TPF-5(372) BIM for Bridges and Structures

Annual Software Vendor Workshop

20-22 July 2021

Day 1 - Tuesday, 20 July 2021

BIM FOR BRIDGES AND STRUCTURES TPF-5(372)

Workshop Structure & Schedule

Participants

HDR Project Team

TPF Sponsors

CBS T-19 Committee

Software Vendors

Invited Observers

Mics are muted by default

Vendors, please use "Raise hand" to request unmute

Guests/Observers please enter questions in Chat

Sessions will be recorded for future reference

BIM FOR BRIDGES AND STRUCTURES
TPF-5(372)

Tuesday 20 July

Time	Session	Objectives
9:00am-10:20am	Updates on TPF-5(372)	• Overall Schedule / Scope review • IDM / MVD • Data Dictionary • General Q&A
10:20am-10:40am	Scheduled Break	
10:40am-11:20am	Demo w/ Q&A: Allplan & LARSA	Demonstrate early development progress and/or intent to support "BIM for Bridges and Structures"
11:20am-12:00pm	Demo w/ Q&A: PGSuper	

Wednesday 21 July

Time	Session	Objectives
9:00am-10:20am	Review of Software Vendor Engagement Plan	• Letter of Intent • Unit Test Suite • Certification • General Q&A
10:20am-10:40am	Scheduled Break	
10:40am-11:20am	Demo w/ Q&A: Bentley Systems	Demonstrate early development progress and/or intent to support "BIM for Bridges and Structures"
11:20am-12:00pm	Demo w/ Q&A: OpenBrIM	

Thursday 22 July

Time	Session	Objectives
9:00am-10:20am	bSI IFC4.3 Progress	• Candidate Standard status • Feedback from participating Vendors on results • General Q&A
10:20am-10:40am	Scheduled Break	
10:40am-11:20am	Demo w/ Q&A: Autodesk	Demonstrate early development progress and/or intent to support "BIM for Bridges and Structures"
11:20am-12:00pm	Demo w/ Q&A: Trimble – Quadri & Tekla Structures	

Today's Schedule – Day 1

	Time	Session	Objectives
Tuesday 20 July	9:00am-10:20am	Updates on TPF-5(372)	**Overall Schedule / Scope review** **IDM / MVD** - Final IDM scope and format delivery - MVD creation and mvdXML delivery **Data Dictionary** - Data Dictionary content - Proposed Data Dictionary governance and delivery - bS-USA USDD Working Group - USDD and bSDD **General Q&A**
	10:20am-10:40am	**Scheduled Break**	
	10:40am-11:20am	Demo w/ Q&A: **Allplan & LARSA**	Demonstrate early development progress and/or intent to support "BIM for Bridges and Structures"
	11:20am-12:00pm	Demo w/ Q&A: **PGSuper**	

BIM FOR BRIDGES AND STRUCTURES
TPF-5(372)

Updates on TPF-5(372)

Overall Scope & Schedule

IDM / MVD Development Progress

Data Dictionary Content Development & Governance

BIM FOR BRIDGES AND STRUCTURES
TPF-5(372)

Overall Scope & Schedule
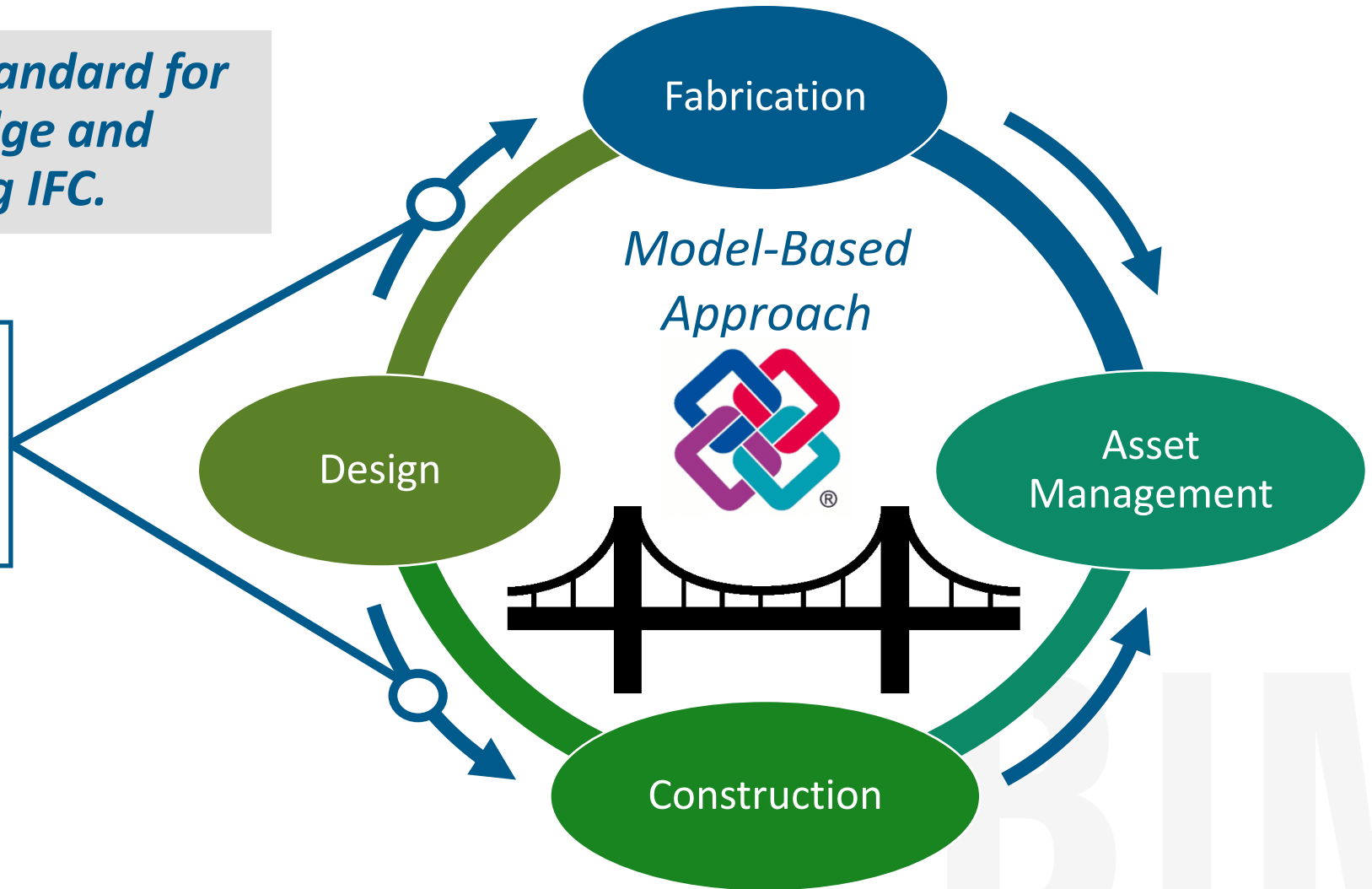
AASHTO Bridge Vision

Develop a National Standard for open exchange of bridge and structure data utilizing IFC.

