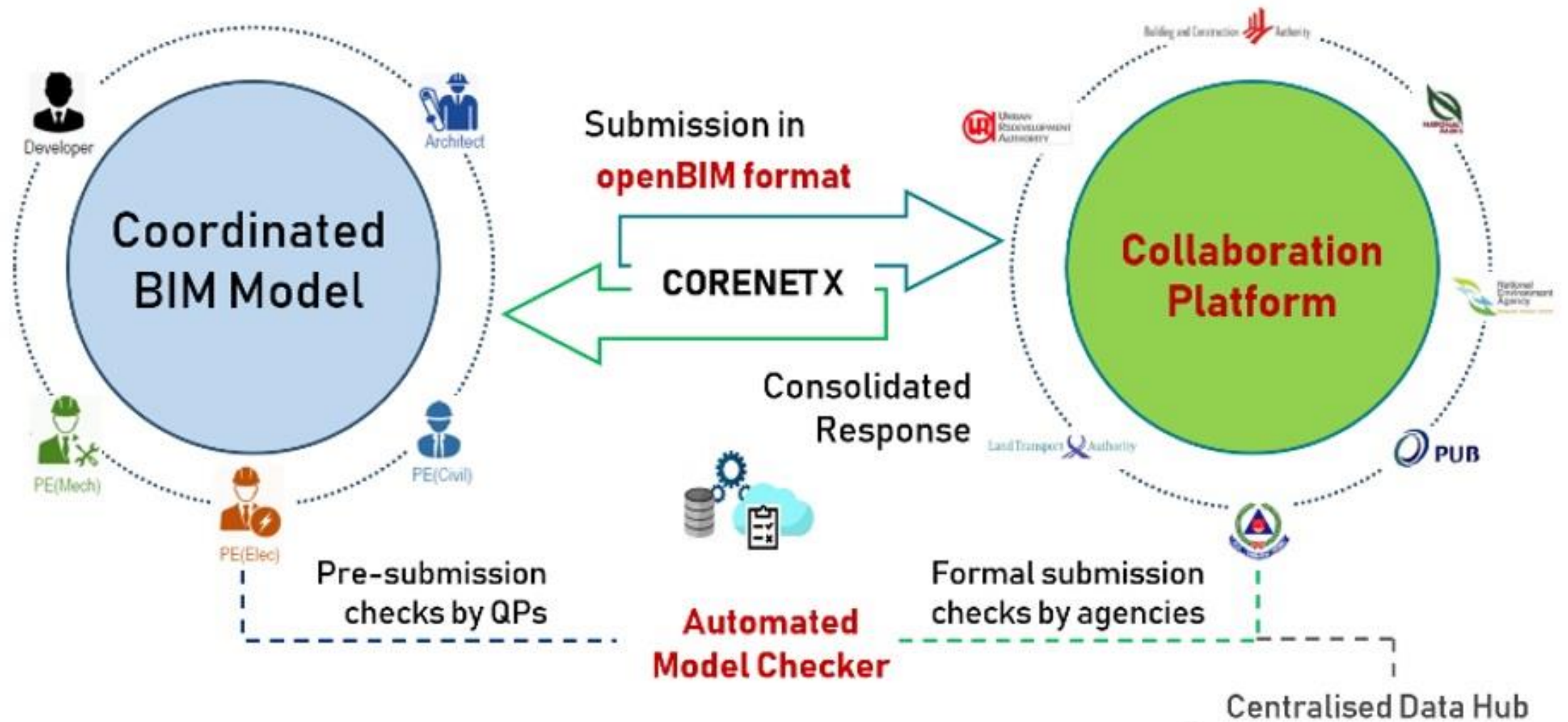# IFC-SG 101
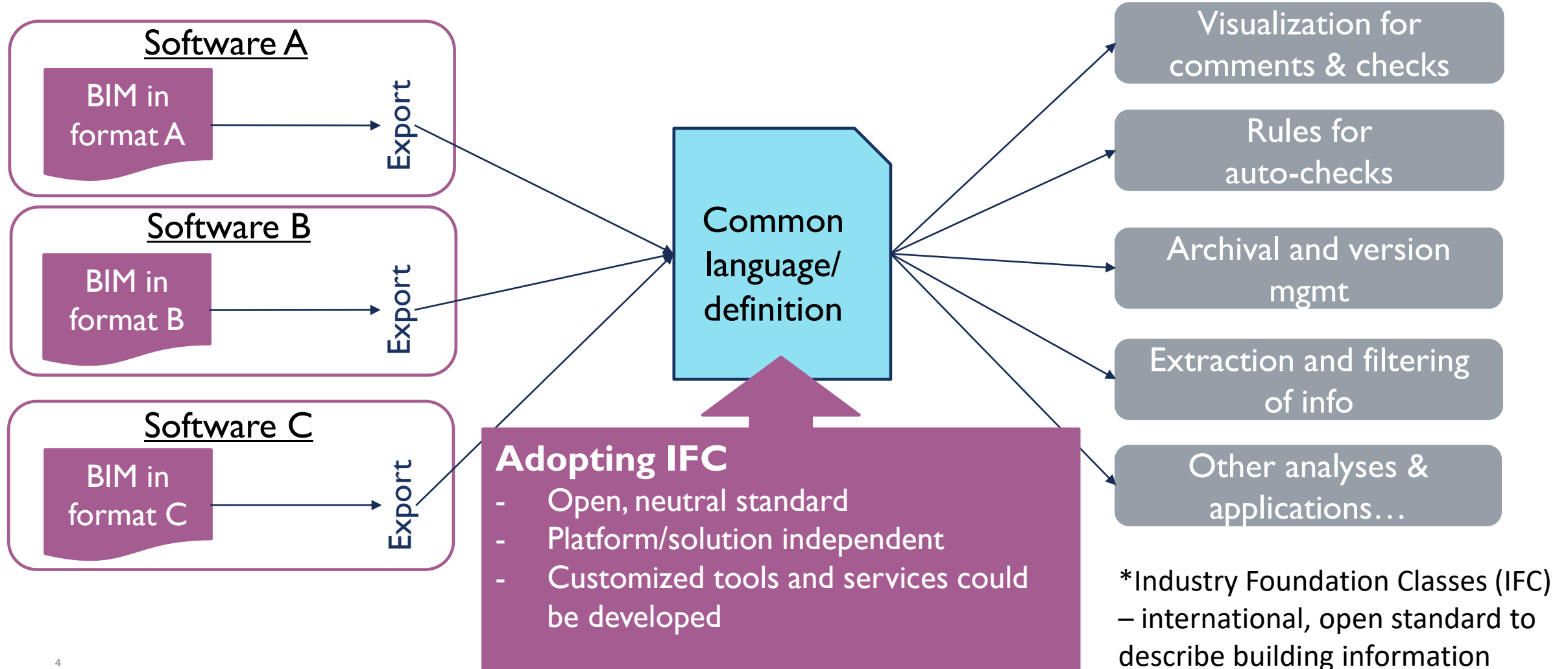
OBJECTIVE

