Model Coordination Workflow: 5 years of Evolution

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Agenda:

1. The presentations
2. Model coordination: Essential for Design to construction
3. Improve your methods
4. Collaboration starts with communication

The presenters and experience.

Darren Roos, CM-BIM, LEED AP

- Corporate BIM/VDC Director, Bernards
- Regional BIM/VDC Director – W Coast Suffolk Construction
- Integrated Construction Coordinator, Mortenson
- Application engineer HSC

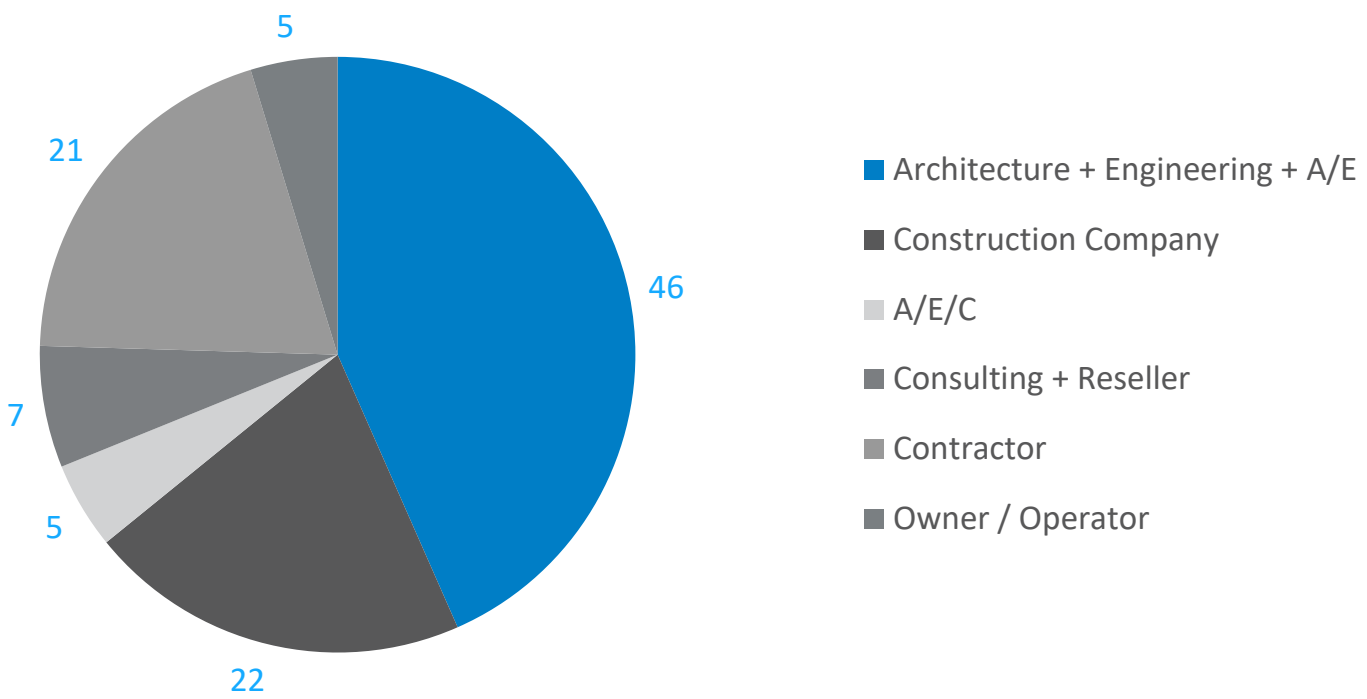
Darren Roos

Christian Proulx

Christian Proulx

- VP Sales & Marketing, BIM Track
- BIM Solutions Director, BIM One
- Senior project manager, Aéroport de Québec inc. YQB
- Airport Planner, Aéroport de Québec inc. YQB
- Project manager, Aéroport de Québec inc. YQB

Who’s In the room



A quick overview of the attendees that registered for this presentation. Almost half of the attendees are design professionals and the other half are construction professionals. This is exactly the right audience benefiting from 3D model coordination.

AU 2012 -
Coordinate and Dominate BIM Projects

- Introduction to Augmented Reality

AU 2014 -
How to Make Navisworks and BIM 360 Glue your BFF during Coordination and Construction process

- AR for handouts

5 years have passed quickly. This is an example to help you understand how things evolved in the last 5 years. In 2012, Darren was part of a class at AU on AR for coordination. It was little known at the time. In 2014, AR was also part of Darren's presentation.

AU 2016

Last year, as you probably all noticed, AR is becoming close to mass use in our industry.

Coordination has evolved

- Our lives 5 years ago

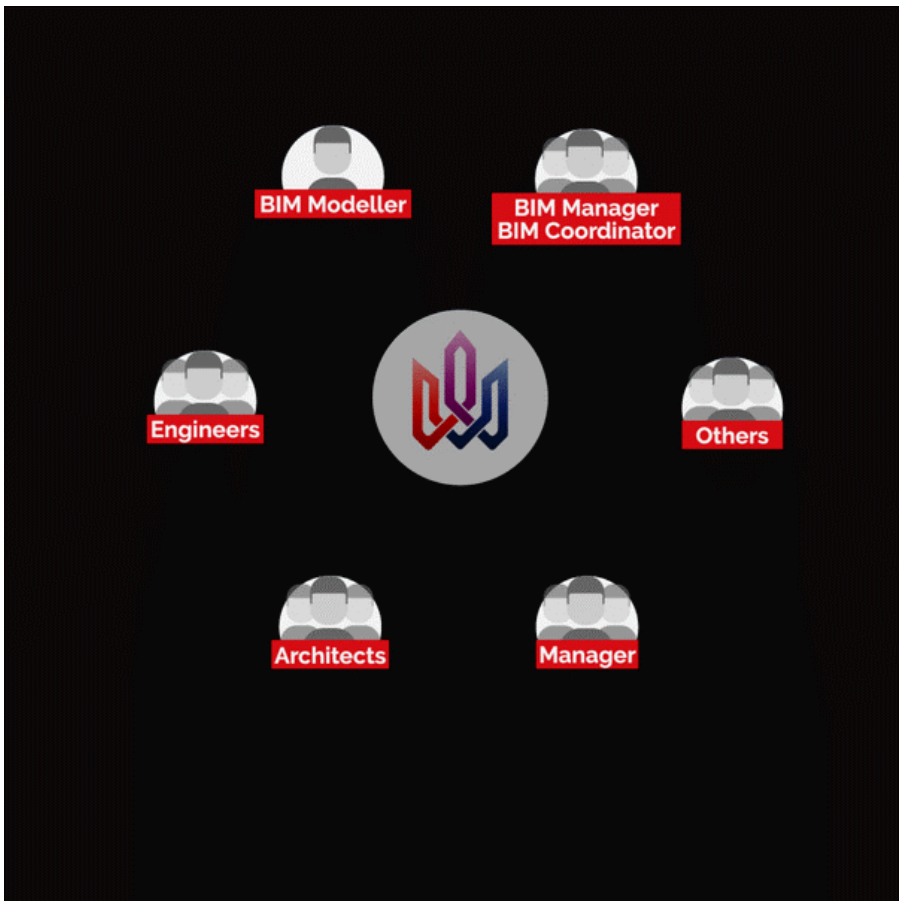
But what about coordination? Not much changed. Same statements are crossing people's mind. Am I needed in this meetings? Maybe you feel your process hasn't evolve in the last 5 years. If you compare it with AR, model coordination stayed almost the same.

Coordination has evolved

Communication enhancing:

- Centralized through cloud platforms
- Just in time
- Location based
- Communication centric, not file centric
- Rich in metadata
- Automatic history tracking and quick reporting

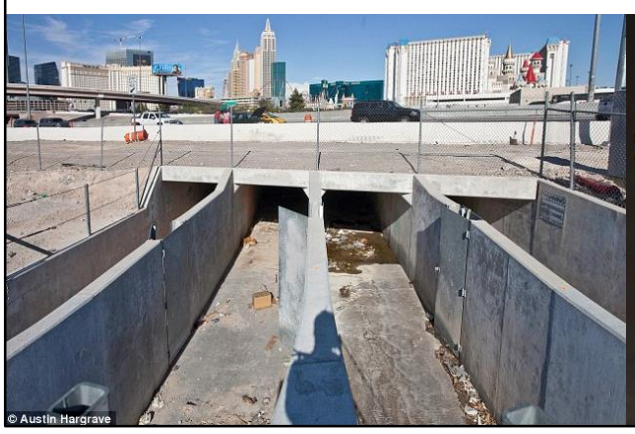
Eliminating unnecessary meetings and emails



Not everyone was static. Issue tracking platforms have been growing. And don’t confuse issue tracking with viewpoint sharing or task management. Issue tracking have certain criteria that makes this process much more efficient.

