

Unique Identifier for 3D Cadastre Objects Registration

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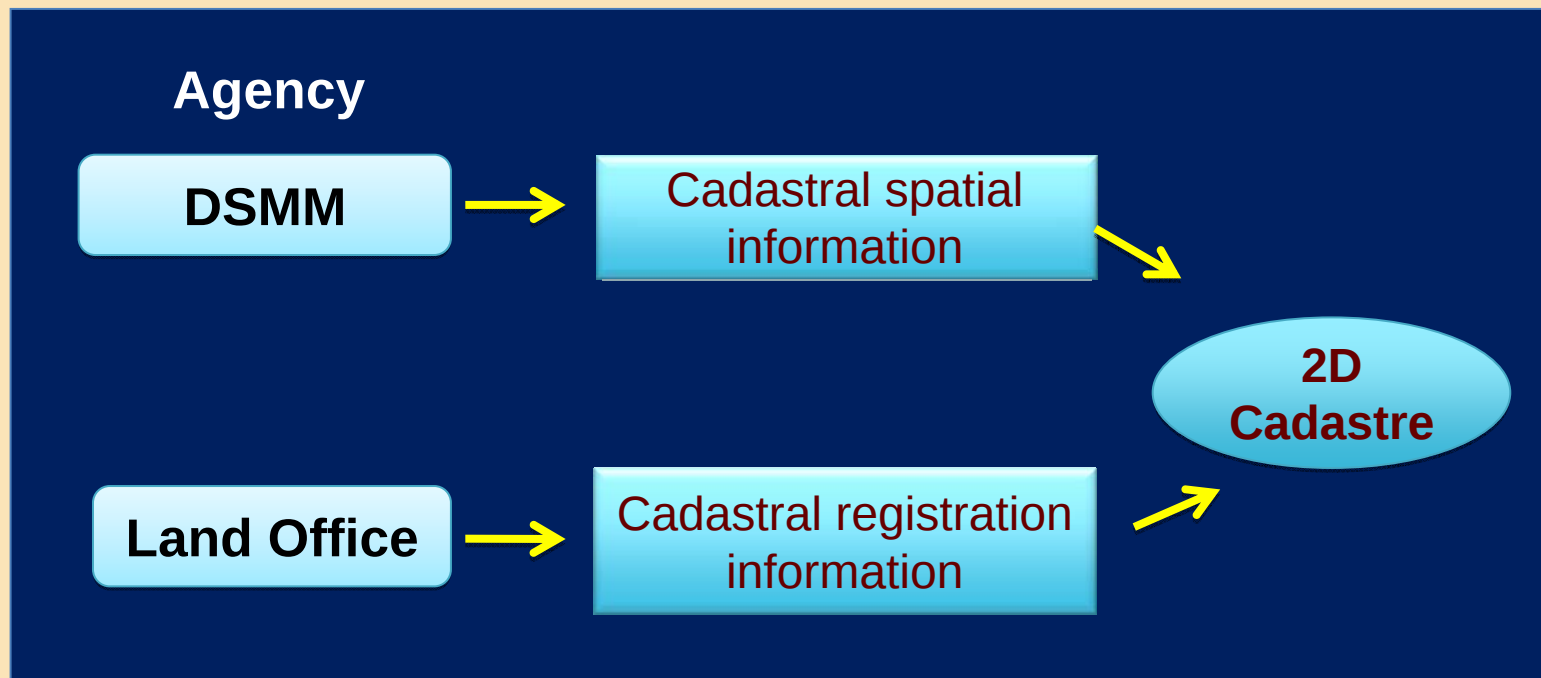
UTM, Malaysia

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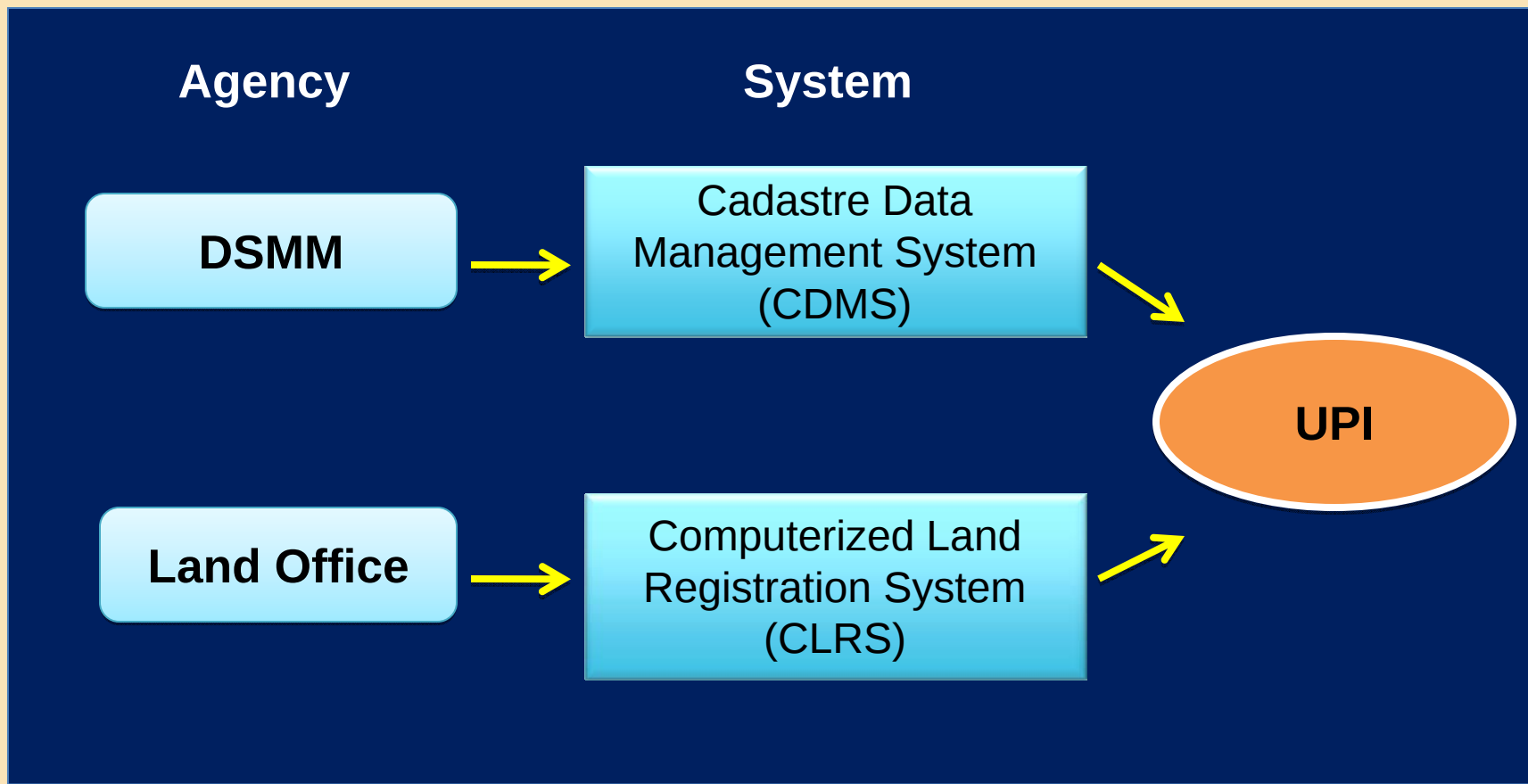
- Introduction
- Unique Parcel Identifier (UPI)
- Unique Feature Identifier (UFI)
- Dual Half-Edge (DHE) for cadaster
- Concluding remarks

