
gcudm Documentation

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Pat Daburu

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This package (*gcudm*) contains the *GeoComm Unified Data Model* implemented as a [GeoAlchemy2](#) object-relational model.

Each version of the package represents the corresponding version of the *data model*.

If you want to get started using the library, check out *the tutorial*.

1.1 Installation

You can install the library using *pip*.

```
pip install gcudm
```

If you need a specific version of the data model, specify it when you install.

```
pip install gcudm==0.0.1
```

1.2 Build Your Database

gcudm is built on [GeoAlchemy 2](#) (and [SQLAlchemy](#)). We try not to come between you and the underlying platforms, so if you're familiar with these frameworks everything should work as you expect.

One convenience that is provided is the `gcudm.model.load()` function which you can call to make sure that all the modules that define [object-relational mappings](#) are loaded. You should do this before you create your database tables from the model to make sure that all the classes that implement the [declarative base](#) are loaded.

```
from gcudm.base import Base
import gcudm.model
from sqlalchemy import create_engine

# Load the entire model.
gcudm.model.load()

# The rest is standard SQLAlchemy...
# ...just create an engine.
engine = create_engine(
    'postgresql://<user>:<password>@<host>/<your-database>',
    echo=True)
```

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```
# Now create the tables in your database.  
Base.metadata.create_all(engine)
```


2.1 Road Centerlines

class gcudm.models.road_centerlines.RoadCenterline (**kwargs)

Bases: sqlalchemy.ext.declarative.api.Base, *gcudm.base.ModelMixin*

Road centerlines are the principal polyline features that represent road segments traversable by most emergency vehicles.

Table Name road_centerlines

Geometry Type Linestring

addCodeL

Additional Code Left

This field needs a description.

Search	Display

Requested	Required

NENA *AddCode_L*

addCodeR

Additional Code Right

This field needs a description.

Search	Display

Requested	Required

NENA *AddCode_R*

addRngPreL

Left Address Number Prefix

This field needs a description.

Search	Display

Requested	Required

NENA *AdNumPre_L*

addRngPreR

Right Address Number Prefix

This field needs a description.

Search	Display

Requested	Required

NENA *AdNumPre_R*

countryL

Country Left

This field needs a description.

Search	Display

Requested	Required

NENA *Country_L*

countryR

Country Right

This field needs a description.

Search	Display

Requested	Required

NENA *Country_R*

effective

Effective Date

This field needs a description.

Search	Display

Requested	Required

esnL

ESN Left

This field needs a description.

Search	Display

Requested	Required

NENA *ESN_L*

esnR

ESN Right

This field needs a description.

Search	Display

Requested	Required

NENA *ESN_R*

expire

Expiration Date

This field needs a description.

Search	Display

Requested	Required

fromAddL**Left ‘From’ Address**

This field needs a description.

Search	Display

Requested	Required

NENA *FromAddr_L*

fromAddR**Right ‘From’ Address**

This field needs a description.

Search	Display

Requested	Required

NENA *FromAddr_R*

gcUnqId**GeoComm ID**

This field needs a description.

Search	Display

Requested	Required

geometry

classmethod geometry_type () → gcudm.geometry.GeometryTypes

Get the geometry type defined for the model class.

Returns the geometry type

incMuniL**Incorporated Municipality Left**

This field needs a description.

Search	Display

Requested	Required

NENA *IncMuni_L*

incMuniR**Incorporated Municipality Right**

This field needs a description.

Search	Display

Requested	Required

NENA *IncMuni_R*

lgcyName**Legacy Street Name**

This field needs a description.

Search	Display

Requested	Required

NENA *LSt_Name*

lgcyPrTySp**Legacy Street Name Pre Type Separator**

This field needs a description.

Search	Display

Requested	Required

lgcyPrType**Legacy Street Name Pre Type**

This field needs a description.

Search	Display

Requested	Required

NENA *LSt_PreDir*

lgcyPreDir**Legacy Street Name Pre Directional**

This field needs a description.

Search	Display

Requested	Required

lgcyPreMod**Legacy Street Name Pre Modifier**

This field needs a description.

Search	Display

Requested	Required

lgcyPstDir**Legacy Street Name Post Directional**

This field needs a description.

Search	Display

Requested	Required

NENA *LStPosDir*

lgcyPstMod**Legacy Street Name Post Modifier**

This field needs a description.

Search	Display

Requested	Required

lgcyType**Legacy Street Name Post Type**

This field needs a description.

Search	Display

Requested	Required

NENA *LSt_Type*

metadata = MetaData(bind=None)

msagCommL**MSAG Community Name Left**

This field needs a description.

Search	Display

Requested	Required

NENA *MSAGComm_L*

msagCommR**MSAG Community Name Right**

This field needs a description.

Search	Display

Requested	Required

NENA *MSAGComm_R*

parityL

Parity Left

This field needs a description.

Search	Display

Requested	Required

NENA *Parity_L*

parityR

Parity Right

This field needs a description.

Search	Display

Requested	Required

NENA *Parity_R*

postDir

Street Name Post Directional

This field needs a description.

Search	Display

Requested	Required

NENA *St_PosDir*

postMod

Street Name Post Modifier

This field needs a description.

Search	Display

Requested	Required

NENA *St_PosMod*

postType

Street Name Post Type

This field needs a description.

Search	Display

Requested	Required

NENA *St_PosTyp*

preDir

Street Name Pre Directional

This field needs a description.

Search	Display

Requested	Required

NENA *St_PreDir*

preMod

Street Name Pre Modifier

This field needs a description.

Search	Display

Requested	Required

NENA *St_PreMod*

preType

Street Name Pre Type

This field needs a description.

Search	Display

Requested	Required

NENA *St_PreTyp*

preTypeSep

Street Name Pre Type Separator

This field needs a description.

Search	Display

Requested	Required

NENA *St_PreSep*

rngType

Ranging Type

This field needs a description.

Search	Display

Requested	Required

srcFullNam

here is an annotation!

srcLastEd

Source of Last Update

This field needs a description.

Search	Display

Requested	Required

srcOfData

Data Source

This field needs a description.

Search	Display

Requested	Required

srcUnqId
NENA ID

This field needs a description.

Search	Display

Requested	Required

NENA *RCL_NGUID*

stateL
State Left

This field needs a description.

Search	Display

Requested	Required

NENA *State_L*

stateR
State Right

This field needs a description.

Search	Display

Requested	Required

NENA *State_R*

strName
Street Name

This field needs a description.

Search	Display

Requested	Required

NENA *StreetName*

toAddL

Left ‘To’ Address

This field needs a description.

Search	Display

Requested	Required

NENA *ToAddr_L*

toAddR

Right ‘To’ Address

This field needs a description.

Search	Display

Requested	Required

NENA *ToAddr_R*

unincCommL

Unincorporated Community Left

This field needs a description.

Search	Display

Requested	Required

NENA *UnincCom_L*

unincCommR**Unincorporated Community Right**

This field needs a description.

Search	Display

Requested	Required

NENA *UnincCom_R*

updateDate**Last Update**

This field needs a description.

Search	Display

Requested	Required

uploadAuth**Upload Authority**

This field needs a description.

Search	Display

Requested	Required

2.2 Emergency Service Boundaries (EMS)

Say something descriptive about the ‘esbems’ module.

