Session 5
Experimentation Division (ED) & Accelerated Capabilities Division (ACD)

Session Name: Cellular Technologies and Mobile Applications Development and Experiments
Briefers: COL Brownfield, COL Caulkins
Provide an update for cellular applications and mobile applications supporting the Warfighter.
• Capabilities Development Integration Division (CDID) Experimentation Division (ED) and Accelerated Capabilities Division (ACD) roles in wireless capability development

• Active Cellular Technology Experiments
  – Advanced Wireless Network – Tactical (AWN-T)
  – Army Expeditionary Warfighter Experiment (AEWE)

• ACD Areas of Emphasis
  – ACD Priorities
  – Tenets of Army Cellular
  – Fort Bliss Proof of Concept
  – CSDA Purpose/Phases
  – Apps Completed Projects
**Transforming Cyber While at War**

- **Experimentation Division, CDID (a.k.a. the Fort Gordon Battle Lab):** The Experimentation Division is chartered as a research, analysis, prototyping, experimentation and assessment facility which leverages innovative concepts and technologies to support the warfighter.

- **Portfolio of Core Competencies:**
  - Live and Concepts Experimentation
    - Systems and Functional Integration
    - Communications Effect Model and Simulation
    - Future NetOps Analysis and Development
  - AFORGEN and Distributed R&D IT Enterprise Services
    - Satellite Regional Hub Node / Network Service Center – Training (NSC-T)
    - Network Operations and Security Center (NOSC) for Battle Lab Collaborative Simulation Environment (BLSCE)

- **Key Partners:** Army G8, ARCIC, ATEC, PEO-3CT, PEO-I, CERDEC, BMC/AETF, NG/Reserve.
• The Experimental Division current areas of project focus:
  – Network Integration Exercise (NIE)
  – Dynamic Spectrum Access (DSA)
  – Convergence
  – Waveform Enhancement (DVB-S2, WIN-T Inc 2, etc.)
  – Cellular Wireless

• Accelerated Capabilities Division (ACD): ACD will accelerate the development of Network, Apps, and Cyber-related solutions in response to verifiable warfighter needs. The current areas of focus are:
  – Network Integration Exercise (NIE)
  – Dynamic Spectrum Access (DSA)
  – Connecting Soldiers to Digital Applications
  – NSWG II/CSMB
Live Experimentation & Accelerated Capabilities Synergy

ACD
- App Education & Development
- CSDA
- Cyber Solutions
- Capitalize on culture of Social Networking

DSA
- Wireless Solutions

NIE Event Support

Collaboration with DOD, GOVT Agencies & Academia
- Network Development

NSWG Support

System Integration

LIVE EXP
- Technology Evaluation & Assessment
- RHN Development & Training Support

TRL 1: Basic Principles
TRL 2: Concept Created
TRL 3: Active R&D Starts
TRL 4: Component Validation Lab
TRL 5: Component Validation Lab+
TRL 6: System & Prototype demo
TRL 7: System & Prototype demo+
TRL 8: System Completed
TRL 9: System Proven
Experimentation Division
Live Experimentation

Wireless Evolution Overview
1. Wireless Handsets and Modems (various)
2. Base Station Sub-System
3. Core Network
4. Applications Servers
## History of Cellular

