Thematic model　：　Tunnel model 坑道・地下道（2／2）

- LOD1～LOD4により、定義する構成要素が変わる

Geometric / semantic theme	**Property type**	**LOD1**	**LOD2**	**LOD3**	**LOD4**
Volume part of the tunnel shell	*gml:SolidType*	•	•	•	•
Surface part of the tunnel shell	*gml:MultiSurfaceType*	•	•	•	•
Terrain intersection curve	*gml:MultiCurveType*	•	•	•	•
Curve part of the tunnel shell	*gml:MultiCurveType*		•	•	•
Tunnel parts	*TunnelPartType*	•	•	•	•
Boundary surfaces (chapter 10.4.3)	*AbstractBoundarySurfaceType*		•	•	•
Outer tunnel installations (chapter 10.4.2)	*TunnelInstallationType*		•	•	•
Openings	*AbstractOpeningType*			•	•
Hollow spaces (chapter 10.4.5)	*HollowSpaceType*				•
Interior tunnel installations	*IntTunnelInstallationType*				•

Tab. 6: Semantic themes of the class *_AbstractTunnel*.

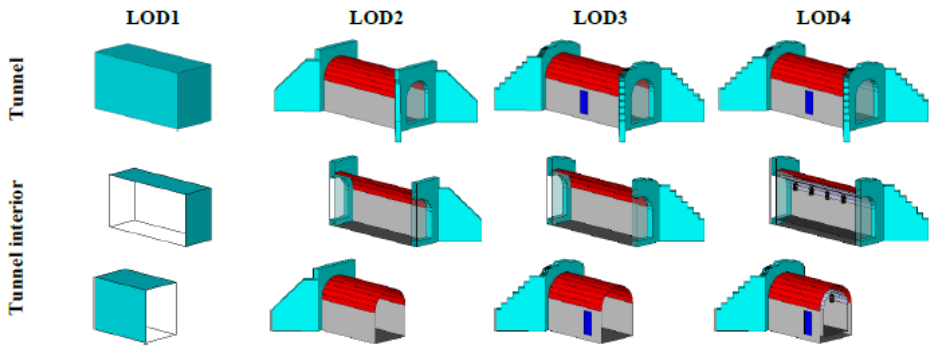
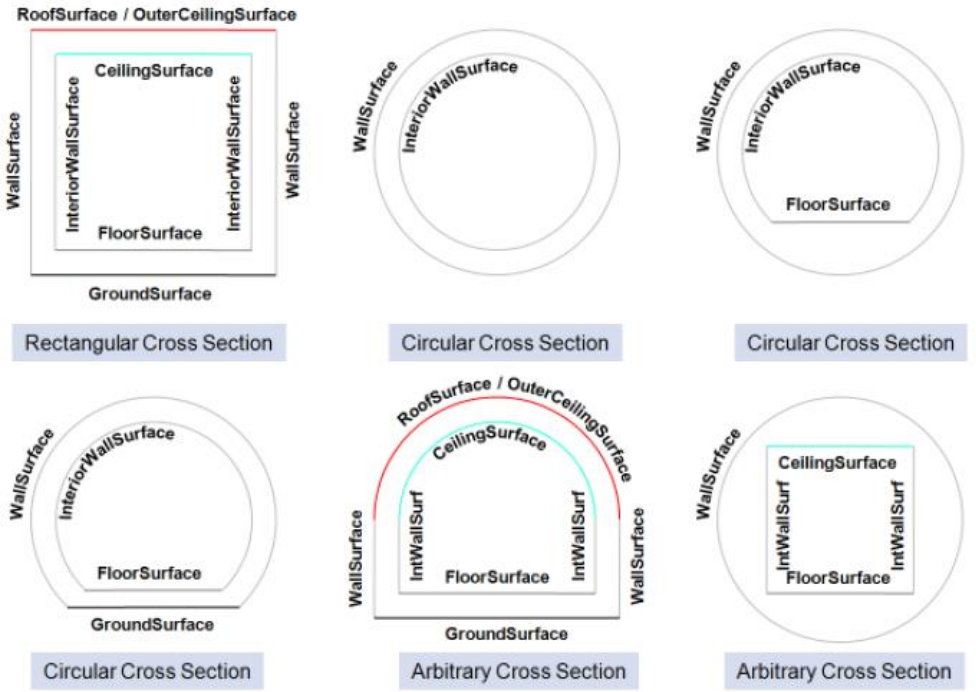


Fig. 40: Tunnel model in LOD1 – LOD4 (source: Karlsruhe Institute of Technology (KIT)).

