

Round of introductions of the participants – Expectations and Use Cases

2nd Joint SIG 3D and OGC Workshop on the CityGML UtilityNetworkADE
Karlsruhe, March 2-3, 2017

SIG3D

www.sig3d.org



SIG 3D Working Group of the German SDI (GDI-DE)

Activities and Expectations

02 March 2017

**Dr.-Ing. Egbert Casper
Chairman SIG3D**

CITIS



SIG3D – Who we are

- **History.**
 - originally founded in 2002 as part of the SDI initiative of the German state of North-Rhine Westphalia (GDI-NRW)
 - working group of the national German SDI (GDI-DE)
- **Organization.**
 - independant and open working group on a national an international basis,
 - members of the public administration, research institutes and private companies
- **Competence Network.**
 - we support integrated solutions with all aspects of 3D city and regional models, e.g. modeling, storage, deployment, usage, visualization and marketing of 3D models
- **3D Spatial Data Infrastructure.**
 - we support the deployment of 3D SDI's for all possible use cases
- **Standardization.**
 - we originally developed CityGML and engage in international standards of open and interoperable 3D SDI's (e.g. CityGML and INSPIRE) .

SIG3D – Where we are involved

Activities of the SIG 3D:

- **Regional**
Städtetag NRW
Common working group
- **National**
AdV, GDI-DE
Common working groups, coherence and cooperation
- **Europe wide**
INSPIRE
Experts in Technical Working Groups, SDIC + LMO
- **International**
Open Geospatial Consortium (OGC)
Experts in CityGML Standards Working Group,
MoU

SIG3D – How we are involved

most of the production work is done in working groups (→ sig3d.org)

- **SIG3D ALKIS 3D Working Group**
- **SIG3D Continuation Working Group**
- **SIG3D Energy Working Group**
- **SIG3D Modeling Working Group**
- **SIG3D Quality Working Group**
- **SIG3D Utility Networks Group**
 - **Development and harmonization of a CityGML UtilityNetworksADE for common use of infrastructure based computations and simulations in 3D city models**

Why do we need a Utility Networks ADE for 3D city models ?

- **demand for inter domain models for CityGML 2.x**
- **integration of different data from different sources**
- **preparation for integration into later CityGML versions**

Expectations to the SIG3D

- **coordinated UtilityNetworks ADE for CityGML 2.0**
- **appropriate data model for inter domain use**
- **specification (at least) for top three application areas,**

... any questions ???

... please ask now !!!

Dr.-Ing. Egbert Casper

cas@citis.consulting

<http://www.citis.consulting>

cas@sig3d.org

<http://www.sig3d.org>

HOCHSCHULE DÜSSELDORF
FB MASCHINENBAU UND VERFAHRENSTECHNIK

CENTRUM FÜR STRÖMUNGSSIMULATION (CFS)
(Prof. Dr.-Ing. habil. A. C. Benim)

