

Indoor Abstract Spaces: Linking IndoorGML and LADM

19-10-2016

Sisi Zlatanova, Ki-Joune Li, Christiaan Lemmen and Peter van Oosterom

Presentation at the 5th International FIG 3D Cadastre Workshop,
18-20 October, Athens, Greece

Motivation

- linking legal spaces (LADM) and physical objects (CityGML, LandXML, InfraGML, BIM/IFC,...or IndoorGML)
see Atazadeh, Kalantari and Rajabifard (2016), yesterday
- IndoorGML has concept of abstract space, might correspond well to LA_SpatialUnit (defined by RRRs)
- some differences:
 - LADM is a conceptual model, IndoorGML is a XML schema
 - IndoorGML focuses on indoor spaces, LADM addresses all spaces
- complementary standards → explore synergy

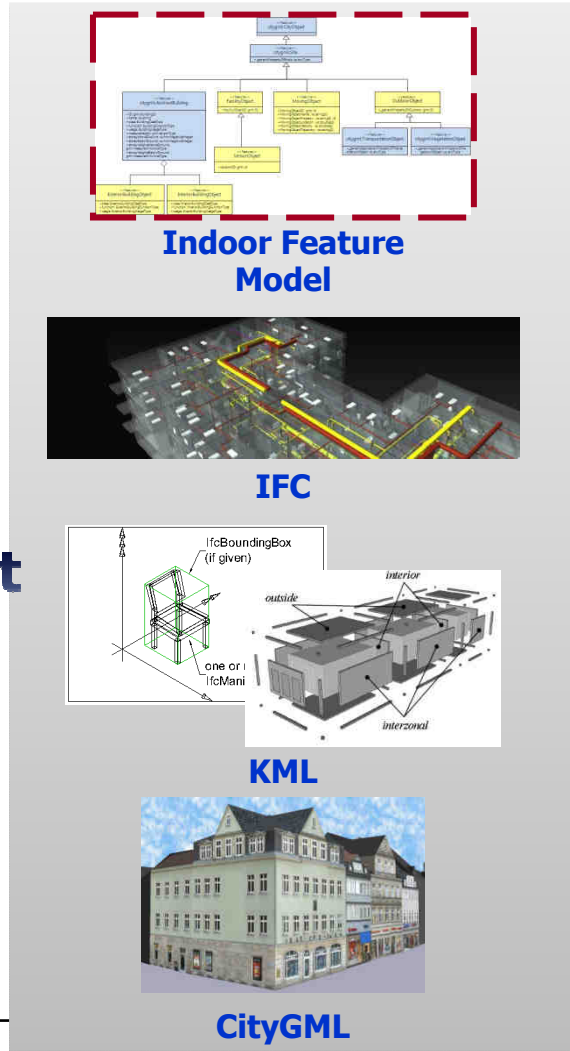


Overview

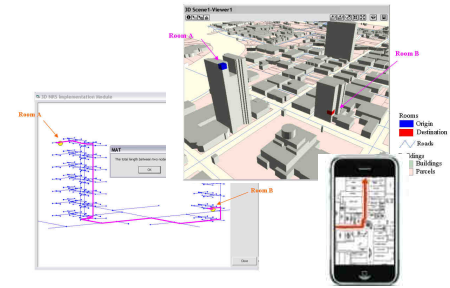
- introduction IndoorGML
(LADM assumed known)
- combining IndoorGML-LADM
- conclusion

