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Solving the clash between Model Coordination and Navisworks

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Learning Objectives

- Identify factors driving the decision of when to use Model Coordination and/or Navisworks
- Understand and deal better with clash avoidance
- Hear about real world use cases of clash standards and processes
- Build optimized dashboards to make your clash detection more productive for the project team

Description

Currently, Autodesk have two 3D coordination and clash detection tools in their portfolio of products. Deciding which one to use between Model Coordination and Navisworks can be a challenge. Have you wondered how large multi nationals like AECOM are making that decision? In this industry talk AECOM will share some of our ideas and workflows with you on how best to leverage Model Coordination and Navisworks on your vertical infrastructure projects.

Speaker(s)



Left to Right: Shashwat Bhardwaj, Craig Howie and Namit Ranjan

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Shashwat Bhardwaj is a Senior Implementation Consultant at Autodesk based in Bangalore, India. He is a Civil engineer by degree and started his career as a structural engineer in power plant industry and worked on many detailed design and construction projects. He works with Autodesk enterprise customers by innovating and evolving their design to construction workflows using AEC products and Autodesk construction Cloud solutions. [LinkedIn](#)

Model Coordination and/or Navisworks

'Should we use Model Coordination or Navisworks on this project?' This is a question we at AECOM have been asking ourselves over the last few months. We have some answers to this and want to share some of these with you, let's start with discussing functionality overlap.

Functionality overlap

Currently there are at least 5 main functions that overlap between Model Coordination 'the module within BIM 360/ACC' and the 'desktop application' Navisworks.

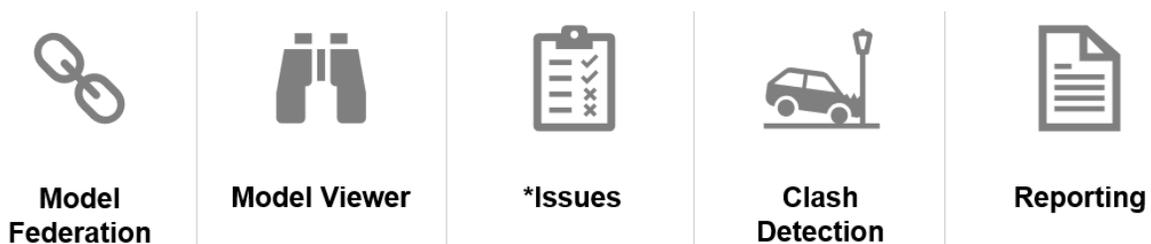


Figure 1 – 5 main functionalities overlapping between Model Coordination and Navisworks

Combinations of how we use the tools today

Currently there are essentially 3 combinations of these tools that we use today on our projects, each with their own focus and specific use cases. They are:



Figure 2 – 3 combinations of tool(s) we are actively using on projects

How we decide what tool combinations to use?

So, features overlap, there are also different combinations of tools that you can use, we consider the following to be the key drivers of which tool or tool combinations we deploy on a project. These are some of the questions you need to ask yourself.

Size and Complexity:

What are the sizes of models, file formats and quantity of models? Are there lots of project stakeholders?

Reporting & dashboarding requirements:

Does the team or client want reporting and dashboarding? How detailed does this need to be?

Need for Customizability:

Does the team need to customize things permanently and use pre-set templates with, Clash Rules, Clash Tests, Search Sets and Tolerances?

Team Setup:

Roles & responsibilities - Who will do the clash detection? Will there be a BIM Manager doing this?

Skills - Does the skills level of the team require a low-tech or higher-tech solution?

Licensing - Does the team have the required licensing needed?

Projects – Complexity grading

So, features overlap, there are different combinations of tools that you can use, we understand the key drivers of each tool and tool combination.

What we do is we then grade the project as either ‘basic’ or ‘complex’. For basic we will lean towards Model Coordination as it is easier and less effort and is somewhat self-managing after initial setup, it is ideal where there is no BIM Manager beyond just initial setup activities. For complex we lean towards Model Coordination + Navisworks, this is a little more complicated and requires more effort and needs a level of central oversight and management, you will likely need a BIM Manager beyond just initial setup activities. While for complex projects this is the preferred approach, there remains a need of very complex projects especially those which might not be using BIM 360/ACC as the design CDE (Common Data Environment) use still use Navisworks (Standalone).

