Practical Considerations for Use of Mobile Apps at the Tactical Edge

19th ICCRTS

June 17, 2014

Jonathan Agre, Karen Gordon, Marius Vassiliou

Institute for Defense Analyses

Summary of Main Points

- DoD has strong interest in using mobile electronics and mobile apps at the tactical edge
  - Multi-function, size, weight, power
- Desire to take advantage of rich Mobile App environment
- Simple adoption of commercial apps at tactical edge is not feasible due to technical and market differences in the ecosystems
- Changes are needed in software development practice, customization, communications infrastructure, design of Apps, and deployment of Apps
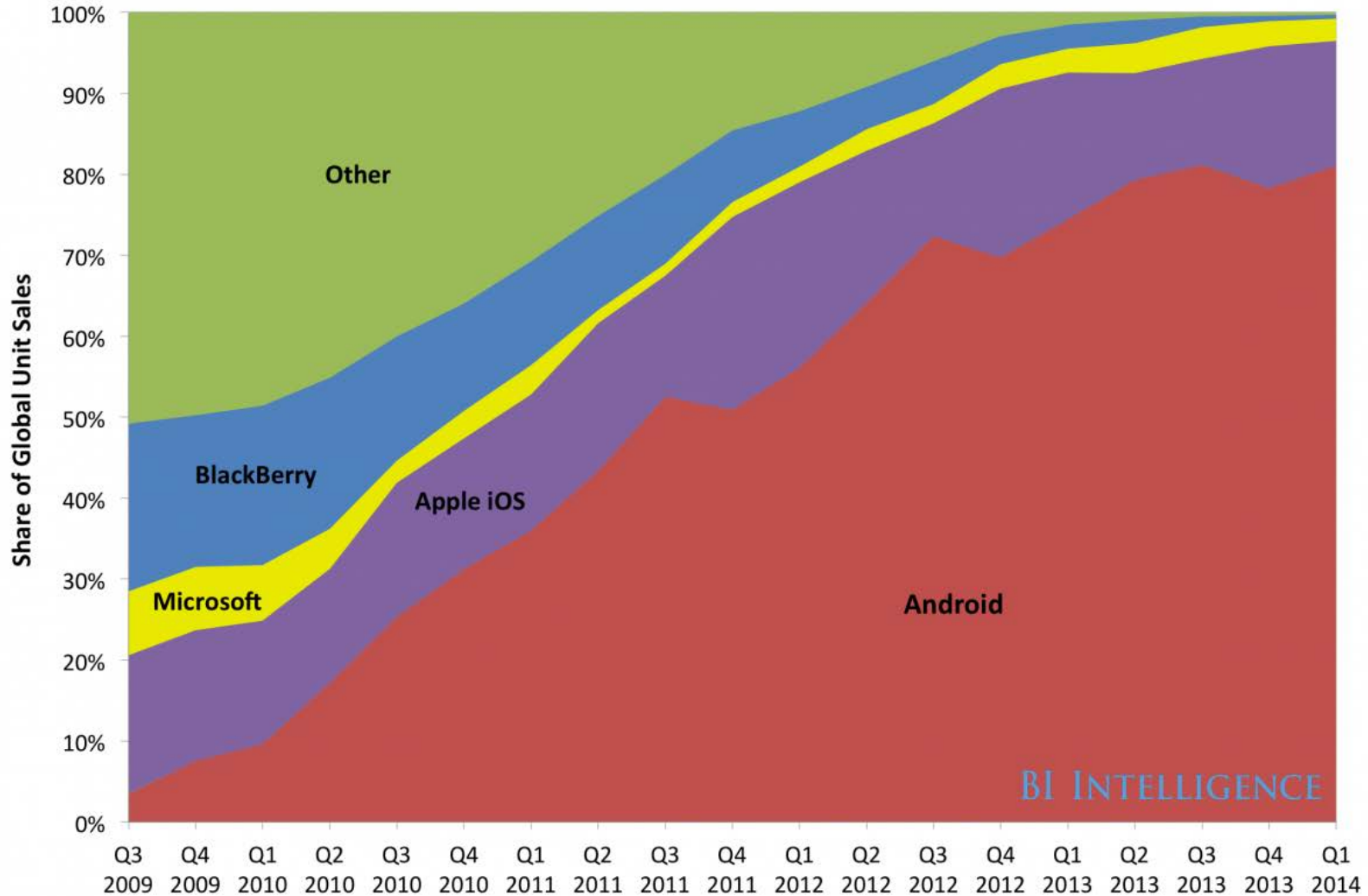
- Mobile App Mass Market
- Commercial Mobile App Ecosystem
- DoD Mobile App Environment
- Challenges for DoD Mobile Apps
- Recent efforts at DoD
- Identification of Areas for Further R&D
- Conclusions