IndoorGML goal: support creation of (navigation) applications

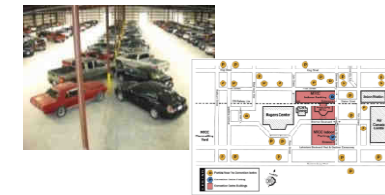
**Indoor
GML** **Import**



Application



Indoor/Outdoor Navigation

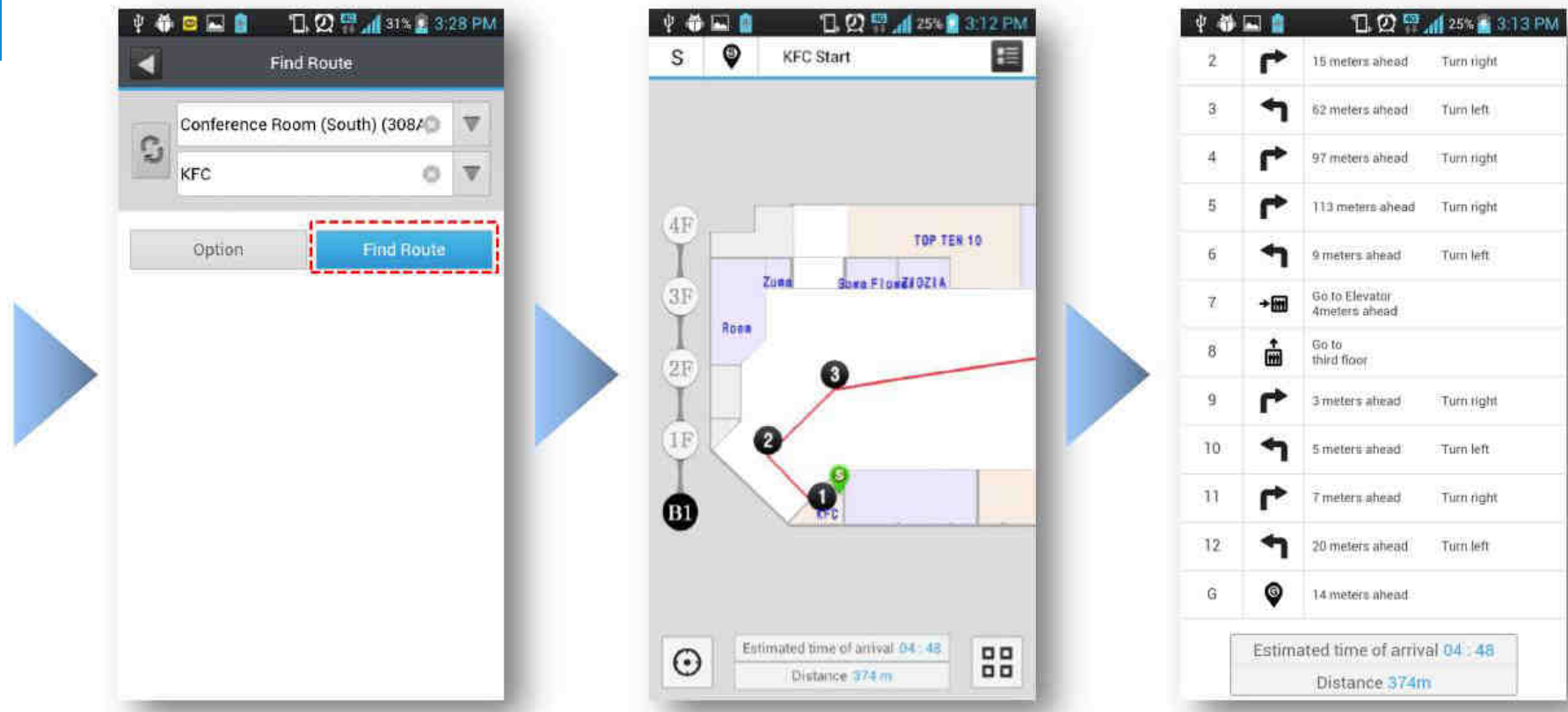


Indoor Parking



Indoor Evacuation

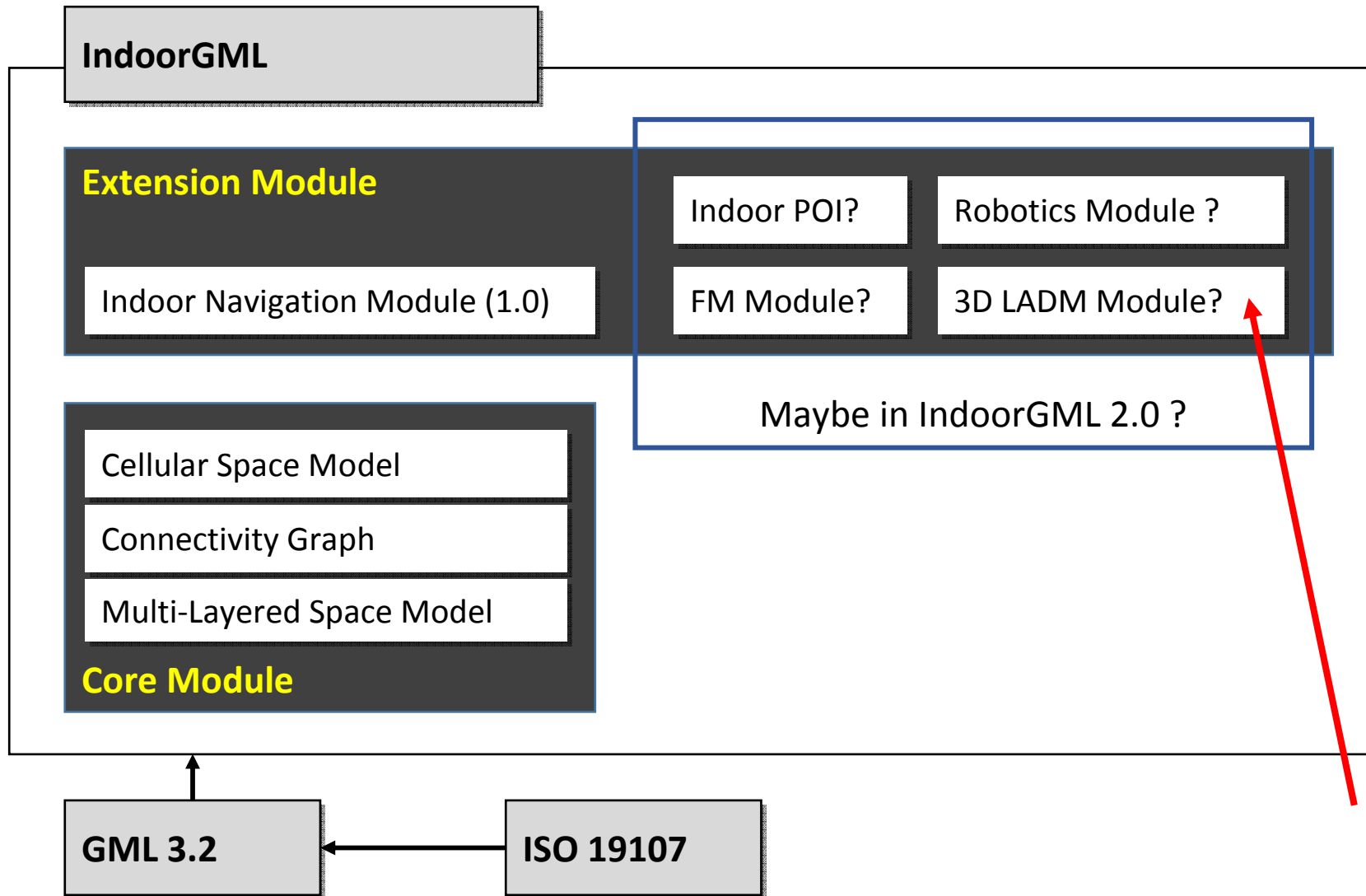
