Introduction to the Intercloud

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With acknowledgement to my research colleagues from Cisco: Krishna Shankar, Steve Diamond, Erik Ludvigson, Monique Morrow

HUAWEI

Network Based Value Added

Voice – SS7/IN, CDR

Mobile – HLR, 2G/3G

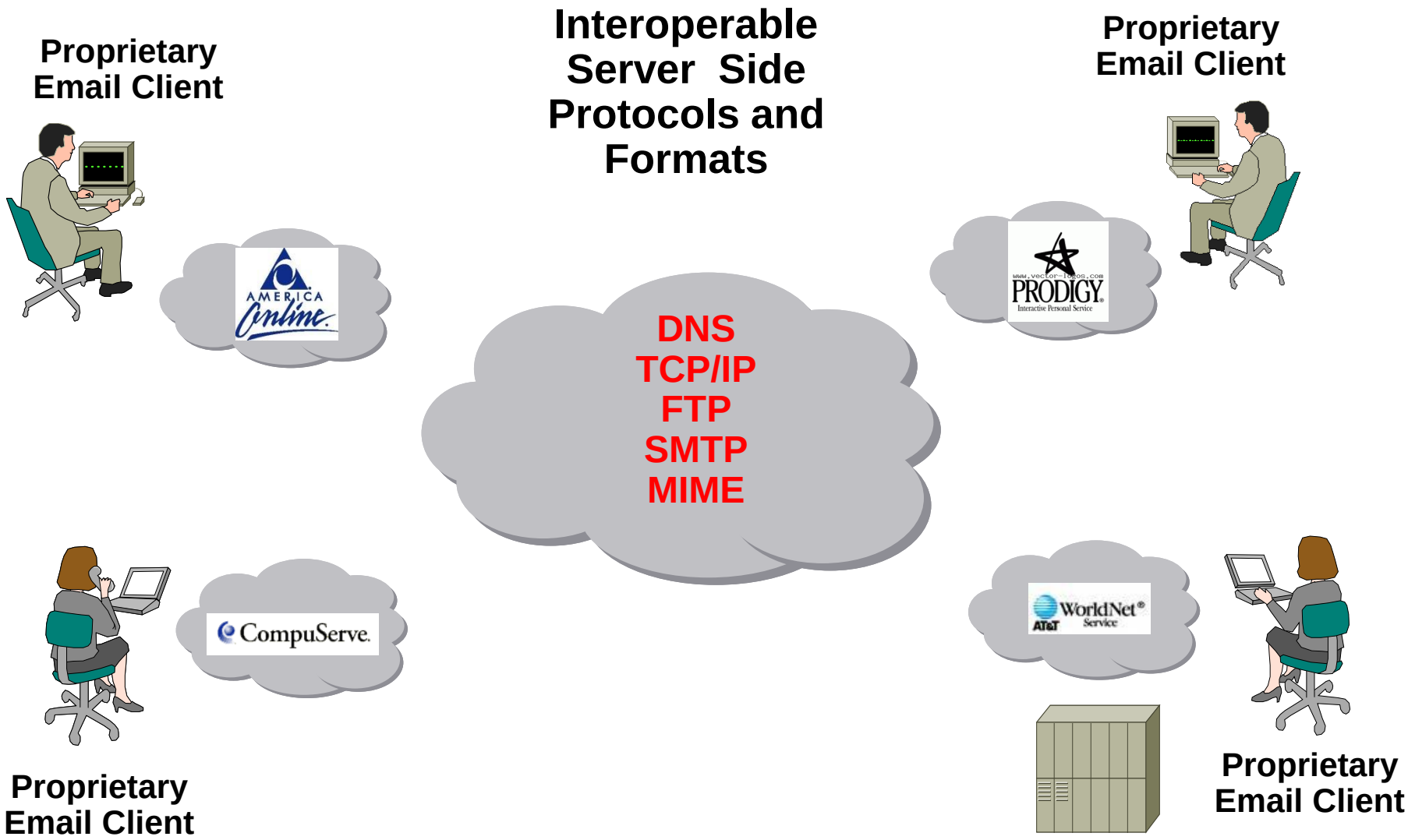
Internet – OSPF, BGP, AS

Email – SMTP

VPN – MPLS

Cloud – Intercloud

A Profound Breakthrough

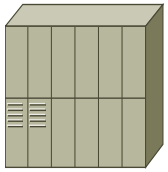


A Profound Breakthrough, Again

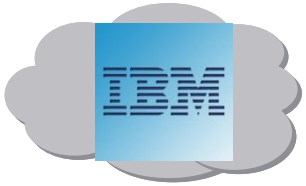
Proprietary Computing, Storage Client

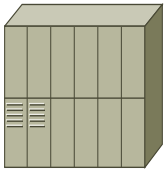
Interoperable Server Side Protocols and Formats

Proprietary Computing, Storage Client



SVMP*
SSRP*
SOIP*





Proprietary Computing, Storage Client

***Simple VM Mobility Protocol**
***Simple Storage Replication Protocol**
***Simple Other Intercloud Protocols As Needed**

