

How Forge makes life easier leveraging your 4D project data

CS500683

António Hipólito

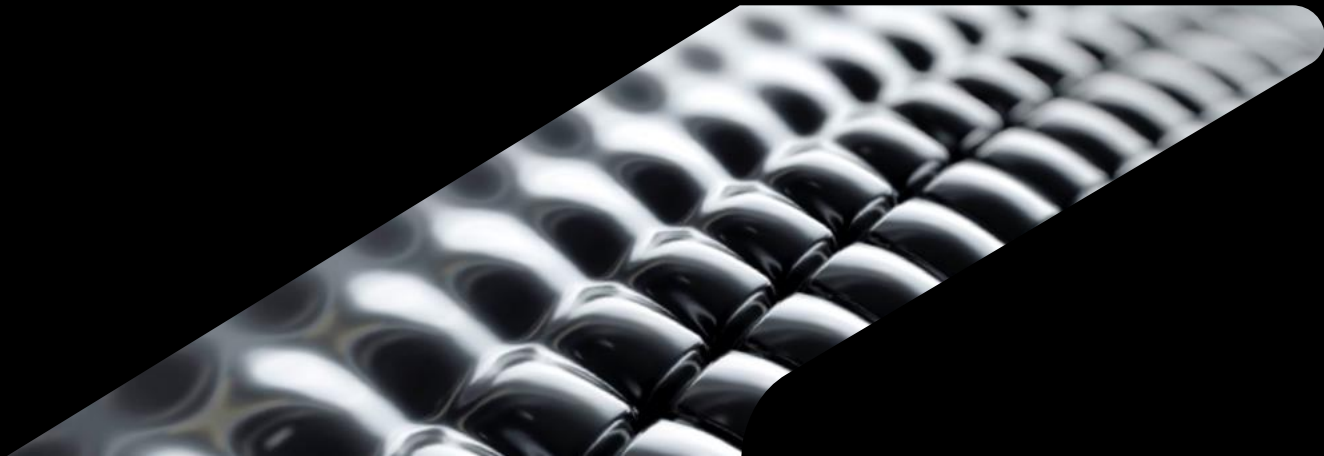
Mota-Engil Global Technical Services

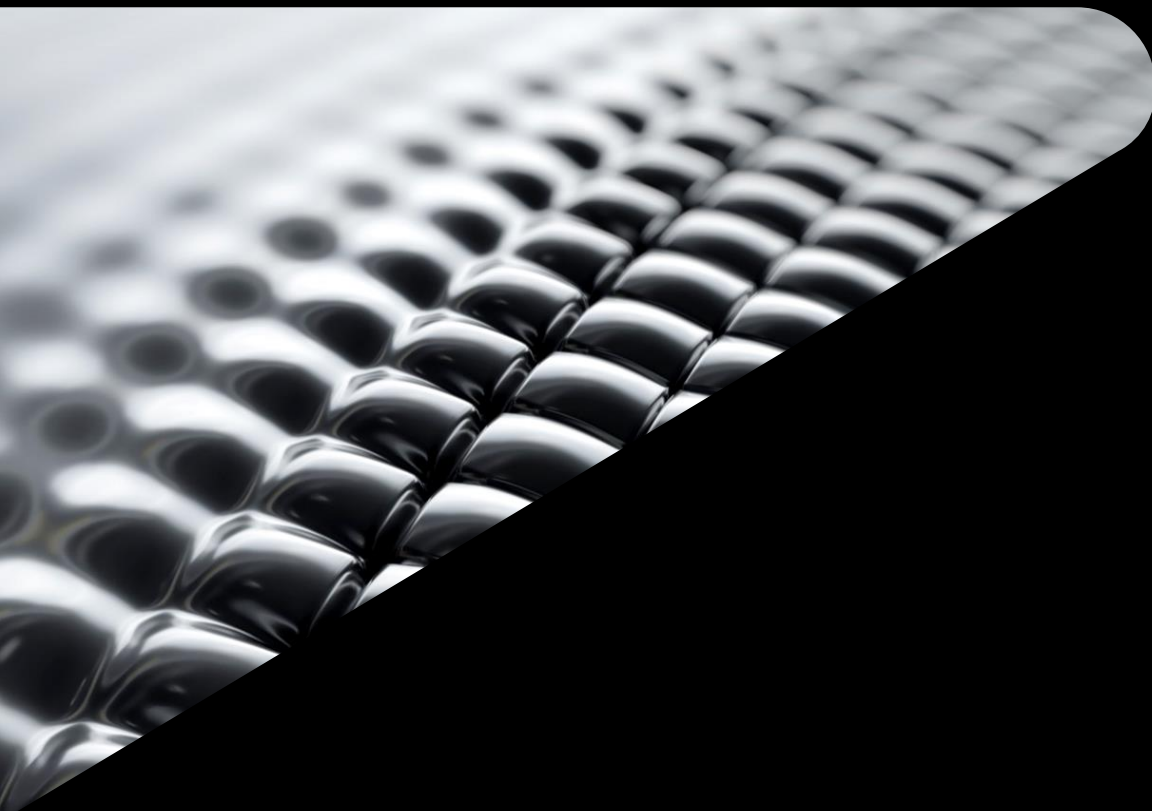
antonio.hipolito@mota-engil.pt

Sebastian Zaje

Autodesk Technical Solution Executive

sebastian.zaje@autodesk.com





context

about us

About me



António Hipólito

Structures & Civil Construction Director at Mota-Engil Global Technical Services

Civil Engineer, 22 years at Mota-Engil Group

Global support (Europe, Africa and Latin America), from concept design to construction field and maintenance

Engineering, Architecture, Quantity Survey, BIM Process

36 years as developer (started at 10 years old with ZX spectrum, then MS DOS, then Windows, then Cloud !)

The mind is like a parachute... It only works if we keep it open (Albert Einstein)

About me



Sebastian Zaje

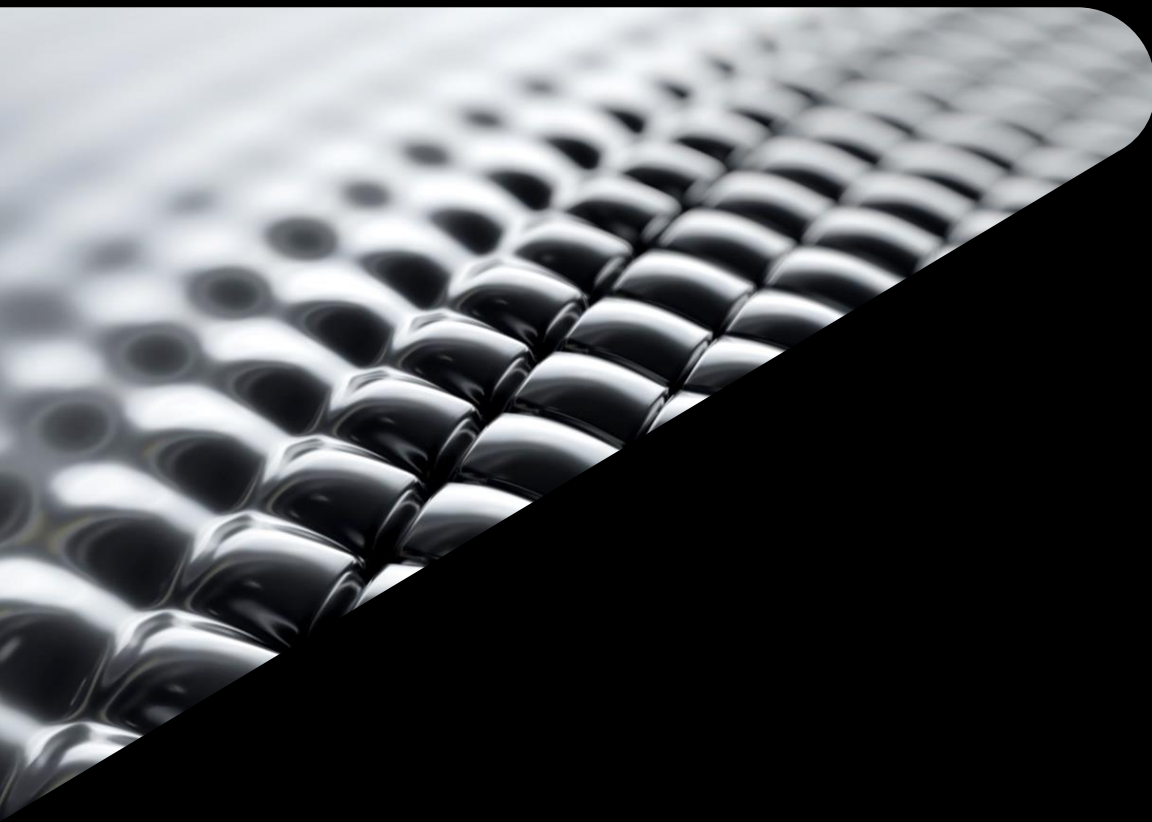
Technical Solutions Executive at Autodesk

14.5 years at Autodesk (*between Latin America and Iberia*)

Supporting corporate accounts (Construction, Engineering, and Energy) to provide value through technology and help transform their organization on the path to success.

11 times at AU (Physical ones) and all the virtual ones.

Speaker management, content selection, speaker coaching, and mentoring for Spanish and Portuguese languages.



