5/5



Mélanie BATS CTO @ Obeo melanie.bats@obeosoft.com

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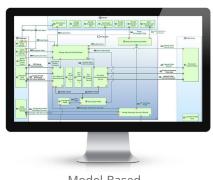




Open-sourceSysML V2 Modeling Tool

Obeo | Introduction

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



Domain-Specific Modeling



Model-Based Systems Engineering



Enterprise Architecture







2500

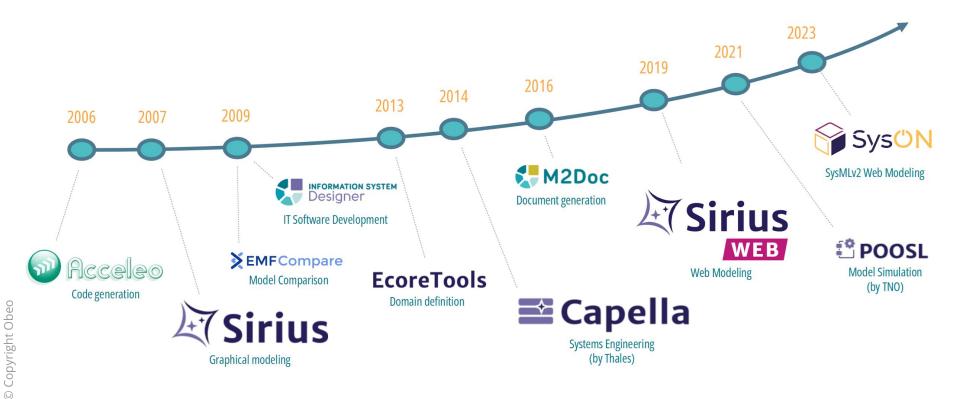
We are a global reference player in the field of open-source

Number of FTE days of open-source contributions in 2023





Obeo | Open source involvement





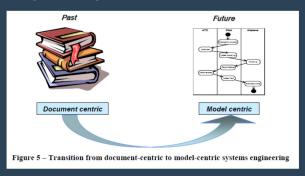


MBSE | Background and Ambition

"Model-based systems engineering (MBSE) is the formalized application of modeling to support system requirements, design, analysis, verification and validation activities beginning in the conceptual design phase and continuing throughout development and later life cycle phases."

Vision 2020 (INCOSE-TP-2004-004-02, Sep 2007)

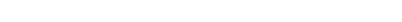
MBSE is expected to **replace** the **document-centric** approach that has been practiced by systems engineers in the past and to influence the future practice of systems engineering by being **fully integrated into the definition of systems engineering processes**, as illustrated in Figure 5.



SysUN

Vision 2020 (INCOSE-TP-2004-004-02, Sep 2007)

OBEO





MBSE adoption challenges | with SysML v1 ecosystem

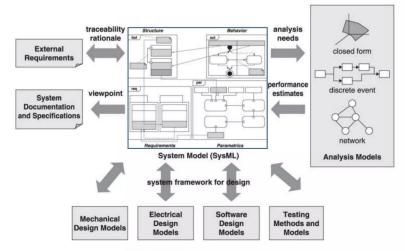
- Usability and Adoption Barriers
- Interoperability and Integration of tools
- Extensibility and expressiveness





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- Expressiveness and consistency of the language
- API for interoperability with other engineering models and tools
- Extensibility to support domain specific applications







SysML V2 | Our vision

SysML v2 is a significant **improvement** to SysML v1 and a very promising piece of technology:

- Better Interoperability
- Enabler for formal verification and Al interactions
- Foundation for building libraries of domain specific ontologies
- Foundation for supporting MBSE processes



If we truly want the **Digital Engineering** revolution to happen, viewing or authoring a SysML v2 model should be easily available to every Systems Engineers and beyond.



Obeo aims to pave the way for the SE industry by providing an open-source foundational authoring tool.









- SysML v2 has the potential to be a game changer
- What now?









Changing the game | with Open Source

Prevent Vendor Lock-in

Accessible data

Accessible tools

Competitive prices

Web/Modern experience

Libraries ecosystem enablement

For SysML v2 to succeed, foundational tool capabilities like SysML v2 model viewing, authoring, storing, sharing should be **easily accessible to the** large organizations, suppliers, SME, startups, vendors, universities, students...

