ITU Workshop on
"Bridging the Standardization Gap"

(Vientiane, Lao People's Democratic Republic, 30-31 July 2012)

Cloud Computing work in ITU-T
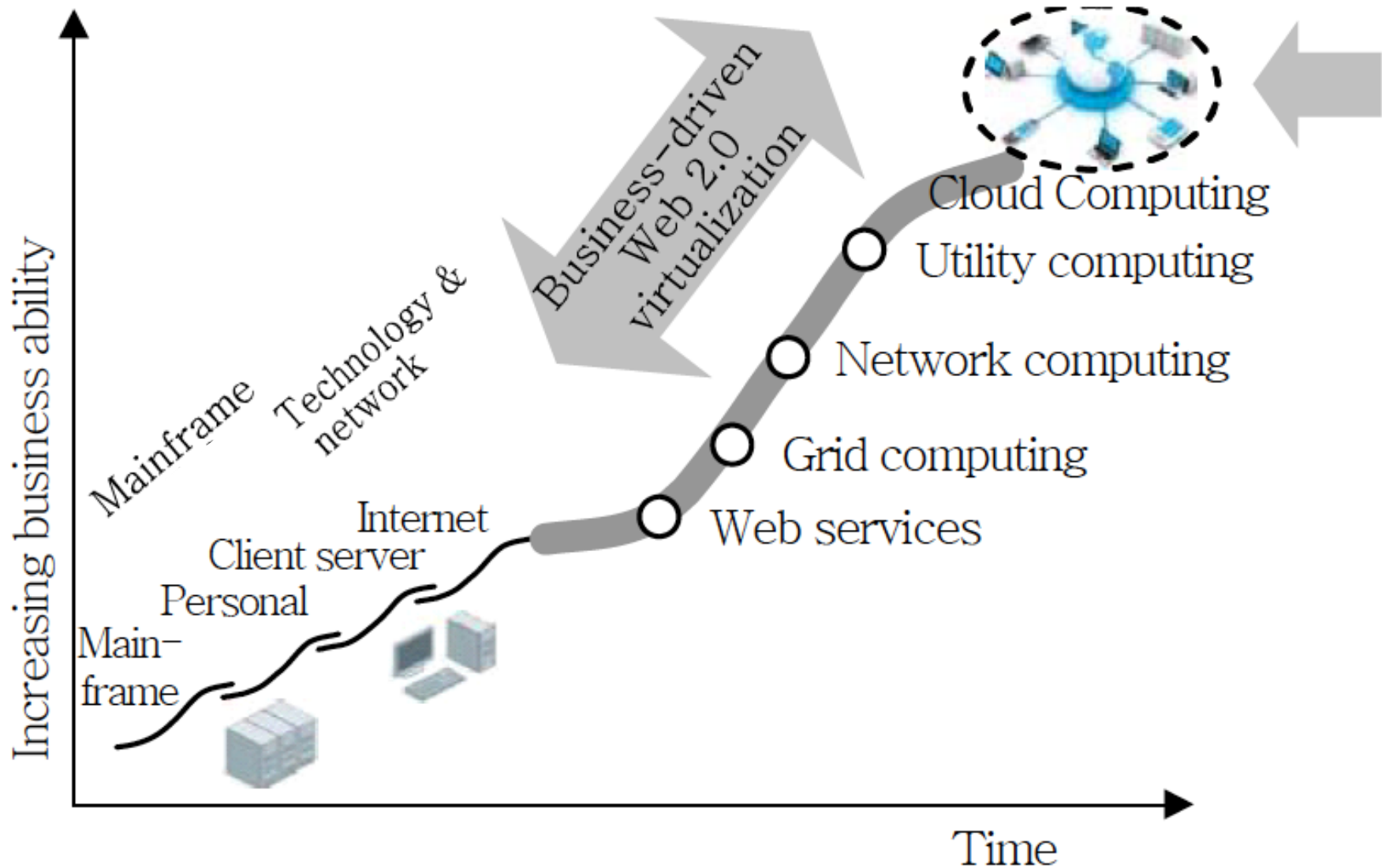
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Contents

