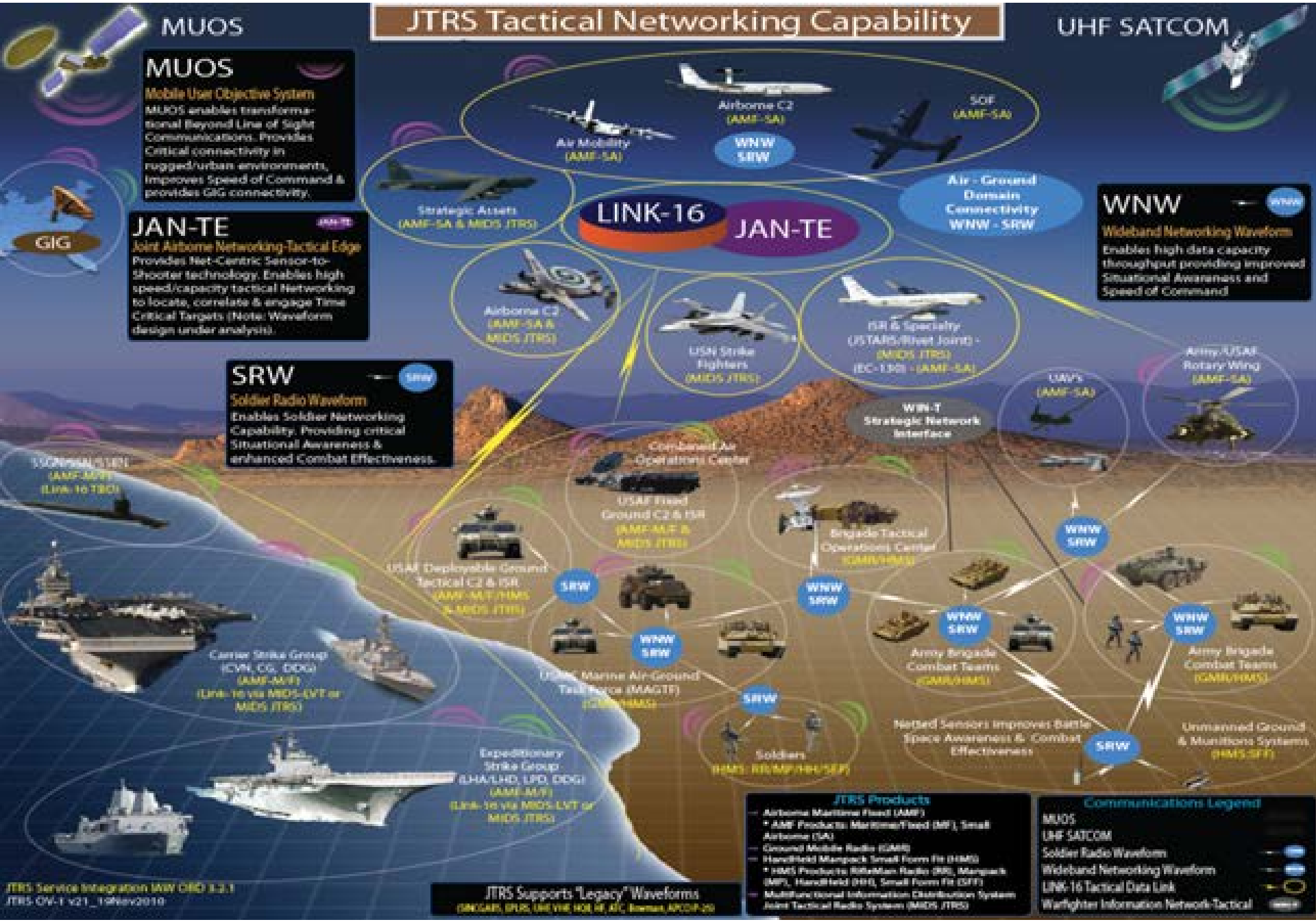
Wireless Innovation Forum
26 March 2015
Joint Tactical Networks

CAPT Kevin Peterson

Program Manager

Joint Tactical Networks



What Happened?

