

➔ **Tactical Service Bus:**
*The flexibility of service oriented architectures
in constrained theater environments*

Tactical Edge in NATO Context ➔

Tactical still very much under control of national forces:

- Zone of Operations
- Coordination between zones at operative levels

Evolution towards more collaboration at tactical level:

- Friendly force tracking
- Close Air support
- REACTIVITY
- Collaborating at tactical level implies using radio communication systems
 - Common waveform, common settings
 - Software Defined Radio

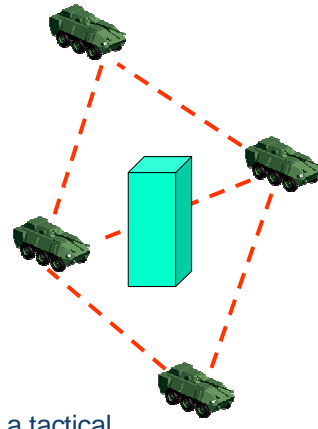
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Radio Communications in a tactical environment

Radio communications over VHF/UHF/... :

- Un-guaranteed connectivity:
 - Distance versus radio range
 - Path obstruction and jamming
 - Mobility
- Radio Errors:
 - Corrupted data/retransmission delays
- Radio silence:
 - Listening only
- Limited bandwidth, variable throughput
 - Shared spectrum & Multiple hops
- No IP broadband always-on connectivity in a tactical environment in a foreseeable future



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Operational procedures may partly work-around those limitations

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Impact on field information systems

Lack of connectivity guarantee

- Uncertain remote service availability

Changing topology

- No guaranteed Service Delivery

Radio Errors & Silence

- No guaranteed Data Delivery

Platform self management:

- Autonomous information system
- Need for data caching and synchronization

Service and Platform Mobility management keeping track of:

- The platform presence in the network
- The platform network topology
- The services to platform binding

Data and service delivery management:

- Message formatted according to operational context (situation, recipients, radio silence)
- Service behavior adapted to underlying network capabilities

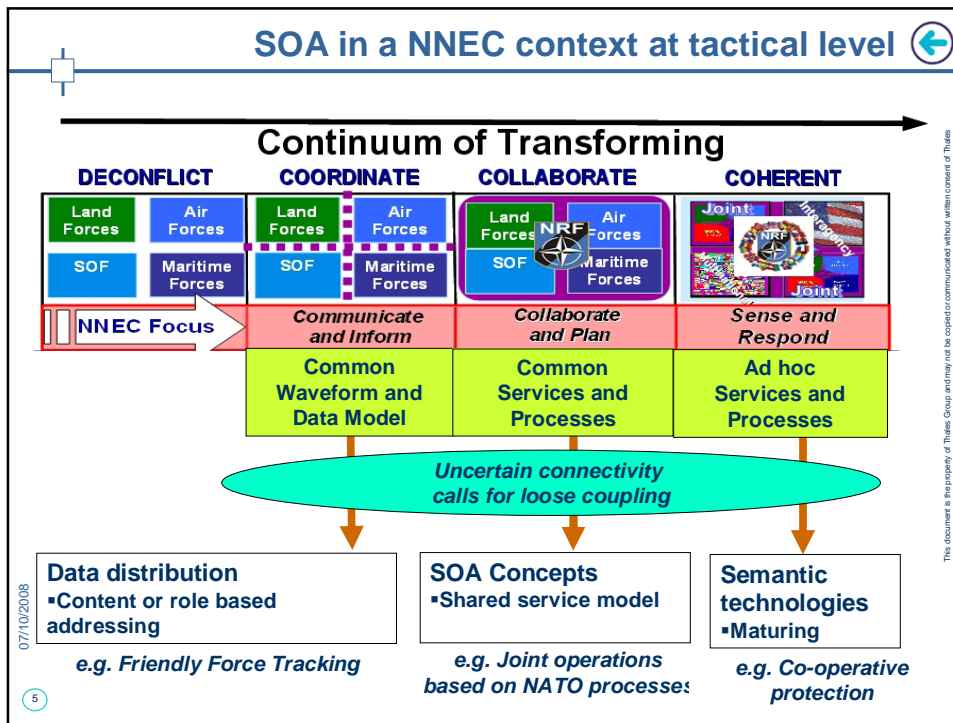
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SOA in a NNEC context at tactical level



Enterprise Service Bus in tactical environments

- SOA widely implemented on Enterprise Service Buses.
 - Reactivity based on business indicators and processes
- Foreseeable issues of ESB deployments on tactical radios:
 - Deployment:
 - ESB assumes IP, not all tactical radios are IP capable.
 - Permanent connectivity – LAN networking
 - Performances:
 - Huge overhead due to SOAP/XML/HTTP/TCP/IP protocols
 - > x20 versus raw data size.
 - ESB unlikely leverage IP multicast on radio bearers
 - Limited data & service delivery control:
 - Fixed & reliable broadband connectivity assumed.
 - Unaware of topology and mobility
 - Unaware of operational priority
 - 2 service levels only: full service or no service