Fun fact about Vegas

- There’s estimated to be at least 1,000 people living beneath Vegas in underground tunnels
- The shrimp consumption in Las Vegas is over 60,000 pounds per day, higher than the rest of the nation combined
- The Las Vegas Strip is the brightest place on Earth when looked at from outer space



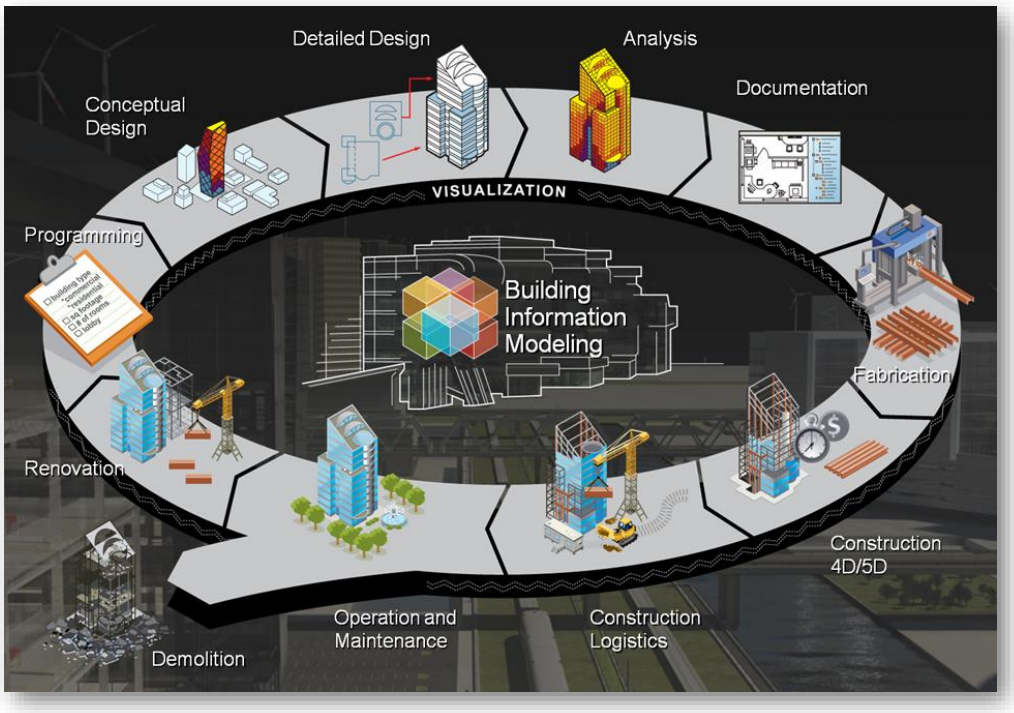

Just in case you already know what we are about issue tracking.

Maybe you didn’t know those 3 fun facts.

Establishing model coordination as an essential process to obtain the benefits from BIM projects.

Nice slick process

- Virtual design, construction, procurement, operations, etc
- Leverage prefabrication
- Build from the models
- Reduce rework
- Save money and time



The concepts of BIM are great. There is no need to add more to it than this. It offers lots of benefits and potentials.
Many progress have been made since the beginning of this virtual modeling

Virtually to Reality

The concept is great. You can do the project twice (virtually and then for real). In the hands of imaginative people, the tools can give them some kind of superpowers compared to the previous methods.

Challenges

- Design ≠ Constructability
- Errors are found before construction (or not)
- When design is wrong:
  - ✓ Quantities are wrong
  - ✓ Planning is wrong
  - ✓ Execution is wrong

Challenges are making this dream a bit more difficult to achieve.

The problem resides in the execution. What is the purpose of putting a lot of time modeling if the models aren't done right?

Why don’t I get the full benefits from BIM

The complexity of the process

The learning curve

Poor model quality

Bad modeling techniques

Virtual but not realistic

Poor coordination

Difficult collaboration

There might be multiple reasons but at least 3 of them are identified. The complexity of the process can discourage people and with time being limited, the process get halted. The different maturity levels are requesting more collaboration efforts. But the most important reason why we don’t get the full benefits of BIM is the poor quality of the models.

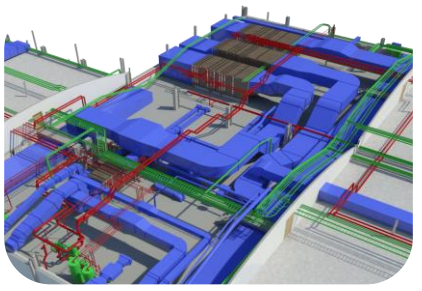
BIM model coordinator

What my friends think I do

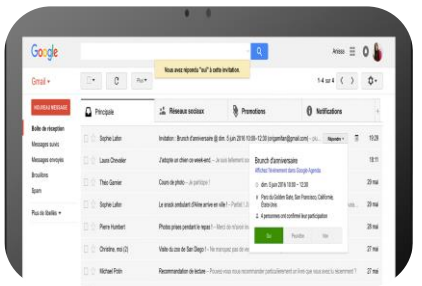
What my mom thinks I do

What society thinks I do

What my boss think I do



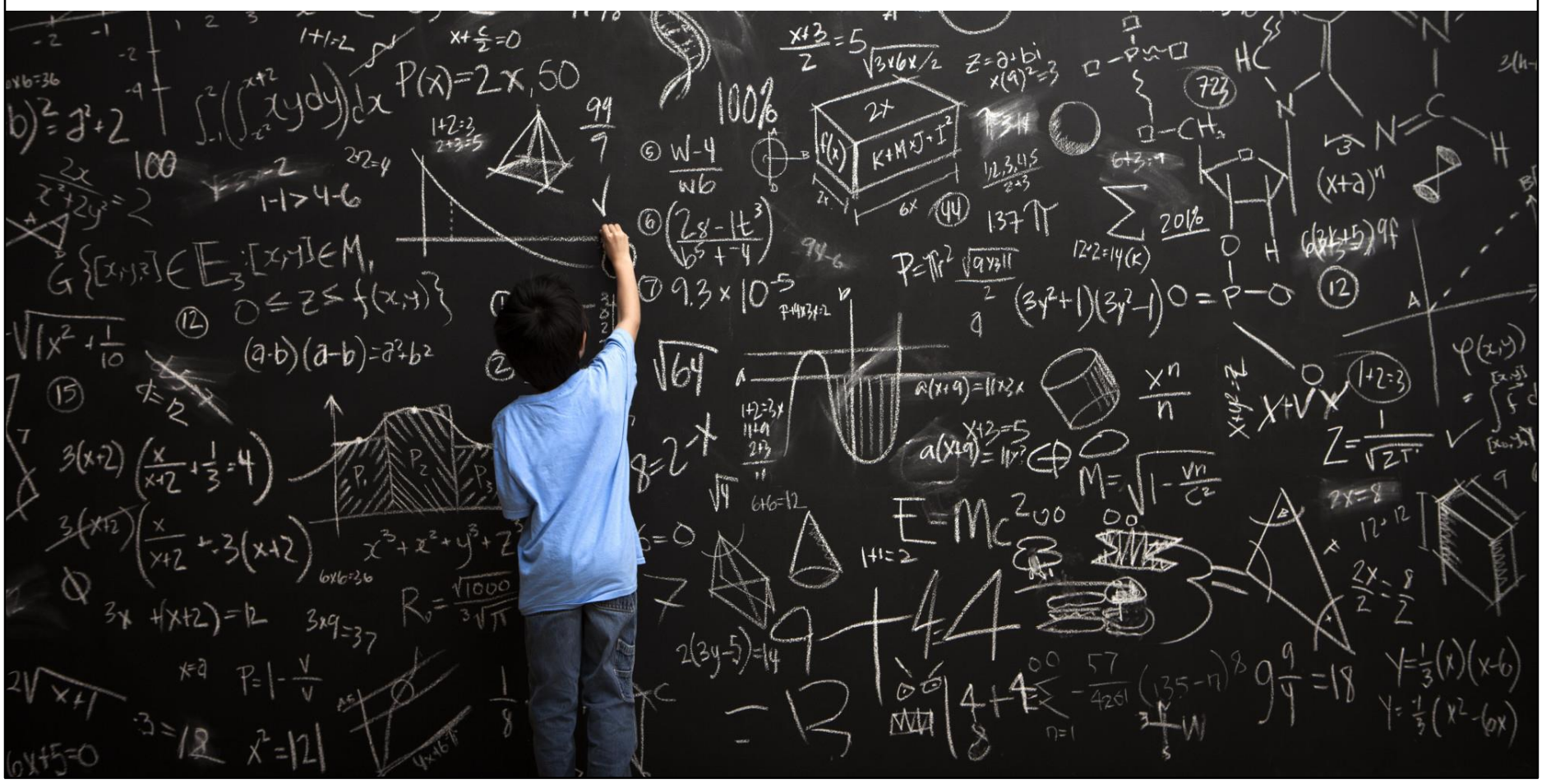
What I think I do



What I actualy do

The BIM coordinator’s job is very important. Your reality might be this one. Don’t worry, there is a solution.

What's the solution?



So what's the solution of this complex task?

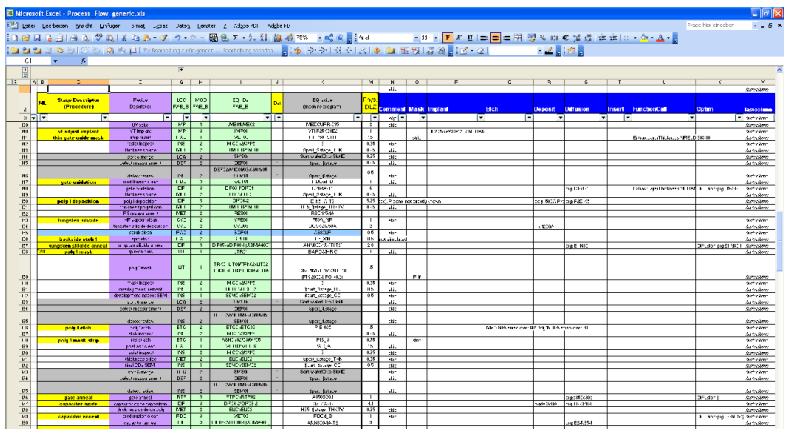
2017 Model coordination

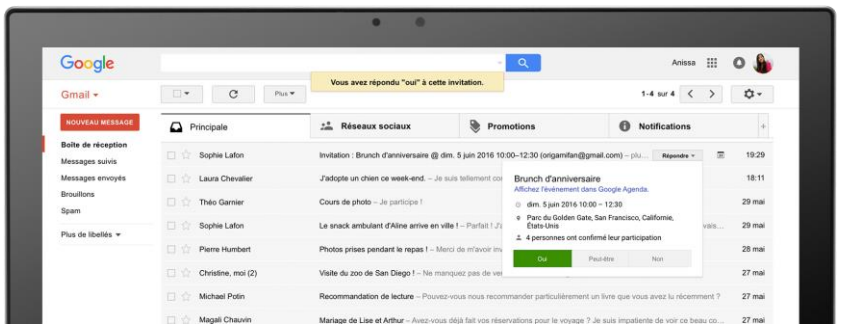
The solution is Model coordination done right. The 2017 way and not the 2012 way.

