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Refined LA_Level Modelling

in LADM

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Land Administration Domain Model

LADM Design is based on

common pattern of "people – land" relationships

The common denominator, or the pattern that can be observed in land administration systems with:

- legal/ administrative data,
- party/ person/ organization data,
- spatial unit (parcel) / immovable object data,
- data on surveying or object identification
- geometric/topological data

[Lemmen Ch., 2012]

A *"level"* is a collection of spatial units with a geometric, and/or topologic, and/or thematic coherence.

Adaptable and adoptable in local conditions

Effective and efficient system development and maintenance of flexible (generic) systems
ask for further standardization

LADM Requirements

Continuum of Spatial objects

01

Different Organizations

02

Keep data to the source (SDI)

03

Identifiers
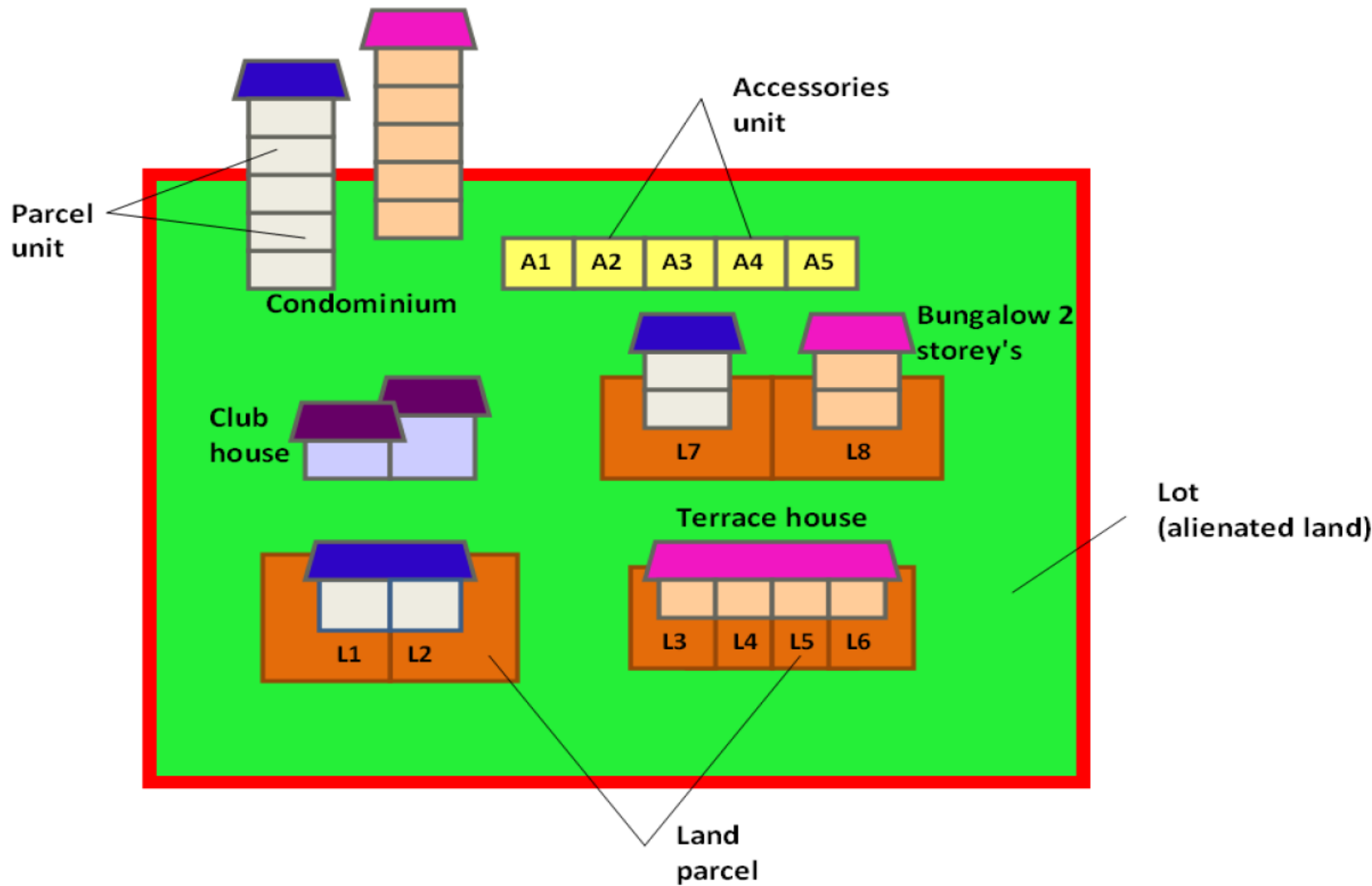
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STRATA TITLES

