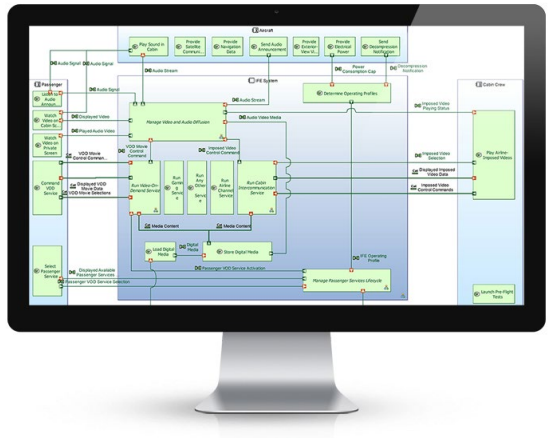
REALIZING THE POTENTIAL OF SYSML V2 WITH SYSON

The Fundamental Role of Open-Source for Enabling the Digital Engineering Transformation

Stéphane Lacrampe - Obeo

OBEO | **Company Profile**

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



Domain-Specific Modeling

Sirius

Model-based Systems Engineering

Capella

SysON

Enterprise Architecture

OBEO SmartEA

ECLIPSE FOUNDATION

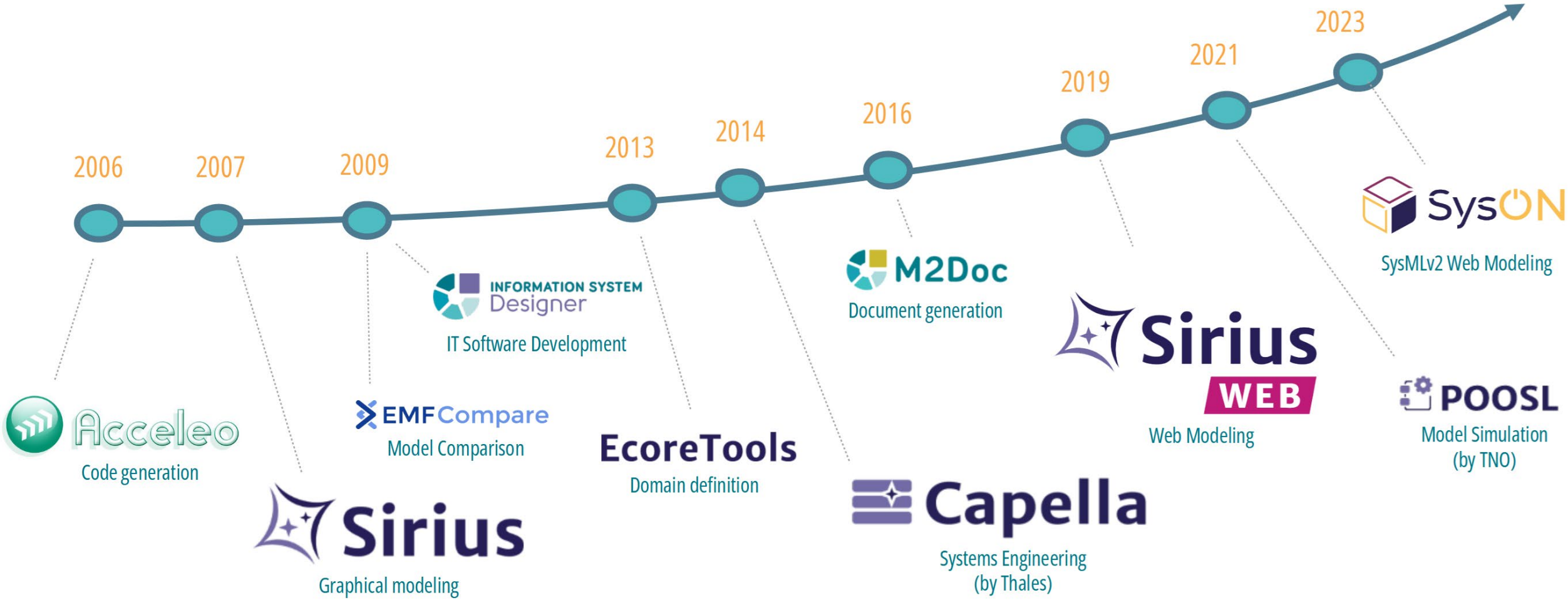
We are a global reference player in the field of open-source

2500

Number of FTE days of open-source contributions in 2023

OBEO

OBEO | **Open-source Involvement**



MBSE | **Background**

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"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)

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MBSE | **Ambition**

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.