- What is IFC & IFC-SG

- How IFC-SG captures local Regulatory Requirements

- How to map Regulatory requirements into IFC

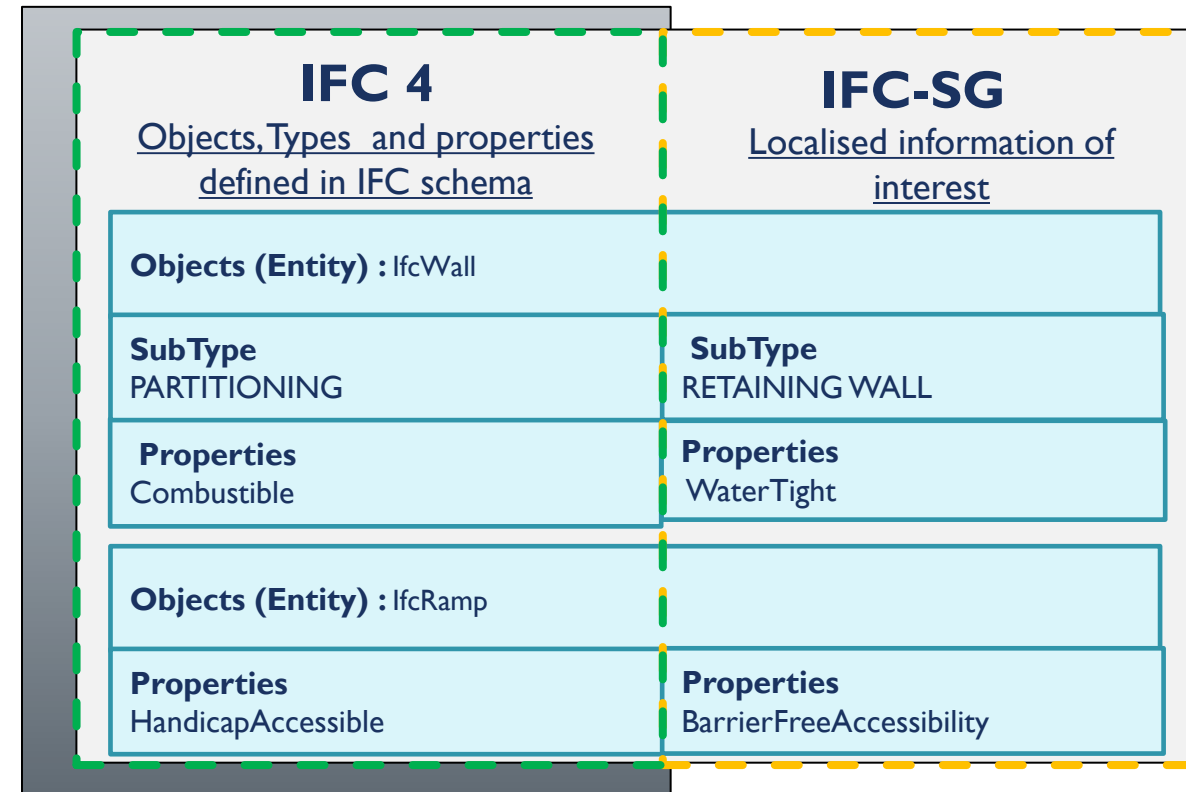- How to read the IFC-SG Excel

Coordinated BIM Model

Developer · Architect · PE(Mech) · PE(Elec) · PE(Civil)

Submission in **openBIM format**

CORENET X

Consolidated Response

Collaboration Platform

Pre-submission checks by QPs

Automated Model Checker

Formal submission checks by agencies

Centralised Data Hub

STANDARDISING INFORMATION TO SUPPORT CORENET X, USING IFC AS THE COMMON REPRESENTATION

Software A

BIM in format A

Export

Software B

BIM in format B

Export

Software C

BIM in format C

Export

Common language/ definition

Adopting IFC
- Open, neutral standard
- Platform/solution independent
- Customized tools and services could be developed

Visualization for comments & checks

Rules for auto-checks

Archival and version mgmt

Extraction and filtering of info

Other analyses & applications…

*Industry Foundation Classes (IFC) – international, open standard to describe building information

CAPTURING REGULATORY REQUIREMENTS

IFC-SG captures the Regulatory Requirements of Singapore Code of Practices

- Development of IFC-SG is based on IFC4 (Reference View), with no amendments to the IFC schema

- Localization includes addition of subtypes and properties to address regulatory checks leveraging on the information predefined in IFC Schema

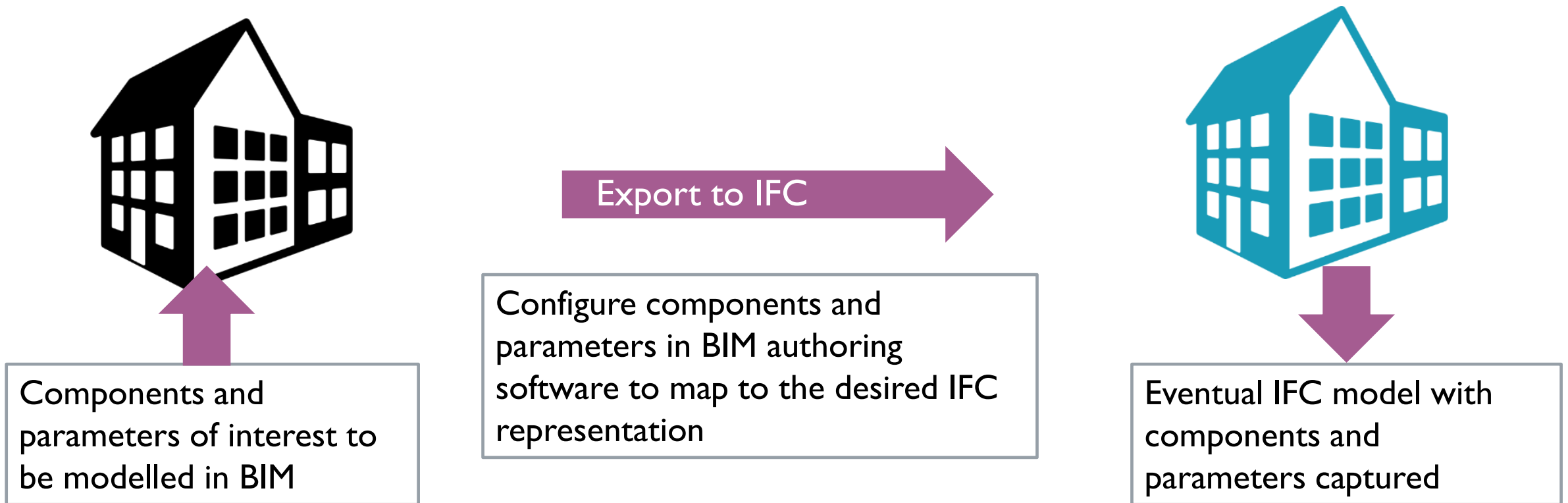| **IFC 4** Objects, Types and properties defined in IFC schema	**IFC-SG** Localised information of interest
Objects (Entity) : IfcWall	
SubType PARTITIONING	**SubType** RETAINING WALL
Properties Combustible	**Properties** WaterTight
Objects (Entity) : IfcRamp	
Properties HandicapAccessible	**Properties** BarrierFreeAccessibility

Information predefined in IFC's schema.

Localised information of interest (sub types and properties) from regulatory requirements.

FLOW OF INFORMATION FROM NATIVE BIM TO IFC

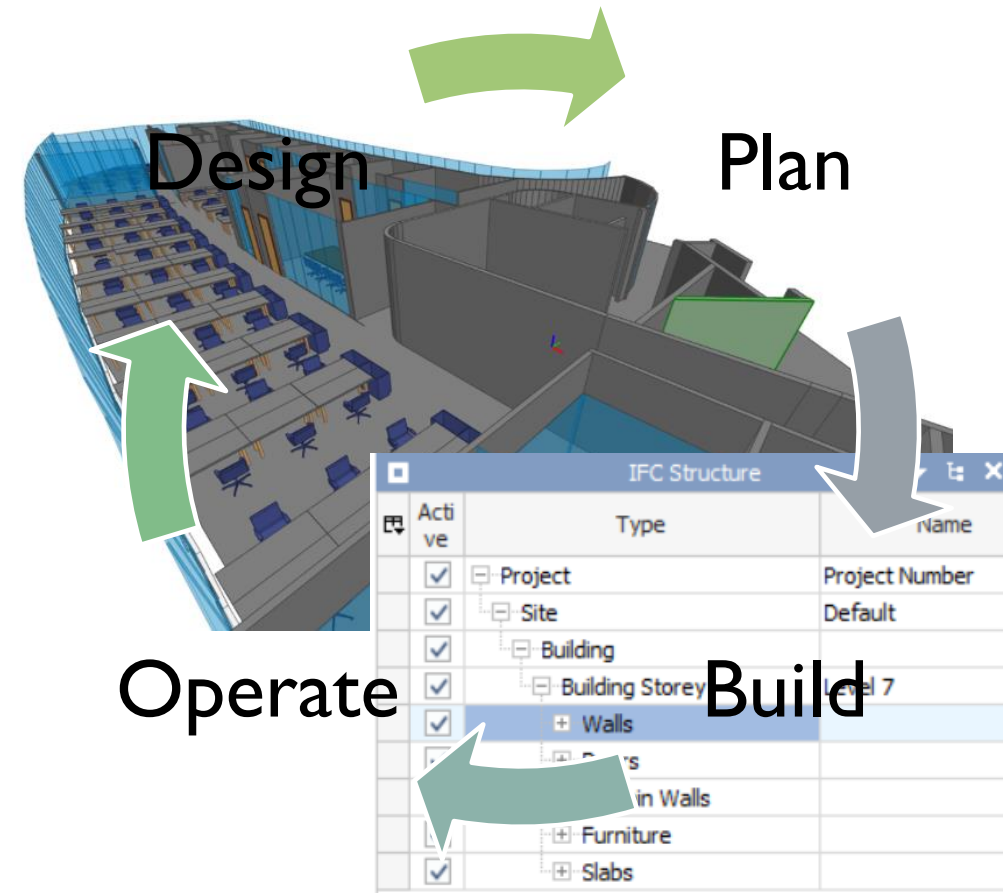Information in IFC comes from information modelled in the Native BIM Model

