
Enonic XP Documentation

Release 6.4.3

Enonic AS

November 11, 2016

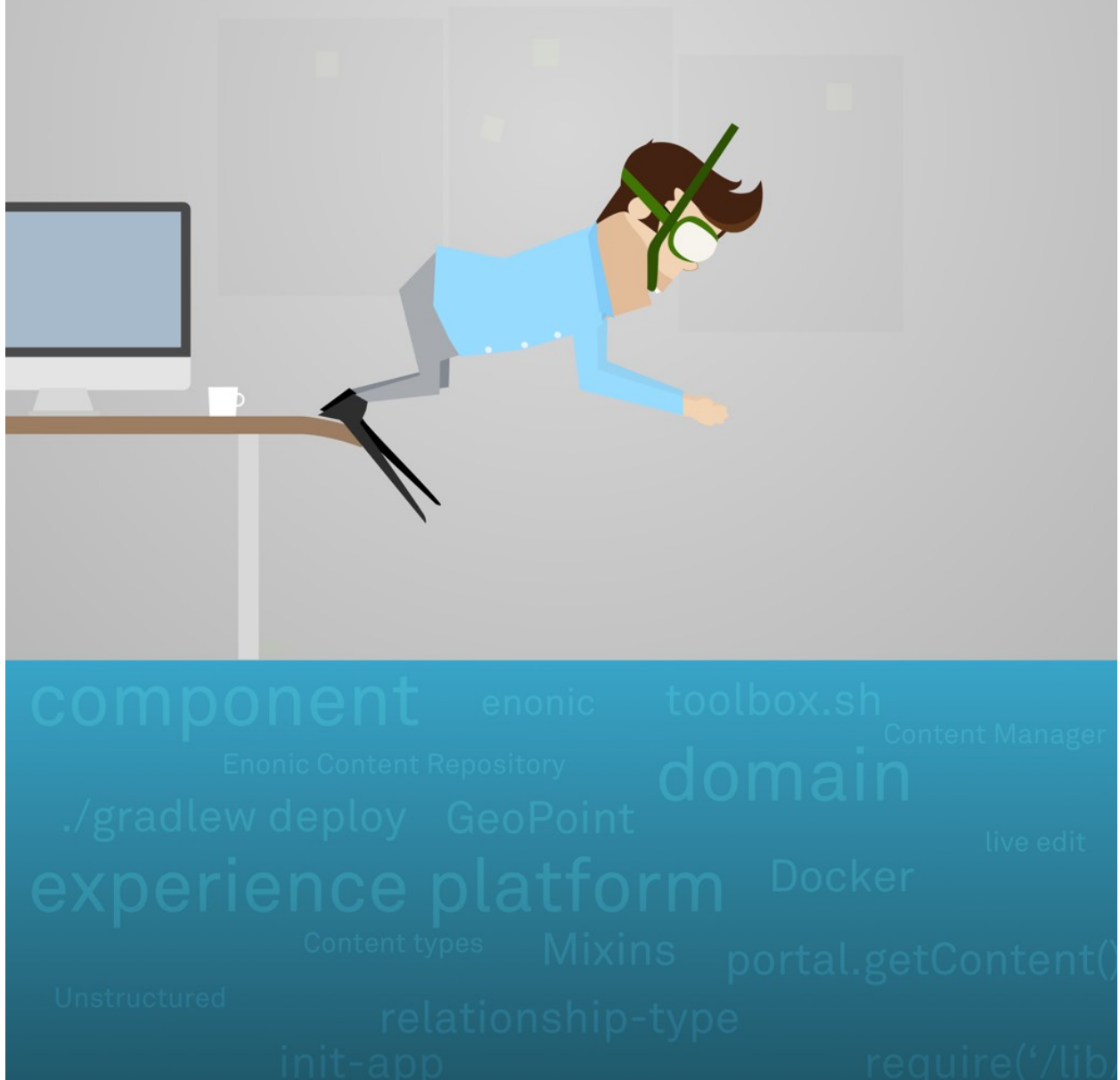
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Congratulations - you've found the official Enonic XP 6.4 documentation. We really hope you like our technology and use it to build amazing things :-).

We've put together some funky documentation - for installation check out [Getting Started](#) or move on to the [Tutorials](#). The more savvy will probably enjoy our [API and Reference Guide](#).

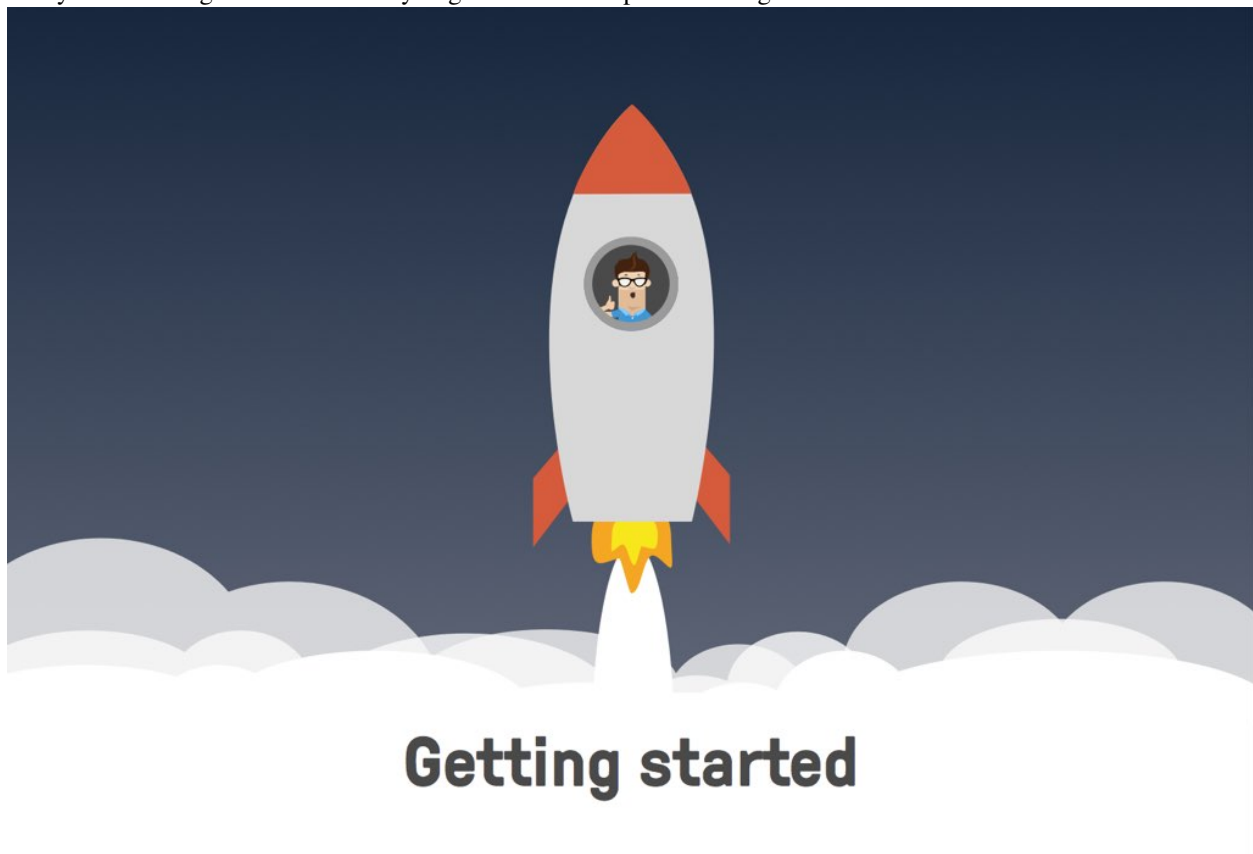
Enjoy! - *The Enonic Development Team*

Dive into our DOCUMENTATION



Getting Started

So - you're looking for the fastest way to get Enonic XP up and running?



Select **ONE** of the options below to get going:

1.1 Use Enonic Cloud

Enonic Cloud is a one-stop-shop hosted version of Enonic XP, available on demand.

Complete the following steps:

- [Request Free Cloud Trial](#)
- [Log In](#)
- [Superhero Blog](#)
- [Next Steps](#)

1.1.1 Request Free Cloud Trial

We're offering a time limited free trial - running your very own cloud instance of Enonic XP. All you need to do is:

- Request a [Free Cloud Trial of Enonic XP](#)

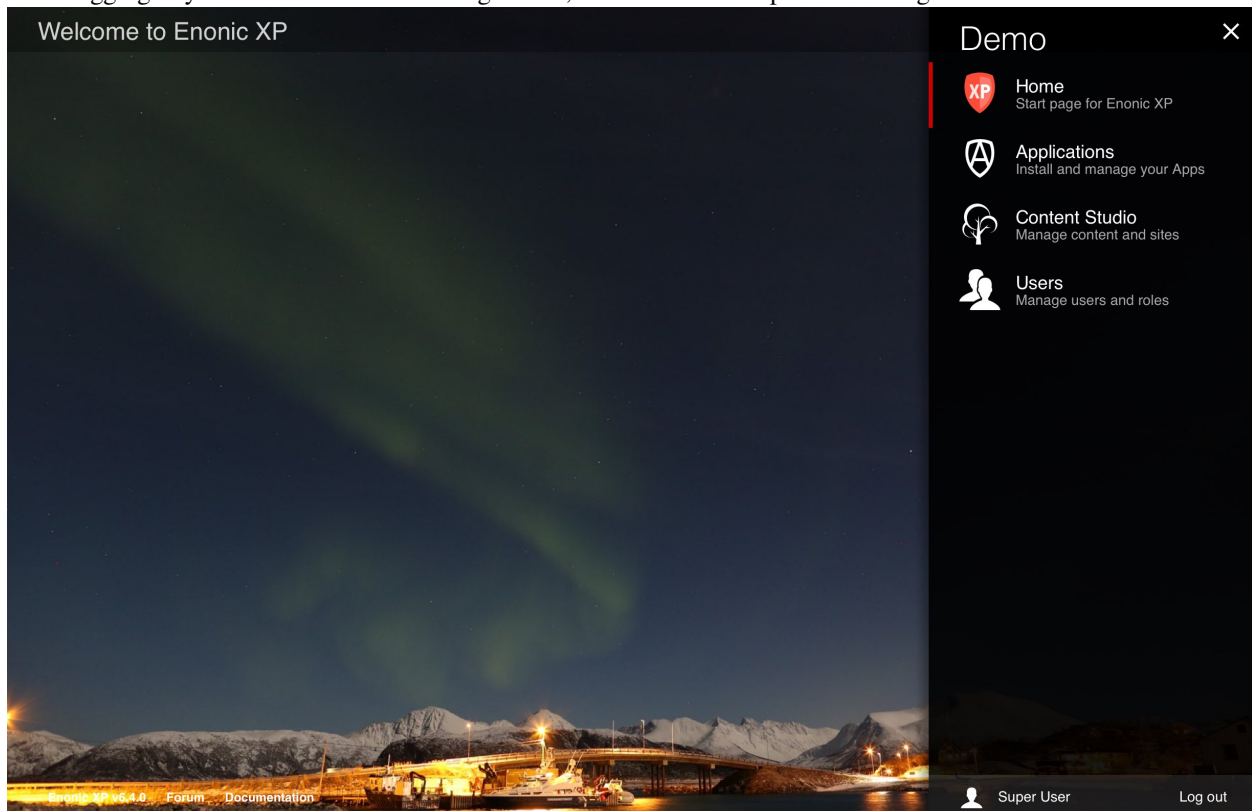
Note: Enonic also offers paid cloud instances, ranging from “Developer Cloud” to “Platium Cloud”. [Check out our offerings](#)

1.1.2 Log In

After requesting a Trial, you should receive an informative e-mail about your installation.

- Click the link in your e-mail to reach the administrative interface, it should be in the following form:
`http://<my-email-com>.tryme.enonic.io`
- Log in with username `su` and password `password`.

After logging in you should see the following screen, with the launcher panel to the right:



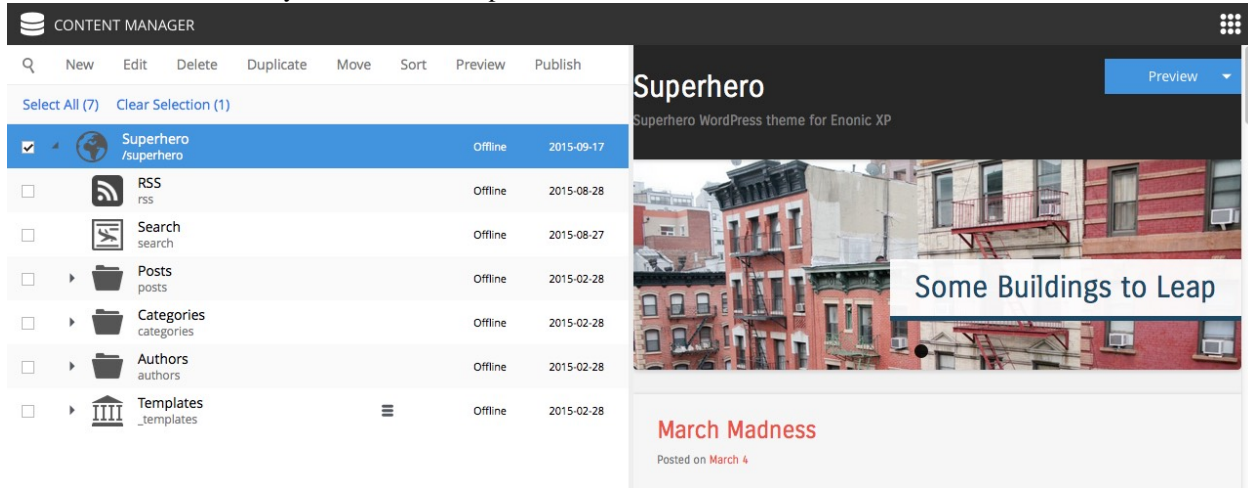
1.1.3 Superhero Blog

For your enjoyment, we've created the Superhero Blog application and pre-installed it on the trial instance.

This is a simple blog, basically emulating Wordpress - even using one of their nice themes. Follow these steps to try it out:

Start blogging

- Open the Launcher panel (top right)
- Select the “Content Studio” tool
- Once it has loaded, you will find the superhero site and all it's content there



Watch Video

Watch this video to learn more about the Superhero Blog Application, and the Content Studio tool:



1.1.4 Next Steps

Congratulations on getting started :-)

If you're ready for some more fun, we recommend looking into the following:

- Browse [Enonic Market](#) for more
- Watch the [Platform Video](#)
- Hook up with the community on [our forum](#)
- Build your first Application with [My First App](#)
- More about [Sites](#)

1.2 Install on my Computer

This section describes how to install Enonic XP on your own computer. If you have any problems, please look at our [Troubleshooting](#) section.

Note: General Requirements

- Any OS supporting Java (Mac, Linux, Windows etc)
 - Java JDK 1.8 (update 40 or newer)
 - At least 1 GB of available memory
 - HTTP port 8080 should be available (this can be changed if needed, see [Configuration](#))
-

1.2.1 Install Java

Warning: To run Enonic XP, you need Java Development Kit (JDK) 1.8.40 JDK or newer.

Check JDK Version

If you're not sure what JDK version you have (or even if you have one), run the following in your terminal/shell:

```
javac -version
```

This should produce a response such as: "javac 1.8.0_60"

Having problems with your existing Java installation? Check out our [Troubleshooting Java](#) documentation.

Optionally Install Java

If it turns out you're on the wrong java version, follow these steps

- Download it from <http://www.oracle.com/technetwork/java/javase/downloads/index.html>

The screenshot shows the Oracle Technology Network (OTN) website. The main navigation bar includes links for Products, Solutions, Downloads, Store, Support, Training, Partners, and About. The breadcrumb trail indicates the path: Oracle Technology Network > Java > Java SE > Downloads. The left sidebar lists various Java products and support options. The main content area is titled 'Java SE Downloads' and features two download buttons: 'Java Platform (JDK) 8u60' and 'NetBeans with JDK 8'. A red arrow points to the 'Click here' text above the Java logo download button. The right sidebar lists various Java SDKs and Tools, Java Resources, and Java APIs.

- Follow the instructions for your respective operating system

1.2.2 Download Enonic XP

Enonic XP is available in a simple universal distribution file - running on all platforms (Windows, Linux, OSX etc)

- [Download Enonic XP distribution](#)
- Unzip the file to a suitable location

Command-line version (OSX/Linux only):

```
curl -O http://repo.enonic.com/public/com/enonic/xp/distro/6.4.3/distro-6.4.3.zip
unzip distro-6.4.3.zip
cd enonic-xp-6.4.3
```

Next - let's get the server started

1.2.3 Start the server

Now that the software has been downloaded, you're ready to start the server - start the respective file from command line.

Linux and OS X:

```
[XP Installation Folder]/bin/server.sh
```

Windows:

```
[XP Installation Folder]\bin\server.bat
```

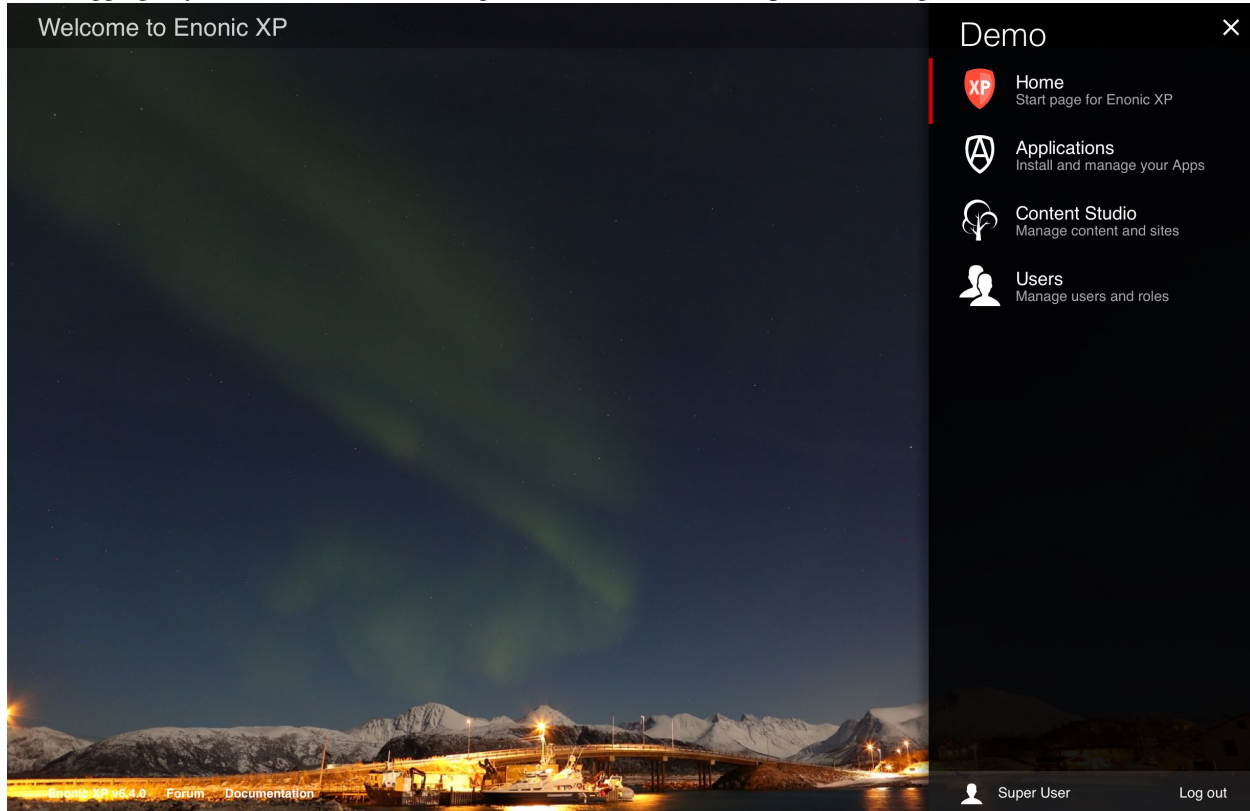
This will start Enonic XP. When successfully started, the following will appear at the end of the log:

```
12:53:14.302 INFO c.e.x.l.framework.FrameworkService - Started Enonic XP in 7378 ms
```

1.2.4 Log In

- Point your browser to `http://localhost:8080`
- Log in with username `su` and password `password`.

After logging in you should see the following screen, with the launcher panel to the right:

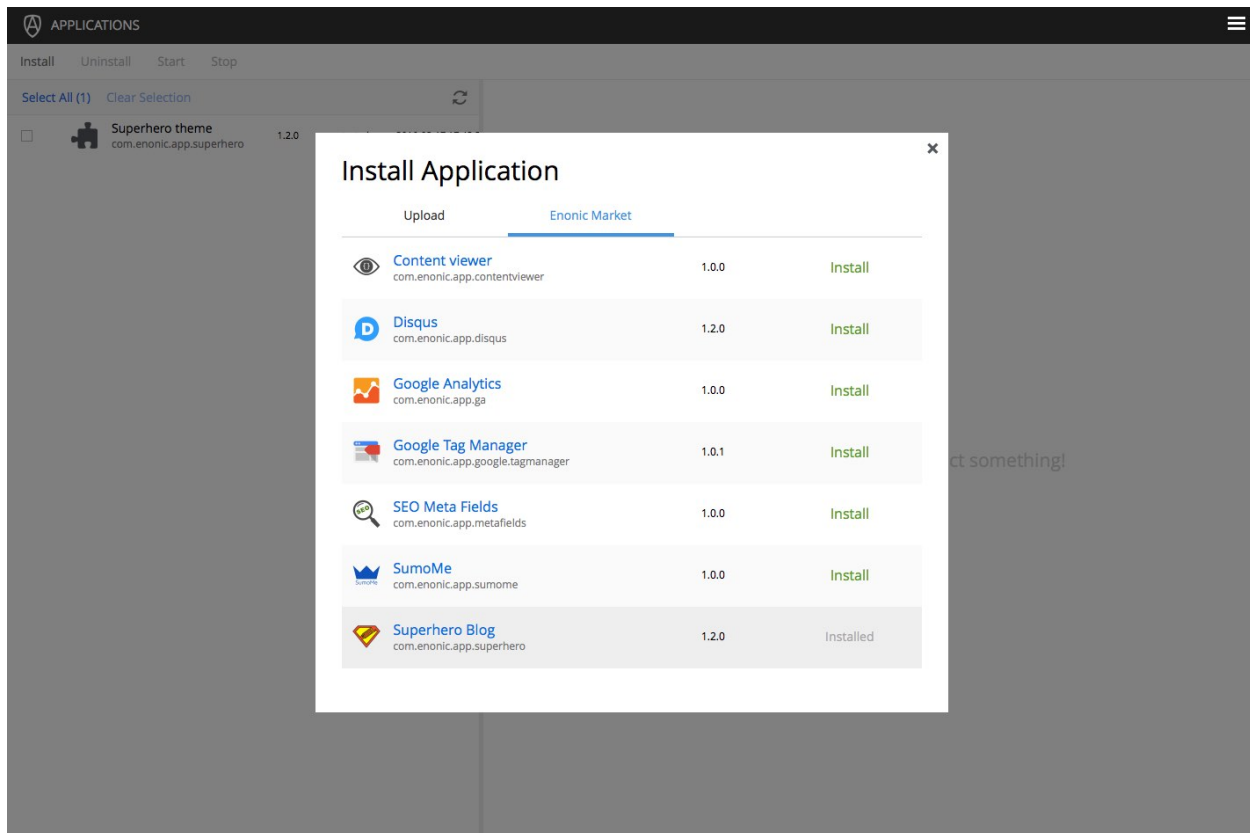


1.2.5 Install Superhero Blog

This is a simple blog, basically emulating Wordpress - even using one of their nice themes. Follow these steps to try it out:

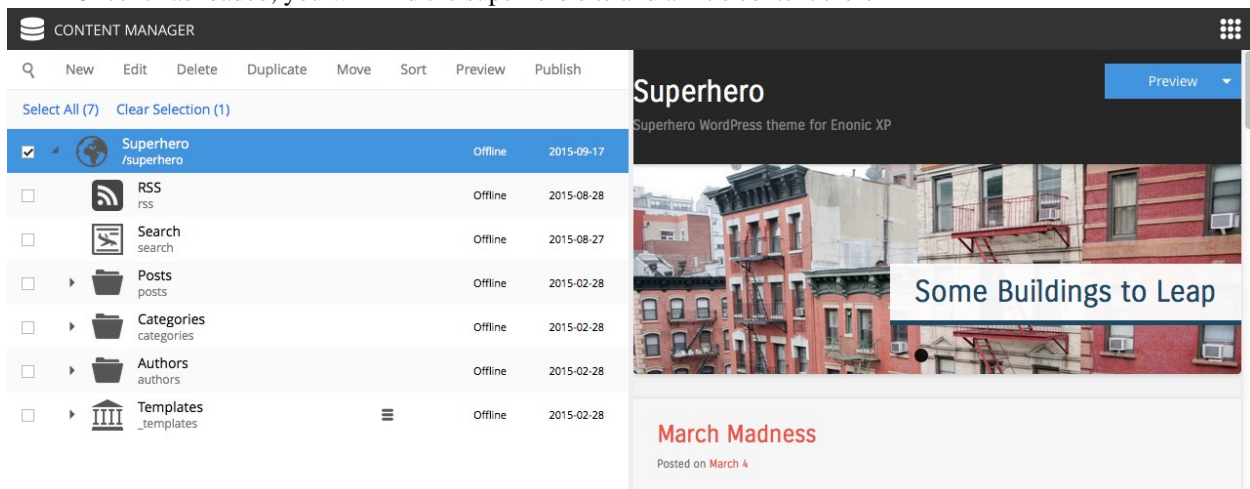
Install from Market

- Open the *Applications* tool from the launcher panel to the right
- Click *Install* from the menu (top left)
- Select *Enonic Market* from the dialogue
- Browse to the application named “Superhero Blog” and click *Install*



Start blogging

- Open the Launcher panel (top right)
- Select the “Content Studio” tool
- Once it has loaded, you will find the superhero site and all it’s content there



Watch Video

Watch this video to learn more about the Superhero Blog Application, and the Content Studio tool:



1.2.6 Next Steps

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- Build your first Application with [My First App](#)
- More about [Sites](#)

1.3 Install with Docker

We're huge devop fans - and devops love [Docker](#). Docker is the most popular application container platform in the world. For your convenience, we build Docker images of every Enonic XP release.

**Complete the following steps:**

- [Install Docker](#)
- [Start Server](#)
- [Log In](#)
- [Install Superhero Blog](#)
- [Next Steps](#)

1.3.1 Install Docker

Running Enonic XP with Docker actually requires access to a Docker container - now, that's a surprise!

Note: Docker version 1.8.1 or newer is required to complete this guide

If you don't already have a Docker up and running, we recommend reading the brilliant documentation on how to get started with Docker:

- [Docker for Windows](#)
- [Docker for OSX](#)
- [Docker for Linux](#)

1.3.2 Start Server

Launch Enonic XP on Docker

With Docker up and running, installing Enonic XP is as smooth as baby skin. Execute the commands below in your terminal/shell to get going.

- Create a storage container for configuration files, applications and data (XP_HOME)

```
docker run -it --name xp-home enonic/xp-home
```

- Install and start Enonic XP, mounting the xp-home volume

```
docker run -d -p 8080:8080 --volumes-from xp-home --name xp-app enonic/xp-app
```

This will download the latest stable Enonic XP image, start it, and map it to port 8080 on your docker-host. You can optionally add `:<versionnumber>` at the end of the command to launch a specific version of Enonic XP - i.e.

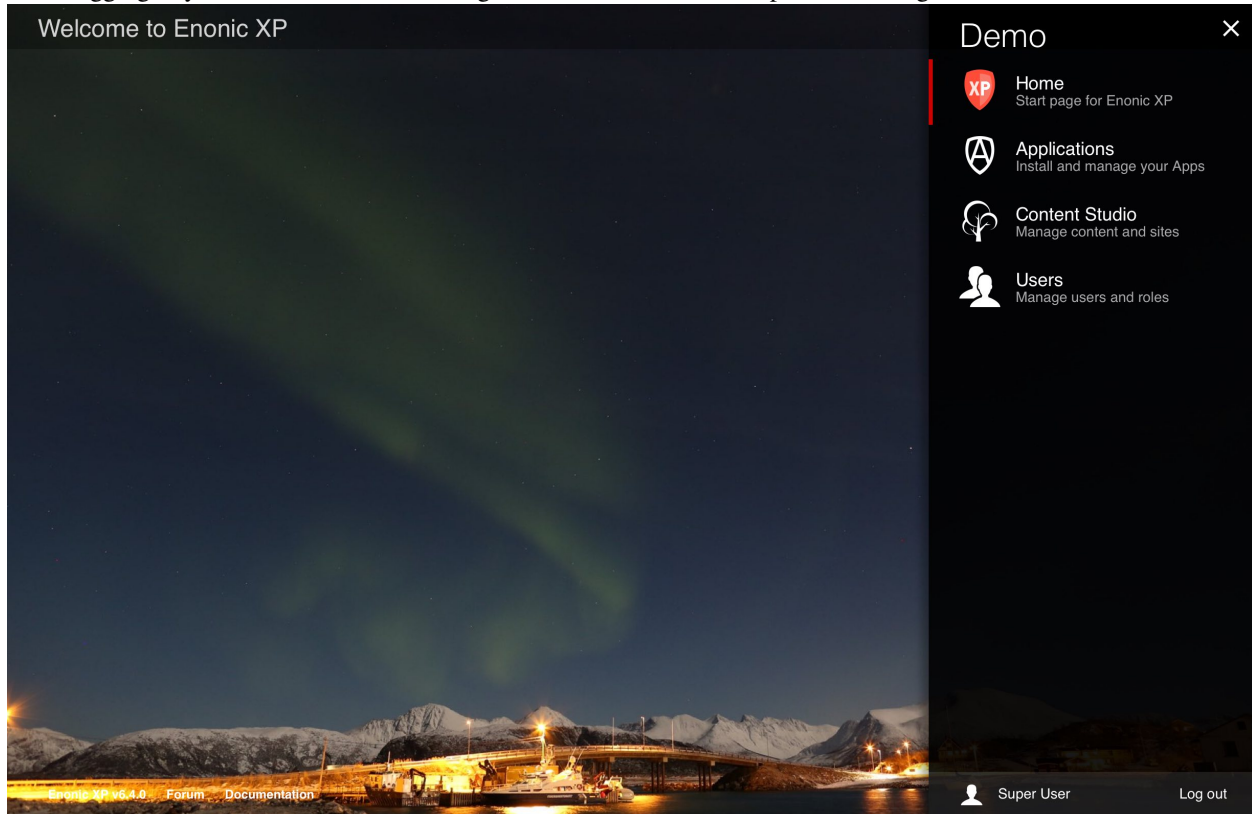
```
docker run -d -p 8080:8080 --volumes-from xp-home --name xp-app enonic/xp-app:6.4
```

Check out our [Project page at Docker Hub](#) for more info.

1.3.3 Log In

- Point your browser to `http://<mydockercontainer>:8080`
- Log in with username `su` and password `password`.

After logging in you should see the following screen, with the launcher panel to the right:

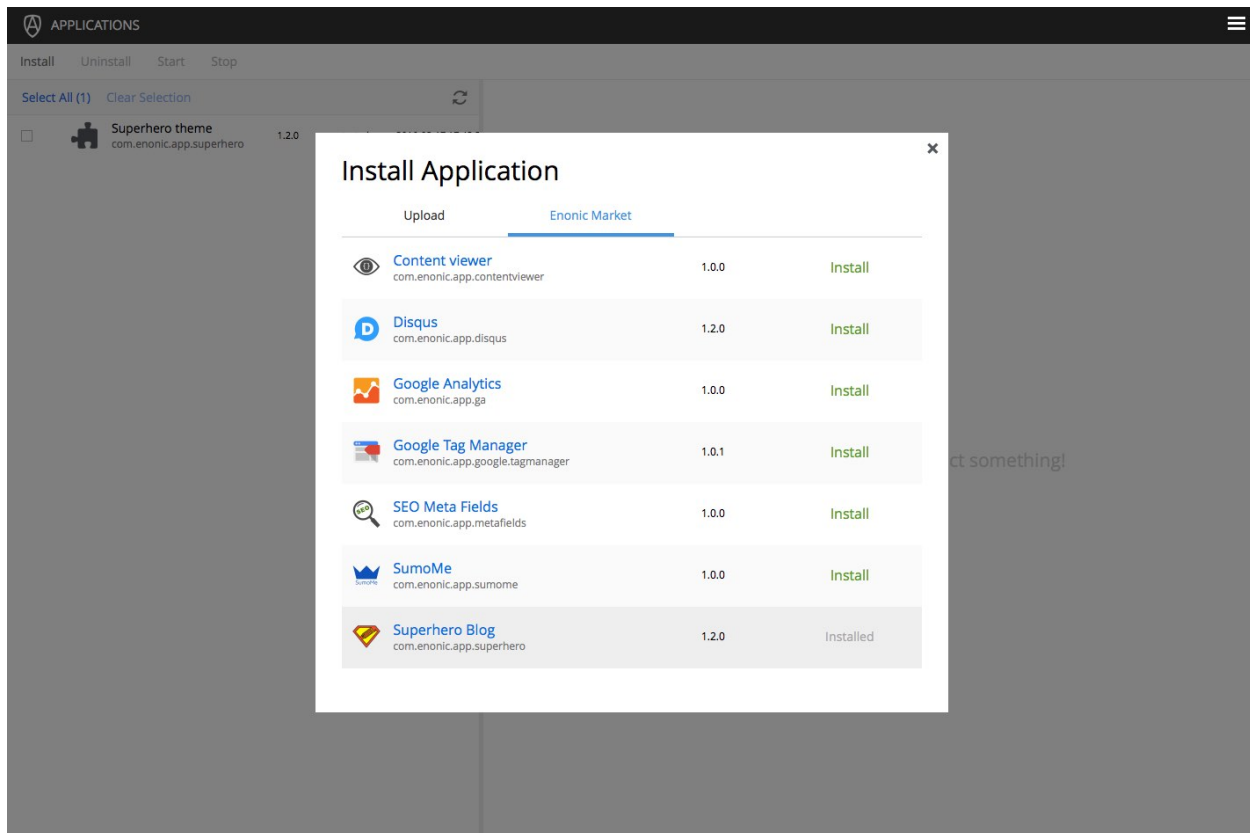


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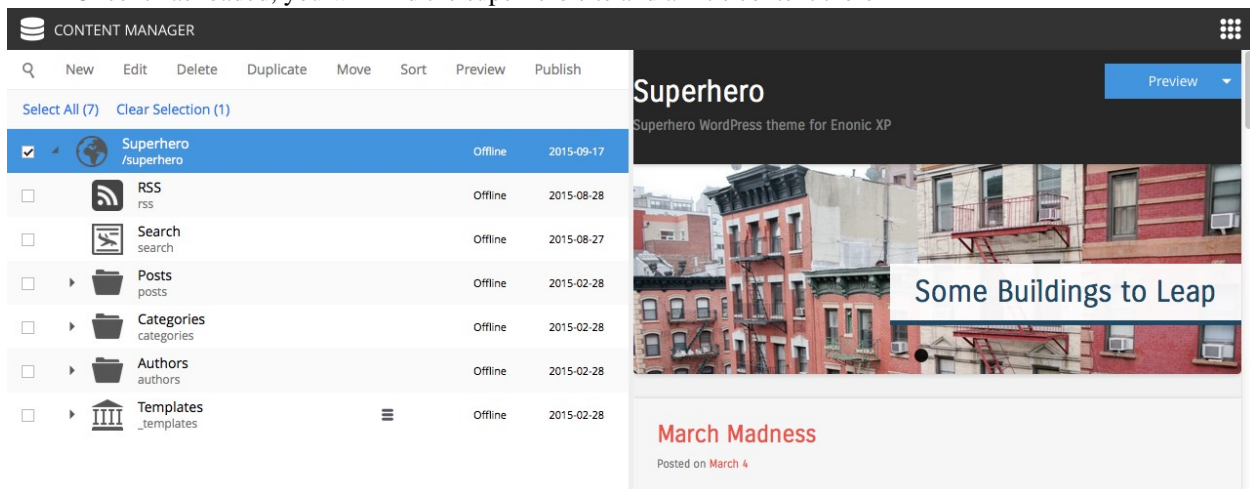
Install from Market

- Open the *Applications* tool from the launcher panel to the right
- Click *Install* from the menu (top left)
- Select *Enonic Market* from the dialogue
- Browse to the application named “Superhero Blog” and click *Install*



Start blogging

- Open the Launcher panel (top right)
- Select the “Content Studio” tool
- Once it has loaded, you will find the superhero site and all it’s content there



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- More about [Sites](#)

Ready to learn something new? Well you've come to the right place!

You will find our tutorials below.

2.1 XP Installation (Video)

This video demonstrates how to install Enonic XP on your local computer.

Here are some resources related to installation and hosting of Enonic XP

- *Install on my Computer*
- *Operations Guide*
- *Install as service*
- *Clustering*
- *Monitoring*
- *Backup and Restore*

2.2 Project Init (Video)

This video demonstrates how to initialize a new application project using existing project or starter kits

Here are some additional resources related to application development

- *Developer Guide*
- *Projects*
- *Libraries*

2.3 Javascript MVC (Video)

This video demonstrates how to build site html parts using Javascript as controller and Thymeleaf as view technology.

Here are some resources related to site development

- *Sites*

- [Content Types](#)
- [Views](#)
- [Part](#)

2.4 My First App

This guide will lead you through the required steps to build the “Hello World” app for Enonic XP.

In this tutorial, you will learn how to initialize new application projects and deploy them. We will create a simple website that displays a list of countries and cities with a Google map of each city. Upon completion, you will be familiar with content types, page and part components, page templates, regions, and the Content Studio app. You won’t be writing any code - just copy/paste from the examples.

The screen-shots below show the final product of this tutorial.

Note: To complete this tutorial, you will need a local running installation (see [Install on my Computer](#)) of Enonic XP and a text editor of your choice. All terminal actions assume you’re using OSX or Linux.

2.4.1 Initialize project

Enonic XP includes the [Toolbox CLI](#) which can perform several useful operations. The [init-project](#) operation will clone an existing project from a repository source, such as [GitHub](#). The starter-vanilla project will initialize a new application with the standard structures required (see [Projects](#)).

1. Create a new folder at a suitable location on your filesystem for the application project files. e.g. `/Users/<username>/projects/myapp` This will be the project root.
2. Change directory in the terminal to this project root.
3. Run the following command, replacing `[$\text{\$XP_INSTALL}$]` with the path to your unzipped XP installation:

```
[ $\text{\$XP\_INSTALL}$ ]/toolbox/toolbox.sh init-project -n com.company.myapp -r starter-vanilla -c 1.0.0
```

Tip: Only basic characters (a-z, 0-9 and .) must be used for application names, and the name must be globally unique. We recommend following standard Java package naming conventions such as `com.mycompany.myapp`.

Your project folder will now be filled with the standard folder structure for developing an app.

2.4.2 Build and Deploy

Now that we have set up a project, we should test that it builds and deploys successfully. But before deploying the app, the `$\text{\$XP_HOME}$` environment variable must be set to the path of the home folder of the XP installation.