≠ your traditional coordination meetings

5 years ago

- Meeting: too late, too long, no follow-up
- Emails: what? when? I can't find it
- Reporting: any progress?
- = no real coordination





In 2012, the meeting were always too late for your teams progression. They were too long because too many people invited. Few people are doing their follow-up.
Lots of emails were exchanged and you don't seem to be able to recall the email you were supposed to answer.
Reporting is a hard task because the information has to be validated all the time. No standard process in place or information is inaccurate due to latency.
The final result is no real coordination.

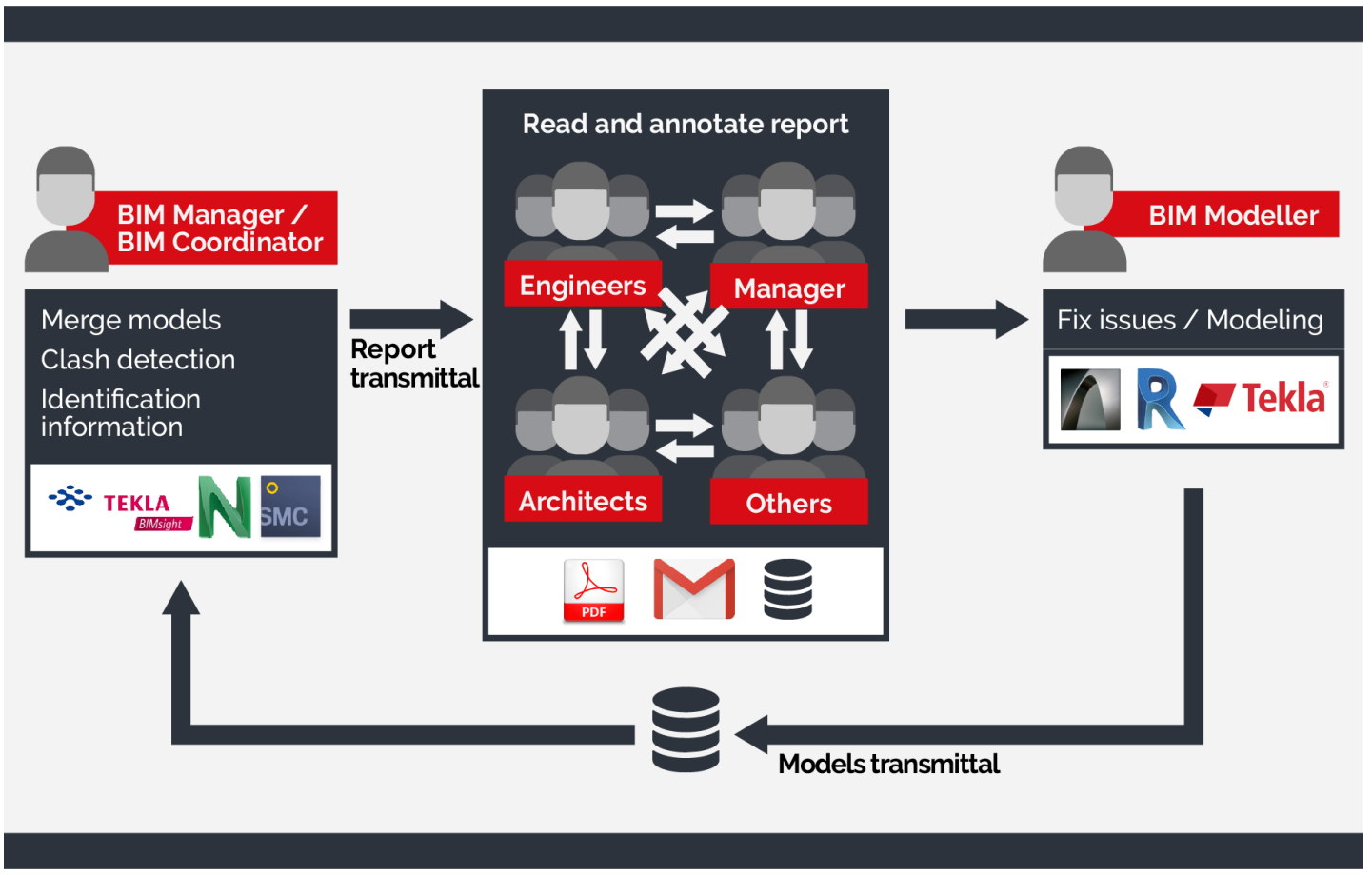
Coordination meetings

- Are you waiting for your turn to speak?
- Did you have the time to solve everything you needed or you need to schedule another meeting?
- Were you waiting for the meeting outputs before giving the go on production or make a decision?
- Are you waiting for the upload of the models to access the comments?
- Do you have to explain it all back to your project manager to get is approval?
- How much time do you need to compile all the things that have to be addressed?
- You're keeping a record of everything in your notebook?

Stop doing this! You're now in 2017

If you recognize yourself in this list of examples, you have to stop doing it and start implementing 2017 processes.

Typical coordination workflow



1. The designer/modellers are producing models with the available models shared by everyone.
2. They then also share their models through a common data environment or any standard file sharing methods
3. The quality control team are analysing the models and producing a report that can be under different types.
4. The reports is transmitted to the rest of the team for review. Other comments can be added and then the report is handed to the modellers for then to correct the models.

This generates many problems and errors.

Key elements to stimulate communication

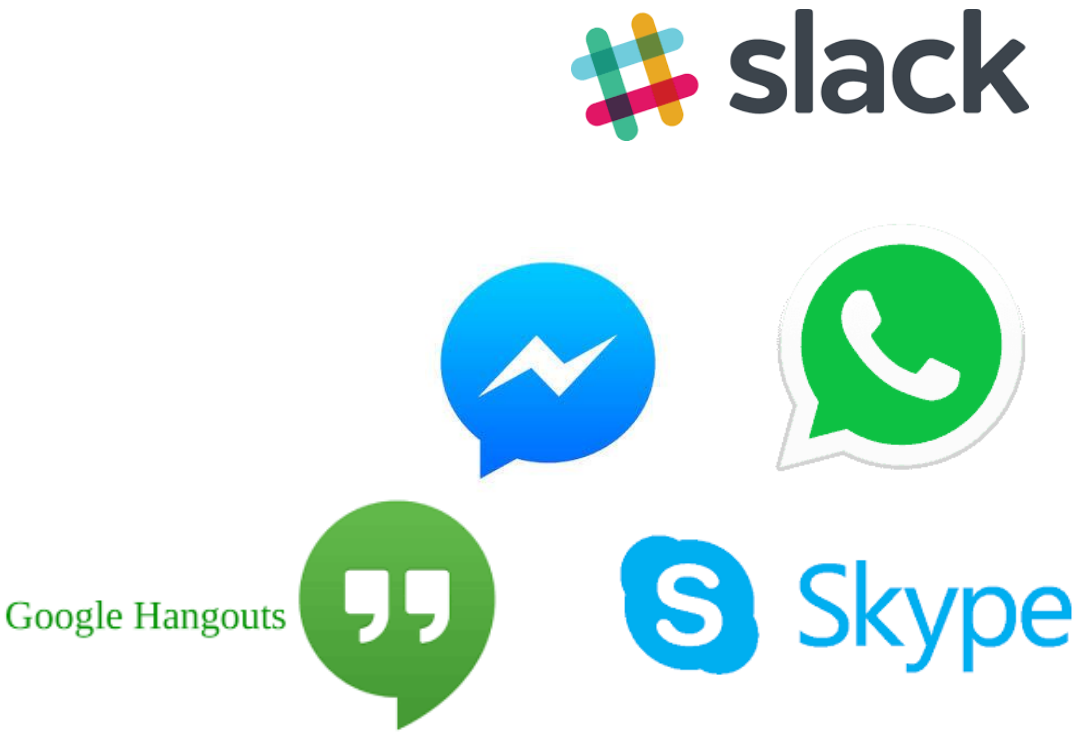
- Data driven, not file driven (cloud)
- Cross-platform connectivity (OpenBIM philosophy)
- Integrations (API)
- Maximum efficiency (minimum tasks)
- Flexible (mobile, web-based, configurations)
- Easy and intuitive (Adhesion = use of software = efficiency)

The typical process is lacking a lot of key elements a great model coordination process should have such as:

- Data driven, not file driven (issues stored in the cloud and updated instantly)
- Cross-platform connectivity (OpenBIM philosophy) to answer all possible combination of tools
- Integrations (API) direct sync of the data cross-platforms
- Maximum efficiency (minimum tasks)
- Flexible (mobile, web-based, configurations)
- Easy and intuitive (reducing adoption barrier to stimulate adhesion and Adhesion = use of software = efficiency)