- トンネルの形状により、各面をCityGMLのどの構成要素で定義するか細かく設定できる



Thematic model　：　Bridge model 橋梁（１／２）

- 橋梁は、橋梁の外形と付属物から構成することができる

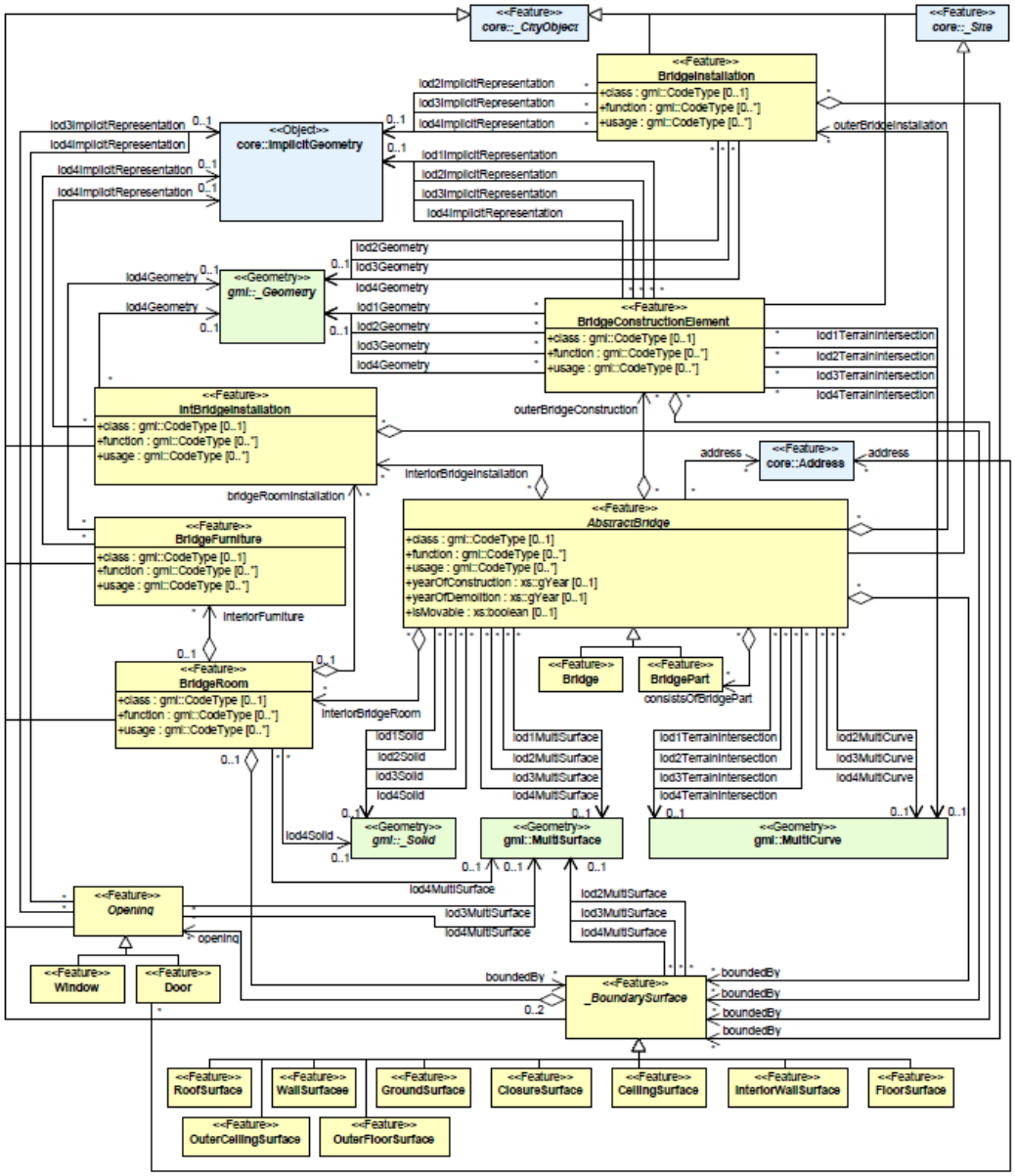


Fig. 45: UML diagram of the bridge model, part one.

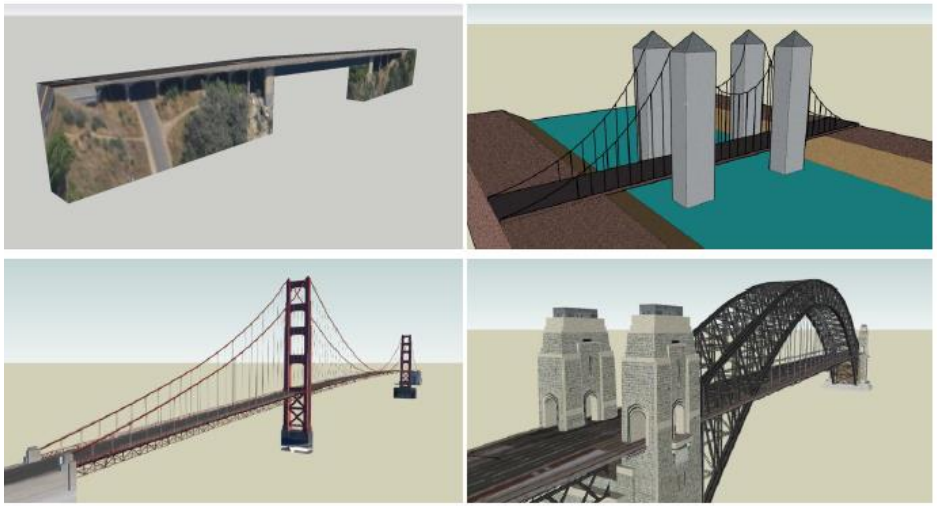


Fig. 44: Examples for bridge models in LOD1 (upper left), LOD2 (upper right), LOD3 (lower left) and LOD4 (lower right) (source: Google 3D warehouse)

Thematic model　：　Bridge model 橋梁（2／2）

- LOD1～LOD4により、定義する構成要素が変わる

Geometric / semantic theme	Property type	LOD1	LOD2	LOD3	LOD4
Volume part of the bridge shell	*gml:SolidType*	•	•	•	•
Surface part of the bridge shell	*gml:MultiSurfaceType*	•	•	•	•
Terrain intersection curve	*gml:MultiCurveType*	•	•	•	•
Curve part of the bridge shell	*gml:MultiCurveType*		•	•	•
Bridge parts (chapter 10.5.1)	*BridgePartType*	•	•	•	•
Boundary surfaces (chapter 10.5.3)	*AbstractBoundarySurfaceType*		•	•	•
Outer bridge installations (chapter 10.5.2)	*BridgeInstallationType*		•	•	•
Bridge construction elements (chapter 10.5.2)	*BridgeConstruction-ElementType*	•	•	•	•
Openings (chapter 10.5.4)	*AbstractOpeningType*			•	•
Bridge rooms (chapter 10.5.5)	*BridgeRoomType*				•
Interior bridge installations	*IntBridgeInstallationType*				•

Tab. 7: Semantic themes of the class *_AbstractBridge*.