Export to IFC

Components and parameters of interest to be modelled in BIM

Configure components and parameters in BIM authoring software to map to the desired IFC representation

Eventual IFC model with components and parameters captured

WHAT IS IFC?

WHAT IS IFC?

Industry Foundation Classes

International Open Standard Representing The Built Environment

- A standardized digital description of the built environment.

- Developed by buildingSMART International to facilitate interoperability in the architecture, engineering and construction (AEC) industry

- IFC is published as an official ISO standard – ISO16739

Design

Plan

Operate

Build

VERSIONS OF IFC TO-DATE

1996
1997 IFC 1.0
1998 IFC 1.5
1999 IFC 2.0
2000 IFC 2x
2003 IFC 2x2
2006 IFC 2x3
2007 IFC 2x3 TC1
2013 IFC 4
2017 IFC 4 Add2
2017 IFC 4.1
2019 IFC 4.2
2020 IFC 4.3 RC1&2
2021 IFC 4.3 RC3
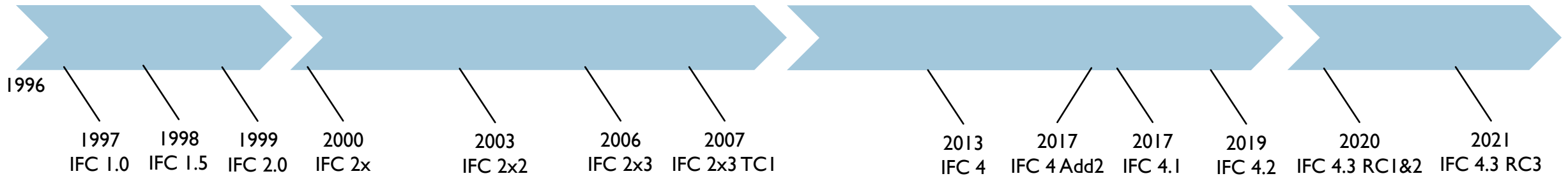
Version	Name (HTML Documentation)	ISO publication	Published (yyyy-mm)	Current Status	HTML download (ZIP)	EXPRESS	XSD	pSet XSD	OWL HTML	RDF	TTL
4.3.rc4	Coming soon	-	Coming soon	In progress							
4.3.rc3	IFC4.3 RC3	-	2021-03	Candidate							
4.3.rc.2	IFC4.3 RC2	-	2020-11	Archived				-			
4.3.rc.1	IFC4.3 RC1	-	2020-04	Archived				-			TTL IFC4.3 RC1
4.2.0.0	IFC4.2	-	2019-04	Withdrawn	ZIP	EXP	IFC4x2.xsd	-			
4.1.0.0	IFC4.1	-	2018-06	Withdrawn	ZIP	EXP	IFC4x1.xsd	-	ifcOWL IFC4.1	RDF	TTL
4.0.2.1	IFC4 ADD2 TC1	ISO 16739-1:2018	2017-10	Official	ZIP	EXP	IFC4.xsd	-	ifcOWL IFC4 ADD2 TC1	RDF	TTL
4.0.2.0	IFC4 ADD2	-	2016-07	Retired	ZIP	EXP	IFC4_ADD2.xsd	-	ifcOWL IFC4 ADD2	RDF	TTL
4.0.1.0	IFC4 ADD1	-	2015-06	Retired	ZIP	EXP	IFC4_ADD1.xsd	-	ifcOWL IFC4 ADD1	RDF	TTL
4.0.0.0	IFC4	ISO 16739:2013	2013-02	Retired	ZIP	EXP	ifcXML4.xsd	PSD_IFC4.xsd	ifcOWL IFC4	RDF	TTL
2.3.0.1	IFC2x3 TC1	ISO/PAS 16739:2005	2007-07	Official	ZIP	EXP	IFC2X3.xsd	PSD_R2x3.xsl	ifcOWL IFC2x3 TC1	RDF	TTL

MODEL VIEW DEFINITION (MVD) AND IFC

The MVD defines a subset of the overall IFC schema, to focus on a set of information for a use case or workflow. It can be used to define exchange requirements of a project.