Focus of pooled fund project

BIM FOR BRIDGES AND STRUCTURES TPF-5(372)

Model-Based Approach

Fabrication

Design

Asset Management

Construction

BIM FOR BRIDGES AND STRUCTURES TPF-5(372)

Overall AASHTO Vision

Industry shift to:

- Digital delivery

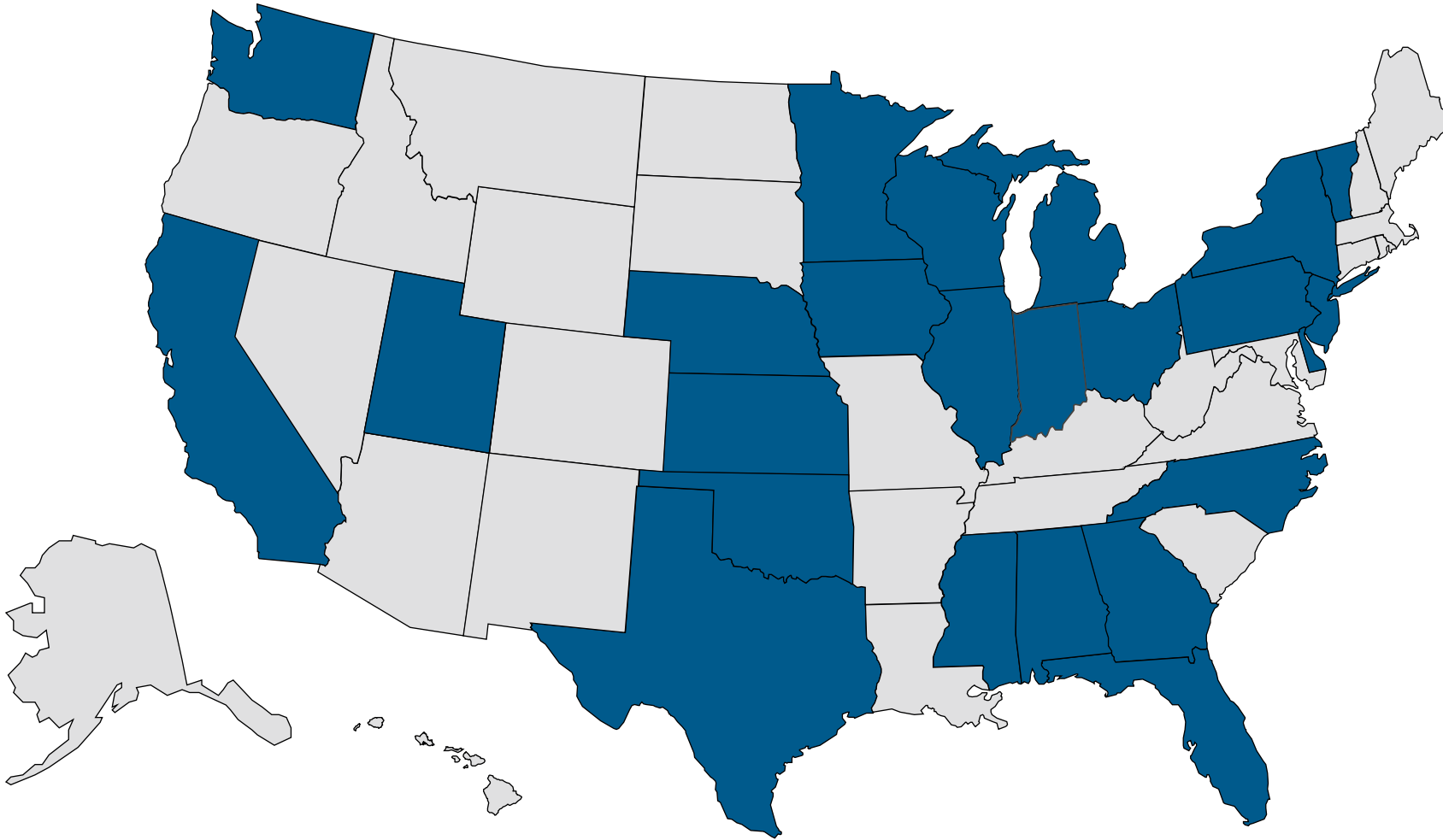- Model as the legal document

- Digital as-builts

Key Milestones

- Creation of BIM for Bridges and Structures Pooled Fund in 2017

- AASHTO Adoption of IFC in 2019

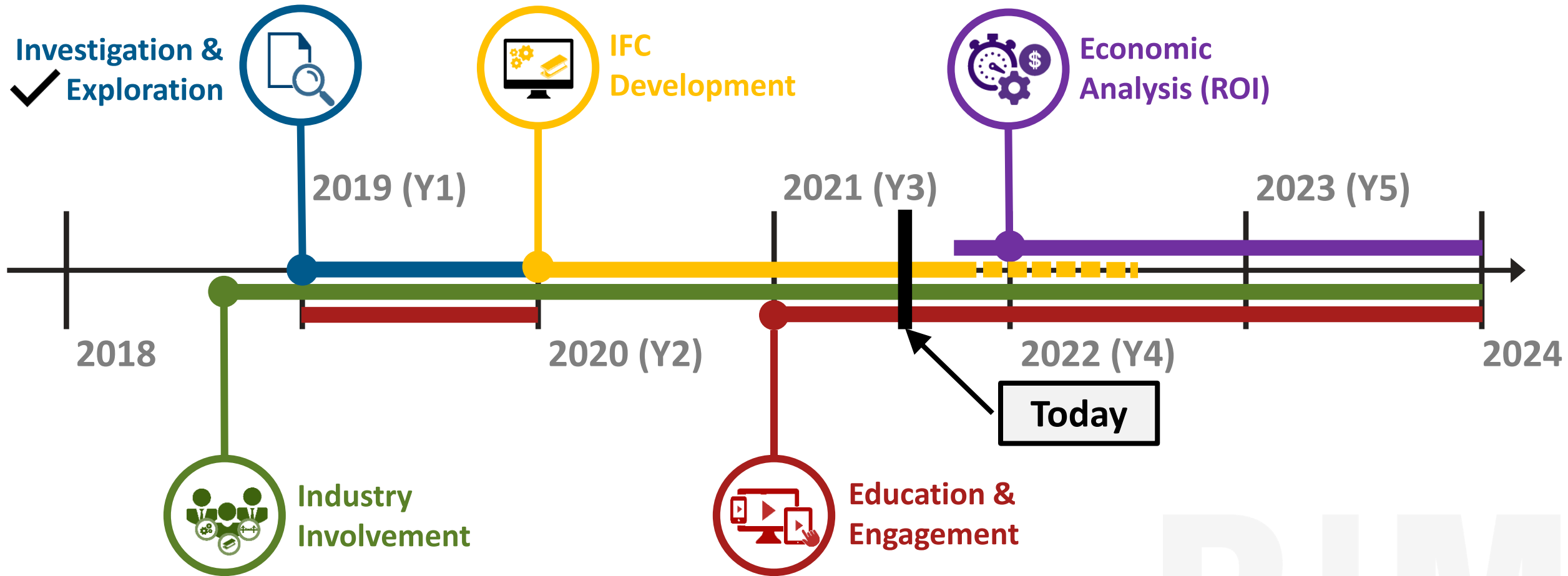- Creation and funding of *TPF-5(480) "BIM for Infrastructure"* in 2021