LA_Level Modelling

◎ Support of a wide range of spatial units;

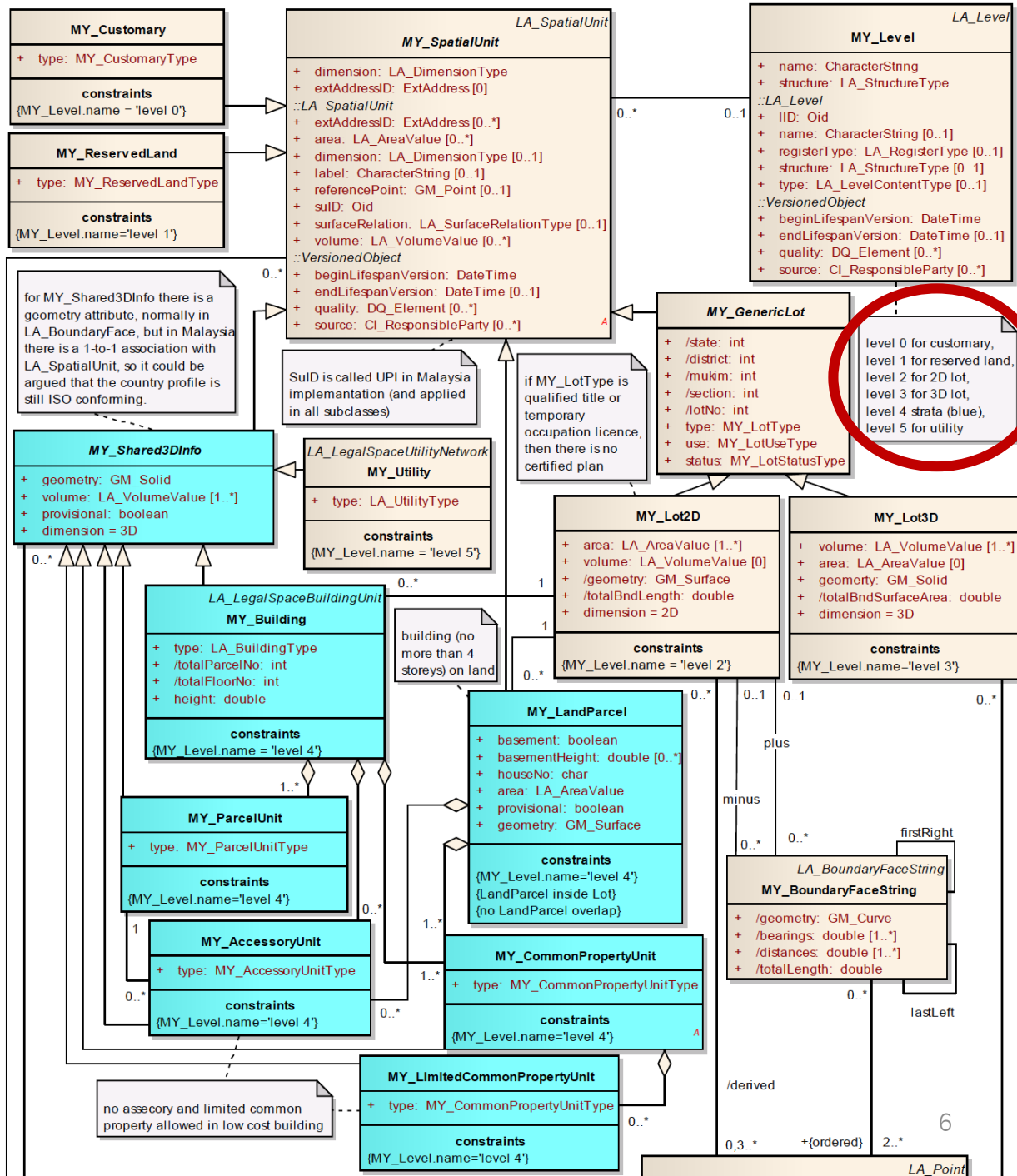◎ Each one has different requirements;

◎ Thematic coherence.