Open-source is key to the success of SysML v2. We need **enterprise grade** and **low cost** tools, accessible to the entire industry to **embrace the Digital Engineering revolution**, enabling to build on top of this foundation a community of tools, ontologies, model assets, practices...



Open Source | Benefits



Industrial **benefits** from a **robust and high-quality** open-source SysML v2 modelling environment:

- **Easier access** to education, academia, and experimentation
- Mitigating vendor lock-in / simplify the sharing of data and modelling environments
- Enhanced sustainability and **long term availability** of the tool
- Enabling industrial collaboration, investments sharing and improved product roadmap influence
- Lowering the price expectations for foundational capabilities
- Encouraging investments and competition on higher value capabilities
- Technological enabler for third-party addons fostering a rich ecosystem





















SysML v2 Pilot Implementation







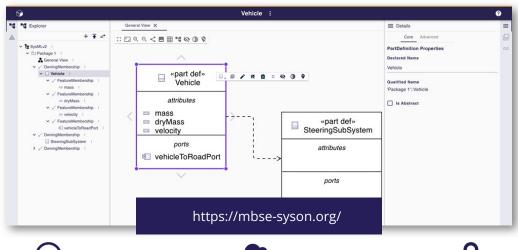






SysON | Open source SysML v2 Modeling Tool

SysML v2 web-based authoring tool available as open-source





Standard Compliant

SysON aims at providing an implementation of the OMG's specification SysML v2: language concepts, REST API, and interoperability textual format



Web-Based

Graphical, form-based and tabular structured editors that can be used from a web browser, without any specific installation on user's desktop



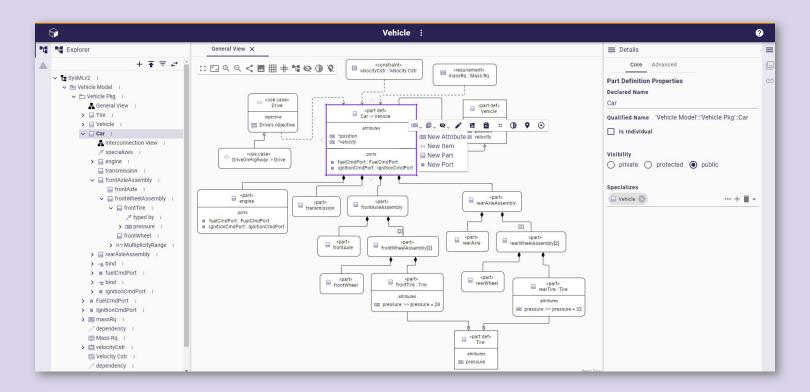
Open-Source

Hosted in the Eclipse community, SysON aims to catalyze industrial collaboration, accelerate innovation, and foster the adoption of SysMLv2





SysON | Demo

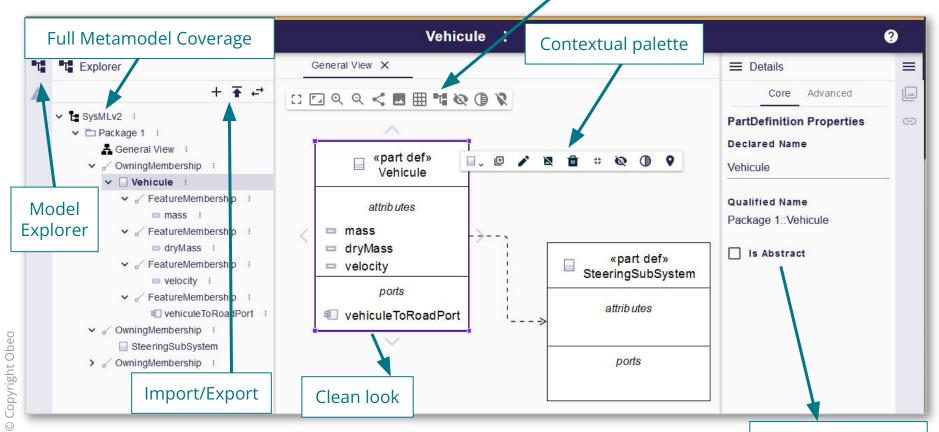






SysON | Web Based User Experience

Auto-Layout, Hide, Fade , Zoom, SVG...

