Paper ID 004

NATO Network Enabled Capability (NNEC) challenges: Why NATO Air Command and Control System (ACCS) might be a good case?

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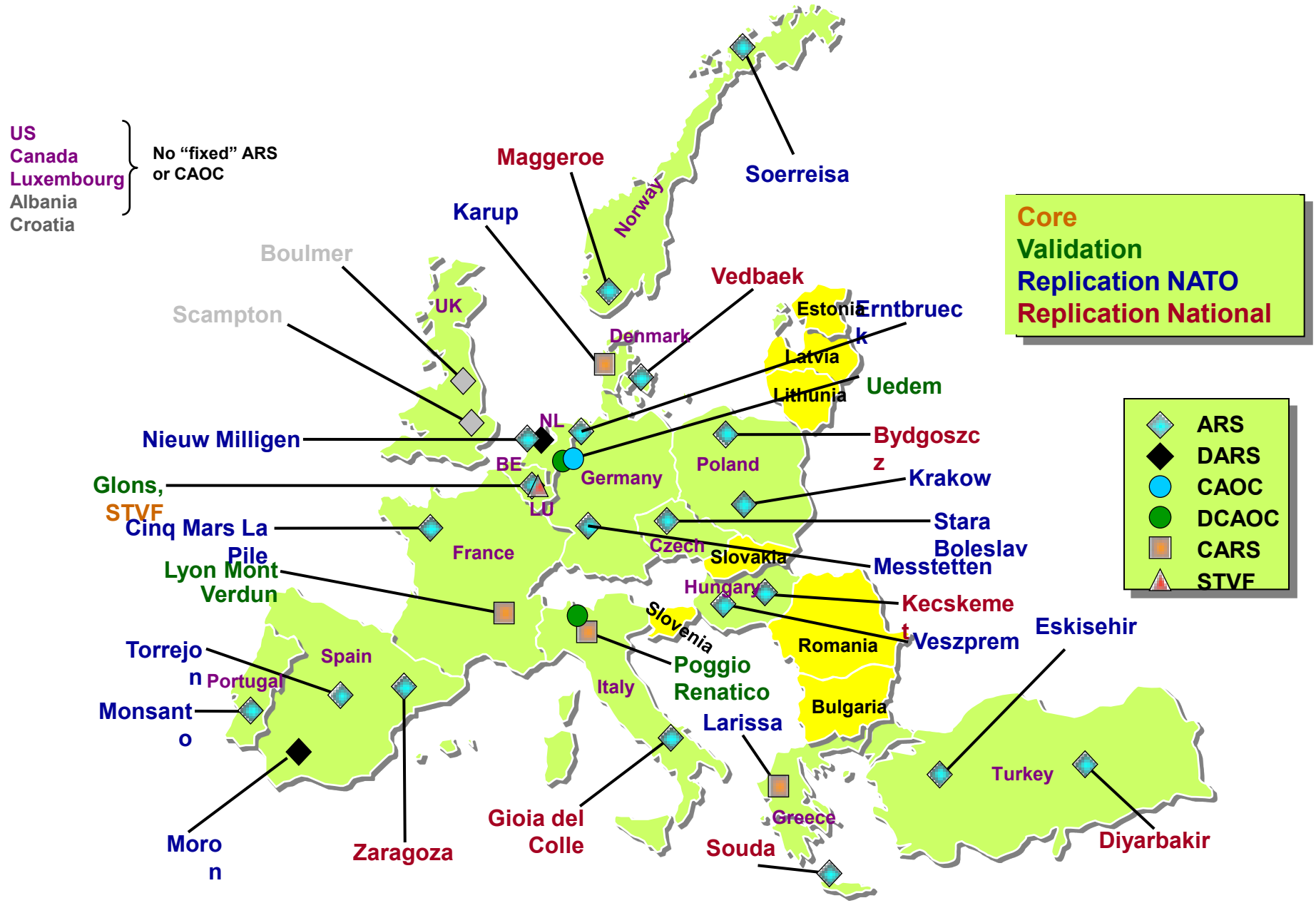
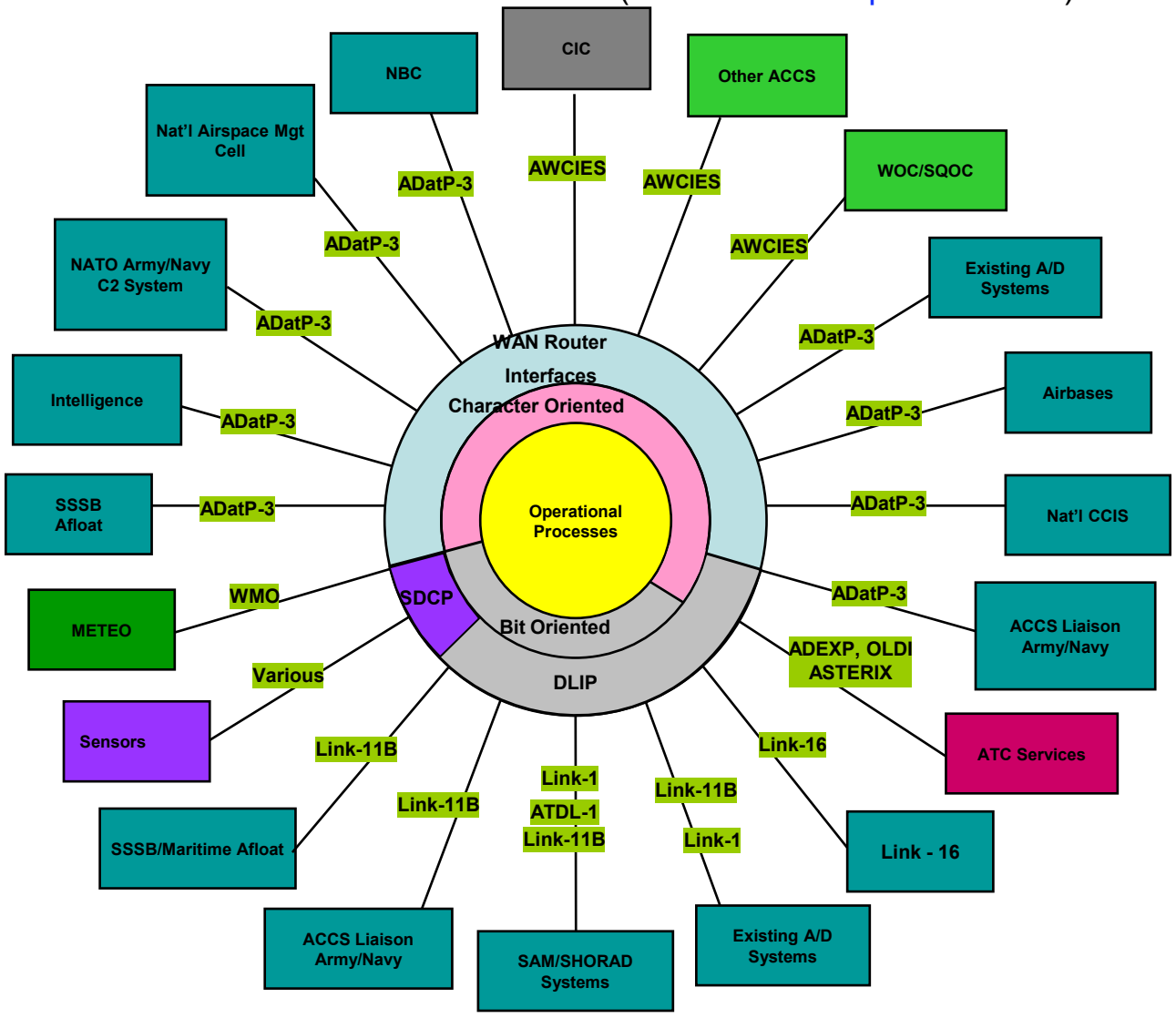
Coarse grain : Why ACCS is a good Case?