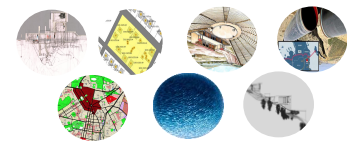# Cadastral objects related to strata titles within a lot

[Zulkifili et al., 2014]

Strata specializations:

- MY_Shared3DInfo;
- MY_BuildingUnit;
- MY_ParcelUnit;
- MY_AccessoryUnit;
- MY_LandParcel;
- MY_CommonPropertyUnit and MY_LimitedCommonProperty Unit.

All organized in 1 level (level 4)

MY_Customary

+ type: MY_CustomaryType

constraints
{MY_Level.name = 'level 0'}

MY_ReservedLand

+ type: MY_ReservedLandType

constraints
{MY_Level.name='level 1'}

LA_SpatialUnit

MY_SpatialUnit

+ dimension: LA_DimensionType
+ extAddressID: ExtAddress [0]
::LA_SpatialUnit
+ extAddressID: ExtAddress [0..*]
+ area: LA_AreaValue [0..*]
+ dimension: LA_DimensionType [0..1]
+ label: CharacterString [0..1]
+ referencePoint: GM_Point [0..1]
+ suID: Oid
+ surfaceRelation: LA_SurfaceRelationType [0..1]
+ volume: LA_VolumeValue [0..*]
::VersionedObject
+ beginLifespanVersion: DateTime
+ endLifespanVersion: DateTime [0..1]
+ quality: DQ_Element [0..*]
+ source: CI_ResponsibleParty [0..*]

LA_Level

MY_Level

+ name: CharacterString
+ structure: LA_StructureType
::LA_Level
+ lID: Oid
+ name: CharacterString [0..1]
+ registerType: LA_RegisterType [0..1]
+ structure: LA_StructureType [0..1]
+ type: LA_LevelContentType [0..1]
::VersionedObject
+ beginLifespanVersion: DateTime
+ endLifespanVersion: DateTime [0..1]
+ quality: DQ_Element [0..*]
+ source: CI_ResponsibleParty [0..*]

for MY_Shared3DInfo there is a geometry attribute, normally in LA_BoundaryFace, but in Malaysia there is a 1-to-1 association with LA_SpatialUnit, so it could be argued that the country profile is still ISO conforming.

SuID is called UPI in Malaysia implementation (and applied in all subclasses)

if MY_LotType is qualified title or temporary occupation licence, then there is no certified plan

level 0 for customary,
level 1 for reserved land,
level 2 for 2D lot,
level 3 for 3D lot,
level 4 strata (blue),
level 5 for utility

MY_GenericLot

+ /state: int
+ /district: int
+ /mukim: int
+ /section: int
+ /lotNo: int
+ type: MY_LotType
+ use: MY_LotUseType
+ status: MY_LotStatusType

MY_Shared3DInfo

+ geometry: GM_Solid
+ volume: LA_VolumeValue [1..*]
+ provisional: boolean
+ dimension = 3D

LA_LegalSpaceUtilityNetwork
MY_Utility

+ type: LA_UtilityType

constraints
{MY_Level.name = 'level 5'}

MY_Lot2D

+ area: LA_AreaValue [1..*]
+ volume: LA_VolumeValue [0]
+ /geometry: GM_Surface
+ /totalBndLength: double
+ dimension = 2D

constraints
{MY_Level.name = 'level 2'}

MY_Lot3D

+ volume: LA_VolumeValue [1..*]
+ area: LA_AreaValue [0]
+ geomerty: GM_Solid
+ /totalBndSurfaceArea: double
+ dimension = 3D

constraints
{MY_Level.name='level 3'}

LA_LegalSpaceBuildingUnit
MY_Building

+ type: LA_BuildingType
+ /totalParcelNo: int
+ /totalFloorNo: int
+ height: double

constraints
{MY_Level.name = 'level 4'}

building (no more than 4 storeys) on land

MY_LandParcel

+ basement: boolean
+ basementHeight: double [0..*]
+ houseNo: char
+ area: LA_AreaValue
+ provisional: boolean
+ geometry: GM_Surface

constraints
{MY_Level.name='level 4'}
{LandParcel inside Lot}
{no LandParcel overlap}