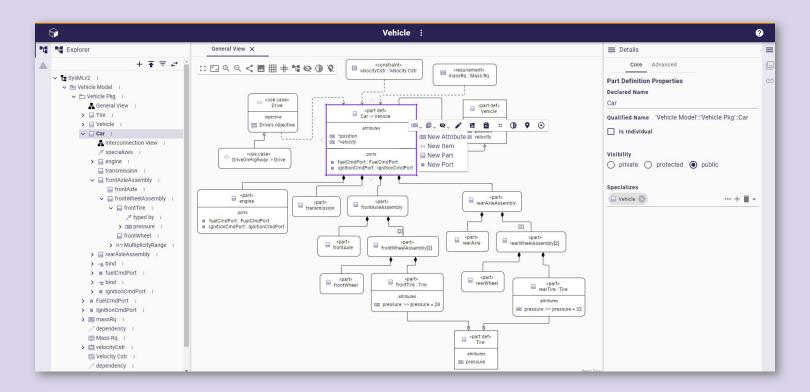




Rich Property View

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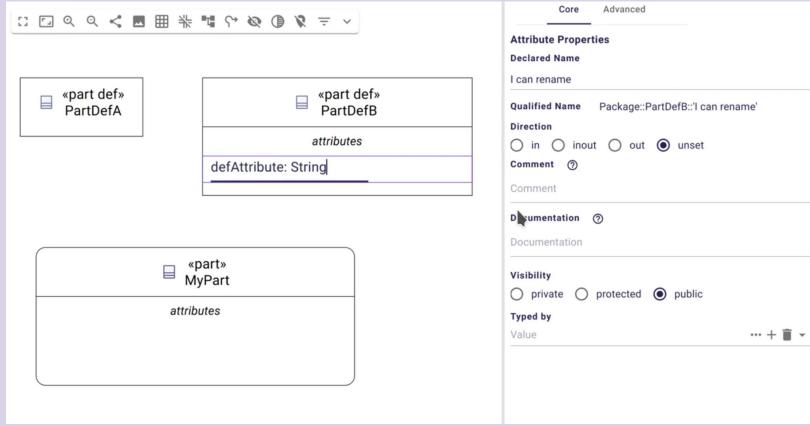
One click Onboarding | Eased Adoption and User Experience







Tailored Text editing | Smart Label Edit







Tailored Text editing | Import / Export Sysml v2 Syntax

```
Enter or paste SysMLv2 text to create new objects in the model
      attribute def OnOffCmd;
      attribute def Light;
      port def OnOffCmdPort {
          out onOffCmd: OnOffCmd;
      port def LightPort {
          out light: Light;
      part context {
          part user {
              port onOffCmdPort: OnOffCmdPort;
              perform illuminateRegion.sendOnOffCmd {
                  out onOffCmd = onOffCmdPort.onOffCmd;
          interface userToFlashlight connect user.onOffCmdPort to flashlight.onOffCmdPort {
              ref flow references illuminateRegion.onOffCmdFlow
                  from source.onOffCmd to target.onOffCmd;
              port onOffCmdPort: ~OnOffCmdPort:
              perform illuminateRegion.produceDirectedLight {
                  in onOffCmd = onOffCmdPort.onOffCmd;
                  out light = lightPort.light;
              port lightPort: LightPort;
          part reflectingSource {
              nort lightDort: -. LightDort
                                                                                                           ← CREATE OBJECTS
```







SysON Status and Roadmap

SysON | Project involvement

Project Lead





(French Atomic Energy Authority)

Interested Parties

BlueKei Solutions Fraunhofer Fokus IncQuery Labs Keio University Modelware Solutions NASA Jet Propulsion Laboratory Project Performance International (PPI) Sensmetry The University of Arizona Virginia Tech





SysON | Features overview

Project Management	
Projects Browser	
Project Editor	
SysML V2 Views	
General View	(Partial)
Interconnection View	(Partial)
Action Flow View	(Partial)
State Transition View	(Partial)
Sequence View	8
Geometry, Grid	8
Browser View	
KerML/SysML v2 Libraries	

