
gcudm Documentation

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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

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

Table Name road_centerlines

Geometry Type LINESTRING

2.1.1 addCodeL

Additional Code Left - This field needs a description.

Search	Display

Requested	Required

NENA *AddCode_L*

2.1.2 addCodeR

Additional Code Right - This field needs a description.

Search	Display

Requested	Required

NENA *AddCode_R*

2.1.3 addRngPreL

Left Address Number Prefix - This field needs a description.

Search	Display

Requested	Required

NENA *AdNumPre_L*

2.1.4 addRngPreR

Right Address Number Prefix - This field needs a description.

Search	Display

Requested	Required

NENA *AdNumPre_R*

2.1.5 countryL

Country Left - This field needs a description.

Search	Display

Requested	Required

NENA *Country_L*

2.1.6 countryR

Country Right - This field needs a description.

Search	Display

Requested	Required

NENA *Country_R*

2.1.7 effective

Effective Date - This field needs a description.

Search	Display

Requested	Required

2.1.8 esnL

ESN Left - This field needs a description.

Search	Display

Requested	Required

NENA *ESN_L*

2.1.9 esnR

ESN Right - This field needs a description.

Search	Display

Requested	Required

NENA *ESN_R*

2.1.10 expire

Expiration Date - This field needs a description.

Search	Display

Requested	Required

2.1.11 fromAddL

Left ‘From’ Address - This field needs a description.

Search	Display

Requested	Required

NENA *FromAddr_L*

2.1.12 fromAddR

Right ‘From’ Address - This field needs a description.

Search	Display

Requested	Required

NENA *FromAddr_R*

2.1.13 gcUnqlId

GeoComm ID - This field needs a description.

Search	Display

Requested	Required

2.1.14 incMuniL

Incorporated Municipality Left - This field needs a description.

Search	Display

Requested	Required

NENA *IncMuni_L*

2.1.15 incMuniR

Incorporated Municipality Right - This field needs a description.

Search	Display

Requested	Required

NENA *IncMuni_R*

2.1.16 IgcyName

Legacy Street Name - This field needs a description.

Search	Display

Requested	Required

NENA *LSt_Name*

2.1.17 IgcyPrTySp

Legacy Street Name Pre Type Separator - This field needs a description.

Search	Display

Requested	Required

2.1.18 IgcyPrType

Legacy Street Name Pre Type - This field needs a description.

Search	Display

Requested	Required

NENA *LSt_PreDir*

2.1.19 IgcyPreDir

Legacy Street Name Pre Directional - This field needs a description.

Search	Display

Requested	Required

2.1.20 IgcyPreMod

Legacy Street Name Pre Modifier - This field needs a description.

Search	Display

Requested	Required

2.1.21 IgcyPstDir

Legacy Street Name Post Directional - This field needs a description.

Search	Display

Requested	Required

NENA *LStPosDir*

2.1.22 IgcyPstMod

Legacy Street Name Post Modifier - This field needs a description.

Search	Display

Requested	Required

2.1.23 lgcyType

Legacy Street Name Post Type - This field needs a description.

Search	Display

Requested	Required

NENA *LSt_Type*

2.1.24 msagCommL

MSAG Community Name Left - This field needs a description.

Search	Display

Requested	Required

NENA *MSAGComm_L*

2.1.25 msagCommR

MSAG Community Name Right - This field needs a description.

Search	Display

Requested	Required

NENA *MSAGComm_R*

2.1.26 parityL

Parity Left - This field needs a description.

Search	Display

Requested	Required

NENA *Parity_L*

2.1.27 parityR

Parity Right - This field needs a description.

Search	Display

Requested	Required

NENA *Parity_R*

2.1.28 postDir

Street Name Post Directional - This field needs a description.

Search	Display

Requested	Required

NENA *St_PosDir*

2.1.29 postMod

Street Name Post Modifier - This field needs a description.

Search	Display

Requested	Required

NENA *St_PosMod*

2.1.30 postType

Street Name Post Type - This field needs a description.

Search	Display

Requested	Required

NENA *St_PosTyp*

2.1.31 preDir

Street Name Pre Directional - This field needs a description.