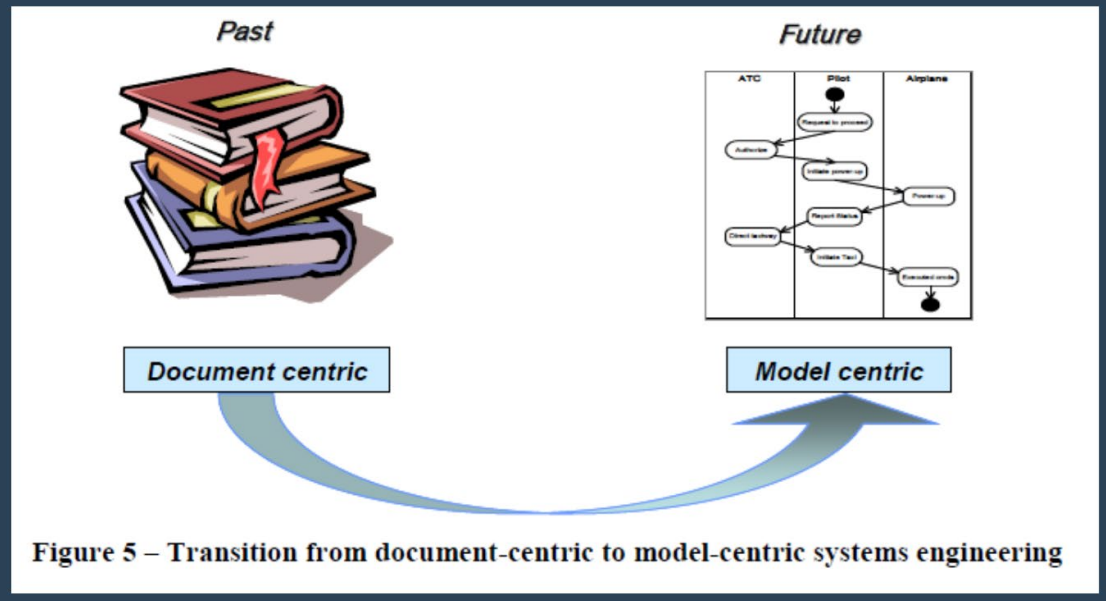


Figure 5 – Transition from document-centric to model-centric systems engineering

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

MBSE | The 2020 SERC Maturity Survey

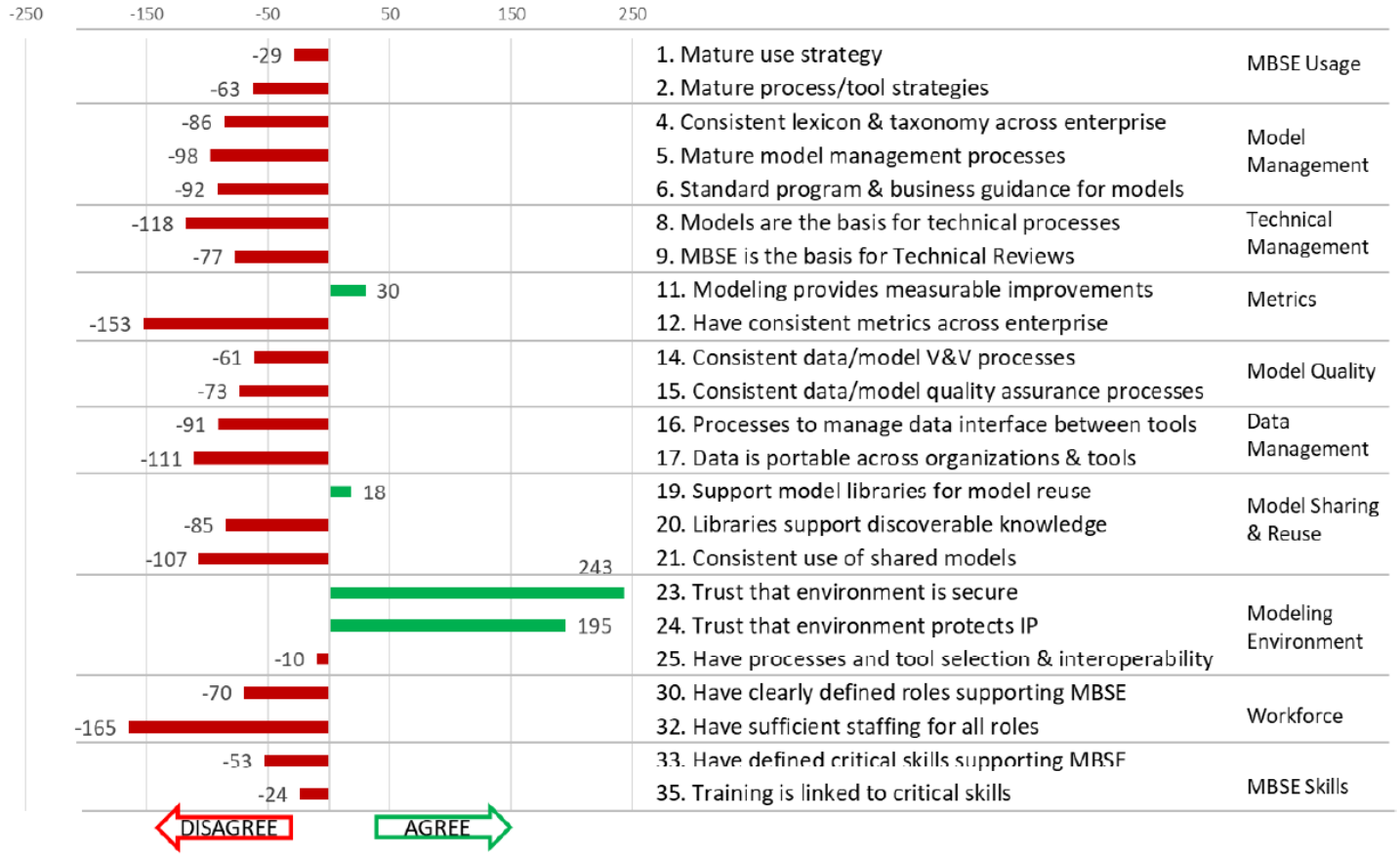
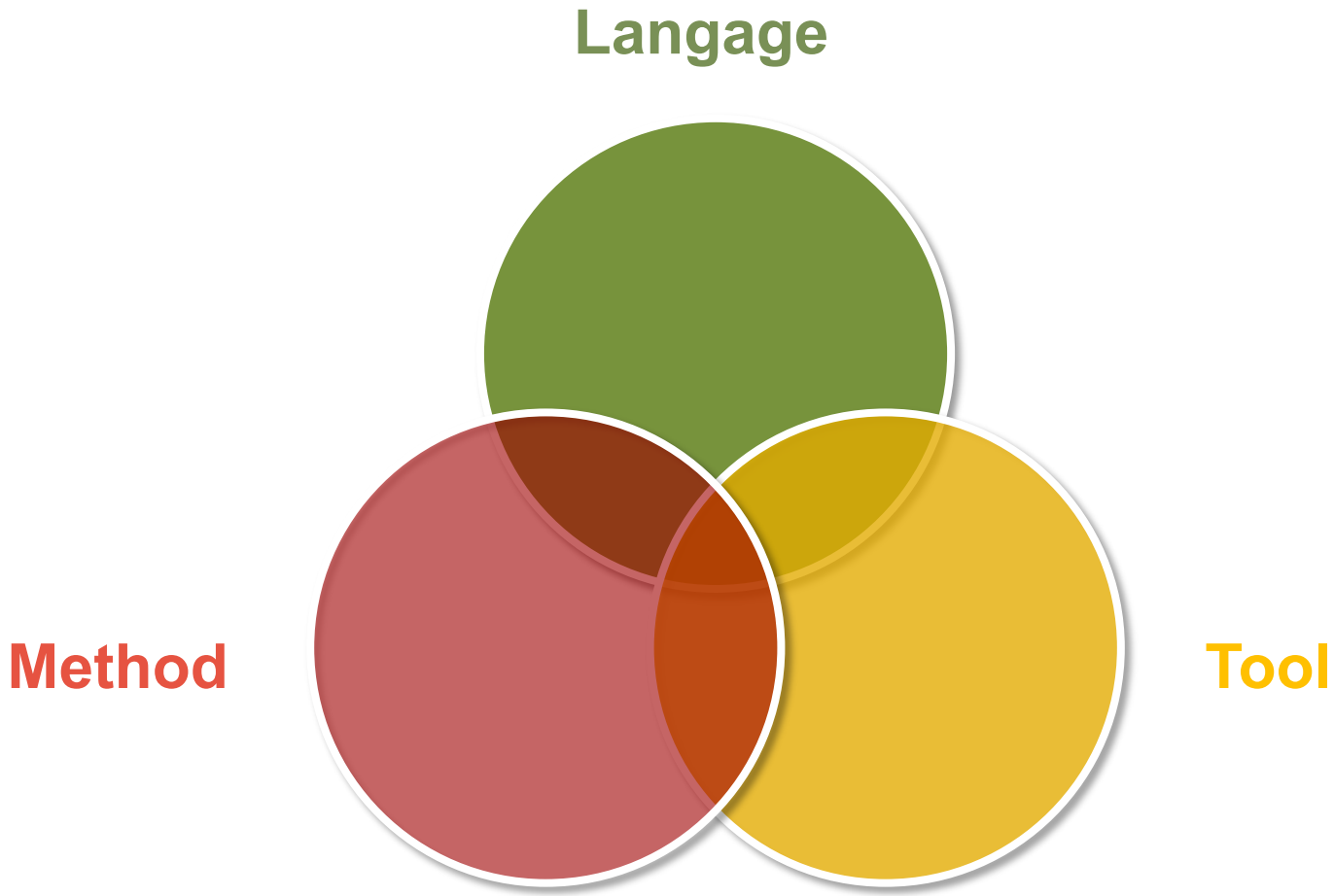