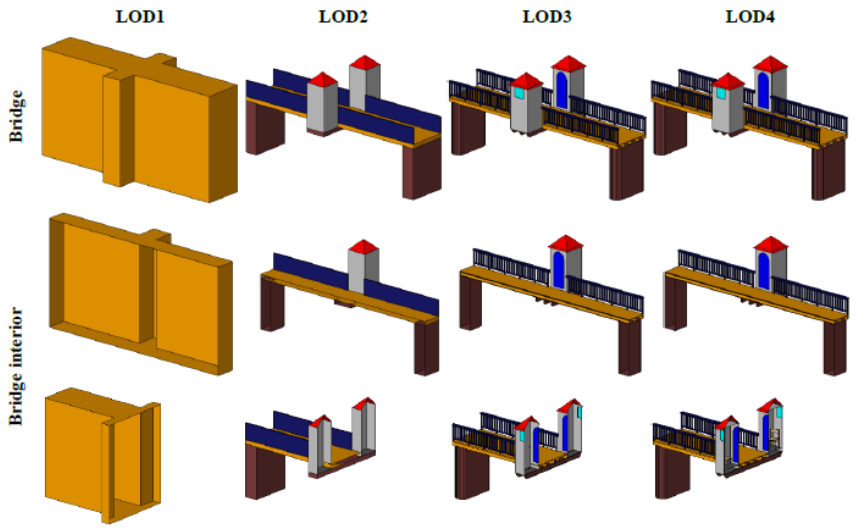
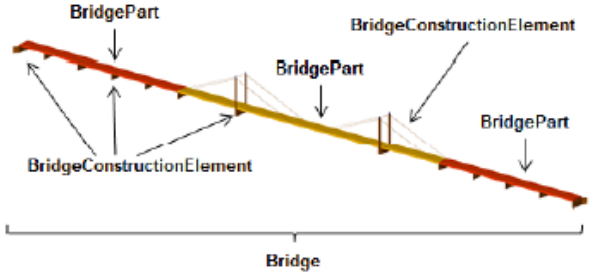
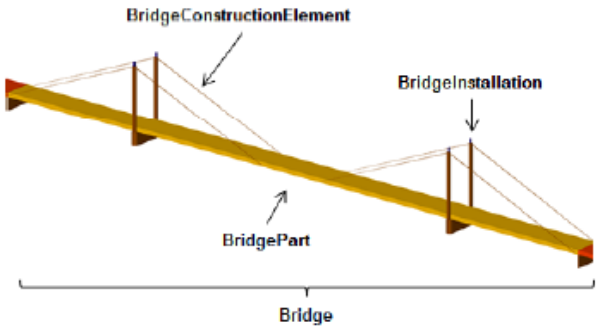
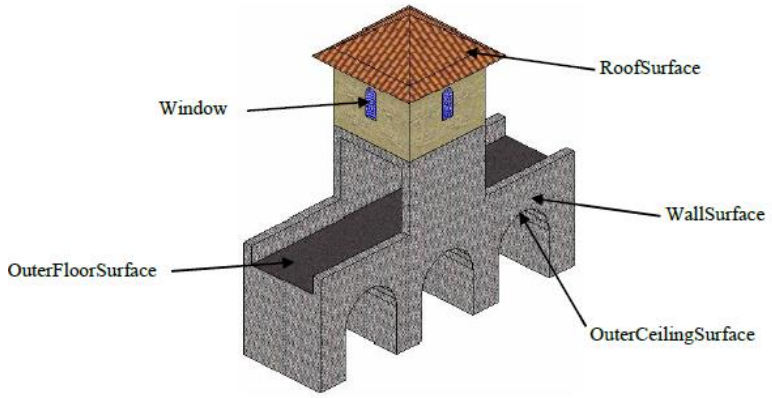


Fig. 46: Bridge model in LOD1 – LOD4. (source: Karlsruhe Institute of Technology (KIT))

- 橋梁の形状により、各面をCityGMLのどの構成要素で定義するか細かく設定できる







Thematic model : Water bodies 水部

- 水部は、水面と水中の地形との境界面から構成することができる

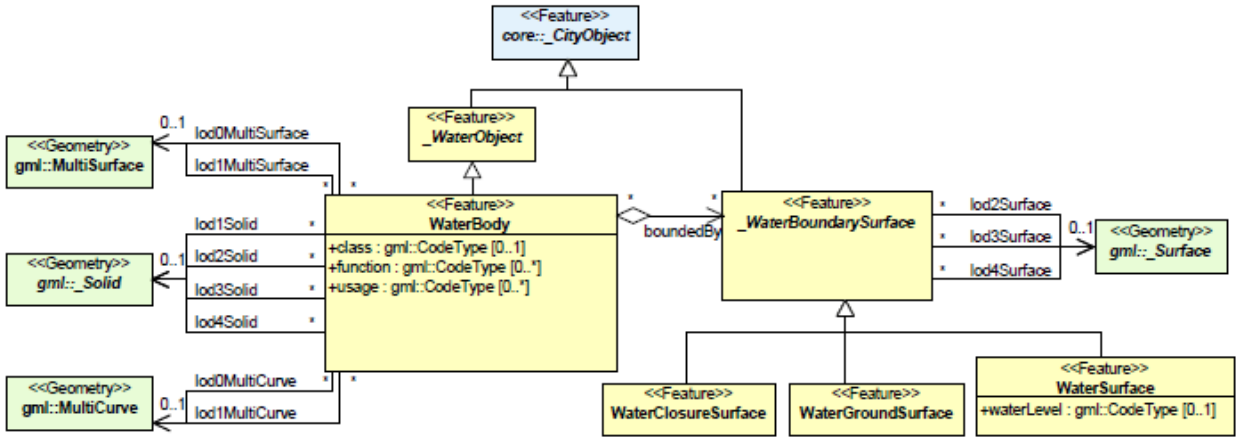


Fig. 56: UML diagram of the water body model in CityGML. Prefixes are used to indicate XML namespaces associated with model elements. Element names without a prefix are defined within the CityGML *WaterBody* module.

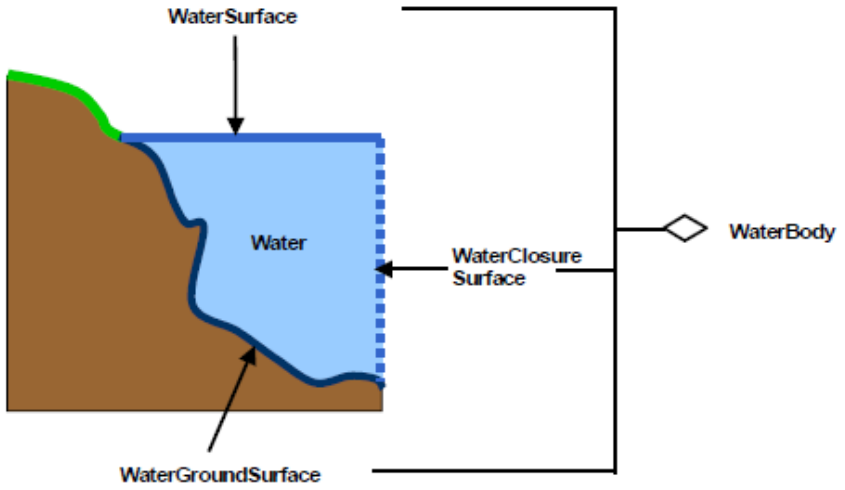


Fig. 55: Illustration of a water body defined in CityGML (graphic: IGG Uni Bonn).

