

IST-118 – SOA recommendations for Disadvantaged Grids in the Tactical Domain

Frank T. Johnsen and Trude H. Bloebaum, FFI, Norway

Peter-Paul Meiler, TNO, Netherlands

Ian Owens, Cranfield Defence Academy, UK

C. Barz and N. Jansen, Fraunhofer FKIE, Germany

Outline

Our paper presents lessons learned from IST-090, and the plan of work for the recently started IST-118.

Presentation outline

- What is SOA?
- Important findings: IST-090
- Introducing IST-118, the IST-090 follow-on group
- Conclusion

Service Oriented Architecture (SOA)

It is a paradigm, not a technology!

- Definitions in the “*Reference model for service oriented architecture 1.0*”, OASIS standard, October 2006:
 - “**SOA is a paradigm** for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. It provides a uniform means to offer, discover, interact with and use capabilities to produce desired effects consistent with measurable preconditions and expectations.”
 - “**A service is a mechanism** to enable access to resources, where the access is provided **using a prescribed interface** and is exercised consistent with constraints and policies as **specified by the service description.**”

Implementing a SOA

- The SOA paradigm can be implemented using different technologies
 - Examples are Web services, DDS, Corba, etc.
 - Currently, Web services technology is most widely adopted for this purpose.
 - Interoperable implementation based on WS-I profiles
 - Identified by NATO NEC feasibility study as the *key enabling technology for NATO NEC*
- However, the technologies have communication overhead
 - Web services and DDS have been looked at by NATO RTO/IST-090

IST-090 – SOA challenges for real-time and disadvantaged grids

- Motivation
 - The Service Oriented Architecture (SOA) approach has been chosen by the NATO C3 Board as the recommended method to achieve information interoperability in NATO.
- Objectives
 - identify challenges and show how to make SOA applicable at the tactical level
- Outcome
 - Awareness of challenges related to extending a SOA to tactical networks
 - Experimentation showing that SOA can work at lower levels than previously thought

Important findings: IST-090

- We identified three possible approaches to extend SOA to the tactical domain:
 1. Adapt existing Web services standards for use in disadvantaged grids.
 2. Use other technologies in certain sub-systems (e.g. DDS). Integrate these with Web services through the use of gateways.
 3. Employ other technologies in the entire information infrastructure.
- In IST-090 the two first approaches were both investigated
 - We adapted Web services for use in disadvantaged grids, and used DDS together with a DDS to Web services gateway in a sub-system.
- Because of the inherent interoperability benefits of Web services, the upcoming efforts in IST-118 will focus mainly on this technology.

Important findings: IST-090

- When adapting Web services to tactical networks, we identified three areas that need to be addressed:
 1. Dependency on end-to-end connections
 2. Network heterogeneity
 3. Network overhead
- In IST-090 we have addressed these issues both through national efforts and experiments, as well as through collaboration and the final IST-090 demonstration.