```
class gcudm.models.esbems.EsbEms (**kwargs)
```

```
    Bases: sqlalchemy.ext.declarative.api.Base, gcudm.base.ModelMixin, gcudm.
    models.esbs.EsbMixin
```

This table needs a description.

Table Name esbems

Geometry Type Polygon

agencyID**Agency ID**

This field needs a description.

Search	Display

Requested	Required

NENA *Agency_ID***country****Country**

This field needs a description.

Search	Display

Requested	Required

county**County**

This field needs a description.

Search	Display

Requested	Required

displayName**Display Name**

This field needs a description.

Search	Display

Requested	Required

NENA *DisplayName*

effective**Effective Date**

This field needs a description.

Search	Display

Requested	Required

expire**Expiration Date**

This field needs a description.

Search	Display

Requested	Required

gcUnqId**GeoComm ID**

This field needs a description.

Search	Display

Requested	Required

geometry

classmethod geometry_type () → gcudm.geometry.GeometryTypes

Get the geometry type defined for the model class.

Returns the geometry type

metadata = **MetaData**(bind=None)

routeURI**Service URI**

This field needs a description.

Search	Display

Requested	Required

NENA *ServiceURI*

serviceNum

Service Number

This field needs a description.

Search	Display

Requested	Required

NENA *ServiceNum*

serviceURN

Service URI

This field needs a description.

Search	Display

Requested	Required

NENA *ServiceURI*

srcLastEd

Source of Last Update

This field needs a description.

Search	Display

Requested	Required

srcOfData

Data Source

This field needs a description.

Search	Display

Requested	Required

srcUnqId
NENA ID

This field needs a description.

Search	Display

Requested	Required

NENA RCL_NGUID

state
State

This field needs a description.

Search	Display

Requested	Required

updateDate
Last Update

This field needs a description.

Search	Display

Requested	Required

uploadAuth
Upload Authority

This field needs a description.

Search	Display

Requested	Required

vCardURI
Agency vCard URI

This field needs a description.

Search	Display

Requested	Required

NENA *AVcard_URI*

2.3 Emergency Service Boundaries (Fire)

Say something descriptive about the ‘esbfire’ module.