Figure E-5. Overall Capability Maturity Scorecard by Question.

https://sercuarc.org/wp-content/uploads/2020/03/SERC-SR-2020-001-Benchmarking-the-Benefits-and-Current-Maturity-of-MBSE-3-2020.pdf

MBSE | **The Triptych**



SYSML V2 | FROM SYSML V1 TO SYSML V2

- **SysML v1.0**
  - 2007: first release
  - Evolved since…

- **SysML v2**
  - 2015 - 2017: SysML v2 RFP WG
  - 2018 - 2024: Development of SysML v2

Final adopted SysML v2 specifications anticipated between March and June 2025

SYSML V2 | **Challenges**

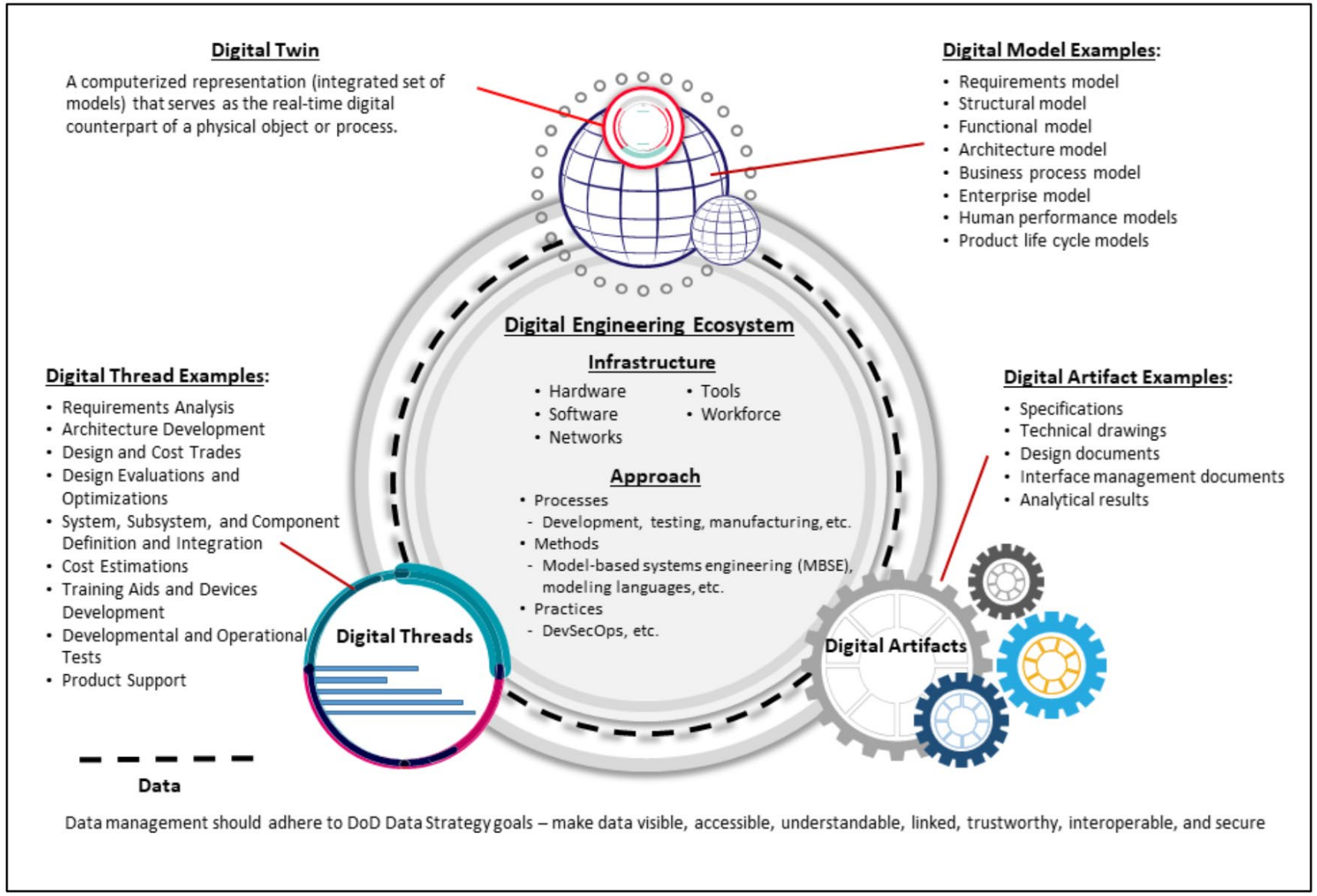
Usability and **Learning curve**

Interoperability and **Integration** of tools

Extensibility and **expressiveness**

Removing SysML v1's obstacles to MBSE adoption

Figure 1. Digital Engineering Framework



DOD INSTRUCTION 5000.97 on Digital Engineering – Dec 2023

SYSML V2 | **Objectives for 2035**

NDIA

Practices

4. Model-based systems engineering, integrated with simulation, multi-disciplinary analysis, and immersive visualization environments is standard practice.

