BIM Execution, Custom Attribution, and a Private Cloud: The Bergen Light Rail Project

Martin Amdal and Terje Glad

BIM Manager and VDC Specialist

Class summary

Bergen’s Light-Rail Project Building Information Modeling (BIM) strategy was shaped by strict demands: 300-plus professional stakeholders, lots of tunnels, heavy storm events, traffic, and tracks running down the middle of Norway’s second-largest city. The unique execution plan created for this project was customized from a mix of private and government guides. The resulting plan included model specifications, level of development (LOD) progressions, quality assurance criteria, and collaboration policies. The project capitalized on iConstruct, FME, and A360 cloud-based collaboration service to automatically create and compose the federated/collaboration model. A powerful set of custom information was added to objects at this collaboration stage to further facilitate the mapped processes. Autodesk Consulting and Premium Support assisted to optimize and customize workflows. And Autodesk Consulting is currently working on a joint Autodesk, Inc./Sweco cloud solution, so the entire project team will have an updated model available every day as this project moves toward completion. AIA Approved.

Key learning objectives

- Discover what is included in an ICT and BIM execution plan made for a complex transportation project
- Learn how to plan and control information development and level of detail
- Learn how to automate the creation of the federated 3D model, and how to add custom attributes to objects
- See how Autodesk has helped out the project team with their expertise, and how Sweco and Autodesk are developing a custom cloud solution

Introduction

Introduction | Agenda

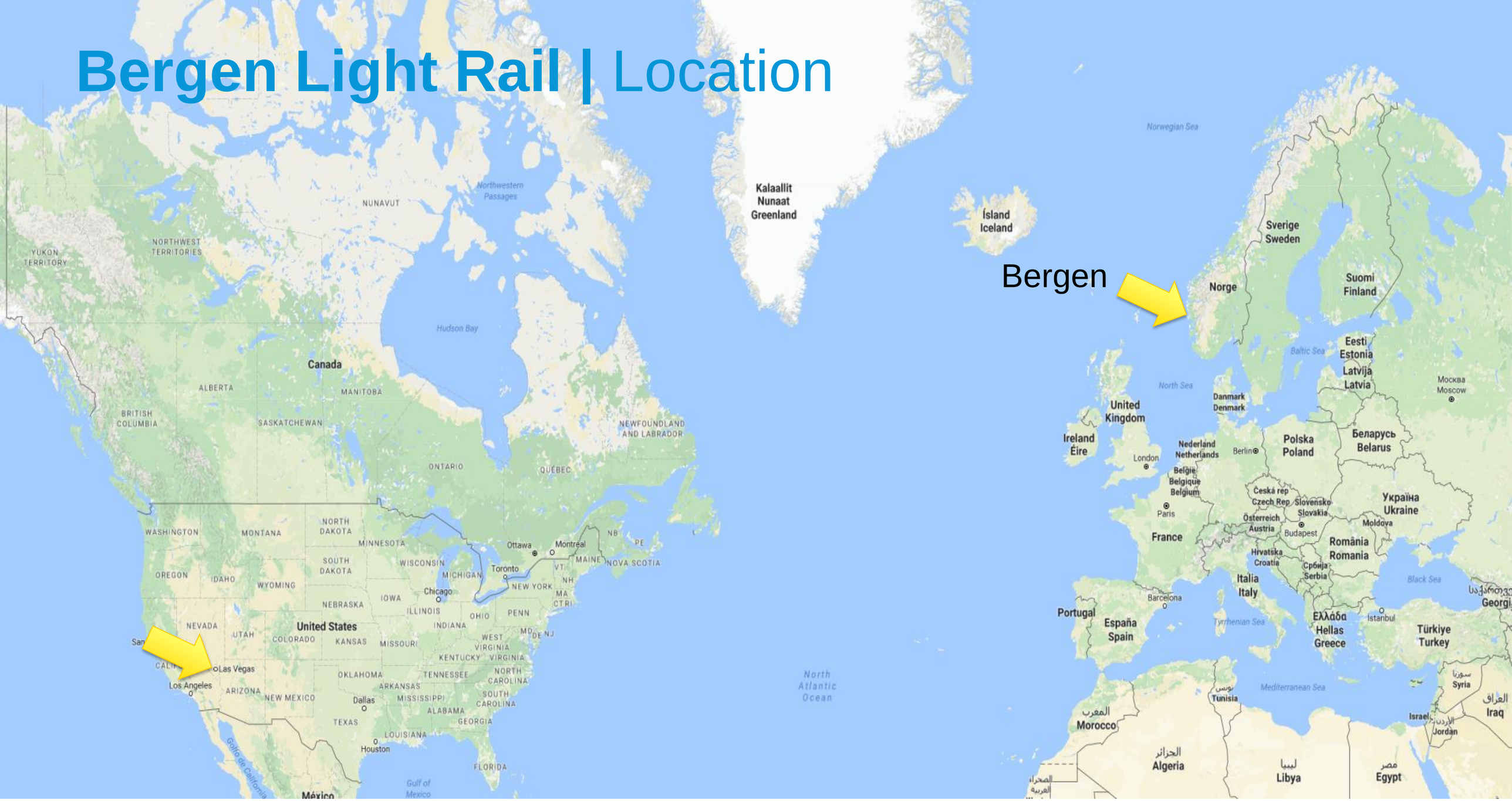
- The Bergen Light Rail project
- ICT/BIM Execution Plan
- Information Development
- Automated solution for federated models and to enrich models with information
- Sweco BIM Cloud and Issue Tracker

Introduction | Speakers

- Martin Amdal
  - Senior Engineer and BIM Specialist
  - Role in BLR project: ICT Manager
  - Design processes and methods
- Terje Glad
  - VDC Specialist
  - Role in BLR project: BIM Manager
  - Technology
- Sweco
  - 14.500 employees in Europe
  - 1300 in Norway

Bergen Light Rail

Bergen Light Rail | Location

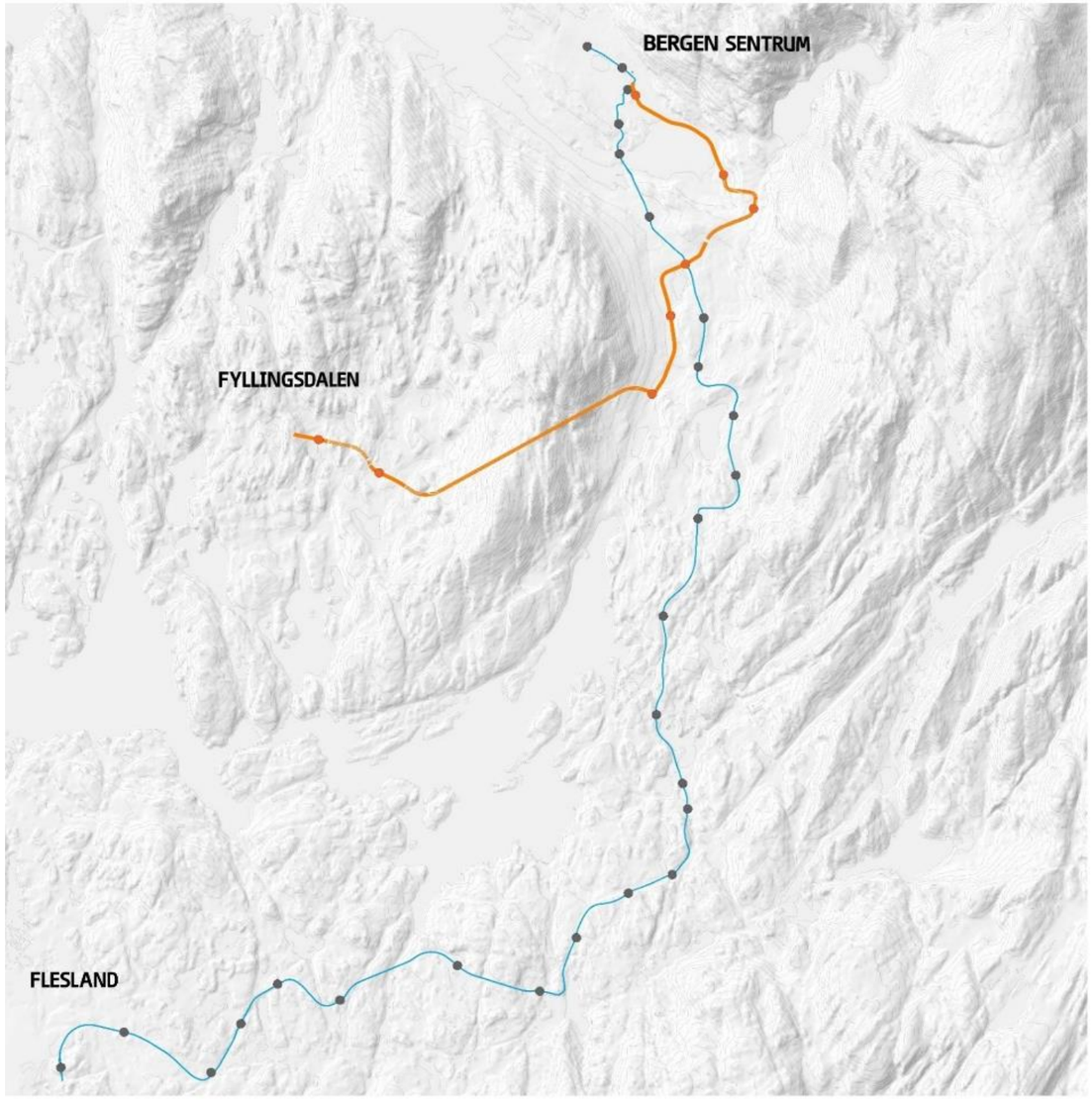


Bergen Light Rail | Location

- Norways second largest city – Bergen
- 280.000 inhabitants

- Poor public transportation and lots of cars in city center

- Light Rail transit system decided in 2000



Bergen Light Rail | Location

Bergen Light Rail | Location

Image © Nordic - Office of Architecture

Bergen Light Rail | Location

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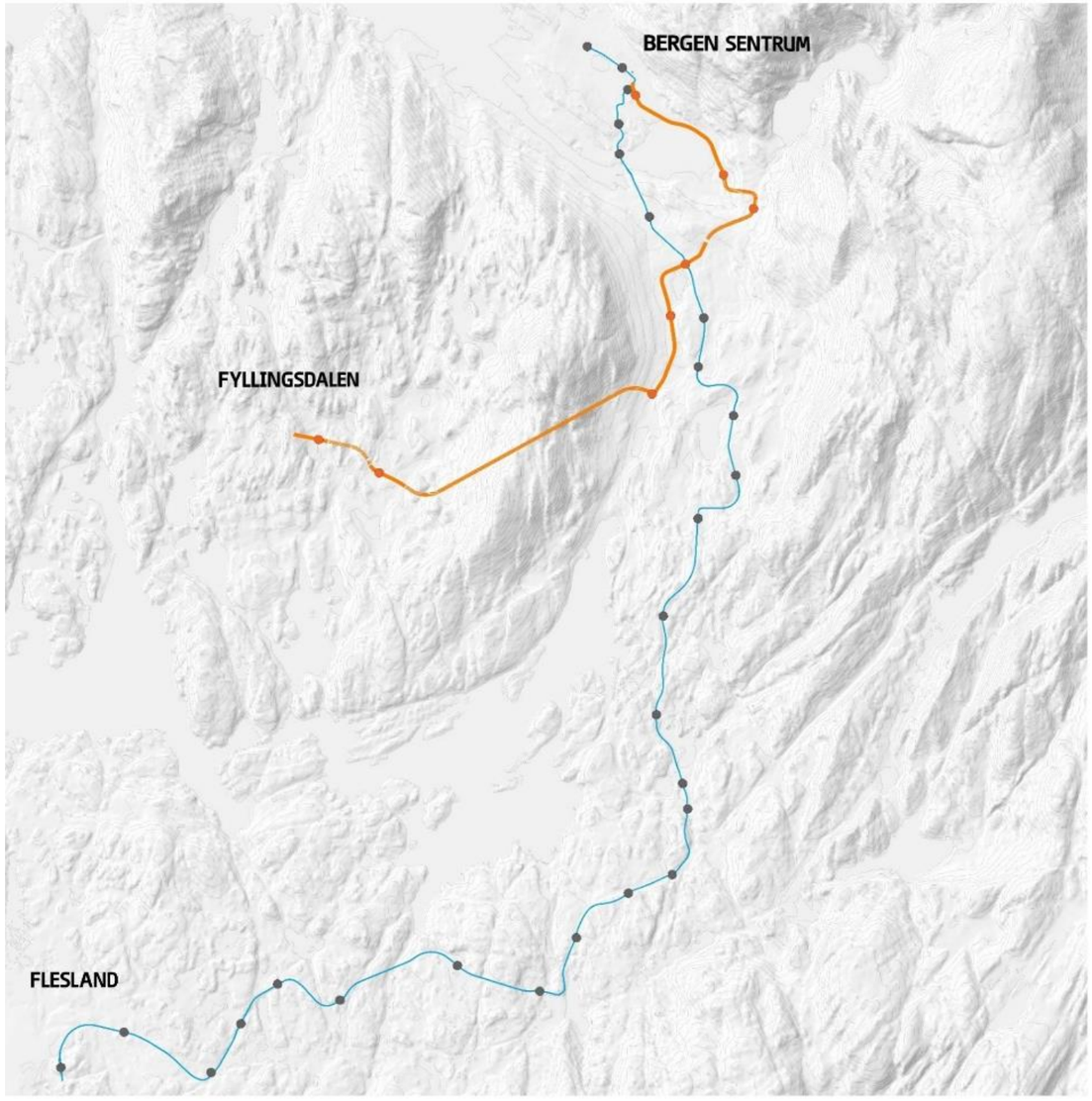
- Blue line: Line 1, existing stages (1-3)

- Orange line: Line 2, the new stage (4)



Bergen Light Rail | Location

Image © Sweco Norge AS

ICT/BIM Execution Plan

ICT/BIM Execution Plan | Contract

- Bergen Light Rail Development (BLRD)
- About 40 employees

- ICT/BIM in the contract
  - 6 pages in the contract dedicated to ICT/BIM
  - Requirements include
    - Roles and responsibilities
    - Definition of LOD
    - Communication and collaboration
    - Establish and use the ICT/BIM Execution Plan

