Introduction to the Wireless Innovation Forum (SDR Forum Version 2.0)

26 November 2016
What is the Wireless Innovation Forum

A nonprofit “mutual benefit corporation” dedicated to:

“advancing technologies supporting the innovative utilization of spectrum and the development of wireless communications systems, including essential or critical communications systems”
Incorporated in California as a Non-profit Mutual Benefit Organization

Registered with the US Government as a Standards Development organization under the National Cooperative Research and Production Act of 1993, as amended by the Standards Development Advancement Act of 2004

DEPARTMENT OF JUSTICE

Antitrust Division

Notice Pursuant to the National Cooperative Research and Production Act of 1993—The Software Defined Radio Forum

Notice is hereby given that, on September 20, 2004, pursuant to section 6(a) of the National Cooperative Research and Production Act of 1993, 15 U.S.C. 4301 et seq. ("the Act"). The Software Defined Radio Forum ("SDR Forum") has filed written notifications simultaneously with the Attorney General and the Federal Trade Commission disclosing (1) the name and principal place of business of the standards development organization and (2) the nature and scope of its standards development activities. The notifications were filed for the purpose of invoking the Act’s provisions limiting the recovery of antitrust plaintiffs to actual damages under specified circumstances.

Pursuant to section 6(b) of the Act, the name and principal place of business of the standards development organization is: The Software Defined Radio Forum,
The Forum Is Its Members

And many more…

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Thank You to Our Sponsors

Google

Leonardo

Motorola Solutions

Thales
# Board of Directors

<table>
<thead>
<tr>
<th>Position</th>
<th>Director</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair of the Board of Directors</td>
<td>Manuel Uhm</td>
<td>Ettus Research</td>
</tr>
<tr>
<td>Forum Chair/President</td>
<td>Bruce Oberlies</td>
<td>Motorola Solutions</td>
</tr>
<tr>
<td>Forum Vice-Chair/ Vice President</td>
<td>Raghavan Muralidharan</td>
<td>Tata SED</td>
</tr>
<tr>
<td>Secretary</td>
<td>Al Jette</td>
<td>Nokia</td>
</tr>
<tr>
<td>Chief Financial Officer/Treasurer</td>
<td>Ken Dingman</td>
<td>Harris</td>
</tr>
<tr>
<td>Chief Technology Officer</td>
<td>Claude Belisle</td>
<td>NordiaSoft</td>
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<tr>
<td>Chief Marketing Officer</td>
<td>Vacant</td>
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<tr>
<td>Chief Regulatory Officer</td>
<td>Preston Marshall</td>
<td>Google</td>
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## Class Directors

<table>
<thead>
<tr>
<th>Category</th>
<th>Director</th>
<th>Organization</th>
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<tbody>
<tr>
<td>Large Company</td>
<td>David Hagood</td>
<td>Cobham</td>
</tr>
<tr>
<td>Medium Company</td>
<td>Alberto Quintana</td>
<td>Indra</td>
</tr>
<tr>
<td>Small Company</td>
<td>Kurt Schaubach</td>
<td>Federated Wireless</td>
</tr>
<tr>
<td>Government/Non Profit</td>
<td>Paul Anuszkievicz</td>
<td>CTIA</td>
</tr>
<tr>
<td>Academic</td>
<td>Linda Doyle</td>
<td>CTVR</td>
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## At Large Directors

<table>
<thead>
<tr>
<th>Category</th>
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<th>Organization</th>
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<tbody>
<tr>
<td>General</td>
<td>Claudio Armani</td>
<td>Selex ES</td>
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<tr>
<td>General</td>
<td>Mark Gibson</td>
<td>Comsearch</td>
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<td>General</td>
<td>Doug Knisely</td>
<td>Qualcomm</td>
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<td>General</td>
<td>Glenn Laxdal</td>
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<td>General</td>
<td>David Renaudeau</td>
<td>Thales</td>
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<td>General</td>
<td>Darcy Swain-Walsh</td>
<td>MITRE</td>
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<tr>
<td>General</td>
<td>Neeti Tandon</td>
<td>AT&amp;T</td>
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Pillars of Strategy

Wireless Innovation Forum

“Driving the future of radio communications and systems worldwide”

Advocacy
Collaborating with governments, regulators, standards bodies, and research sponsors, acting as the voice of the advanced wireless community

Innovation
Identifying and fostering research, both with the Forum and in other bodies worldwide, on Technical, Business or Regulatory innovations required to address emerging wireless communications requirements

Education
Educating the R&D community (researchers, developers, academia, etc.) and decision makers across the wireless value chain