MY_ParcelUnit

+ type: MY_ParcelUnitType

constraints
{MY_Level.name='level 4'}

MY_AccessoryUnit

+ type: MY_AccessoryUnitType

constraints
{MY_Level.name='level 4'}

MY_CommonPropertyUnit

+ type: MY_CommonPropertyUnitType

constraints
{MY_Level.name='level 4'}

LA_BoundaryFaceString
MY_BoundaryFaceString

+ /geometry: GM_Curve
+ /bearings: double [1..*]
+ /distances: double [1..*]
+ /totalLength: double

firstRight

lastLeft

plus

minus

/derived

MY_LimitedCommonPropertyUnit

+ type: MY_CommonPropertyUnitType

constraints
{MY_Level.name='level 4'}

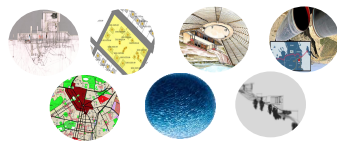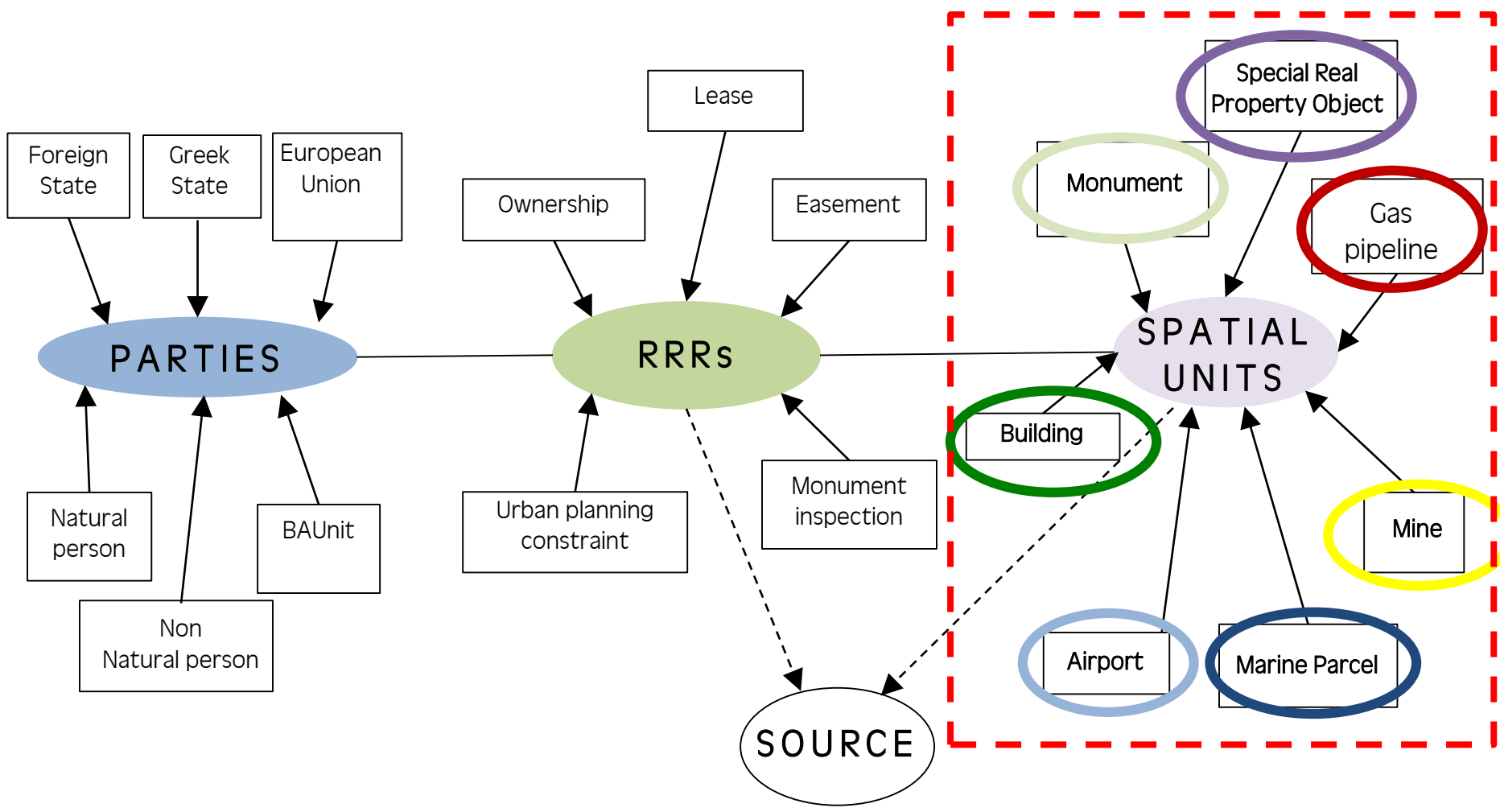no assecory and limited common property allowed in low cost building