```
class gcudm.models.esbfire.EsbFire(**kwargs)
    Bases: sqlalchemy.ext.declarative.api.Base, gcudm.base.ModelMixin, gcudm.
    models.esbs.EsbMixin
```

This table needs a description.

Table Name esbfire

Geometry Type Polygon

agencyID

Agency ID

This field needs a description.

Search	Display

Requested	Required

NENA *Agency_ID*

country

Country

This field needs a description.

Search	Display

Requested	Required

county

County

This field needs a description.

Search	Display

Requested	Required

displayName**Display Name**

This field needs a description.

Search	Display

Requested	Required

NENA *DisplayName*

effective**Effective Date**

This field needs a description.

Search	Display

Requested	Required

expire**Expiration Date**

This field needs a description.

Search	Display

Requested	Required

gcUnqId**GeoComm ID**

This field needs a description.

Search	Display

Requested	Required

geometry

classmethod geometry_type() → gcudm.geometry.GeometryTypes

Get the geometry type defined for the model class.

Returns the geometry type

metadata = MetaData(bind=None)

routeURI

Service URI

This field needs a description.

Search	Display

Requested	Required

NENA ServiceURI

serviceNum

Service Number

This field needs a description.

Search	Display

Requested	Required

NENA ServiceNum

serviceURN

Service URI

This field needs a description.

Search	Display

Requested	Required

NENA ServiceURI

srcLastEd**Source of Last Update**

This field needs a description.

Search	Display

Requested	Required

srcOfData**Data Source**

This field needs a description.

Search	Display

Requested	Required

srcUnqId**NENA ID**

This field needs a description.

Search	Display

Requested	Required

NENA *RCL_NGUID*

state**State**

This field needs a description.

Search	Display

Requested	Required

updateDate**Last Update**

This field needs a description.

Search	Display

Requested	Required

uploadAuth

Upload Authority

This field needs a description.

Search	Display

Requested	Required

vCardURI

Agency vCard URI

This field needs a description.

Search	Display

Requested	Required

NENA *AVcard_URI*

2.4 Emergency Service Boundaries (Law)

Say something descriptive about the ‘esblaw’ module.

```
class gcudm.models.esblaw.EsbLaw(**kwargs)
    Bases: sqlalchemy.ext.declarative.api.Base, gcudm.base.ModelMixin, gcudm.
    models.esbs.EsbMixin
```

Emergency service boundaries for law enforcement define the areas to which law enforcement responds.

Table Name esblaw

Geometry Type Polygon

agencyID

Agency ID

This field needs a description.

Search	Display

Requested	Required

NENA *Agency_ID*

country
Country

This field needs a description.

Search	Display

Requested	Required

county
County

This field needs a description.

Search	Display

Requested	Required

displayName
Display Name

This field needs a description.

Search	Display

Requested	Required

NENA *DisplayName*

effective
Effective Date

This field needs a description.

Search	Display

Requested	Required

expire**Expiration Date**

This field needs a description.

Search	Display

Requested	Required

gcUnqId**GeoComm ID**

This field needs a description.

Search	Display

Requested	Required

geometry

classmethod geometry_type() → gcudm.geometry.GeometryTypes

Get the geometry type defined for the model class.

Returns the geometry type

metadata = MetaData(bind=None)

routeURI**Service URI**

This field needs a description.

Search	Display

Requested	Required

NENA *ServiceURI*

serviceNum**Service Number**

This field needs a description.

Search	Display

Requested	Required

NENA *ServiceNum*

serviceURN

Service URI

This field needs a description.

Search	Display

Requested	Required

NENA *ServiceURI*

srcLastEd

Source of Last Update

This field needs a description.

Search	Display

Requested	Required

srcOfData

Data Source

This field needs a description.

Search	Display

Requested	Required

srcUnqId

NENA ID

This field needs a description.

Search	Display

Requested	Required

NENA *RCL_NGUID*

state

State

This field needs a description.

Search	Display

Requested	Required

updateDate

Last Update

This field needs a description.

Search	Display

Requested	Required

uploadAuth

Upload Authority

This field needs a description.

Search	Display

Requested	Required

vCardURI

Agency vCard URI

This field needs a description.

Search	Display

Requested	Required

NENA *AVcard_URI*

2.5 Emergency Service Boundaries (PSAP)

Say something descriptive about the ‘esbpsap’ module.

class gcudm.models.esbpsap.**EsbPsap** (**kwargs)

Bases: sqlalchemy.ext.declarative.api.Base, *gcudm.base.ModelMixin*, gcudm.models.esbs.EsbMixin

This table needs a description.

Table Name esbpsap

Geometry Type Polygon

agencyID

Agency ID

This field needs a description.

Search	Display

Requested	Required

NENA *Agency_ID*

country

Country

This field needs a description.

Search	Display

Requested	Required

county

County

This field needs a description.

Search	Display

Requested	Required

displayName

Display Name

This field needs a description.

Search	Display

Requested	Required

NENA *DisplayName*

effective

Effective Date

This field needs a description.

Search	Display

Requested	Required

expire

Expiration Date

This field needs a description.

Search	Display

Requested	Required

gcUnqId

GeoComm ID

This field needs a description.

Search	Display

Requested	Required

geometry

classmethod geometry_type () → gcudm.geometry.GeometryTypes

Get the geometry type defined for the model class.

Returns the geometry type

metadata = **MetaData**(bind=None)

routeURI

Service URI

This field needs a description.

Search	Display

Requested	Required

NENA *ServiceURI*

serviceNum

Service Number

This field needs a description.

Search	Display

Requested	Required

NENA *ServiceNum*

serviceURN

Service URI

This field needs a description.

Search	Display

Requested	Required

NENA *ServiceURI*

srcLastEd

Source of Last Update

This field needs a description.

Search	Display

Requested	Required

srcOfData**Data Source**

This field needs a description.

Search	Display

Requested	Required

srcUnqId**NENA ID**

This field needs a description.

Search	Display

Requested	Required

NENA *RCL_NGUID*

state**State**

This field needs a description.

Search	Display

Requested	Required

updateDate**Last Update**

This field needs a description.

Search	Display

Requested	Required

uploadAuth**Upload Authority**

This field needs a description.

Search	Display

Requested	Required

vCardURI**Agency vCard URI**

This field needs a description.

Search	Display

Requested	Required

NENA *AVcard_URI*

3.1 gcudm

GeoComm Unified Data Model

3.2 gcudm.base

The GeoAlchemy declarative base for the data model is defined in this module along with some other helpful classes.