Tools and Environment

7. Systems engineering tools and environments enable seamless, trusted collaboration and interactions as part of the digital ecosystem.

Competencies

9. Systems engineering education is part of the standard engineering curriculum, and is supported by a continuous learning environment.

INCOSE Systems Engineering Vision 2035

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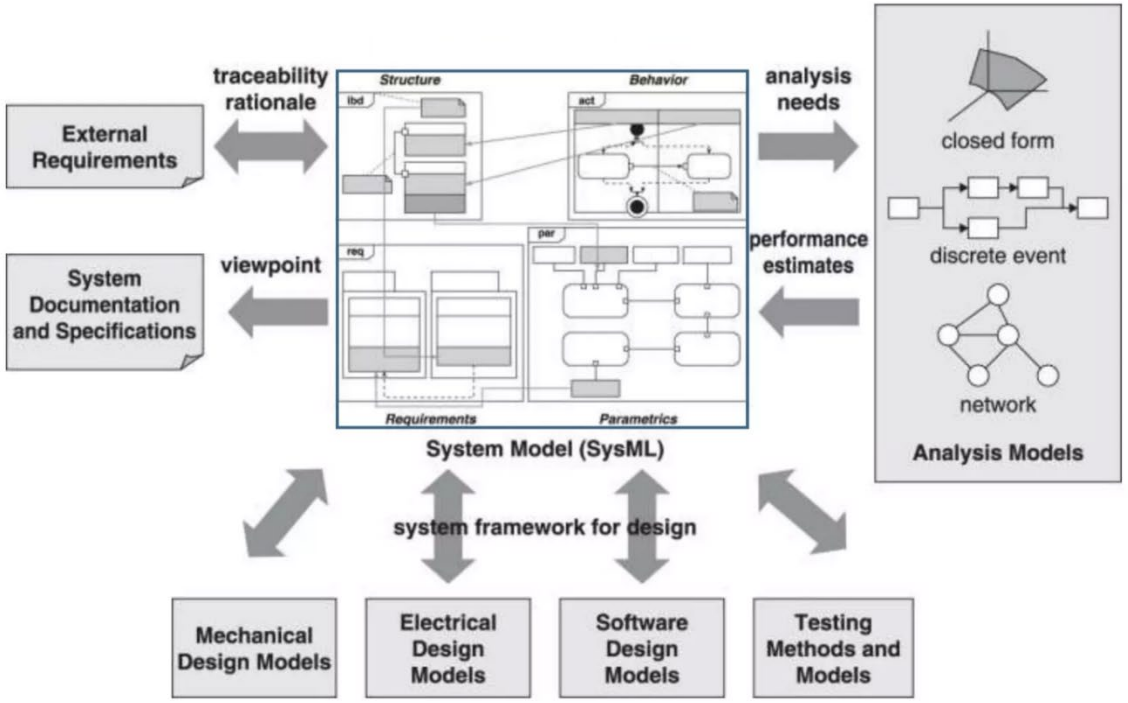
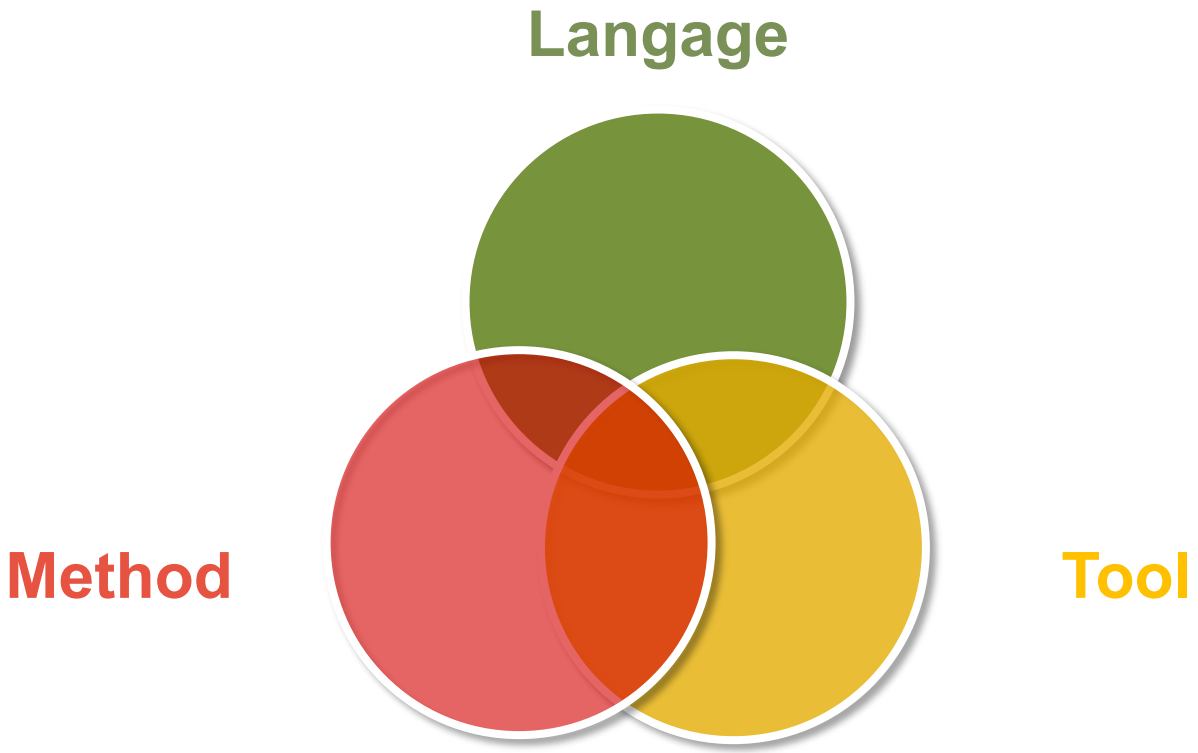
SYSML V2 | **Key Innovations**

- **Expressiveness and consistency**
  - Enables to be more **precise**
  - Enables **analysis** and **automation**
- **API for interoperability**
  - With other engineering **models**
  - With other engineering **tools**
- **Extensibility**
  - To support **domain-specific** applications



