IEEE Standards: Cloud Computing

Initiative and Standards Sponsorship

- IEEE ran a Cloud Computing Initiative from 2012-2014
- Moved to IEEE Computer Society management at the beginning of 2015 as Cloud Computing Initiative comes to an end
- All standards projects sponsored by IEEE Computer Society

Standards Working Groups

- IEEE P2301, Cloud Profiles, led by John Messina (NIST): monthly meetings
- IEEE P2302, Intercloud, led by Deepak Vij: bimonthly meetings
  - Draft development underway
    - http://grouper.ieee.org/groups/2302/
- Study group led by Joel Fleck of HP covering adaptive management of cloud computing
  - Expecting to submit official project startup request in 1Q15
Intercloud Testbed

IEEE Standards Association Industry Connections Program for pre-standards work

- Intended to complement work of IEEE P2302 Working Group
- Providing a reference model to allow design verification, support feedback based on findings, and provide enhancement recommendations to the standards working group

Participants

- Executive committee of 6 members
  - Hong Kong Polytechnic University
  - Telx Corporation
  - University of Essex
  - Dell Software
  - University of Colorado
  - University of Calgary

- 21 Founding Members:
  - AT&T, Centre for Development of Advanced Computing (C-DAC), CITIC Telecom International, Cloudscaling, ComputeNext, DOCOMO Innovations, Fraunhofer, Global Intercloud Technology Forum (GICTF), Hong Kong Polytechnic University, JT Global, Juniper Networks, Orange, Second University Naples, ServiceMesh/CSC, 6fusion, Telx Group, University of Essex, University of Melbourne, University of Stavanger, University of Ulster, Virtustream

Intercloud Testbed: Progress Toward Deliverables

6 Working Groups have been meeting regularly (mostly weekly)

- Ontology/Resources
- Federation Protocol
- Conversational Protocol
  - Security
  - Naming
  - Architecture

Detailed specifications from each working group are being formally proposed back into P2302

Timeline:
Selected code modules in prototype and network functioning in 2015

Engineering collaboration/code site (Wiki/Jira/Git) in regular use
## Initiative Highlights

<table>
<thead>
<tr>
<th>Conferences</th>
<th>Digital Presence &amp; Outreach</th>
<th>Education</th>
<th>Publications</th>
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</table>
| • Creation of annual IEEE Cloud Computing for Emerging Markets (CCEM), India, and leveraging IEEE’s cloud presence in India  
• Complimenting existing conferences with regional cloud congresses, subject matter experts, organizing tracks and panels | • Cloud portal is highly successful, averaging 5K-6K visitors monthly  
• Volunteer-managed digital bi-monthly newsletter: Cloud-Link, blog posts  
• Active social media: >1,400 Twitter, >5,200 Facebook, >3,900 LinkedIn  
• Wikipedia page  
• Technical community ~6K | • Development and delivery of 40 high quality advanced e-Learning curriculum modules  
• Introductory video series on big data  
• First use case (Vcopious™) for virtual CCEM conference with Educational Activities and IEEE MCE (Meetings, Conferences & Events) | • Drove creation of 3 new publications for IEEE  
• Transactions on Cloud Computing (TCC), launched 2013  
• Cloud Magazine, launched 2014 |

[cloudcomputing.ieee.org](http://cloudcomputing.ieee.org)
Big Data: Elements

Collection (example sources)
- Sensor data
- Web: text, images, video
- Email
- Location data
- Telephone calls
- Reports
- Databases

Storage/Databases
- Relational databases (SQL)
- NoSQL
- Graphs
- Documents
- ...