AWCIES with 6500 Physical Interfaces have Transformation Challenges Similar to other Capabilities

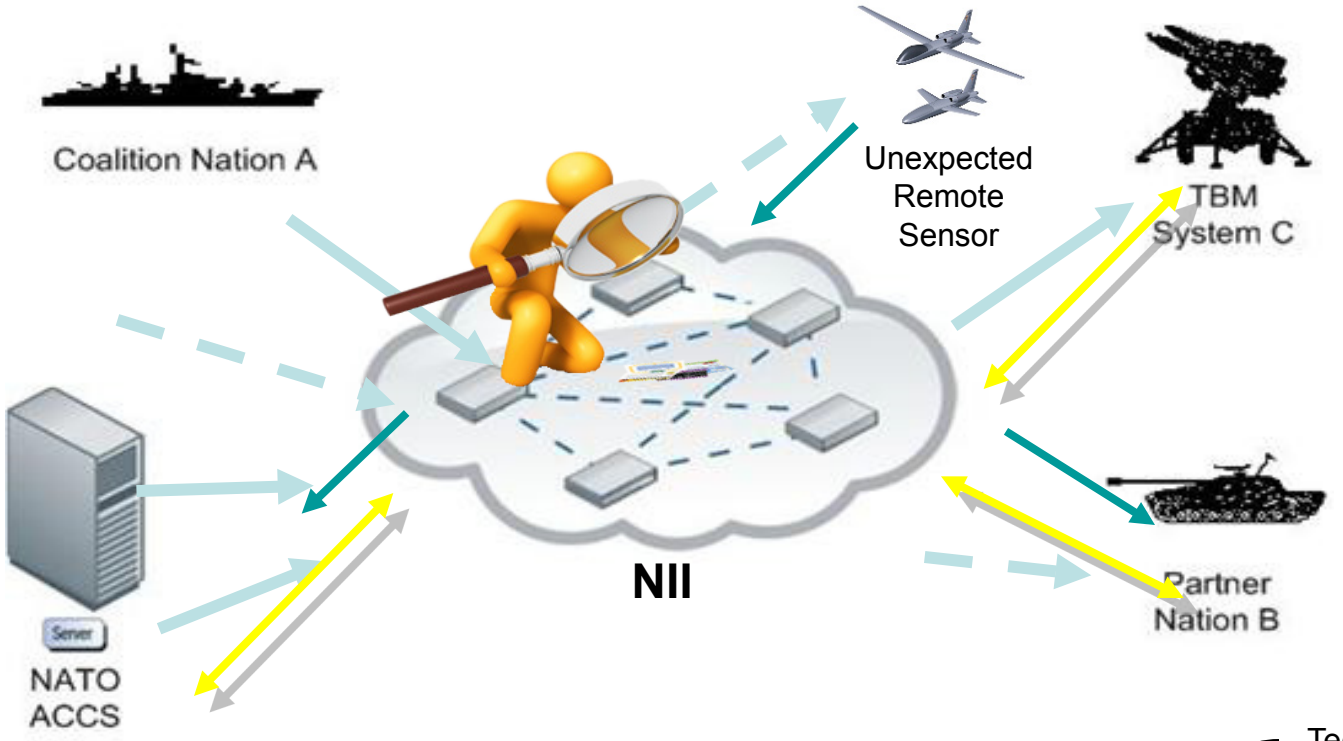
(connect to unexpected users)

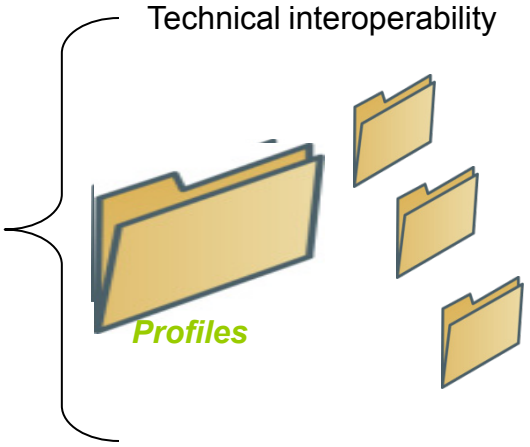


What are NNEC Identified Convergence Challenges?