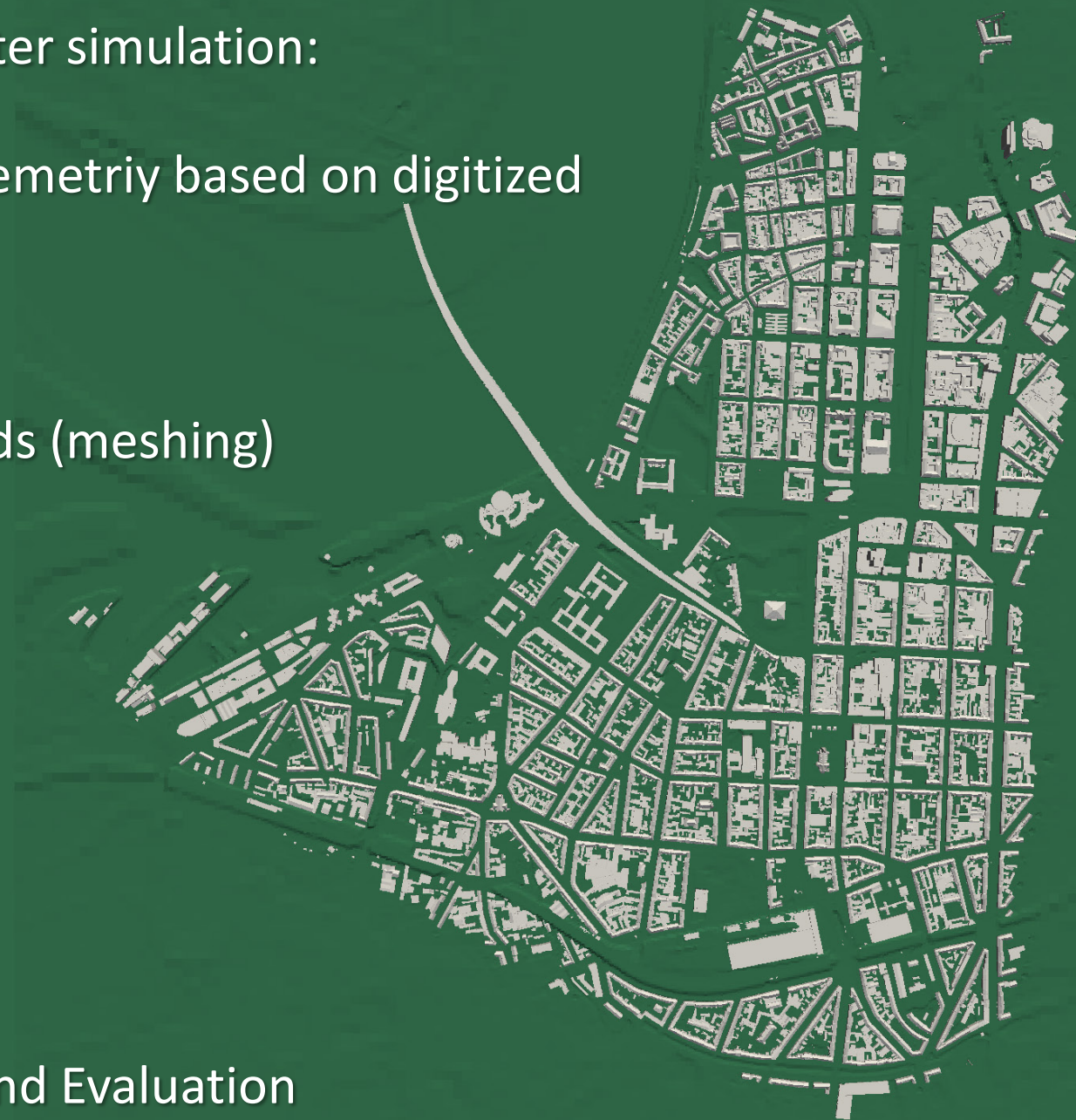
Dr. Younis. S. Saeed Rashed
Centrum für Strömungssimulation (CFS)
Faculty of Mechanical and Process Engineering
Dusseldorf University of Applied Sciences
Postal: Münsterstr. 156, Visitor: Rather Str. 23 b, D-40476 Düsseldorf
Mobile: +4915735414659

