NIST Public Working Group on Federated Cloud (PWGFC)
IEEE P2302 Intercloud Kickoff

John Messina, Chair, NIST PWGFC
Bob Bohn, Chair, IEEE P2302 Working Group
Steve Diamond, Chair IEEE Cloud Computing Standards Committee
31 August 2017
NIST and IEEE Team on Intercloud
Overall Agenda

- Introduction
- Scope, Purpose, and Need
- IEEE Intercloud History and Vision
- Goals, Outputs, Policies, Membership, Process
- How to Find Information and Mailing List
- GOSUB “NIST PWGFC Agenda”
- GOSUB “IEEE P2302 Agenda”
- Meeting Wrap-up
NIST PWGFC & IEEE P2302 Intercloud Team

- NIST Public Working Group on Federated Cloud (PWGFC)
  - John Messina (john.messina@nist.gov)
    • Chair, NIST Public Working Group on Federated Cloud
  - Craig Lee (Craig.A.Lee@aero.org)
    • Vice Chair, NIST Public Working Group on Federated Cloud

- IEEE Cloud Computing Standards Committee (CCSC)
  - Steve Diamond (s.diamond@computer.org)
    • Chair, IEEE Cloud Computing Standards Committee (P2302 Sponsor)
  - Bob Bohn (robert.bohn@nist.gov)
    • Chair, IEEE P2302 Intercloud Working Group
  - David Bernstein (david@cloudstrategypartners.com)
    • Vice Chair, IEEE P2302 Intercloud Working Group
  - Christy Bahn (c.bahn@ieee.org)
    • IEEE P230 Intercloud Staff Liaison
IEEE Intercloud History and Vision

David Bernstein
Vice Chair, IEEE P2302 Intercloud Working Group

- 2010 was when the first Intercloud concept was presented to IEEE
- 2011 saw the formation of the original P2302 working group
- 2012-2016 Several IEEE Intercloud Workshops, Several P2302 drafts, and IEEE Sponsored intercloudtestbed.org

This Recap is a summary of the Project Authorization (PAR) and the work done within the P2302 Working Group.

While the PAR should still be followed, there is no requirement to re-use any of the following work product.
Simple View of Intercloud
From Global Intercloud Technology Forum, 2009
Make Cloud Like the Phone or Internet
## Public Network Federation Trends

<table>
<thead>
<tr>
<th>Telephony Federation</th>
<th>Internet Federation</th>
<th>Cloud Federation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Took 100 Years</td>
<td>Took 15-20 Years</td>
<td>Taking 5-10 Years</td>
</tr>
<tr>
<td>Formal Standard (ITU) for Protocols</td>
<td>Informal Standard (IETF) for Protocols</td>
<td>De Facto Standards for User Protocols (AWS, GCE)</td>
</tr>
<tr>
<td>Peer to Peer Federation model</td>
<td>Peer to Peer Federation model</td>
<td>Peer to Peer Federation model</td>
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Purpose

*From IEEE P2302 Project Authorization Request*

- Creates an economy amongst cloud providers
- Transparent to users and applications
- Provides for a dynamic infrastructure
- Can support evolving business models
- Appropriate infrastructure for economic audit and settlement.
Need

From IEEE P2302 Project Authorization Request

- The growth of the Phone Network and the Internet was facilitated by the creation of an interoperable service marketplace between service consumers and service providers
- Cloud landscape today consists of incompatible cloud offerings, based on both proprietary and open architectures
- Clouds today do not interoperate
- Resulting in absolute limitations in geographical coverage, resource functionality, and resource scalability
- A cloud provider may not have resources where a cloud consumer needs them; a cloud provider may not offer the type of resource needed; and a cloud provider's resources cannot be infinitely elastic
- Intercloud interoperability and federation to solve these problems.
Scope

From IEEE P2302 Project Authorization Request

- This standard defines topology, functions, and governance for cloud-to-cloud interoperability and federation. Topological elements include clouds, roots, exchanges (which mediate governance between clouds), and gateways (which mediate data exchange between clouds). Functional elements include name spaces, presence, messaging, resource ontologies (including standardized units of measurement), and trust infrastructure. Governance elements include registration, geo-independence, trust anchor, and potentially compliance and audit. The standard does not address intra-cloud (within cloud) operation, as this is cloud implementation-specific, nor does it address proprietary hybrid-cloud implementations.
IEEE Intercloud Objectives

- **Support Transparent Infrastructure**
  - Like the Internet
  - Like the Phone Network

- **Cloud Implementation Independent**
  - Like the Internet Router
  - Like the Phone Network CO Switch
  - Based on Standards

- **Simple Protocol Set, Easy to Join**
  - Like an ISP, simple IP based protocols enough to get started
  - Supports Regional Governance

- **Support for Generalized Resource Federation**
  - Not Just VM’s – IaaS, PaaS, *aaS
  - Extensibility to Any Describable Resource Type
  - Communities can Add Resource Types

- **Support for Multiple (Open or Proprietary) Federation Topologies**
  - Network Abstraction

- **Global Scale Capable**
IEEE Intercloud Use Case

Today: Wholesale Networking with MPLS

US Carrier provides VPN to multi-location Corporation via MPLS using its own network infrastructure.

