

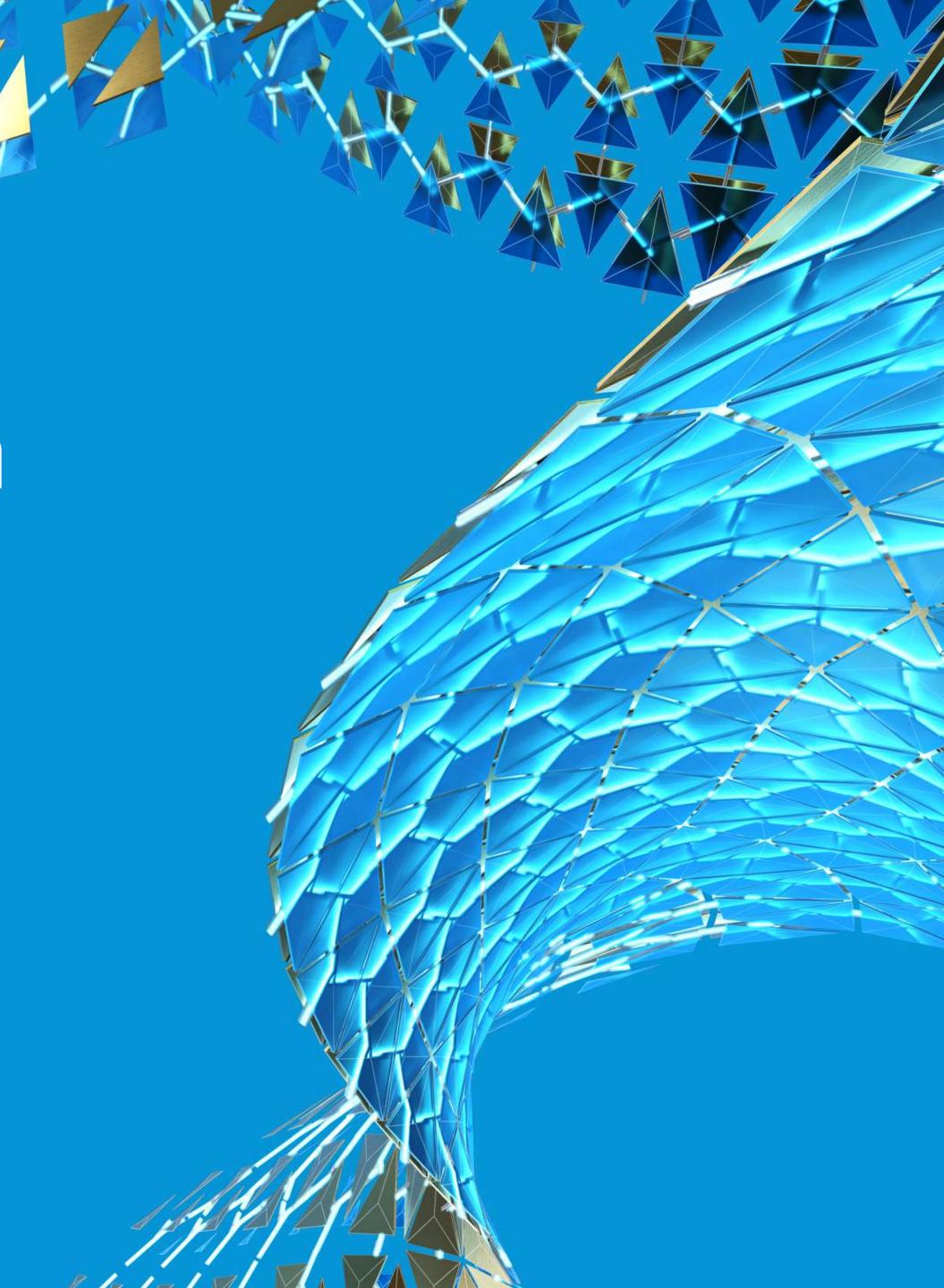
# Development Progress on IFC for Infrastructure

Marek Suchocki - Autodesk

Sales Development Executive | @msuchocki

Tiina Perttula - Ramboll

Chair of building SMART International InfraRoom





#### Marek Suchocki

#### Sales Development Executive

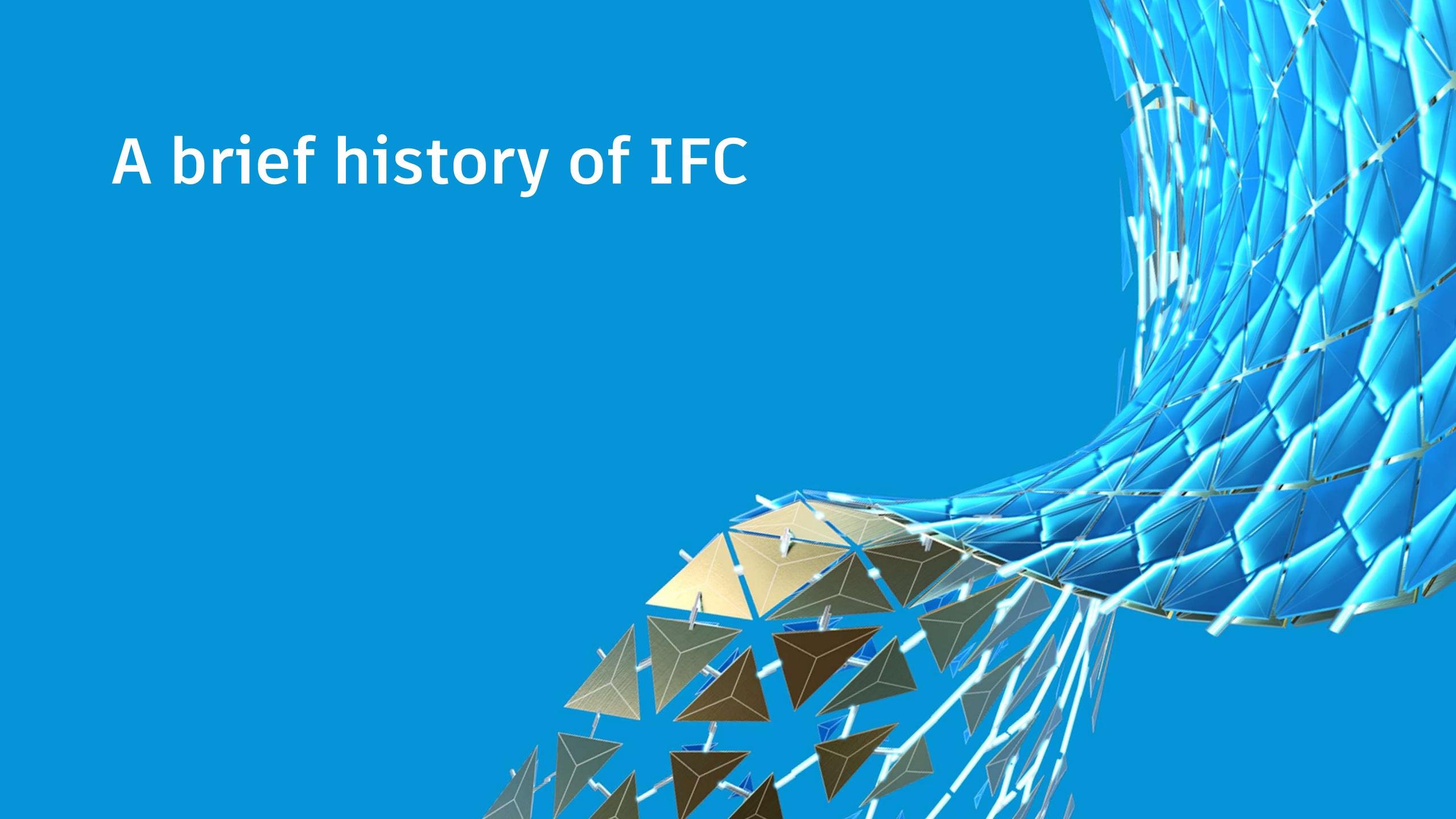
Marek holds a degree in Civil Engineering, is a Chartered Engineer, Chartered IT Professional, Fellow of the British Computer Society, Fellow of the Institution of Civil Engineers (ICE) and a Member of the Chartered Institution of Civil Engineering Surveyors (CICES). Marek sits on expert panels within the CICES, the ICE, the UK BIM Alliance, the buildingSMART InfraRoom and the British Standards committee that authored UK BIM standards and the ISO 19650 standards series.



#### Tiina Perttula

#### Chair of building SMART InfraRoom

Tiina works as a Development Manager and Infra BIM expert within Ramboll. Tiina is the Chair of the buildingSMART International InfraRoom Steering Committee and has previously worked as a BIM champion within Väylä the Finnish Transport Infrastructure Agency.



## The IAI

Autodesk creates the Industry Alliance for Interoperability.

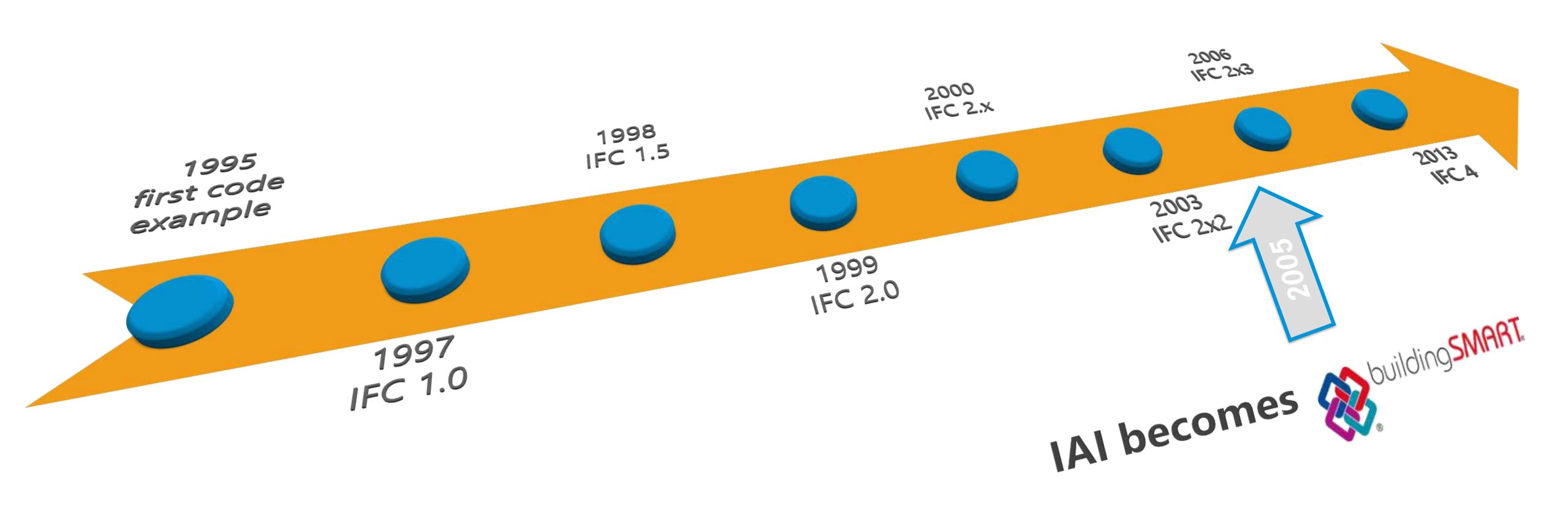


IAI renamed as
International Alliance
for Interoperability.
First version of IFC
published.