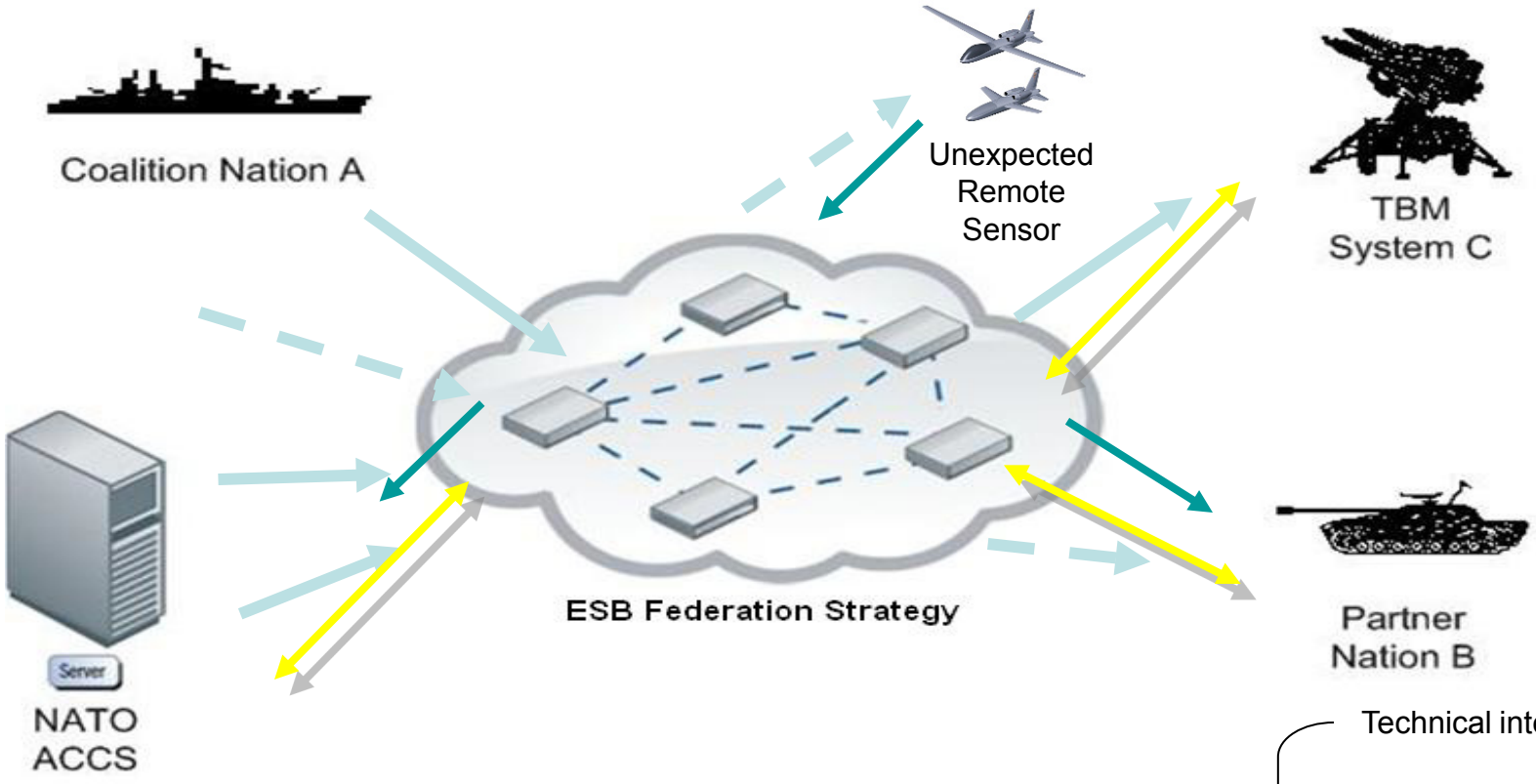
- Implement SOA on existing and/or developmental systems
- Limit impact on existing architectures when interfacing with an unexpected source
- Flexibly share information between NATO, Nation and coalition within future operations types
- Provide technical interoperability using non-NATO standards and formats
- Allow NATO and National programs with different levels of ambition and implementation timeframes to converge to NNEC
- Adapt to any NATO coalition or partnership or ad hoc need to share information

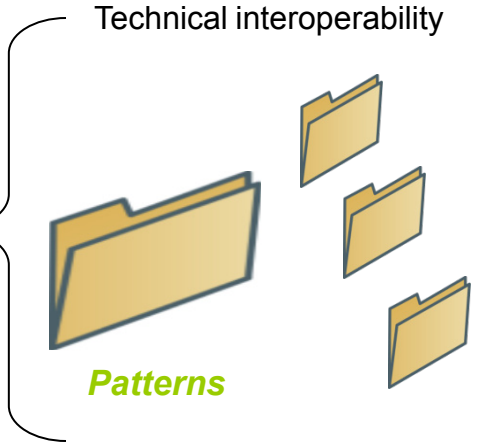
NNEC Challenges: Interoperability with "Unexpected" in Coalition Environment





