NIST Cloud Computing Program Timeline

**May 2010**
- NIST CC Forum & Workshop I
  - Outreach & Fact finding with USG, Industry, SDOs
  - Evaluate past models & lessons learned

**Nov 2010**
- NIST CC Forum & Workshop II
  - Define fresh approach to support secure & effective USG cloud computing adoption, prioritize interoperability, portability, & security requirements, collaborate, more quickly respond to operational needs
  - Collaboratively define working group scope & resources
  - Develop Detailed Plan

**March 2011**
- Launch CC Strategic Program
  - Initiate Stakeholder Meetings
  - Collaboratively define working group scope & resources
  - Develop Detailed Plan

**Oct 2011**
- Execute CC Strategic Program
  - Continue Stakeholder meetings
  - Integrate results into tactical priorities

**NIST CC Forum & Workshop III**
- Complete USG Cloud Computing Technology Roadmap Interagency Report
  - Assess Results & Replan

**Tactical efforts**

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NIST Cloud Computing Program Timeline

**NIST CC Definition**

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National Institute of Standards and Technology

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U.S. Department of Commerce
The roadmap will define and prioritize USG requirements for interoperability, portability, and security for cloud computing in order to support secure and effective USG adoption of Cloud Computing.

NIST has created the following Working Groups:

<table>
<thead>
<tr>
<th>Cloud Computing Target Business Use Cases Working Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cloud Computing Reference Architecture Working Group</td>
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<tr>
<td>Cloud Computing Standards Roadmap Working Group</td>
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<tr>
<td>Cloud Computing Security Working Group</td>
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<tr>
<td>Cloud Computing SAJACC Technical Use Cases Working Group</td>
</tr>
</tbody>
</table>
MISSION STATEMENT

NIST Cloud Computing Standards Roadmap Working Group will survey the existing standards landscape for security, portability, and interoperability standards / models / studies / etc. relevant to cloud computing, determine standards gaps, and identify standardization priorities.
Charter

Charter – December 27, 2010
Conveners – Mike Hogan and Annie Sokol
Participation – WG is open to all interested parties
Liaisons – The work of the NIST CC WGs is interrelated and CCSRWG will liaise with the other WGs as needed.
Deliverable – A recommended Cloud Computing Standards Roadmap document
Target Date in Charter – March 31, 2011
Deliverable

The NIST Cloud Computing Standards Roadmap document will serve as an input to the USG Cloud Computing Technology Roadmap.

Target Date in Charter – March 31, 2011

Present Target Date – April 30, 2011
Participants & Meetings

• Email sign-up
  – January 18, 2011: 346
  – February 15, 2011: 462
  – April 2011: 537 (>250 known organizations – national and globally)

• Meetings
  – First meeting was January 6, 2011
  – Every Thursday afternoon at 1:00 P.M. ET
  – Bi-weekly meetings since March 10, 2011 (except April 7)
  – Total of 11 meetings
  – The number of participants range between 20+ - 40+
  – F2F Meeting – January 20, 2011, following DAPS38 meeting
  – Use Case Integration Ad hoc group – met for three weeks
# Standards Roadmap document

Cloud Computing Standards Roadmap Working Group (CCSRWG)

<table>
<thead>
<tr>
<th>Date</th>
<th>Document #</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 26</td>
<td>Doc.#21</td>
</tr>
<tr>
<td>February 2</td>
<td>Doc.#29</td>
</tr>
<tr>
<td>February 9</td>
<td>Doc.#36</td>
</tr>
<tr>
<td>February 17</td>
<td>Doc.#40</td>
</tr>
<tr>
<td>February 23</td>
<td>Doc.#42</td>
</tr>
<tr>
<td>March 2</td>
<td>Doc.#48</td>
</tr>
<tr>
<td>March 9</td>
<td>Doc.#52</td>
</tr>
<tr>
<td>March 23</td>
<td>Doc.#56</td>
</tr>
<tr>
<td>March 28</td>
<td>Doc.#60</td>
</tr>
</tbody>
</table>

Comments due: April 11, 2011
Cloud Computing Standards Roadmap Working Group (CCSRWG)