Tech demoed at A/E/C Systems 95. Membership opened to any interested parties.

# IFC through the years



## What exactly is an IFC?

#### **IFC** = Industry Foundation Class

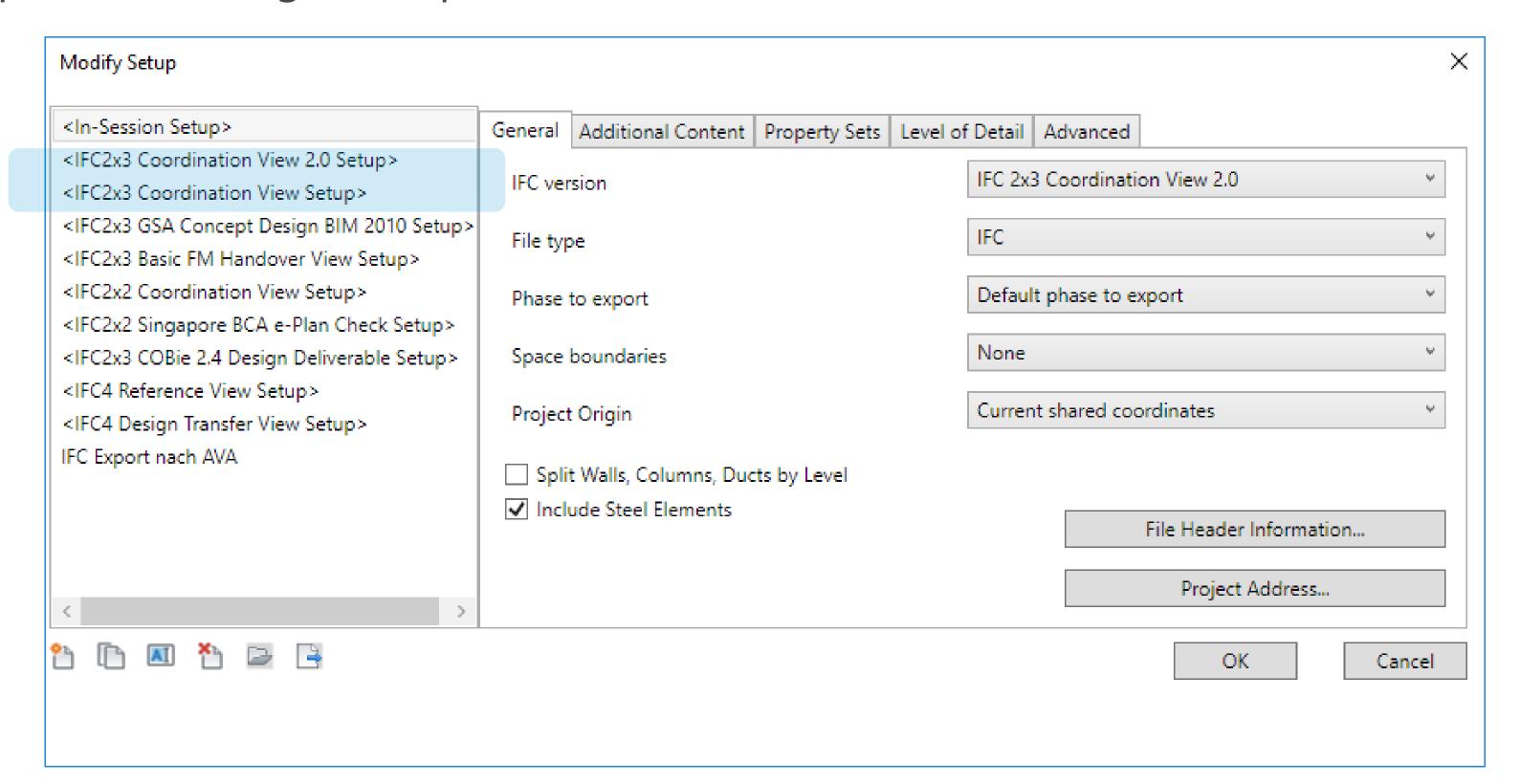
- IFC is developed by buildingSMART
- IFC is a data model to describe architectural, building and construction industry data
- IFC is platform neutral
- IFC is an open file format specification not controlled by a single party
- IFC is object-based
- IFC is an ASCII (human readable) file format
- IFC is available in many forms: IFC-SPF (STEP), IFC-XML (STEP-XML) and IFC-ZIP (compressed SPF or XML)
- IFC is an official International Standard ISO 16739-1:2018
- IFC is being modernised with ifcOWL (RDF triple language), ifcJSON (JavaScript Object Notation) and ifcHDF5 (Hierarchical Data Format v5) as trials to overcome limitations in its current forms

### IFC Model View Definitions

You need 3 components for a valid IFC file: IFC Schema, IFC version, MVD.

An MVD is a subset of the IFC schema, needed to satisfy one or many Exchange Requirements

The MVD must be specified during the export:



### IFC 2x3 Coordination View

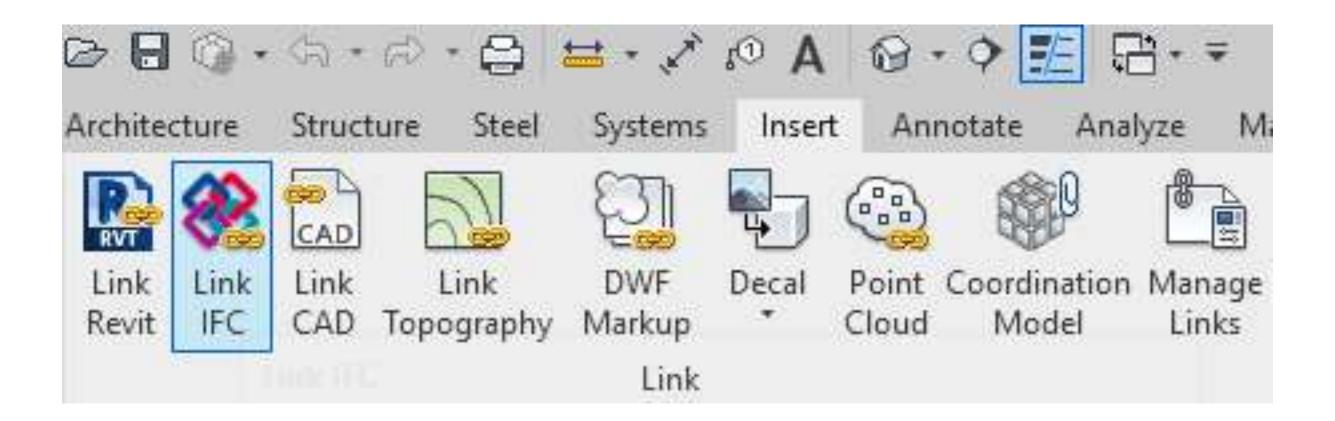
- targets coordination between architectural, mechanical and structural engineering tasks during the design phase.
- the shared model is supposed to be re-editable by the receiving application.
- includes the definition for spatial structure, building, and building services elements with shape representations.
- includes parametric shapes for a limited range of standard elements.
- includes ability to include non-parametric shape for all other elements,
- to which property sets, material definitions and alphanumeric information can be assigned
- round-trip scenarios are explicitly excluded

http://www.buildingsmart-tech.org/specifications/ifc-view-definition/coordination-view-v2.0/summary

#### IFC4 Reference View

#### Goal of the Reference View:

- provide building information for the widest array of software without geometry modification.
- applications such as viewing, estimating, building, operating, and other downstream analysis.

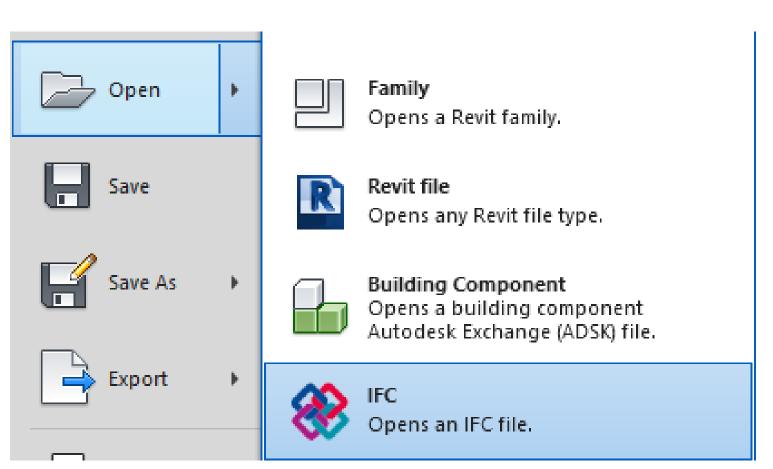


http://www.buildingsmart-tech.org/specifications/ifc-view-definition/ifc4-coordination-views/ifc4-cvs-summary