context

the company

Mota-Engil Group

**design, construction, management and
operation of infrastructures**

Europe

Africa

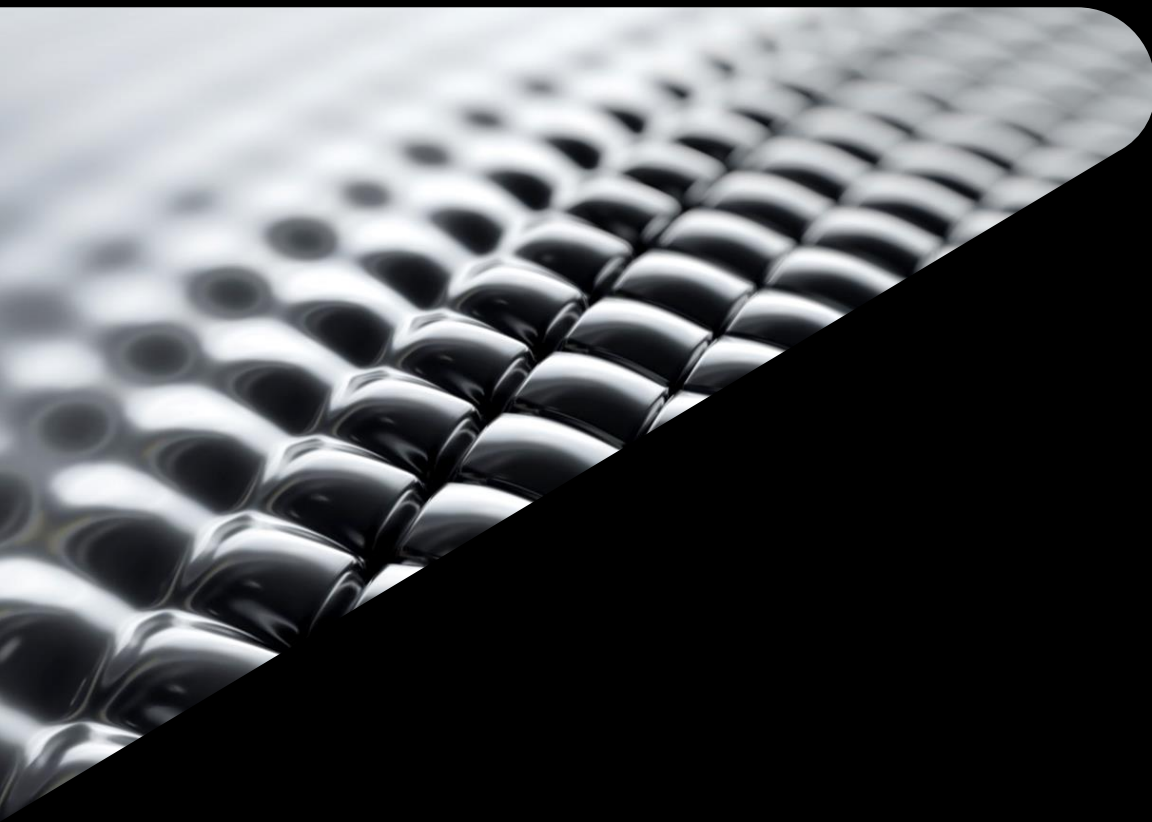
Latin America

**3 continents
25 countries
hundreds of construction sites**

Engineering and Construction

**Airports
Buildings
Bridges
Dams
Ports
Roads
Railroads
among others**

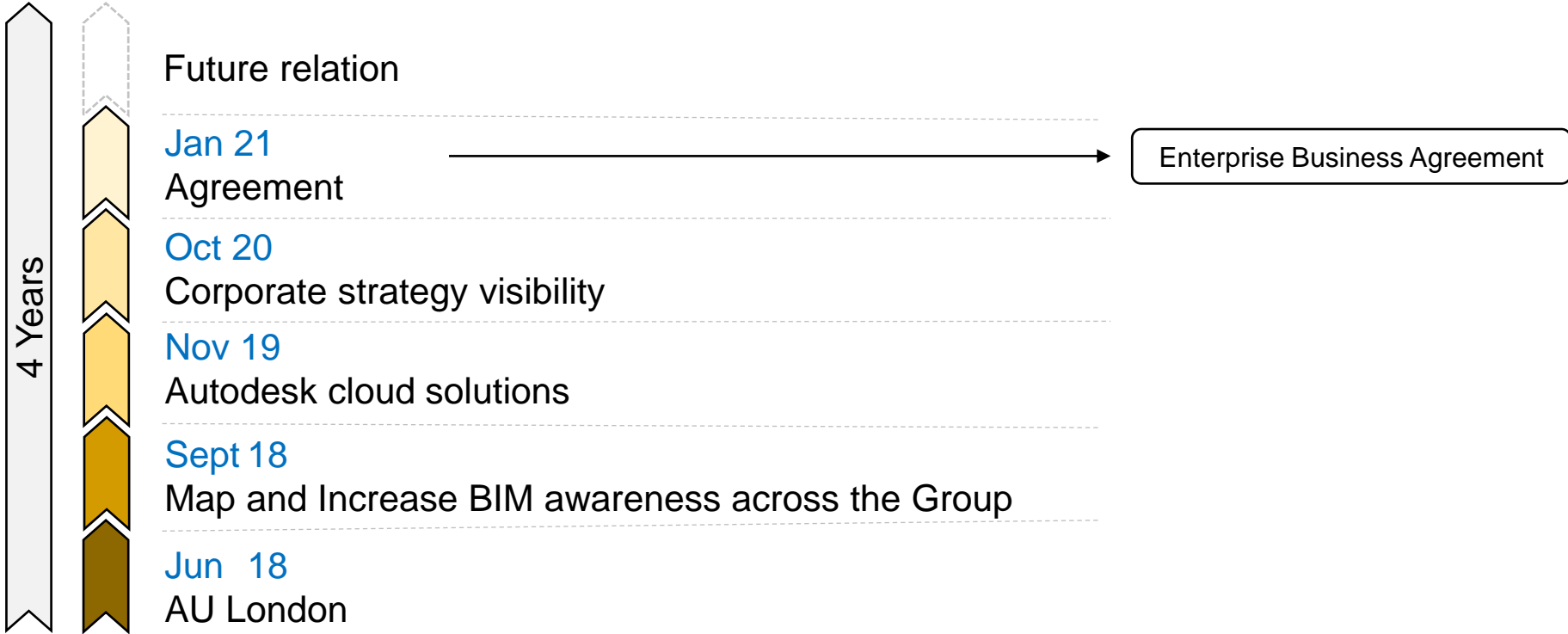




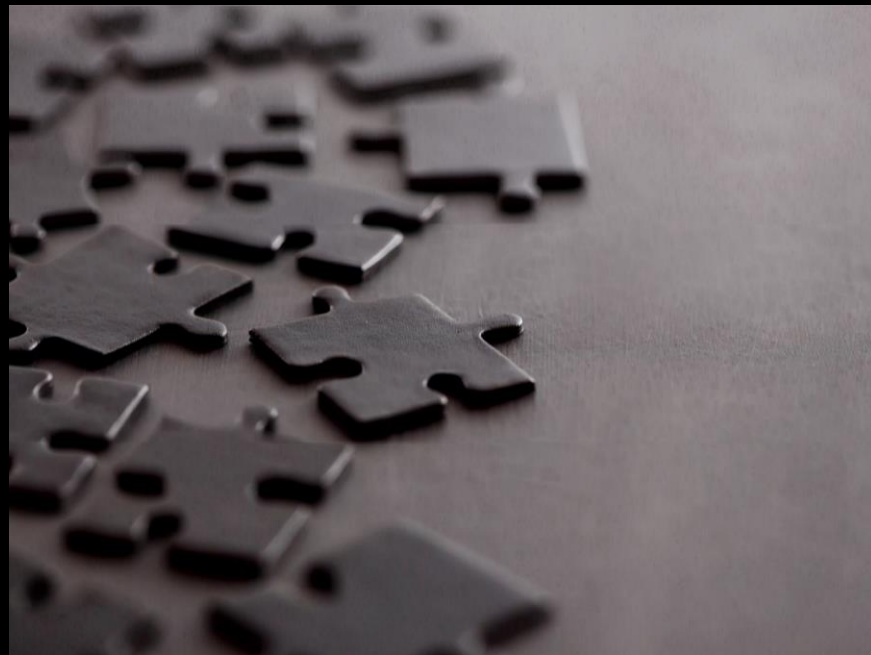
context

relationship with Autodesk

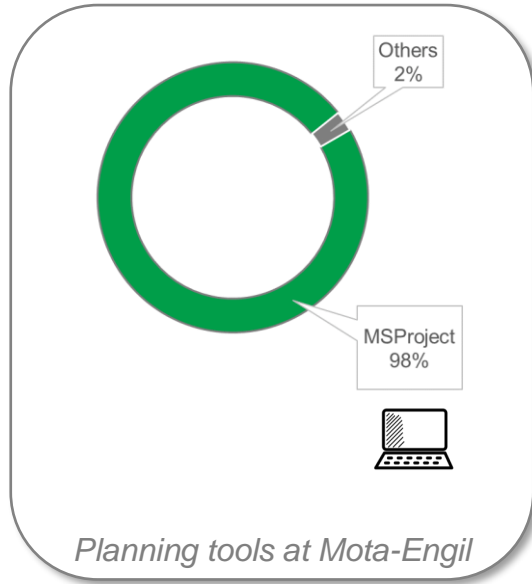
Relationship with Autodesk in last 4 years



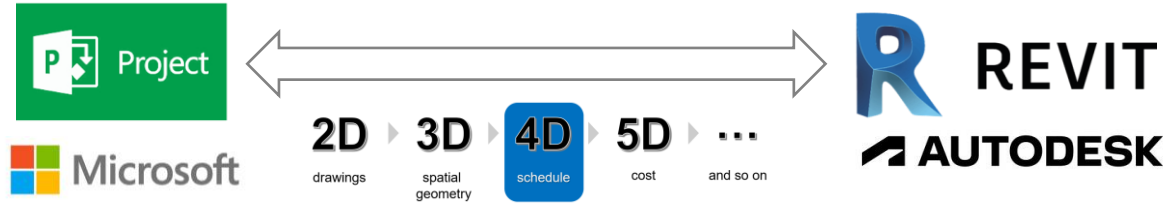
The challenge



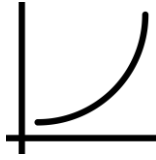
Challenge



What is the seamless way to connect MS Project and Revit?



Goals



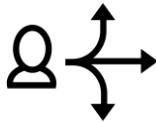
- Fast learning curve
- Short development time



- Improved coordination and communication among all stakeholders
- Minimize the number of used platforms



- Ability to visualize each construction stage from any angle point, sectioning, etc.



- Ability to easily run different scenarios and easily implement adjustments to construction sequence