1. Why Cloud Computing?
2. Study Structure on CC
3. Definition & Eco-system
4. RA & Services
5. Conclusion

1. Why Cloud Computing?
History of Computing

1. Why Cloud Computing?
Ways for Computing Power

Private Car

Rental or Public Vehicle

Cheap Price

Easy-to-use

Pay-as-you-go

Whatever-you-want

VS

Buying it with expensive price

Just Rental with cheap price

1. Why Cloud Computing?

"CLOUD COMPUTING"

On-demand Outsourcing

"**Pay-as-You-Go**"

2. Study Structure on CC

Brief Summary of FG-Cloud Computing

- **FG-Cloud Computing (FG-CC): 02.2010 ~ 12. 2011**
- **FG-CC** has completed and has released 7 Technical Reports
  1) Introduction to the cloud ecosystem: **definitions,** taxonomies, use cases and high-level requirements
  2) Functional requirements and **reference architecture**
  3) Requirements and framework architecture of cloud **infrastructure**
  4) Cloud resource **management** gap analysis
  5) Cloud **security**
  6) Overview of **SDOs** involved in cloud computing
  7) Cloud computing **benefits** from telecommunication and ICT perspectives

http://www.itu.int/en/ITU-T/focusgroups/cloud/Documents/FG-coud-technical-report.zip

2. Study Structure on CC

ITU-T SG13

- **Lead study group for <u>Future Networks</u> and <u>NGN</u>**
- **Lead study group on <u>Mobility Management</u> and <u>Fixed-Mobile Convergence</u>**
- **<u>Lead study group on Cloud Computing (TSAG: 01. 2012)</u>**

WP	Title	Questions
1	Coordination, planning and global outreach of NGN including mobile	10, 15, 25
2	Service requirements, scenarios and evolution aspects	3, 12, 13, 24
3	Frameworks and functional architectures	5, 9, 22
4	QoS and security	4, 16, 17
5	Future networks	7, 19, 20, 21
6 (New)	Cloud Computing	26, 27, 28

2. Study Structure on CC

New Working Party on CC (Feb 2012)

- Question 26/13 :Cloud computing ecosystem, inter-cloud and general requirements"

- Question 27/13 :Cloud functional architecture, infrastructure and networking

- Question 28/13 :Cloud computing resource management and virtualization

- New Recommendations:
  - Definition and vocabulary
  - Ecosystem , use cases and general requirements
  - Reference Architecture of cloud computing
  - Infrastructure functional requirements
  - Resource Management, DaaS and InterCloud …

- Two Collaborative Teams were agreed between ITU-T SG13 and ISO IEC SC 38 for definition and architecture

2. Study Structure on CC

Organizations active in cloud standards

Management API, Inter-cloud and security

- DMTF – Distributed Management Task Force — APIs for managing cloud resources
- SNIA - Storage Networking Industry Association
- OGF – Open Grid Forum — API for Cloud Storage
- GICTF - Global Inter-Cloud Technology Forum — Inter-Cloud
- TM Forum – TeleManagement Forum — Cloud Services E2E SLA
- OASIS — Identity in the Cloud
- Cloud Security Alliance — Security aspects

Definition, Ecosystem , Network, Access & Architectures

- ISO IEC-JTC 1; SC 38: Distributed Application Platforms and Services (SOA, WS, Cloud)
- ITU-T - Cloud Computing Focus Group , *SG 13 and SG 17*
- NIST - National Institute of Standards and Technology
- W3C – activities on HTML-5 (offline mode, multi-device…)
- IETF - Network & Real Time Communication protocols

ETSI IEEE atis Portability, Inter-Cloud, Marketplace, Private cloud…

3. Definition and Eco-system

ITU-T Cloud Computing Definition

- **Cloud Computing**:
A model for enabling service users to have ubiquitous, convenient and on-demand network access to a shared pool of configurable resources (e.g., networks, servers, storage, applications, and services), that can be rapidly provisioned and released with minimal management effort or resource pooling provider interaction. Cloud computing enables cloud services.