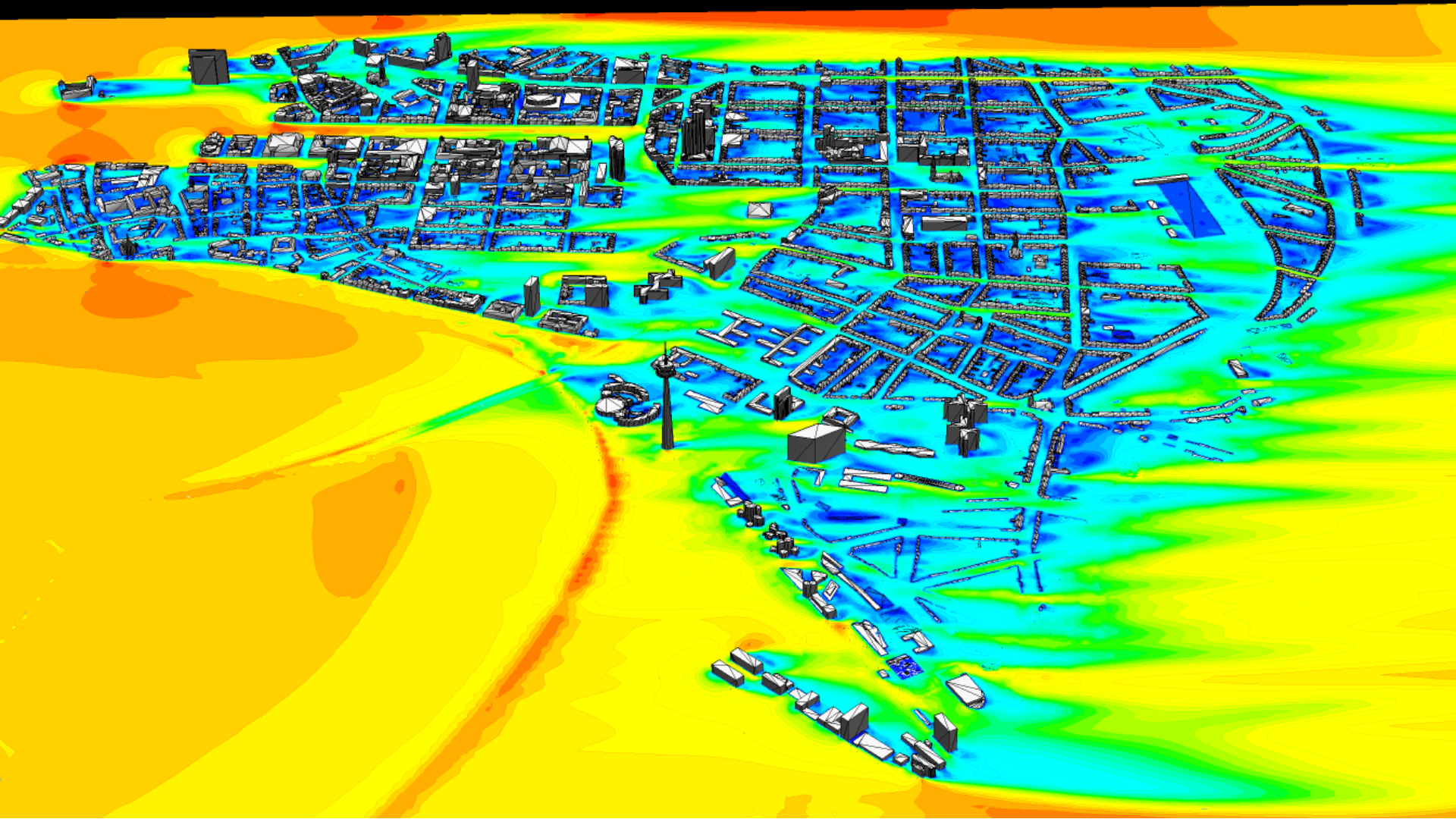
Expectations/ interest in this workshop

- Integrating City GML-LoD2.XML and Geb-LoD2.dxf with the ANSYS/ ICEM CFD, How we can prepare clean STL files that can be manipulated by ICEM CFD?
- Best method to mesh dirty geometric data that can be supported by ANSYS/ Fluent regardless the use of SnappyHexMesh.
- More detail about SIG3D

Steps of computer simulation:

- Collection of geometry based on digitized GIS-Data
- Generating grids (meshing)
- Mathematical and Numerical Modeling
- Execution of Simulation
- Presentation and Evaluation