Search	Display

Requested	Required

NENA *St_PreDir*

2.1.32 preMod

Street Name Pre Modifier - This field needs a description.

Search	Display

Requested	Required

NENA *St_PreMod*

2.1.33 preType

Street Name Pre Type - This field needs a description.

Search	Display

Requested	Required

NENA *St_PreTyp*

2.1.34 preTypeSep

Street Name Pre Type Separator - This field needs a description.

Search	Display

Requested	Required

NENA *St_PreSep*

2.1.35 rngType

Ranging Type - This field needs a description.

Search	Display

Requested	Required

2.1.36 srcFullNam

Source Full Name - This field needs a description.

Search	Display

Requested	Required

2.1.37 srcLastEd

Source of Last Update - This field needs a description.

Search	Display

Requested	Required

2.1.38 srcOfData

Data Source - This field needs a description.

Search	Display

Requested	Required

2.1.39 srcUnqlId

NENA ID - This field needs a description.

Search	Display

Requested	Required

NENA *RCL_NGUID*

2.1.40 stateL

State Left - This field needs a description.

Search	Display

Requested	Required

NENA *State_L*

2.1.41 stateR

State Right - This field needs a description.

Search	Display

Requested	Required

NENA *State_R*

2.1.42 strName

Street Name - This field needs a description.

Search	Display

Requested	Required

NENA *StreetName*

2.1.43 toAddL

Left ‘To’ Address - This field needs a description.

Search	Display

Requested	Required

NENA *ToAddr_L*

2.1.44 toAddR

Right ‘To’ Address - This field needs a description.

Search	Display

Requested	Required

NENA *ToAddr_R*

2.1.45 unincCommL

Unincorporated Community Left - This field needs a description.

Search	Display

Requested	Required

NENA *UnincCom_L*

2.1.46 unincCommR

Unincorporated Community Right - This field needs a description.

Search	Display

Requested	Required

NENA *UnincCom_R*

2.1.47 updateDate

Last Update - This field needs a description.

Search	Display

Requested	Required

2.1.48 uploadAuth

Upload Authority - This field needs a description.

Search	Display

Requested	Required

Say something descriptive about the ‘esbems’ module.

2.2 Emergency Services Boundary (EMS)

This table needs a description.

Table Name esbems

Geometry Type LINESTRING

2.2.1 agencyID

Agency ID - This field needs a description.

Search	Display

Requested	Required

NENA *Agency_ID*

2.2.2 country

Country - This field needs a description.

Search	Display

Requested	Required

2.2.3 county

County - This field needs a description.

Search	Display

Requested	Required

2.2.4 displayName

Display Name - This field needs a description.

Search	Display

Requested	Required

NENA *DisplayName*

2.2.5 effective

Effective Date - This field needs a description.

Search	Display

Requested	Required

2.2.6 expire

Expiration Date - This field needs a description.

Search	Display

Requested	Required

2.2.7 gcUnqlId

GeoComm ID - This field needs a description.

Search	Display

Requested	Required

2.2.8 routeURI

Service URI - This field needs a description.

Search	Display

Requested	Required

NENA *ServiceURI*

2.2.9 serviceNum

Service Number - This field needs a description.

Search	Display

Requested	Required

NENA *ServiceNum*

2.2.10 serviceURN

Service URI - This field needs a description.

Search	Display

Requested	Required

NENA *ServiceURI*

2.2.11 srcLastEd

Source of Last Update - This field needs a description.

Search	Display

Requested	Required

2.2.12 srcOfData

Data Source - This field needs a description.

Search	Display

Requested	Required

2.2.13 srcUnqlId

NENA ID - This field needs a description.

Search	Display

Requested	Required

NENA *RCL_NGUID*

2.2.14 state

State - This field needs a description.

Search	Display

Requested	Required

2.2.15 updateDate

Last Update - This field needs a description.

Search	Display

Requested	Required

2.2.16 uploadAuth

Upload Authority - This field needs a description.

Search	Display

Requested	Required

2.2.17 vCardURI

Agency vCard URI - This field needs a description.

Search	Display

Requested	Required

NENA *AVcard_URI*

Say something descriptive about the 'esbfire' module.

