IDA

Commercial Technologies at the Tactical Edge

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Overview

- Major trends driving use of COTS
- Challenges of the tactical edge
- Examples of experiments and pilots
- Identification of areas for further R&D
- Policy and Acquisition Issues
- Conclusions

Trends

- Declining influence of the DoD in the ICT sector
- Consumerization of ICT
- Growing demand for cyber security
- Moderation of requirements
- Popular adoption by DoD of telework
- Increasing unsatisfactory outcomes of ICT programs of record

COTS Growth Curves

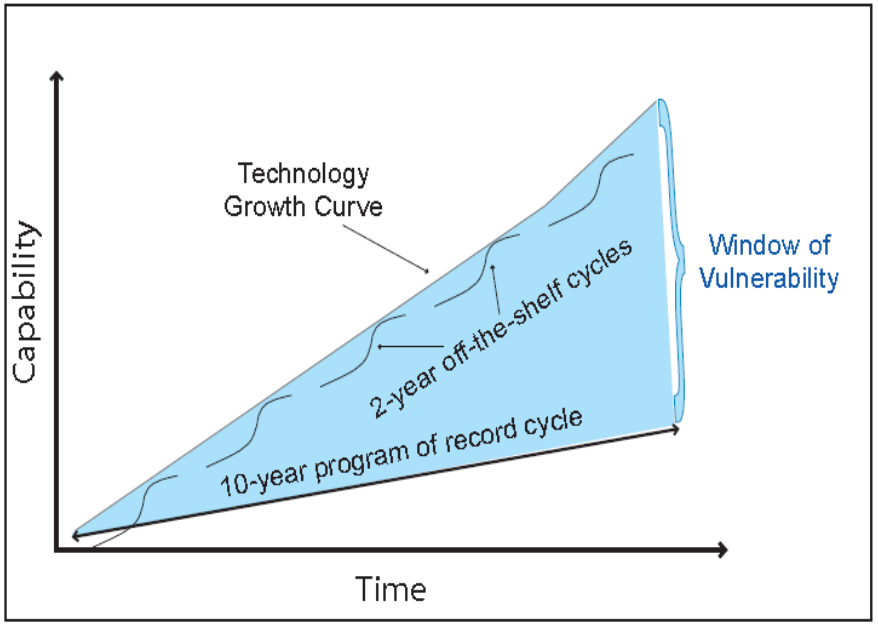


Figure 1

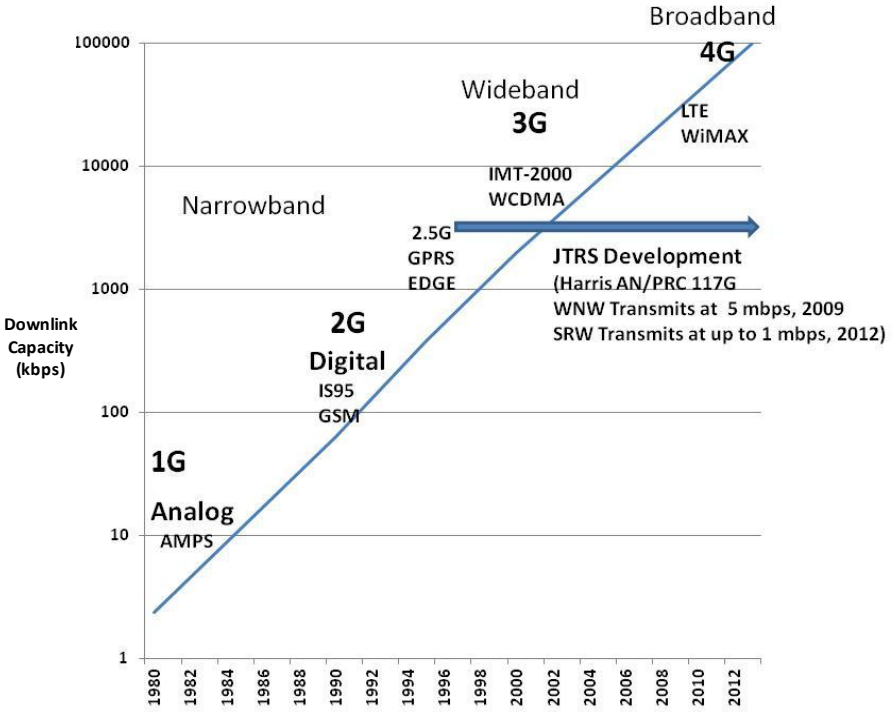
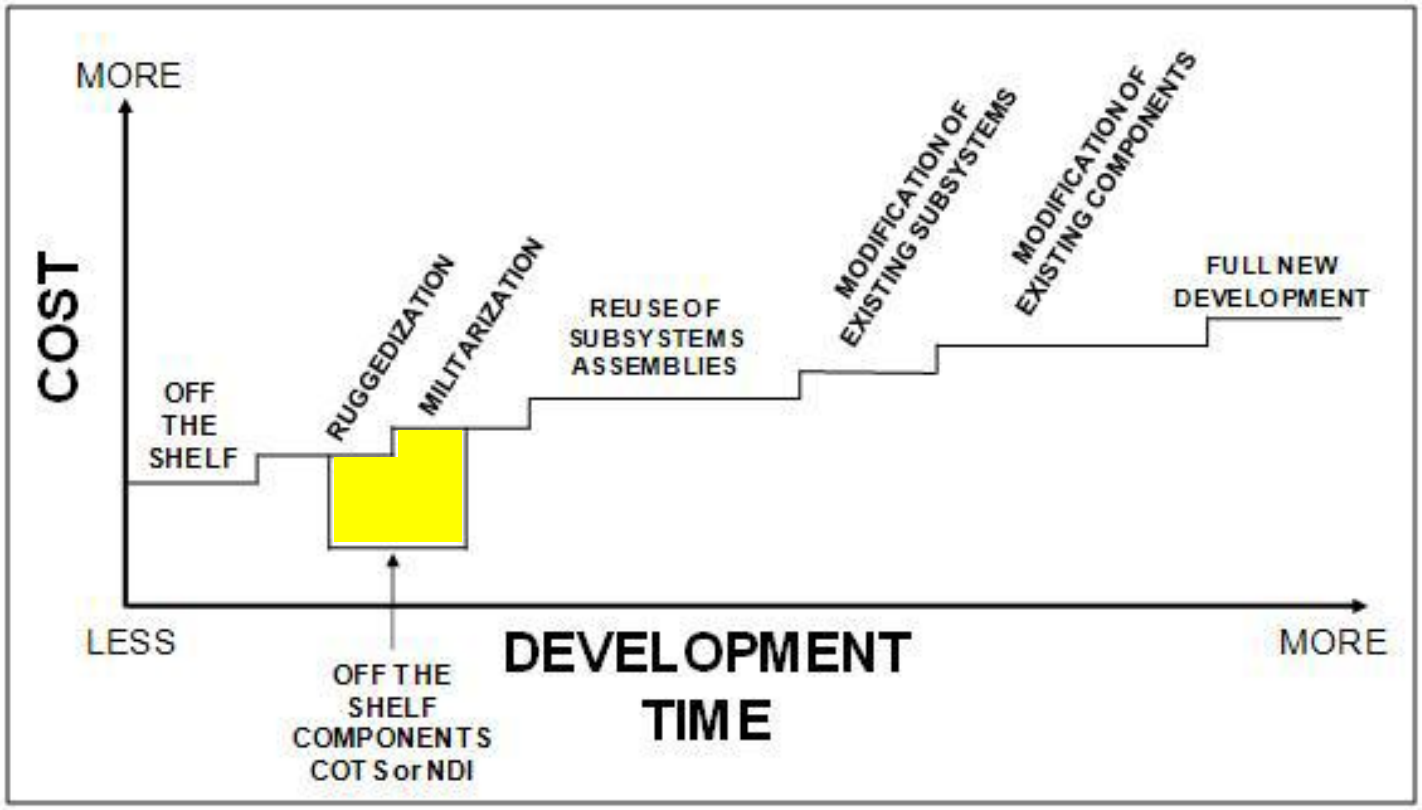


Figure 2

Figure 1 Source: K. J. Cogan and R. De Lucio, *Network Centric Warfare Case Study: U.S. V Corps and 3rd Infantry Division (Mechanized) During Operation Iraqi Freedom Combat Operations (Mar-Apr 2003),*