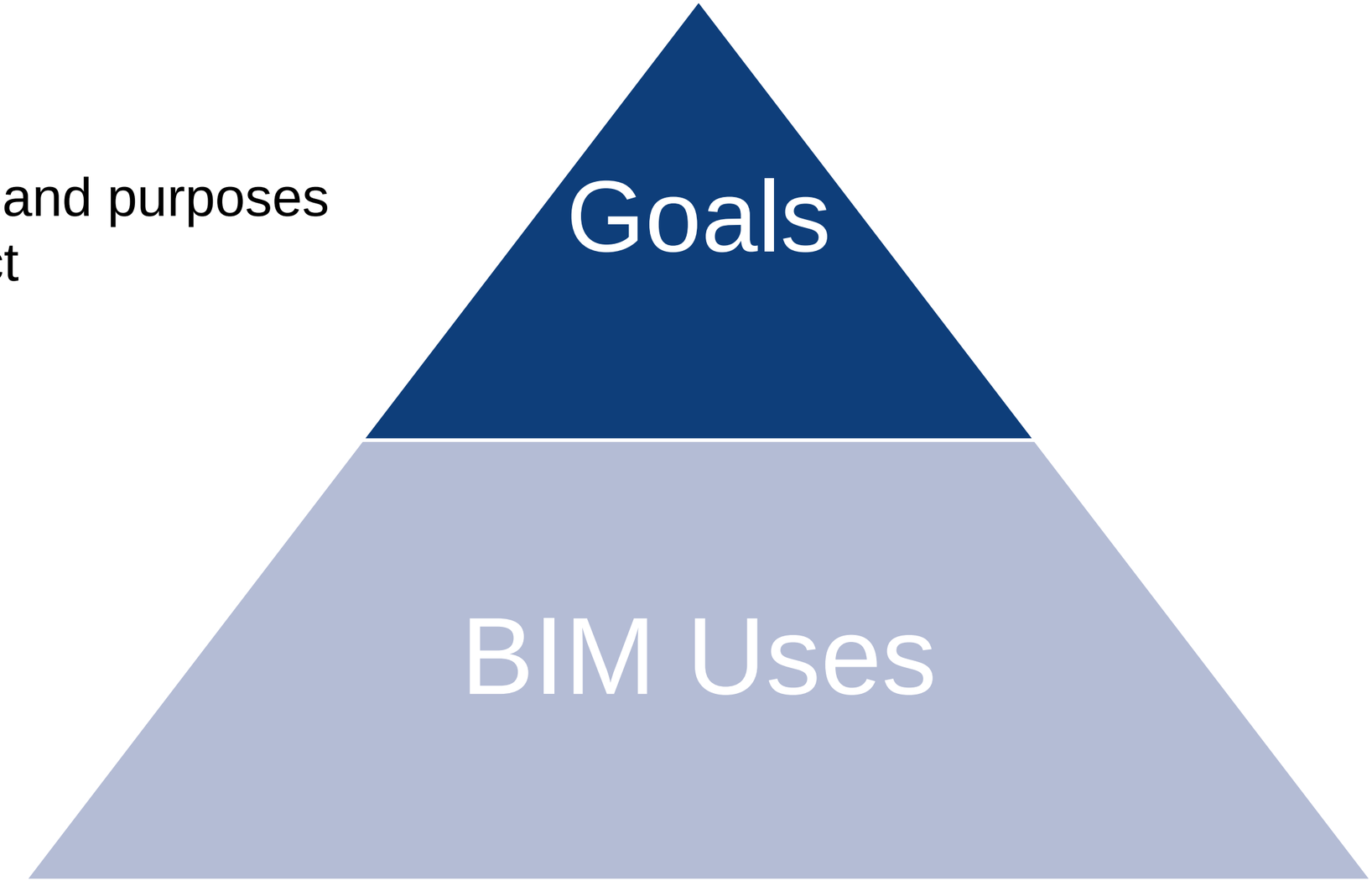
- All requirements and our description from tenders is included in our contract

ICT/BIM Execution Plan

1. BIM Strategy
2. Organization
3. Processes and workflows
4. Structuring models
5. Information exchanges
6. Collaboration and communication
7. Quality Assurance
8. ICT Systems

ICT/BIM Execution Plan | BIM Strategy

Task 1: Identify the goals and purposes by using BIM in the project



ICT/BIM Execution Plan | BIM Strategy

Goals

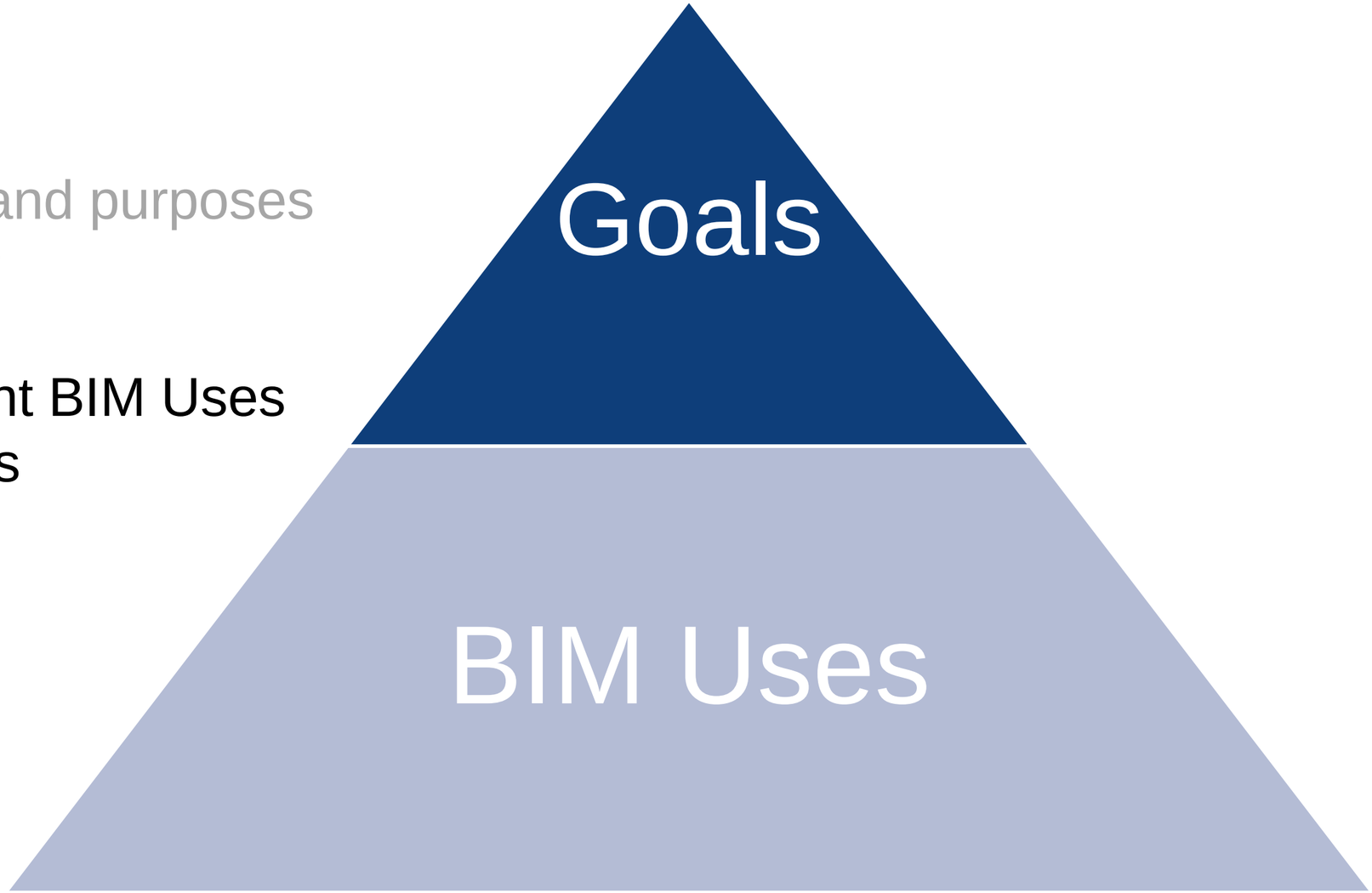
The goals we set was:

- M1 – Ensure quality in designed solutions
- M2 – Secure efficient communication throughout the project
- M3 – Designing constructible solutions
- M4 – Increase safety
- M5 – Reduce total costs

ICT/BIM Execution Plan | BIM Strategy

Task 1: Identify the goals and purposes by using BIM in the project

Task 2: Identify the different BIM Uses needed to achive the Goals



ICT/BIM Execution Plan | BIM Strategy

AUTODESK.

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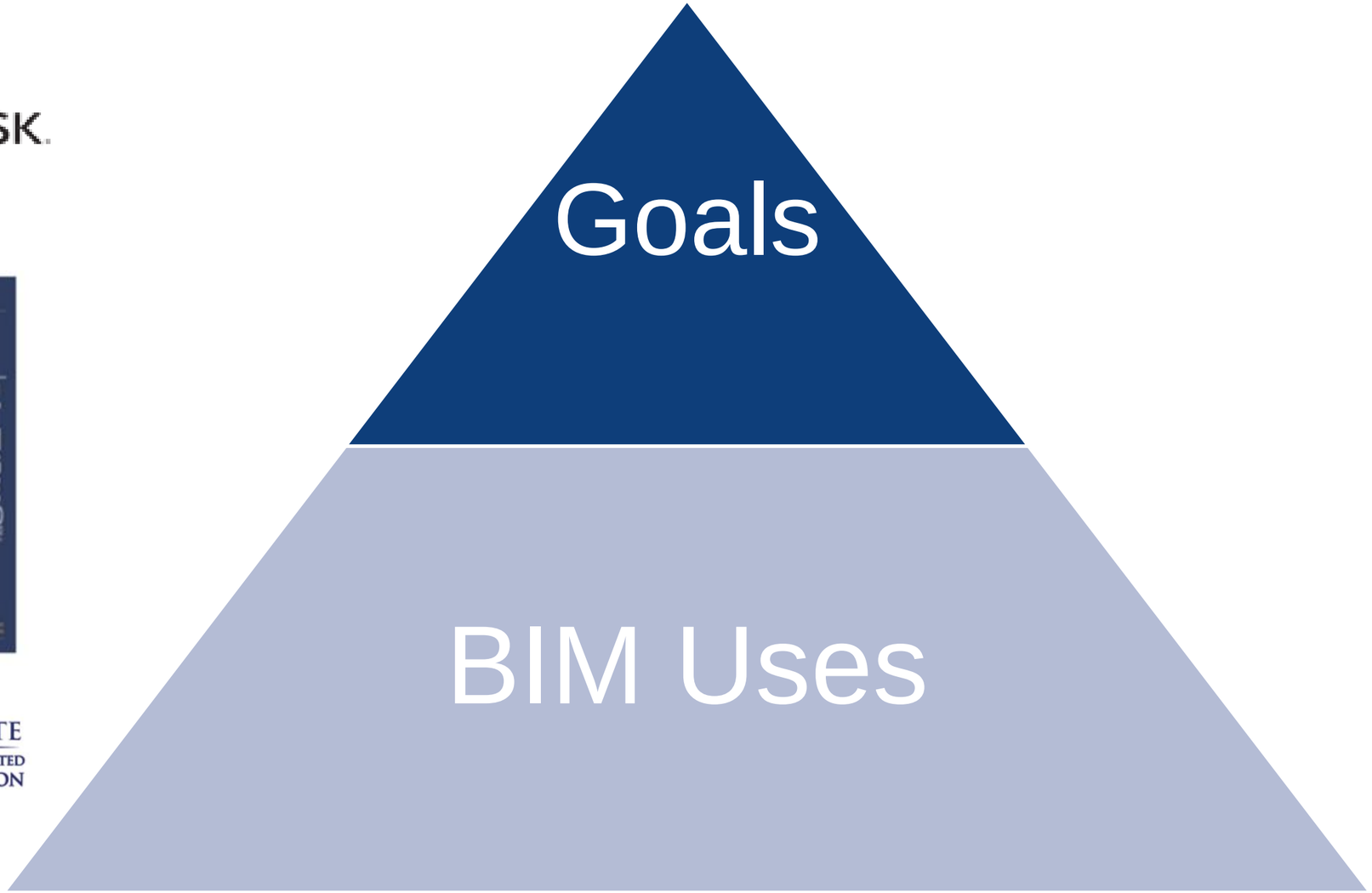
COMPUTER INTEGRATED
CONSTRUCTION



ICT/BIM Execution Plan | BIM Strategy

- Example

3.1 M1 – Sikre kvalitet i prosjekterte løsninger

Dette målet går ut på å prosjektere inn kvalitet, fremfor å kontrollere det inn.