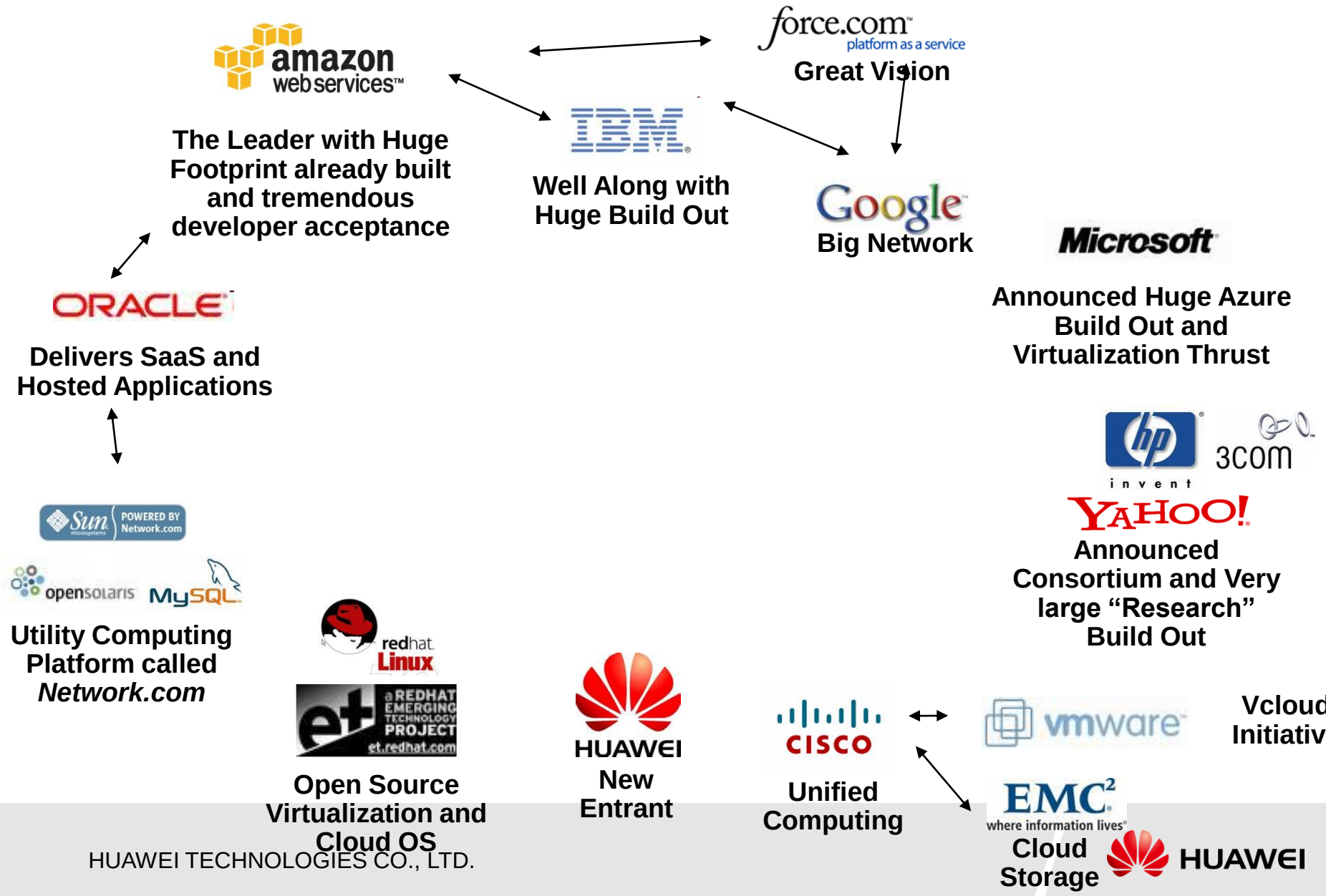
Proprietary Computing, Storage Client

It Really could be a Déjà Vu

"I'm seeing a possibility of inter-cloud problems mirroring the Internet problems we had thirty or forty years ago,“, Vint Cerf, Vice President and Chief Internet Evangelist for Google

Large Cloud Players and Landscape

Notice who is NOT on the chart – the large Telco/Service Providers



Is This the Future of Cloud?

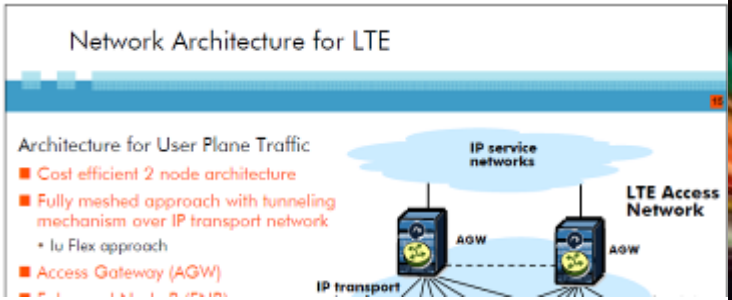
Carriers Mobility drive will accelerate adoption of Cloud Computing as a back end