Indoor navigation map and text guidance



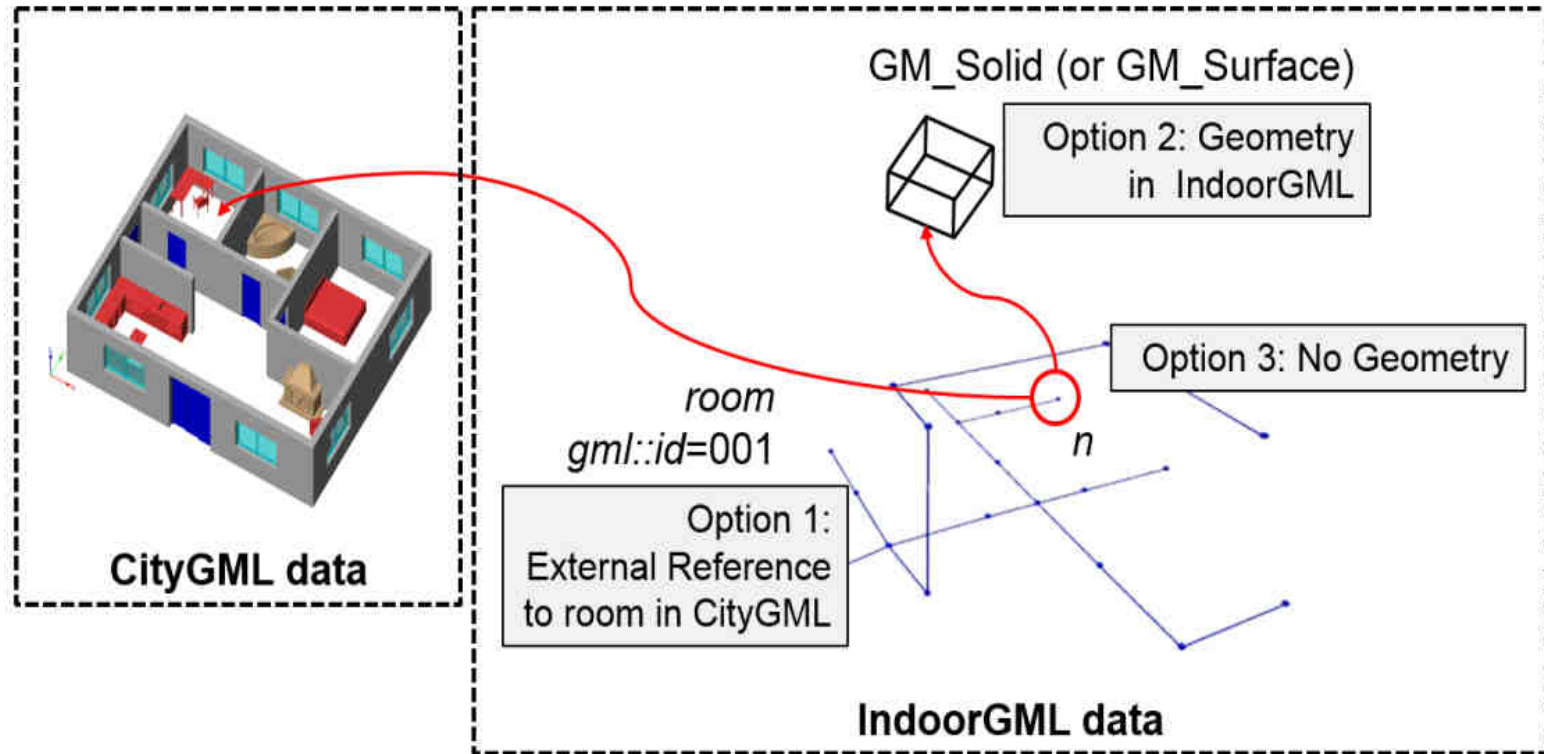
Basic concepts IndoorGML

- cellular space (main modelling element)
 - network (topology)
 - multi-layered space model (to support various views)
 - IndoorGML semantics
-
- two modules:
 - Core module (network)
 - Navigation Module (semantics)