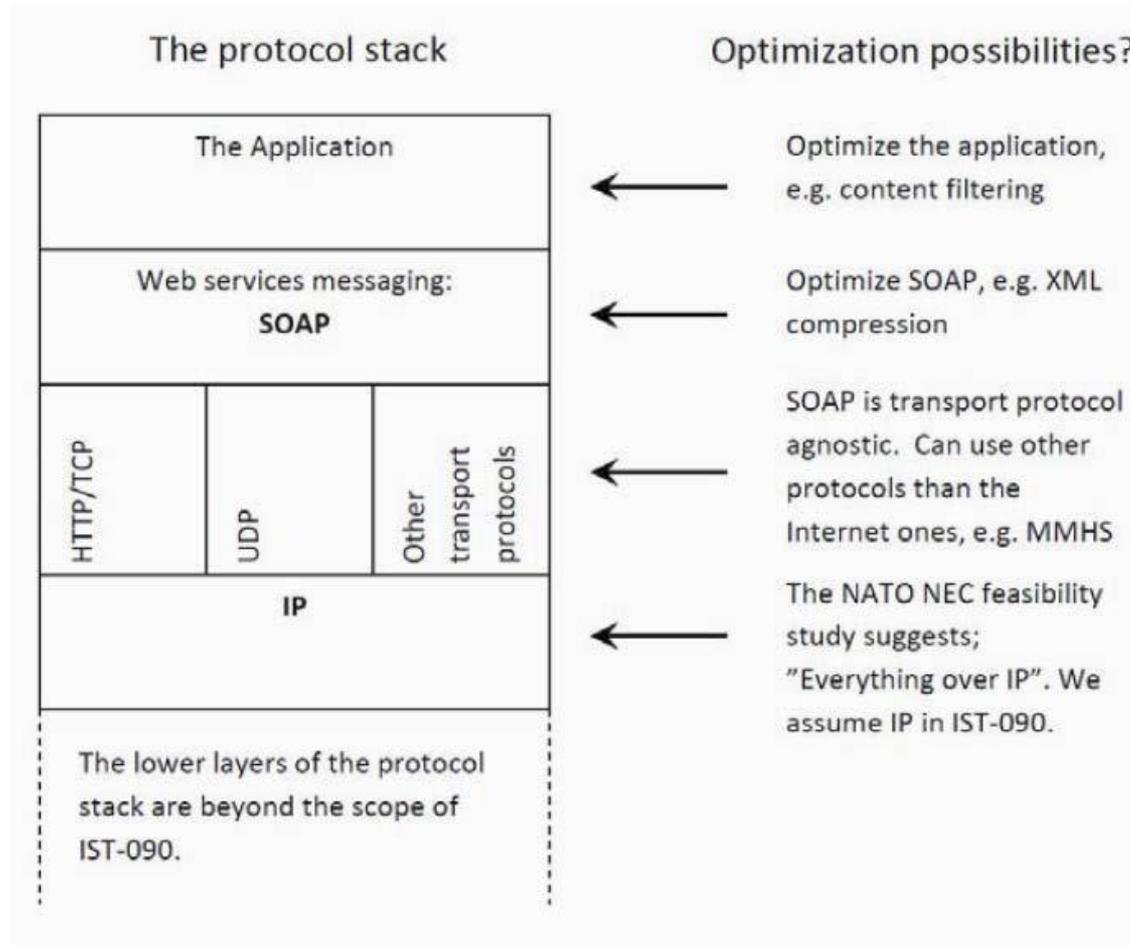
Important findings: IST-090

- Dependency on end-to-end connections can be removed by adding intermediaries (proxies) to the network.
- Hiding network heterogeneity
 - adopting the “Everything over IP” mindset
 - mitigating differences in network capacities and quality by adding delay tolerance to the messages exchanged
- Network overhead can be addressed through different approaches

Important findings: IST-090

- We considered different means to reduce the network traffic generated by Web services:
 - Reducing XML overhead with data compression.
 - E.g., EFX, GZIP
 - Reducing communication overhead by replacing the transport protocol.
 - Reducing information overhead by optimizing the applications' need for information exchange.
- Proxies provide a convenient place to implement optimizations, so that clients and services can be COTS.

Overview of optimization possibilities



Importance of standardization

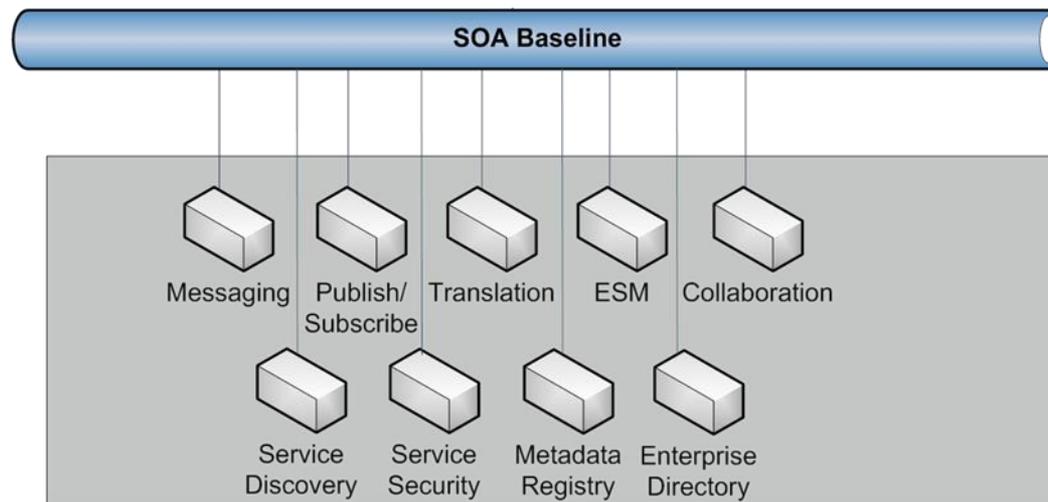
- A key principle when building a SOA is the use of standards in order to enable interoperability between domains.
- However, while basing system interaction on standards enables interoperability, it does not ensure it.
 - Optional features
 - Ambiguities
- Often, additional information is needed for interoperability
 - Interoperability profiles (by WS-I)
 - SOA baseline (by NATO CESWG)
 - These focus on infrastructure networks
- There is a need to provide guidance and best practices on how to make SOA applicable at the tactical level.