A Practical Guide to SysML 3rd Edition (Figure 18.1)

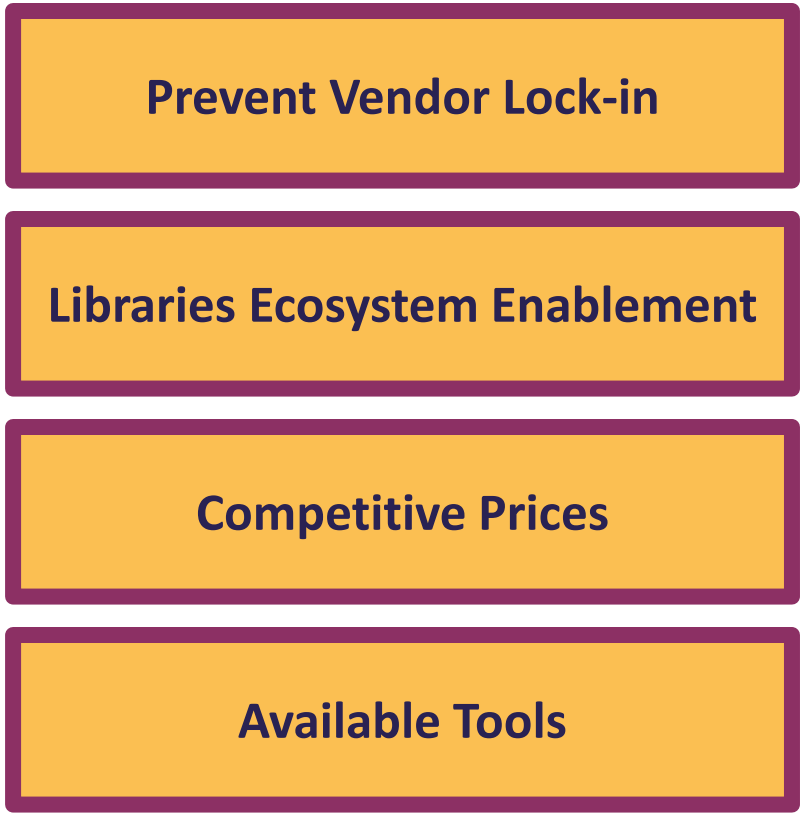
SYSML V2 | **A Potential Game Changer**



What now?

SYSML V2 | **How to Change the Game?**

- **Ensure interoperability amongst SysML tools**
  - SysML Tools, Suppliers
  - Model Checking, Analysis
- **Enable the Digital Thread with "all" engineering tools**
  - Requirements, Simulation, Mechanical, Electrical, Software



SYSML V2 | **How to Change the Game?**

- **Enable seamless collaborations and interactions**
  - Across the digital ecosystem

Accessible Data

Web/Modern User Experience

Competitive Price

SYSML V2 | **How to Change the Game?**

- **Train the workforce**
- **Enable innovation**
  - A.I., Formal Methods, Model Execution
  - Academia, Startups, …