Spectrum of Development Strategies



MOTS – Modified-off-the-shelf

Modifications to COTS for military purposes that retains ability to keep up with COTS product evolution

Source: Test & Evaluation Management Guide, Sixth Edition, US DoD, December, 2012, Chap 23

Issues with COTS and the Tactical Edge

Interoperability/Integration	**With the IP-based GIG and with existing tactical network equipment – JTRS, WIN-T (JNN) and WIN-T INC 2**
Disconnected, Intermittent, and Limited (DIL) Communications	**Delay Tolerance**
	Mobile Ad Hoc Networks (MANETs)
	Loss of infrastructure
Security	**Cyber Offense/Defense methods**
	Encryption for data at rest/data in transit
	LPI/LPD, Antijam, Anti-spoof
	Authentication – 2 factor, biometrics
	Cross domain
	Patching
Environmental Factors	**Rugged, water proof**
	User interface -sun glare, night vision mode, low light, touchable with glove
Acquisition	**Supply-chain considerations**
Network Operations and Management	**Spectrum**
	AAA
	Monitoring, Remote auditing
	Loss of infrastructure
	Capture of equipment (remote wipe)
	Remote peripheral control
Size, Weight, and Power (SWAP) Constraints	**Power requirements, battery life, battery type**
	Portability
App Management	**App ecosystem**

Hardened Smartphones, Tablets

Sample
Commercial Features

- Multi-band cellular radio (2G, 3G, 4G, LTE)
- WiFi (b/g/n), Bluetooth
- Near Field Communication
- Microphone
- High resolution display
- GPS
- Accelerometer
- High resolution Camera
- Multiprocessors
- Android OS and Application Ecosystem
- Voice, Data, Video
- Internal Storage
- SIM, SD, MicroSD interfaces
- USB (or similar) support
- Stereo Headphone jack

Sample
Military Features

- Ruggedized
- Tactical Radio Interface
- Encryption (e.g., FIPS 140-2, NSA Suite B)
- CAC Authentication