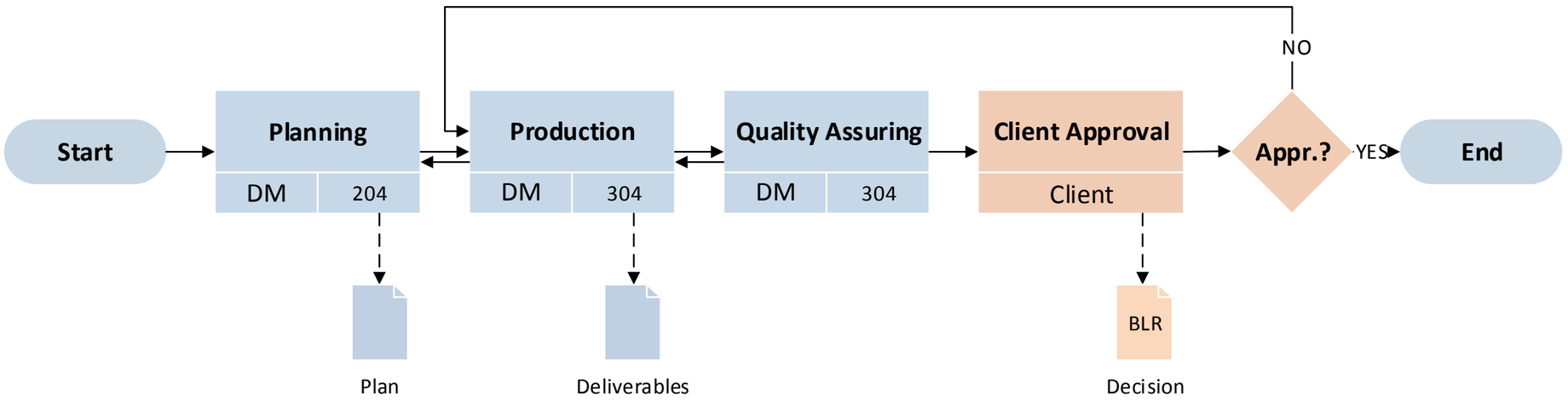
Ved å jobbe mot detaljerte nøyaktige grunnlagsmodeller, ha gode prosesser for modellutvikling, tverrfaglig samhandling og informasjonsutveksling vil man kunne oppnå dette. Ved å sette opp gode rutiner for oppbygging og utvikling av fagmodellene vil man underveis i prosjektet kunne benytte tekniske analyser for å vurdere ulike løsninger, alternativer og beslutninger basert på riktig underlag.

BIM-prosess	Beskrivelse
Grunnlagsmodellering	Denne prosessen brukes i målet M1 for å lage detaljerte grunnlagsmodeller med høy nøyaktighet, som brukes som underlag for planlegging og prosjektering. Dette bidrar til at man kan prosjektere med høyere nøyaktighet og har bedre oversikt over eksisterende situasjon.
Modellutvikling	Modellutvikling er prosessen som brukes for å lage/modellere de ulike fagmodellene. Gjennom å ha en god prosess for modellutviklingen som inkluderer

ICT/BIM Execution Plan | Org. / Responsibilities

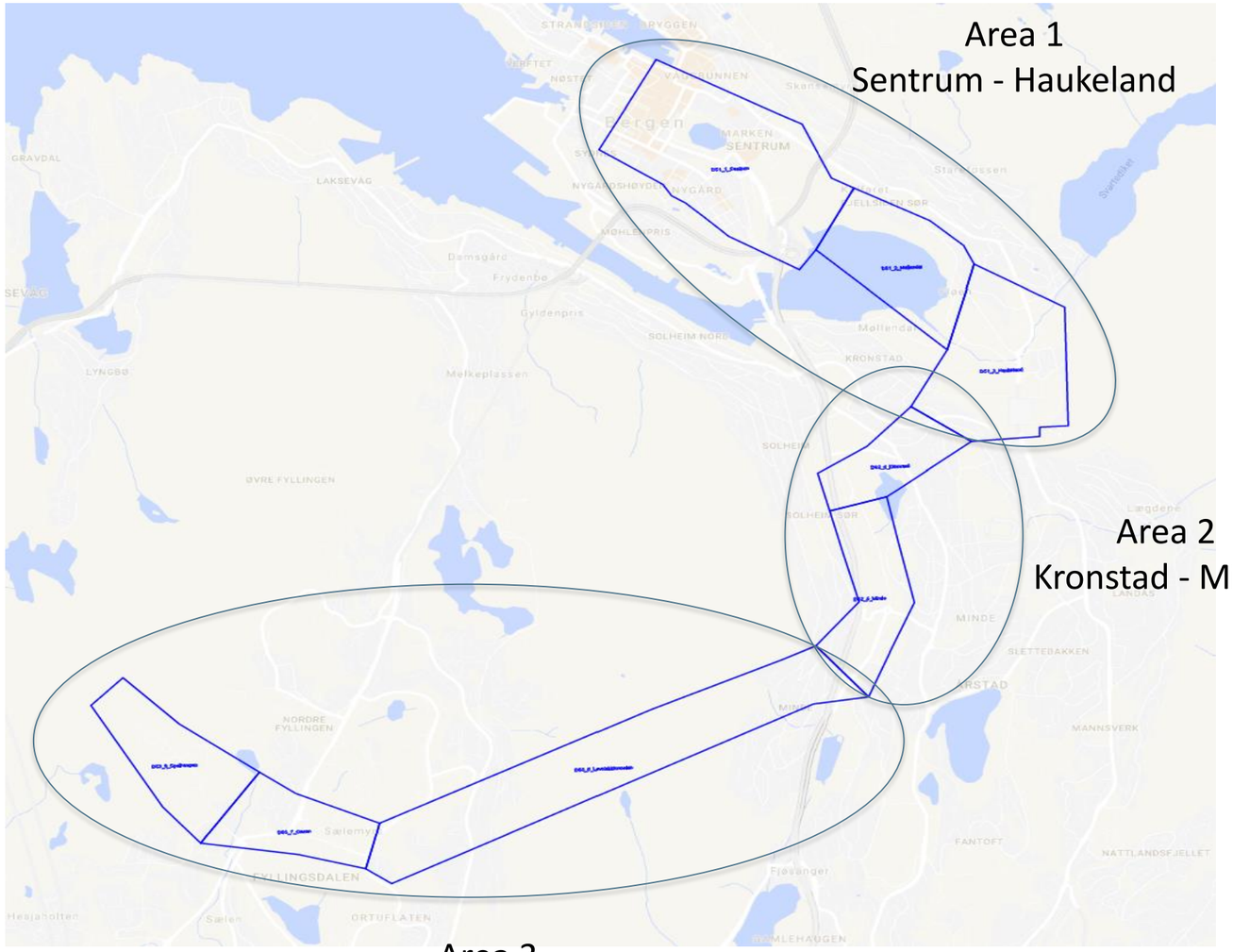
Oppdragsleder	IKT-leder	Teknisk leder	Fagansvarlig	PGL	BIM-koordinator	Modellansvarlig	Modellutvikler
Oppgaver							
Overordnet				**Delstrekning**			
Se over leveranser	Etablere pålitelig informasjonsutveksling gjennom felles informasjonsmiljø	Lede og legge til rette for tverrfaglig informasjonsutvikling i oppdraget som helhet	Bekrefte faglig kvalitet og implementere kvalitetssikringsrutiner for fagmodeller	Lede tverrfaglig informasjonsutviklings-prosess innenfor delstrekning	Lede all BIM-koordinering innenfor delstrekningen	Sørge for at informasjonsutvikling skjer i overenstemmelse med IKTL	Utvikle fagmodell iht. IKTL
Bekrefte leverandørs evne til å levere iht. kravspesifikasjon i kontrakt	Motta og ta vare på informasjon i informasjonsmodeller		Lede faglig informasjonsutvikling og -godkjennings-prosess		Legge til rette for fagenes informasjonsutvikling	Sørge for at leveranser er i overenstemmelse med IKTL	Produsere milepæl- og faseleveranser
	Etablere rutine for tverrfaglig koordinering av informasjon		Laste opp fagmodeller, tegninger og dokumentasjon til prosjekthotell ved leveranse		Utføre tverrfaglige kollisjons- og konsistenskontroller	Være bindeledd mellom fag og IKT-team	
	Konfigurere informasjon mtp leveranser i de forskjellige fasene				Laste opp tverrfaglige modeller til prosjekthotell ved leveranse		
	Definere hva slags informasjon grunnlags- og fagmodeller skal inneholde						

ICT/BIM Execution Plan | Processes and workflows



ICT/BIM Execution Plan | Structuring models

- Model/project areas and sub-areas



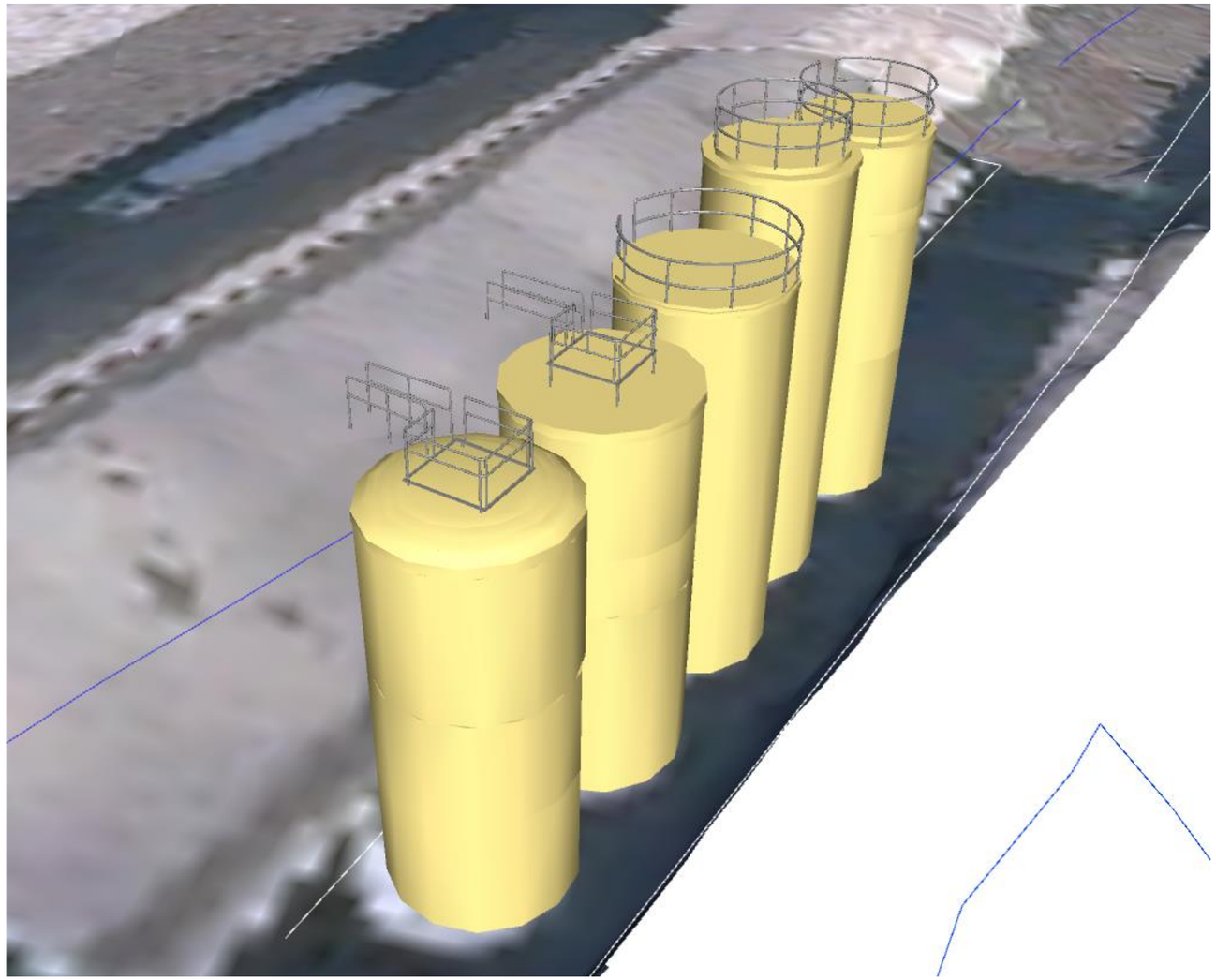
ICT/BIM Execution Plan | Structuring models

- Model types:
  - Base Models (Existing Conditions)
  - Discipline Models (Planned situation)
  - Interdisciplinary Models

- Model formats:
  - DWG, IFC, LandXML, NWD

ICT/BIM Execution Plan | Structuring models

- Base model:

