Annual Meeting
Software Defined Radio Forum, Inc

8 December 2015

Slide 1

Annual Meeting
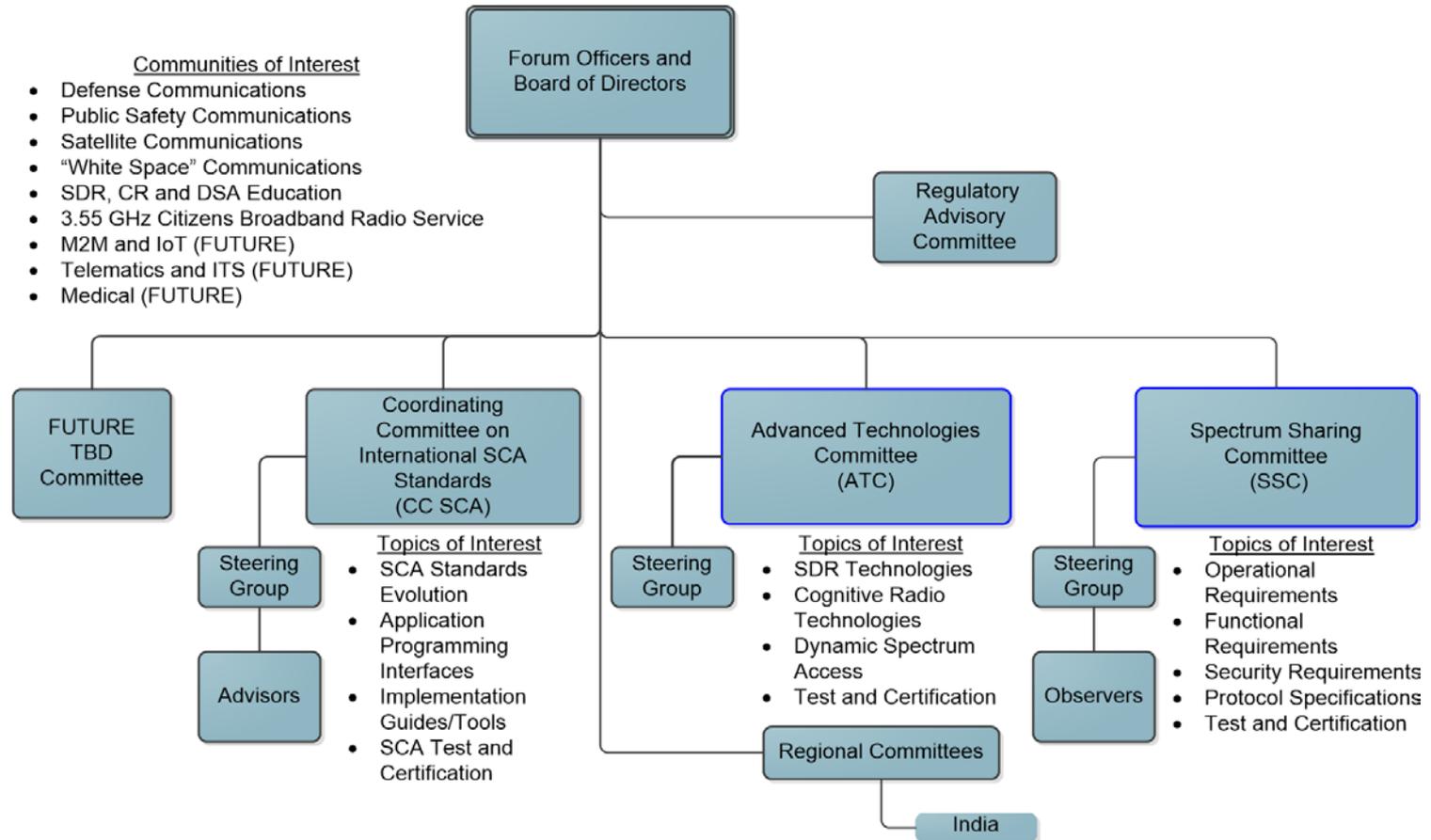# Software Defined Radio Forum, Inc

Advanced Technologies Committee (Formerly the Spectrum Innovation Committee) Report

8 December 2015

Current Structure: Connecting Experts with Experts

Organizational Structure for The Wireless Innovation Forum
10 November 2015

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ATC Activities (FY2015)

- **What was accomplished in FY2015 (1 July 2014 to 30 Jun 2015)**
  - Report:
    - Wireless Innovation Forum Top 10 Most Wanted Wireless Innovations Document WINNF-11-P-0014 Version V4.0.0 2 June 2015
    - Dynamic Spectrum Sharing Annual Report - 2014 Document WINNF-14-P-0001 Version V0.2.16 14 August 2014

  - Specifications:
    - Certification Test Plan SSRF Conformance for OpenSSRF Software v3.1.0 Document WINNF-14-S-0023 Version V1.0.0 10 February 2015
    - Certification Test Requirements for Conformance with the Standard Spectrum Resource Format (SSRF) Document WINNF-14-S-0022 Version V2.0.0 10 Feburary 2015

ATC Activities (FY2015)

- **What was accomplished in FY2014 (1 July 2014 to 30 Jun 2015)**
  - Recommendations:
    - Wireless Innovation Forum's Comments to the FCC regarding the Use of Bands above 24 GHz for Mobile Communications Document: WINNF-14-R-0021 Version 1.0.0 12 January 2015
    - Endorsement of Standard Spectrum Resource Format Version 3.x Working Document WINNF-14-R-0019 Version V1.0.0 12 January 2015
    - Wireless Innovation Forum's Comments to the FCC and NTIA regarding the Public Notice and Request for Comments on the Model City for Demonstrating and Evaluating Advanced Spectrum Sharing Technologies Document: WINNF-14-R-0017 Version 1.0.0 19 August 2014

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Top 10 Most Wanted Wireless Innovations

Innovation #1: (modified) Techniques for Efficient Porting of Waveform Applications Between Embedded Heterogeneous Platforms