Sample
Public Safety Features

- Ruggedized
- Public Safety band
- Push to talk

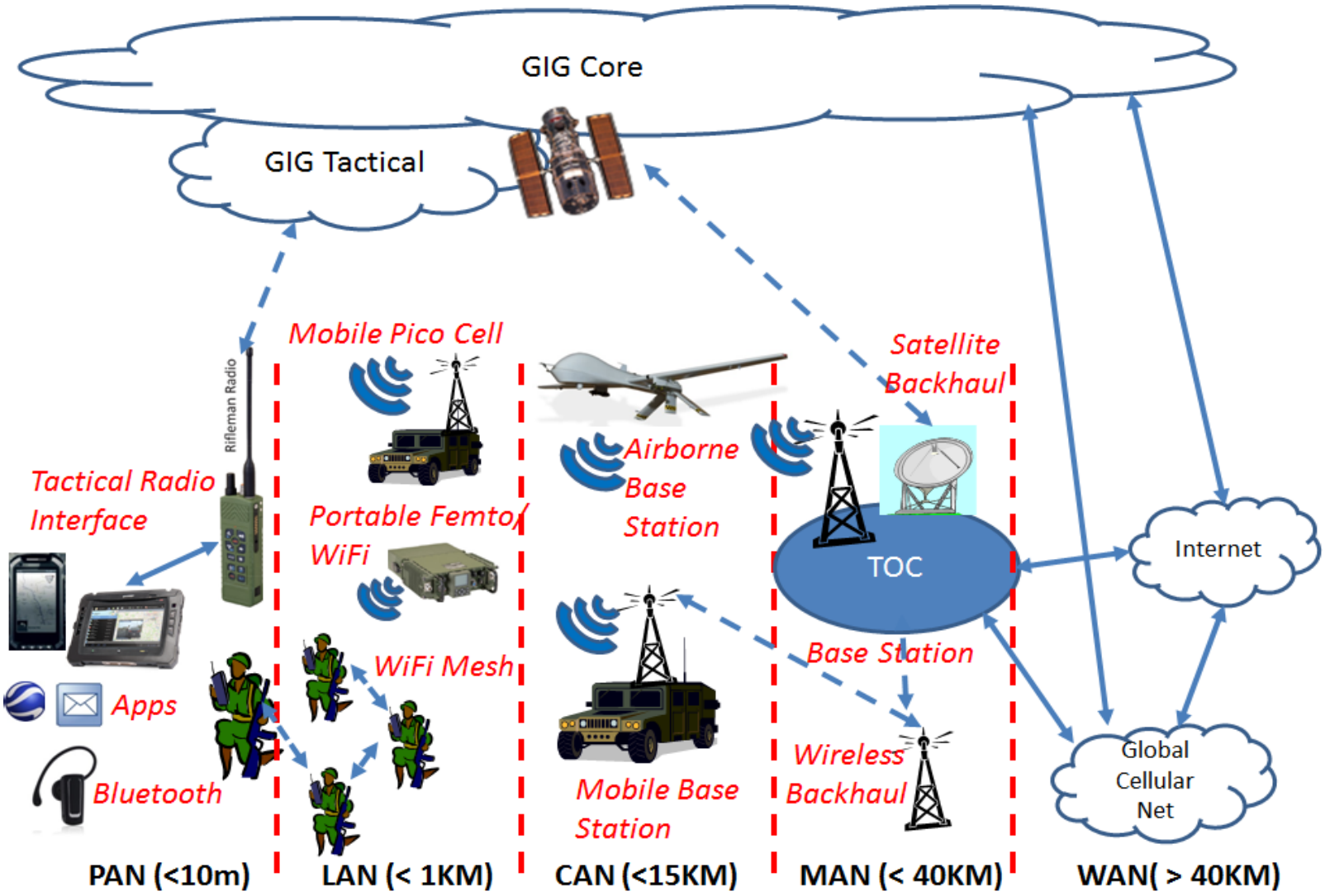
Smartphone Pilots

- Nett Warrior – C2 to the foot soldier
  - Ruggedized phone, plugs into AN/PRC154/Rifleman Radio
  - Location information
  - NIE test results highlighted issues
- NSA Fishbowl Project – Provide secure communications over COTS Android phone
  - Mobility Capabilities Package
- USMC Trusted Handheld Platform
  - Virtualization, isolation, HW root of trust, trusted boot
  - Modular development
- Multi-Access Cellular Extension (MACE)
  - RF ranging for location in GPS challenged environments (WiFi/Cellular to WIN-T)

Military Capabilities and Commercial Apps

Military Capability	Similar Commercial Smartphone/Tablet Apps
Command and Control	Chat/IM, SMS, MMS, voice call, video call, Twitter, email, Skype
Mission Planning and Execution	Electronic Flight Bag
Situation Awareness (Blue Force Tracking)	WAZE, Google Maps/Earth, StarChart, Location-based Apps, News feeds
Streaming Video	YouTube, Hulu, Crackle
ISR	Home Monitoring, Friends Tracking, Picture tagging
Soldier as a Sensor	WAZE, Ratings
Biometrics	Face, Voice, Keystroke, IRIS Recognition, fingerprint matching, browsers
Secure, Hands-Free Communications	WICKR, Speech-to-text, Siri
Information Sharing, Access	Dropbox, browsers, Splashtop Whiteboard
Document and Media Exploitation (DOMEX)	Google Translate, iTranslate, Mobile OCR
Education, Training	YouTube, Wikipedia, Dictionary,
Personal applications	Alerts, financial, social media, shopping, games, etc

COTS Comm and Tactical Comm



COTS Networking for the Tactical Edge

- AT&T Remote Mobility Zone – Drop in cellular base station and Satcom for disaster response and remote locations
- KnightHawk (Harris) – Hardened 3G Cellular capability in a box for the field
- Navy Wireless WWAN – 4G LTE cellular net for ship-area network
- Airborne cellular base station
  - BACN (Northrup-Grumman)
  - Forward Airborne Secure Transmission and Communications (FASTCOM)