Utility ADE Requirements for Conflict Recognition Services

Utility ADE Workshop 2-3 March 2017 – Karlsruhe - Steve Smyth

Activity

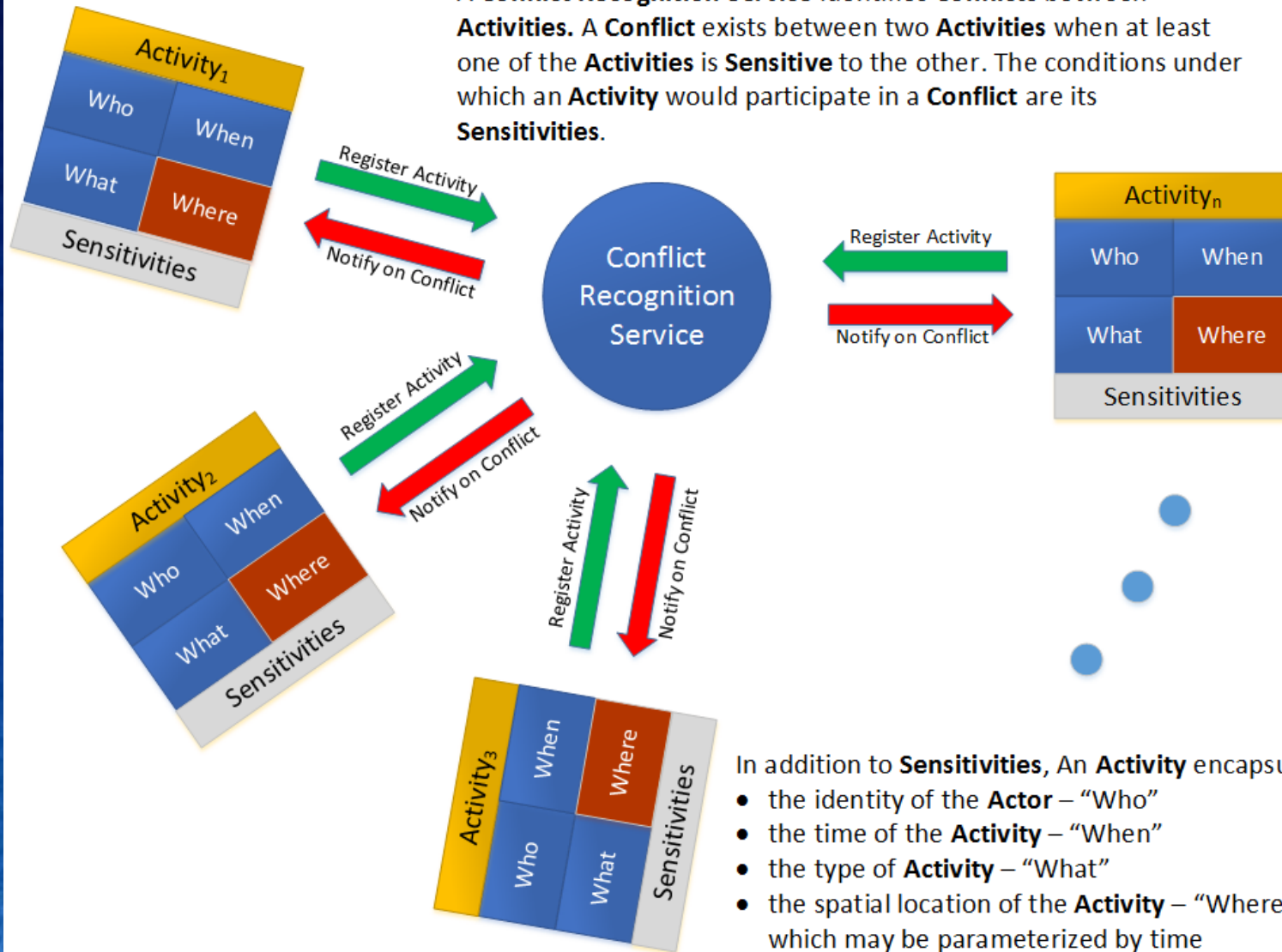
- An activity has
 - physical and temporal extent
 - semantic type
 - function or purpose
 - sensitivities to other activities
 - owner, manager, controller, or observer
- Examples:
 - Street (construction, maintenance, existence)
 - Festival, attack, construction of a building
 - Storm, radiation plume, road noise
 - Flood, pipeline, lake, car park, cable, pipeline