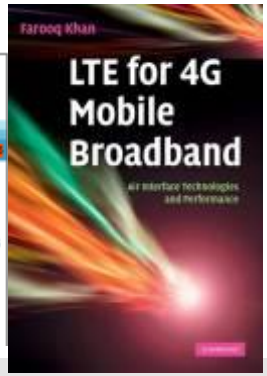
Open Handhelds

Netbooks

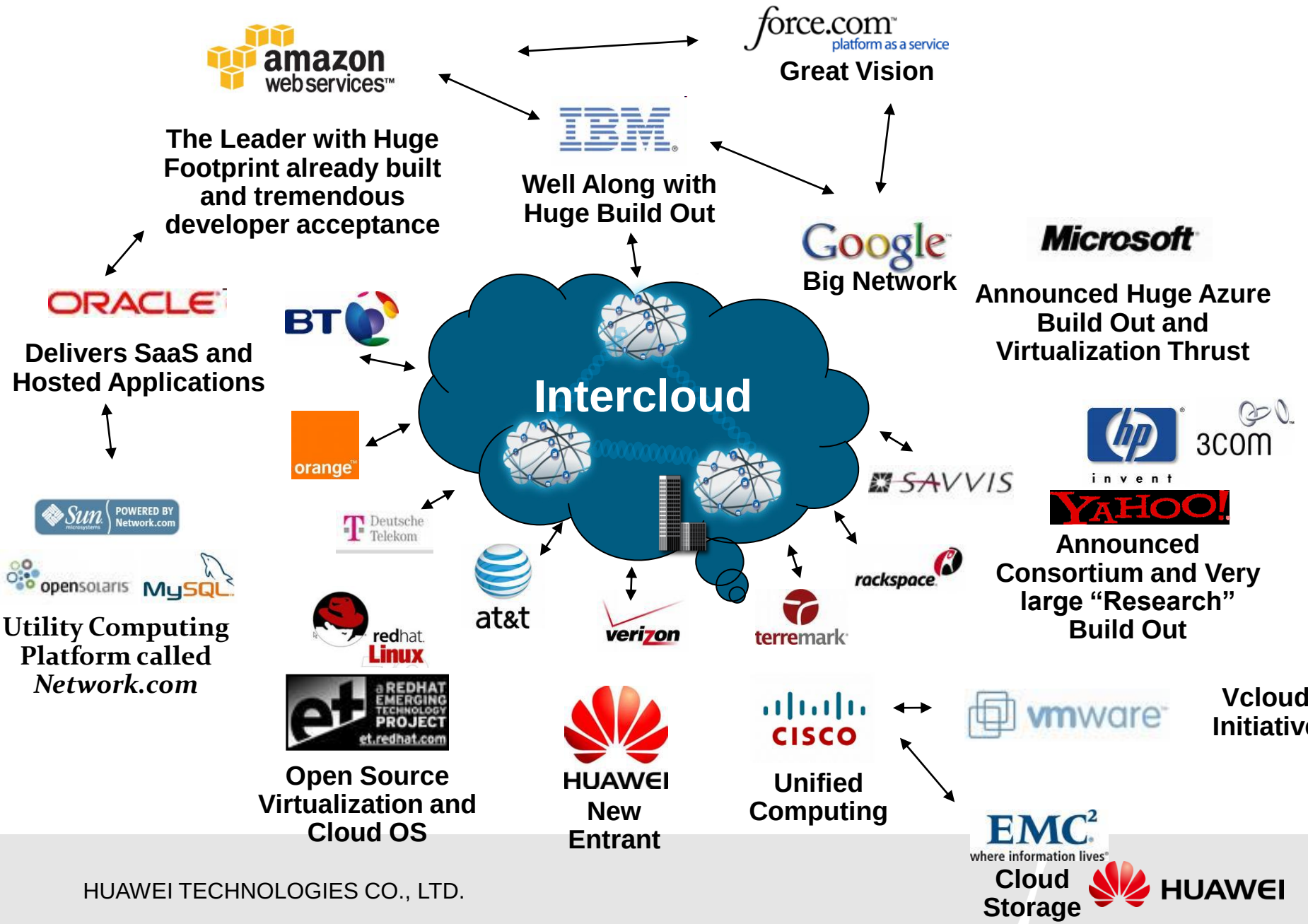
Open Wireless Networks

4G/LTE – All IP network design for Wireless



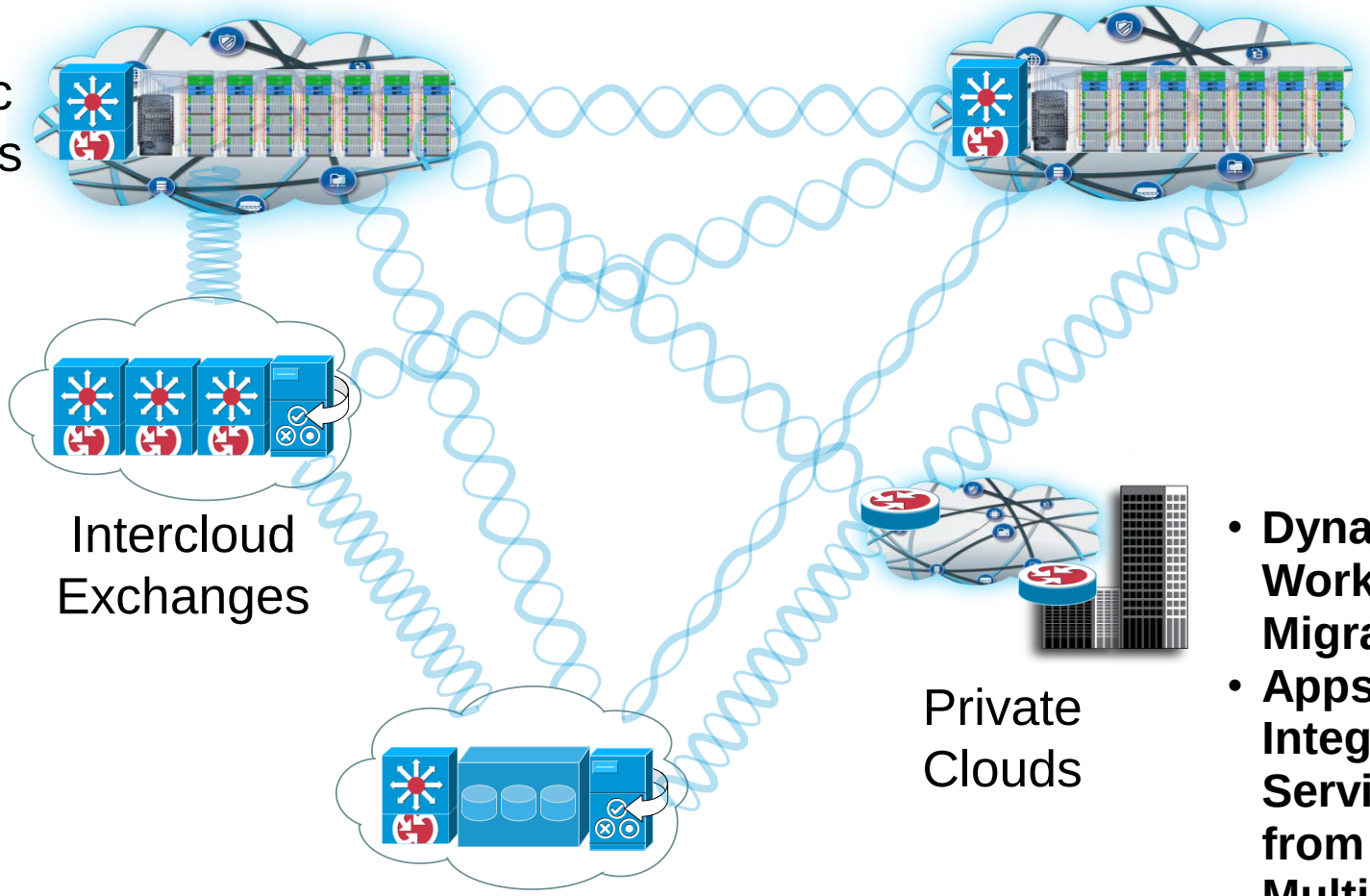


A Likely Long Term Outcome



Vision—The Intercloud

Flexible Infrastructure and a New Application Platform

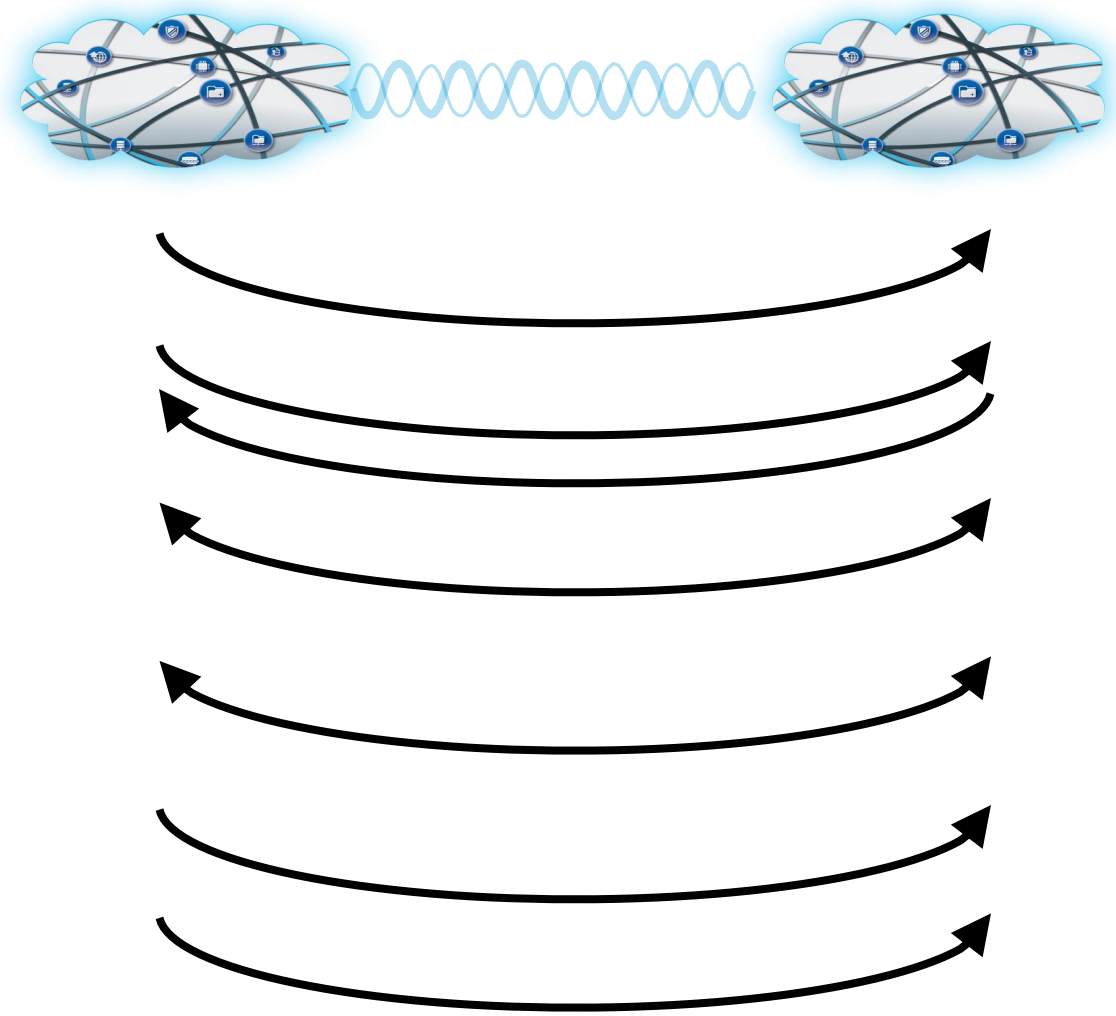


A Federation of Clouds Based on Open Standards:

- **Naming, Discovery**
- **Trust**
- **Exchange, Peering**

- **Dynamic Workload Migration**
- **Apps Integrate Services from Multiple Clouds**

Dynamic Workload Migration – Simple VM Mobility



Cloud 1 / Cloud 2 transport
→ XMPP

Cloud 1 finds Cloud 2
→ Naming, Presence