Mass Market for Mobile Apps

- ## Increasing use of smart mobile electronics
  - ### In 2013 more smart phones sold than conventional phones
- ## Huge market in Apps for mobile electronics
  - ### 2013 - Global revenue from app stores is expected to rise 62% this year to $25 billion, according to Gartner
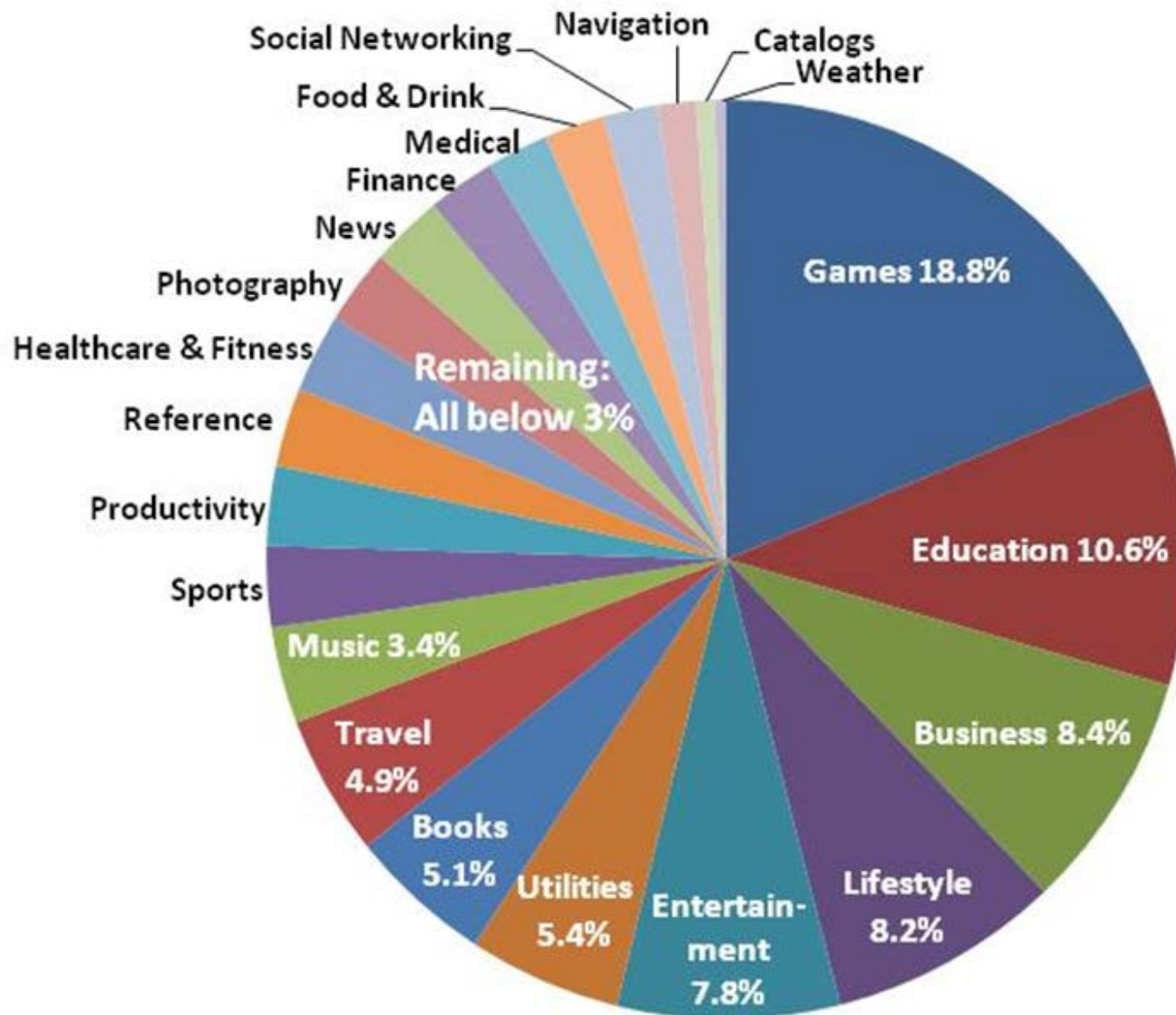
iPhones sold	500 million
iOS devices sold	800 million
Active iTunes accounts	800 million
Countries represented	155
Active iOS apps	1.1 million
iOS downloads	60 billion
Registered iOS developers	300,000
Payments to iOS developers	$13 billion

