OVERVIEW, ISSUES & NEXT STEPS
FOR THE
SECURITY, RELIABILITY, AND PERFORMANCE
FOR SOFTWARE DEFINED AND VIRTUALIZED ECOSYSTEMS
(SRPSDVE) STUDY GROUP

Presentation to the ETR-RT

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IEEE COMMUNICATIONS SOCIETY

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Outline

- ◾ **Background**

- ◾ **Study Group's:**
  - – **Leadership and Participating Companies**
  - – **Goals, Approach**
  - – **Challenges and Hot Issues Debated**

- ◾ **SDN/NFV Work Worldwide**

- ◾ **Current SDN/NFV Standardization Efforts**

- ◾ **Decisions for the Study Group to Make**

- ◾ **Possible Options/Approaches**

- ◾ **Next Steps / Actions**

IEEE Communications Quality & Reliability (CQR) Emerging Technology Reliability Roundtable*
(Tucson, Arizona – May 12, 2014)

Outcome:

- **Unanimous agreement to issue a Call For Participation (CFP) for a new IEEE Study Group (a.k.a. the SRPSDVE Study Group)**

- **Maintain momentum on Emerging Technologies (SDN, NFV, etc.) by avoiding a protracted Standards effort**

* http://www.ieee-cqr.org/2014/ETR-RT.htm

IEEE Strategic Direction

- ## Fact:
  - SDN, NFV and related areas have been identified as one of IEEE's future directions

- ## Action:
  - Significantly increase the IEEE standardization activities in this areas within the existing projects and with new projects
  - Establish liaisons with other Standards Developing Organizations (SDOs) working on this area

IEEE STANDARDS ASSOCIATION

Call for Participation for a NEW Study Group on Security, Reliability, and Performance for Software Defined and Virtualized Ecosystems

IEEE Standards Association (IEEE-SA) announces a Call for Participation in the IEEE Study Group for Security, Reliability, and Performance for Software Defined and Virtualized Ecosystems (SRPSDVE).

Scope and Purpose

The objective of this Study Group (SG) is to identify primary standards development opportunities in the security, reliability, and performance aspects of the SDN, NFV, NGSON, and related areas.