Cloud 1 trusts Cloud 2
→ Certificates, Trustsec

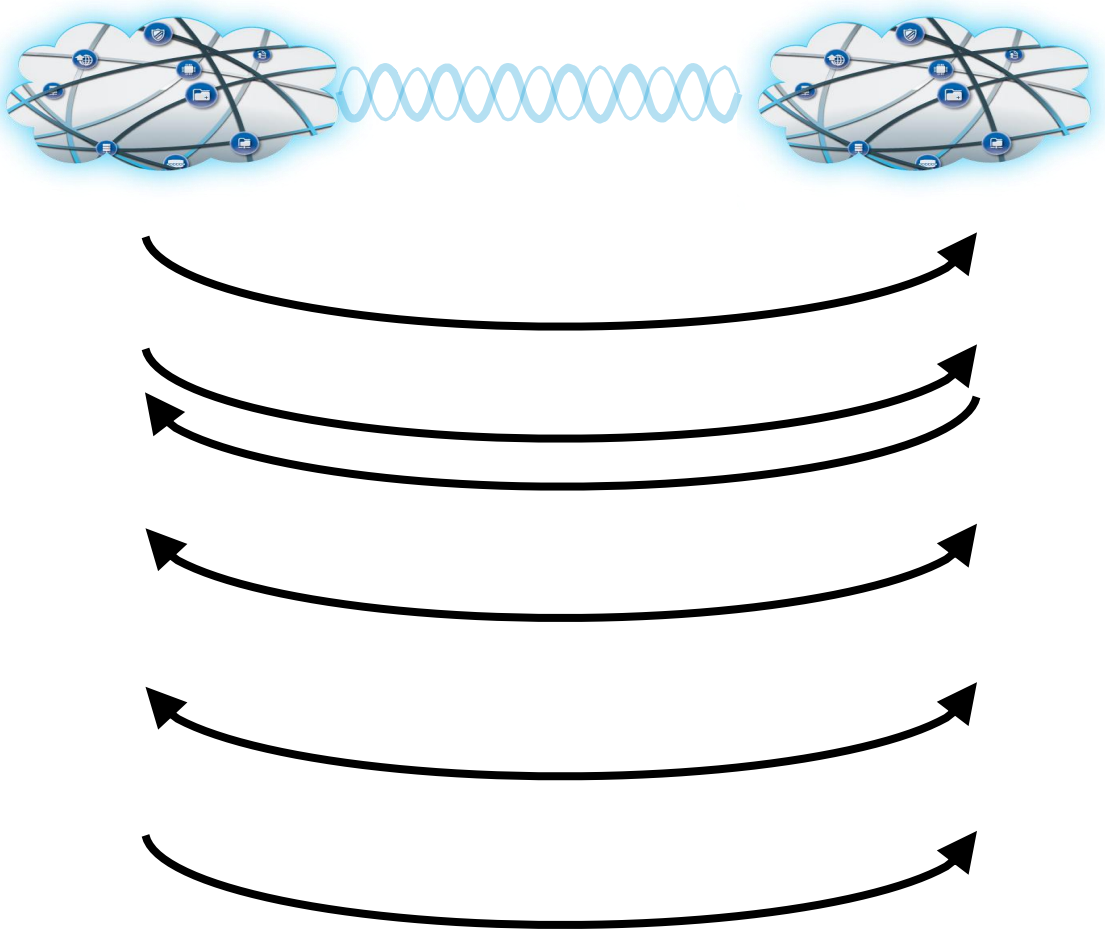
Cloud 1/2 negotiate
→ Policy, Entitlement, Security, Metering

Cloud 1 sets up Cloud 2
→ Placement, Deployment, Format, Motion

Cloud 1 sends to Cloud 2
→ Transfer, Management

VM Runs in Cloud 2
→ Addressing, VLAN, WWN, Filesystem

Dynamic Workload Federation – Generalized Service Access



Cloud 1 / Cloud 2 transport
→ XMPP

Cloud 1 finds Cloud 2
→ Naming, Presence

Cloud 1 trusts Cloud 2
→ Certificates, Trustsec

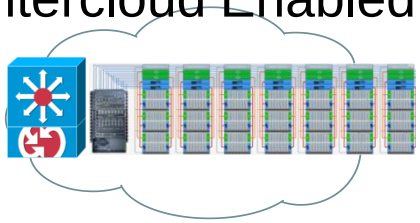
Cloud 1 queries Cloud 2 for Services
→ RDF/SPARQL, OWL

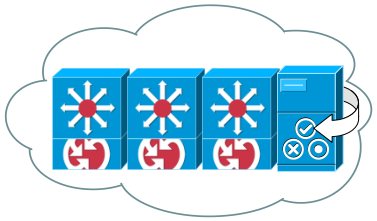
Cloud 1 selects; receives protocols, interface
→ Web Services; REST API