Thematic model : Transportation 交通施設

- 交通施設は、車道、軌道、交差点、その他通行可能な場所から構成することができる

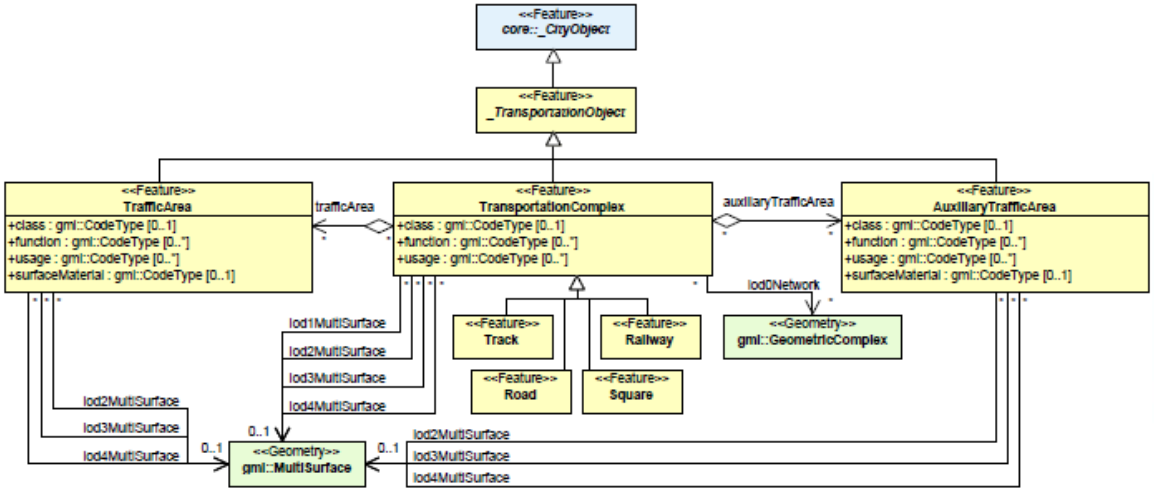


Fig. 59: UML diagram of the transportation model in CityGML. Prefixes are used to indicate XML namespaces associated with model elements. Element names without a prefix are defined within the CityGML *Transportation* module.

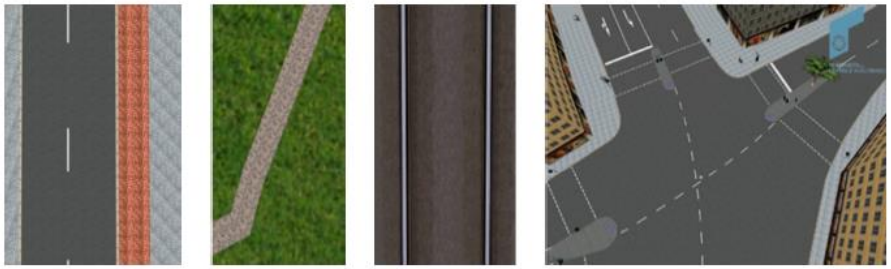


Fig. 57: Representations of *TransportationComplex* (from left to right: examples of road, track, rail, and square) (source: Rheinmetall Defence Electronics).

- LOD0は線分による表現、高さをもつ面で表現、LOD2～4はレーンごとに区分して表現することができる

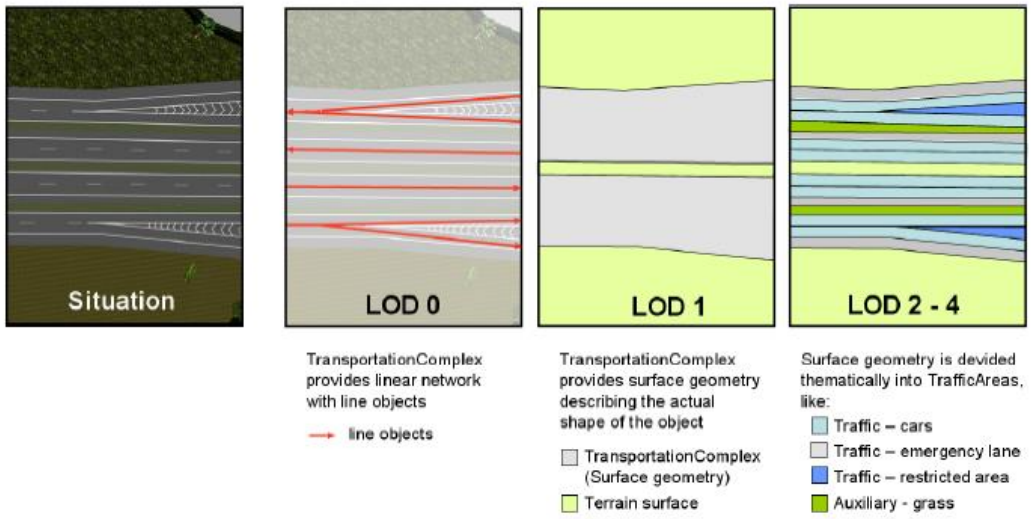


Fig. 60: *TransportationComplex* in LOD0, 1, and 2-4 (example shows part of a motorway) (source: Rheinmetall Defence Electronics).