Introduction

- Cadastre
 - the 3Rs (rights, responsibilities, restrictions)

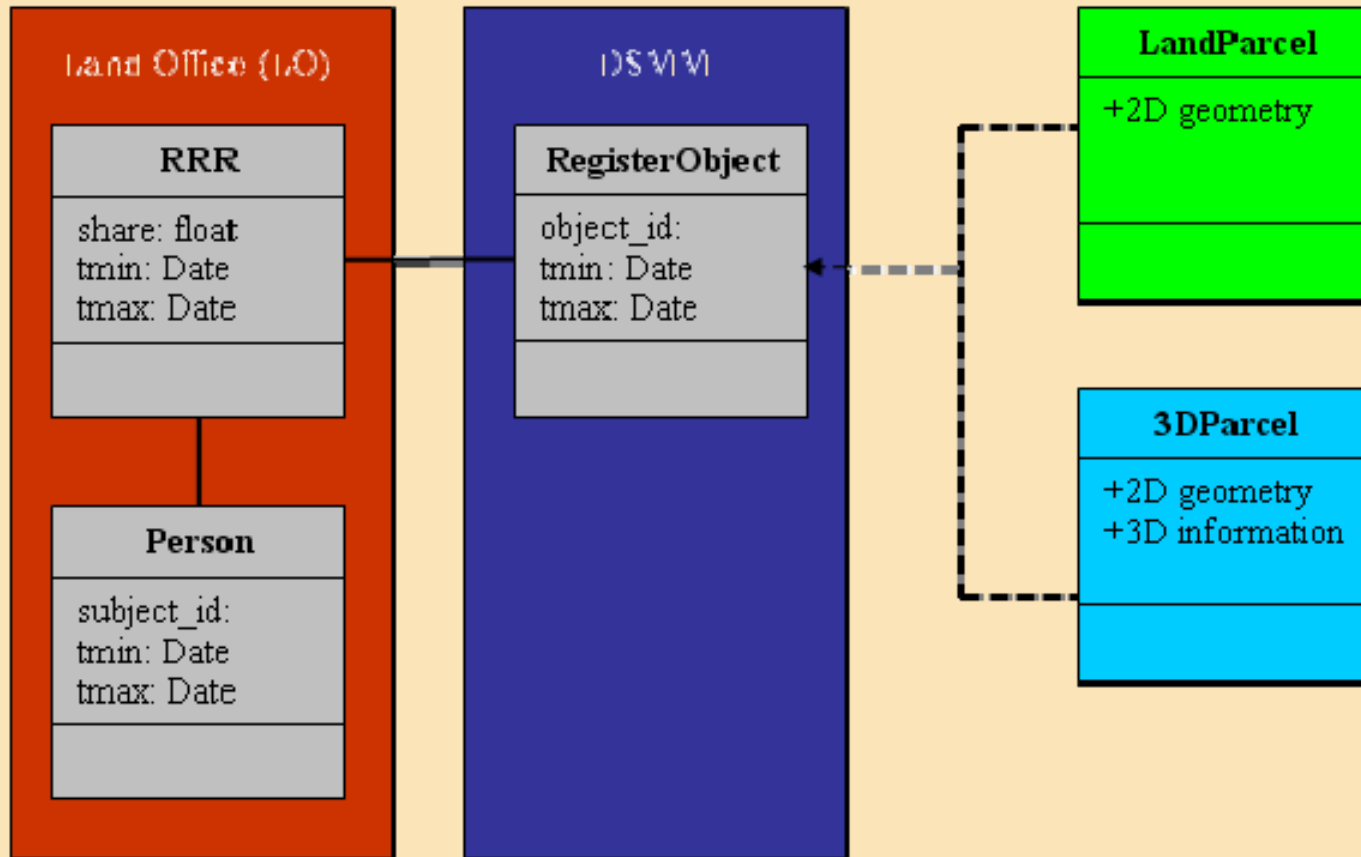


Introduction



Introduction

- UPI works within 2D cadastre system
- 3D cadastre objects?
- Registration
 - Strata, stratum, overlapping properties
- Logical modelling of objects
 - FIG core cadastre data model?
 - LADM
- Legal and institutional aspects



**Adaptation of CCDM into Integrated 3D Cadastre Model for Malaysia where
LandParcel and 3DParcel is part of RegisterObject**

UPI

- Fundamentally, the structure is based on code for “state”, “district”, “sub-district” (*mukim*), “section” and “lot number”
- Tasks and benefits of having UPI including data retrieval and exchange