Conflicts

- A conflict exists when
 - another activity exposes an property to which this activity is sensitive and
 - the activities overlap in space and time
- Examples:
 - It rains during an outdoor festival
 - A 15 m tsunami strikes a 10 m seawall
 - A gas pipeline is dug up during a road repair
 - *Aedes aegypti* mosquito bites animal infected with Zika virus

Conflict Recognition Service (CRS)

A **Conflict Recognition Service** identifies **Conflicts** between **Activities**. A **Conflict** exists between two **Activities** when at least one of the **Activities** is **Sensitive** to the other. The conditions under which an **Activity** would participate in a **Conflict** are its **Sensitivities**.



Utility Conflict Recognition Service (CRS) Use Cases

1. Recognition of conflicts in space and time between utilities and construction activities
 1. Potential – construction activities may have possibility of damaging infrastructure
 2. Primary – storm causes gas pipeline to break with subsequent explosion and fire
 3. Secondary – pipeline explosion damages electric cables and water pipes
2. Simulation
 1. Estimate risk exposure or damage assessment
 2. Determine optimal reconfiguration

Utility Conflict Recognition Service (CRS) Modelling Requirements

- Support simulation
 - Functional characteristics: size, carrying capacity, functional status
 - Material properties: dimensions, materials, strength limits
 - Geometry and topology
- Support dynamic properties
- Support control of access, visibility, levels-of-detail

Use Case 1.1 Detail

Recognizing Potential Conflicts Between Digging and Buried Infrastructure Activities

Intersection of human activities and

- valuable
- dangerous
- secret

things.