<table>
<thead>
<tr>
<th>Year</th>
<th>AT&amp;T</th>
<th>Verizon</th>
<th>Sprint</th>
</tr>
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<tbody>
<tr>
<td>1985</td>
<td>1G</td>
<td>AMPS</td>
<td>AMPS</td>
</tr>
<tr>
<td>1990</td>
<td>2G</td>
<td>TDMA</td>
<td>TDMA</td>
</tr>
<tr>
<td>1995</td>
<td>2.5G</td>
<td>cdmaOne</td>
<td>cdmaOne</td>
</tr>
<tr>
<td>1995</td>
<td>2.75G</td>
<td>cdmaOne</td>
<td>cdmaOne</td>
</tr>
<tr>
<td>2010</td>
<td>3.5G</td>
<td>LTE</td>
<td>Wimax</td>
</tr>
<tr>
<td>2011</td>
<td>4G</td>
<td>LTE</td>
<td>Wimax</td>
</tr>
<tr>
<td>2015</td>
<td>LTE</td>
<td>LTE Advanced</td>
<td>LTE Advanced</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Channel Size</th>
<th>Data Throughput</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 kHz</td>
<td>19 kb/s</td>
</tr>
<tr>
<td>30 kHz</td>
<td>19 kb/s</td>
</tr>
<tr>
<td>1.25 MHz</td>
<td>9.6 kb/s</td>
</tr>
<tr>
<td>1.25 MHz</td>
<td>128 kb/s</td>
</tr>
<tr>
<td>1.25 MHz</td>
<td>384 kb/s</td>
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<tr>
<td>1.25 MHz</td>
<td>384 kb/s</td>
</tr>
<tr>
<td>1.25 MHz</td>
<td>512 kb/s</td>
</tr>
<tr>
<td>1.25 MHz</td>
<td>512 kb/s</td>
</tr>
<tr>
<td>5-10 MHz</td>
<td>50 Mb/s</td>
</tr>
<tr>
<td>5-40 MHz</td>
<td>50 Mb/s</td>
</tr>
<tr>
<td>5-10 MHz</td>
<td>50 Mb/s</td>
</tr>
<tr>
<td>5-40 MHz</td>
<td>50 Mb/s</td>
</tr>
</tbody>
</table>

### Data Rates shown are SHARED by multiple users

Notes:
- Actual bandwidth for each of these technologies is X 1.5 since they are all frequency division duplex systems and uplink has lower power.
- Throughput numbers are downlink only.
- EVDO rev B available. Sprint and Verizon chose not to deploy. Throughputs for rev B expected to be 5-15 Mb/s down.
- HSPA+ and EVDO rev B use channel bonding to achieve higher data rates. Channel bonding is the use of 2 or more channels.
**Advanced Wireless Network – Tactical (AWN-T) Experimentation Overview**

**Background**
- Sponsored by ARCIC ACD
- Addresses capability gaps related to connecting dismounts and key leaders to connect to tactical network for SA / C2 apps
- 22 systems related to COTS wireless and security evaluated in last 12 months
- Evaluation efforts focused on tactical infrastructure (Tier 2/3) to enable apps
- Collaborated with MITRE, PEO C3T SPO, PM WIN-T, PEO Soldier, PM CPS&I, CERDEC, JFCOM, GTRI
- Leverages commercial standards for IP interoperability with tactical systems

**Objectives**
- Integrate industry solutions to demonstrate capabilities for commercial broadband wireless to support expeditionary ops
  - Based on 4G (802.16e WiMax)
  - Operates distributed IP core integrated with WIN-T INC 1 and Tactical Radio
  - Employs spectrum flexibility for CONUS / OCONUS
  - Compliant with Suite B (non-CCI, software based security for SAB)
- Inform developer requirements (material, combat and training) and ONS
- Conduct limited JITC interoperability assessment

**EXPERIMENTATION TIMELINE**

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
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<tr>
<td>Oct</td>
<td>Nov</td>
<td>Dec</td>
<td>Jan</td>
</tr>
<tr>
<td>3G/4G assessment (complete)</td>
<td>BAA</td>
<td>lab eval</td>
<td>FTX</td>
</tr>
<tr>
<td>3G/4G assessment (complete)</td>
<td>BAA</td>
<td>lab eval</td>
<td>FTX</td>
</tr>
<tr>
<td>BAA + 4 week evaluation</td>
<td>4G systems integrated with WIN-T INC 1 &amp; TR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integration with WIN-T INC 1 (including RITE 3G)</td>
<td>Suite B compliant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bn / CO level</td>
<td>JUICE/DICE demo at Ft Bliss (June)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3G/4G Integration</td>
<td>WIN-T INC 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soldier connectivity (Tier 1)</td>
<td>Aerial layer</td>
<td></td>
<td></td>
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<tr>
<td>Cross Domain</td>
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Possible NIE 12.1 event
AWN-T Fort Bliss Coordination