UPI

Example of UPI code for 2D parcel

UPI	State	District	Sub-District (‘mukim’)	Section	Lot
0101010000001234	JOHOR	BATU PAHAT	BAGAN		
	01	01	01	000	0001234
0201010000003456	KEDAH	KOTA SETAR	ALOR MALAI		
	02	01	01	000	0003456
0301010000006789	KELANTAN	BACHOK	ALOR BAKAT		
	03	01	01	000	0006789

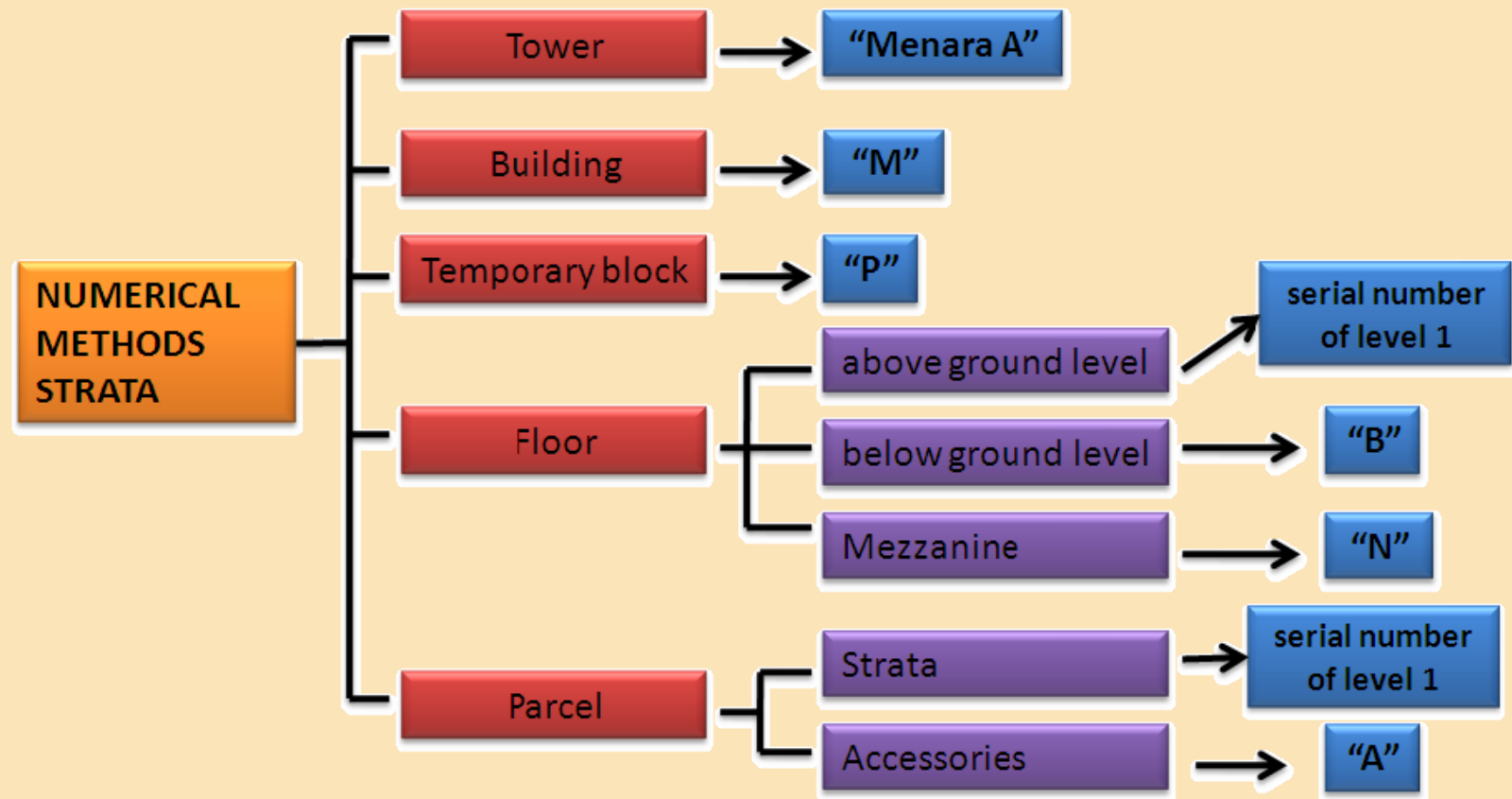
UPI

- It is a unique way to identify 2D parcel
- Strata and other 3D objects registration?
- Unique feature identifier (UFI)

The UFI

- It is based on the current “manual” practice of the 3D objects registration, e.g.
 - Apartment
 - Townhouse, and
 - Hanging properties
- Other 3D situations
 - Apartment and underground objects e.g. tunnel

- Current practice for 3D objects - no unique ID.



UFI coding

- An identifier of 3D cadastre object
- Extension of the UPI code
- The UPI: state, district, sub-district ('mukim'), section, lot number
- The UFI: building, level, and parcel
- 16 characters of UPI and 10 characters for 3D objects (26 characters for UFI)

The UFI

BOUNDARY	TYPE	CHARACTER
Building	Numeric & Alphabet	3
Floor	Numeric & Alphabet	3
Unit	Numeric	4

