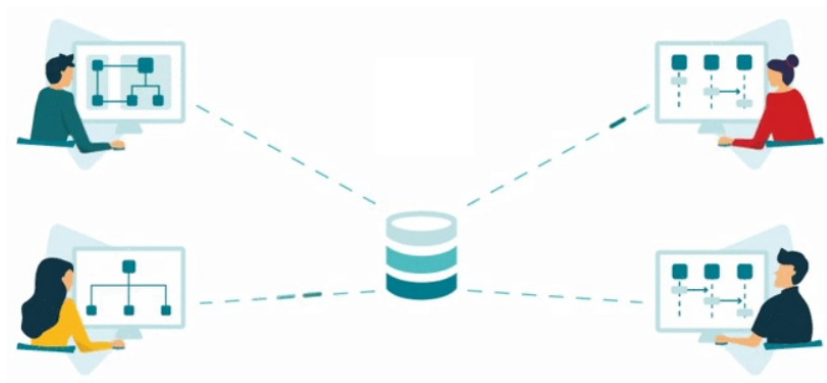# Working in a Multi-user Mode with Team for Capella

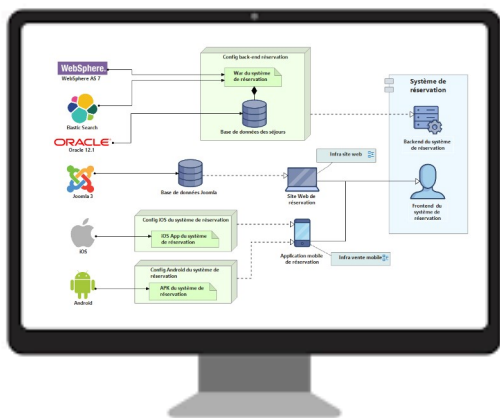**Maxime Porhel**

Product Lead @Obeo

OBEO

Obeo

Company Profile

Obeo | Visual Tools for Designing Innovations

We develop cutting-edge **modeling** software to empower teams **designing** or **transforming complex systems**

Sirius — Domain-Specific Modeling

Capella — Model-Based Systems Engineering

OBEO SmartEA — Continuous Enterprise Architecture

Canada
France
Japan
India
Brazil
Australia

ECLIPSE FOUNDATION
Strategic Member

We are a global reference player in the field of open-source

2500

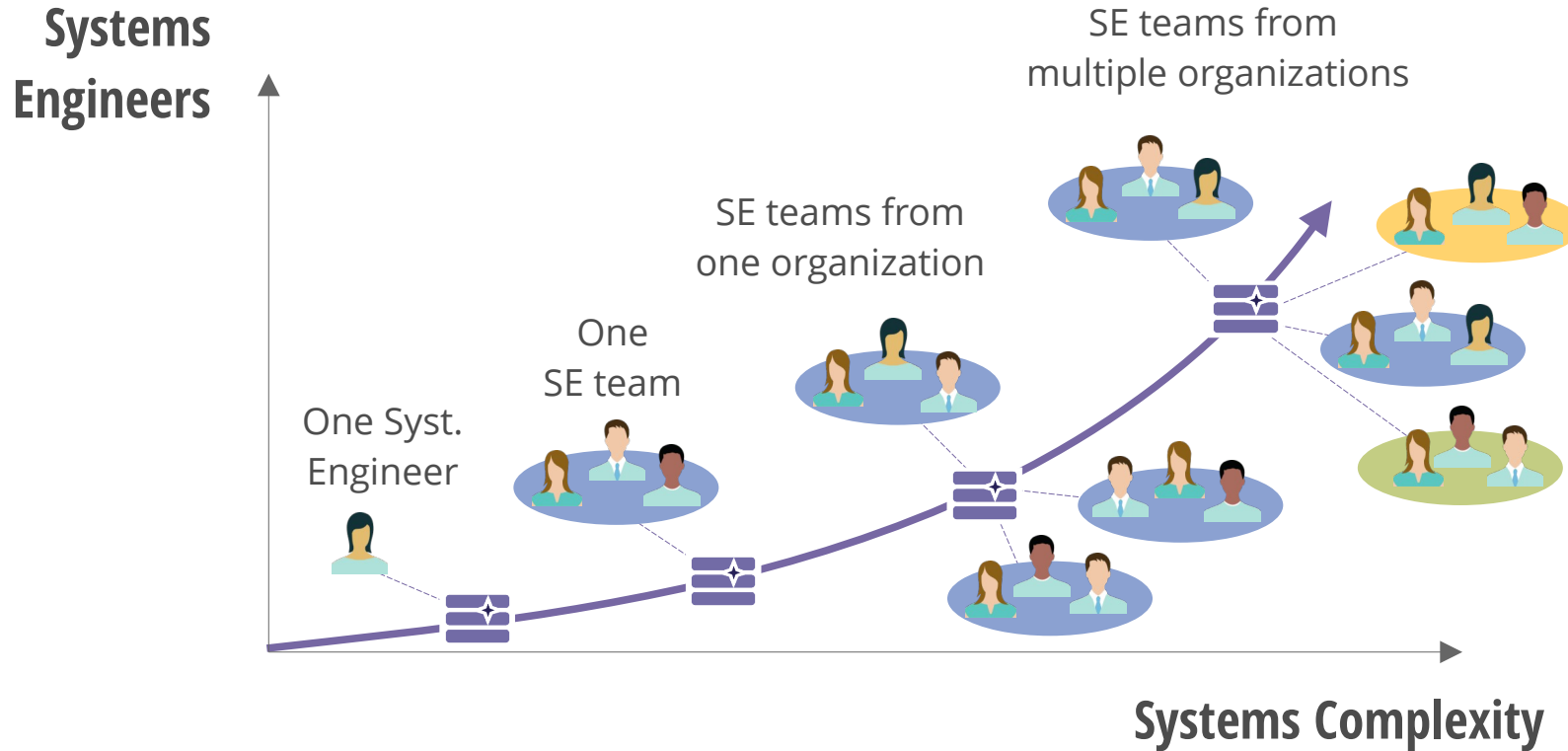Number of FTE days of open-source contributions in 2023

OBEO

Capella and Obeo | We're involved since the beginning

- **We developed Sirius**
  - The graphical framework on which Capella workbench is based
- **We managed the migration to open-source**
  - Seting-up the Eclipse development process
  - Applying the Eclipse best-practices
- **We contribute to the development of Capella**
  - 6 active committers to the source-code
  - Website management and events organization (Capella Days and webinars)
- **We provide Capella add-ons**
  - Document generation : *M2Doc*
  - Collaboration : *Team for Capella, Publication for Capella, Cloud for Capella, Ecodesign for Capella, …*

Tailoring Capella for your most-critical projects

OBEO

Mastering Large-Scale Systems Engineering Projects

Systems Engineers

SE teams from multiple organizations

SE teams from one organization

One SE team

One Syst. Engineer

Systems Complexity

OBEO

Context of Real-life Projects using Capella

THALES AUSTRALIA

OneSky project (Australian Civil and Military Air Traffic Management System)

*„Development of a complex System of Systems (SoS) composed of more than **10** systems, deployed at **12** sites, and providing more than **50** interfaces to legacy systems, (...) which led to the formalization of more than **6000** solution requirements".*

Laura Mallon & Peter Havanga – Capella Days 2021

ThermoFisher SCIENTIFIC

Transmission Electron Microscopes

*„Three product line families, composed of **400** modules with a total of over **1,000** active configurations, which are continuously upgraded and updated over a **20-year** lifespan by **400** engineers across **4** sites in Europe".*

Joost Dierkse - Capella Days 2022

esa European Space Agency

Galileo 2nd Generation

*„Core system composed of currently **28** satellites in orbit (**24** providing service worldwide), **2** ground centres, **15** remote sites worldwide complemented by a set of service facilities".*

**Catherine Morlet & Alberto Gonzalez Fernandez – Capella Days 2023**

OBEO

Capella
Collaboration with files

Capella | File oriented

- **Capella Project**

  - three main files:

    - .capella: Capella semantic model

      - components, functions, capabilities and all Capella concepts

    - .aird: graphical data

      - tables, diagrams, layout, …

    - .afm: metadata file for version and enabled Viewpoints consistency checks

  - Diagrams displayed

    - as children of their root object

    - in *Representations per category* subtree

  - Capella model tree displayed as child of the .aird file
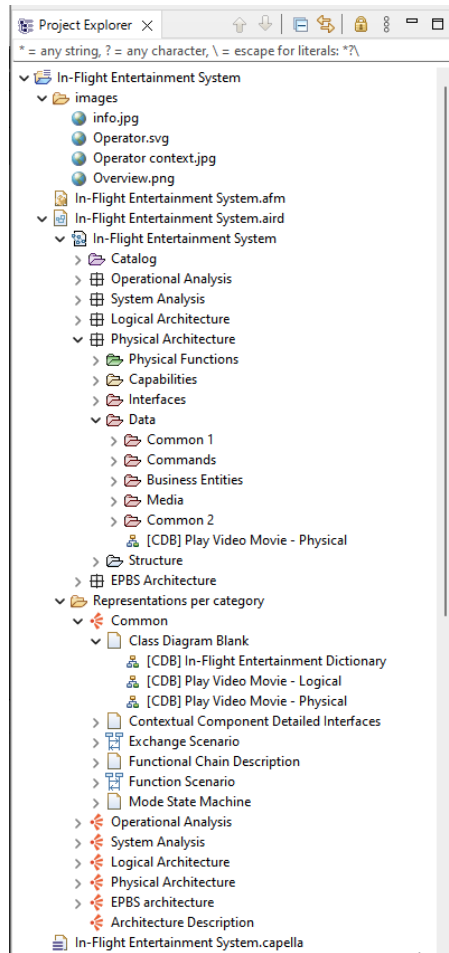
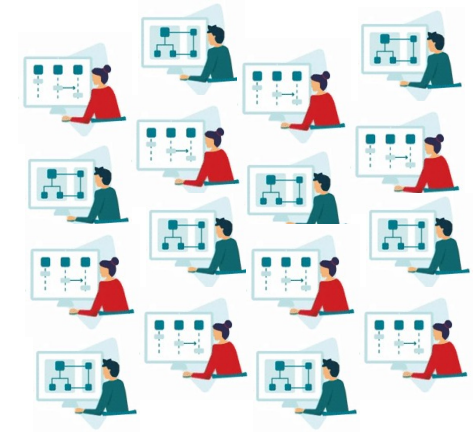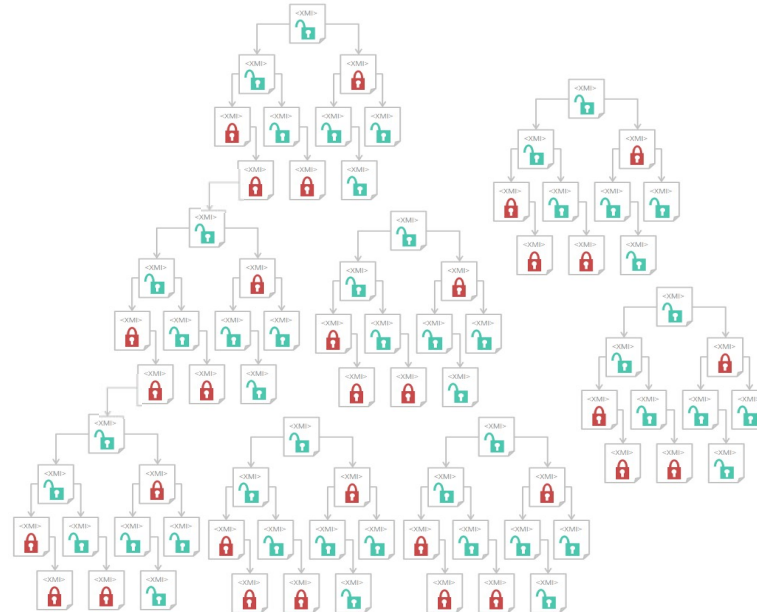# Capella | Collaboration with files: reconciliation using diff & merge

- **Classic collaboration problems with files**
  - Version identification with rename/suffixes
  - Split the model into fragment files (Fragment... menu, creating .capellafragment and .airdfragment files)
  - Manage the files with a Software Configuration Management tool
  - Manage locks and identify changes at a file level
  - Reconcile using diff & merge

OBEO
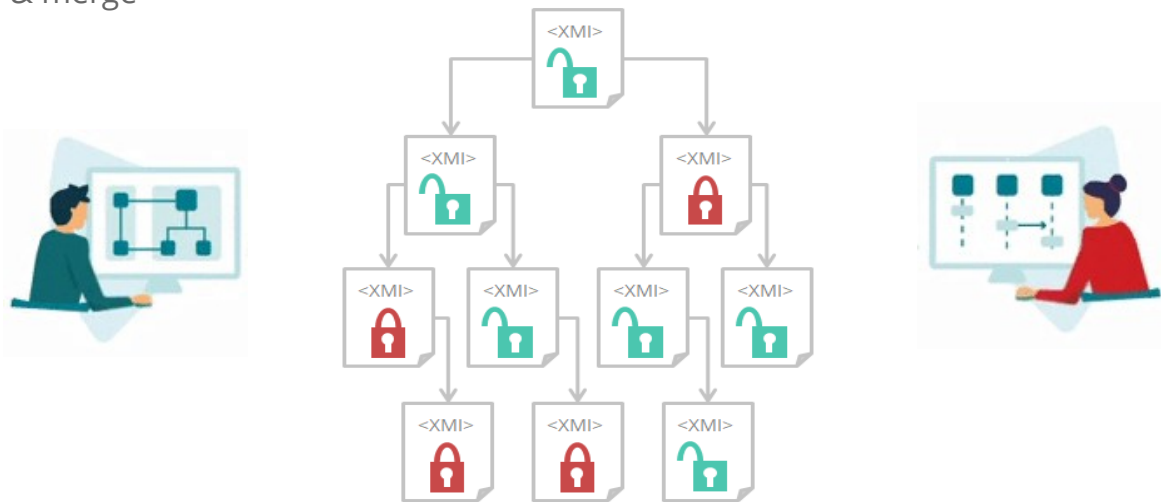
Capella | Collaboration with files: reconciliation using diff & merge

- **Limitation of the fragmentation approach**
  - Capella and Graphical models are directed graphes of objects with multiple inter-objects references
  - Changes can have impacts in several parts of the model
    - Numerous technical objects are not displayed to the end user
    - Elements like Traceability/Allocation links are not stored closed to their referenced elements

OBEO
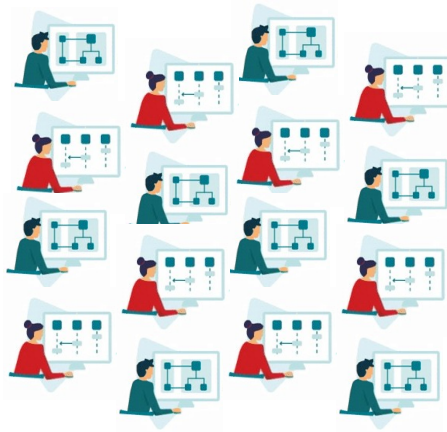
Capella | Collaboration with files: reconciliation using diff & merge

- Managing **conflicts** and **reconciliations with your team** using diff/merge tool is **time consuming** and **not error-proof**

Team for Capella
Live collaboration

Team for Capella
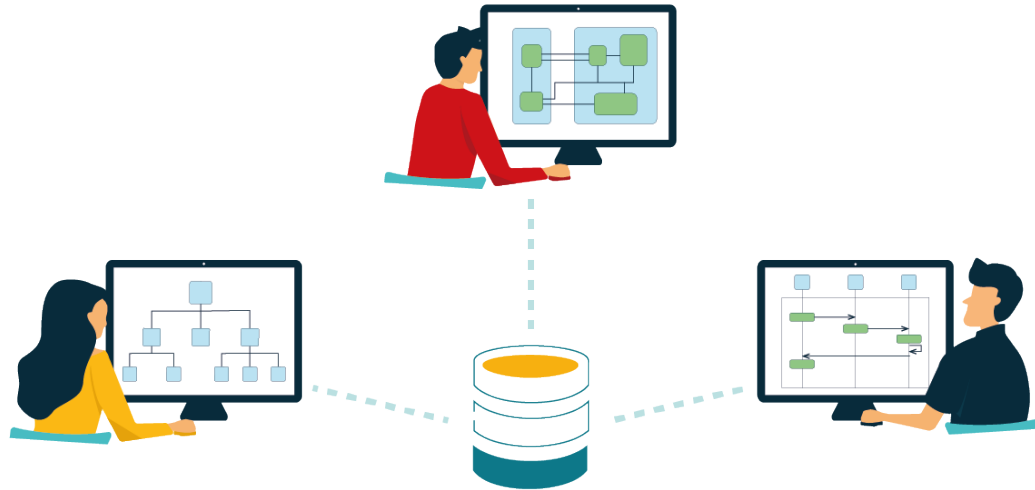
**A COLLABORATIVE CAPELLA ADD-ON
TO SIMULTANEOUSLY EDIT MODELS WITH YOUR TEAM**

OBEO

Team for Capella | Simultaneously edit models with your team members

Live Collaboration

Simultaneously work with
other users and dynamically
see their modifications.

Time Saving

Don't waste your time
resolving conflicts generated
by concurrent updates.

Standard Data Access

Your models and their
representations always
remain accessible.

