



Sponsored by



Current Status of the Energy ADE for CityGML

93rd OGC Technical Committee

Tokyo, Japan

Jean-Marie Bahu, EIFER

03 December 2014



Copyright © 2014 Open Geospatial Consortium



Agenda



- CityGML & urban energy modelling
 - Urban context
 - CityGML
 - The Application Domain Extension (ADE) concept
 - Energy modelling
 - Application

- Development of the Energy ADE
 - Our approach
 - Partners
 - Working groups & First results
 - Next steps



CITYGML & URBAN ENERGY MODELLING

Urban context



- Ecological and urban **challenges**
- **Sustainable** city development
Smart City concept & Big Data
- **Complex city context:**
 - Multi-domains
 - Multi-scale
 - Multi-actors



➔ **Need of integrative expertise for multi-criteria decision support based on a systemic and multi-scale approach:**

Modelling & simulation VS Observational & data analytics

➔ **Need of an interoperable open standard, manageable into a 3D GDI with different levels of aggregation → “information hub”**

CityGML Energy ADE concept



- **CityGML**

- OGC-standard spatial data format
- Application independent Geospatial Information Model
- Data exchange & multi-domains
- Multi-purpose
- Multi-resolution



- CityGML is **extendable**.

2 types of extension:

- Generics – Generic objects and attributes
- Application Domain Extension (**ADE**)

- **What is an ADE ?**

- Extension of the CityGML model for specific application domains
- Formal specification in separate XML schemas referencing the CityGML schemas
- An extension type with advantages & limits

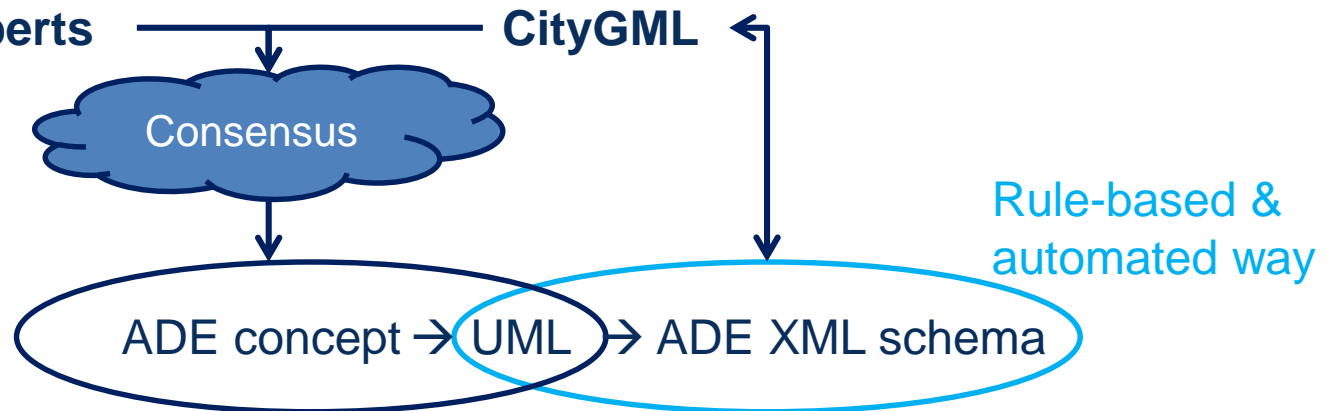
CityGML Energy ADE development



- **2 types of ADEs:**

- Extension of existing CityGML feature types
- Definition of new feature types

- **Domain experts**



- CityGML = **ontology** of the urban space

→ ADE development = Extend this ontology for domain specific data-models

- **Reference document:** *Modeling an application domain extension of CityGML in UML*
- OGC Best Practice, 2014

Energy modelling



- **Urban energy dimensions**

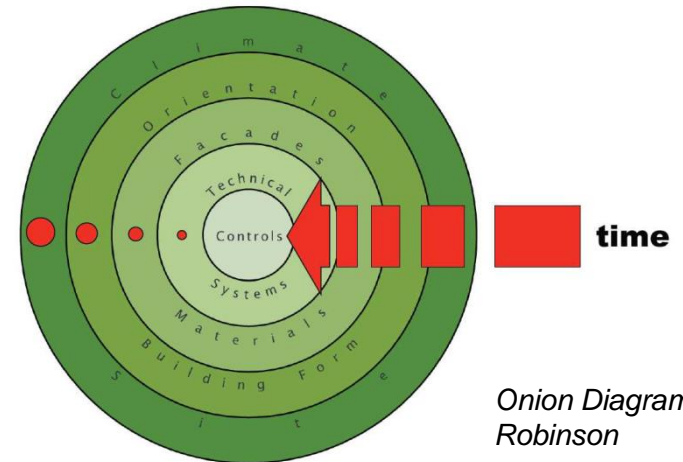
- Energy generation, storage, demand, transport
- Multi-resolution: spatially and temporally
- Different layers