## IFC4 Design Transfer View

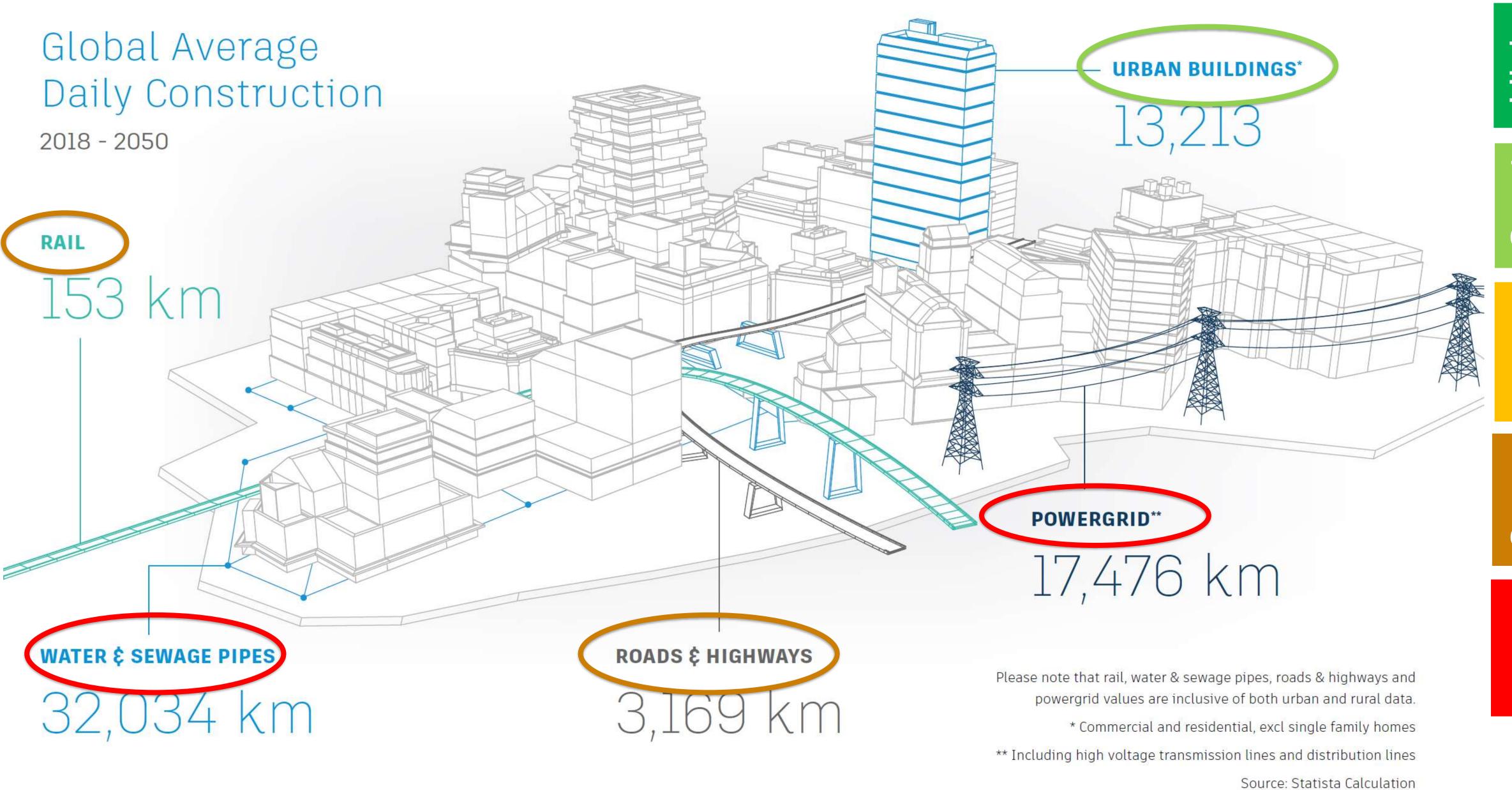
#### Goal of the Design Transfer View

- to provide building information with support for editing of interconnected elements.
- applications include inserting, deleting, moving, and modifying physical building elements and spaces.
- target scenario is an architect providing building design information to an engineer where geometric modifications may need to be made.



http://www.buildingsmart-tech.org/specifications/ifc-view-definition/ifc4-coordination-views/ifc4-cvs-summary