Table 1 – We use this basic table to grade and decide which tool/tools to use

Type of project	Model Coordination	Navisworks (Standalone)	Model Coordination + Navisworks
Basic	✓		
Complicated			✓
Very Complicated *with conditions		✓	

Clash Avoidance

We cannot discuss coordination and especially clash detection without discussing clash avoidance. Dealing with 'prevention' vs 'cure', makes sense right!

What causes a clash?

So, let's start back at the basics, 'what causes a clash', and which of those causes are the most detrimental. Some of this might be subjective however when we asked our teams, we got very similar responses.

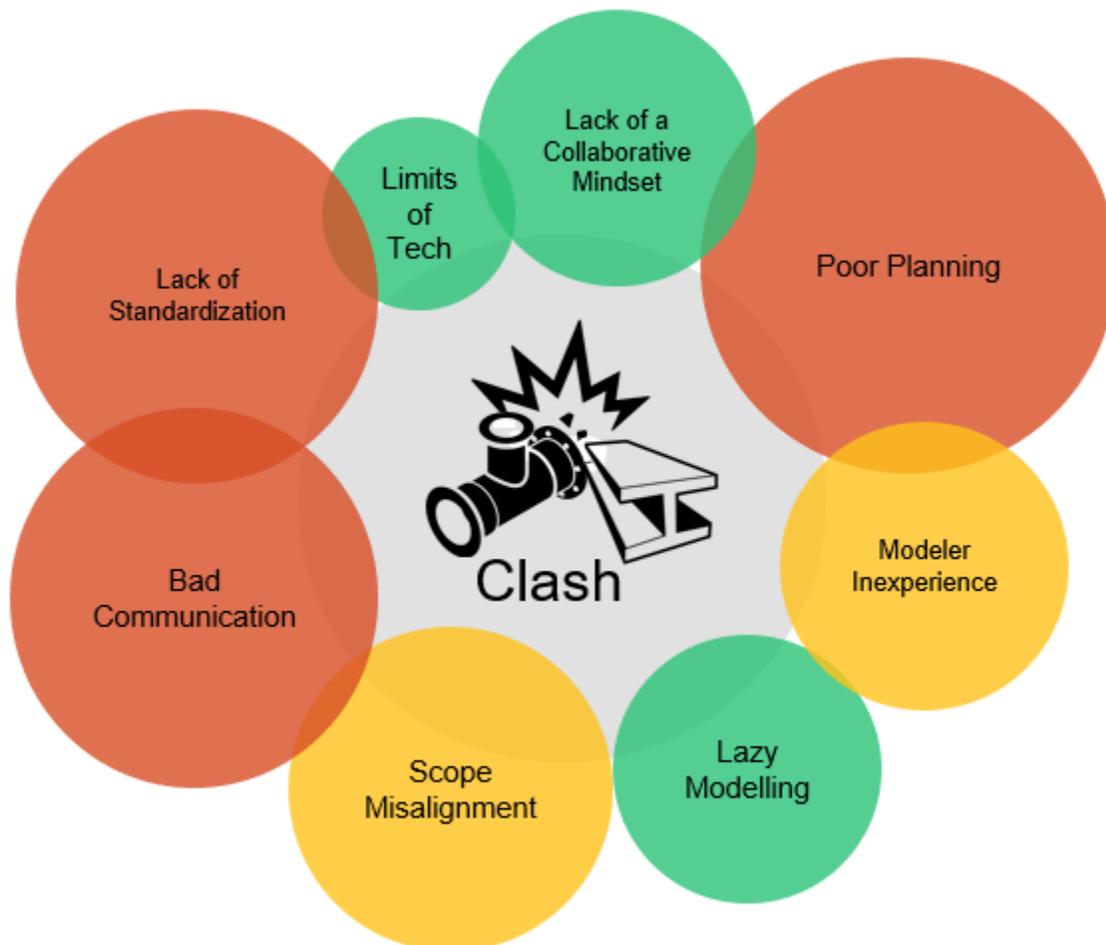


Figure 3 – Top causes of clashes

So, we seem to know very clearly what causes clashes, one would think that if we know the cause then we would easily be able to prevent this from happening. The reality is that projects that we deliver are far from simple, sometimes things are in your control and other times they

are not. This is particularly the situation with a Modeler, they often get involved in projects at a certain point and a level in the project team where they may not have influence over certain things, so what can they do about clash avoidance?