- Software Vendors implement various MVDs to help support industry's needs. Some of the notable MVD includes
  - o IFC2x3 Coordination View 2.0
  - o IFC4 Reference View
  - o IFC4 Design Transfer View
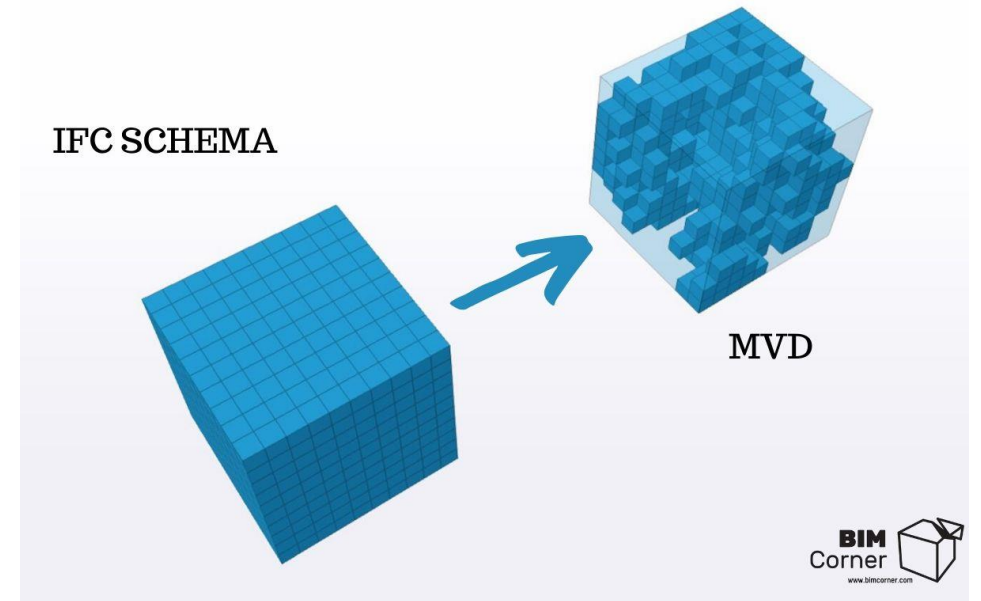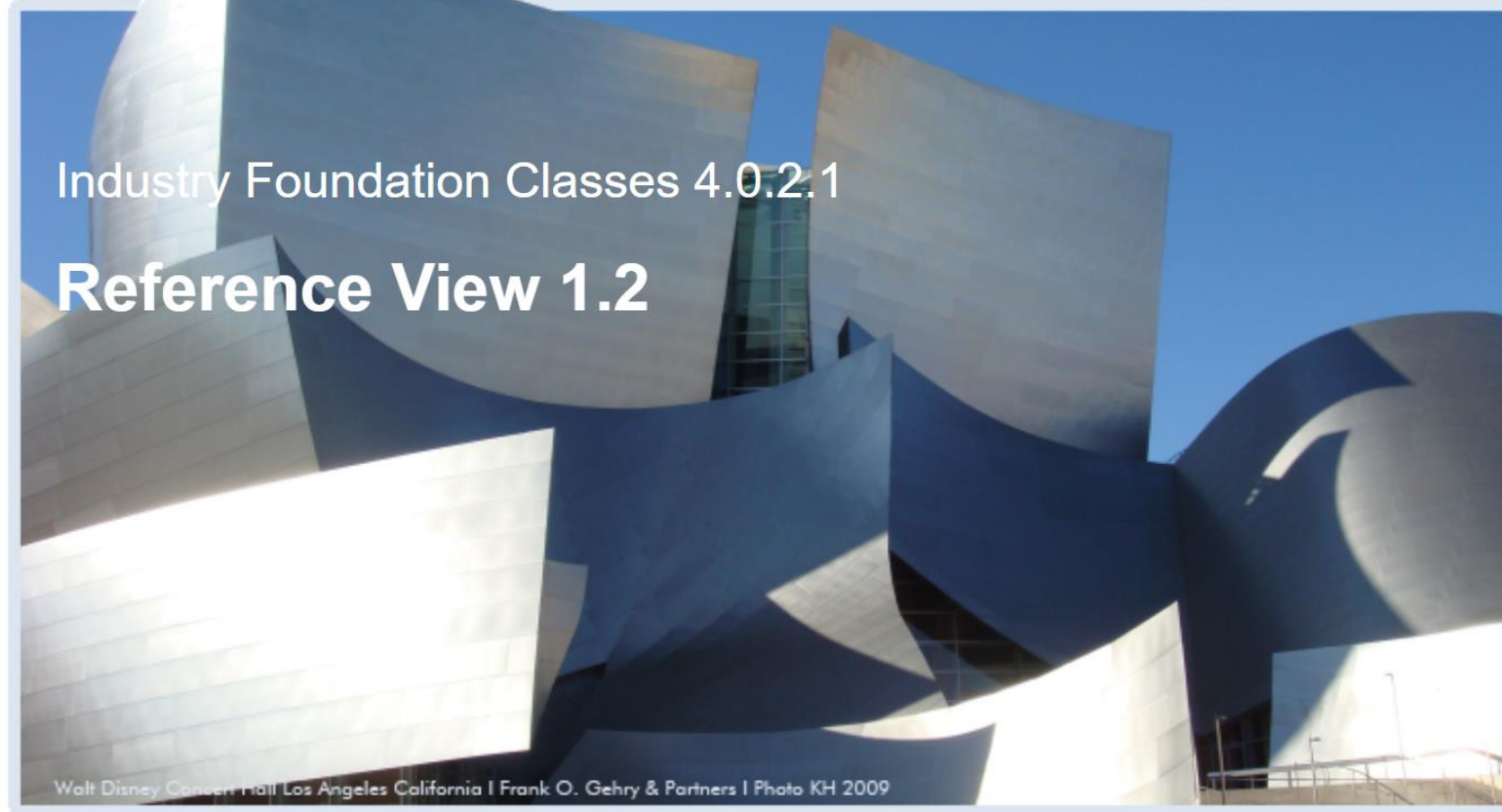
IFC SCHEMA

MVD

BIM Corner
www.bimcorner.com

Credits: BIM Corner

buildingSmart International - IFC Documentation

KEY DATA STRUCTURES IN IFC TO DESCRIBE BUILDING ELEMENTS
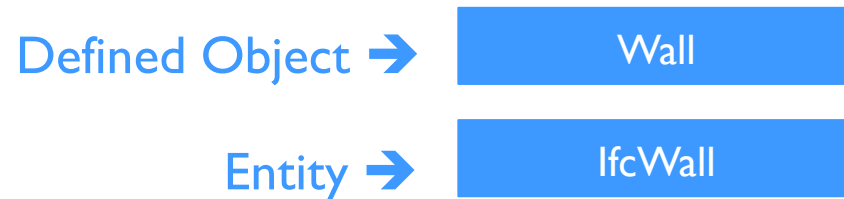
Entity

Sub-types

Property Set & Properties

KEY DATA STRUCTURES – ENTITY

An Entity is an object defined in the IFC data model

It can be used to define a physical element or a conceptual idea

A physical element - Wall / Window / Furniture / Slab / Beam / Column

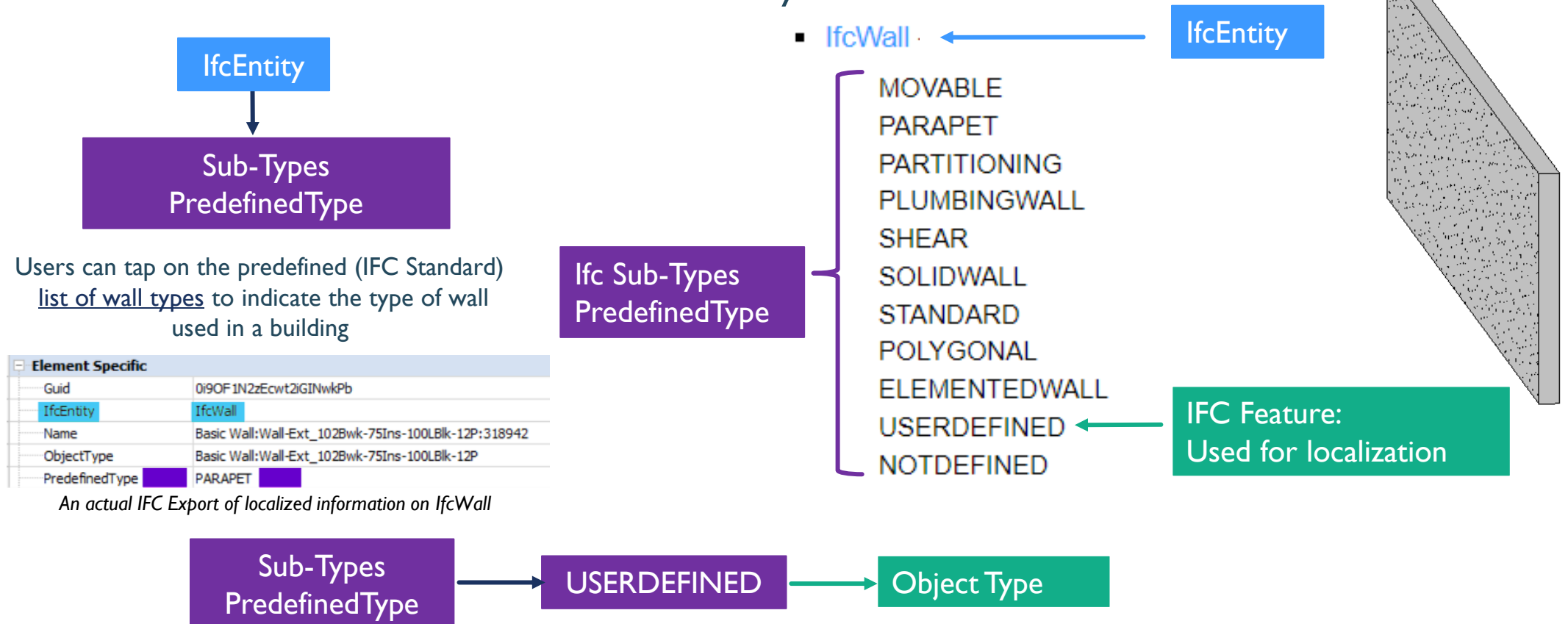A conceptual idea – Space / Spatial Zones / Site / Room / Area

Defined Object ➜ | Wall |
| --- |

Entity ➜ | IfcWall |
| --- |

The data item names for types, entities, rules and functions start with the prefix "Ifc" and continue with the English words in PascalCase naming convention (no underscore, first letter in word in upper case)