OBEO
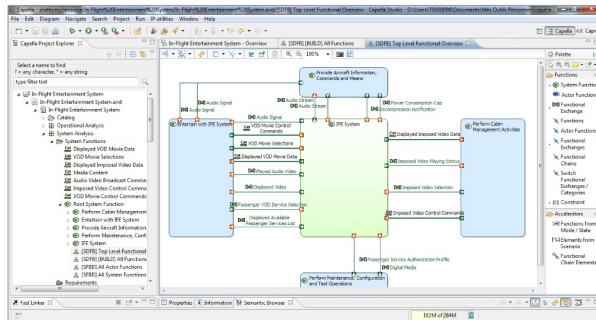
Components

Client

Capella Workbench + add-ons*

Team for Capella Client
(Capella add-on)
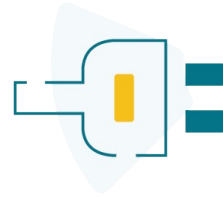
UI Additions:
- Export/Import/Connection wizards add-on)
- Lock/Unlock actions
- Commit History view

Core components extension
- Client/Server communication
- Capella model alternate serialization

Other add-ons
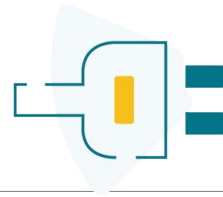
Main add-ons features
- UI extensions (diagrams, layers, actions,...)
- Capella model extensions

Team for Capella extension*
- Model extensions alternate serialization

*To run other add-ons in a collaborative mode, you must install their *Team for Capella* extension
(provided with most commercial and open-source add-ons)

OBEO

Secured Access | Models are protected against unauthorized access

Connections rely on
your **authentication** system
(via LDAP / OpenId Connect)

Exchanges between the clients
and the server can be **encrypted**
(via HTTPS & SSL)

Access rights to models
can be **configured**
for each user

OBEO

Team for Capella | UX similar to standard use of Capella, with additions

- **Capella Connected Project**

  - 2 files:
    - .team.aird: connection information
    - .team.afm: metadata file version/Viewpoints consistency checks

  - No more .capella nor images files: **data is stored on server**

  - Lazy loading of graphical data

  - Capella model tree still displayed as child of the .aird file

  - Authentication at project opening

Team for Capella | UX similar to standard use of Capella, with additions

- Connected decorator:

- Connected user indication: ✓ 🗎 In-Flight Entertainment System.team.aird [user1]

- Lock status information :
  - ▸ 📁 Media
  - ▸ 📁 Structure [user2]

- Contextual menus

🔒 Lock / Unlock...	▸	🔒 Lock element
📄 Show Commit History		🔒 Lock element and all its descendants
Fragment		🔒 Unlock element and all its descendants

- Remote image management

🖼 Manage Images from Remote Server

Manage images on the server

* = any string, ? = any character, \\ = escape for literals: *?\\

- ▾ 🔲 In-Flight Entertainment System
  - 📁 images

info.jpg   Opera...t.jpg   Operator.svg

Over....png

| Upload from workspace |
| Upload |
| New Folder |
| New Project |
| Rename |
| Delete |

○ List display   ● Grid display

[Close]

Project Explorer

* = any string, ? = any character, \\ = escape for literals: *?\\

- ▾ 📁 In-Flight Entertainment System.team
  - 🗎 In-Flight Entertainment System.team.afm
  - ▾ 🗎 In-Flight Entertainment System.team.aird [user1]
    - ▾ 🔲 In-Flight Entertainment System
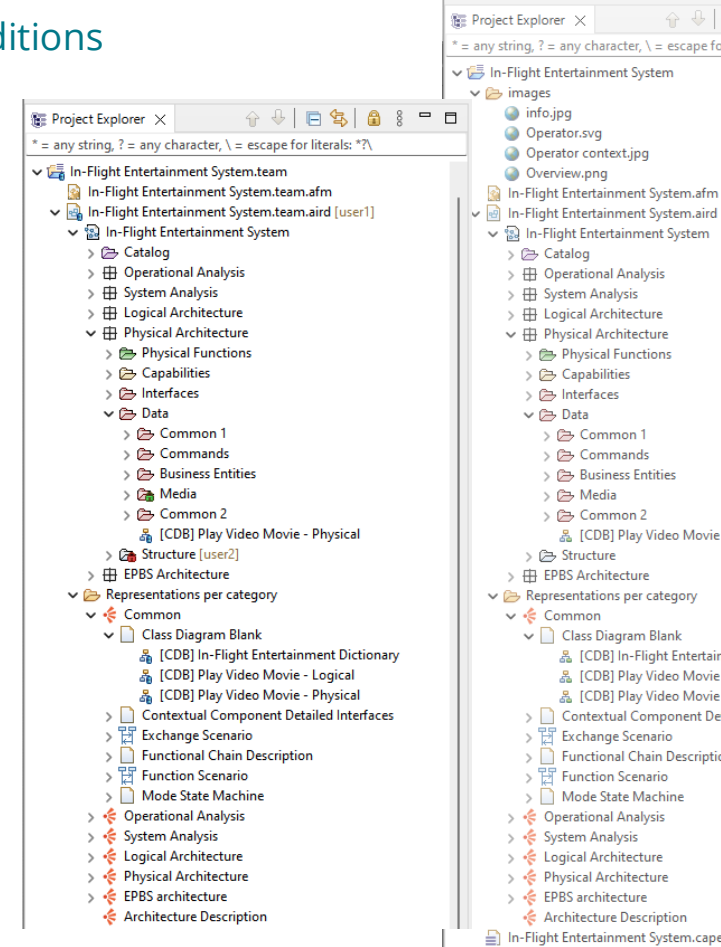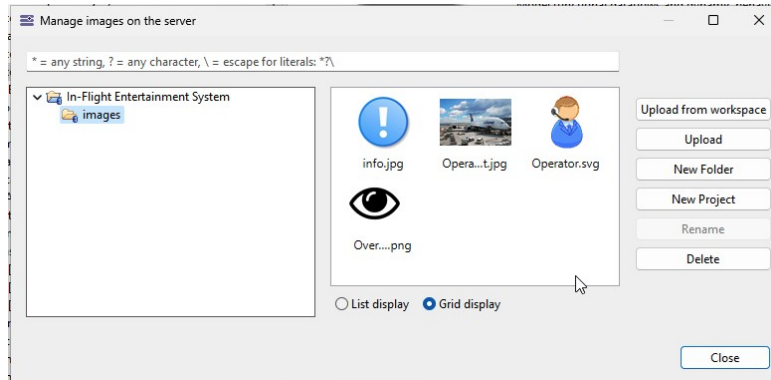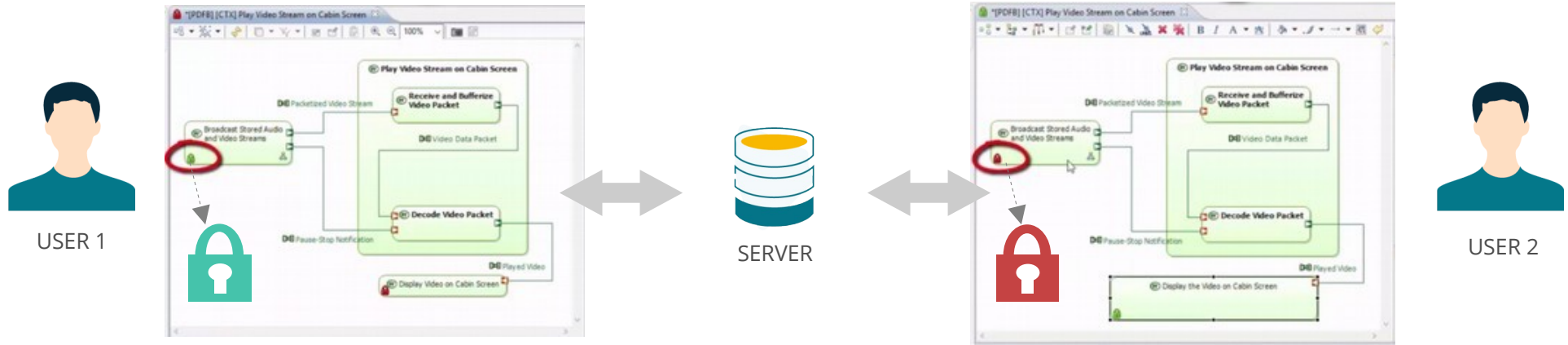   - ▸ 📁 Catalog
      - ▸ 🔲 Operational Analysis
      - ▸ 🔲 System Analysis
      - ▸ 🔲 Logical Architecture
      - ▾ 🔲 Physical Architecture
        - ▸ 📁 Physical Functions
        - ▸ 📁 Capabilities
        - ▸ 📁 Interfaces
        - ▾ 📁 Data
          - ▸ 📁 Common 1
          - ▸ 📁 Commands
          - ▸ 📁 Business Entities
          - ▸ 📁 Media
          - ▾ 📁 Common 2
            - 🖥 [CDB] Play Video Movie - Physical
        - ▸ 📁 Structure [user2]
      - ▸ 🔲 EPBS Architecture
  - ▾ 📁 Representations per category
    - ▾ ⟨ Common
      - ▾ 📄 Class Diagram Blank
        - 🖥 [CDB] In-Flight Entertainment Dictionary
        - 🖥 [CDB] Play Video Movie - Logical
        - 🖥 [CDB] Play Video Movie - Physical
      - ▸ 📄 Contextual Component Detailed Interfaces
      - ▸ 📄 Exchange Scenario
      - ▸ 📄 Functional Chain Description
      - ▸ 📄 Function Scenario
      - ▸ 📄 Mode State Machine
    - ▸ ⟨ Operational Analysis
    - ▸ ⟨ System Analysis
    - ▸ ⟨ Logical Architecture
    - ▸ ⟨ Physical Architecture
    - ▸ ⟨ EPBS architecture
    - ⟨ Architecture Description