Global Smartphone Market Share By Platform

Share of Global Unit Sales

Other

BlackBerry

Apple iOS

Microsoft

Android

BI INTELLIGENCE

Source: IDC, Strategy Analytics

http://www.businessinsider.com/iphone-v-android-market-share-2014-5

Categories of Mobile Apps in iTunes App Store

Pie chart with the following labeled categories:

- Games 18.8%
- Education 10.6%
- Business 8.4%
- Lifestyle 8.2%
- Entertainment 7.8%
- Utilities 5.4%
- Books 5.1%
- Travel 4.9%
- Music 3.4%
- Sports
- Productivity
- Reference
- Healthcare & Fitness
- Photography
- News
- Finance
- Medical
- Food & Drink
- Social Networking
- Navigation
- Catalogs
- Weather

Remaining: All below 3%

IDA | Common Usage and Military Analogs

Fraction of Users Who Engaged in Activity			Tactical Edge Applicability
Activity	Smartphone	Tablet	
Sent text message to phone	90.50%	*	Command, Control, and Communications (C3)
Took photos	83.40%	*	Intelligence, Surveillance, Reconnaissance (ISR)
Used email	77.80%	73.60%	C3
Accessed weather	67.10%	64.60%	Situation Awareness
Accessed social networking	65.30%	67.50%	Collaboration
Accessed search	58.70%	73.90%	Situation Awareness
Played games	52.90%	66.30%	Training
Accessed maps	51.20%	*	Situation Awareness
Accessed news	49.20%	58.80%	Situation Awareness
Listened to music on phone	48.00%	*	Training
Accessed photo/video sharing site	*	51.50%	ISR
Read books	*	51.20%	Training
Watched video	*	50.90%	ISR; Training
Accessed retail	*	49.80%	Logistics