1990's	DARPA SPEAKeasy – Software Defined Radios should be relatively easy
Early 2000's	Joint Program Office stood up, first Acquisition Program Baseline set
2005-2007	Joint Program Executive Office / "Clusters" 1-5 -- Cost estimates doubled!
2011	MUOS waveform schedule slip – Red Team: significant cost, schedule growth GMR "Nunn-McCurdy Breach" → Cancellation of GMR
2012	HMS Rifleman Radio (SRW) with SRW Net Manager Fielding Decision SRWNM + JWNM → JENM AMF contract concluded with no radios procured JPEO JTRS Disestablished, Radio Programs → Military Services, JTNC stood up MUOS waveform: 0 Information Assurance defects
2013	HMS Manpack (SRW) with JENM Fielding Decision JENM user feedback: "Too difficult to use" MNVR contract (WNW, SRW) – doubts remained about WNW Military Services individual sponsorship of waveforms, JENM still joint IDA paper critical of SCA, suggests hardware interface standards instead
2014	JTNC Charter MUOS MOT&E slip – end-to-end integration, waveform as culprit MNVR test re-plan, schedule slip to 2016 SINCGARS vs. SRW – Future Narrow Band needed? / MANETs questioned

2015

- Transition of JTN
- Formal delivery of Waveforms to DoD Waveform Repository

Product / Service	Gaining Office	Version for DoD Waveform Repository	Status of formal submission to DoD CIO for DoD Waveform Repository
MUOS	Navy Satellite Communications PMW-146	MUOS v3.1.3	Pending delivery from developer (LM/GD); on track for June 2015 submit to CIO
Link-16	Navy MIDS PMA/W-101	L-16 v1.09	L-16 v1.08 is near completion and will be assessed and provided to MIDS.
SRW	PM Tactical Radios (TR)	SRW v1.2.1	Delivered Jan 2015
WNW	PM TR	WNW v4.2	Pending delivery from developer (GD), on track for June 2015 submit to CIO
SINCGARS	PM TR	SINC v2.0	Delivered Dec 2014
JENM	PM WIN-T	JENM v3.3	Early FY 2016 following integration into J-TNT laptop and acceptance into NIE 16.2
Information Repository	JTNC	“as is” turnover of all other GPR source code and files	Hardware servers form basis of DoD Waveform Repository; includes all previous legacy waveforms and products

Possible Current Viewpoint: "The Bad View"

MUOS	Not operational, No radios fielded, Call reliability questioned
WNW	Not operational, No radios fielded, Scalability questioned
SRW	Radio fielding scaled back, Performance questioned
JAN-TE	Cancelled as Joint waveform, Navy TTNT
JENM	Too difficult to use, Not finished, Need questioned
SCA	Structure questioned (CORBA, POSIX), Need questioned
Tech basis	MANETs questioned, Should have been next gen SINCGARS?
Other WFs	
- HQII, HF, UHF/VHF LOS	Not in use
- BOWMAN	Not in use by US
- UHF SATCOM, SINCGARS	Used by HMS Manpack only
- Link-16	Used by MIDS only
- EPLRS	Deleted as requirement
Summary	JPEO JTRS Terminated Waveforms back to individual Services Split-up of JTN "vision of interoperability and forward compatibility has not been realized, despite billions of dollars investment in JTRS"

