Net-Centric Conversations

The enterprise unit of work

v1.0

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Introduction

- Harvey Reed
  - Implementer’s perspective
  - Chief Engineer Global Combat Support System – Air Force

- Fred Stein
  - Operations and theory perspective
  - Co-author of “Network Centric Warfare”, CCRP 1999
  - Contributor to Army War College
Goal

- Bridge theory, experimentation and practice into a single approach for creating persistent net-centric capabilities across the enterprise in a stable and scalable manner
Overview

- Review network centric warfare
- Limitations of current approaches
- Requirements for scaling
- Net-Centric Conversations
  - Definition
  - Organizing principles
- Example from GCSS-AF
- Implementing Net-Centric Conversations
- Conclusion
**Industrial Age to the Information Age**

**Characterized by**

<table>
<thead>
<tr>
<th>Technical</th>
<th>Orders of Magnitude more Interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social</td>
<td>Orders of Magnitude more Interrelationships</td>
</tr>
<tr>
<td>Military Civilian Government Allies</td>
<td>Orders of Magnitude more Interdependence</td>
</tr>
</tbody>
</table>

How do we change our processes

→ requirements – acquisition – develop – operate?

How do we develop systems that

→ can SCALE enough, and
→ are AGILE enough for the Information Age?
The Operational Environment

Conveyed Commander’s Intent

Physical Domain
Force Advantage Position Advantage

Plan, Organize, Deploy, Employ & Sustain Cycle

Information Domain
Information Advantage

Shared Awareness

Speed and Access

Cognitive Domain
Cognitive Advantage

Conveyed Commander’s Intent

Network Centric Operations

Precision Force

Social Domain
Cultural Awareness

Compressed Operations

Integrity - Service - Excellence
1. A Robustly Networked Force Improves Information Sharing
2. Information Sharing and Collaboration Enhances the Quality of Information and Shared Situational Awareness
3. Shared Situational Awareness Enables Collaboration and Self Synchronization and Enhances Sustainability and Speed of Command
4. These in Turn Dramatically Increase Mission Effectiveness
An Example of Joint Operations
People – Platforms – Connections

Sensor input linked to Command Center

Agility is the Key
Platforms, In IT, In Personnel

Imarsat (V)
Iridium (V)
UHF TAC SAT (V/D)
Laser Rangefinder - GPS
Locates Target for engagement

C2 Center request more Data to task weapons Platform
Link 16 (D)
UHF Sat (V)
Combat Track II (D)

Final Link To Target
GPS (D)

Link 16 (D)
Radar (D)
UFH (V)

UHF (V)
Combat Track II (D)
Keyboard to Bomb
Engages Targets

Integrity - Service - Excellence
"Scenario" -- Close Air Support

- UAV identifies targets
- Transmits location to UAV Ground-station which pushes to Air Force SADL (WINFAC) workstation
- WINDFAC pushes to F16s & A10s, Heads Up (HUD) display in Cockpit for execution

"...I'm a believer in Digital CAS Technology" – Army Ground Liaison Officer

"...night missions are normally an Exercise in futility but this was amazing" - Air Warrior
Recent Combat Example in Iraq

- CAOC
- ADOCS
- IMTDS
- TST Cell
- UAV
- SOF
- Enemy Target
- Kill Box
- SADL NETWORK
- Link-16 NETWORK
- JRE
- Broker
- Link 16 Enemy Target
- Link 16 Friendly Ground Track

Integrity - Service - Excellence
**Situation: Army Armor reinforces Marine Infantry**

- Blue SA cannot be exchanged between Army and Marine – Voice only
- Ground BSA maybe available to AF F16 in data form but not A 10s – Voice only
- Marine Helo support not on the same nets as Army Helo – No Data Exchange
- Network control – does not cross organizational boundaries

**Limited Network Visibility**

**Voice only**

**Close Air Support**

**Voice and DATA if SADL**
Network Centric Warfare Trends

- Evolving from breaking down radio and other comm stovepipes to true net-centric integration
  - Breaking down stovepipes
    - LINK16, SADL
    - More participants (people and machines) can interact
  - Net-centric integration
    - Integrate many participants to implement “mission threads”
STEP 0:
Systems and people are stovepiped
Network Centric Evolution

STEP 1:
Break communication stovepipes

KEY ENABLERS:
1. Message-based integration using enterprise service bus (ESB)
2. Radio integration such as BUG-E
Network Centric Evolution

STEP 2:
Integrate along the lines of mission threads

KEY ENABLERS:
1. Services
   1. Publish/Subscribe
   2. Web Service
   3. Business Process
2. Discovery services & search

OPS SUPPORT

OPS
Network Centric Warfare Value

- Integrity
- Service
- Excellence
Currently stovepipe systems make agreements with their nearest neighbors – but no mechanism to describe and manage an entire thread of processing.
Net-Centric Conversations

Scaling requires Multi-party Agreement

Net-Centric Conversations provide a means to create one agreement that covers many participants. This assures we can manage change over time.
A Net-Centric Conversation (NCC) is a persistent multi-party agreement across a set of relationships between sensors, shooters, decision makers and other participants which create a net-centric capability.
An NCC is described, registered, and discoverable, and represents the persistent net-centric capability.