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

Commercial Mobile Apps Ecosystem
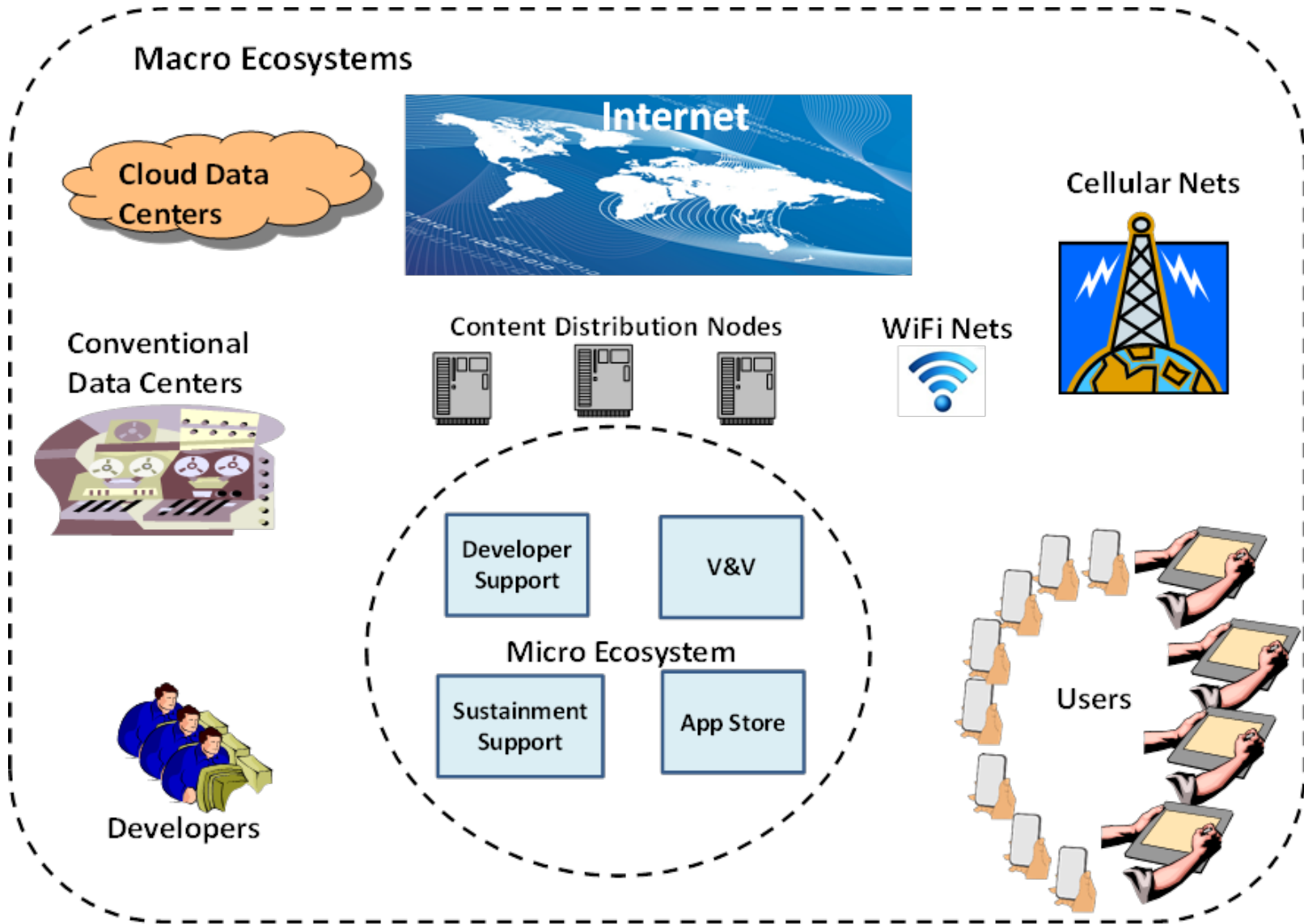
IDA

Main Functions of App Store Deployment

IDA

- Interact with App Store App
- Secure efficient hosting of Apps
- Identification of user platforms, correct versions
- Efficient downloads
- Authentication and access control
- Attestation of the Apps
- Support for updates and maintenance functions
- Support for upgrades
- Display of Apps, ratings, search
- Support for accounting functions – payments
- Deliver user data to developer – activities, location…