Communication is changing

- Cloud platforms
- SaaS
- Instant messaging

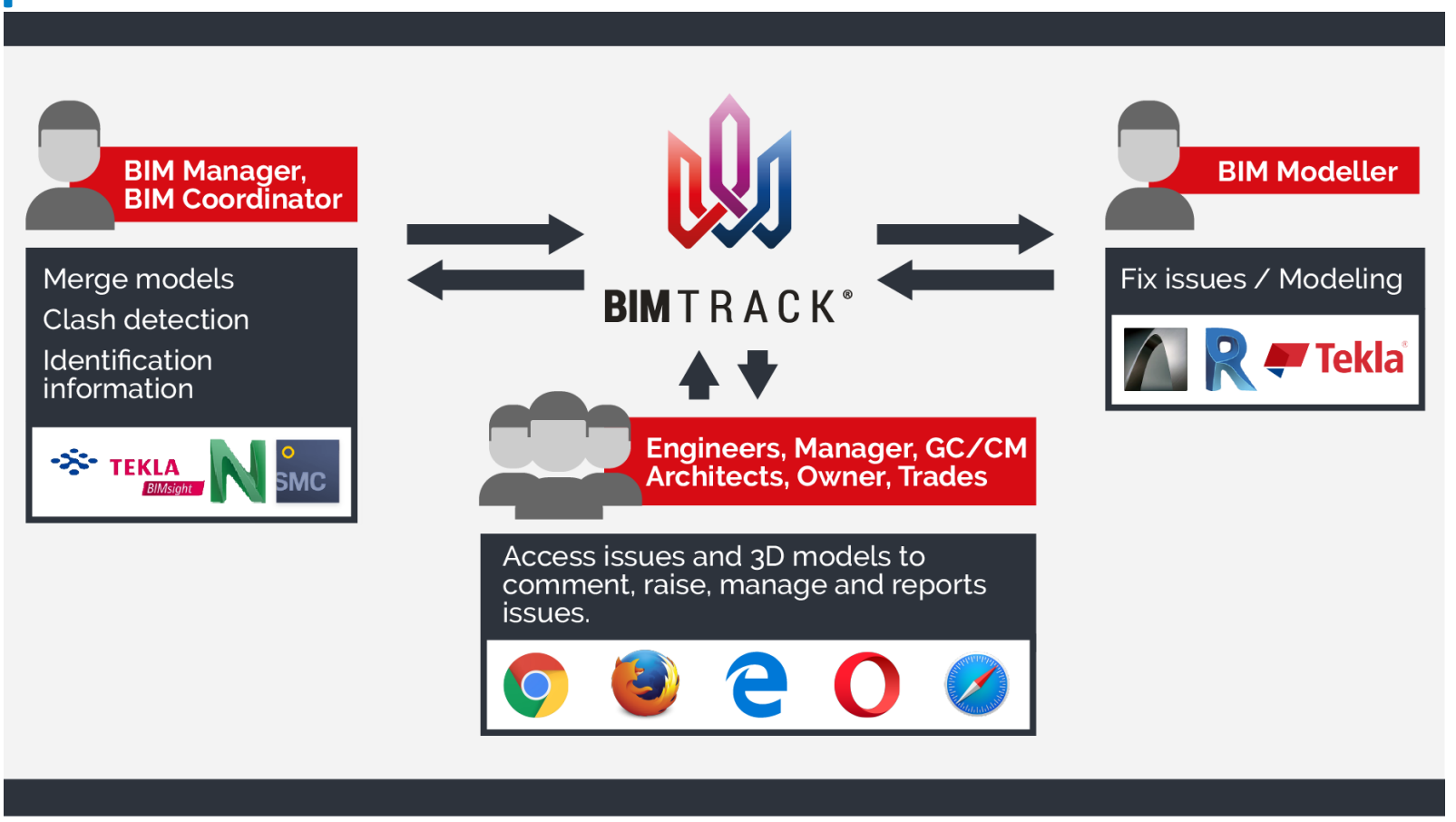


As you know, communication is changing. Slack is revolutionizing the business communications. But many of us are already using different Instant messaging tools to communicate. Why, because if used carefully, it can bring lot more effectiveness.

The cloud is essential for instant access. The paying ones are also Software as a Service, because it brings more flexibility and this is what we need.

Instant messaging unlike phone calls, can be managed and answered when it’s the best time for it. They can also leave important tracks of the discussions for further reference.

Optimized workflow – instant access to data



This is why some companies have evolved toward an optimized workflow for issue tracking that includes all the benefits of instant communications.

1. The designer/modellers are producing models with the available models shared by everyone.
2. They also share their models through a common data environment or any standard file sharing methods
3. The difference is that the issues can be raised at any time and documented along the way. Eliminating the gate process and making model coordination fluid.
4. Plus, the issues are available through a web interface that all stakeholders can have access to. Participating at any moment in the day and automatically shared with the team and documented.

This brings freedom of action to the team.

Facilitating communications for coordination

- Where is it located?
- Who is involved in the issue?
- Who should take ownership to resolve the issue?
- How critical is this issue at this point in time?
- Is this a new issue or an existing issue?
- How long has this issue been unresolved?

The goal of issue tracking is to facilitate communications to improve coordination. The following elements have to be accessible at all time.

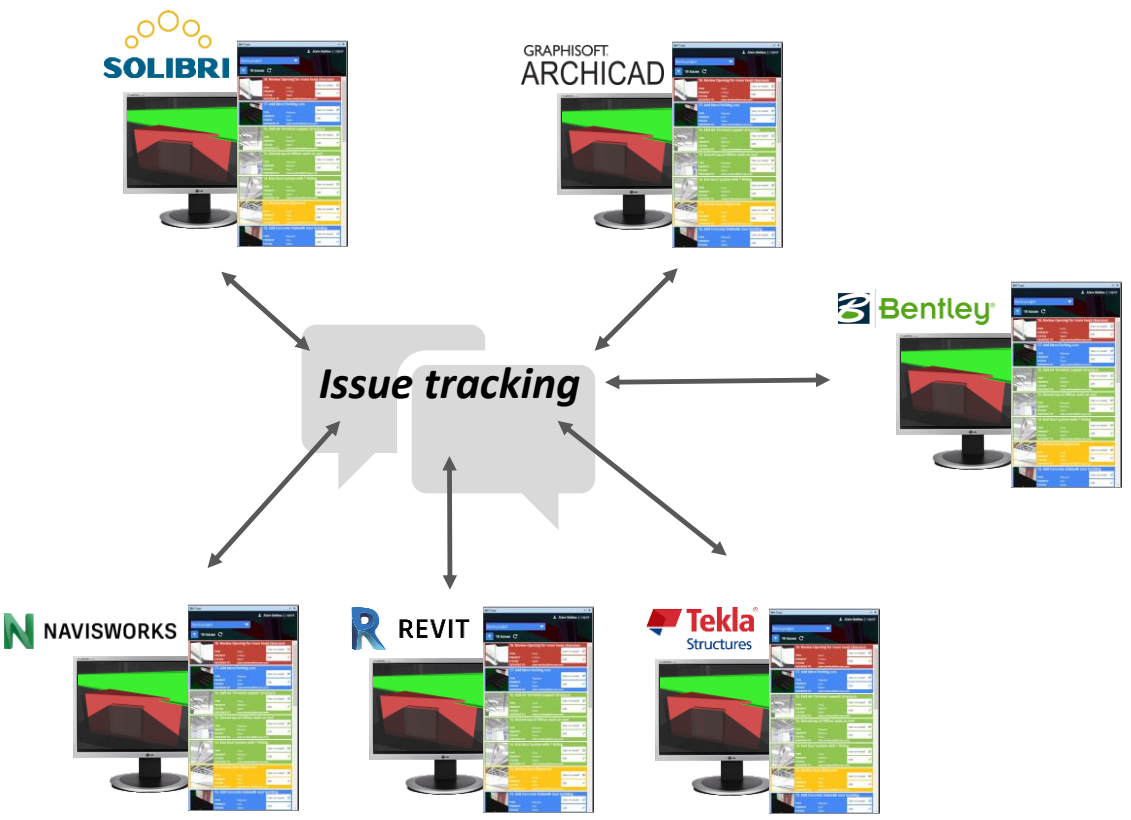
Integrations

Facilitating Data flow & eliminating manual tasks

Facilitating communications start with integrations to streamline the data flow and eliminate manual tasks.

Integrations

- Addins



The most powerful integration is the development of Addins.

Designing seamless addins helps the users stay “In-Context”. The continuity of the experience is very important from one addin to the other. And it needs to feel like it’s part of the host software.

Also, the integration of different software is essential for model coordination. Projects are not uniforms and different tools have to be connected together to form the perfect ecosystem.

Integrations

- Addins
- API integrations

Because no system can do it all, different tools have different specialities. They serve different purposes such as data visualisation, model validation and other project management solutions. The role of the issue tracking platform is to centralize the different problems and have them organized so they can be taken care of. Open API are essential to create an automated data flow to scale the benefits of the different tools.