Commercialization
Advancing standards, certifications, and demonstrations that enhance value, reduce total life cost of ownership and allow timely delivery of products, technologies and services

Organizations driving technology innovation in commercial, civil, and defense communications around the world
Educate technology suppliers on roadmap requirement (Market Pull)

- Development Tools & Middleware Providers (4)
- Spectrum Access System/Database Providers (7)
- Boards/Subsystem Providers (3)
- Application/-Waveform Providers (2)
- Engineering Services/Consultants (3)
- Equipment Manufacturers, Infrastructure Providers and System Integrators (24)
- Operators/Service Providers (3)
- Government Procurement Agencies (4)
- End Users/Subscribers

Educate customers on technologies and solutions (Technology Push)

- Research Laboratories (11)
- Industry Associations and Standards Bodies (6)
- Investors
- Test & Verification
- Regulation and Policy
- Educational Institutions (7)

Educate Research, Standards and Regulation Bodies From All Levels of the Value Chain

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The Forum’s Collaborative Model

Standards Bodies (IEEE, OMG, ETSI, ITU, etc.)

Standards

Profiles

Certifications (future)

Reports, Recommendations, Specifications

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Memberships and Partnerships

Wireless Innovation Forum Memberships and Partnerships
## FY2016 Downloads

<table>
<thead>
<tr>
<th>Category</th>
<th>Downloads</th>
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<tr>
<td>Conference Proceedings</td>
<td>49,825</td>
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<td>Work Products</td>
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<td>• Reports</td>
<td>18,091</td>
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<tr>
<td>• Recommendations</td>
<td>17,426</td>
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<td>• Specifications</td>
<td>5,338</td>
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<td>Market Studies</td>
<td>2,929</td>
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<td>SCA Standards Portfolio</td>
<td>3,808</td>
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<td>Other</td>
<td>39,525</td>
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<td>Total</td>
<td>145,202</td>
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http://www.wirelessinnovation.org/knowledge-center
Organizational Structure for The Wireless Innovation Forum
10 November 2015

Communities of Interest
- Defense Communications
- Public Safety Communications
- Satellite Communications
- “White Space” Communications
- SDR, CR and DSA Education
- 3.55 GHz Citizens Broadband Radio Service
- M2M and IoT (FUTURE)
- Telematics and ITS (FUTURE)
- Medical (FUTURE)

Forum Officers and Board of Directors

Regulatory Advisory Committee

Advanced Technologies Committee (ATC)

Topics of Interest
- SDR Technologies
- Cognitive Radio Technologies
- Dynamic Spectrum Access
- Test and Certification

Steering Group

Observers

Regional Committees

Spectrum Sharing Committee (SSC)

Topics of Interest
- Operational Requirements
- Functional Requirements
- Security Requirements
- Protocol Specifications
- Test and Certification

FUTURE TBD Committee

Coordinating Committee on International SCA Standards (CC-SCA)

Topics of Interest
- SCA Standards Evolution
- Application Programming Interfaces
- Implementation Guides/Tools
- SCA Test and Certification

Steering Group

Advisors

Regional Committees

Slide 8
Top 10 Most Wanted Wireless Innovations

**Innovation #1**: Techniques for Efficient Porting of Waveform Applications Between Embedded Heterogeneous Platforms

**Innovation #2**: Network Management of Mobile Ad-Hoc Radios

**Innovation #3**: 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

http://www.wirelessinnovation.org/top-ten-wireless-innovations
The Forum’s Advocacy Agenda: Improving the Utilization of Spectrum

Dynamic Situational Prioritization
Minimizing Regulatory Barriers to Entry
Technology and Service Neutrality
Licensed, Unlicensed, Sharing and Hierarchical Models
Minimum Technical Restrictions
Harmonized Standards
Networked and Synchronized Databases
Spectrum Sensing
Receiver Specifications

http://www.wirelessinnovation.org/advocacy-agenda
FY2016 Accomplishments

WINNF-16-P-0019-V1.0.0 Context for Cognitive Radio Based Public Safety Communications Systems

WINNF-16-R-0058-V1.0.0 Response to Ofcom Call for Information on 3.8 GHz to 4.2 GHz
FY2017 Plans

Receiver Performance Guidelines and Evaluation Criteria

Update to the Advocacy Agenda

Update to the Top 10 List

Execute on Platform Strategy
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Observers

India

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Steering Group
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
Structure for Coordinating Committee on International SCA Standards