## How applicable has IFC been?



High use

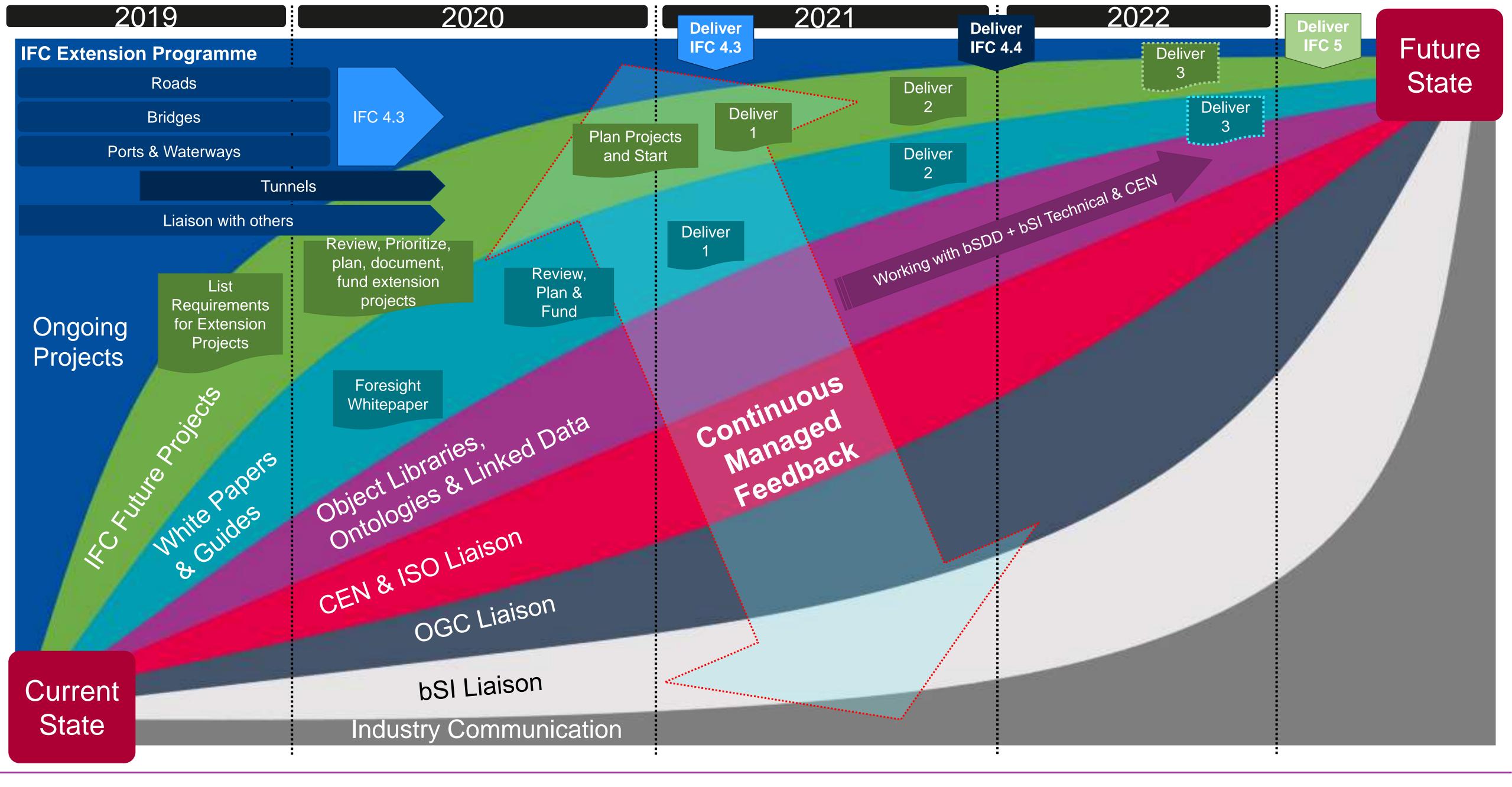
Modest

Some

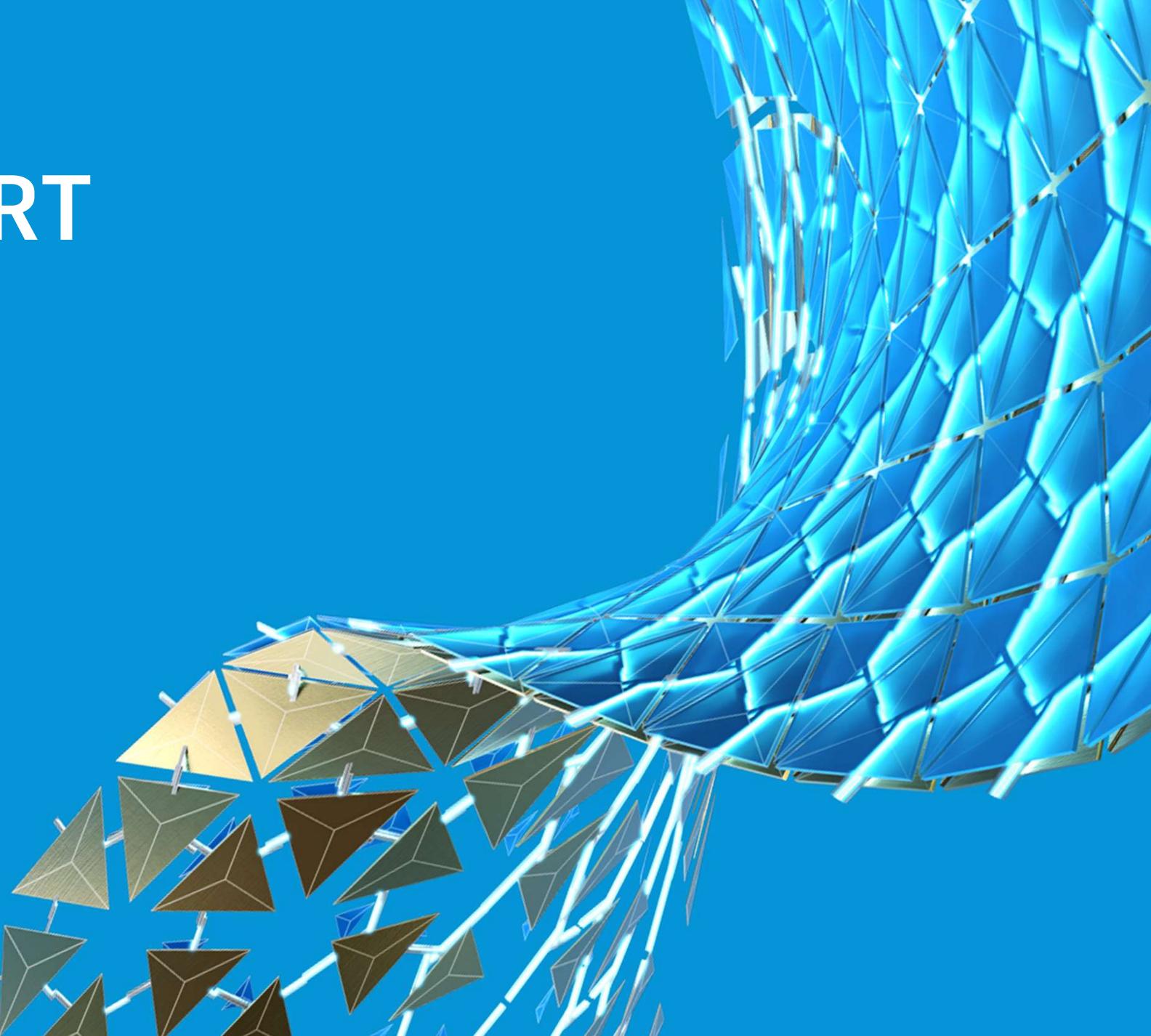
No use







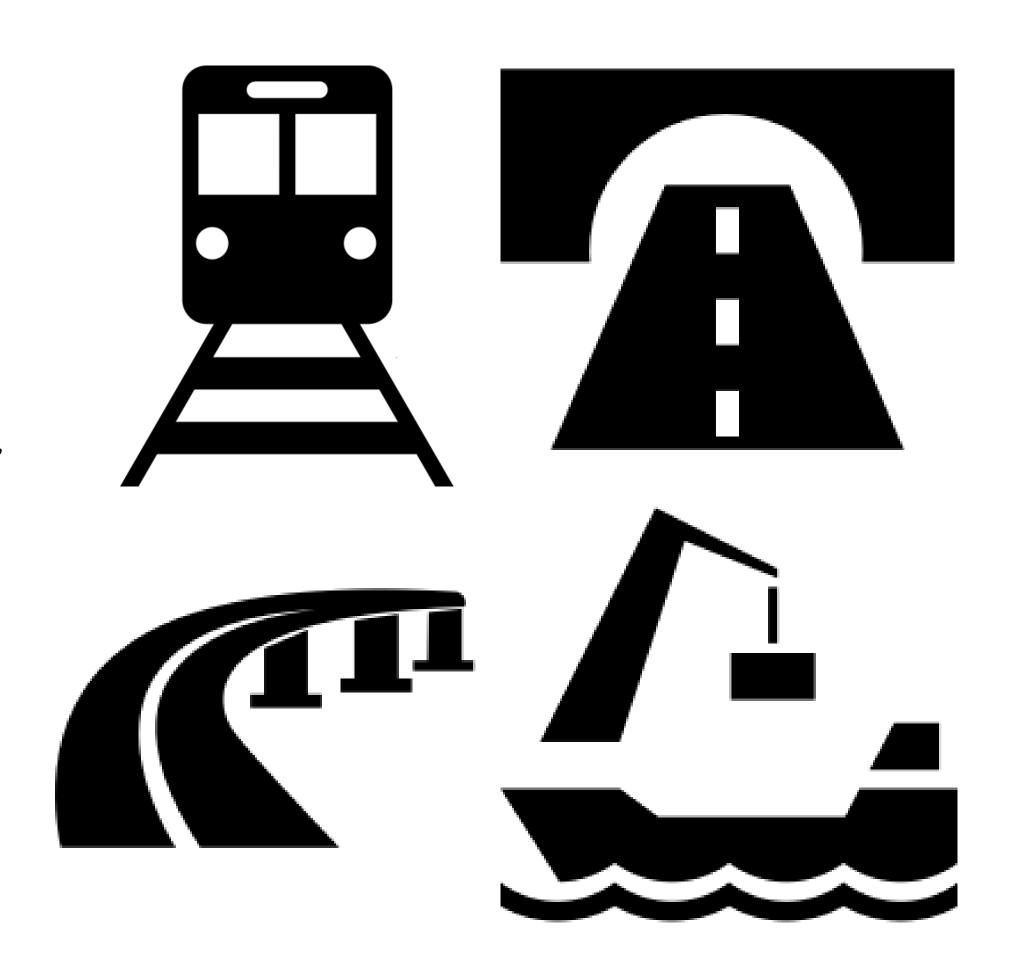
# building SMART InfraRoom



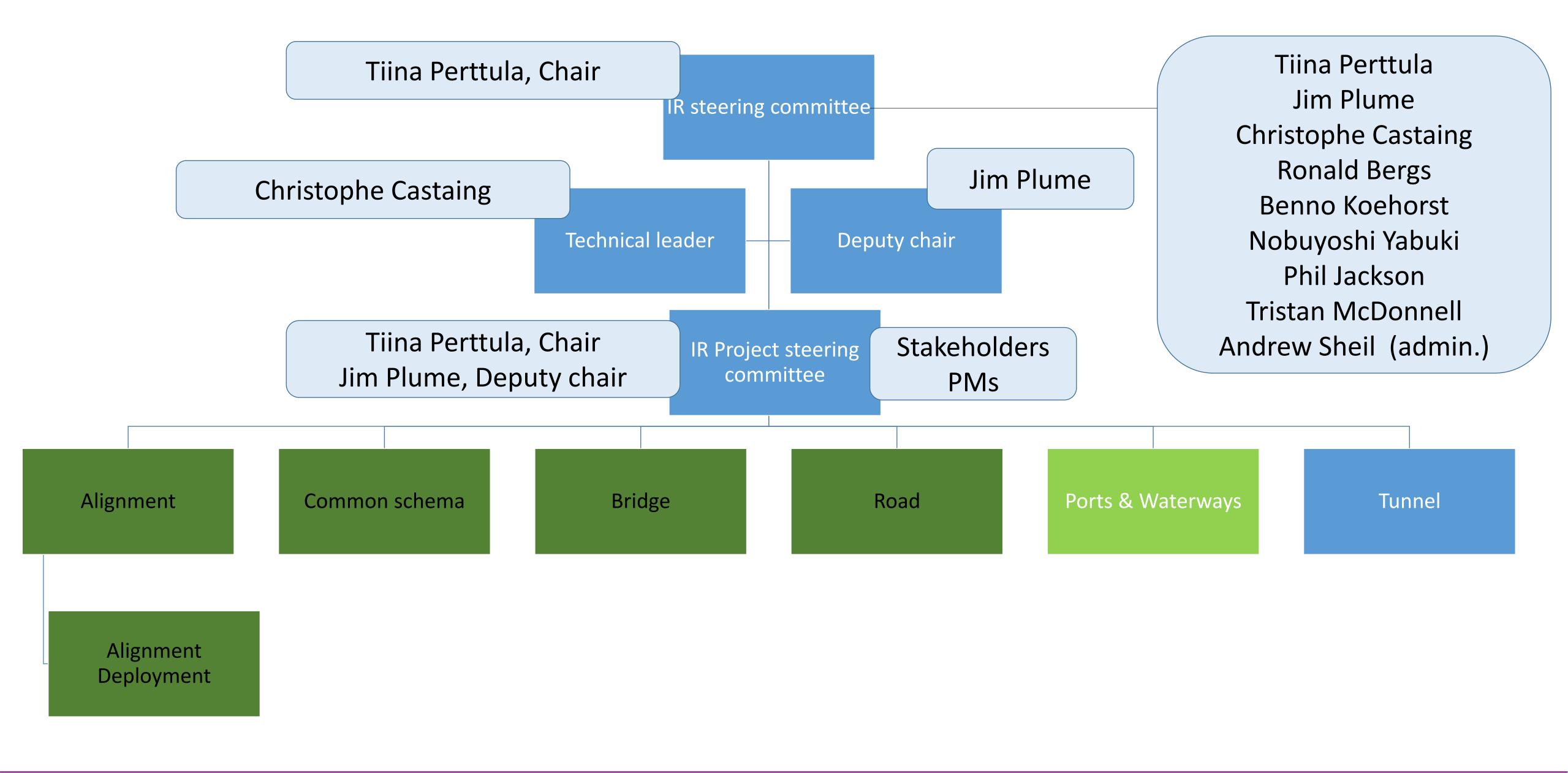
### InfraRoom Mission & Scope

Mission: To combine, enhance and develop open standards for intelligent data, which enable process and data integration for Infrastructure

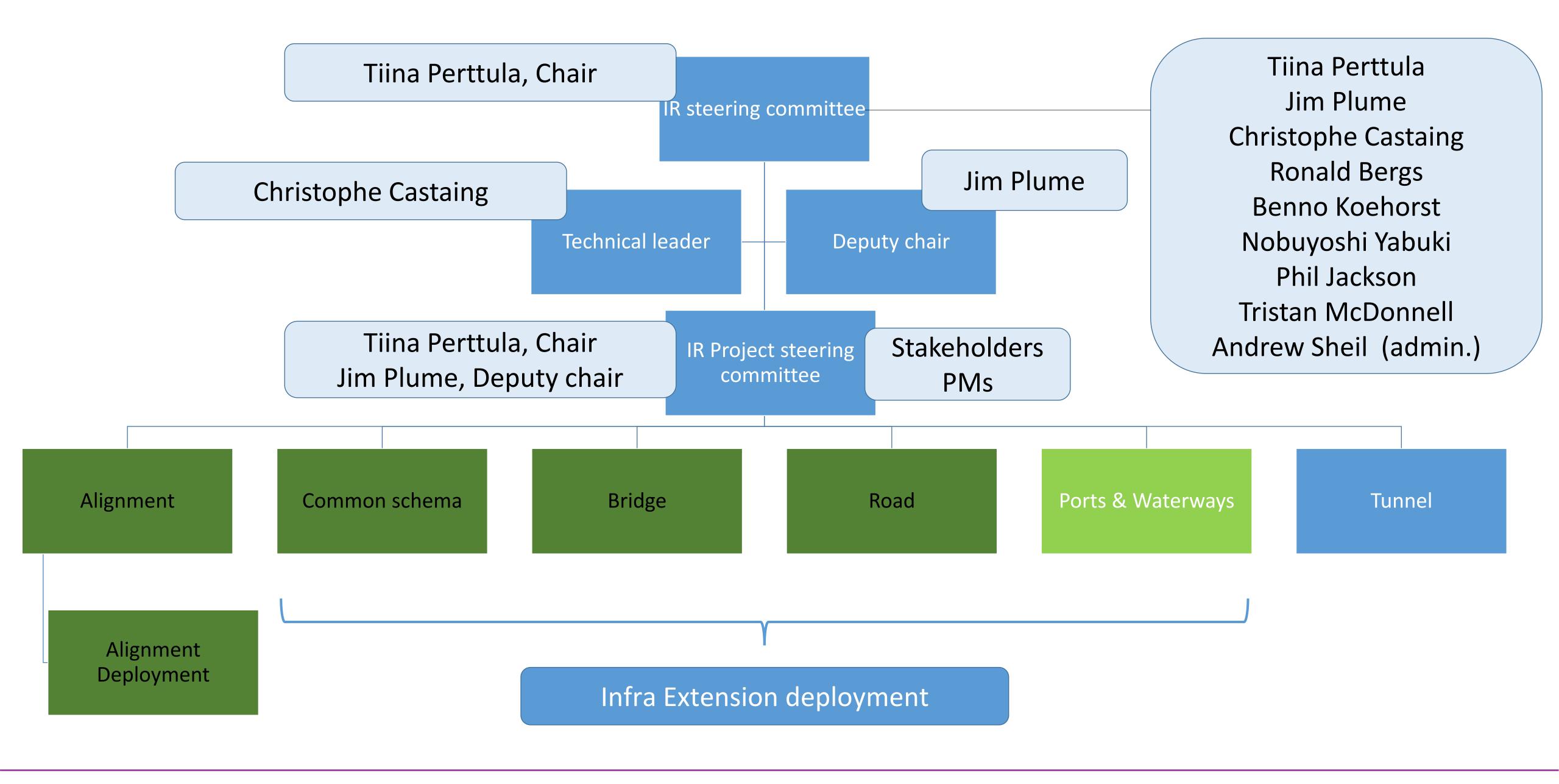
Scope: Information exchange and process standards to support effective management of constructed built environment & linking and integrating across BIM and GIS.