Project Explorer

* = any string, ? = any character, \\ = escape fo

- ▾ 📁 In-Flight Entertainment System
  - ▾ 📁 images
    - ⬤ info.jpg
    - ⬤ Operator.svg
    - ⬤ Operator context.jpg
    - ⬤ Overview.png
  - 🗎 In-Flight Entertainment System.afm
  - ▾ 🗎 In-Flight Entertainment System.aird
    - ▾ 🔲 In-Flight Entertainment System
      - ▸ 📁 Catalog
      - ▸ 🔲 Operational Analysis
      - ▸ 🔲 System Analysis
      - ▸ 🔲 Logical Architecture
      - ▾ 🔲 Physical Architecture
        - ▸ 📁 Physical Functions
        - ▸ 📁 Capabilities
        - ▸ 📁 Interfaces
        - ▾ 📁 Data
          - ▸ 📁 Common 1
          - ▸ 📁 Commands
          - ▸ 📁 Business Entities
          - ▸ 📁 Media
          - ▾ 📁 Common 2
            - 🖥 [CDB] Play Video Movie
        - ▸ 📁 Structure
      - ▸ 🔲 EPBS Architecture
  - ▾ 📁 Representations per category
    - ▾ ⟨ Common
      - ▾ 📄 Class Diagram Blank
        - 🖥 [CDB] In-Flight Entertai
        - 🖥 [CDB] Play Video Movie
        - 🖥 [CDB] Play Video Movie
      - ▸ 📄 Contextual Component De
      - ▸ 📄 Exchange Scenario
      - ▸ 📄 Functional Chain Descriptio
      - ▸ 📄 Function Scenario
      - ▸ 📄 Mode State Machine
    - ▸ ⟨ Operational Analysis
    - ▸ ⟨ System Analysis
    - ▸ ⟨ Logical Architecture
    - ▸ ⟨ Physical Architecture
    - ▸ ⟨ EPBS architecture
    - ⟨ Architecture Description
  - 🗎 In-Flight Entertainment System.cape

OBEO

Demo

- Connect to a project
- Live Collaboration

OBEO

Team for Capella | Shared server and collaborative work mechanisms

USER 1

SERVER

USER 2

Fine-Grained Locking

Objects are automatically **locked***
when modified and **unlocked** when saved

+

Real-time changes

Other users automatically see locks
and access to **saved changes**

*Possibility to explicitly lock elements

OBEO

Keep track of changes | Commits History

Commits   Related elements

Filter

Time	User	Description
06/09/18 09:13:04	user1	Add LF in LF8
06/09/18 09:12:07	user1	change LF8 parent
06/09/18 09:10:54	user1	Add realize SF
06/09/18 09:06:43	user1	Create new SF
05/09/18 18:01:10	user1	rename LF8
05/09/18 17:59:12	user1	Create 3 LF
05/09/18 17:58:21	user1	

Add realize SF

- Root Logical Function
  - LogicalFunction 8_renamed
    - [Function Realization] to SystemFunction
  - new Diagram LFB
- Manage Passenger Services Lifecycle
  - Determine Service Availability
    - SystemFunction 1

File	Edit	Diagram	Navigate	Search	Project	Run	Wi

New	Alt+Shift+N >
Open Projects from File System...	
Recent Files	>
Close Editor	Ctrl+W
Close All Editors	Ctrl+Shift+W
Save	Ctrl+S
Save with Description	Ctrl+Alt+S
Save As...	
Save All	Ctrl+Shift+S
Revert	

Commit Description

Please provide a description:

OK   Ignore   Cancel

OBEO

Demo

- Save with description
- Commit history
    - Commit history changes / commit presentation
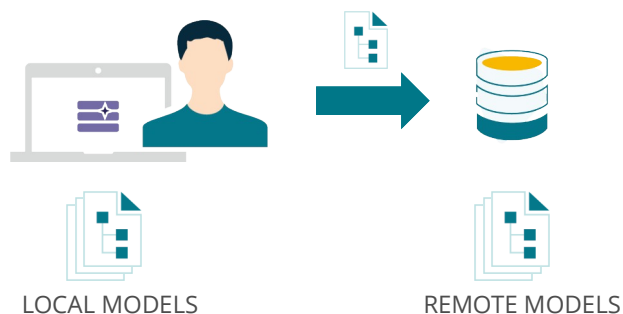   - Diff/merge
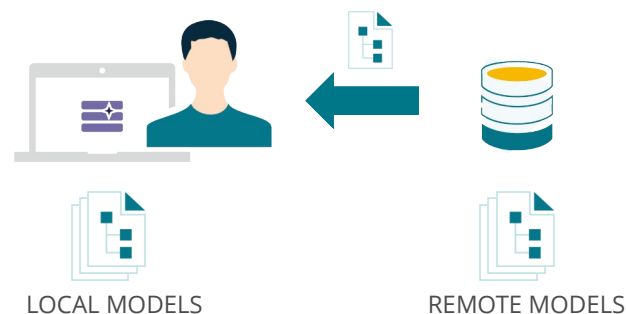- Export activity report