IEEE Standardization Process
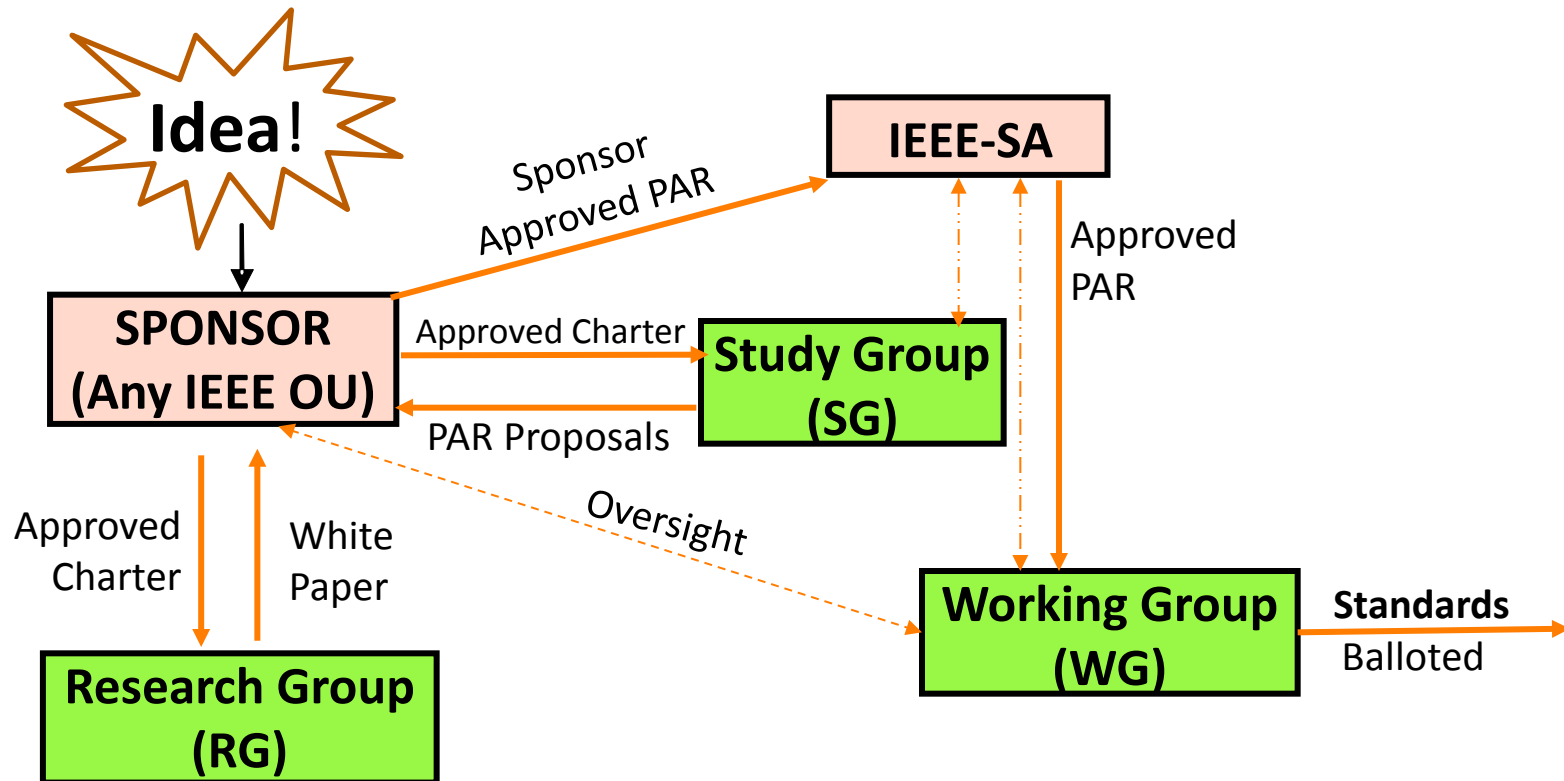
Research Group (RG) - formed when *enough* interest has been identified in a particular area of study

Study Group (SG) - formed when *substantial* interest has been identified in a particular area of study

Working Group (WG) - formed when *mature* interests and key stakeholders' interests have been identified

SRPSDVE Study Group Leadership

- **Chair: Spilios Makris (Palindrome Technologies)**

    spilios.makris@palindrometech.com

- **Security (Co-Vice Chairs):**
    - **Ashutosh Dutta (AT&T, ETSI Liaison to IEEE)**
        ashutosh.dutta@att.com

    - **Anton Kaska (Borealis Traders of New England, LLC)**
        anton@kaska.net

- **Reliability (Co-Vice Chairs):**
    - **Chandru Mirchandani (Lockheed Martin)**
        chandru.j.mirchandani@lmco.com
    - **Mike Tortorella (Assured Networks)**
        w2iy@verizon.net

- **Performance (Vice Chair):**
    - **Mohammad Asad Chaudhry (Univ. of Toronto)**
        masadch@ieee.org