Modeler techniques for clash avoidance

So, we know what causes clashes, how can modelers positively contribute themselves to clash avoidance. There are 5 main techniques we are busy driving with our teams to help 'prevent' clashes, they are as follows:

Service zone approach - Service zone modelled in 3D 'massing' and then defined and documented in 2D

Section box tool - Dynamic use of section box tool in Revit or add-ins like COINS

MEP live linking - MEP teams link WIP model to WIP models for faster turnaround on seeing updates from other MEP teams, vs waiting to share models say weekly via Design Collaboration

Model segregation - We in the past have split models into every single discipline, for example models for MEP comprising of a mechanical, Electrical, Plumbing and Fire model. This mostly was a reaction to model performance and segregating responsibility. We are currently actively looking at options of having fewer discipline models to break sub-discipline silos that this creates

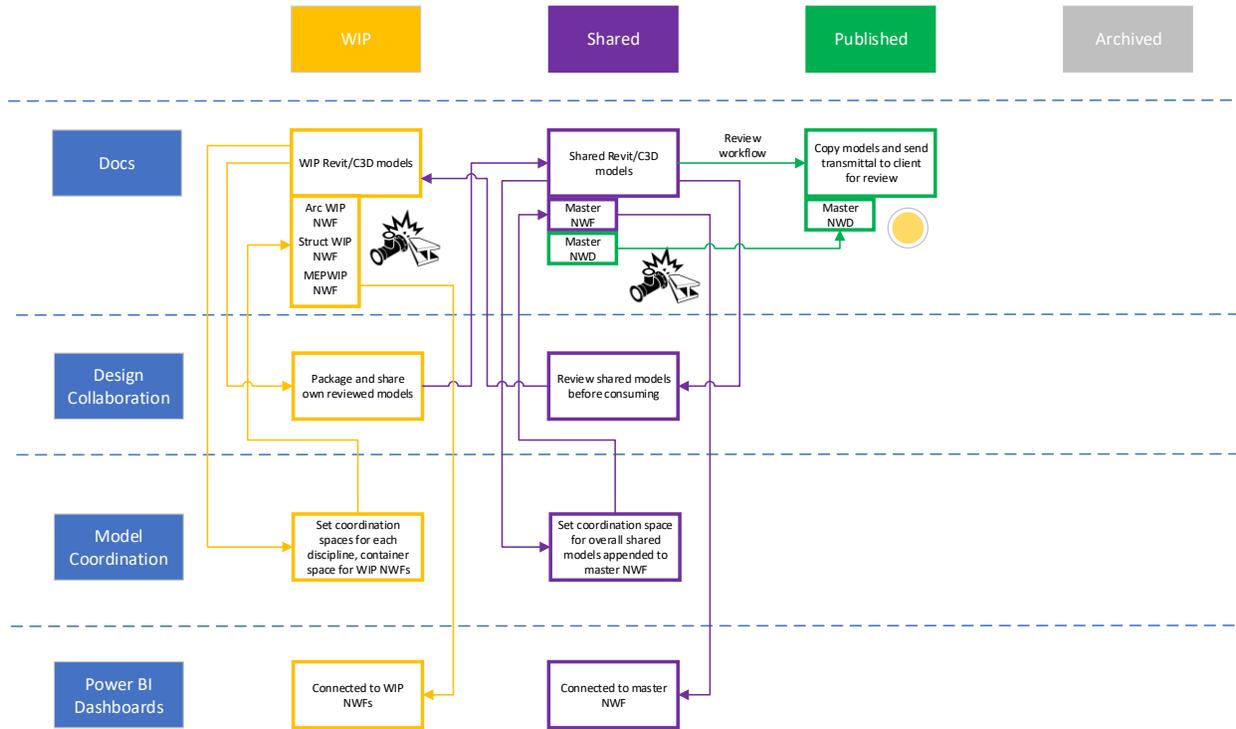
Screen setup - We believe that modelers can have an organised workspace which has both production and coordination elements which drives better spatial awareness and thus the opportunity to avoid clashes is made easier.