```
class gcudm.base.Base(**kwargs)
```

Bases: object

The most base type

```
    metadata = MetaData(bind=None)
```

```
class gcudm.base.ModelMixin
```

Bases: object

This mixin includes columns and methods common to objects within the data model.

```
    effective = Column(None, DateTime(), table=None)
```

Effective Date

This field needs a description.

Search	Display

Requested	Required

```
expire = Column(None, DateTime(), table=None)
```

Expiration Date

This field needs a description.

Search	Display

Requested	Required

```
gcUnqId = Column(None, GUID(), table=None, primary_key=True, nullable=False)
```

GeoComm ID

This field needs a description.

Search	Display

Requested	Required

```
classmethod geometry_type () → gcudm.geometry.GeometryTypes
```

Get the geometry type defined for the model class.

Returns the geometry type

```
srcLastEd = Column(None, DateTime(), table=None)
```

Source of Last Update

This field needs a description.

Search	Display

Requested	Required

```
srcOfData = Column(None, String(), table=None)
```

Data Source

This field needs a description.

Search	Display

Requested	Required

```
srcUnqId = Column(None, String(), table=None)
NENA ID
```

This field needs a description.

Search	Display

Requested	Required

NENA RCL_NGUID

```
updateDate = Column(None, DateTime(), table=None)
Last Update
```

This field needs a description.

Search	Display

Requested	Required

```
uploadAuth = Column(None, String(), table=None)
Upload Authority
```

This field needs a description.

Search	Display

Requested	Required

3.3 gcudm.meta

This module contains metadata objects to help with inline documentation of the model.

```
gcudm.meta.COLUMN_META_ATTR = '__meta__'
    the property that contains column metadata
```