17 April 2013

- Forum Officers and Board of Directors
- Coordinating Committee on International SCA Standards (CC SCA)
  - Advisors
  - CC SCA Steering Group, Executive Board
  - SCA Implementers Work Group
  - SCA API Work Group
  - SCA Test and Evaluation Work Group
  - SCA Next Work Group
  - International Security Services Work Group
  - International Tactical Radio Work Group
  - Transceiver Work Group
The CC SCA is led by a Steering group of worldwide tactical radio manufacturers
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, OCCAR-EA, FR, Ge, IT, SW, NOR MoD, EDA, NATO
- Appointed upon invitation issued by the Steering Group
Standards serving SDR in the general sense

- Stemming from SCA
- Developed by
  - Partner entities (e.g. JTNC Standards)
  - WInnF

SCA 2.2.2 and 4.1

WInnF-developed Standards: Transceiver, IRSS, (U)Lw AEPs, PIM IDL Profiles

Policy setting efforts underway

- Web-based Issues collection mechanism, open to all
- Architecture Board operation in installation
- Branding strategy under development, with specific logos under final validation
REPORTS
WINNF-16-P-0025.V0.6.0 (IR1) SCA 4.1 Compliancy Interim Release 1

SPECIFICATIONS
WINNF-14-S-0016-V2.0.1 IDL Profiles for Platform Independent Modeling of SDR Applications

RECOMMENDATIONS
WINNF-16-R-0085-V1.0.0 Endorsement of SCA 4.1
WINNF-16-R-0066-V1.0.0 Comments on SCA 4.1 Candidate
Started early 2015 aiming for completion end 2016

Chaired by JTNC Standards

Project to deliver WiInnF specification capturing compliancy criteria for all SCA 4.1 requirements

Interim deliveries already available (on partial scope)
Started early 2015

Project now to deliver

- PIM standard by end 2016
- PSM standards (C, SCA, VHDL, …) to follow closely

Delayed for best reason: active participation

- Cobham, DGA, Harris, FKIE, HKE, JTNC Standards, NordiaSoft, Rockwell-Collins, Rohde & Schwarz, Thales
- TEMs so far: Paris, Ottawa, Wichita, Erlangen, Rennes, Ottawa, Paris
- Weekly 2h teleconferences

Follow-up projects to aim at

- Domain-oriented profiles for portability improvement
- Capabilities extensions
Started early 2015 aiming for completion end 2016

Project to deliver exploratory report identifying technology / standards gaps for coalition contexts

Contributions and involvement from government stakeholders remain welcome (NATO countries and beyond)
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10 November 2015

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Advisors

Advanced Technologies Committee (ATC)

Steering Group
- Topics of Interest
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  - Cognitive Radio Technologies
  - Dynamic Spectrum Access
  - Test and Certification

Observers

Regional Committees

India

Spectrum Sharing Committee (SSC)

Steering Group
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  - Functional Requirements
  - Security Requirements
  - Protocol Specifications
  - Test and Certification

Forum Structure
Spectrum Sharing Committee: Scope

• Serve as a common industry and government standards body to support the development and advancement of spectrum sharing technologies

• Initial focus on 3.55 GHz, with aims to advance this technology for all applicable spectrum bands that can benefit from it.

• This Committee is intended to facilitate the interpretation and implementation of FCC rulemaking to a level that allows industry and government parties to collaborate on implementation of a common efficient, well functioning ecosystem around this technology.
The main activities that will conducted in the Committee include:

• Detailing common industry and government functionality and architecture for Spectrum Access Systems (SAS), sensors, and devices
• Interoperability requirements and protocol definition to allow for open competitive and well functioning systems
• Common framework for testing and integration of components of spectrum sharing technologies to allow for rapid certification and deployment and predictability, thus expanding the ecosystem and increasing utility of the spectrum
• Details of requirements, processes, and methods for protection of incumbent users as required by the spectrum rules
• Operational procedures definition for the well functioning of the system as it pertains to spectrum assignment, managements and interoperability
Participation to Date – 200+ People, 50+ Organizations

Members

- Airspan Networks
- Amdocs
- Astrapi
- AT&T*
- Cable Labs
- CTIA*
- Communications Research Centre, Canada*
- ComSearch*
- Ericsson*
- Federated Wireless*
- Google*
- Harris Corporation
- Huawei*
- Idaho National Labs
- Intel
- ITS (NTIA)
- Key Bridge Global*
- LGS Innovations
- LS Telcom
- MITRE

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

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

* Denotes Steering Group Member
Committee Structure

Observers
- Government agencies that are engaged in the development of this system (i.e. FCC, NTIA, NIST)
- Current incumbent users of the spectrum
- Researchers and academics with special knowledge and contribution
- Operators, users, and equipment providers with no declared intent to use the system but with interest in the topic