Processing
- Filtering
- Categorization
- Extraction

Analytics
- Monitoring, exception reporting
- Visualization
- Prediction

Security & Privacy
- Encryption
- Access control
- Anonymization

Big Data: Analytics — Use Examples

Purchasing - Amazon
Communications - People networks; calling patterns
Environment - Weather anomalies
Disease Management - Symptoms - Device readings
Power Outages
Crime & Terrorism

IEEE Big Data

IEEE new initiative on Big Data
- Funded by IEEE Technical Activities in 2014 and NIC in 2015
- Big Data portal, social media presence, and technical community
- Jose’ Moura (SPS) and David Belanger (Comsoc) appointed as initiative leaders
- Oct 1-2, 2014 workshop at Stevens Institute of Technology
- Rob Fish and Cherry Tom attended from IEEE-SA
- *The Institute* September 2014 issue on Big Data
- **Seeking SA volunteer standards experts to provide direction for IEEE standards**

IEEE-SA Big Data-related standards activities
- IoT + sensors + networks
- E health – Mobile health
- Cloud Computing – Intercloud
- Smart Grid & Smart Home
- Internet Trust, Security, and Privacy

Other IEEE activities
- IEEE Big Data Congress, June 27 - July 2, 2014
- Big Data & Smart Devices conference, 20-21 Nov, Bangalore, India
- New publication in 2015: *Transactions on Big Data*

bigdata.ieee.org

Interested IEEE Societies, Councils, & OUs

<table>
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<tr>
<th>Biometrics Council</th>
<th>Power &amp; Energy Society</th>
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<tr>
<td>Circuits and Systems Society</td>
<td>Photonics Society</td>
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<tr>
<td>Council on EDA</td>
<td>Reliability Society</td>
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<tr>
<td>Consumer Electronics Society</td>
<td>Sensors Council</td>
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<tr>
<td>Computational Intelligence Society</td>
<td>Signal Processing Society</td>
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<tr>
<td>Computer Society</td>
<td>Society on Social Implications of Technology</td>
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<tr>
<td>ComSoc</td>
<td>Standards Association</td>
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<tr>
<td>Control Systems Society</td>
<td>Systems, Man, and Cybernetics Society</td>
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<tr>
<td>Educational Activities</td>
<td>Systems Council</td>
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<tr>
<td>Engineering in Medicine and Biology Society</td>
<td>Technical Activities</td>
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<tr>
<td>Geoscience and Remote Sensing Society</td>
<td>Vehicular Technology Society</td>
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<td>Oceanic Engineering Society</td>
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2015 Considerations

- Development of a well-coordinated technical community in big data
  - All (IEEE and non-IEEE) welcome to join, participate, and contribute to its activities, and contribute to growth in IEEE membership
- Outreach to industry, government, and academia to collaboratively identify, develop, and advance policies and practices, and standards
- Creation of training opportunities and educational initiatives ranging from basics of big data and why everyone should care about data to advanced training for the practitioner
- Launching new conferences or workshops, or augmenting existing ones for maximum coverage on big data and more effectively identify and pull together through its many experts more focused tracks, papers, and keynote speakers
- Launching of new Journals or augmenting existing ones

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data => information => knowledge => wisdom => action
IEEE Standards Related to Big Data
Smart Grid and Digital Energy Management

- IEEE 1901 Series - Powerline Communication
- IEEE 2030 series on the smart grid, including electric vehicle infrastructure
- IEEE 1547 series on handling distributed resources in electric power systems
- IEEE 1815 series on electric power systems communications

Find more smart grid standards and projects at http://smartgrid.ieee.org/standards

IEEE Standards Related to Big Data
eHealth

- ISO/IEEE 11073 series Health Informatics - Medical/Health Device Communication Standards
Big Data & Cloud Computing

- Cloud Computing an enabler of Big Data
  - Variety of sources
  - Distributed computing for large volumes of data
  - Remote access by data user
  - Elastic resources for variability and high velocity of data

- Is it possible to have Big Data without cloud computing?
  - Yes, e.g. existing high performance computers and simulations

Big Data & Open Data

- Open Data one source of Big Data
  - Initiative of cities and governments to provide data to citizens
    - Personal or social use
    - Entrepreneurial use
    - An aspect of smart cities

- Data is in various forms, standards would be useful for uploading, storage, access

IEEE-SA Internet of Things (IoT)

IoT, including many types of sensor data, is a key source of Big Data

Web area devoted to IEEE-SA’s work in IoT

Highlights IEEE existing standards and projects that relate to IoT

Promotes IEEE P2413 and CSHBA Industry Connections projects

Promotes workshops and panel discussions

Includes links to relevant IoT materials on the web

http://standards.ieee.org/innovate/iot/