Thematic model : Vegetation 植生

- 植生は、固体の植生地物または植生被覆で定義する

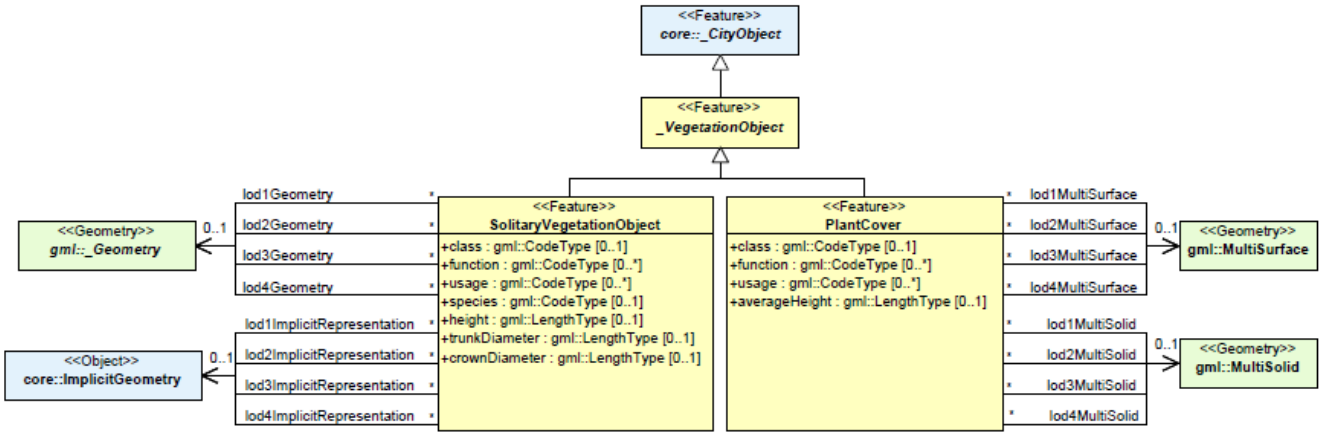


Fig. 64: UML diagram of vegetation objects in CityGML. Prefixes are used to indicate XML namespaces associated with model elements. Element names without a prefix are defined within the CityGML *Vegetation* module.

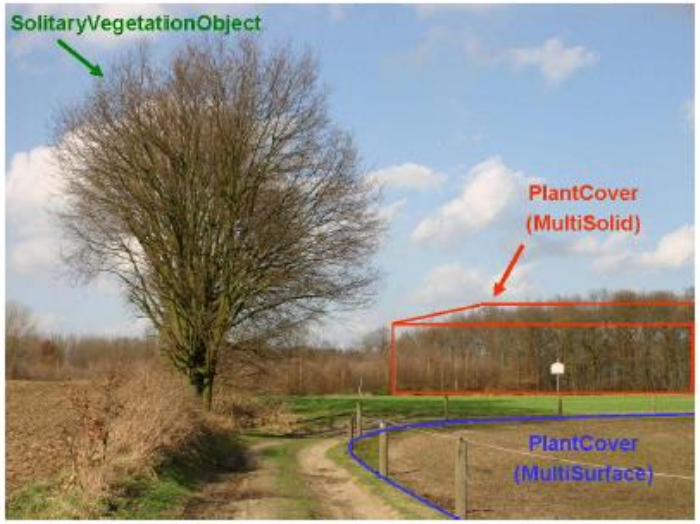


Fig. 63: Example for vegetation objects of the classes *SolitaryVegetationObject* and *PlantCover* (graphic: District of Recklinghausen).

固体（ソリッド）の森林モデルの例

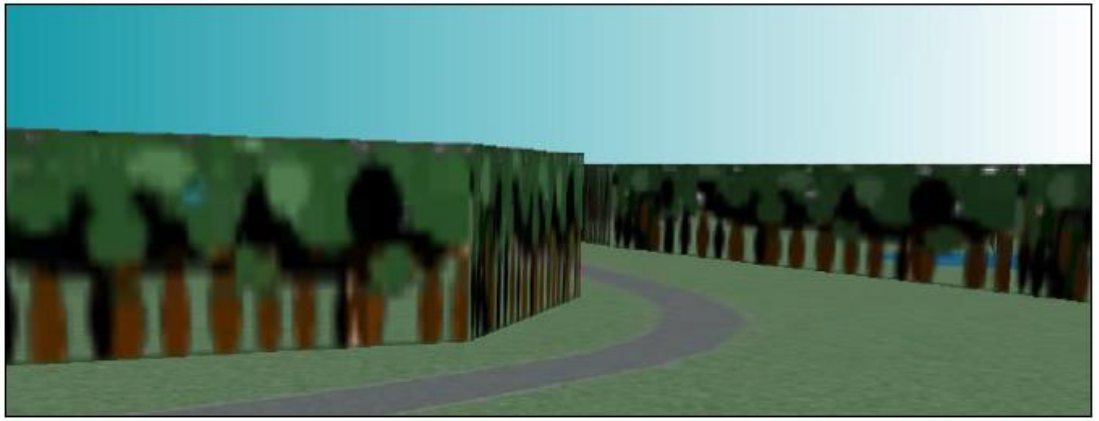


Fig. 66: Example for the visualisation/modelling of a solid forest (source: District of Recklinghausen).

Thematic model : City furniture 付属施設

- 都市における案内板や車止めなどの様々な付属施設を定義できる

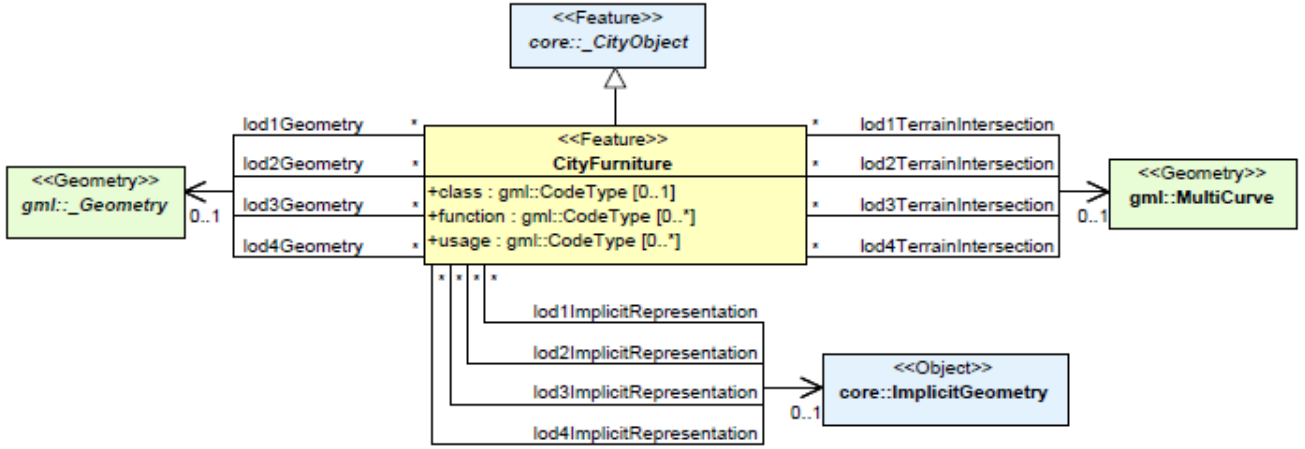


Fig. 69: UML diagram of city furniture objects in CityGML. Prefixes are used to indicate XML namespaces associated with model elements. Element names without a prefix are defined within the CityGML *CityFurniture* module.