IfcWindow   IfcSlab   IfcSpace
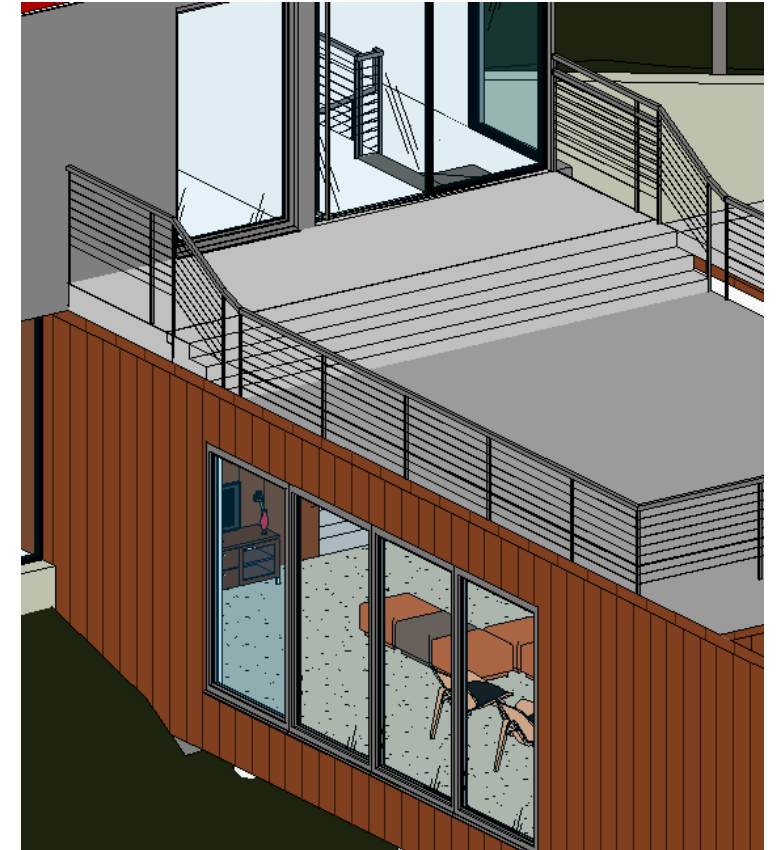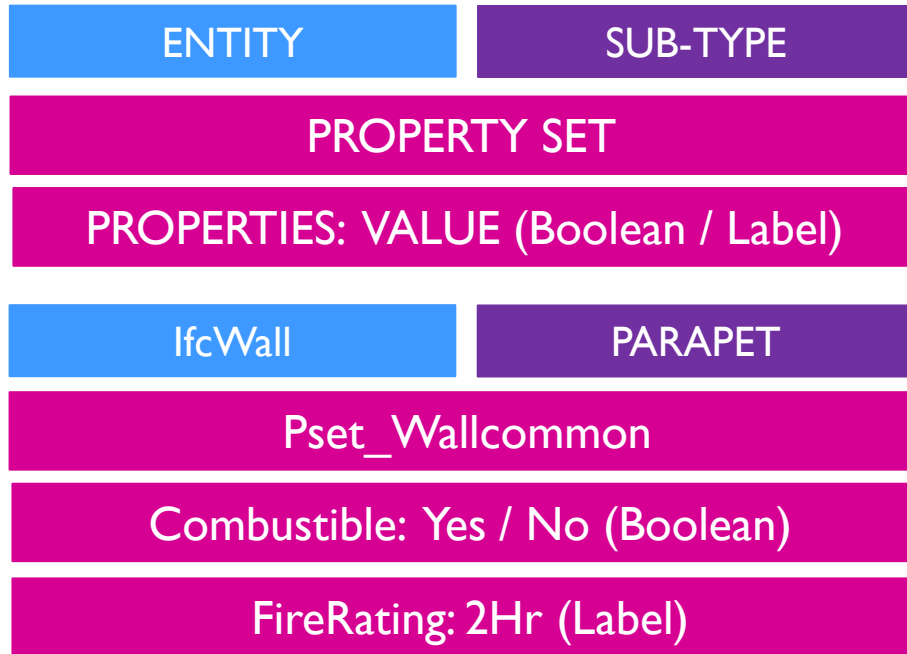
KEY IFC DATA STRUCTURES – SUB-TYPES

Defines/describes the object defined (Entity) in the data model with <mark>sub-types</mark>.

It is the next level of detail to further describe the entity.

IfcEntity

↓

**Sub-Types
PredefinedType**

Users can tap on the predefined (IFC Standard) <u>list of wall types</u> to indicate the type of wall used in a building

Element Specific	
Guid	0i9OF1N2zEcwt2iGINwkPb
IfcEntity	IfcWall
Name	Basic Wall:Wall-Ext_102Bwk-75Ins-100LBlk-12P:318942
ObjectType	Basic Wall:Wall-Ext_102Bwk-75Ins-100LBlk-12P
PredefinedType	PARAPET

An actual IFC Export of localized information on IfcWall

- IfcWall ← **IfcEntity**

**Ifc Sub-Types
PredefinedType**

MOVABLE
PARAPET
PARTITIONING
PLUMBINGWALL
SHEAR
SOLIDWALL
STANDARD
POLYGONAL
ELEMENTEDWALL
USERDEFINED ← **IFC Feature:
Used for localization**
NOTDEFINED

**Sub-Types
PredefinedType** → **USERDEFINED** → **Object Type**

KEY IFC DATA STRUCTURES – PROPERTY SET & PROPERTIES

Set/Group of Properties that describes the function or feature of the Entity/Sub-Type

ENTITY	SUB-TYPE
PROPERTY SET	
PROPERTIES: VALUE (Boolean / Label)	
IfcWall	PARAPET
Pset_Wallcommon	
Combustible: Yes / No (Boolean)	
FireRating: 2Hr (Label)	

Property Set   **Properties**   **Value (Type)**

PsetName	Properties			
Pset_WallCommon				
	Template	PropertyName	Value	Reference
	Single Value	Reference	IfcIdentifier	
	Enumerated Value	Status	IfcLabel	PEnum_ElementStatus
	Single Value	AcousticRating	IfcLabel	
	Single Value	FireRating	fcLabel	
	Single Value	Combustible	fcBoolean	
	Single Value	SurfaceSpreadOfFlame	IfcLabel	
	Single Value	ThermalTransmittance	IfcThermalTransmittanceMeasure	
	Single Value	IsExternal	IfcBoolean	
	Single Value	LoadBearing	IfcBoolean	
	Single Value	ExtendToStructure	IfcBoolean	
	Single Value	Compartmentation	IfcBoolean	
Pset_ReinforcementBarPitchOfWall	Template	PropertyName	Value	Reference
	Single Value	Description	IfcText	
	Single Value	Reference	IfcLabel	
	Enumerated Value	BarAllocationType	IfcLabel	PEnum_ReinforcementBarAllocationType
	Single Value	VerticalBarPitch	IfcPositiveLengthMeasure	
	Single Value	HorizontalBarPitch	IfcPositiveLengthMeasure	
	Single Value	SpacingBarPitch	IfcPositiveLengthMeasure	

Table 103 — IfcWall Property Sets for Objects

WHAT IS IFC-SG?

IFC-SG is localized IFC data model that is developed based on the IFC standard to address local regulatory needs

KEY DATA STRUCTURES OF IFC–SG

Entity

Sub-types

Property Set & Properties

USERDEFINED Object Type

USERDEFINED Property Set & Properties
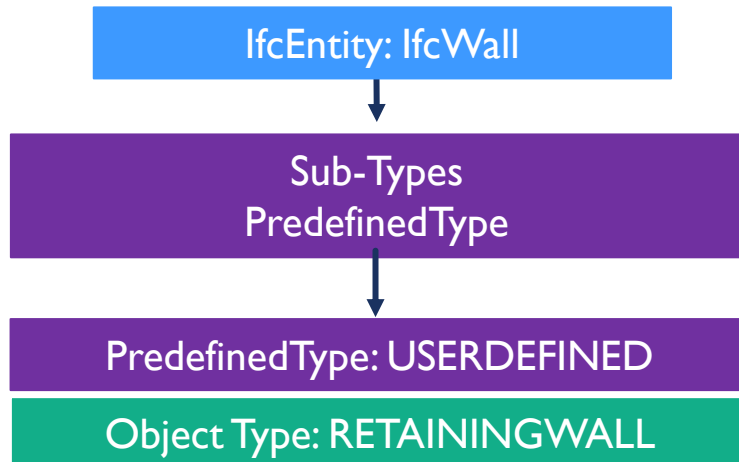
Information predefined in IFC's schema.