Cloud 1 calls services in Cloud 2
→ Metering, SLAs

Intercloud Elements

Clouds which are Intercloud Enabled





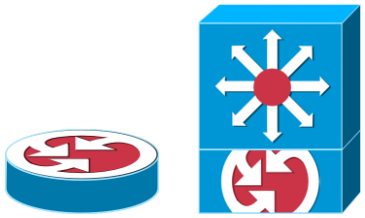
Intercloud **Exchanges**

protocols
formats
processes
practices
governance

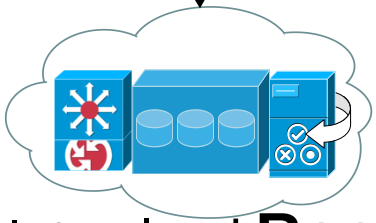
Standards, Industry Associations

University Funded work and Partnerships

Public Testbed

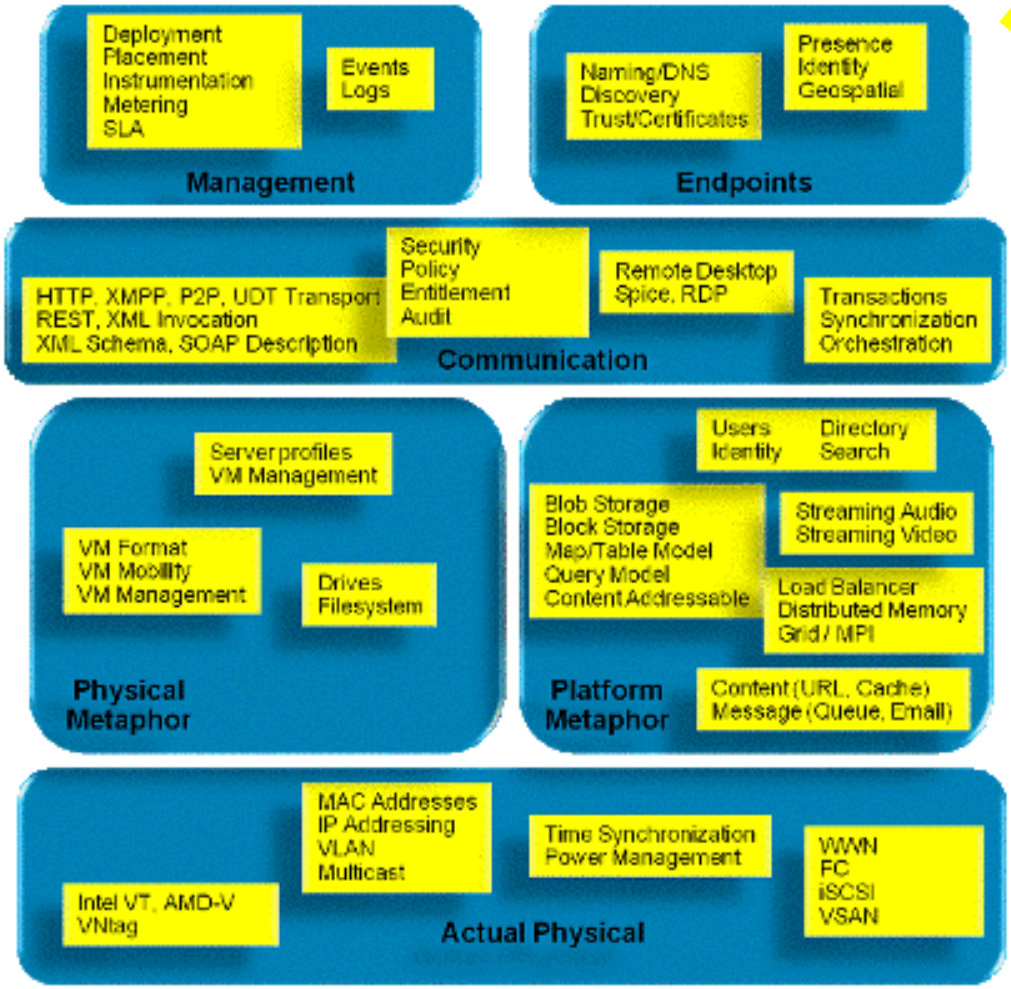


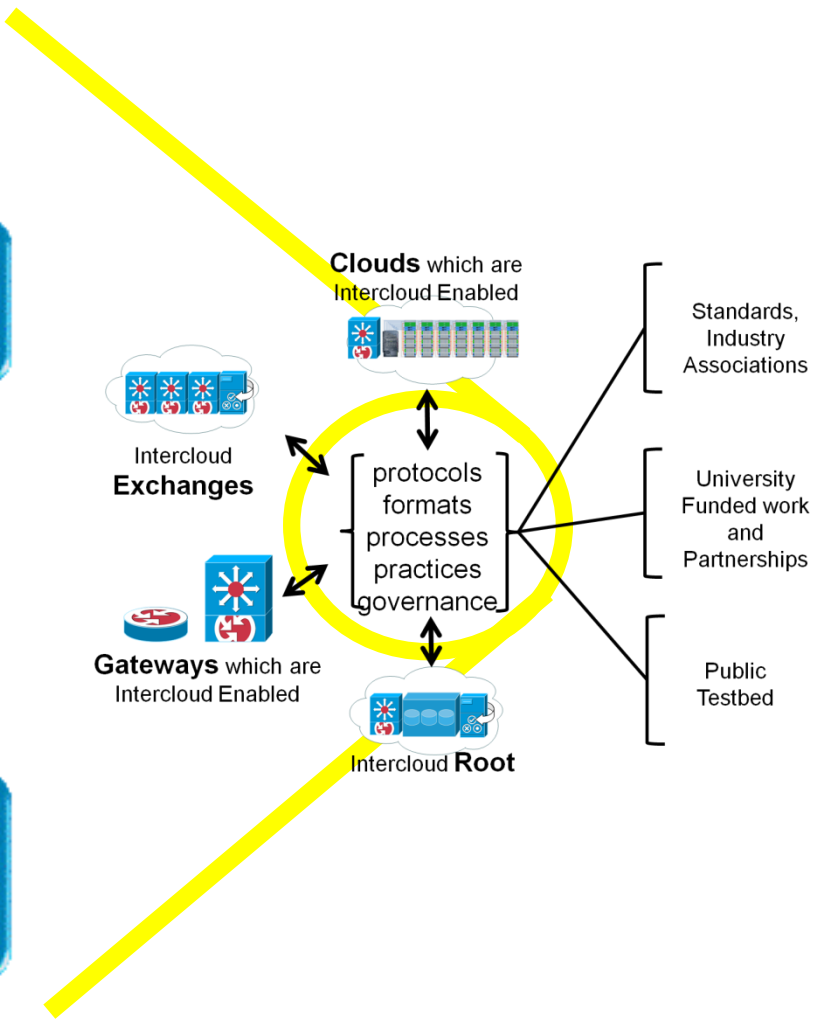
Gateways which are Intercloud Enabled



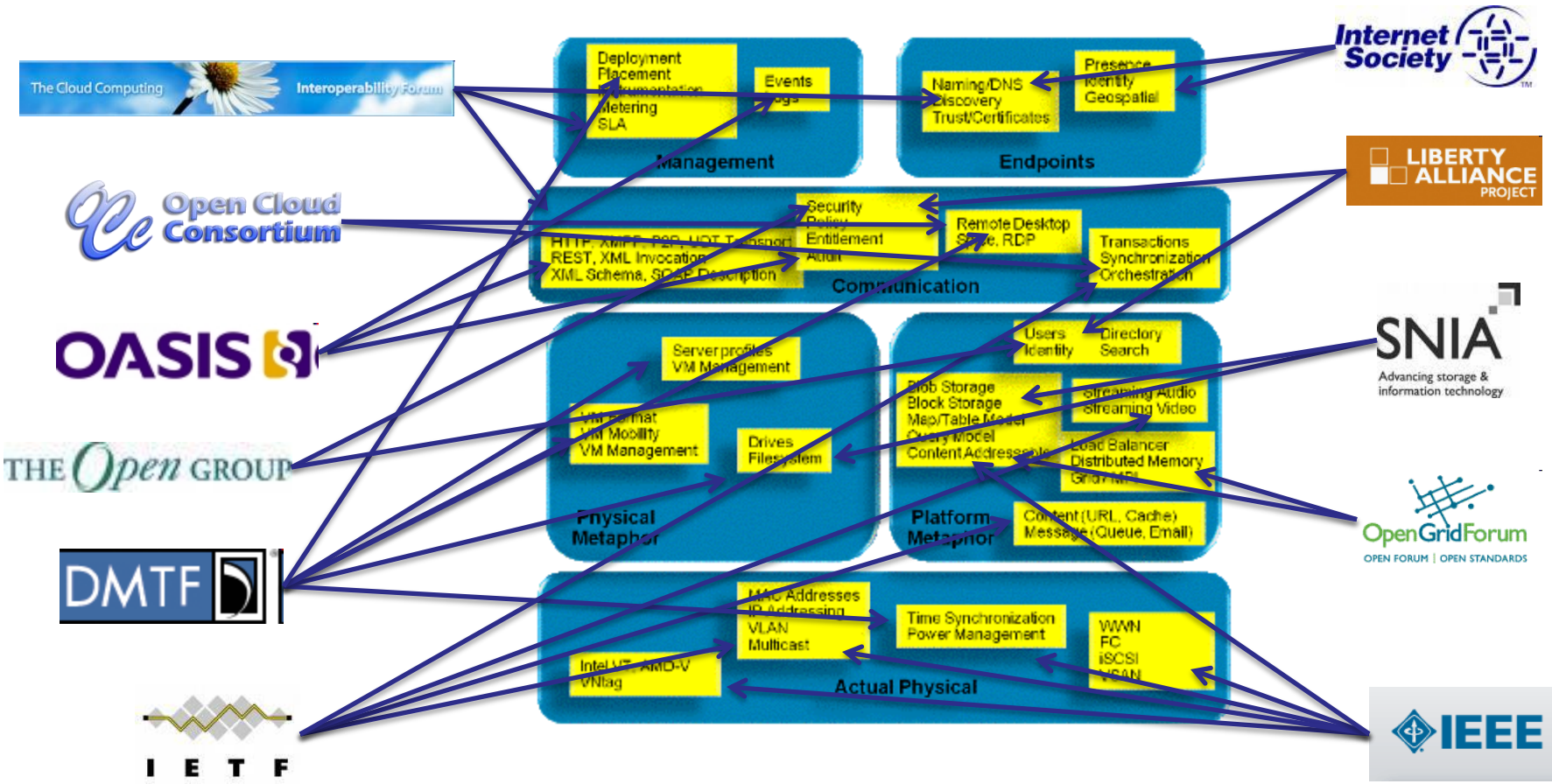
Intercloud **Root**

Palette of Standards Areas

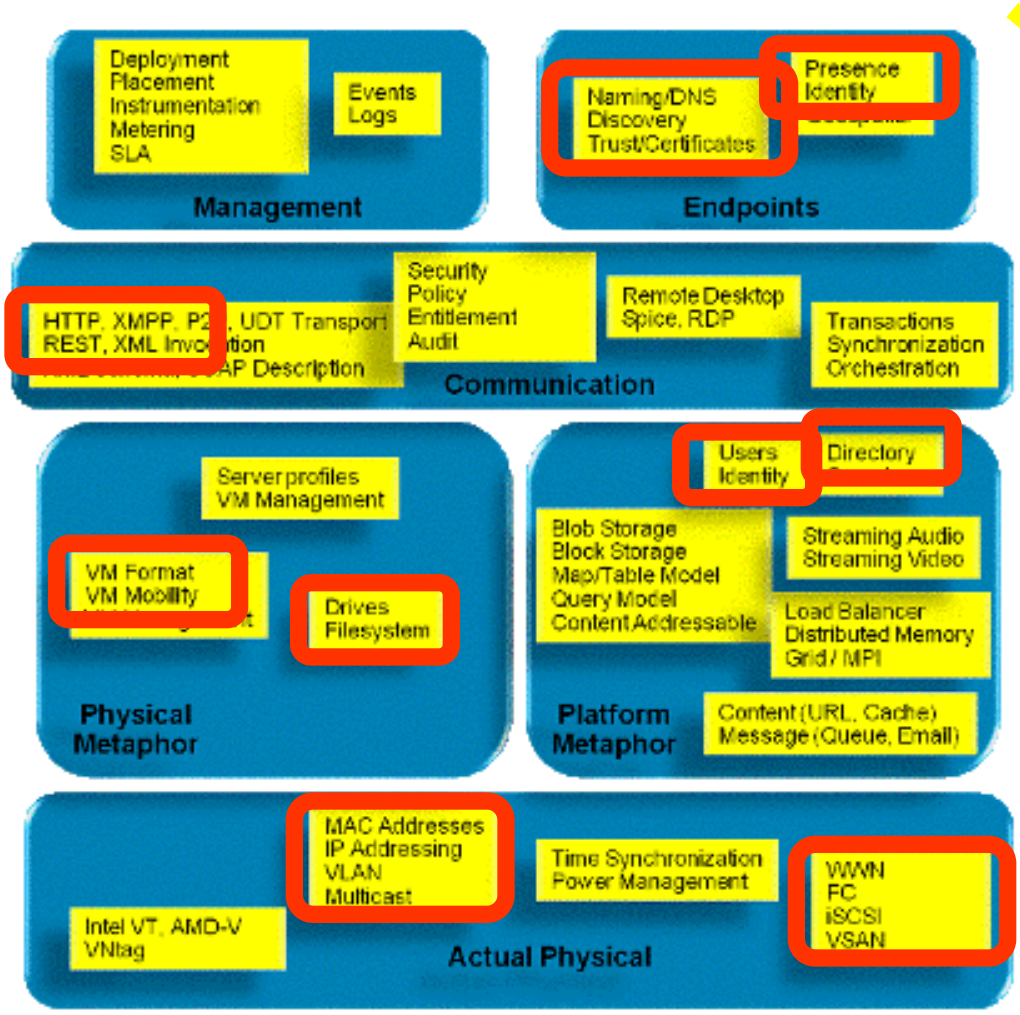


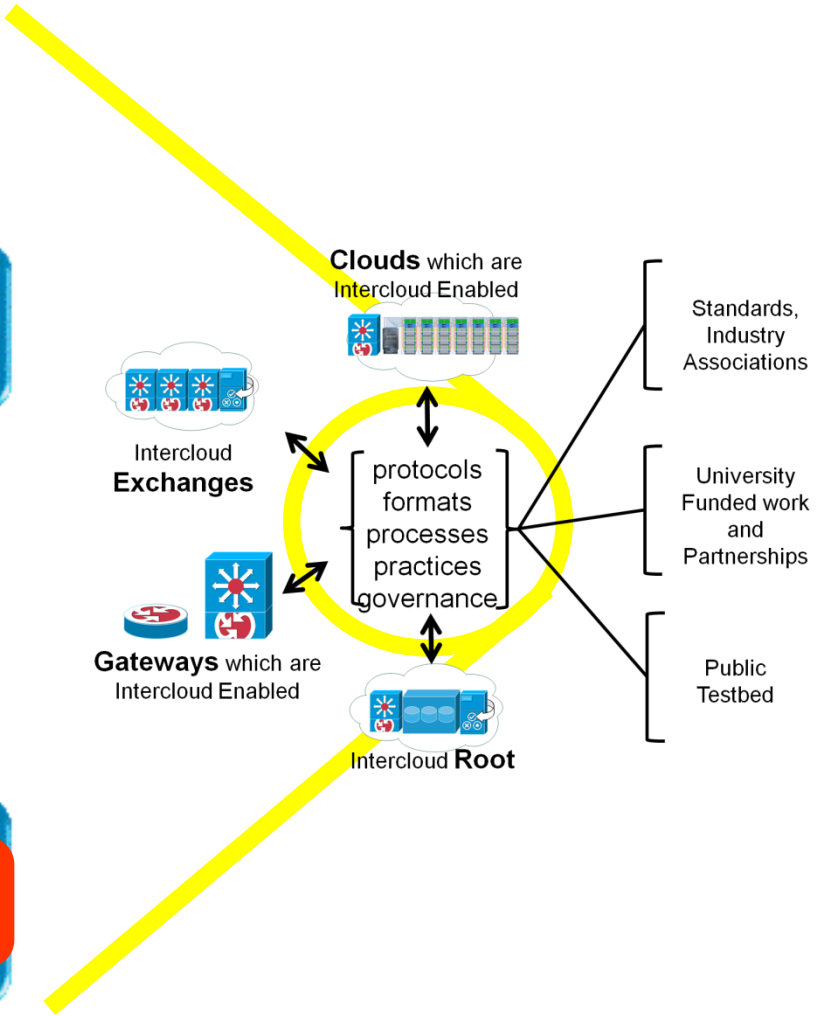


Multiple Standards and Associations



Good Initial Standards Focus Areas

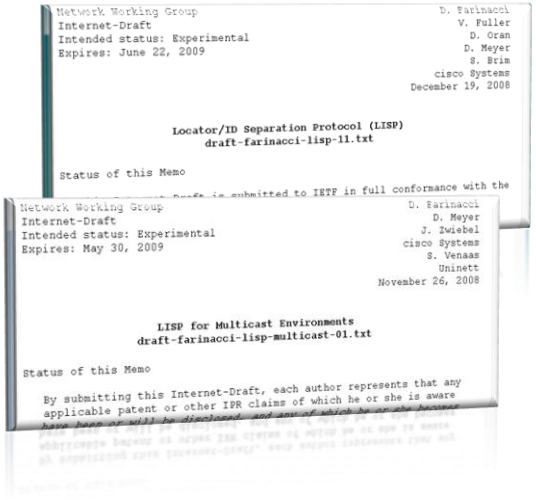


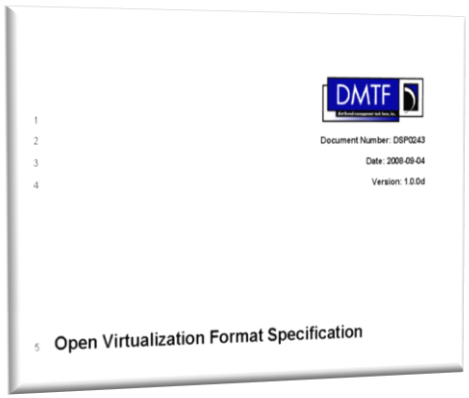