Example of 3D objects

Three different type of buildings

- Apartment
- Townhouse
- Hanging properties



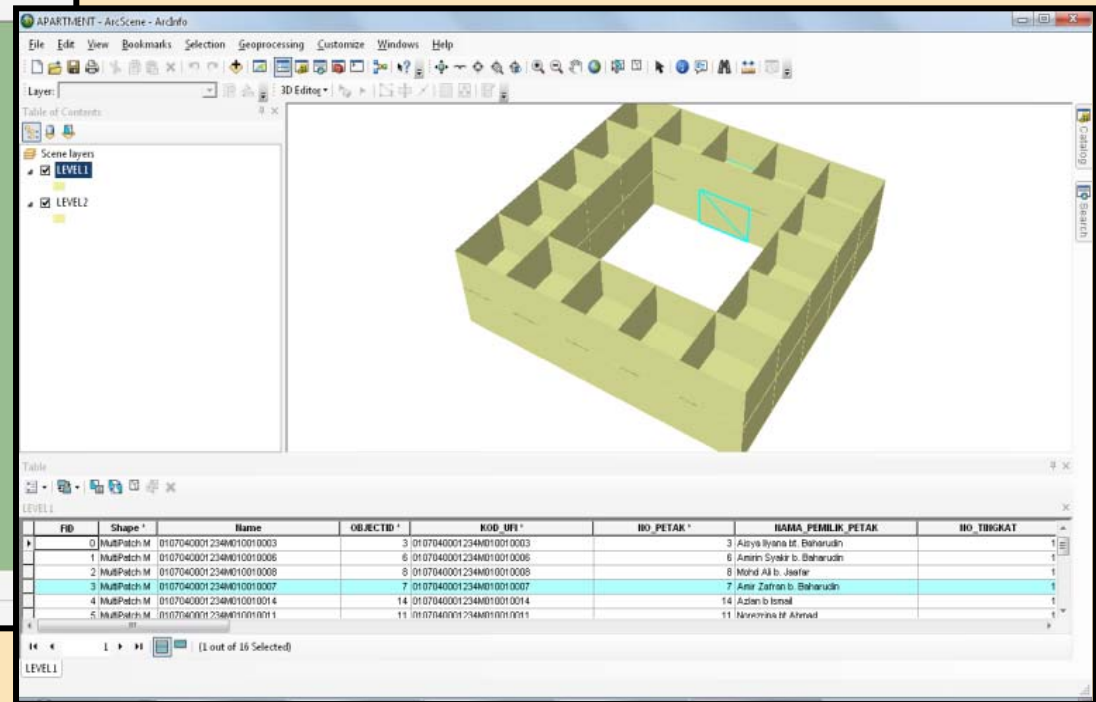
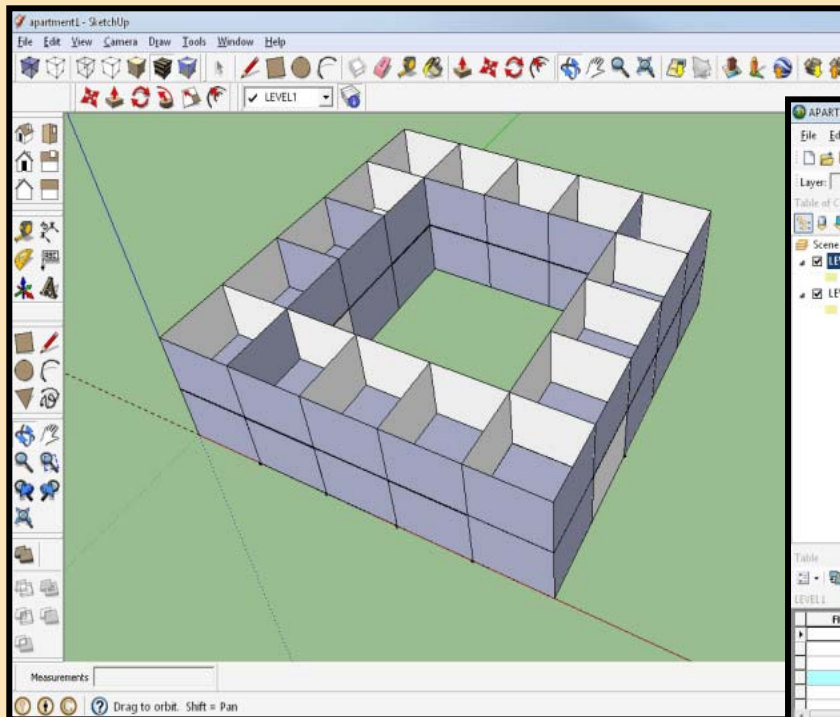
The UFI for apartment

- 'M' represents type of a building 'Apartment', e.g. M01, M02, M03, etc.
- Numeric and 'B' for building level
 - 001, lowest level (ground)
 - B01, for highest level of underground (or basement)
- Strata parcel, begin from lowest level of the building

State	District	Sub-District (‘Mukim’)	Section	Lot No.	Building	Floor	Unit
03	02	01	001	0001234	M01	001	0007
UFI	0302010010001234M010010007						