Localised information of interest (object types and properties) from Regulatory Requirements.

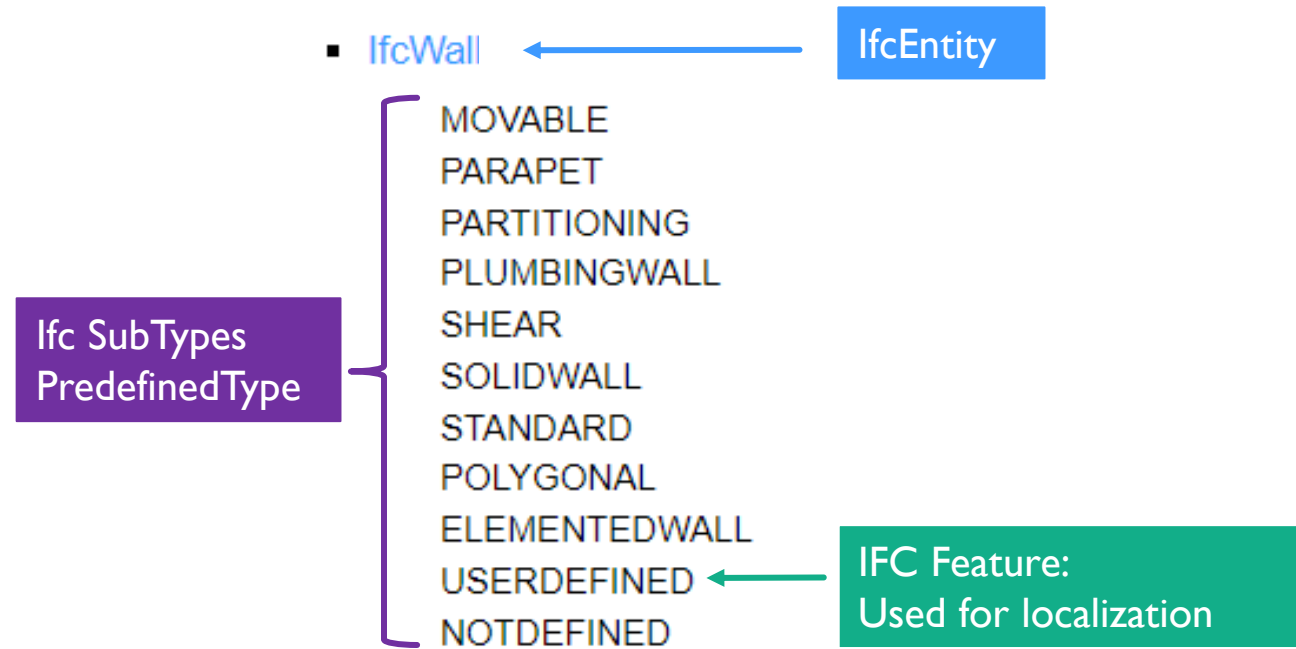# KEY DATA STRUCTURES OF IFC–SG

USERDEFINED OBJECT TYPE

When no Predefined Type exists to describe the Entity. E.g RETAININGWALL

Users may use "USERDEFINED" as Subtype provided by IFC to capture the localized information

An actual IFC Export of localized information on IfcWall

KEY DATA STRUCTURES OF IFC–SG

<u>USERDEFINED PROPERTY SETS & PROPERTIES</u>

When no Property Sets or Properties exists to describe the Entity. E.g. A wall with a WaterTight feature

Users may use USERDEFINED feature provided by IFC to capture the localized information

ENTITY	SUB-TYPE
USERDEFINED PROPERTY SET	
USERDEFINED PROPERTIES:VALUE	

IfcWall	PARAPET
SGPset_Wall	
WaterTight: Yes / No	
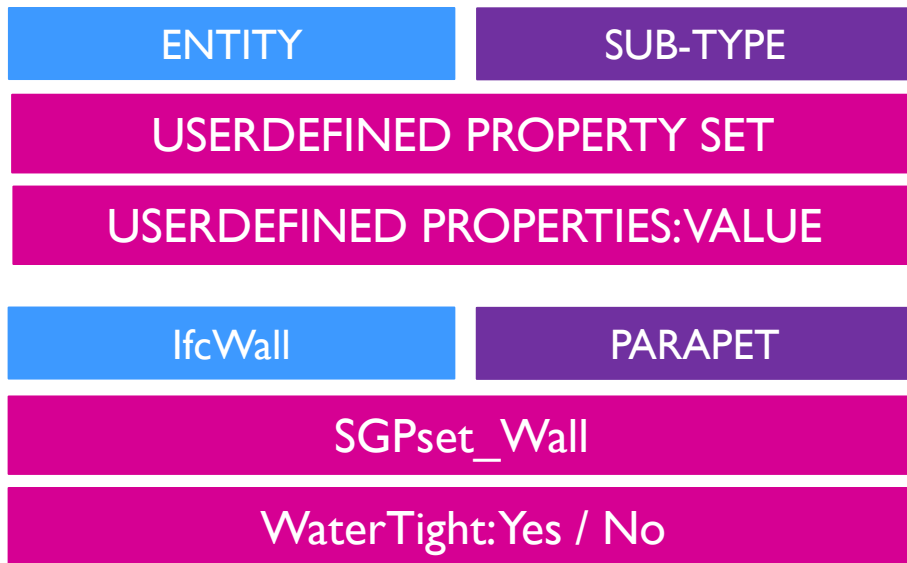
For USERDEFINED Property Sets, the naming are pre-fixed with "SG" to indicate that it captures Singapore localized requirement

PsetName	Properties	
Pset_WallCommon		
	Template	**PropertyName**
	Single Value	Reference
	Enumerated Value	Status
	Single Value	AcousticRating
	Single Value	FireRating
	Single Value	Combustible
	Single Value	SurfaceSpreadOfFlame
	Single Value	ThermalTransmittance
	Single Value	IsExternal
	Single Value	LoadBearing
	Single Value	ExtendToStructure
	Single Value	Compartmentation
Pset_ReinforcementBarPitchOfWall		
	Template	**PropertyName**	**Value**
	Single Value	Description	IfcText
	Single Value	Reference	IfcLabel
	Enumerated Value	BarAllocationType	IfcLabel
	Single Value	VerticalBarPitch	IfcPositi
	Single Value	HorizontalBarPitch	IfcPositi
	Single Value	SpacingBarPitch	IfcPositi

Table 103 — IfcWall Property Sets fo

Element Specific	
Guid	0i9OF1N2zEcwt2iGINwkPb
IfcEntity	IfcWall
Name	Basic Wall:Wall-Ext_102Bwk-75Ins-100LBlk-12P:318942
ObjectType	Basic Wall:Wall-Ext_102Bwk-75Ins-100LBlk-12P
PredefinedType	PARAPET

SGPset_Wall	
Watertight	Yes

An actual IFC Export of localized information on IfcWall

19

SPACE REPRESENTATION IN IFC-SG

- Spaces were identified & checked by Agencies.