Innovation #2 (new) Network Management of Mobile Ad-hoc Radios

Innovation #3: (modified) Receiver Performance Interference Thresholds

Innovation #4: Low Cost Wide Spectral Range RF Front-End (Multi-octave Contiguous) (Tx,Rx)

Innovation #5: Efficient Techniques to Minimize Power Amplifier Spectral Regrowth in Non-contiguous Spectral Environment

Innovation #6: Increase Communications Time on Battery Charge by an Order of Magnitude

Innovation #7: Context Aware Cognitive Radio

Innovation #8: Interference Mitigation Techniques

Innovation #9: Standardized Computer Interpretable Policy Language for Cognitive Radio

Innovation #10: Flexible Regulatory Framework for Temporary, Cooperative and Opportunistic Access

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Dynamic Spectrum Sharing Annual Report

The members of the Wireless Innovation Forum have created this report for Regulators, Policy Makers, Spectrum Managers, Network Planners, and Wireless Researchers who need to understand the state of technologies such as dynamic spectrum access and their ability to facilitate spectrum sharing. The report will act as a reference guide to clearly identify and synthesize a harmonized view of the results of spectrum sharing research and trials, identify what is in development, and articulate what issues are being addressed and what issues still need to be resolved.

Downloads to date: 4,386

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Dynamic Spectrum Sharing
Annual Report - 2014

Document WINNF-14-P-0001
Version V0.2.16
14 August 2014

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ATC Activities (FY2015)

- **Planned for FY2016 (1 July 2015 to 30 June 2016)**
  - Release Receiver Performance Guidelines
  - Release 2nd Annual Dynamic Spectrum Sharing Annual Report

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Current Project: Context Aware Cognitive Radio

For developers of complex information systems with intelligent automated behaviour who need to incorporate diverse and varying information sources into their automated decision processes…

**The project will provide tools … that will aid in defining, designing and selecting Cognitive Radio Systems…**

Selected Cognitive Radio Capabilities and Missions

CR Capabilities	CR Missions and Impacts
Dynamic Spectrum Access	Cognitive (Intelligent) Electronic Warfare
Cooperative Relaying (Synthetic MIMO)	Joint Component/Waveform Optimization
Concurrent Processing	Role-based (Mission-goal) Reconfiguration
Cross-network Cooperation/Coexistence	Dynamic Policy Compliance
Radio Resource Management	Power Optimization and Management
Self Healing Networks	Spectrum Auctions/Markets
Interference Suppression (Self, External)	Dynamic Network (Vendor) Selection
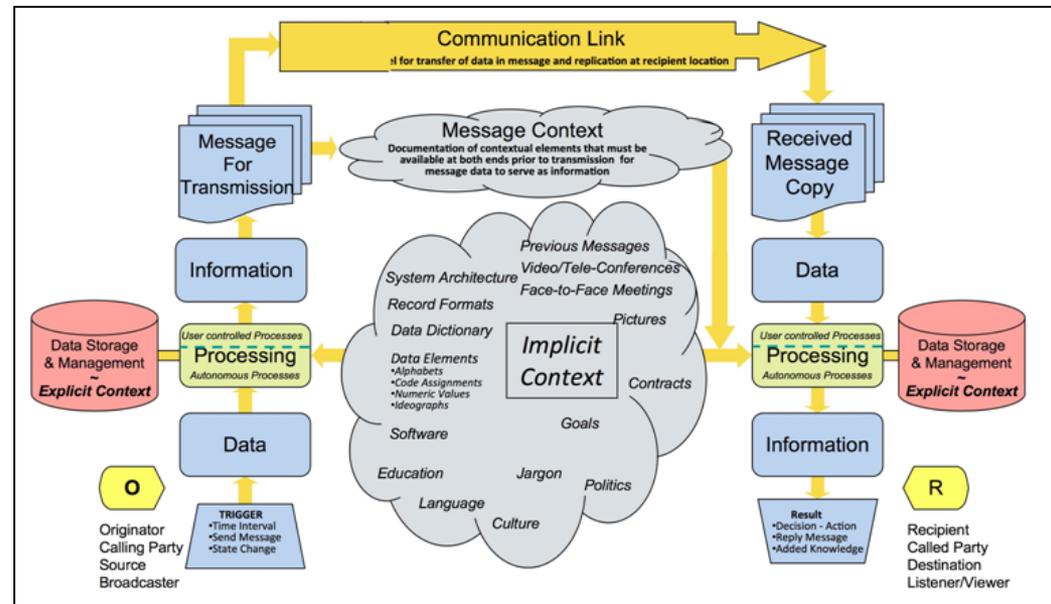
Current Project: Receiver Performance Guidelines

Spectrum Unusable Due to consumer GPS RX Design

LightSquared-held Spectrum   GPS (20MHz BW)   LightSquared-held Spectrum

LTE DWN 1   LTE DWN 2   LTE UP   LTE UP

1525   1559   1565   1585   1605   1610   1626   1660.5

"Consumer" GPS
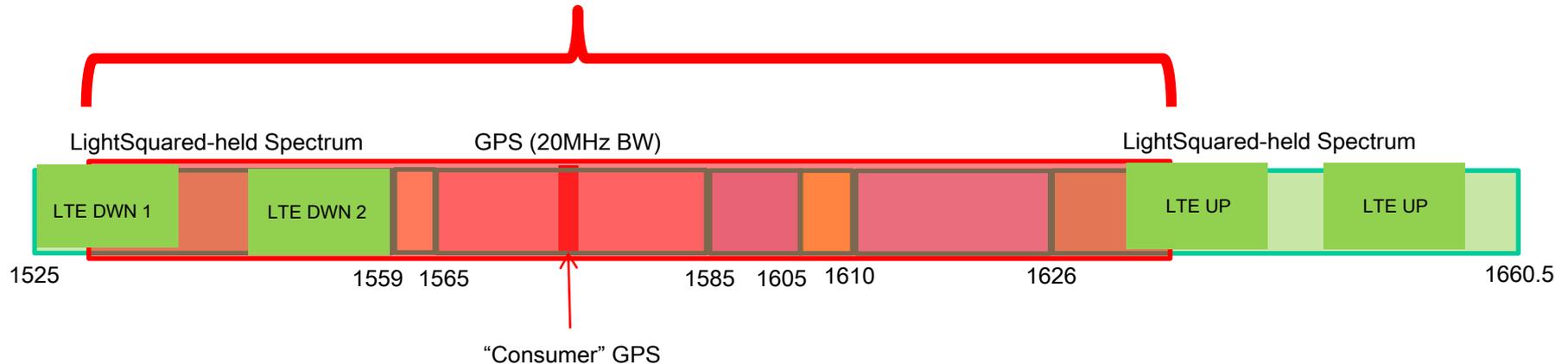
- **LightSquared followed all of the rules…**
- **Without GPS receiver spec, market did not design to allow spectrum reuse**
- **Because of <u>GPS receiver interference issues</u>, the FCC rescinded authorization**
- **$2.7 B Investment lost**
- **Receiver Minimum Performance Guidelines will be a necessary part of spectrum sharing solutions**