The UFI

3D objects of “Apartment” in SketchUp and ArcGIS 10



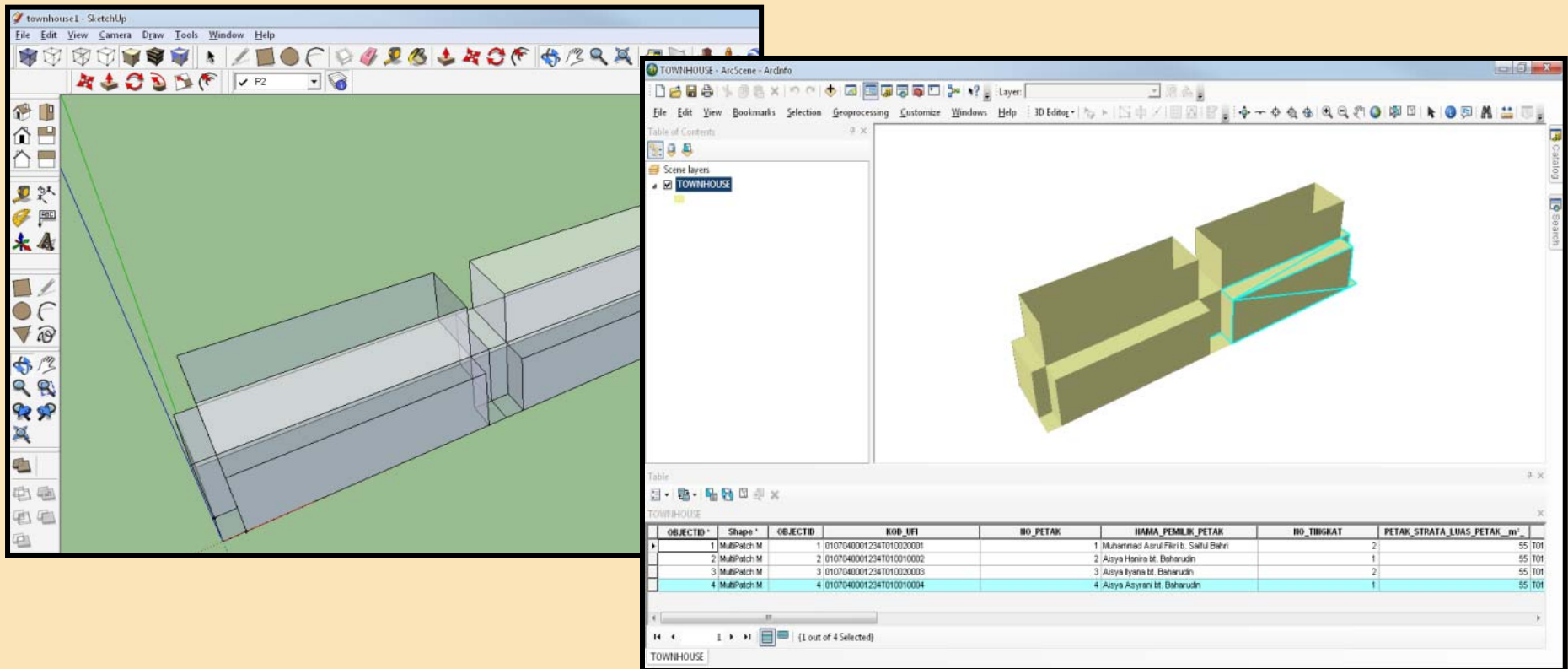
The UFI for Townhouse

- 'T' represents 'Townhouse', e.g. T01, T02, T03, etc.
- Numeric code, 001 for the lowest level of the building
- The strata parcel code begins from the first floor and first parcel in the building

State	District	Sub-District (‘Mukim’)	Section	Lot No.	Building	Floor	Unit
03	02	01	001	0001234	T01	002	0001
UFI	0302010010001234T010020001						

The UFI

3D objects of “Townhouse” in SketchUp and ArcGIS 10



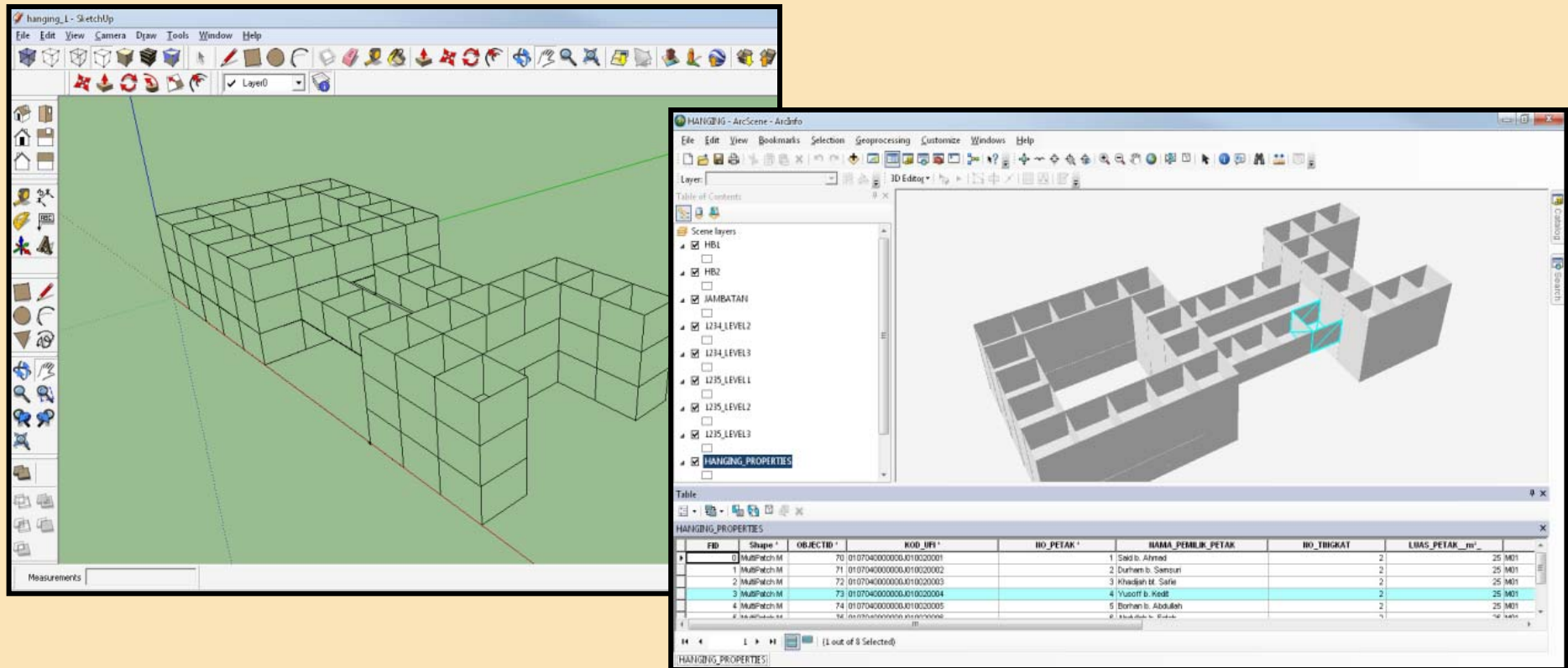
The UFI for hanging properties

- 'J' represents a property parcel of a bridge
- Level of the properties determine according to the level of the bridge it belongs to.
- A parcel of a bridge that merges with the first building (M01) is considered the first parcel (0001)

State	District	Sub-District (‘Mukim’)	Section	Lot No.	Building	Floor	Unit
03	02	01	001	0001234	J01	002	0001
UFI	0302010010001234J010020001						