Q.E.D. Self-evident

Waveform : SDR Product View

Tenets: Interoperable, Secure, Affordable

MUOS

WNW

SRW

LINK 16

Platforms

TBD

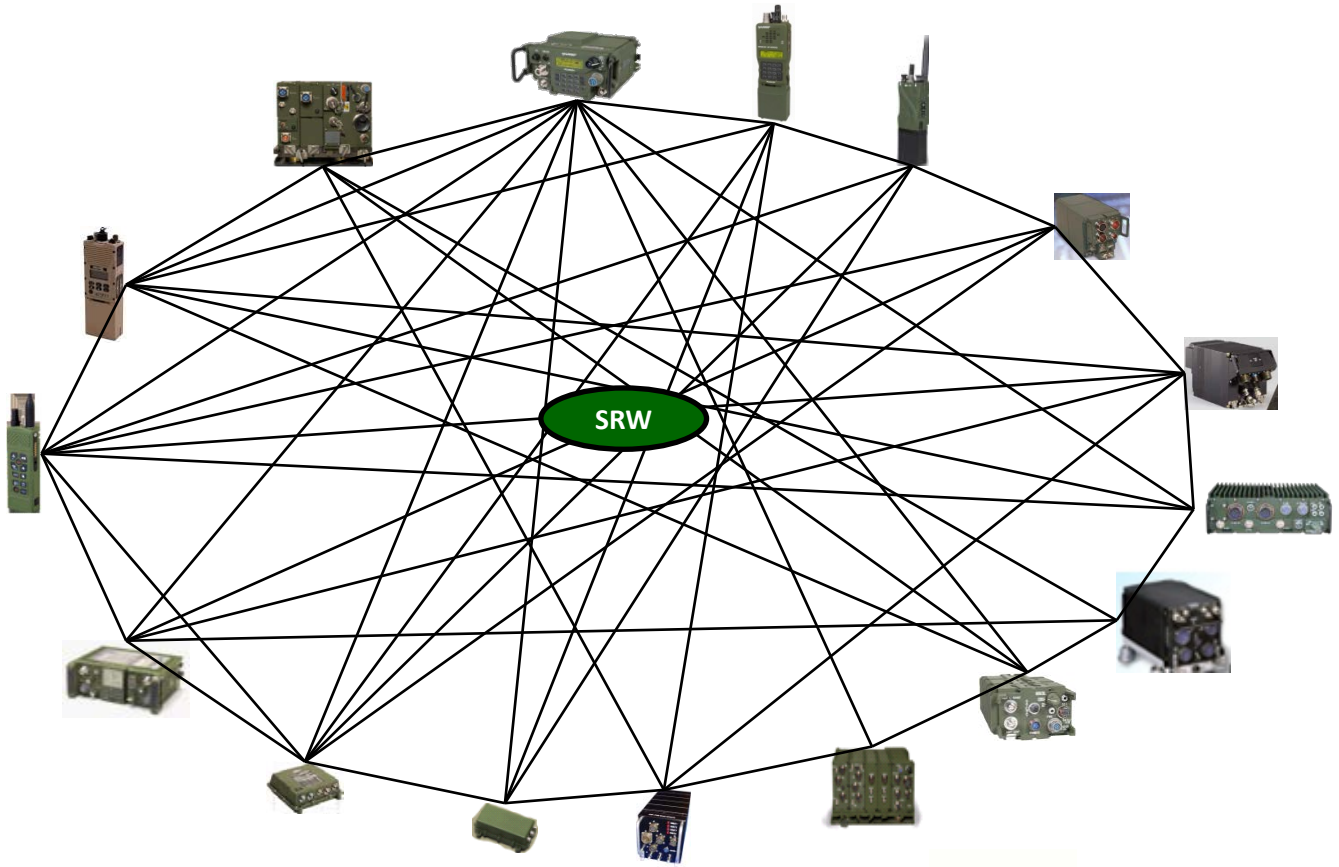
TBD

m (NDI)

Platforms

Interoperability Example

Tenets: ✓ Interoperable, Secure, Affordable



GENERAL DYNAMICS C4 Systems
Rockwell Collins
HARRIS
BAE SYSTEMS
EXELIS
NORTHROP GRUMMAN
BOEING
THALES