Fig. 67: Real situation showing a bus stop (left). The advertising billboard and the refuge are modelled as *CityFurniture* objects in the right image (source: 3D city model of Barkenberg).

Fig. 68: Real situation showing lanterns and delimitation stakes (left). In the right image they are modelled as *CityFurniture* objects with *ImplicitGeometry* representations (source: 3D city model of Barkenberg).

Thematic model　：　Land use 土地利用

- 土地利用は、用途による区分を属性として持つことができる

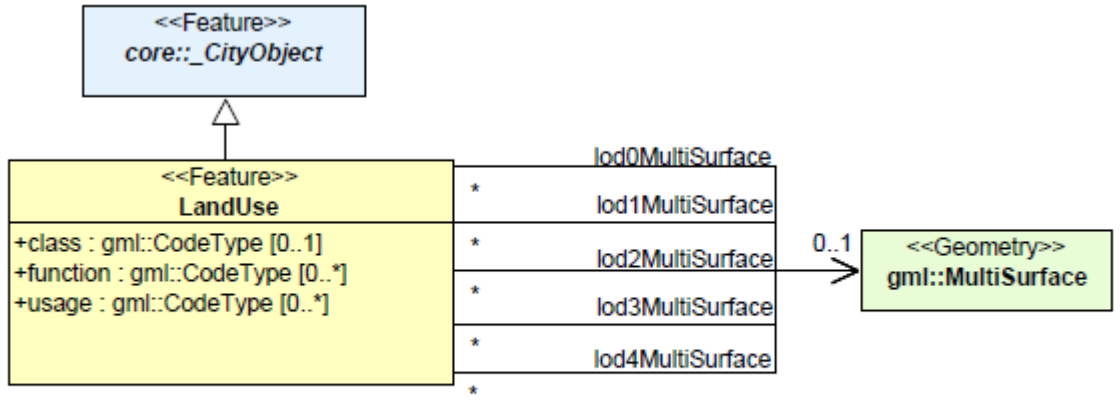


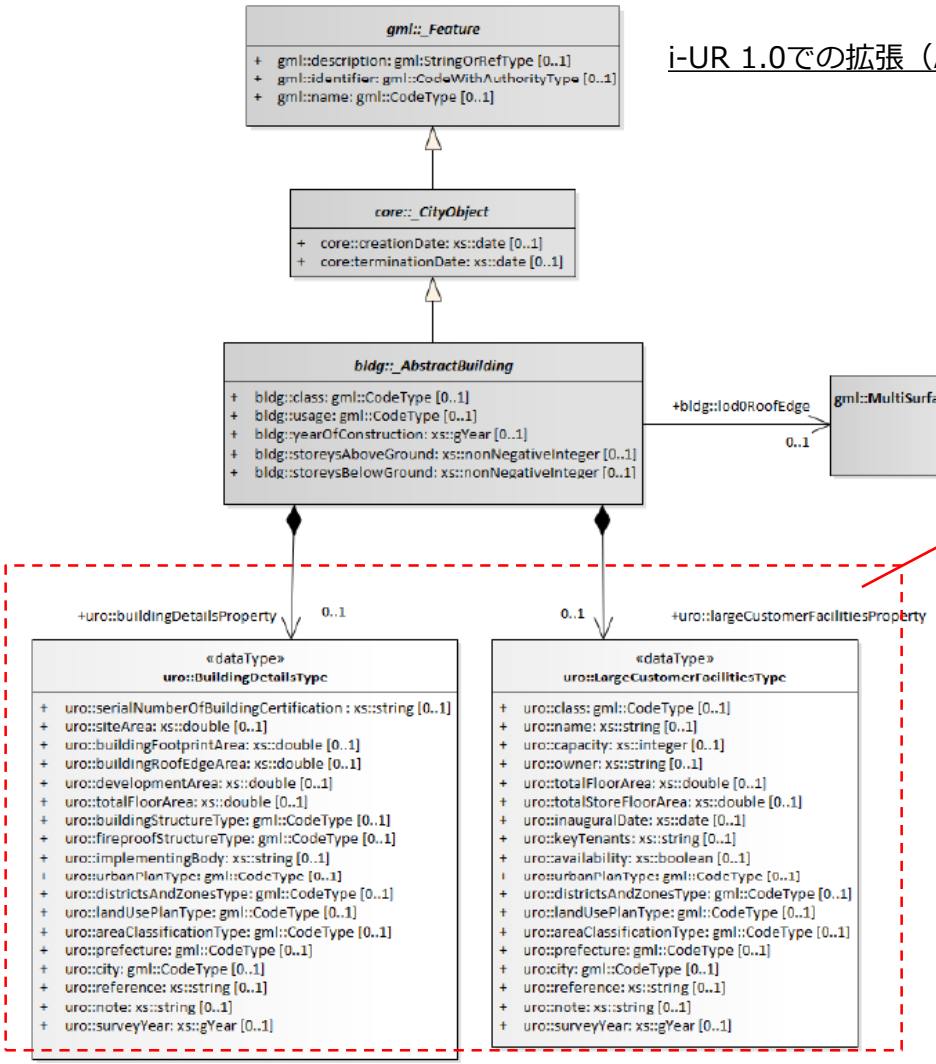
Fig. 71: UML diagram of land use objects in CityGML. Prefixes are used to indicate XML namespaces associated with model elements. Element names without a prefix are defined within the CityGML *LandUse* module.

Fig. 72: LOD0 regional model consisting of land use objects in CityGML (source: IGG Uni Bonn).