DoD Mobile App Environment
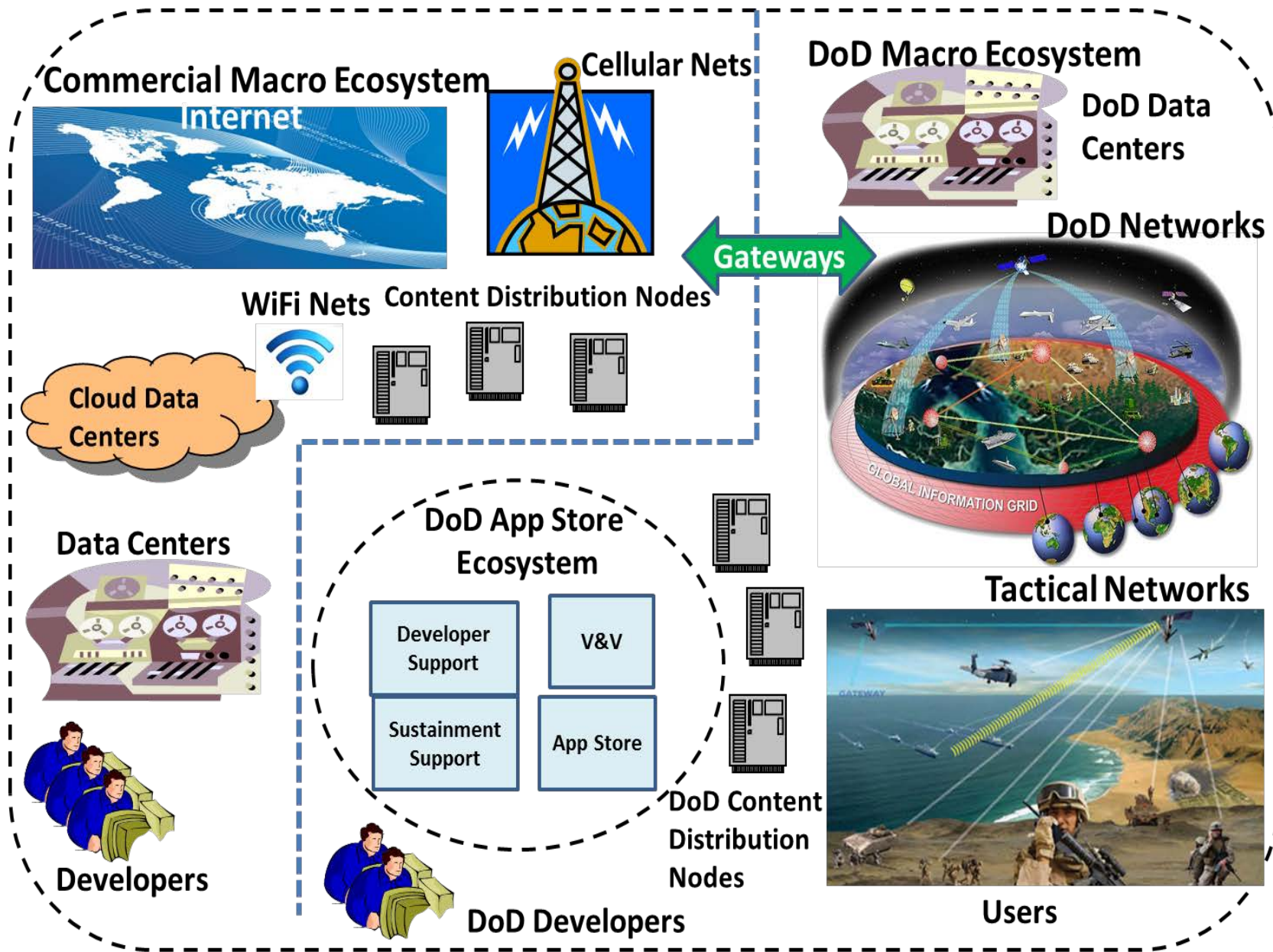
# Comparison of DoD and Commercial App Ecosystem

	Commercial	DoD
Complexity of Application	**Low, single function**	**Low to High (integrated functions)**
Software Development	**Rapid, Evolutionary, User Driven**	**Traditional, slow, requirements driven**
Communication Environment	**Robust, high data rates**	**Disconnected, intermittent, Limited**
V&V	**Basic, App store provided**	**Complex, DoD provided**
Security/Access Control	**Basic**	**Mission critical**
Privacy	**Basic, Developer controlled**	**Critical, DoD controlled**
Developer Motivation	**70% of sales**	**Contract**
Crowd-based feedback	**High (>1 Billion users)**	**Low (< 3 Million users in all DoD)**
Monetization	**In-App, Selling data**	**None**