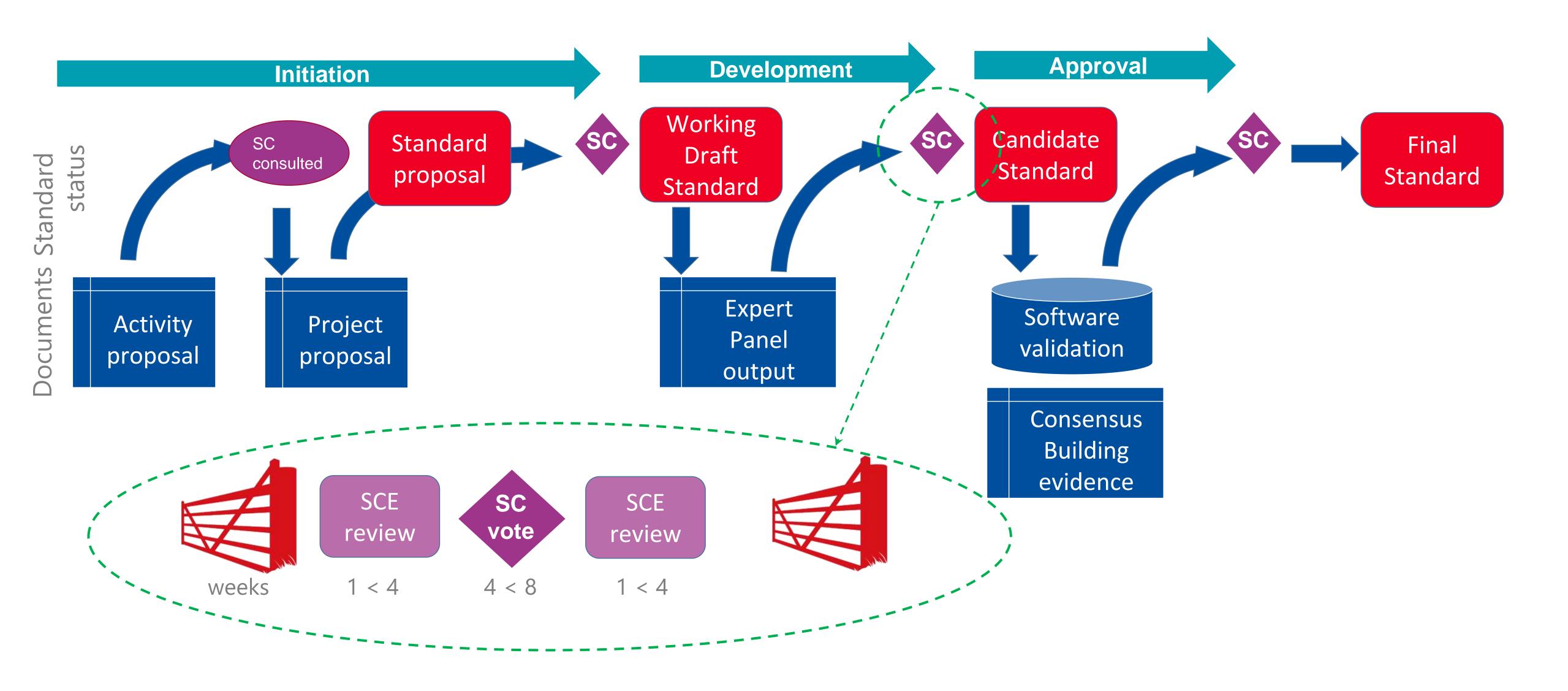






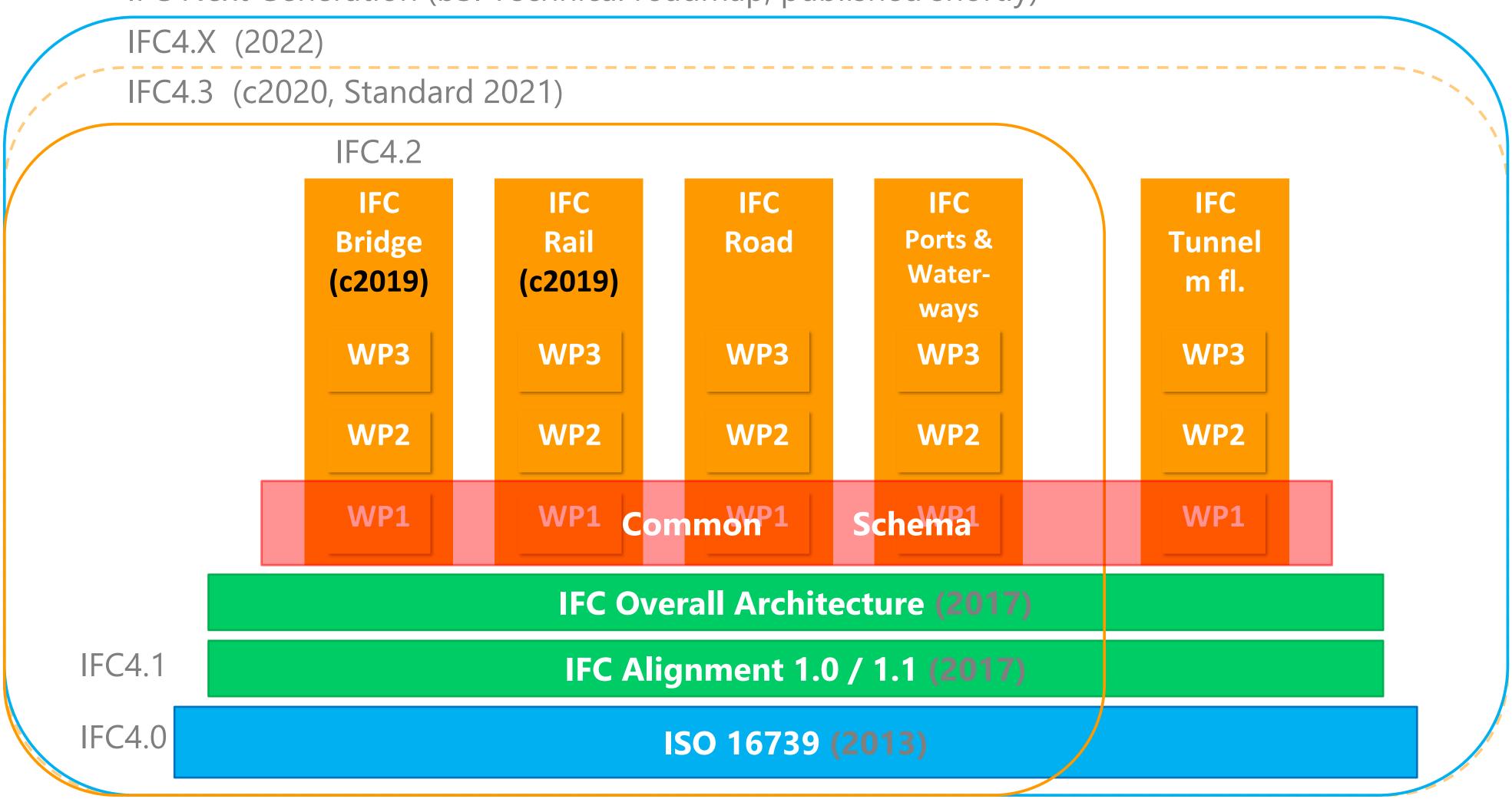


## bSI Standards Development Process



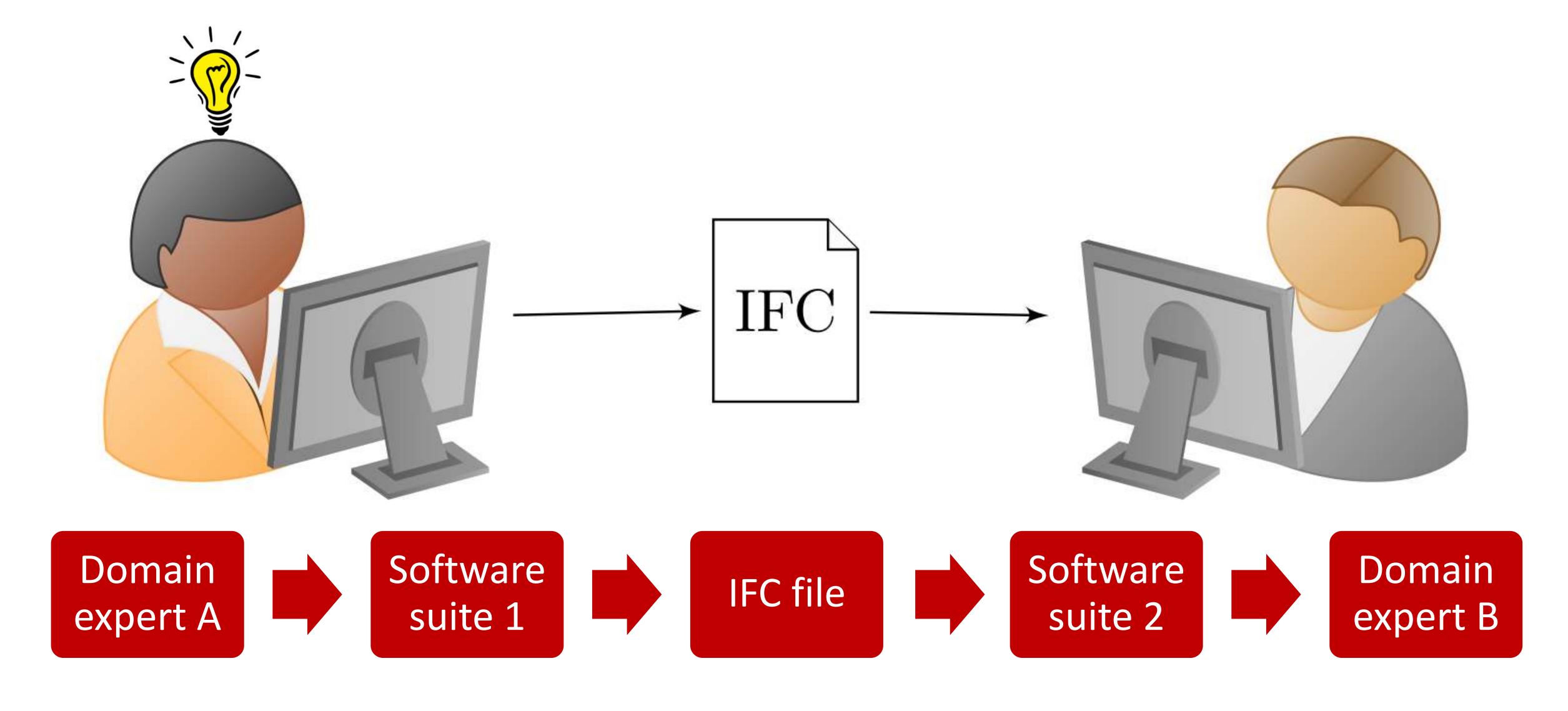
## Infrastructure Extensions – Overall Progress

IFC Next Generation (bSI Technical roadmap, published shortly)





