ARCHITECTURE FOR SERVICE-ORIENTED PROCESS - MONITORING AND CONTROL

IMC-AESOP

Key Innovation

IMC-AESOP investigates a Service-oriented Architecture approach for monitoring and control of very large scale Process Control Systems (continuous process applications). Large process industry systems are a complex (potentially very large) set of (frequently) multi-disciplinary, heterogeneous, networked distributed systems that function as a complex system of which the components are themselves systems, i.e. System-of-Systems (SoS).

IMC-AESOP realises a SoA-based approach for next generation of SCADA/DCS systems targeting Process Control Applications

The future "Perfect Plant" will enable monitoring and control information flow in a cross-layer way. As such the different systems including SCADA/DCS will be part of a distributed ecosystem, where components can dynamically be discovered, added or removed, and dynamically exchange information and collaborate. This cross-layer and cross-enterprise collaboration will be driven by business needs and enable future factories to fulfil the set of Maier's criteria. To achieve this vision, IMC-AESOP will have to deal with key challenges such as operational and managerial independence of the service-oriented constituent systems, real-time web services, interoperability, plug and play, self-adaptation, reliability, energy-awareness, high-level cross-layer integration and cooperation, event-propagation and -management.

The SoA-based approach proposed by IMC-AESOP can, on one hand, simplify the integration of monitoring and control systems on application layer. On the other hand, the networking technologies that are already known to control engineers could also simplify the inclusion of or migration from existing solutions and the integration of the next generation SCADA and DCS systems at network layer. Moreover, engineering methods and tools are being investigated and highlights on the domain's future will be provided by research and academic partners.

IMC-AESOP will demonstrate the application feasibility in pilots, based on real-world industrial use cases provided from several end-users. The IMC-AESOP partnership among important ICT stakeholders of the industrial value chain is a key aspect of the project that allows foreseeing important contributions to relevant standardization bodies.

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Project website
http://www.imc-aesop.de

Community contribution to the project
4.499.902 Euro

Project start date
01 September 2010

Duration
30 months

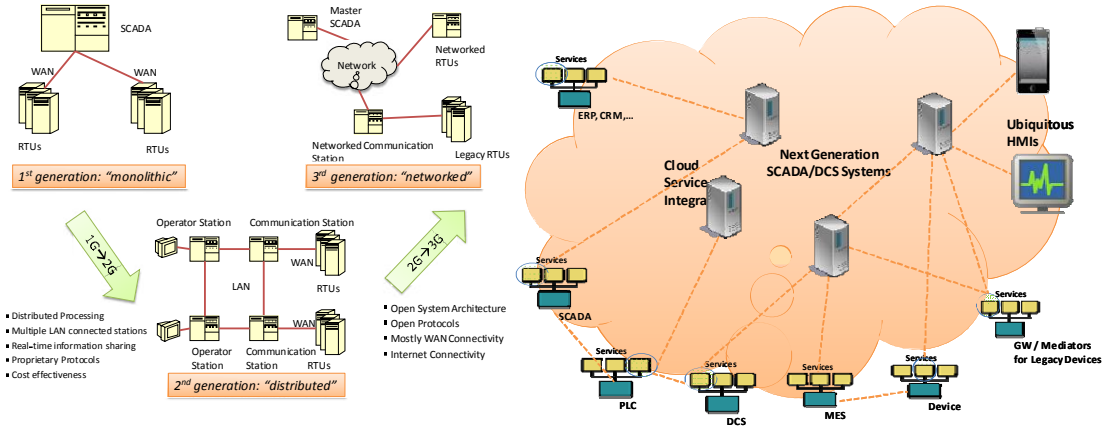
Technical approach

IMC-AESOP envisions a SoA-based SCADA/DCS infrastructure that enables cross-layer service-oriented collaboration not only at horizontal level, e.g. among cooperating devices and systems, but also at vertical level between systems located at different levels of an enterprise architecture.