People Digging and Pipelines













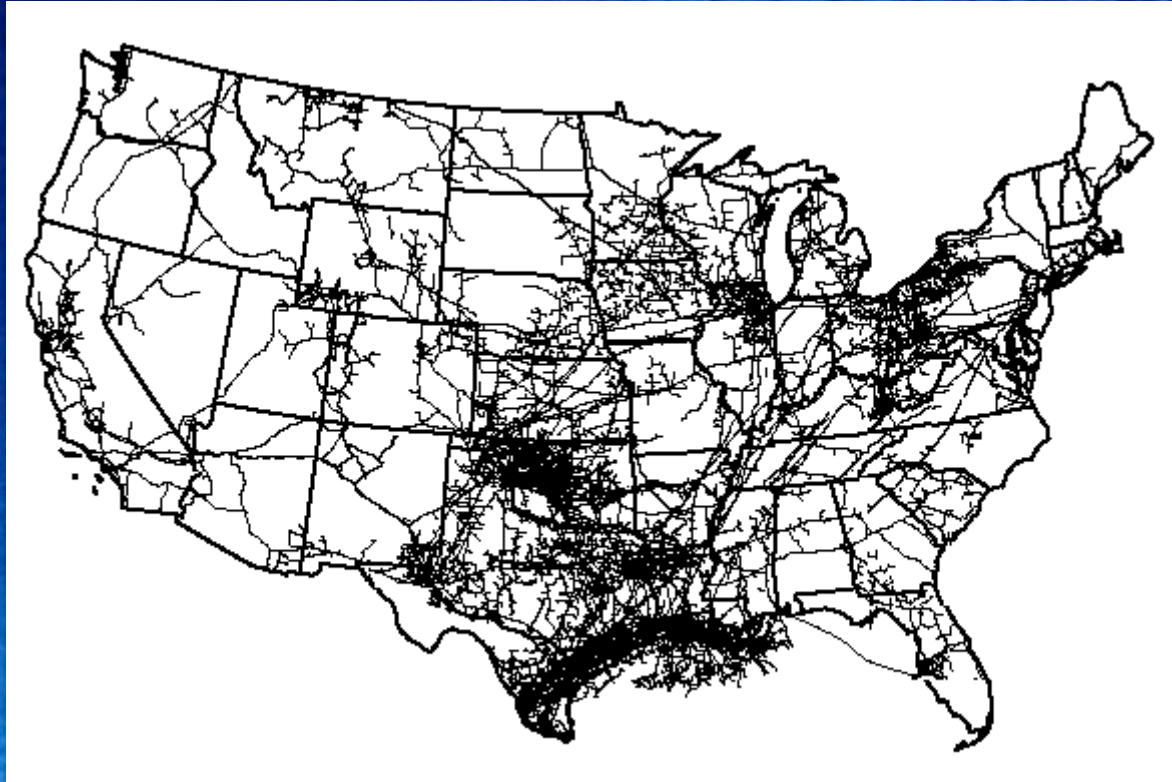




Extent of Underground Utilities (USA)

- About 800 thousand km oil and gas pipelines
- 150 thousand km Internet backbone
- 10 million km water and sewer pipelines
- 4,5 million km underground power cables
- 1,2 million underground transformers

Major US Pipelines



Digging Activities (US)

- About 90% planned, 10% emergencies
- About 100K per day large enough to require notification under state laws – about one per 3K population
- About 1 million assets potentially affected per day
- About \$2M / day for the determination of potential conflicts

Use Case 1.1: Potential Conflict Recognition

- Define digging volume in space and time.
- Compare with volume of underground assets (e.g. intersect volumes)
- Deny access, guard, mark, ignore as appropriate

Implementation of the ADEs for PostgreSQL

- In development at AIT
- Based on current **Energy ADE** v. 0.8 and extending the 3DCityDB 3.3.1
- Planned to be released soon (Spring 2017) with Apache 2.0 license

- Same approach planned for the **UtilityNetworks ADE**

- Want to join / cooperate? Contact us! ☺
giorgio.agugiaro@ait.ac.at

3D City Database extension
for the
CityGML Energy ADE 0.8

(for PostgreSQL)

Documentation

2017



2 Data Modelling and Database Design

2.1 UML class diagrams

The following pages cite several parts of the both of CityGML specification and of the Energy ADE guidelines which are necessary for a better understanding. Design decisions in the model are explicitly visualised within the UML diagrams. Following parts of the Energy ADE are presented in detail:

- Time series and schedule module,
- Material and Construction module,
- Building Physics module,
- Occupancy module,
- Energy Systems module

In addition, whenever necessary, parts of the CityGML UML diagrams are also depicted, in order to better show where the Energy ADE elements connect to the existing classes.

For intuitive understanding, classes which will be merged to a single table in the relational schema, are shown as orange blocks in the UML diagrams, while n:m relations, which only can be represented by additional tables, are represented as green blocks.

Please note that the UML diagrams presented in the following Figures have been simplified for better readability, i.e. diagrams regarding codelists and enumerations are omitted.

2.1.1 Time series and schedule module

This module introduces two classes: `_TimeSeries` and `_Schedules`, essential to model the time-dependent inputs and results, e.g. of urban energy analyses. These classes are used in other modules of the Energy ADE.

All `_TimeSeries` subclasses share some common properties, gathered in the `TimeValuesProperties` class, regarding for example the acquisition method, the type of interpolation, the source of the time series data, etc.

Time series can be either regular or irregular. Regular time series contain values generated at regularly spaced interval of time, over a given temporal extent (i.e. start, end and duration time). In irregular time series, data follows a temporal sequence, but the measurement points may not happen at a regular time interval. Therefore, each value must be associated with its own timestamp.