Integrations

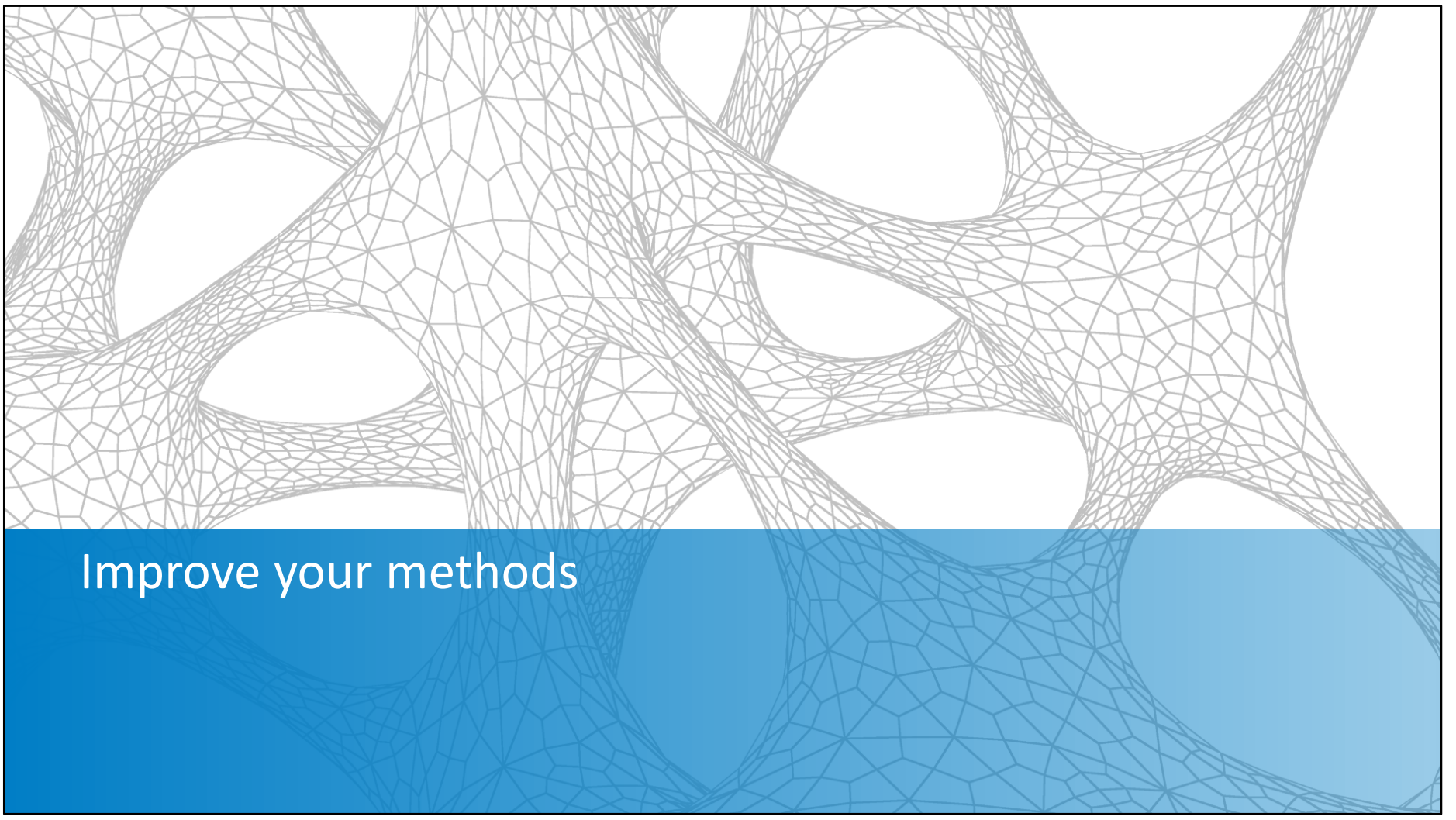
- Addins
- API integrations
- OpenBIM

OPEN BIM is a universal approach to the collaborative design, realization, and operation of buildings based on open standards and workflows.

IFC ➡ Standardized 3D model format

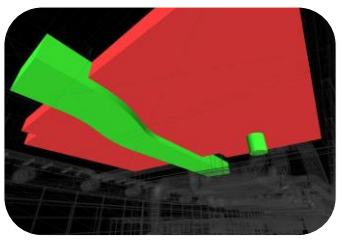
BCF ➡ Standardized issue format

Finally, the communication schema of model coordination is the OpenBIM standards. The standard 3D model format (IFC) and the standard issue format (BCF) are fixing the holes that can still be found between addins and API integrations.

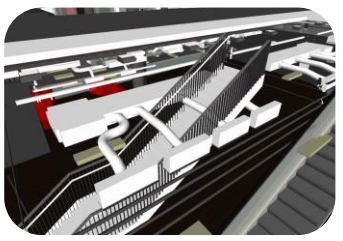


How do you improve your methods?

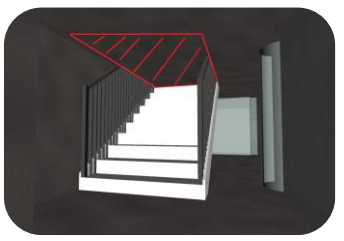
Issues raised in model coordination



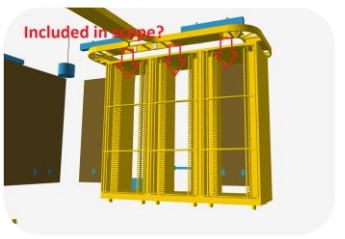
Clash



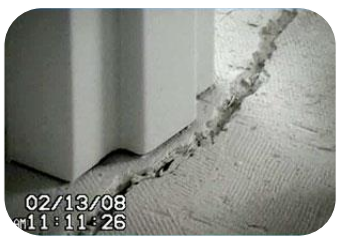
Errors or omissions



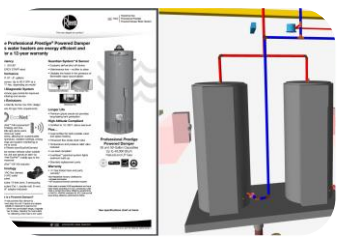
Requests



RFI



Defects



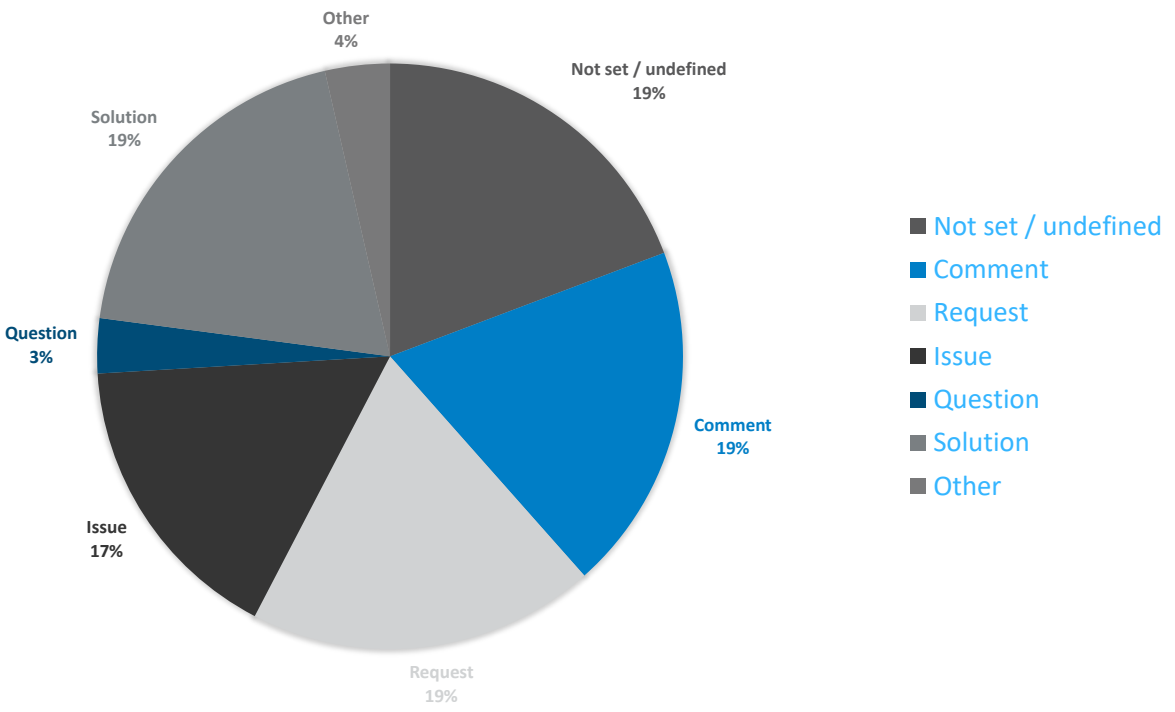
Replacements

Data validation

First you need to identify the different potential type of issues.
There is more to model coordination than clash detection. This is a list of examples that can be used in different projects. They all have a purpose and are worth documenting.
Clash: Typical clash detection have to be shared with colleagues
Errors or omissions: When identified, these errors are better corrected in the design phase than in the construction phase
Requests: coordination also means you need other colleagues or designers from other disciplines to perform actions in there model for you to integrate correctly.
RFI (Request For Information): Very important communication with contractual impacts such as validation if furniture of equipment is included in scope or not.
Defects: When defects or field issues are identified, they have to be share with the office for review and assign the resources to fix it
Replacements: Trades may request replacements, this is often the case when specified equipment are not available or if a equivalent equipment would perform the same way but cheaper
Data validation: BIM models contain a lot of data and the

accuracy is very important

Type of issues



Data provided by BIM Track

This is a set of data extracted from the BIM Track database for about 18,000 issues from many different projects. Clashes are included in the issue category and you can observe that the different categories are almost spread equally between not set, comment, request, issue, question and solution. This means issue tracking is closer to communication channels than only sharing clashes.