BIM FOR BRIDGES AND STRUCTURES
TPF-5(372)
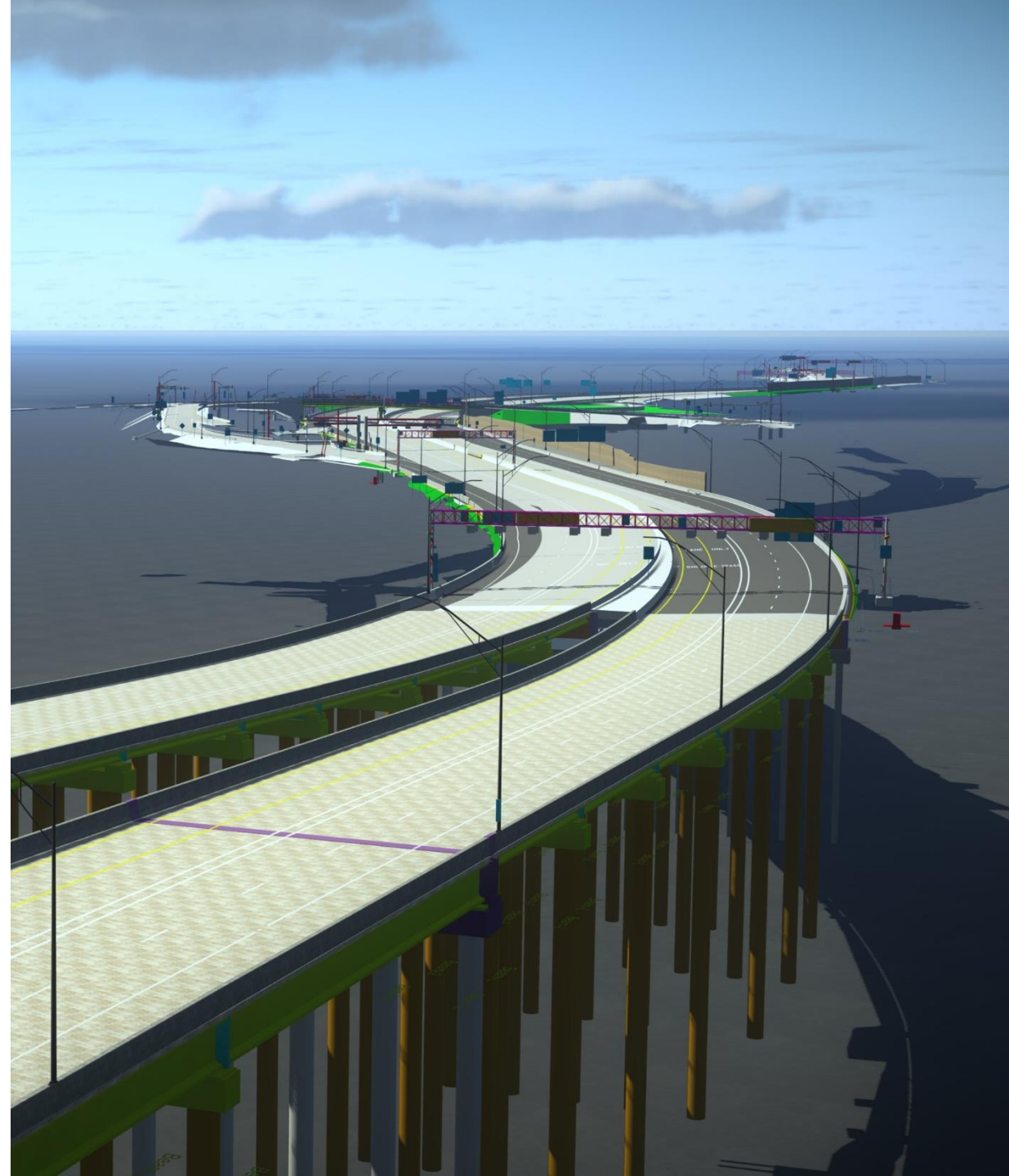
Overall Scope & Schedule

24 STATES PARTICIPATING

01 Alabama	14 New Jersey
02 California	15 New York State
03 Delaware	16 North Carolina
04 Florida	17 Ohio
05 Georgia	18 Oklahoma
06 Illinois	19 Pennsylvania
07 Indiana	20 Texas
08 Iowa	21 Utah
09 Kansas	22 Vermont
10 Michigan	23 Washington
11 Minnesota	24 Wisconsin
12 Mississippi	FHWA
13 Nebraska	
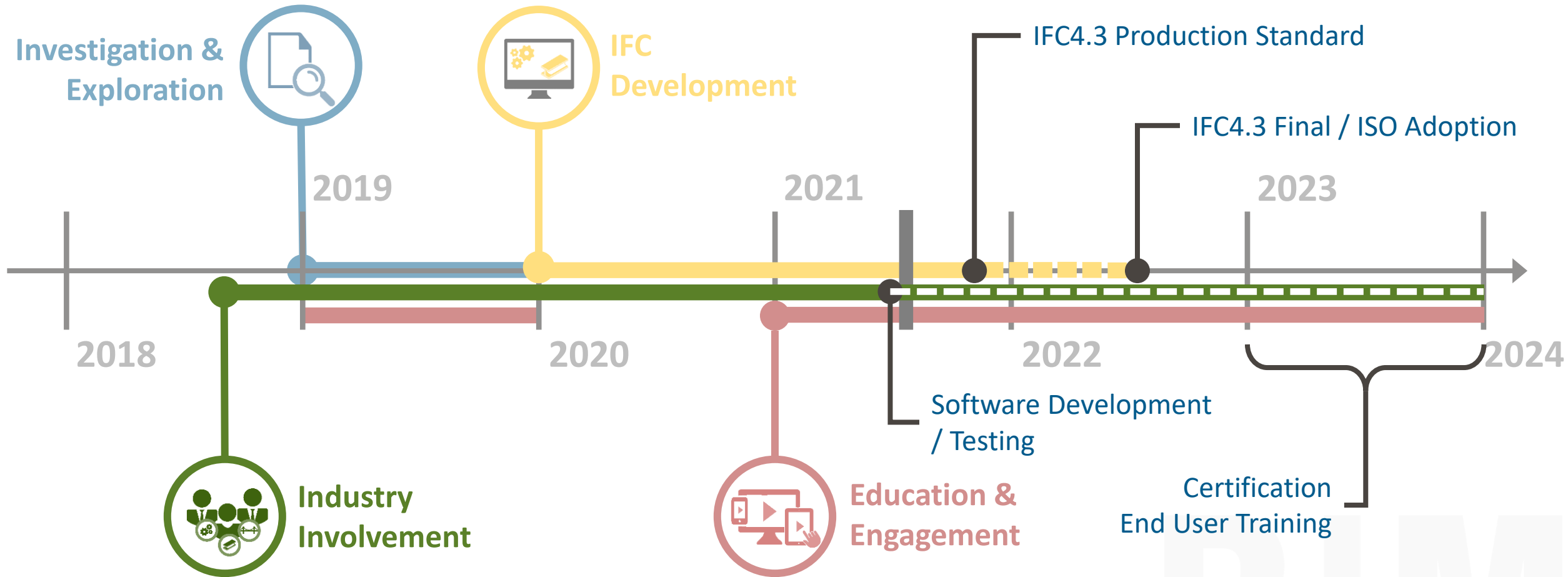
BIM FOR BRIDGES AND STRUCTURES
TPF-5(372)