- Implementation on a pilot project & ability to scale to multiple projects

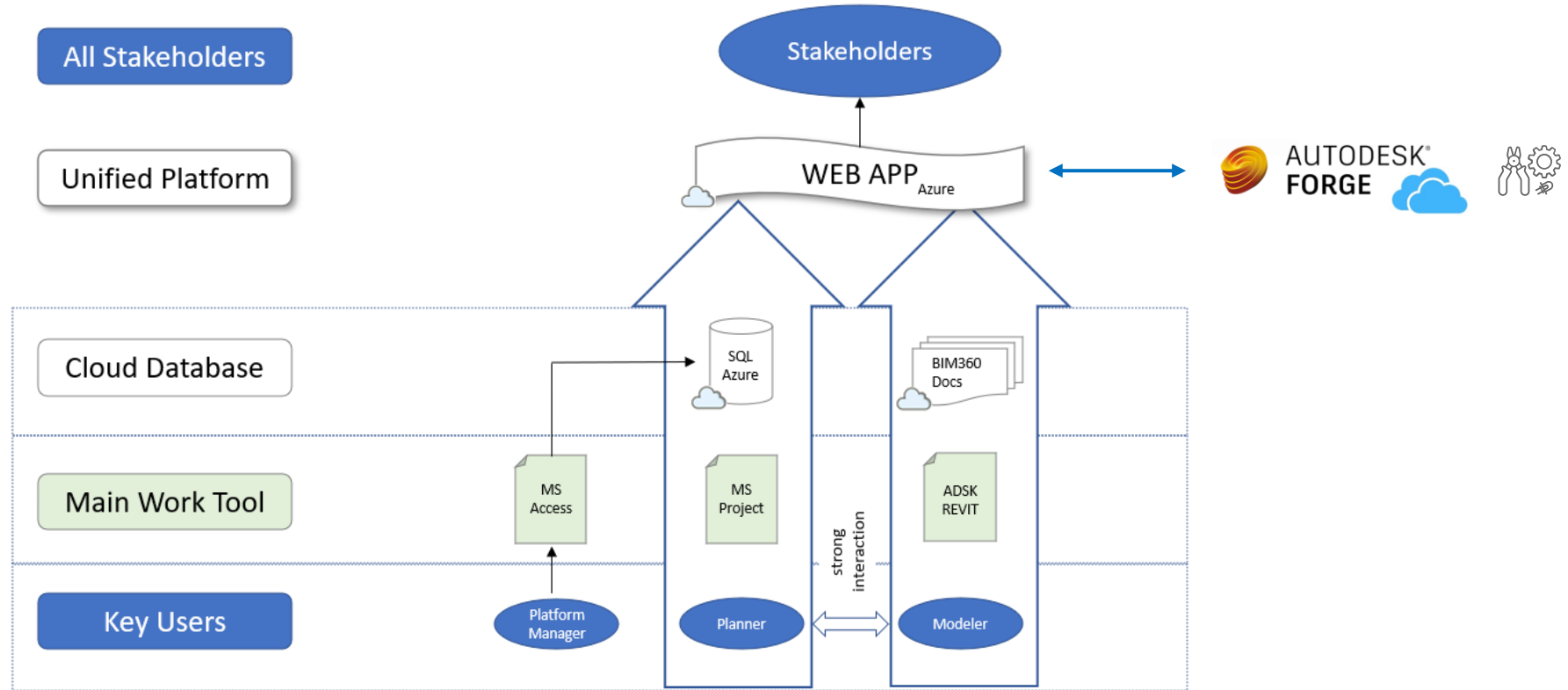
Make it simple and significant

Our Development Slogan

The idea



Workflow



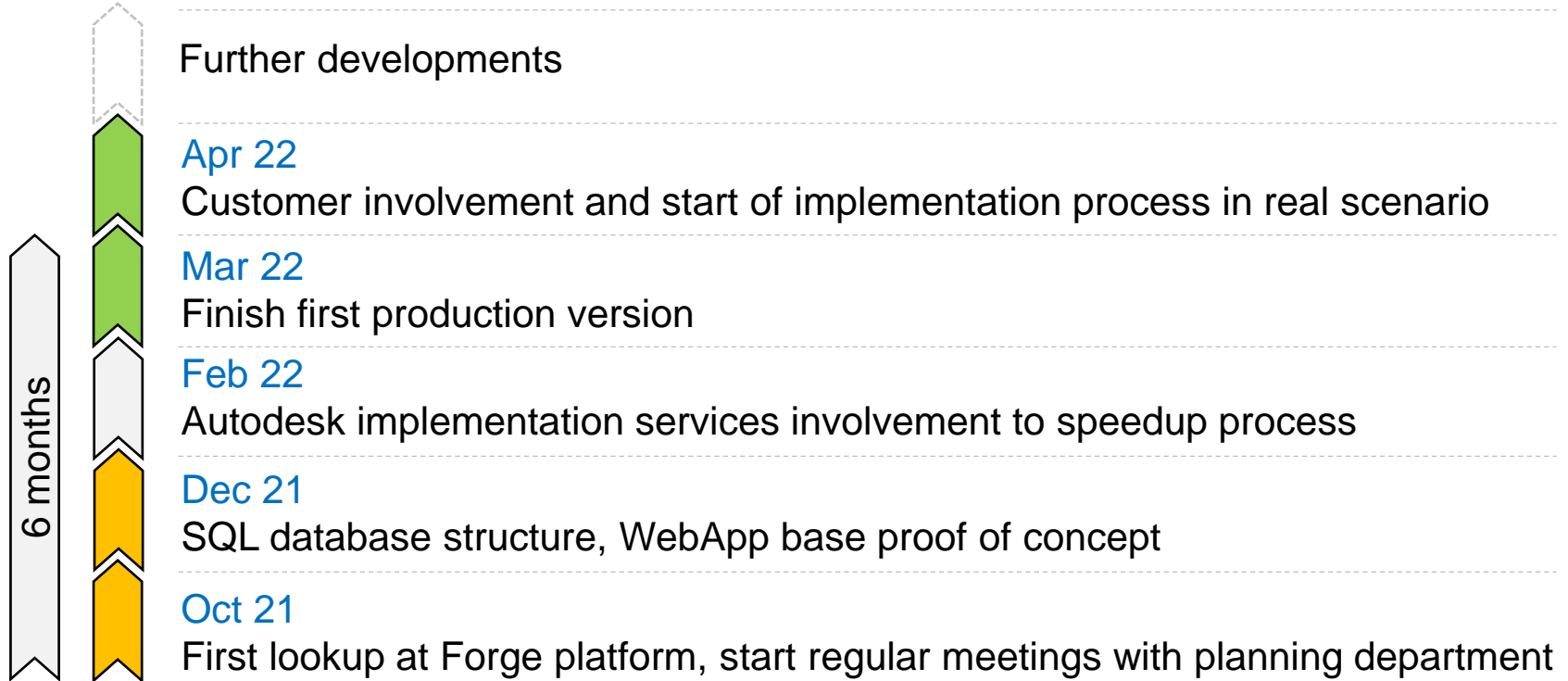
Workflow



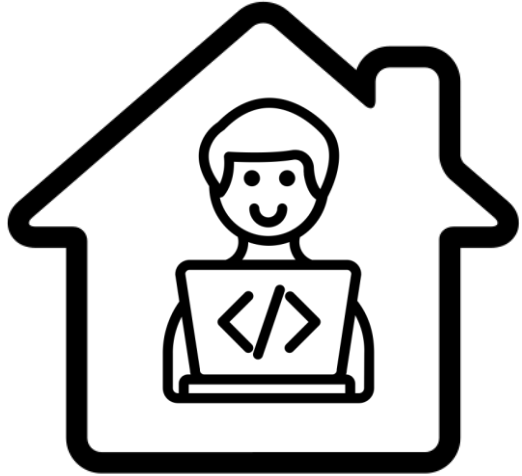
The process



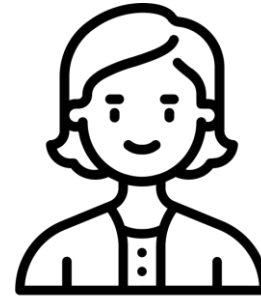
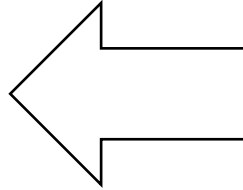
Timeline



Development model



In house development



Autodesk Implementation Services
tutoring

Development team



António Hipólito
Mota-Engil

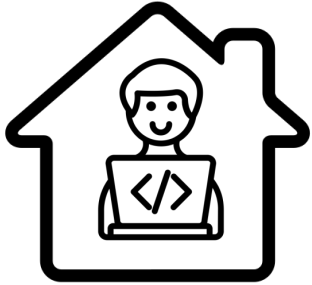


Bruna Gavioli
Solution Architect
Autodesk Consulting



Ahmed Zakzouk
Solution Architect
Autodesk Consulting

Knowledge base for the development phase



www



Microsoft

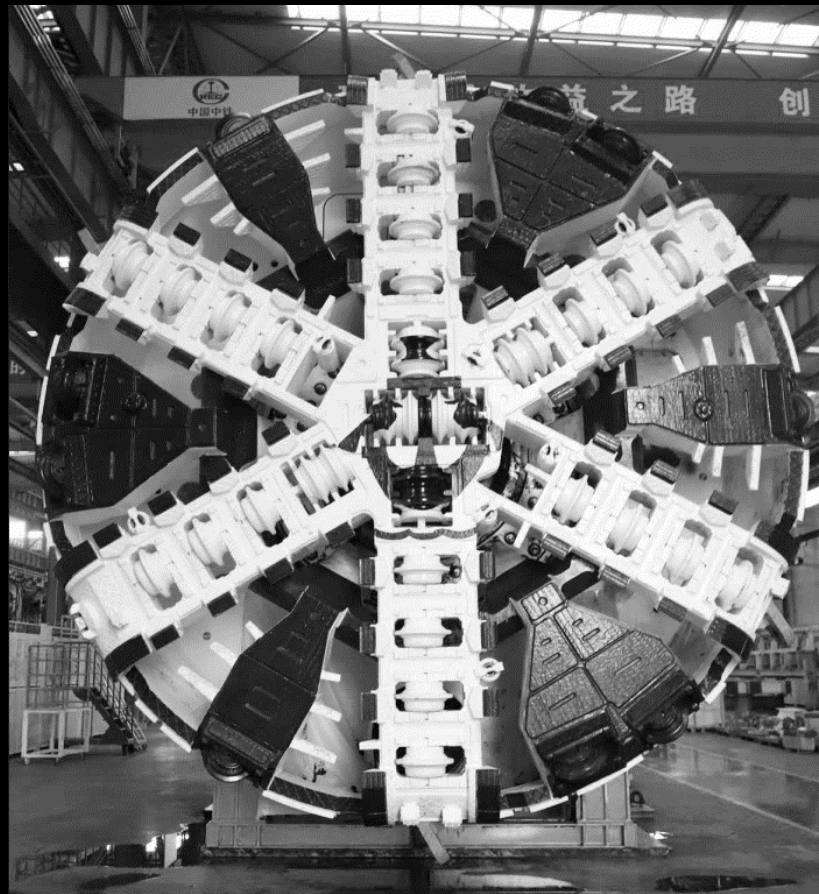


Autodesk

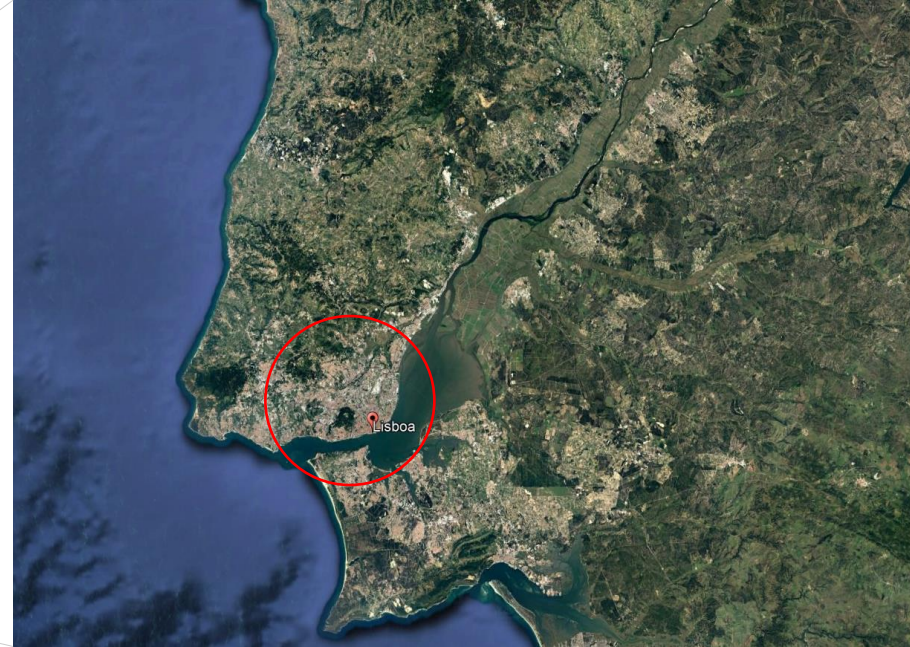


AUTODESK®
FORGE

The pilot



Lisbon General Drainage Plan



Lisbon General Drainage Plan



- 2 drainage tunnels 5.5m diameter, 5km + 1km length
- 5 intersection works
- 2 discharge works
- 133 M EUR
- Design + Build contact



picture from jn.pt (2014/09/22)