Basic Components of IndoorGML



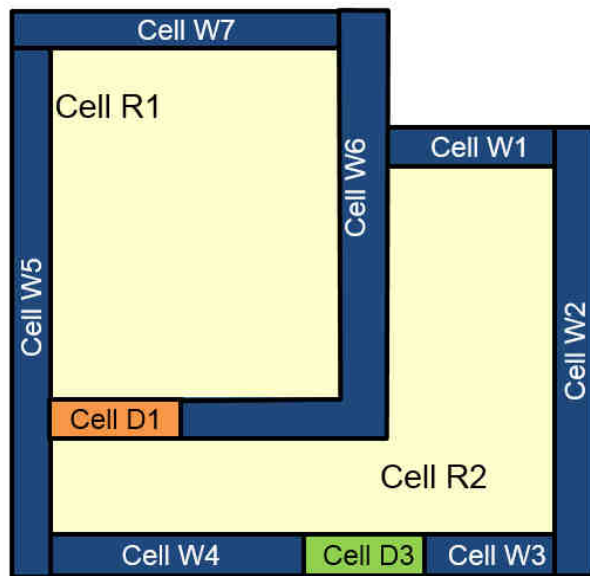
Geometry and topology



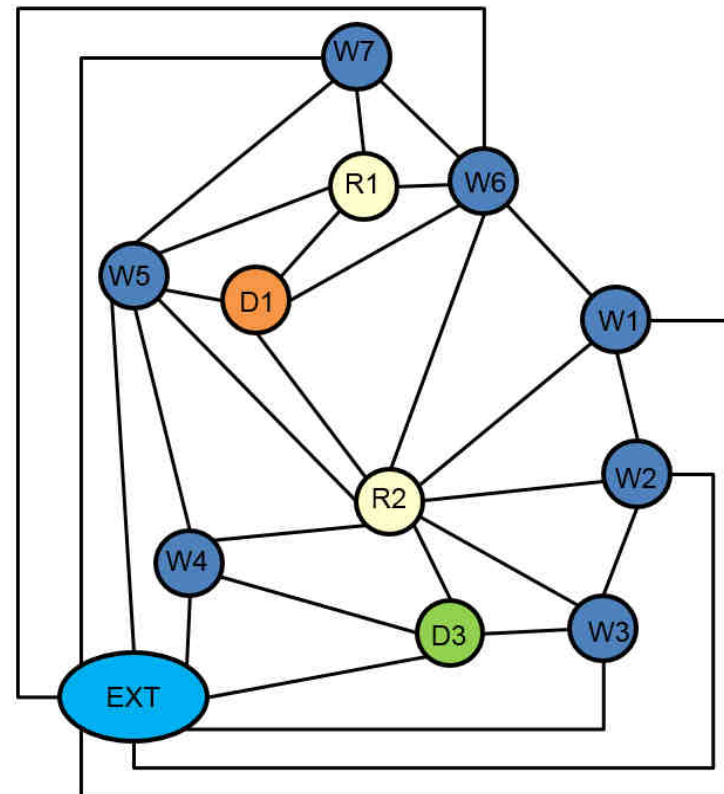
Network (Topology) of Cell spaces

Primal Space	from	to	Dual Space
	3 dim.	0 dim.	
	2 dim.	1 dim.	
	1 dim.	2 dim.	
	0 dim.	3 dim.	

