Coalition C2 Interoperability Challenges

Peter Gorm Larsen

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- Systematic Profile
- Coalition Interoperability Challenges
- Summary

Systematic Software Engineering A/S

Århus, DK

- Headquarters
- Project oriented software development
- 311 employees
- SEI CMMI Level 5, ISO 9001:2000 certified and AQAP 110+150

Copenhagen, DK

- Professional services
- 14 employees

London, UK

- International sales & marketing
- Product orientation
- 44 employees
- ISO 9001:2000 certified

Washington, USA

- Sales & marketing, USA
- Product orientation
- 6 employees

Systematic Software Engineering A/S

Mission Critical

- Established in **1985** and now Denmark's **largest privately-owned** software and systems company
- **370+ employees**; 70% hold a MSc or PhD in software engineering
- High **employee satisfaction** – attractive **workplace** for **ambitious** software engineers
- Dun & Bradstreet credit rating: **AAA**
  - **High solidity. No bank debt** – fully **self-financing**
  - CMMI **Level 5** and ISO 9001:2000 and AQAP 2110 + 150
  - Supplier of products and projects to more than **27 countries**, **export share** is 60%
  - 97% of our **customers would recommend Systematic** to other customers
  - For further information – see **www.systematic.dk**

SYSTEMATIC
software engineering

The IT-Knowledge Company

Interoperability Solution Bricks

IRIS Connects

Systems

Nations

Forces

The IRIS Messaging Suite:

- IMT
- IOM for Outlook
- IRIS Forms
- IRIS DEF

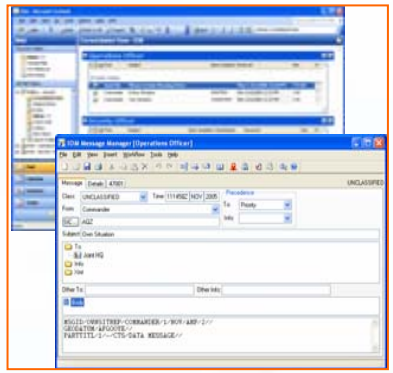
MIP Suite:

- SitaWare
- Pocket SitaWare
- IRM

IRIS Messaging Suite Overview

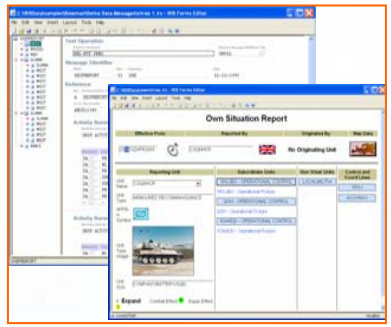
IRIS Organisational Messaging

- COTS Messaging Systems supporting role based organisational messaging.
- IOM as Windows solution based on MS Exchange & Outlook.



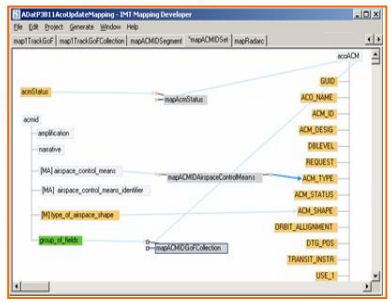
IRIS Forms

- COTS product for structured document handling.
- Automated data entry forms understandable to both humans and computers.



Information Mapping Tool

- COTS product to map between dissimilar formats.
- User friendly graphical way to translate data between messages and/or databases.