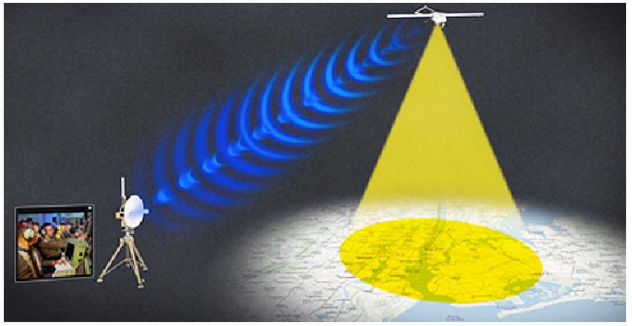


Figure 2 — UAV over New York

Tactical Radio Alternatives to Program of Record

- Mid Tier Vehicular Radio (MNVR) – more affordable alternative to the Ground Mobile Radio
- JTRS Rifleman Radio fair and open competition for full rate production
  - Goal to incorporate state-of-art COTS
- Soldier Radio Waveform (SRW) Appliqué
  - Add an SRW capability to existing vehicle SINGCARS radio
  - Agile bidding process

AN/PRC 152A
(SRW - Harris)

AN/PRC 117G
(MNVR - Harris)

AN/PRC 154 Rifleman radio
(Thales)

RF 330E TR
(Rifleman Radio - Harris)

Selected R&D Areas that can impact Tactical Networks

- Software Defined Networking (SDN)
- Autonomic Networks (ANs)and Self Organizing Networks (SONs)
- Cognitive radio – spectrum sharing
- Hands-free operation
  - Face recognition, gesture-based inputs, speech recognition
- Software engineering methods to address MOTS

Policy and Acquisition Issues/Questions

- Timing of adoption
  - When to adopt in terms of product life-cycle? Does there need to be a mass market?
- Customization
  - How to accomplish MOTS to realize benefits? How to do patches and updates?
- Early investment
  - How to ensure COTS products are available with desired capability? Is early R&D investment sufficient? How much?
- Standardization
  - Wait for an adopted standard? Emerging standards? Should DoD participate in standards development?
- Acquisition
  - How to efficiently acquire? How can DoD define requirements in a timely manner? How can DoD regulations be simplified for COTS/MOTS
- Incentives
  - How to interest developers in the DoD-size market?

Samsung Evolution Kit TV

Replace modular box to upgrade TV

Conclusions

- Recent trends have come together to:
  - increase the availability of viable and cost-effective commercially-based ICT solutions
  - drive the demand for commercial ICT at the tactical edge,
  - cause the DoD to relax unnecessarily stringent robustness and security constraints,
  - change the way the DoD acquires and uses ICT
- DoD needs to develop strategies and policy to take maximum advantage of the current situation
  - Standardization, MOTS

Opportunities are here to leverage COTS to increasingly realize goals of Net-Centric operations

Commercial Communications in Military Applications

Communication Regime	Commercial Technology	Commercial Examples	Application	User Mobility	Infrastructure Mobility	Military analog /Example/Prototype Adoption
PAN	Bluetooth, NFC	Embedded in smartphone, tablet	Ear-Mic, Headmounts, Authentication	Dismounted		Wired, tethered interfaces CAC smartcard
	GPS	Embedded in smartphone	Location-based applications			PLGR, DAGR
	USB, Sleeves		Interface to Tactical Nets			Intf to Riflemanr Radio, SINCGARs, MONAX
LAN	WiFi APs, MiFi Hotspots, Femto cellular	AT&T Femto cell	Voice, data, video	Dismounted	Fixed or Portable	Knightlite, JTRS Rifleman Radio, SINCGARS
	WiFi Mesh		Voice, data,	Dismounted	Portable	MACE App(Mesh), JTRS Rifleman Radio MANET, Harris 117G
CAN	3G, 4G LTE Mobile Base Station	ATT ARMZ, LGS Pico, Qualcomm,	Voice, data, video, position	Mobile	Portable	KnightHawk, LM MONAX, SRW Appliqué, MNVR
	Airborne Base Station	AirGSM	Voice, data, video	Mobile	Portable	FASTCOM, BACN, LM MONAX
	Backhaul	WiBack, Many Satcom providers	Backhaul for control and data		Fixed, Portable	WIN-T
MAN	3G, 4G-LTE Base Station	Many commercial providers	Voice, data, video, position	Mobile	Fixed or Slowly mobile	Navy WWAN