1. Run the following command in the terminal, replacing `[$\text{\$XP_INSTALL}$]` with your installation location (no brackets):

Linux and OSX:

```
export XP_HOME=[XP Installation Folder]/home
```

Windows:

```
set XP_HOME=[XP Installation Folder]/home
```

2. Execute the following command (from the project root directory):

Linux and OSX:

```
./gradlew deploy
```

Windows:

```
gradlew deploy
```

The included [Gradle](#) wrapper will build the app and then attempt to deploy it to your installation.

The deployment step simply moves the result of the build (the application JAR file) into the `$XP_HOME/deploy` directory. From there, Enonic XP will detect, install and start the application automatically.

You will need to access the Administrative console to check that the app has installed and started.

3. Log in to the Administrative console (<http://localhost:8080>) with the Administrative user credentials (userid **su** and password **password**).
4. Navigate to the Applications Tool. The application you just deployed should be listed here.
5. Click the app called “Myapp” to see information about it and confirm that it has started.

Note: You can change the display name of the application by editing the `gradle.properties` file.

2.4.3 Create the Hello World Site

Our next goal is to set up a “Hello World” site in Content Studio, but first we must add some initial configuration to our project.

Site descriptor

An application can serve many purposes and building sites is just one of them. The `site.xml` file is the descriptor that will let Enonic XP know that this app can be added to a site. Site-wide configurations can be defined in this file but we will leave the `config` element empty for now (see [Site Descriptors](#)).

A basic `site.xml` file was automatically created by the `init-project` script:

```
[project-root]/src/main/resources/site/site.xml
```

Note: All of the files we will be working with are below the “site” directory in the project folder - `src/main/resources/site`. All file paths from now on will begin with “site/”.

Page Component

Page components are the most basic building blocks of websites in Enonic XP (see [Page](#)). They require a JavaScript controller and optionally an XML descriptor and an HTML view. This first example does not need a descriptor file.

A page controller (see [Page](#)) is a JavaScript file that handles requests such as GET and POST. Controllers usually pass data in the form of a JavaScript object to be dynamically rendered in an HTML view. No data is passed in the example below, but the view file is specified and rendered as static HTML.

1. Create a folder called `hello` inside the `site/pages` directory.
2. Create the page controller and page view files specified below inside the `hello` folder:

Listing 2.1: Hello page controller - `site/pages/hello/hello.js`

```
var thymeleaf = require('/lib/xp/thymeleaf'); // Import the thymeleaf render function

// Handle the GET request
exports.get = function(req) {

  // Specify the view file to use
  var view = resolve('hello.html');

  // Render HTML from the view file
  var body = thymeleaf.render(view, {});

  // Return the response object
  return {
    body: body
  }
};
```

The view below is a simple HTML file. This file will be updated later to handle dynamic content.

Listing 2.2: Hello page view - `site/pages/hello/hello.html`

```
<!DOCTYPE html>
<html>
  <head>
    <title>Hello world</title>
  </head>
  <body data-portal-component-type="page">
    <h1>Hello world</h1>
  </body>
</html>
```

3. Once these files are in place, redeploy the app from the terminal with `./gradlew deploy`.


Tip: Each page controller must reside in its own folder under the `site/pages` directory. The name of the controller JavaScript file must be the same as the directory that contains it. The HTML view file can reside anywhere in the project and have any valid file name. This allows view files to be shared between components.

Create Site

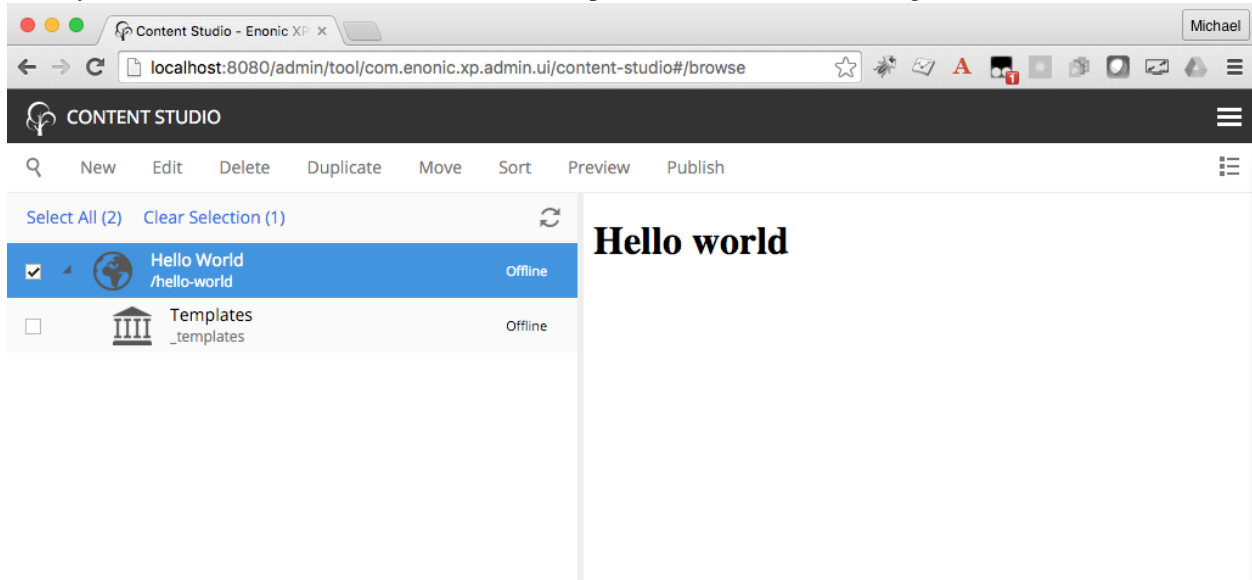
Now that the files are in place, we can create the site in a browser using the Content Studio admin tool. Switch between

different tools by clicking the menu icon  (top right) to open the Launcher panel.

1. In your browser, navigate to the Content Studio tool. (Use the menu icon at the top right)
2. Click “New” and select “Site” from the list of content types (Opens a tab for editing the new site).
3. Fill in the form with Display Name: “Hello World”.
4. Select your “MyApp” application in the “Applications” dropdown.

5. If you don't see a blue area on the right of the page then click this button  in the toolbar to open the Page Editor.
6. Use the dropdown in the Page Editor (blue area) to select the "hello" page.
7. Click the "Save draft" button in the toolbar (top-left).
8. Now close the "Hello World" site editor tab to see the content pane.

When you click on the "Hello World" site content, the preview should look something like this:



2.4.4 Add some Countries

In order to make our "World" slightly more interesting, we need some data - or more specifically countries.

To add structured data (such as countries), we need so-called *Content Types*. The content type defines the form (and underlying schema) of items you manage.

1. Create a folder called "country" inside the "content-types" folder of your project.
2. Add the Country content type file below to this folder.

Listing 2.3: Country content type - site/content-types/country/country.xml

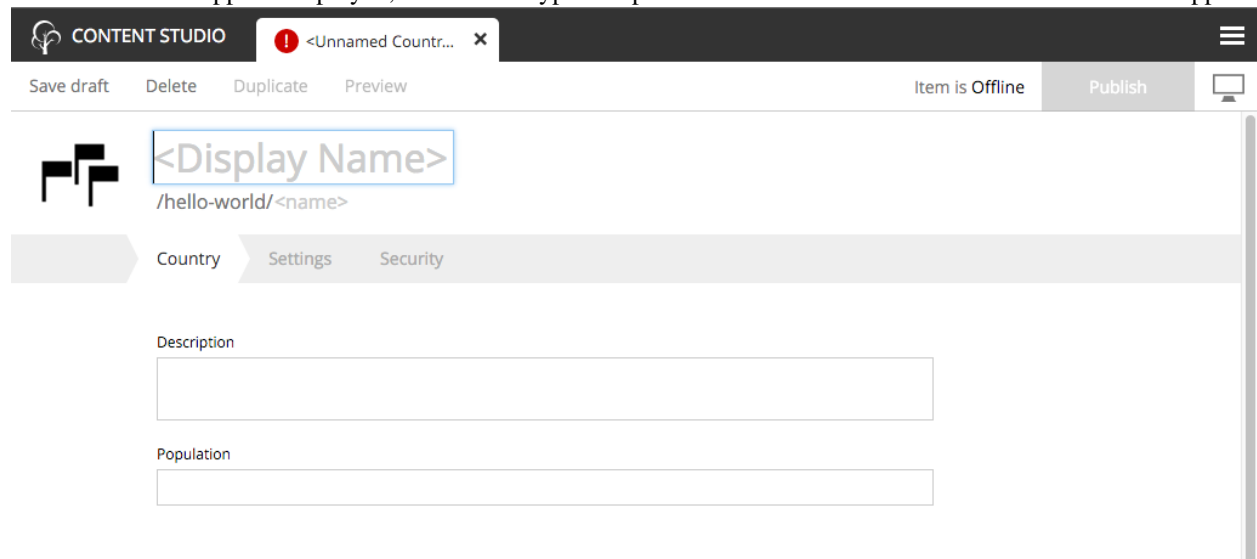
```
<content-type>
  <display-name>Country</display-name>
  <super-type>base:structured</super-type>
  <form>
    <input type="TextArea" name="description">
      <label>Description</label>
      <occurrences minimum="0" maximum="1"/>
    </input>
    <input type="TextLine" name="population">
      <label>Population</label>
      <occurrences minimum="0" maximum="1"/>
    </input>
  </form>
</content-type>
```

Each content type can have a custom icon that will be visible in the Content Studio interface. Though not required, content icons can be helpful for content editors.

3. Copy the image below to the the same folder (content-types/country) with the name *country.png*.



This content type defines form inputs for **description** and **population**. Every content has a built-in field for **Display Name**. When the app is redeployed, this content type will produce the form seen below in the Content Studio app.



Tip: Each content type must reside in its own folder under the `site/content-types` directory. The name of the content type XML file and the icon PNG file must be the same as the directory that contains them.

2.4.5 Create the Country Part

We also need a way to present a country - because every country wants to be seen. This time, rather than just making another page controller, we will create a *Part* component. Parts are reusable components that can be added to pages containing “regions” - more on this later.

1. Create a folder called “country” inside the “parts” folder in your project.
2. Add the part **controller** and **view** files below to the “country” folder:

Listing 2.4: Country part controller - `site/parts/country/country.js`

```
var portal = require('/lib/xp/portal'); // Import the portal functions
var thymeleaf = require('/lib/xp/thymeleaf'); // Import the Thymeleaf rendering function

// Handle the GET request
```

```

exports.get = function(req) {

    // Get the country content as a JSON object
    var content = portal.getContent();

    // Prepare the model object with the needed data from the content
    var model = {
        name: content.displayName,
        description: content.data.description,
        population: content.data.population
    };

    // Specify the view file to use
    var view = resolve('country.html');

    // Return the merged view and model in the response object
    return {
        body: thymeleaf.render(view, model)
    }
};

```

The part controller file above handles the GET request and passes the country content data to the view file which is shown below.

Listing 2.5: Country part view - site/parts/country/country.html

```

<div>
    <h3 data-th-text="${name}"></h3>
    <div data-th-if="${population}" data-th-text="'Population: ' + ${population}"></div>
    <div data-th-if="${description}" data-th-text="${description}"></div>
</div>

```

2.4.6 The Hello Region Page

Parts start to make sense when placed into a *region*. Regions are “slots” contained within pages or layouts. Pages and layouts may contain multiple regions, and each region must have a unique name.

Let’s create a new page component with a single region called “Main”. We will later place the “Country” part into this region.

The benefit of a region (see *Regions*) is that a page component can be re-used across multiple different pages by simply adding different parts to them as needed.

1. Create a folder called “hello-region” in your project’s site/pages/ folder.
2. Add the “Hello region” page descriptor, controller and view files:

Listing 2.6: Page descriptor - site/pages/hello-region/hello-region.xml

```

<page>
    <display-name>Hello Region</display-name>
    <config/>
    <regions>
        <region name="main"/>
    </regions>
</page>

```

The XML file above is a *Descriptor*. Regions and page configurations can be defined here.

Listing 2.7: Page controller - site/pages/hello-region/hello-region.js

```
var portal = require('/lib/xp/portal'); // Import the portal functions
var thymeleaf = require('/lib/xp/thymeleaf'); // Import the Thymeleaf rendering function

// Handle the GET request
exports.get = function(req) {

    // Get the content that is using the page
    var content = portal.getContent();

    // Extract the main region which contains component parts
    var mainRegion = content.page.regions.main;

    // Prepare the model that will be passed to the view
    var model = {
        mainRegion: mainRegion
    }

    // Specify the view file to use
    var view = resolve('hello-region.html');

    // Render the dynamic HTML with values from the model
    var body = thymeleaf.render(view, model);

    // Return the response object
    return {
        body: body
    }
};
```

This page controller uses a portal library (see `lib-portal` in *Javascript Libraries*) to get the content and extract the “main” region which was defined in the descriptor XML file.

Listing 2.8: Page view - site/pages/hello-region/hello-region.html

```
<!DOCTYPE html>
<html>
<head>
    <title>Hello world</title>
</head>
<body data-portal-component-type="page">
    <h1>Country</h1>
    <div data-portal-region="main">
        <div data-th-if="{mainRegion}" data-th-each="component : {mainRegion.components}" data-th-
            <div data-portal-component="{component.path}" data-th-remove="tag"></div>
        </div>
    </div>
</body>
</html>
```

The view file above defines the place on the page where the region will render component parts that are dragged and dropped in the Page Editor.

3. When done - redeploy your app once again!

```
./gradlew deploy
```


Tip: You can restart XP in *Development mode* and then the app won't have to be redeployed after making changes.

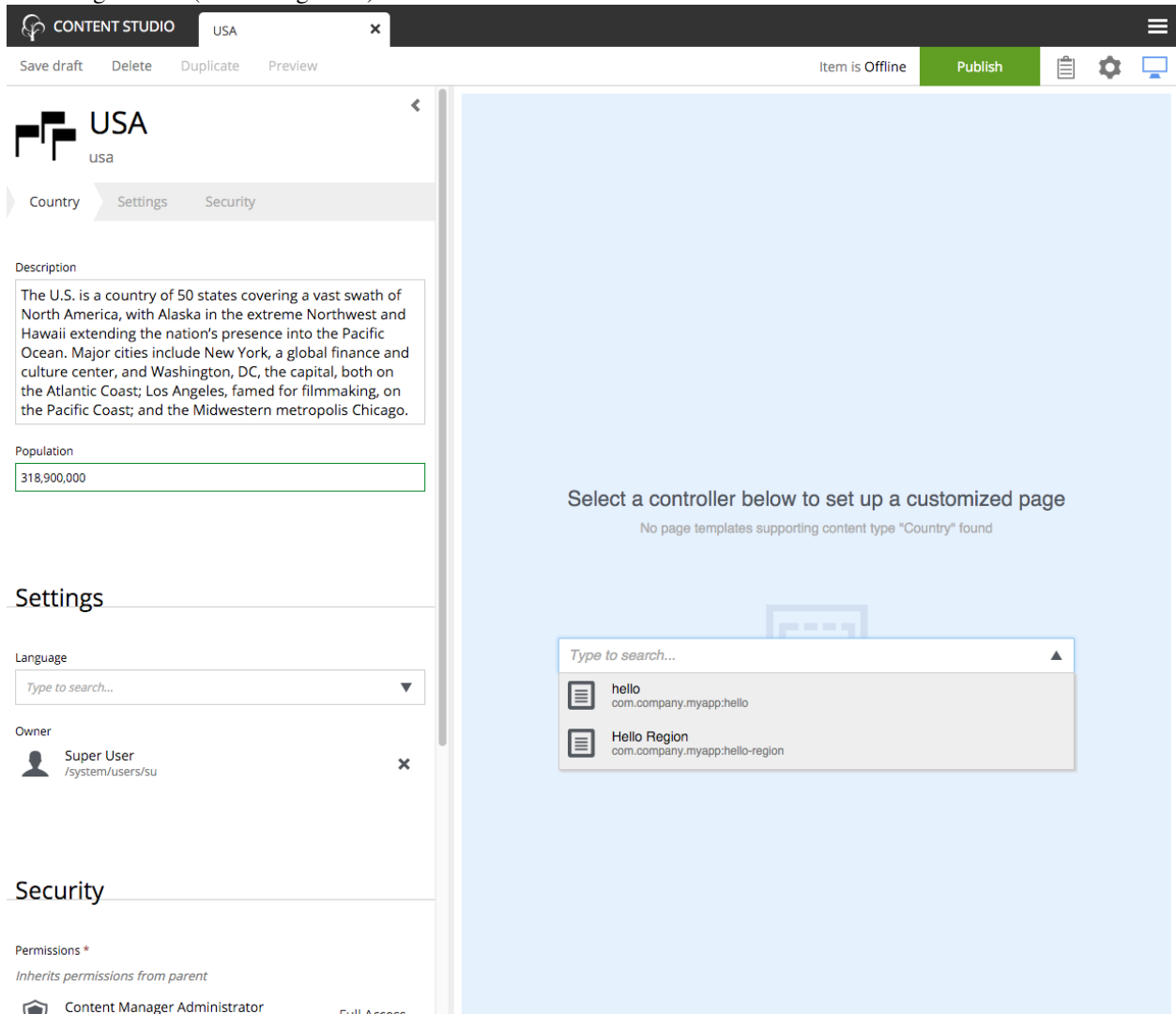
2.4.7 Add your favorite country

Now that the “Country” content type is installed (and we have a part to display them), we can create new countries using the Content Studio interface.

1. Right-click on the “Hello World” site from the navigation tree and select “New”. The “Create Content” dialogue will open.
2. Click “Country” from the list of content types.
3. Fill in the form with the details of your favorite country.

Similar to the site, we must also configure a view for the country

4. In the toolbar, in the top right corner of the page, click the button with the monitor icon  to activate the Page Editor (blue background).



The screenshot shows the Content Studio interface for a content item named 'USA' of type 'Country'. The left sidebar contains the following sections:

- Description:** The U.S. is a country of 50 states covering a vast swath of North America, with Alaska in the extreme Northwest and Hawaii extending the nation's presence into the Pacific Ocean. Major cities include New York, a global finance and culture center, and Washington, DC, the capital, both on the Atlantic Coast; Los Angeles, famed for filmmaking, on the Pacific Coast; and the Midwestern metropolis Chicago.
- Population:** 318,900,000
- Settings:** Language dropdown set to 'Type to search...'
- Owner:** Super User (/system/users/su)
- Security:** Permissions section showing 'Inherits permissions from parent' and 'Content Manager Administrator' with 'Full Access'.

The main area is a blue background with the text 'Select a controller below to set up a customized page' and 'No page templates supporting content type "Country" found'. A search box is open, showing results for 'hello' and 'Hello Region' controllers.

5. In the Page Editor, select “Hello Region” from the template selector dropdown. If the dropdown arrow is not visible, double-click inside the option field or start typing “hello world” in it to see the options.



6. Click the cog button to open the Inspection Panel (far right).
7. In the Inspection Panel, click the “Insert” tab. This reveals a list of default components that can be placed into regions.



8. Click and drag the “Part” into the box on the page.
9. A new dropdown option will appear. Select the “country” part.
10. Save draft and close the content edit tab.

When you click on the country in the content pane, you should see a preview of the rendered page, something like this:

The screenshot shows the Content Studio interface. On the left, there is a list of content items:

Selection	Icon	Name	Status	Last Modified
<input type="checkbox"/>		Hello World /hello-world	Offline	2016-02-19
<input checked="" type="checkbox"/>		USA usa	Offline	2016-02-20
<input type="checkbox"/>		Templates _templates	Offline	2016-02-19

On the right, the preview of the 'Country' page is shown. The title is 'Country'. Below it, the section 'USA' is displayed. The content includes the population (318,900,000) and a description of the U.S. as a country of 50 states covering a vast swath of North America, with Alaska in the extreme Northwest and Hawaii extending the nation's presence into the Pacific Ocean. Major cities include New York, a global finance and culture center, and Washington, DC, the capital, both on the Atlantic Coast; Los Angeles, famed for filmmaking, on the Pacific Coast; and the Midwestern metropolis Chicago.

2.4.8 The Country Page Template


With our current solution, sadly, we would have to create a new page for every country we add. As this is not a very effective way of working with large data sets, we will create a page template that will automatically render all country content.



1. Select the Templates item located below the “Hello World” site in the content pane.
2. Click “New” and select “Page Template”.
3. Fill in the form as follows:
 - Display Name: “Country”
 - Supports: “Country” (selected from the list of content types)



4. If the blue Page Editor panel is not displayed on the right, click the button in the toolbar.
5. Select the “Hello Region” controller with the dropdown in the blue Page Editor panel.

6. Open the Inspection Panel (activated from the cog button  in the toolbar).

7. Under the “Insert” tab, drag and drop a “Part”  into the empty region where it says “Drop here”.

8. Select the “country” part from the dropdown.

9. Click “Save draft” in the toolbar and close the tab.

Every “Country” content you create will now use this template by default.

Tip: The “Support” property is the key. A page template will support rendering of the content types specified here.

Try this out by creating a few new countries in your site. Be aware that every content you create will be a child of the content that was selected in the content pane, so make sure you select the “Hello World” site before clicking “New” in the toolbar. Or get in the habit of right-clicking the parent content and selecting “New” from the context menu. This way you will never accidentally create a content in the wrong place.

Extra task

Make your Favorite Country use the page template too!

You might remember that your favorite country was “hardcoded” - so let’s change it to use templates as well.

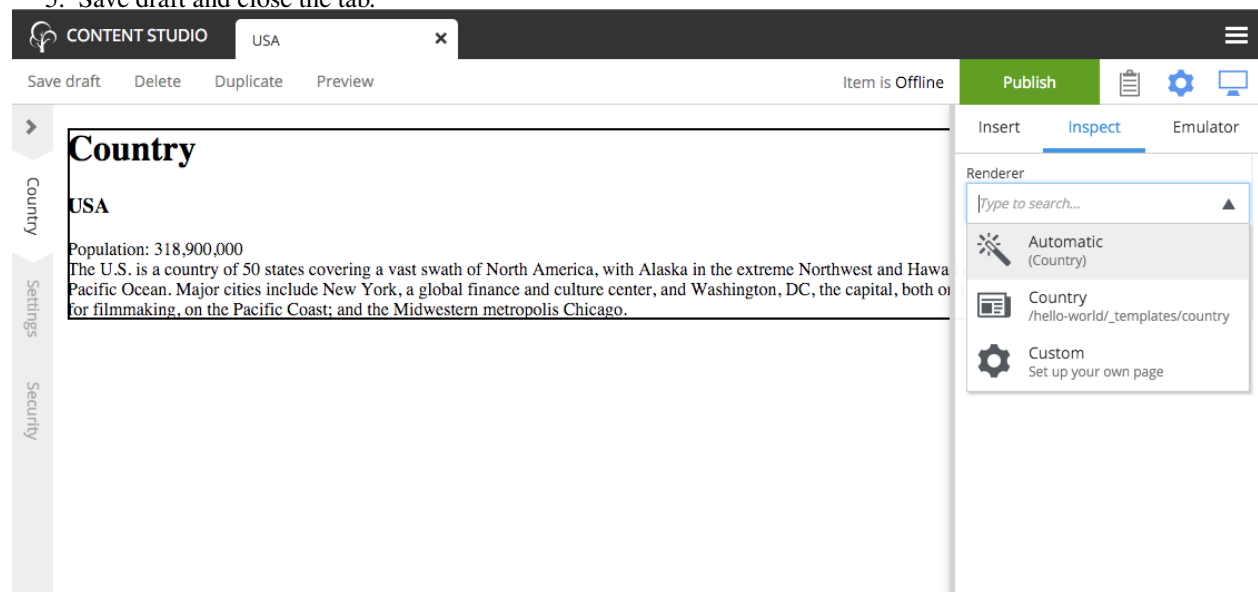
1. In the Content pane, double click the country content to edit it.

2. Open the Inspection Panel  and select the “Inspect” tab if it’s not already selected.

3. You should see a label for “Renderer” with “Custom” selected and a label for “Page controller” with “Hello Region” selected. If you see a label for “Part” instead then click on the page above the country name to select the page. Then click the “Inspect” tab. (See image below)

4. Now select “Automatic” from under the “Renderer” label in the “Inspect” tab.

5. Save draft and close the tab.



The screenshot shows the Enonic XP Content Studio interface. The top bar includes the 'CONTENT STUDIO' logo, a tab for 'USA', and buttons for 'Save draft', 'Delete', 'Duplicate', and 'Preview'. The main content area displays a 'Country' content type with the title 'Country' and subtitle 'USA'. The 'Population' is listed as 318,900,000. The description states: 'The U.S. is a country of 50 states covering a vast swath of North America, with Alaska in the extreme Northwest and Hawaii in the Pacific Ocean. Major cities include New York, a global finance and culture center, and Washington, DC, the capital, both of which are important for filmmaking, on the Pacific Coast; and the Midwestern metropolis Chicago.' The right sidebar shows the 'Inspect' tab selected, with a 'Renderer' dropdown menu open. The dropdown menu lists three options: 'Automatic (Country)', 'Country /hello-world/_templates/country', and 'Custom Set up your own page'. The 'Automatic (Country)' option is currently selected.

You can select another *Page template* at any time, or even customize the presentation of a single content.

2.4.9 The Country List Part

Each country content can now be viewed on a page. But the site home page is still a bit empty. This section will have you alter the “hello” page controller and view files to list all of the country contents.

1. Edit the “hello” page controller `site/pages/hello/hello.js` and replace the file’s contents with the code below:

```
var thymeleaf = require('/lib/xp/thymeleaf'); // Import the thymeleaf render function
var contentLib = require('/lib/xp/content'); // Import the content service functions
var portal = require('/lib/xp/portal'); // Import the portal functions

// Handle the GET request
exports.get = function(req) {
  var model = {};

  var nearestSite = portal.getSite();

  // Get all the country contents (in the current site)
  var result = contentLib.query({
    start: 0,
    count: 100,
    contentTypes: [
      app.name + ':country'
    ],
    "query": "_path LIKE '/content' + nearestSite._path + '/*'"
  });

  var hits = result.hits;
  var countries = [];

  // Loop through the contents and extract the needed data
  for(var i = 0; i < hits.length; i++) {

    var country = {};
    country.name = hits[i].displayName;
    country.contentUrl = portal.pageUrl({
      id: hits[i]._id
    });
    countries.push(country);
  }

  // Add the country data to the model
  model.countries = countries;

  // Specify the view file to use
  var view = resolve('hello.html');

  // Compile HTML from the view with dynamic data from the model
  var body = thymeleaf.render(view, model);

  // Return the response object
  return {
    body: body
  }
};
```

- Now edit the “hello” view file `site/pages/hello/hello.html` and replace its contents with the code below:

```
<!DOCTYPE html>
<html>
<head>
  <title>Hello world</title>
</head>
<body data-portal-component-type="page">
  <h1>Hello world</h1>
  <h2>Countries</h2>
  <ul>
    <li data-th-each="country : ${countries}">
      <strong>
        <a data-th-href="${country.contentUrl}" data-th-text="${country.name}"></a>
      </strong>
    </li>
  </ul>
</body>
</html>
```

- If you didn’t start XP in *Development mode* then redeploy the app from the command line with `./gradlew deploy`.

Each country that you created is now listed on the home page and the names are also links to the individual content pages.

2.4.10 Hello Geo World

Going back to your site, you will now see a list of the countries we have added. To make this even more exciting, we will add a City content type with geo-location and a *City list* part with configuration capabilities.

City content

The next steps will create a content type for adding cities with location coordinates.

- Create a folder called *city* inside the project’s `site/content-types` folder.
- Add the content type file below to your project. Because the content type’s folder is named “city” the file must be named “city.xml”.

Listing 2.9: City content type - `site/content-types/city/city.xml`

```
<content-type>
  <display-name>City</display-name>
  <super-type>base:structured</super-type>
  <form>
    <input type="GeoPoint" name="location">
      <label>Location</label>
      <occurrences minimum="1" maximum="1"/>
    </input>
    <input type="TextLine" name="population">
      <label>Population</label>
      <occurrences minimum="0" maximum="1"/>
    </input>
  </form>
</content-type>
```

The file above defines a *content type* for cities with a required field for the location in latitude and longitude.

3. Copy the image below and save it in the same folder with the City content type. Name it “city.png”.



City list part

We need a *part component* to display the city data. It will list the cities and show a Google map of each location.

1. Create a folder called *city-list* inside the project’s *site/parts* folder.
2. Add the part descriptor file. It must be named *city-list.xml*.

Listing 2.10: City list part descriptor - *site/parts/city-list/city-list.xml*

```
<part>
  <display-name>City list</display-name>
  <config>
    <input type="ComboBox" name="mapType">
      <label>Map type</label>
      <occurrences minimum="0" maximum="1"/>
      <config>
        <option value="ROADMAP">ROADMAP</option>
        <option value="SATELLITE">SATELLITE</option>
        <option value="HYBRID">HYBRID</option>
        <option value="TERRAIN">TERRAIN</option>
      </config>
    </input>
    <input type="TextLine" name="zoom">
      <label>Zoom level 1-15</label>
      <occurrences minimum="0" maximum="1"/>
    </input>
  </config>
</part>
```

The part descriptor above has a configuration similar to those found in content types.

3. Add the part controller file. It must be named *city-list.js*.

Listing 2.11: City list part controller - *site/parts/city-list/city-list.js*

```
var contentLib = require('/lib/xp/content'); // Import the content library functions
var portal = require('/lib/xp/portal'); // Import the portal functions
var thymeleaf = require('/lib/xp/thymeleaf'); // Import the Thymeleaf rendering function

// Handle the GET request
exports.get = function (req) {

  // Get the part configuration for the map
```

```

var config = portal.getComponent().config;
var zoom = parseInt(config.zoom) && config.zoom <= 15 && config.zoom >= 1 ? config.zoom : 10;
var mapType = config.mapType || 'ROADMAP';

// String that will be inserted to the head of the document
var googleMaps = '<script src="http://maps.googleapis.com/maps/api/js"></script>';

var countryPath = portal.getContent()._path;

// Get all the country's cities
var result = contentLib.query({
  start: 0,
  count: 100,
  contentTypes: [
    app.name + ':city'
  ],
  query: "_path LIKE '/content" + countryPath + "/*'",
  sort: "modifiedTime DESC"
});

var hits = result.hits;

var cities = [];

if (hits.length > 0) {
  googleMaps += '<script>function initialize() {';

  // Loop through the contents and extract the needed data
  for (var i = 0; i < hits.length; i++) {

    var city = {};
    city.name = hits[i].displayName;
    city.location = hits[i].data.location;
    city.population = hits[i].data.population ? 'Population: ' + hits[i].data.population : null;

    cities.push(city);

    if (city.location) {
      city.mapId = 'googleMap' + i;

      googleMaps += 'var center' + i + ' = new google.maps.LatLng(' + city.location + ');

      googleMaps += 'var mapProp = {center:center' + i + ', zoom:' + zoom +
        ', mapTypeId:google.maps.MapTypeId.' + mapType + ', scrollwheel: false'
        + 'var map' + i + ' = new google.maps.Map(document.getElementById("google'
        + 'var marker = new google.maps.Marker({ position:center' + i + '}); mark

    }

  }

  googleMaps += '}' google.maps.event.addDomListener(window, "load", initialize);</script>';
}

// Prepare the model object that will be passed to the view file
var model = {
  cities: cities
};

```

```
// Specify the view file to use
var view = resolve('city-list.html');

// Return the response object
return {
  body: thymeleaf.render(view, model),
  // Put the maps' javascript into the head of the document
  pageContributions: {
    headEnd: googleMaps
  }
};
```

This controller uses *Page Contributions* to put the Google Maps JavaScript into the head of the document.

4. Add the part view file. It must be named city-list.html to match the “resolve” function in the controller.

Listing 2.12: City list part view - site/parts/city-list/city-list.html




```
<div class="cities" style="min-height:100px;">
  <h3>Cities</h3>
  <div class="city" data-th-each="city : ${cities}">
    <h3 data-th-text="${city.name}"></h3>
    <div data-th-if="${city.population}" data-th-text="${city.population}"></div>
    <div data-th-id="${city.mapId}" data-if="${city.mapId}" style="width:100%;height:300px;"></div>
    <br/><br/>
  </div>
</div>
```

5. If you didn’t start XP in *Development mode* then build and deploy your project one final time with `./gradlew deploy`.

All of the project’s files are now complete. The rest of the steps will be performed in the Content Studio interface.

2.4.11 Create Cities

Now let’s make use of the new city content type and part component. First we need to add the “City list” part to the “Country” page template.

1. Edit the “Country” page template. Find it in the content pane below the templates 
2. Open the Inspect Panel by clicking the cog button  in the toolbar.
3. Under the Insert tab, click and drag a Part  to the page region below the “country” part. (This may be a bit tricky because the “country” part is small.)
4. Select the “City list” part from the dropdown in the box.
5. Save and close the tab.

Now we need to create a few City contents under each country. (Sample data is available in the table below.)

1. From the content pane, select a country content that you created earlier. It is important that each city content is created under its country.
2. Right-click the country content and select “New”. The “Create content” dialogue will open.

3. Now select “City” from the list of content types.
4. Fill in the city name and location; the population is optional. The location format must be comma separated latitude and longitude with decimals.
5. Save draft.
6. Create several more city contents below each country content by repeating the previous steps. Sample data is provided in the table below.

Country	City	Lat,Long	Population
USA	San Francisco	37.7833,-122.4167	837,442
	Las Vegas	36.1215,-115.1739	603,488
	Washington D.C.	38.9047,-77.0164	658,893
Norway	Oslo	59.9100,10.7500	618,683
	Bergen	60.3894,5.3300	265,857
	Trondheim	63.4297,10.3933	178,021
Colombia	Bogota	4.5981,-74.0758	7,000,000
	Medellin	6.2308,-75.5906	2,440,000
	Barranquilla	10.9639,-74.7964	1,885,500

Each country page will now have a list of the cities you created with a Google map of the location. It should look something like this:

CONTENT STUDIO

Q

New

Edit

Delete

Duplicate

Move

Sort















Preview

Publish

Select All (14)

Clear Selection (1)

↺

<input type="checkbox"/>	 Hello World /hello-world	Offline	2016-02-19
<input checked="" type="checkbox"/>	 USA usa	Offline	2016-02-20
<input type="checkbox"/>	 San Francisco san-francisco	Offline	2016-02-20
<input type="checkbox"/>	 Las Vegas las-vegas	Offline	2016-02-20
<input type="checkbox"/>	 Washington D.C. washington-d-c	Offline	2016-02-20
<input type="checkbox"/>	 Norway norway	Offline	2016-02-20
<input type="checkbox"/>	 Oslo oslo	Offline	2016-02-20
<input type="checkbox"/>	 Bergen bergen	Offline	2016-02-20
<input type="checkbox"/>	 Trondheim trondheim	Offline	2016-02-20
<input type="checkbox"/>	 Colombia colombia	Offline	2016-02-20
<input type="checkbox"/>	 Bogota bogota	Offline	2016-02-20
<input type="checkbox"/>	 Medellin medellin	Offline	2016-02-20
<input type="checkbox"/>	 Barranquilla barranquilla	Offline	2016-02-20
<input type="checkbox"/>	 Templates _templates	Offline	2016-02-19

Country

USA


Population: 318,900,000

The U.S. is a country of 50 states covering a vast swath of North America, with Alaska in the extreme Northwest and Hawaii extending the nation's presence into the Pacific Ocean. Major cities include New York, a global finance and culture center, and Washington, DC, the capital, both on the Atlantic Coast; Los Angeles, famed for filmmaking, on the Pacific Coast; and the Midwestern metropolis Chicago.

Cities


San Francisco

Population: 837,442



Las Vegas

Population: 603,488




Washington D.C.

Population: 658,893

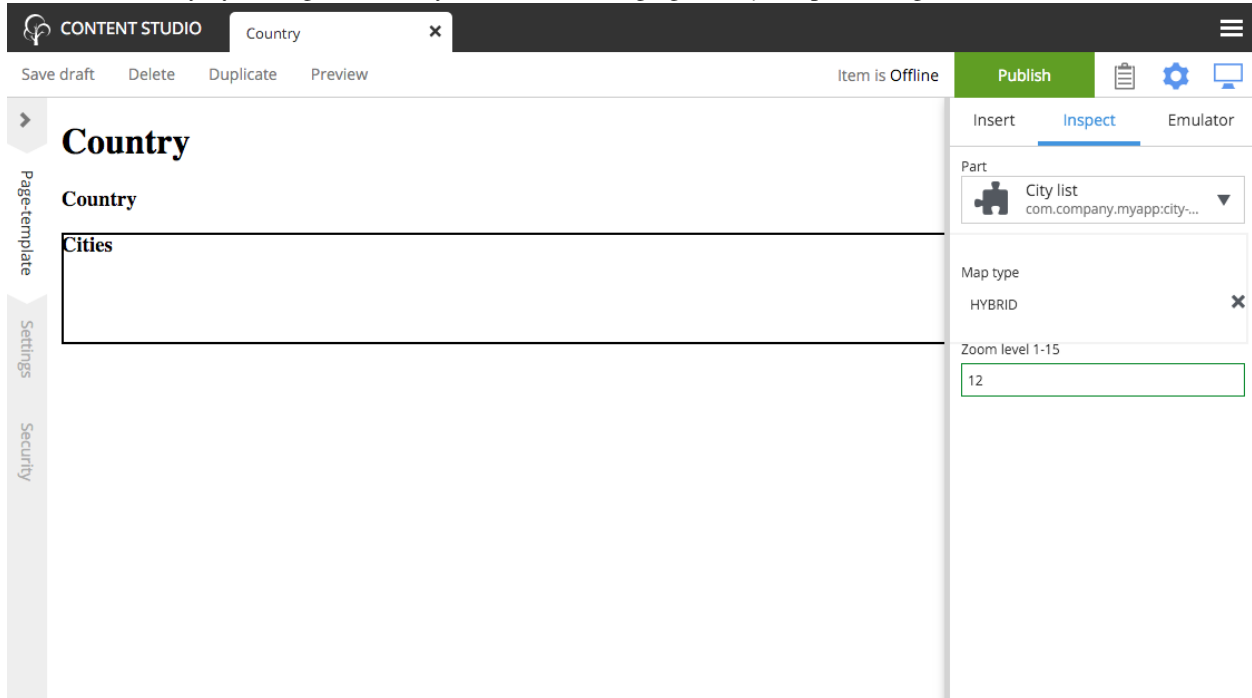
2.4.12 Configure City List

The *City list* part descriptor (`site/parts/city-list/city-list.xml`) has configuration inputs for the map type and zoom level. You can set the default values for these inputs by editing the *City list* part in the *Country* page template.

1. Open the *Country* page template for editing.

2. Open the Inspection Panel by clicking the cog button  in the toolbar.
3. Click on the *City list* part in the Page Editor panel.
4. Under the “Inspect” tab of the Inspection Panel, set the Map type to “HYBRID” and Zoom level to 12.
5. Save draft and close the edit tab.

Now all of the countries will show the city maps with the new settings. You can override these defaults for any individual country by editing the Country content and changing its *City list* part configuration.