Receiver Performance Guidelines Project

This report is being developed for regulators, designers, manufacturers and users of wireless communications systems

who are developing wireless policy and equipment to access shared spectrum or to coexist with adjacent spectrum uses while understanding impact to current spectrum users.

The report will produce a set of actionable guidelines to design and evaluate the performance of receivers that will coexist in shared & adjacent spectrum bands that can be used as a foundation for future radio systems.

Project Positioning:

For Regulators, Policy Makers, Spectrum Managers, Network Planners, and Wireless Researchers

Who need to understand the state of technologies such as dynamic spectrum access and their ability to facilitate spectrum sharing,

The Spectrum Sharing Annual Report is a reference guide

That clearly identifies and synthesizes a harmonized view of the results of Spectrum Sharing research and trials, identifies what is in development, and articulates what issues are being addressed and still need to be resolved.

Unlike reports from individual, independent projects and trials that provide only a limited view of the state of spectrum sharing,

This product will consolidate the results from around the world in summary form, providing an easy reference for the target audience on the state of spectrum sharing and its viability in specific markets.

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CC SCA Report

8 December 2015

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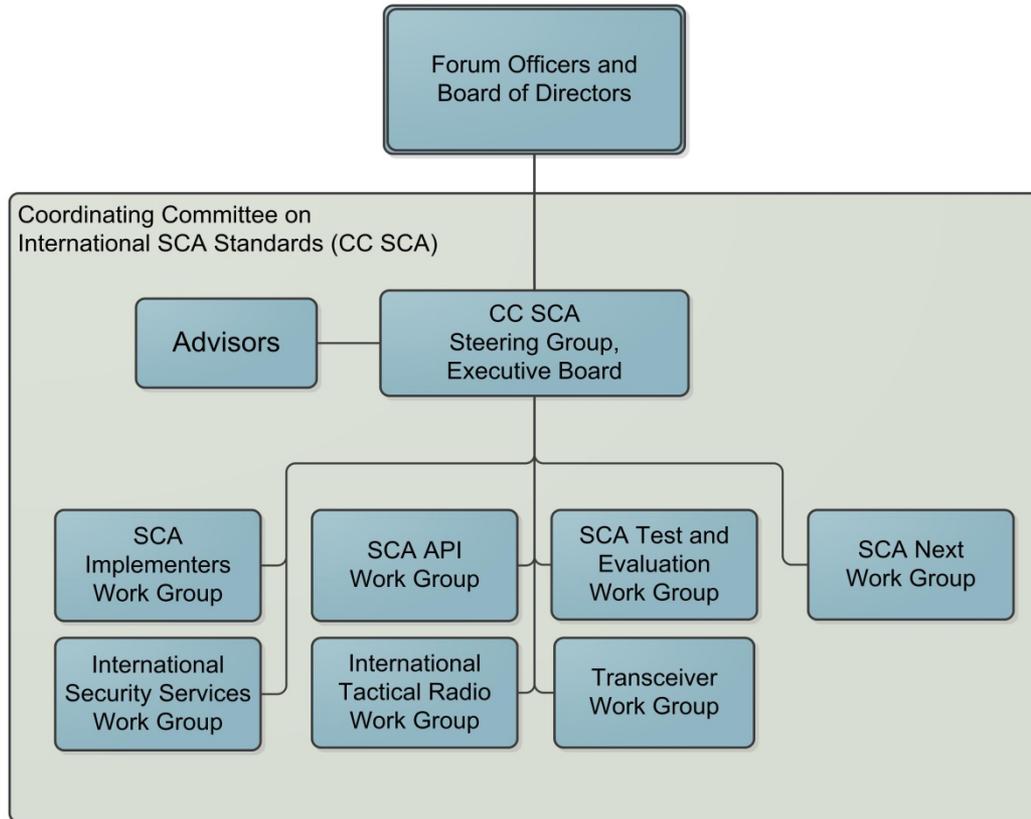
version 2.0

CC SCA Mission

To support the harmonization of the SCA standards at the international level for the mutual benefits of all stakeholders to include:

- Defining an industry driven SCA evolution roadmap for the international community
- Profiling the SCA specification and related APIs to define internationally accepted variants that are hosted by the Forum
- Developing extensions to the SCA standards that address any gaps between the defined SCA evolution roadmap and Forum accepted SCA specification variants
- Providing implementation and certification guides, tools etc. easing implementation and supporting proliferation
- Establishing and managing industry led certification programs where appropriate

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CC SCA Structure

Structure for Coordinating Committee on International SCA Standards
17 April 2013

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The CC SCA is led by a Steering group of worldwide tactical radio manufacturers

HARRIS

THALES

Raytheon

ROHDE & SCHWARZ

Selex ES
A Finmeccanica Company

Rockwell Collins

Hitachi Kokusai Electric

indra

a4ESSOR
alliance for ESSOR

CC SCA Advisory Council

Grouping together the Steering Group and CC SCA Advisors

- Answering to the essential need of a venue for manufacturers and customers to interact
- Met at least twice a year since creation (~2011)
- Now delivering beyond expectations: Advisory Council enabled the normative referencing of WInnF PIM IDL Profiles by SCA 4.1

Who are Advisors?