• June demo at Ft Bliss:
  – No NET training requirement
  – Commercial spectrum authorization (2.5GHz & 3.5GHz)
  – 2 powered sites, 50’x50’ each
  – Range testing to 3 miles (conducted by AWN-T pers)

• Proposed NIE 12.1 event
  – Lead Integrator for Standards-based 3G/4G Cellular Scenarios
  – Expand scope to Tier 1 (CO equipment)
    • Conduct DOTML-PF assessment
  – Integrate with Upper TI and Lower TI
  – Examine Security Solutions for Data at Rest and Key Management
**Army Expeditionary Warfighter Experiment (AEWE) Experimentation Overview**

**Background**
- Sponsored by Maneuver Center
- Maneuver Battle Lab (MBL) - conducts a campaign of experimentation to enhance the capabilities & effectiveness of the current force
- Addresses capability gaps for Communications (Voice and Data) Alternatives for the Soldier and Small Unit. Focus on Cellular Technologies and Digital Applications.
- Focused on tactical infrastructure (Tier 1/2) to enable experimentation by MBL
- Collaborated with Maneuver Battle Lab, Northrop Grumman, Raytheon
- Leverages commercial standards for IP interoperability with tactical systems centered around the WiMax protocol.

**Objectives**
- Create a baseline network that serves as a bearer for MBL to conduct specific experiments
  - Based on 4G (802.16e WiMax) and IP protocols
  - Employs Aerial Tier
  - Colorless Network
- Develop a communications architecture for MBL to plug emerging and novel soldier level technologies
- Focus Areas
  - Soldier Load and Power
  - Small Unit Resupply
  - Class 1 UAS, SUGV and UGS
  - Cellular Communications

**When and Where**
- Fort Benning McKenna Urban Training Site
- 15 Aug – 18 November
AEWE Organizational Structure

- **ARCIC**
  - Experiment Sponsor
  - Primary Stakeholder

- **MCoE**
  - CG - Experiment Director
  - CDID - Guidance/Oversight
  - MBL - Executive Agent

- **ATEC, AEC**
  - Analysis Lead
  - (Analytical Findings)

- **Signal Center**
  - Network Design
  - Network Accreditation
  - Lead Technical Integrator

- **Industry & Government Systems Providers**
  - Industry – 37 Systems
  - Gov’t Agencies – 23 Systems

- **MCOE**
  - EXFOR
  - Land/Ranges/Airspace
  - Equipment & Facility Spt
  - Personnel Augmentation

- **WCBF/TRISA**
  - Vignettes
  - White Cell
  - OPFOR C2
Government and Industry Partners

- 19 Government Partners (Experiment Support Functions + 23 sponsored technologies)
- 21 Industry Partners (37 sponsored technologies)
- 60 Selected Technologies: Network and Mission Command (14); Soldier Load (8); Soldier Power (7); Robotics (18); Resupply (9); other (4)
Spiral G Experiment Objectives

- Identify and Assess Solutions for Managing/Reducing Soldier/Small Unit Load and the Effects of Soldier Load.
- Identify and Assess Power Solutions for Soldiers and Small Units.
- Identify and Assess Alternatives for Small Unit Resupply
- Identify and Assess Class I UAS, SUGV, and UGS Alternatives.
- Identify and Assess Communications (Voice and Data) Alternatives for the Soldier and Small Unit. Focus on Cellular Technologies and Digital Applications.
AEWE EXFOR Network

Legend:
1. Case 1: HERCM 4G Network Equipment
2. Case 2: 4G Base Station
3. Case 3: 4G User Node
4. Case 3: 4G Cellular Handset

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Accelerated Capabilities Division
SIGCoE-ACD’s Priorities