US Carrier provides “US VPN” to multi-location Corporation via MPLS via Wholesale of partner network.
Cloud Services such as Compute and Storage can ALSO be Wholesaled by US Carrier through the MPLS VPN in area where they don’t operate infrastructure.
Different organizations that need to collaborate on joint business goals can securely share resources (data and services) among a defined set of federation partners.
Architectural Classification of Interoperable Clouds

Inter-Cloud architectures and application brokering: taxonomy and survey; Nikolay Grozev and Rajkumar Buyya
Topologies - different cloud interoperability

**Multi-Point Voluntary Federation:**
Clouds collaborate directly with each other but may use distributed entities for directories or brokering.

**Centralized Voluntary Federation:**
Clouds use a central entity to facilitate resource sharing.

**Multiplexing Mandatory Service:**
Clients access Multiple clouds through a service.

**Multiplexing Mandatory Library:**
Clients develop their own Brokers by using a unified cloud API as a library.

[Diagram showing cloud federation models]
IEEE Intercloud
P2302 Draft
Elements

Intercloud
Exchanges

Clouds which are Intercloud Enabled

protocols
formats
processes
practices
governance

Gateways which are Intercloud Enabled

Intercloud Root

Standards, Open Source

University Funded work and Partnerships

Public Testbed
Intercloud Testbed

An Open, Global, Cloud Interoperability Project

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How IEEE Intercloud P2302 Draft Works

1) Matchmaking of Supplier Clouds with Requester Clouds

Signaling Network

Like IP Routing or IN/SSN

2) Actual Federation using Network Extensions

Bearer Network

Like TCP/IP and HTTP
IEEE Intercloud P2302 Draft Signaling Network Parts

- **Cloud Service Provider (CSP) Namespace**
  - Like Autonomous Systems (AS) numbers in IP
  - Like Signaling Point Code (SPC) in SS7
  - Managed by a distributed Name Service (like DNS)
- **Federated Trust and Identity**
  - Like Internet Certificates
  - Managed by a distributed Trust and Identity Service
  - More precisely like International Grid Trust Federation (igtf.net)
- **Conversational Substrate (XMPP)**
  - Presence, Conversation, and Auditing
  - Managed by a distributed Messaging Service
- **Transport/Services (Web Sockets)**
  - Point to Point API based Services Infrastructure over which Matchmaking Occurs
- **Semantic Directory and Solvers (OWL Ontology)**
  - OWL Ontologies for Resources, SLAs, Economics, and Networks
  - Managed by a distributed Directory Service
- **Replication (BitTorrent)**
  - For the Name, Trust and Identity, Messaging, and Directory Services
  - Managed by a distributed Replication Service
Reference IEEE Intercloud P2302 Draft
Components

➢ CSP Namespace
➢ Federated Identity
➢ Conversational Substrate (XMPP)
➢ Transport/Services (Web Sockets)

➢ Replication (BitTorrent)
➢ Semantic Directory (Ontology, RDF)

Intercloud Root

➢ CSP Namespace
➢ Federated Identity
➢ Conversational Substrate (XMPP)
➢ Transport/Services (Web Sockets)

➢ Replication (BitTorrent)
➢ Semantic Directory (Ontology, RDF)
➢ Solver (Hadoop/Sparql)
➢ Auditing

Intercloud Exchanges

➢ CSP Namespace
➢ Federated Identity
➢ Conversational Substrate (XMPP)
➢ Transport/Services (Web Sockets)

➢ Federating API
➢ Federating Transport
➢ Federating Implementation

Intercloud Gateway
Goals, Outputs, Policies, Membership, Process
PWGFC/P2302 Intercloud Goals & Outputs

- The NIST PWGFC will develop a **cloud federation vocabulary and conceptual model** based on the Scope and Purpose.
  - The PWGFC interim outputs will be contributed to the IEEE P2302 Working Group in real-time.
  - The PWGFC ultimate output will be a NIST Technical Report.