Clash Standards & Processes

Before jumping into clash detection, it is worth talking a little bit about information management within BIM 360/ACC, and having a clear approach to:

- How information flows through 'container states' (ISO 19650)
- How information is connected, 'container state transitions' (ISO 19650)
- How you use the different modules and features to achieve the above
- Where you use certain file formats (Where will you have RVT, NWF or NWDs)
- Where you do certain activities (markups, issue pins, clash detection and reviews for example)

BIM 360/ACC
Model flow between modules



*This diagram is not intended to be read in series, best reviewed with animations switched on.

Figure 4 – How we connect information across work states, this is our version of an ISO 19650 way of thinking, some of our other regions go into more detail and are very specific about how they deal with suitability codification etc. We are slowly releasing this to teams and regions which are not as up-to date with a lot of the ISO 19650 terminology, so we do not want to overload them with unfamiliar jargon and principles

Setup of clash detection standard

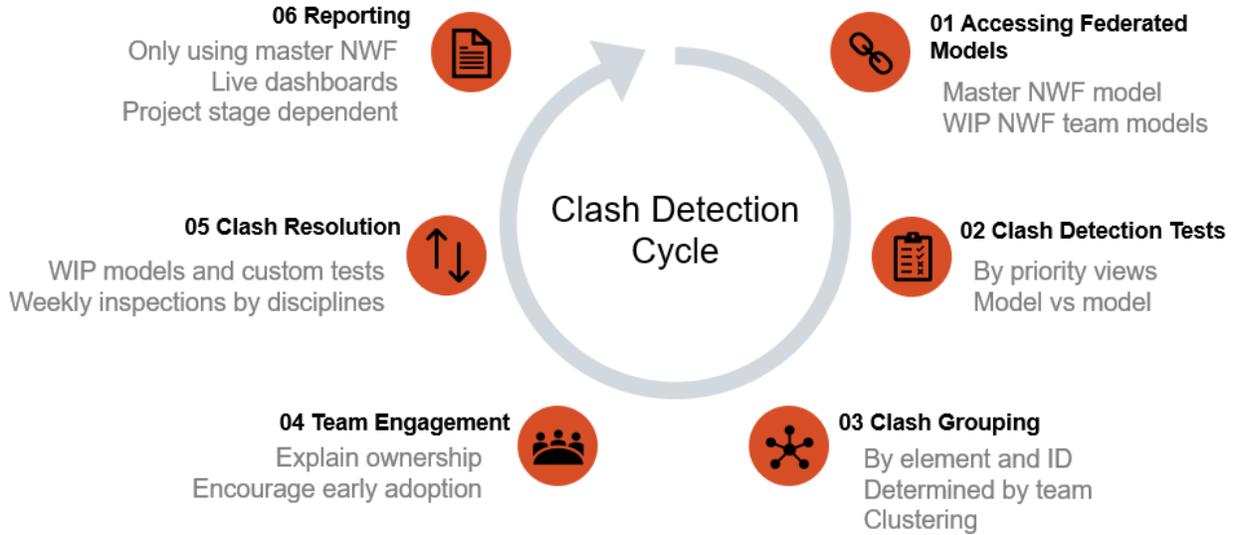


Figure 5 – These are the key focus areas in our current clash detection cycle (black text), we then went about embedding new features and thinking over the top (Grey text).