Study Group Participants' Affiliation

1. ABB, India
2. AGH Univ. of Science & Technology, Poland
3. Alcatel-Lucent
4. Allot Communications
5. Amdocs
6. Assured Networks
7. AT&T
8. Bell Labs, China
9. Boeing
10. Borealis Traders of New England
11. Brocade
12. Budapest Univ. of Technology, Hungary
13. CAIR DRDO, India
14. Catapult Consultants
15. Ciena
16. Cisco
17. CMRIT, India
18. COSMOTE, Greece
19. Create-Net, Italy
20. CUNY
21. Emerson Climate Technologies
22. Ericsson
23. Fluke Networks
24. Gilat Satellite Networks
25. GIT, India
26. GSU
27. Huawei, China & India
28. IBM
29. Illinois Institute of Technology
30. Indian Institute of Technology, India
31. Infosys
32. Intel Corp.
33. John Hopkins University
34. Juniper Networks
35. KerrNet Consulting, Canada
36. Llamastam Consulting, India
37. Lockheed Martin
38. Manhattan College
39. Manipal Institute of Technology, India
40. McGill Univ./Jewish Gen. Hospital, Canada
41. MITRE Corp.
42. Nakina Systems of Ottawa, Canada
43. National Chiao Tung University, China
44. NIST
45. OGCIO, Hong Kong
46. Oracle
47. Orange
48. OTE, Greece
49. Palindrome Technologies
50. PESIT, India
51. Politecnico di Milano, Italy
52. QuEST Forum
53. Rockwell Automation
54. RTI International
55. Rutgers University
56. Palindrome Technologies
57. Sasken Communication Technologies
58. Secure Computing Innovation Foundation
59. Sensus Metering System
60. SFI Connect, Ireland
61. Software Reliability Research LCC
62. SUNY at Buffalo
63. SYSREL
64. Tangentix, England
65. TCS , India
66. The Nemacolin Group
67. Unb
68. Uniandes
69. University of Maryland
70. University Putra, Malaysia
71. University of Wisconsin at Madison
72. UTL
73. Verizon
74. Verizon Wireless
75. Wipro

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Study Group's Goals

- **Assess whether there is an opportunity for the IEEE, under Communications Society (ComSoc) sponsorship, to launch a standardization activity regarding the security, reliability, and performance aspects of the:**
  - **Software Defined Networking (SDN)**
  - **Network Functions Virtualization (NFV)**
  - **Next Generation Service Overlay Network (NGSON), and**
  - **Related areas**

- **Prepare a Project Authorization Request (PAR) to launch the official standardization process (if consensus is reached)**

IEEE Project Authorization Request (PAR)
Example Outline

1.1 Project Number:

1.2 Type of Document:

1.3 Life Cycle:

2.1 Title:

3.1 Working Group:

3.2 Sponsoring Society and Committee:

4.1 Type of Ballot:

4.2 Expected Date of submission of draft to the IEEE-SA for Initial Sponsor Ballot:

4.3 Projected Completion Date for Submittal to RevCom:

5.1 Approximate number of people expected to be actively involved in the development of this project:

5.2.a. Scope of the complete standard:

5.2.b. Scope of the project:

5.3 Is the completion of this standard dependent upon the completion of another standard:

5.4 Purpose:

5.5 Need for the Project:

5.6 Stakeholders for the Standard:

6.0. Intellectual Property:

7.1 Are there other standards or projects with a similar scope?

7.2 Joint Development: Is it the intent to develop this document jointly with another organization?

8.1 Additional Explanatory Notes (Item Number and Explanation):

Study Group's Approach

- Demonstrate and document the steps necessary to establish an early standardization presence in the security, reliability, and performance topics

- Follow-up on liaisons among other Standards Developing Organizations (SDOs) to get the status on outstanding issues

- Perform a gap analysis of the SDN/NFV worldwide work on Security, Reliability, and Performance with the goal to answer the question:

> **"Which aspects of that work could be taken to IEEE for standardization?"**

- Use the above information to draft a PAR for ComSoc

Challenges & Hot Issues Debated

- **The area is "hot" now!**
  - Is it a hype or here to stay?
  - What are the synergies between SDN and NFV?

- **Too many SDOs involved**
  - Understand the many distributed and potentially complementary industry initiatives
  - Many overlaps are expected
  - Is any coordination possible?