2.4.13 Go Online

Now that your “Hello World” is complete, it’s time to publish.

1. Select the “Hello World” site in the content pane
2. Right-click and select “Publish” from the context menu, or click the “Publish” button in the toolbar
3. The Publishing Wizard will appear. Check the “Include children” checkbox
4. Verify that all your items are listed - click “Publish”!

When publishing content, all the selected items and changes are “cloned” from draft to the master branch (*Repository*).

You will always see the draft version of content in the preview window and the Page Editor of the Content Studio. If you have placed your site on root level, you can also see your live site at this url: <http://localhost:8080/portal/master/hello-world>.

Well done - you just created your first App for Enonic XP - The Enonic team congratulates you - we look forward to seeing all the brilliant things you will make and are always looking for [feedback](#).

2.4.14 Some Pro Tips

Adding libraries to your project

Why re-invent the wheel for each app you make? Reusable code can be created in libraries and added to any XP project. Some essential tools can be found in the [Util lib](#), [Menu lib](#), [RECAPTCHA](#) and [Landing page](#) libraries.

Adding apps to your site

A website can be created from a single app. But a site's functionality can be extended by adding other pre-made apps. SEO Meta Fields, Disqus comments and Google Analytics are just a few of the many apps that can instantly add features to your site. See what's available at the [Enonic Marketplace](#).

Handling Multiple projects

A **best practice** for working on multiple projects would involve keeping a separate XP_HOME folder for each project. The folder structure for such a setup would look something like this:

```
/Users/<name>/development
/Users/<name>/development/software/<xp-install-version>
/Users/<name>/development/xp-homes/<project-name>/home
/Users/<name>/development/projects/<project-name>/<project-source-files>
```

An actual implementation with projects called my-first-app and company-site would look like this:

```
/Users/mla/development/software/enonic-xp-6.3.1
/Users/mla/development/software/enonic-xp-6.4.0
/Users/mla/development/xp-homes/my-first-app/home
/Users/mla/development/xp-homes/company-site/home
/Users/mla/development/projects/my-first-app/...
/Users/mla/development/projects/company-site/...
```

This allows you to have one Enonic XP installation for each version and as many different XP_HOME folders as you need for your projects. When switching from one project to another, you only have to change the XP_HOME environment variable and then restart the installation of the Enonic XP version that the project was created for.

Check this [Enonic Labs article](#) for a more in-depth process. It also includes some bash scripting that will help with setting and changing \$XP_HOME and starting and stopping XP.

Logging JSON objects

While developing an app, it can be helpful to see the structure of objects returned by library functions. The best way to do this is to set up a utilities JavaScript file in the project lib folder. Add the following function to the utilities file:

```
site/lib/utilities.js
```

```
exports.log = function (data) {
  log.info('Utilities log %s', JSON.stringify(data, null, 4));
};
```

Call the log function in any controller like the example below and then check the log after refreshing the page.

```
var util = require('utilities');

var content = portal.getContent();
util.log(content);
```

This logging function and many other useful functions are included in the [Util library](#).

Continuous build with Dev Mode or Gradle

It can be quite time consuming to frequently use the terminal to redeploy an app during development. Starting Enonic XP in dev-mode will make most changes to your app code visible immediately on localhost. See the [Development mode](#) page for more information about its capabilities and limitations.

Another option is to use `./gradlew -t deploy` in the terminal from the project root. This will automatically build and redeploy your app every time changes to a file are detected. This method is slower than dev-mode, but it handles some situations that dev-mode doesn't. Gradle 2.7 or newer is required.

Both dev-mode and Gradle continuous-mode require the `$XP_HOME` environment variable to be set in the terminal window.

2.4.15 Next Steps

This tutorial only covered the basics of app development. Explore the documentation for more in-depth coverage.

Check our [GitHub](#) page for examples of more advanced apps. The [Superhero](#) blog app is also a good place to see more advanced code. The [Google Analytics](#) app demonstrates extending the Content Studio interface

Need help? Ask questions on our [forum](#) or answer questions from others.

The screenshot below shows the Content Studio interface with content on the left and a site preview on the right.

The screenshot displays the Content Studio interface. The top bar includes the 'CONTENT STUDIO' logo and a search icon. Below the bar, a navigation menu shows 'New', 'Edit', 'Delete', 'Duplicate', 'Move', 'Sort', 'Preview', and 'Publish'. The main area is divided into two panes. The left pane, titled 'Select All (15) Clear Selection (1)', lists content items with checkboxes, icons, names, and dates. The right pane, titled 'Hello world', shows a preview of the 'Hello world' page with a section titled 'Countries' containing a list of links: Colombia, Norway, and USA.

Item	Status	Date
<input checked="" type="checkbox"/> Hello World /hello-world	Offline	2016-02-19
<input type="checkbox"/> USA usa	Offline	2016-02-20
<input type="checkbox"/> San Francisco san-francisco	Offline	2016-02-20
<input type="checkbox"/> Las Vegas las-vegas	Offline	2016-02-20
<input type="checkbox"/> Washington D.C. washington-d-c	Offline	2016-02-20
<input type="checkbox"/> Norway norway	Offline	2016-02-20
<input type="checkbox"/> Oslo oslo	Offline	2016-02-20
<input type="checkbox"/> Bergen bergen	Offline	2016-02-20
<input type="checkbox"/> Trondheim trondheim	Offline	2016-02-20
<input type="checkbox"/> Colombia colombia	Offline	2016-02-20
<input type="checkbox"/> Bogota bogota	Offline	2016-02-20
<input type="checkbox"/> Medellin medellin	Offline	2016-02-20
<input type="checkbox"/> Barranquilla barranquilla	Offline	2016-02-20
<input type="checkbox"/> Templates _templates	Offline	2016-02-19
<input type="checkbox"/> Country country	Offline	2016-02-20

Hello world

Countries

- [Colombia](#)
- [Norway](#)
- [USA](#)

The image below is what a page of the site will look like when finished.

Country

USA

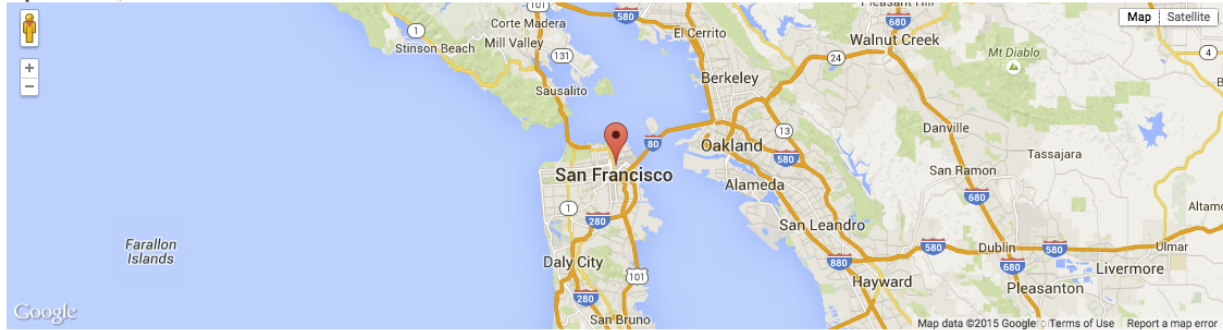
Population: 318,900,000

The U.S. is a country of 50 states covering a vast swath of North America, with Alaska in the extreme Northwest and Hawaii extending the nation's presence into the Pacific Ocean. Major cities include New York, a global finance and culture center, and Washington, DC, the capital, both on the Atlantic Coast; Los Angeles, famed for filmmaking, on the Pacific Coast; and the Midwestern metropolis Chicago.

Cities

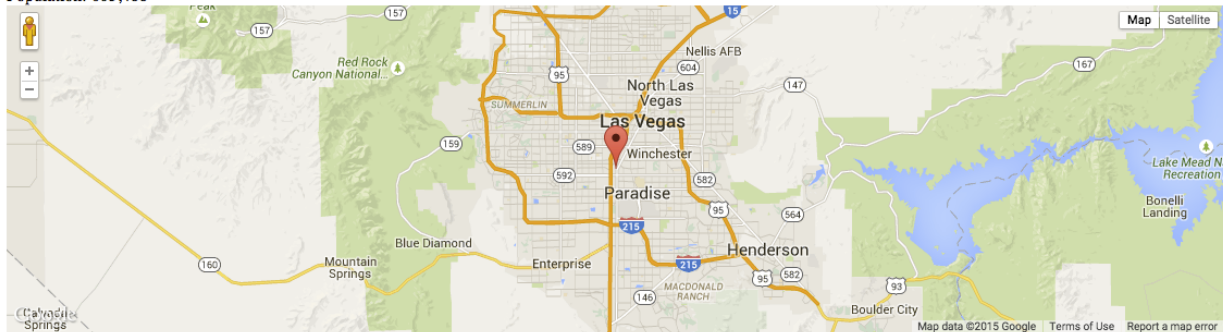
San Francisco

Population: 837,442



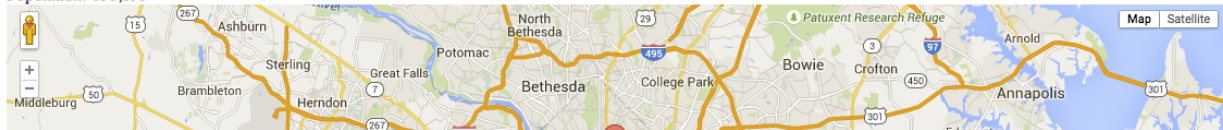
Las Vegas

Population: 603,488



Washington D.C.

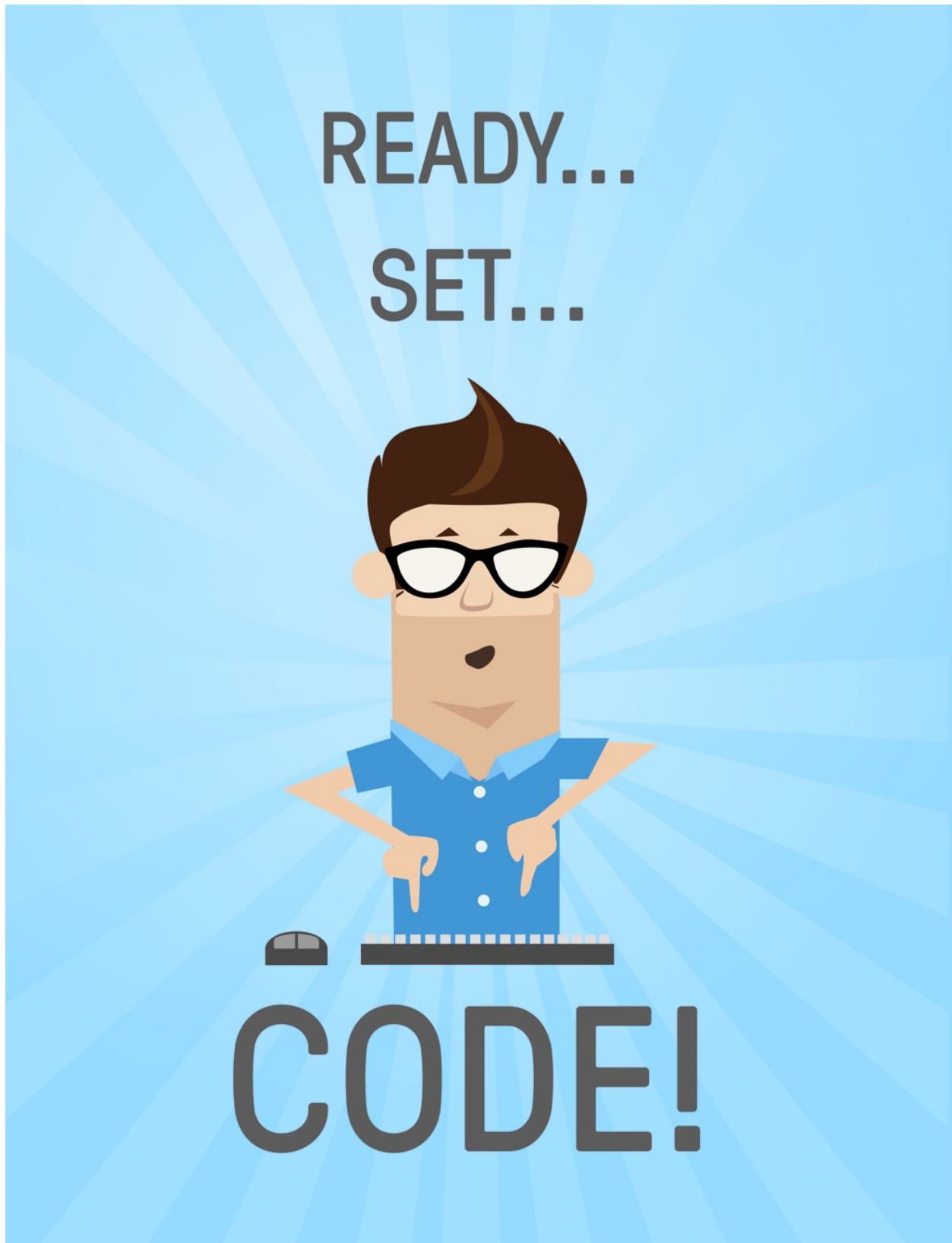
Population: 658,893



Developer Guide

We <3 Developers!

We're thrilled to see you here - If you're a first timer to Enonic XP, we recommend starting on *My First App* and the *Tutorials* section - or if you're more familiar with XP, how about drilling into the *Node Domain* chapter. If you're actually looking for APIs - you'll find them over here *API and Reference Guide*.



3.1 Applications

Like anything that calls itself an operating system - Enonic XP has Applications. The applications can be installed and run on a single server, or an entire cluster.

It is important to note that applications are not limited to being “Web Applications” - they can be running server jobs, provide internal API's to other applications, offer HTTP services, include custom Admin Tools, extend other tools or applications, or be used to build sites.

Applications may even carry data, for instance, to initialize a repository or populate a new site.

3.1.1 Life Cycle

Applications and have the following life-cycle:

- installed
- started
- stopped
- uninstalled

When installing applications in an XP cluster - the application is uploaded and stored in the system repository - and then started on all nodes. If an application contains an initialization script, this script will only be executed on the master node - running only once.

3.1.2 Composition

An application file is typically a JAR (.jar). This is short for Java Archive. Enonic XP is built on top of Java and the powerful OSGi framework, so developers with special requirements may utilize capabilities such as exposing and consuming services from other applications. However, since Enonic XP is designed to run *Serverside JavaScript*, most *Projects* will be completely free of Java.

To speed up development and enable a high degree of re-use, applications can be composed of *Libraries* in addition to your own code. Libraries can be built almost like you create applications. Libraries (and applications) are shared through Maven repositories. An example is <https://repo.enonic.com>. Anyone may configure and run their own repository - for internal as well as external use.

For your amusement, we can also tell you that Enonic XP itself is composed from more than 50 different applications - making the platform extremely modular.

3.1.3 Other Resources

To learn more about applications and how they are built - continue reading the *Developer Guide*, but pay special attention to the following chapters:

- *Projects*
- *Libraries*

3.2 Libraries

Enonic XP provides the concept of libraries in order to speed up development and re-use of functionality and code. Technically, libraries are very similar to *Applications*, but the main difference is that a library cannot be installed and started by itself.

So, a library may consist of all the same objects you find in applications - such as *Assets*, *Content Types* and *HTTP Controllers* - things you may need in an application.

3.2.1 Finding Libraries

A number of standard and 3rd party libraries are available with the core XP release, check out: *Javascript Libraries*. You will also find a wide range of libraries on the Enonic Market - <https://enonic.com/market/libraries>

3.2.2 Adding libraries

Libraries are added to your project by simply referring to them in your build script. Read more about this on our *Projects* documentation.

3.2.3 Best practice

If you wonder when/how you should create a library, here are some guidelines

- Strong cohesion: Keep the components in a library together only if they are strongly related. Split them up in multiple libs if they are not.
- Weak coupling: A library should avoid having dependencies. In practice, this will not always be possible, but apart from the XP APIs, other dependencies should raise an alarm, and only be included after careful analysis showing there is no other way.
- Use names that are self-explanatory and follow the java naming conventions - for example `com.company.lib.mylib`.

3.3 Projects

This section provides an overview of how to setup, build and deploy new projects for applications and libraries.

3.3.1 Project Initialization

The fastest way to get started with any XP project is to use a starter project. The starter-vanilla project on GitHub - <https://github.com/enonic/starter-vanilla> is often used.

To get going, we recommend using the *init-project* script that is a part of the Enonic XP installation.

In the terminal, move to the XP installation's toolbox folder. Copy/paste the command below and specify an empty folder for `-d` and an appropriate app name for `-n`. Then execute the command to get your very own project initialized.

```
toolbox.sh init-project -d <projectFolder> -n com.mycompany.myApp -r enonic/starter-vanilla
```

The `init-project` command simply clones the entire Git project (to the local folder that was specified with `-d`), then removes the Git references. It also updates your build script files by adding the specified app name (`-n`) to the project.

Once this is done, you must clean up and adapt the code to your own requirements.

You may, in principle, apply this command to any standard XP application or library project!

3.3.2 Project structure

To build applications with Enonic XP, you will typically setup a project. The fastest way to do this is using the `init-project` feature included in the Enonic XP toolbox utility.

The project structure is similar to [Maven](#) projects for those who are familiar with that.

Below is a sample project folder structure - all items are folders, except for `site.xml` and `build.gradle`:

```
my-first-app/
  build.gradle
  src/
    main/
      java/
      resources/
        admin/
          widgets/
          tools/
        assets/
        lib/
        services/
        site/
          content-types/
          error/
          filters/
          i18n/
          layouts/
          mixins/
          pages/
          parts/
          site.xml
        views/
```

Every file and folder has a specific function and meaning.

build.gradle [Gradle](#) script for building the application or library. This file describes the actual build process.

src/main/java/ Optional folder where you place any java code that might be included in the project - following traditional Maven style development.

src/main/resources/ This is where all non-java code is placed, and thus where you will typically be working with your XP projects. All folders described below are relative to this folder

admin/tools This is where you place code for admin tools. Tools are administrative user interfaces (apps) running in their own separate browser tab. Create tools if you need a back-office utility to manage your applications or similar.

admin/widgets Widgets are essentially user interface components that can be embedded within selected tools. I.e. you can create a widget that extends the Content Studio detail panel.

assets/ Public folder for external css, javascript and static images etc. etc.

lib/ This is the last place the global `require` JavaScript-function looks, so it is a good place to put default JavaScript files here.

services/ Services are a special type of http controller that will be mounted on a fixed url pattern that looks like this: `_/service/<myapp>/<myservice>`. You may use services like any other JavaScript controller in the system.

site/site.xml The `site.xml` file contains basic information for a site created with the application. Settings for the application can be defined in the `config` element and the values for these settings can be updated using the Content Studio tool.

```
<site>
  <x-data mixin="menu-item"/>
  <config>
    <field-set name="info">
      <label>Info</label>
      <items>
        <input type="TextLine" name="company">
          <label>Company</label>
          <occurrences minimum="1" maximum="1"/>
        </input>
        <input type="TextArea" name="description">
          <label>Description</label>
          <occurrences minimum="1" maximum="1"/>
        </input>
      </items>
    </field-set>
  </config>
</site>
```

site/content-types/ Content schemas are placed here. Used to create structured content (see *Content Types*).

site/error/ Create custom http error pages by placing an error controller in this directory (see *Error Handling*).

site/filters/ This is where generic http response filters are placed. Filters can be used for post processing any given request - also across applications added to a site. A common use case is adding script tags to pages - but possibilities are virtually endless.

site/i18n/ This folder will contain application localization files (i18n is short for Internationalization). Files placed in this folder must follow Java's standard property file format, one file for each language. Here is an example: <https://docs.oracle.com/javase/tutorial/i18n/resbundle/propfile.html>

site/mixins/ Mixin schema-types are placed here. A mixin can be used to add common fields to multiple content-types or other schemas (see *Mixins*).

site/pages/ Page controllers are placed here. They will be used to render pages and page templates (see *Page*).

site/parts/ Part controllers should be placed here. Parts are dynamically configurable components that can be placed on pages (see *Part*).

site/layouts/ Layout controllers should be placed here. Layouts are similar to parts, but in addition have one or more regions. Regions enable placement of other components inside the layout. (see *Layout*).

views/

Views are any kind of files that are used for rendering. The folder is optional, as view files can be placed anywhere you want, just keep in mind what path to use when resolving them (see *Views*).

3.3.3 Build script

By default, Enonic uses Gradle as the main build tool. This is a highly flexible Java-based utility that builds on the popular Maven project tools and code repository structures. Enonic provides a Gradle plugin that greatly simplifies the build process. If you used the starter-vanilla project to initialize your project, you will have all the basic tools you need to get going.

Running a build

If you have not installed Gradle, the fastest way to get going is to execute the gradle wrapper script.

Move into your project root folder and execute the following command:

OSX/Linux:

```
./gradlew build
```

Windows:

```
gradlew.bat build
```

The gradle wrapper will download all necessary files to run gradle and produce the project artifacts. These will typically be placed in the projects build/libs/ folder.

gradle.properties

Your project should contain a `gradle.properties` file. Set `xpVersion` to the version of Enonic XP you are working with, and look over the other settings to make sure they are correct.

build.gradle

The `build.gradle` file defines all the dependencies to other libraries.

There are three standard scopes (keywords) used in the dependency list

- Compile (default gradle scope, compiles library and adds it to class path - standard for pure Java libraries)
- Include (XP custom scope that merges the `/src/main/resources` folder in the library with your project - any code in your project overwrites the library files)
- Webjar (Extracts the content of the specified Webjar - <http://www.webjars.org/> - placing it into the assets folder, using the version number as root folder)

gradle deploy

To have Gradle automatically deploy new applications to your XP installation, you have to specify an environment variable that tells Gradle where to place the artifact (application file).

OSX/Linux:

```
export XP_HOME=/path/to/xp-installation/home
```

Windows:

```
set XP_HOME=c:\path\to\xp-installation\home
```

With `$XP_HOME` set, run the following command to build and deploy the file

OSX/Linux:

```
./gradlew deploy
```

Windows:

```
gradlew.bat deploy
```

Once completed, your XP installation will detect, install and start the files.

3.3.4 Installing an application

There are several ways to install applications

- Uploading directly from the “Applications” admin tool - this will install and start the application in the entire cluster
- Use the *Toolbox CLI* command line utility - this will install and start the application in the entire cluster.
- And finally, the developer way - copying the application JAR file to the `$XP_HOME/deploy` folder - this will install and start the application on the local node (typically used by developers)

Once an application is placed in this folder, it will be picked up, installed and started by the local instance. If the application is removed it will be stopped and uninstalled.

OSX/Linux command line to copy the artifact to the deploy folder:

```
cp build/libs/[artifact].jar $XP_HOME/deploy/.
```

For your convenience - we have simplified this process by adding a `deploy` task to your build. Instead of manually copying to the deploy folder, you can simply execute `gradle deploy`:

```
./gradlew deploy
```

For the `deploy` command to work, you have to set the `XP_HOME` environment variable (in your shell) to your actual Enonic XP home directory.

Run the following command to set the `XP_HOME` variable

OSX/Linux:

```
export XP_HOME=/path/to/xp-installation/home
```

Windows:

```
set XP_HOME=c:\path\to\xp-installation\home
```

Continuous Deploy

To continuously build and deploy your application on changes, you can use [Gradle continuous mode](#). This will watch for changes and run the specified task when something changes. To use this with the `deploy` task, you can run the following command:

```
./gradlew -t deploy
```

This will deploy and reload the application on the server when something changes in your project. The continuous deployment mode is most useful when coding Java, or other changes that require a full compile and re-deploy.

For the instant updates of JavaScript code without re-deploying, check out [Development mode](#).

3.3.5 Sample library

In this example, we will create support for redirection of URLs. For this, we need a content-type, and a simple JavaScript file.

The content-type, let's just call it `url`, defines the URLs that the code may redirect to. So in the `content-types` directory, add a new directory and name it `url`. Then, in this directory, create the content type:

Listing 3.1: src/main/resources/site/content-types/url/url.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<content-type>
  <display-name>URL</display-name>
  <content-display-name-script>$('url')</content-display-name-script>
  <super-type>base:structured</super-type>
  <form>
    <input type="TextLine" name="url">
      <label>URL</label>
      <occurrences minimum="1" maximum="1"/>
    </input>
  </form>
</content-type>
```

To make it easier to notice when creating a new content in Enonic XP, add this icon, `url.png` in the same directory:



Now, we need the JavaScript. Since we are talking about a redirect here, the script must be placed on a page. So, in the `pages` directory, we add a folder: `url-redirects`. In this, we need the page descriptor:

Listing 3.2: src/main/resources/site/pages/url-redirect/url-redirect.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<page>
  <display-name>URL redirect</display-name>
  <config/>
</page>
```

Then, we add the code that does the actual redirect:

Listing 3.3: src/main/resources/site/pages/url-redirect/url-redirect.js

```
var portal = require('/lib/xp/portal');

// Handle GET request
exports.get = handleGet;

function handleGet() {
  var result = portal.getContent();
  var url = result.data.url;

  var response = {};

  if (url) {
    response.redirect = url;
  }
  else {
    response.body = 'No URL configured.'
  }
}
```

```
    return response;
}
```

This library can now be included in any app where you might want redirect functionality, or in other libs that can build more advanced functions based on this simple example.

3.3.6 Development mode

You can start the server in dev-mode to speed up the development process. When using this mode, you only need to deploy your code once - or when certain situations arise (see below).

Start server using dev-mode:

```
$ $XP_INSTALL/bin/server.sh dev
```

First time you will need to deploy the code (app, lib, etc.) using the `deploy` task (see *Installing an application*):

```
$ ./gradlew deploy
```

After that, you do not need to redeploy your application except...

- when modifying Java code.
- when deleting a page, part or layout component.
- when deleting a content-type, mixin or relationship-type.
- when changing source directories.
- if you have source-transformation tools (typescript, less, sass).

Warning: Do not use dev-mode in production environments. It takes a little more time to render pages and caches are sometimes disabled.

3.4 Schemas

As the low level storage of Enonic XP is entirely schema-less, we have created a high-level schema concept that is used to configure many of the forms you see in the Enonic XP Admin.

Schemas are made up of the following main concepts:

- A rich set of widgets called *Input Types*
- Building rich *Forms* by combining Input Types and layouts
- Horizontal inheritance across forms through the use of *Mixins*

3.4.1 Input Types

Input types are specified by XML snippets and used in combinations to build forms. An input type has both a front-end and a back-end. Each input type will return a property with a specific value type.

The following XML configuration is common for all input types:

```
<input name="name" type="type-name">
  <label>Some label</label>
  <occurrences minimum="0" maximum="1"/>
  <config/>
</input>
```

@name The name attribute is the technical name used in templates and result sets to refer to this value.

@type The type refers to one of the many input types which are explained below.

label The label text will become the label for the input field in the editable form of the admin console.

occurrences Detailed definition of how many times this field may be repeated inside one content. Set `minimum` to zero for fields that are not required, and `maximum` to zero for fields that have no restriction on the number of values.

config Optional configuration that is used by some of the input-types. The config consists of elements with optional attributes. Each element/attribute name with dashes is automatically camel-cased (`relationship-type -> relationshipType`).

Input types

AttachmentUploader

This field enables uploading of one or more files that will be stored as attachments to the current node/content. This is different from media content where each media is a separate node that can be linked to.

```
<input type="AttachmentUploader" name="myname">
  <label>My Label</label>
  <occurrences minimum="0" maximum="0"/>
</input>
```

CheckBox

A checkbox field has a value if it is checked, or no value if it is not checked. Therefore, the only values for occurrences that makes sense is a minimum of zero and a maximum of one.

```
<input name="name" type="CheckBox">
  <label>Required</label>
  <occurrences minimum="0" maximum="1"/>
</input>
```

ComboBox

A ComboBox needs a list of options.

```
<input name="name" type="ComboBox">
  <label>Required</label>
  <occurrences minimum="1" maximum="1"/>
  <config>
    <option value="one">Option One</option>
    <option value="two">Option Two</option>
  </config>
</input>
```

option This element defines the option label. The `value` attribute defines the actual value to set when this option is selected. Multiple `option` settings are ordered.

Date

A simple field for dates with a calendar pop-up box in the admin console. The default format is yyyy-MM-dd.

```
<input name="name" type="Date">
  <label>Date (with tz)</label>
  <occurrences minimum="0" maximum="1"/>
  <config>
    <timezone>true</timezone>
  </config>
</input>
```

timezone true if timezone information should be used. Default is false.

DateTime

A simple field for dates with time. A pop-up box with a calendar and time selector allows easy editing. The format is yyyy-MM-dd hh:mm for example, 2015-02-09T09:00. The date-time could be of type `local` (no datetime) or with a timezone. This is done using configuration:

```
<input name="name" type="DateTime">
  <label>DateTime (with tz)</label>
  <occurrences minimum="0" maximum="1"/>
  <config>
    <timezone>true</timezone>
  </config>
</input>
```

timezone true if timezone information should be used. Default is false.

Double

A double value input-type.

GeoPoint

Stores a GPS coordinate as two comma-separated decimal numbers.

- The first number must be between -90 and 90, where a negative number indicates a location south of equator and a positive is north of the equator.
- The second number must be between -180 and 180, where a negative number indicates a location in the western hemisphere and a positive number is a location in the eastern hemisphere.

HtmlArea

A field for inputting multi-line text, with formatting options.

Long

A simple field for large integers.

RadioButton

An input type for selecting one of several options, defined in the `config` element.

```
<input name="name" type="RadioButton">
  <label>Radio Buttons</label>
  <occurrences minimum="0" maximum="0"/>
  <config>
    <option value="one">Option One</option>
    <option value="two">Option Two</option>
  </config>
</input>
```

option This element defines the option label. `value` attribute defines the actual value to set when this option is selected. Multiple `option` settings are ordered.

Tag

An intuitive input format for specifying a set of simple strings.

TextArea

A field for inputting multi-line text.

TextLine

A field for inputting a single line of text.

```
<input name="socialSecurityNumber" type="TextLine">
  <config>
    <regexp>\b\d{3}-\d{2}-\d{4}\b</regexp>
  </config>
</input>
```

regexp A regular expression that restricts the valid values for the input. Optional, if not set any text is a valid value.

Time

A simple field for time. A pop-up box allows simple selection of a certain time. The default format is `hh:mm`.

3.4.2 Item Sets

Item sets represent a special capability of forms that allow you to nest other form items hierarchically.

Inputs in item sets are grouped into logical units, allowing them to repeat as a complex input type - since item sets support occurrences too. Item sets are both visually and semantically grouped as the name of the item set is used in the persisted property structure. An item set actually produces a property set.

Here is an example of an item set with two inputs. The resulting form will allow multiple entries of phone numbers with labels:

```
<item-set name="contact_info">
  <label>Contact Info</label>
  <items>
    <input name="label" type="TextLine">
      <label>Label</label>
      <occurrences minimum="0" maximum="1"/>
    </input>
    <input name="phone_number" type="TextLine">
      <label>Phone Number</label>
      <occurrences minimum="0" maximum="1"/>
    </input>
  </items>
  <occurrences minimum="0" maximum="0"/>
</item-set>
```

name The set needs a name for reference in result sets.

label The set label is printed as a header on the box that will surround the group in the input form.

occurrences Occurrence configuration can be done at any level.

Tip: It is also possible to nest item sets inside each other

3.4.3 Schema Layouts

To shape the presentation of a form, one can use layouts. Currently, only one layout exists.

Field set

A field set may be used to group items visually. The example below will create a form in the admin console with the inputs grouped under the label of the field set.

```
<field-set name="metadata">
  <label>Metadata</label>
  <items>
    <input name="tags" type="Tag">
      <label>Tags for tag cloud</label>
      <occurrences minimum="0" maximum="5"/>
    </input>
  </items>
</field-set>
```

@name The field set needs a name for reference.

label The label will appear as a heading above the inputs that are grouped inside.

items The fields inside the set must be listed inside an `items` element.

3.4.4 Mixins

Structures of data that are repeated in different content types or component descriptors may be defined as mixins. Such structures (like a set of address fields or a combobox with a standard set of values) would be defined once in a mixin and then the mixin would be called in other schemas that require these fields. The mixin

definition file must be placed in the folder `site/mixins/[name]` and named `[name].xml`. For example, `site/mixins/us-address/us-address.xml`.

```
<mixin>
  <display-name>U.S. Address format</display-name>
  <items>
    <item-set name="address">
      <label>Address</label>
      <occurrences minimum="0" maximum="0"/>
      <items>
        <input type="TextLine" name="addressLine">
          <label>addressLine</label>
          <occurrences minimum="0" maximum="2"/>
        </input>
        <input type="TextLine" name="city">
          <label>City</label>
          <occurrences minimum="1" maximum="1"/>
        </input>
        <input type="TextLine" name="state">
          <label>State</label>
          <occurrences minimum="0" maximum="1"/>
        </input>
        <input type="TextLine" name="zipCode">
          <label>Zip code</label>
          <occurrences minimum="0" maximum="1"/>
        </input>
      </items>
    </item-set>
  </items>
</mixin>
```

Tip: A mixin may optionally have its own specific icon. The icon can be assigned to the mixin by adding a PNG file with the same name, in the mixin folder, e.g. `site/mixins/us-address/us-address.png`

Using a mixin

Below is an example of a simple content type that uses the `us-address` mixin (inline) and the `menu-item` mixin (x-data). Notice that the name of the mixin file is used and not the mixin's Display Name.

```
<content-type>
  <display-name>Using mixins</display-name>
  <super-type>base:structured</super-type>
  <form>
    <field-set name="basic">
      <label>Status</label>
      <items>
        <inline mixin="us-address"/>
      </items>
    </field-set>
  </form>
  <x-data mixin="menu-item"/>
</content-type>
```

inline When a mixin is added with the `inline` element, the inputs will be included with the content data. Inline mixins can be used in content types, component descriptors, and the `site.xml` file.

x-data Mixins can also be added with an `x-data` element in content types and the `site.xml` file. Be aware that any `x-data` inputs added to the `site.xml` file will be applied to all content types in the site.

3.4.5 Forms

The main purpose of the schema concept is to construct forms that can be edited through the admin interface or used programmatically, without coding a custom interface and complex controllers. A form is basically a composition of layouts and input types. When a form is populated and submitted, the result will be a basic property structure that can be stored directly into *Nodes*.

Some hands on examples where forms are used in the system are *Content Types* and *Sites*.

Basic Setup

Forms can be defined through Java or XML, where the latter is the most common.

Below is an example configuration in xml:

```
<form>
  <input name="choice1" type="ComboBox">
    <label>Choice1</label>
    <occurrences minimum="0" maximum="1"/>
    <config>
      ...
    </config>
  </input>
</form>
```

Adding Mixins

To simplify maintenance of forms, mixins can be created and injected into a form simply by referencing it. The form will render as if everything in the mixin was written directly in the form itself. Read more about *Mixins*.

```
<form>
  <field-set name="basic">
    <label>Status</label>
    <items>
      <inline mixin="us-address"/>
    </items>
  </field-set>
</form>
```

3.5 Serverside JavaScript

Enonic XP primarily uses server-side JavaScript for application development. Our goal is to enable any developer - PHP, .net, Java, Python, etc, etc to quickly be productive with Enonic XP.

Here are some highlights on how it works:

- Runs on the Java Virtual Machine using the Nashorn JavaScript engine, a high performance, portable and robust platform.
- Multithreaded request-response approach - simplifying software development and utilization of modern multi-core hardware

- Implements central parts of CommonJS module specification (<http://wiki.commonjs.org/wiki/Modules/1.1>) like RequireJS - but not all
- You can invoke Java directly from your scripts - quickly accessing powerful Java libraries

Beyond simply executing JavaScript on the server, the XP framework provides a range of capabilities, primarily associated with HTTP. Read more below to learn about the basic concepts.

3.5.1 HTTP Controllers

Serverside JavaScript is used in the http controllers of Enonic XP. Every *Page*, *Part*, *Layout*, *Services* etc. must have a controller.

JavaScript controllers are invoked from the portal by exporting functions matching the desired HTTP Method it implements. As such, any controller must explicitly declare one or more “exports” in order to handle requests: GET, POST, DELETE are examples of such methods.

The appropriate function will automatically be invoked for every request sent to the controller

Example usage

```
// Handles a GET request
exports.get = function(req) {}

// Handles a POST request
exports.post = function(req) {}
```

A handler function receives a parameter with a request object, and returns a response object.

```
exports.get = function(request) {

  if (request.mode === 'edit') {
    // do something...
  }

  var name = request.params.name;
  log.info('Name = %s', name);

  return {
    body: 'Hello ' + name,
    contentType: 'text/plain'
  };
};
```

3.5.2 Global JavaScript objects and functions

The following global functions and objects are available in the Enonic XP framework.

App

The globally available app object holds information about the contextual app it was delivered from.

app.name
Name of the application.

app.version

Version of the application.

Examples:

```
// Get application name
var name = app.name; // com.enonic.app.superhero

// Get application version
var version = app.version; // 1.2.0
```

Log

This globally available `log` object holds the logging methods. It's one method for each log level and takes the same number of parameters.

`log.debug(message[, args])`

Arguments

- **message** (*string*) – Message to log as a debug-level message.
- **args** (*array*) – Optional arguments used in message format.

`log.info(message[, args])`

Arguments

- **message** (*string*) – Message to log as an info-level message.
- **args** (*array*) – Optional arguments used in message format.

`log.warning(message[, args])`

Arguments

- **message** (*string*) – Message to log as a warning-level message.
- **args** (*array*) – Optional arguments used in message format.

`log.error(message[, args])`

Arguments

- **message** (*string*) – Message to log as an error-level message.
- **args** (*array*) – Optional arguments used in message format.

Examples:

```
// Log a simple message
log.debug('Hello World');

// Log a formatting message
log.info('Hello %s', 'World');

// Log a formatting message
log.warning('%s %s', 'Hello', 'World');

// Log using the built-in JSON converter
log.error('My JSON %s', object );
```

Resolve()

This globally available function resolves a fully qualified path to a local resource based on the current location. It does not check if a resource exists at the specified path. This function supports both relative (with dot-references) and absolute paths.

resolve (*path*)

Arguments

- **path** (*string*) – Path to resolve using current location.

Returns The fully qualified resource path of the location.

Examples:

```
// Absolute path
var path1 = resolve('/views/myview.html');

// Relative path - in this case, the resource must be in the same folder
var path2 = resolve('myview.html');

// Relative path (same as above)
var path3 = resolve('./myview.html');

// Relative path - resource is one level up
var path4 = resolve('../myview.html');
```

Require()

This globally available function will load a JavaScript file and return the exports as objects. The function implements parts of the [CommonJS Modules Specification](#).

require (*path*)

Arguments

- **path** (*string*) – Path to the JavaScript to load.

Returns The loaded JavaScript object exports.

Examples:

```
// Absolute path
var lib1 = require('/lib/mylib.js');

// Relative path
var lib2 = require('mylib');

// Relative path (same as above)
var lib3 = require('./mylib.js');

// Relative path
var lib4 = require('../mylib');
```

If the path is relative then it will start looking for the file from the local directory. If the file is not found there, it will start scanning in parent directories that have a /lib folder until it reaches the resources/ folder. The file extension .js is not required.

