Bridging the Digital Divide with Net-Centric Tactical Services (NCTS)

Agenda

- Introduction & Background
- Digital Divide Challenge
- NCTS
- Questions
Experience with Tactical Sensors & Systems Integration

- **Sensors**
  - Laser range Finding Binoculars
  - UAVs
  - RFID Active and Passive Tags
  - Environmental Sensors
  - GPS
  - Chemical and Biological sensors
  - Barcode Scanners
  - Digital Cameras and Video Recorders
  - Unmanned Ground Sensors (UGS)

- **Mobile Computing Devices**
  - Talla-Tech Ruggedized PDA (RPDA)
  - Inter-4 Devices
  - Commander’s Digital Assistant (CDA)
  - Ruggedized Laptops and Toughbooks

- **Short Range Communications and Local Networks**
  - SINCGARS
  - PRC-148
  - 802.11
  - Bluetooth
  - Ad Hoc Networks

- **Long Range Communications**
  - PSC-5
  - PRC-117
  - Iridium
  - Inmarsat
  - Globalstar

- **Enterprise Systems and Global Networks**
  - C2 Systems
  - Intelligence Systems
  - Logistics Systems
  - Enterprise Portals

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Operational Context
Integration Challenge

- The current DoD trend is moving towards Net-centric operations / Service Oriented Architectures (SOAs) that are based on enabling technologies such as TCP/IP, XML and SOAP. This solution is optimal for an enterprise or Global Information Grid (GIG) environment.

- However this solution cripples “disadvantaged” devices operating over tactical radio networks at the edge of the battlespace.

- A solution is required that leverages the flexibility of the SOA environment without crippling tactical radio networks.

![](image)

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The Digital Divide: Enterprise vs. Tactical

- **Enterprise Environment**
  - Provides strategic and operational planning
  - Unconstrained Bandwidth (>10Mbps)
  - Stable Communications Infrastructure
  - Need to pass large amounts of data in a timely manner
  - Need to discover and share data across disparate systems without developing new interfaces
  - Need for extensible, scaleable, and flexible standards to allow new systems to come on-line and integrate easily
  - Works well for NCES enabling technologies (XML, HTTP, TCP/IP, SOAP, HAIPI, etc)

- **Tactical Environment**
  - Provides operational execution
  - Constrained by low bandwidth (<10 kbps)
  - Constrained by unstable, dynamic communications networks and connections
  - Tightly coupled to others defined on the tactical network, they have no way of getting information without knowledge of ‘what is out there’
  - Only need the relevant data for their Area of Responsibility (AOR)
  - Have well defined information needs
  - Need to receive actionable information in a timely manner that has immediate relevancy

Impact of Net-Centric Technologies

- **Standard Technologies**: include WSDL, SOAP/XML, HTTP, TCP/IP
- **Goal/Benefit**: Provide discovery, reuse, understandability, and accessibility to enhance coordination and collaboration of information
- **Cost**: Require robust bandwidth to be effective
- **Impact for the Tactical User**: Bandwidth availability on tactical communications networks is too limited for a complete SOA implementation.
Example: SA Messages of Equal Value

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### Solution

**Net-Centric Tactical Services (NCTS):** Develop a set of “Tactical Services” that act as a gateway between the tactical network and a SOA Network.

- Provide infrastructure services that extend the concepts of NCES and can be used for all COI
- Develop COI specific services

**Standardize:** Adopt “enabling” technologies and specifications as standards optimized for the low-bandwidth tactical environment.

- Example: Joint Variable Message Format (JVMF) as one standard messaging specification in place of XML on the tactical network
- Example: Sensor Data Link (SDL) as another standard data specification

![Diagram of NCTS](image)

**NCTS Capabilities**

- Provides a directory service of connected devices and sensors
- Provides meta-data descriptions of available tactical data
- Implements a message translation service
- Utilizes Discovery Services to find available services
- Implements SOAP and WSDL interface with enterprise consumers
- Functions as a protocol gateway between the enterprise and tactical networks
NCTS Components Overview

- **Tactical Network Interface** – connects to low-bandwidth tactical devices through tactical messaging formats & communications protocols (e.g. JVMF, MIL-STD 188-220C).

- **Mediation Engine** - manages the overall information mediation process including message translation.

- **Device Manager** – registers tactical devices and manages connection states and metadata of devices; provides off-line data queuing mechanism for tactical devices to ensure information delivery.

- **Subscription Manager** – manages subscriptions of tactical devices and enterprise systems.

- **Web Services Interface** – connects to high-bandwidth SOA services/systems via XML, SOAP, and WSDL technologies; allows enterprise systems to subscribe to tactical data.

- **Databases/Queues/Caches** – persists or caches data between the tactical network and enterprise; stores registered devices and subscriptions.

Summary of NCTS Services

- **Tactical Interface Services**
  - **Device Registration Service** – allows tactical devices to register with NCTS
  - **Report Publishing Service** – provides ability for tactical devices to publish reports to the enterprise
  - **Subscription Service** – provides mechanism for tactical devices to subscribe to data on the enterprise
  - **Disconnected Messaging** – persists data subscription results to support disconnected communications situations

- **Enterprise Interface Services**
  - **Device Discovery Service** – allows discovery of tactical devices registered with NCTS
  - **Data Discovery Service** – allows enterprise to identify types of data available on the tactical networks through NCTS
  - **Subscription Service** – provides mechanism for enterprise to subscribe to data on the tactical network
NCTS Benefits Summary

- Translation between XML based network traffic (standard for the GIG), and traditional DoD message formats (e.g. JVMF, SDL) to allow for the optimal balance of bandwidth and flexibility on each side of the communication barrier

- Message translation service that allows all messages and data assets received from devices in binary formats to be translated into XML and published to the collateral space through web services

- A link to the Enterprise Core Services, such as the publishing and discovery services, that would otherwise be unavailable to systems in the tactical environment due to bandwidth constraints

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