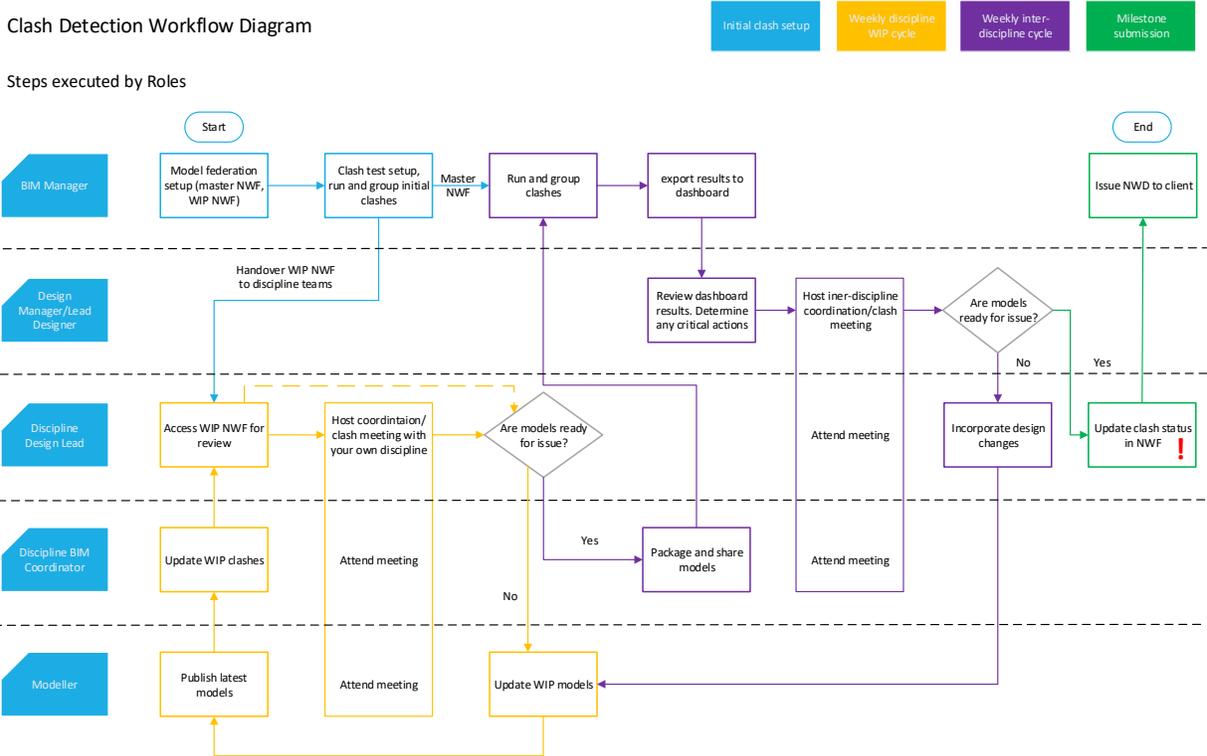


Figure 6 – Our current Clash detection process for ‘complicated’ projects, the diagram is very clear about which roles are involved, what their tasks are and shifts the focus of clash detection towards design leadership away from the notion that clash detection is just a ‘BIM person thing’

Lessons learnt

As we have been rolling out the above process, we have realized a few things that you should consider, especially in the case of larger projects. Here they are

- Publish times can take a while, so allow for this in your process
- *Do not publish sheets if not completely essential (It takes longer)
- Turn off clashes in Model Coordination if you are using Navisworks for clash detection (It takes longer)

Reporting and dashboarding

There's no better way than dashboarding to aggregate all your important project metrics in one place. Reporting and dashboarding help you identify trends and patterns and enable you to make informed decisions.

However, to make your project decisions data-driven, it is important to utilize the correct data in the correct way. Not all dashboards create equal value. As we all know, data export is the first place to start this process, let's look at the data export options in our context:

Options	Skills & Access Required	Features
<ul style="list-style-type: none"> • In-Product Reporting 		
Issue Reports	Basic: Project Member/Admin	Project specific and granular issues report
Data Connector	Basic - Intermediate: Project Admin or Account Admin with Executive Overview access	Export of all services across one or all projects
Insight	Basic: Project Member/Admin	Project level insights with out of the box and partner services
<ul style="list-style-type: none"> • Forge APIs 		
Service wise reporting	Advanced: Project Access + Forge API Knowledge	Full control over data – source and type
Data Connector	Advanced: Project Access + Forge API Knowledge	Control over what to export
<ul style="list-style-type: none"> • Export-Import 		
<ul style="list-style-type: none"> ○ Export from Navisworks 		
Export from Navisworks	Basic – Intermediate: Knowledge of Navisworks and BI tools	XML export of data which – can be used in any tool

Figure 7 - Data export options

From the Autodesk Construction Cloud in-product reporting features, we can extract issue reports directly from the web application. This simple export does not require any customization of the tool.

If you need to customize the data reporting and would like to create your own BI (Business intelligence) dashboards, then you can extract the account level data of the ACC project with the help of Data connector. Data connector offers you the flexibility to analyze data using your own business intelligence tools with low level of code integration.

Furthermore, from the insights tool in the construction cloud platform you can connect data from partner applications to your Insights dashboards. This means you don't have to switch between applications as you can view all relevant project data in a single area to provide a holistic view of project performance.

There are chances that the data insights from the in-product features are not providing you the required information, hence, with the help of Forge based API's you can access design and engineering data and customize it based on your project requirements. This requires high code involvement.