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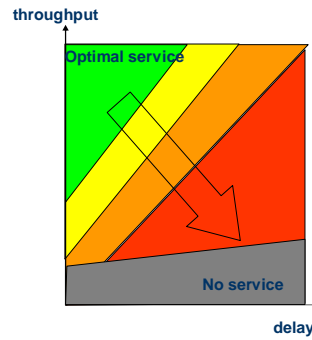
Tactical Service Bus approach

■ The TSB interconnects “tactical” data & services providers

and consumers with the following features:

- Mobility & Presence Management
 - Any network topology, any bearers
- Data and Service Delivery Management
 - Synchronized service registry
 - Service adaptation to network conditions
 - Optimized routing taking into account broadcast capabilities of radio bearers
 - Message formatting according to operational needs:
 - Reliability, Priority and targeted receivers
 - Content dependent data compression
- Loose producer & consumer coupling:
 - Publish/Subscribe/notify paradigm
- Data and Service interoperability with other systems
 - Standard interfaces: legacy and new SW applications
 - Data Dissemination System over LAN (DDS) and Tactical Data Link (TDL)

Service Behavior Example:



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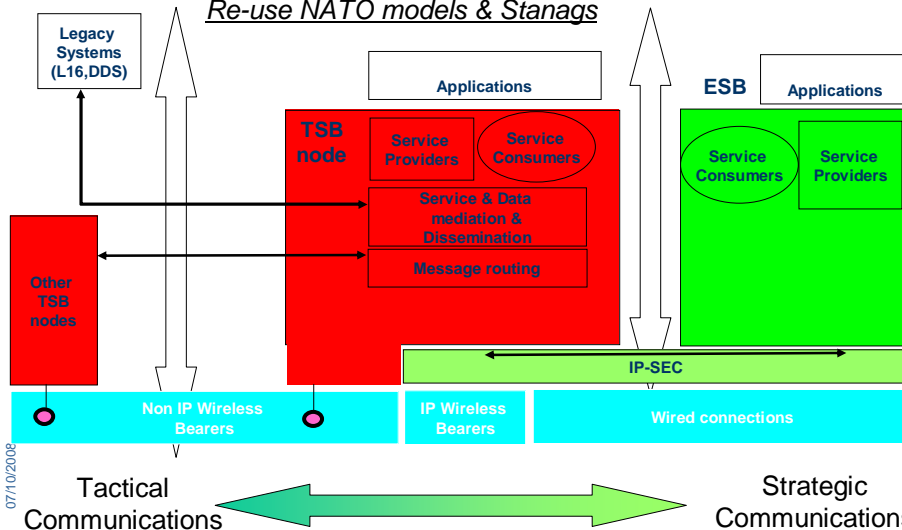
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TSB in an open environment

Standardized data, message & service models:

Re-use NATO models & Stanags



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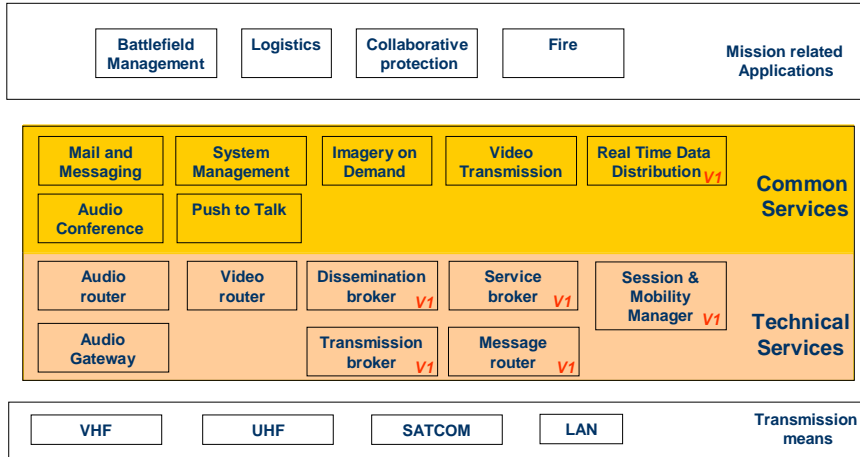
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Supported Services and Applications

TSB brings technical services but also common generic services:



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9

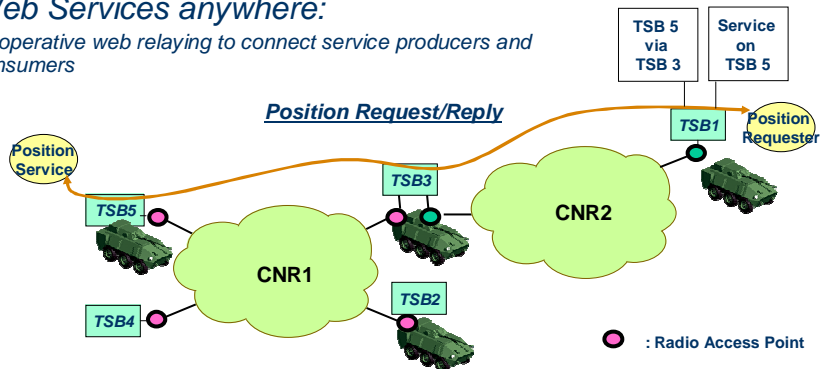
V1 : available as part of 1st TSB release