- Net-centric Conversation (business process, chat, pub/sub, etc)
- Mission Information (messages)
- Mission Services (incl. data and sensors)
- Enterprise Services (messaging, storage, etc)

Net-Centric Conversations are registered and “point to” dependent services and metadata.

When a service or metadata is versioned, we can do simple impact analysis.
An NCC has both human and machines as participants and is completely described by the set of possible message exchanges between them.

<table>
<thead>
<tr>
<th>NCC Name</th>
<th>Users</th>
<th>Systems</th>
<th>Messages</th>
<th>CONOPS &amp; Doctrine</th>
<th>Mission Effectiveness KPIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser-target-01</td>
<td>U-1, U-2, U-3</td>
<td>S-1, S-2, S-3, S-4</td>
<td>M-1, M-2, M-3, M-4, M-5, M-6</td>
<td>SOF</td>
<td>1. Ave time to target</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. Ave accuracy</td>
</tr>
</tbody>
</table>
An NCC is associated with a set of net-centric KPIs.
- Business / Warfighter KPIs
- Not technical level
- KPIs may in part be derived from technical
An NCC has an Agility Profile derived from the agility metrics of the participants and messages

(NOTIONAL)

<table>
<thead>
<tr>
<th>Participant type</th>
<th>Participant Name</th>
<th>Min time to develop / train</th>
<th>Organization</th>
<th>Min time to re-configure</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>U-1</td>
<td>Train=10 days</td>
<td>AETC</td>
<td>n/a</td>
</tr>
<tr>
<td>Service</td>
<td>S-1</td>
<td>42 days</td>
<td>Contractor-1</td>
<td>n/a</td>
</tr>
<tr>
<td>Service</td>
<td>S-2</td>
<td>67 days</td>
<td>Contractor-2</td>
<td>13 days</td>
</tr>
<tr>
<td>Service</td>
<td>S-3</td>
<td>83 days</td>
<td>Contractor-2</td>
<td>5 days</td>
</tr>
<tr>
<td>Message</td>
<td>M-1</td>
<td>120 days</td>
<td>COI-1</td>
<td>n/a</td>
</tr>
<tr>
<td>Message</td>
<td>M-2</td>
<td>160 days</td>
<td>COI-1</td>
<td>n/a</td>
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<tr>
<td>Message</td>
<td>M-3</td>
<td>200 days</td>
<td>COI-2</td>
<td>n/a</td>
</tr>
<tr>
<td>Perimeter</td>
<td>P-1</td>
<td>n/a</td>
<td>AFNOSC</td>
<td>Firewall=90 days</td>
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<tr>
<td>Perimeter</td>
<td>P-2</td>
<td>n/a</td>
<td>DISA</td>
<td>Firewall=60 days</td>
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<tr>
<td>Perimeter</td>
<td>P-3</td>
<td>n/a</td>
<td>DISA</td>
<td>Firewall=45 days</td>
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</tbody>
</table>
Organizing Principle #5

- Portfolio management of NCCs reduces the complexity of the enterprise, and forms the basis of value-based evolution of the enterprise.

**NCC Mission KPIs**
- Bombs delivered
- People deployed
- Planes Available

**Agility Metrics**
- Time to change a business process
- Time to change a mission service
- Time to change a network connection

**Need to change**

**How long to change?**
Example from GCSS-AF
Notional

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<tr>
<th>NCC Name</th>
<th>Users</th>
<th>Systems &amp; Services</th>
<th>Messages</th>
<th>Security Perimeters</th>
<th>CONOPS &amp; Doctrine</th>
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<tr>
<td>Notify-01</td>
<td>none</td>
<td>S-1 (personnel) S-2 (force readiness</td>
<td>M-1 (airman status change)</td>
<td>P1 (personnel security) P2 (GCSS-AF</td>
<td>Alert Airman status</td>
<td>1. Average time to deliver</td>
</tr>
<tr>
<td></td>
<td></td>
<td>combat support) S-3 (force readiness</td>
<td></td>
<td>security) P3 (warfighter security)</td>
<td>change</td>
<td>alert from personnel to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>warfighter) E-1 (ESB) E-2 (ESB)</td>
<td></td>
<td></td>
<td></td>
<td>warfighter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E-3 (ESB)</td>
<td></td>
<td></td>
<td></td>
<td>2. Percent delivered from</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>personnel to warfighter</td>
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Mission Effectiveness KPIs:
1. Average time to deliver alert from personnel to warfighter
2. Percent delivered from personnel to warfighter
Implementing Net-Centric Conversations

Net-Centric Conversations are implemented in a Net-Centric Conversation discovery service which has “URI” pointers to other discovery services. This provides necessary and sufficient cross-linking so that participants can be discovered. This requires a proactive approach to integration. It is not sufficient to just “point to” a service and use it. The owner of the “thread” must create a net-centric conversation and register it. Failure to register net-centric conversations results in an inability to manage change across the enterprise.
### Conclusion

- **NCC is the enterprise unit of net-centric capability**

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