Exports

The globally available `exports` keyword is used to expose functionality from a given JavaScript file (controllers, libraries etc). This is part of the `require.js` spec.

Simply use the `exports` keyword to expose functionality from any JavaScript file.

Double underscore `__`

The double underscore is available in any server-side JavaScript code and is used for wrapping Java objects in a JavaScript object. Read more about *Invoking Java*.

3.5.3 HTTP Request

The following object is passed along with every HTTP request. The object is similar to many traditional request objects, except for two special properties: `mode` and `branch`. These properties are specific to the XP Portal, automatically indicating the contextual branch and rendering mode.

The `request` object represents the HTTP request and current context for the controller.

```
{
  "method": "GET",
  "scheme": "http",
  "host": "enonic.com",
  "port": "80",
  "path": "/my/page",
  "url": "http://enonic.com/my/page?debug=true",
  "mode": "edit",
  "branch": "master",
  "params": {
    "debug": "true"
  },
  "headers": {
    "Language": "en",
    "Cookies": "mycookie=123; other=abc;"
  },
  "cookies": {
    "mycookie": "123",
    "other": "abc"
  }
}
```

method HTTP method of the request.

scheme Scheme of the request.

host Host of the request.

port Port of the request.

path Path of the request.

url URL of the request.

mode Portal rendering mode, one of: `edit`, `preview`, `live`.

branch Name of the repository branch, one of: `draft`, `master`.

body Optional text value

params Name/value pairs with the query/form parameters from the request.

headers Name/value pairs with the HTTP request headers.

cookies Name/value pairs with the HTTP request cookies.

3.5.4 HTTP Response

The `response` object is the value returned by an HTTP controller - as a response to an *HTTP Request*.

```
{
  "status": 200,
  "body": "Hello World",
  "contentType": "text/plain",
  "headers": {
    "key": "value"
  },
  "cookies": {},
  "redirect": "/another/page",
  "pageContributions": {},
  "postProcess": true,
  "applyFilters": true
}
```

status HTTP response status code (default is 200).

body HTTP message body of the response that can either be a string or a JavaScript object.

contentType MIME type of the body (defaults to `text/plain`; `charset=utf-8`).

headers Name/value pairs with the HTTP headers to be added to the response.

cookies HTTP cookies to be added to the response. Will be described in a later section.

redirect URI to redirect to. If specified, the value will be set in the “Location” header and the status will be set to 303.

pageContributions A special filter available for sites and page components allowing page components to contribute html to the main page markup. See *Page Contributions*

postProcess Post-processing is a special filter for sites and pages, if enabled it will reprocess a page looking for page contributions and rendering components in a page. (See also *Page Contributions*) (default is `true`). Set to `false` if you want to speed up page rendering in cases where there are no regions or page components.

applyFilters Whether or not to execute the filters after rendering. Set to `false` to skip execution of filters. (See also *Response Filters*) (default is `true`).

3.5.5 HTTP Cookies

There are two ways that Http Cookie values can be set in responses.

- If the value is a string then the cookie is created using default settings.
- If the value is an object then it will try to apply the settings. Every field is optional except “value”.

Here’s an example of how the cookies should be set:

```
return {
  status: 200,
  body: "Hello World",
  headers: {
```

```
    "header1": "value1"
  },
  cookies: {
    "plain": "value",
    "complex": {
      value: "value",
      path: "/valid/path",
      domain: "enonic.com",
      comment: "Some cookie comments",
      maxAge: 2000,
      secure: false,
      httpOnly: false
    }
  }
};
```

3.5.6 Websockets

Warning: Websocket support is experimental.

Websocket support allows a service to act as a websocket channel that you can connect to from a web-browser.

A get method must be implemented to handle initialization of the websocket.

```
// Create a websocket if websocket request.
exports.get = function (req) {

  if (!req.websocket) {
    return {
      status: 404
    };
  }

  return {
    websocket: {
      data: {
        user: "test"
      },
      subProtocols: ["text"]
    }
  };
};
```

A websocket event handler named `websocketEvent` is required. It will be called for every websocket event from a client. See example below.

```
// Listen to a websocket event
exports.websocketEvent = function (event) {

  if (event.type == 'open') {
    // Do something on open
  }

  if (event.type == 'message') {
    // Do something on message recieved
  }
}
```

```

    if (event.type == 'close') {
      // Do something on close
    }
  };

```

Below is an example of a simple chat. A library called `lib-websocket` has functions for sending messages back and adding/removing clients in groups. Adding to groups allows for multicast message sending.

```

// Lib that contains websocket functions.
var websocketLib = require('/lib/xp/websocket');

// Listen to a websocket event
exports.websocketEvent = function (event) {

  if (event.type == 'open') {
    // Send message back to client
    websocketLib.send(event.session.id, 'Welcome to our chat');

    // Add client into a group
    websocketLib.addToGroup('chat', event.session.id);
  }

  if (event.type == 'message') {
    // Propagate message to group
    websocketLib.sendToGroup('chat', event.message);
  }

  if (event.type == 'close') {
    // Remove client from a group
    websocketLib.removeFromGroup('chat', event.session.id);
  }
};

```

3.5.7 Invoking Java

In Enonic XP, there is a standard object named `__` (double underscore), accessible from any serverside JavaScript code, which provides a way to wrap Java objects in a JavaScript object. The `__` object has functions that allow JavaScript to communicate with Java classes. The `newBean` function will wrap the Java object named in the parameter, for instance:

```

var bean = __.newBean('com.enonic.xp.lib.io.IOHandlerBean');

```

This line is from the `lib-io` library, which is a good example of how this is used. In the Java `IOHandlerBean` class, there are several methods, like the `readLines` method:

```

public List<String> readLines( final Object value )
    throws Exception
{
    final CharSource source = toCharSource( value );
    return source.readLines();
}

```

This method is now accessible as a function on the JavaScript `bean` and may be invoked from JavaScript, like this:

```
exports.readLines = function (stream) {  
  return __.toNativeObject(bean.readLines(stream));  
};
```

This results in a global JavaScript function `readLines`. This example also shows the use of the `toNativeObject` method, which in this case, converts a Java String array to a JSON object. The reference documentation for the `__` object can be found here: [The `__` object](#).

3.6 Assets

Applications and libraries commonly use files that will be delivered to the client (typically web browsers) without being modified. Examples are icons, css files, javascript files etc. Enonic XP provides a standard and optimized approach to serving assets across applications.

Developers simply place the files they want to use into their project's `/src/main/resources/assets/` folder. These files can then be dynamically accessed through the asset service. The asset service is typically available through `_/asset/<myapp>/path/to/myasset.ext`.

The `assetUrl()` portal function lets you easily create links to assets.

assetUrl (*path* [,*application*] [,*type*] [,*params*])

Arguments

- **path** (*string*) – Path to the asset.
- **application** (*string*) – Application where the asset exists. Default is current application.
- **type** (*string*) – URL type. Either server (server-relative URL) or absolute. Default is server.
- **params** (*object*) – Custom parameters to append to the url.

Returns The the relative or absolute URL to the asset.

3.7 Services

Services allow the creation of http endpoints without binding them to specific paths.

Services typically consist of a single JavaScript file which bares the name of the service. This controller must be in a folder with the same name and must be located in the `/src/main/resources/services` folder. For example, a logout service would look like this: `/src/main/resources/services/logout/logout.js`

The service can then be accessed on a relatively mounted URL, as seen below, where `application` is the application name (without version):

```
*/_/_/service/[application]/[service-name]
```

The portal function `serviceUrl()` will create a dynamic URL for a service.

serviceUrl (*name* [,*application*] [,*type*] [,*params*])

Arguments

- **name** (*string*) – Name of the service.
- **application** (*string*) – Application where the service exists. Default is current application.

- **type** (*string*) – URL type. Either server (server-relative URL) or absolute. Default is server.
- **params** (*object*) – Custom parameters to append to the url.

Returns The the relative or absolute URL to the service.

Attention: For sites, you may only access the services of the apps that have been added to that site.

The following example is a simple service that returns a JSON object with the date and a counter.

```
var counter = 0;

exports.get = function(req) {

  counter++;

  return {
    body: {
      time: new Date(),
      counter: counter
    },
    contentType: 'application/json'
  };
};
```

3.8 Views

Instead of composing the HTML, JSON or other output in your javascript controllers, it's often easier to use a full MVC (Model View Controller) approach.

Enonic XP supports pluggable view technologies and ships the following view libraries out-of-the-box.

- Thymeleaf - typically used with HTML (see `lib-thymeleaf` in *Javascript Libraries*)
- Mustache - typically for use with JSON (see `lib-mustache` in *Javascript Libraries*)
- Xslt - recommended for XML processing (see `lib-xslt` in *Javascript Libraries*)

3.9 Sites

Sites can be built from one (or more) applications. But only applications that contain a specific structure and a site descriptor can be used for this purpose.

This chapter will dive into the details on how to build sites and the various components of a site, such as pages and parts.

3.9.1 Site Descriptors

To indicate that an application provides “site capabilities” and allow it to be added to sites, a site descriptor must be placed into the application. Within your project, simply add a file called `/main/src/resources/site/site.xml`.

The `site.xml` file also makes use of the *Schemas* concept, so you may easily define custom forms for configuring the application when adding it to a site. These configurations are made in the `<config>` element.

Listing 3.4: `/main/src/resources/site/site.xml`

```
<site>
  <x-data mixin="menu-item"/>
  <config>
    <field-set name="info">
      <label>Info</label>
      <items>
        <input type="TextLine" name="company">
          <label>Company</label>
          <occurrences minimum="1" maximum="1"/>
        </input>
        <input type="TextArea" name="description">
          <label>Description</label>
          <occurrences minimum="1" maximum="1"/>
        </input>
      </items>
    </field-set>
  </config>
</site>
```

All controllers within the app can access the configured values with the `portal.getSiteConfig()` function.

```
var portal = require('/lib/xp/portal');

// Find the site configuration for this app in current site.
var siteConfig = portal.getSiteConfig();
```

An app's `site.xml` file may optionally contain `<x-data>` elements for adding *Mixins* and a `<filters>` element for adding *Response Filters*.

3.9.2 Content Types

To enable simple configuration and setup of publishing forms, validation and data types - Enonic XP ships with a content api. Central to this api are Content Types. Structured, indexed and searchable content items are created from Content types. Content Types build on the *Forms* concept, so they are very similar to other configurable forms in Enonic XP.

Content repository

Every content item produced is eventually stored as nodes in the low level storage, read more about the *Node Domain*.

A system standard repository called `cms-repo` is initialized when installing Enonic XP. This is where content is stored when working with content in the Content Studio application or the content-API.

The content-API actively uses the branch capabilities. The `cms-repo` has two branches:


- `draft`
- `master`

The content seen while working in Content Studio is in the `draft` branch. Content in the portal is served from the `master` branch.

Publishing a content moves it from the `draft` branch to the `master` branch.

Sample Content type

A “Person” content type might look something like this:



Purple Tentacle


/superhero/authors/purple-tentacle

Person

Settings

Security

Photo *

☐


Bio *

I have great plans to take on the world

Email *

purple@dott.game

Website

Twitter Name

Facebook Name

The underlying schema configuration would look like this

```
<?xml version="1.0" encoding="UTF-8"?>
<content-type>
  <display-name>Person</display-name>
  <super-type>base:structured</super-type>
</content-type>
```

```
<form>
  <input type="imageSelector" name="photo">
    <label>Photo</label>
    <occurrences minimum="1" maximum="1"/>
  </input>
  <input type="HtmlArea" name="bio">
    <label>Bio</label>
    <occurrences minimum="1" maximum="1"/>
  </input>
  <input type="TextLine" name="email">
    <label>Email</label>
    <occurrences minimum="1" maximum="1"/>
  </input>
  <input type="TextLine" name="website">
    <label>Website</label>
    <occurrences minimum="0" maximum="1"/>
  </input>
  <input type="TextLine" name="twitter">
    <label>Twitter Name</label>
    <occurrences minimum="0" maximum="1"/>
  </input>
  <input type="TextLine" name="facebook">
    <label>Facebook Name</label>
    <occurrences minimum="0" maximum="1"/>
  </input>
</form>
</content-type>
```

And the persisted (and searchable node) would look like this: NB! The content type defined properties are stored within the 'data' propertySet.

```
{
  "_id": "c814b68c-7dd3-4851-a35e-6709b07409d4",
  "_name": "purple-tentacle",
  "_path": "/superhero/authors/purple-tentacle",
  "creator": "user:system:su",
  "modifier": "user:system:su",
  "createdTime": "2016-01-07T07:23:42.149Z",
  "modifiedTime": "2016-01-07T07:26:49.129Z",
  "type": "com.enonic.sampleapp:person",
  "displayName": "Purple Tentacle",
  "hasChildren": true,
  "language": "en",
  "valid": true,
  "data": {
    "photo": "10b6cf60-581a-43cd-aa76-30a0c3503a45",
    "bio": "<p>Have great plans to take on the world</p>",
    "email": "purple@dott.game"
  },
  "x": {},
  "page": {},
  "attachments": {}
}
```

Standard Content Properties

- `_id` = string

- `_name` = fulltext
- `_parent` = string
- `attachment` = string
- `displayName` = fulltext
- `contentType` = string
- `creator` = string
- `createdTime` = datetime
- `data` = type
- `x` = type
- `form` = none
- `language` = string
- `modifiedTime` = datetime
- `owner` = string
- `page` = minimal
- `page.regions` = none
- `site` = none
- `thumbnail` = none
- `type` = string

A content has a set of standard properties (sorted alphabetically below).

`_id` The content id (same as node id)

`_name` The content name (same as node name)

`_parent` The parent content path (same as node parent)

`attachment` If content contains attachments, a list of attachment-names and properties.

`contentType` The content schema type.

`creator` The user principal that created the content.

`createdTime` The timestamp when the content was created.

`data` A property-set containing all user defined properties defined in the content-type.

`displayName` Name used for display purposes.

`language` The locale-property of the content.

`modifiedTime` Last time the content was modified.

`owner` The user principal that owns the content.

`page` The page property contains page-specific properties, like template and regions. This will typically be reference to a page-template that supports the content-type.

`site` If `contentType` is `portal:site`, this will contain site-specific information.

`thumbnail` A thumbnail representing the content.

`type` A property used to identify content in a node repository.

x A property-set containing properties from mixins, also known as xtra data.

Base Content Types

A set of basic content types are provided with the installation.

Content types have a set of properties you need to know about:

- Content types are named with their application name, i.e. `base:folder`, where “base” is the application - but also have a nice display name like “Folder”
- `abstract` (default: `false`) means you cannot create content with this content type
- `final` (default: `false`) means it is not possible to create content types that “extend” this
- `allow-child-content` (default: `true`) if `false`, it will prevent users from creating child items on content of this type. (i.e. prevents creating child items of images)

Folder (`base:folder`)

- `abstract`: `false`
- `final`: `false`
- `allow-child-content`: `true`

Folders are simply containers for child content, with no other properties than their name and Display Name. They are helpful in organizing your content.

Media (`base:media`)

- `abstract`: `true`
- `final`: `false`
- `allow-child-content`: `false`

This content type serves as the abstract supertype for all content types that are considered “files” in their natural habitat. These are listed on the [Media Content Types](#) page.

Shortcut (`base:shortcut`)

- `abstract`: `false`
- `final`: `true`
- `allow-child-content`: `true`

This is used for redirecting a visitor to another content item in the structure. The content type name is `base:shortcut`.

Structured (`base:structured`)

- `abstract`: `true`
- `final`: `false`
- `allow-child-content`: `true`

This is possibly the most commonly used base type for creating other content types. The structured content type is the foundation for basically any other structured content you can come up with, such as the `Person` content in the previous example.

Unstructured (base:unstructured)

- abstract: false
- final: true
- allow-child-content: true

The unstructured content type is a special content type that permits the creation of any property or structure without actually defining it first. This is convenient for user generated content from forms on a site.

Caution: There is currently no UI for unstructured content so they will appear empty in the admin console. However, a custom page template that supports base:unstructured may easily be created to show name/value pairs.

Media Content Types

The system ships with a set of pre-defined media content types. When files are uploaded in the Content Studio interface or through the content API - they will be transformed to one of the following content-types.

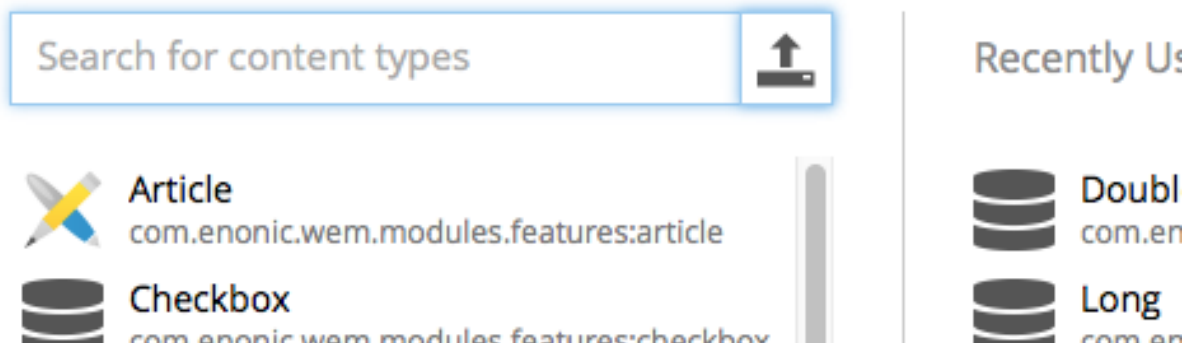
Common settings for all the content types listed below.

- super-type: base:media
- abstract: false
- final: true
- allow-child-content: false

Tip: Enonic XP treats media content pretty much like any other content items - for instance the person, but they all have at least one attachment (namely the file).

Create Content

In: /archive/long-value



Here are the various media content types that also come installed with Enonic XP:

Text (media:text) Plain text files.

Data (media:data) Miscellaneous binary file formats.

Audio (media:audio) Audio files.

Video (media:video) Video files.

Image (media:image) Bitmap image files.

Vector (media:vector) Vector graphic files like .svg.

Archive (media:archive) File archives like .zip, tar and jar.

Document (media:document) Text documents with advanced formatting, like .doc, .odt and pdf.

Spreadsheet (media:spreadsheet) Spreadsheet files.

Presentation (media:presentation) Presentation files like Keynote and Powerpoint.

Code (media:code) Files with computer code like .c, .pl or .java.

Executable (media:executable) Executable application files.

Unknown (media:unknown) Everything else.

Portal content types

In order to build sites in a secure and fashionable manner, Enonic XP also ships with a few special purpose content types.

Site (portal:site)

- super-type: base:structured
- abstract: false
- final: true
- allow-child-content: true

The Site content type allows creating websites. By creating a content of type Site, it will become the root of a website.

This content type provides a special behavior for the content, allowing to select and configure applications for the website. The types (content types, relationship types and mixins) of the applications selected will be available to be used inside the website content tree.

Note: The content types of an application can only be used under a content of type Site which has the application selected.

Page Template (portal:page-template)

- super-type: base:structured
- abstract: false

- final: true
- allow-child-content: true

Page templates are the equivalent of “master slides” in keynote and powerpoint. They enable you to set up pages that will be used when presenting other content types. From the sample content type above, the page template “Person Show” was taking care of the presentation.

Template folder (portal:template-folder)

- super-type: base:folder
- abstract: false
- final: true
- allow-child-content: portal:page-template only

This is a special content-type. Every site automatically creates a child content of this type named `_templates`. The templates folder holds all the page templates of that site. It may not hold any other content type, and it may not be created manually in any other location.

Custom Content Types

Custom Content Types can be created using Java or simple xml files - and deployed through applications.

When using xml, each content type must have a separate folder in the application resource structure. i.e. `site/content-types/<my-content-type-name>`.

Each folder must then hold a file with the name of the content type and `.xml` extension (e.g. `my-content-type-name.xml`).

This is the basic structure of a `content-type.xml` file:

```
<content-type>
  <display-name>Choices</display-name>
  <content-display-name-script>$('firstName', ' ', 'lastName')</content-display-name-script>
  <super-type>base:structured</super-type>
  <is-abstract>>false</is-abstract>
  <is-final>>true</is-final>
  <allow-child-content>>true</allow-child-content>
  <form>
    <input name="choice1" type="ComboBox">
      <label>Choice1</label>
      <occurrences minimum="0" maximum="1"/>
      <config>
        ...
      </config>
    </input>
  </form>
</content-type>
```

display-name The display name of the content type is used throughout the admin console to recognize it. But the technical name is the name of the folder the file is placed in.

super-type Many properties are inherited from the super-type. All custom content types must either inherit `base:structured` directly or indirectly. The icon and the general form to edit the fields of the content are important properties that are inherited from `base:structured`.

is-abstract If a content type is abstract, no content of this type may be instantiated. It may still be used as a super type for other content types.

is-final Final content types may not be used as super types of other content types.

allow-child-content Default is true, which allows nodes to be added in the tree below a content of this type.

form Fields in the content type are defined as input elements which are placed inside the `form` element. All legal input types are described below.

input `name` and `type` are mandatory attributes of the input element. `label` and `occurrences` are mandatory child elements.

config Some input types have a complex configuration that is defined inside a `config` element. It is mandatory for the content types that need it.

content-display-name-script The name of a content may be generated by JavaScript from the values in the form, including values that are added through a mixin.

Tip: A content type may optionally have its own specific icon. The icon can be assigned to the content type by adding a PNG file with the same name, in the content type folder, e.g. `site/content-types/my-content-type-name/my-content-type-name.png`

3.9.3 Response Filters

Response filters are scripts, similar to controllers, that allow customizing or adapting the response of page controllers. Notice that this actually applies to pages from any application added to the site.

The page and component controllers are processed during rendering and then the response filters will be executed afterward.

To add a response filter, create a folder `site/filters` in the application and place a `[filter-name].js` file within this folder. A filter must export a method named `responseFilter`. This method receives the request and response objects as parameters and must return a response object (see [HTTP Controllers](#)).

Here is an example of a `[filter].js` file:

Listing 3.5: `site/filters/trackingScript.js`

```
exports.responseFilter = function (req, res) {
  var trackingScript = '<script src="http://some.site/js/tracking.js"></script>';

  if (!res.pageContributions.bodyEnd) {
    res.pageContributions.bodyEnd = [];
  }
  res.pageContributions.bodyEnd.push(trackingScript);

  if (req.params.debug === 'true') {
    res.applyFilters = false; // skip other filters
  }

  return res;
};
```

In addition, the filter must be declared in the `site.xml` descriptor by adding a `<response-filter>` element within the `<filters>` element, with `@name` and `@order` attributes.

Listing 3.6: site/site.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<site>
  <filters>
    <response-filter name="trackingScript" order="10"/>
  </filters>
  <x-data mixin="html-meta"/>
  <config>
    <input type="ContentSelector" name="profiles">
      <label>Profiles folder</label>
      <occurrences minimum="0" maximum="1"/>
      <config>
        <relationship-type>system:reference</relationship-type>
        <allow-content-type>base:folder</allow-content-type>
      </config>
    </input>
  </config>
</site>
```

Response filters may change any of the values of the response object, that includes: HTTP status code, response body, HTTP headers, cookies and page contributions.

It is also possible to return the response object received without any changes.

Execution order

An application can contain multiple filters declared in `site.xml`. Multiple applications can be selected for a Site. When a page is rendered, all the filters declared in all the applications selected for the site will be executed. The order in which the filters are executed depends on the `filters order` (as defined in `site.xml`) and the order of the applications configured on the Site.

The filters with a **lower order** will be executed **first**. In case there are several filters with the same `order` number, the position of the applications (as configured for a Site in Content Studio) determines the order of execution.

The filter-chain execution can be interrupted from either a controller or a filter by setting the `applyFilters` field in the response. When this value is set to `false` all of the remaining filters will be skipped. (See [HTTP Response](#)).

3.9.4 Site Input Types

For the Content Studio and sites, several custom input types have been created. These may freely be used by any schema in the site domain, such as content types - page, part, and site descriptors.

ContentSelector

References to other content are specified by this input type.

```
<input name="name" type="ContentSelector">
  <label>Cited In</label>
  <occurrences minimum="0" maximum="0"/>
  <config>
    <relationship>system:reference</relationship>
    <allowType>citation</allowType>
    <allowType>my.other.app:quote</allowType>
    <allowPath>${site}/people/</allowPath>
    <allowPath>./*</allowPath>
```

```
<allowPath>/quotes*</allowPath>
</config>
</input>
```

relationship This setting defines the name of which relationship-type to use. Default is `system:reference`.

allowType This is used to limit the content types that may be selected for this input. Use one setting for each content-type.

allowPath This is used to limit the path of the content that may be selected for this input. The site on which the content exists, can be wildcarded with `${site}` Use one setting for each path expression.

Listing 3.7: allowPath samples

```
<!--
All children of <site>/people, e.g
/mySite/people/myContent
/mySite/people/myGroup/anotherContent
-->
<allowPath>${site}/people/*</allowPath>

<!--
All content in mySite starting with people, including children, e.g
/mySite/peoples
/mySite/people/myContent
/mySite/peoples/myContent
/mySite/people/myGroup/anotherContent
-->
<allowPath>/mySite/people*</allowPath>

<!-- All children of the current content -->
<allowPath>./*</allowPath>

<!-- All children of the current content's parent -->
<allowPath>../*</allowPath>
```

HtmlArea

A field for entering html in a WYSIWYG HTML editor. It supports inserting images and linking to media content in general. More configuration options will be available here soon!

ImageSelector

An ImageSelector is used to add images to a form. Existing image content may be selected, or a new image may be uploaded from the file system.

```
<input name="image" type="ImageSelector">
  <label>Non-required image</label>
  <occurrences minimum="0" maximum="1"/>
  <config>
    <allowPath>./*</allowPath>
  </config>
</input>
```

allowPath This is used to limit the path of the images that may be selected for this input. The site on which the content exists, can be wildcarded with `${site}` Use one setting for path expression.

3.9.5 Relationship Types

Custom content types may have relationships to each other or other content types. For instance, a person may have an image, or an employee may have a boss, or belong to a department. These relationships must be defined with a specific *relationship type*, then used in the custom content with an input type `ContentSelector`. The relationship type definition is an XML file. It must be placed in the folder, `site/relationship-types/[name]` and be named `[name].xml`. Here is an example of a relationship-type:

```
<relationship-type>
  <display-name>Citation</display-name>
  <from-semantic>citation in</from-semantic>
  <to-semantic>cited by</to-semantic>
  <allowed-from-types/>
  <allowed-to-types>
    <content-type>com.enonic.xp.modules.features:article</content-type>
  </allowed-to-types>
</relationship-type>
```

from-semantic Text to describe the “from” relationship.

to-semantic Text to describe the “to” relationship.

allowed-from-types Any content type may use this relationship-type.

allowed-to-types Wherever this relationship-type is used, only an article may be selected.

The content types have the format `module-name:content-type-name`. The module may be `system` for built-in types.

Tip: A relationship type may optionally have its own specific icon. The icon can be assigned to the relationship type by adding a PNG file with the same name, in the relationship type folder, i.e. `site/relationship-types/[name]/[name].png`

System relationship types

There are two default relationship types that may be used out of the box. These represent general relationship types that may be reused often.

system:reference No content type restriction, from-semantic = “relates to”, to-semantic = “related of”.

system:parent No content type restriction, from-semantic = “parent of”, to-semantic = “child of”.

3.9.6 Page

A page component is the most basic building block of a site. Each page component must have a JavaScript controller file and optionally an XML descriptor and an HTML view file. These files can define regions in the page where parts and layouts may be added, or they can define a simple page without any compositions. Page components can be added to content individually through the Content Studio interface or they can be used to create page templates that automatically render supported content types.

Any number of page templates can be created from a single page component. Thanks to the magic of page templates, even very large sites will typically have very few page components—perhaps one for all the HTML pages and one for RSS pages.

Pages should be placed in the folder `site/pages/[page-name]`

Descriptor

The page descriptor is an XML file that is used to define regions and custom input fields for page configuration. If a page does not require regions or configuration options then the descriptor may be omitted.

The file must be named `[page-name].xml`. For example, if a page component is named “default” then the file must reside at `site/pages/default/default.xml`.

```
<page>
  <display-name>My first page</display-name>
  <config>
    <!-- input fields... -->
  </config>
  <regions>
    <region name="top"/>
    <region name="bottom"/>
  </regions>
</page>
```

display-name A simple human readable display name.

config The `config` element is where input fields are defined for configurable data that may be used on the page.

regions This is where regions are defined. Various component parts can be dragged and dropped into regions on the page.

Controller

A page controller handles requests to the page. The controller is a required file written in JavaScript and must be named `[page-name].js`. A controller exports a method for each type of HTTP request that should be handled. The handle method has the request object as a parameter and returns the response object (see [HTTP Controllers](#)).

```
// Handles a GET request
exports.get = function(req) {}

// Handles a POST request
exports.post = function(req) {}
```

Here’s a simple controller that acts on the GET request method.

```
exports.get = function(req) {

  return {
    body: '<html><head></head><body><h1>My first page</h1></body></html>',
    contentType: 'text/html'
  };
};
```

Render-view

If you feel like concatenating strings to create an entire web page is a little too much hassle, Enonic XP also supports views. A view is rendered using a rendering engine; we currently support XSLT, Mustache and Thymeleaf rendering engines. This example will use Thymeleaf.

To make a view, create a file `my-first-page.html` in the view folder.

```
<!DOCTYPE html>
<html>
  <head>
  </head>
  <body>
    <h1>My first page, with a view!</h1>
  </body>
</html>
```

In our `[page-name].js` file, we will need to parse the view to a string for output. Here is where the Thymeleaf engine comes in. Using the Thymeleaf rendering engine is easy; here is how we do it.

```
var thymeleaf = require('/lib/xp/thymeleaf');

exports.get = function(req) {

  // Resolve the view
  var view = resolve('/site/view/my-first-page.html');

  // Define the model
  var model = {
    name: "John Doe"
  };

  // Render a thymeleaf template
  var body = thymeleaf.render(view, model);

  // Return the result
  return {
    body: body,
    contentType: 'text/html'
  };
};
```

Unlike controllers and descriptors, view files can reside anywhere in your project and have any valid file name. This allows for code reuse as multiple page components can share the same view. If the view file is in the same folder as the page controller then it can be resolved with only the file name `resolve('file-name.html')`. Otherwise, the full path should be used, starting with a `'/'` as in the example above.

Dynamic-content

We can send dynamic content to the view from the controller via the `model` parameter of the `render` function. We then need to use the rendering engine specific syntax to render it. The controller file above passed a variable called `name` and here is how to extract its value in the view using Thymeleaf syntax.

```
<!DOCTYPE html>
<html>
  <head>
  </head>
  <body>
    <h1>My first page, with a view!</h1>
    <h2>Hello <span data-th-text="${name}>World</span></h2>
  </body>
</html>
```

More on how to use Thymeleaf can be found in [the official Thymeleaf documentation](#).

Regions

To be able to add components like images, component parts, or text to our page via the Page Editor drag and drop interface, we need to create at least one region. Regions can be declared in the page descriptor. Each region will be referenced by name.

```
<page>
  <display-name>My first page</display-name>
  <config />
  <regions>
    <region name="main"/>
  </regions>
</page>
```

You will also need to handle regions in the controller.

```
var portal = require('/lib/xp/portal');

// Get the current content. It holds the context of the current execution
// session, including information about regions in the page.
var content = portal.getContent();

// Include info about the region of the current content in the parameters
// list for the rendering.
var mainRegion = content.page.regions["main"];

// Extend the model from previous example
var model = {
  name: "Michael",
  mainRegion: mainRegion
};
```

To make the Page Editor understand that an element is a region, we need an attribute called `data-portal-component-type` with the value `region` in our HTML.

```
<!DOCTYPE html>
<html>
  <head>
  </head>
  <body>
    <h1>My first page, with a view!</h1>
    <h2>Hello <span data-th-text="${name}">World</span></h2>
    <div data-portal-region="main">
      <div data-th-each="component : ${mainRegion.components}" data-th-remove="tag">
        <div data-portal-component="${component.path}" data-th-remove="tag" />
      </div>
    </div>
  </body>
</html>
```

We can now use the Page Editor drag and drop interface to drag components into our page.

3.9.7 Part

A part is a building block that can be placed in a *region* on a page or layout. As with pages, each part is composed of a JavaScript controller, an XML descriptor and an HTML view.

The part descriptor and controller files must be placed in the folder `site/parts/[part-name]`

Descriptor

The part **descriptor** is where input fields are defined for custom configuration of the part. The descriptor is not required if the part does not need any custom configuration. Parts cannot contain regions.

When used, the descriptor file must have the same name as the *part* folder that contains it `site/parts/[part-name]/[part-name].xml`:

```
<part>
  <display-name>My favorite things</display-name>
  <config>
    <field-set name="things">
      <label>Things</label>
      <items>
        <input type="TextLine" name="thing">
          <label>Thing</label>
          <occurrences minimum="0" maximum="5"/>
        </input>
      </items>
    </field-set>
  </config>
</part>
```

Controller

To drive this part, we will also need a **controller**. The controller typically uses library functions to get content and/or configurations and prepare data which it passes to the view file for dynamic rendering.

```
site/parts/[part-name]/[part-name].js
```

```
var portal = require('/lib/xp/portal'); // Import the portal functions
var thymeleaf = require('/lib/xp/thymeleaf'); // Import the thymeleaf render function

// Handle GET requests
exports.get = function(portal) {

  // Find the current component from request
  var component = portal.getComponent();

  // Find a config variable for the component
  var things = component.config["thing"] || [];

  // Define the model
  var model = {
    component: component,
    things: things
  };

  // Resolve the view
  var view = resolve('/site/view/my-favorite-things.html');

  // Render a thymeleaf template
  var body = thymeleaf.render(view, model);

  // Return the result
  return {
    body: body,
    contentType: 'text/html'
  };
}
```

```
};  
  
};
```

View

The HTML generated by the part must have a single root element. The `things` parameter is basically just JSON data passed from the controller and we can iterate over it easily in Thymeleaf and print its values.

```
<section>  
  <h2>A list of my favorite things</h2>  
  <ul class="item" data-th-each="thing : ${things}">  
    <li data-th-text="${thing}">A thing will appear here.</li>  
  </ul>  
</section>
```

The part can now be added to the page via drag and drop. You will be able to configure the part in the *context window* in live-edit.

3.9.8 Layout

Layouts are used in conjunction with `regions` to organize the structure of the various component parts that will be placed on the page via Page Editor drag and drop. Layouts can be dropped into the page `regions` and then `parts` can be dragged into the layout. This allows multiple layouts (two-column, three-column, etc.) on the same page and web editors can change things around without touching any code. Making a layout is similar to making pages and part components. Layouts cannot be nested.

Layout contains - like pages and parts - a descriptor, a controller and a view, and should be placed in the folder `site/layouts/[layout-name]`

Descriptor

The layout descriptor defines regions within the layout where parts can be placed with the Page Editor. The file must be named `[layout-name].xml`.

```
<layout>  
  <display-name>70/30</display-name>  
  <config/>  
  <regions>  
    <region name="left"/>  
    <region name="right"/>  
  </regions>  
</layout>
```

Controller

The layout controller composes the view of the layout based on HTTP requests. The file must be named `[layout-name].js`.

```
var portal = require('/lib/xp/portal');  
var thymeleaf = require('/lib/xp/thymeleaf');  
  
exports.get = function(req) {
```

```
// Find the current component.
var component = portal.getComponent();

// Resolve the view
var view = resolve('./layout-70-30.html');

// Define the model
var model = {
  leftRegion: component.regions["left"],
  rightRegion: component.regions["right"]
};

// Render a thymeleaf template
var body = thymeleaf.render(view, model);

// Return the result
return {
  body: body,
  contentType: 'text/html'
};
};
```

View

A layout view defines the markup for the layout component. The sample view below is created in Thymeleaf, but it could be created in any view engine that is supported.

```
<div class="row">
  <div data-portal-region="left" class="col-sm-8">
    <div data-th-each="component : ${leftRegion.components}" data-th-remove="tag">
      <div data-portal-component="${component.path}" data-th-remove="tag" />
    </div>
  </div>

  <div data-portal-region="right" class="col-sm-4" >
    <div data-th-each="component : ${rightRegion.components}" data-th-remove="tag">
      <div data-portal-component="${component.path}" data-th-remove="tag" />
    </div>
  </div>
</div>
```

Styling

For a layout to have any meaning, some styling must be applied to the view. The desired CSS should be placed in the /assets folder of the application, and included in the page where the layout should be supported. For example, the view my-first-page.html supports Bootstrap layouts:

```
<head>
  <meta charset="utf-8"/>
  <meta name="viewport" content="width=device-width, initial-scale=1.0"/>
  <link data-th-href="${portal.assetUrl({'_path=css/bootstrap.min.css'})}" href="../../assets/css/bootstrap.min.css" />
</head>
```

3.9.9 Page Contributions

Page contributions are fragments of HTML that a component (part or layout) can contribute to the page in which it is contained. The idea is to allow components to add JavaScript or CSS stylesheets globally in the page, although it is not restricted to scripts or styles.

Page contributions help with solving 2 problems:

- Allow components to insert scripts or styles in specific positions in the page where it is often required.
For example, a component providing web analytics might require that a script is inserted at the end of the page `<body>`. Or a stylesheet needed for a component must be inserted in the `<head>` tag.
- Avoid duplicating script libraries or stylesheets required for a component. Even if the same component is included multiple times in a page, the library script contributed will only be added once.

Any part or layout controller can contribute content to the page. The values from all component contributions will be included in the final rendered page. Duplicated values will be ignored. There are four positions where contributed content can be inserted in the page:

- `headBegin`: After the `<head>` opening tag.
- `headEnd`: Before the `</head>` closing tag.
- `bodyBegin`: After the `<body>` opening tag.
- `bodyEnd`: Before the `</body>` closing tag.