- **What needs?**

- Need for linking urban planning & energy planning at different stages
- Different needs regarding Energy:
 - Diagnosis & prospective,
 - Sizing & optimization of energy systems,
 - Energy management strategies

- **Urban modeling approaches**

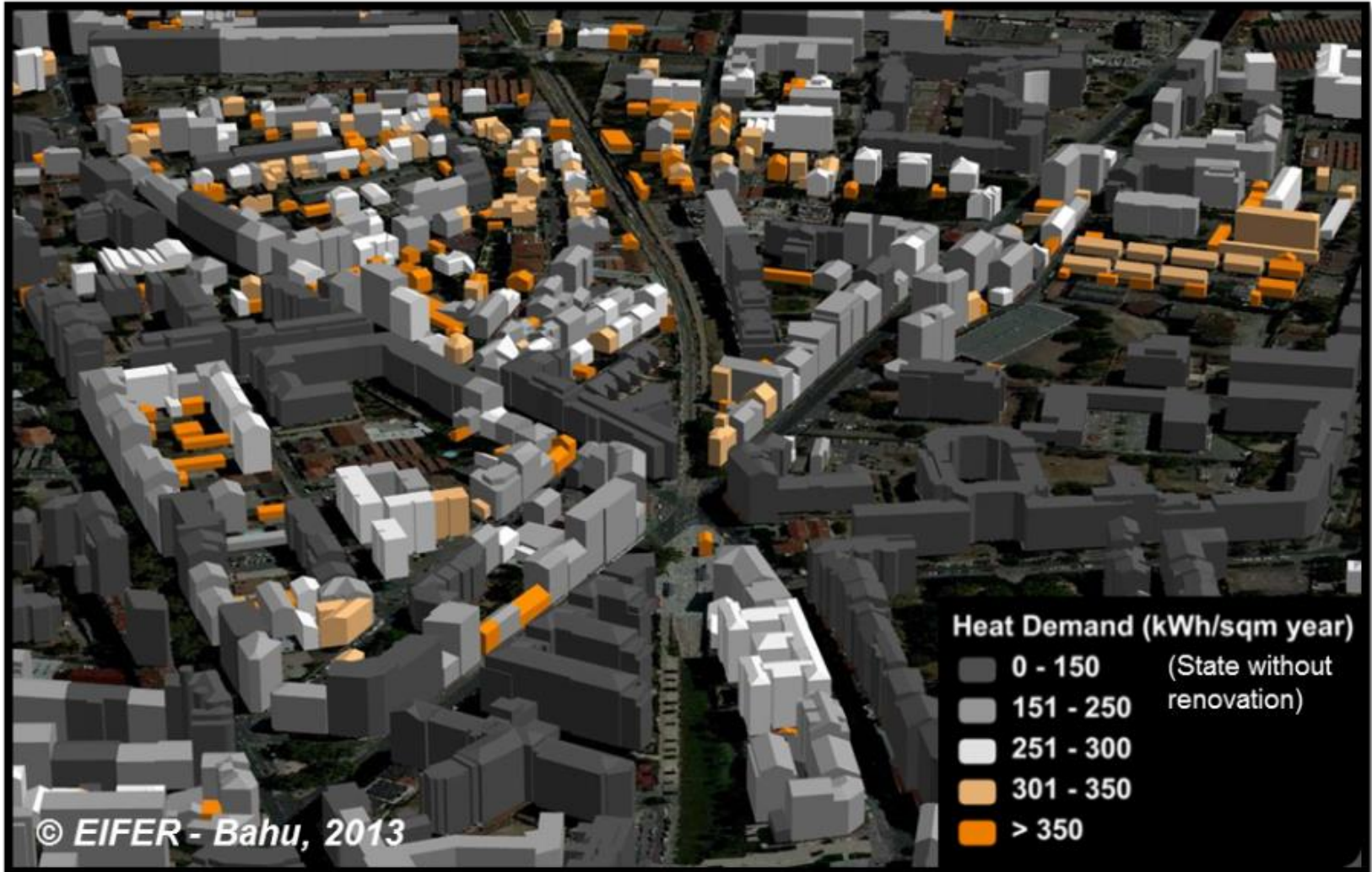
- Top-Down and Bottom-up
- Engineering: Static energy balance & Dynamic simulation