Adjacency Graph

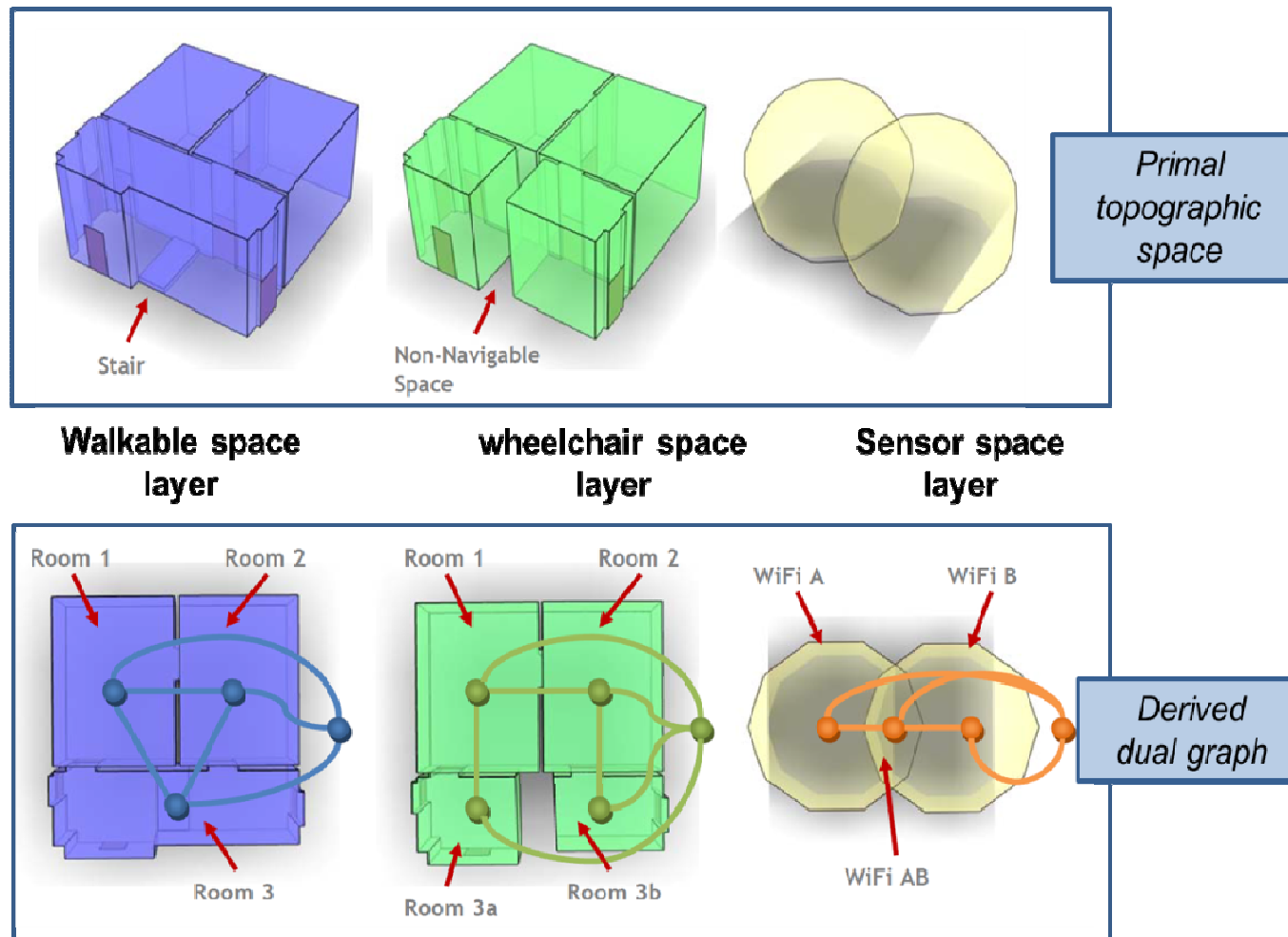


Ext
Primal Space



Dual Space

Subdivision (abstract) cell spaces: diability, sensors, (or ... RRR)



Important characteristics of IndoorGML

- cells do not need to be bordered by physical features



- cells can be also defined based on
 - aggregation of physical spaces or
 - physical space subdivision into smaller units
- multiple space subdivisions per building possible (including RRR based and reusing geometry of other cell spaces)



Overview

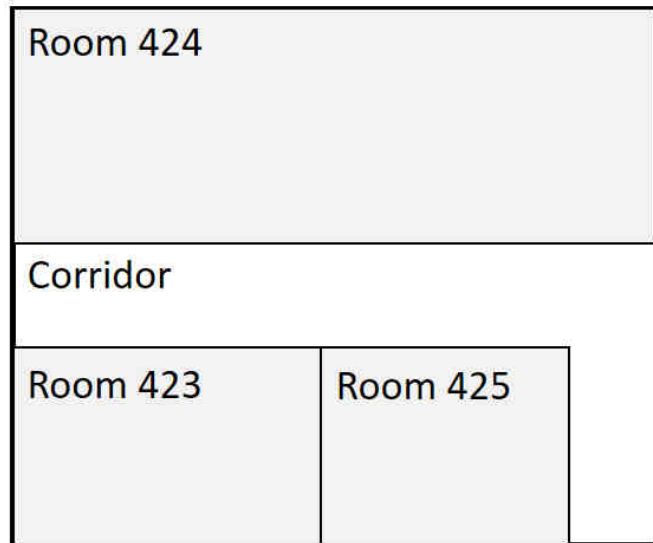
- Introduction IndoorGML
- **Combining IndoorGML-LADM**
- Conclusion

Combining IndoorGML-LADM

Two steps

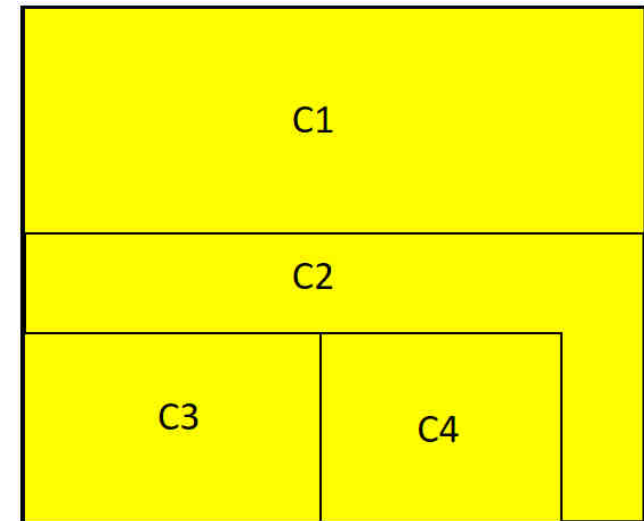
1. derive LADM space layer with RRR abstract spaces within IndoorGML context
 2. create 'equivalence' association between LADM LA_SpatialUnit and IndoorGML abstract spaces (similar to other LADM classes and corresponding external classes)
- note the SDI approach is taken
 - sometimes step 1 may be sufficient for RRRs not registered in Land Administration System (but with similar RRR pattern):
 - Example indoor environments with different RRRs: Shopping malls, Railway and metro stations, Museums, Airports, Hospitals,...
 - Associated parties types: public users, maintenance, managers