Construction project goal: minimize flood risk at down part of Lisbon

Lisbon General Drainage Plan

Main stakeholders

Community

Client



Support



iscte

Contractor



Support

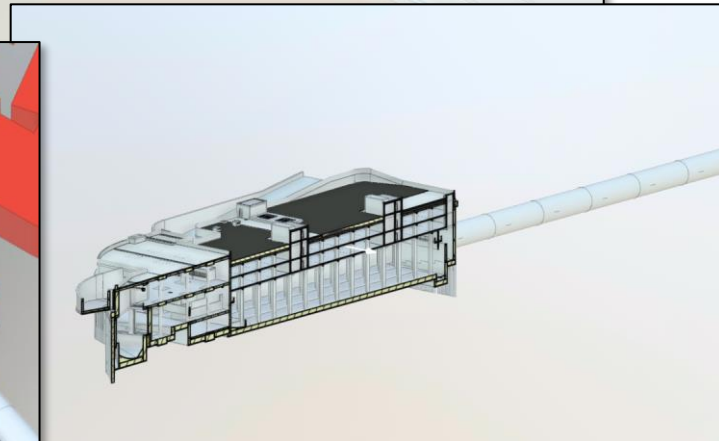
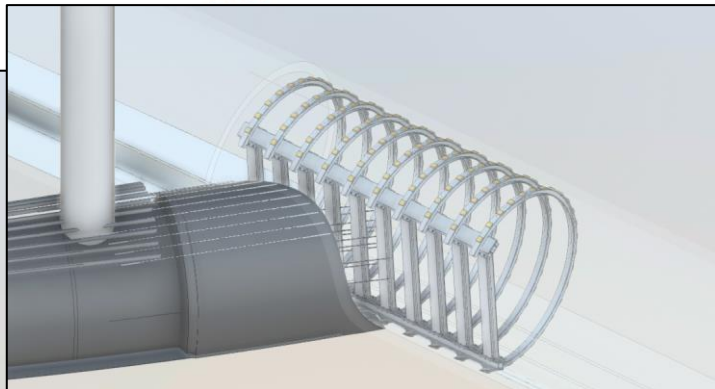
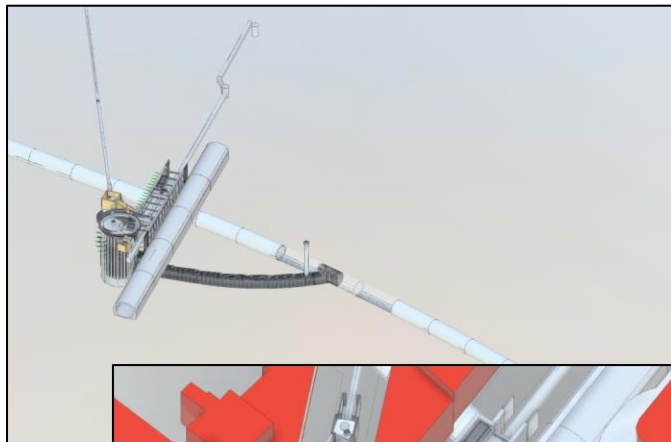


Lisbon General Drainage Plan

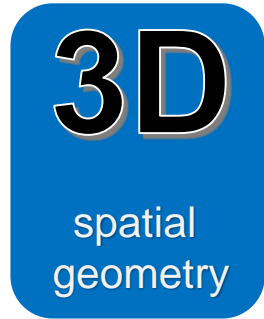


3D

spatial
geometry

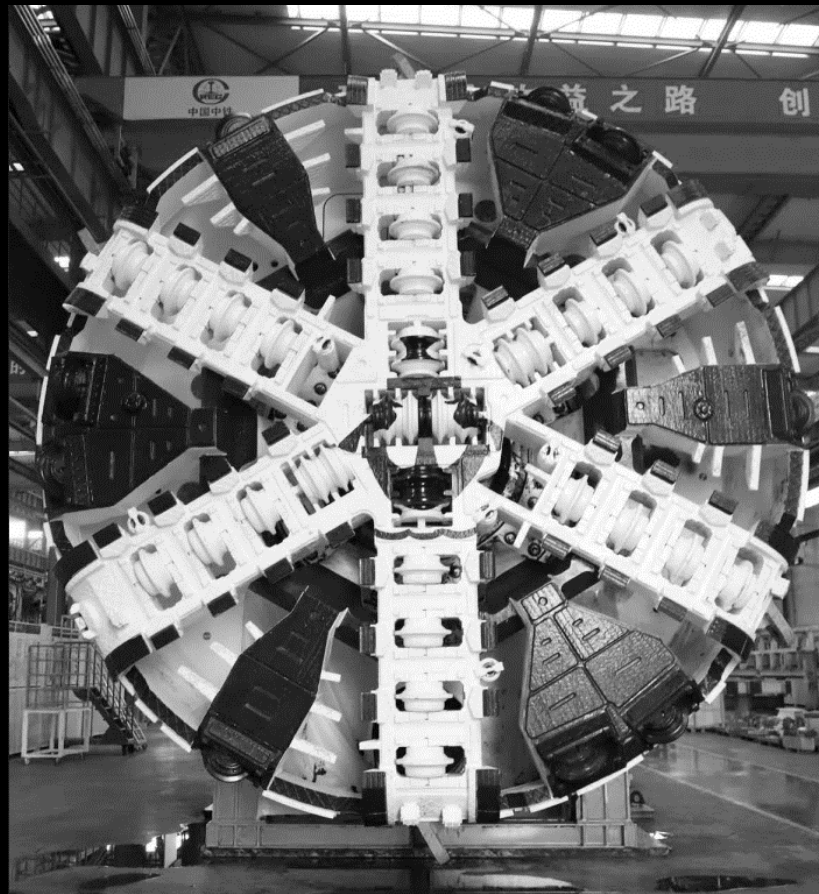


Lisbon General Drainage Plan



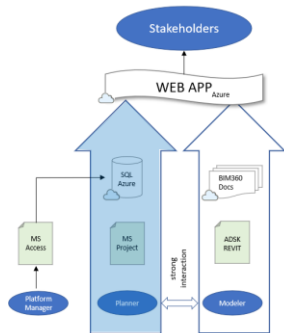
The 4D implementation

the images and data presented afterwards are for class demonstration purposes only and might be inaccurate



Planner

The Planner Side : Setup : Fill three additional columns



PT TM4 Draft v1 2022.02.02.mpp - Project Professional

Antonio Hipólito AH

File Task Resource Report Project View **Add-ins** Help Gantt Chart Format Tell me what you want to do

Upload to Cloud

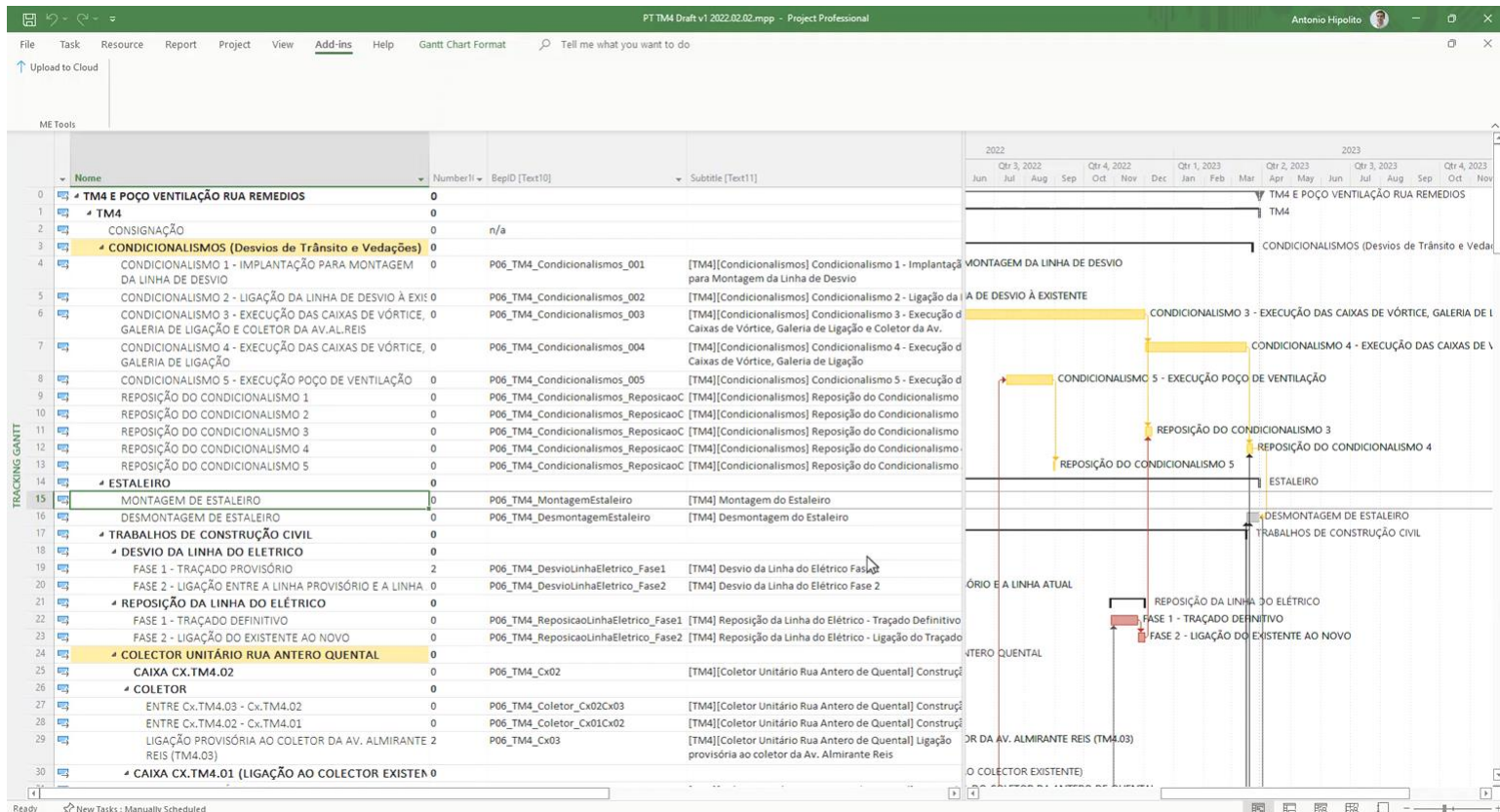
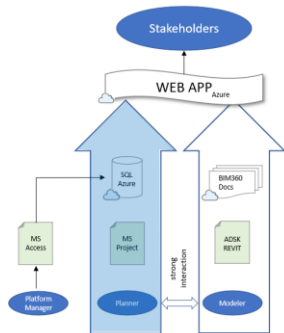
ME Tools