OBEO

Team for Capella
Workflows

Import & Export | Working locally or remotely

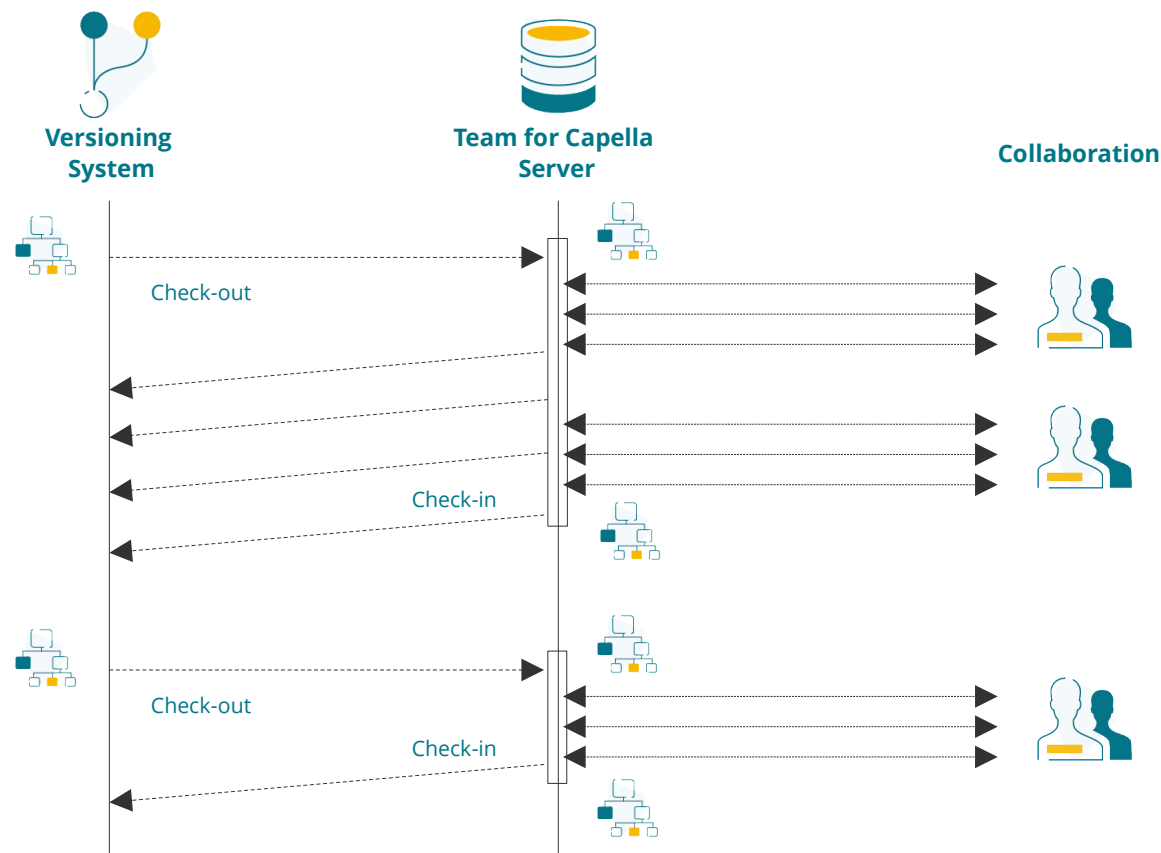## Share a local project

LOCAL MODELS   REMOTE MODELS

Upload a local project from your desktop to the server, to allow other users to simultaneously work on this project
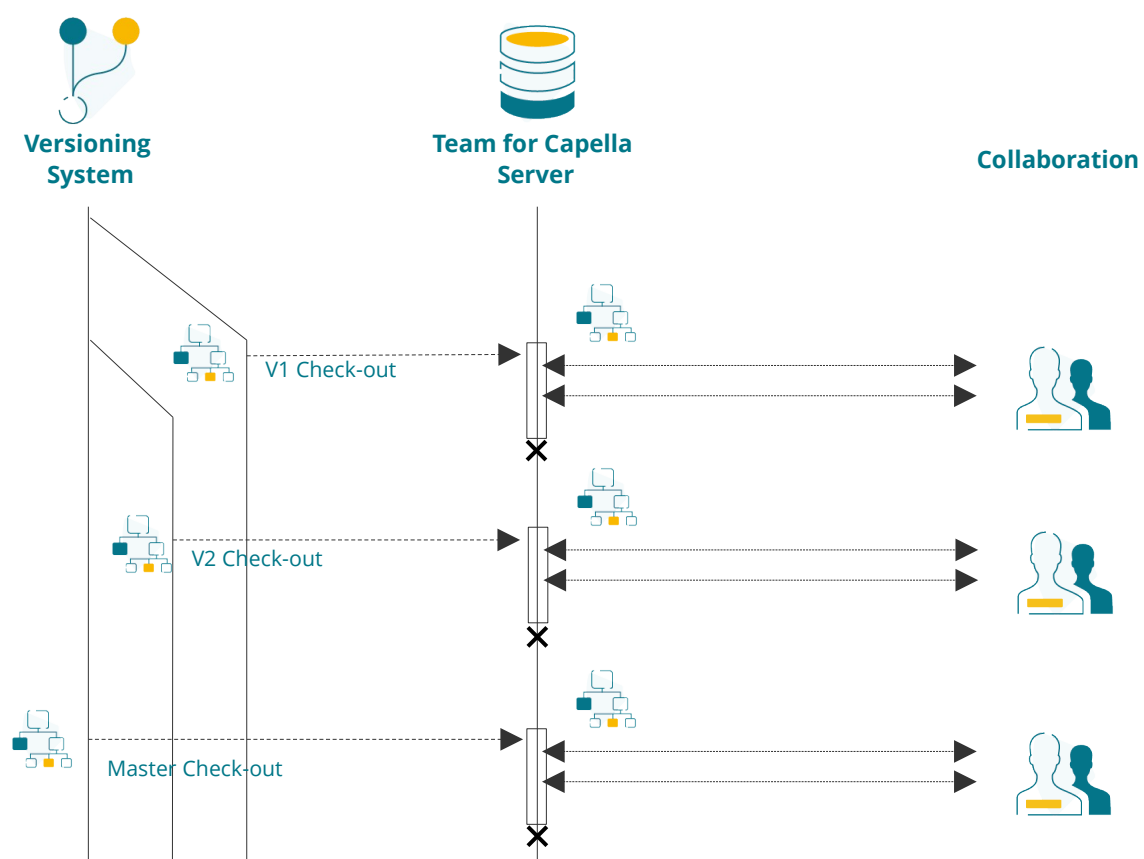
Retrieve a remote project

LOCAL MODELS   REMOTE MODELS

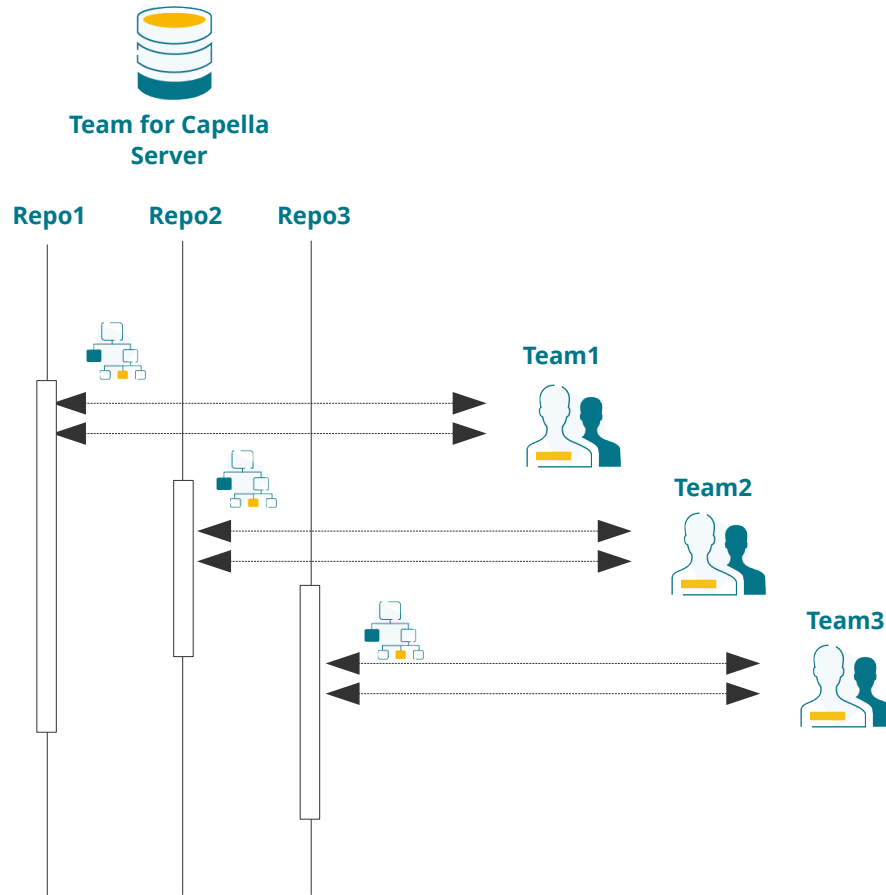**Download** a remote project from the server to your desktop, to allow you to locally work on a copy of the project

OBEO

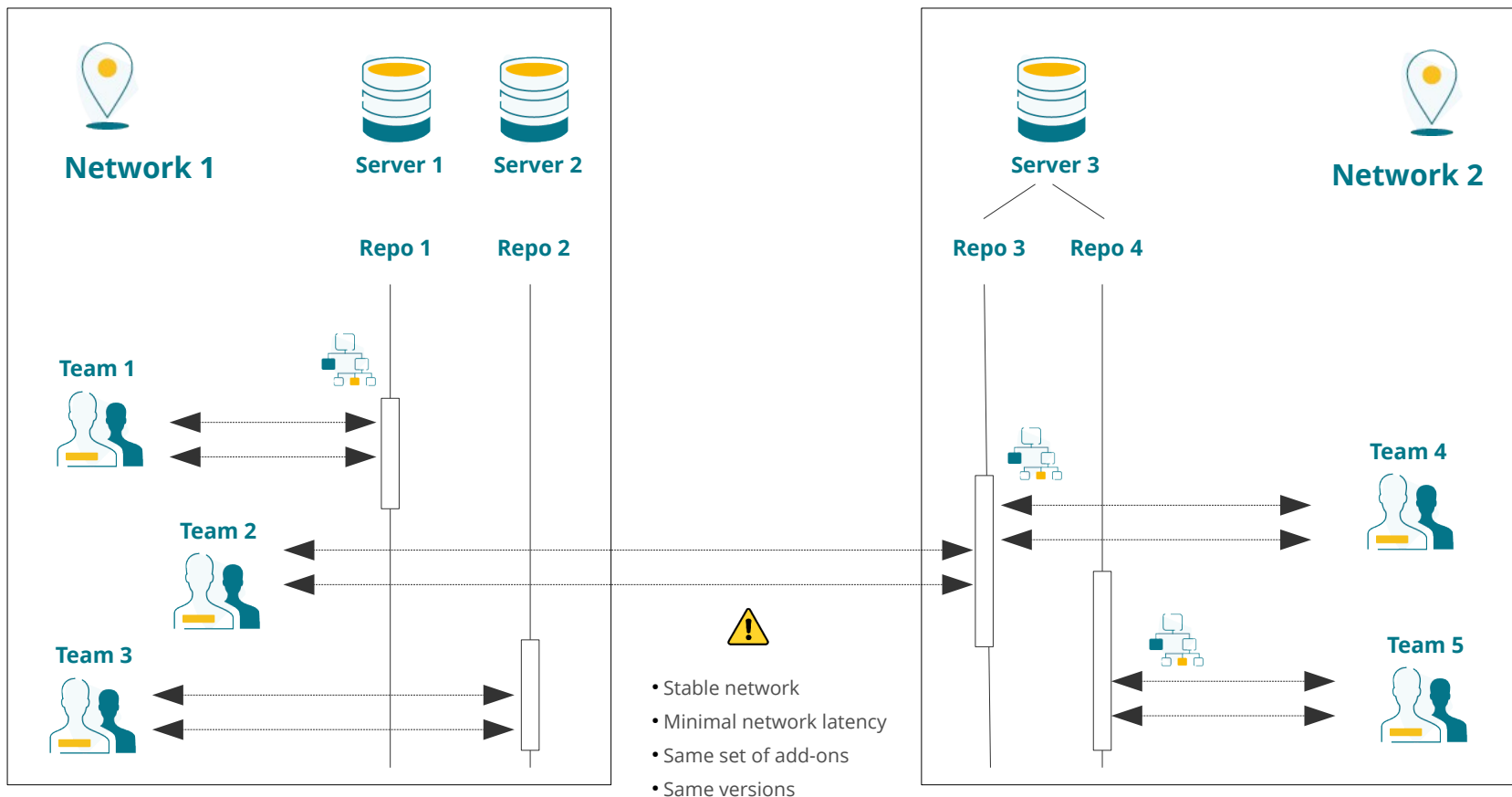# Version control | Easy to integrate into your IT (built-in Git support)

Versioning System

Team for Capella Server

Collaboration

Check-out

Check-in

Check-out

Check-in

OBEO

Version control | Easy to integrate into your IT (built-in Git support)