ESB Federation Strategy and Patterns are Proposed Approach to NNEC Challenges

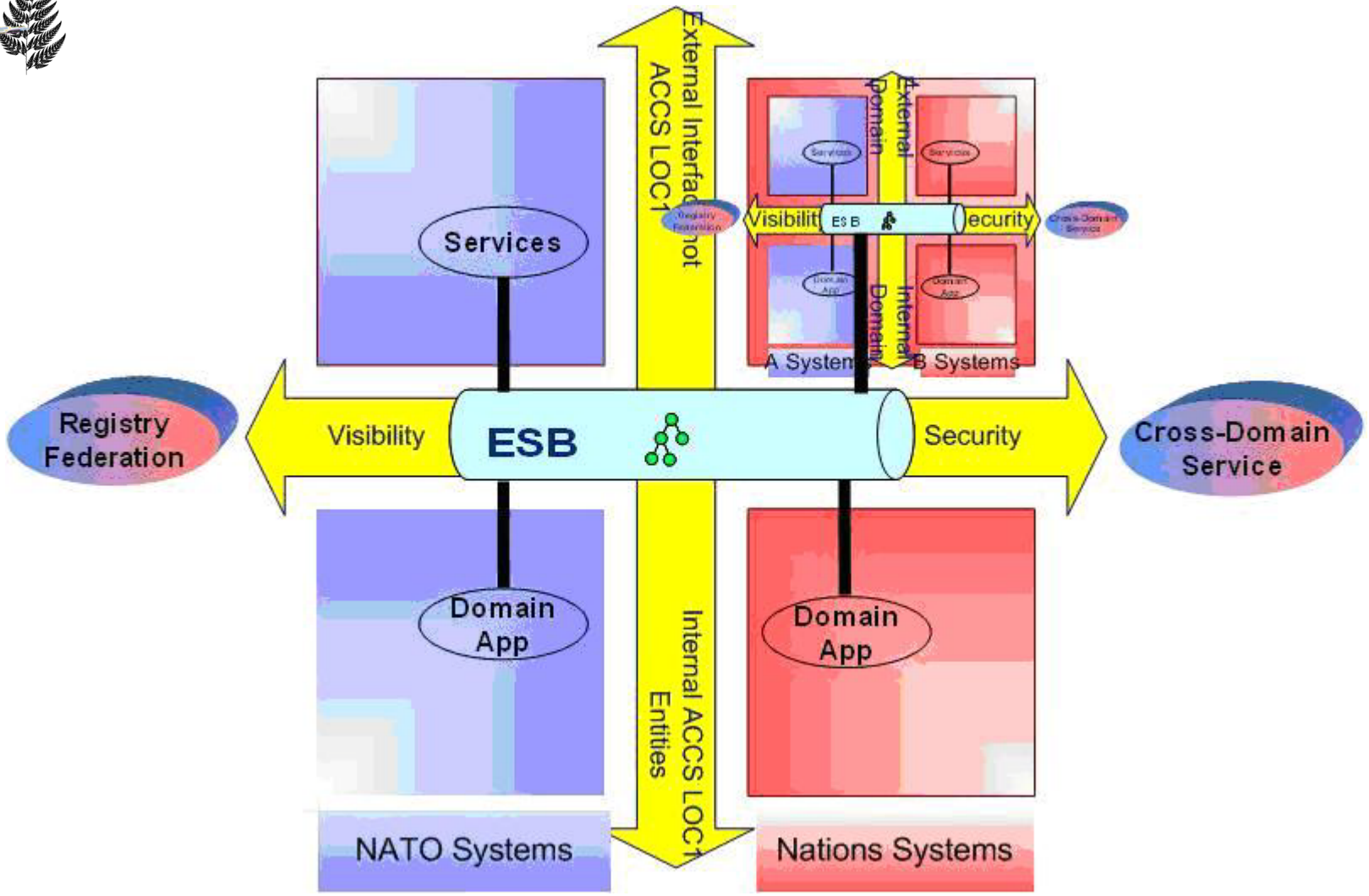




ESB Federation Strategy

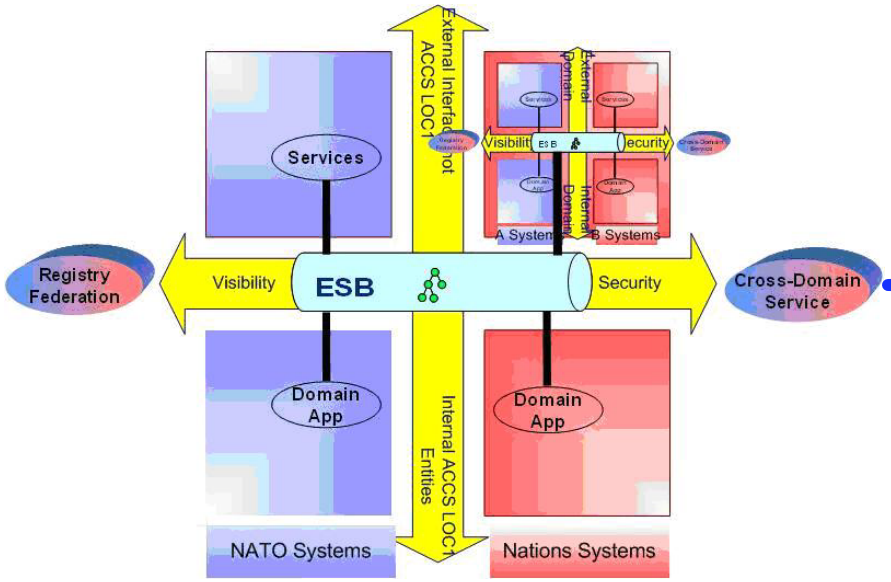
- The strategy is to federate all vendor-independent ESB initiatives and allow NATO and Nations' systems to flexibly share information
- The ESB federation could be built incrementally with systems being added or replaced in a repeatable pattern
- Topologically, the ESB federation can be seen as a complex network of systems, applications and services connected to nodes, which are the ESBs: The Fractal Approach