Nome	Number1	BepID [Text10]	Subtitle [Text11]
0 ▶ TM4 E POÇO VENTILAÇÃO RUA REMEDIOS	0		
1 ▶ TM4	0		
2 ▶ CONSIGNAÇÃO	0	n/a	
3 ▶ CONDICIONALISMOS (Desvios de Trânsito e Vedações)	0		
4 ▶ CONDICIONALISMO 1 - IMPLANTAÇÃO PARA MONTAGEM DA LINHA DE DESVIO	0	P06_TM4_Condicionalismos_001	[TM4][Condicionalismos] Condicionalismo 1 - Implantação para Montagem da Linha de Desvio
5 ▶ CONDICIONALISMO 2 - LIGAÇÃO DA LINHA DE DESVIO À EXISTENTE	0	P06_TM4_Condicionalismos_002	[TM4][Condicionalismos] Condicionalismo 2 - Ligação da Linha de Desvio à Existente
6 ▶ CONDICIONALISMO 3 - EXECUÇÃO DAS CAIXAS DE VÓRTICE, GALERIA DE LIGAÇÃO E COLETOR DA AV. ALMIRANTE REIS	0	P06_TM4_Condicionalismos_003	[TM4][Condicionalismos] Condicionalismo 3 - Execução das Caixas de Vórtice, Galeria de Ligação e Coletor da Av.
7 ▶ CONDICIONALISMO 4 - EXECUÇÃO DAS CAIXAS DE VÓRTICE, GALERIA DE LIGAÇÃO	0	P06_TM4_Condicionalismos_004	[TM4][Condicionalismos] Condicionalismo 4 - Execução das Caixas de Vórtice, Galeria de Ligação
8 ▶ CONDICIONALISMO 5 - EXECUÇÃO POÇO DE VENTILAÇÃO	0	P06_TM4_Condicionalismos_005	[TM4][Condicionalismos] Condicionalismo 5 - Execução do Poço de Ventilação
9 ▶ REPOSIÇÃO DO CONDICIONALISMO 1	0	P06_TM4_Condicionalismos_Reposicao01	[TM4][Condicionalismos] Reposição do Condicionalismo 1
10 ▶ REPOSIÇÃO DO CONDICIONALISMO 2	0	P06_TM4_Condicionalismos_Reposicao02	[TM4][Condicionalismos] Reposição do Condicionalismo 2
11 ▶ REPOSIÇÃO DO CONDICIONALISMO 3	0	P06_TM4_Condicionalismos_Reposicao03	[TM4][Condicionalismos] Reposição do Condicionalismo 3
12 ▶ REPOSIÇÃO DO CONDICIONALISMO 4	0	P06_TM4_Condicionalismos_Reposicao04	[TM4][Condicionalismos] Reposição do Condicionalismo 4
13 ▶ REPOSIÇÃO DO CONDICIONALISMO 5	0	P06_TM4_Condicionalismos_Reposicao05	[TM4][Condicionalismos] Reposição do Condicionalismo 5
14 ▶ ESTALEIRO	0		
15 ▶ MONTAGEM DE ESTALEIRO	0	P06_TM4_MontagemEstaleiro	[TM4] Montagem do Estaleiro
16 ▶ DESMONTAGEM DE ESTALEIRO	0	P06_TM4_DesmontagemEstaleiro	[TM4] Desmontagem do Estaleiro
17 ▶ TRABALHOS DE CONSTRUÇÃO CIVIL	0		
18 ▶ DESVIO DA LINHA DO ELÉTRICO	0		
19 ▶ FASE 1 - TRAÇADO PROVISÓRIO	2	P06_TM4_DesvioLinhaEletrico_Fase1	[TM4] Desvio da Linha do Elétrico Fase 1
20 ▶ FASE 2 - LIGAÇÃO ENTRE A LINHA PROVISÓRIA E A LINHA ATUAL	0	P06_TM4_DesvioLinhaEletrico_Fase2	[TM4] Desvio da Linha do Elétrico Fase 2
21 ▶ REPOSIÇÃO DA LINHA DO ELÉTRICO	0		
22 ▶ FASE 1 - TRAÇADO DEFINITIVO	0	P06_TM4_ReposicaoLinhaEletrico_Fase1	[TM4] Reposição da Linha do Elétrico - Traçado Definitivo
23 ▶ FASE 2 - LIGAÇÃO DO EXISTENTE AO NOVO	0	P06_TM4_ReposicaoLinhaEletrico_Fase2	[TM4] Reposição da Linha do Elétrico - Ligação do Traçado Existente ao Novo
24 ▶ COLETOR UNITÁRIO RUA ANTERO QUENTAL	0		
25 ▶ CAIXA CX.TM4.02	0	P06_TM4_Cx02	[TM4][Coletor Unitário Rua Antero de Quental] Construção
26 ▶ COLETOR	0		
27 ▶ ENTRE CX.TM4.03 - CX.TM4.02	0	P06_TM4_Coletor_Cx02Cx03	[TM4][Coletor Unitário Rua Antero de Quental] Construção
28 ▶ ENTRE CX.TM4.02 - CX.TM4.01	0	P06_TM4_Coletor_Cx01Cx02	[TM4][Coletor Unitário Rua Antero de Quental] Construção
29 ▶ LIGAÇÃO PROVISÓRIA AO COLETOR DA AV. ALMIRANTE REIS (TM4.03)	0	P06_TM4_Cx03	[TM4][Coletor Unitário Rua Antero de Quental] Ligação provisória ao coletor da Av. Almirante Reis
30 ▶ CAIXA CX.TM4.01 (LIGAÇÃO AO COLETOR EXISTENTE)	0		

TRACKING GANTT

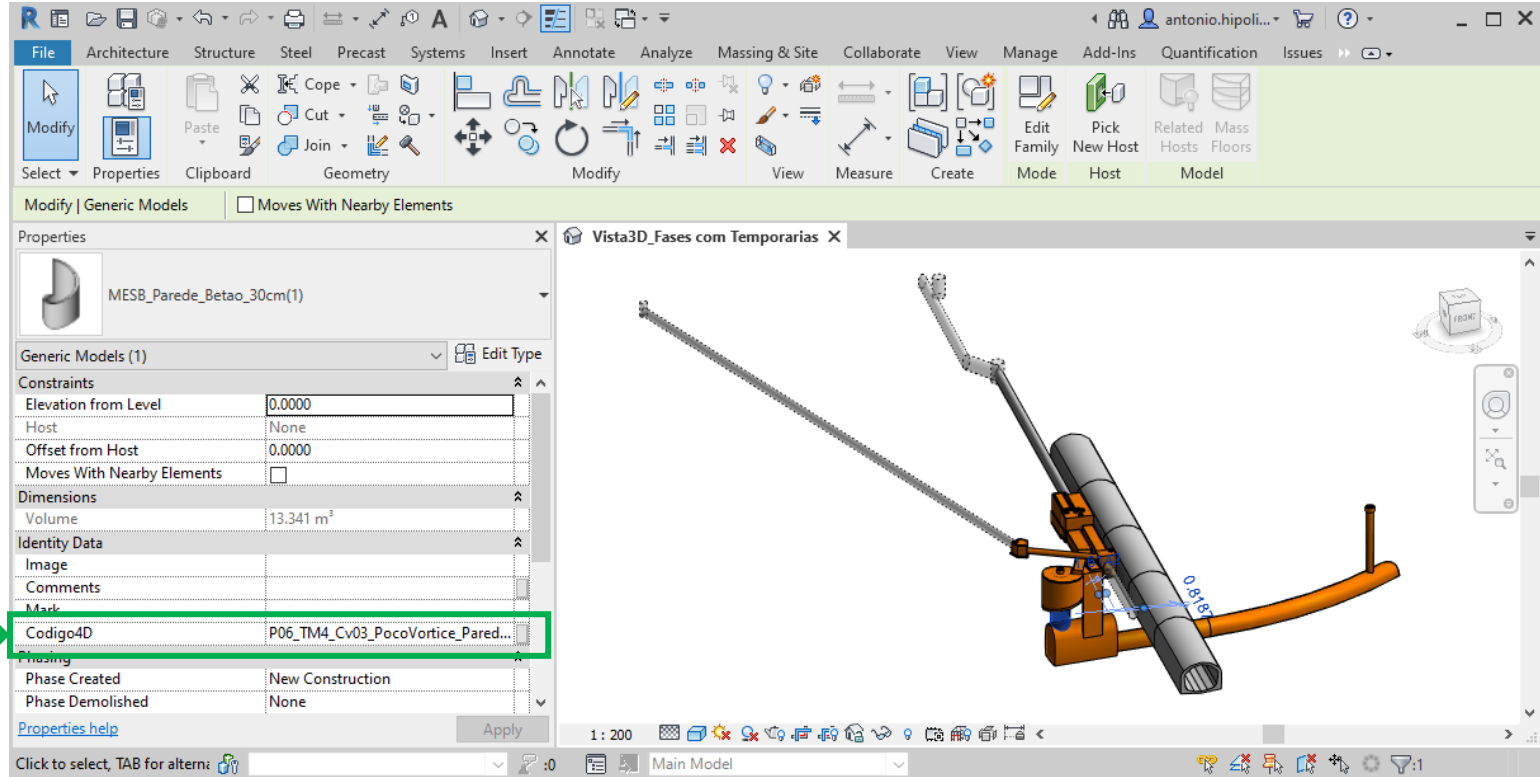
Ready New Tasks: Manually Scheduled

The Planner Side : Update Cloud (SQL Database)



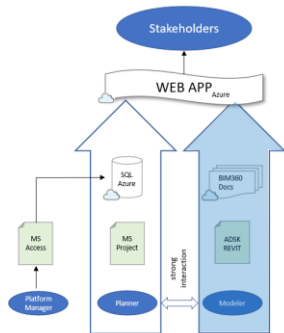
Modeler

The Modeler Side : Setup : Split & Connect objects to tasks



Revit Parts can be used to split objects

The Modeler Side : Update Cloud (BIM360 / ACC Docs)



AUTODESK Construction Cloud
Document Management - Túneis de Drenagem da Cidade de Lisboa

Antonio Hipólito

Pastas Revisões Transmissões Problemas

Visualizar por: Pastas Conjuntos

Carregar arquivos Mostrando 44 itens

Pesquisar Área de retenção

Nome	Descrição	Versão	Tamanho	Última atualização	Atualizado por	Revisão	Problema	Status da...	Conjunto
P00-TCB-GER-PE-M3D-TOP-00.00.rvt		V1	8,4 MB	2 de mai de 2022 às ...	catarina feio				
P00-TMSA-GER-PE-M3D-TOP-00.00.rvt		V1	44,3 MB	2 de mai de 2022 às ...	catarina feio				
P01-TMSA-TUN-PE-M3D-COP-00.00.rvt		V1	15,8 MB	12 de mai de 2022 às ...	catarina feio				
P01-TMSA-TUN-PE-M3D-STR-00.00.rvt		V1	206,8 MB	2 de mai de 2022 às ...	catarina feio				
P02-TMSA-TM1-PE-M3D-COP-00.00.rvt		V1	16,4 MB	2 de mai de 2022 às ...	catarina feio				
P02-TMSA-TM1-PE-M3D-EQP-00.00.rvt		V1	16,4 MB	2 de mai de 2022 às ...	catarina feio				
P02-TMSA-TM1-PE-M3D-ESG-00.00.rvt		V1	16,4 MB	2 de mai de 2022 às ...	catarina feio				
P02-TMSA-TM1-PE-M3D-IEL-00.00.rvt		V1	16,4 MB	2 de mai de 2022 às ...	catarina feio				
P02-TMSA-TM1-PE-M3D-STR-00.00.rvt		V1	16,4 MB	2 de mai de 2022 às ...	catarina feio				
P04-TMSA-TM2-PE-M3D-COP-00.00.rvt		V1	7,4 MB	27 de mai de 2022 às ...	catarina feio				
P04-TMSA-TM2-PE-M3D-EQP-00.00.rvt		V2	4,6 MB	27 de mai de 2022 às ...	catarina feio				
P04-TMSA-TM2-PE-M3D-IEL-00.00.rvt		V2	10,7 MB	27 de mai de 2022 às ...	catarina feio				
P04-TMSA-TM2-PE-M3D-STR-00.00.rvt		V2	17,1 MB	27 de mai de 2022 às ...	catarina feio				
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P05-TMSA-TM3-PE-M3D-EQP-00.00.rvt		V1	3,8 MB	2 de mai de 2022 às ...	catarina feio				