- NIE event support
- NSWG II – wireless/End-User-Device (EUD) sub-working group
- Wireless solutions – DSA
- Creating apps and assisting others to create apps (right seat ride at SIGCoE)
  - resiliency app
- Working with CSDA community (MCCoE, ARCIC, other schools, NETCOM, CIO/G6, NSA, DARPA, SOCOM, CERDEC, etc)
- ALC 2015 support
- Security:
  - Security for mobile devices
  - Security for apps
  - FIPS certifications
  - Certificates of Networthiness
Tenets for Army Cellular

Extend the network to the Soldier and his immediate leader – to meet disadvantaged users’ voice and data needs at the company level

Leverage commercial infrastructure when available - must be capable of roaming through commercial networks when they are available and commanders deem the risk is mitigated

Provide frequency agility/efficiency to the hand held – to fill gaps when host nation/commercial entities will not allow access to spectrum, risk is not mitigated, spectrum degraded due to ECM

Must be affordable – develop a cost efficient means to extend services where no commercial infrastructure exists; COAs must be developed so resource informed decisions can be made

Security – solution must be adaptable to meet individual user’s minimum security requirements without driving cost (a Soldier may operate unclass, where a leader may need Secret)
**Tenets for Army Cellular**

**Provide transport to Army Apps** – connects disadvantaged Soldiers to the data needed to meet mission goals

**Enhance interoperability in a JIIM/coalition environment** – in the absence of commercial infrastructure, provides JIIM/coalition partners a means to connect

**Tailored access/services** – capability to manage who has access to what capabilities depending on their current mission

**Interoperable with Army networks** – Interoperable with legacy and future networks but not reliant on them; system can operate as a stand alone when full Army infrastructure isn’t needed

**Integrated with unified NetOps tools** – NetOps requirements must be minimal and integrated in unified NetOps tools to prevent the addition of a stove-piped management systems
“Army mobile cell nodes must be cognitive; that is, these nodes must be capable of sensing the spectrum environment around it to determine what is transmitting on what frequencies. Then, through the use of DSA, the nodes must be able to determine what frequencies are available for it to transmit on. This process must be completely automatic without operator involvement and the technology to do so must be resident in both the handheld and the mobile cellular nodes.”

– Army Cellular Capability Development Strategy (DRAFT)
In partnership with CERDEC and ARCIC, rapidly explore cellular technology advances that address spectrum agility/DSA, security, smart phone interoperability, SWAP, interference tolerance, and cost efficiencies in order to recommend potential solutions that extend the Army’s network to meet deployed disadvantaged Soldiers’ needs at the company and below levels.

**Additional Goals:**

- Determine supportability of CSDA Phase II
- Determine DOTMLPF-C issues related to implementation of a cellular solution
- Determine how selected technology could be integrated with WIN-T
- Evaluate operation of voice, select Battle Command systems, and Army Apps over wireless systems and the WIN-T network
- Refine CONOPS while developing TTPs on operating wireless in a tactical environment
- Determine feasibility of sharing spectrum through DSA technologies
CSDA Purpose

- App programming courses this FY
- FA53, GS CIV, warrants
- Right seat ride for app programmers
- Use “fa53” search string to find our free apps
CSDA Phases

✓ MCCoE given CSDA lead with SIGCoE support
✓ “Phase I” continues
✓ For “Phase II,” security and policy are huge
Apps (Completed Projects)

- Army Creeds
- Soldier Blue Book
- Signal LT Handbook
- Physical Readiness Training
- Sigcts
- Mobile Learn
- Fort Gordon Post Directory
- Shok
- Grid/Nav
- BAH Calculator
- Army Values
- Bugle Calls
- Resiliency Goals Book

- Rights Warning Card
- AIT PSG Handbook
- 21B10 Handbook
- BCT Smart Card
- Go For Green
- APFT/Body Fat Calculator
- PRT Card
- Signal Conference
- Sniper Awareness
- Capture Avoidance
- AAR
- Army Professional Ethic
- Fort Bliss Post Directory

More info at – apps.army.mil
Session 5
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Questions/Comments?