Overall Scope & Schedule

Investigation & Exploration ✓

IFC Development

Economic Analysis (ROI)

Industry Involvement

Education & Engagement

2018

2019 (Y1)

2020 (Y2)

2021 (Y3)

2022 (Y4)

2023 (Y5)

2024

Today

BIM
FOR BRIDGES AND STRUCTURES
TPF-5(372)

Overall Scope & Schedule

Investigation & Exploration

IFC Development

IFC4.3 Production Standard

IFC4.3 Final / ISO Adoption

2018   2019   2020   2021   2022   2023   2024

Software Development / Testing

Industry Involvement

Education & Engagement

Certification End User Training

BIM FOR BRIDGES AND STRUCTURES TPF-5(372)

IDM/MVD Development Progress

IDM/MVD Development Progress

Structure Types

- Slab
- Girder (i.e. I-girder, I-beam, box girder, deck beam)
- Common buried structures (box culverts, three-sided structures, arches)
- Retaining walls associated with or adjacent to a bridge

Material Types

- Reinforced Concrete
- Precast/Prestressed Concrete
- Post-Tensioned Concrete
- Steel

BIM FOR BRIDGES AND STRUCTURES TPF-5(372)

IDM/MVD Development Progress

Structure Types

- Slab
- Girder (i.e. I-girder, I-beam, box girder, deck beam)
- Common buried structures (box culverts, three-sided structures, arch-type)
- Retaining walls associated with or adjacent to a bridge

Material Types

- Reinforced Concrete
- Precast/Prestressed Concrete
- Post-Tensioned Concrete
- Steel

BIM FOR BRIDGES AND STRUCTURES TPF-5(372)

IDM/MVD Development Progress

Out of Scope

- Truss bridges
- Tied-Arch bridges
- Arch bridges
- Cantilever bridges
- Cable-stayed bridges
- Suspension bridges
- Rigid frame bridges
- Sign structures/sign gantries
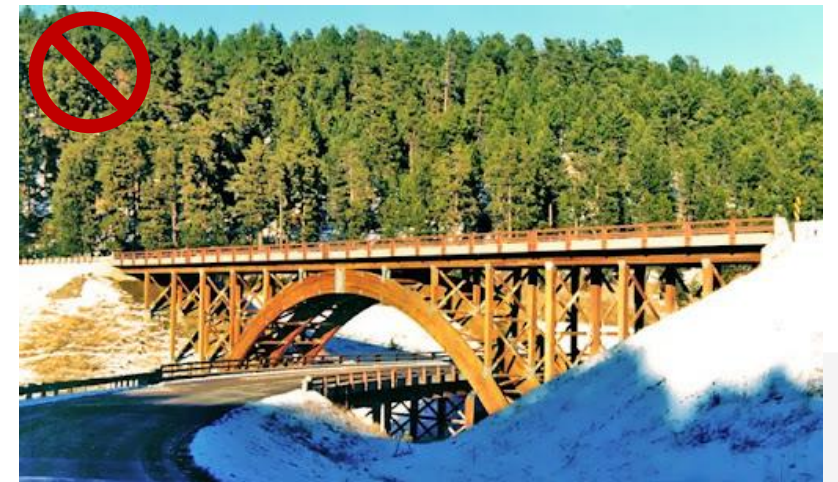- Noise barriers

Material Types

- Timber

IDM/MVD Development Progress

Out of Scope

- Truss bridges
- Tied-Arch bridges
- Arch bridges
- Cantilever bridges
- Cable-stayed bridges
- Suspension bridges
- Rigid frame bridges
- Sign structures/sign gantries
- Noise barriers

Material Types

- Timber

BIM FOR BRIDGES AND STRUCTURES
TPF-5(372)

IDM/MVD Development Progress

IDM/MVD Development Progress

Data Dictionary (DD)

MID 2021

Information Delivery Manual (IDM)

LATE 2021

Model View Definition (MVD)

EARLY 2022

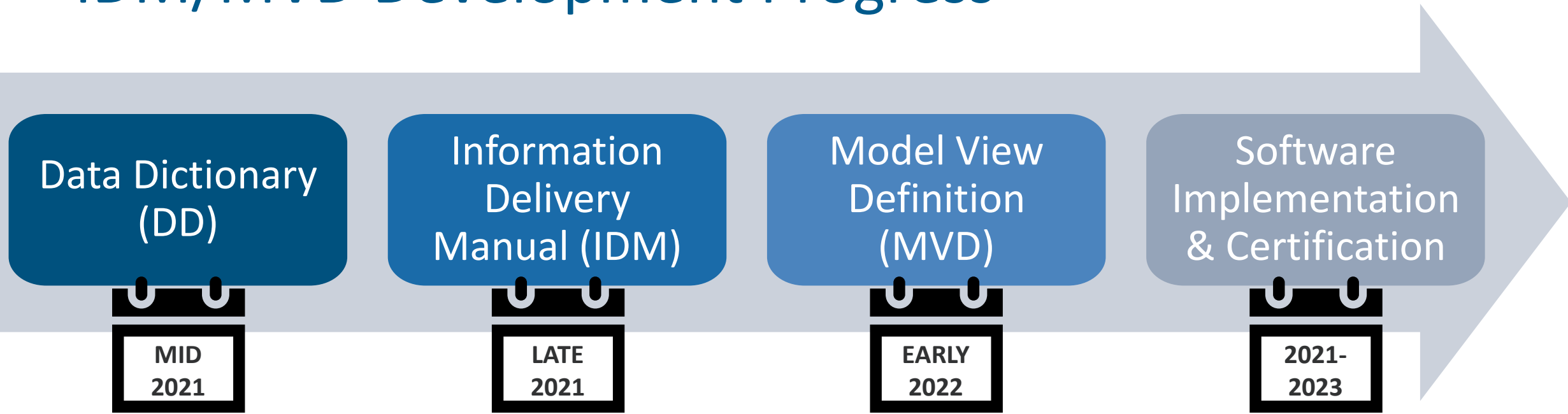**Software Implementation & Certification**