The UFI

3D objects of “hanging properties” in SketchUp and ArcGIS 10



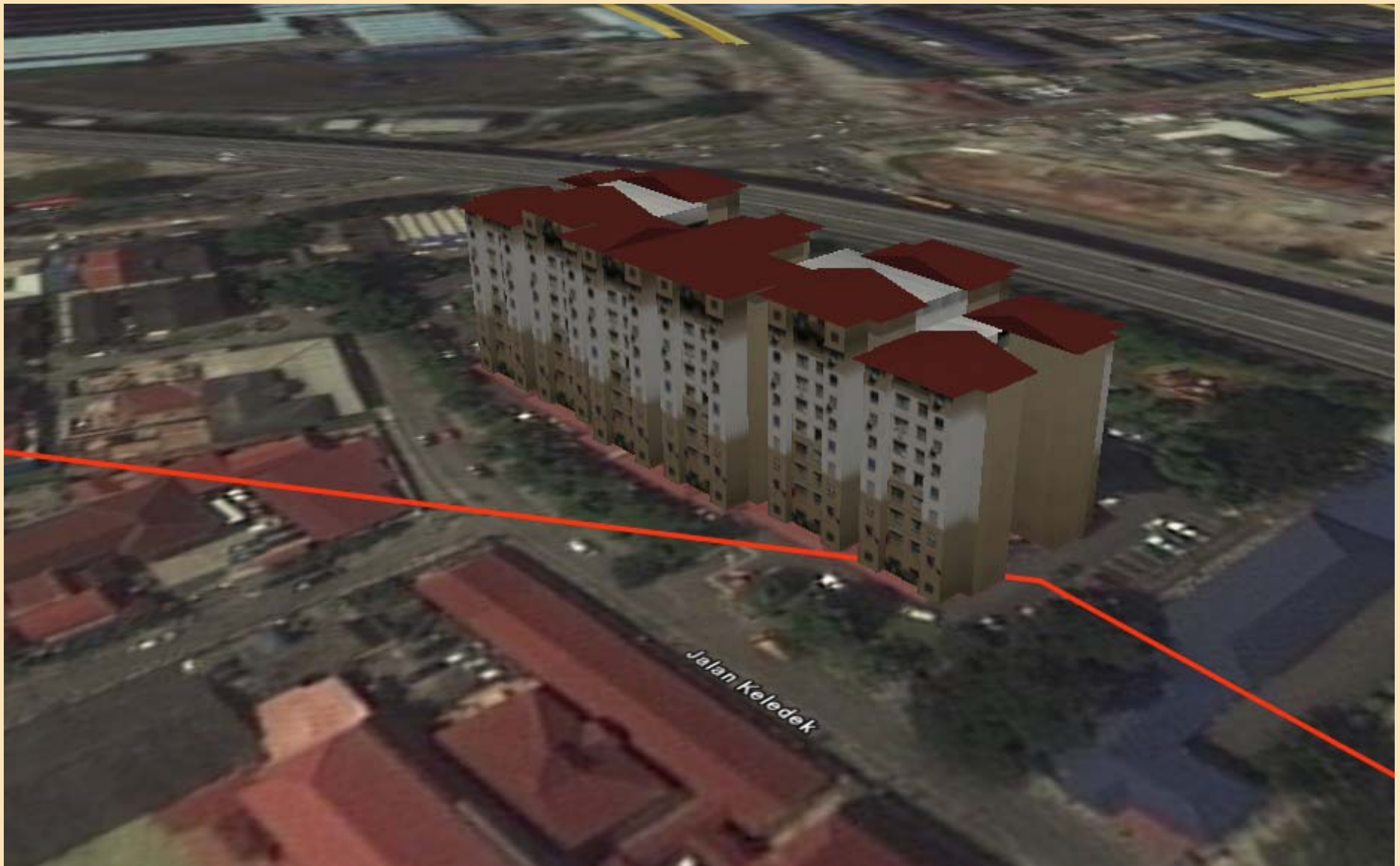
Registration of other 3D situation

- Apartments and tunnels
- No requirement from authorities and owners

Apartment and tunnel



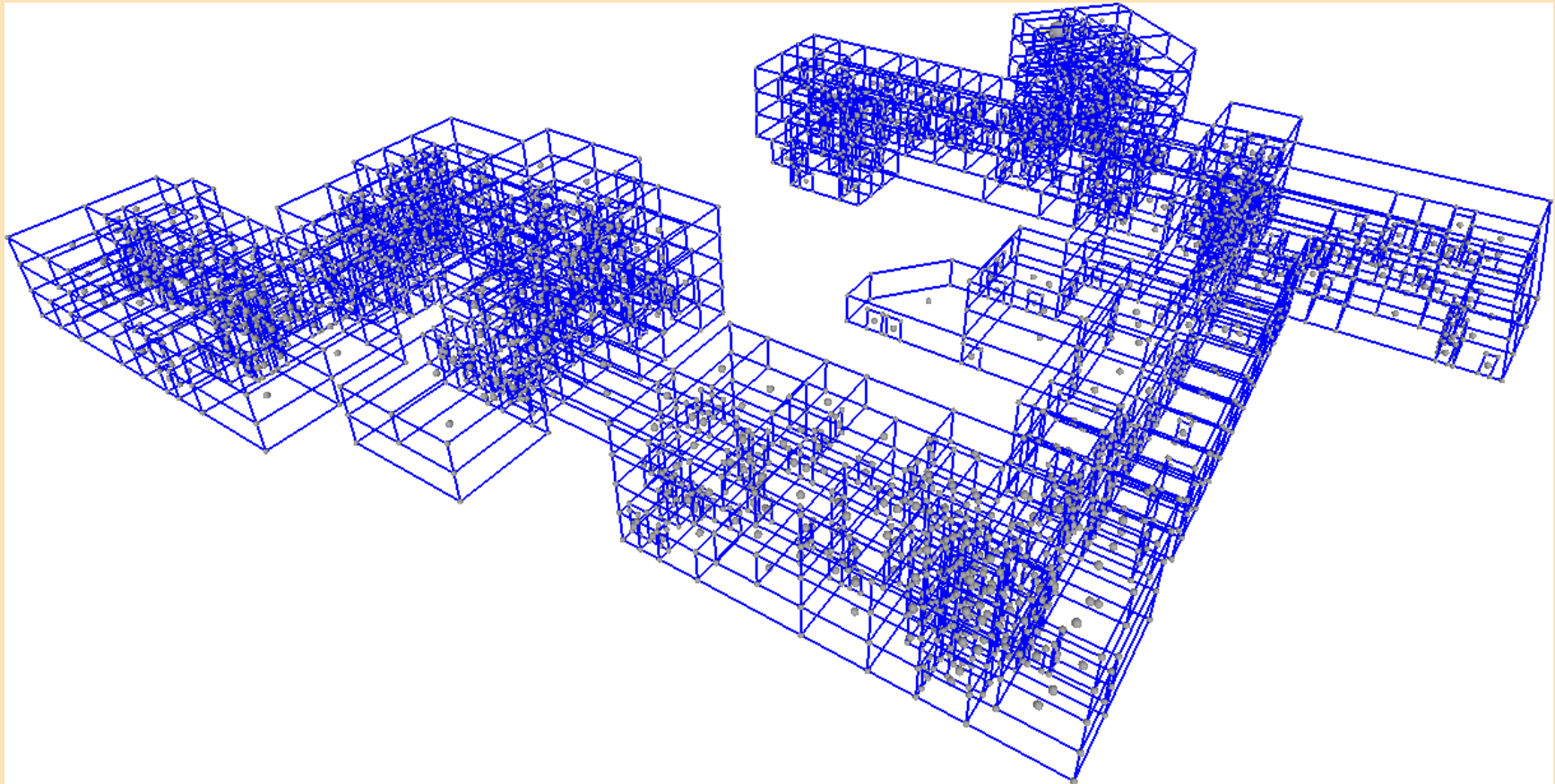




The DHE Approach

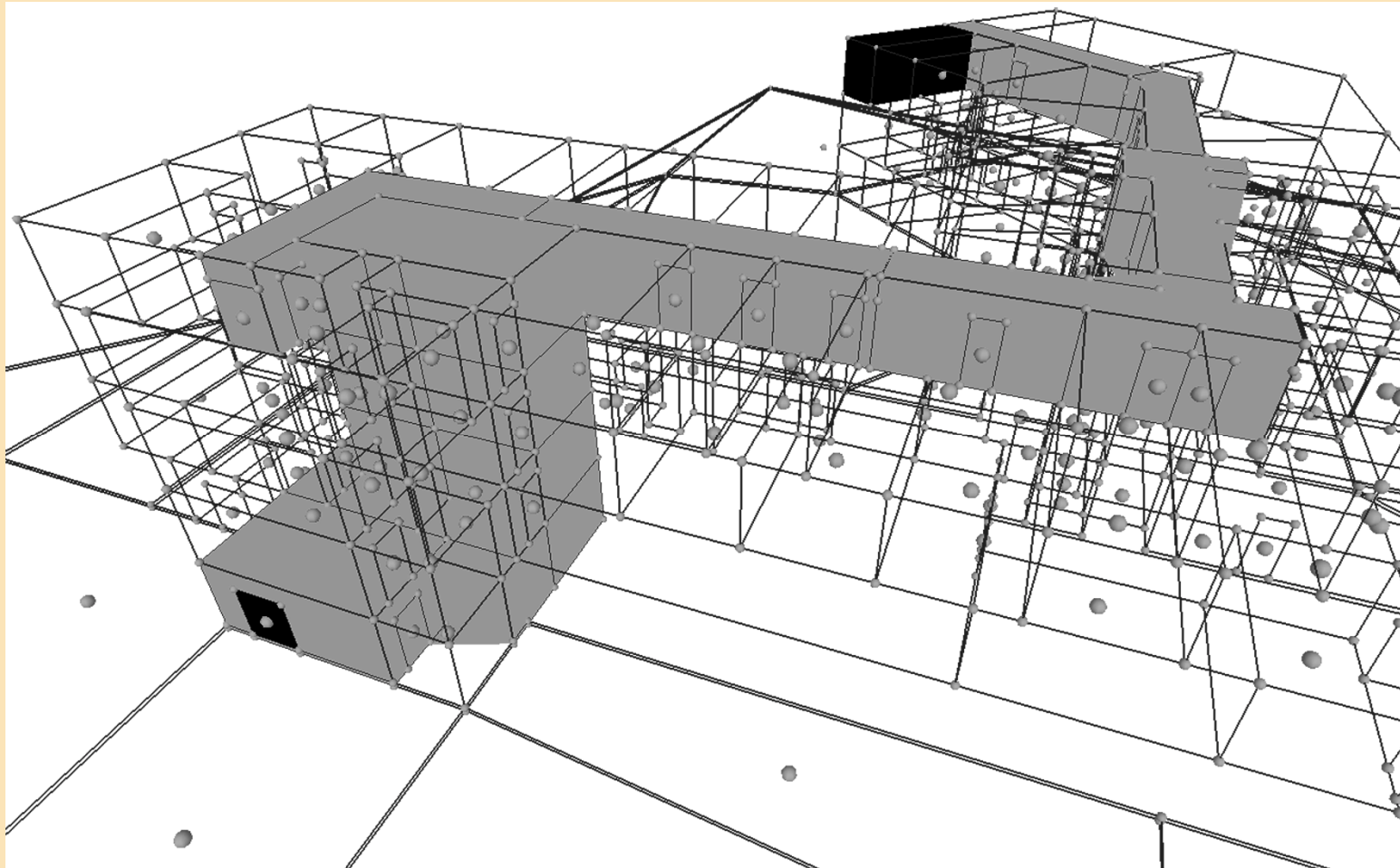
- One possible approach is to use the recently developed DHE (Dual Half-Edge) data structure to express the relationships between volumetric entities ('parcels').
- This model allows the expression of adjacency between parcels, as well as their geometric definition

Building Model: this may also apply to Hanging Properties.



