ITU-T Cloud Computing Event

Main Technical Results of Focus Group Cloud Computing

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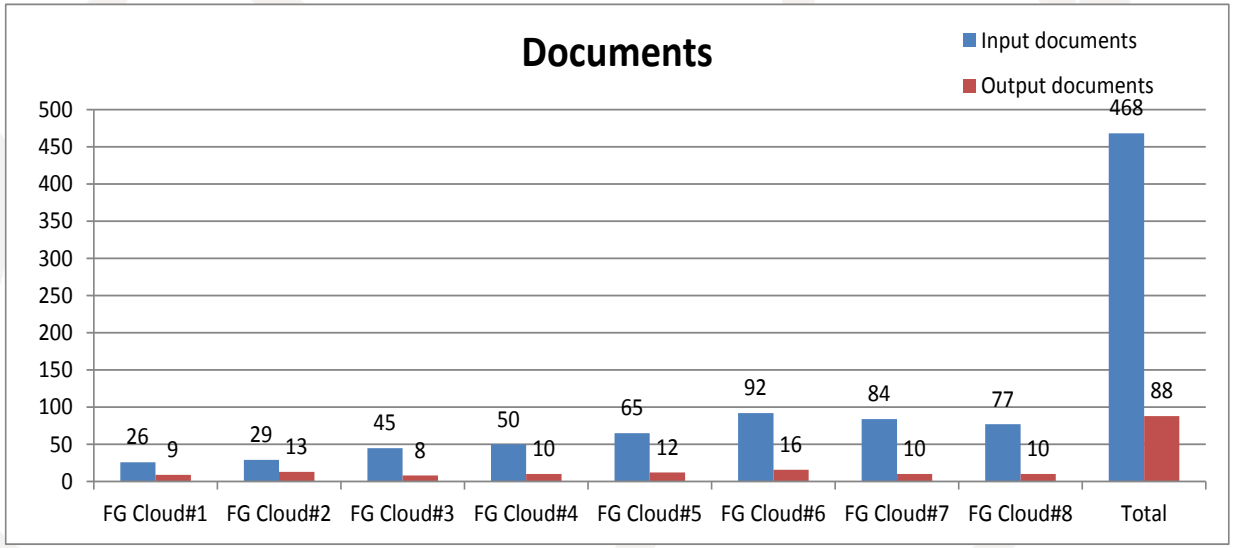
Main Focus Group Cloud results

1. Ecosystem: definition use cases & requirements
2. Functional requirements & Reference Architecture
3. Infrastructure: network & computing
4. Security
5. Resource management