```
{
  "body": "<html>...</html>",
  "pageContributions": {
    "headEnd": "value",
    "bodyEnd": [
      "value1", "value2"
    ]
  }
}
```

Some remarks:

- All the `pageContributions` fields are optional. The `pageContributions` object is optional and each property inside is optional.
- The value for a contribution can be a string or an array of strings.
- The values are unique within an injection point (or tag position). If the same string is contributed from different parts, or from the same part that exists multiple times in the page, the value will only be inserted once. E.g. if two parts include a script for jQuery, it will be included once. But if one part is contributing to `headBegin` and another one contributes the same value to `bodyEnd`, then it will be inserted in both places.
- If the tag does not exist in the rendered page, the value is ignored. I.e. if there is no `<head>` tag, the contributions to `headBegin` and `headEnd` will just be ignored.
- The contributions are inserted in a post-processing step during rendering. That means that there will not be any processing of Thymeleaf tags or similar. Contributions are treated as plain text.

3.9.10 Error Handling

Enonic XP enables you to displaying nice custom error pages for your site.

Create the following folder in your project `src/main/resources/site/error` and place an `error.js` within it. The file follows the same pattern as controllers and filters. If certain methods are implemented and exported, they will be executed in case of errors during rendering.

If an error occurs during processing - the system looks for an `error.js` script within the relevant application - sites specifically it will go through all applications added to the site (in order).

If an `error.js` script is found, it looks for an exported method named `handleXXX` where `XXX` is the HTTP status-code of the error. If not found, it will try to find the generic error method `handleError` instead.

Here is an example of an `error.js` file:

```
var thymeleaf = require('/lib/xp/thymeleaf');

var view404 = resolve('page-not-found.html');
var viewGeneric = resolve('error.html');

exports.handle404 = function (err) {
  var body = thymeleaf.render(view404, {});
  return {
    contentType: 'text/html',
    body: body
  };
};

exports.handleError = function (err) {
  var debugMode = err.request.params.debug === 'true';
  if (debugMode && err.request.mode === 'preview') {
    return;
  }

  var params = {
    errorCode: err.status
  };
  var body = thymeleaf.render(viewGeneric, params);

  return {
    contentType: 'text/html',
    body: body
  };
};
```

The input parameter for the `handleXXX` and `handleError` functions is an error JSON object containing the status code, error message, Java Exception object, and the original request object:

```
{
  "status": 404,
  "message": "Some error message",
  "exception": "<the actual exception object in Java>",
  "request": "<original request JSON>"
}
```

The expected returned value for the function is a response object (see [HTTP Controllers](#)).

The error processing logic will try every handle-function in application order until it can get a result (not undefined or null). This means that an error function can decide to not handle a specific error and let the next one deal with it. If no result is returned by any function, it will be eventually handled by the internal error page.

Also note that if an error occurs inside the custom-error code, then the internal error page will be rendered.

3.10 Localization

Enonic XP provides a standard approach to code localizations, simply by adding resource bundles to your applications, and actively using the `localize` functions in “controllers” and “views”. Content localization currently requires building separate structures - we are working on process tools to simplify this in future releases.

To see how this is used in a controller, see `lib-i18n` in *Javascript Libraries*.

3.10.1 Resource Bundle

The resource-bundle consists of a collection of files containing the phrases to be used for localization. The resource-bundle should be placed in a folder named `i18n` under the application `site` folder.

Each locale to be localized should be represented by a single resource, e.g this could be a structure for an app supporting

- ‘English’ (default)
- ‘English US’
- ‘Norwegian’
- ‘Norwegian Nynorsk’

```
site/i18n/phrases.properties
site/i18n/phrases_en_us.properties
site/i18n/phrases_no.properties
site/i18n/phrases_no_nn.properties
```

The filename of a resource determines what locale it represents:

```
phrases[_languagecode][_countrycode][_variant].properties
```

Caution: The filename should be in lowercase.

The `languagecode` is a valid ISO Language Code. These are the two-letter codes as defined by ISO-639. You can find a full list of these codes at a number of sites, such as: http://www.loc.gov/standards/iso639-2/php/English_list.php.

The `countrycode` is a valid ISO Country Code. These are the two-letter codes as defined by ISO-3166. You can find a full list of these codes at a number of sites, such as: <http://www.iso.ch/iso/en/prods-services/iso3166ma/02iso-3166-code-lists/list-en1.html>

A sample `phrases.properties` file would look like this:

```
user.greeting = Hello, {0}!
complex_message = Good to see you. How are you doing?
message_url = http://localhost:8080/{0}
message_multi_placeholder = My name is {0} and I live in {1}
message_placeholder = Hello, my name is {0}.
med_\u00e6_\u00f8_\u00e5 = This contains the norwegian characters æ, ø and å
```

Placeholders

Placeholders are marked with `{<number>}`. The given number corresponds with the function argument named `values` and the placement of the parameter. See below for an example.

Encoding and special characters

The encoding of localization resource bundle files must be ISO-8859-1, also known as Latin-1. All non-Latin-1 characters *in property-keys* must be entered using Unicode escape characters, e.g u00E6 for the Norwegian letter ‘æ’. The values may also be encoded, but this is not required.

3.10.2 Resolving locale

A locale is composed of language, country and variant. Language is required, country and variant are optional.

The string-representation of a locale is:

LA[_CO] [_VA]

where

- LA = two letter language-code
- CO = two letter country-code
- VA = two letter variant-code.

The variant argument is a vendor or browser-specific code. For example; WIN for Windows, MAC for Macintosh, and POSIX for POSIX. Where there are two variants, separate them with an underscore, and put the most important one first. For example, a Traditional Spanish collation might construct a locale with parameters for language, country and variant as: “es”, “ES”, “Traditional_WIN”.

When a localize function is called upon, a locale is resolved to decide which localization to use.

The following is considered, in this order:

- Given as argument to function
- Language specified on site

3.10.3 Finding best match

When localizing a keyword, a best match pattern will be applied to the resource bundle to select the localized phrase. If the locale for a request is resolved to “en-US”, these files will be considered in given order:

- phrases_en_us.properties
- phrases_en.properties
- phrases.properties

If the locale for a request would have been resolved to en, the phrases_en_us.properties file would not have been considered when localizing a keyword.

If the locale does not match a specific file, the default phrases.properties will be used.

If no matching localization key is found in any of the files in a bundle, a default NOT_TRANSLATED will be displayed.

3.11 Node Domain

At the core of Enonic XP lies a distributed data storage - all persistent items in Enonic XP are stored as nodes.

3.11.1 Overview

Years of experience has taught us that traditional approaches to data storage (read SQL) are unsuited for the common requirements of modern cloud-based applications and platforms. A key goal of Enonic XP was to deliver a complete stack - virtually eliminating complex dependencies to 3rd party applications, and minimize requirements to infrastructure.

With the growing popularity of various so-called NoSQL (Not Only SQL) solutions, we evaluated many different technologies and found great inspiration in the following:

Git

- (+) Cherry picking
- (+) Branching
- (+) Pull requests
- (-) Performance search
- (-) Granularity of access (all or nothing)

Java Content Repository

- (+) Hierarchy
- (+) Granularity
- (+) Feature set
- (+) Unstructured
- (-) Performance
- (-) Complexity (not document oriented)
- (-) Attached data model
- (-) Requires additional storage backend

Elasticsearch

- (+) Document oriented
- (+) Scalability
- (+) Performance
- (+) Search
- (+) Aggregations
- (-) Search engine, not a database
- (-) No blob support
- (-) No security
- (-) Creates schemas

We were unable to find any single solution that was sufficiently simple and included our desired feature set - so we decided to build our own; the Enonic Content Repository.

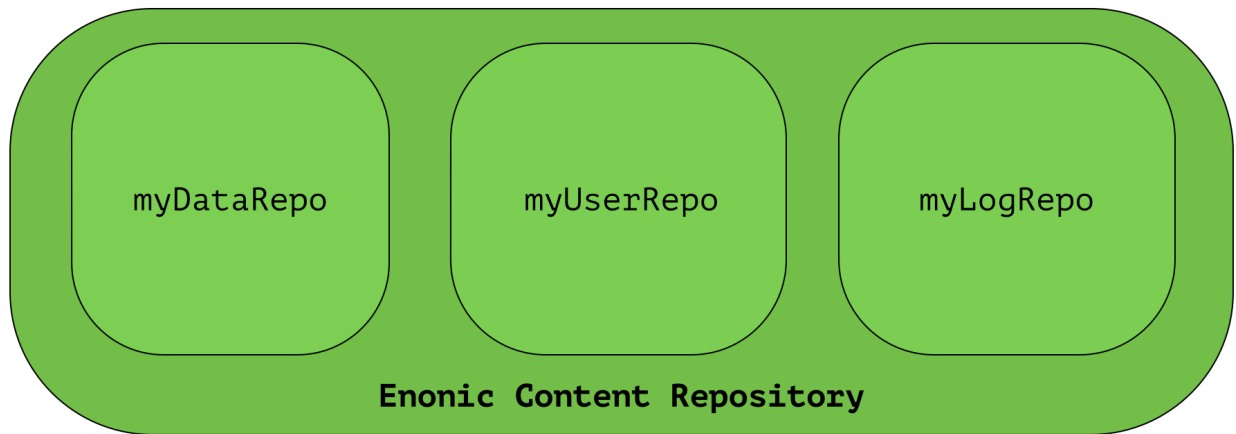
The Enonic Content Repository is a place where you can store data, or more specific: *Nodes*.

It is built on top of Elasticsearch and exposes many of it's capabilities in search and aggregations and scalability - but in addition, provides the following capabilities:

- Hierarchical storage model

- Versioning support
- Complete Access Control and security model
- Blob support - using shared filesystem and append-only approach
- Repository and Branch concepts for content staging
- Schemaless - Add any property you like, at any time
- Rich set of value types (*HTMLPart*, *XML*, *Binary*, *Reference* etc..)
- SQL-like query syntax

The Enonic Content Repository itself contains one or more separate repositories based on the application need. For instance, an application could demand a setup having three repositories - one for application data, one for users and one for logging:



The reasons for having several separated repositories are many, and explained in detail in the [Repository](#) below.

3.11.2 Nodes

A Node represents a single storable entity of data. It can be compared to a “row” in sql, or a “document” in document oriented storage models. Nodes are, as mentioned in the previous section, stored in a repository.

Every node has:

- a name
- a parent-reference
- an id
- a timestamp
- a (possibly empty) set of *Property* key/value.

Consider two nodes - one node representing the city “Oslo” and another representing the company, “Enonic”:

```
_id = 1001
_name = 'oslo'
_parent = ROOT

displayName = 'Oslo'
data.population = 647676
data.area = 454.03
location = geoPoint('59.9127300,10.7460900')
```

```
_id = 102131
_name = 'enonic'
_parent = '/oslo'

displayName = 'Enonic'
category = 'Software company'
employees = 20
```

The nodes have different properties. There is no schema to a node, so a node property value with the same property-name can have different value-types across nodes.

3.11.3 Property

Properties represent a placement of data in a node - following the simple `key = value` pattern. A property has a path. Elements in the path are separated by `.` (dot). Every property has also a type. See the complete list of [Value Types](#).

```
myProperty
data.myProperty
cars.brands.skoda
```

For a property to be able to hold other properties, it has to be of type `Set`. In the above samples, `data`, `cars` and `brands` are properties of type `Set`.

Some characters are illegal in a property key. Here's a list of illegal characters:

- `_` is illegal as the first character, because it is a reserved prefix for *System Properties*.
- `.` is illegal as any character, since it is the path separator.
- `[` and `]` are also illegal as any character. These are used as array index indicators.

Here's an example of some properties:

```
first-name = "Thomas"
cities = ["Oslo", "San Francisco"]
city.location = geoPoint('37.785146,-122.39758')
person.age = 39
person.birth-date = localDate("1975-17-10")
```

3.11.4 Value Types

At the core of the node domain are value types. Every property to be stored in a node must have a value type. The value type enables the system to interpret and handle each piece of data specially - applying to both validation and indexing.

All value-types support arrays of values. All elements in an array must be of the same value-type.

Below is a complete list of all supported value-types.

String A character string.

Index value-type `String`

Example `'myString'`

BinaryReference Reference to a binary object.

Index value-type String

Example 'my-binary-ref'

Boolean A value representing true or false.

Index value-type String

Example true

Double Double-precision 64-bit IEEE 754 floating point.

Index value-type Double

Example 11.5

GeoPoint Represents a geographical point, given in latitude and longitude.

Index value-type GeoPoint

Example '59.9090442,10.7423389'

Instant A single point on the time-line.

Index value-type Instant

Example 2015-03-16T10:00:02Z

LocalTime A time representation without timezone.

Index value-type String

Example 10:00:03

LocalDateTime A date-time representation without timezone.

Index value-type String

Example 2015-03-16T10:00:02

Long 64-bit two's complement integer.

Index value-type Double

Example 1234

Reference Holds a reference to other nodes in the same repository.

Index value-type String

Example '0b7f7720-6ab1-4a37-8edc-731b7e4f439e'

Set A special value type that holds properties as it's value, allowing nested levels of properties, creating tree structures within a single node.

Index value-type N/A

XML Accepts a String containing valid XML.

Index value-type String

Example '<property>myPropertyValue</property>'

3.11.5 System Properties

To reduce complexity, we explicitly dropped the use of namespaces. Thus, in order to separate system properties from user defined properties, we reserved `_` as a starting character for system properties.

Below are the system properties explained.

_id Holds the id of the node, typically generated automatically in the form of a UUID.

_name Holds the name of the node. The name must be unique within its scope (all nodes with same parent).

_parentPath Reference to parent node path.

_path The path is resolved from the node name and parent path.

_timestamp The last change to the node version.

_nodeType Used to create collections for nodes in a repository.

_versionKey The id of the node version.

_state Used for keeping state of a node in a branch.

_permissions_read The principals that have read access.

_permissions_create The principals that have create access.

_permissions_delete The principals that have delete access.

_permissions_modify The principals that have modify access.

_permissions_publish The principals that have publish access.

_permissions_readpermissions The principals that have access to read the node permissions.

_permissions_writepermissions The principals that have access to change the node permissions.

3.11.6 Repository

A repository is a place where nodes can be stored. Data stored in a repository will typically belong to a common domain. Fetches and searches are by default executed against a single repository, so it makes sense to keep data from different domains separated in different repositories. For instance, in the Enonic XP CMS, content and data concerning user management are separated into two repositories. The Content Studio application uses the `cms-repo` repository, and the User Manager application uses the `system-repo` repository.

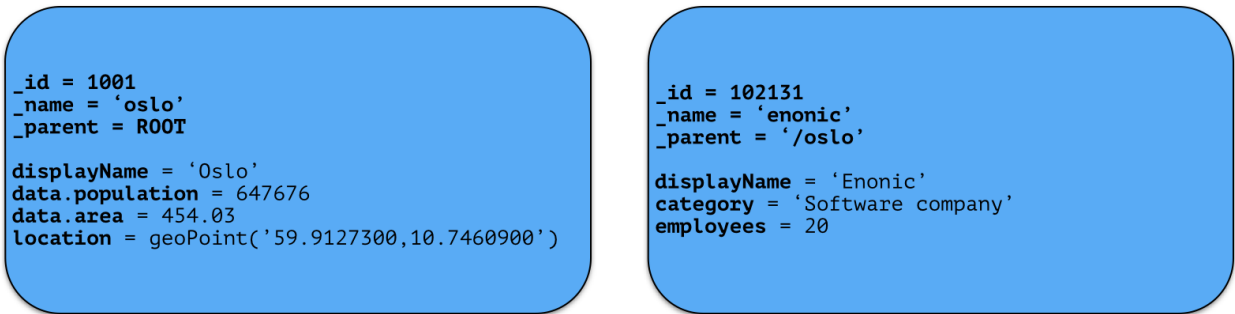
When nodes are stored in the repository, two things happens:

- The node properties are stored in a *Blobstore* as a *node-version*. A node-version is an entity representing the properties of the node, without name, parent and other meta-data.
- The node is inserted into a *branch*. The branch keeps track of a tree-structure referring to node-versions.

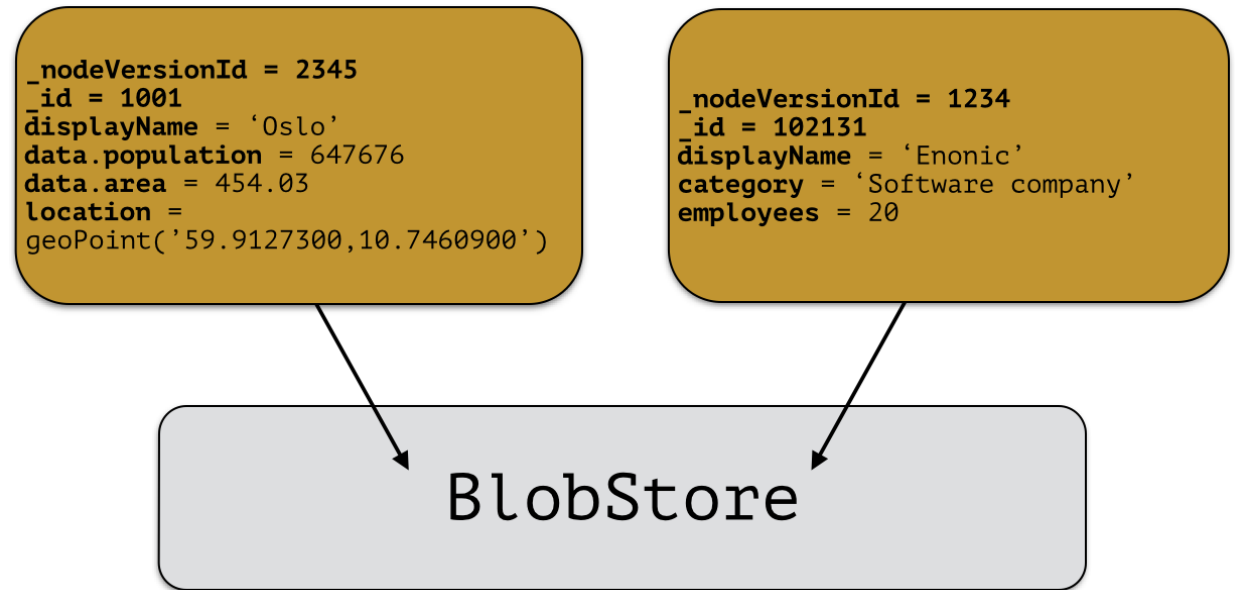
A repository will always contain a default branch, called ‘master’. If there is more than one branch, API methods are used for resolving diff between and pushing changes from one branch to another.

Node versions and branches

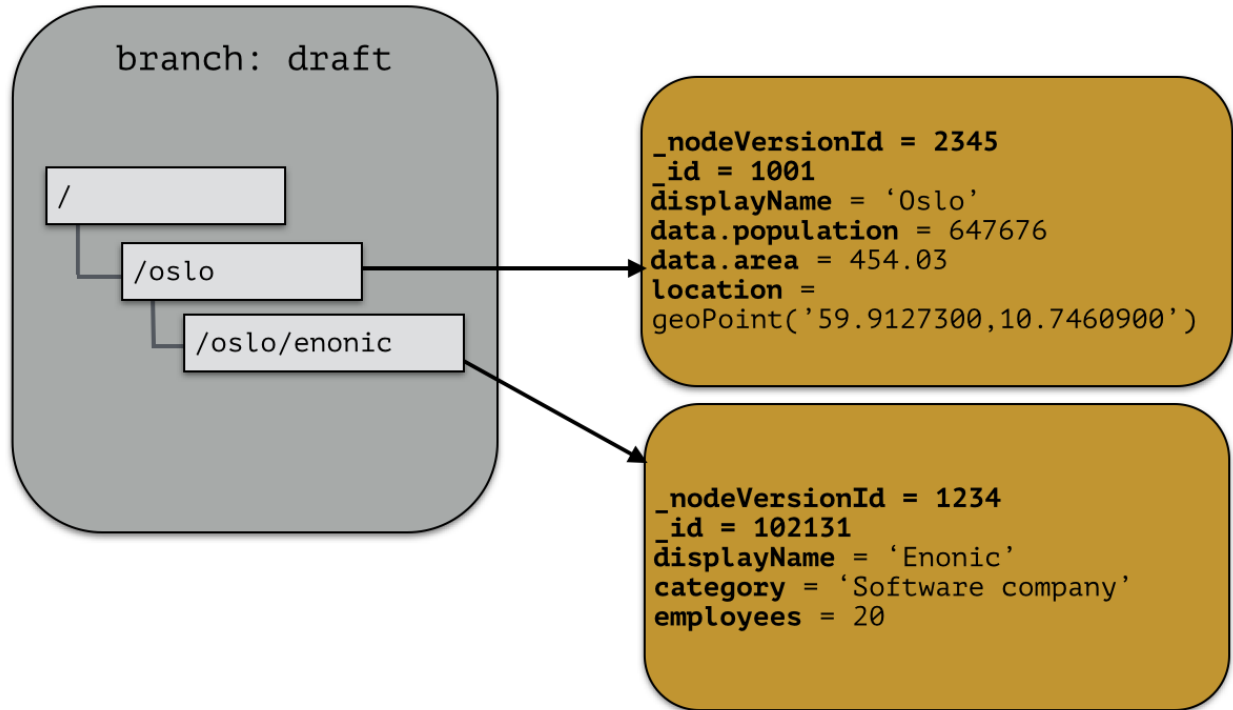
Consider the ‘Oslo’ and ‘Enonic’ nodes from earlier sections:



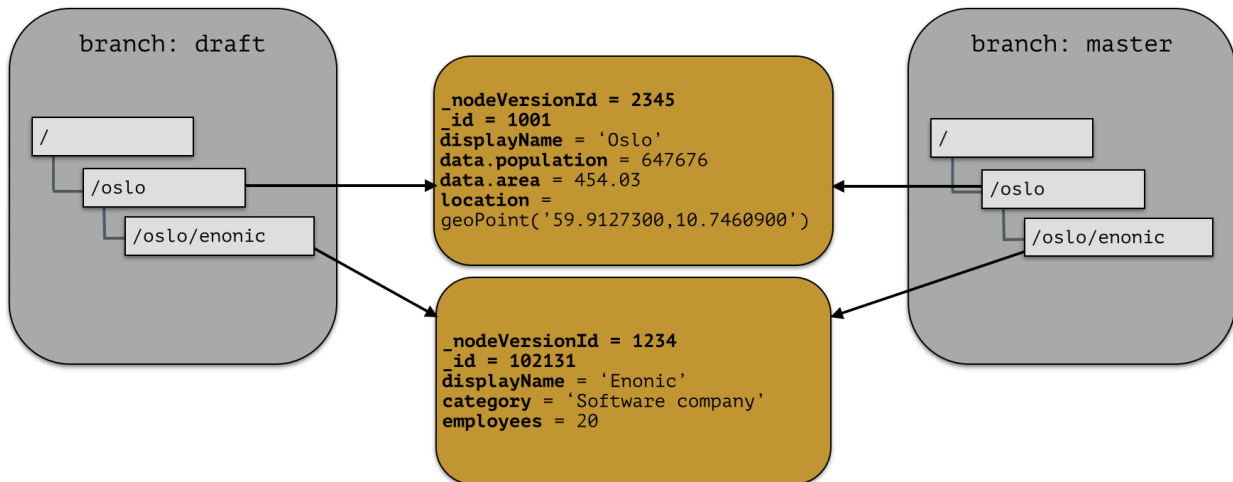
There will be two *node-versions* in the repository stored in the blobstore:



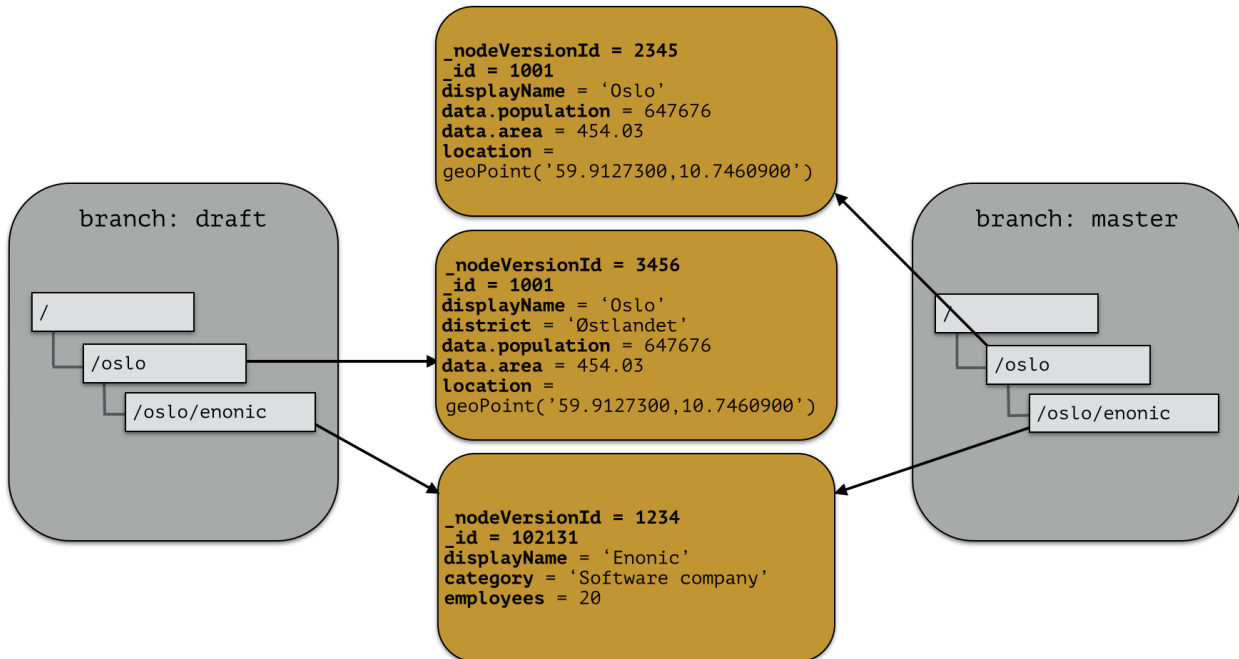
A node-version is a representation of a node's properties. A node-version has no knowledge of name, parent or other meta-data: just the properties of a node. At the same time, the targeted branch (named 'draft' in this example) gets two entries:



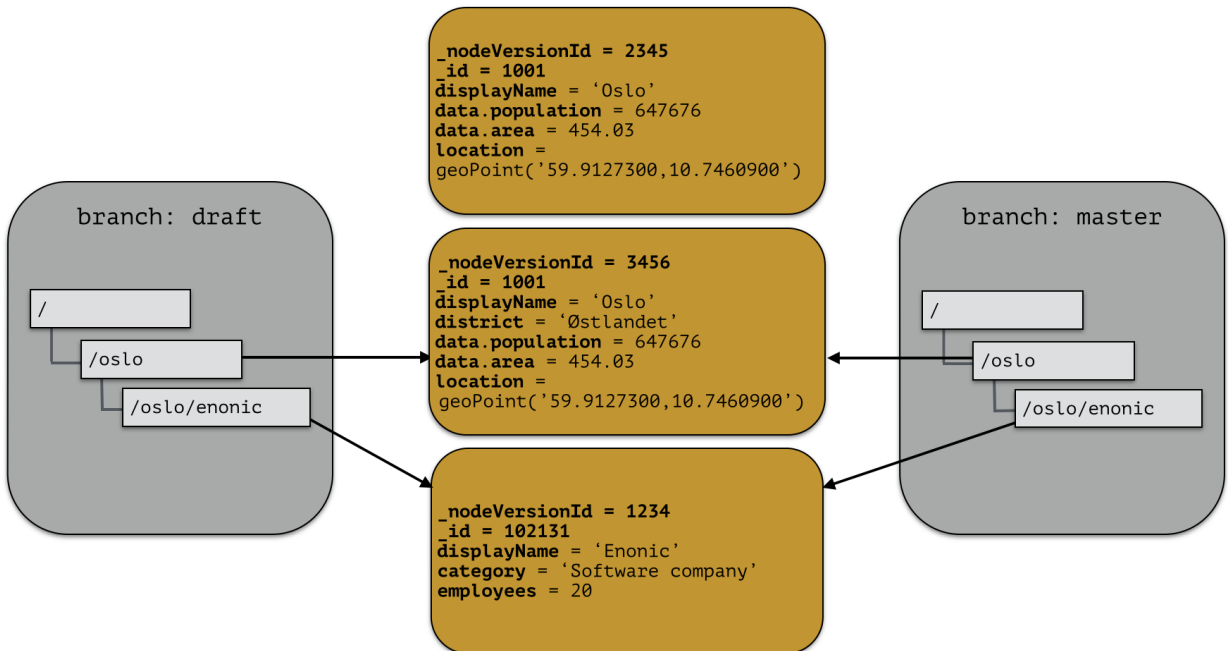
The node-versions are now a part of a tree-structure, based on the node's name and parent. If we *push* the content of branch 'draft' to the default branch 'master', we end up with something like this:



At the moment, there are two branches pointing to the same node-versions. This means that a single node version can exist in several branches with different structures. Now, consider that the 'oslo' - node is updated and stored to the 'draft'-branch, resulting in a new node-version with the same id and an updated pointer from the branch:



The two branches now point to different node-versions of the 'oslo' node. Again, doing a push-operation from 'draft' to 'master' will result in both nodes pointing to the same node-versions:



Repository characteristics

Note: Currently, there is no API for creating and managing repositories, so this information is for reference only at the moment.

A repository should be tuned to match the characteristic of the data you want to store, e.g:

- Expected number of documents
- Read or Write - optimized
- Real-time/near real-time/batch - data availability requirements
- Analyzing
- Archiving strategy

For instance; a log repository will have to be able to handle a large amount of data, but there will probably be no real-time requirements for data to be available. Also, archiving data will be needed to prevent the repository from growing infinitely.

3.11.7 Blobstore

The blobstore is a file system location defaulted to `$XP_HOME/repo/blob`. The blobstore itself is split into one directory for nodes and one for binaries.

3.12 Search

This section explains how to find data in the Enonic Content Repository. For a system that deals with storing and retrieving data, a rich search-API is paramount.

3.12.1 Overview

When searching in Enonic XP, you are searching for nodes, or content if working in the context of the [CMS content API](#). This documentation is general and intended for the *Node Domain*, but except for some built-in property-values and the addition of some convenience parameters in the content domain, everything is valid for both domains.

In general, the search-APIs deal with a number of basic parameters:

- start
- count
- query
- filter
- aggregations

Start & count

When searching, the result will contain a number of matching nodes. This number is given by the provided `count` parameter in the query. The result will also contain a value indicating the total number of hits for the search: `total`. The `start` parameter indicates from what position in the result set we should start retrieving results.

Lets consider a search matching 1000 documents. Usually, one does not retrieve all these results at once, but rather a subset of the result - and fetch the next subset of the result if necessary. This type of data-retrieving is called paging.

Typically, one will decide the number of wanted results for each iteration, e.g 100:

- start = 0
- count = 100

Then, for the next iteration, we will start from the first result not retrieved in the first iteration:

- `start = 100`
- `count = 100`

The `total` return field can be used to create page-navigation for the search result, by dividing the `total` hits by the page-size (`count`) to get the needed number of pages.

Query

The query-part of a search is where the constraints are defined. All nodes in the repository will match when then query parameter is empty. The query is defined in the [Query Language](#) section.

The results matching the query constraint will be assigned a score. This is imperative for fulltext-type queries. The score of a matching document depends on how the constraint is defined, e.g which fulltext-like function is used. See the [Query Functions](#) section for details.

Filter & query-filter

A filter also applies constraints. The difference between a filter-constraint and a query-constraint, is that the hits matching the filter are not scored. Scoring hits is a costly operation, and makes no sense for typical filter constraints like “`price > 10`”, so it’s a good way of optimizing searches by appending non-fulltext operations to the filter-constraint instead of the query-constraint.

There are also two different kinds of filters. A *query-filter* is a part of the query-constraint, meaning that aggregations results are also affected by these constraints. A *filter* on the other hand, is not considered in the aggregations calculations, meaning that applying a filter will not impact the aggregation result.

Aggregations

An aggregation is a function, or something that is executed, on a collection of search results. The search-results are defined by the query and query-filter of the search request. See the [Aggregations](#) section for details.

3.12.2 Node Indexing

When nodes are persisted, they will automatically be indexed. If no special indexing instructions are passed with the node, the node will be indexed based on the property types.

Indexing instructions

By default, nodes will be indexed using the “type” instruction - using the `propertyType` to determine how it should be indexed. Special indexing options may be passed along with the node - forcing special handling of one or more properties. These options are described below:

type (default) Indexing is done based on type; e.g numeric values are stored as both string and numeric.

string Force indexing as a string-value only, no matter what type of data.

datetime Indexed as a datetime-value and string, no matter what type of data. If not able to parse value as date-time, no value will be indexed.

numeric Indexed as a numeric (double) and string, no matter what type of data. If not able to parse value as number, no value will be indexed.

minimal Indexed as a string-value only, no matter what type of data.

none Value not indexed.

ngram nGram-indexed fields are available for search by using the nGram-function. An nGram-analyzed field will index all substring values from 2 to 15 characters.

Consider this value of a property of type `text-line`:

```
"article"
```

This is split into the following tokens when analyzed:

```
'ar', 'art', 'arti', 'artic', 'articl', 'article'
```

For more information about how the nGram-function works, check out the nGram-function.

fulltext Fulltext-indexed fields are available for search by using the fulltext-function. A fulltext-analyzed field will be split into tokens.

Consider this value of a property of type `text-line`:

```
"This article contains information test-driven development"
```

This is split into the following tokens when analyzed:

```
'this', 'article', 'contains', 'information', 'about', 'test', 'driven', 'development'
```

For more information about how the fulltext-function works, check out the fulltext-function.

3.12.3 Indexed content properties

All user defined properties are indexed and available for queries.

In addition there are a number of standard content-properties available for search:

_alltext A collection of all fulltext-analyzed fields (`textLine`, `textArea`, `htmlArea`) in a content in one property

_id Holds the id of the content, typically generated automatically in the form of a UUID.

_manualordervalue The order value used when child-content is ordered manually

_name Holds the name of the content

_parentPath Reference to parent content path.

_path The content path

_permissions_read The principals that have read access.

_permissions_create The principals that have create access.

_permissions_delete The principals that have delete access.

_permissions_modify The principals that have modify access.

_permissions_publish The principals that have publish access.

_permissions_readpermissions The principals that have access to read the content permissions.

_permissions_writepermissions The principals that have access to change the content permissions.

_references Outgoing references to other content.

_score Calculated relevance for a hit

_state Used for keeping state of a content in a branch.

_timestamp The last change to the content version.

_versionKey The id of the node version.

attachment.size If any attachments, contains an array of attachment sizes

attachment.label If any attachments, contains an array of attachment labels

attachment.mimetype If any attachments, contains an array of attachment mime-types

attachment.name If any attachments, contains an array of attachment name

attachment.binary If any attachments, contains an array of attachment file-name

creator The user principal that created the content.

createdTime The timestamp when the content was created.

data A property-set containing all user defined properties defined in the content-type.

displayName Name used for display purposes.

language The locale-property of the content.

modifiedTime Last time the content was modified.

owner The user principal that owns the content.

page The page property contains page-specific properties, like template and regions.

page.region.component.textcomponent.text This property contains all values in the text-components added to pages

type The content-type name

x A property-set containing properties from mixins, also known as extra data. Indexed values depend on the specified mixins.

3.12.4 Query Functions

Here's a description of all functions that can be used in a query.

fulltext

The fulltext function is searching for words in a field, and calculates relevance scores for matches based on a set of rules (e.g number of occurrences, field-length).

Tip: Only fields analyzed as text are considered when applying the fulltext-function. This includes, as default, all text-based fields in the content-domain.

Syntax

```
fulltext (<fields>, <search-string>, <operator>)
```

Fields

Fields is a string containing a comma-separated list of fields to include in the search. Wildcards are supported in field-names.

You can boost - thus increasing or decreasing hit-score pr field basis - if providing more than one field to the query by appending a weight-factor: ^N:

```
fulltext('title^5,description', 'my search string', 'AND')
```

Operator

The allowed operators are:

- OR Matches if any of the words in the search-string matches.
- AND Matches only if all words in search-string matches.

Search-string syntax

The search-string supports a set of operator:

- + signifies AND operation.
- | signifies OR operation.
- – negates a single token.
- * at the end of a term signifies a prefix query.
- (and) signify precedence.
- ~N after a word signifies edit distance (fuzziness) with a number representing [Levenshtein distance](#).
- ~N after a phrase signifies slop amount.

Examples

Match if “myField” contains any of the given words.

```
fulltext("myField", "cheese fish cake onion", "OR")
```

Match if any field with path starting with “myData.myProperties” contains any of the given words.

```
fulltext("myData.myProperties.*", "cheese fish cake onion", "OR")
```

Match if “myField” contains any of the given words and “myCategory” = “soup”.

```
myCategory = "soup" AND fulltext("myField", "cheese fish cake onion", "OR")
```

Match if “myField” contains all the given words.

```
fulltext("myField", "cheese fish cake onion", "AND")
```

Match if “myField” contains “Levenshtein” with a fuzziness distance of 2.

```
fulltext("myField", "Levenshtein~2", "AND")
```

Match if “myField” contains “fish” and not “boat”.

```
fulltext("myField", "fish -boat", "AND")
```

Match if any field under data-set data contains “fish” and not “boat”.

```
fulltext("data.*", "fish -boat", "AND")
```

nGram

An n-gram is a sequence of n letters from a string. The nGram-function is used to search for words or phrases beginning with a given search string. Typically, find-as-you-type searches will use this function.

Tip: Only fields analyzed as text are considered when applying the ngram-function. This includes, as default, all text-based fields in the content-domain.

Syntax

```
ngram(<field>, <search-string>, <operator>)
```

Operator

The allowed operators are:

- OR Matches if any of the words in the search-string matches.
- AND Matches only if all words in search-string matches.

Examples

Matches if “myField” contains any word beginning with “lev”, e.g “Levenshteins Algorithm”.

```
ngram("myField", "lev", "AND")
```

Matches if “myField” contains words beginning with “lev” and “alg”, e.g “Levenshteins Algorithm”.

```
ngram("myField", "lev alg", "AND")
```

Matches if “myField” contains words beginning with “fish” or “boat”, e.g “fishpond” or “boatman”.

```
ngram("myField", "fish boat", "OR")
```

range

The range functions test each value in the given field for a given range.

Syntax

```
range(<field>, <from>, <to>, [<includeFrom>], [<includeTo>])
```

The `from` and `to` values must be of the same type.

`includeFrom` and `includeTo` are optional with default value `'false'`, meaning that the actual values for the `from` and `to` are not included as matches.

Unbounded ranges can be queried by providing an empty string as argument.

Examples

Matches all that have a version-string in the range, including `'6.3.0'`

```
range('version', '6.3.0', '6.4.0', 'true', 'false')
```

```
range('publishFrom', instant('2015-08-01T09:00:00Z'), instant('2015-08-01T11:00:00Z'))
```

Matches all that have values between 2.0 and 3.0, including 2.0

```
range('myValue', 2.0, 3.0, 'true', 'false')
```

Matches all that have `publishFrom`-date newer than the given date.

```
range('publishFrom', instant('2015-08-01T09:00:00Z'), '')
```

Matches all that have `publishTo`-date older than the given date.

```
range('publishTo', '', instant('2015-08-01T09:00:00Z'))
```

3.12.5 Order Functions

Here's a description of all functions that can be used in order-by clause.

geoDistance

The `geoDistance`-function enables you to order the results according to distance to a given geo-point.

Tip: Documents with no geo-point property with the given path will be ordered last if matching the query.

Syntax

```
geoDistance(<field>, <location>)
```

Field Field-argument accepts a path to a property containing `geoPoint` data.

Location The location is a `geoPoint` from which the distance factor should be calculated, formatted as "latitude,longitude".

Examples

Order by distance from "shopLocation" to the fixed location.