- Individuals related to MoDs active in the area of International SDR Standards
- Current list of Advisors covers JTNC Standards, OCCAR-EA, DGA, EDA, NATO, German MoD, Swedish MoD, IT MoD
- Appointed upon invitation issued by the Steering Group

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SCA Evolution WG: SCA 4.1

Feb: Draft SCA 4.1 published

Mar-Apr: WInnF takes lead in adjudication of comments recieved regarding Core Spec

- 20 Meetings; 106 Man Hours for meetings: 26 Issues Adjudicated
- Of Note: addition of multi-core support in SCA

Apr-July: normative referenceing of WInnF PIM IDL Profiles

- 3 Meetings; 13 Man Hours for meetings
- PIM IDL Profiles v2.0.1 released

Aug: SCA v4.1 Final Draft Released

- ICWG Approval (WInnF support expressed)

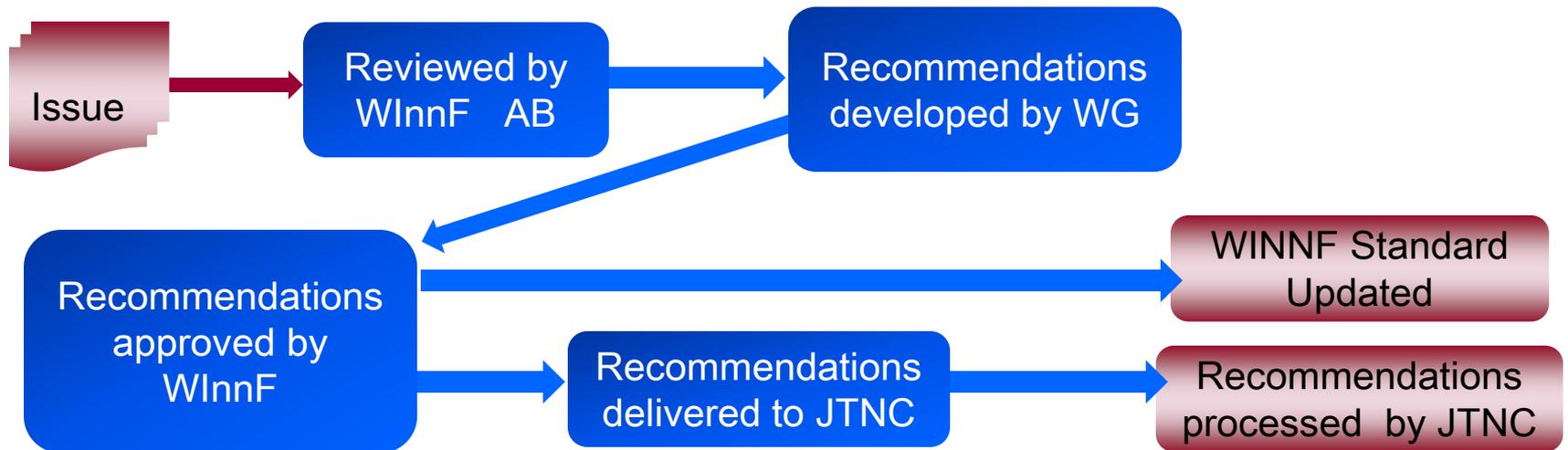**Sep: SCA 4.1 released**

Dec: WInnF Endorsement of SCA 4.1

Additional CC SCA Activities

OCCAR ESSOR Agreement

- For the exchange of information in order to support the harmonization of the Software Communication Architecture (SCA) standards at international level

SCA Comment Handling

- Web-based Issues collection mechanism, open to all

Issue → Reviewed by WInnF AB → Recommendations developed by WG → Recommendations approved by WInnF → WINNF Standard Updated / Recommendations delivered to JTNC → Recommendations processed by JTNC

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Transceiver Next WG

Revision to WInnF Transceiver Facility V1.0.0 specification

- Improves the V1 content based on years of implementation experience

- Integrates contributions for a larger international basis than early practitioners of V1

- Features implementation-abstract standard APIs that allow a high degree of portability for SDR Applications

- Broadens applicability of the specification to other categories of SDR Applications such as Test and Measurement, Dynamic Spectrum Allocation, TV Broadcasting or Sensing

SCA Advocacy WG

ITR SIG Market Report (WINNF-15-P-0064)

- Business Models for new entrants in SDR Tactical Radio Market

"Wireless Innovation Forums Contribution to SCA 4.1"

- October 2014 Military Embedded System magazine
- January 2016 Springer Journal of Signal Processing

SCA New Market Opportunity Report

- Expand the adoption of the SCA technology into new markets, sharing its benefits to other domains, making it a de-facto standard for heterogeneous embedded systems and facilitating the growth of innovation around the technology.

CC SCA Test & Evaluation WG

Finalize SCA Test Lab Recommendations

- Complete report that provides an overview understanding of an SCA test Lab.

- Identify artifacts that are the inner workings for the SCA Test Lab's existing.

- Identify the business case as it pertains to the financial concerns of a business entity.

Future Project Considerations

Candidate Report Projects

- SCA 4.1 Adoption: Report on adoption aspects and implications
- Coalition Interoperability: Identify opportunities for tactical communications improvements in coalition operations

Candidate Specification Projects

- Harmonization of Time related APIs/services
- 4.1 Test & Eval Criteria
- Military Transceiver Profiles

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Spectrum Sharing Committee Report
8 December 2015

Slide 24

Overall 2015 Accomplishments in Establishing Part 96 Ecosystem

Grown to 49 Organizations Reflecting:

- The 4 Major US Carriers
- Major LTE Infrastructure Suppliers
- The US SOC and Chip Providers
- Recently added Enterprise WiFi Channel
- Incumbent interests, such as satellite and Wireless ISPs
- Spectrum Access System Providers
- Plus Government, other standards body observers

Created cohesive, cross industry positions

- Common Reconsideration positions on power, protection
- Ex-parte meeting on power measurement

Established Operational Frameworks for the 3.5 Ecosystem

- Authentication, training, synchronization, ...