This rest of this presentation is based upon the Ninth Working Draft + NIST draft comments on the Ninth Working Draft
<table>
<thead>
<tr>
<th>Concept of Operation</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Apply NIST Cloud Computing definition</td>
</tr>
<tr>
<td>2</td>
<td>Leverage the work of NIST Working Groups</td>
</tr>
<tr>
<td>3</td>
<td>Build an inventory of standards</td>
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<tr>
<td>4</td>
<td>Map standards to use cases and RA model</td>
</tr>
<tr>
<td>5</td>
<td>Determine standards gaps and overlaps</td>
</tr>
<tr>
<td>6</td>
<td>Identify USG standardization priorities</td>
</tr>
<tr>
<td>7</td>
<td>Recommendations</td>
</tr>
</tbody>
</table>
NIST Definition of Cloud Computing

“Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.”
Step 2: NIST CCSRWG Collaboration Site


Standards Roadmap

Description

NIST is leading the development of a USG Cloud Computing Roadmap. This roadmap will define and prioritize USG requirements for interoperability, portability, and security for cloud computing in order to support secure and effective USG adoption of Cloud Computing.

Objectives

Cloud computing owes its existence to a sizable collection of standards that have been developed to facilitate communication, data exchange, and security. Still other standards are emerging to focus on technologies that support cloud computing, such as virtualization. Standards Developing Organizations (SDOs) and others have and are developing cloud computing conceptual models, reference architectures, standards roadmaps, etc. The NIST Cloud Computing Standards Roadmap Working Group will leverage this existing, publicly available work, plus the work of the other NIST Working Groups, to develop a NIST Cloud Computing Standards Roadmap that can be incorporated into the USG Cloud Computing Roadmap.

The NIST Cloud Computing Standards Roadmap Working Group will survey the existing standards landscape for security, portability, and interoperability standards/models/studies/etc. relevant to cloud computing, determine standards gaps, and identify standardization priorities.

The primary deliverable will be a recommended Cloud Computing Standards Roadmap document. Supporting deliverables will be developed as necessary.

Mailing List and Meeting Information

It is anticipated that there will be weekly 2-hour meetings by telecon. Propose date and time: Thursdays @1300 to 1500 ET.

The dial-in information for the weekly meeting is as follows:

- Phone: 866-507-7813
- Passcode: 5949635
Leverage the work of NIST Working Groups AND Other work

Cloud Computing Standards Roadmap Working Group

NIST Cloud Computing Working Groups

SDOs & Others Standards, Conceptual Models, Reference Architectures, Standards Roadmaps, Studies
### Inventory of Standards Relevant to Cloud Computing

#### Basic Definitions and Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Developed By</th>
<th>Purpose</th>
<th>Document Info</th>
<th>Standard Status</th>
<th>Categorization</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Internet Protocol Suite (TCAP)</td>
<td>IETF</td>
<td>The Internet Protocol Suite is one of the most important protocols to be transmitted on the Internet. TCAP is a collection of TCP/IP that defines the Transmission Control Protocol (TCP) and the Internet Protocol (IP), which are the two main networking protocols defined in this standard.</td>
<td>RFC 675, 12497, RFC 1590, D1994</td>
<td>Transport, Network</td>
<td>RFC 2616, 061999</td>
<td>Standard RFC</td>
</tr>
<tr>
<td>HyperText Transfer Protocol (HTTP)</td>
<td>Internet Engineering Task Force (IETF), Worldwide Web Consortium (W3C)</td>
<td>The HyperText Transfer Protocol (HTTP) is a networking protocol for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web.</td>
<td>HTTP 1.1, RFC 2616, 061999</td>
<td>Standard RFC</td>
<td>Transport, Network</td>
<td>WWW</td>
</tr>
<tr>
<td>Extensible Markup Language (XML)</td>
<td>Worldwide Web Consortium (W3C)</td>
<td>XHTML is a text-based language for describing documents that is machine-readable. XML is an extension of the HTML, giving it the ability to be used for data exchange.</td>
<td>HTML 4.01, 122009</td>
<td>WWW</td>
<td>XML 1.1 2006</td>
<td>WWW</td>
</tr>
<tr>
<td>Simple Object Access Protocol (SOAP)</td>
<td>The XML Protocol Working Group of the Worldwide Web Consortium (W3C)</td>
<td>SOAP is a protocol specification for exchanging structured information in the implementation of Web Services in complex networks. SOAP can be used to define the public interface of web services, permitting access to the underlying, complex entities via a simple, text-based interface.</td>
<td>SOAP 1.2, 06042003</td>
<td>WWW</td>
<td>NA</td>
<td>Architectural style</td>
</tr>
</tbody>
</table>