- As there is vast number of spaces definition, users can input the name of the spaces in the properties of the object.
  Users are to refer to the excel provided to assign Entities, Subtypes, Property Sets & properties for space representations
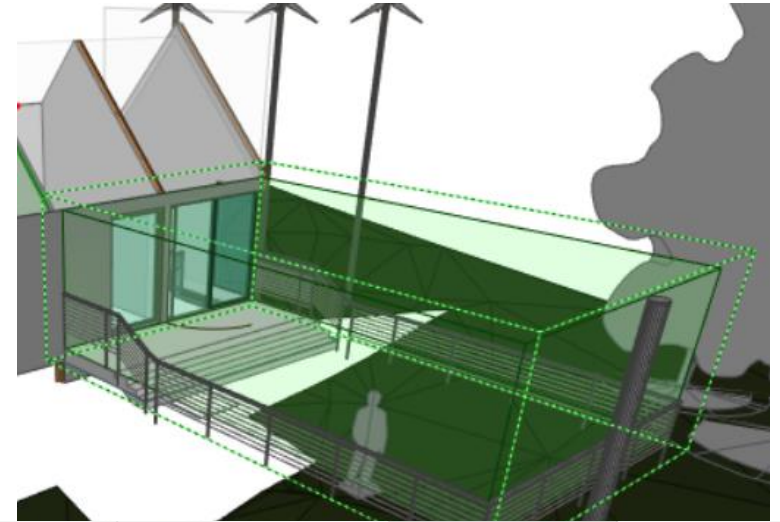
ENTITY– IfcSpace

USERDEFINED PROPERTY SET

USERDEFINED PROPERTIES: VALUE

SGPset_Space

SpaceName: Kitchen / Corridoor … etc (Label)

URA excel which documents the space information

UNDERSTANDING THE MAPPING

UNDERSTANDING THE MAPPING
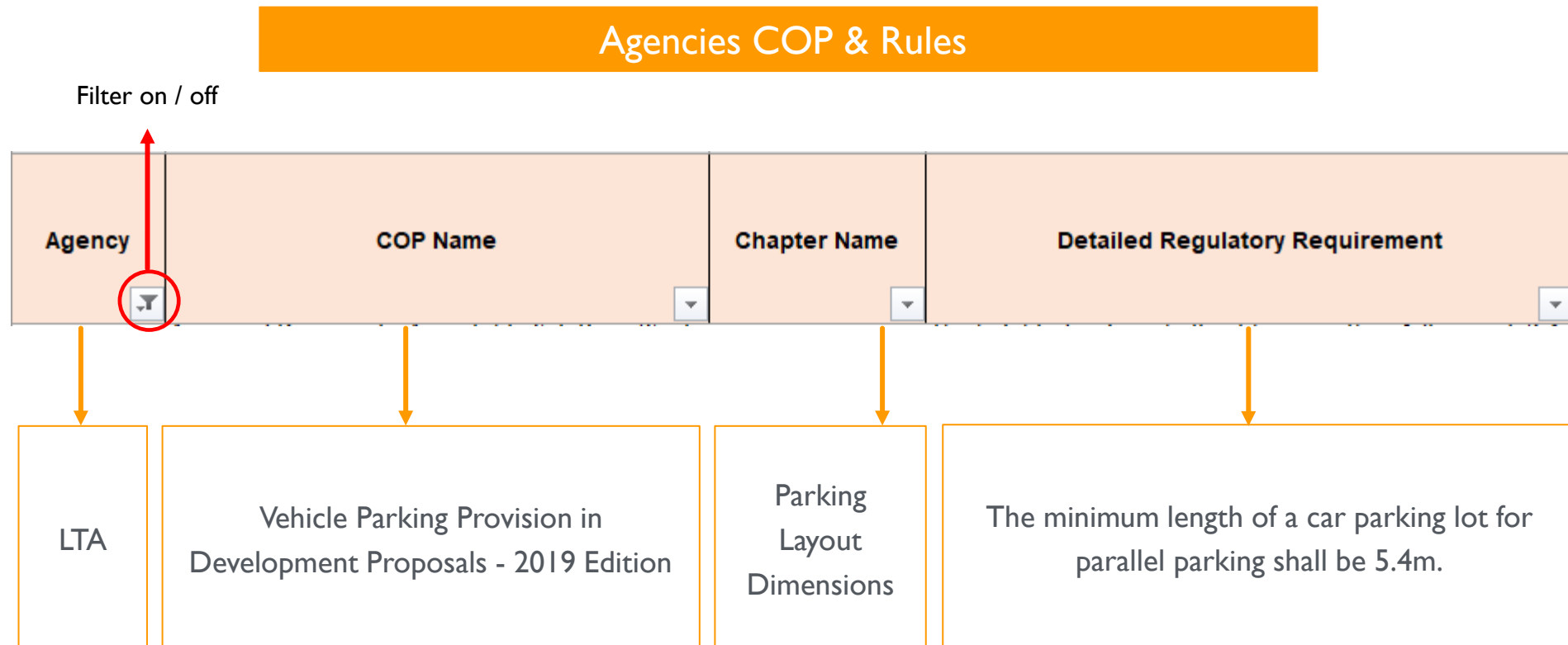
IFC-SG MAPPING