Versioning System

Team for Capella Server

Collaboration

V1 Check-out

V2 Check-out

Master Check-out

OBEO

Simultaneous teams | Using several projects on several repositories

Geo-distributed teams | Using several servers

Network 1

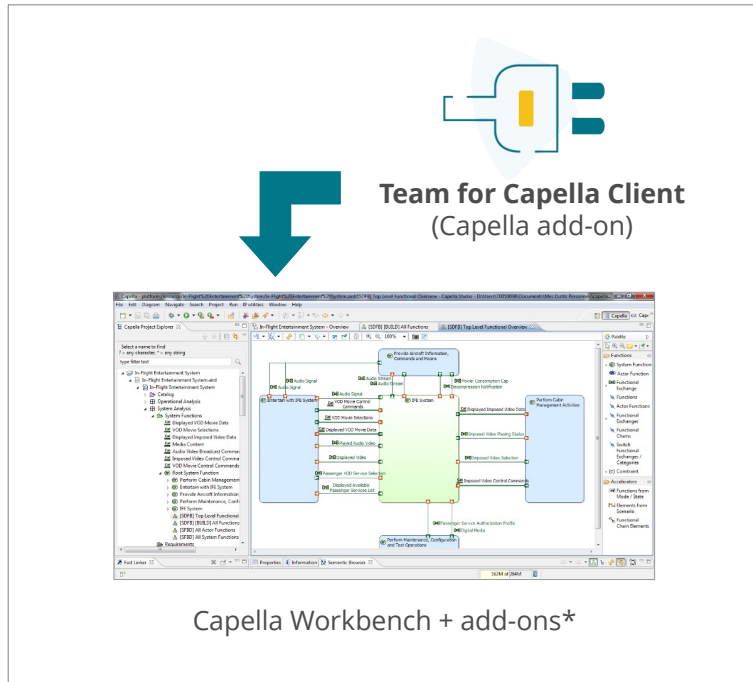Server 1 Server 2

Repo 1 Repo 2

Team 1

Team 2

Team 3

Server 3

Repo 3 Repo 4

Network 2

Team 4

Team 5

⚠️

• Stable network
• Minimal network latency
• Same set of add-ons
• Same versions

OBEO

Team for Capella
Deployments

Components

Client

Server

Team for Capella Client
(Capella add-on)

Capella Workbench + add-ons*

Scheduler
(administration & backups)

Server-side client
Capella
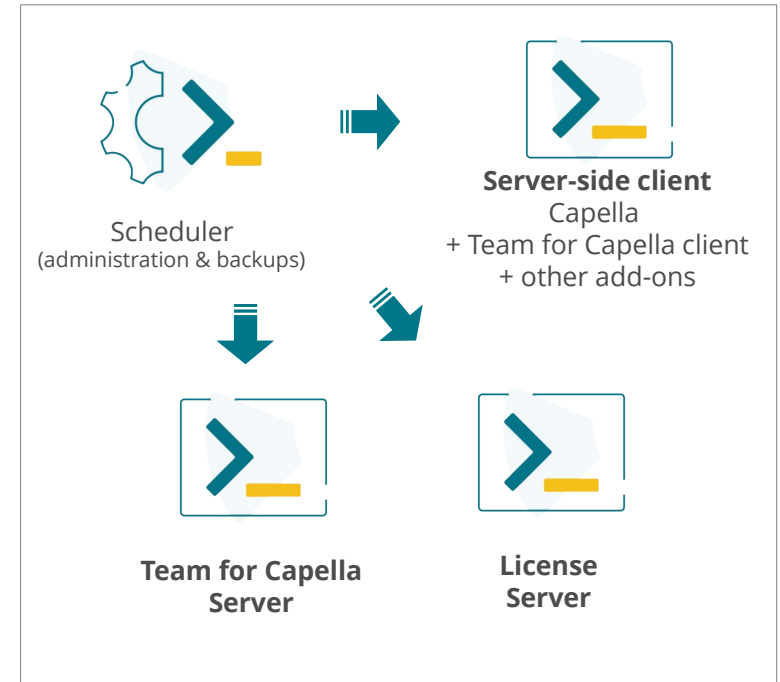+ Team for Capella client
+ other add-ons

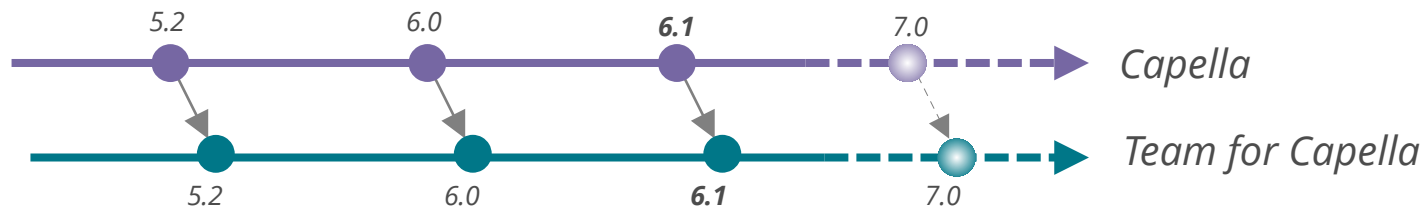**Team for Capella Server**

License Server

*To run other add-ons in a collaborative mode, you must install their *Team for Capella* extension
(provided with most commercial and open-source add-ons)

Release Cycle | Following closely Capella

- **Release cycles aligned with Capella**

5.2   6.0   **6.1**   7.0

Capella

Team for Capella

5.2   6.0   **6.1**   7.0

Team for Capella 7.0 (July 2024)

- Compatibility with Capella 7.0
- UX enhancements
- Packaging, installation and deployment enhancements
- Server, Importer and Exporter enhancements

obeosoft.com/team-for-capella-releases

OBEO

Deployment Modes

On-Premise

Deployed on
your own infrastructure

- ✔ *Rely on your IT*
- ✔ *Possible isolated system*
- ✔ *Possible customized deployment*
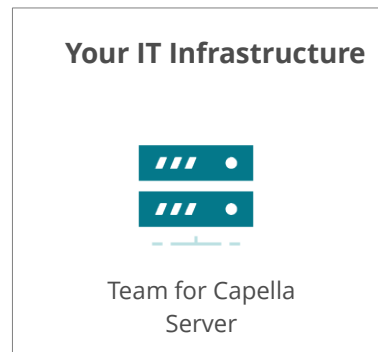
Cloud

Installed by Obeo on
a Cloud infrastructure

- ✔ *IT and deployment managed by Obeo*
- ✔ *Ready-to-use and uniform environment*
- ✔ *Easy collaboration with partners
  and external entities*

OBEO

On-Premise | Two deployment modes: **Local** or **Remote** client
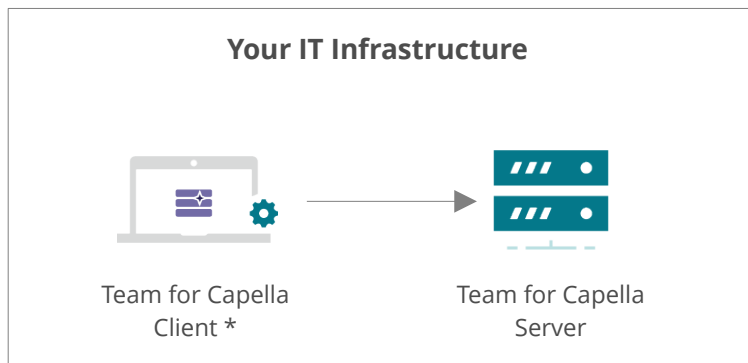
LOCAL CLIENT

Team for Capella
Client *

Your IT Infrastructure

Team for Capella
Server

☑ Easier to deploy

REMOTE CLIENT

Remote Desktop

Your IT Infrastructure

Team for Capella
Client *

Team for Capella
Server

☑ Better performances

☑ Easier management

OBEO

* Team for Capella Client = *Capella* workbench + *Team for Capella* add-on + other add-ons

Cloud | Deployed for you on a dedicated Cloud infrastructure managed by Obeo

Cloud for Capella - Team

Cloud Infrastructure

aws *managed by Obeo*

Team for Capella
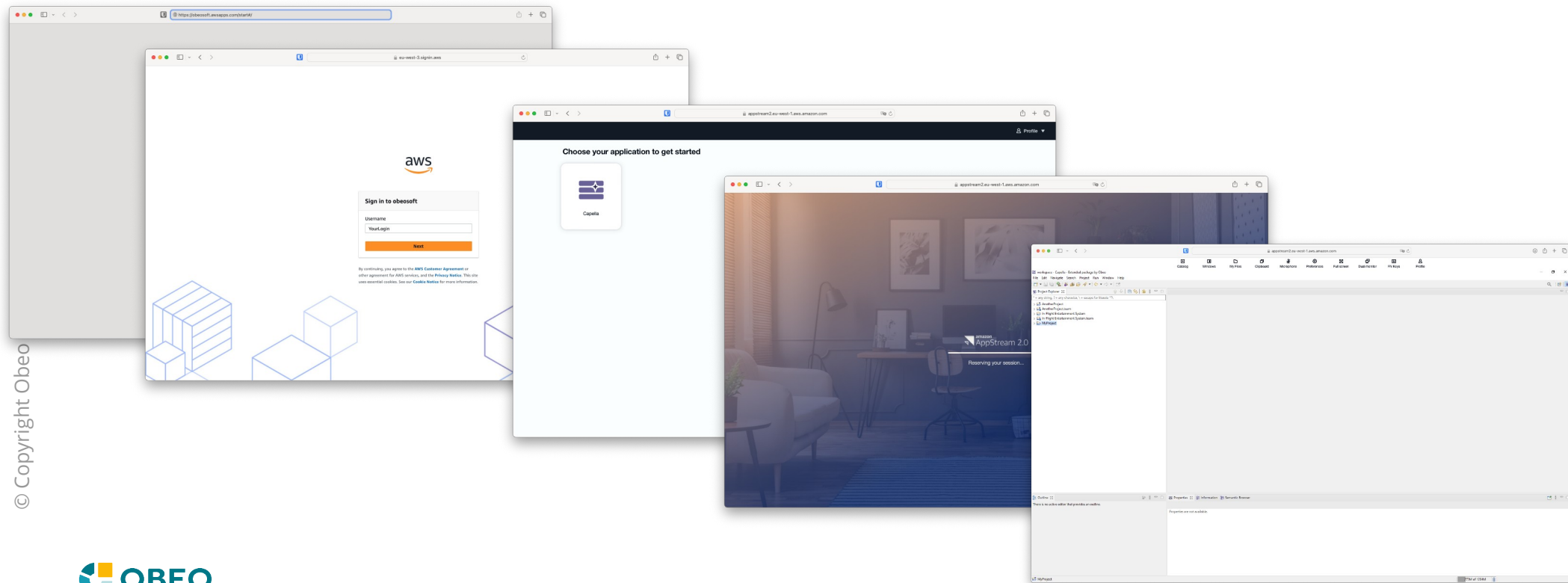Client
+
Pre-installed Add-ons*