Diagram Management		
Contextual Palette, Direct Edit, Multi-Selection, Reconnect, Hide/Fade, Collapse/Expand, Drag&Drop, Compartments, Custom Shapes, Assisted Layout (Auto-Layout, Ruler, Grid, Align, Distribute)		
Edit Graphical Properties, Undo/Redo, Copy/Paste	8	
Collaboration & Interoperability		
Share Links (Projects, Diagrams)	Ø	
Concurrent authoring	Ø	
Download/Upload JSON	Ø	
Download/Upload SysML v2 JSON	8	
Download/Upload SysML v2 textual format	(Partial)	
SysML v2 API	×	







General view | Structure

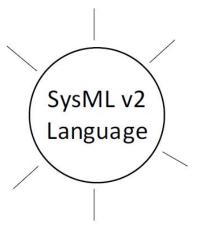
Behavior

- function-based
- state-based
- sequence-based
- use cases

Structure

- decomposition
- interconnection
- classification

Requirements



Analysis

- analysis cases
- expression language

Verification

- verification cases

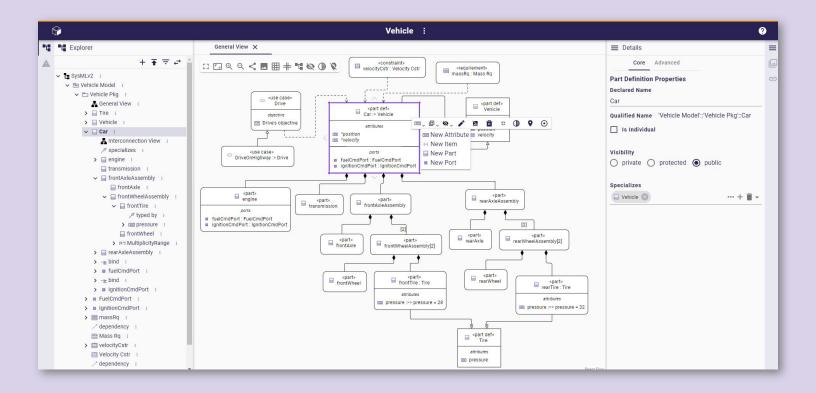
View & Viewpoint





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General View | Demo







Interconnection View | Structure

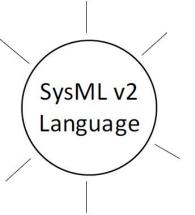
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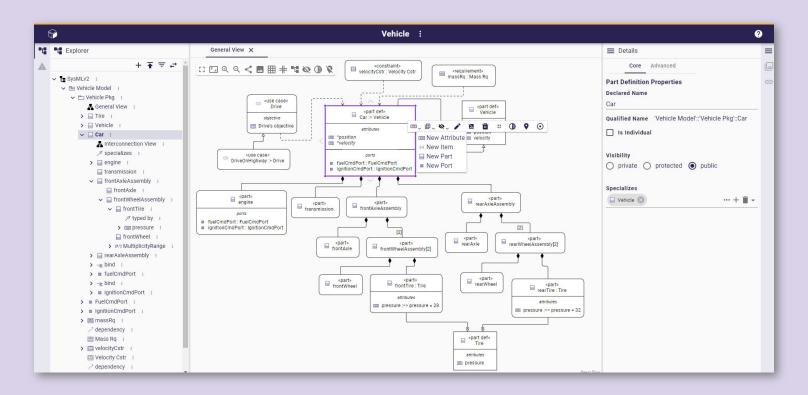






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Interconnection View | Demo







State Transition View | Behavior

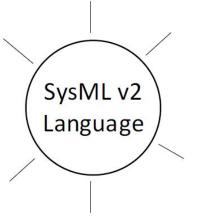
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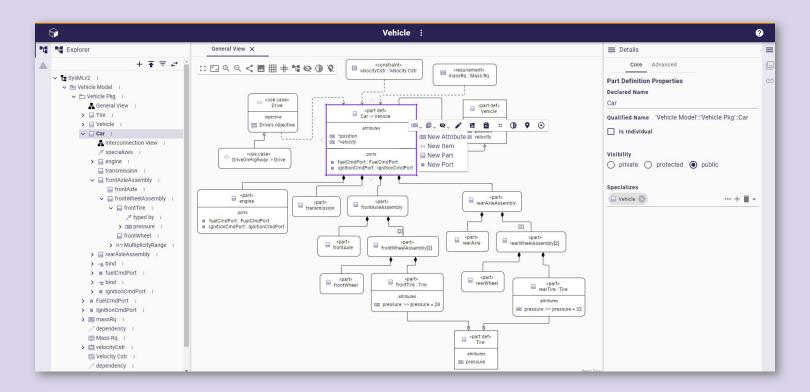
- verification cases