2021-2023

IDM/MVD Development Progress

Data Dictionary (DD)	Information Delivery Manual (IDM)	Model View Definition (MVD)	Software Implementation & Certification
MID 2021	**LATE 2021**	**EARLY 2022**	**2021-2023**
Steel entities	Process Narrative(s)	Concept Templates	Unit Test Suite
Concrete entities	Process Map(s)	IFC Mappings	b-Cert setup
IDM scope review	Exchange Requirements	MVD documentation	bSDD / USDD setup
IFC mappings		mvdXML delivery	

BIM FOR BRIDGES AND STRUCTURES
TPF-5(372)

BIM
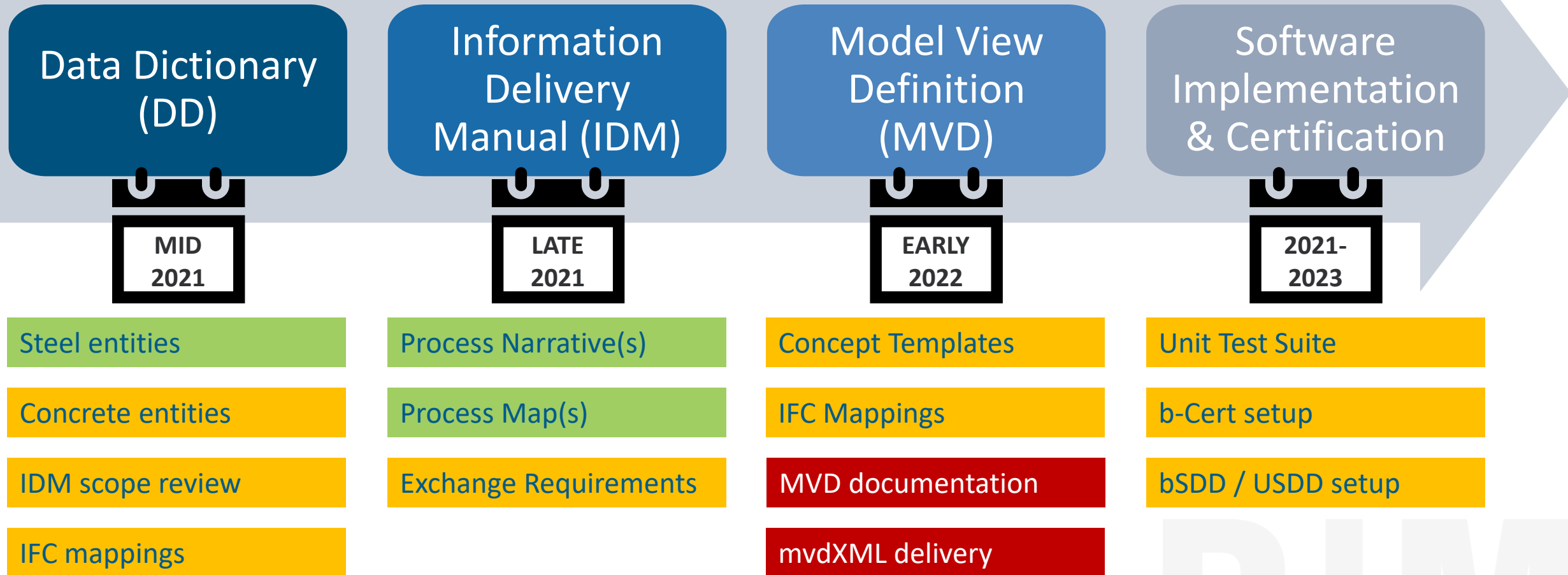
IDM/MVD Development Progress

Data Dictionary & Exchange Requirements

- Detailed review of bridge elements and properties (1st - Steel, 2nd - Concrete)
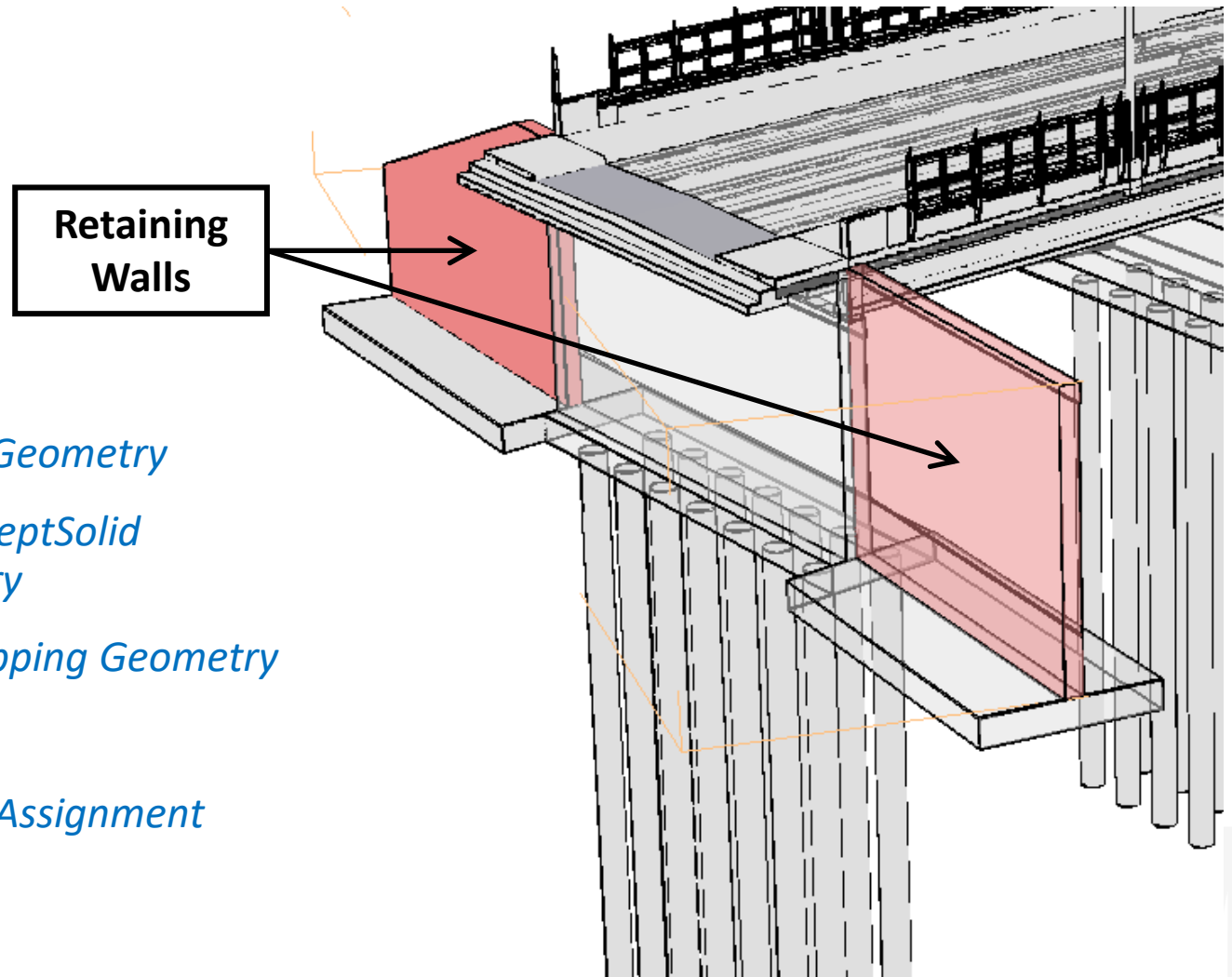
- Combined recommendation from WG2 and HDR Team