The major scientific and technical objectives of the approach behind that infrastructure are:

- Propose a system-of-systems approach for distributed dynamically collaborative monitoring and control based on Service-Oriented Architecture (SoA). Application for very large scale distributed systems in Process Control applications (up to tens of thousands of devices and systems exposing/consuming and processing "Services")
- Investigate how "deep in the enterprise architecture" is possible to go with SoA? Is it feasible to get SoA at the device level inside process control loops? How large is the percentage of devices that can reliably be incorporated in the SoA architecture?
- Build a foundation for predictive performance of such SoA architecture based on a formal approach to event based systems.

- Propose a migration approach from legacy systems (e.g. a 20-year old machine) to a SoA compliant system.
- Propose a transition path from the new SoA-based SCADA and DCS to be an adequate legacy system in the next 20 years.



IMC-AESOP Approach: Far beyond current Process Control Systems
Towards a „Distributed Dynamically Collaborative System-of-Systems"

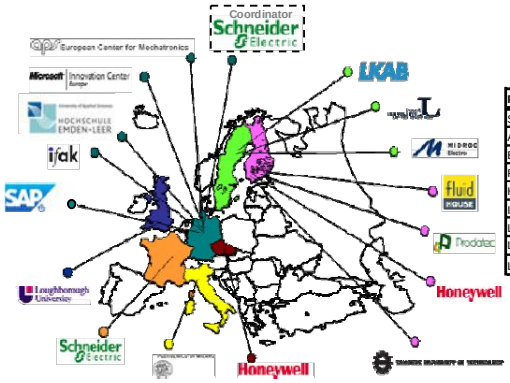
Demonstration and Use

All concepts and components developed within the IMC-AESOP project will be continuously evaluated using three representative use-cases associated to corresponding application scenarios., i.e., IMC-AESOP will not only design and implement this visionary infrastructure, but will also demonstrate the application feasibility, migrating legacy systems or building completely new systems in three industrial pilots. The first scenario, a plant lubrication system provided and evaluated by LKAB, addresses engineering, control, monitoring and maintenance aspects. The second scenario proposed by FluidHouse aims to investigate engineering and monitoring aspects in an oil lubrication system. A third scenario driven by Honeywell's customers will be focussing on control and monitoring for plant energy optimization.

Scientific, Economic and societal Impact

The IMC-AESOP project is looking at specification, development and prototyping distributed networked SCADA/DCS systems in automation devices and systems, by applying the SoA paradigm. As a matter of fact, Service-oriented Process Monitoring and Control as part of SCADA/DCS systems heavily depends on the integration of networked embedded systems, which is expected to grow reaching the e500 Bn in 2020. The results of IMC-AESOP will have a deep impact in that grow, expanding the potential applicability also to other domains like Energy Management, Logistics, Manufacturing, etc. Under this light the impact that IMC-AESOP would achieve might be significant and cross-domain, enabling Europe as a technology leader in Service-Oriented Process Monitoring and Control with strong synergies to the world-wide trend into System-of-Systems (S-o-S) Engineering.

Consortium



Participant organisation name	Country
Schneider Electric Automation GmbH	DE
APS Europäisches Center für Mechatronik	DE
Europäisches Microsoft Innovation Center GmbH	DE
FluidHouse Oy	FI
Honeywell, spol. s r.o.	CZ
Institut für Automation und Kommunikation e.V.	DE
Loughborough University	UK
Luleå University of Technology	SE
Luossavaara-Kiirunavaara Aktiebolag (LKAB)	SE

Participant organisation name	Country
University of Applied Sciences Emden/Leer	DE
Midroc Automation	SE
Politecnico di Milano	IT
Prodatec Oy	FI
SAP AG	DE
Schneider Electric Industries SAS	FR
TTI-SÄÄTIÖ (TUT)	FI
Honeywell Oy	FI

First achievements

1) First complete analysis of the state-of-the-art
2) Use-Cases Specified
3) Preliminary Compilation of "Requirement Specifications"
4) 1st Compilation of Recommendations from members of the International Innovation Advisory Board (IIAB)
5) Preliminary "Plan to use and disseminate foreground knowledge"
6) Organization of two special sessions within the IEEE Industrial Electronics Society Conferences and Industrial Forum.