- **Cloud Services**:
A service that is delivered and consumed on demand at any time, through any access network using any connected devices using cloud computing technologies.
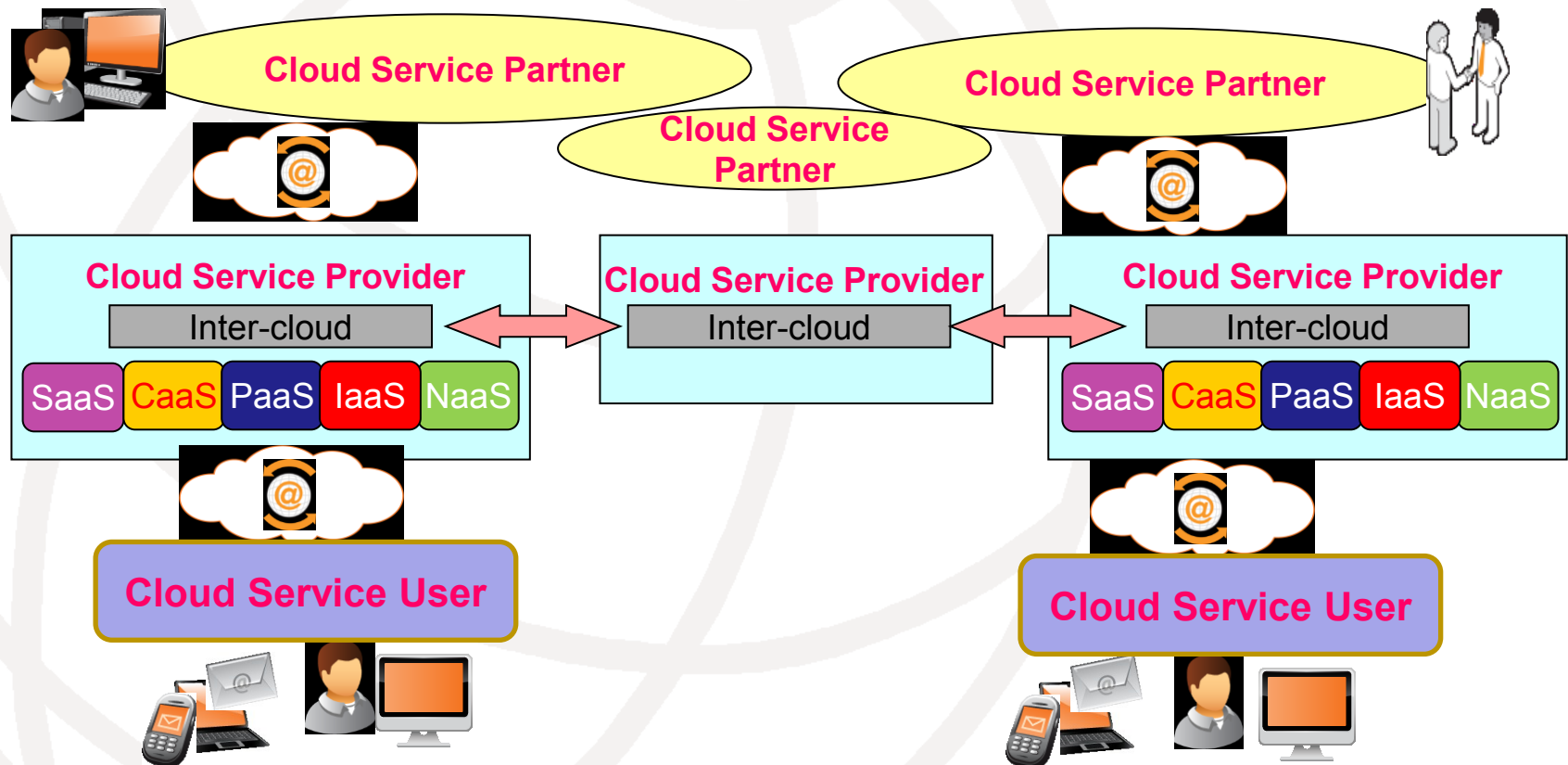 - **Cloud service categories: SaaS, CaaS, PaaS, IaaS, NaaS**