- Collaboration with other CBS Technical Committees

BIM FOR BRIDGES AND STRUCTURES TPF-5(372)

IDM/MVD Development Progress

IFC Mapping & Concept Templates
Example: Retaining Wall

- Defined in IFC schema as a wall (IfcWall)

- Predefined Type: RETAININGWALL

- Concept Templates (IfcWall):

  - *Property Sets*

  - *Quantity Sets*

  - *Material Layer Set*

  - *Path Connectivity*

  - *Spatial Containment*

  - *Axis 2D Geometry*

  - *Surface Geometry*

  - *Body SweptSolid Geometry*

  - *Body Clipping Geometry*

  - *Voiding*

  - *Product Assignment*

Retaining Walls

DD Content, Implementation, & Governance

Content → **Agency** → **Service**

Domain expertise

Multiple domains

Multiple stakeholders

Variable scope

Process expertise

Content Quality Control (QA/QC)

Service tools and access

Access expertise

Centralized database and access

Multitude of content

Economy of scale

BIM FOR BRIDGES AND STRUCTURES TPF-5(372)

DD Content, Implementation, & Governance

Content

United States Data Dictionary

Terms (harmonize & collate)

Definitions

Mapping to Classifications (ASTM/OmniClass/…)

Mappings to IFC, LandXML, etc.

Multiple infrastructure domains

Coordination with partners:

FHWA, AISC/NSBA, ACI, PCI, …

Questions:
How do you distribute the content to the software developers and end users?

How do you reliably and consistently maintain (expand / revise / redact) the content?

BIM FOR BRIDGES AND STRUCTURES
TPF-5(372)

DD Content, Implementation, & Governance

Question:
How is the content stored, managed, and provisioned?

Service

buildingSMART Data Dictionary (bSDD v5)

DB Framework

Content Storage

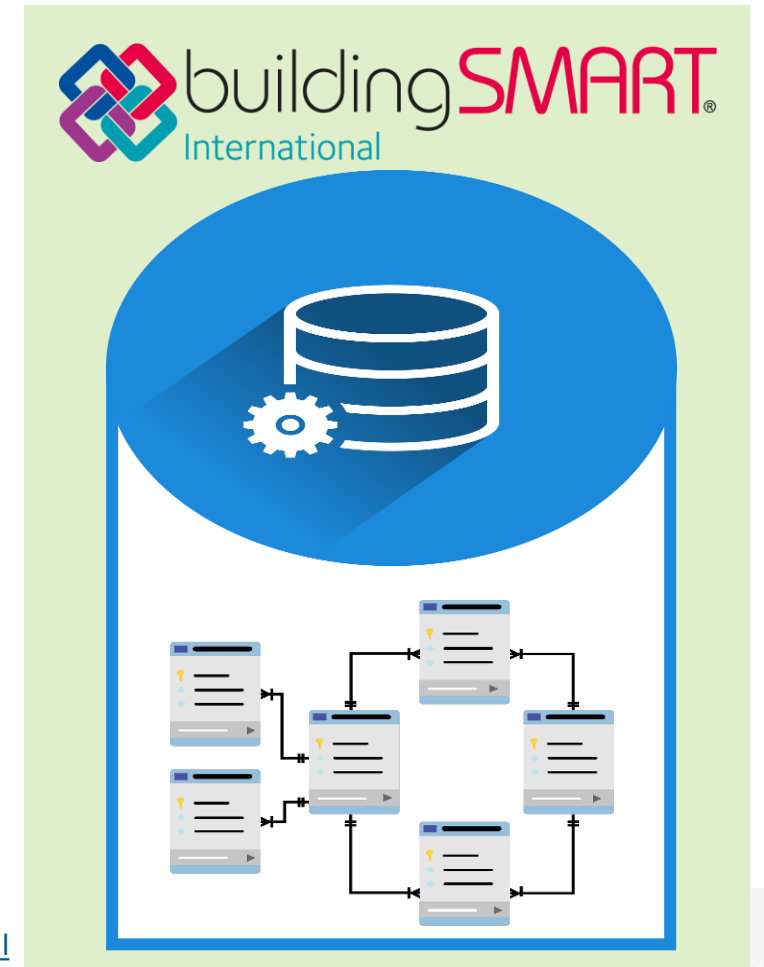Aggregation (International DDs)

Common editing tools & process

Search

Centralized access via APIs and Web Service

buildingSMART Data Dictionary - buildingSMART International

BIM
FOR
BRIDGES
AND STRUCTURES
TPF-5(372)

DD Content, Implementation, & Governance

Service

How does an end user utilize the data dictionary?