### IFC Exchange Flow Abstraction





## **Ensuring Exchange Quality**



#### Storyline (SL)

- Real life data exchange
- Covers 1-to-many exchanges

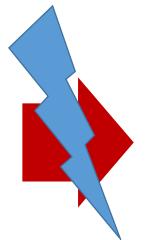


- Small, atomic example
- Little-to-no overhead

Validation: do the right things

Verification: do things right

Domain expert A



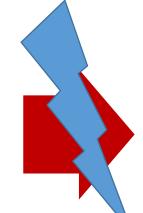
Software suite 1



IFC file



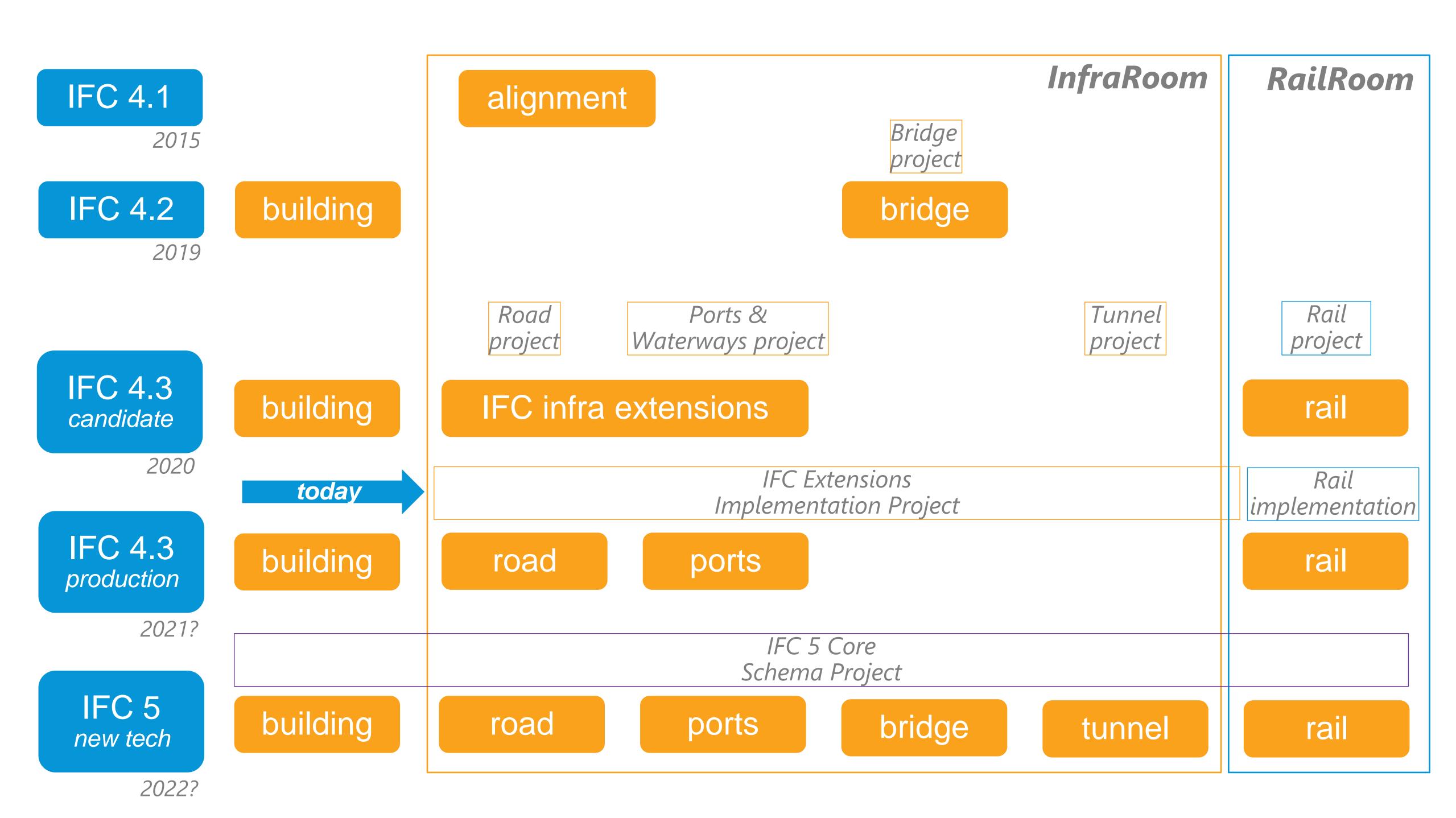
Software suite 2



Domain expert B







## Organisations providing scenarios

IFC Infrastructure Extensions programme

Well developed scenario









Bridges

Rail

Drainage Ports

Yet to provide scenario



















Väylävirasto

Trafikledsverket

Statens vegvesen

**Norwegian Public Roads** 

Administration



**ACTIVITIES** 





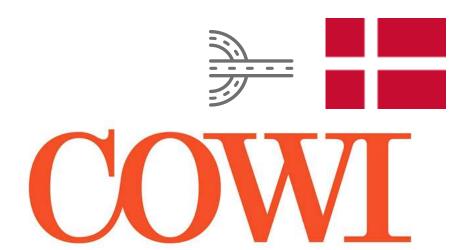
























## Software vendor pilot implementation

IFC Infrastructure Extensions programme





## AUTODESK. TITT



























































# Organisations providing scenarios

IFC Railway programme



























Illustrative scenarios

Rail Specific	Infrastructure generic
Alignment with Cant	Alignment
Linear placement	Linear placement (point)
Swept solid geometry with cant	Linear span placement (From-To)
Railway spatial structure/zone	Linear placement – broken chainage
System functional breakdown	Earthworks
Wireless connectivity	Subgrade
Track elements	Drainage
Spatial elements	Terrain and soil models
Overhead Contact Line elements	Geotechnics
Telecom elements	System of systems