Recent DoD Activities

- 2010 Apps4Army
  - 53 Apps submitted, 25 vetted and made available on DoD Storefront
  - 50% failed certification, legal review was long, DoD Cloud had problems
- 2010 DARPA Transformative Apps Project
  - App Store Architecture, Middleware, Secure Android
- 2012 New Army Software Marketplace
  - Listed 25 Apps iTunes on App store (some from Apps4Army)
- 2012 DOD CIO – Mobile Device Strategy and Implementation Plan (2013) includes enterprise App Store
- 2014 DISA – Offer enterprise MDM service (unclassified)
  - Allows Android and iOS phones in addition to Blackberry
  - Includes support for App Store, PKI, directory and email
 - App store currently has 16 Apps
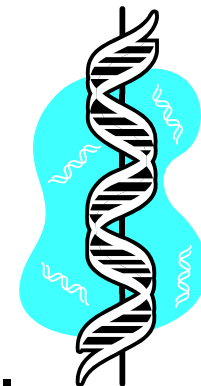
- Motivate, sustain developers for supporting DoD ecosystem
- Apps adapted to DIL networks and for Mobile Ad Hoc Networks
- Methods to reduce reachback
  - Content Delivery Nodes at tactical edge (DARPA)
  - Other forms of edge processing
- Secure Conversations over mobile devices (NSA)
- Methods to modify COTS software
  - Modified off the shelf (MOTS) software development to keep up with product cycles

IDA | Conclusions

- DoD has strong interest in using mobile electronics and mobile apps at the tactical edge
  - Multi-function, Size, weight, power
- Desire to take advantage of rich mobile App environment
- Simple adoption of commercial apps at tactical edge is not feasible due to technical and market differences in the ecosystems
- Changes are needed in software development practice and customization, communications infrastructure, design of Apps, deployment of Apps

Further R&D is needed to leverage commercial Mobile Apps to increasingly realize goals of Net-Centric operations

IDA | **Backup**

# Spectrum of Development Strategies
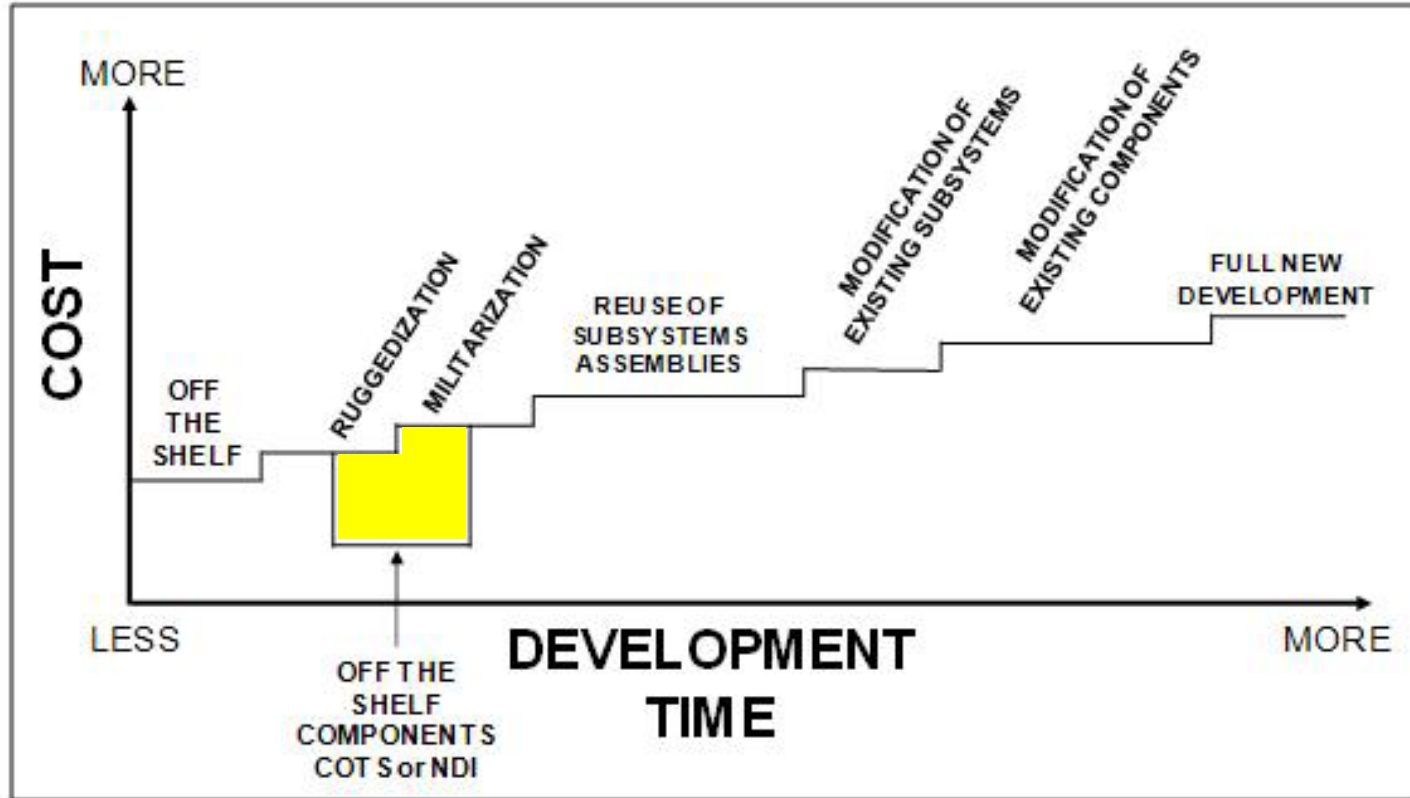
MOTS – Modified-off-the-shelf
  Modifications to COTS for military purposes that retains ability to keep
  up with COTS product evolution