Team for Capella
Server

Web Client
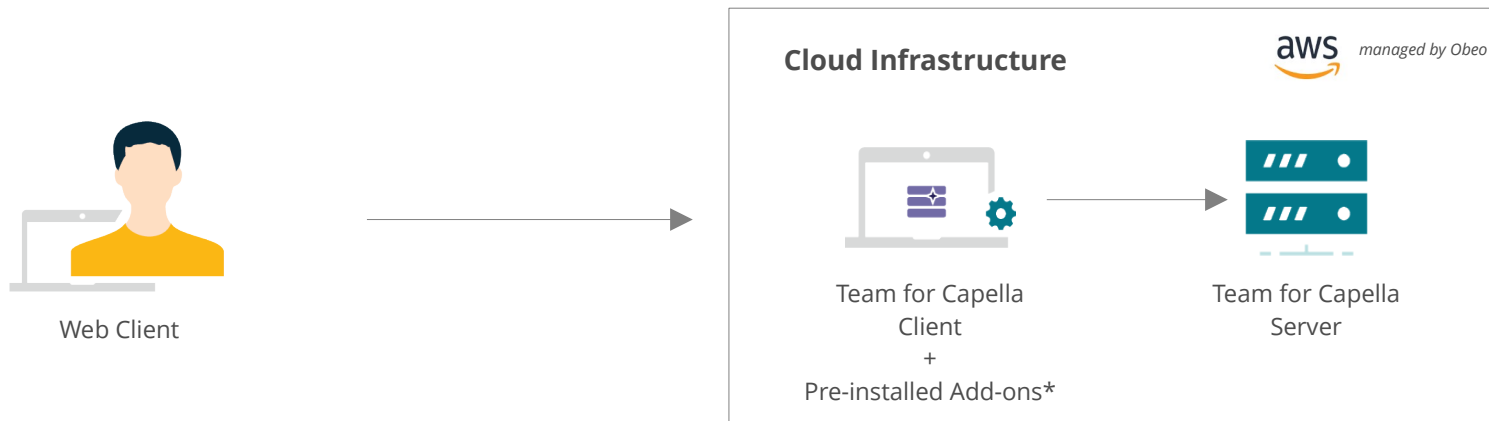
✔ Quick start on a ready-to-use environment
✔ Team and partners all on the same version
✔ Automatic and constant backups
✔ Scalability plan to handle increased usages

OBEO

* M2Doc, Requirements, PVMT, Filtering, System to Subsystem, XHTML Generation

Cloud for Capella | Demo

- **Access Capella in your web brower**

- **URL provided by Obeo**

OBEO

C4C Team | Included services

- **Installation**
  - Capella on virtual machines hosted in a cloud infrastructure
  - Selected additional add-ons
  - Team client add-on in Capella and a default server connection configuration.
  - Team server (including the Scheduler and Git) with a default repository on an additional virtual machine.
- **Administration**
  - Virtual machine hosting the Team clients : users account creation, recovery, ...
  - Virtual machine hosting the Team server.
- **Assistance to upgrade**
  - Capella, selected additonal add-ons, Team client and server.
- **Maintenance and support***
  - Assistance related to the cloud infrastructure
  - Support on the integration of installed add-ons
  - Support on Team and M2Doc features.

* Does not cover the whole Capella environment/features (can be adressed through a specific service)

Cloud for Capella | A few numbers

- **Different kind of usage observed in current deployments**

  - Deployment over several years
  - PoC deployment to test the collaboration and different workflow before adoption and on premise deployment

- Single repository,
- 2 users working on a few shared projects
- Users also on their own local projects
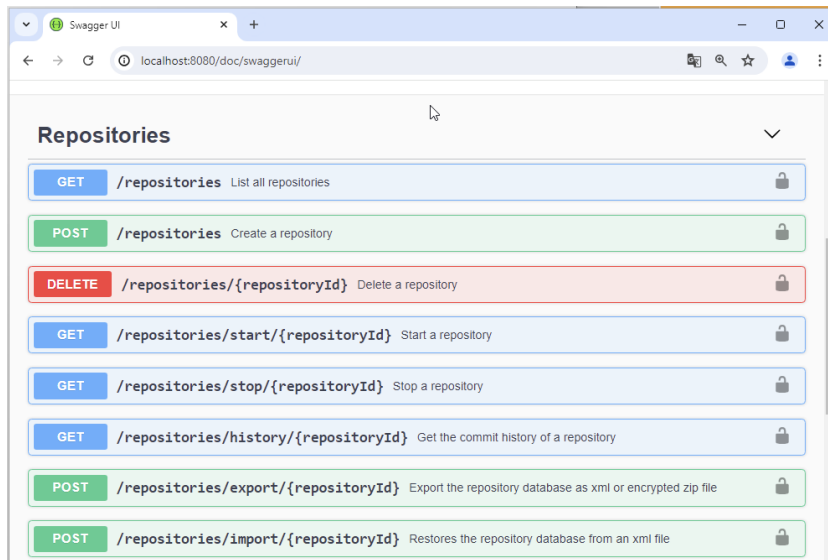 not yet or no more requiring collaboration

- Single repository,
- 15 System Engineers working at the same time on the shared model
- Big model (~700 diagrams)
- A few file based variants, slightly and carefully modified

- 1~5 repositories,
- 2-5 projects per repository,
- 2~5 registered users per repository
- Users from different companies

- ~20 dynamic repositories (created/managed by customer)
- 1 project per repository,
- 2-3 System Engineers working on each repository
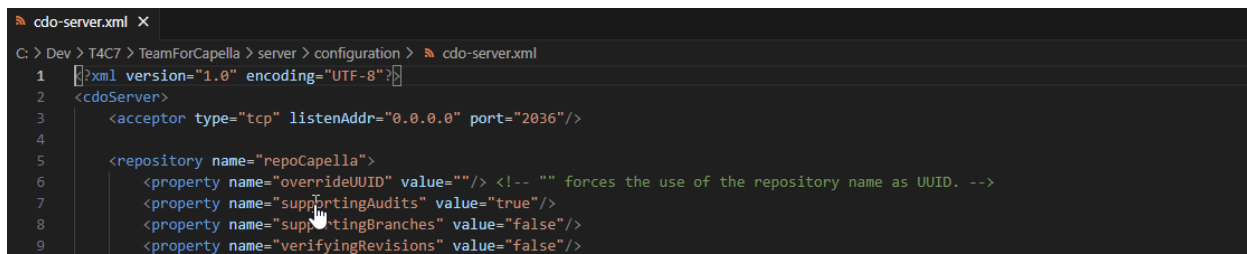
OBEO