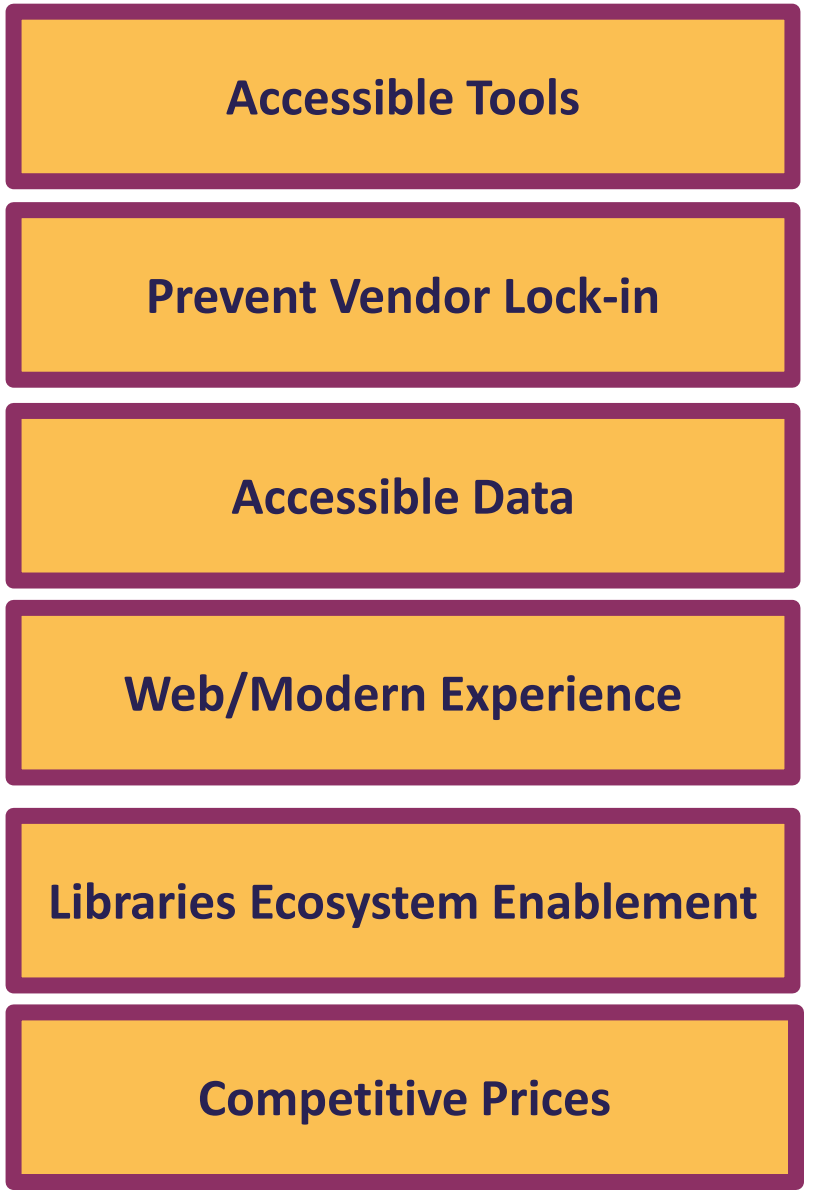
Web/Modern Experience

Available Tools

Competitive Prices

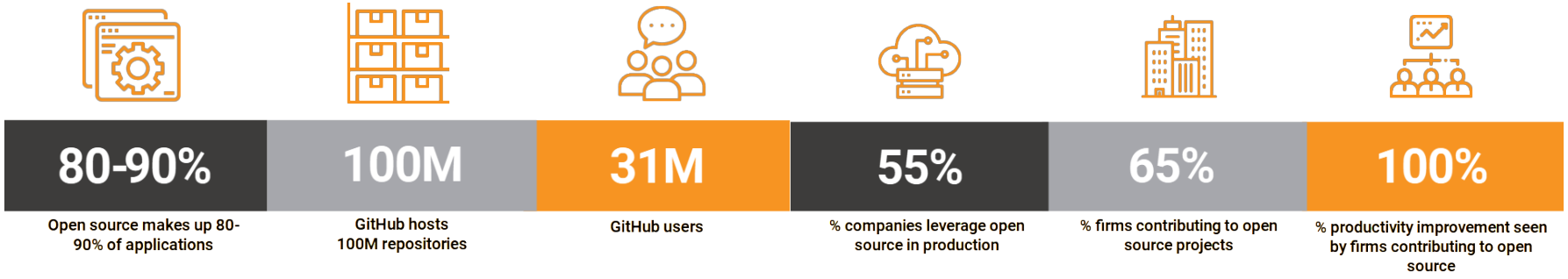
OPEN SOURCE | The Way to SysML v2 Success

- **Provide foundational capabilities**
  - Model viewing, authoring, storing, sharing
- **Accessible at a low cost to the entire industry ecosystem**
  - Large organizations, suppliers, SME, startups, vendors, universities, students
- **Enabling the emergence of a community of enterprise-grade capabilities**
  - Tools, ontologies, model assets, practices…
- **To embrace the Digital Engineering revolution!**



OPEN SOURCE | **Why?**

- Industrial **benefits** from a **robust and high-quality** technology:
  - Easier access to education, academia, and experimentation
  - Mitigating vendor lock-in / simplify the sharing of data and applications
  - Enhanced sustainability and long term availability of the technology
  - 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