3. Definition and Eco-system
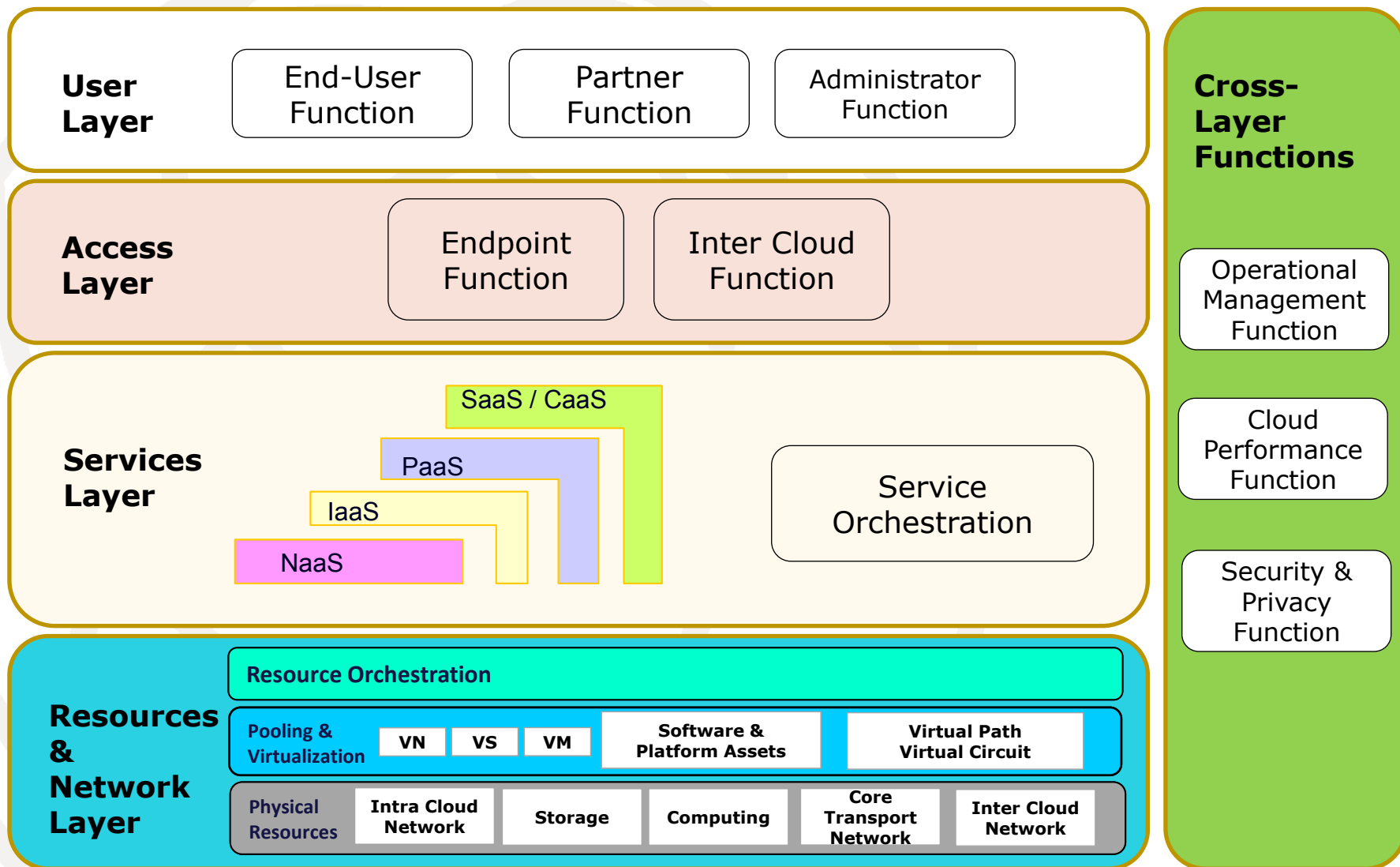
Cloud Computing Eco-system

Three actors playing different roles:
1. Cloud Service Provider CSP: XaaS Provider, Inter-Cloud…
2. Cloud Service User CSU: Consumer, Enterprise…
3. Cloud Service Partner CSN: Application Developer, Integrator…

4. RA and Services

Cloud Computing Reference Architecture

User Layer
- End-User Function
- Partner Function
- Administrator Function

Access Layer
- Endpoint Function
- Inter Cloud Function

Services Layer
- SaaS / CaaS
- PaaS
- IaaS
- NaaS
- Service Orchestration

Resources & Network Layer
- Resource Orchestration
- Pooling & Virtualization
  - VN
  - VS
  - VM
  - Software & Platform Assets
  - Virtual Path Virtual Circuit
- Physical Resources
  - Intra Cloud Network
  - Storage
  - Computing
  - Core Transport Network
  - Inter Cloud Network

Cross-Layer Functions
- Operational Management Function
- Cloud Performance Function
- Security & Privacy Function

Main Cloud Layers and functions

- Access layer:
  - Endpoint : controls cloud traffic and improves cloud service delivery
  - Inter Cloud: addresses delivering any cloud service across two or more CSPs
- Services layer:
  - Service Orchestration: is the process of deploying and managing "Cloud Services"
  - Cloud Services: provides instances (and composition) of CaaS, SaaS, PaaS, IaaS & NaaS
- Resources & Network Layer:
  - Resource orchestration
  - Pooling Virtualization: compute, storage, network, software & platform assets
  - Physical resources