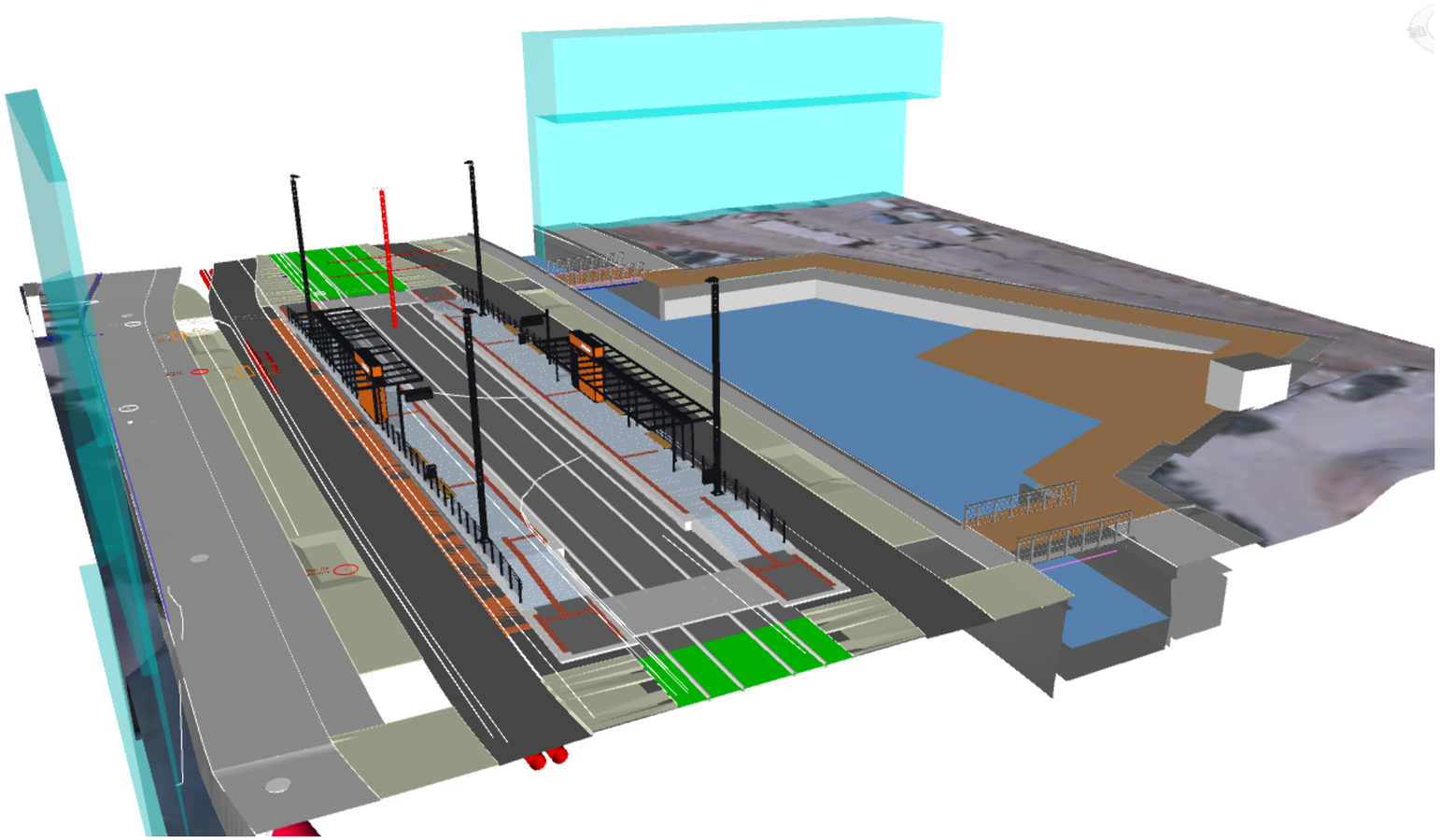


ICT/BIM Execution Plan | Structuring models

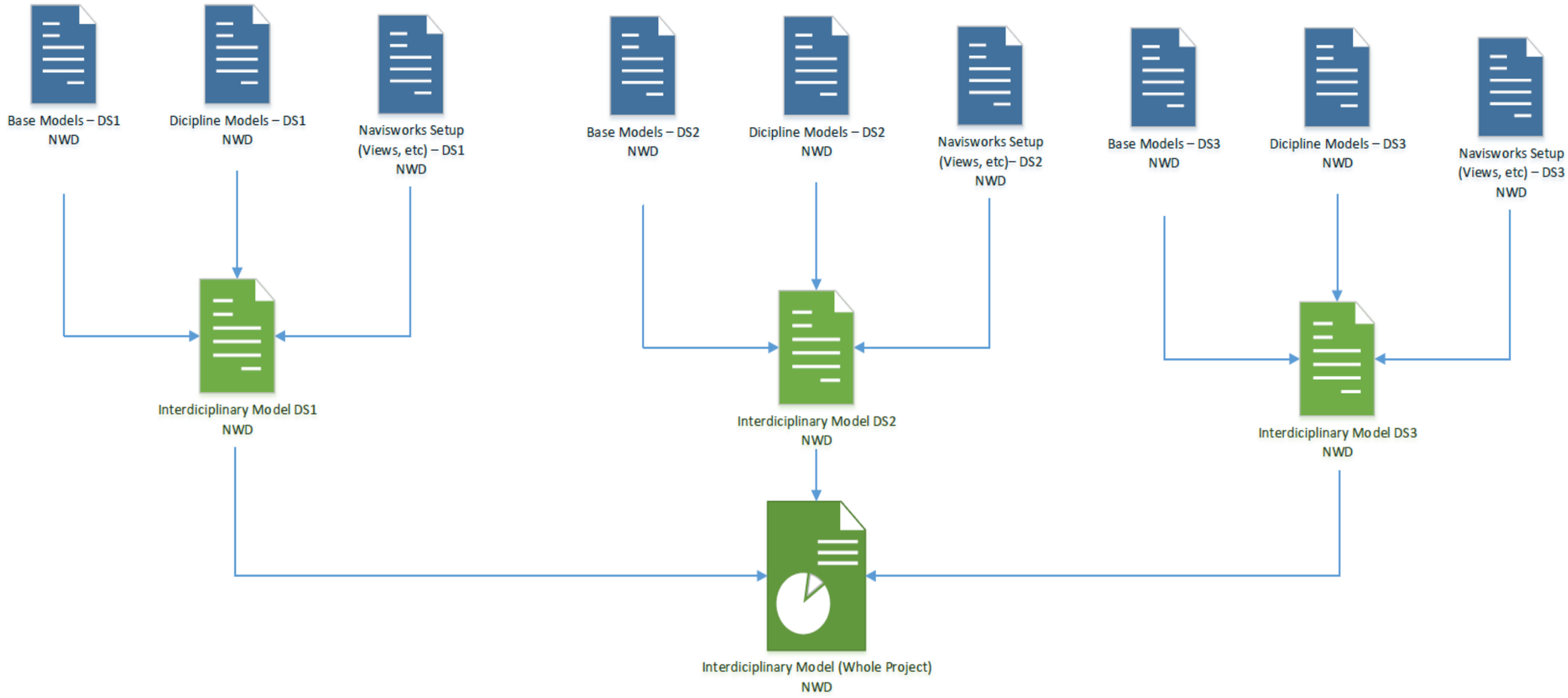
- Discipline Model:

ICT/BIM Execution Plan | Structuring models

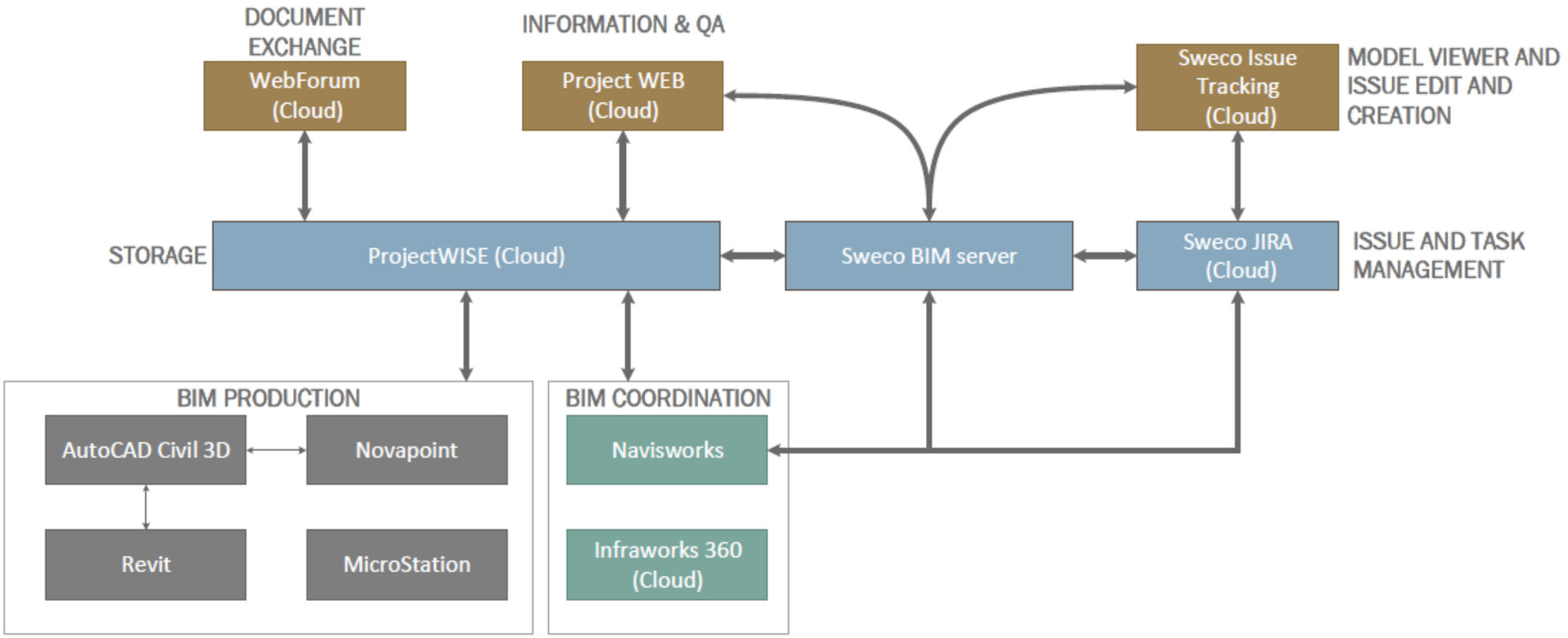
- Interdisciplinary Model:



ICT/BIM Execution Plan | Structuring models



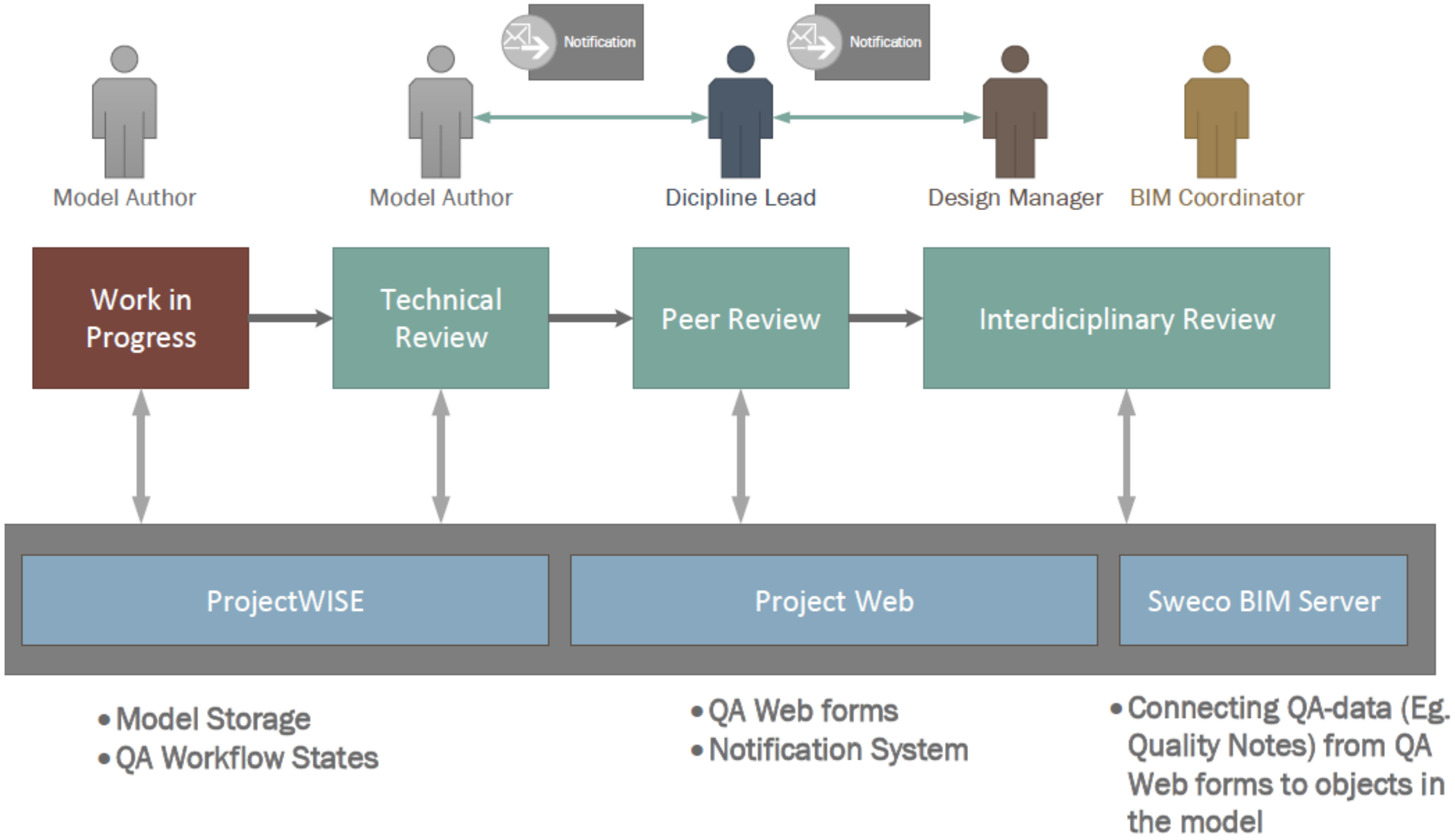
ICT/BIM Execution Plan | Information Exchanges



ICT/BIM Execution Plan | Collaboration

- ICT systems
- Project Office
- Work methods
  - ICE – Integrated Concurrent Engineering
  - Scrum / sprints
- Project Web Page