Data Connector: Data connector allows project administrators and members to extract data from projects by running or scheduling data extractions. This requires Executive overview access. A proof-of-concept dashboard has been developed using Data Connector to capture account level issue related information.

There are two ways by which you can extract the ACC data using data connector. You can either download the csv report to your local system and capture the insights; or directly in Microsoft PowerBi with the help of certified Autodesk Construction cloud connector you can get the data and create your own BI dashboards.

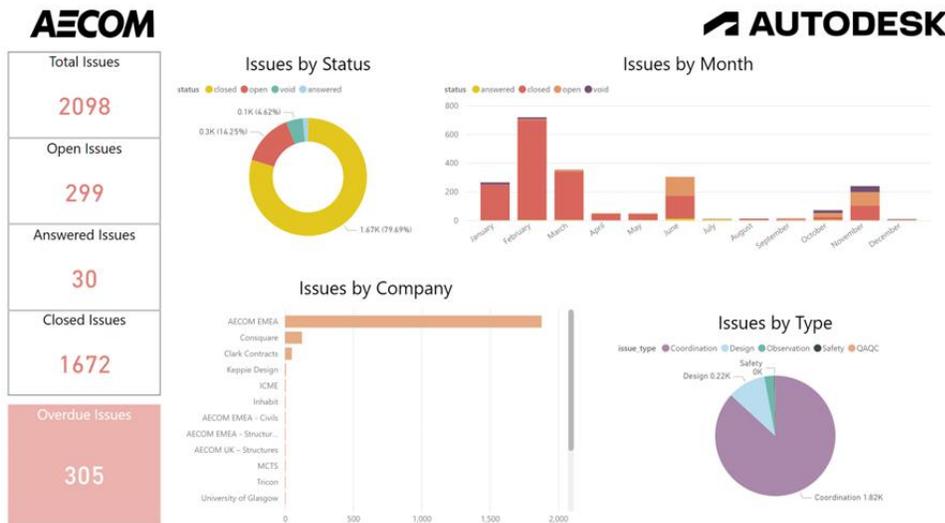


Figure 8 - Issues Dashboard

his is one of the dashboard samples that we developed as a proof of concept with AECOM to showcase the integration of Account level insights with the help of the ACC Data connector in PowerBi. The dashboard captures account level information of the total number of issues created. Issues can be filtered by company, type and status and has a timeline of creation date with status to show a trend line.

Autodesk Forge: Forge is Autodesk's cloud development platform. The Forge platform is a set of web services APIs which can be used to build innovative cloud powered applications. Since we've been talking about ACC and BIM 360, it would be interesting to add that both - ACC &

BIM 360 are based on top of Forge- and that means – your files, your issues, clashes and pretty much everything on BIM 360 and ACC is accessible and controllable via Forge.