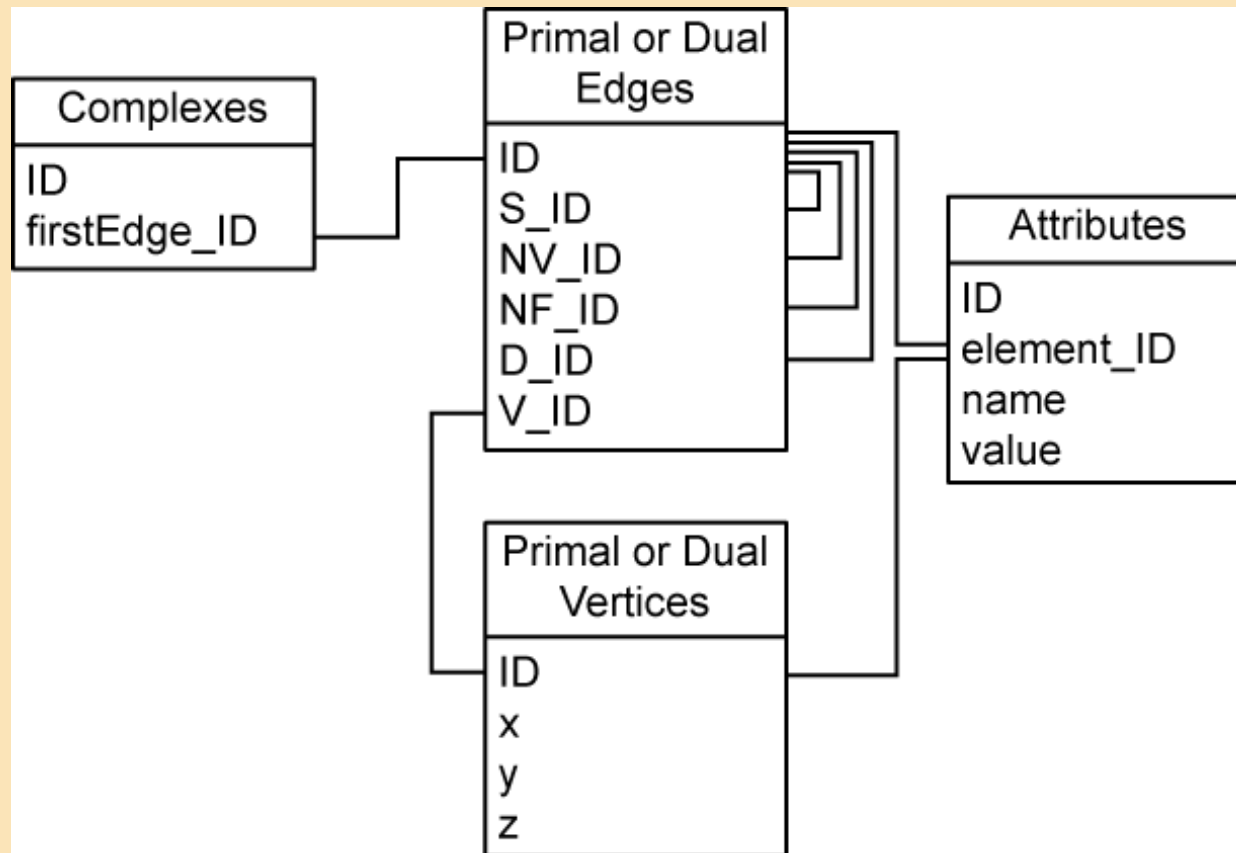
Boguslawski et al (2011)

Escape Route: Connected 'Parcels'



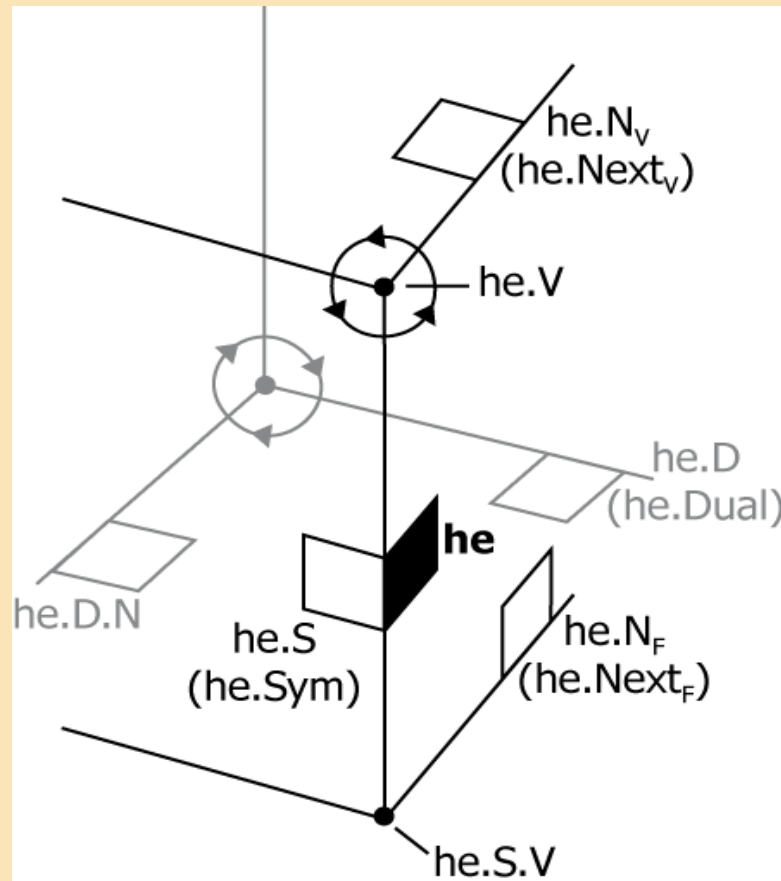
Boguslawski et al (2011)

3D Parcels are Dual Vertices, connected by Dual Edges



Boguslawski et al (2011)

Primal and Dual Structures are permanently linked



Boguslawski et al (2011)

Integrating Tunnels into the Cadastre

- To integrate tunnels within the cadastre the 2D outline must be extended downwards.
- Intersection with the tunnel can be calculated.
- ‘Ownership’ of tunnel parts can be assigned
- Vertical DHE linkages can be preserved: 2D parcel; rock volume; tunnel volume.
- The UPI is for the parts under each 2D parcel.
- The tunnel is the sum of connected parcels.

Concluding remarks

- Formalize 3D objects registration with the authorities
 - Other types of 3D objects
 - More complex situations
- Realizing a full blown 3D cadastre system requires . . .

Thank you!

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