ICT/BIM Execution Plan | Quality Assurance



ICT/BIM Execution Plan

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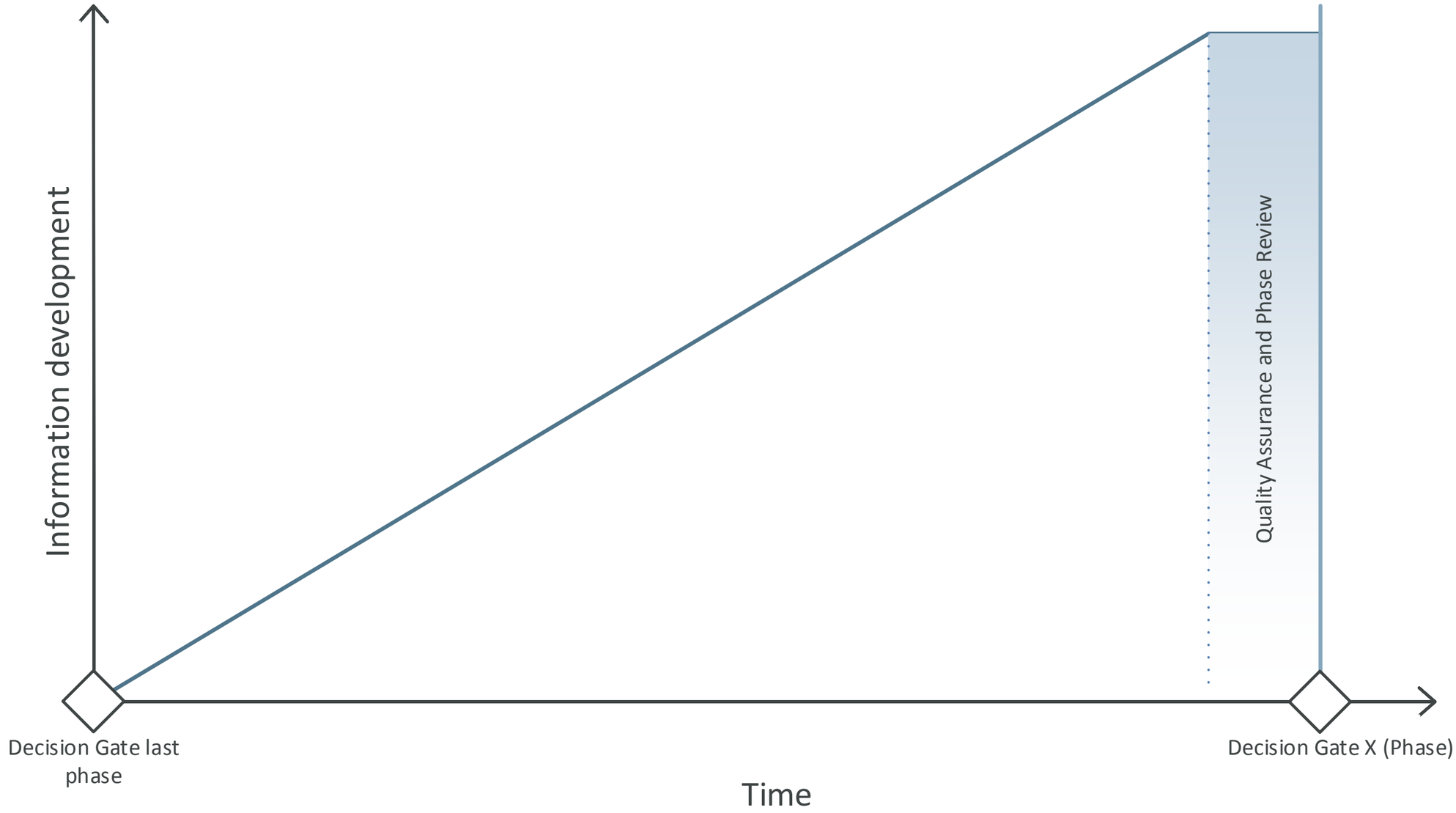
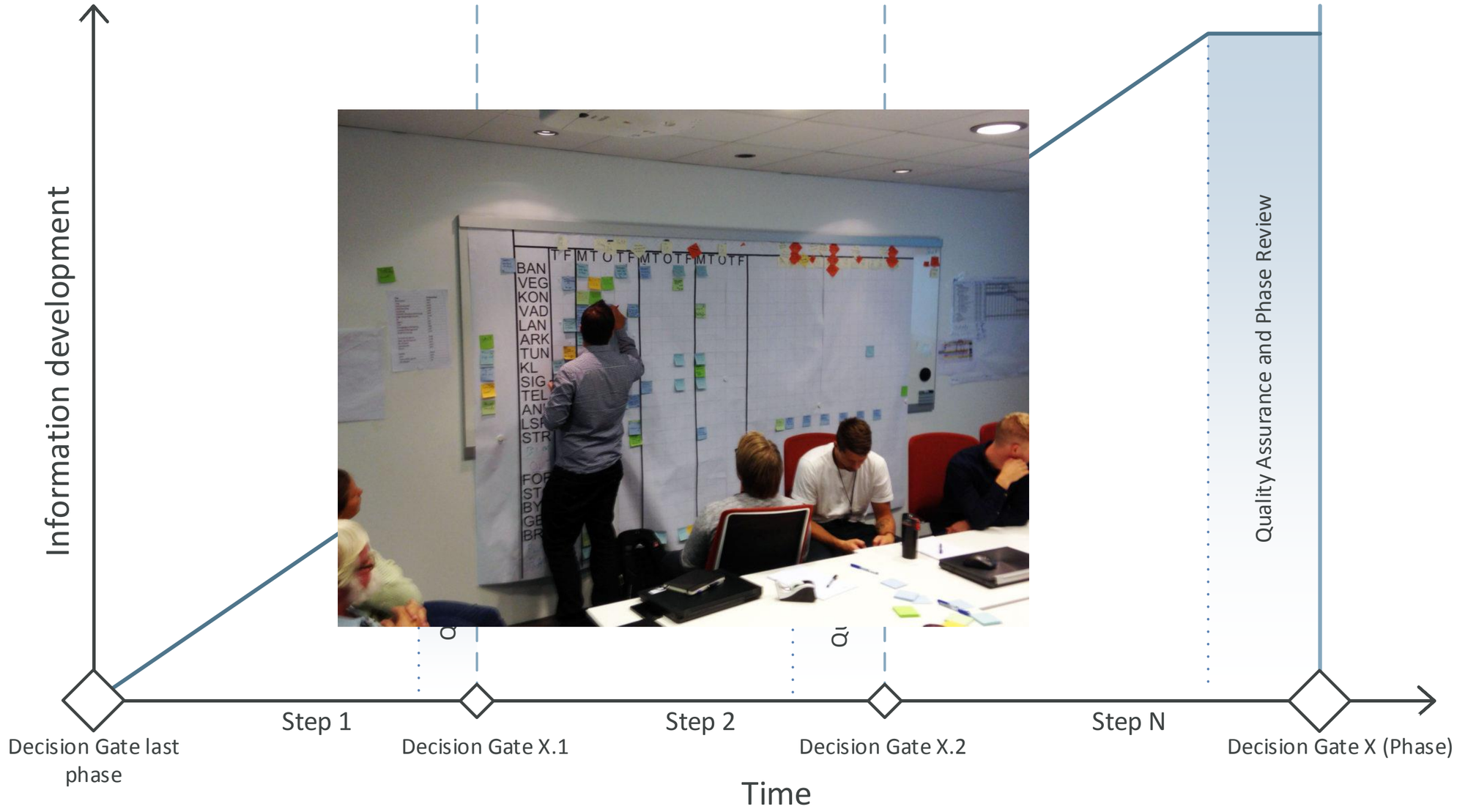
Information Development

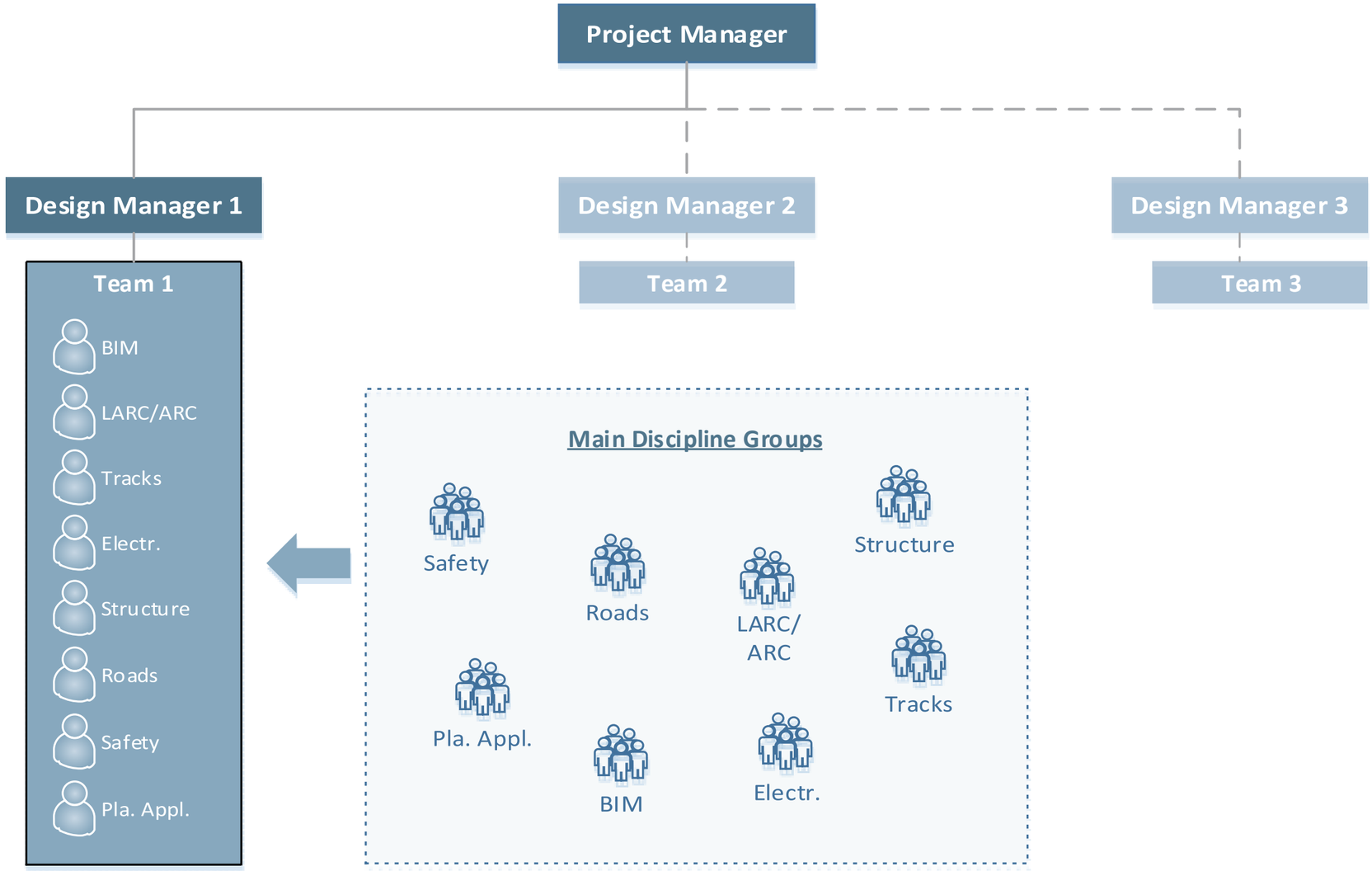
Information Development | Steps / Reviews



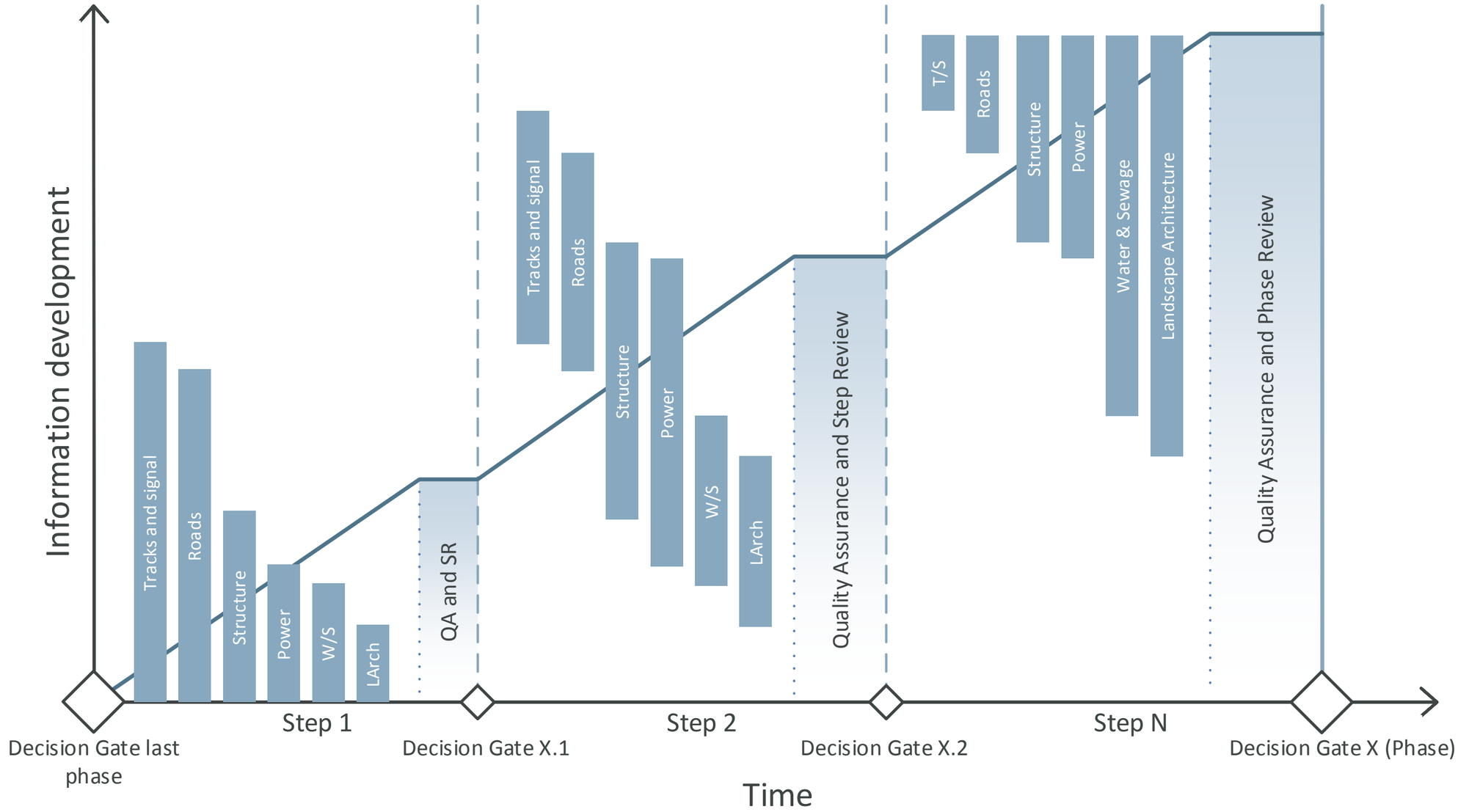
Information Development | Steps / Reviews