Current Marketplace

Tenets: ✓Interoperable, Secure, ✓Affordable

JTN Product Portfolio

Oct-14	Army Program Of Record (POR) [8]								Navy POR [2]		Non-Developmental Initiative (NDI) [21 and growing]																			
	HMS				AMF		GMR	MNVR	MIDS	DMR	GD		BAE	Harris					Exelis		Raytheon	NGC	RCI	Hughes	Thales			Vulcan	SSC LANT
Platform	Rifleman Radio AN/PRC-154	SFF-B	SFF-D RT 1948/D	Manpack AN/PRC-155	TBD AMF-SALT	TBD AMF-SANR	AN/VRC-107	AN/VRC-118	AN/USQ-190	AN/USC-61	TBD	SRW Applique	Phoenix	AN/PRC-117G	AN/PRC-152 /152A	RF-330E-TR	SRW Applique	SSDL/STT (w/ ViaSat)	Soldier Radio - Rifleman (SR-R)	SRW Applique	AN/ARC-231	Freedom 350/450	AN/ARC-210 Gen5	TBD	AN/PRC-148	AN/PRC-148B	SRW Applique	CSR-SDR	JTN
Nr Channels	1	2	1	2	2	2	2/3/4	2	4		2	1	2/4	1	1/1	1	1	2	1	1	2	2/2	1	1	1	2	1	1	4
WNW				WNW		WNW	WNW	WNW			WNW		WNW	WNW								WNW							WNW
SRW	SRW	SRW	SRW	SRW	SRW	SRW	SRW	SRW			SRW	SRW	SRW	SRW	SRW	SRW	SRW	SRW	SRW	SRW		SRW	SRW		SRW	SRW	SRW		SRW
MUOS				MUOS						MUOS				MUOS							MUOS	MUOS	MUOS	MUOS				MUOS	
SINCGARS		SINC		SINC		SINC	SINC	SINC		SINC	SINC		SINC	SINC	SINC			SINC			SINC	SINC				SINC			SINC
UHF SATCOM/DAMA				DAMA			DAMA			DAMA				DAMA							DAMA								
HF							HF			HF																			
JENM	●	●	●	◑	○	○	◑	●	○	○	◑	●	◑	◑	●	●	●	◑	●	●	○	◑	○	○	○	◑	●	○	●

Statement A: Approved for public release; distribution is unlimited (Case # PEOC3T-2015-5240)

Security Assessments

Tenets: ✓Interoperable, ✓Secure, ✓Affordable

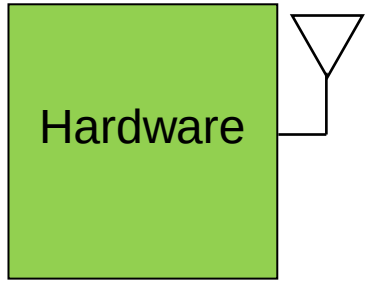
Product	Letter	Product	Letter
MUOS	Oct 2013	SINCGARS	Mar 2012
WNW	Mar 2012 Mar 2014 Jun 2015	Bowman HF	Apr 2013 Oct 2013
SRW	Feb 2011	Link-16	Nov 2013
JENM 1.2	Oct 2012 Oct 2014 (IATO)	JENM 2.3 JENM 3.1 JENM 3.2 JENM 3.3	Mar 2012 Feb 2015 (IATT) Sep 2015 (IATT) Mar 2016 (ATO)

Generations of Software Defined Tactical Radios

Gen 1 & Gen 2 (w/ COMSEC)

PRC-77

PRC-119



Pre-mid 1980's

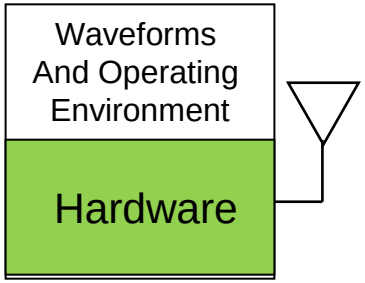
- Waveforms implemented entirely in hardware
- One capability for each radio