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

IDA

- 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

MOTS Example: Samsung Evolution Kit TV

IDA
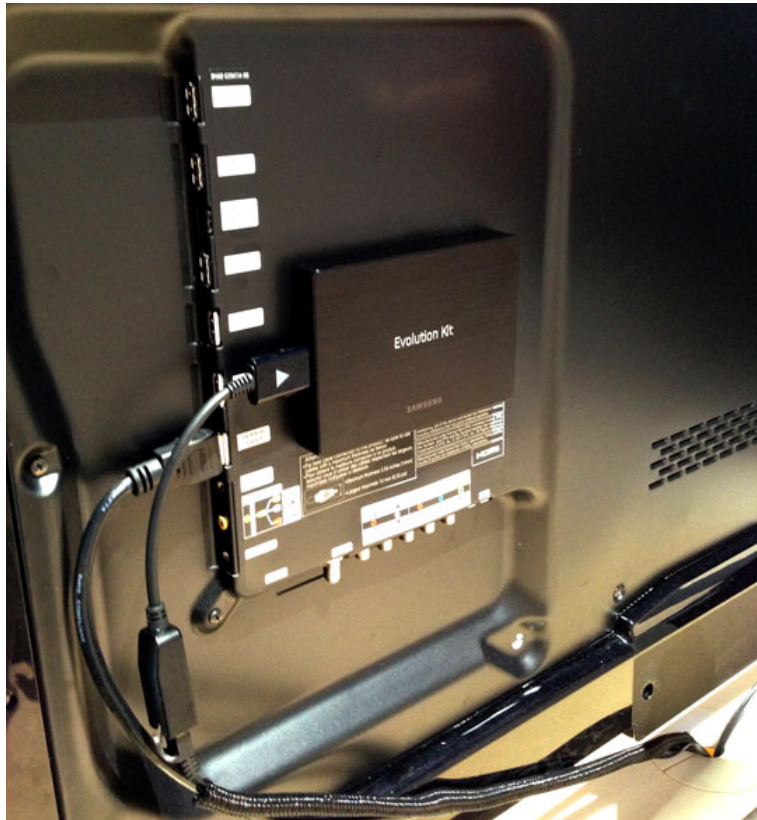
Replace modular box to upgrade TV