LA_Point

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PROPOSED MLAS FOR GREECE

- ◎ Various organizations are source of different RRRs and spatial data.

- ◎ Digital collaboration and data exchange are supported by LADM.

- ◎ LADM covers complete land administration spectrum.
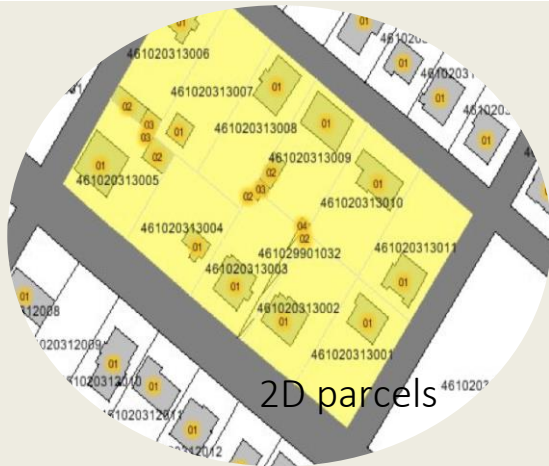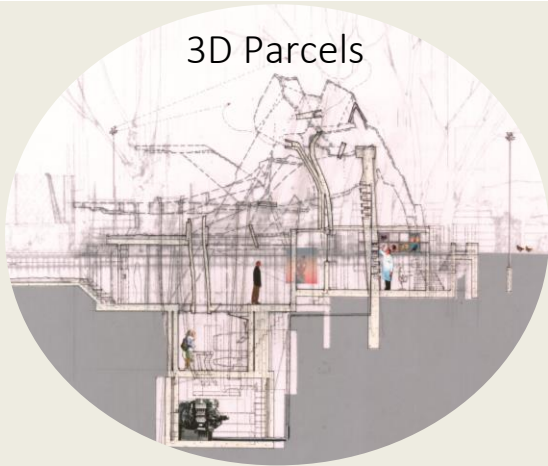
- ◎ Thematic coherence.

Concept

LA_Level Modelling

PARTIES — Foreign State, Greek State, European Union, Natural person, Non Natural person, BAUnit

RRRs — Lease, Ownership, Easement, Urban planning constraint, Monument inspection

SPATIAL UNITS — Special Real Property Object, Monument, Gas pipeline, Building, Mine, Airport, Marine Parcel