```
ORDER BY geoDistance("shopLocation", "59.9127300,10.7460900")
```

3.12.6 Aggregations

An aggregation is a function that is executed on a collection of search results. The search-results are defined by the query and query-filter of the search request.

For instance, consider a query returning all nodes that have a property “price” less than, say, \$100. Now, we want to divide the result nodes into ranges, say 0-\$25, \$25-\$50 and so on. We also would like to know the average price for each category. This could be done by doing multiple separate queries and calculating the average manually, but this would be very inefficient and cumbersome. Luckily, aggregations solve these types of problems easily.

In some API functions it is possible to send in an aggregations expression object. This object is either in Java or a JSON like the following:

```
"aggregations" : {
  "[name]" : {
    "[type]" : {
      ... body ...
    },
    "aggregations": {
      ... sub-aggregations ...
    }
  }
}
```

There are two different types of aggregations:

- **Bucket aggregations:** A bucket aggregation places documents matching the query in a collection - a bucket. Each bucket has a key.
- **Metrics aggregations:** A metric aggregation computes metrics over a set of documents.

Typically, you will divide data into buckets and then use metric aggregations to calculate e.g average values, sum, etc for each bucket, if necessary.

terms

The ‘terms’ aggregation places documents into bucket based on property values. Each unique value of a property will get its own bucket. Here’s a list of properties:

field (string) The property path.

size (int) The number of bucket to return, ordered by the given orderType and orderDirection. Default to 10.

order (string) How to order the results, type and direction. Default to `_term ASC`.

Types:

- `_term`: Alphabetic ordering of bucket keys.
- `_count`: Numeric ordering of number of document in buckets.

Here’s an example of the terms aggregation:

```
"aggregations": {
  "categories": {
    "terms": {
      "field": "myCategory",
      "order": "_count desc",
      "size": 10
    }
  }
}
```

The above example gives a result with this structure:

```
"aggregations": {
  "categories": {
    "buckets": [{
      "docCount": 132,
      "key": "articles"
    },
    {
      "docCount": 101,
      "key": "documents"
    },
    {
      "docCount": 43,
      "key": "case-studies"
    }
  ]
}
```

range

The range aggregation query defines a set of ranges that represents a bucket. Here's a list of properties:

field (string) The property path.

ranges (range[]) The range-buckets to create.

range (from: number, to: number) Defines a range to create a bucket for. From-value is included in bucket, to is excluded.

Here's an example of the range aggregation:

```
"price_ranges": {
  "range": {
    "field": "price",
    "ranges": [
      { "to": 50 },
      { "from": 50, "to": 100 },
      { "from": 100 }
    ]
  }
}
```

The above example gives a result with this structure:

```
"price_ranges": {
  "buckets": [{
    "docCount": 2,
    "key": "a",
    "to": 50
  },
  {
    "docCount": 4,
    "from": 50,
    "key": "b",
    "to": 100
  },
  {
    "docCount": 1,
    "key": "c",
    "from": 100
  }
]
```

```
{
  "docCount": 4,
  "from": 100,
  "key": "c"
}]
}
```

dateRange

The `dateRange` aggregation query defines a set of date-ranges that represents a bucket. Only documents with properties of type 'DateTime' will be considered in the `dateRange` aggregation buckets. Here's a list of properties:

field (string) The property path.

format (string) The date-format of which the buckets will be formatted to on return. Default to `YYYY-MM-DDThh:mm:ssTZD`.

ranges (range[]) The range-buckets to create.

range (from: number, to: number) Defines a range to create a bucket for. From-value is included in bucket, to is excluded. The from and to follows a special date-math explained below.

Here's an example of the `dateRange` aggregation:

```
"my_date_range": {
  "dateRange": {
    "field": "date",
    "format": "MM-yyy",
    "ranges": [{
      "to": "now-10M"
    },
    {
      "from": "now-10M"
    }]
  }
}
```

The above example gives a result with this structure:

```
"price_ranges": {
  "buckets": [{
    "docCount": 2,
    "key": "a",
    "to": 50
  },
  {
    "docCount": 4,
    "from": 50,
    "key": "b",
    "to": 100
  },
  {
    "docCount": 4,
    "from": 100,
    "key": "c"
  }]
}
```

Date-math expression

The range fields accepts a date-math expression to calculate the time-spans.

Now minus a day:

```
now-1d
```

The given date minus 3 days plus one minute:

```
2014-12-10T10:00:00Z||-3h+1m
```

Range describing now plus one day and thirty minutes, rounded to minutes:

```
now+1d+30m/m
```

dateHistogram

The date-histogram aggregation query defines a set of bucket based on a given time-unit. For instance, if querying a set of log-events, a `dateHistogram` aggregations query with interval `h` (hour) will divide each log event into a bucket for each hour in the time-span of the matching events. Here's a list of properties:

field (string) The property path.

interval (string) The time-unit interval for creating bucket. Supported time-unit notations:

- `y` = Year
- `M` = Month
- `w` = Week
- `d` = Day
- `h` = Hour
- `m` = Minute
- `s` = Second

format (string) Output format of date string.

minDocCount (int) Only include bucket in result if number of hits \leq `minDocCount`.

Here's an example of the `date_histogram` aggregation:

```
"by_month": {
  "dateHistogram": {
    "field": "init_date",
    "interval": "1M",
    "minDocCount": 0,
    "format": "MM-yyy"
  }
}
```

The above example gives a result with this structure:

```
"by_month" : {
  "buckets" : [{
    "docCount" : 8,
    "key" : "2014-01"
  }, {
    "docCount" : 10,
```

```

    "key" : "2014-02"
  }, {
    "docCount" : 12,
    "key" : "2014-03"
  }
]
}

```

stats

The stats-aggregations calculates the following statistics for the parent-aggregation buckets:

- avg
- min
- max
- count
- sum

Here's a list of properties:

field (string) The property path.

Here's an example of the stats aggregation:

```

{
  "start": 0,
  "count": 0,
  "aggregations": {
    "products": {
      "terms": {
        "field": "data.product.category",
        "order": "_count desc",
        "size": 10
      },
      "aggregations": {
        "priceStats": {
          "stats": {
            "field": "data.product.price"
          }
        }
      }
    }
  }
}

```

The above example gives a result with this structure:

```

"products": {
  "buckets": [{
    "key": "tv",
    "docCount": 123,
    "priceStats": {
      "count": 123,
      "min": 2599,
      "max": 87944,
      "avg": 7400,
      "sum": 578100
    }
  ]
}

```

```
    }
  },
  {
    "key": "blu-ray player",
    "docCount": 42,
    "priceStats": {
      "count": 42,
      "min": 699,
      "max": 5999,
      "avg": 1548,
      "sum": 65016
    }
  },
  {
    "key": "reciever",
    "docCount": 12,
    "priceStats": {
      "count": 12,
      "min": 2999,
      "max": 26950,
      "avg": 5548,
      "sum": 66756
    }
  }
}]
}
```

geo-distance

The `geo_distance` aggregation needs a defined range to split the documents into buckets. Only documents with properties of type 'GeoPoint' will be considered in the `geo_distance` aggregation buckets.

Here's a list of properties:

field (string) The property path.

ranges (range[]) The range-buckets to create.

range (from: number, to: number) Defines a range to create a bucket for. From-value is included in bucket, to is excluded.

unit (string) The measurement unit to use for the ranges. Legal values are either the full name or the abbreviation of the following: km (kilometers), m (meters), cm (centimeters), mm (millimeters), mi (miles), yd (yards), ft (feet) or nmi (nauticalmiles).

origin (lat: number, lon: number) The GeoPoint from which the distance is measured.

Here's an example of the range aggregation:

```
"aggregations": {
  "distance": {
    "geo_distance": {
      'field': "data.cityLocation",
      'unit': "km",
      'origin': {
        'lat': "90.0",
        'lon': "0.0"
      },
      'ranges': [ { 'from': 0, 'to': 1200 }, { 'from': 1200, 'to': 4000 }, { 'from': 4000,
```

```
}
}
```

The above example gives a result with this structure:

```
"aggregations":
  {"distance":
    {"buckets": [{
      "key": "*-1200.0",
      "doc_count": 3,
    },
    {
      "key": "1200.0-4000.0",
      "doc_count": 4,
    },
    {
      "key": "4000.0-12000.0",
      "doc_count": 5,
    },
    {
      "key": "12000.0-*",
      "doc_count": 1,
    }
  ]},
}
```

NOTE: At the time of writing, there is only one way of find out which result belongs to which bucket: By also sorting the result on `geo_distance`, and matching the order to the number of each bucket. In a future version, there will easier ways of doing this.

3.12.7 Ordering results

Any field can be used to order the result, either (default) DESC (descending) or ASC (ascending). The default field for ordering is `_score`

`_score`

The score-value is calculated based on a number of factors, e.g number of matching clauses in boolean expressions, how often the term appears in the documents when searching for text etc. See [elasticsearch-documentation](#) for more insight.

3.12.8 Querying date and time

Querying against date and time-fields may require some knowledge on how data is stored and indexed.

LocalDate

LocalDate represents a date without time-zone in the ISO-8601 calendar, e.g 2015-03-19. LocalDate-properties are stored as a ISO LocalDate-formatted string in the index, thus all searches are done against string-values.

LocalDate string-format:

```
yyyy-MM-dd
```

Given a node with a property named 'myLocalDate' of type `localDate` and value `2015-03-19`, all of the following queries will match:

```
myLocalDate = '2015-03-19'
myLocalDate > '2015-03-18'
myLocalDate <= '2015-03-19'
```

LocalTime

`LocalTime` represents a time without time-zone in the ISO-8601 calendar, e.g `11:39:49`. `LocalTime`-properties are stored as a ISO `LocalTime`-formatted string in the index, thus all searches are done against string-values.

`LocalTime` string-format:

```
HH:mm[:ss[.SSS]]
```

`LocalTime` string value examples:

```
09:30
10:00
10:00:30
10:00:30.142
```

Since the queries are matching string-values, the input time in query must either adhere the same string-format restrictions, or be wrapped in a function `time` which accepts a time-formatted string as input.

Given a node with a property named 'myLocalTime' of type `localTime` and value = `09:36:00`, all the following queries will match:

```
myLocalTime > '09:00'
myLocalTime = '09:36'
myLocalTime = '09:36:00'
myLocalTime LIKE '09:*'
myLocalTime < '09:36:01'
myLocalTime < '09:36:00.1'
```

This must be wrapped in time-function since its not padded with a leading 0:

```
myLocalTime > time('9:00')
```

If optional fractions of seconds are given, the string format will also contain this even if 0, and expression will not match unless wrapped in time-function:

```
myLocalTime = time('09:36:00.0')
```

Even if the string-matching will do the job 99% of the time, the safest bet is to always go with the time-function when applicable.

LocalDateTime

`LocalDateTime` represents a date-time without time-zone in the ISO-8601 calendar, e.g `2015-03-19T11:39:49`. `LocalDateTime`-properties are stored as a ISO `LocalDateTime`-formatted string in the index, thus all searches are done against string-values.

`LocalDateTime` string-format:

```
yyyy-MM-ddTHH:mm[:ss[.SSS]]
```

Since the queries are matching string-values, the input `dateTime` in query must either adhere the same string-format restrictions, or be wrapped in a function `dateTime` which accepts a `dateTime`-formatted string as input.

Given a node with a property named 'myLocalDateTime' of type `localDateTime` and value `2015-03-19T10:30:00`, all of the following queries will match:

```
myLocalDateTime = '2015-03-19T10:30:00'
myLocalDateTime = dateTime('2015-03-19T10:30')
myLocalDateTime < dateTime('2015-03-19T10:30:00.001')
```

DateTime / Instant

`DateTime` represents a date-time with time-zone in the ISO-8601 calendar, e.g `2015-03-19T11:39:49+02:00`. Its possible to query properties of with value-type *DateTime* both as an ISO instant and as ISO `dateTime`, using the provided built-in functions `instant` and `dateTime`.

Instant string-format (instant always given in UTC-time):

```
yyyy-MM-ddTHH:mm[:ss[.SSS]]Z
```

Instant string value examples:

```
2015-03-19T16:30:20Z
2015-03-19T16:30:20.123Z
```

`DateTime` string-format (Z for UTC, else offset in hours and minutes):

```
yyyy-MM-ddTHH:mm[:ss[.SSS]](Z|+hh:mm|-hh:mm)
```

`DateTime` string value examples:

```
2015-03-19T16:30:20Z
2015-03-19T16:30:20+01:00
2015-03-19T16:30:20-01:30
2015-03-19T16:30:20.123-01:30
```

Given a node with a property named 'myDateTime' of type `dateTime` and value `2015-03-19T10:25:00+02:00`, all of the following queries will match:

```
myDateTime = instant('2015-03-19T08:25:00Z')
myDateTime = dateTime('2015-03-19T08:25:00Z')
myDateTime = dateTime('2015-03-19T10:25:00+02:00')
myDateTime = dateTime('2015-03-19T11:25:00+03:00')
```

3.12.9 Querying paths

All nodes have three system-properties concerning the node placement in a branch, all of type `String`:

- `_name`: The node name without path.
- `_parentPath`: The parent node path.
- `_path`: The full path of the node.

Finds node with path `/content/mySite/myCategory/myContent`.

```
_path = '/content/mySite/myCategory/myContent'
```

Finds all nodes with name `myContent` in a folder named `myCategory`, e.g `/content/test/thisIsMyCategory/myContent` and `/content/myCategory/myContent`.

```
_name = 'myContent' AND _parentPath LIKE '*myCategory'
```

Finds all nodes under the path /content/mySite/myCategory including children of children.

```
_path LIKE '/content/mySite/myCategory/*'
```

Finds only first level children under the path /content/mySite/myCategory.

```
_parentPath = '/content/mySite/myCategory'
```

3.12.10 Querying references

References to other nodes are stored in a property named `_references`. This could be used to find incoming references to a node.

Find all nodes referring to the node with id = 'abc':

```
_references = 'abc'
```

3.13 Admin

Go go backoffice!

Complex applications often require some kind of “back office” tools for management. Enonic XP provides a standardized approach to deliver and extend Admin tools.

This document describes how you can build your own *Admin Tools* and extend some of the default tools shipped with XP through *Widgets*.

3.13.1 Admin Tools

Warning: Admin Tool support is experimental.

Admin Tools are independent “back office” user interfaces designed to manage Enonic XP or installed applications. Each tool will run in it’s own browser tab - here are some of the reasons for this:

- Faster user interfaces and better deep-linking support
- Developers can use their favorite front-end frameworks
- Simplified debugging

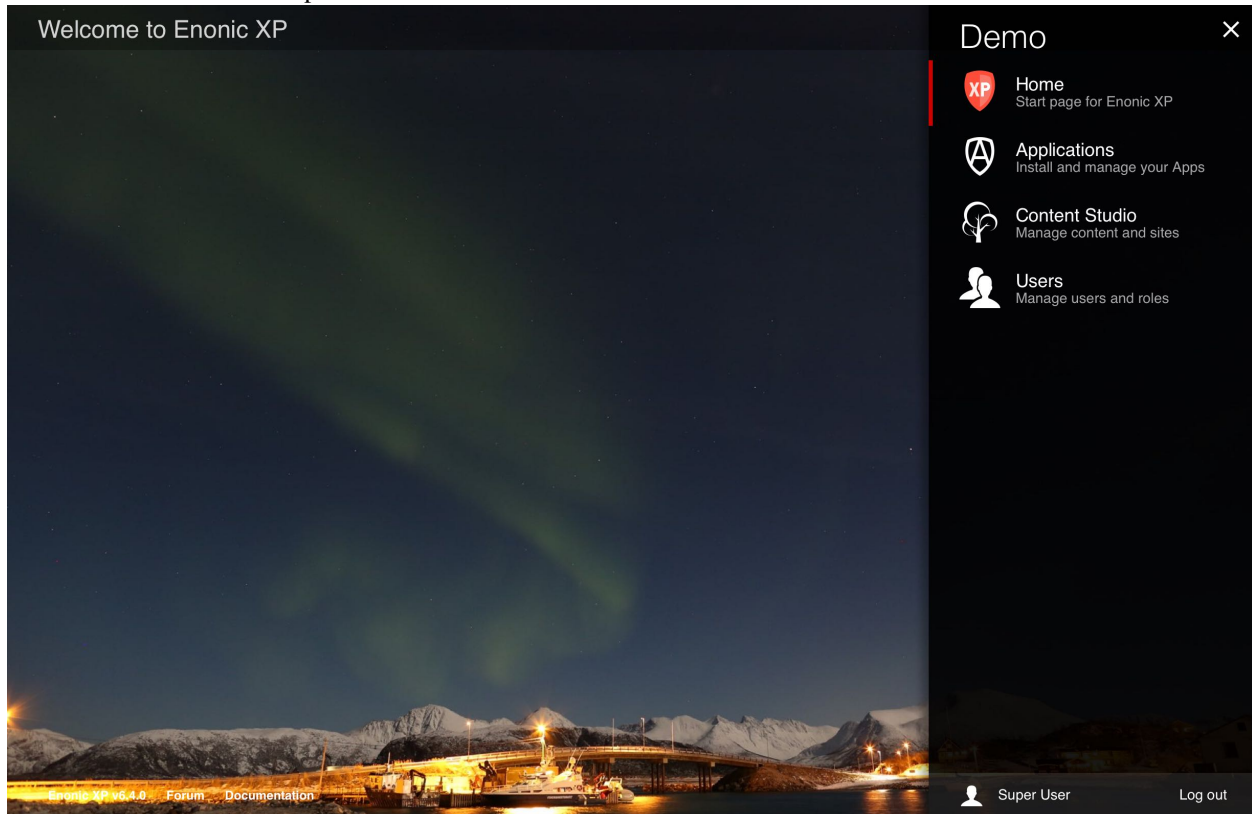
Standard Tools

Enonic XP ships with the following tools by default:

- Home (The default tool)
- Applications (Install, stop, start and uninstall applications)
- Content Studio (Create and manage content and sites)
- Users (Create, setup and manage users, groups and roles)

Launcher

Navigation between the various Admin Tools is done via the “Launcher Panel”, Accessible from the top right corner. This icon and the Launcher panel should be available across all Admin Tools.



To create a new Admin Tool, you must create a new folder in your project structure, i.e. `admin/tools/[tool-name]`. Then you must place a descriptor, an icon and a controller there.

Descriptor

The tool descriptor defines the basic info to be displayed in the launcher and which roles are required to access the tool.

The descriptor file must have the same name as the tool, i.e. `admin/tools/[tool-name]/[tool-name].xml`:

```
<tool>
  <display-name>My Tool</display-name>
  <description>Control my stuff</description>
  <allow>
    <principal>role:system.admin</principal>
    <principal>role:myapp.myrole</principal>
  </allow>
</tool>
```

Icon

You should add an SVG icon to the tool. This will be displayed in the launcher panel together with the info from the descriptor. The icon file must have the same name as the tool, i.e. `admin/tools/[tool-name]/[tool-name].svg`:

Controller

To drive the tool, we will need a **controller** (See [HTTP Controllers](#)). The controller typically produces the initial tool html. Depending on the tool implementation it may also handle sub-requests from the tool.

The controller must have the same name as the tool, i.e. `admin/tools/[tool-name]/[tool-name].js`:

```
exports.get = function (req) {
  return {
    body: '<html><head></head><body><h1>My first tool</h1></body></html>',
    contentType: 'text/html'
  };
};
```

Adding the Launcher Panel menu

Adding the Launcher Panel menu to a custom admin tool requires a few extra steps. The view file must include a JavaScript CONFIG object and the launcher.js file from the built-in XP admin UI app. The controller file below shows two parameters with the required values and the view file below shows how to use them.

```
var portalLib = require('/lib/xp/portal');
var thymeleaf = require('/lib/xp/thymeleaf');

exports.get = function (req) {

  var params = {
    adminUiAssetsUrl: portalLib.assetUrl({path: "", application: "com.enonic.xp.admin.ui"}),
    launcherJsUrl: portalLib.assetUrl({path: "/js/launcher.js", application: "com.enonic.xp.admin.ui"})
  }

  return {
    body: thymeleaf.render(view, params)
  };
};
```

The two script elements must be placed in the `<body>` of the view page. The CONFIG `appId` must match the name of the admin tool. This will work for an app named “system-info”.

```
<body>
  <script data-th-inline="javascript">
    /**/
      var CONFIG = {
        portalAssetsUrl : /*[[${adminUiAssetsUrl}]]*/,
        appId: 'system-info'
      };
    /*]]&gt;*/
  &lt;/script&gt;
  &lt;script type="text/javascript" data-th-src="${launcherJsUrl}"&gt;&lt;/script&gt;
&lt;/body&gt;</pre></div><div data-bbox="112 810 259 829" data-label="Section-Header"><h2>3.13.2 Widgets</h2></div><div data-bbox="125 852 415 869" data-label="Text"><div style="border: 1px solid black; padding: 5px;"><b>Warning:</b> Widget support is experimental.</div></div><div data-bbox="112 931 147 948" data-label="Page-Footer"><hr/>110</div><div data-bbox="654 931 889 949" data-label="Page-Footer">Chapter 3. Developer Guide</div>
```

Widgets are user interface components that can be used to extend various Admin Tools. Currently, the only available extension point for widgets are detail panels in the Content Studio tool.

To create a widget, you must create a new folder in your project structure, i.e. `admin/widgets/[widget-name]`. Then you must place a descriptor and a controller there.

Descriptor

The widget descriptor defines the display name and the interfaces it matches.

An interface is simply a unique identifier that is used to create a link between a tool and the widget. For example, for your widget to be displayed in the “Content Studio” detail panel, add the interface “contentstudio.detailpanel”

The descriptor file must match the widget name, i.e. `admin/widgets/[widget-name]/[widget-name].xml`:

```
<widget>
  <display-name>My first widget</display-name>
  <interfaces>
    <interface>contentstudio.detailpanel</interface>
  </interfaces>
</widget>
```

Controller

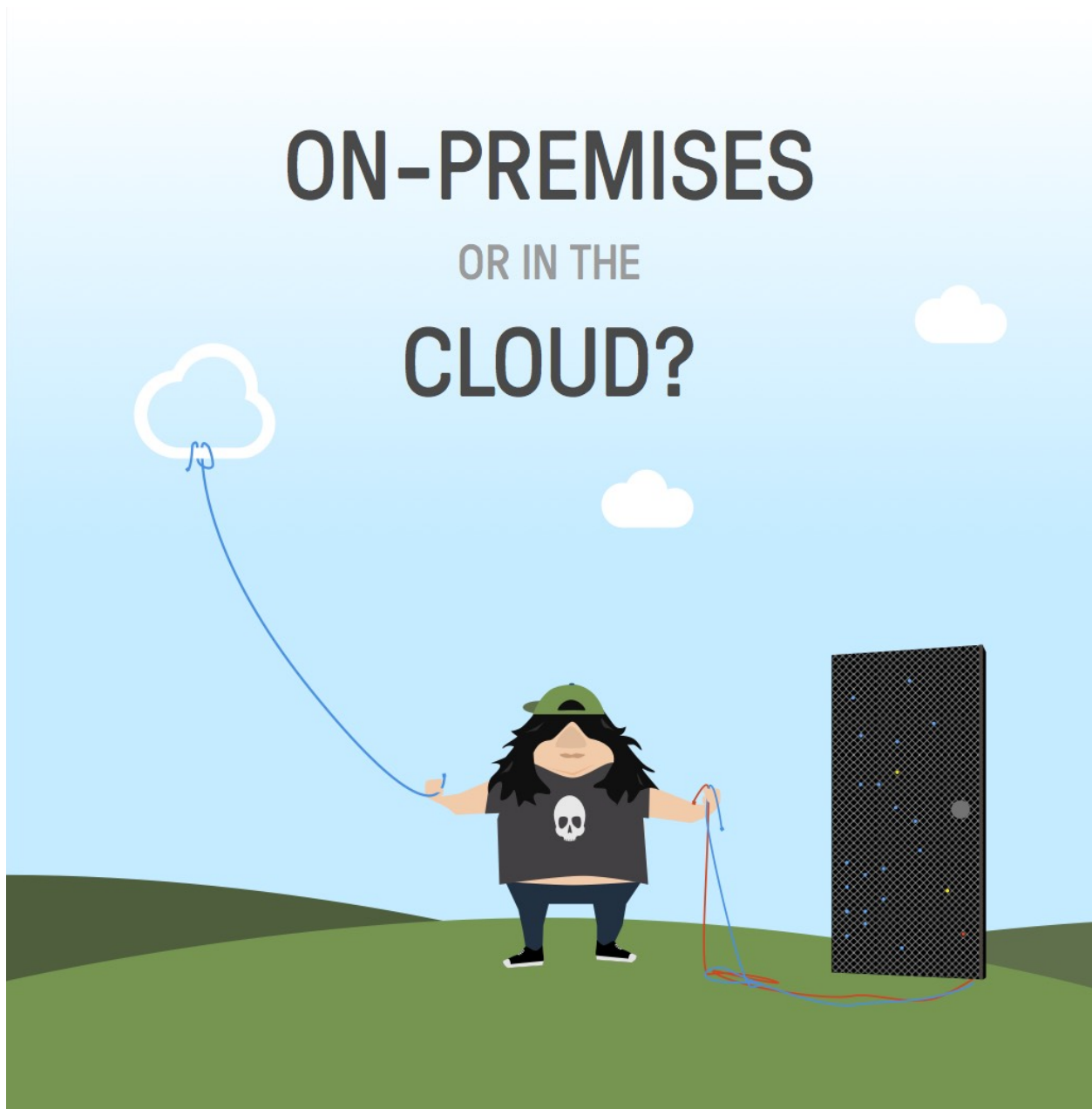
To drive the widget, we will need a controller (See [HTTP Controllers](#)). The controller typically produces the initial widget html. Depending on the widget implementation it may also handle sub-requests from the widget.

The controller file must match the widget name, i.e. `admin/widgets/[widget-name]/[widget-name].js`:

```
exports.get = function (req) {
  return {
    body: '<html><head></head><body><h1>My first widget</h1></body></html>',
    contentType: 'text/html'
  };
};
```

Operations Guide

This guide gives you all the gory details on how to tune Enonic XP - if you're looking for installation guides try [Getting Started](#)



4.1 Package Structure

The unzipped Enonic XP distribution will have the following structure (folders with a * will not appear until the installation is started the first time)

```
enonic-xp-[version]
|- bin/
|- home/
  |- config/
  |- data/ *
  |- deploy/
  |- logs/
```

```

|- repo/ *
|- snapshots/
|- work/ *
|- lib/
|- system/
|- toolbox/
|- work/ *

```

The root installation folder is referred to as `XP_INSTALL`. Here's an explanation of all the other folders:

bin/ Contains the scripts for starting and stopping Enonic XP and setting environment variables.

home/ Home directory, also called `XP_HOME`. All files for a specific instance of XP reside here. This folder can be copied to other locations for working with multiple projects.

config/ Configuration files are placed here, including Virtual Host and `system.properties`.

data/ Additional data like exports and dumps. This folder will not appear until certain operations are run.

deploy/ Hot deploy directory. Applications are automatically installed upon placing their JAR files in this directory.

logs/ Default location for logs.

repo/ Repository data (blobs and indexes). This folder will not appear until the installation is started for the first time.

snapshots/ This is where snapshots are stored when using the *snapshot*-operation. This folder will not appear until a snapshot is done.

work/ Cache and generated bundles are stored here. This folder will not appear until the installation is started the first time.

lib/ Contains the bootstrap code used to launch Enonic XP.

system/ System OSGi bundles are placed here.

toolbox/ Command-line interface tool to manage the server. See *Toolbox CLI*.

work/ OSGi cache is stored here. This folder will not appear until the installation is started for the first time.

4.2 Configuration

Enonic XP, system modules, and 3rd party modules can easily be configured by editing the files in the `$XP_HOME/config/` directory.

When changing files ending with `.cfg`, their respective modules will automatically restart with the new configuration. Files ending with `.properties` require a full restart of Enonic XP to be applied. In a clustered environment each node must be restarted.

4.2.1 System Configuration

The default `system.properties` are listed below.

Listing 4.1: `$XP_HOME/config/system.properties`

```
#  
# Installation settings  
#  
xp.name = demo  
  
#  
# Configuration FileMonitor properties  
#  
felix.fileinstall.poll = 1000  
felix.fileinstall.noInitialDelay = true
```

4.2.2 Virtual Host Configuration

Virtual hosts have their own configuration file and settings are automatically updated upon changes. A sample virtual host configuration is listed below.

Listing 4.2: `$XP_HOME/config/com.enonic.xp.web.vhost.cfg`

```
enabled = true  
  
mapping.test.host = localhost  
mapping.test.source = /status/a  
mapping.test.target = /full/path/status/a  
  
mapping.intranet.host = enonic.com  
mapping.intranet.source = /  
mapping.intranet.target = /portal/master/enonic.com  
  
mapping.admin.host = enonic.com  
mapping.admin.source = /admin  
mapping.admin.target = /admin
```

In this example file, three mappings are configured.

host Host-name to match.

source Requested path to match.

target Path to which the request is sent.

In the second example, mapping “intranet”, a site is mapped to the root of the URL, which would be normal in production environments.

In the third example, the admin site is mapped to `enonic.com/admin`.

4.2.3 Mail Configuration

The mail server used for sending email messages can be configured. A sample mail configuration is listed below.

Listing 4.3: `$XP_HOME/config/com.enonic.xp.mail.cfg`

```
smtpHost=mail.server.com  
smtpPort=25  
smtpAuth=true  
smtpUser=user
```

```
smtpPassword=secret
smtpTLS=false
```

smtpHost Host name of the SMTP server. Default localhost.

smtpPort TCP port of the SMTP server. Default 25.

smtpAuth Enable authentication with the SMTP server. Default false.

smtpUser User to be used during authentication with the SMTP server, if 'smtpAuth' is set to true.

smtpPassword Password to be used during authentication with the SMTP server, if 'smtpAuth' is set to true.

smtpTLS Turn on Transport Layer Security (TLS) security for SMTP servers that require it. Default false.

4.2.4 Storage Configuration

Repository Configuration

Repository configuration can be set using `com.enonic.xp.repo.cfg` file.

Listing 4.4: `$XP_HOME/config/com.enonic.xp.repo.cfg`

```
#
# Blobstore configuration to use.
#
blobStore.dir = ${xp.home}/repo/blob

#
# Where to store snapshots.
#
snapshots.dir = ${xp.home}/snapshots
```

Elasticsearch configuration

The cluster functionality is facilitated by Elasticsearch, so all relevant Elasticsearch settings are available.

When changing `com.enonic.xp.elasticsearch.cfg`, the node will automatically restart with the new configuration.

Listing 4.5: `$XP_HOME/config/com.enonic.xp.elasticsearch.cfg`

```
node.name = local-node
node.master = true

path = ${xp.home}/repo/index
path.data = ${path}/data
path.work = ${path}/work
path.conf = ${path}/conf
path.logs = ${path}/logs
path.plugins = ${path}/plugins

cluster.name = mycluster
cluster.routing.allocation.disk.threshold_enabled = false

http.enabled = false
network.host = 127.0.0.1
transport.tcp.port = 9300-9400
```

```
gateway.expected_nodes = 1
gateway.recover_after_time = 5m
gateway.recover_after_nodes = 1
discovery.zen.minimum_master_nodes = 1
discovery.zen.ping.unicast.hosts = 127.0.0.1

index.recovery.initial_shards = quorum
```

node.name Node name. Default `local-node`.

node.master Allow this node to be eligible as a master node. Default `true`.

node.data Allow data to be distributed to this node. Default `true`.

path Path to directory where elasticsearch stores files. Default `${xp.home}/repo/index`. Should be on a local file-system, not sharded.

path.data Path to directory where to store index data allocated for this node. Default `$path/data`.

path.work Path to temporary files. Default `${xp.home}/repo/index/work`.

path.conf Path to directory containing configuration. Default `$path/conf`.

path.logs Path to log files. Default `${xp.home}/repo/index/logs`.

path.plugins Path to where plugins are installed. Default `$path/plugins`.

cluster.name Cluster name. Default `mycluster`.

cluster.routing.allocation.disk.threshold_enabled Prevent shard allocation on nodes depending on disk usage. Default `false`.

http.enabled Enable the HTTP module. Default `false`.

network.host Set the bind address and the address other nodes will use to communicate with this node. Default `127.0.0.1`. Can be an explicit *IP-address*, a *host-name* or an *alias*. See the section below for an overview of aliases.

transport.tcp.port Custom port for the node to node communication. Defaults to the range 9300–9400.

gateway.expected_nodes Number of nodes expected to be in the cluster to start the recovery immediately. Default 1.

gateway.recover_after_time Time to wait until recovery happens once the nodes are met. Default 5m.

gateway.recover_after_nodes Number of nodes expected to be in the cluster to start the recovery after `gateway.recover_after_time`. Default 1.

discovery.zen.minimum_master_nodes Ensure a node sees N other master eligible nodes to be considered operational within the cluster. Default 1.

discovery.zen.ping.multicast.enabled Enable multicast ping discovery. Default `false`.

discovery.zen.ping.unicast.hosts List of master nodes in the cluster to perform discovery when new nodes are started. Default `127.0.0.1, [::1]`.

index.recovery.initial_shards Number of shards expected to be found on full cluster restart per index. Default `quorum`.

Network host aliases

- `_local_`: Will be resolved to the local ip address.
- `_non_loopback_`: The first non loopback address.
- `_non_loopback:ipv4_`: The first non loopback IPv4 address.
- `_non_loopback:ipv6_`: The first non loopback IPv6 address.

- `__[networkInterface]_`: Resolves to the ip address of the provided network interface. For example `_en0_`
- `__[networkInterface]:ipv4_`: Resolves to the ipv4 address of the provided network interface. For example `_en0:ipv4_`
- `__[networkInterface]:ipv6_`: Resolves to the ipv6 address of the provided network interface. For example `_en0:ipv6_`

4.2.5 Jetty HTTP Configuration

Jetty HTTP settings can be configured using `com.enonic.xp.web.jetty.cfg` file.

Listing 4.6: `$XP_HOME/config/com.enonic.xp.web.jetty.cfg`

```
# Set this if host name (or ip) needs to be fixed.
host =

# Socket timeout for connections.
timeout = 60000

# True to send server header.
sendServerHeader = false

# True to enable HTTP connections.
http.enabled = true

# Http port number to use.
http.port = 8080

# Session timeout (when inactive) in minutes.
session.timeout = 60

# Cookie name to use for sessions.
session.cookieName = JSESSIONID

# Enable GZIP compression for responses.
gzip.enabled = true

# Minimum number of bytes in response to consider compressing the response.
gzip.minSize = 16

# True to enable request logging.
log.enabled = false

# Request log file.
log.file = ${xp.home}/logs/jetty-yyyy_mm_dd.request.log

# True to append to the file, or create new one when started.
log.append = true

# True to use extended format.
log.extended = true

# Timezone to display timestamp in.
log.timeZone = GMT
```

```
# Number of days to retain the logs.
log.retainDays = 31
```

4.2.6 OSGi Shell Configuration

To enable or configure OSGi shell, use `com.enonic.xp.server.shell.cfg` file.

Listing 4.7: `$XP_HOME/config/com.enonic.xp.server.shell.cfg`

```
#
# Remote shell configuration
#

enabled = false
telnet.ip = 127.0.0.1
telnet.port = 5555
telnet.maxConnect = 2
telnet.socketTimeout = 0
```

4.2.7 DoS Filter Configuration

The DoS (denial of service) filter can be configured using `com.enonic.xp.web.dos.cfg` file.

Listing 4.8: `$XP_HOME/config/com.enonic.xp.web.dos.cfg`

```
# Enable dos filter (true/false)
enabled = false

# Maximum number of requests from a connection per second. Requests in excess of this are first delayed
maxRequestsPerSec = 25

# Delay imposed on all requests over the rate limit. -1 = reject request, 0 delay.
delayMs = 100

# Length of time, in ms, to blocking wait for the throttle semaphore.
maxWaitMs = 50

# Number of requests over the rate limit able to be considered at once.
throttledRequests = 5

# Length of time, in ms, to async wait for semaphore.
throttleMs = 30000

# Length of time, in ms, to allow the request to run.
maxRequestMs = 30000

# Length of time, in ms, to keep track of request rates for a connection, before deciding that the user is
maxIdleTrackerMs = 30000

# If true, insert the DoSFilter headers into the response.
insertHeaders = true

# If true, usage rate is tracked by session if a session exists.
trackSessions = true
```

```
# If true and session tracking is not used, then rate is tracked by IP+port (effectively connection)
remotePort = false

# A comma-separated list of IP addresses that will not be rate limited.
ipWhitelist =
```

4.2.8 Market Configuration

The market-place for installing applications can be configured using the `com.enonic.xp.market.cfg` file

Listing 4.9: `$XP_HOME/config/com.enonic.xp.market.cfg`

```
marketUrl = https://market.enonic.com/applications
```

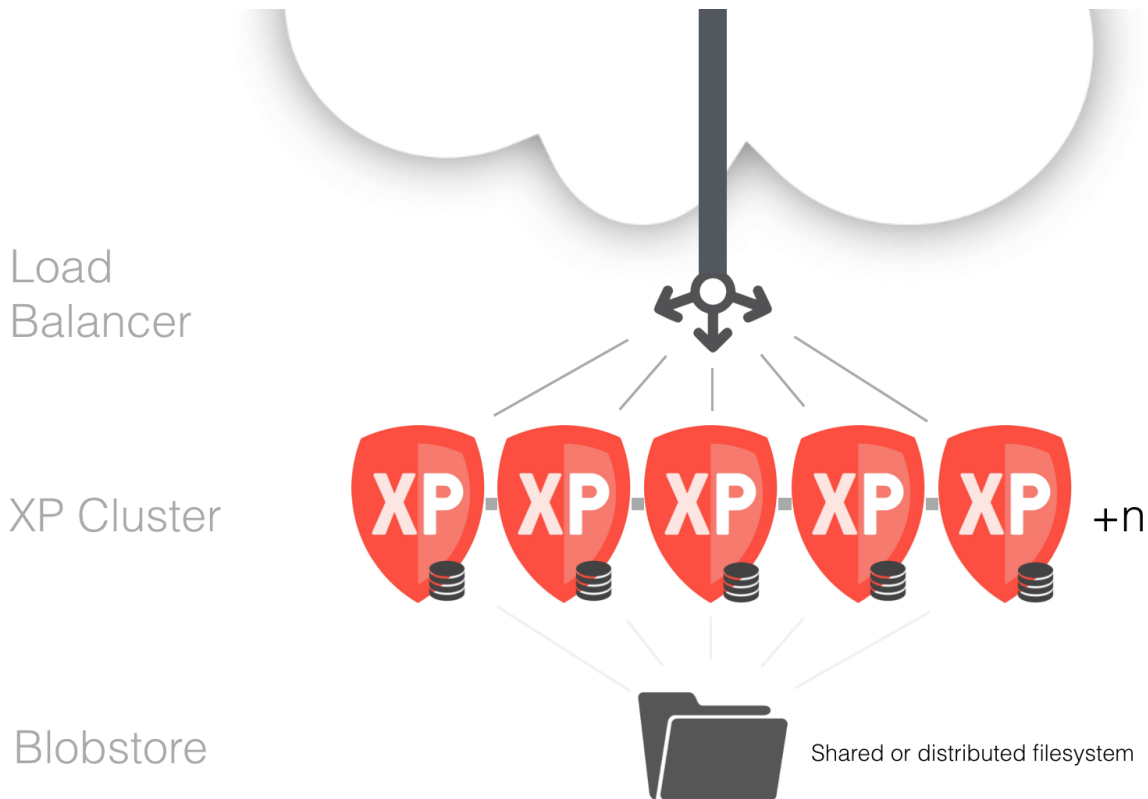
4.3 Clustering

4.3.1 Introduction

System Requirements

Enonic XP clusters have minimal requirements to infrastructure, it needs:

- Distributed (or shared) filesystem
- Load balancer - to make sure traffic is routed to different nodes



These components are standard ingredients in modern clouds and they are readily available as software as well. An XP cluster can also be launched on a regular computer for testing or development purposes.

Basic cluster setup on local machine

We have tried to make deployment of XP as simple and fail-safe as possible. By default it is configured to run on a local computer and it will not start looking for nodes in the network until you configure it to do so.

To test a cluster on your local machine, you need to do the following:

1. **Get two XP installations:** Download an `$XP_DISTRO` and copy it to a second `$XP_DISTRO` folder.

Typically, you will already have an XP-installation by now, so just copy the `$XP_DISTRO` folder to make another node.

2. **Share data:** Prepare a common place for storing data and configure both XP instances:

In `$XP_DISTRO/home/config/com.enonic.xp.repo.cfg` set the following property to point to a common directory:

```
blobStore.dir = /some/common/path
```

3. **Give each node its own HTTP-port:** Since you will run two nodes on the same machine, you also need to set two different HTTP-ports to be able to run two instances at once:

In `$XP_DISTRO/home/config/com.enonic.xp.web.jetty.cfg` set the following property to different values for the two nodes, typically 8080 and 8090

```
http.port = somePort
```

4. **Start your cluster:** Start both nodes by their respective `bin/server.sh` or `bin/server.bat`. They will connect and you should have a live cluster on your machine. You can check the current cluster info at:

```
http://localhost:8080/status/cluster
```

Note: By default, if no `XP_HOME` environment variable is set, the `XP_HOME` used is the one located in the `XP_DISTRO/home` folder which will work nicely for the above example. If you have set `XP_HOME` in the shell where you try to start the server, this will override the default settings. So for the above test, unset the `XP_HOME` variable if needed:

```
unset XP_HOME
```

4.3.2 Cluster configuration

There are a well of options at your disposal to configure and tune the cluster behavior. See [Elastic-search configuration](#) for a subset of the available settings. All settings referred to in this chapter are set in `$XP_HOME/config/com.enonic.xp.elasticsearch.cfg` unless otherwise specified.

There are some key elements to consider when setting up a cluster:

1. Set up a shared storage for the nodes -> [Shared storage Configuration](#)
2. Make sure that nodes are connected -> [Network configuration](#)
3. Distribute the data between the nodes -> [Replica setup](#)
4. Ensure cluster data integrity -> [Cluster partition settings](#)
5. Ensure cluster stability -> [Cluster stability settings](#)
6. Make sure nodes recover correctly -> [Node recovery settings](#)
7. Monitoring the cluster -> [Cluster monitoring](#)
8. Deploying applications -> [Deploying Apps in cluster](#)
9. Securing data -> [Backing up a cluster](#)

4.3.3 Shared storage Configuration

For now, the nodes in the cluster need a shared storage to store data as files. Setting this up is highly individual for different operating systems and infrastructures, but as a basic guideline:

1. Get access to a shared or distributed file system and mount it on the nodes that will be part of the cluster
2. Configure `$XP_HOME/config/com.enonic.xp.repo.cfg` to point to the mounted storage:

```
blobsStore.dir = /path/to/shared/disk/folder
```

4.3.4 Network configuration

The nodes in a cluster need to be able to discover and communicate with other nodes in the network. The nodes communicate through TCP.

Each node binds to an IP-address and port, and communicates to other nodes specified in a list of other nodes bind addresses. Verify that your network allows TCP traffic on a specific port or port-range for the nodes to communicate and then configure the nodes to use these addresses.

Settings

network.host

The `network.host` setting specifies the TCP-address used for node communication. The default value for this is `127.0.0.1`, which means that this node will never be able to talk to other nodes.

The `network.host` setting can be an explicit *IP-address*, a *host-name* or an *alias*. See the [Storage Configuration](#) section for an overview.

transport.tcp.port

The `transport.tcp.port` value defines the port that the node will use for communication. This defaults to a range of ports; `9300-9400`, meaning that it will use the first available port in this range.

discovery.zen.ping.unicast.hosts

The `discovery.zen.ping.unicast.hosts` value contains a comma-separated list of nodes that are allowed to join the cluster. Each value is either in the form of `host:port` or `host:port1-port2` (port-range).

Sample config

```
transport.tcp.port = 9300-9400
network.host = _eth0:ipv4_
discovery.zen.ping.unicast.hosts = 10.0.6.47[9300-9400],10.0.6.49[9300-9400],10.0.6.73[9300-9400],10.0.6.74[9300-9400]
```

Tip: Why aren't my nodes connecting

The most common issue is that the node binds to a different network address than specified in the unicast list. When a node starts, the log will show the current bind-address of the node in a message similar to this:

```
09:01:43.282 INFO org.elasticsearch.http - [loadtest-appserver1] bound_address {inet[/10.0.6.49:9300]}
```

Make sure that the bind-addresses match those specified in the unicast-list. If it still doesn't work, it's time to blame the firewall or consult the [Troubleshooting](#)

4.3.5 Replica setup

Number of replicas

For a cluster to perform, each node must be able to do its share of work. Enonic XP searches for data in a number of Elasticsearch indices. An index can have a number of replicas (copies) spread around to the nodes in the cluster, so each node can query its local index for data.

The indices in Enonic XP have one replica configured by default. When a cluster has more than two nodes, this number must be increased to ensure that each node has a replica of the indices.

The number of replicas can be set at runtime with the Toolbox CLI `set-replicas`, and the recommended settings for replicas is `number of nodes - 1`

So for a 3 node cluster, the number of replicas should be set to 2.

4.3.6 Cluster partition settings

One of the main motivations of a cluster is to ensure that even if one or several nodes fail, the service you are providing should still be available. In an ideal world, a 100 node cluster should be fully operational even if 99 nodes are down. But in the real world, we also need to consider the cluster data integrity. This introduces a common dilemma in clustered environments; how to avoid the dreaded split-brain situation.

In a split-brain scenario, nodes get divided into smaller clusters that don't communicate with each other, and each cluster believing that the nodes in the other cluster are dead. This can easily happen in a cluster with 4 nodes on two different locations:

<<<Figure>>>

If the nodes on location-1 are disconnected from the master node on location-2, they will regroup and select a new master on location-1 and still provide service. The nodes on location-2 will assume that the nodes in location-1 are dead, so they will also continue serving requests. but they have no way of synchronizing data between the locations. This will break the integrity of the cluster and make data invalid.

To avoid this situation, there are a couple of basic properties of a cluster that should be ensured:

1. Beyond a two node cluster, there should be an odd number of nodes. So 1,2,3,5,7 etc are all acceptable cluster configurations.
2. When nodes are forming separate smaller clusters, only the cluster-partition with the majority of nodes should be fully operational and accept writes.
3. The minority cluster partitions can be allowed to serve read-only requests if that is acceptable for the provided service.

Settings

`discovery.zen.minimum_master_nodes`

This is the most important setting to set correctly to ensure cluster data integrity. A node will not accept requests before the number of 'minimum_master_nodes' are met. For instance, in a 3 node cluster with 3 master nodes and 'minimum_master_nodes' setting of '2', imagine that one of the nodes loose connection to the two other nodes. This node will only see one possible master node (itself) and will not accept requests. The remaining two other nodes will still work, and when the lost node reconnects again, it will get the fresh data from the other nodes and rejoin the cluster.

Important: As a rule of thumb, this setting should be set to $N/2+1$, where N is the total number of nodes. So for a 5 node cluster, `discovery.zen.minimum_master_nodes = 5/2+1 = 3` (rounding down to the nearest integer)

So what about a 2 node cluster? It will be impossible to avoid a possible split-brain scenario with this setup. It's highly recommended to add one node as a tie-breaker. This node may act as a dedicated master node (with `node.data = false`, see [Cluster stability settings](#)) which enables it to run on less expensive hardware since it will not handle any external requests.

Tip: Why nodes leave the cluster

There are 2 main reasons why cluster nodes leave the cluster

1. Network failure
2. Node not responding

Network failures

Network failures are the main reason for cluster stability-issues. The problems could have any number of reasons, from a router breaking down to complex scenarios where e.g a firewall cuts the connection in one direction between two nodes

Node not responding

If a node does not get a response on a ping to the master node within a set timeout, it will consider it as dead and invoke an election process. Likewise, the master node expects that a slave node will respond within a certain amount of time. This is usually caused by a node doing a stop-the-world garbage collection, and not being able to respond to the request at all for a period of time.

4.3.7 Cluster stability settings

In a low load environment, there is probably no need to do a lot of tuning since it will perform acceptable with the default setup. If you expect heavy load, there are a couple of things to consider when setting up the cluster topology.

Dedicated master nodes

A cluster consists of a number of nodes sharing data and state between them. A cluster needs to have exactly one node acting as a master-node at any time. The master-node is responsible for managing the cluster-state. In a busy cluster, the master-nodes will have to do a lot of work to ensure that all other nodes get the needed information.

Since the cluster stability depends on a healthy master node, it may be a good idea to set aside a number of nodes as *dedicated master nodes*. These dedicated master nodes should not be handling external requests, but rather concentrate on keeping the cluster nodes in sync and stable.

A node can be configured to be allowed to act as a master-node by the setting `node.master`.

A dedicated master node should have the following settings:

```
node.master = true
node.data = false
```

Data nodes

Data nodes are the workhorses of the cluster. They will handle the bulk load of the requests, depending on the master node to keep them in sync. These nodes need the most memory and CPU power.

A dedicated data node should have the following settings:

```
node.master = false
node.data = true
```

4.3.8 Node recovery settings

Node recovery happens when a node starts or reconnects to the cluster after a e.g a network shortage.

Consider a cluster of 2 nodes. When a node starts for the first time, it will try to connect to a cluster. If no master found, it will elect itself as master, then proceed to initialize the index-data locally. If it does find an existing master

node, it will require the master to provide it with data. This is all good, but there may occur situations where a new node in an existing cluster starts initializing data before the nodes with existing data can inform the new node that there is already data in the cluster.

Settings

`gateway.recover_after_nodes`

Defaults to 1. Do not start the recovery of local indices before this number of nodes (master or data) has joined the cluster.

`gateway.recover_after_master_nodes`

Defaults to 0. Do not start the recovery of local indices before this number of master-nodes is present in the cluster.

4.3.9 Cluster monitoring

See *Cluster monitoring*

4.3.10 Deploying Apps in cluster

To deploy applications in a cluster you need to deploy the application to every node, as loading and installation of apps is done on a per-node basis. This also means you can choose what applications to deploy on each node.

Warning: Remember that XP only supports running one version of an application at any time. So don't leave the old versions of your applications in the deploy directory.

4.3.11 Backing up a cluster

Backing up a cluster is done in the same way as backing up a single node installation, the only difference is that the `snapshots.dir`-option should point to a shared file system location, see *Storage Configuration*.

1. First, on any cluster node, take a `:toolbox-snapshot` of the indices. This will store a cluster-wide snapshot of all data at a point of time. This can be configured to run as an automatic job; Only the diff from the last snapshot will be stored, so the operation is quick.
2. Second, take a file copy of your blobstore.

We recommend using incremental backup for the blobstore (rsync or similar) as this will only copy the recently changed files. The combined data from the snapshots and blobstore copy is all you need in order to restore Enonic XP.

4.3.12 Sample configurations

2-node cluster

```
node.name = local-node-1
node.master = true

cluster.name = mycluster

network.host = _en0_
transport.tcp.port = 9300-9400

gateway.expected_nodes = 1
gateway.recover_after_nodes = 1
discovery.zen.minimum_master_nodes = 1
discovery.zen.ping.unicast.hosts = <node1Address>,<node2Address>
```

3-node cluster

```
node.name = local-node-1
node.master = true

cluster.name = mycluster

network.host = _en0_
transport.tcp.port = 9300-9400

gateway.expected_nodes = 2
gateway.recover_after_nodes = 2
discovery.zen.minimum_master_nodes = 2
discovery.zen.ping.unicast.hosts = <node1Address>,<node2Address>,<node3Address>
```

5-node cluster

```
node.name = local-node-1
node.master = true

cluster.name = mycluster

network.host = _en0_
transport.tcp.port = 9300-9400

gateway.expected_nodes = 3
gateway.recover_after_nodes = 3
discovery.zen.minimum_master_nodes = 3
discovery.zen.ping.unicast.hosts = <node1Address>,<node2Address>,<node3Address>,<node3Address>,<node3Address>
```

7-node cluster with dedicated roles

```
# NODE1 - NODE-3 dedicated masters
# -----

node.name = node-1/node-2/node-3
node.master = true
node.data = false

cluster.name = mycluster
```

```

network.host = _en0_
transport.tcp.port = 9300-9400

gateway.recover_after_master_nodes = 2
discovery.zen.minimum_master_nodes = 2
discovery.zen.ping.unicast.hosts = <node1Address>,<node2Address>,<node3Address>,<node3Address>,<node3Address>

# NODE4 - NODE-7 dedicated data nodes
# -----

node.name = node-4/node-5/node-6/node-7
node.master = false
node.data = true

cluster.name = mycluster

network.host = _en0_
transport.tcp.port = 9300-9400

gateway.recover_after_master_nodes = 2
discovery.zen.minimum_master_nodes = 2
discovery.zen.ping.unicast.hosts = <node1Address>,<node2Address>,<node3Address>,<node3Address>,<node3Address>

```

4.4 Monitoring

We provide some basic metric tools for monitoring which are easily accessed in a simple JSON format.

4.4.1 Basic status info

To access the monitoring JSON feed you can point to the following url:

```
http://localhost:8080/status
```

This will give you a list of status-reporters. Each reporter has a name and can be accessed using the following pattern:

```
http://localhost:8080/status/<name>
```

4.4.2 Cluster monitoring

There are two tools at your disposal for monitoring the health of the cluster and indices:

Cluster health

```
http://<host>:<port>/status/cluster
```

Which should give you a response like this:

```

{
  "localNode": {
    "hostName": "Runars-MacBook-Pro.local",
    "id": "xUfgZ2FdRu6q-CLJA4CIkA",

```

```
    "isMaster": true,
    "numberOfNodesSeen": 2,
    "version": "1.4.4"
  },
  "members": [
    {
      "address": "inet[/127.0.0.1:9300]",
      "hostName": "Runars-MacBook-Pro.local",
      "id": "xUfgZ2FdRu6q-CLJA4CIkA",
      "isMaster": true,
      "version": "1.4.4"
    },
    {
      "address": "inet[/127.0.0.1:9301]",
      "hostName": "Runars-MacBook-Pro.local",
      "id": "yvHpvM7KQn6y6yTZ-QIRNw",
      "isMaster": false,
      "version": "1.4.4"
    }
  ],
  "name": "mycluster",
  "state": "YELLOW"
}
```

This view gives a brief overview of the nodes in the cluster. For convenience, the current local node to which the request was made has a separate entry in addition to being in the list of members.

The “state” property is the most important:

- **Green:** Cluster is operational and all configured replicas are distributed to a node
- **Yellow:** Cluster is operational, but there are replicas that are not distributed to any node
- **Red:** Cluster is not operational

To see the details about how the replicas are distributed, let’s continue to the `Index stats` report:

Index stats

```
http://<host>:<port>/status/index
```

Which should give you a response like this:

```
{
  "summary": {
    "total": 8,
    "started": 4,
    "unassigned": 4,
    "initializing": 0,
    "relocating": 0,
  },
  "shards": {
    "initializing": [],
    "relocating": [],
    "started": [
      {
        "id": "search-cms-repo(0)",
        "nodeAddress": "10.0.6.146",
        "nodeId": "xUfgZ2FdRu6q-CLJA4CIkA",
```

```

        "type": "PRIMARY"
      },
      {
        "id": "search-system-repo(0)",
        "nodeAddress": "10.0.6.146",
        "nodeId": "xUfgZ2FdRu6q-CLJA4CIkA",
        "type": "PRIMARY"
      },
      {
        "id": "storage-system-repo(0)",
        "nodeAddress": "10.0.6.146",
        "nodeId": "xUfgZ2FdRu6q-CLJA4CIkA",
        "type": "PRIMARY"
      },
      {
        "id": "storage-cms-repo(0)",
        "nodeAddress": "10.0.6.146",
        "nodeId": "xUfgZ2FdRu6q-CLJA4CIkA",
        "type": "PRIMARY"
      }
    ],
    "unassigned": [
      {
        "id": "search-cms-repo(0)",
        "nodeAddress": "UNKNOWN",
        "type": "REPLICA"
      },
      {
        "id": "search-system-repo(0)",
        "nodeAddress": "UNKNOWN",
        "type": "REPLICA"
      },
      {
        "id": "storage-system-repo(0)",
        "nodeAddress": "UNKNOWN",
        "type": "REPLICA"
      },
      {
        "id": "storage-cms-repo(0)",
        "nodeAddress": "UNKNOWN",
        "type": "REPLICA"
      }
    ]
  }
}

```

This gives an overview of how the indices are distributed and what state the index parts (**shards**) are currently in. A shard could be either PRIMARY or REPLICA (copy of a primary shard). These are the possible states:

- **total**: Total number of index parts (e.g two repositories with two indices with one replica for each index)
- **started**: Shards that are currently assigned to a node
- **unassigned**: Shards waiting to be distributed to a node. Typically a setup with a number of replicas where one or more nodes are not running
- **relocating**: Shards that are currently moving from one node to another
- **initializing**: Shards that are currently being recovered from disk at startup.

The `shards` section gives a more detailed overview on the shard distribution.

4.5 Install as service

When installing Enonic XP on a standard production server, you will want to set it up to run as a service.

First, make sure the correct version of Java is installed on your system. See [Install Java](#) for guidance.

4.5.1 Linux

Install with script

Attention: The script is written for and tested on Ubuntu / CentOS. For other distributions, the manual installation may be necessary.

Prerequisites

- User with *sudo* rights
- Java JRE 1.8+ installed
- `/lib/lsb/init-functions` installed

1. Download the Enonic XP distribution
2. Unzip the distribution
3. Run script: `sudo ./enonic-xp-6.4.3/service/install_service.sh`
4. *Optional:* Set **JAVA_HOME** and **JAVA_OPTS** variables in `/etc/xp.conf`
5. Start service: `sudo service xp start`
6. Check log: `sudo tail -f /home/xp/enonic/xp/logs/server.log`

Manual installation

See `linux-detailed-service-install`

4.5.2 Windows

Info on running XP as a service in windows will come later.

4.6 Backup and Restore

Backing up your data is vital for any installation.

All the data in an Enonic XP installation is stored in `$XP_HOME/repo`. This directory has two folders: `blob` and `index`.

The `blob` folder contains all files needed by the system to manage your data, while the `index` folder contains the Elasticsearch index folders. These are dependent on each other in the sense that one is not much use without the other.

That leaves us with ensuring that two elements are safely stored for retrieval in an emergency:

- `$XP_HOME/repo/blobs`

- `$XP_HOME/repo/index`

4.6.1 Backup vs Export

The export/import-API enables you to dump your data to a serialized format. The serialized data could then be imported into another instance. This is very useful, but is not optimal for a backup/restore scheme since it requires some work to get things up and running again, especially when working with big installations with a lot of data. The backup/restore-process described below on the other hand, should enable a quick and safe way to get your system back to operation when in a hurry.

See *Export and Import* for more information on export/import.

4.6.2 Backing up blobs

The blobs are just files on a filesystem. This should be backed up by your preferred way of doing file-backups.

The folder to backup is:

- `$XP_HOME/repo/blobs`

4.6.3 Backing up indexes

Backing up the indices is a bit more complex than just copying the index-folder since it involves floating data with state, especially in a clustered environment. To help you out, we have a snapshot-API. A snapshot is exactly that; a snapshot of the indices state at a point of time. There are 4 rest-resources at your disposal.

http://<your-installation>/admin/rest/repo/snapshot Stores a snapshot of the current indices state.

http://<your-installation>/admin/rest/repo/list Returns a list of available snapshots for the installation.

http://<your-installation>/admin/rest/repo/restore Restore a snapshot of the indices state.

http://<your-installation>/admin/rest/repo/delete Deletes a snapshot or a group of snapshots.

Snapshot

The snapshot rest-service accepts a JSON in this format:

```
{
  "repositoryId": "<repository-id>"
}
```

A snapshot of the given repository will be created for later retrieval. Each subsequent snapshot will store the changes between this snapshot and the last snapshot of the given repository. This means that only changed data are stored when doing subsequent snapshots. The default location where snapshots are stored is `$xp_home/snapshots`. A name of the snapshot will be given at snapshot-time, and returned in the snapshot-result.

To ease the process, we have provided a *snapshot* tool.

Restore

The restore rest-service accepts a JSON in this format:

```
{
  "snapshotName": "<snapshot-name>",
  "repository" : "<repository-id>"
}
```

The indices will be closed for the duration of a restore operation, meaning that no request will be accepted while the restore is running. To ease the process, we have provided a *restore* tool.

Warning: Restoring a snapshot will restore data to the exact state of the indices at the snapshot-time, meaning all other changes will be lost.

Delete

The delete rest-service accepts a JSON in this format:

```
{
  "snapshotNames": ["name1", "name2"],
  "before" : "<timestamp>"
}
```

Deletes either all snapshots before timestamp, or given snapshots by name. To ease the process, we have provided a *delete-snapshots* tool.

4.7 Export and Import

Exporting and importing data in your Enonic XP installation is useful both for securing data and migrating between installations. Enonic XP ships with a set of tools (*Toolbox CLI*) to ease the operation of exporting and importing data from the system.

Caution: At the moment, exporting and importing data can only be done to and from files on the same server running Enonic XP.

4.7.1 Export

The export operation will extract data for a given content URL and store it as XML in a sub-folder under `$XP_HOME/data/export`. The REST service for export is found at the following URL:

```
http://<host>:<port>/admin/rest/export/export
```

The export REST service accepts a JSON in this format:

```
{
  "sourceRepoPath": "<source-repo-path>",
  "exportName": "<name>",
  "importWithIds": <true|false>,
  "dryRun": <true|false>
}
```

To ease the process, we have provided an *export* tool.

4.7.2 Import

The import will take data from a given export directory and load it into Enonic XP at the desired content path. The REST service for import is found at the following URL:

```
http://<host>:<port>/admin/rest/export/import
```
















The import REST service accepts a JSON in this format:

```
{
  "exportName": "<name>",
  "targetRepoPath": "<target-repo-path>",
  "importWithIds": <true|false>,
  "importWithPermissions": <true|false>,
  "dryRun": <true|false>
  "xslSource": "<xsl-file-path>"
  "xslParams": {
    "<name>": "<value>"
  }
}
```

To ease the process, we have provided an *import* tool.

4.7.3 Export data structure

Let's look at how this works. The following structure will be exported:

<input type="checkbox"/>		Demo site /demo-site		New
<input type="checkbox"/>		Case studies case-studies		New
<input type="checkbox"/>		Powered by sites powered-by-sites		New
<input type="checkbox"/>		Enonic.com enonic-com		New
<input type="checkbox"/>		A demo case study a-demo-case-study		New
<input type="checkbox"/>		Enonic man.png enonic man.png		New
<input type="checkbox"/>		Enonic.com iphone.png enonic.com iphone.png		New
<input type="checkbox"/>		Enonic.com desktop.png enonic.com desktop.png		New
<input type="checkbox"/>		Contact Enonic contact-enonic		New
<input type="checkbox"/>		Enonic Office enonic-office		New
<input type="checkbox"/>		Enonic in Oslo.jpg enonic in oslo.jpg		New
<input type="checkbox"/>		Templates _templates		New
<input type="checkbox"/>		Case study show case-study-show		New
<input type="checkbox"/>		Landing page landing-page		New

Run the export command:

```
$ ./toolbox.sh export -a su:password -s cms-repo:draft:/ -t myExport
```

Below is the resulting structure in the export folder \$XP_HOME/data/export/myExport:

```
./content
./content/_
./content/_/node.xml
./content/demo-site
./content/demo-site/_
./content/demo-site/_/manualChildOrder.txt
./content/demo-site/_/node.xml
./content/demo-site/_templates
...
./content/demo-site/case-studies
./content/demo-site/case-studies/_
./content/demo-site/case-studies/_/node.xml
./content/demo-site/case-studies/a-demo-case-study
...
./content/demo-site/case-studies/a-demo-case-study/enonic man.png
./content/demo-site/case-studies/a-demo-case-study/enonic man.png/_
./content/demo-site/case-studies/a-demo-case-study/enonic man.png/_/bin
./content/demo-site/case-studies/a-demo-case-study/enonic man.png/_/bin/Enonic man.png
...
./content/demo-site/case-studies/powered-by-sites
...
./content/demo-site/contact-enonic
...
```

content The base folder of the export. All content in `cms-repo` has this as root path.

content/_ All folders named `_` are system folders for the data at the current level.

content/_/node.xml The definition of the node, e.g. all data for the current node

content/demo-site This is the site from the screenshot above.

content/demo-site/_/manualChildOrder.txt Our demo-site has manually ordered children, this file contains an ordered list of children.

content/demo-site/case-studies This ‘case-studies’ content is the first element in the site.

content/demo-site/case-studies/a-demo-case-study/enonic man.png/_/bin The A demo case study content has a binary attachment called `Enonic man.png`. The folder `_/bin` contains the actual binary files.

4.7.4 Changing export data

It is possible to make manual changes to the exported data before importing.

Using the above export as an example, the `demo-site displayName` can be changed to something more suitable:

```
myExport $ vi content/demo-site/_/node.xml

<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<node xmlns="urn:enonic:xp:export:1.0">
  <id>2dfbdc41-af98-4b3c-a2a9-9dc4814d003a</id>
  <childOrder>_manualordervalue DESC</childOrder>
  <nodeType>content</nodeType>
  <data>
    <boolean name="valid">true</boolean>
    <string name="displayName">My much nicer demo-site!</string>
    <string name="type">portal:site</string>
    <string name="owner">user:system:su</string>
```

After some data has been changed, it can be imported again:

```
$ ./toolbox.sh import -a su:password -s myExport -t cms-repo:draft:/
```



Caution: Editing exported data is experimental at the moment and will potentially cause trouble if not done carefully. For exports without ids, references will be broken and must be fixed manually. When importing *with* ids onto existing data, renaming and changing manual order will not yet work as expected.

4.8 Troubleshooting

This document is an up-to-date list of known problems (and how to fix them) for our current release and development releases.

4.8.1 Wrong Java version

Verify that Java 1.8 (update 40 or higher) is installed and that this version is actually used.

Run `java -version` in the shell where you attempt to start Enonic XP:

```
$ java -version
java version "1.8.0_40"
Java(TM) SE Runtime Environment (build 1.8.0_40-b26)
Java HotSpot(TM) 64-Bit Server VM (build 25.40-b25, mixed mode)
```

The boot log will also output the version of Java that was actually used.

If the Java version does not match your expected version, make sure that the `JAVA_HOME` environment variable is set correctly. For OS X and Linux users - execute the following in your command line:

```
export JAVA_HOME=`/usr/libexec/java_home -v 1.8`
```

Optionally add the line to your `~/ .properties` file to make the change persistent.

Check the [Troubleshooting Java](#) page for more Java help.

4.8.2 Port 8080 already taken

A lot of different web software defaults to port 8080. If you find that the log is complaining about this, simply identify the other software you have running on this port and stop it.

If shutting down other software that uses port 8080 is not an option, you may set a different port for Enonic XP. See [Configuration](#).

4.8.3 Unexpected behavior

While frequently redeploying an app during development, some instability or unexpected behavior may be noticed. This can be caused by certain changes to the app files. For example, changing the app name in the `build.gradle` file, or deleting content import `node.xml` files. When this occurs, the project may need a clean build `gradle clean build`. Sometimes the app JAR file may need to be deleted from the `$XP_HOME/deploy` directory as well, and then replaced with the clean build JAR file.

Having two versions of the same app in the `$XP_HOME/deploy` folder will cause problems.

4.8.4 Cannot login after install

There could be a problem with file permissions on Windows if Enonic XP was unzipped and started from within the “My Documents” folder. This may allow XP to start, but the users cannot log in. The solution would be to unzip the Enonic XP distribution outside of the “My Documents” folder, or to manually change the file permissions.

4.8.5 Sending email with lib-mail not working

Check the installation’s *Mail Configuration*.

4.9 Troubleshooting Java

Important: This documentation is based on OSX, Windows version coming later..

4.9.1 Check current JDK version

To see all installed JDK’s on you environment, if any, type the following command in your terminal:

```
~/ $ /usr/libexec/java_home -V
Matching Java Virtual Machines (4):
  1.8.0_45, x86_64:  "Java SE 8"      /Library/Java/JavaVirtualMachines/jdk1.8.0_45.jdk/Contents/Home
  1.8.0_40, x86_64:  "Java SE 8"      /Library/Java/JavaVirtualMachines/jdk1.8.0_40.jdk/Contents/Home
  1.8.0_20, x86_64:  "Java SE 8"      /Library/Java/JavaVirtualMachines/jdk1.8.0_20.jdk/Contents/Home
  1.7.0_67, x86_64:  "Java SE 7"      /Library/Java/JavaVirtualMachines/jdk1.7.0_67.jdk/Contents/Home
~/ $
```

If you have a JDK equal to or above version 1.8.0_40, but the `javac -version` points to another version, proceed to set the `JAVA_HOME` environment variable correctly.

4.9.2 Setting JAVA_HOME

If you don’t have a JDK equal to or above version 1.8.0_40, you must install a newer version.

- Go to the [JDK page](#) and click the “JDK download” button. This button will always link to the latest version.
- Follow the [installation instructions](#).
- After installation, proceed to check that the `JAVA_HOME` environment variable is set correctly.

To check the current `JAVA_HOME` environment variable:

```
~/ $ echo $JAVA_HOME
/Library/Java/JavaVirtualMachines/jdk1.8.0_60.jdk/Contents/Home
~/ $
```

If this is not set correctly, you must set the correct one either for this terminal session, or in your `.profile` or `.bashrc` for all terminal sessions.

- To set the correct `JAVA_HOME` for the current terminal session; invoke the following command in your terminal. This command will set `JAVA_HOME` to the newest installed 1.8 JDK-version:

```
~/ $ export JAVA_HOME=`/usr/libexec/java_home -v 1.8`
```

- To set for all terminal sessions, add the entry to either your `~/ .bash_profile` or `~/ .profile`.

```
$ vim .bash_profile

export JAVA_HOME=$(/usr/libexec/java_home -v 1.8)

$ source .bash_profile

$ echo $JAVA_HOME
/Library/Java/JavaVirtualMachines/1.8.0_45.jdk/Contents/Home
```


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```
dependencies {  
  include 'com.enonic.xp:<name>:6.4.3'  
}
```

Where name is the name of the library. Here's a list of available libraries:

- lib-auth
- lib-cache
- lib-content
- lib-context
- lib-http-client
- lib-i18n
- lib-io
- lib-mail
- lib-mustache
- lib-portal
- lib-thymeleaf
- lib-xslt
- lib-websocket

To include both lib-mail and lib-content you can add both inside the dependency list like this:

```
dependencies {  
  include 'com.enonic.xp:lib-mail:6.4.3'  
  include 'com.enonic.xp:lib-content:6.4.3'  
}
```

Note: The server-side JavaScript reference documentation can be accessed using the following links:

- [Read in your browser](#)
- [Download as zip](#)

5.2 View Functions

Some view technologies support a set of view functions. The list of view functions below are supported out-of-the-box:

5.2.1 assetUrl

This generates a URL pointing to a static file in the site/assets folder, such as CSS, background images, etc.

Parameters:

_path Path to the asset.

_application Use this when the asset referenced is in another application. Defaults to current application. Use the app name, for example, `com.enonic.blog.superhero`.

_type URL type. Either `server` (server-relative URL) or `absolute`. Default is `server`.

everything else Custom parameters to append to the url.

Usage in Thymeleaf:

```
<a data-th-href="${portal.assetUrl({'_path=css/main.css'})}">Link</a>
```

Usage in XSLT:

```
<xsl:stylesheet version="2.0" exclude-result-prefixes="#all"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:portal="urn:enonic:xp:portal:1.0">

  <xsl:template match="/">
    <xsl:value-of select="portal:assetUrl('_path=a')"/>
  </xsl:template>

</xsl:stylesheet>
```

5.2.2 attachmentUrl

This generates a URL pointing to an attachment.

Parameters:

_id Id to the content holding the attachment.

_path Path to the content holding the attachment.

_name Name to the attachment.

_label Label of the attachment. Default is `source`.

_download Set to `true` if the disposition header should be set to attachment. Default is `false`.

_type URL type. Either `server` (server-relative URL) or `absolute`. Default is `server`.

everything else Custom parameters to append to the url.

Usage in Thymeleaf:

```
<a data-th-href="${portal.attachmentUrl({'_download=true'})}">Link</a>
```

Usage in XSLT:

```
<xsl:stylesheet version="2.0" exclude-result-prefixes="#all"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:portal="urn:enonic:xp:portal:1.0">

  <xsl:template match="/">
    <xsl:value-of select="portal:attachmentUrl('_download=true')"/>
  </xsl:template>

</xsl:stylesheet>
```

5.2.3 componentUrl

This generates a URL pointing to a component.

Parameters:

_id Id to the page.

_path Path to the page.

_component Path to the component. If not set, the current path is set.

_type URL type. Either `server` (server-relative URL) or `absolute`. Default is `server`.

everything else Custom parameters to append to the url.

Usage in Thymeleaf:

```
<a data-th:href="${portal.componentUrl({'_component=main/1'})}">Link</a>
```

Usage in XSLT:

```
<xsl:stylesheet version="2.0" exclude-result-prefixes="#all"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:portal="urn:enonic:xp:portal:1.0">

  <xsl:template match="/">
    <xsl:value-of select="portal:componentUrl('_component=main/1')"/>
  </xsl:template>

</xsl:stylesheet>
```

5.2.4 imageUrl

This generates a URL pointing to an image.

Parameters:

_id Id to the image.

_path Path to the image. If **_id** is specified, this parameter is not used.

_format Format of the image.

_scale Resize and crop the image to fit the available area. See: [Scaling](#)

_quality Quality for JPEG images, ranges from 0 (max compression) to 100 (min compression). Default is 85.

_background Background color.

_filter Styling filters to use on the image. More than one filter may be combined with a semicolon. See: [Styling](#)

_type URL type. Either `server` (server-relative URL) or `absolute`. Default is `server`.

everything else Custom parameters to append to the url.

Usage in Thymeleaf:

```


```

Usage in XSLT:

```
<xsl:stylesheet version="2.0" exclude-result-prefixes="#all"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:portal="urn:enonic:xp:portal:1.0">

  <xsl:template match="/">
    <xsl:value-of select="portal:imageUrl('_id=11', 'scale=width(200)')"/>
    <xsl:value-of select="portal:imageUrl('_path=test', 'scale=width(200)')"/>
  </xsl:template>
</xsl:stylesheet>
```

```
</xsl:template>
</xsl:stylesheet>
```

5.2.5 pageUrl

This generates a URL pointing to a page.

Parameters:

_id Id to the page. If id is set, then path is not used.

_path Path to the page. Relative paths is resolved using the context page.

_type URL type. Either server (server-relative URL) or absolute. Default is server.

everything else Custom parameters to append to the url.

Usage in Thymeleaf:

```
<a data-th-href="${portal.pageUrl({'_path=/my/page', 'a=3'})}">Link</a>
```

Usage in XSLT:

```
<xsl:stylesheet version="2.0" exclude-result-prefixes="#all"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:portal="urn:enonic:xp:portal:1.0">

  <xsl:template match="/">
    <xsl:value-of select="portal:pageUrl('_path=/my/page', 'a=3')"/>
  </xsl:template>

</xsl:stylesheet>
```

5.2.6 serviceUrl

This generates a URL pointing to a service.

Parameters:

_service Name of the service.

_application Other application to reference to. Default is current application.

_type URL type. Either server (server-relative URL) or absolute. Default is server.

everything else Custom parameters to append to the url.

Usage in Thymeleaf:

```
<a data-th-href="${portal.serviceUrl({'_service=myservice', 'a=3'})}">Link</a>
```

Usage in XSLT:

```
<xsl:stylesheet version="2.0" exclude-result-prefixes="#all"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:portal="urn:enonic:xp:portal:1.0">

  <xsl:template match="/">
    <xsl:value-of select="portal:serviceUrl('_service=myservice', 'a=3')"/>
  </xsl:template>

</xsl:stylesheet>
```

```
</xsl:template>
</xsl:stylesheet>
```

5.2.7 imagePlaceholder

This command generates a URL to an image placeholder.

Parameters:

width Width of image.

height Height of image.

Usage in Thymeleaf:

```

```

Usage in XSLT:

```
<xsl:stylesheet version="2.0" exclude-result-prefixes="#all"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:portal="urn:enonic:xp:portal:1.0">

  <xsl:template match="/">
    <xsl:value-of select="portal:imagePlaceholder('width=10','height=10')"/>
  </xsl:template>

</xsl:stylesheet>
```

5.2.8 localize

This localizes a phrase.

Parameters:

_key The property key.

_locale A string-representation of a locale. If the locale is not set, the site language is used.

_values Optional placeholder values (comma separated).

Usage in Thymeleaf:

```
<div data-th-text="${portal.localize({'_key=mystring','_locale=en'})}">Not translated</div>
```

Usage in XSLT:

```
<xsl:stylesheet version="2.0" exclude-result-prefixes="#all"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:portal="urn:enonic:xp:portal:1.0">

  <xsl:template match="/">
    <xsl:value-of select="portal:localize('_key=mystring')"/>
  </xsl:template>

</xsl:stylesheet>
```

5.2.9 processHtml

This function replaces abstract internal links contained in an HTML text by generated URLs.

Parameters:

_value Html value string to process.

_type URL type. Either “server” (server-relative URL) or “absolute”. Default is “server”

Usage in Thymeleaf:

```
<div data-th-text='${portal.processHtml({'_value=some text'})}'>Text</div>
```

Usage in XSLT:

```
<xsl:stylesheet version="2.0" exclude-result-prefixes="#all"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:portal="urn:enonic:xp:portal:1.0">

  <xsl:template match="/">
    <xsl:value-of select="portal:processHtml('_value=some text')"/>
  </xsl:template>

</xsl:stylesheet>
```

5.3 Query Language

When finding nodes and content you will be using our query language. It is based on SQL and looks very similar.

5.3.1 queryExpr

Grammar:

```
queryExpr = [ constraintExpr ] [ orderExpr ] ;
```

- If no constraint-expression is given, all documents will match.
- If no order-expression is given, results will be ordered by *_score* descending.