# Software vendor pilot implementation

IFC Railway programme







Bentley®

**C** Catenda

S DASSAULT SYSTEMES

























additional Railway Room pilot implementation participants



























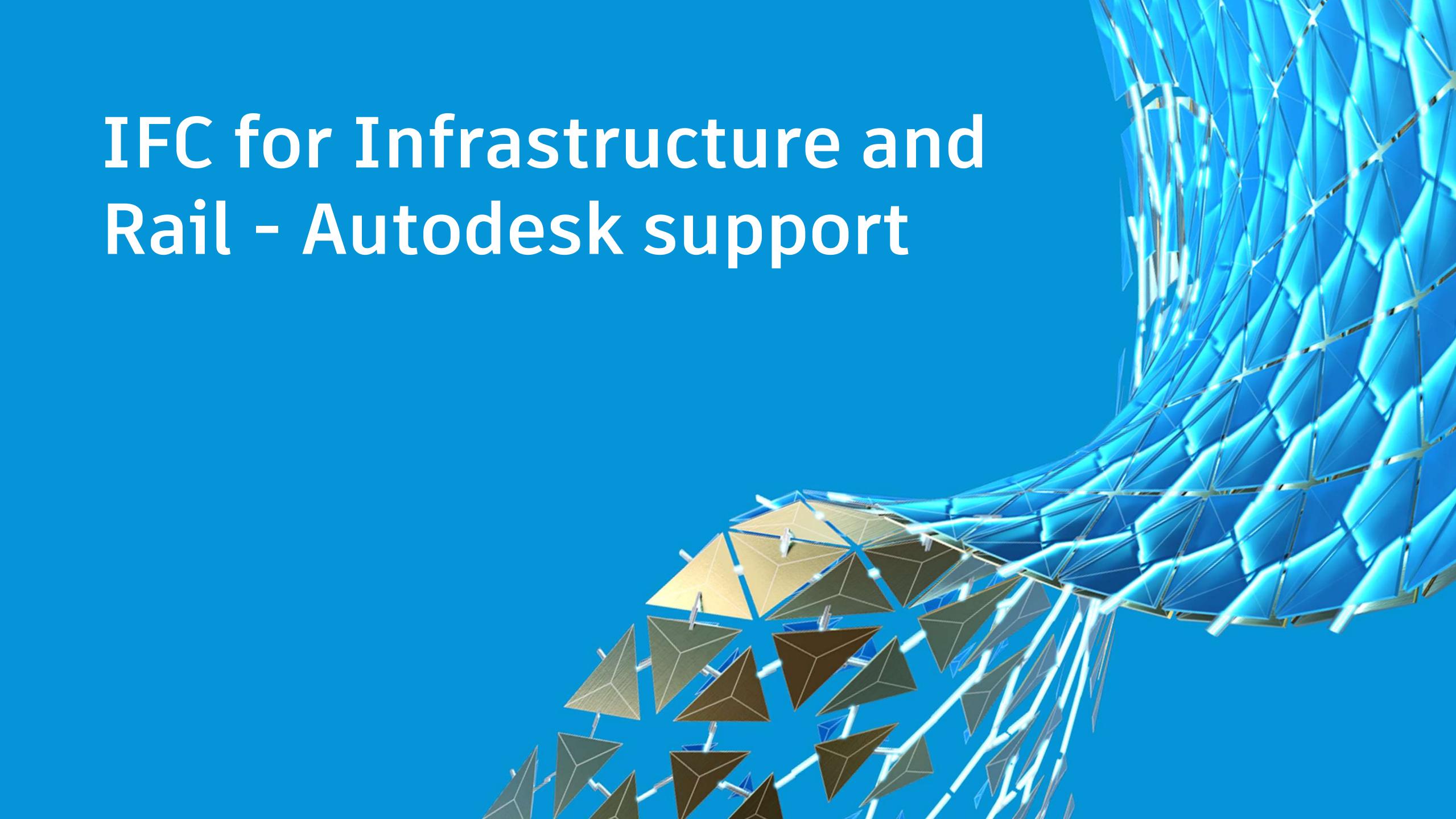




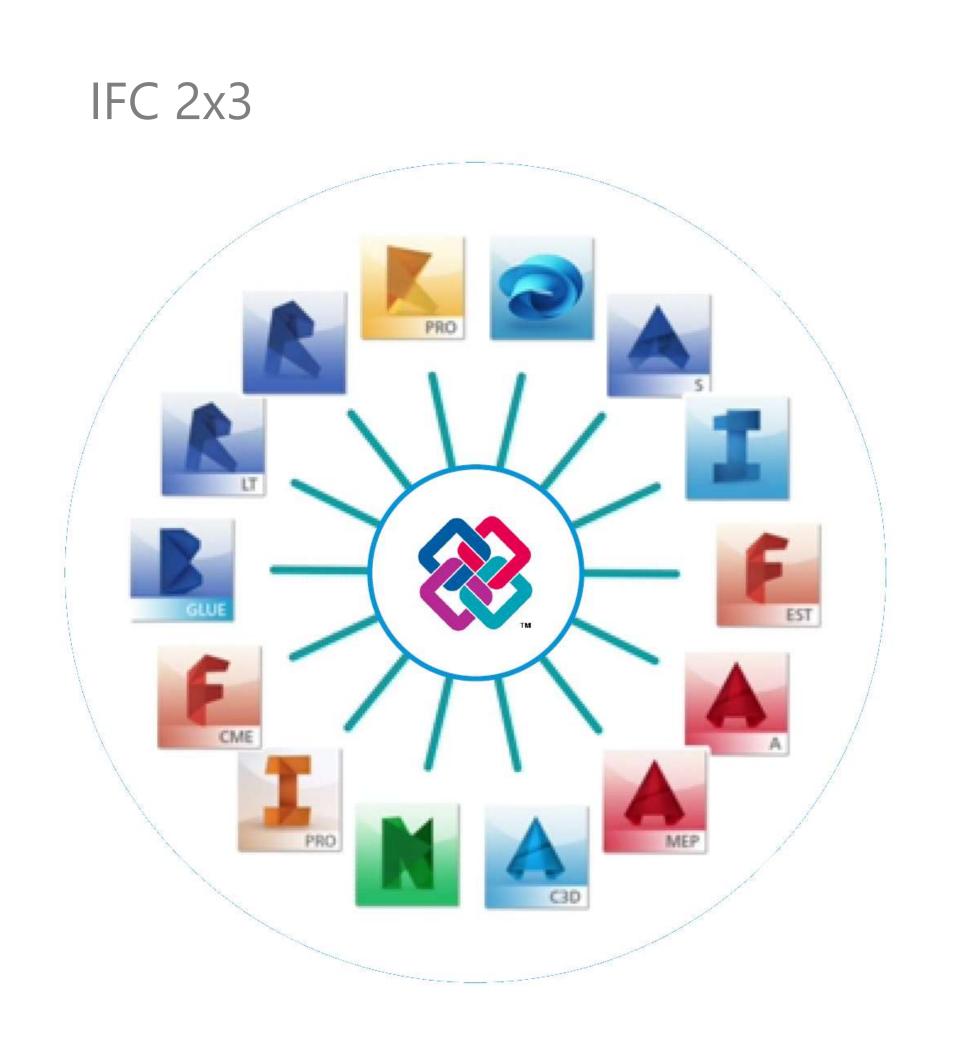
# IFC 4.3 Status update

#### As of October 2020

- IFC 4x3\_RC1 (release candidate 1) needs to be revised
- On October 21st (day after this class was recorded!) an Expert Panel meeting will receive feedback on IFC4x3\_RC2
- Plan is to release IFC4x3\_RC2 during the buildingSMART Virtual Summit at end of October
- Schema is being revised due to:
  - o concerns raised during the early extensions testing in the Railway programme
  - vendor feedback,
  - experience from production of reference files,
  - o and result of survey with IFC Rail stakeholders.
  - Issues with the alignment definition were identified
  - o and ongoing concerns with rail spiral support not meeting industry needs.
- This also has a consequent impact on IFC Infrastructure Extensions programme



# Autodesk IFC for Infrastructure Support currently





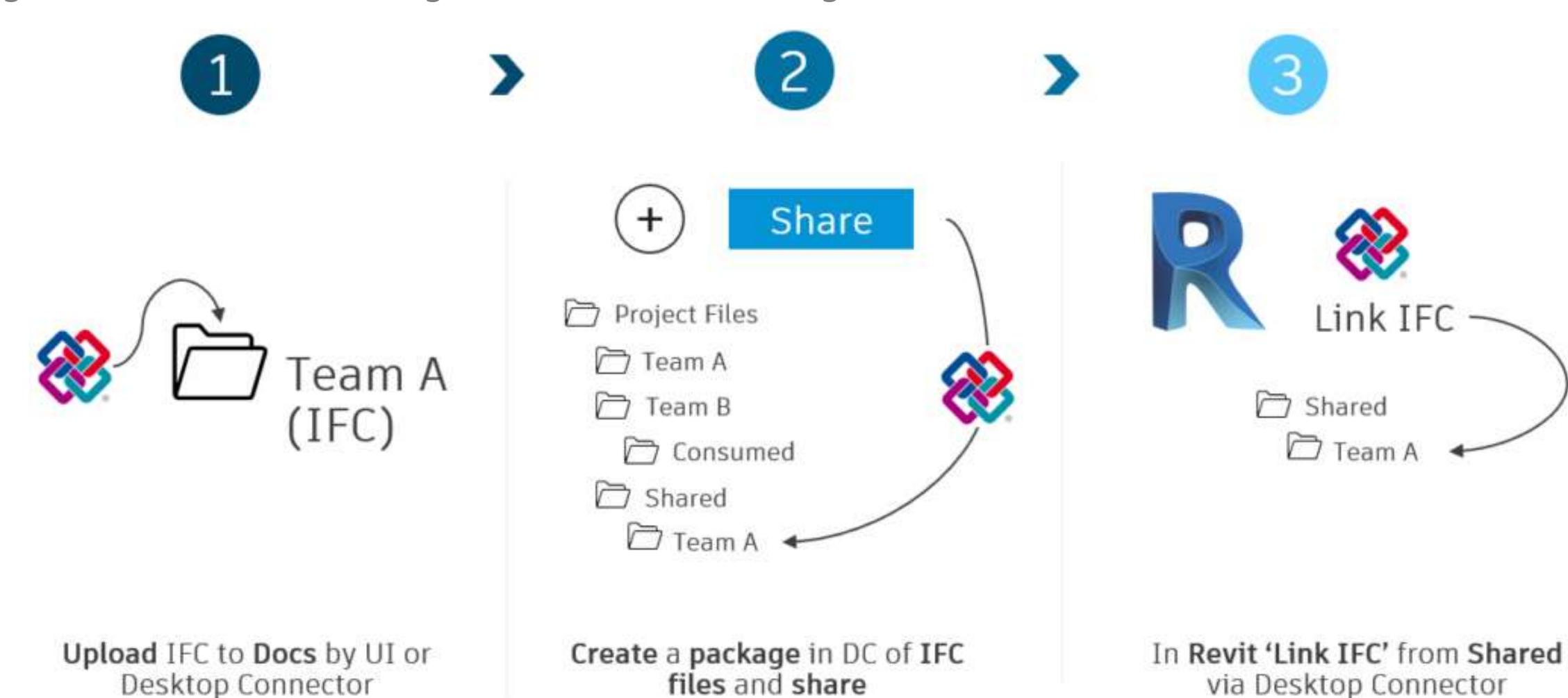


IFC 4.1



# Autodesk IFC for Infrastructure Support currently

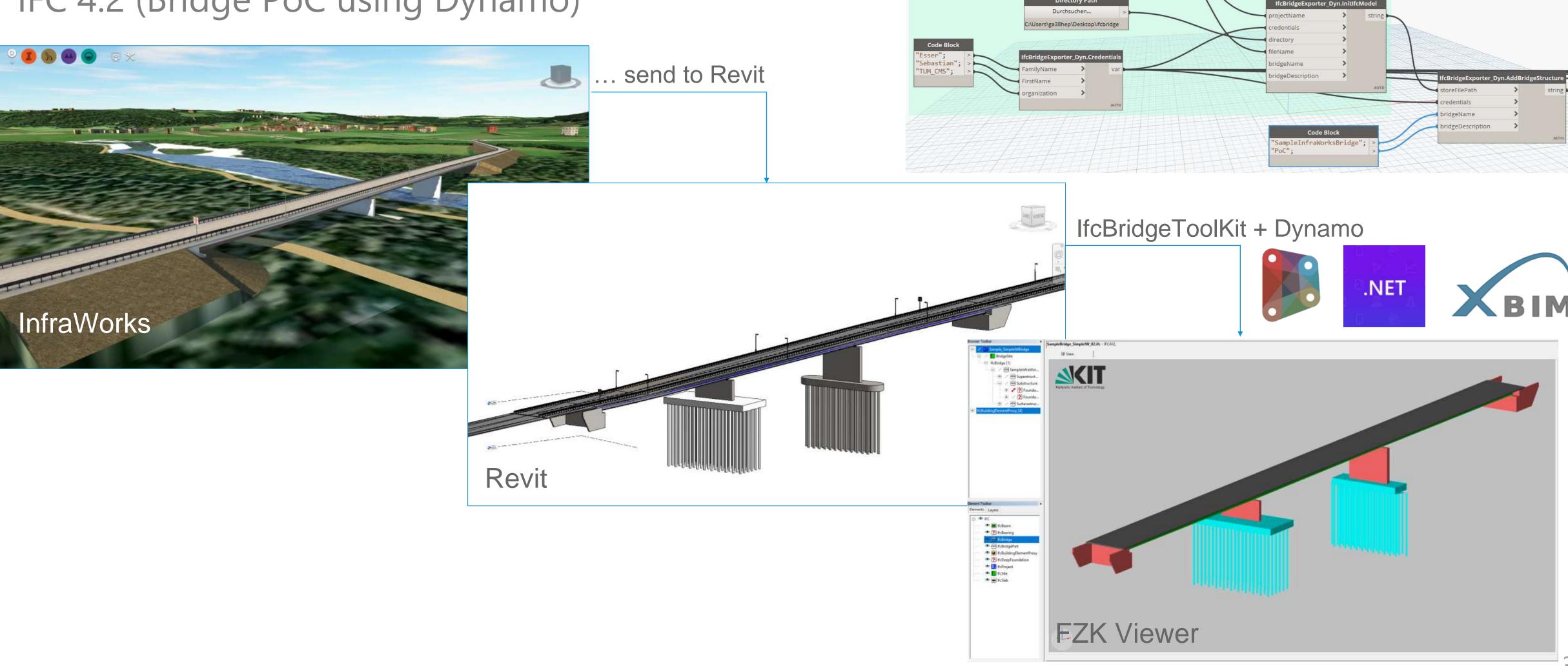
Design Collaboration - IFC Integration into BIM360 Design



#### Autodesk IFC for Infrastructure Support currently Init new Ifc 4x2 Model



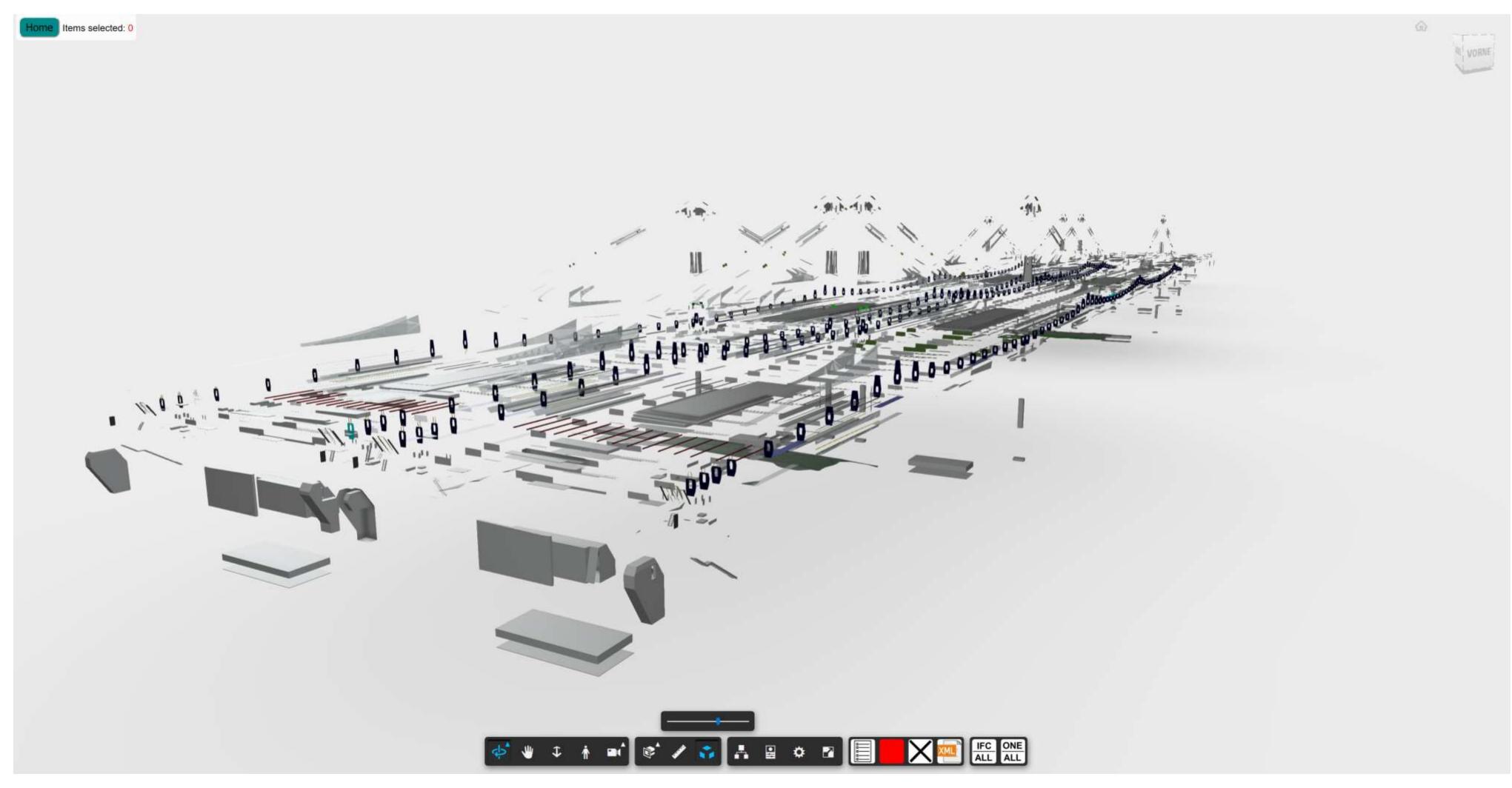
IFC 4.2 (Bridge PoC using Dynamo)