2.3 Emergency Services Boundary (Fire)

This table needs a description.

Table Name esbfire

Geometry Type LINESTRING

2.3.1 agencyID

Agency ID - This field needs a description.

Search	Display

Requested	Required

NENA *Agency_ID*

2.3.2 country

Country - This field needs a description.

Search	Display

Requested	Required

2.3.3 county

County - This field needs a description.

Search	Display

Requested	Required

2.3.4 displayName

Display Name - This field needs a description.

Search	Display

Requested	Required

NENA *DisplayName*

2.3.5 effective

Effective Date - This field needs a description.

Search	Display

Requested	Required

2.3.6 expire

Expiration Date - This field needs a description.

Search	Display

Requested	Required

2.3.7 gcUnqlId

GeoComm ID - This field needs a description.

Search	Display

Requested	Required

2.3.8 routeURI

Service URI - This field needs a description.

Search	Display

Requested	Required

NENA *ServiceURI*

2.3.9 serviceNum

Service Number - This field needs a description.

Search	Display

Requested	Required

NENA *ServiceNum*

2.3.10 serviceURN

Service URI - This field needs a description.

Search	Display

Requested	Required

NENA *ServiceURI*

2.3.11 srcLastEd

Source of Last Update - This field needs a description.

Search	Display

Requested	Required

2.3.12 srcOfData

Data Source - This field needs a description.

Search	Display

Requested	Required

2.3.13 srcUnqlId

NENA ID - This field needs a description.

Search	Display

Requested	Required

NENA *RCL_NGUID*

2.3.14 state

State - This field needs a description.

Search	Display

Requested	Required

2.3.15 updateDate

Last Update - This field needs a description.

Search	Display

Requested	Required

2.3.16 uploadAuth

Upload Authority - This field needs a description.

Search	Display

Requested	Required

2.3.17 vCardURI

Agency vCard URI - This field needs a description.

Search	Display

Requested	Required

NENA *AVcard_URI*

Say something descriptive about the ‘esblaw’ module.

2.4 Emergency Services Boundary (Law)

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

Table Name esblaw

Geometry Type LINESTRING

2.4.1 agencyID

Agency ID - This field needs a description.

Search	Display

Requested	Required

NENA *Agency_ID*

2.4.2 country

Country - This field needs a description.

Search	Display

Requested	Required

2.4.3 county

County - This field needs a description.

Search	Display

Requested	Required

2.4.4 displayName

Display Name - This field needs a description.

Search	Display

Requested	Required

NENA *DisplayName*

2.4.5 effective

Effective Date - This field needs a description.

Search	Display

Requested	Required

2.4.6 expire

Expiration Date - This field needs a description.

Search	Display

Requested	Required

2.4.7 gcUnqlId

GeoComm ID - This field needs a description.

Search	Display

Requested	Required

2.4.8 routeURI

Service URI - This field needs a description.

Search	Display

Requested	Required

NENA *ServiceURI*

2.4.9 serviceNum

Service Number - This field needs a description.

Search	Display

Requested	Required

NENA *ServiceNum*

2.4.10 serviceURN

Service URI - This field needs a description.

Search	Display

Requested	Required

NENA *ServiceURI*

2.4.11 srcLastEd

Source of Last Update - This field needs a description.

Search	Display

Requested	Required

2.4.12 srcOfData

Data Source - This field needs a description.

Search	Display

Requested	Required

2.4.13 srcUnqlId

NENA ID - This field needs a description.

Search	Display

Requested	Required

NENA *RCL_NGUID*

2.4.14 state

State - This field needs a description.

Search	Display

Requested	Required

2.4.15 updateDate

Last Update - This field needs a description.

Search	Display

Requested	Required

2.4.16 uploadAuth

Upload Authority - This field needs a description.

Search	Display

Requested	Required

2.4.17 vCardURI

Agency vCard URI - This field needs a description.

Search	Display

Requested	Required

NENA *AVcard_URI*

Say something descriptive about the 'esbpsap' module.

2.5 Emergency Services Boundary (PSAP)

This table needs a description.

Table Name esbpsap

Geometry Type LINESTRING

2.5.1 agencyID

Agency ID - This field needs a description.