- **Realizing SDN and NFV specifications & requirements!**
  - Avoid duplicate efforts
  - Pursue a fast-track development

SDN/NFV Work Worldwide: Partial List

- **ONF – Open Flow**

- **NIST – Cloud Computing**

- **ETSI – NFV**

- **IETF/IRTF – SDrN, SDNP, SDN RG**

- **Ericsson – Service Provider SDN**

- **OMA – Device Mgmt 2.0**

- **IEEE P1903 (NGSON)**

- **3GPP**

- **OMG (SDN)**

- **SDR (Software Defined Radio) Forum**

- **Stanford University – Programmable Open Mobile Internet (POMI)**

- **Ohio State University – Software Defined Antenna**

*Source: Niranth Amogh "Software Defined-ness in Networks (SDN)",
Software Defined Ecosystem Standards Working Meeting",
Newark, NJ, April 25, 2014

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Current Standardization Efforts on SDN
Examples

- **IETF Forwarding and Control Element Separation (ForCES) Working Group**

- **Open Network Foundation**

  - Pushing OpenFlow

  - Interfaces between:

    1. Applications and controller and
    2. Controller and switching infrastructure

- **ITU-T SG13 (Future Networks) and SG11 (SDN signaling)**

- **IRTF Software Defined Networking Research Group**

- **ETSI NFV**

Decisions for the SRPSDVE SG to Make

- Should we ask for the formation of IEEE Working Groups?
  If yes, for which one(s)?

  - Reliability, Security, Performance

- Ensure that complementary work is pursued at the IEEE and ETSI SDN/NFV Working Groups as well as other Standards Developing Organizations (SDOs) regarding SDN/NFV/Cloud Computing

- Review the draft PAR(s) and gain a consensus from the SRPSDVE Study Group

- Present the Study Group's recommendation(s) to the IEEE ComSoc Board for their consideration and final decision on the formation or not of <u>new</u> Working Group(s)

-

Possible Options/Approaches - 1

A future IEEE <u>Reliability</u> Working Group may:

1. Capitalize on the knowledge and lessons learned from previous telecom outage classification and analysis efforts and tailor a suitable scheme for the outages in software defined and virtualized ecosystems (e.g., Cloud Computing, SDN/NFV, NGSON)

In other words…., move from the current ad-hoc (e.g., "InfoWorld") analysis to an *IEEE standardized categorization and analysis methodology* for such outage data

Possible Options/Approaches - 2

2. Establish a <u>voluntary</u> outage reporting database for outages in software defined and virtualized ecosystems (e.g., Cloud Computing, SDN/NFV, NGSON) where, besides the industry, IEEE members around the world may contribute information from:

- Literary searches in academic and trade articles

- News websites

- Blogs, fora, and operator mailing lists about outage incidents

In other words…., provide a source of publicly available outage data for research and periodic reports regarding the "state of the software-defined and virtualized ecosystems" avoiding the need for FCC-mandated reporting of such outages

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Possible Options/Approaches - 3

4. Level of Resilience
   - N+1, or N+x
5. Level of Service Availability (e.g., five 9's vs. three 9's)
   - Cost vs. Need for Reliability
6. Use Cases
   - Data Center vs. Mobile
7. Key Performance Indicators (KPIs)
8. Hot Swap
   - E.g., Protocol for Hot Swap of two SDN Controllers
9. Balance in Provision of Reliability
   - Hardware vs. Software
10. Layered vs. Cross-layered

Possible Options/Approaches - 4

11. Standard requirements for service reliability attributes
    - Accessibility
    - Continuity
    - Release

12. Standard reliability models for SDN/NFV architectures
    - Stochastic Petri net models
        - Failovers
        - Timing

13. Establishment of explicit, quantitative links between service reliability attributes and reliability/behavior of SDN/NFV infrastructures

*Source: Mike Tortorella, Rutgers University

Next Steps / Actions

- **Liaise with the ETSI NFV REL Working Group Chairman (Marcus Schöller) during the IEEE Emerging Technologies Roundtable (May 11, 2015) on potential topics of collaboration with the IEEE SRPSDVE Study Group (e.g., synergies, complementary work)**

- **Use the contributions from the past SRPSDVE meetings to achieve a consensus in issuing or not of a PAR to address the standardization of SDN, NFV and related areas focusing on Security, Reliability, and Performance topics**

- **Write and distribute a <u>Draft</u> PAR to the Study Group members ahead of the next Study Group meeting in late June 2015**