Multi-Space Layer Model

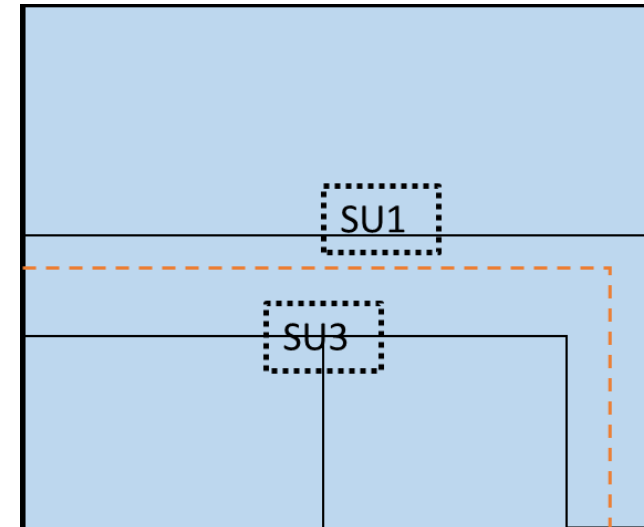


Given Indoor Space

Cell partition

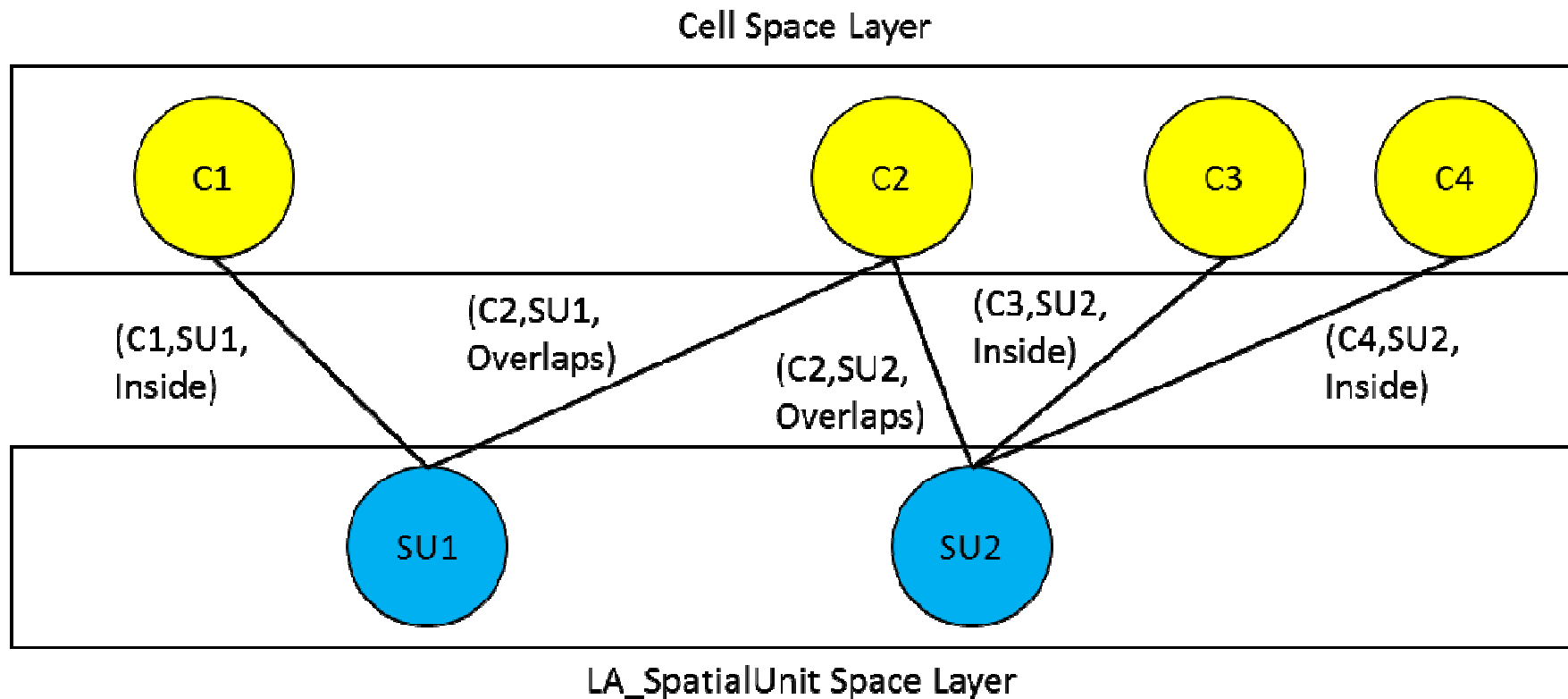


SpatialUnit partition
(reusing geometry)