Drag & Drop to Update Cloud Model

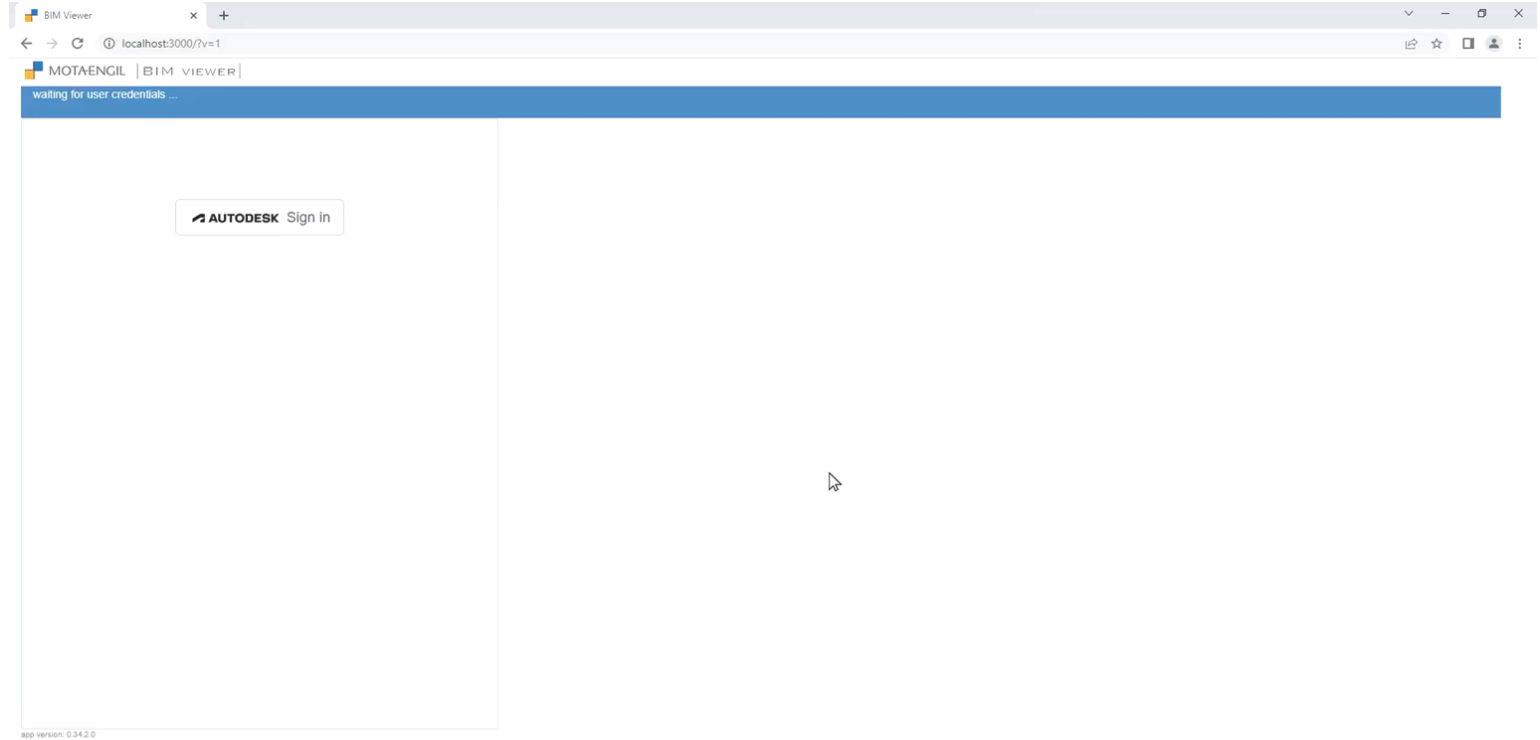
Stakeholder



MOTA-ENGIL



The Stakeholders Side : Login Process



Login with Autodesk credentials

The Stakeholders Side : Manage Models



BIM Viewer
localhost:3000/?v=1

MOTAENGIL | BIM VIEWER
Antonio Hipolito

Project: 12335 - Túneis de Drenagem da Cidade de Lisboa
Schedule: aux - teste de desenvolvimento (TM4)

Viewer | Planner

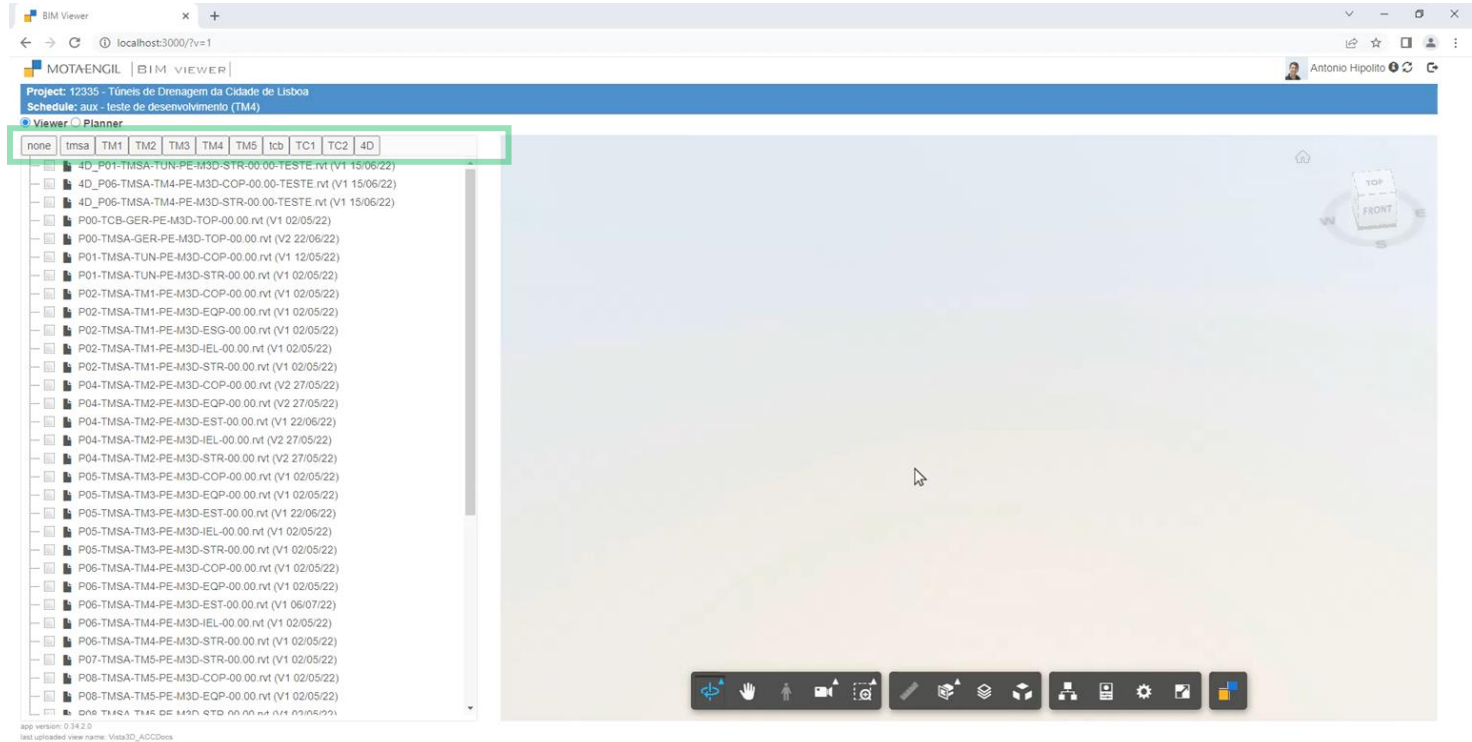
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<input type="checkbox"/>											P02-TMSA-TM1-PE-M3D-STR-00.00.rvt (V1 02/05/22)
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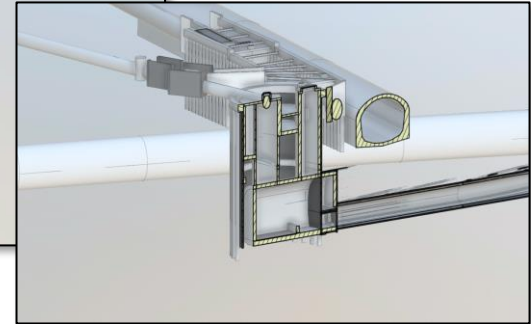
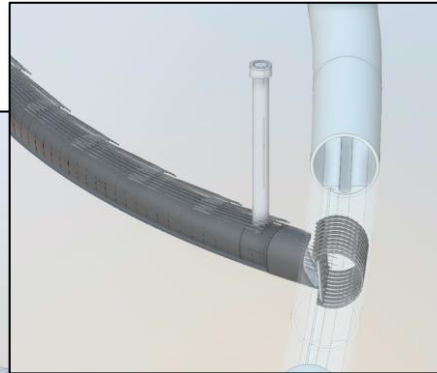
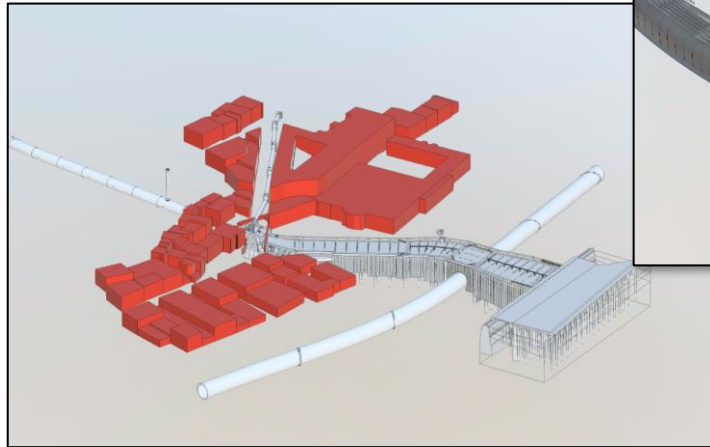
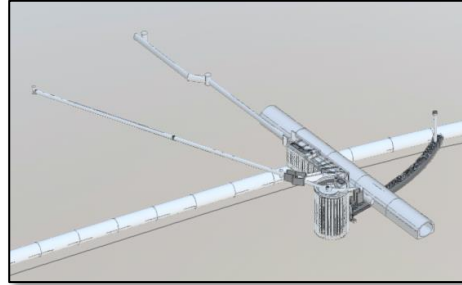
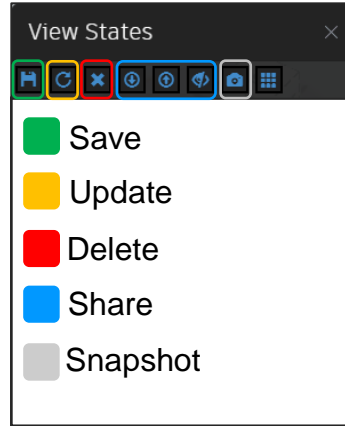
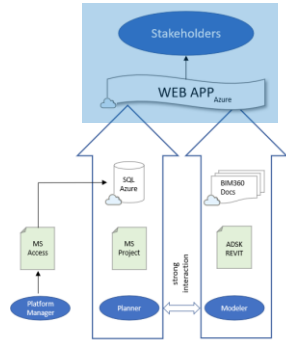
Get all latest versions from the correct Autodesk Construction Cloud folder
Link any model on the right place with shared coordinate system and a single click

The Stakeholders Side : Manage Models



Custom action buttons by project

The Stakeholders Side : Manage Views



View States Extension



The Stakeholders Side : Scheduling Viewer !