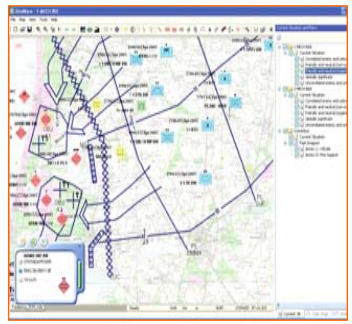
MIP Suite Overview

SitaWare

- COTS Core C2 functionalities
- Situational Awareness and BFT on tablet, laptop and desktop

IRIS Replication Mechanism

- COTS interoperable infrastructure
- Infrastructure on handheld, tablet and desktop



Pocket Suite

- Situation Awareness and BFT on handheld devices
- Complete with infrastructure and messaging

IRIS Customers

NATO

- NATO HQ, NC3A, SHAPE HQ, NATO Commands

National Ministries of Defence in 27 countries

- Austria, Australia, Belgium, Bulgaria, Canada, Czech Republic, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland, Turkey, UK, USA, UAE and Slovenia

Active Marketing in Many More Countries

- Lithuania, Slovenia, Saudi Arabia, UAE, Oman, Malaysia, Singapore, New Zealand & Chile
- Other countries that NATO co-operates with through Combined Endeavor

Defence Contractors

- Alcatel, BAE Systems, Boeing, CDC, DASA, EDS, ICL, Lockheed Martin, MacDonald Dettwiler, Marconi Mobile, Northrop Grumman, Raytheon (Hughes), SAIC, Telefonica, Thales, etc.

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Proposed Interoperability Silver Bullets

- You've probably heard one or more of the following 'silver bullets' to interoperability proposed:

XML solves the interoperability problem

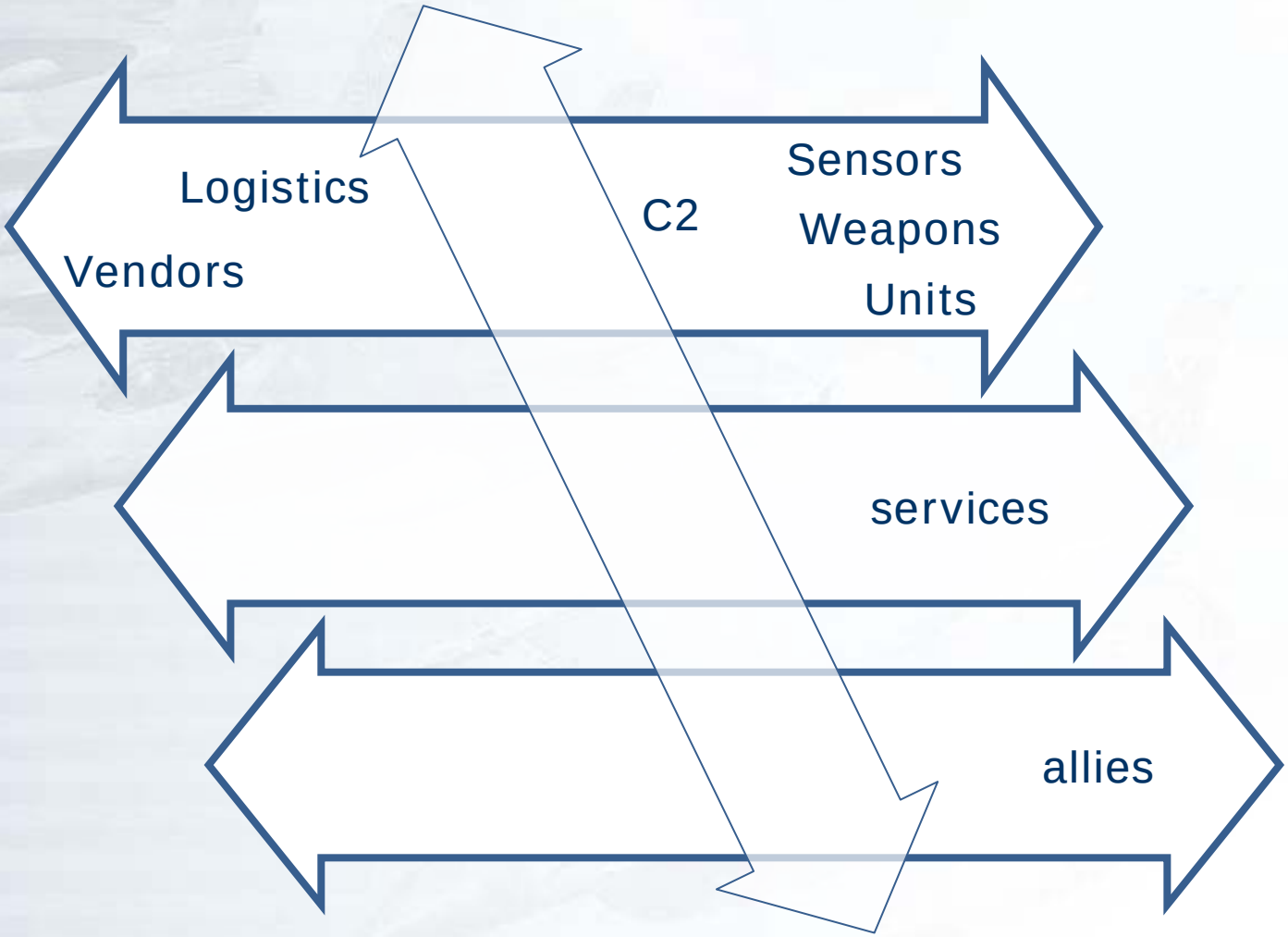
Web services (SOA) solve the interoperability problem