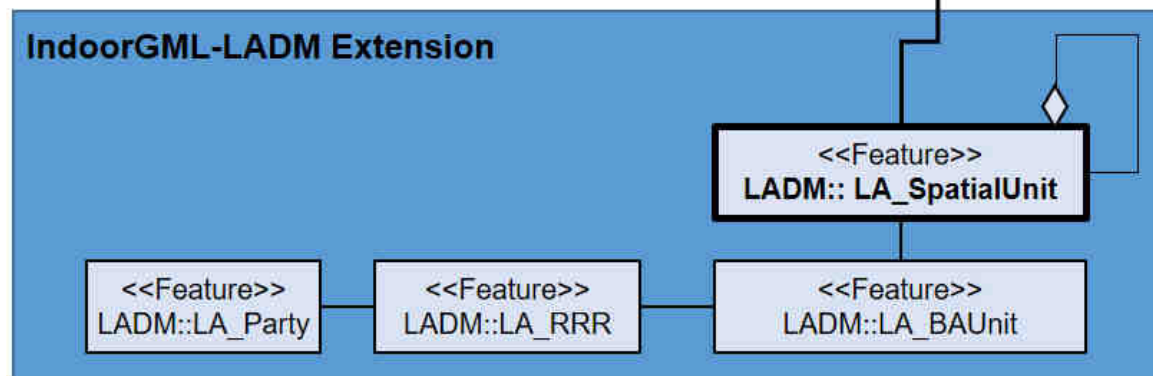
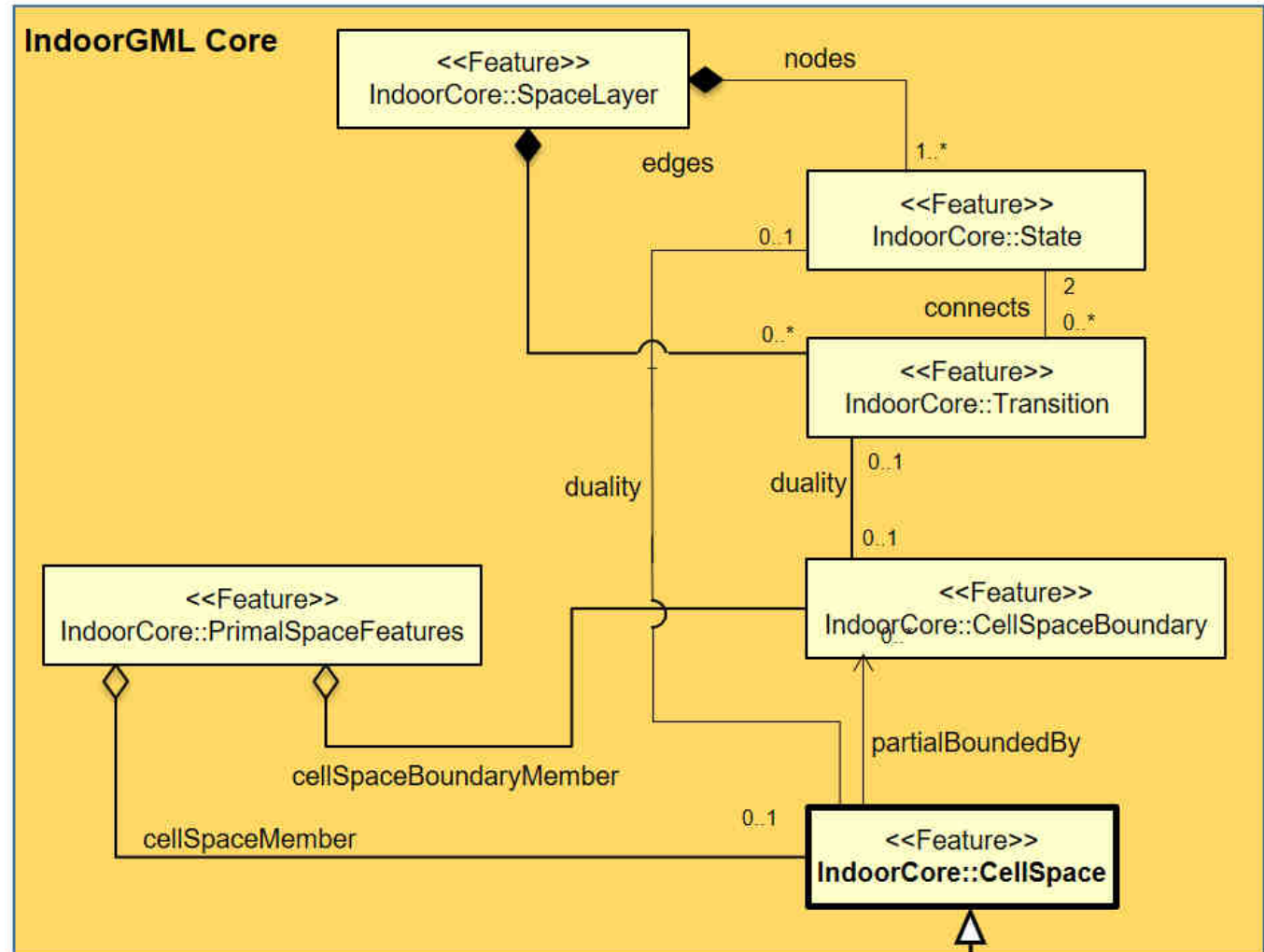
Inter-Layer Connection IndoorGML Multi-Space Layer Model