Use Cases: Workload mobility, Service (storage) federation

Specific Intercloud Projects

- **Addressing – IETF LISP**

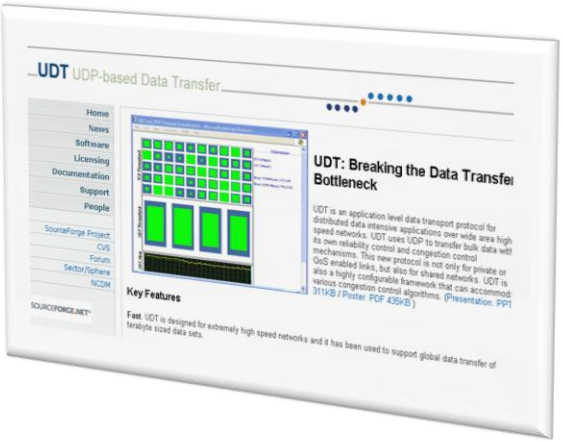




- **Virtual Machines - DMTF OVF**

- **Conversations – XMPP.org**

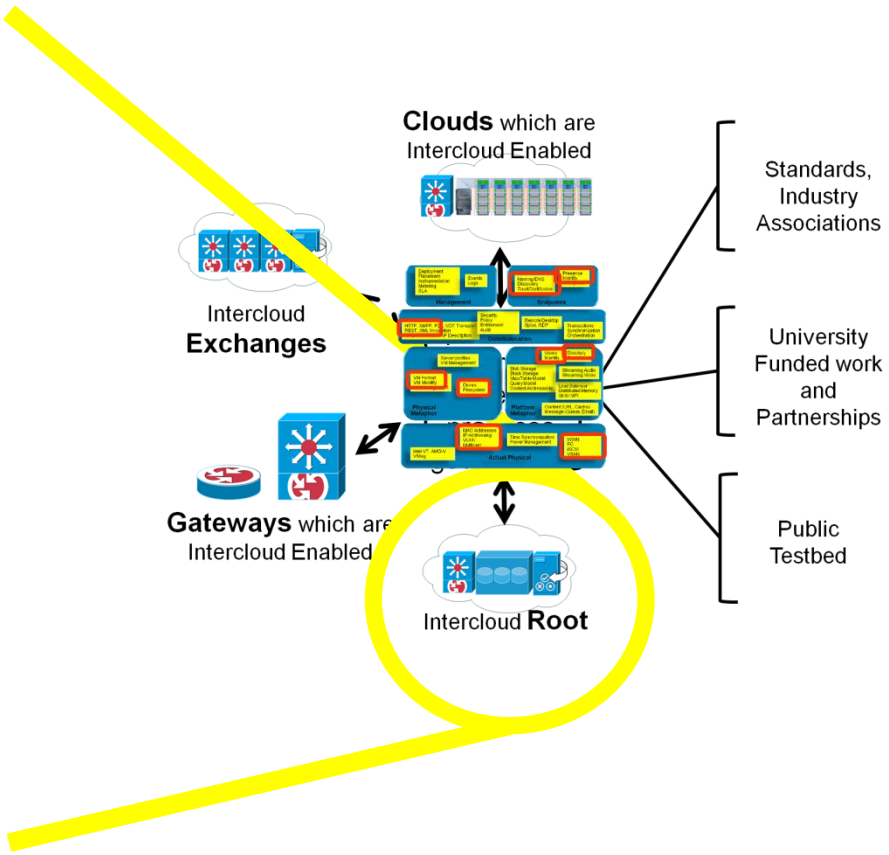
- **UCI – W3C, Google Code**



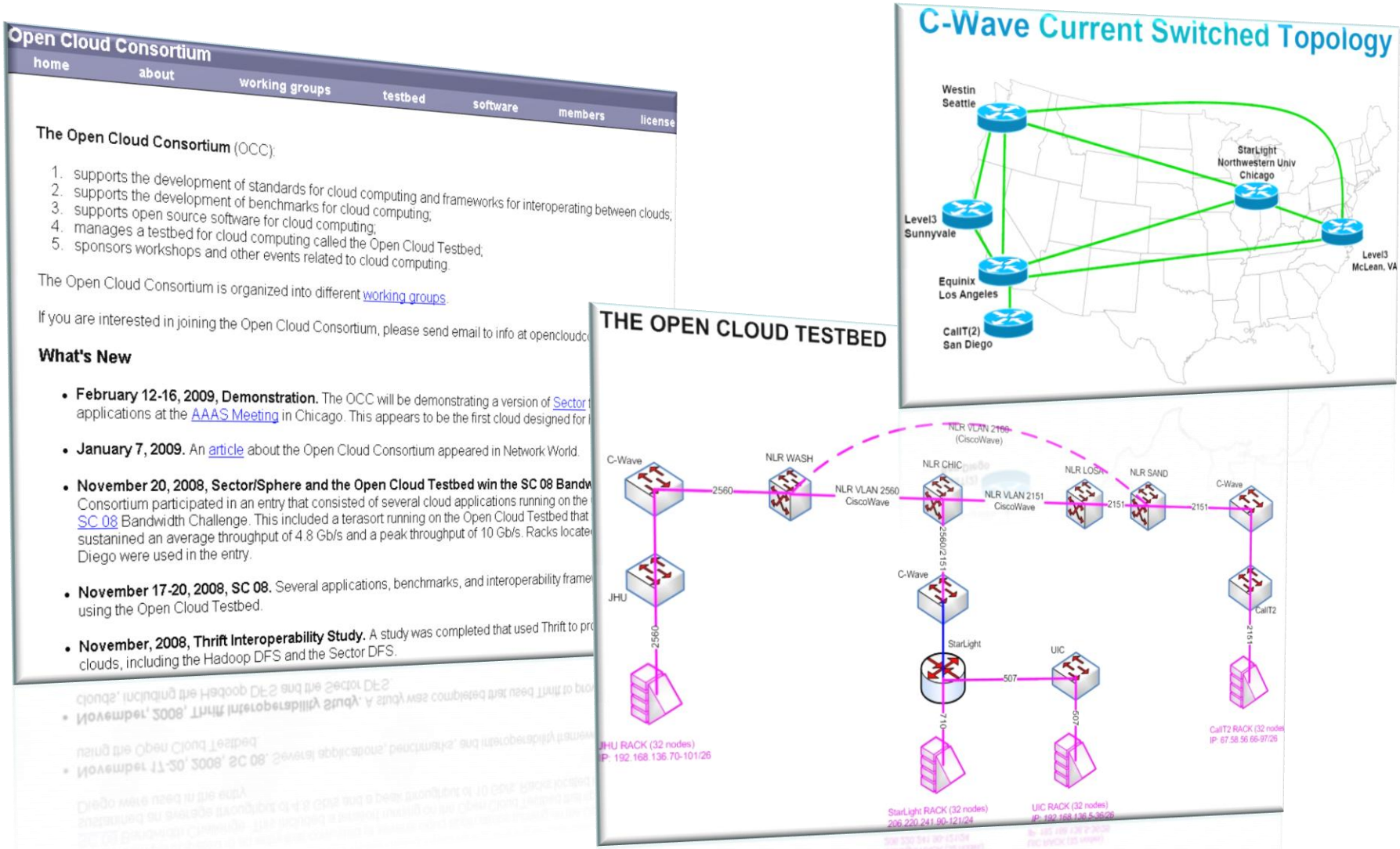
- **Distributed Storage Acceleration - opencloudconsortium.org, udt.sourceforge.net**

Intercloud Root – Design, Specification, Prototype

- Root Cloud DNS, LDAP, and Certificate Authority (FreeIPA?)
  - Cloud Naming/DNS
  - Cloud Presence/Discovery
  - Cloud Identity/Authentication
- Speaks XMPP
  - Is Root XMPP server
- Namespace Manager
  - Root software MAC address space authority
  - Root LISP IP Address DB
  - Root LISP Multicast DB
  - Root software WWN address space authority