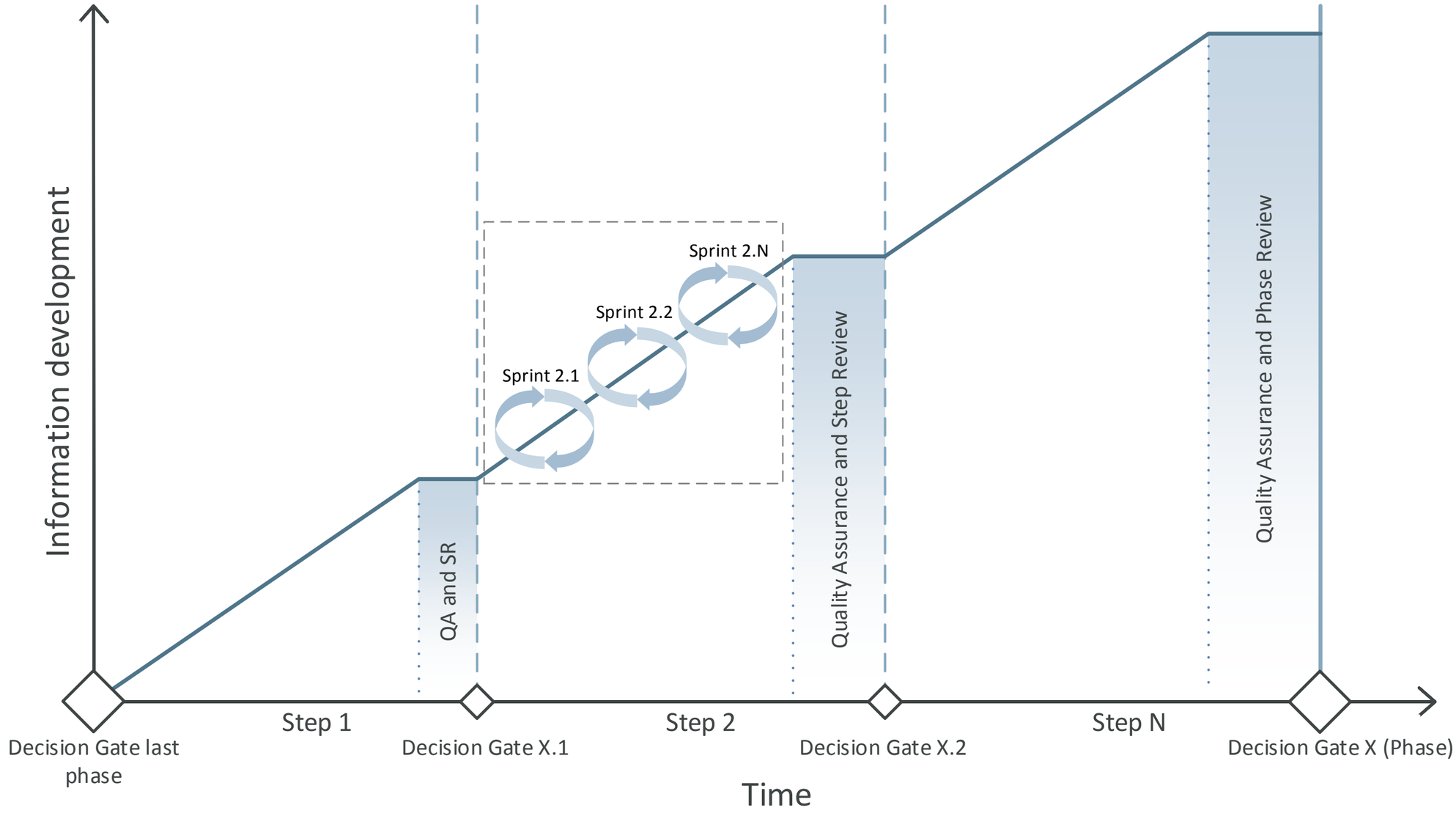
Information Development | Organization / Teams



Information Development | LOD



Information Development | Sprints



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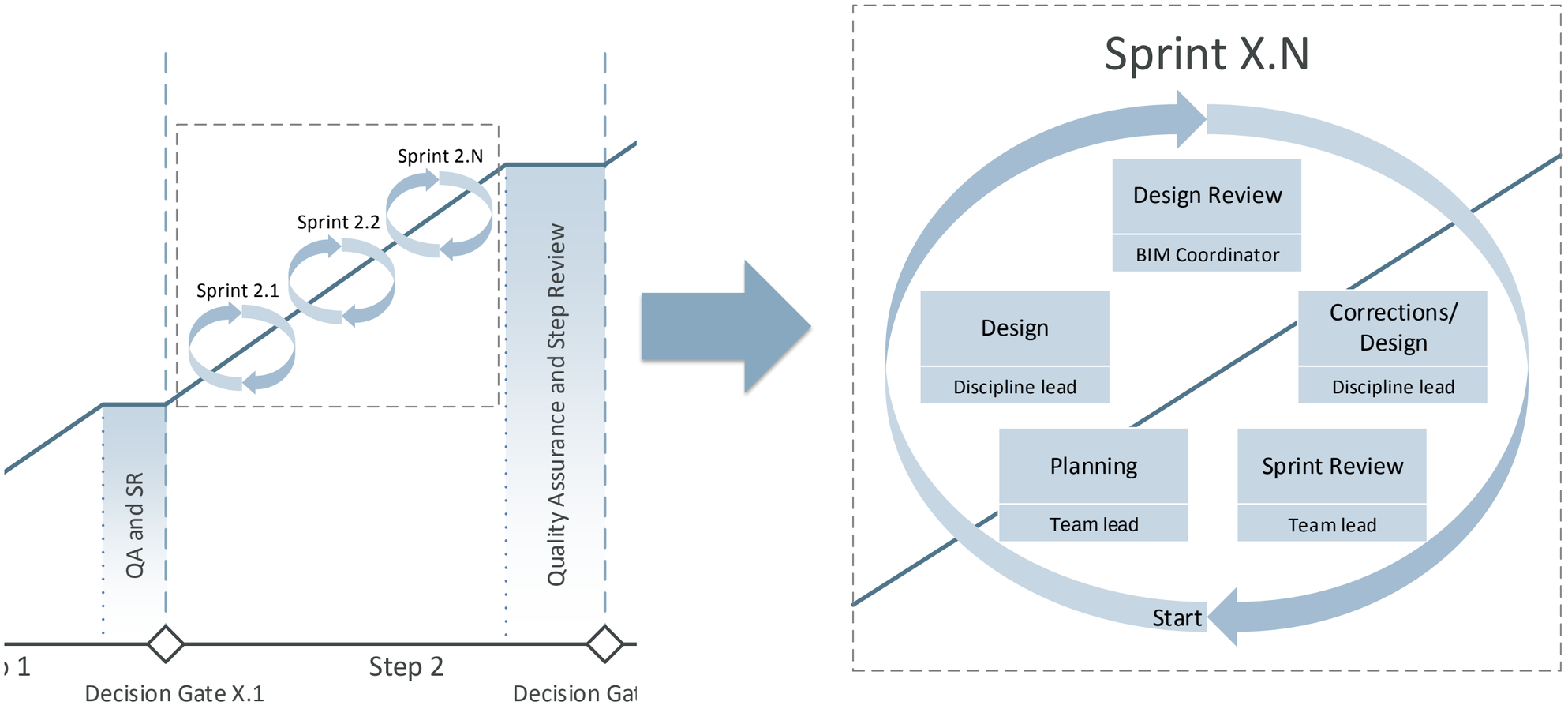

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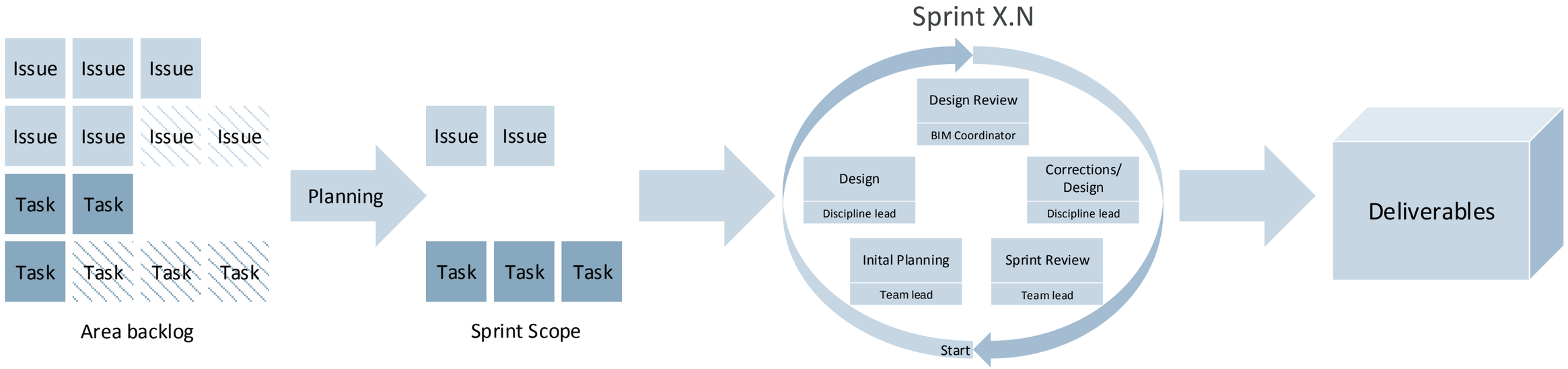

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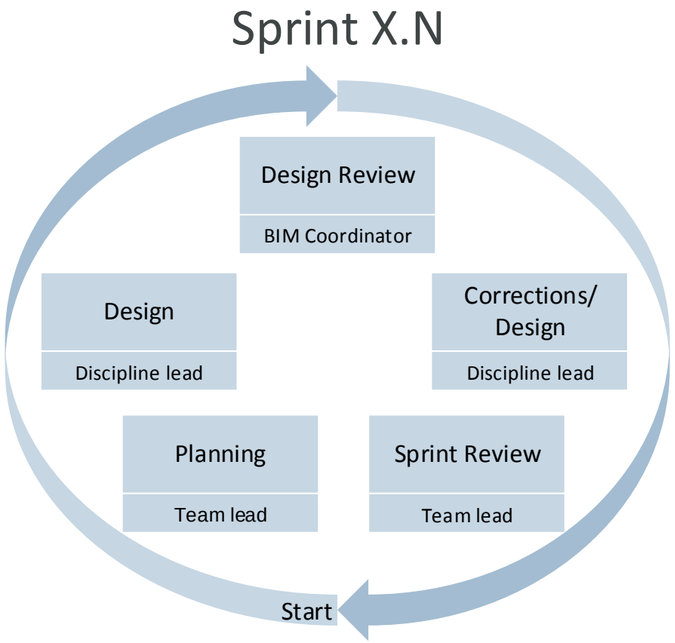
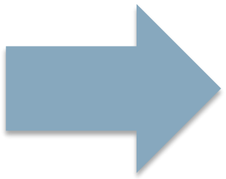
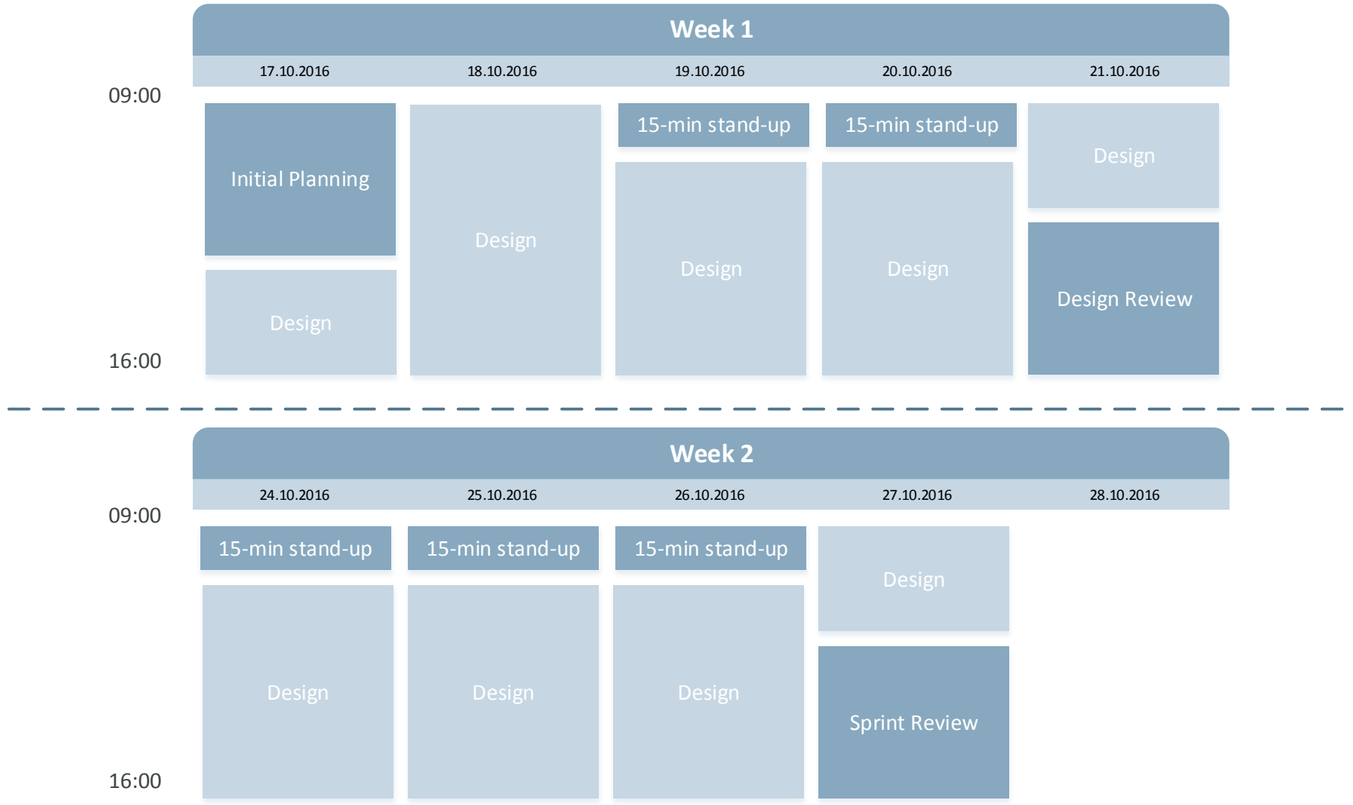






Information Development

- Specified LOD for Decision Gates throughout the phase
- Reveal dependencies between disciplines
- Engineering and design in Sprints or ICE
- Backlog of tasks and issues contained within Project Management Tool (JIRA)
- Step Reviews with the client to ensure progress