IST-118 – SOA recommendations for disadvantaged grids in the tactical domain

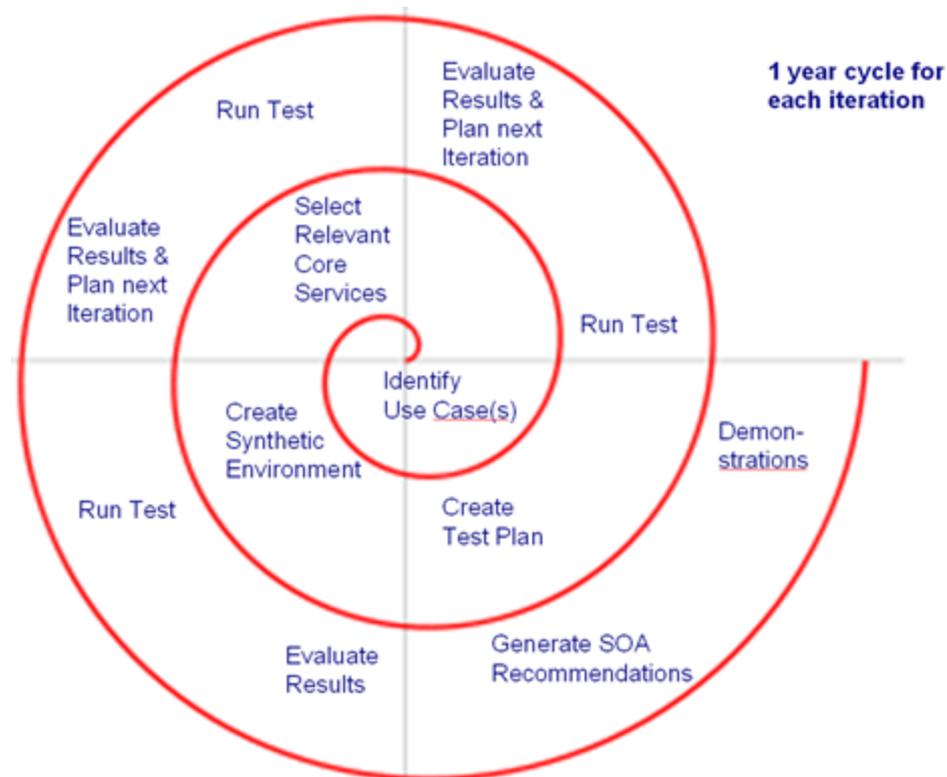
- IST-118 is a newly started NATO working group, which aims to provide concrete recommendations and guidelines when it comes to extending the SOA paradigm into the tactical domain.
- The group currently consists of domain experts from
 - the NATO Communications and Information (NCI) Agency,
 - Germany,
 - the Netherlands,
 - Norway, and
 - the United Kingdom.
- Interested in contributing/participating?
 - Please contact the group chairman, Peter-Paul Meiler (peter-paul.meiler@tno.nl).

NATO IST-118

- The main focus is on identifying what we call tactical SOA foundation services.
 - which core enterprise services do we need support for in the tactical domain?
- We aim to investigate how services from the SOA baseline can be extended for use in tactical networks → *Tactical SOA profile*



IST-118 spiral approach



Conclusion

- We have seen the main findings of IST-090. Recommendations from that group include employing optimizations such as
 - removing the dependency on end-to-end connections,
 - addressing network heterogeneity, and
 - reducing the network traffic overhead of Web services.
- The group suggested introducing proxies to implement these optimizations, in an attempt to provide a separation of concerns between proprietary enhancements and COTS services and clients.
 - Alternatives to Web services (e.g., DDS) were considered for use in certain sub-systems, but the main focus was on Web services as that technology has been identified by NATO as the key enabler for NNEC.
- IST-118 is a recently started NATO STO group intended as a follow-on to IST-090.
 - The goal is to provide a profile for using (a subset of) the core enterprise services in tactical networks: a *Tactical SOA Profile*
 - All NATO nations are welcome to join the group