ESB Federation Coarse Grain Strategy: ACCS NNEC* Perspective



* Prototype for post ACCS LOC1

ESB Federation Strategy Based on Four Similarity Elements



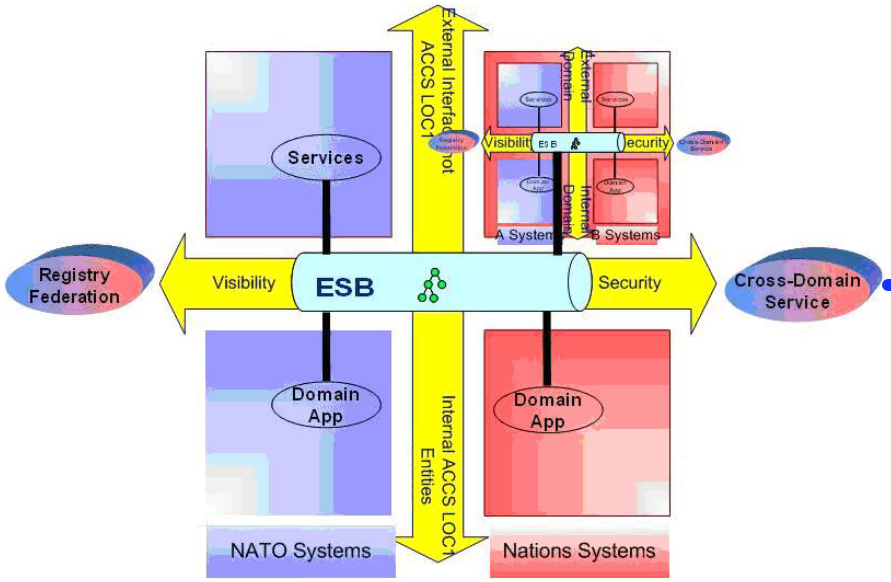
1) **Visibility**

2) **Security / IA**

3) **Information Required**

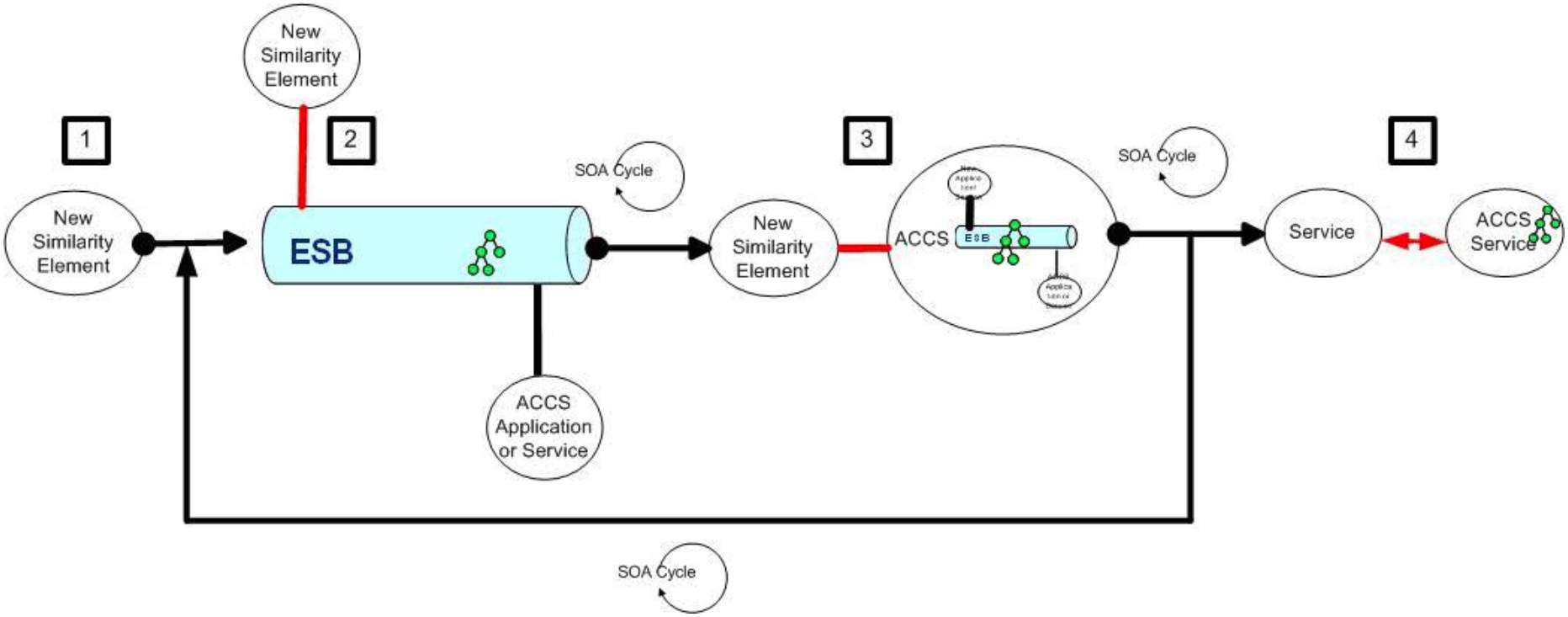
4) **Other ESB connections**

Five Environmental Parameters Generating Irregularity of Patterns