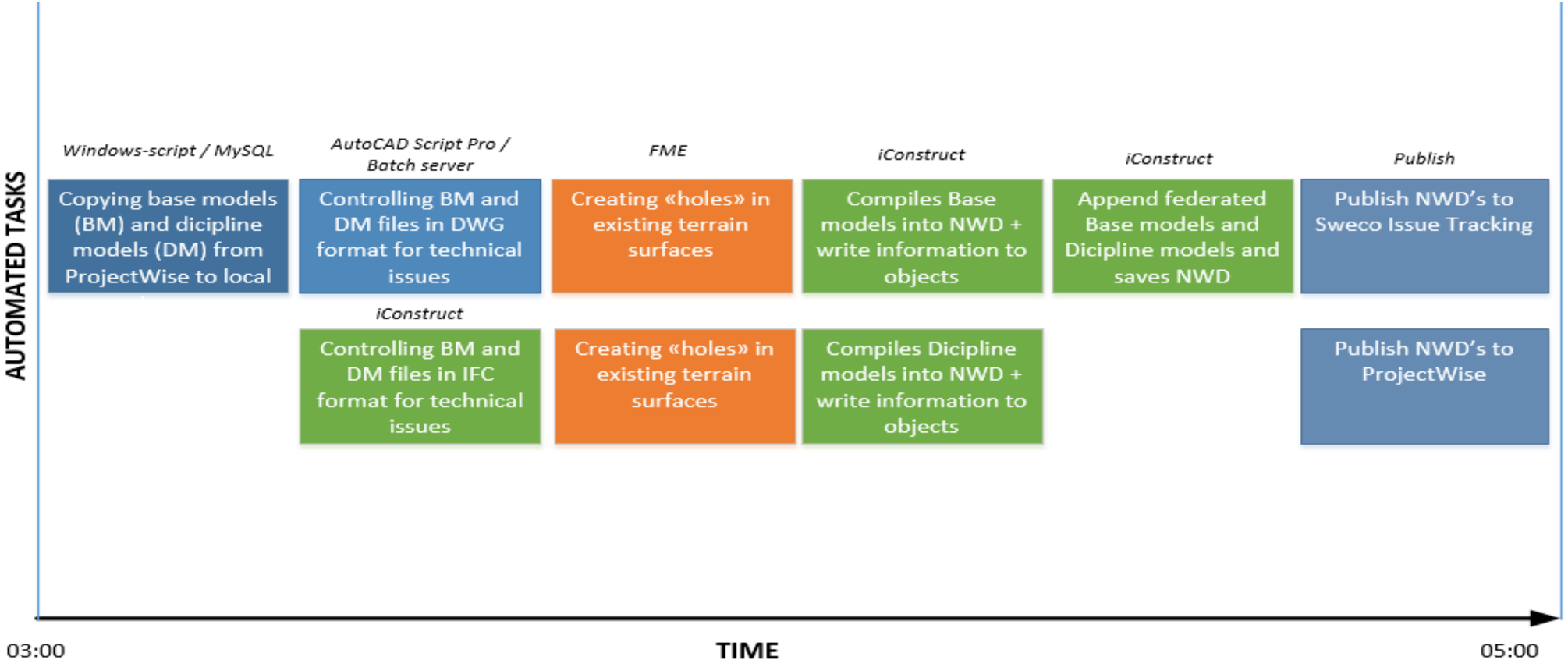
Technology and the private cloud

Technology and the private cloud

- Automation
- Custom attribution
- Issue and task management

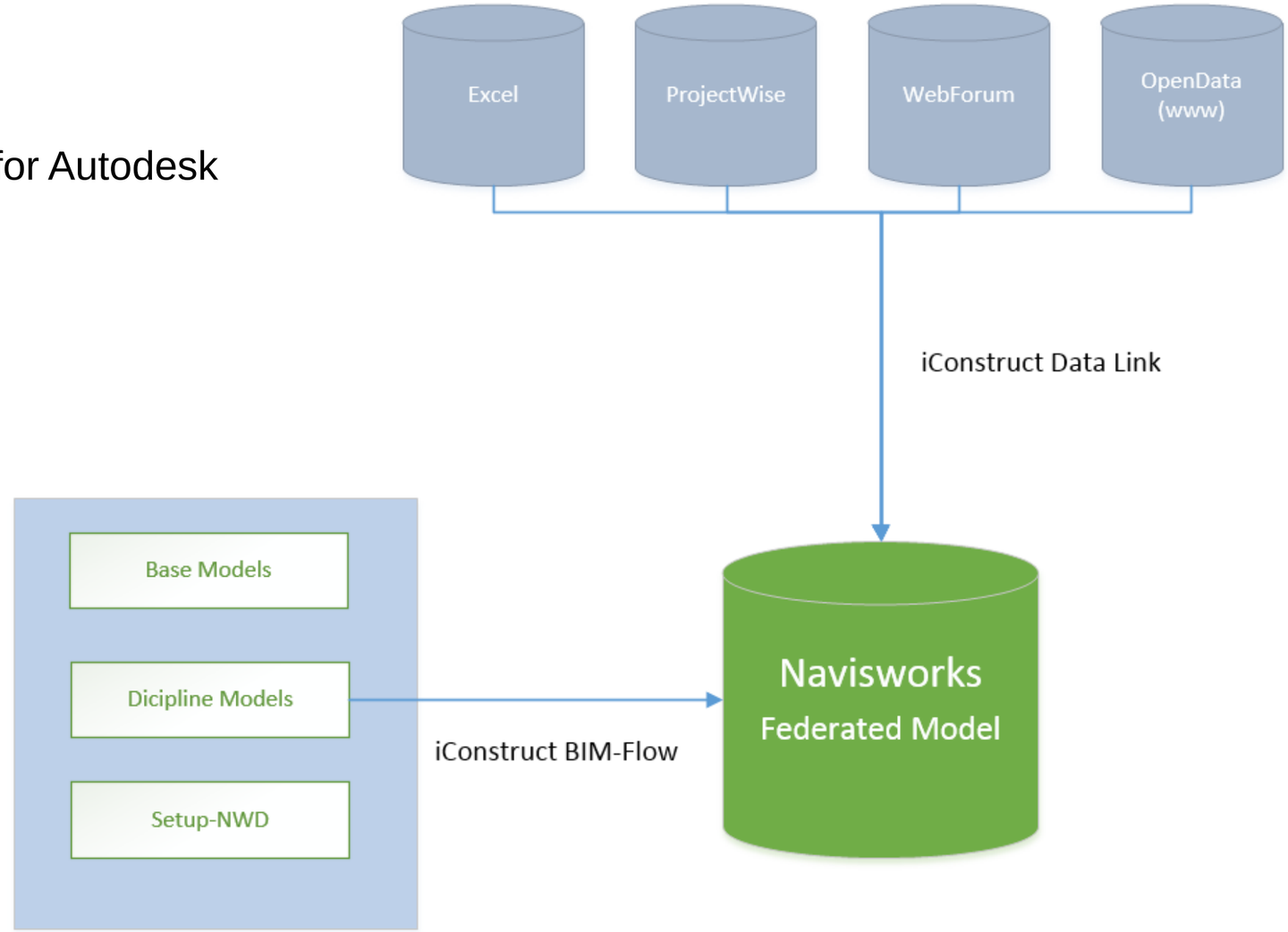
Technology and the private cloud | Automation and custom attribution

- Automated tasks



Technology and the private cloud | Automation and custom attribution

- Custom attribution
  - Using PDC iConstruct for Autodesk Navisworks



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I7

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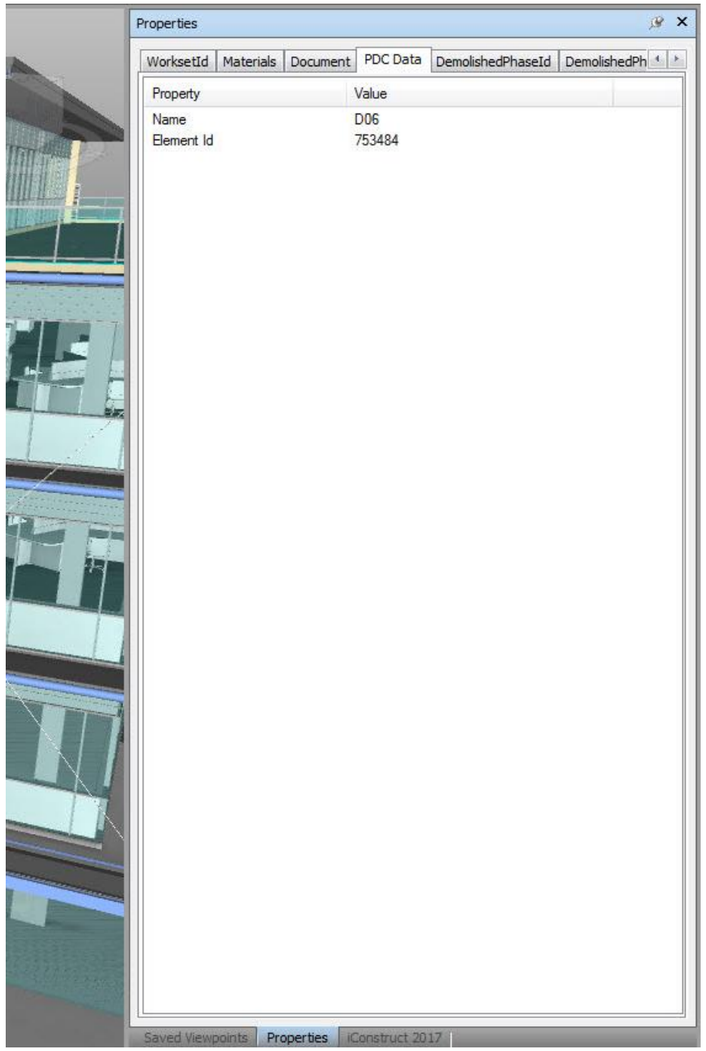

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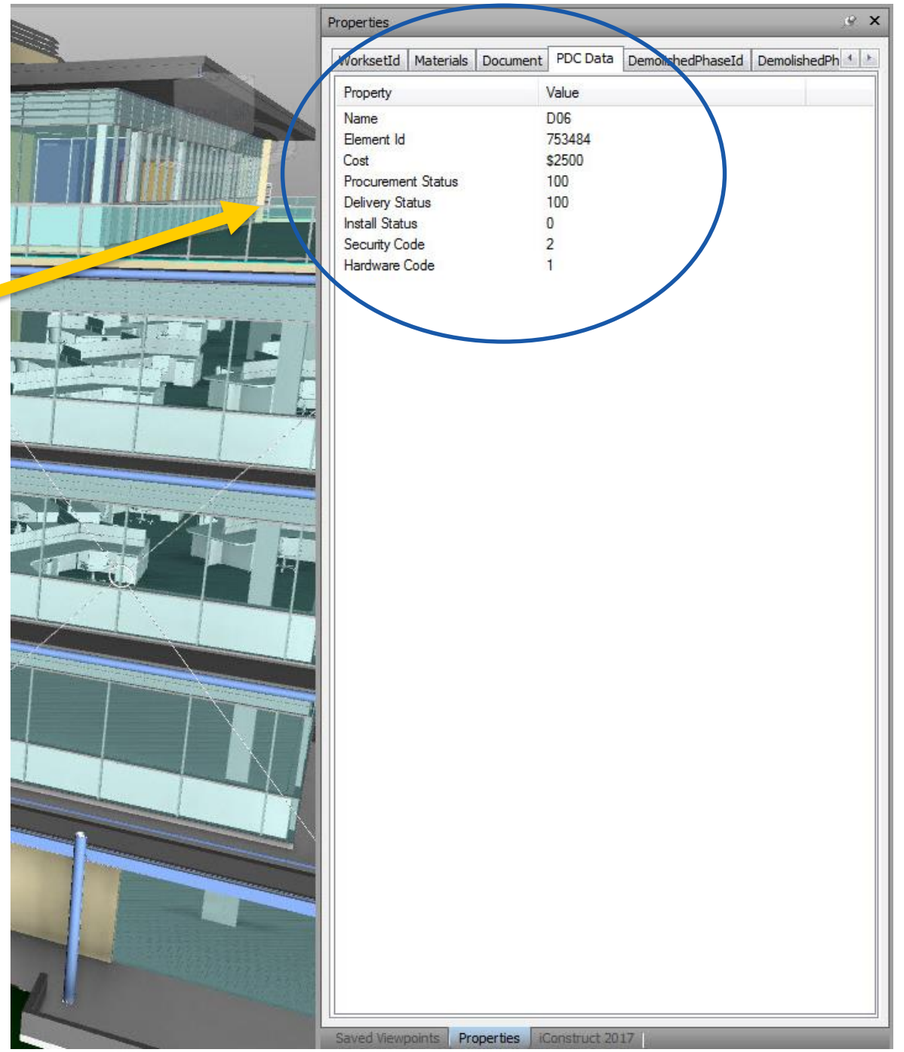