Recognized by FCC as the body that speaks for industry

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Participation to Date – 154 People, 49 Organizations

Members

- Alcatel-Lucent Bell Labs*
- Astrapi
- AT&T*
- Communications Research Centre, Canada
- ComSearch*
- Ericsson
- Fairspectrum
- Federated Wireless*
- Google*
- Harris Corporation
- Huawei*
- Idaho National Labs
- Intel
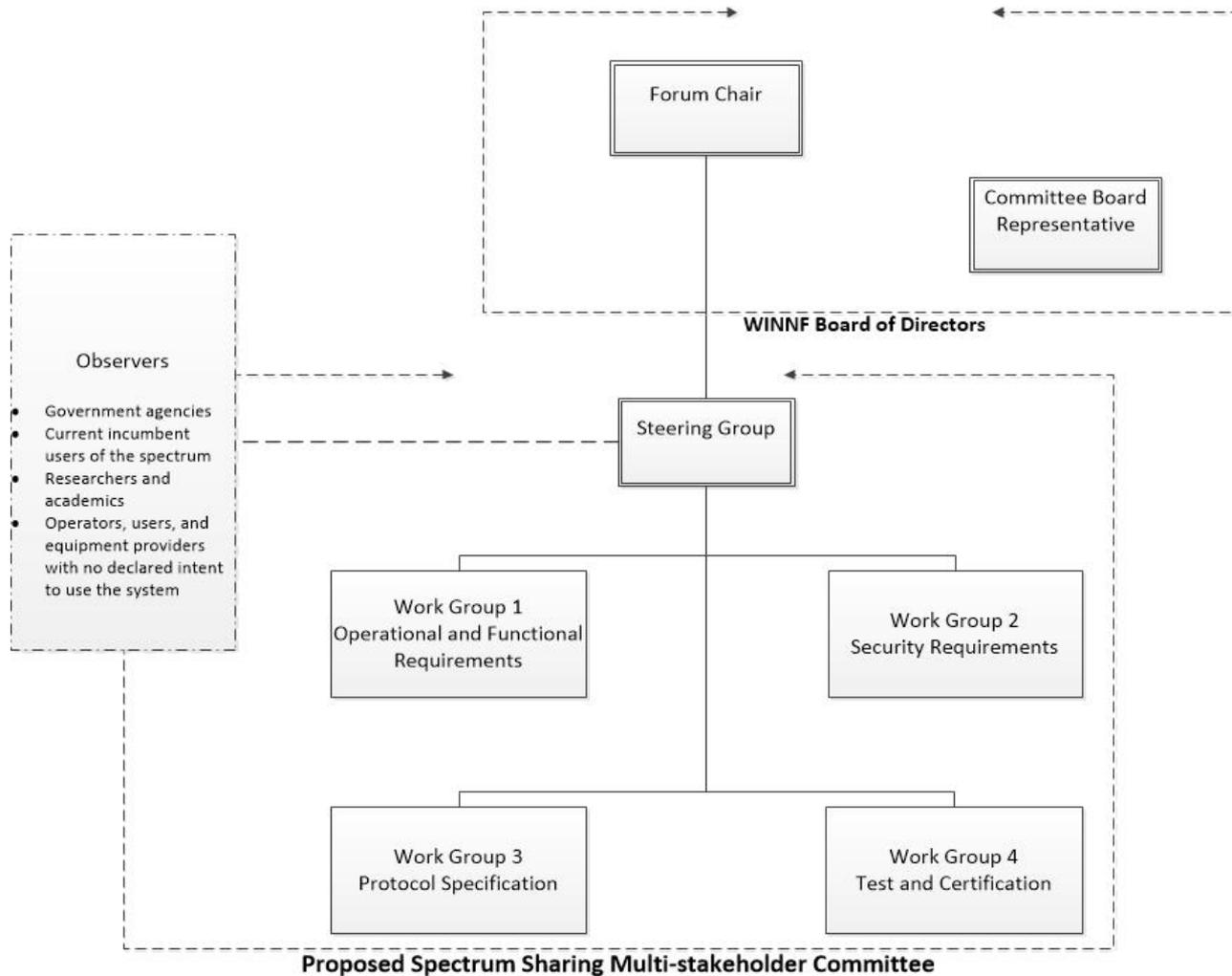- ITS (NTIA)
- Keybridge Global*
- MITRE
- Motorola Solutions*

- NASA
- Nokia Networks*
- Pathfinder Wireless*
- RED Technologies
- Rockwell Collins
- Ruckus Wireless
- Qualcomm*
- SIA
- Sony
- Spectrum Bridge
- Tarana Wireless
- T-Mobile*
- Verizon*
- Virginia Tech
- Vistology
- WISPA
- ZTE USA

Denotes Steering Group Member

Observers

- IEEE DySPAN-SC
- DMI for US DoD
- Kingfisher Systems for US DoD
- New America Foundation
- NAB
- Roberson and Associates for US DoD
- US Army/CIO
- US DISA DSO
- US DoD/CIO
- US Navy
- US NIST
- US NSWC
- US NTIA
- Utilities Telecom Council
- WiMAX Forum

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Committee Structure

Status Update from WInnForum

WG1 (Operational and Function Requirements, Chairs: Andy Clegg, Google and Al Jette, Nokia Networks)

- SAS Functional Architecture Approved
- 41 "Scenarios" Identified
- Requirements for Commercial Operation in the U.S. 3550-3700 MHz CBRS Band: February 2016

WG2 (Security Requirements, Chair: Charles Clancy, Federated Wireless)

- Operational Security Requirements: February 2016
- Communication Security Requirements: February 2016

WG3 (Protocols, Chairs: Jesse Caulfield, Keybridge Global and Prakash Moorut, Nokia Networks)