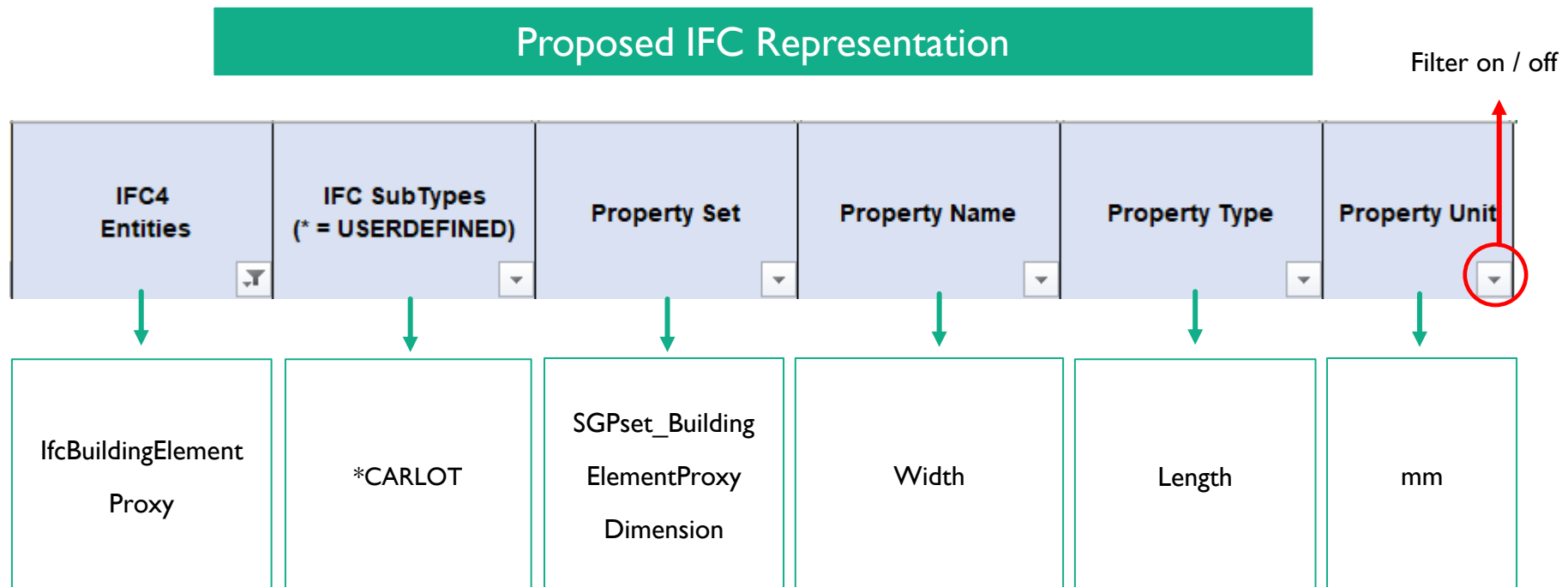# UNDERSTANDING THE MAPPING

IFC-SG MAPPING

UNDERSTANDING THE MAPPING

IFC-SG MAPPING

Proposed IFC Representation

Filter on / off

IFC4 Entities	IFC SubTypes (* = USERDEFINED)	Property Set	Property Name	Property Type	Property Unit
IfcBuildingElement Proxy	*CARLOT	SGPset_Building ElementProxy Dimension	Width	Length	mm
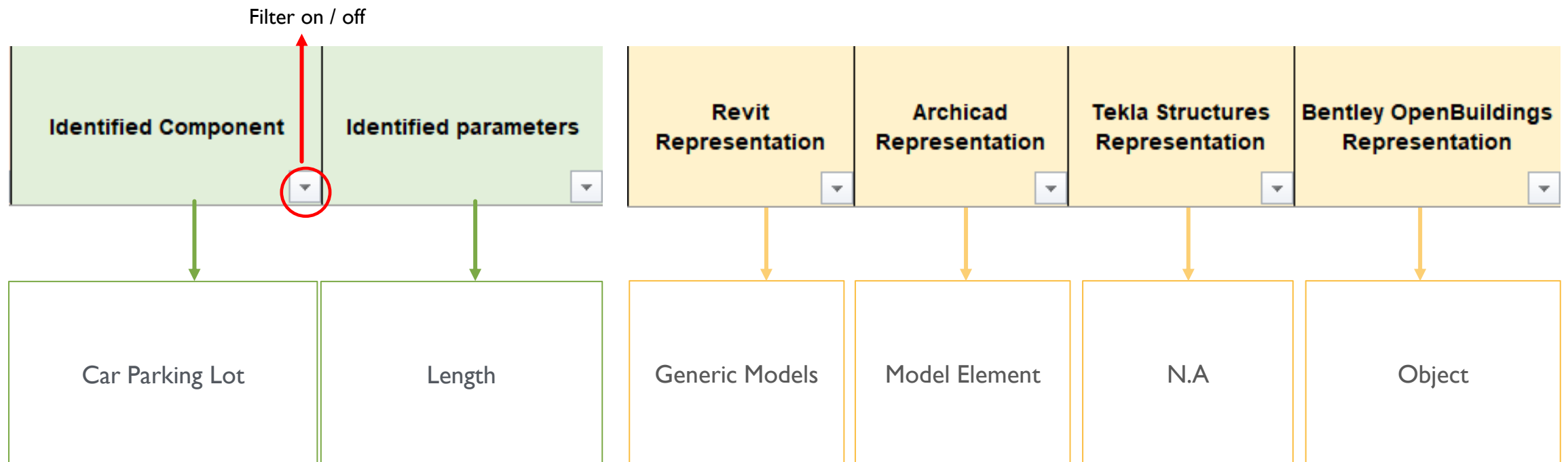
* = USERDEFINED Subtype

AUTO POPULATING DIMENSIONS

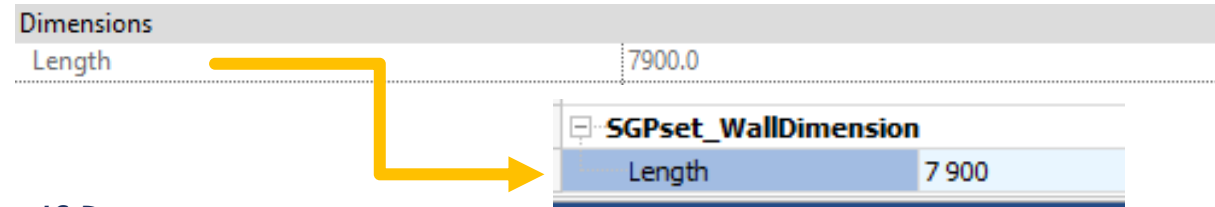*Dimensions in Native BIM auto populates & information will be exported to IFC*

Default dimensions in Native BIM will be exported under the Property Set SGPset_EntityDimension
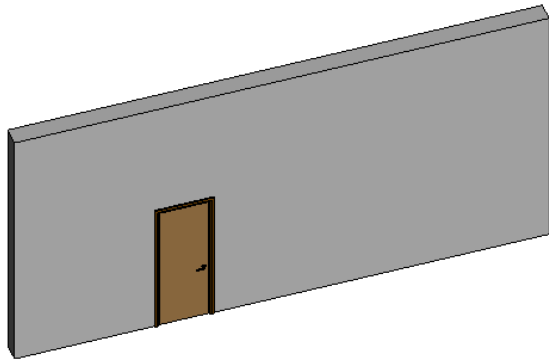
E.g. IfcWall
Default dimensions
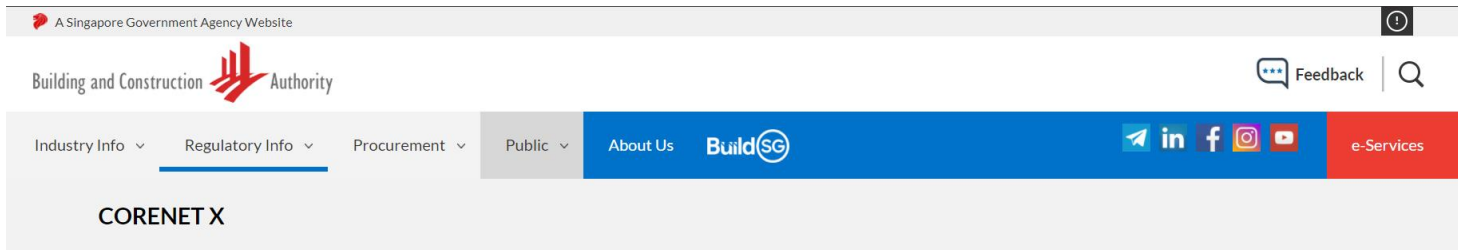*"Length" will be exported under SGPset_WallDimension with property "Length".*

Dimensions		
Length		7900.0

SGPset_WallDimension	
Length	7 900

E.g. IfcDoor
Default dimensions
"Width" will be exported under SGPset_DoorDimension with property "Width".

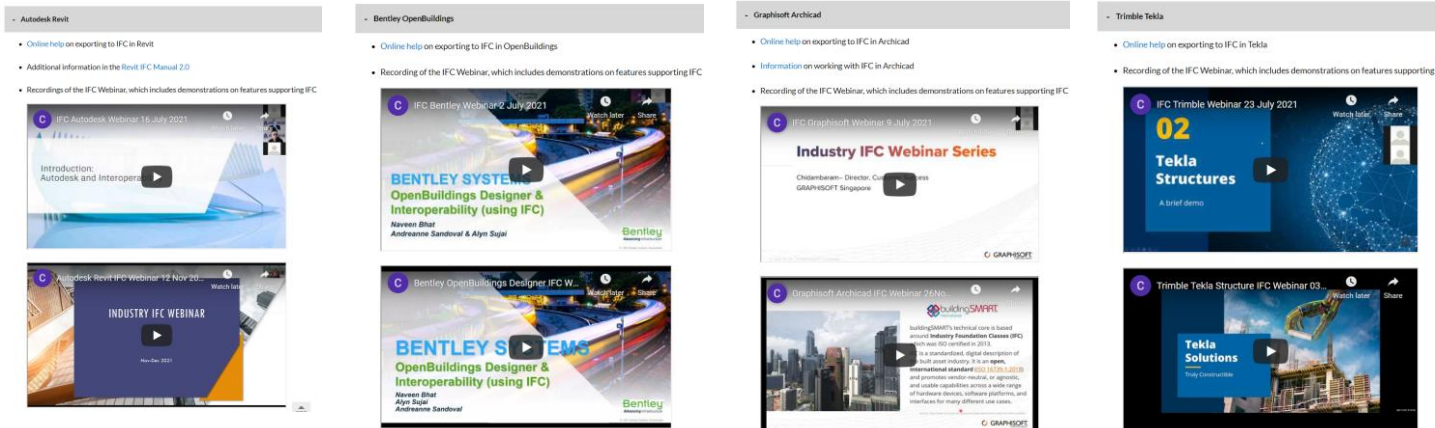| Dimensions		
Width		810.0

SGPset_DoorDimension	
Width	810

CORENET X BCA WEBSITE

More information on IFC and recordings are available on the website: https://www1.bca.gov.sg/regulatory-info/building-control/corenet-x

CHANGELOG

Date	Description
22 Nov 2022	Added description on auto populating dimensions