SOURCE

3D Parcels

Mines

2D parcels

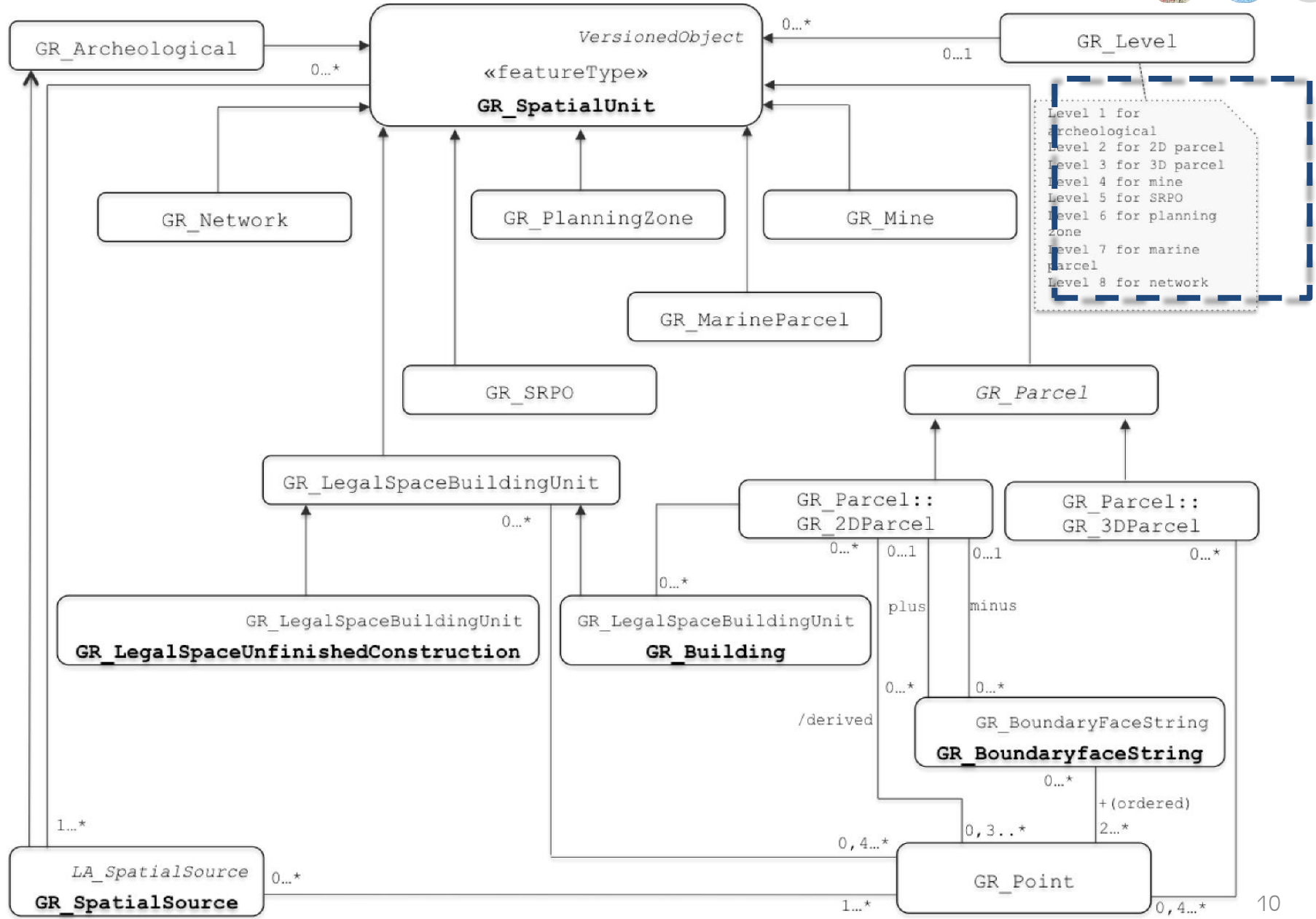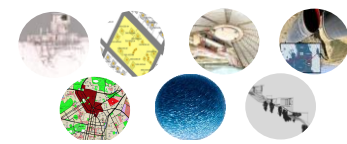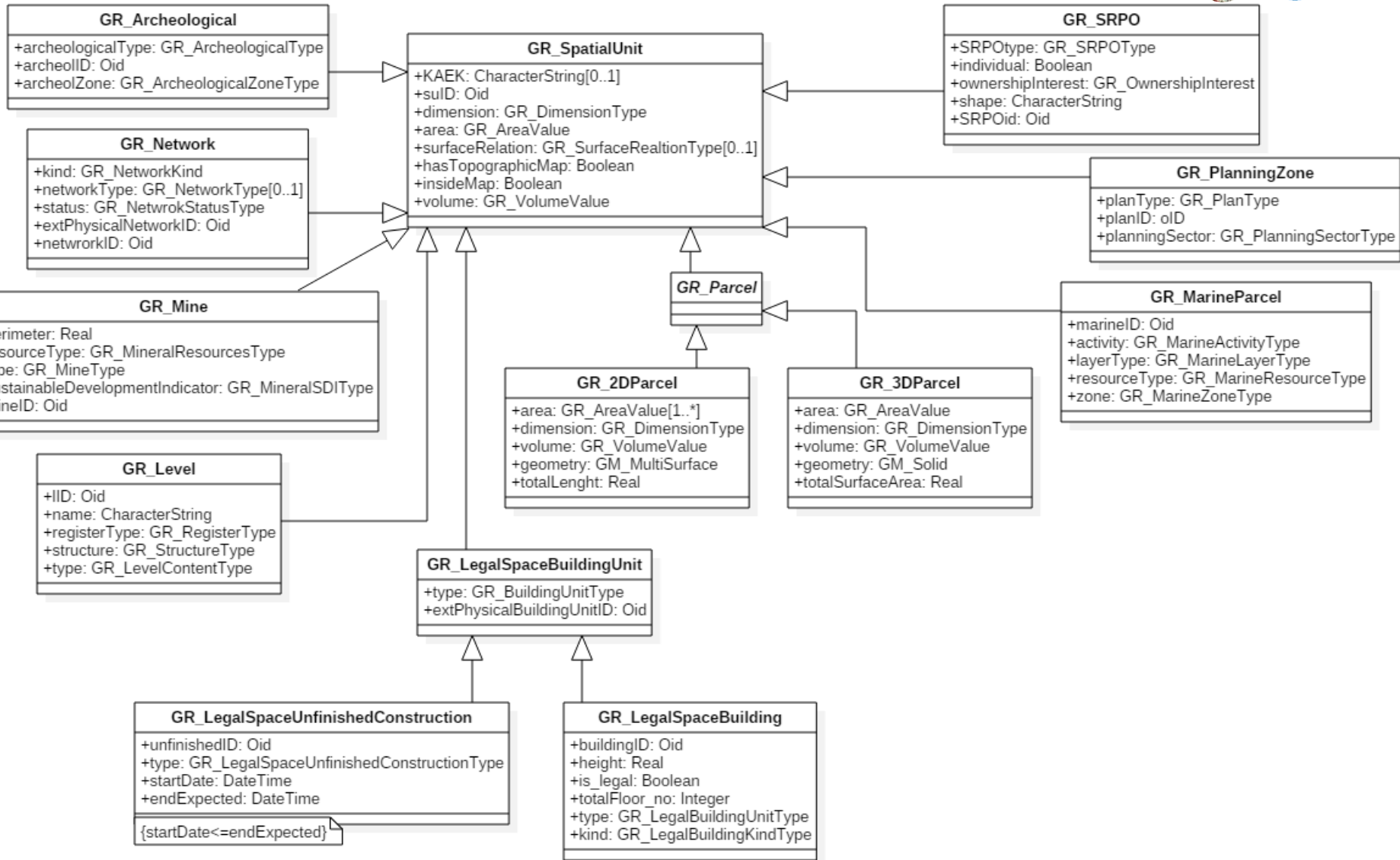Special Right Property Objects