Opencloud Testbed = Possible Intercloud Testbed



Next Intercloud Activity

The Session is a follow-on to a series of meetings in 2009 among government, industry, and standards groups. These include a Cloud Interoperability Workshop (March), a Cloud Standards Coordination Session (July), and a Government Cloud Initiatives and Standards Roadmaps Workshop (September).

The results of these meeting include a Cloud Standards Coordination group and a proposal for a Cloud Standards Roadmap Process.

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OMG TECHNICAL MEETING SPECIAL EVENT

Cloud Interoperability Roadmaps Session

December 10, 2009, Long Beach, CA

08:00 - 08:45	**(Rackspace)** - Adrian Otto, Cloud Developer, Rackspace
08:45 - 09:15	**(Open Cloud Consortium)** - Surenda Reddy, VP of Cloud Computing, Yahoo
09:15 - 10:00	**(IBM)** Ginny Ghezzo, Senior Development Manager, Emerging Technologies, IBM *Thinking Dynamically About the Infrastructure*
10:15 – 11:00	**(Microsoft)** - Mark Ryland, National Standards Officer (USA), Microsoft *Interoperability in the Cloud: Challenges and Opportunities*
11:00 – 11:45	**(RightScale)** - (TBD)
13:30 – 14:30	**(NASA)** - Chris Kemp, CIO of NASA Ames
14:30 – 15:00	**(GICTF)** - Hiroshi Sakai, GICTF Secretariat, Supervisor, Global Inter-Cloud Technology Forum *Introduction to Global Inter-Cloud Technology Forum and its Roadmaps*
15:15 – 15:45	**(DMTF)** - Winston Bumpus, President, Distributed Management Task Force *Will Cloud Computing be Open and Interoperable?*
15:45 – 16:15	**(OGF)** - Craig Lee, President, Open Grid Forum *An Open Cloud Computing Interface Status Update*

Thank You

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