- Interim Technical Report Approved
- SAS to CBSD Protocol (Chair: Prakash Moorut, Nokia Networks): February 2016
- SAS to SAS Protocol (Chair: James Ni, Federated Wireless): March 2016

WG4 (Test and Certification, Chair: Kurt Schaubach, Federated Wireless)

- High level Certification Flow Approved
- Test and Certification Objectives: February 2016
- Test and Certification Requirements Specification: May 2016

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Other activities

WG1/WG3 Joint Architecture Task Group

- Complete

FSS Joint Task Group

- Complete

WG1/WG2 Joint ESC Task Group

- In Progress

3650 Task Group

- In Progress

Approved Documents (FY2016)

WINNF-15-P-0023-V1.0.0 Interim SAS to CBSD Protocol Technical Report-A

- http://groups.winnforum.org/d/do/8699

WINNF-15-P-0060-V1.0.0 SSC WG4 Certification Process

- http://groups.winnforum.org/d/do/8648

WINNF-15-P-0047-V1.0.0 SAS Functional Architecture

- http://groups.winnforum.org/d/do/8512

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Regulatory Filings (FY2016)

WInnF-15-R-0058 Reply comments to FCC re: Second FNPRM in regards to 3550-3650 pt1

- http://groups.winnforum.org/d/do/8489

WInnF-15-R-0059 Reply Comments to FCC re: Second FNPRM in regard to operations in 3550-3650 band pt2

- http://groups.winnforum.org/d/do/8488

WINNF-15-R-0045 Comments to the FCC regarding the R&O Matter of Amendment of the Commission's Rules

- http://groups.winnforum.org/d/do/8487

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Test Harness Development

https://github.com/Wireless-Innovation-Forum/Spectrum-Access-System

CY2015 Meetings

Work groups meet on alternating schedule every two week

Face to face meetings approximately every 6 weeks

- 27 January
- 30 April
- 25 June
- 6 Aug
- 16 to 17 Sept
- 3 to 4 November

Webinar presented 17 June

- https://www.youtube.com/watch?v=IQ2a4ZRjGgE

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Software Defined Radio Forum, Inc

India Regional Committee Report

8 December 2015

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India Regional Committee

Objective

- to spread WinnF in India and acquire membership;
- to organize local meetings for members interaction and participation

During 2015, two one day meetings were held

- one on SCA by Nordiasoft team
- another on Tactical SDRs by David Renaudeau of Thales.

Members in India Region are:

- Bharat Electronics Limited
- Rolta
- Tata Power SED

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Software Defined Radio Forum, Inc

Operations Report

8 December 2015

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Total Membership (As of 30 October Each Year)

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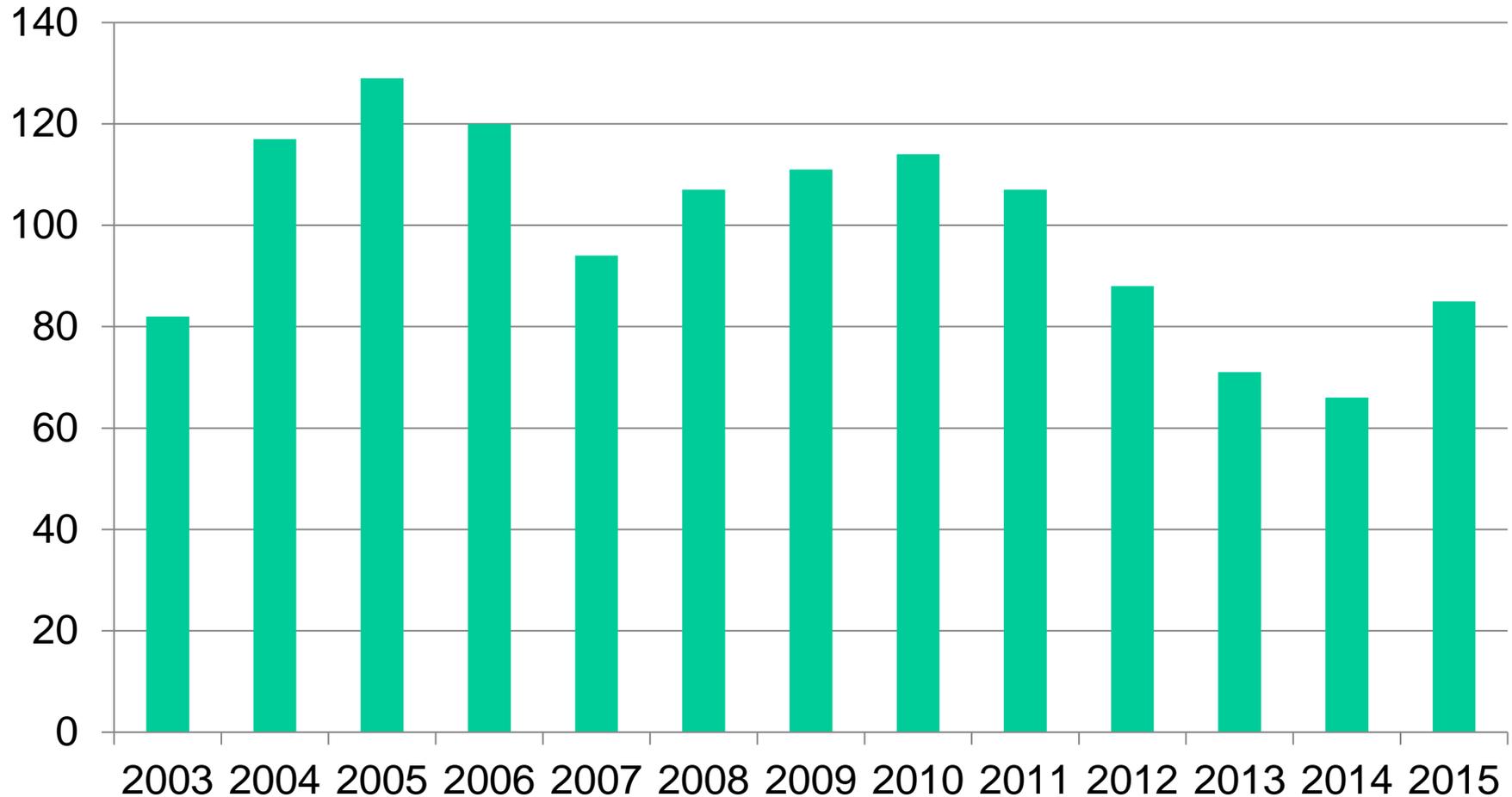
New Members Since the Last Annual Meeting - 29