View & Viewpoint





State Transition View | Demo







Action Flow View | Behavior

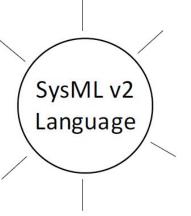
Behavior

- function-based
- state-based
- sequence-based
- use cases

Structure

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- classification

Requirements



Analysis

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Verification

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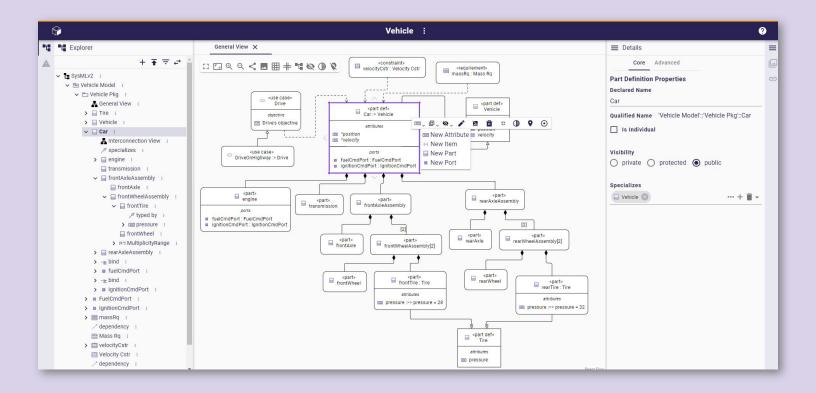
View & Viewpoint





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Action Flow View | Demo





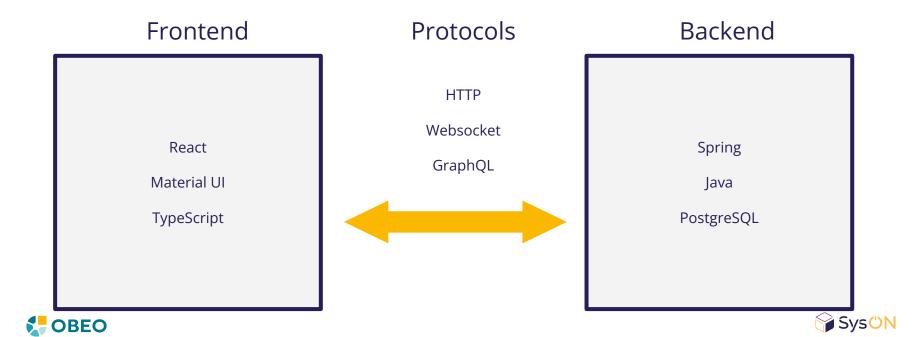


SysON | Architecture and technological choices

- Currently supported browser: Chrome, Firefox
- Build on top of Sirius Web, relying on mainstream web technologies



Deployed on a Web Server





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Extensibility | Go beyond

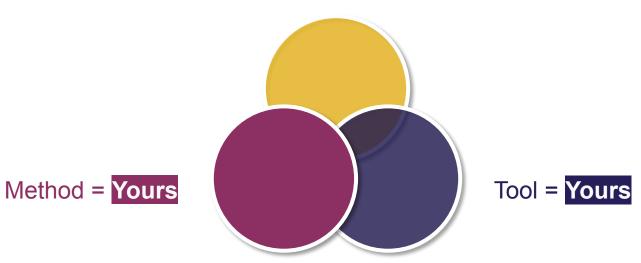
- Specialize: Take into account SysML v2 language extension, Contribute new tools, new visualisations...
- Interact with external tools
 - Python tooling,
 - Execution tooling: New command to configure or run simulation and get back simulation results in views...
- Document generation





MBSE | Trio

Language = **Your extension**





SysON | Leveraging Sirius Web: beyond language support



- The 3 pillars of MBSE: Language, Method and Tool
- Sirius Web is a Low Code Modelling platform
 - Eased customization for method/process support
 - Eased integration thanks to its component based architecture