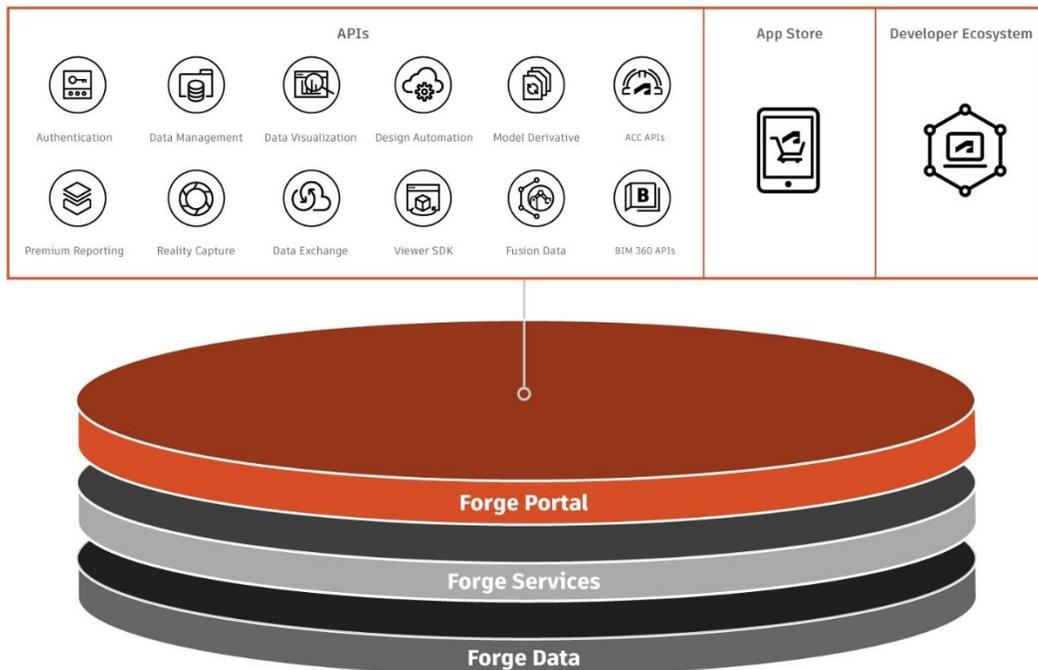


Figure 9 - Autodesk Forge

A proof-of-concept dashboard has been developed using Forge Model Coordination APIs to have visualization for Clash progress, distribution, categories and resolved clashes vs. total. The timeline of clashes with status is intended to provide a trend. Relevant filters to select project, type, company, and roles allows to narrow down on the data and get precise information.

Export-Import: The most conventional way to utilize data. This is once again a clash dashboard, but this takes in data from Navisworks. It provides trends of clashes to provide insights on coordination, detailed clash information by package and discipline. Clashes are distributed by status and priority level.

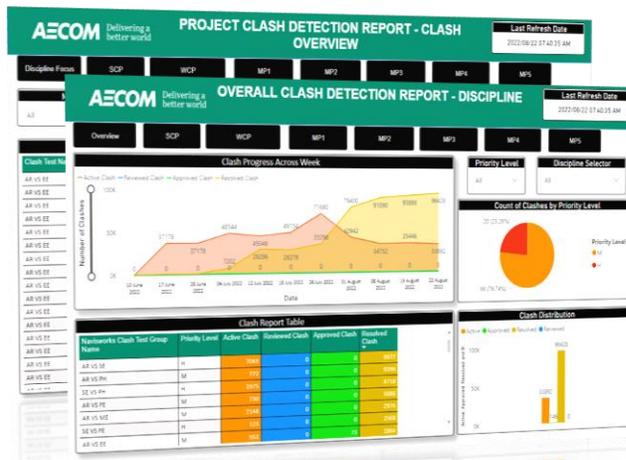


Figure 10 – Navisworks Clash Dashboard

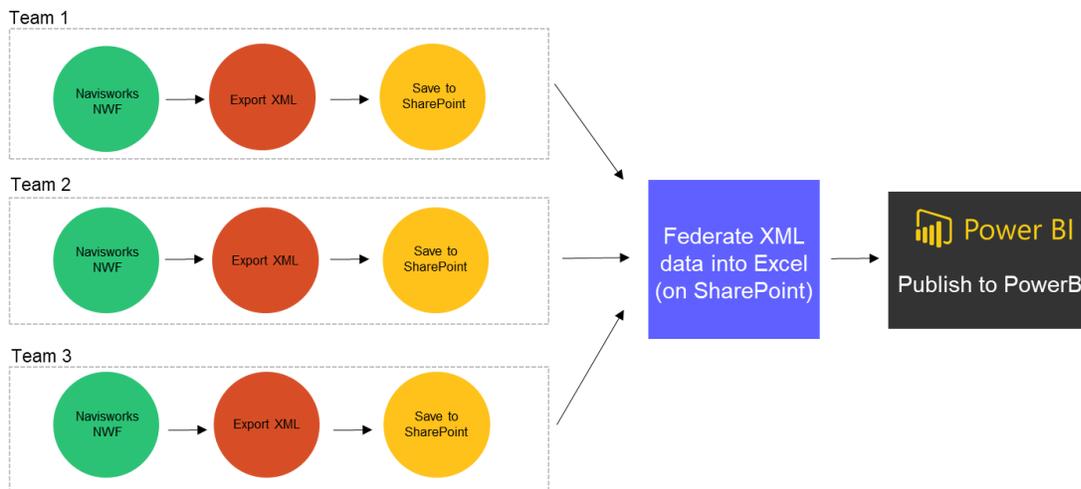


Figure 11– Export-Import Workflow

Thank you for reading this handout and either joining use in-person in New Orleans, joining our session via livestream, or even accessing this handout after the event via the Autodesk University website. We would really appreciate you insights over social media.