- The IEEE P2302 Intercloud Working Group will develop a **cloud federation standard** based on the Scope and Purpose.
  - The PWGFC interim contributions will serve as input.
  - Feedback on PWGFC vocabulary and conceptual architecture contributions will be provided to the PWGFC in real-time.
  - The P2302 initial output is expected to be an IEEE Standard.
  - We then plan to contribute the P2302 Standard to ISO/JTC1/SC38 to create an International Standard.
Policies, Membership, Outputs

Common Scope and Purpose
Anyone Can Join Either or Both Groups
No Other Memberships Required

NIST PWGFC
- NIST PWGFC P&P
- NIST PWGFC Members
- NIST PWGFC Technical Report/Special Publication

IEEE P2302
- IEEE P2302 P&P
- IEEE P2302 Members
- IEEE P2302 Standard
- International Standard
Process Flow

Common Scope and Purpose

NIST PWGFC
Vocabulary and Conceptual Architecture

IEEE P2302 Intercloud Working Group
Industry Standard

Future International Standardization Process

Feedback on vocabulary and conceptual model from P2302 to PWGFC
Involvement

- Who may join the NIST PWGFC?
  - Anyone

- Who may join the IEEE P2302 Intercloud Working Group?
  - Anyone

- Is an IEEE membership required to join the P2302 Intercloud Working Group?
  - No

- May anyone participate in both NIST PWGFC and IEEE P2302?
  - Yes
How to Find Information

▸ NIST Public Working Group on Federated Cloud (PWGFC) URL

▸ Request to be on NIST PWGFC Mailing List
  - [fedcloud@nist.gov](mailto:fedcloud@nist.gov)

▸ IEEE P2302 Intercloud Working Group URL
  - [http://sites.ieee.org/sagroups-2302/](http://sites.ieee.org/sagroups-2302/)

▸ Request to be on IEEE P2302 Intercloud Working Group List
  - [STDS-P2302@ieee.org](mailto:STDS-P2302@ieee.org)
NIST PWGFC Call to Order

John Messina
Chair, NIST Public Working Group on Federated Cloud
NIST PWGFC Agenda

- Call NIST PWGFC to Order, John Messina
- Roll Call of Individuals (PWGFC Establishment)
- Voting Rights for PWGFC
  - Everyone at every meeting is a voter
- Structure of PWGFC Work/Workplan
  - 4th Thursday of Month 1:00PM EST (10:00AM PST)
- Structure of P2302 Work/Workplan
  - 4th Thursday of Month 2:00PM EST (11:00AM PST)
- Call for Collection of Resources – fedcloud@nist.gov
- Q&A
- Action Items
- Adjourn PWGFC
Adjourn PWGFC

John Messina
Chair, NIST Public Working Group on Federated Cloud
IEEE P2302 Call to Order

Bob Bohn
Chair, IEEE P2302 Intercloud Working Group
IEEE P2302 Intercloud WG Agenda

- Call IEEE P2302 Intercloud Working Group to Order, Robert Bohn
- Roll Call of Individuals (P2302 Establishment)
- Voting Rights for IEEE P2302 Working Group
  - Everyone at this meeting is a voter
  - Maintain (and others may achieve) voting rights by attendance at 2 out of 3 meetings
- IEEE Patent Policy (Call for Patents)
- Structure of PWGFC Work/Workplan
  - 4th Thursday of Month 1:00PM EST (10:00AM PST)
- Structure of P2302 Work/Workplan
  - 4th Thursday of Month 2:00PM EST (11:00AM PST)
- Call for Volunteers for Secretary
- Q&A
- Action Items
- Adjourn IEEE P2302
IEEE Patent Policy (Call for Patents)

- The chair or the chair’s delegate of an IEEE standards-developing working group or the chair of an IEEE standards Sponsor shall be responsible for informing the participants at a meeting that if any individual believes that Patent Claims might be Essential Patent Claims, that fact should be made known to the entire working group and duly recorded in the minutes of the working group meeting.

- This request shall occur at every standards-developing meeting once the PAR is approved by the IEEE-SA Standards Board. The chair or the chair's delegate shall ask any patent holder or patent applicant of a Patent Claim that might be or become an Essential Patent Claim to complete and submit a Letter of Assurance in accordance with Clause 6 of the IEEE-SA Standards Board Bylaws. Information about the draft standard will be made available upon request.

- IEEE-SA Standards Board Operations Manual Subclause 6.3.2
Call for Potentially Essential Patents

• If anyone in this meeting is personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance:
  • Either speak up now or
  • Provide the chair of this group with the identity of the holder(s) of any and all such claims as soon as possible or
  • Cause an LOA to be submitted
IEEE P2302 Standardization Process
How to Find Information

- NIST Public Working Group on Federated Cloud (PWGFC) URL

- Request to be on NIST PWGFC Mailing List
  - [fedcloud@nist.gov](mailto:fedcloud@nist.gov)

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