SyML v2 meta-model + SysON editors specification =



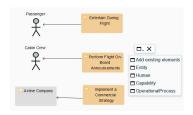






Additional specification Additional/enhanced editors









Extensibility | Tailored Editor

Research collaboration with IRT Saint Exupéry : EasyMOD project

- Methods and tools for complex systems development
- Interaction modes for system architects and engineers
- Acceptability and wide deployment of modeling solutions
- Efficiency and productivity of system engineers through optimized tool use
- Support for industry adoption through user-centered design and practical tool extensions

→ Prototype demonstrates how **SysON** enables **user-friendly methodology-aligned tools**

- Tailored Editor: Specifically designed to fit the methodology
- Methodology Integration: Tools integrated to guide system engineers
- Extensibility: Contributed as add-on without code forking







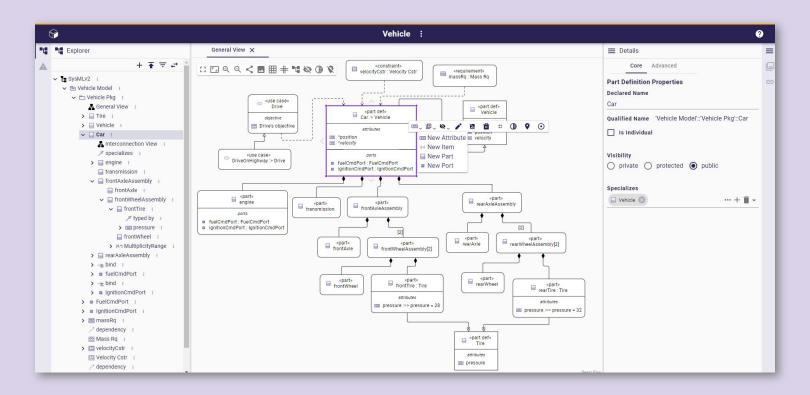
```
library package SEIM {
   action def Function;
    allocation def AllocatedFunction {
        end function : Function;
        end component : LogicalConstituent;
    interface def FunctionalFlow {
        end source;
        end target;
    interface def LogicalFlow {
        end source;
        end target;
    part def LogicalConstituent;
    port def FunctionPort;
    port def ConstituentPort;
```





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SysON Extension | Demo







```
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```

```
package AIDA_Drone {
   import SEIM::**;
   package 'Constituent Analysis' {
        part Drone : LogicalConstituent {
            part Structure : LogicalConstituent {
                in port 'CP 1' : ConstituentPort;
               in port 'CP 2' : ConstituentPort;
            part 'Flight control and monitoring system' : LogicalConstituent {
                in port 'CP 4' : ConstituentPort;
               in port 'CP 5' : ConstituentPort;
                in port 'CP 7' : ConstituentPort;
                in port 'CP 8' : ConstituentPort;
                in port 'CP 11' : ConstituentPort;
               out port 'CP 9' : ConstituentPort;
                out port 'CP 10' : ConstituentPort;
            part Payload : LogicalConstituent {
               in port 'CP 2' : ConstituentPort;
                in port 'CP 5' : ConstituentPort;
                in port 'CP 6' : ConstituentPort;
                in port 'CP 7' : ConstituentPort;
               out port 'CP 3' : ConstituentPort;
            part 'Propulsion system' : LogicalConstituent {
                in port 'CP 2' : ConstituentPort;
                out port 'CP 3' : ConstituentPort;
```

```
package 'Functionnal Analysis'
    action <LogFun_1> 'Provide direct remote identification information' : Function {
       in port 'FIP 1' : FunctionPort;
       in port 'FIP 2' : FunctionPort;
       in port 'FIP 3' : FunctionPort;
       out port 'FOP 1' : FunctionPort;
   action <LogFun_3> 'Provide drone navigation data' : Function {
       in port 'FIP 1' : FunctionPort;
       in port 'FIP 12' : FunctionPort;
       out port 'FOP 1' : FunctionPort;
       out port 'FOP 3' : FunctionPort;
       out port 'FOP 4' : FunctionPort;
       out port 'FOP 5' : FunctionPort;
       out port 'FOP 6' : FunctionPort;
    action <LogFun_4_4> 'Manage mission' : Function {
       in port 'FIP 1' : FunctionPort;
       in port 'FIP 2' : FunctionPort;
       in port 'FIP 4' : FunctionPort;
       in port 'FIP 5' : FunctionPort;
       in port 'FIP 6' : FunctionPort;
       in port 'FIP 7' : FunctionPort;
       in port 'FIP 9' : FunctionPort;
       in port 'FIP 10' : FunctionPort;
       in port 'FIP 13' : FunctionPort;
       out port 'FOP 2' : FunctionPort;
       out port 'FOP 3' : FunctionPort;
       out port 'FOP 7' : FunctionPort;
```