Attaching relevant data (info & classifications based on standards) to model elements in software

[bSDD APIv5 SketchUp connection (vimeo.com)](vimeo.com)

DD Content, Implementation, & Governance

Content

US Data Dictionary

Centralized content across domains & partners

National consensus standard

Infrastructure *(and buildings)*

Content managed by USDD Working Group, a subset of the bS-USA Technical Committee

buildingSMART USA

USDD

Agent

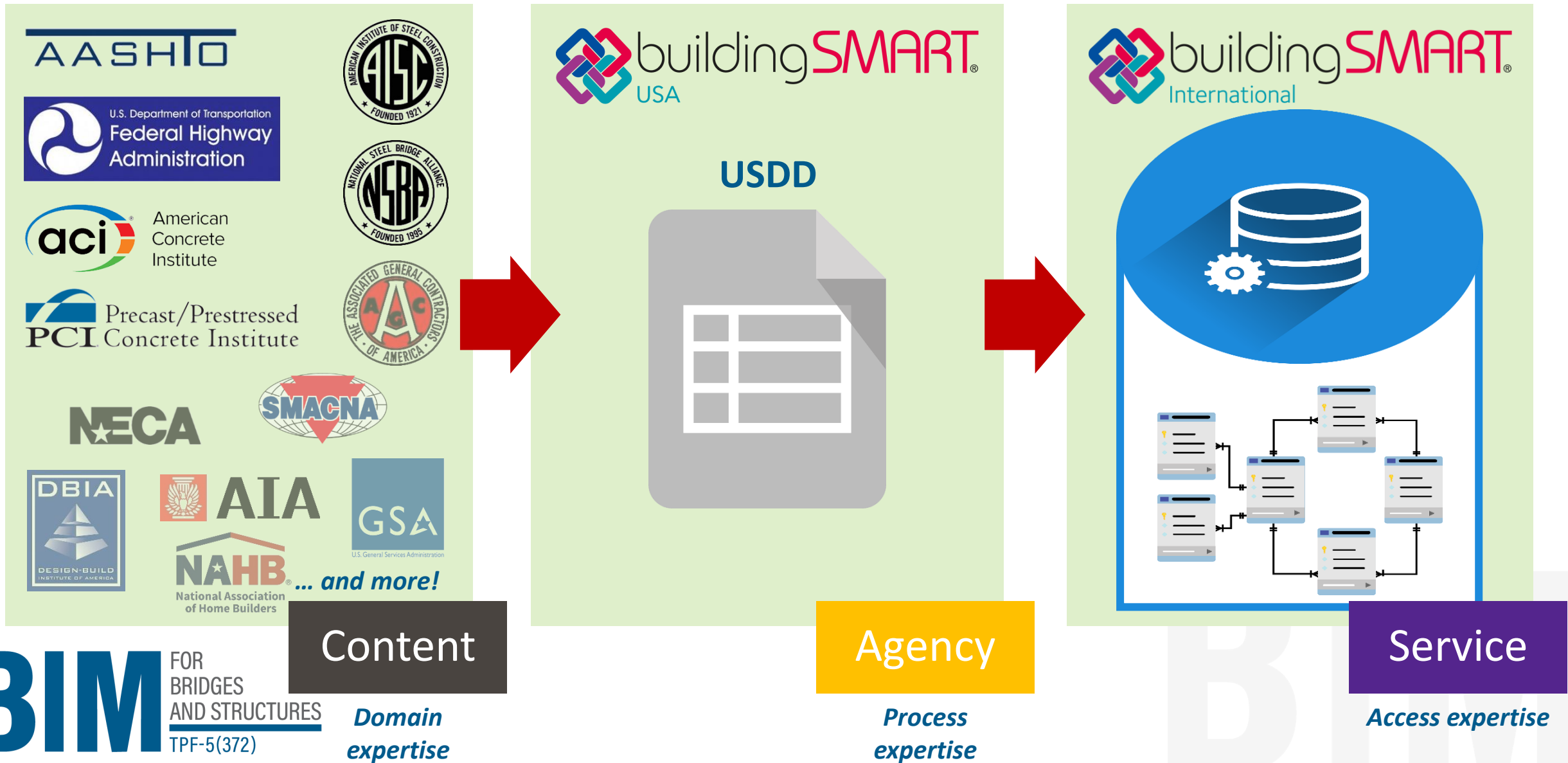### buildingSMART USA

USDD "Owner" & Agency

USDD has IPR resolved for aggregated DD

Agents designated by USDD WG and bS-USA TC Steering Committee

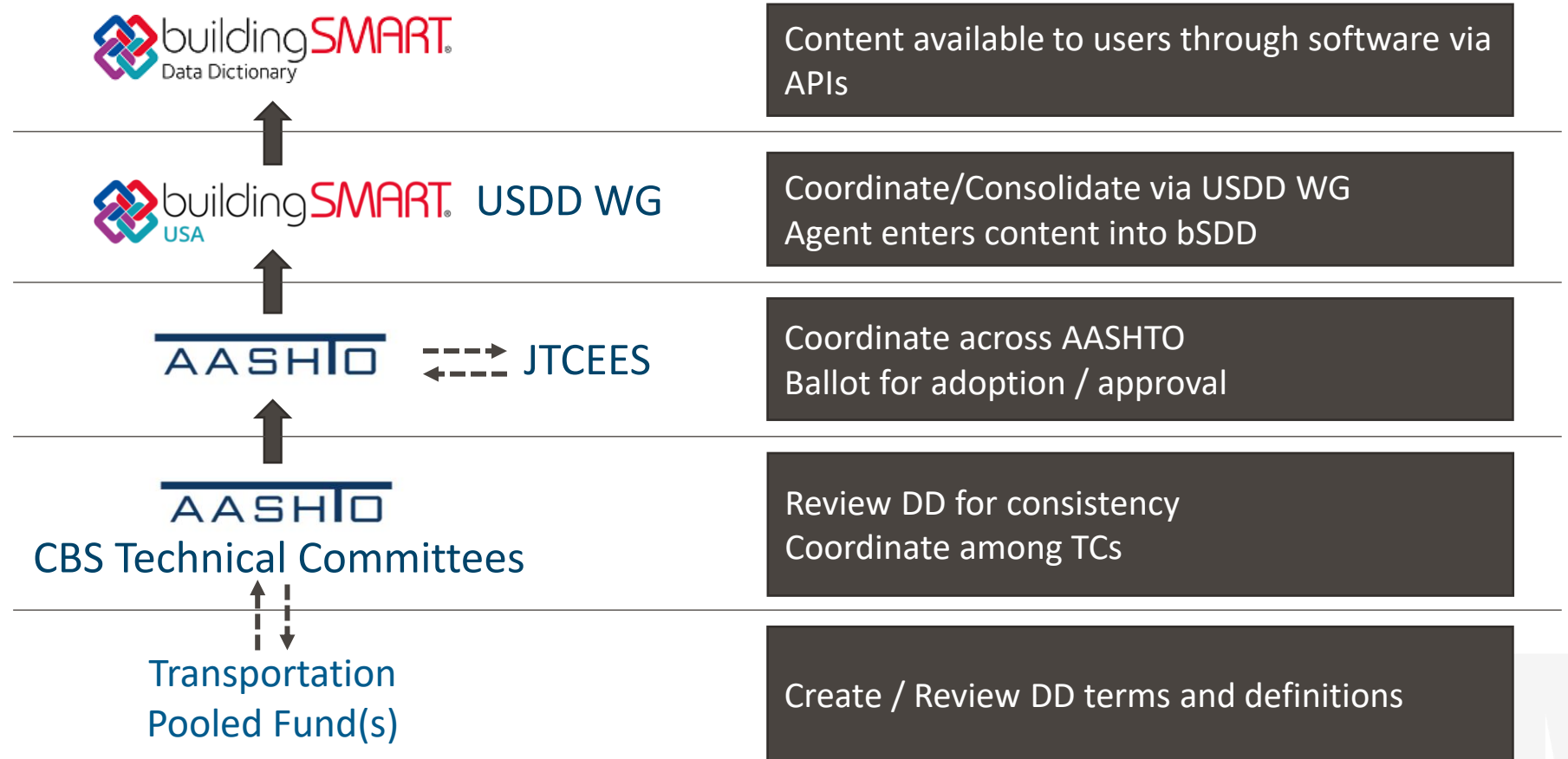Content Owner and Agency fees aggregated by bS-USA from US stakeholders and paid to bSI as lump sum