Thematic model　：　Application Domain Extension (ADE) 拡張機能（１／３）

- CityGMLでは、前ページまでに示された標準的な地物以外に、様々な分野の地物拡張定義を可能としている
  ➔ ADE (Application Domain Extension）と呼ぶ
- 日本においても、内閣府が公表している「i-UR」（i-都市再生のデータ仕様）では、「Urban Planning ADE」として、都市再生用に「建物」属性や「土地利用」属性の拡張を定義している

i-UR 1.0での拡張（ADE）の例



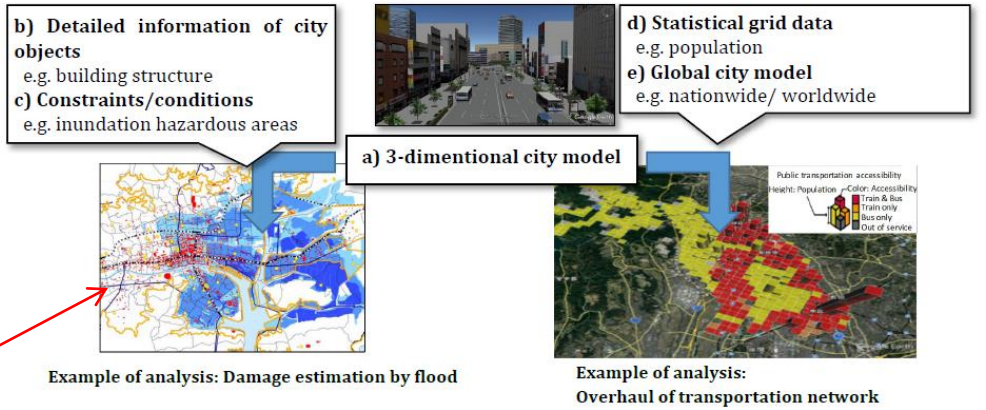


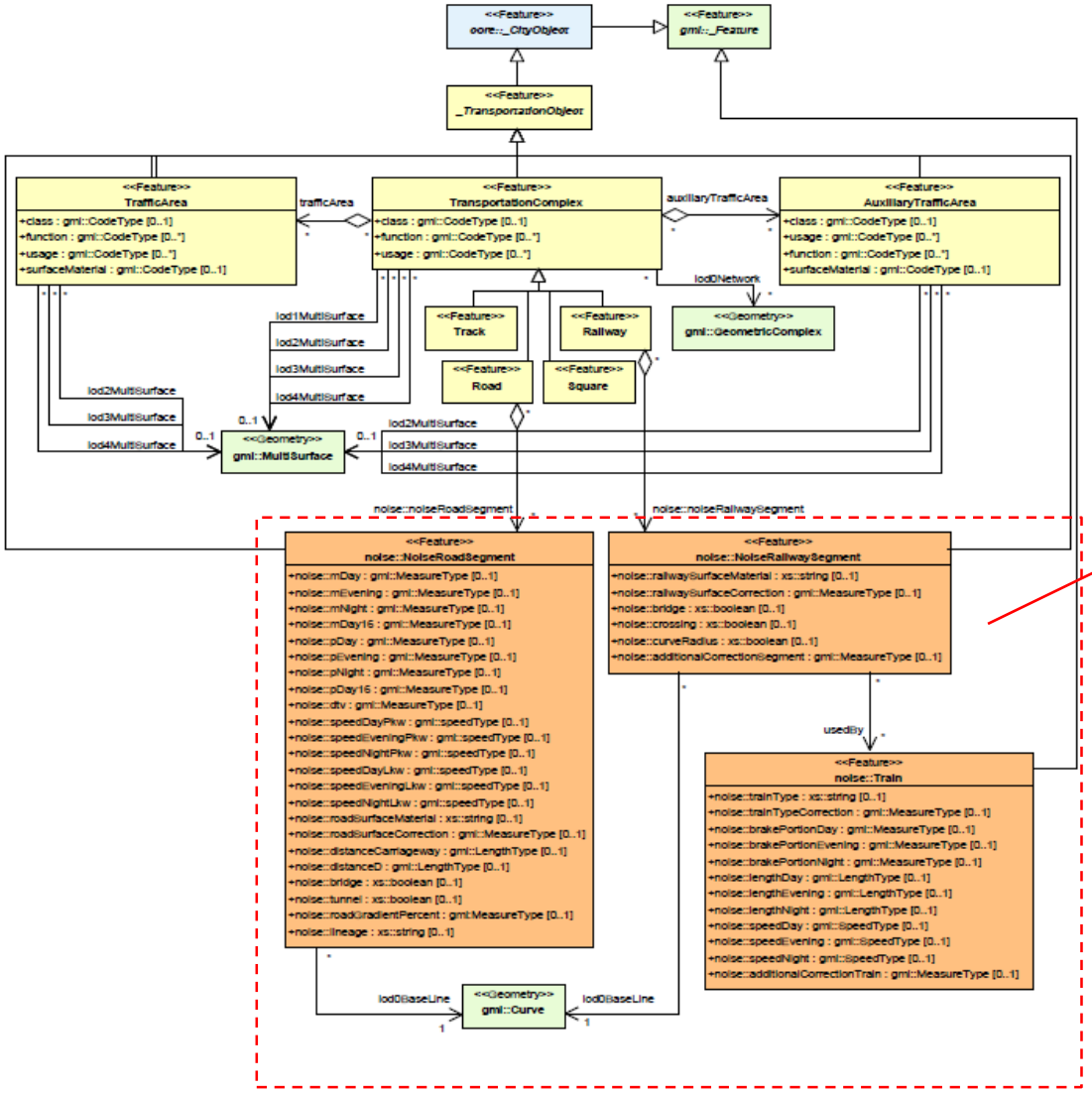
Figure 1 Structure of i-UR Data

建物の詳細な情報を持つことができるよう、都市再生用に建物の属性を拡張している

（i-UR 1.0より）

Thematic model　：　Application Domain Extension (ADE) 拡張機能（２／３）

「Noise Immision ADE」（騒音）の例



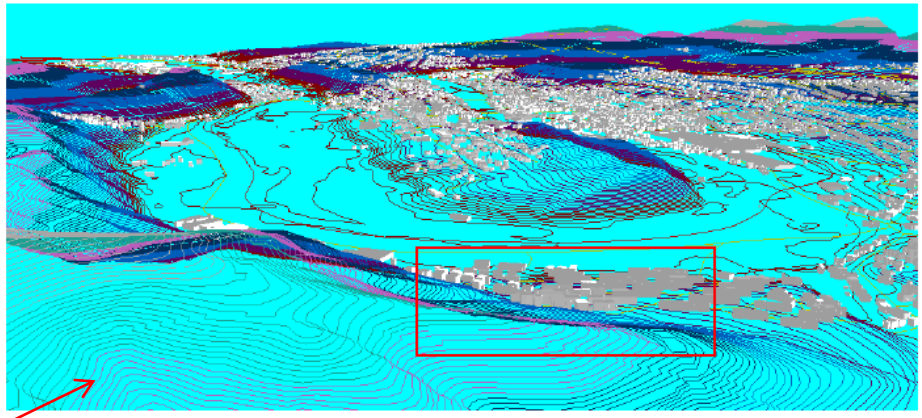
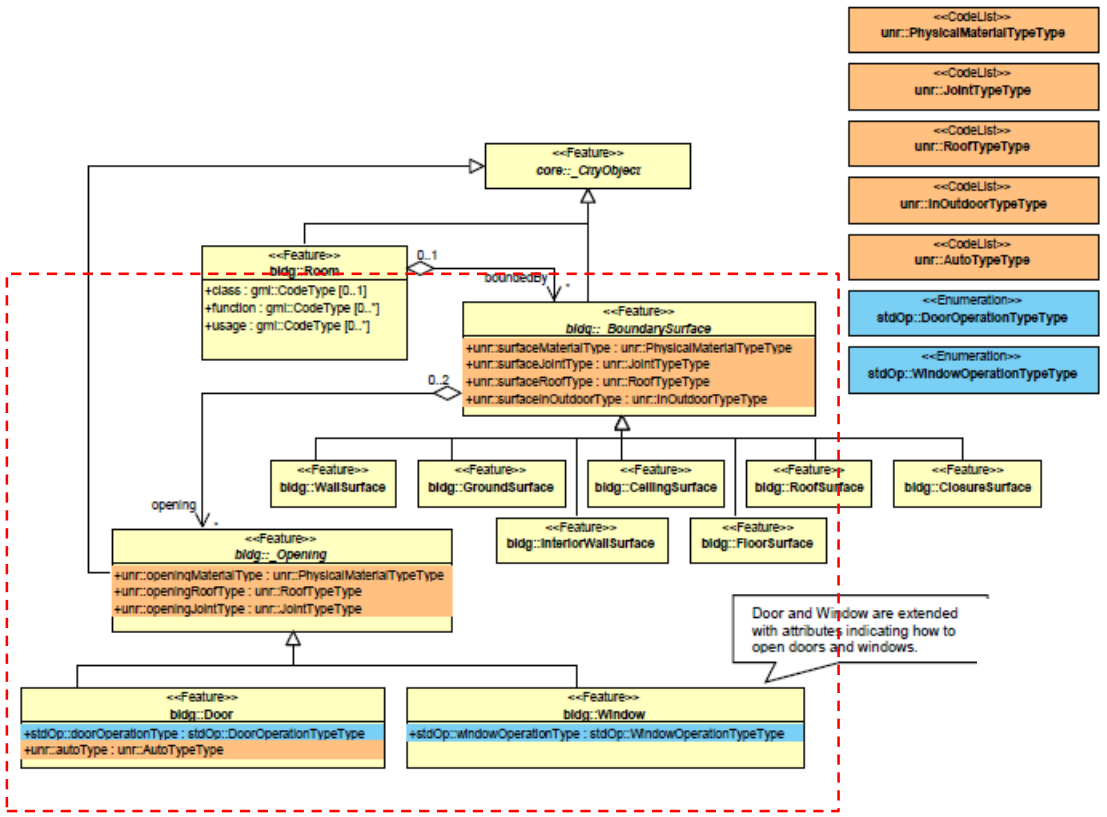


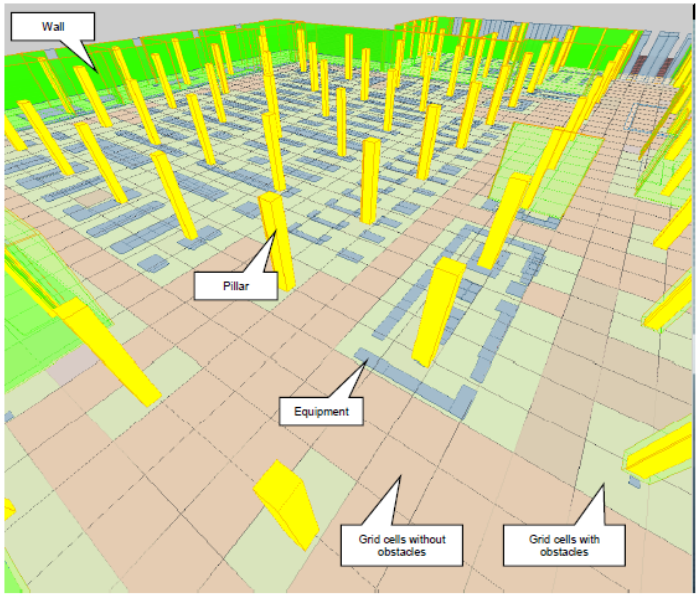