# Autodesk IFC for Infrastructure Support currently

ПП

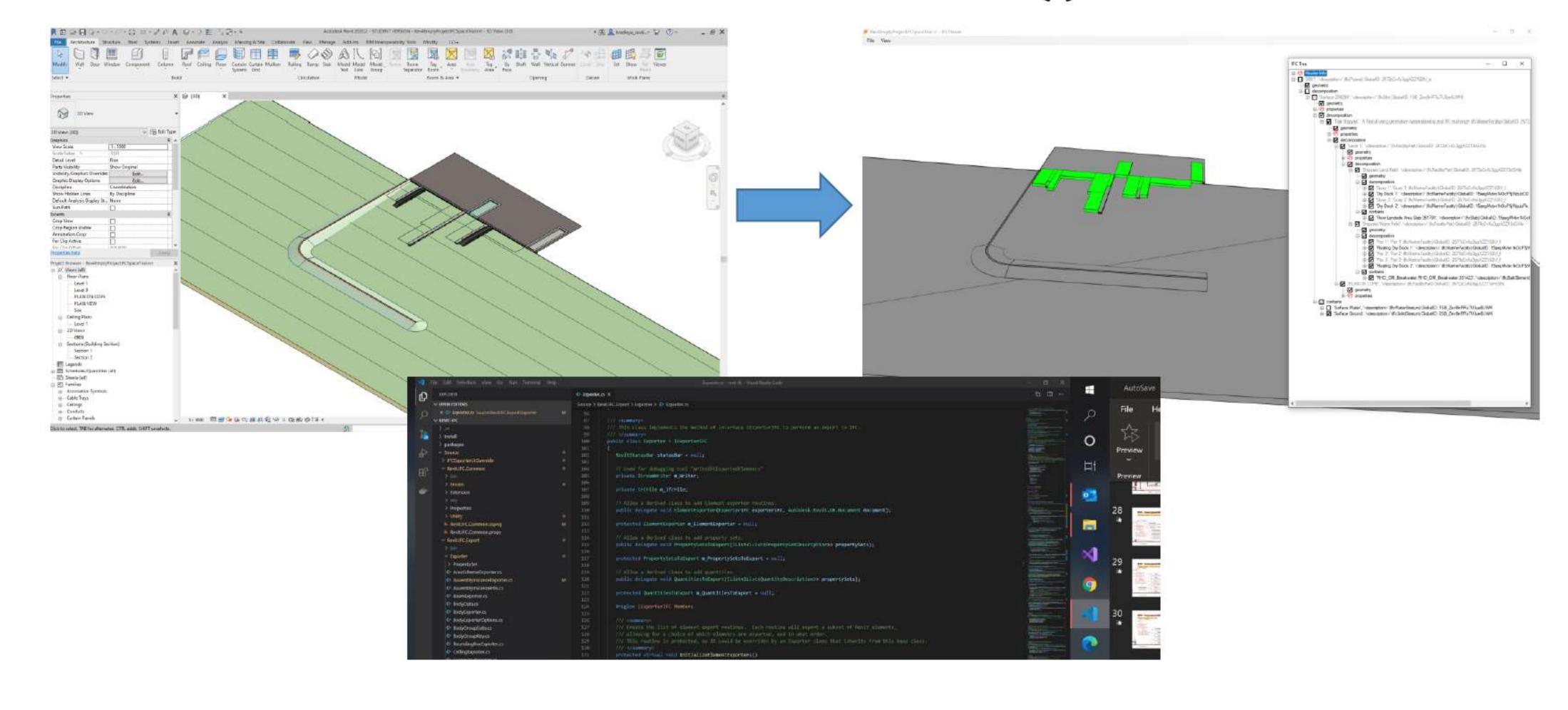
IFC 4.2 (Bridge PoC in Forge)



# Autodesk IFC for Infrastructure Support currently

IFC 4.3 Ports & Waterways PoC – using IFC Revit Toolkit (7) GitHub

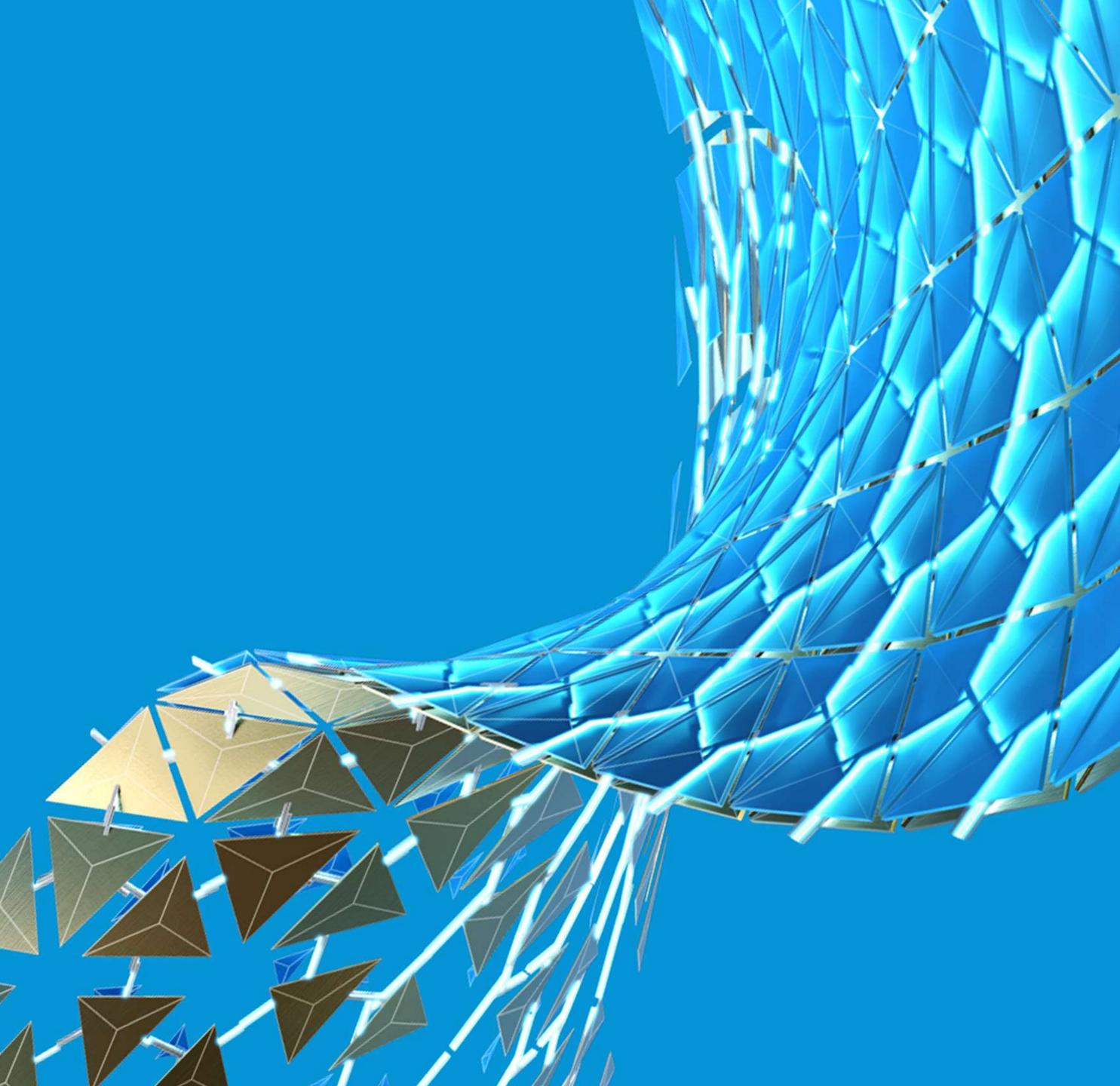




# Autodesk IFC for Infrastructure and Rail ongoing Investment

- Autodesk has an internal IFC for Infrastructure working group
- Autodesk continues to collaborate with the Technical University of Munich on IFC 4.3 PoCs
- Autodesk continues to support the IFC 4.3 deployment programme for infrastructure and rail
- Autodesk joined the Open Design Alliance (ODA) in September 2020
  - Will adopt the ODA IFC library replacing the current Jotne solution
  - Note, ODA need to implement IFC 4.3 elements before it can be used in software
- Autodesk will participate in buildingSMART IFC 4.3 finalization work
- Autodesk will engage with buildingSMART on the critical IFC 4.3 (and beyond) certification

## Final Words



# Get ready for IFC 4.3 and beyond

- Follow the efforts of the buildingSMART InfraRoom <a href="https://www.buildingsmart.org/standards/rooms/infrastructure/">https://www.buildingsmart.org/standards/rooms/infrastructure/</a>
- Join buildingSMART International or your local Chapter <a href="https://www.buildingsmart.org/about/get-involved/membership-and-benefits/">https://www.buildingsmart.org/about/get-involved/membership-and-benefits/</a>
- Perhaps participate in the IFC 4.3 deployment programme <a href="https://www.buildingsmart.org/standards/calls-for-participation/ifcroad/">https://www.buildingsmart.org/standards/calls-for-participation/ifcroad/</a>
- Use Infrastructure and Rail modelling tools e.g. Civil 3D, InfraWorks or Revit to create suitable BIM candidate files
- Undertake your own trials using:
  - Revit Toolkit on Github
  - Dynamo with Revit and Civil 3D
  - Autodesk Forge
  - Project Explorer for Civil 3D



















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