Gen 3

PSC-5

PSC-3

RT-1523E



Mid 1980's until 2000

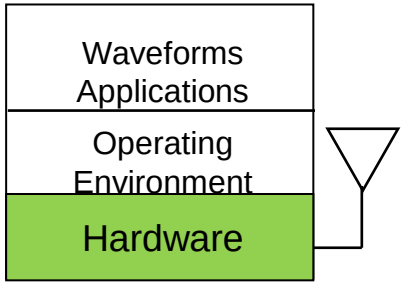
- Waveforms implemented in Hardware and Software
- Waveform applications & operating environment combined
- HW Crypto ASIC

Gen 4

AN/VRC-118

AN/PRC-155

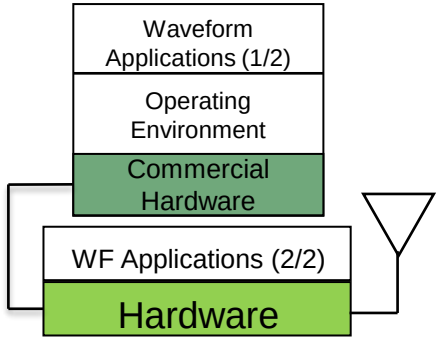
AN/PRC-154A



2010-Present

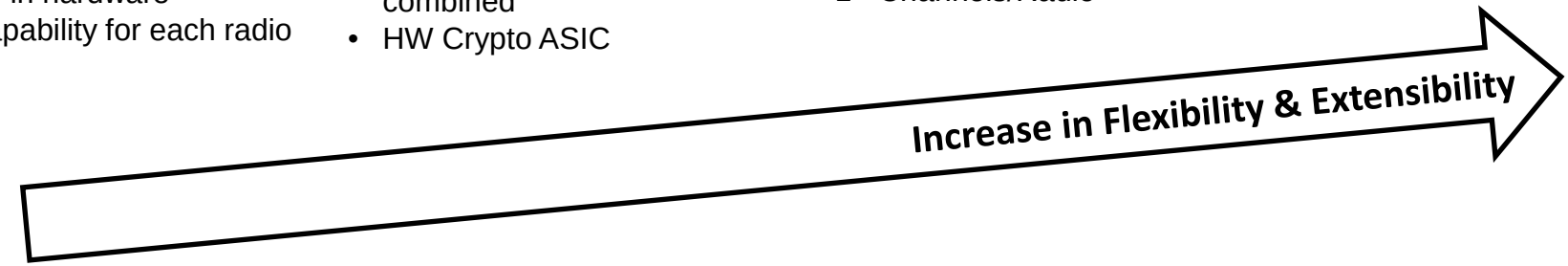
- Separated waveform application from operating environment (OE)
- Created standardized OE to enhance waveform portability
- Reprogrammable Crypto ASIC
- 1+ Channels/Radio

Gen 5



Emerging

- Uses commercial devices for presentation layer and applications
- Tether or sleeve for military waveforms



The Need for a Common Net Manager (JENM)

Need: Single network manager framework for all lower tactical nets

Need Operating System-agnostic / Deployed to many Compute Environments

Need: Automated interactions across applications

i.e. a Services Oriented Architecture (SOA) framework

Need: Monitor networks performance

Includes fault occurrences, connectivity status, network topology, radio position, and situational awareness

Need: Plan and configure disparate networking radios to ensure interoperability

Need: Common OTAM solution set for all radios

Need: User enhancements to simplify handling of complex data entry

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WNW				WNW		WNW	WNW	WNW			WNW		WNW	WNW								WNW							WNW
SRW	SRW	SRW	SRW	SRW	SRW	SRW	SRW	SRW			SRW	SRW	SRW	SRW	SRW	SRW	SRW	SRW	SRW	SRW		SRW	SRW		SRW	SRW	SRW		SRW
MUOS				MUOS						MUOS				MUOS							MUOS	MUOS	MUOS	MUOS				MUOS	
SINCGARS		SINC		SINC		SINC	SINC	SINC		SINC	SINC		SINC	SINC	SINC			SINC			SINC	SINC				SINC			SINC
UHF SATCOM/DAMA				DAMA			DAMA			DAMA				DAMA							DAMA								
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JENM	●	●	●	◑	○	○	◑	●	○	○	◑	●	◑	◑	●	●	●	◑	●	●	○	◕	○	○	○	◑	●	○	●