```
class gcudm.meta.ColumnMeta
    Bases: tuple
```

Metadata for table columns.

Variables

- **label** (*str*) – a human-friendly label for the column
- **description** (*str*) – a human-friendly description of the column

- **nena** (*str*) – the name of the equivalent NENA field
- **requirement** (*Requirement*) – defines the source data contract
- **usage** (*Usage*) – defines how the data in the column is expected to be used
- **guaranteed** (*bool*) – Is the column guaranteed to contain a non-empty value?
- **calculated** (*bool*) – May the column's value be generated or modified by a calculation?

calculated

description

get_enum (*enum_cls*: *Type[Union[gcudm.meta.Requirement, gcudm.meta.Usage]]*) → *gcudm.meta.Requirement*
Get the current value of an attribute defined by an enumeration.

Parameters *enum_cls* – the enumeration class

Returns the value of the attribute

guaranteed

label

nena

requirement

usage

class *gcudm.meta.Requirement*

Bases: *enum.IntFlag*

This enumeration describes contracts with source data providers.

NONE = 0

data for the column is neither requested nor required

REQUESTED = 1

data for the column is requested

REQUIRED = 3

data for the column is required

gcudm.meta.TABLE_META_ATTR = *'__meta__'*

the property that contains table metadata

class *gcudm.meta.TableMeta*

Bases: *tuple*

Metadata for tables.

Variables *label* (*str*) – a human-friendly label for the column

label

class *gcudm.meta.Usage*

Bases: *enum.IntFlag*

This enumeration describes how data may be used.

DISPLAY = 2

The data is displayed to users.

NONE = 0

The data is not used.

SEARCH = 1

The data is used for searching.

`gcudm.meta.column(dtype: Any, meta: gcudm.meta.ColumnMeta, *args, **kwargs) → sqlalchemy.sql.schema.Column`

Create a GeoAlchemy Column annotated with metadata.

Parameters

- **dtype** – the GeoAlchemy column type
- **meta** – the meta data

Returns a GeoAlchemy Column

3.4 gcudm.model

This module contains general members to help you work with the model.

`gcudm.model.IS_MODEL_CLASS = '__model_cls__'`
signifies a model class

`gcudm.model.load()`
Load the data model.

`gcudm.model.model(label: str)`
Use this decorator to provide meta-data for your model class.

Parameters **label** – the friendly label for the class

3.5 gcudm.types

This module contains custom GeoAlchemy/SQLAlchemy types.

class `gcudm.types.GUID(*args, **kwargs)`
Bases: `sqlalchemy.sql.type_api.TypeDecorator`

This is a Platform-independent GUID type that uses PostgreSQL's UUID type (and otherwise uses CHAR(32), storing as stringified hex values.

See also:

http://docs.sqlalchemy.org/en/latest/core/custom_types.html#backend-agnostic-guid-type

impl
alias of `sqlalchemy.sql.sqltypes.CHAR`

load_dialect_impl(dialect)
Return a `TypeEngine` object corresponding to a dialect.

This is an end-user override hook that can be used to provide differing types depending on the given dialect. It is used by the `TypeDecorator` implementation of `type_engine()` to help determine what type should ultimately be returned for a given `TypeDecorator`.

By default returns `self.impl`.

process_bind_param(value, dialect)
Receive a bound parameter value to be converted.

Subclasses override this method to return the value that should be passed along to the underlying `TypeEngine` object, and from there to the DBAPI `execute()` method.

The operation could be anything desired to perform custom behavior, such as transforming or serializing data. This could also be used as a hook for validating logic.

This operation should be designed with the reverse operation in mind, which would be the `process_result_value` method of this class.

Parameters

- **value** – Data to operate upon, of any type expected by this method in the subclass. Can be `None`.
- **dialect** – the `Dialect` in use.

process_result_value (*value, dialect*)

Receive a result-row column value to be converted.

Subclasses should implement this method to operate on data fetched from the database.

Subclasses override this method to return the value that should be passed back to the application, given a value that is already processed by the underlying `TypeEngine` object, originally from the DBAPI cursor method `fetchone()` or similar.

The operation could be anything desired to perform custom behavior, such as transforming or serializing data. This could also be used as a hook for validating logic.

Parameters

- **value** – Data to operate upon, of any type expected by this method in the subclass. Can be `None`.
- **dialect** – the `Dialect` in use.

This operation should be designed to be reversible by the “`process_bind_param`” method of this class.

Python Module Dependencies

The `requirements.txt` file contains this project's module dependencies. You can install these dependencies using `pip`.

```
pip install -r requirements.txt
```

4.1 requirements.txt

```
GeoAlchemy2>=0.4.2,<1
parameterized>=0.6.1,<1
pip-check-reqs>=2.0.1,<3
psycpg2>=2.7.4,<3
psycpg2-binary>=2.7.4,<3
pylint>=1.8.4,<2
pytest>=3.4.0,<4
pytest-cov>=2.5.1,<3
pytest-pythonpath>=0.7.2,<1
setuptools>=38.4.0
Sphinx>=1.7.1,<2
sphinx-rtd-theme>=0.2.4,<1
SQLAlchemy>=1.2.6,<2
singleton-decorator>=1.0.0,<2
titlecase>=0.12.0,<1
tox>=3.0.0,<4
twine>=1.11.0,<2
```


CHAPTER 5

Indices and tables

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