Alcatel Lucent

Astrapi

AT&T (Returning)

BeeCube

ComSonic

ComSearch

ENSTA (Returning)

Ericsson

Fairspectrum

Huawei (Returning)

Intel (Returning)

KACST

Lime Micro

Nokia Networks

NTIA/ITS (Returning)

Pathfinder Wireless

Qualcomm (Returning)

RED Technologies

Ruckus Wireless

SIA

Siru Innovations

Sony

Spectrum Bridge (Returning)

Tarana Wireless

T-Mobile

University of Oulu (Returning)

Verizon

WISPA

ZTE USAENSTA (Returning)

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Lost Members Since Last Meeting - 10

Space Coast

Coherent Logix

Rafael Advanced Defense Systems

Nutaq

Spectrum Signal Processing

Tata Consultancy

DSO Singapore

CDAC

Shared Spectrum

Telecast Technologies

CY2015 Meetings and Events

General

- WInnComm: 24 to 26 March
- WInnComm Europe: 5 to 9 October

CCSCA Events

- SCA 4.1 Draft Release Webinar: 18 Feb
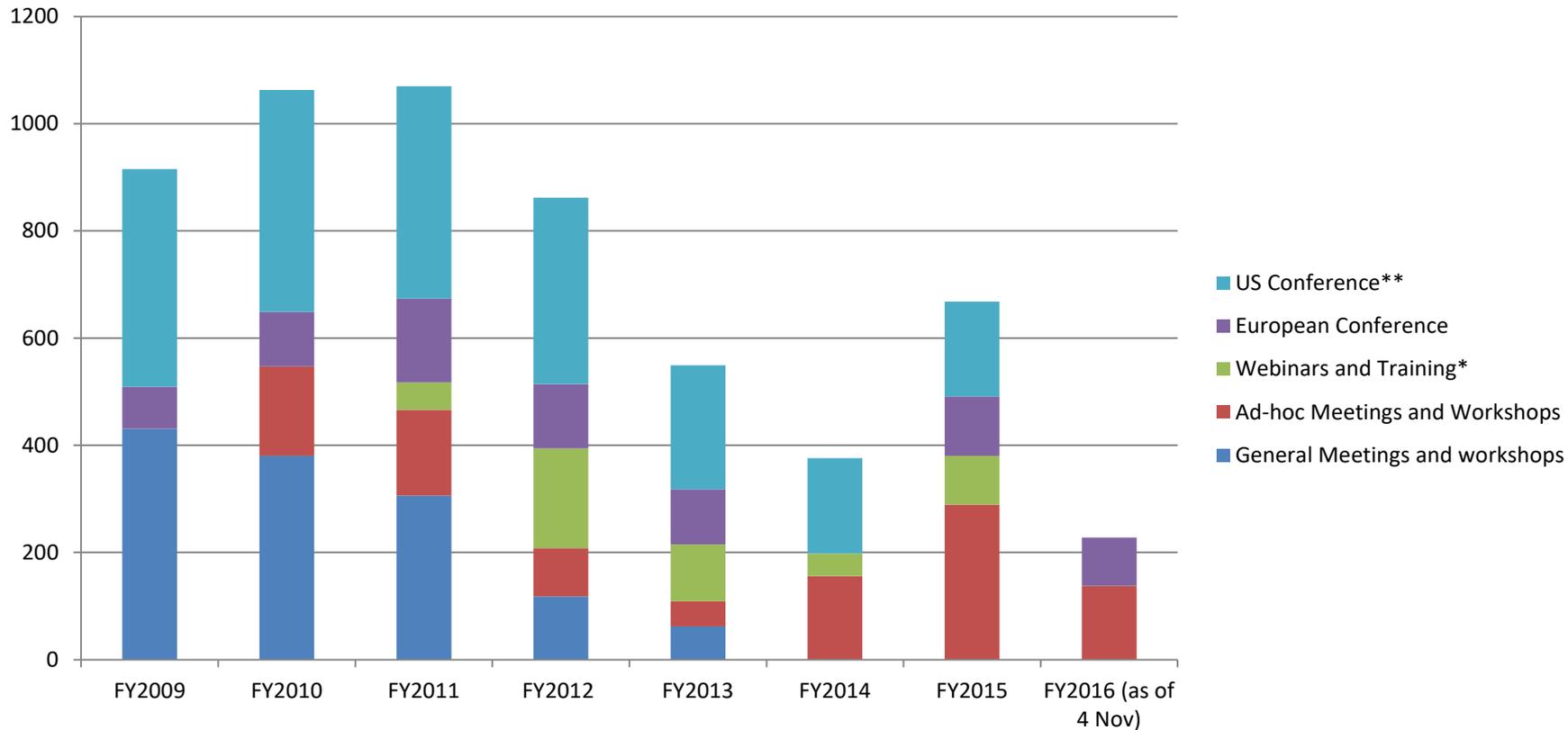- Transceiver Next Meetings
  - 26 to 28 May
  - 14 to 16 July
  - 16 to 18 September

India Regional Committee Meetings

- 11 May
- 2 July

Spectrum Sharing Committee Events

- Introduction to the 3.5 GHz Band Webinar: 17 June
- Committee Meetings
  - 27 January
  - 30 April
  - 25 June
  - 6 Aug 2015
  - 16 to 17 September
  - 3 to 4 November

Performance by Attendance

Legend:
- US Conference**
- European Conference
- Webinars and Training*
- Ad-hoc Meetings and Workshops
- General Meetings and workshops

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Supporting Collaborative Development of Reports, Recommendations and Specifications