Time series values may be stored in an external file (e.g. csv or text), both for regular (`RegularTimeSeriesFile` class) and irregular time series (`IrregularTimeSeriesFile` class). A number of attributes must be provided as metadata about the file, for example about the decimal symbol, the record and field separators, etc.

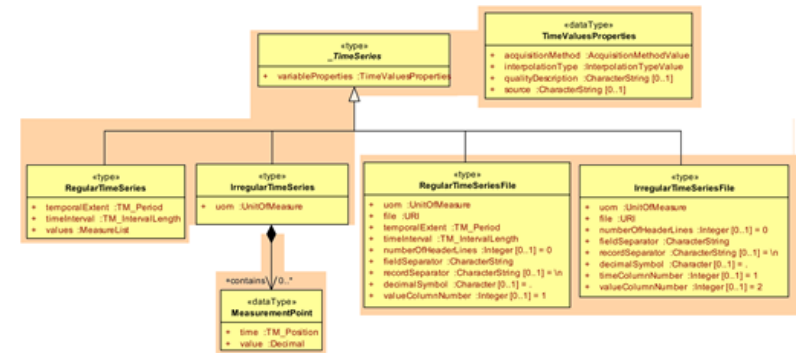


Figure 1: UML diagram of TimeSeries

Schedules can be modelled in four possible ways and are derived from the abstract class `_Schedule`, depending on the available information and the application requirements. They range from a simple constant value to a detailed schedule characterised by time depending values (i.e. a `_TimeSeries` object), with `DualValue` and `DailyPattern` schedules in between.

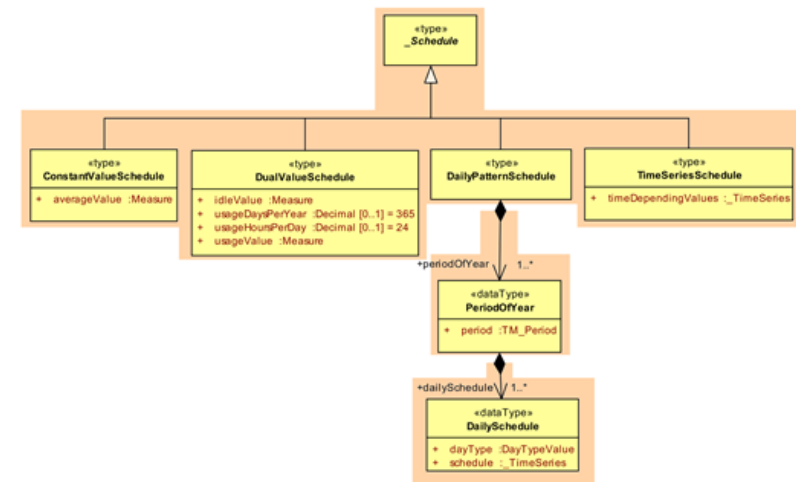


Figure 2: UML diagram of Schedules

2.1.2 Material and Construction module

The Material and Construction module characterises the building construction parts, detailing their structure and specifying their thermal and optical properties.

Relevant projects for UtilityNetwork ADE

- **IntegrCiTy: Multi-energy networks in cities**
 - JPI Urban Europe Era-NET Smart Cities project, 2016-2019
 - Cities: **Geneva, Vevey (CH), Stockholm**
 - <http://integrcity.epfl.ch>

- **Topics of interest: intersection of modeling/simulation and GIS-based tools**
 - input for the creation of simulation scenarios
 - topology of networks (electricity, heat, gas)
 - geographical position of substations/transformers → computation of different levels of aggregation (link to Energy ADE)
 - storage and visualization of simulation results
 - link between topology and topography → visualize results, e.g., heatmaps



By the way ...

Next UtilityNetworks ADE workshop in Vienna?