Examples:

```
myCategory = 'article'
myCategory = 'article' ORDER BY title DESC
ORDER BY title
```

5.3.2 constraintExpr

Grammar:

```
constraintExpr = compareExpr
                | logicalExpr
                | dynamicConstraint
                | notExpr ;
```

5.3.3 compareExpr

Grammar:

```
compareExpr = fieldExpr operator valueExpr ;
fieldExpr   = propertyPath ;
operator     = '=', '!=', '>', '>', '<', '<=', 'LIKE', 'NOT LIKE', 'IN', 'NOT IN' ;
valueExpr    = string | number | valueFunc ;
valueFunc    = geoPoint | instant | time | dateTime, localDateTime ;
geoPoint     = '" ' lat ', ' lon '" ' ;
instant      = 'instant(' string ')' ;
time         = 'time(' string ')' ;
dateTime     = 'dateTime(' string ')' ;
localDateTime = 'localDateTime(' string ')' ;
```

Examples:

```
user.myCategory = "articles"
user.myCategory IN ("articles", "documents")
user.myCategory != "articles"
user.myCategory LIKE "*tic*"
myPriority < 10
myPriority <= 10
myPriority > 10
myPriority < 100
myPriority != 10
myInstant = instant('2014-02-26T14:52:30.00Z')
myInstant <= instant('2014-02-26T14:52:30.00Z')
myInstant <= dateTime('2014-02-26T14:52:30.00+02:00')
myTime = time('09:00')
myLocalDateTime = time('2014-02-26T14:52:30.00')
myLocation = '59.9127300,10.7460900'
myLocation IN ('59.9127300,10.7460900','59.2181000,10.9298000')
```

5.3.4 logicalExpr

Grammar:

```
logicalExpr = constraintExpr operator constraintExpr ;
operator     = 'AND' | 'OR' ;
```

Examples:

```
myCategory = "articles" AND myPriority > 10
myCategory IN ("articles", "documents") OR myPriority <= 10
```

5.3.5 dynamicConstraint

Grammar:

```
dynamicConstraint = functionExpr ;
```

Examples:

```
fulltext('myCategory', 'Searching for fish', 'AND')
ngram('description', 'fish boat', 'AND')
```

5.3.6 notExpr

Grammar:

```
notExpr = 'NOT' constraintExpr ;
```

Examples:

```
NOT myCategory = 'article'
```

5.3.7 orderBy

Grammar:

```
orderBy = 'ORDER BY' ( fieldOrderBy | dynamicOrderBy )  
          ( ',' ( fieldOrderBy | dynamicOrderBy ) )* ;
```

5.3.8 fieldOrderBy

Grammar:

```
fieldOrderBy = propertyPath [ direction ] ;  
direction>   = 'ASC' | 'DESC' ;
```

Examples:

```
_name ASC  
_timestamp DESC  
title DESC  
data.myProperty
```

5.3.9 dynamicOrderBy

Grammar:

```
dynamicOrderBy = functionExpr [ direction ] ;  
direction      = 'ASC' | 'DESC' ;
```

Examples:

```
geoDistance('59.9127300,10.746090')
```

5.3.10 propertyPath

Grammar:

```
propertyPath = pathElement ( '.' pathElement )* ;  
pathElement  = ( [ validJavaIdentifier - '.' ] )* ;
```

Examples:

```
myProperty  
data.myProperty  
data.myCategory.myProperty
```

Tip: Wildcards in propertyPaths are supported in functions `fulltext` and `ngram` only at the moment. When using these functions, expressions like this are valid:

```
myProp*
*Property
data.*
*.myProperty
data.*.myProperty
```

5.3.11 functionExpr

Grammar:

```
functionExpr = functionName '(' arguments ')';
```

5.3.12 Examples

Find all documents where property ‘myCategory’ is populated with a value, and the value does not equal ‘article’.

```
myCategory LIKE '*' AND NOT myCategory = 'article'
```

Find all document where property ‘myCategory’ is either ‘article’ or ‘document’ and title starts with ‘fish’.

```
myCategory IN ('article', 'document') AND ngram('title', 'fish', 'AND')
```

Find all documents where any fulltext-analyzed property contains ‘fish’ and ‘spot’, and order them ascending by distance from Oslo.

```
fulltext('_allText', 'fish spot', 'AND') ORDER BY
geoDistance('data.location', '59.9127300,10.7460900') ASC
```

Find all documents where any property under data-set ‘data’ contains ‘fish’ and ‘spot’, and order them ascending by distance from Oslo.

```
fulltext('data.*', 'fish spot', 'AND') ORDER BY
geoDistance('data.location', '59.9127300,10.7460900') ASC
```

5.4 Toolbox CLI

The toolbox is a CLI (command line interface) tool that is used to do administration tasks. Toolbox executables are located in `$XP_INSTALL/toolbox` folder. Use `toolbox.sh` for mac/unix environments and `toolbox.bat` for windows environments.

To get help for the commands, just type the following:

```
$ ./toolbox.sh
usage: toolbox <command> [<args>]

The most commonly used toolbox commands are:
    delete-snapshots  Deletes snapshots, either before a given timestamp or by name.
    dump              Export data from every repository.
    export             Export data for a specified path.
```

help	Display help information
import	Import data from a named export.
init-project	Initiates an Enonic XP application project.
install-app	Install an application from URL or file
list-snapshots	Returns a list of existing snapshots with name and status.
load	Import data from a dump.
reindex	Reindex content in search indices for the given repository and branches.
reprocess	Reprocesses content in the repository.
restore	Restores a snapshot of a previous state of the repository.
set-replicas	Set the number of replicas in the cluster.
snapshot	Stores a snapshot of the current state of the repository.
upgrade	Upgrade a dump to the current version. The upgraded files will be written

See 'toolbox help <command>' for more information on a specific command.

To get help for a specific command, you can type `toolbox.sh help <command>`, like:

```
$ toolbox.sh help import
```

Here's a list of all the commands that you can do with the toolbox:

5.4.1 snapshot

Create a snapshot of all or a single repository while running. The snapshots will be stored in the directory given in `snapshots.dir` option in the [Storage Configuration](#) (default `$xp_home/snapshots`).

Attention: For a clustered installation, the snapshot-location must be on a shared file-system.

Usage:

```
NAME
    toolbox snapshot - Stores a snapshot of the current state of the
    repository.

SYNOPSIS
    toolbox snapshot -a <auth> [-h <host>] [-p <port>] [-r <repository>]

OPTIONS
    -a <auth>
        Authentication token for basic authentication (user:password).

    -h <host>
        Host name for server (default is localhost).

    -p <port>
        Port number for server (default is 8080).

    -r <repository>
        the name of the repository to snapshot (default is all repositories)
```

Example:

```
$ ./toolbox.sh snapshot -a su:password
```

Related:

- List available snapshots with names: [list-snapshots](#)

- Restore snapshot: *restore*

5.4.2 restore

Restore a named snapshot.

Usage:

```
NAME
    toolbox restore - Restores a snapshot of a previous state of the
    repository.

SYNOPSIS
    toolbox restore -a <auth> [-h <host>] [-p <port>] [-r <repository>]
    -s <snapshotName>

OPTIONS
    -a <auth>
        Authentication token for basic authentication (user:password).

    -h <host>
        Host name for server (default is localhost).

    -p <port>
        Port number for server (default is 8080).

    -r <repository>
        The name of the repository to restore.

    -s <snapshotName>
        The name of the snapshot to restore.
```

Example:

```
$ ./toolbox restore -a su:password -r cms-repo \
-s cms-repo2015-07-02t11:53:13.224z
```

5.4.3 list-snapshots

List all the snapshots for the installation.

Usage:

```
NAME
    toolbox list-snapshots - Returns a list of existing snapshots with name
    and status.

SYNOPSIS
    toolbox list-snapshots -a <auth> [-h <host>] [-p <port>]

OPTIONS
    -a <auth>
        Authentication token for basic authentication (user:password).

    -h <host>
        Host name for server (default is localhost).
```

```
-p <port>  
    Port number for server (default is 8080).
```

Example:

```
$ ./toolbox.sh list-snapshots -a su:password
```

5.4.4 delete-snapshots

Deletes all snapshots before the given timestamp.

Usage:

```
NAME  
    toolbox delete-snapshots - Deletes snapshots, either before a given  
    timestamp or by name.  
  
SYNOPSIS  
    toolbox delete-snapshots -a <auth> -b <before> [-h <host>] [-p <port>]  
  
OPTIONS  
    -a <auth>  
        Authentication token for basic authentication (user:password).  
  
    -b <before>  
        Delete snapshots before this timestamp.  
  
    -h <host>  
        Host name for server (default is localhost).  
  
    -p <port>  
        Port number for server (default is 8080).
```

Example:

```
$ ./toolbox.sh delete-snapshots -a su:password -b 2015-02-14t14:24:20.618z
```

5.4.5 export

Extract data for a given repository, branch and content path. The result will be stored in the `$XP_HOME/data/export` directory.

Usage:

```
NAME  
    toolbox export - Export data for a specified path.  
  
SYNOPSIS  
    toolbox export -a <auth> [-h <host>] [-p <port>] -s <sourceRepoPath>  
    [--skipids] -t <exportName>  
  
OPTIONS  
    -a <auth>  
        Authentication token for basic authentication (user:password).  
  
    -h <host>  
        Host name for server (default is localhost).
```

```

-p <port>
    Port number for server (default is 8080).

-s <sourceRepoPath>
    Path of data to export. Format:
    <repo-name>:<branch-name>:<node-path>.

--skipids
    Flag that skips ids in data when exporting.

-t <exportName>
    Target name to save export.

```

Example:

```
$ ./toolbox.sh export -a su:password -s cms-repo:draft:/ -t myExport
```

5.4.6 import

Import data from a named export and load it into Enonic XP at the desired content path.

Usage:

```

OPTIONS

-a <auth>
    Authentication token for basic authentication (user:password).

-h <host>
    Host name for server (default is localhost).

-p <port>
    Port number for server (default is 8080).

-s <exportName>
    A named export to import.

--skipids
    Flag that skips ids.

-t <targetRepoPath>
    Target path for import. Format:
    <repo-name>:<branch-name>:<node-path>. e.g 'cms-repo:draft:/'

-xslParam <xslParam>
    Parameter to pass to the XSL transformations before importing nodes.
    Format: <parameter-name>=<parameter-value> . e.g. 'applicationId=com.enonic.myapp'

-xslSource <xslSource>
    Path to xsl file (relative to <XP_HOME>/data/export) for applying
    transformations to node.xml before importing.

```

Example:

```
$ ./toolbox.sh import -a su:password -s myExport -t cms-repo:draft:/
```

Tip: An XSL file and a set of *name=value* parameters can be optionally passed for applying transformations to each `node.xml` file, before importing it.

This option could for example be used for renaming types or fields. The `.xsl` file must be located in the `$XP_HOME/data/export` directory.

5.4.7 reindex

Reindex the content in the search indices for the given repository and branches.

Usage:

```
NAME
    toolbox reindex - Reindex content in search indices for the given
    repository and branches.

SYNOPSIS
    toolbox reindex -a <auth> -b <branches>... [-h <host>] [-i] [-p <port>]
    -r <repository>

OPTIONS
    -a <auth>
        Authentication token for basic authentication (user:password).

    -b <branches>
        A comma-separated list of branches to be reindexed.

    -h <host>
        Host name for server (default is localhost).

    -i
        If flag -i given true, the indices will be deleted before recreated.

    -p <port>
        Port number for server (default is 8080).

    -r <repository>
        The name of the repository to reindex.
```

Example:

```
$ ./toolbox.sh reindex -a su:password -b draft -i -r cms-repo
```

5.4.8 set-replicas

Set the number of replicas in the cluster.

Usage:

```
NAME
    toolbox set-replicas - Set the number of replicas in the cluster.

SYNOPSIS
    toolbox set-replicas -a <auth> [-h <host>] [-p <port>] [--]
    <numberOfReplicas>

OPTIONS
    -a <auth>
        Authentication token for basic authentication (user:password).
```

```

-h <host>
    Host name for server (default is localhost).

-p <port>
    Port number for server (default is 8080).

--
    This option can be used to separate command-line options from the
    list of argument, (useful when arguments might be mistaken for
    command-line options

<numberOfReplicas>
    Number of replicas

```

Example:

```
$ ./toolbox.sh set-replicas -a su:password 2
```

5.4.9 dump

Export data from every repository. This is used to backup the entire repository when doing an upgrade. The result will be stored in the `$XP_HOME/data/dump` directory.

Usage:

```

NAME
    toolbox dump - Export data from every repository.

SYNOPSIS
    toolbox dump -a <auth> [-h <host>] [-p <port>] -t <target>

OPTIONS
    -a <auth>
        Authentication token for basic authentication (user:password).

    -h <host>
        Host name for server (default is localhost).

    -p <port>
        Port number for server (default is 8080).

    -t <target>
        Dump name.

```

Example:

```
$ ./toolbox.sh dump -a su:password -t myDump
```

5.4.10 load

Load data from a named dump and load it into Enonic XP. The dump read has to be stored in the `$XP_HOME/data/dump` directory.

Attention: A load must never be performed on a repo with existing content. It's meant to be used on empty repos. Make sure the repo is emptied first (delete contents)!

Usage:

```
NAME
    toolbox load - Import data from a dump.

SYNOPSIS
    toolbox load -a <auth> [-h <host>] [-p <port>] -s <source>

OPTIONS
    -a <auth>
        Authentication token for basic authentication (user:password).

    -h <host>
        Host name for server (default is localhost).

    -p <port>
        Port number for server (default is 8080).

    -s <source>
        Dump name.
```

Example:

```
$ ./toolbox.sh load -a su:password -s myDump
```

5.4.11 upgrade

Upgrade a data dump from a previous version to the current version. The output of the upgrade will be placed alongside the dump that is being upgraded and will have the name <dump-name>_upgraded_<new-version> unless a target location is specified with -t.

The current version XP installation must be running with the upgraded app deployed.

Usage:

```
NAME
    toolbox upgrade - Upgrade a dump.

SYNOPSIS
    toolbox upgrade -d dump-path -t target-location

OPTIONS
    -d <dump>
        Directory for dump.
```

Example:

```
$ ./toolbox.sh upgrade -d ./data/dump/5.3.1-dump
```

The output would appear as:

```
/data/dump/5.3.1_upgraded_6.0.0/
```

5.4.12 init-project

The init-project tool initializes a new application project structure by retrieving a Git repository, removing all references to the Git repository, and adapting its build file properties (gradle.properties).

Usage:

```

NAME
    toolbox init-project - Initiates an Enonic XP application project

SYNOPSIS
    toolbox init-project [-a <authentication>]
                        [(-c <checkout> | --checkout <checkout>)]
                        [(-d <destination> | --destination <destination>)]
                        (-n <name> | --name <name>)
                        (-r <repository> | --repository <repository>)
                        [(-v <version> | --version <version>)]

OPTIONS
    -a <authentication>
        Optional authentication token for basic authentication (user:password)

    -c <checkout>, --checkout <checkout>
        Branch or commit to checkout.

    -d <destination>, --destination <destination>
        Optional destination path to create your project, if not specified current
        directory will be used

    -n <name>, --name <name>
        Unique qualifying name that will be given to your application i.e.
        com.company.myapp. NOTE: Choose the name carefully as changing it at a later
        point in time will require updating your content too.

    -v <version>, --version <version>
        Optional version number that will be set in your application project, if not
        used 1.0.0-SNAPSHOT will be set

    -r <repository>, --repository <repository>
        Git repository you wish to use as starting point. Supports both full urls to
        any standard xp git-hosted project, or optionally a GitHub repository path
        (account/repo) - account defaults to "enonic" if not specified

```

Examples:

```
$ toolbox.sh init-project -d ~/Dev/xp/apps/myApp -n com.company.myapp -v 0.9.0 -r https://github.com
```

```
$ toolbox.sh init-project -n com.company.myapp -v 1.0.0-SNAPSHOT -r enonic/starter-base
```

```
$ toolbox.sh init-project -n com.company.myapp -r starter-base
```

5.4.13 install-app

Installs an application on all nodes

Usage:

```

NAME
    toolbox install-app - Installs an application on all nodes

SYNOPSIS
    toolbox install-app -a <auth> (-u <url> | -f <file>) [-h <host>] [-p <port>]

```

```
OPTIONS
  -a <auth>
      Authentication token for basic authentication (user:password)

  -u <url>
      Url to application

  -f <file>
      Path to application jar-file

  -h <host>
      Host name for server (default is localhost)

  -p <port>
      Port number for server (default is 8080)
```

Example:

```
$ ./toolbox.sh install-app -a su:password -u http://repo.enonic.com/public/com/enonic/app/superhero
$ ./toolbox.sh install-app -a su:password -f /Users/rmy/Dev/apps/superhero/build/libs/superhero-1.2.
```

5.5 Image Processor

Enonic XP includes a number of image processing commands that may be used to set the size or add style to the images. The commands are appended to the image URLs. To automatically create the URLs, use the *imageUrl* view function.

5.5.1 Scaling

Scale Max

Scales the image proportionally, so the longest edge has the given number of pixels.

Arguments:

size The length of the longest edge. Required

Example:

```
max(600)
```

Scale Wide

Scales the image to fit the given width of the picture. If the image is taller than the given height, it is cropped on top and bottom, based on the focal point position.

Arguments:

width Width in pixels

height maximum height in pixels

Example:

```
wide(600,200)
```

Scale Block

Scales the image, while keeping the aspect ratio, so it fills the rectangle specified by width and height. Then crops the overflowing axis based on the focal point position. The result of a call to this method will be an image that always has the exact size of the specified input.

Arguments:

width Width in pixels

height Height in pixels

Example:

```
block(600,200)
```

Scale Square

Scales the image proportionally to match the shortest edge. The longest edge will be cropped based on the focal point position.

Arguments:

size The length of both sides in pixels

Example:

```
square(600)
```

Scale Height

Scales the image proportionally to match the given height.

Arguments:

height Height in pixels

Example:

```
height(600)
```

Scale Width

Scales the image proportionally to match the given width.

Arguments:

width Width in pixels

Example:

```
width(600)
```

5.5.2 Styling

Block

Pixelates the image creating a mosaic like effect.

Arguments:

size The number of pixels squared, that should be combined to one block. Default: 2

Example:

```
block(5)
```



Blur

Applies a blur effect.

Arguments:

radius How much blur to apply. Default: 2

Example:

```
blur(8)
```



Border

Applies a rectangular border around the image.

Arguments:

width The width of the border in pixels. Default: 2

color The color of the border as a decimal or hexadecimal number. Default: 0 / 0x000000 (black)

Example:

```
border(5)
border(4, 0x777777)
```



Emboss

Applies an embossing effect on the image.

No arguments

Example:

```
emboss ()
```



Grayscale

Creates a grayscale variant of the image.

No arguments

Example:

```
grayscale ()
```



Invert

Inverts the colors in the image.

No arguments

Example:

```
invert()
```

**Rounded**

Rounds the corners of the image, with an option of adding a border around the rounded image.

Arguments:

radius The number of pixels from each corner where the rounding starts. Default: 10

borderSize The width of the border in pixels. Default: 0

borderColor The color of the border as a decimal or hexadecimal number. Default: 0 / 0x000000 (black)

Example:

```
rounded()  
rounded(15)  
rounded(10,1)  
rounded(8,4,0x777777)
```



Sharpen

Applies a sharpening filter to the image.

No arguments

Example:

```
sharpen()
```



RGB Adjust

Adjust the red, green and blue levels in the image.

Arguments:

red The adjusted red level for the image. Default: 0

green The adjusted green level for the image. Default: 0

blue The adjusted blue level for the image. Default: 0

Example:

```
rgbadjust(2.0, 0.25, -1.75)
```



HSB Adjust

Adjust the hue, saturation and brightness levels in the image.

Arguments:

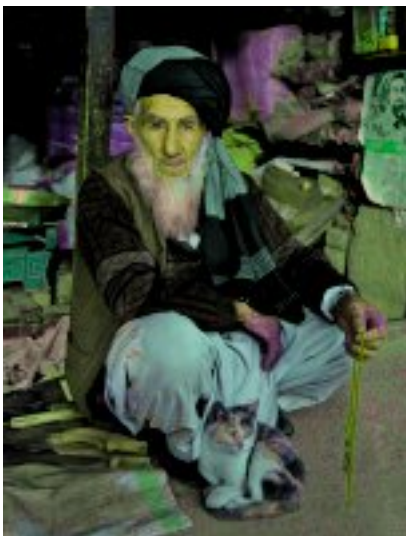
hue Value from -1 to 1, of how far around the color wheel to move the hue of the image. Default: 0

saturation Value from -1 to 1 to adjust the intensity of the colors in the image. Default: 0

brightness Value from -1 to 1 to adjust the brightness of the image. Default: 0

Example:

```
hsbadjust (0.5, -0.1)  
hsbadjust (-0.15, 0.2, -0.2)
```



Edge

Creates an abstract image by brightening every edge and darkening every even surface of the image.

No arguments

Example:

```
edge ()
```



Bump

Creates a 3D looking texture, based on darkening and lighting each side of edges in the image.

No arguments

Example:

```
bump ()
```



Sepia

Creates a grayscale image with a yellow-reddish tint to make it look like an old photograph.

Arguments:

depth The brightness of the tint. Default: 20

Example:

```
sepia()  
sepia(25)
```



Rotate 90

Rotates an image 90 degrees

No arguments

Example:

```
rotate90()
```



Rotate 180

Rotates an image 180 degrees

No arguments

Example:

```
rotate180()
```



Rotate 270

Rotates an image 270 degrees

No arguments

Example:

```
rotate270()
```



Flip horizontal

Flips an image horizontally

No arguments

Example:

```
flipH()
```



Flip vertically

Flips an image vertically

No arguments

Example:

```
flipv()
```



Colorize

Makes a grayscale image, then applies a tint, based on the specified color.

Arguments:

red Red boost value. Default: 1

green Green boost value. Default: 1

blue Blue boost value. Default: 1

Example:

```
colorize(3,1,1.5)
```



HSB Colorize

Makes a grayscale image, then applies a tint, based on the specified color.

Arguments:

color The tint color as a decimal or hexadecimal number. Default: 0xFFFFFFFF

Example:

```
hsbcolorize(0x00AAAA)
```



5.6 JavaDoc API

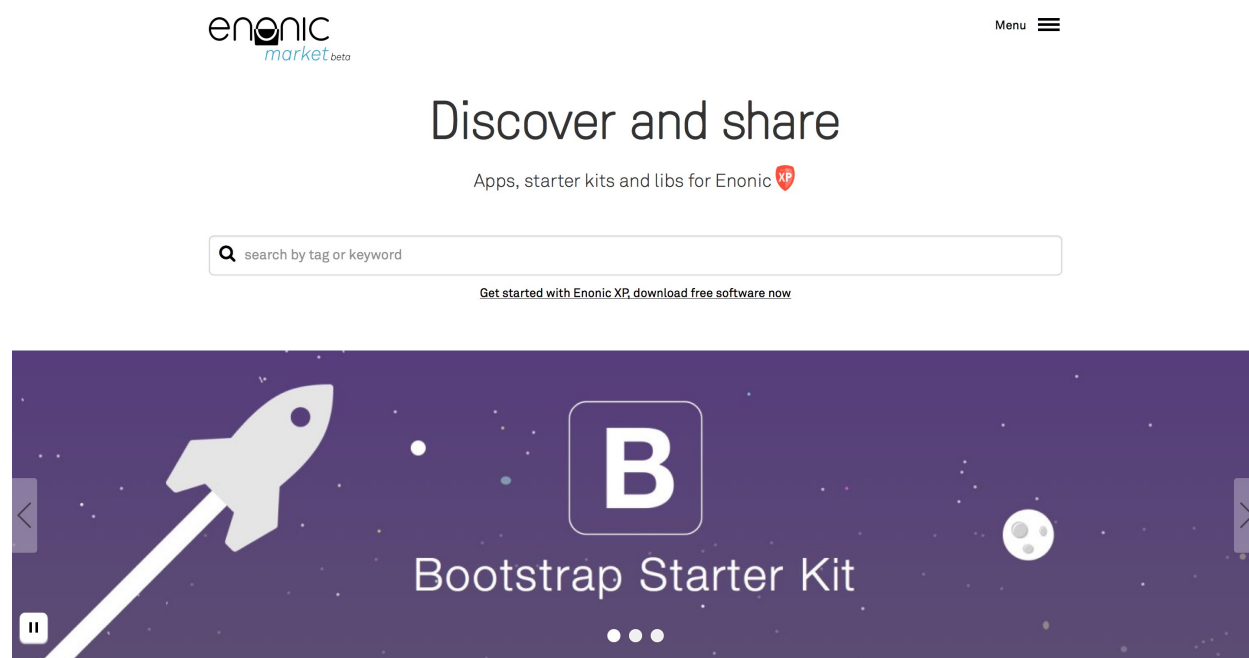
You can either download the JavaDoc [as a zip](#) or view it [directly in your browser](#).

Release Notes

Enonic XP 6.4 is a minor release, with several exciting new features and fixes - there are no breaking changes

6.1 Enonic Market

Enonic Market is now available, indirectly a part of Enonic XP - providing easy access to applications, libraries and starters built by Enonic or other 3rd party vendors. Market applications can even be installed directly from XP. Check it out: <https://market.enonic.com>

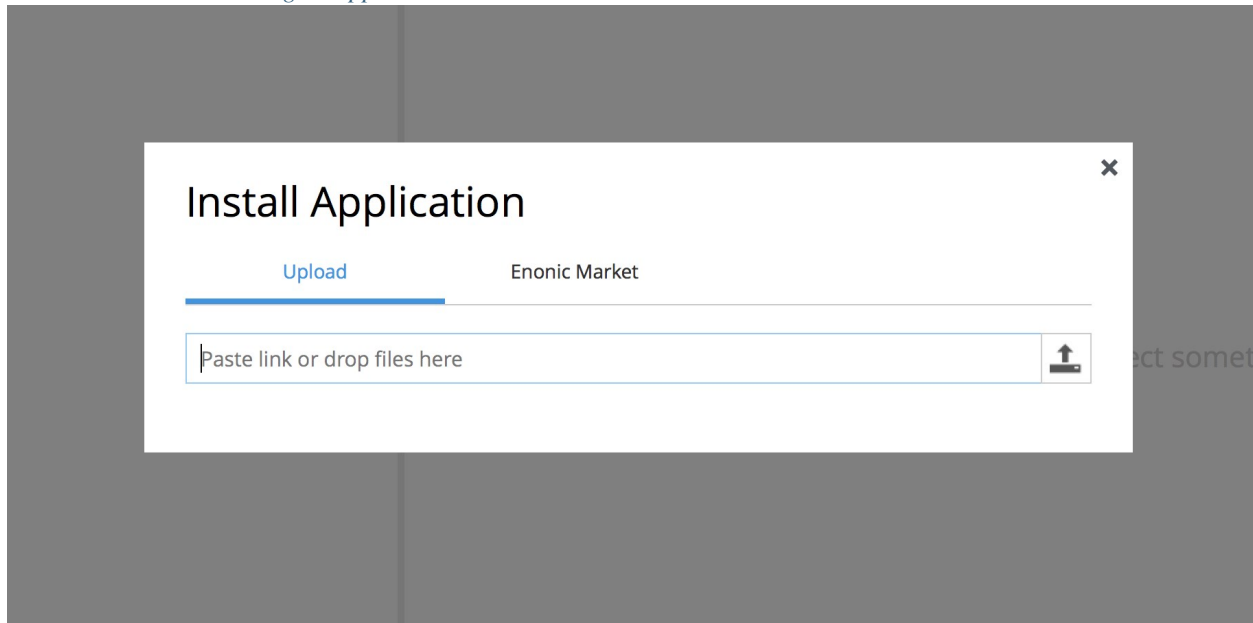


6.2 New App installer

Applications can now be installed directly from the “Applications” admin tool. This applies both to local application files, and applications shared in the Enonic Market. For clustered installations, applications will automatically be distributed and started on all cluster nodes! The system still supports local deployments. Local deployments will override apps installed centrally - i.e. for development or testing purposes.

Application configuration is still handled on file.

Read more about [Installing an application](#)

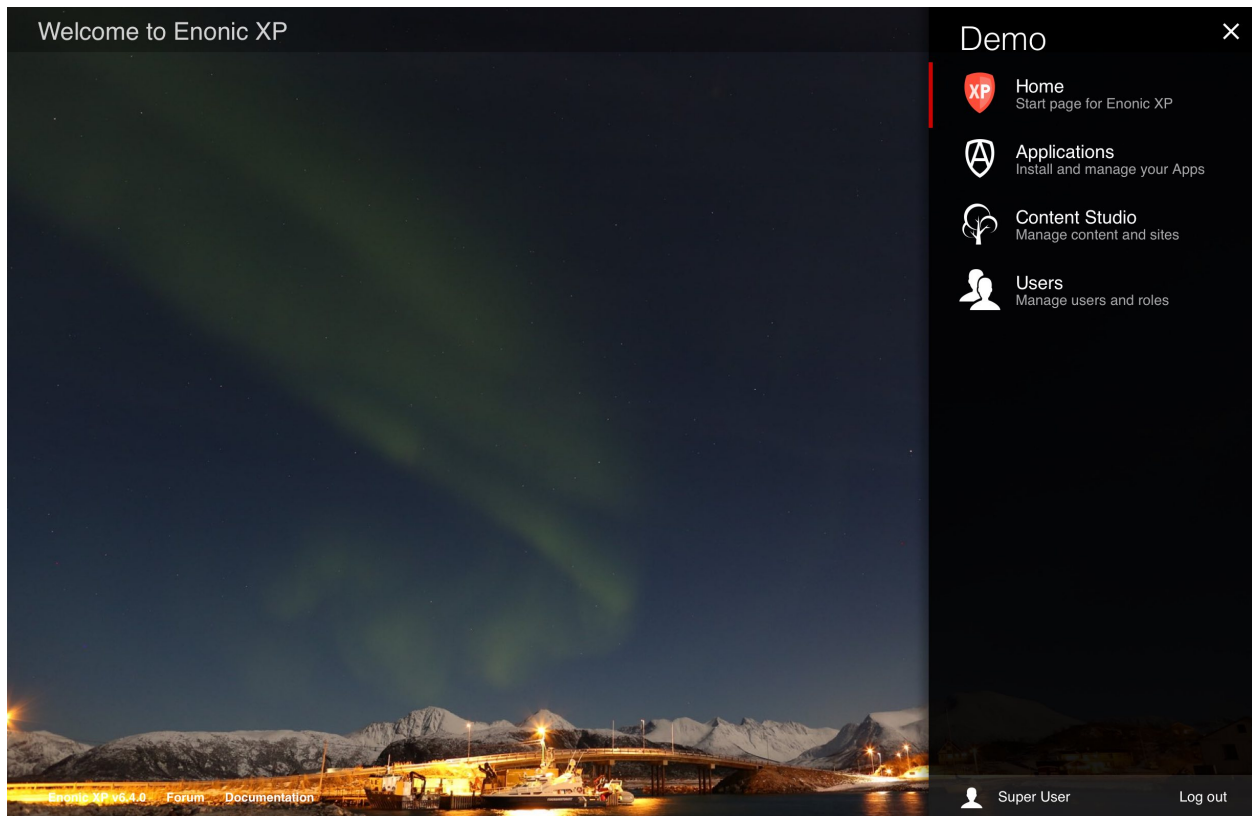


6.3 Pluggable Admin Tools

Enonic XP now supports 3rd party admin tools - (previously admin apps). Each tool is now running in a separate browser tab, allowing developers to pick and choose their favorite front-end technology. Read the documentation for how to get started with [Admin Tools](#).

6.4 Launcher and Home page

The home page is now available as a separate tool, featuring a new tools launcher panel. The launcher panel is easily embedded in other tools - providing global navigation capabilities. The home page currently only serves the purpose of being a start page for choosing other tools - but will provide exciting features in upcoming releases.



6.5 Page Editor

Navigation and user interaction inside Page Editor have been significantly improved to be more intuitive and not take away attention from the components being edited by giving them more focus and space. We've also changed component interaction behaviour and styling to be consistent between the Page Editor and the Page Components view.

6.6 Contextual Navigation

Editors may now navigate directly in the preview area to find what they are looking for, and then click edit. The content navigation panel (to the left) will update selection as the user navigates the site.

6.7 Reference Search

It is now possible to search for incoming and outbound references. All references within a document are now automatically indexed in the virtual property `_references`, making it easy to search for incoming references and outbound references between nodes and content.

6.8 Experimental Websocket support

It is now possible to create and use WebSockets in XP apps. This support is experimental and details may change for future releases. Feel free to test it out and give us feedback so we can implement this the best way. More details on

Websockets.

6.9 Libraries

- lib-content now features a `publish` function (push content from draft to master branch)

6.10 Minor improvements

- Improved organizing of development resources for application projects - see *Project structure*. Developer assets/ libs/ and services/ should now be placed on resources/ root - not within sites/ - see *Upgrading to 6.4*
- XSLT Transformations support in toolbox import utility (Apply transformation to import XML on a per-node basis)
- New input type - AttachmentUploader - Add attachments directly from a form - see *Input Types*
- New “abstract” property for media:document content types (Enabling presentation/indexing of a document abstract)
- New “tags” property for all media:* content-types (Enables tagging and search across media)
- Usability improvements for page editor - removed shader, faster selections and context menu on right-click
- Page Component - Highlighting with dashed borders and show text extract from text components
- Upgraded to Elasticsearch 1.5.2
- JVM now autoselects memory HEAP size - no longer using fixed default values

6.11 Changelog

For a complete list of changes see <http://github.com/enonic/xp/releases/tag/v6.4.0>

Upgrading to 6.4

Warning: This documentation describes upgrading from 6.3.1 to 6.4. Upgrading directly from 6.3.0 is not supported.

7.1 Upgrade Steps

There are no breaking changes in this release, but due to internal changes in repository you will have to dump your data, upgrade the dump, and load it into the new version:

7.1.1 1. Setup new installation

1. Download Enonic XP <http://repo.enonic.com/public/com/enonic/xp/distro/6.4.3/distro-6.4.3.zip>
2. Setup new XP installations - (for all servers in your entire cluster if you have one)

Tip: Remember to update any startup scripts you might have to launch your new installation given a server restart

7.1.2 2. Move configuration

1. Copy your \$OLD_XP_HOME/config/ and deploy/ folders to the the new \$NEW_XP_HOME/ (on all nodes)
2. Remove the \$NEW_XP_HOME/config/org.apache.felix.fileinstall-deploy.cfg file (To support UI-based application installation)

7.1.3 3. Migrate Data

Tip: Remember to backup your existing data before starting this step

1. If possible - stop traffic to the servers to avoid new data coming in during this process, or stop the servers after dumping the data.
2. Dump data from existing server. (*dump*). The dump will be created in \$OLD_XP_HOME/data/dump/

```
toolbox.sh dump -a su:password -t 6.3.1-dump
```

3. Upgrade the dump with a new XP installation. (*upgrade*).

```
toolbox.sh upgrade -d [path/to/OLD_XP_HOME]/data/dump/6.3.1-dump
```

4. Start the new server(s)
5. Copy the upgraded dump files from the old to the new server, place it in \$NEW_XP_HOME/data/dump/. The folder will be named “6.3.1-dump_upgraded_6.4.0”
6. Load the updated dump (*load*)

```
toolbox.sh load -a su:password -s 6.3.1-dump_upgraded_6.4.0
```

7.1.4 4. Install Apps (OPTIONAL)

This release supports installing applications globally, using the repository. Follow the steps below if you want to migrate your apps from file.

1. Make sure the \$XP_HOME/deploy folder of the new installation is empty
2. Install the Applications that was in the \$XP_HOME/deploy folder using the Applications UI tool, or *install-app*

7.2 New Project Structure (OPTIONAL)

Developers can update their application project structure to benefit from some of the new application development capabilities such as *Admin Tools* and *Widgets*, and align their applications for other future improvements,

- move .../resources/site/assets/ to .../resources/assets/
- move .../resources/site/services/ to .../resources/services/
- move .../resources/site/lib/ to .../resources/lib
- Optionally move .../resources/site/views/ to .../resources/views/ - this is an optional folder.

XP is backward compatible, and will scan for assets/ and services/ - initially on root, then in site. But only the first discovered folder will be used. For libraries, the lookup pattern for “require” will now include scanning parent folders with lib/ folders until reaching the resources/ folder.

NB! If you have used explicit require references i.e. “/lib/mylib” these files must now be moved to resources/ root, or referenced relatively instead.

(NB! Applications with updated structure will require minimum XP version 6.4)

Frequently Asked Questions

8.1 What's the latest release?

The latest release can be found here [latest release changelog](#).

8.2 Where can I get the source code?

All source code for Enonic XP is published on our [GitHub project page](#).

8.3 Do you publish changelogs?

Yes. You can go to the [releases tab on GitHub](#) to read the changelog for all versions. If you want to see what's coming, you can go to our [GitHub wiki page](#).

8.4 How is Enonic XP Licensed

Enonic XP is available under the [AGPL 3 license](#), with a linking exception. This basically means that you are free to use and re-distribute Enonic XP according to the AGPL license. The linking exception ensures that you can build custom applications and libraries on top of Enonic XP and license these however you see fit. Any changes made to the Enonic XP core platform however must be licensed as APGL.

We encourage the use of FOSS licensing for 3rd party apps and libraries. Libraries in particular should be licensed with a non-intrusive license such as Apache, BSD or MIT.

Note: This is a major difference from products such as Drupal and Wordpress where your themes, plugins and modules must be licensed as GPL too.

Enonic XP also consists of many 3rd party software components. The complete list can be found in our [Notice.txt file](#)

8.5 What is \$XP_INSTALL?

\$XP_INSTALL and **\$XP_HOME** are referenced frequently in the documentation and it is important to understand the difference. **\$XP_INSTALL** is the top level directory of the XP installation and it contains the directories *bin*, *home*, *lib*, *toolbox* and others.

8.6 What is \$XP_HOME?

\$XP_HOME, by default, is the location of the **\$XP_INSTALL/home** folder which contains the *config*, *deploy*, *repo* and other directories specific to a single XP instance. The home folder can be copied to multiple locations for developers working on more than one project.

There are two situations where the **\$XP_HOME environment variable** must be set:

1. When developers are working on an application and intend to use *./gradlew deploy*.
2. When a *home* folder other than **\$XP_INSTALL/home** is to be used.

8.7 Where can I get help?

The [community forum](#) would be a good place to start. We also offer [formal training courses](#).

Enonic also offers software support subscriptions for business critical installations: <https://enonic.com/pricing>

Glossary

\$XP_HOME By default, this is the location of the \$XP_INSTALL/home folder and it contains directories specific to a single XP instance. The home folder can be copied to multiple locations for developers working on multiple isolated projects. The \$XP_HOME environment variable should be set to the home folder of the project to be run.

\$XP_INSTALL The the location of the unzipped XP download

Tip: The source code for this documentation source is [available on GitHub](#) .

Symbols

`$XP_HOME`, [183](#)

`$XP_INSTALL`, [183](#)

A

`app.name` (app attribute), [53](#)

`app.version` (app attribute), [53](#)

`assetUrl()` (built-in function), [60](#)

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`log.debug()` (log method), [54](#)

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N

Name of the application. (Name of the application attribute), [53](#)

R

`require()` (built-in function), [55](#)

`resolve()` (built-in function), [55](#)

S

`serviceUrl()` (built-in function), [60](#)

V

Version of the application. (Version of the application attribute), [53](#)