1) **Operation type (i.e., relief, asymmetric…)**
2) **NATO partnership (i.e. EU, UN, PfP,...)**
3) **Technology availability (i.e IPv6, Web,…)**
4) **Interoperability targets (i.e ambition, strategy, objectives, effects,...)**
5) **Time (i.e., operations duration, deployment timeframe, operation date,…)**

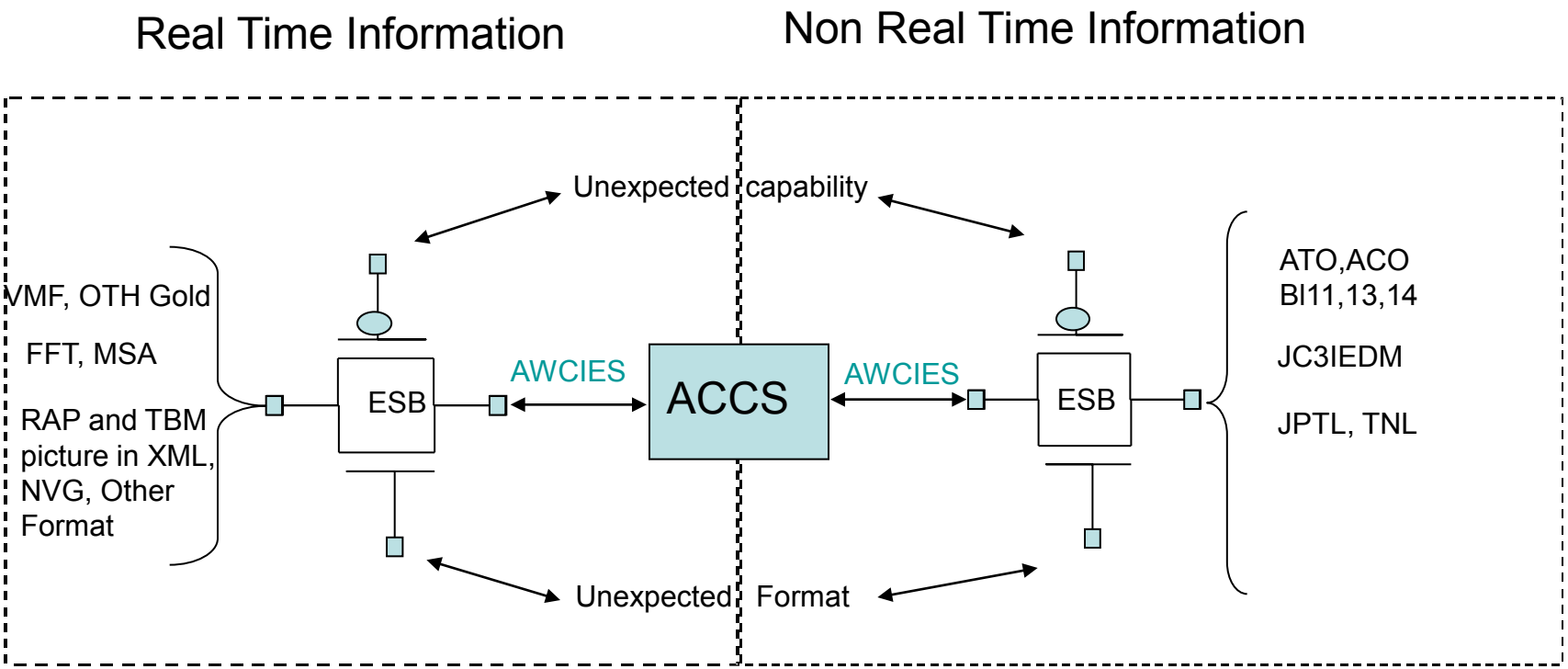
ESB Federation Fine Grain Strategy: ACCS NNEC* Perspective