n-m correspondence between C's and SU's



Link IndoorGML LADM

'equivalence' association
between LA_SpatialUnit
and abstract cell spaces





Overview

- Introduction IndoorGML
- Combining IndoorGML-LADM
- **Conclusion**

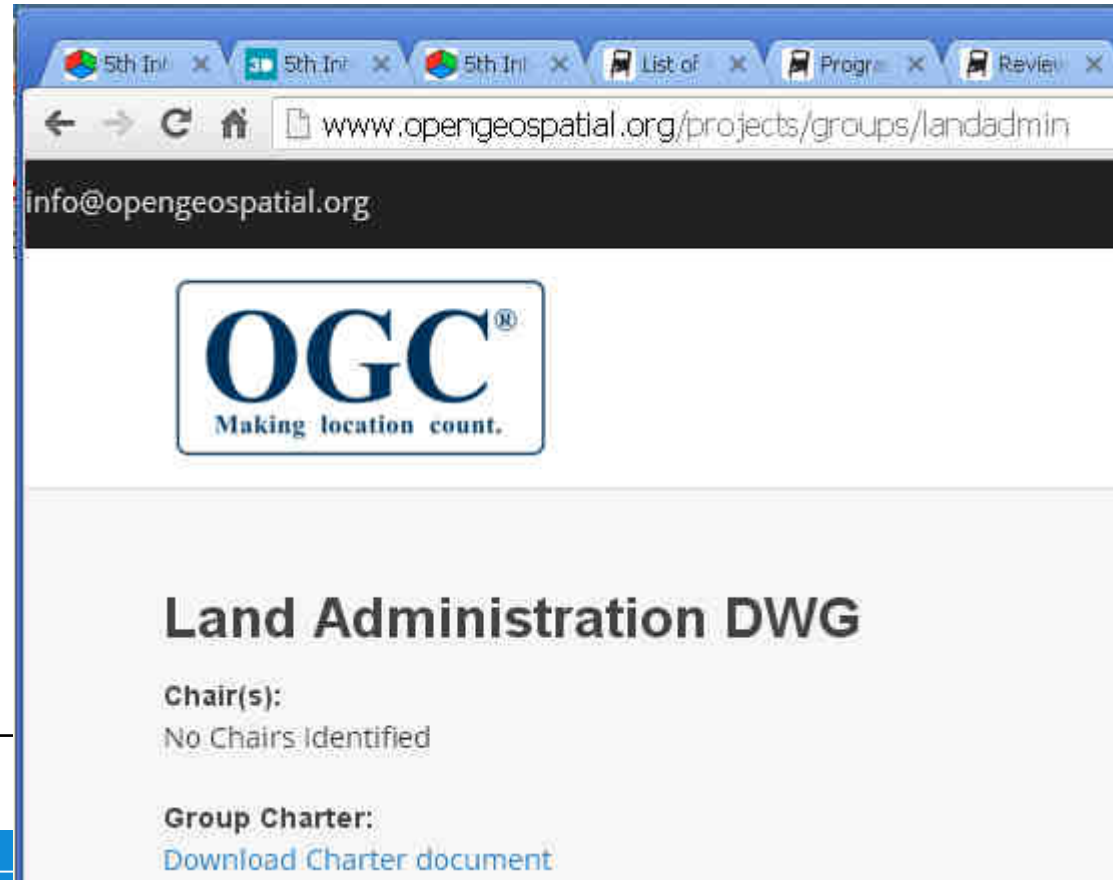
Conclusion

- after initial exploration, still positive about synergy IndoorGML and LADM
- (LADM) 3D legal spaces often need (IndoorGML) reference objects to make sense for orientation / understanding
- abstract spaces (in IndoorGML RRR layer) are linking pin
- future research:
 1. select most prominent use cases, experiment with linkage between the two models
 2. extend IndoorGML also for (nearby) outdoor spaces

Useful Links

- IndoorGML OGC site <http://www.opengeospatial.org/standards/indoorgml>
- more IndoorGML resources are found at <http://indoorgml.net>
- LADM <http://isoladm.org>
- new OGC Domain Working Group (DWG) Land Administration <http://www.opengeospatial.org/projects/groups/landadmin>

- thanks for your attention!



The screenshot shows a web browser window with several tabs open. The active tab is displaying the URL www.opengeospatial.org/projects/groups/landadmin. The page content includes the OGC logo with the tagline "Making location count." Below the logo, the heading "Land Administration DWG" is displayed. Underneath, it states "Chair(s): No Chairs Identified" and "Group Charter: Download Charter document".