4. RA and Services

Cloud interoperability

1. **Service cooperation between Cloud providers**
2. **Cloud interoperability between private & public clouds**
3. **Mutual backup and recovery from a disaster**
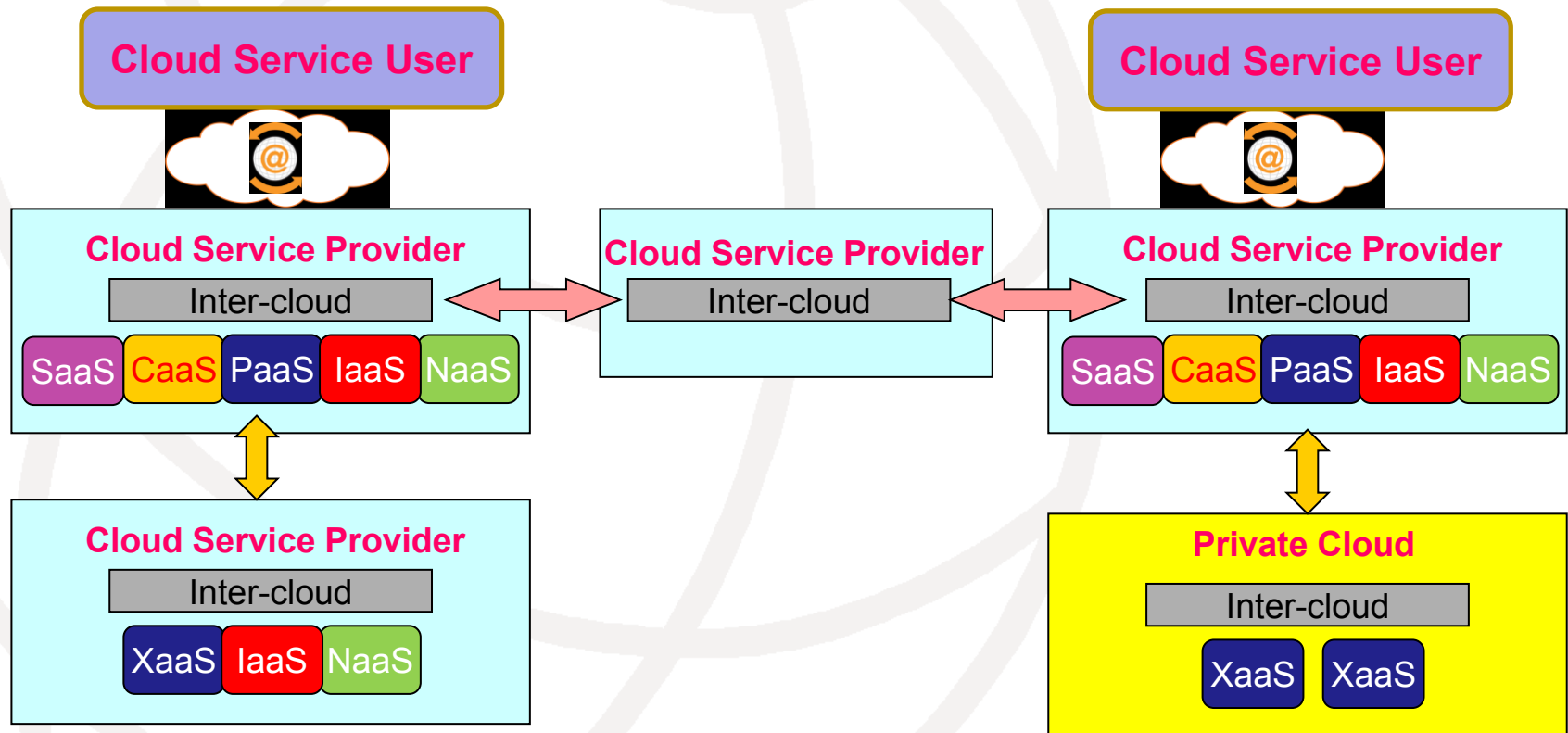
4. RA and Services

Cloud Security & data Privacy

- **Threats for cloud users:**
  - **Lack of security Information** (data location, backup system, disaster recovery…)
  - **Data loss and leakage** (encryption, authentication key…)
  - **Loss of Account/Service management ID** (Attack phishing, fraud..)
- **Requirements For cloud Services provider**
  - **Method to trust cloud providers**' security level shall be provided
  - **Confidentiality/integrity of data** against loss or leakage shall be required
  - **Proper account/identity management** against account/service hijacking shall be provided.
  - **Data Portability**, The capability to change Cloud Service Provider shall be provided

5. Conclusion

Benefits of Cloud Computing

- Reduced Cost
  - Cloud technology is paid incrementally, saving organizations money.
- Increased Storage
  - Organizations can store more data than on private computer systems.
- Highly Automated
  - No longer do IT personnel need to worry about keeping software up to date.

5. Conclusion

Benefits of Cloud Computing

- **Flexibility**
  - Cloud computing offers much more flexibility than past computing methods.

- **More Mobility**
  - Employees can access information wherever they are, rather than having to remain at their desks.

- **Allows IT to Shift Focus**
  - No longer having to worry about constant server updates and other computing issues, government organizations will be free to concentrate on innovation.

17

5. Conclusion
ITU-T Positioning in cloud standards

A **JCA-Cloud** (Joint Coordination Activity) is created to coordinate the ITU-T cloud computing work with Other standardization Organizations