- The ESB federation strategy can also be adopted as an agile transition to a potential direct/better future interface pattern
- However the agile ESB federation strategy will remain extant until it is replaced by a better strategy because of the instability of environmental parameters

* Prototype for post ACCS LOC1

What was investigated and Studied? AWCIES readiness to "Unexpected Users"



- Some future interfaces, standards and formats have been identified and assessed
- ESB federation patterns from ACCS perspective based on:
  - up to 4 different (vendor-independent) ESBs connected, environmental parameters and Likert scale multi-criteria decisions
- Stakeholders involvement and governance needed

FFT Proof of Concept Overview

Link16

J3.5
(Friendly)

TST

J12.0 (8) *Investigate*
J12.0 (5) *Engage**

CAS

J12.0 (20) CAS
J12.4 Change to FAC control

ARS

NFFI

FFTS

Proof of Concept Conditions

PoC Figures	Description
Fighter Simulator	2 (TRS, IABG)
FFT Provider	3 (Imp@ct KFOR, BFTS-NO ISAF, BFTS NC3A)
FFT Format	NFFI 2.0, NFFI 1.3
Transport protocol	IP1 (TCP/IP Socket), IP3 (Web Service PUB/SUBS)
Operational Scenarios	TST, CAS
ACCS Display	DISPMX (ACCSLOC1), LUCY (ACCS Exp)
FFT Refreshment Rate	3 Min, 1Min, 10 Sec
L16 Network	SIMPLE
Fighter Location	Remote (IABG) On Site (TRS)

- Quick-Win: NNEC-2 Software Development achieved within 7 weeks.
- No change in ACCS LOC1 designed architecture
- Minor modifications in ACCS LOC 1 existing functionalities

NNEC-2 Qualitative Results

IO Item	Status	Comment
Fighter Simulator: 1. TRS 2. IABG (EuroFighter)	1. Success 2. Limited Success	1. No comment 2. IABG was able to play only during last CWID week
FFT provider: 1. Imp@ct KFOR: 2. BFTS-NO: 3. BFTS NC3A:	1. Success 2. Success 3. Success	No Comment
FFT format: NFFI 2.0, NFFI 1.3	Success	No Comment
Transport protocol: IP1, IP3	Success	No Comment
Operational Scenarios: 1. TST 2. CAS	Success	No Comment
ACCS Display: 1. DISPMX (ACCS LOC1) 2. LUCY (ACCS Exp)	1. Success 2. Success	1. DISPMX resolution to be improved 2. No comment
FFT refreshment rate: 1. 3 Min 2. 1Min 3. 10 Sec	Success	Optimal rate on the log files See final report

What were the Results and so What?

1. ESB Fed Strategy enabled us to capture technical requirements and implement SOA concepts without alterations to the contracted system like; NFFI, collaborative tools Web Service mechanisms, Registry
2. provided reference for SOA concepts implementation in legacy systems
3. Achieved interoperability with unexpected capability such as US and DEU systems
4. Demonstrated that ESB Fed Strategy addresses the challenge of having capabilities with different NNEC implementation speed
5. Enabled to test and benchmark new technology before any commitment for acquisition
6. showed that ESB federation strategy can be rapidly deployed and be cost competitive

What were the Conclusions?

- Technical Interoperability is still a challenge
- NNEC implementation plans are not comprehensive enough; missing major air assets
- While not a panacea, ESB is a tool that can support sharing of information with unexpected capabilities
- NATO led coalitions C2 can easily implement ESB federation strategy
- Still changes and proactive actions need to be taken to support NATO transformation and NNEC challenges