```
allocation 'esa:0019c981-6309-31a0-be6f-ea230e60b1a6' : AllocatedFunction {
    allocate function ::> 'Functionnal Analysis'::'Provide photos and videos' to component ::> Drone.Payload;
```





2024 Roadmap | Reaching a first level of maturity



Experimenting





SysML 2.0 Compliance

A new version every 8 weeks!





SysML v2 APIs

Project Service Element Navigation Service Query Service

BG

User Experience

Contextual Palette redesign
Command Palette
Multi explorers
Relationships layout
Undo/Redo

General View Improvements

Next

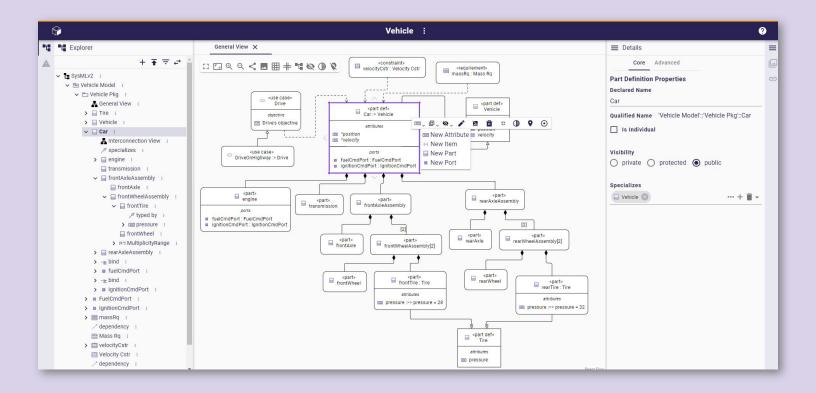
Comments Support





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SysON 2024.11 Preview | Demo







Later | 2025.x...









SysON Getting Involved

SysON | How can I get involved?

- Help us make SysON the best-in-class SysML V2 modelling tool!
 - Try SysON, provide us feedback
 - Talk about it!
- Type of usage you can envision with SysON
 - Academia: SysON for research and teaching
 - Consulting and services: SysON for teaching and customer projects
 - Software vendor: Integrate SysON in your products or leverage SysON
 - Industry: Use SysON on operational projects
- Contact us if you're interested

WE NEED YOU!





SysON | Types of collaborations

Early Adopter Program

- Objective: Gather feedback to enhance SysON and influence its future development
- How: Personalized lightweight collaboration

• Industrial open collaborations

- Objective: Get ready for SysML v2!
- How:
 - Evaluate SysON
 - Identify needs (customization, extensions...) or gaps (missing features...)
 - Define project scope and contract a pilot project
 - Industrialize the solution
- Partnering with Obeo
 - Drive SysON's maturity and success
 - Leverage Obeo's 15 years of expertise in creating high-quality modelling tools
 - Embrace open innovation and sustainable investments











SysON Takeaways

SysON | In a nutshell



Standard Compliant

A pure SysML V2 and KerML implementation



Modern UX

A modern technological stack, an intuitive user experience



Web & Collaborative

No desktop deployment, naturally collaborative



Extensible

Integrate SysON with your processes and tools



Open-Source

Lower costs and easier access and collaborations





Takeaways | Open Source SysML v2

- SysML v2 can be a game changer
- There is a lot to accomplish
 - Interoperability, integration
 - Training
 - Libraries, ontologies
 - Innovation (Al...)
- Fostering the development of SysML v2 enterprise tools as Open-source is the enabler for changing the game.

Make it happen!





Thank you! Questions?



Project page: https://mbse-syson.org/

Documentation: https://doc.mbse-syson.org/syson/main/index.html

Github: https://github.com/eclipse-syson/syson

LinkedIn: https://www.linkedin.com/in/syson-mbse-tool/

Mailing List: https://www.obeosoft.com/en/syson-mailing-list

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