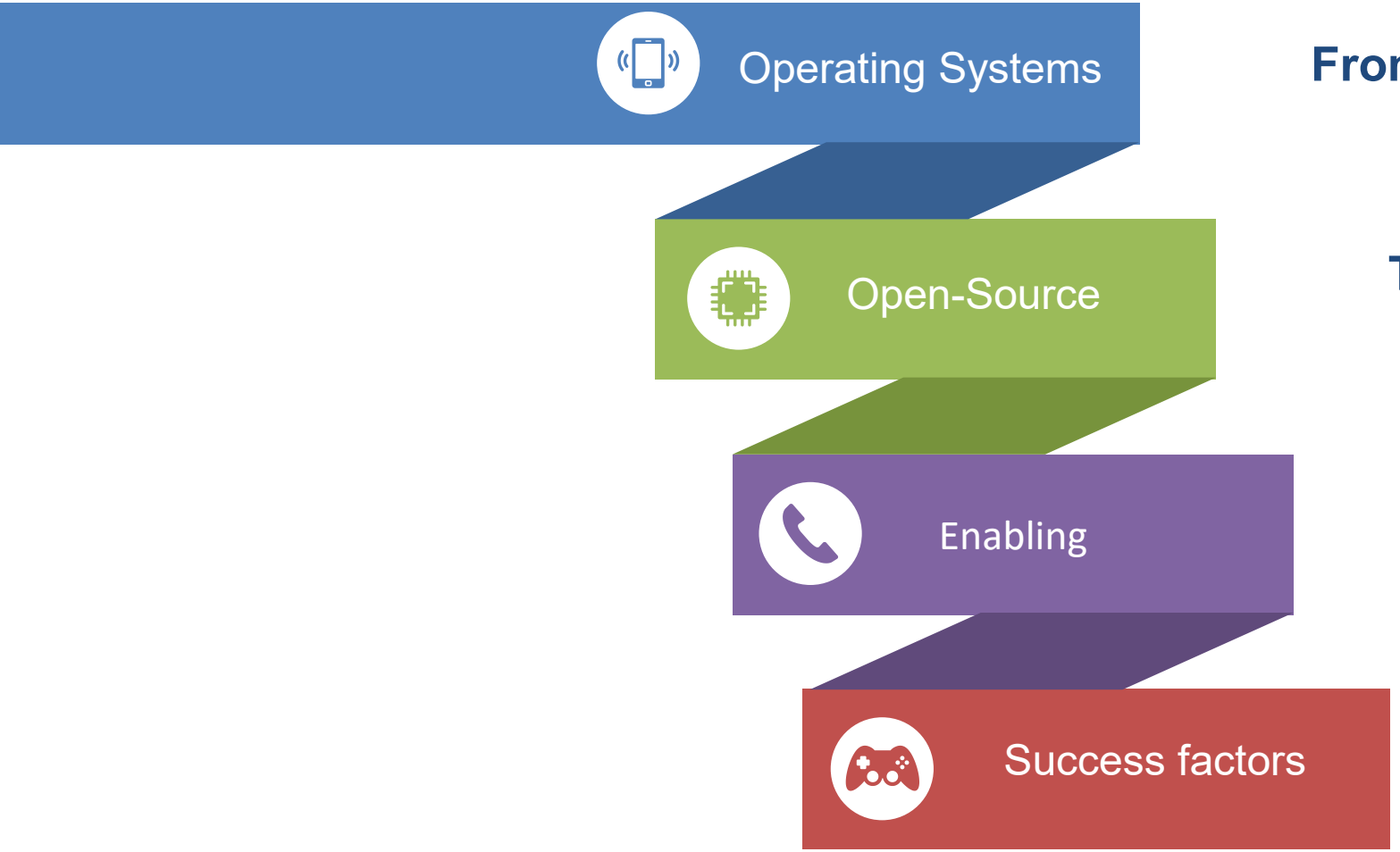
LINUX

GIT

JUPYTER + PYTHON

3 EXAMPLES OF INDUSTRY TRANSFORMATION THROUGH OPEN STANDARDS AND OPEN-SOURCE TOOLS

OPEN SOURCE | **Linux**



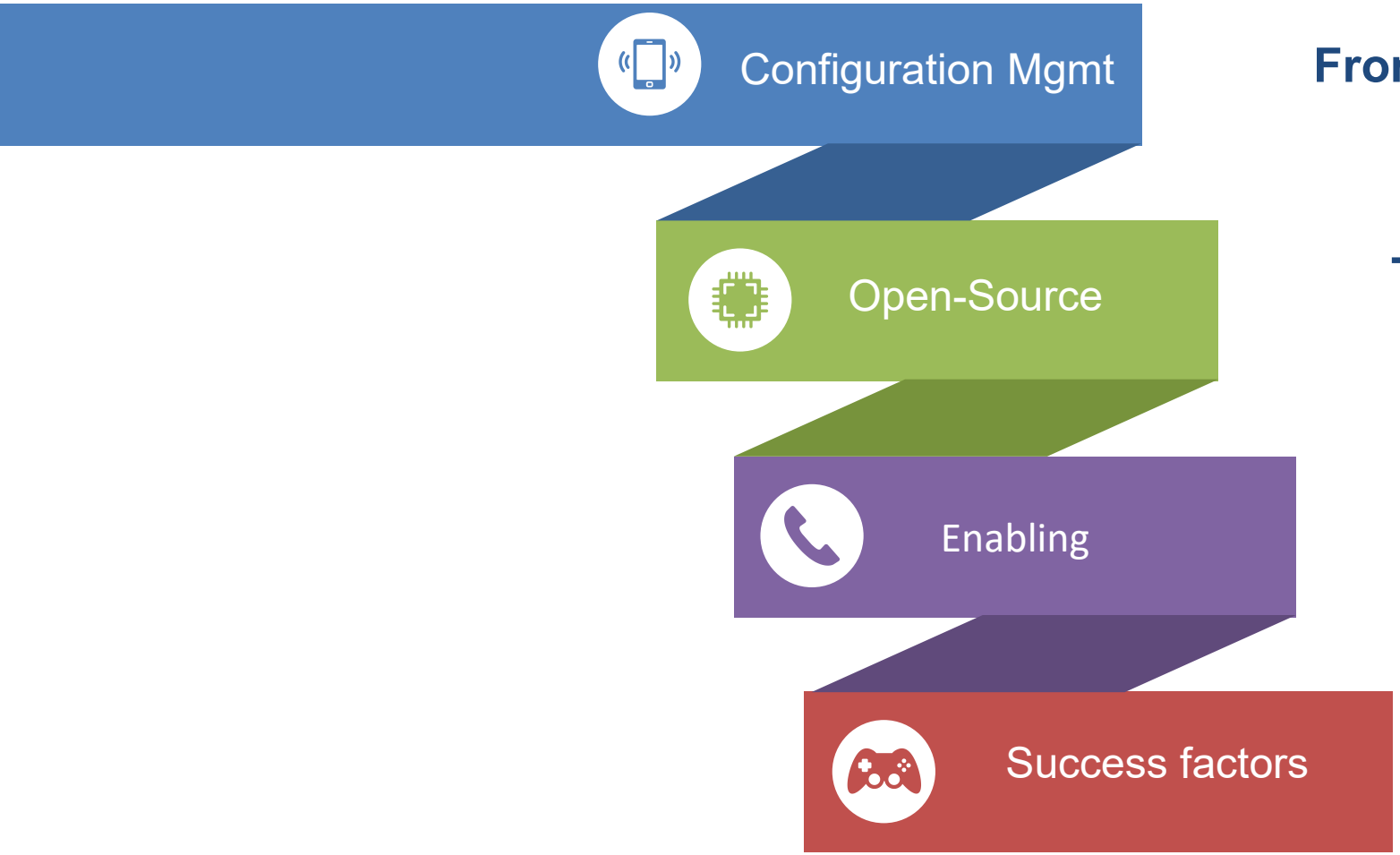
From Windows/Unix

To Linux (POSIX)