The screenshot displays the BIM Viewer Scheduling Viewer interface. The browser address bar shows `localhost:3000/?v=1`. The header includes the MOTAENGIL logo and the text "BIM VIEWER". The project information is as follows:

- Project: 12335 - Túneis de Drenagem da Cidade de Lisboa
- Schedule: aux - teste de desenvolvimento (TM4) < 2021

Below the header, there are two tabs: "Viewer" and "Planner". The "Planner" tab is selected and highlighted with a green box. A green arrow points from a text box "Get into planner mode" to the "Planner" tab. The main content area is divided into two panels. The left panel lists tasks with their IDs, descriptions, and dates:

- [TM4][Coletor Unitário Rua Antero de Quental] Desvio do caudal para o novo coletor
2021-12-21(Tue) => 2021-12-23(Thu)
- [TM4][Coletor Unitário Rua Antero de Quental] Construção da caixa TM4.01
2021-12-24(Fri) => 2021-12-30(Thu)
- [TM4][Coletor Unitário Rua Antero de Quental] Reposição do caudal na nova caixa TM4.01
2022-01-04(Tue) => 2022-01-04(Tue)
- [TM4][CV03][Poço] Execução da cortina de estacas
2022-01-05(Wed) => 2022-01-11(Tue)

The right panel shows a 3D model of a tunnel construction. A "Color Legend" window is open, displaying the following categories and colors:

- In construction (Light Blue)
- In demolition (Yellow)
- Constructed (Blue)
- Temporary activity on object location (Green)

The 3D model shows a complex network of pipes and structures. A timeline at the top indicates the date "2022-01-09 (Sun)" and a "Span: 28". A "play" button is visible next to the date. The bottom of the interface features a toolbar with various icons for navigation and interaction.

The Stakeholders Side : Scheduling Viewer !

The screenshot displays the BIM Viewer Scheduling Viewer interface. At the top, the browser address bar shows 'localhost:3000/?v=1'. The header includes the MOTAENGIL logo and the text 'BIM VIEWER'. Below the header, the project information is displayed: 'Project: 12335 - Túneis de Drenagem da Cidade de Lisboa' and 'Schedule: aux - teste de desenvolvimento (TM4) < 2021-09-20(Mon) - 2023-03-29(Wed) >'. A green arrow points from a text box labeled 'Global project dates' to the schedule range. The interface has two tabs: 'Viewer' and 'Planner', with 'Planner' selected. On the left, a list of activities is shown with their start and end dates and corresponding color-coded bars. The main area features a timeline from 2021-12-13 (Mon) to 2022-01-09 (Sun) with a 'Span: 28' and a 'play' button. A 'Color Legend' pop-up is visible, showing four categories: 'In construction' (light blue), 'In demolition' (yellow), 'Constructed' (blue), and 'Temporary activity on object location' (green). The 3D model shows a complex tunnel structure with various pipes and components. A 'FRONT' view indicator is present in the top right corner of the 3D view. The bottom of the interface contains a toolbar with various navigation and manipulation tools.

Global project dates

Project: 12335 - Túneis de Drenagem da Cidade de Lisboa
Schedule: aux - teste de desenvolvimento (TM4) < 2021-09-20(Mon) - 2023-03-29(Wed) >

Viewer Planner

2021-12-13 (Mon) to 2022-01-09 (Sun) - + play Span: 28

Color Legend

- In construction
- In demolition
- Constructed
- Temporary activity on object location

app version: 0.31.3.0
last uploaded view name: Vista3D_ACCDocs

The Stakeholders Side : Scheduling Viewer !

The screenshot displays the BIM Viewer Scheduling Viewer interface. The top navigation bar includes the MOTAENGIL logo and the text "BIM VIEWER". The main header shows the project name "Project: 12335 - Túneis de Drenagem da Cidade de Lisboa" and the schedule "Schedule: aux - teste de desenvolvimento (TM4) < 2021-09-20(Mon) - 2023-03-29(Wed) >". The left sidebar contains a list of activities with their schedules:

- [TM4][Coletor Unitário Rua Antero de Quental] Desvio do caudal para o novo coletor
2021-12-21(Tue) => 2021-12-23(Thu)
- [TM4][Coletor Unitário Rua Antero de Quental] Construção da caixa TM4.01
2021-12-24(Fri) => 2021-12-30(Thu)
- [TM4][Coletor Unitário Rua Antero de Quental] Reposição do caudal na nova caixa TM4.01
2022-01-04(Tue) => 2022-01-04(Tue)
- [TM4][CV03][Poço] Execução da cortina de estacas
2022-01-05(Wed) => 2022-01-11(Tue)

The main view shows a 3D model of a tunnel structure. A "Color Legend" panel is visible, listing activity types with corresponding colors:

- In construction (light blue)
- In demolition (yellow)
- Constructed (dark blue)
- Temporary activity on object location (green)

The "Selection Dates" panel at the top right shows the date range "2021-12-13 (Mon) to 2022-01-09 (Sun)" with a "Span: 28" and a "play" button. Two green arrows point to the date range and the "play" button, with a label "Two sliders" indicating the date range selection mechanism.

The Stakeholders Side : Scheduling Viewer !

The screenshot displays the BIM Viewer interface for the project "12335 - Túneis de Drenagem da Cidade de Lisboa". The interface includes a header with the project name and a user profile "Antonio Hipolito". Below the header, there is a navigation bar with "Viewer" and "Planner" tabs, with "Planner" selected. The main content area is divided into two sections: a task list on the left and a 3D model on the right.

Task List:

- [TM4][Coletor Unitário Rua Antero de Quental] Desvio do caudal para o novo coletor
2021-12-21(Tue) => 2021-12-23(Thu)
- [TM4][Coletor Unitário Rua Antero de Quental] Construção da caixa TM4.01
2021-12-24(Fri) => 2021-12-30(Thu)
- [TM4][Coletor Unitário Rua Antero de Quental] Reposição do caudal na nova caixa TM4.01
2022-01-04(Tue) => 2022-01-04(Tue)
- [TM4][CV03][Poço] Execução da cortina de estacas
2022-01-05(Wed) => 2022-01-11(Tue)

3D Model:

The 3D model shows a tunnel structure with various components. A "Color Legend" window is open, showing the following categories and colors:

- In construction (Light Blue)
- In demolition (Yellow)
- Constructed (Dark Blue)
- Temporary activity on object location (Green)

The timeline at the top indicates the period from 2021-12-13 (Mon) to 2022-01-09 (Sun), with a span of 28 days. The 3D model includes a "FRONT" view indicator and a "play" button for the timeline.

MS Project Tasks Viewer

The Stakeholders Side : Scheduling Viewer !

The screenshot displays the BIM Viewer interface for a project titled "12335 - Túneis de Drenagem da Cidade de Lisboa". The schedule is set from 2021-09-20 (Mon) to 2023-03-29 (Wed). The interface is divided into a left sidebar for task management and a main 3D view area.

Task List (Left Sidebar):

- [TM4][Coletor Unitário Rua Antero de Quental] Desvio do caudal para o novo coletor
2021-12-21(Tue) => 2021-12-23(Thu)
- [TM4][Coletor Unitário Rua Antero de Quental] Construção da caixa TM4.01
2021-12-24(Fri) => 2021-12-30(Thu)
- [TM4][Coletor Unitário Rua Antero de Quental] Reposição do caudal na nova caixa TM4.01
2022-01-04(Tue) => 2022-01-04(Tue)
- [TM4][CV03][Poço] Execução da cortina de estacas
2022-01-05(Wed) => 2022-01-11(Tue)

3D View Area:

- Color Legend:**
 - In construction (Light Blue)
 - In demolition (Yellow)
 - Constructed (Blue)
 - Temporary activity on object location (Green)
- Timeline:** 2021-12-13 (Mon) to 2022-01-09 (Sun) Span: 28
- 3D Model:** A 3D rendering of a tunnel construction site with various pipes and structures. A "FRONT" view indicator is visible.
- Navigation Tools:** A toolbar at the bottom includes icons for navigation, selection, and viewing.

4D Tasks Viewer

The Stakeholders Side : Scheduling Viewer !