Proposed types for GR_Level

Networks

Marine parcels

Planning Zones

Archaeological spaces

GR_Archeological → GR_SpatialUnit «featureType» *VersionedObject* 0...*

GR_Level 0...* 0...1

Level 1 for archeological
Level 2 for 2D parcel
Level 3 for 3D parcel
Level 4 for mine
Level 5 for SRPO
Level 6 for planning zone
Level 7 for marine parcel
Level 8 for network

GR_Network

GR_PlanningZone

GR_Mine

GR_MarineParcel

GR_SRPO

GR_Parcel

GR_LegalSpaceBuildingUnit 0...*

GR_Parcel::GR_2DParcel 0...* 0...1 plus 0...1 minus 0...* 0...*

GR_Parcel::GR_3DParcel 0...*

GR_LegalSpaceBuildingUnit
GR_LegalSpaceUnfinishedConstruction

GR_LegalSpaceBuildingUnit
GR_Building 0...*

/derived 0...*

GR_BoundaryFaceString
GR_BoundaryfaceString 0...*

+(ordered) 2...*

1...*

LA_SpatialSource
GR_SpatialSource 0...*

0,4...* 0,3..*

GR_Point

1...* 0,4...*

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GR_Archeological
+archeologicalType: GR_ArcheologicalType
+archeolID: Oid
+archeolZone: GR_ArcheologicalZoneType

GR_SpatialUnit
+KAEK: CharacterString[0..1]
+suID: Oid
+dimension: GR_DimensionType
+area: GR_AreaValue
+surfaceRelation: GR_SurfaceRealtionType[0..1]
+hasTopographicMap: Boolean
+insideMap: Boolean
+volume: GR_VolumeValue

GR_SRPO
+SRPOtype: GR_SRPOType
+individual: Boolean
+ownershipInterest: GR_OwnershipInterest
+shape: CharacterString
+SRPOid: Oid

GR_Network
+kind: GR_NetworkKind
+networkType: GR_NetworkType[0..1]
+status: GR_NetwrokStatusType
+extPhysicalNetworkID: Oid
+netwrorkID: Oid