Fig. 97: 3D geodata in CityGML for the calculation of the noise map in Fig. 94: Derived contour lines for the generation of CityGML breaklines, 3D block model in CityGML, 3D road and railway data in CityGML, state road data for higher-level roads in CityGML (source: Surveying and Mapping Agency NRW, State Road Enterprise NRW, Stapelfeldt GmbH, Institute of Geodesy and Geoinformation Uni Bonn).

道路や鉄道からの騒音を3Dで表現するために騒音の値を持つことができるように「交通施設」（道路、軌道）の地物を拡張

Thematic model　：　Application Domain Extension (ADE) 拡張機能（３／３）

「ADE for Ubiquitous Network Robots Services」（ユビキタスネットワーク　ロボット用サービス）の例





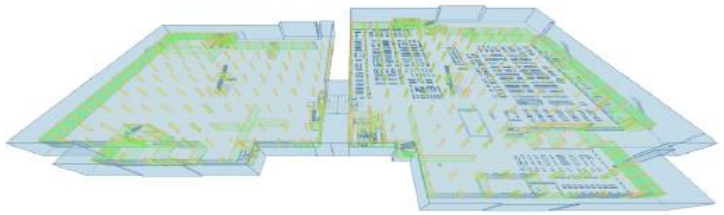


Fig. 105: 3D model of a shopping mall, which consists of two buildings (indoor) and a hallway (outdoor) that connects the buildings.

出入口や開口部、ドアなどの通行箇所の通過点の材質や天井部分の種類、ジョイントの種類などを定義できるように「境界面」地物を拡張している