



ICSE

3rd International Workshop on
Software Engineering for Systems-of-Systems

Florence, Italy

Sunday 17th May

Foreword: Towards Reference Architectures for Systems-of-Systems

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System-of-systems

- Trend of the current/future software-intensive systems
- Main characteristics:
 - Operational independence
 - Managerial independence
 - Evolutionary development => dynamic architecture
 - Emergent behavior
 - Geographic distribution
 - Software-intensivity

System-of-systems

- Representative application domains:
 - Robotics
 - Airport
 - Avionics
 - Smart planet, cities, buildings,
 - Aerospace
 - Warfare
 - Global earth observation
 - ...

Software Architecture


- Fundamental to the software systems development
- Promote several quality characteristics
 - e.g., interoperability, performance, portability, adaptability, and maintainability
- Essential element to the success of SoS
 - ~100 works published on SoS software architectures
 - Concentrated in the last 6~7 years

Reference Architecture

- Special type of software architecture
- Essence of the architectures of a set of software systems
- Knowledge about how to design concrete architectures of systems of a given application domain
- Support to
 - development, standardization, and evolution of software systems
- Real evidence of the importance of reference architectures

Reference Architecture

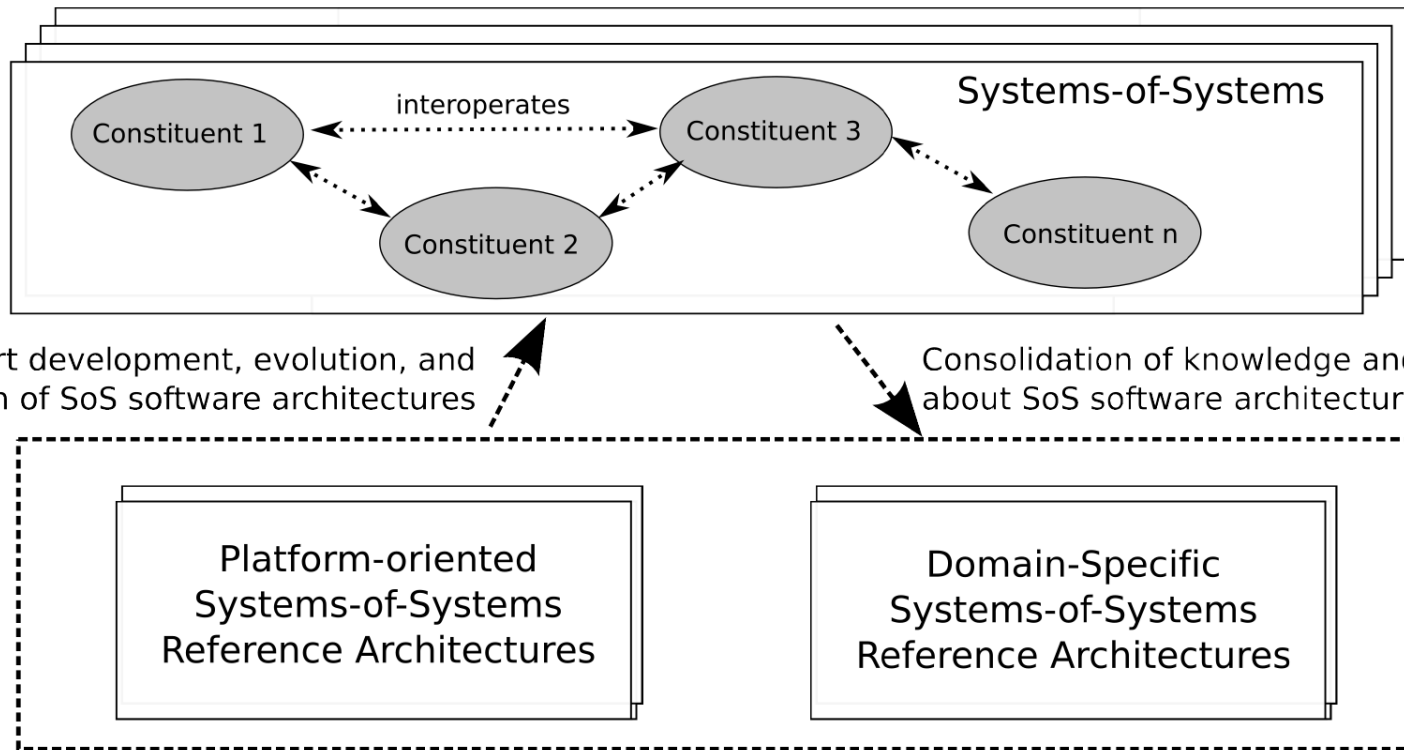
- Many reference architectures
 - Domain-oriented reference architectures
 - AUTOSAR
 - Continua
 - UniversAAL
 - ...
 - Platform-oriented reference architectures
 - S3
 - OASIS
 - OSGi
 - ...



Reference architectures can be also relevant to architect SoS, even more important than they have been currently.

Problem: Interoperability among constituents is still an open issue in SoS.

Reference Architectures for SoS



Main benefit for SoS = Interoperability among constituents

Challenges

1. Mobilization of communities of SoS reference architectures
2. Evolution of existing reference architectures
3. Establishment of new domain-oriented SoS reference architectures
4. Establishment of platform-oriented SoS reference architectures
5. Engineering SoS reference architectures
6. Availability of SoS reference architectures

Perspectives of Research

1. Mobilization of communities of SoS reference architectures
 - (1) Investigation of the advantages/drawbacks of SoS software architectures.
2. Evolution of reference architectures
 - (1) Evolution of reference architectures that could become SoS reference architectures;
 - (2) Approaches (including process, methods, and techniques) to evolve reference architectures to SoS reference architectures.
3. Establishment of SoS reference architectures
 - (1) Establishment of SoS reference architectures; (2) Approaches (including process, methods, and techniques) to build SoS reference architectures.
4. Establishment of SoS reference architectures
 - (1) Architectural styles for SoS; (2) Establishment of SoS reference architectures;
 - (3) Approaches (including process, methods, and techniques) to build SoS reference architectures.
5. Engineering of SoS reference architectures
 - (1) Design process for SoS reference architectures; (2) ADL and representation of SoS reference architectures; (3) Evaluation of SoS reference architectures; (4) Development of automated support to build and maintain SoS reference architectures.
6. Availability of SoS reference architectures

Conclusions

- SoS software architectures
 - Quite youthful research area
- SoS reference architectures
 - Also a quite youthful research area
- Reference architectures **MUST** be explored for this new class of software-intensive systems.



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