BIM FOR BRIDGES AND STRUCTURES
TPF-5(372)

DD Content, Implementation, & Governance

Content — *Domain expertise*

USDD — buildingSMART USA

Agency — *Process expertise*

buildingSMART International

Service — *Access expertise*

BIM FOR BRIDGES AND STRUCTURES TPF-5(372)

DD Content, Implementation, & Governance

USDD Governance Example from AASHTO CBS Point of View

buildingSMART Data Dictionary	Content available to users through software via APIs
buildingSMART USA — USDD WG	Coordinate/Consolidate via USDD WG Agent enters content into bSDD
AASHTO — JTCEES	Coordinate across AASHTO Ballot for adoption / approval
AASHTO CBS Technical Committees	Review DD for consistency Coordinate among TCs
Transportation Pooled Fund(s)	Create / Review DD terms and definitions

BIM FOR BRIDGES AND STRUCTURES
TPF-5(372)

DD Content, Implementation, & Governance

DD Content, Implementation, & Governance

Executive Committee

Committee Chairs + Independent Directors
Supported by bSI US Representative (as an ex officio member)

Industry Committees					Specialty Committees		Services
Chair	Chair	Chair	Chair	Chair	Chair	Chair	Exec Dir
Roads, Bridges and Tunnels	Buildings	Airports	TBD	TBD	Education and Professional Certification	Technical / Solution Provider Group / USDD Working Group	Marketing / Bookkeeping / Admin

BIM FOR BRIDGES AND STRUCTURES
TPF-5(372)

buildingSMART USA

DD Content, Implementation, & Governance

bS-USA Technical Committee

Chair

Jeffrey W. Ouellette

Members

Dennis Shelden

Aaron Costin

Connor Christian

Micah Callough

Abhishek Bhargava

Alexa Mitchell

...

...

USDD Working Group

Chair – Dr. Aaron Costin, Univ of FL

USDD Stakeholder representatives

AASHTO	*AIA*	*Vendors?*
FHWA/USDOT	*AGC*	*…*
AISC/NSBA	*IFMA*	
ACI	*IBPSA*	
PCI	*GSA*	
ASCE	*USACE*	
…	*…*	

BIM FOR BRIDGES AND STRUCTURES TPF-5(372)

USDD: An Information Management Ecosystem

General Q & A

BIM
FOR
BRIDGES
AND STRUCTURES
TPF-5(372)
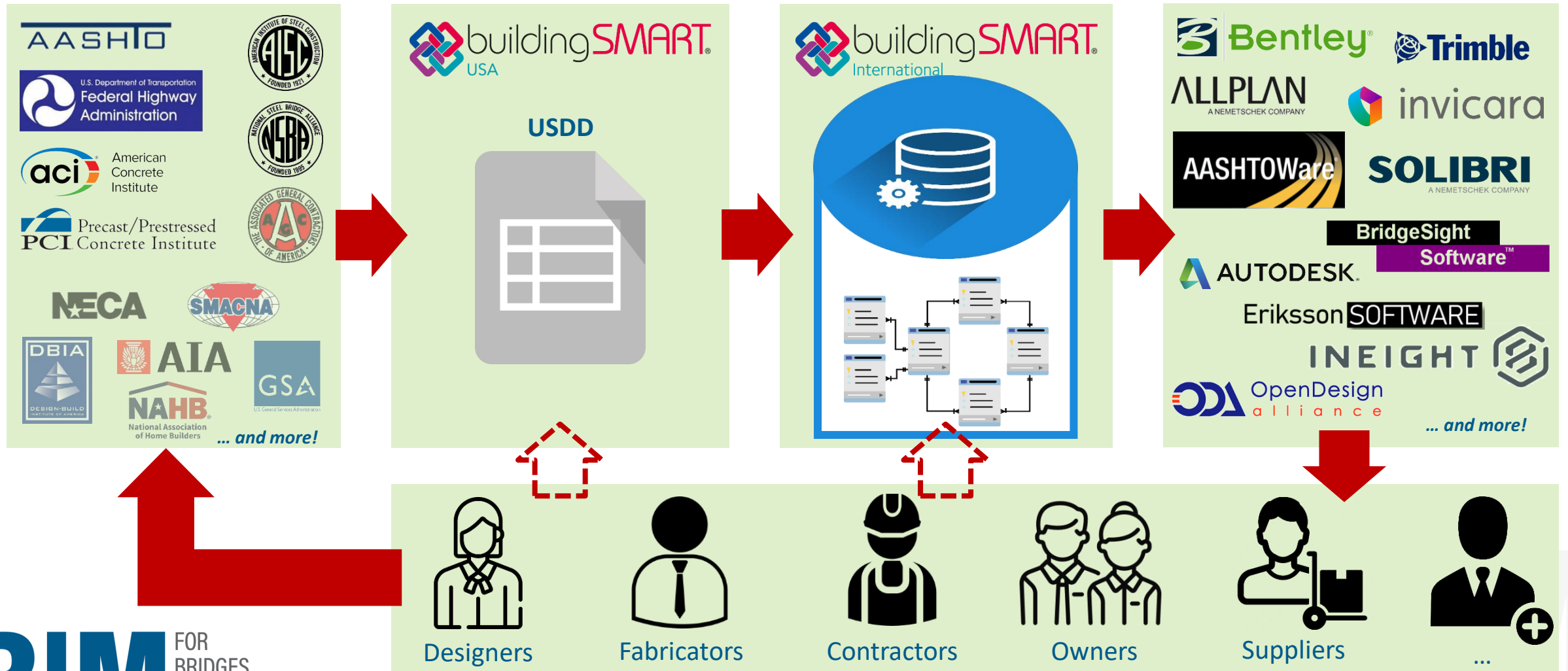
Demos

Allplan & LARSA – 40 mins.

PGSuper – 40 mins.

BIM FOR BRIDGES AND STRUCTURES TPF-5(372)