Repositories management | Static or Dynamic repositories

Web Browser for dynamic repositories

Administrator
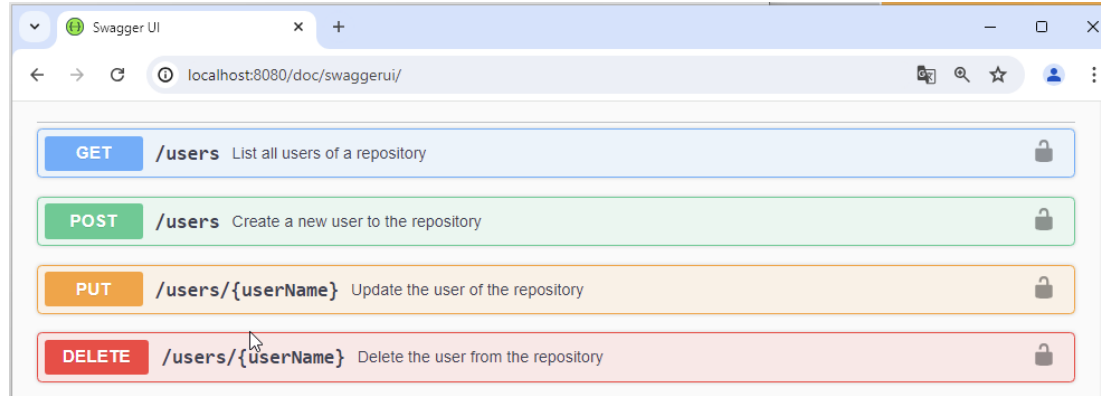
Configuration files + Server restart for static repositories
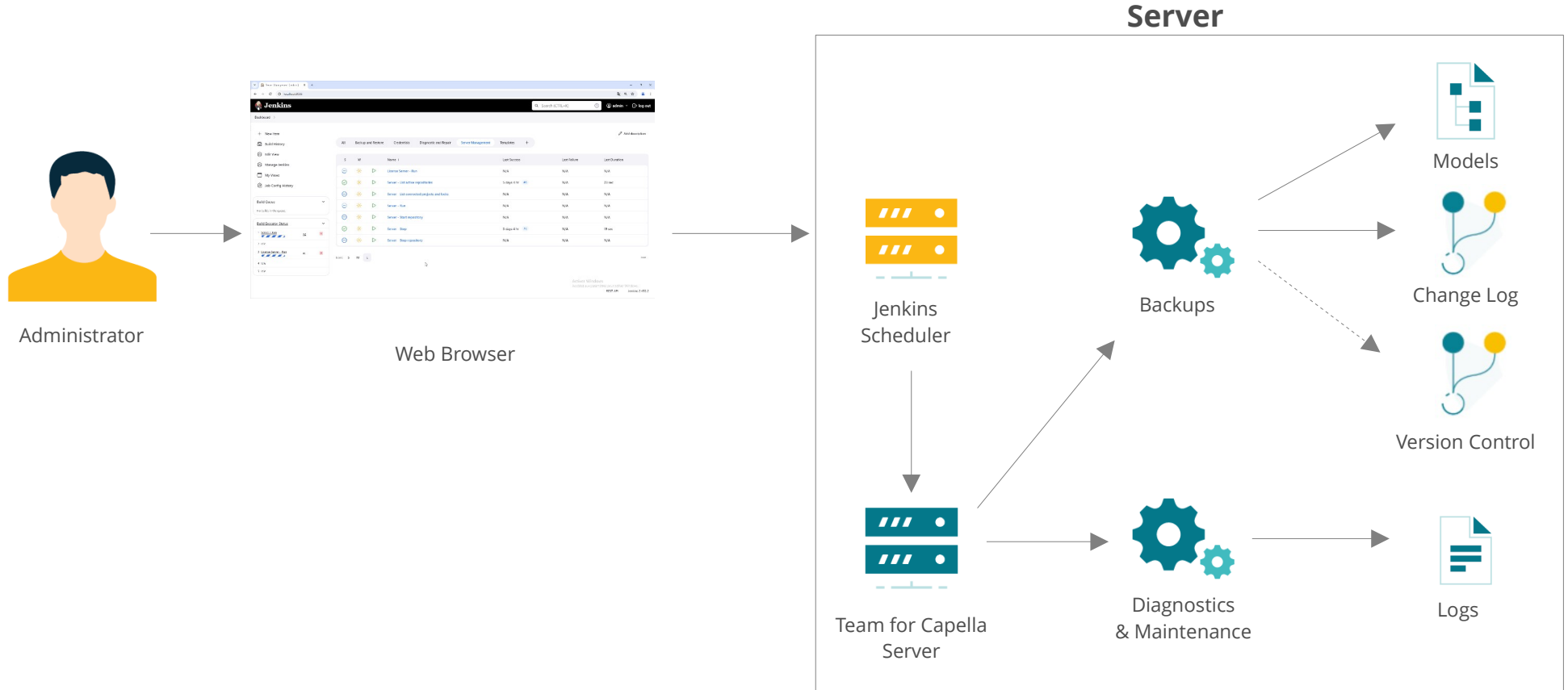
User management | Per repository

Web Browser for both static and dynamic repositories *

* starting with 7.0 for static repositories, depends on the repository configuration

Automate regular tasks | Backups, maintenance, monitoring, ...

Automate regular tasks | Jenkins scheduler

Backup and Restore

S	W		Name ↓	Last Success
⊙	☀	▷	Database - Backup	N/A
⊙	☀	▷	Database - Restore	N/A
⊙	☀	▷	Projects - Delete	N/A
⊙	☀	▷	Projects - Export	N/A
⊙	☀	▷	Projects - Import - repoCapella	N/A
⊙	☀	▷	Repository - Commit history	N/A
⊙	☀	▷	Repository - Import projects from history	N/A
⊙	☀	▷	Repository - List projects	N/A
⊘	☀		User profile - Import model	N/A

Credentials

S	W		Name ↓	Last Success
⊙	☀	▷	Server - Rest Admin - Manage User Tokens	N/A
⊙	☀	▷	Server - Rest Admin - Manage Users	N/A
⊙	☀	▷	Tools - Clear credentials	N/A
⊙	☀	▷	Tools - Store credentials	N/A

Diagnostic and Repair

S	W		Name ↓	Last Success
⊙	☀	▷	Repository - Diagnostic	N/A
⊙	☀	▷	Repository - Maintenance	N/A

Server Management

S	W		Name ↓	
⊙	☀	▷	License Server - Run	
⊘	☀	▷	Server - List active repositories	
⊙	☀	▷	Server - List connected projects and locks	
⊙	☀	▷	Server - Run	
⊙	☀	▷	Server - Start repository	
⊘	☀	▷	Server - Stop	
⊙	☀	▷	Server - Stop repository	

Templates

S	W		Name ↓	
⊘	☀		Projects - Automatic Import and push to Git - Template	
⊘	☀		Projects - Manual Import and push to Git - Template	

OBEO

Automate regular tasks | Jenkins scheduler

- **Default provided jobs can be modified, extended to match your policy**
  - Backup frequency,
  - Backup result export to your SCM tools (Git/GitLab)

- **Team for Capella import jobs can also be combined with other steps**
  - Capella provides its own command line tools
    - Refresh all representations
    - Model validation
    - Export representations as Images
  - Extended by several add-ons
    - XHTML generation
    - Python for Capella
    - M2Doc
    - …

OBEO

References | They use Team for Capella

Team for Capella | Wrap-up

Live Collaboration

Simultaneously work with
other users and dynamically
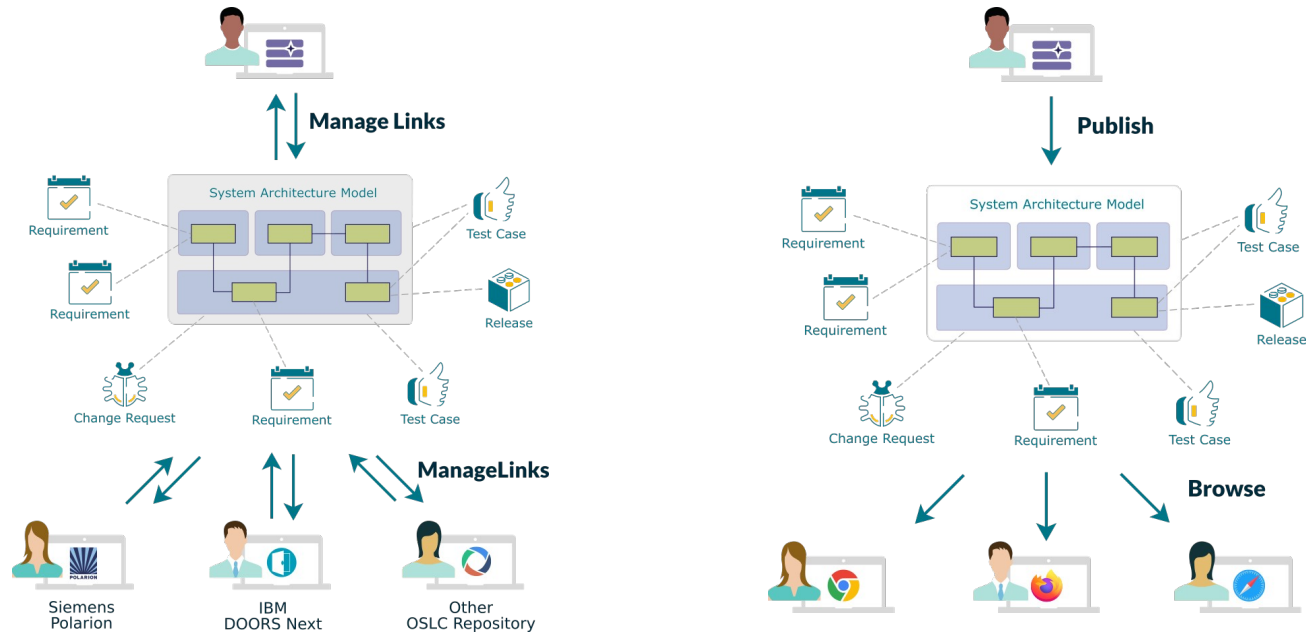see their modifications.

Time Saving

Don't waste your time
resolving conflicts generated
by concurrent updates.

Standard Data Access

Your models and their
representations always
remain accessible.

OBEO

Publication for Capella | Manage Traceability and Publish Models

Integrated sources of truth

Author system design and work items with dedicated, but connected, tools and make this data available across different engineering disciplines.

OBEO