### Inventory of Standards Relevant to Cloud Computing

<table>
<thead>
<tr>
<th>Step 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic Definitions &amp; Standards</strong></td>
</tr>
<tr>
<td>TCP/IP, HTTP, HTML, XML, SOAP, REST, WSDL, SSL/TLS, XML/XMLD, JSON, TRP, DNS, SMTP…</td>
</tr>
</tbody>
</table>

| **High Level Standards & Definition for Cloud and Web Services** |
| OVF, OCCI, CDMI, SPML, Web services, GridFTP, OAuth, OpenID, WS, WSS, SAML, Frameworx, XACML,… |

| **Categorization of Cloud Computing Related Standards** |
| Cloud Taxonomy – output from Reference Architecture Working Group… |

| **Work-in-Progress** |
| White papers… |
Observations on Inventory

• There are not many specific Cloud Computing Standards
  – Open Virtualization Format (OVF)
  – Open Cloud Computing Interface (OCCI)
  – Cloud Data Management Interface (CDMI)

• There are many cloud relevant IT standards to leverage
Visualization of the Inventory Application Platform Architecture

Cloud Computing Capabilities and Resources
- IaaS (Infrastructure as a Service)
  - Hardware
  - Facility
- PaaS (Platform as a Service)
  - Virtualized Infrastructure
- SaaS (Software as a Service)
  - Application
  - Platform Architecture

Cloud Computing Capabilities and Resources
- IaaS (Infrastructure as a Service)
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Data Communication
- SOAP
- REST
- WS-Addressing
- WSDL
- XML
- JSON
- HTML
- HTTP
- SMTP
- FTP
- SSL/TLS
- DNS
- TCP
- IPV4
- IPV6

Security
- SCAP
- XACML
- SPML
- SAML
- OAuth
- OpenID
- XML DSig
- XML Encrypt
- PKI
- Asymmetric Crypto
- Symmetric Crypto

Consumer Interface and Visibility
- POP3/IMAP
- ODF
- OOXML
- JEE
- SQL
- OCCI
- CDMI

National Institute of Standards and Technology
U.S. Department of Commerce
Existing Cloud Computing Specific Standards

Cloud Consumer
- OCCI
- CDMI
- Security Audit
- Privacy Impact Audit
- Performance Audit

Cloud Auditor
- SaaS
- PaaS
- IaaS
- Resource Abstraction and Control Layer
- Physical Resource Layer
- Hardware
- Facility

Cloud Provider
- Cloud Service Management
- Business Support
- Provisioning/Configuration
- Portability/Interoperability

Cloud Carrier

Cloud Broker
- Service Implementation
- Service Aggregation
- Service Arbitrage

Step 4
Cloud Computing Standards Gap Analysis – NIST Contribution

- **SaaS Self-service management**
- **Application specific data formats**
- **Application functional interfaces**
Cloud Computing Standards Gap Analysis – NIST Contribution

- Resource description and discovery
- QoS specification, monitoring, reporting
- SLA specification and negotiation
- Billing and metering
Cloud Computing Standards Gap Analysis – NIST Contribution

- Identity and Access Management
  - Provisioning, management, replication, federation
  - Single sign-on plus strong authentication
- Security auditing and compliance
USG Priorities – NIST Contribution
From Analysis of USG Use Cases

- SaaS Self-service management
- Application specific data formats
- Application functional interfaces

- Resource description and discovery
  - QoS specification, monitoring, reporting
  - SLA specification and negotiation
  - Billing and metering

- Identity and Access Management
  - Provisioning, management, replication, federation
  - Single sign-on plus strong authentication

- Security auditing and compliance
Draft Recommendations

Agencies

• Contribute clear and comprehensive requirements for cloud computing standards projects.
• Participate actively in standards development projects.
• Support the concurrent development of conformity and interoperability assessment schemes.
• Specify cloud computing standards in their procurement and grant guidance.
Draft Recommendations

- Recommend specific cloud computing standards and best practices for USG-wide use.

CIO Council Cloud Computing Standards Working Group
QUESTIONS?
BREAK – 15 MINUTES

10:30 – 10:45