How to identify issues during design

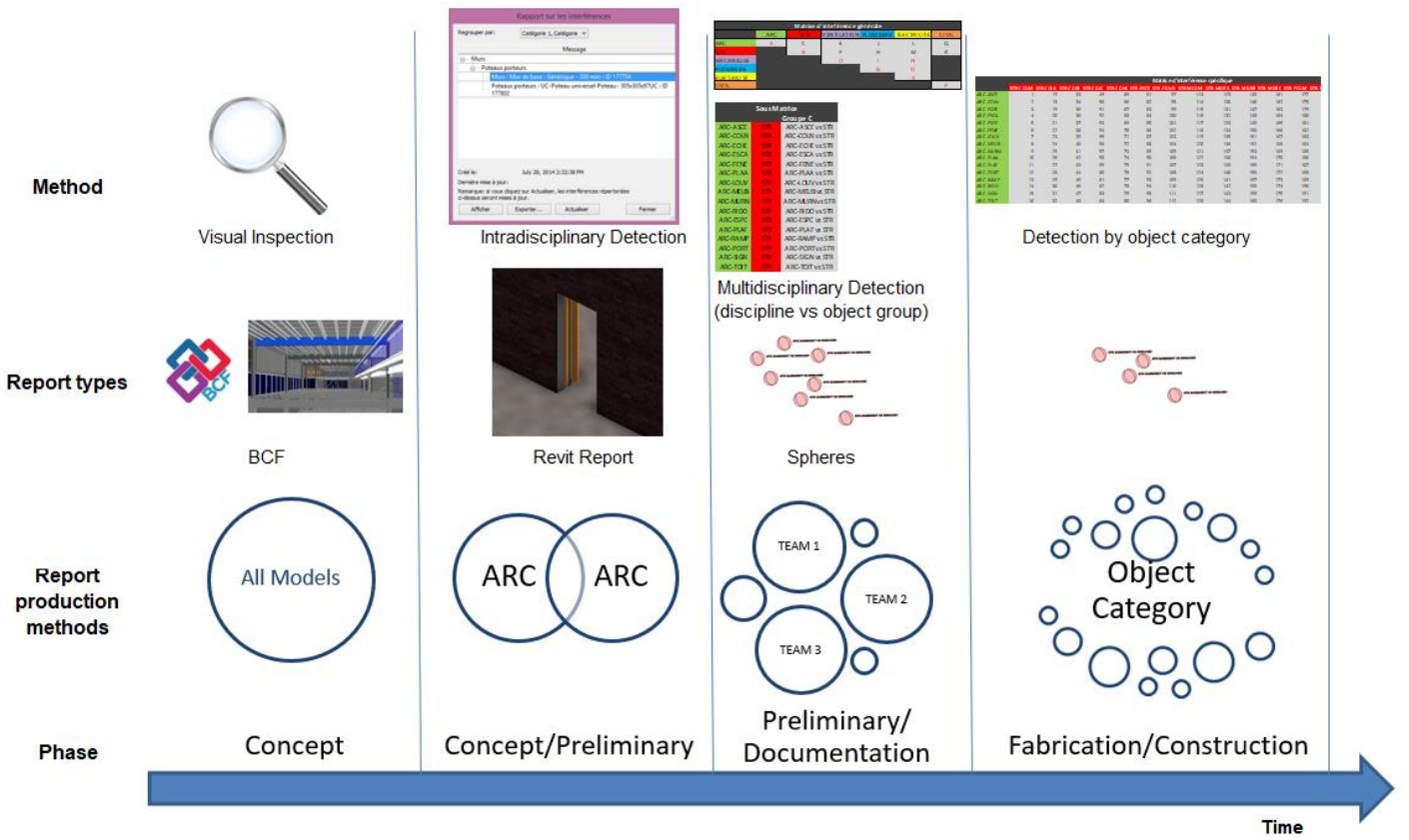
1. Visual inspection
   - Duplication of geometries
   - Incorrect modeling
   - Positioning of models, systems and equipment
2. Data validation: Functional and technical requirements
   - Room area
   - Room specs
   - Equipment specs and performance
   - Code or any regulation compliance
3. Clash detection
   - Intra-disciplinary
   - Inter-disciplinary

There are at least 3 different aspects involved in the activity of model coordination.

These are examples that can be tracked.

1. Visual inspection is the main activity performed during all stages of the project.
2. Data validation can be performed manually with visual inspection or with tools to automate validation
3. Clash detection when performed at the right time with the correct set of rules, can be greatly automated

Methods vs project stage



Depending the project stage, the methods are different. There is more focus on visual inspection in the beginning of the project and on the contrary, more clash detection and data validation towards the end. Misunderstanding of the project stage and adequate methods adapted for the stage can result in lots of time wasted.

Examples of Clash detection methods

Clash Matrix						
	ARC	STR	MEC	PLM	ELEC	CIVIL
ARC	A	C	E	J	L	Q
STR		B	F	H	M	R
MEC			D	I	N	
PLM				G	O	
ELEC					K	
CIVIL						P

Clash detection scheduling is very important. In a standard project evolution, the right set of categories have to be selected. IN red it’s the intra-disciplinary clash tests and in black the inter-disciplinary.

Examples of Clash detection methods

Clash Matrix						
	ARC	STR	MEC	PLM	ELEC	CIVIL
ARC	A	C	E	J	L	Q
STR		B	F	H	M	R
MEC			D	I	N	
PLM				G	O	
ELEC					K	
CIVIL						P

Group C		
Cabinets	vs	STR
Ceiling	vs	STR
Columns	vs	STR
Curtain-wall	vs	STR
Doors	vs	STR
Floors	vs	STR
Fixed Furniture	vs	STR
Guards	vs	STR
Ramps	vs	STR
Roof	vs	STR
Specialised equipments	vs	STR
Stairs	vs	STR
Walls	vs	STR
Windows	vs	STR

Group E		
Cabinets	vs	MEC
Ceiling	vs	MEC
Columns	vs	MEC
Curtain-wall	vs	MEC
Doors	vs	MEC
Floors	vs	MEC
Fixed Furniture	vs	MEC
Guards	vs	MEC
Ramps	vs	MEC
Roof	vs	MEC
Specialised equipments	vs	MEC
Stairs	vs	MEC
Walls	vs	MEC
Windows	vs	MEC

Group F		
Structural floors	vs	MEC
Concrete stairs	vs	MEC
Bracing	vs	MEC
Structural columns	vs	MEC
Structural connections	vs	MEC
Foundations	vs	MEC
Framing	vs	MEC
Structural walls	vs	MEC

Group H		
Fire protection	vs	STR
Heating and cooling	vs	STR
Drainage	vs	STR
Aqueduct	vs	STR

Group I		
Fire protection	vs	MEC
Heating and cooling	vs	MEC
Drainage	vs	MEC
Aqueduct	vs	MEC

Group J		
Fire protection	vs	ARC
Heating and cooling	vs	ARC
Drainage	vs	ARC
Aqueduct	vs	ARC

Group L		
Cable trays	vs	ARC
Pipes and connections	vs	ARC
Data and communication equip	vs	ARC
Electrical equip	vs	ARC
Electrical inst	vs	ARC
Fire detection equip	vs	ARC
Lighting fixtures and devices	vs	ARC
Security devices	vs	ARC
Cables	vs	ARC
Special equip	vs	ARC

Group M		
Cable trays	vs	STR
Pipes and connections	vs	STR
Data and communication equip	vs	STR
Electrical equip	vs	STR
Electrical inst	vs	STR
Fire detection equip	vs	STR
Lighting fixtures and devices	vs	STR
Security devices	vs	STR
Cables	vs	STR
Special equip	vs	STR

Group N		
Cable trays	vs	MEC
Pipes and connections	vs	MEC
Data and communication equip	vs	MEC
Electrical equip	vs	MEC
Electrical inst	vs	MEC
Fire detection equip	vs	MEC
Lighting fixtures and devices	vs	MEC
Security devices	vs	MEC
Cables	vs	MEC
Special equip	vs	MEC

Group O		
Cable trays	vs	PLM
Pipes and connections	vs	PLM
Data and communication equip	vs	PLM
Electrical equip	vs	PLM
Electrical inst	vs	PLM
Fire detection equip	vs	PLM
Lighting fixtures and devices	vs	PLM
Security devices	vs	PLM
Cables	vs	PLM
Special equip	vs	PLM

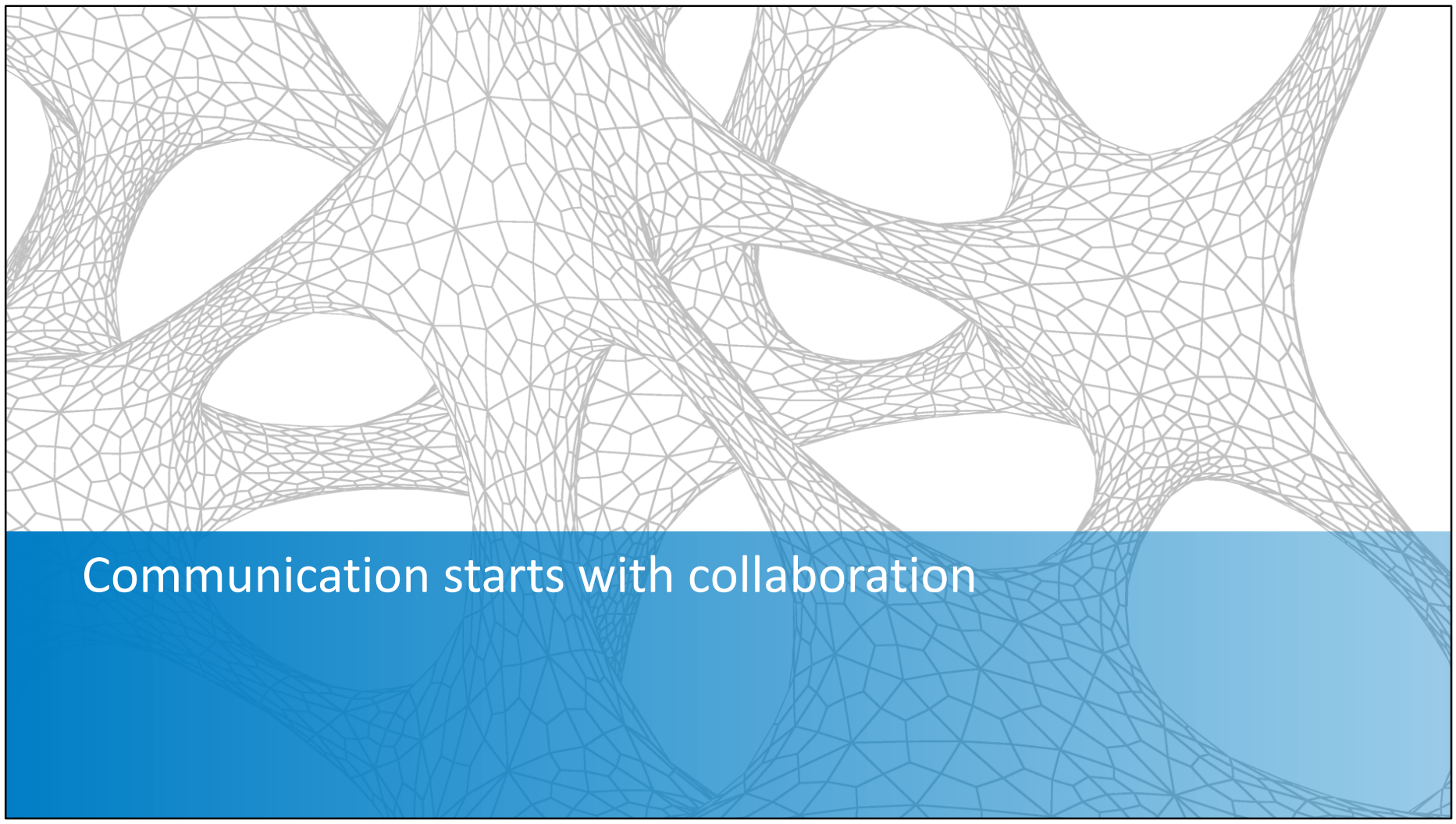
Then the inter-disciplinary clash test can be exploded in several tests depending on the project evolution.