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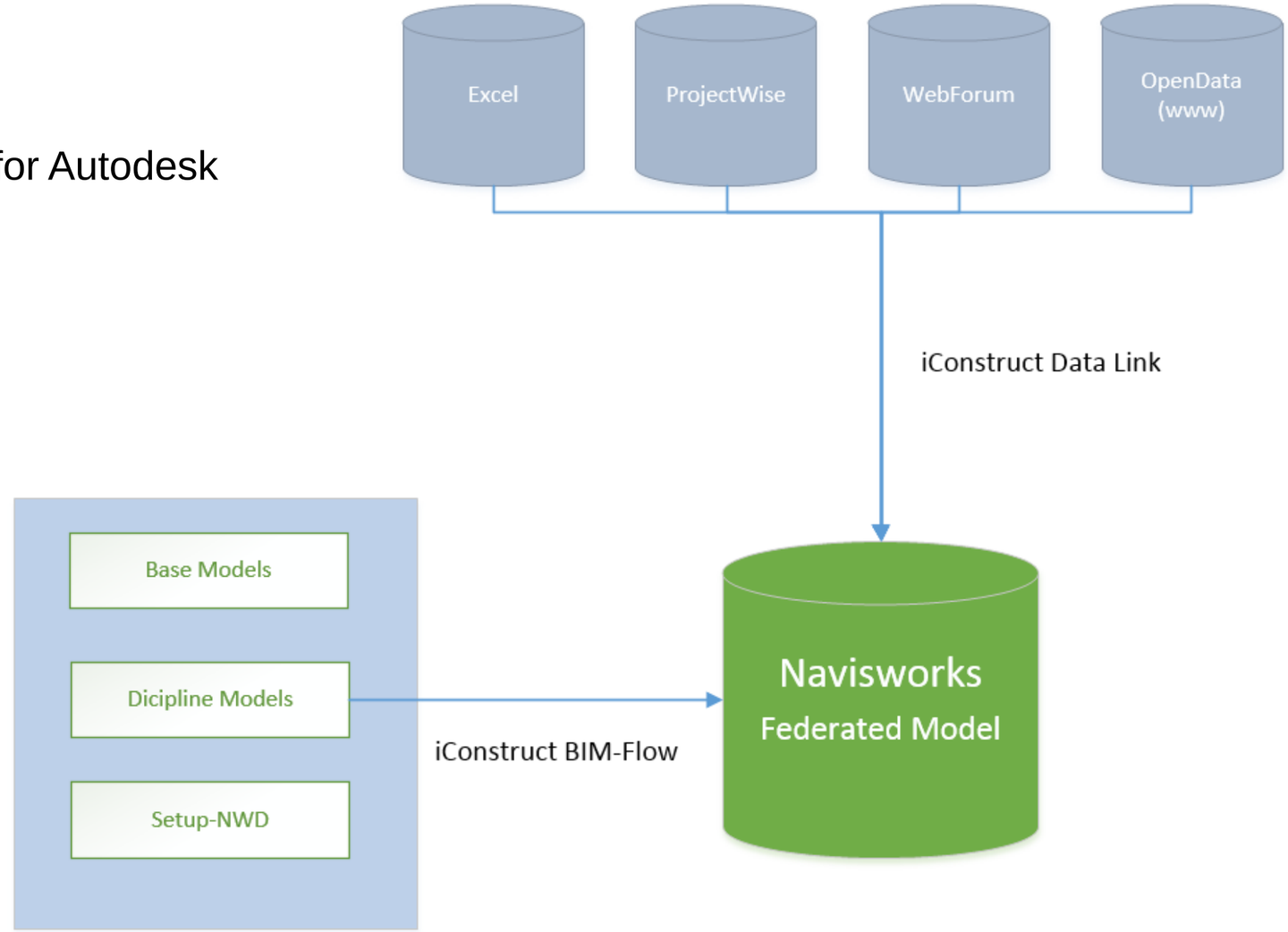
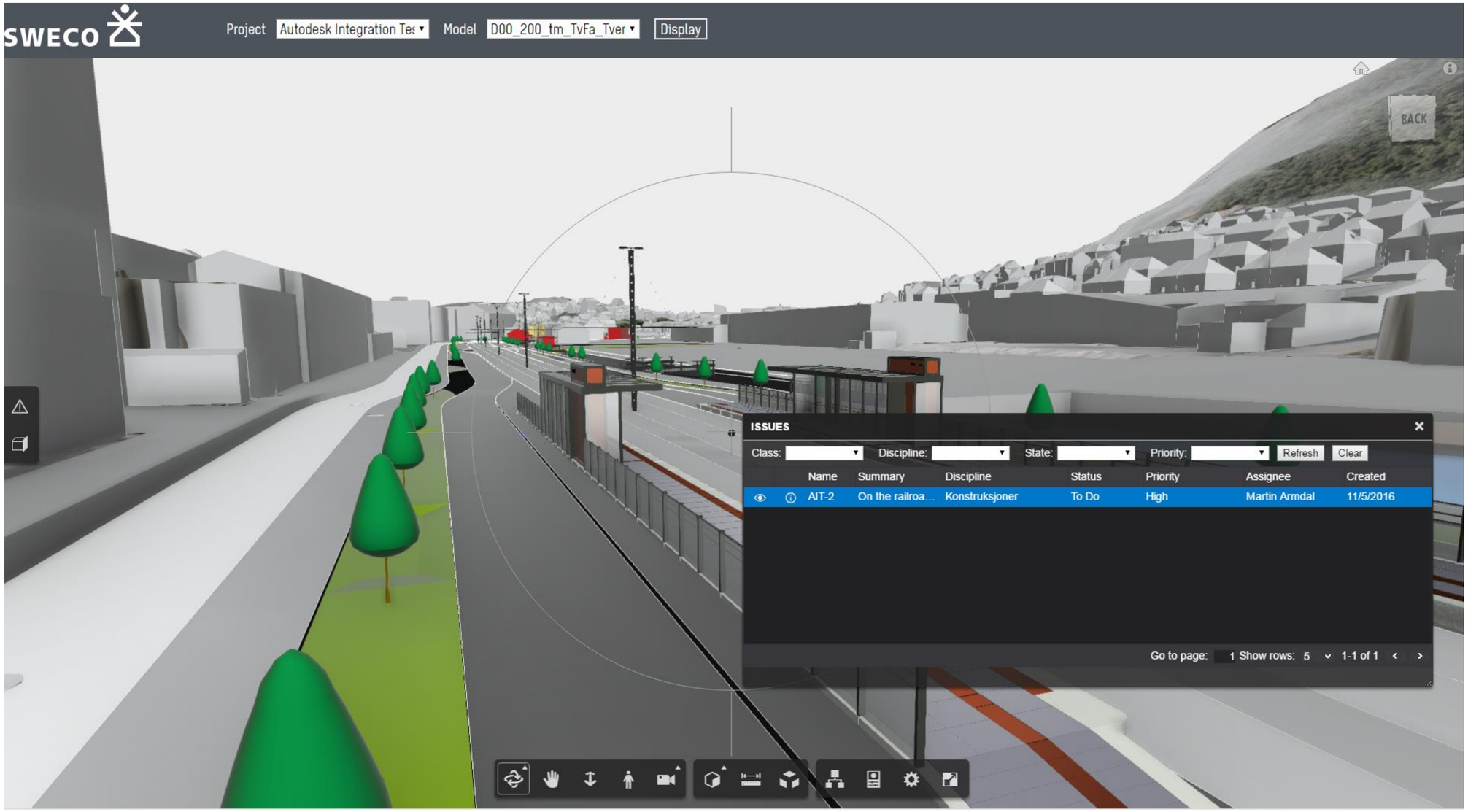


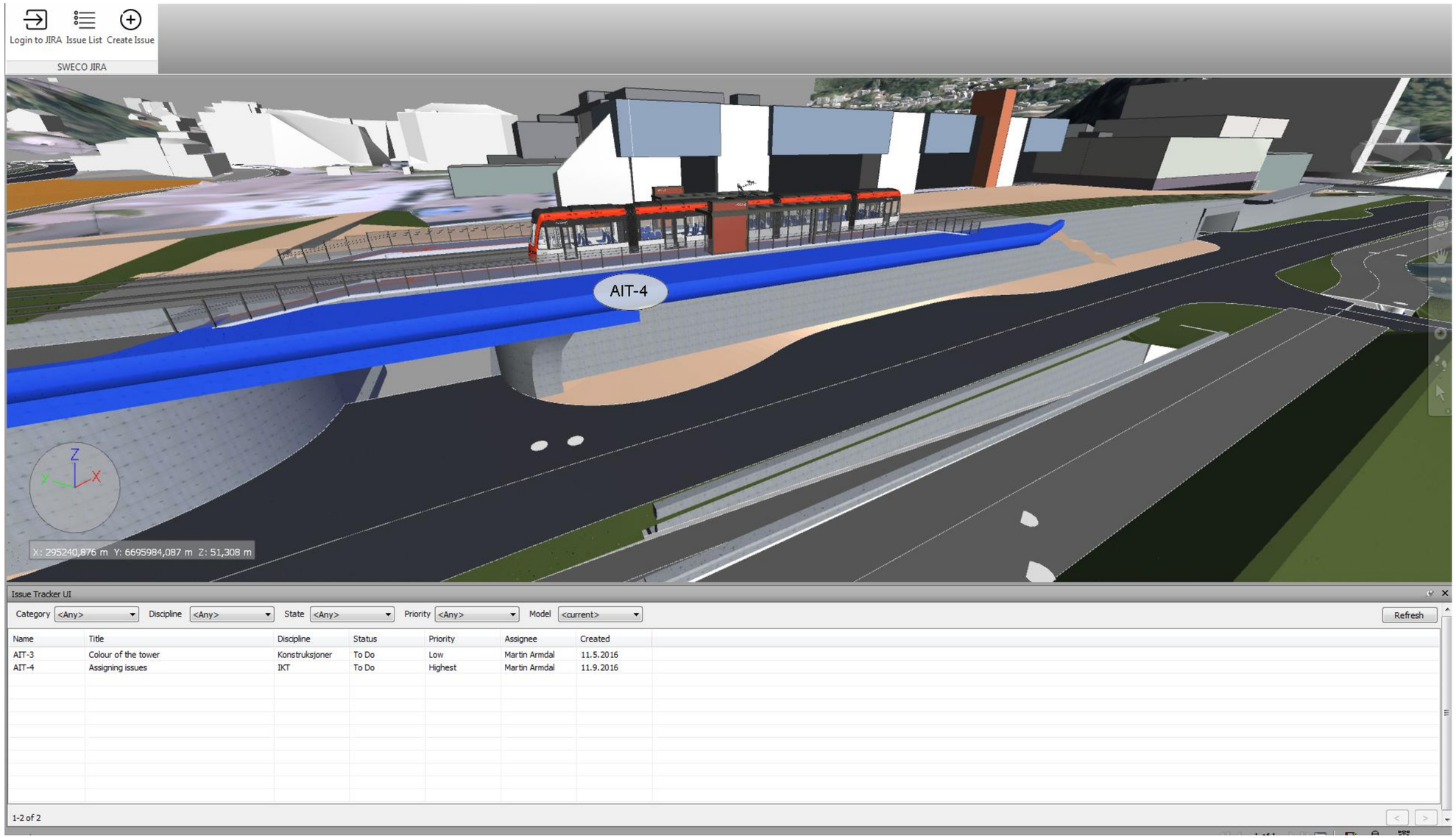
Technology and the private cloud

- Needed a cloud based model viewer with issue tracking capabilities
- Help from Autodesk
- Integration between model viewer and project management tool
- Create and assign issues in a web browser
- Visually identify, describe and assign issues

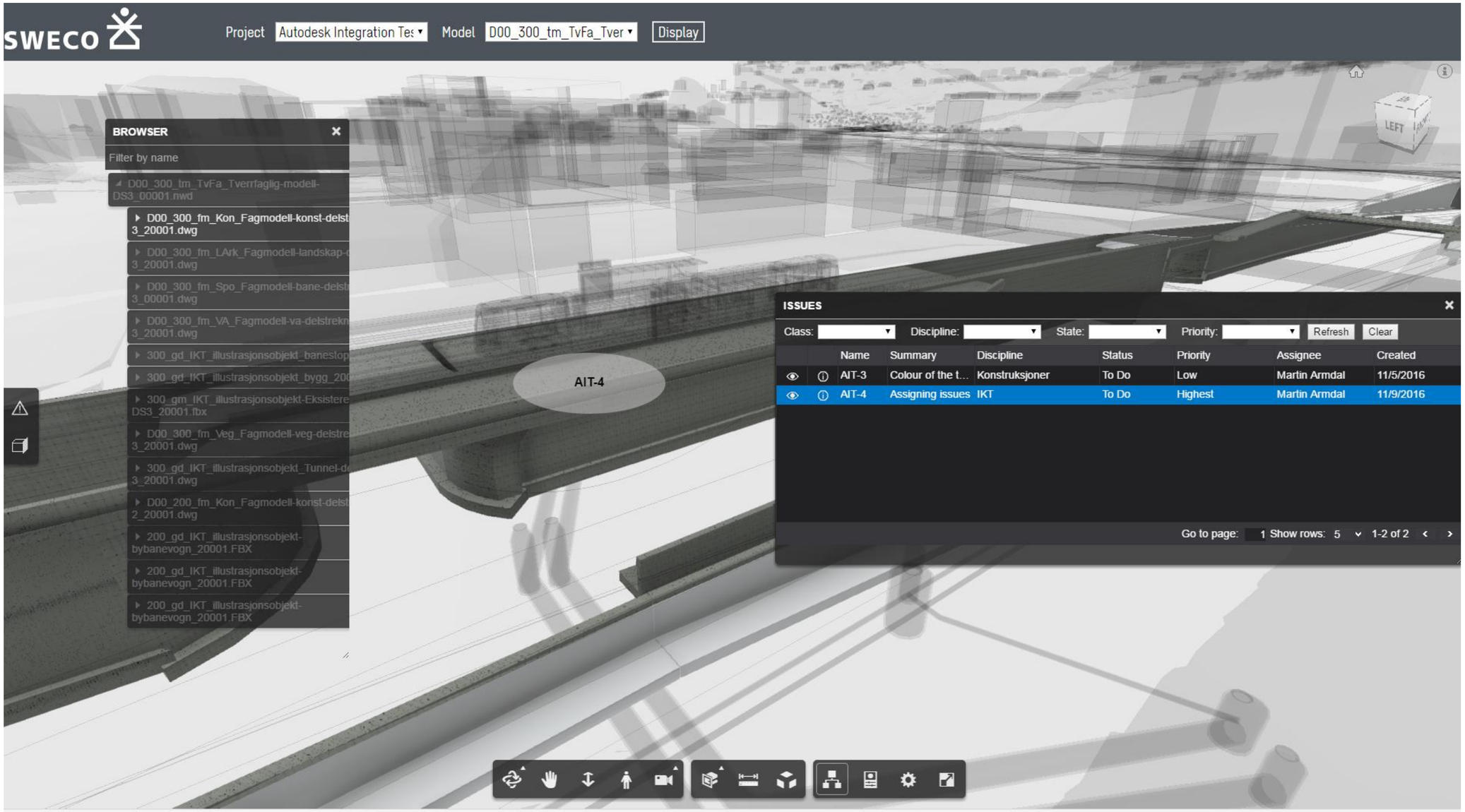
Technology and the private cloud



Technology and the private cloud



Technology and the private cloud



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