WINNF Board of Directors

Forum Chair

Committee Board Representative

Steering Group

Work Group 1
Operational and Functional Requirements

Work Group 2
Security Requirements

Work Group 3
Protocol Specification

Work Group 4
Test and Certification

Work Group 5
Operations

Spectrum Sharing Multi-stakeholder Committee

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REPORTS
WINNF-15-P-0051-V1.0.0 Interim SAS to SAS Protocol Technical Report-A
WINNF-15-P-0023-V1.0.0 Interim SAS to CBSD Protocol Technical Report-A
WINNF-15-P-0060-V1.0.0 SSC WG4 Certification Process
WINNF-15-P-0047-V1.0.0 SAS Functional Architecture
WINNF-15-P-0062-V1.0.0 Interim SAS to CBSD Protocol Technical Report B
WINNF-16-P-0063-V1.0.0 Interim SAS to SAS Protocol Technical Report B
WINNF-16-P-0089-V1.0.0 CBRS Threat Model

SPECIFICATIONS
WINNF-15-S-0112-V1.0.0 CBRS Operational and Functional Requirements
WINNF-15-S-0071 CBRS Operational Security

RECOMMENDATIONS
WINNF-15-R-0200-V1.0.0 WInnForum Comments on 2650 Protection Contours
WINNF-15-R-0092-V1.0.0 Emission Measurement Ex Parte
WINNF-15-R-0058/0059-V1.0.0 Reply Comments on the Second FNPRM
WINNF-15-R-0045-V1.0.0 WInnForum Comments on the Report and Order
Release 2 Publication Timeline

- Certified Professional Installer Model:
  - Apr 13 ’16 - Sep 6 ’16

- Operational and Functional Requirements - V3.0.0:
  - Jul 12 ’16 - Mar 22 ’17

- SAS to SAS Protocol Specification - V2.0.0:
  - Nov 3 ’16 - May 2 ’17

- SAS to CBSD Protocol Specification - V2.0.0:
  - Dec 8 ’16 - Jun 7 ’17

- Testing and Certification Specifications - V2.0.0:
  - Feb 6 ’17 - Jul 28 ’17
GET INVOLVED – JOIN THE FORUM
As a representative of a member organization, you can … | Benefit/Value to the Member
---|---
Initiate and lead market focused work groups, task groups or special interest groups | to drive the creation of reports, recommendations and specifications that incubate and advance new technologies that are important to your organization.
Leverage the Forum’s proven development process and IPR policy | to rapidly advance projects that will get these innovative technologies to market.
Collaborate with other member representatives from leading organizations across multiple market segments and at all levels of the wireless value chain | to quickly build an ecosystem of organizations interested in gaining economies of scale in supporting these technologies through standards based interoperation.
Leverage the Forum’s flexible membership model | to expand this new ecosystem to include all relevant stakeholders.
Leverage the Forum’s reputation as a “honest broker” in presenting technology | to educate regulators on issues important to our organization in establishing this new ecosystem.
Leverage the Forum’s partnerships, US and European conferences, webinars and web presence | to promote the adoption of your ecosystem’s technologies, guidelines and standards.
“The Wireless Innovation Forum has long been, and continues to be, the center of mass for standards and architectures that drive the development of Software Defined and Cognitive Radios for the communications industry,” says Datron’s Bob Schutz. “Datron is committed to providing its commercial, civil and military customers with state of the art communications platforms. Datron’s membership in The Wireless Innovation Forum is an acknowledgement of this commitment and the continued value, we see in the activities of The Wireless Innovation Forum.”
“Five out of six a4ESSOR Main Subcontractors were already members of the Forum. a4ESSOR’s main role/interest is therefore to coordinate their contributions to the Forum in relation to ESSOR products,” said Ugo Manetti, President of a4ESSOR. “We firmly in fact believe that the Forum can offer an extraordinary opportunity, worldwide, for technical exchange in the SDR field and related matters.”
"The Wireless Innovation Forum provides Kolodzy Consulting LLC the forum in which to address the regulatory and technical issues for next generation radios," says Paul Kolodzy, of Kolodzy Consulting LLC. “The onset of more dynamic capabilities within radios and radio networks has created the need for such focused industry-led efforts.”
“Scientific exchange is an important factor for research,” says Ute Miller of RWTH Aachen University. “The WiInnForum is the ideal forum for the research areas of UMIC.”
"We are pleased to be a part of this important organization, which includes some of the world's leading technology innovators in the field of wireless spectrum," said Johanna Dwyer, General Manager of Federated Wireless.
www.WirelessInnovation.org