PV cadaster based on a 3D CM



Energy demand modelling based on 3D CM





DEVELOPMENT OF THE ENERGY ADE

CityGML Energy ADE: our approach



Global objective: Development and harmonization of a CityGML Energy ADE for building heating/cooling energy demand calculation.

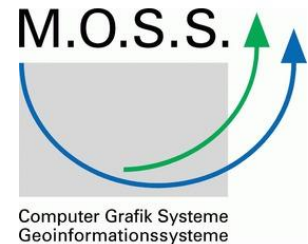
Methodology:

- Sum up the needs & define the aim of the Energy ADE
- Review similar approaches (INSPIRE, local Energy ADEs, etc.)
- Create specific working groups
- Propose a common UML schema based on working group's outputs
- Develop the XML file
- Provide energy simulation tests

CityGML Energy ADE: current partners



Hochschule
für Technik
Stuttgart



CityGML Energy ADE: workshops



1st Workshop in Stuttgart, Germany:

- Agreed on the need for a common CityGML Energy ADE
- Definition of what it should be
- Creation of specific working groups
 - Building Physics and Materials
 - Building Occupant
 - HVAC systems and urban energy infrastructure
 - Metadata and scenarios

Hochschule
für Technik
Stuttgart

2nd Workshop in Karlsruhe, Germany:

- Summary of the working group's outputs
- First proposal of a harmonized Energy ADE
- Common repartition of further working steps



CityGML Energy ADE: working groups

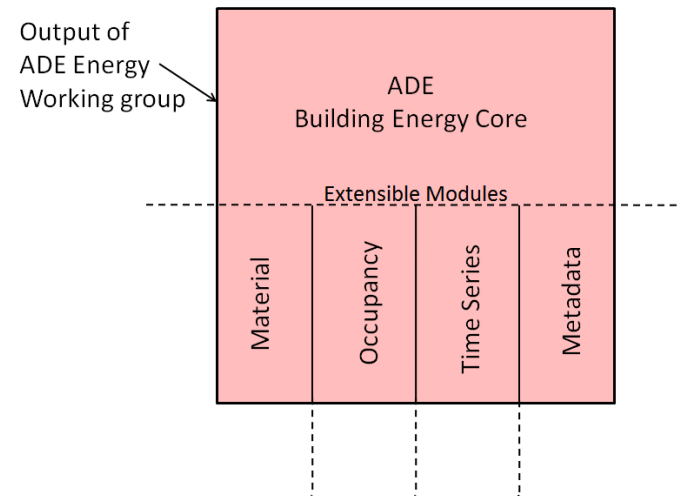
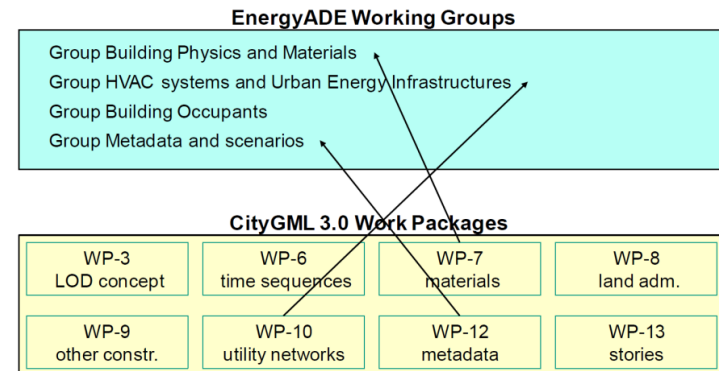


- Connection with existing initiatives (INSPIRE, CityGML 3.0, etc.)