Note that every projectis different. There can be multiple phases at the same time and a wise BIM manager/coordinator will plan this in advance following the project’s schedule.

Quick comparison

Task	Traditional method	Optimized method
Find the issue	- Search for the document - Make sure it's the latest version - Look for keywords or filter if document allow it	- Filter following the right search set
Asses the issue	- Understand the description of the location - Navigate the model to find the problem	- Single click to access location in model - Edit issue to access the description and annotated image
Document the issue resolution	- Call colleagues or write an email to the other participants involved - Write down the information in the document	- Read the comments - Add a comment or screen capture image
Report on issue	- Update the summary of issues	- Print a report

As an exercise, you can try to evaluate the time between the traditional method of manual identification and man meeting and compare it with a cloud bases optimized approach. You can quickly see the direct value. But the indirect benefits can also be: Peace of mind, easy communication, lower stress, clarifying roles, improve the quality of deliverables.


Communication starts with collaboration

Changing the approval process

- Live reviews with clients are replacing certain 2D deliverables
- Web based model review – when & where you want

Handout text:

This process is changing our methods. Now we can do live reviews with our clients and document it directly in the issue tracking platform.
There is no need to bring your computer with the complete suite of software and access the list from any computer with the web-based platform.

How to get the site workers involved

Fluid collaboration

- Instant publication of information through cloud DB

Easy access to information

- Accessible from all kind of devices (Tablet & Smartphone)

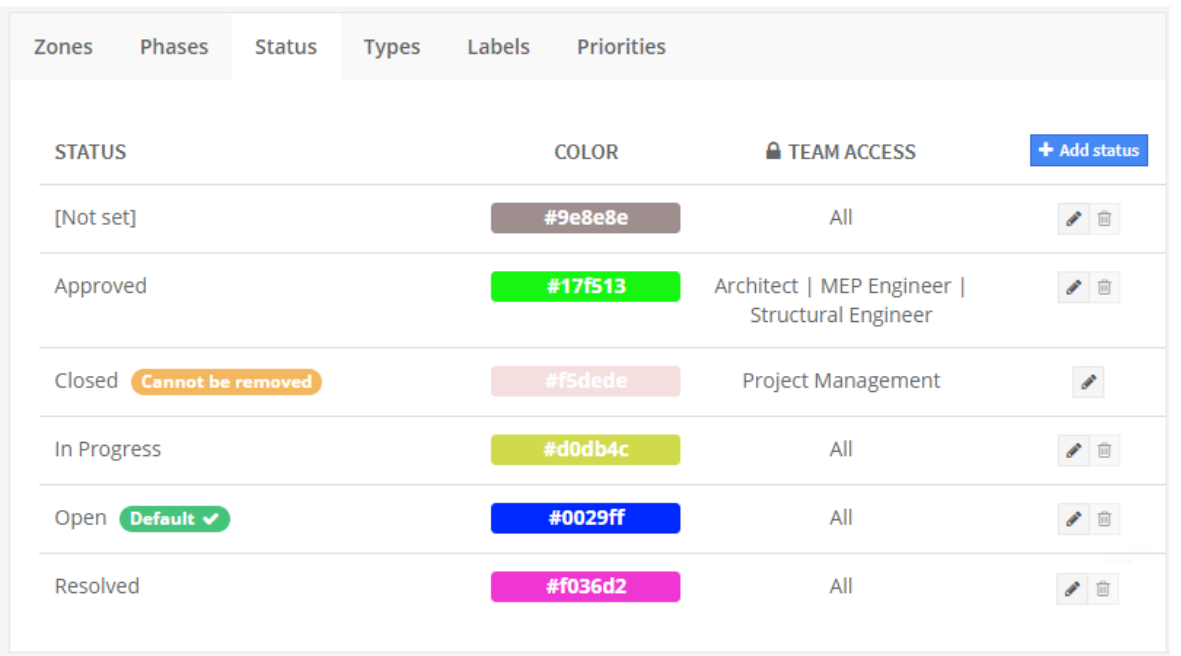
Share knowledge and experience

- Review discussion and history

If collaboration has to be easy, site workers also need to be able to report easily.

Management techniques

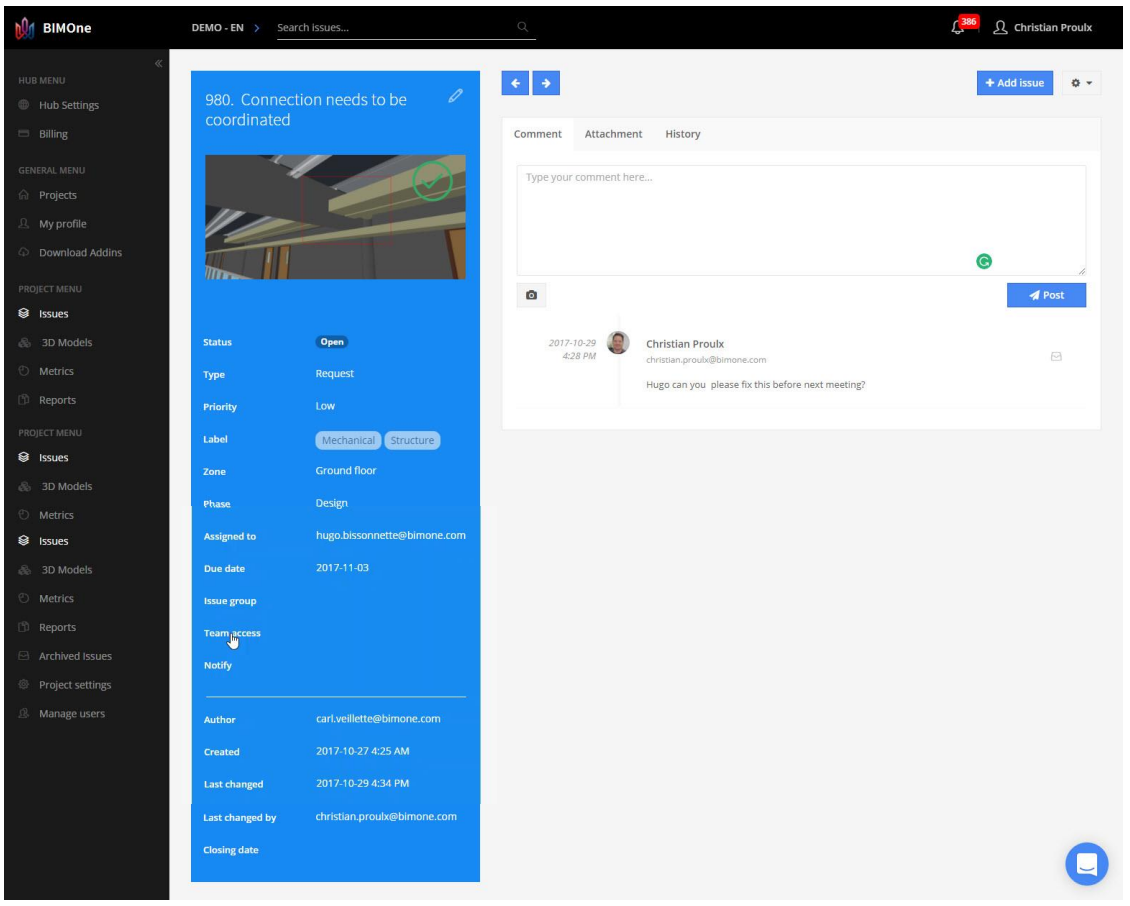
- Restrictions
  - Status limitation to selected teams



Another important aspect of Issue tracking is the issue resolution and approval workflow. Status of issues have to be limited to selected teams to ensure correct resolution.