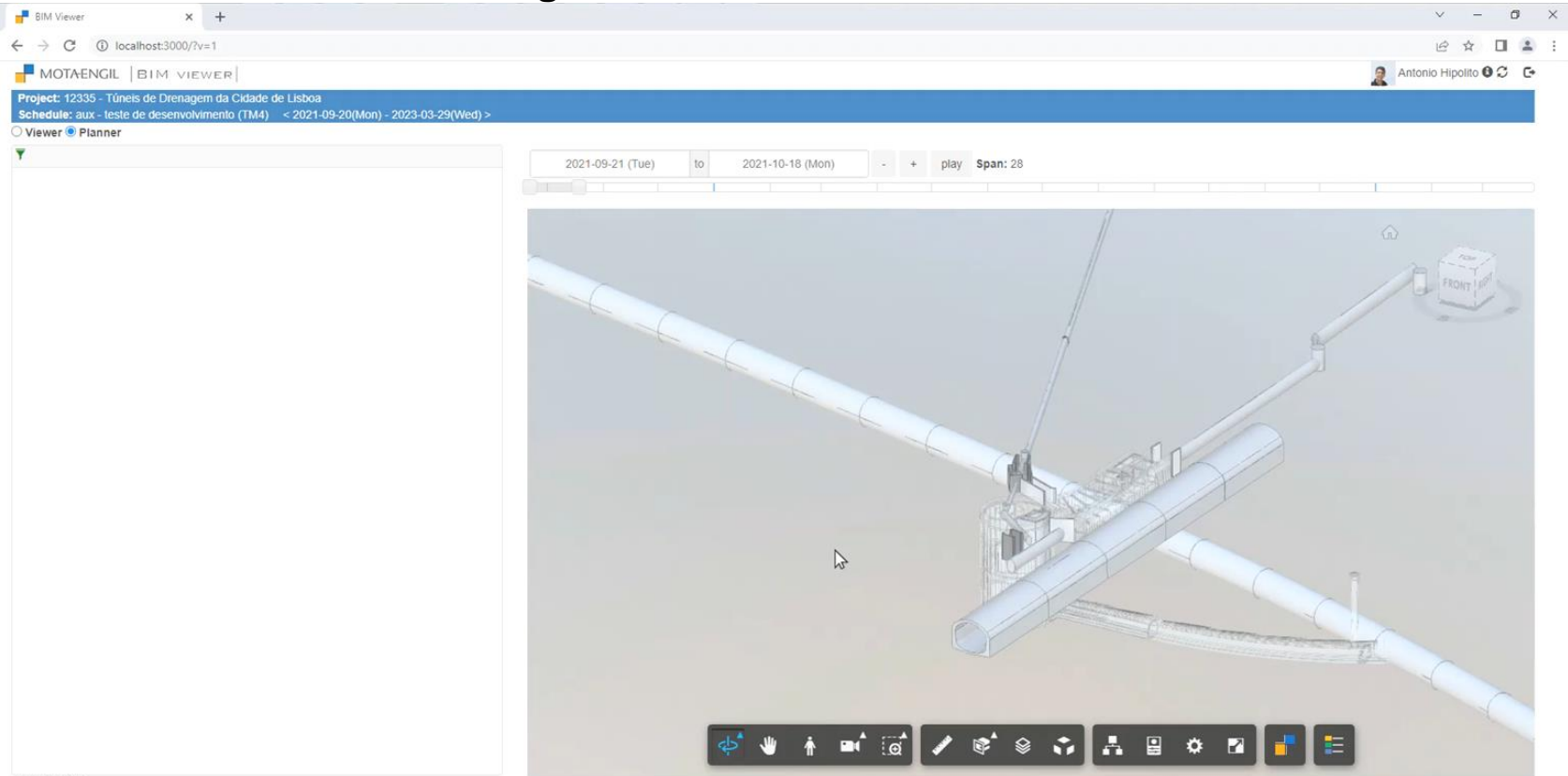
The screenshot displays the BIM Viewer Scheduling Viewer interface. The browser address bar shows 'localhost:3000/?v=1'. The header includes 'MOTAENGIL | BIM VIEWER' and a user profile 'Antonio Hipolito'. The main content area is divided into two panels:

- Left Panel (Task List):** A list of tasks with their names and scheduled dates. The tasks are:
 - [TM4][ColectorCDC04aCV03] Execução da cortina de estacas (2022-01-12(Wed) => 2022-02-08(Tue))
 - [TM4][ColectorCDC04aCV03] Execução da Viga de Coroamento (2022-02-16(Wed) => 2022-03-15(Tue))
 - [TM4][CV03][Poço] Execução da cortina de estacas (2022-01-05(Wed) => 2022-01-11(Tue))
 - [TM4][CV03][Poço] Execução da viga de coroamento (2022-01-14(Fri) => 2022-01-20(Thu))
 - [TM4][CV03][Poço] Execução de betão projetado (2022-02-11(Fri) => 2022-02-14(Mon))
 - [TM4][CV03][Poço] Execução da viga de travamento (2022-02-15(Tue) => 2022-02-21(Mon))
- Right Panel (3D Model):** A 3D model of a tunnel structure. A 'Color Legend' dialog box is open, showing four categories: 'In construction' (light blue), 'In demolition' (yellow), 'Constructed' (dark blue), and 'Temporary activity on object location' (green). The model shows a complex network of pipes and structural elements.

A green double-headed arrow points from the task list to the 3D model, indicating the connection between the two views.

Connect tasks & viewer

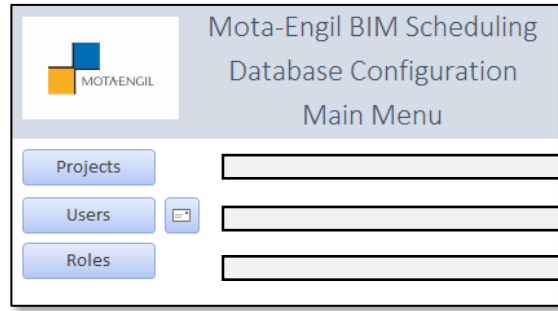
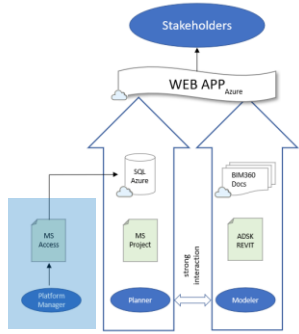
The Stakeholders Side : Scheduling Viewer !



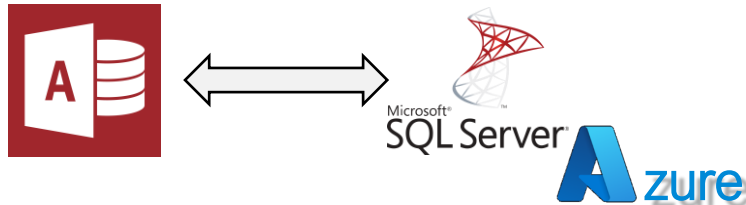
app version: 0.34.2.0
last uploaded view name: Vista3D_ACCDocs

Platform Manager

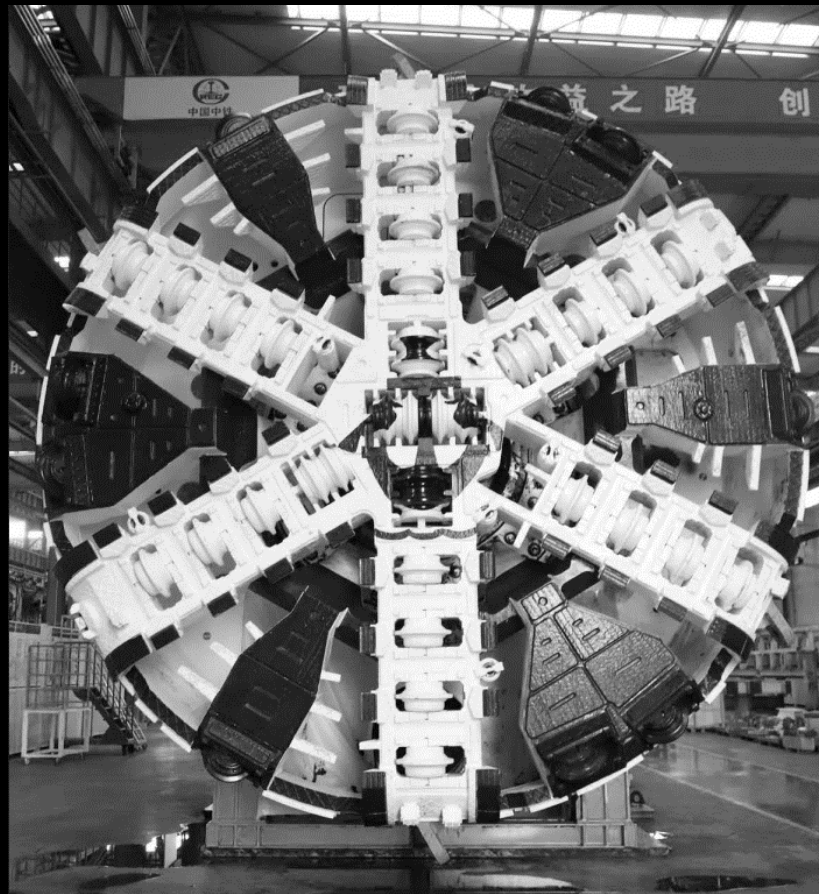
The Platform Manager Side



Manage projects and scheduling options
Manage users and their permissions
Manage users' roles definition



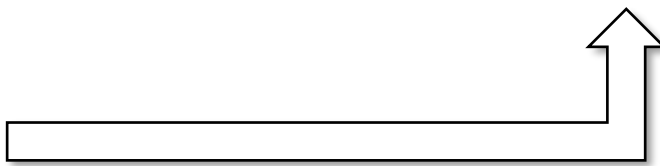
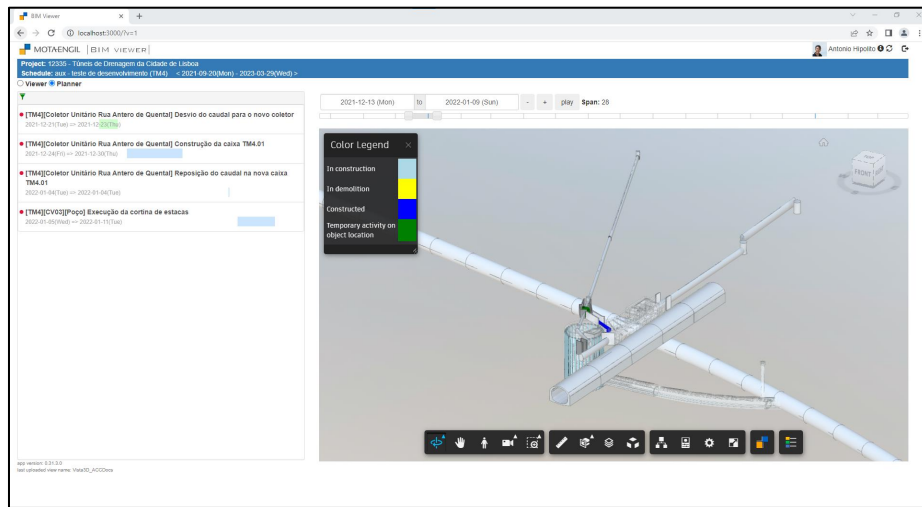
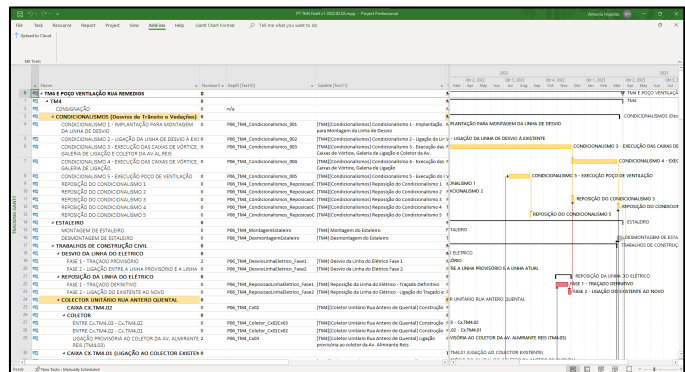
Final words



Key Learnings

- Realize the benefits of uploading your current data into the cloud
- Understand the benefits of displaying 4D data in 3D models: the time analysis is a key factor of success
- Know how Forge can help attain more productivity and reduce project risk by implementing custom high standard workflows
- How to manage model views in a personalized way and for collaborative purposes

a shared picture is worth a thousand words



Questions?

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