Common data models solve the interoperability problem

<insert buzzword here> solves the interoperability problem

- They are also very buzzword compliant.
- They are, however, also ... **NOT TRUE**.
- There is no 'silver bullet' that will solve the interoperability problem.

Interoperability 'Busy Slide' Simplified



Layered Reference Model

It is useful to use a layered reference model when discussing interoperability...

- OSI layered network model
- SW 7-layered architecture model

In short, when discussing interoperability, we are talking about

- Connectivity
- Syntax (i.e. protocols)
- Semantics (i.e. message- and data model standards and their meaning)

Addressing Proposed Silver Bullets

XML (eXtensible Markup Language).

- Allows you to define structure of data (and thereby messages), and to pass both definition and actual data electronically ("Here is the data, ... and here is how to read it").
- Very strong tool in definition of and exchange of data.
- Syntax level (borderline semantics).

SOA (Service Oriented Architecture)

- An architectural framework for building flexible, extensible, scalable systems.
- Connectivity level (system structure), syntax level (via use of XML).
- (Web Services is an implementation of SOA)

Common Data Models

- ['Common' means 'standard', so I will address standards in general ... on the next slide]

Addressing Proposed Silver Bullets (2)

~~Common Data Models~~ ... Standards

- We are going to have to manage a variety of standards because of:
  - Different areas of applicability
  - Different national interests.
- Even in the *utopian* scenario, where we ended up with one standard (the one standard to rule them all), we will see different *versions* or *baselines* of that standard.
- There is no such thing as instantaneous upgrade (across a fleet, a nation, a coalition, ...), so we will *always* have to be able to map between different versions of a given standard (in the best case, and between standards otherwise).
- It seems to be easier to agree on standards in the lower layers of the layered reference model (i.e. towards the connectivity end) than at the higher layers.

Paradigms for Exchanging Information

	Pros	Cons
Messaging	Loose coupling Manual security Proper baselines	Not real time Alternative standards Man-in-the-loop (historical)
Data model	Modularity Near real-time	Closer coupling Data size keeps growing Full history
Data link	Near real time Jamming resistant	Lack of modularity Expensive Lack of baselines

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Summary

- There is no ‘silver bullet’ that will solve the interoperability problem, ...because interoperability is not a *problem* that can be *solved.*
- Interoperability is a *persistent challenge* that must be addressed every time we integrate systems.
- There are technologies (buzzword compliant technologies too) that help *facilitate* interoperability (mainly at the connectivity and syntax levels).
- Standards makes the job easier, but there will *always* be differences to be overcome.

Thank you!

Any questions?