Virtualization, Cloud Computing

Low cost, reliable, flexible, active community/hardware-software compatibility

OPEN SOURCE | **Git**



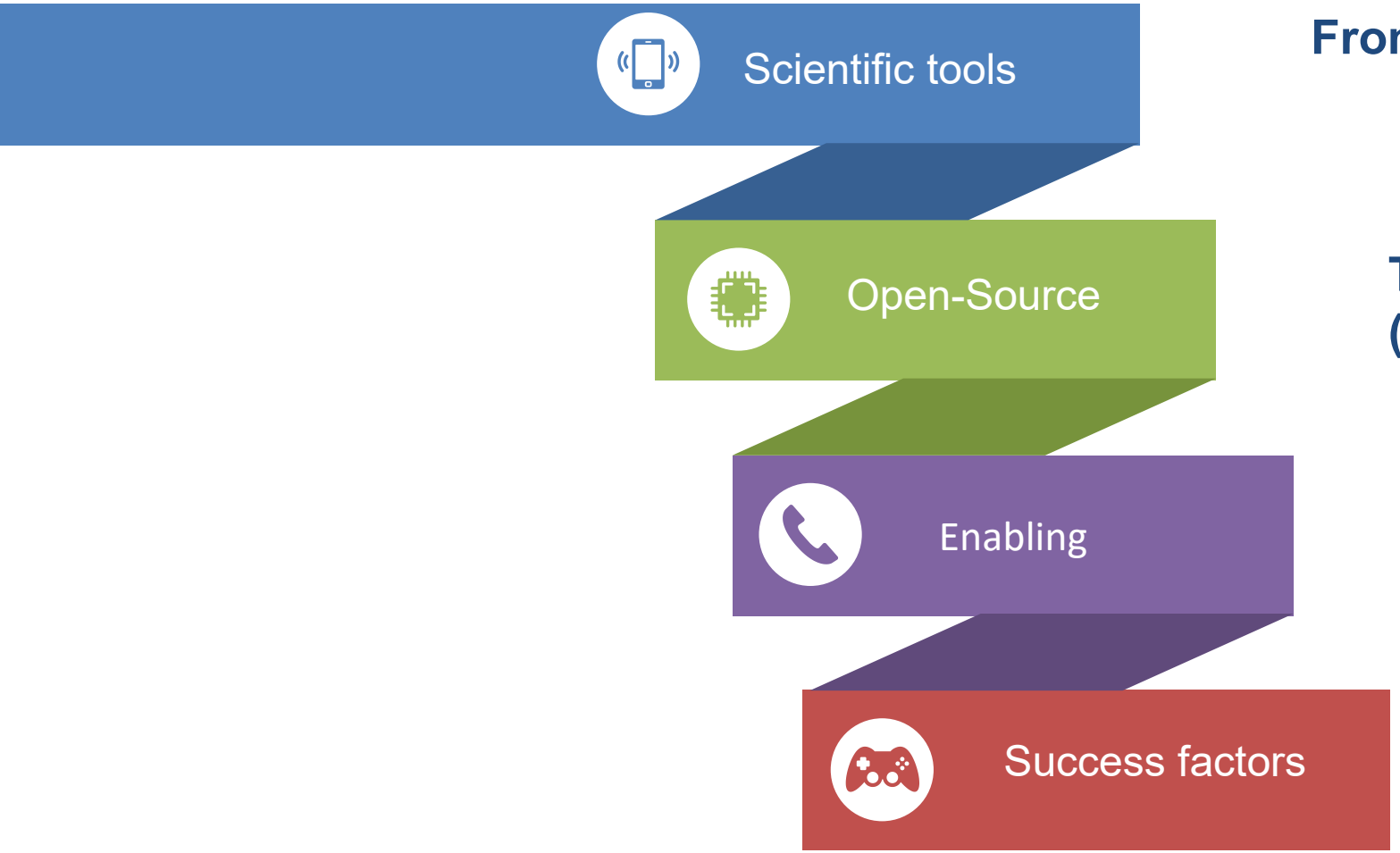
From Clearcase/Perforce

To Git (de facto standard)

DevOps and Agile software development, GitHub / open-source visibility

Decentralized version mgmt, large adoption, community, integration with CI/CD

OPEN SOURCE | **Python + Jupyter Notebook**



From closed tools (Excel, matlab)

To Python & Jupyter Notebook (De Facto Standard)

IA, Data science and analysis techniques, Collaboration workflows, Education

Rich ecosystem of libraries, Tools integration, Accessibility & Interactivity, Visualization

MBSE OPEN-SOURCE TOOLS

OPEN-SOURCE | **Capella**

Capella
Open Source MBSE Solution

NDIA

- **A Success in the MBSE domain**
  - In the top 3 of the most used system architecture tool
  - 1 000+ organizations are using it
  - Vibrant ecosystem (industries, solutions providers, academics)

- **Why?**

Enterprise grade
quality tool & usability

Initial investment /
Industry-SME collaboration

Sustainable business model
(services and add-ons)

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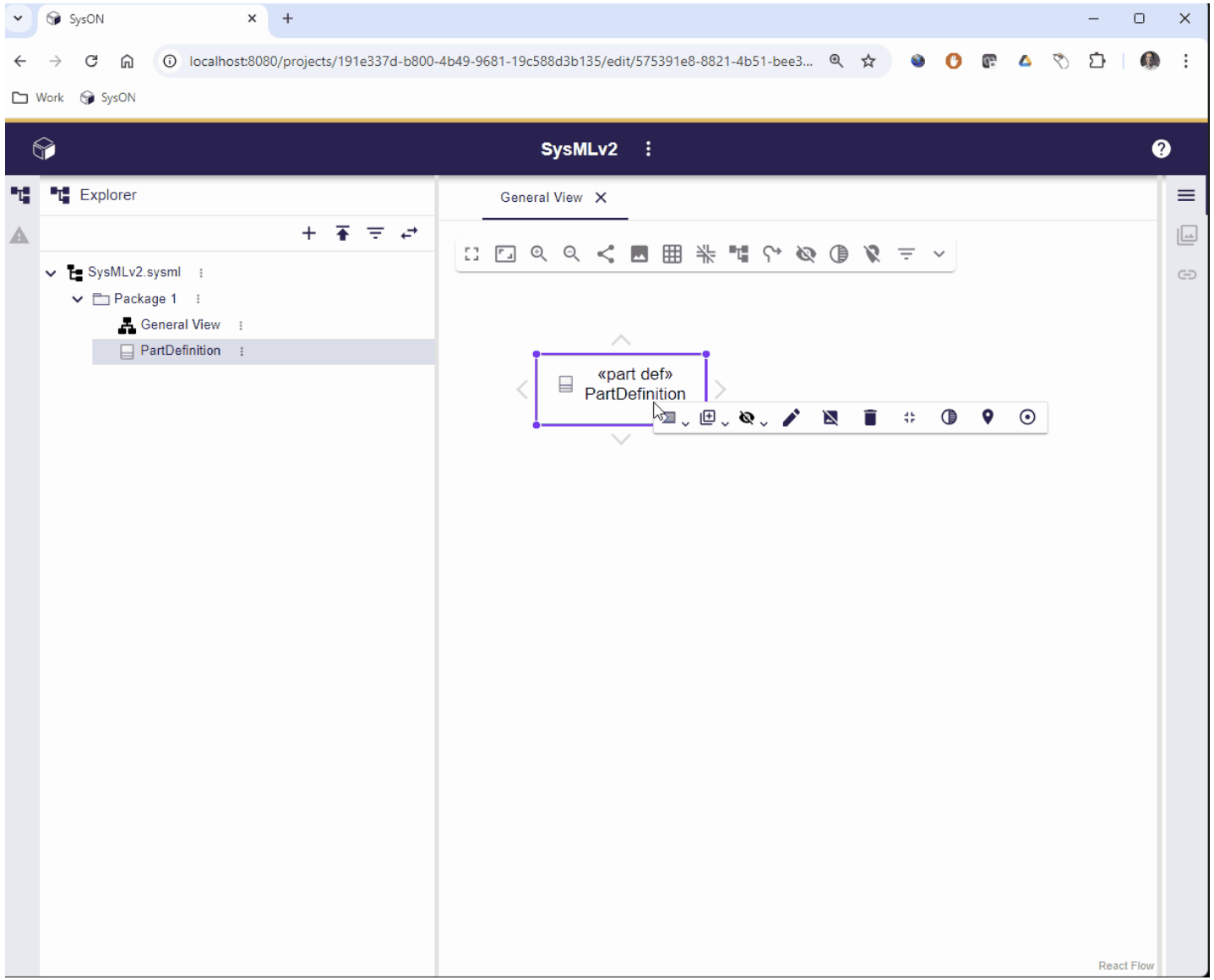
OPEN SOURCE | **SysML V2 Web-based Authoring Tool**



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

https://mbse-syson.org

OPEN-SOURCE | Other SysML V2 Initiatives

SysML v2 Pilot Implementation

Key Takeaways

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

Make it happen!

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