Professional Tools

- Group Portal
  - Document Development
  - File Management
- Tele/Web Conferencing
  - Go To Meeting

Staff Support

- Technical Editing
- Graphic Design
- Configuration Management
- Balloting

Wireless Innovation Forum Memberships and Partnerships

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Website Page Views

Site	2011	2012	2013	2014	2015
External Main Site	183,016	117,633	68,150	83813	67,994
Socious Main Site		121940	116045	128974	102,399
External US Conference	54613	23418	16168	17321	27866
External Europe	30901	16342	8492	5971	16106
Total	268,530	279,333	208,855	236,079	214365

Document Downloads

	FY2012	FY2013	FY2014	FY2015
Conference Proceedings	114,015	122,221	152,866	103,404
Workshop Proceedings	15,740	15248	22,671	12,553
Work Products				
• **Reports**	5,140	9,116	12,107	19,321
• **Recommendations**	4,891	6,270	8,604	17,407
• **Specifications**	2,337	2,558	2,929	6,051
Market Studies	1,272	1,339	1,663	2,867
SCA Standards Portfolio	2,784	3,541	4,858	4,974
Webinars	1,453	2,033	186	-
Other	15,926	16,970	31,597	75,027
Total	163,558	179,297	237,481	125,647

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FY2015 You Tube Channel Views: 2117

Latest Design Strategies using Xilinx Virtex 7 FPGA for Software Radio	510 (24%)
Cognitive Radio Networking In The Ism Band	391 (19%)
Understanding the New U S 3 5 GHz Band	111 (5.2%)
The Software Communications Architecture	251 (12%)
The ADCs of SDR: Parameters, Design Considerations and Implementations	204 (9.6%)
SCA 4 1 Draft Standard Release	52 (2.5%)
Facilitating Spectrum Sharing Between Secondary Systems	123 (5.8%)
Introduction To Spectrum Policy For Technologists	83 (3.9%)
Wireless Innovation Forum Top Ten Most Wanted Wireless Innovations	85 (4.0%)
SCA Standards for Defense Communications: Global Adoption, Proven Performance	66 (3.1%)
Top Down Design Of Wireless Systems	123 (5.8%)
Techniques for Wideband RF IF Signal Recording	42 (2.0%)
Design Of Portable Waveform Sw Applications Using SCA	37 (1.7%)
Wireless Innovation Forum Advocacy Agenda	19 (0.9%)
Declarative Policies for DSA	12 (0.6%)
Generic Development Tools For Many Core Processors	7 (0.3%)

Press Releases (1 of 3)

- Wireless Innovation Forum Commends FCC in FNPRM Comments; Proposes Hosting Multi-Stakeholder Groups
- Wireless Innovation Forum Announces Approval of its FY2015 Operations Plan by Membership
- Wireless Innovation Forum Commends FCC and NTIA on Model City Proposal in NPRM Comments Filed Today
- Wireless Innovation Forum Members Present FCC Briefing in response to 3550 MHz Further NPRM
- Wireless Innovation Forum Announces Technical Program for its WInnComm-Europe 2014 Conference
- Wireless Innovation Forum Welcomes Three New Members
- Wireless Innovation Forum Announces Approval of Final Documents to be Submitted to JTNC for Consideration in the SCA 4.1 Standard
- WInnForum Announces Online Course on SDR Radio Waveform Development in the GNU Environment
- Wireless Innovation Forum Announces 2014 Wireless Innovation Achievement Award Finalists
- Wireless Innovation Forum Welcomes Three New Members

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- Wireless Innovation Forum signs agreement with the Joint Tactical Networking Center
- Wireless Innovation Forum Welcomes Three New Members
- Wireless Innovation Forum Announces Endorsement of Standard Spectrum Resource Format Version 3.x
- WInnForum Commends FCC on beginning the Process of Exploring Mobile Communications in 24 GHz Band
- WInnForum Announces Technical Program for Annual Technical Conference WInnComm 2015
- Joint Tactical Networking Center Publishes Software Communications Architecture (SCA) 4.1 Draft
- Wireless Innovation Forum Announces Approval of New Spectrum Sharing Committee
- Wireless Innovation Forum Announces New Specifications for Public Use
- Wireless Innovation Forum Announces New Transceiver Next Project Group

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- Wireless Innovation Forum Announces 2014 Wireless Innovation Achievement Award Winners on Final Day of WInnComm2015 in San Diego

- Wireless Innovation Forum Praises FCC's Report and Order on the 3.5 GHz Band

- Wireless Innovation Forum Submits Recommendations on the Draft SCA 4.1 Specification to Joint Tactical Networking Center

- Wireless Innovation Forum Accepts Multi-Stakeholder Group requests called out in Report and Order Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band

- Wireless Innovation Forum Welcomes New Board of Directors Members

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Member Discounts

Dozens of discounts negotiated for Forum Members

- Market Studies
- Events
- Products and Services

See Website for Details

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Social Media, etc.

RSS news feed:

- http://feeds.feedburner.com/SDRForumNews

Twitter

- http://twitter.com/winnforum

Linked In:

- http://www.linkedin.com/groups?mostPopular=&gid=95572

Facebook:

- http://www.facebook.com/WInnForum?ref=sgm

Tumblr

- http://winnforum.tumblr.com/

Wikipedia

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Software Defined Radio Forum, Inc

Finance Committee Report

8 December 2015

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Balance Sheet

ASSETS	FY2015	FY2014
CURRENT ASSETS:		
Cash and cash equivalents	$241,625	$230,662
Total Current Assets	$241,625	$230,662
OTHER ASSETS:		
Deposits	$4,615	$10,829
Total Other Assets	$4,615	$10,829
Total Assets	$246,240	$241,491
LIABILITIES AND NET ASSETS		
CURRENT LIABILITIES		
Credit card payable	$6,305	$5,093
Total Current Liabilities	$6,305	$5,093
NET ASSETS:		
Unrestricted net assets	$239,935	$236,398
Total Net Assets	$239,935	$236,398
Total Liabilities and Net Assets	$246,240	$241,491

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