Search	Display

Requested	Required

NENA *Agency_ID*

2.5.2 country

Country - This field needs a description.

Search	Display

Requested	Required

2.5.3 county

County - This field needs a description.

Search	Display

Requested	Required

2.5.4 displayName

Display Name - This field needs a description.

Search	Display

Requested	Required

NENA *DisplayName*

2.5.5 effective

Effective Date - This field needs a description.

Search	Display

Requested	Required

2.5.6 expire

Expiration Date - This field needs a description.

Search	Display

Requested	Required

2.5.7 gcUnqlId

GeoComm ID - This field needs a description.

Search	Display

Requested	Required

2.5.8 routeURI

Service URI - This field needs a description.

Search	Display

Requested	Required

NENA *ServiceURI*

2.5.9 serviceNum

Service Number - This field needs a description.

Search	Display

Requested	Required

NENA *ServiceNum*

2.5.10 serviceURN

Service URI - This field needs a description.

Search	Display

Requested	Required

NENA *ServiceURI*

2.5.11 srcLastEd

Source of Last Update - This field needs a description.

Search	Display

Requested	Required

2.5.12 srcOfData

Data Source - This field needs a description.

Search	Display

Requested	Required

2.5.13 srcUnqlId

NENA ID - This field needs a description.

Search	Display

Requested	Required

NENA *RCL_NGUID*

2.5.14 state

State - This field needs a description.

Search	Display

Requested	Required

2.5.15 updateDate

Last Update - This field needs a description.

Search	Display

Requested	Required

2.5.16 uploadAuth

Upload Authority - This field needs a description.

Search	Display

Requested	Required

2.5.17 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

Bases: object

This is the model's declarative base.

class gcudm.base.ModelMixin

Bases: object

This is the parent class for all entity classes in the model. It defines common fields.

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

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

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

classmethod geometry_type()

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

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

srcUnqId = Column(None, String(), table=None)

updateDate = Column(None, DateTime(), table=None)

uploadAuth = Column(None, String(), table=None)

3.3 gcudm.docstrings

This module contains utilities for setting up docstrings

class gcudm.docstrings.**ModelRstFormatter**

Bases: object

This class supports a number of specialized methods for creating reStructuredText docstrings for classes in this project.

cls2rst (*cls*, *heading*: str, *preamble*: str = None)

Create a docstring for a model class.

Parameters

- **cls** – the class
- **heading** – the heading for the reStructuredText section
- **preamble** – everything that should precede the generated docstring

Returns a reStructuredText docstring

col2section (*table_name*: str, *column_name*: str, *meta*: gcudm.meta.ColumnMeta) → str

Format a block of reStructuredText to represent a column.

Parameters

- **table_name** – the name of the table to which the column belongs
- **column_name** – the name of the column
- **meta** – the column’s meta data

Returns a block of reStructuredText

enum2tbl (*enum_cls*: Type[Union[gcudm.meta.Requirement, gcudm.meta.Usage]], *meta*: gcudm.meta.ColumnMeta, *excluded*: Set[Any], *indent*: int = 1)

static format_line (*indent*: int = 1, *wrap*: bool = True)

Format a line of reStructuredText.

Parameters

- **line** – the line to format
- **indent** – the indentation level of the formatted line
- **wrap** – Should a newline be placed at the end?

Returns the formatted line

static simplify_docstring ()

Simplify a docstring by removing leading and trailing spaces,

Parameters **s** –

Returns

gcudm.docstrings.**model** (*label*: str)

Use this decorator to provide meta-data for your model class.

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

3.4 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 metadata

class `gcudm.meta.ColumnMeta`

Bases: `tuple`

Metadata for table columns.

calculated

Alias for field number 6

description

Alias for field number 1

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

Alias for field number 5

label

Alias for field number 0

na

Alias for field number 2

requirement

Alias for field number 3

usage

Alias for field number 4

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

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

3.5 gcudm.model

Say something descriptive about the ‘model’ module.

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

3.6 gcudm.modes

This module can be used to describe the mode in which the library is running.

3.7 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
psycopg2>=2.7.4,<3
psycopg2-binary>=2.7.4,<3
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
```


CHAPTER 5

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