Management techniques

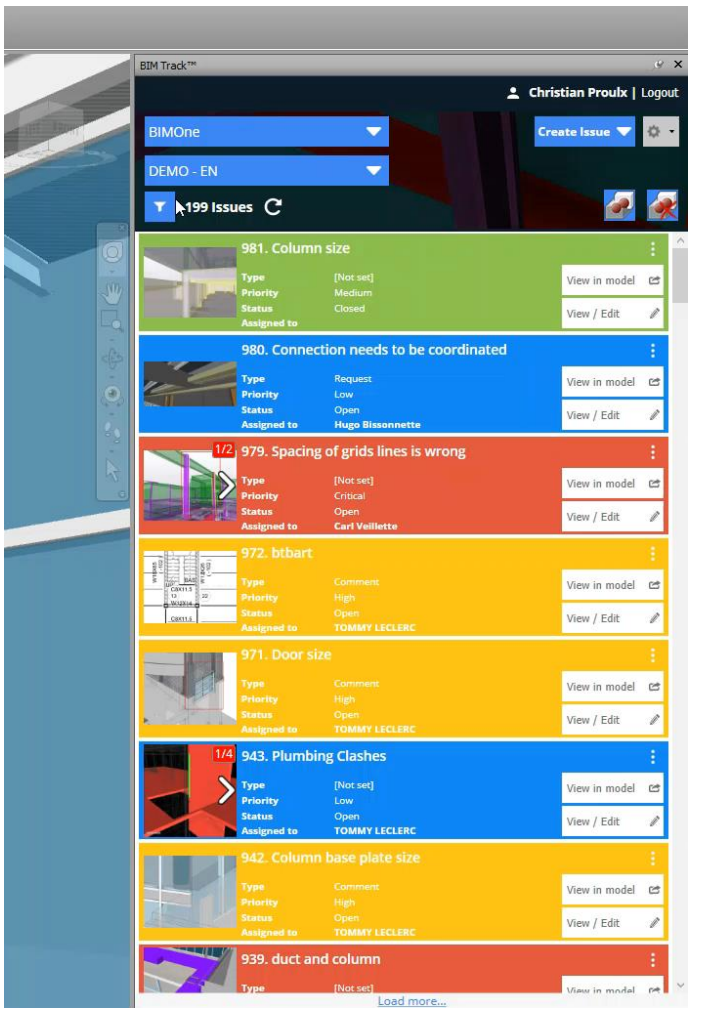
- Restrictions
  - Status limitation to selected teams
  - Visibility for selected teams



Transparency has many benefits on a projects but sometime we need to control the information (WIP: Work in Progress) before it’s shared with the rest of the project team. This is why team access is important to limit the access to selected issues.

Management techniques

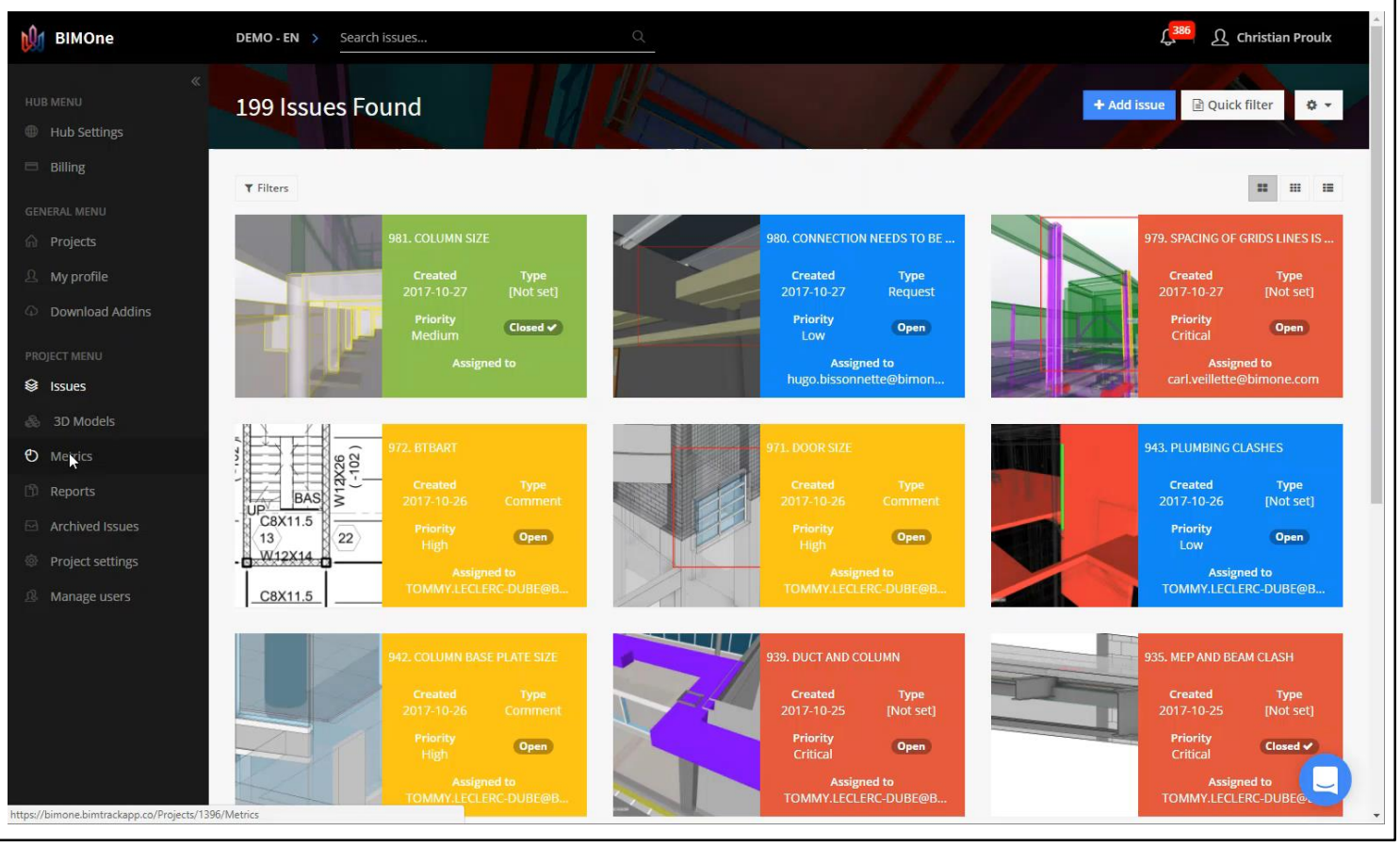
- Restrictions
  - Status limitation to selected teams
  - Visibility for selected teams
- Filtering
  - What to focus on
  - Accurate Reports



Filtering is a key factor that all issue tracking platforms need to have. The metadata can then be filtered for efficient execution or for accurate reports

Management techniques

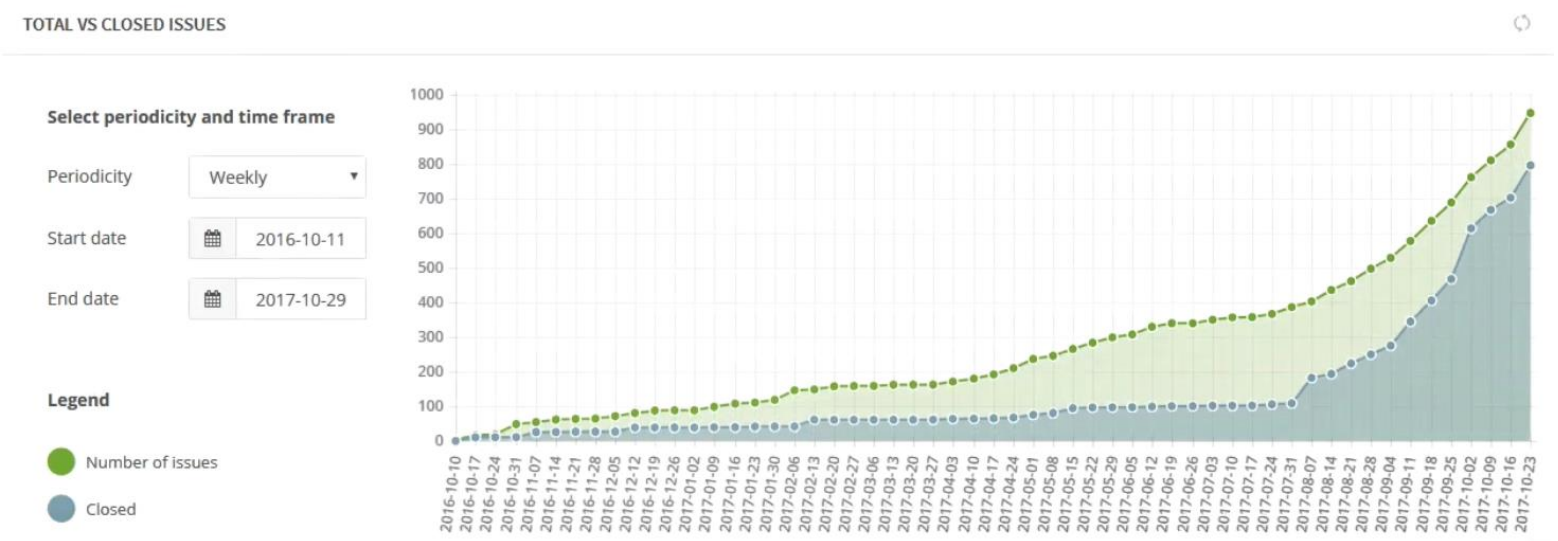
- Metrics



All managers like metrics. They allow them to have a cartesian look at the process and make decisions to improve it or to keep going.

Management techniques

- Metrics
- Progression graph



To understand the global evolution of the number of issues versus the issues that are closed, a progression graph brings a comprehensive vision of the coordination evolution and make this process more tangible.