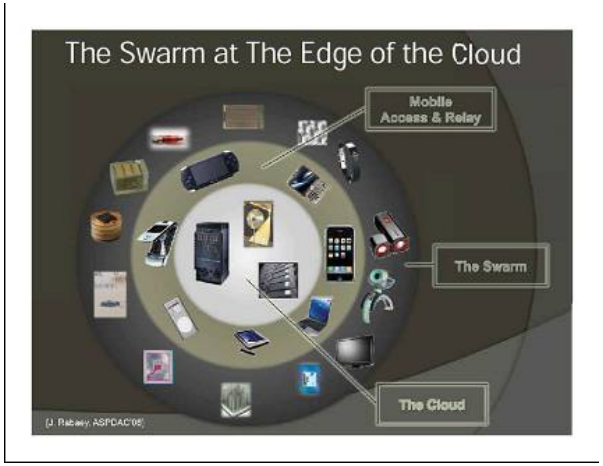
2016 Outlook: "The Better View"

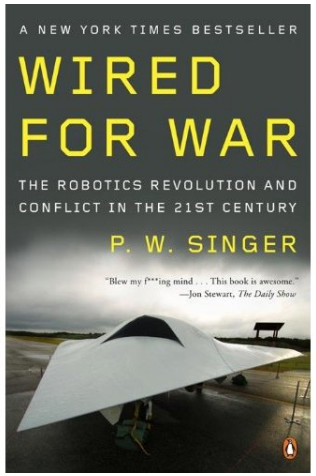
MUOS	Call reliability improvements, HMS Manpack Techeval, MOT&E
WNW	30 node performance stable, Scalability fixes maturing
SRW	Cross-band w/ MUOS & WNW, integration w/ Nett Warrior
JENM	Functions for WNW, SRW, MUOS; User enhancements → Training & Doctrine Command support
SCA	4.1 resolves many discrepancies, strong basis for cont. updates
Tech basis	MANETs will be needed in future tactical environments
Other WFs	Library of waveforms established, available for US companies
Summary	➢ ***Software Defined Radios are mature*** ➢ ***Competitive marketplace for tactical SDRs*** ➢ ***SDRs will continue to improve (Moore's Law intact)*** ➢ ***Multi-tier networks (MUOS-SRW-WNW) soon to be fielded*** ➢ ***Common Net Manager will be ready and tested*** ➢ ***Still need SINCGARS-like (narrowband VHF) waveform***

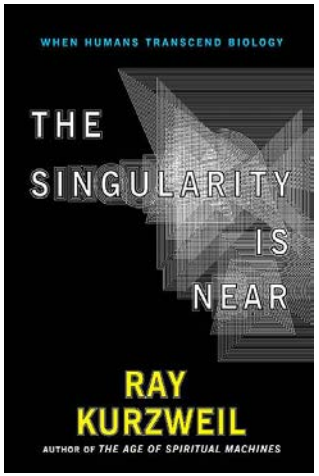
➢ JTRS Vision Will be Realized

My Observations of Trends

- 3D gates, memristors, multi-core and 3D chip architectures
  - →Moore's Law continues (yet data growth outpaces processing improvements)
  - →management of parallel processing and real-time processing is critical
- Competition drives Moore's Law, drives innovation
- Innovation is accelerating (volatility of Fortune 500), Innovators win
- Internet of Things → "the swarm"
- Distributed sensors, smart munitions, autonomous platforms
  - → Ubiquity of tactical wireless devices in future battlefield
  - → Connected, collaborating with big data, tactical cloud computing
  - → Opportunities with centralized control of all RF receivers and transmitters







Gartner "Hype Cycle" View

Hype Cycle Indicators

Gartner

Direction Required:
Develop & Manage the Interfaces