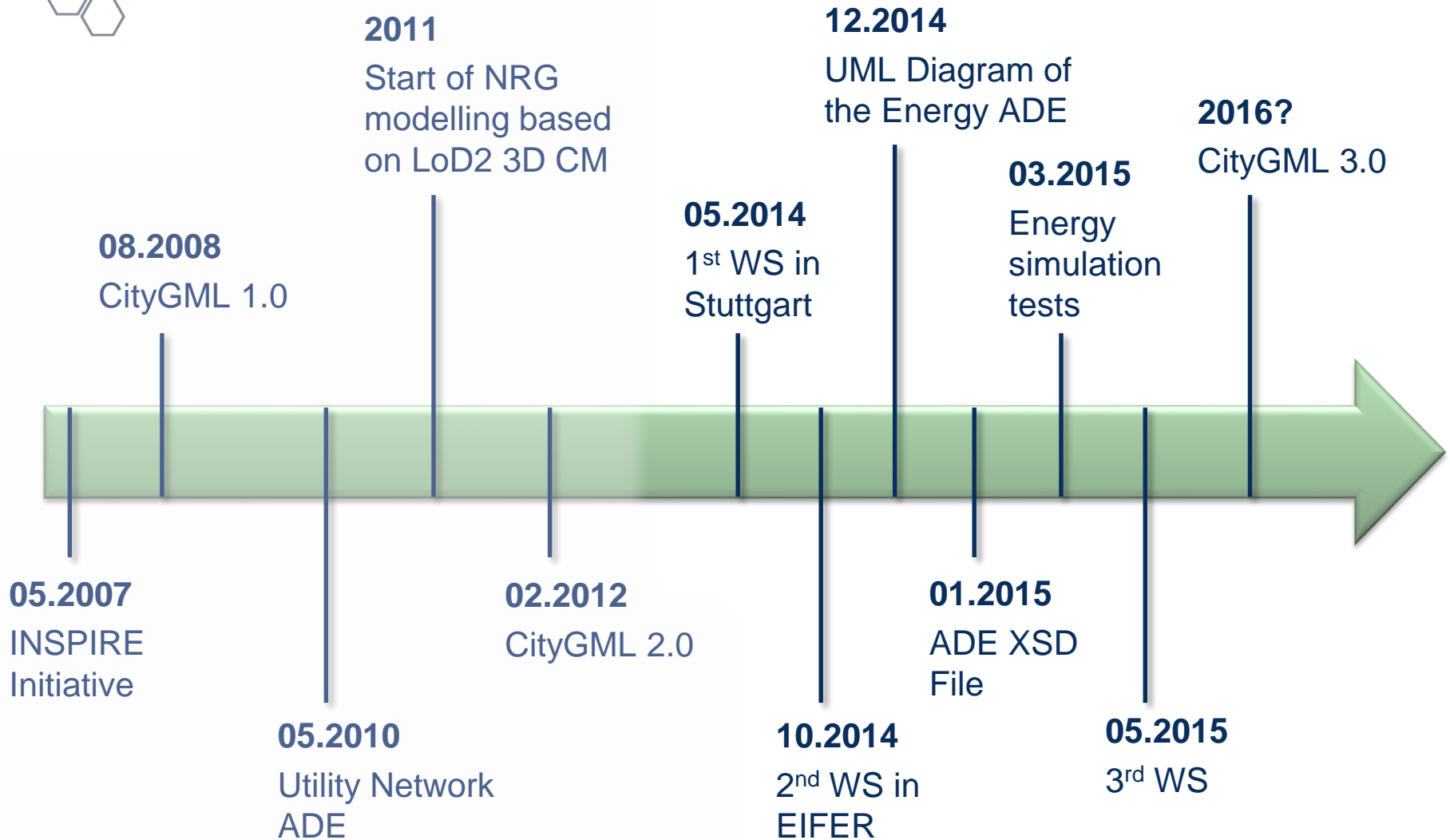
- Working groups:

- Building Physics and Materials
- Building Occupant
- HVAC systems and urban energy infrastructure
- Metadata and scenarios

- Global energy ADE core related to other specific modules



History and next steps





Join us!

Organising committee:

- Volker Coors, Romain Nouvel
- Egbert Casper, Gerhard Gröger
- Jean-Marie Bahu
- Karl-Heinz Häfele
- Hochschule für Technik Stuttgart, Ger.
- SIG 3D of the Geodata Infrastructure, Ger.
- European Institute for Energy Research, Karlsruhe, Ger.
- Karlsruhe Institute of Technology, Ger.

→ <http://en.wiki.energy.si3d.org>