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Ubiquitous service access

Web Services anywhere:
Cooperative web relaying to connect service producers and consumers



Optimized for constrained networks:
Built on web message compression to reduce service access delay

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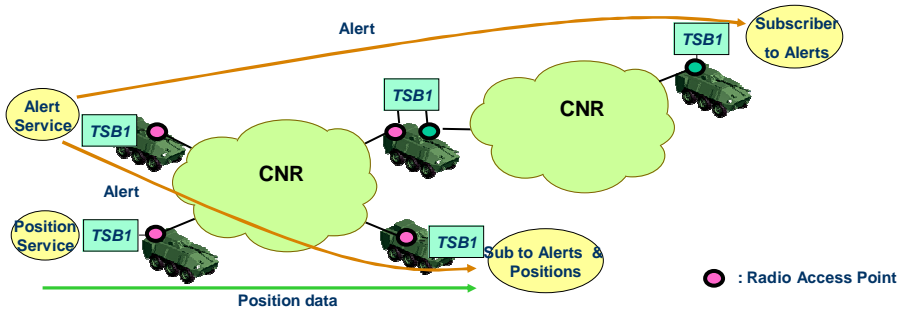
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Event based services

Real time event notifications:
Alerts, Situation Awareness, Chat



Mission aware system:
message prioritization, bandwidth pre-emption

Data dissemination:
Publish/subscribe/notify model

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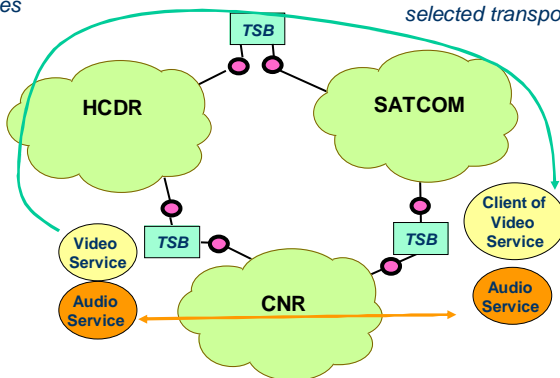
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Matching Services and Resources

Performance based routing:
Selects routes offering required
Service performances

Service transport:
Optimize service flows to
selected transport bearers



Service robustness
Service delivery level adapted to available
capacity/performances

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TSB background

RTO/IST-061 RTG-027 (2004/2006):

- Secure Service Oriented Architectures (SOA) Supporting NEC CWID (2006):

- Demonstration of Secured Web Services, Data Labeling & Data Dissemination through extended NATO IEG

EDA LARA (2005/2006) project:

- Dissemination of sensor data in a maritime environment

- Ad hoc radio system with bandwidth allocation

Thales @SIMOV demonstrator (2007/2008) :

- Land system of system demonstrator highlighting operational scenarios & benefits

- Real time distributed Mission System

- Real radios – simulated air medium

- Sense and respond scenarios

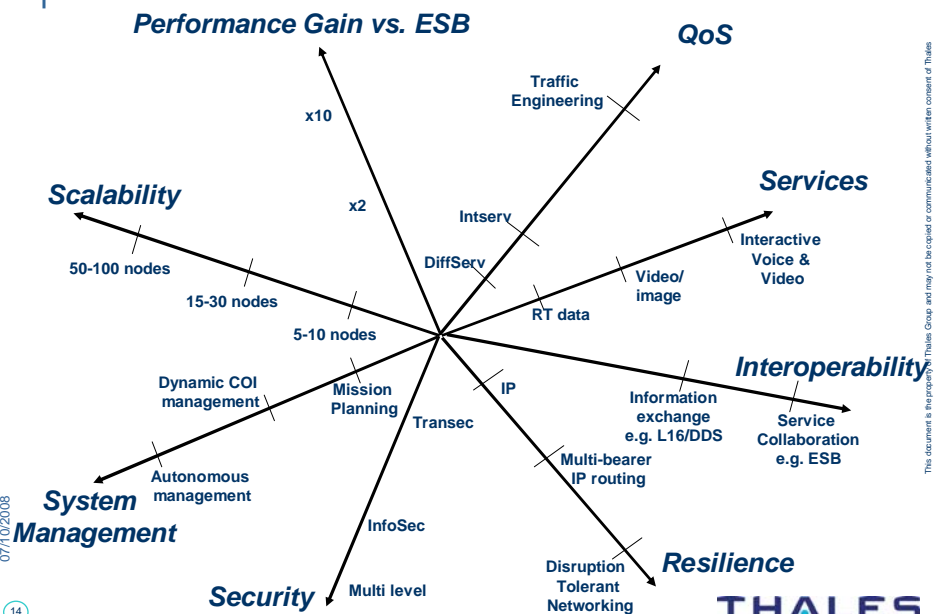
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TSB key progression & evaluation axes



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