GR_PlanningZone
+planType: GR_PlanType
+planID: oID
+planningSector: GR_PlanningSectorType

GR_Mine
+perimeter: Real
+resourceType: GR_MineralResourcesType
+type: GR_MineType
+sustainableDevelopmentIndicator: GR_MineralSDIType
+mineID: Oid

GR_Parcel

GR_MarineParcel
+marineID: Oid
+activity: GR_MarineActivityType
+layerType: GR_MarineLayerType
+resourceType: GR_MarineResourceType
+zone: GR_MarineZoneType

GR_2DParcel
+area: GR_AreaValue[1..*]
+dimension: GR_DimensionType
+volume: GR_VolumeValue
+geometry: GM_MultiSurface
+totalLenght: Real

GR_3DParcel
+area: GR_AreaValue
+dimension: GR_DimensionType
+volume: GR_VolumeValue
+geometry: GM_Solid
+totalSurfaceArea: Real

GR_Level
+lID: Oid
+name: CharacterString
+registerType: GR_RegisterType
+structure: GR_StructureType
+type: GR_LevelContentType

GR_LegalSpaceBuildingUnit
+type: GR_BuildingUnitType
+extPhysicalBuildingUnitID: Oid

GR_LegalSpaceUnfinishedConstruction
+unfinishedID: Oid
+type: GR_LegalSpaceUnfinishedConstructionType
+startDate: DateTime
+endExpected: DateTime

{startDate<=endExpected}

GR_LegalSpaceBuilding
+buildingID: Oid
+height: Real
+is_legal: Boolean
+totalFloor_no: Integer
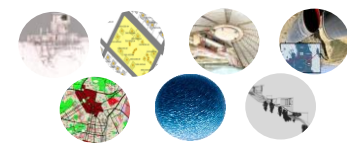+type: GR_LegalBuildingUnitType
+kind: GR_LegalBuildingKindType

Some generic attributes/ classes could be added to LADM and explicitly modelled, as they can be shared among countries.

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Spatial Package: Code lists

«codeList»
GR_BuildingKindType

+ BK01 - Building
+ BK02 - Attachment to building
+ BK03 - Accessory
+ BK04 - Garden

«codeList»
GR_UnfinishedType

+ UN01 - Unknown
+ UN02 - Building
+ UN03 - Storage space
+ UN04 - Accessory
+ UN05 - Common space
+ UN06 - Pipeline

«codeList»
GR_SpatialSourceType

+ SS01 - Topographic map
+ SS02 - Field sketch
+ SS03 - Text description
+ SS04 - Orthophotomap

«codeList»
GR_BuildingType

+ BT01- Industrial building
+ BT02- Commercial building
+ BT03 - Residential building
+ BT04 - Storage space
+ BT05 - Open parking space
+ BT06 - Closed parking space
+ BT07 - Reservoir
+ BT08 - Chamber
+ BT09 - Archeological space
+ BT10 - Special Real Property Object

«dataType»
Surveying and Representation::
GR_Transformation

+ transformation: CC_OperationMethod
+ transformedLocation: GM_Point

«codeList»
GR_Network::
GR_NetworkKind

+ NT01 - utility
+ NT02 - transportation

«codelist»
Surveying and
Representation::
GR_InterpolationType

+ cubic
+ linear
+ nearest neighboor
+ other

«codeList»
GR_SRPO::
GR_OwnershipInterestType

+ OI01 - no ownership nterest
+ OI02 - smaller than 1000 ‰
+ OI03 - 1000 ‰

«codeList»
GR_Planning zone::
GR_BuildingRegulation

+ building coefficient
+ building permit
+ land use

«codeList»
GR_Mine::GR_MineType

+ MQ01 - mine
+ MQ02 - quarry

«codeList»
GR_Mine::GR_MineralActivity

+ MN01 - above surface exloitation
+ MN02 - below surface exploitation
+ MN03 - digging
+ MN04 - environmental rehabilitation

- Identify areas that need further "international" modeling;

- Packages/ classes/ modules could be explicitly modelled as they can be shared among other countries;

- "*Level*" concept and its possibilities needs further exploration in terms of legal, geometrical and thematic coherence.

- The concept of Multipurpose Land Administration System based on LADM should be further studied.

Thank you!

6th LAND ADMINISTRATION DOMAIN MODEL 2017 WORKSHOP