468 Input documents

1

Cloud ecosystem: definitions, taxonomies, use cases & high level requirements

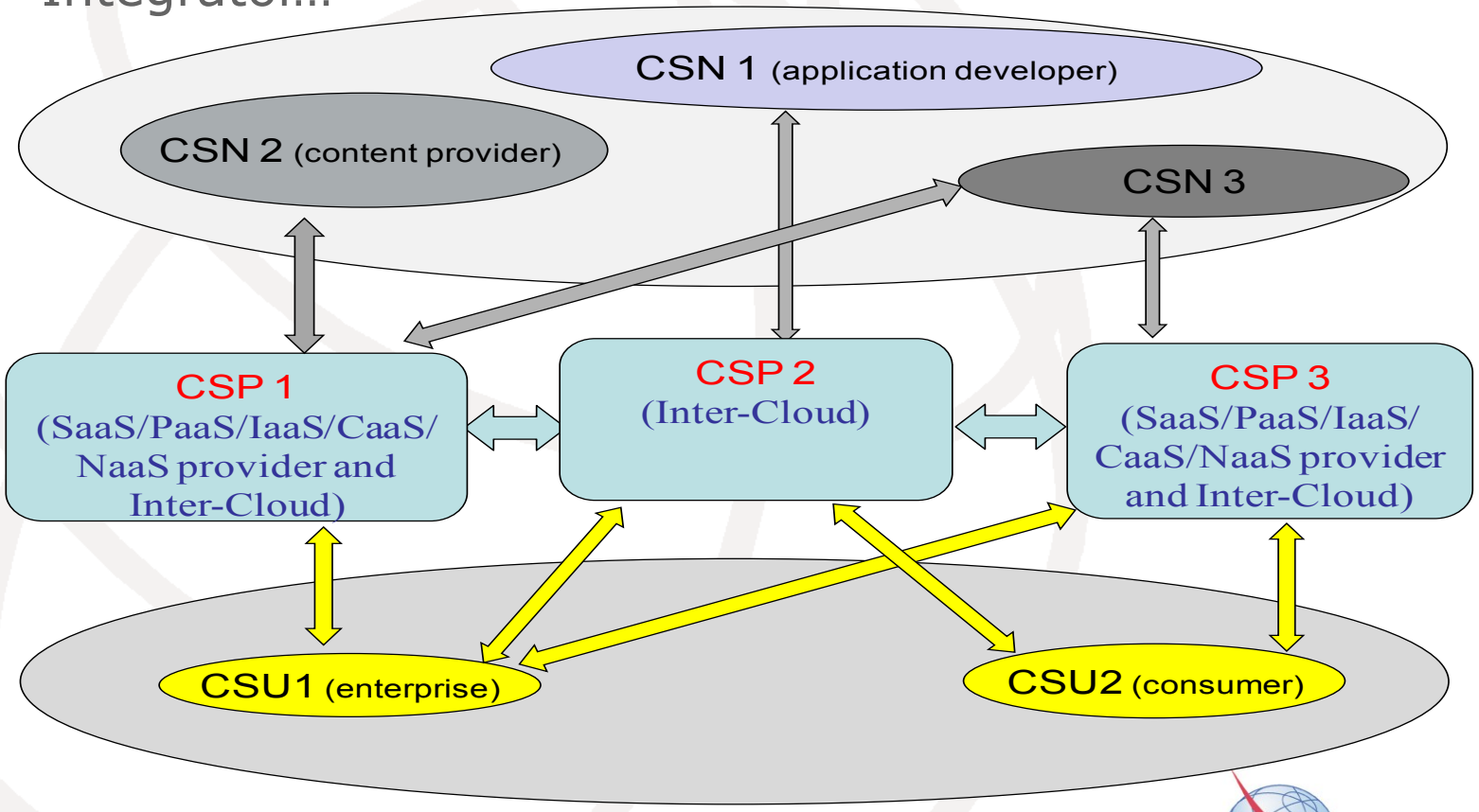
Cloud ecosystem: definitions, taxonomies, use cases & high level requirements

1. Cloud Computing related definitions & taxonomies: 5 Cloud service categories (SaaS, CaaS, PaaS, IaaS, NaaS) with 2 new categories for Communication (real time) and network (transport & inter-cloud)
2. Cloud ecosystem actors (provider, partner & user) and roles
3. Inter-cloud Scenarios : Peering, Federation & Service Broker
4. Telecommunication centric use cases: Service Delivery Platform, Desktop as a Service, Call center, Cloud migration and portability, Inter-cloud (SLA, performance, availability...)
5. High level requirements:
   - For cloud infrastructure accessibility, massive data processing, portability, responsiveness…
   - For cloud services: SLA support, management, Inter-cloud

Cloud Ecosystem

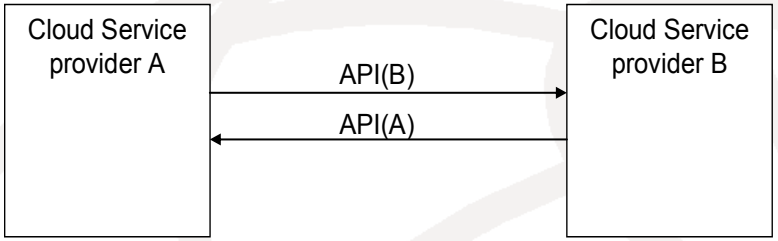
Three actors playing different roles:

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

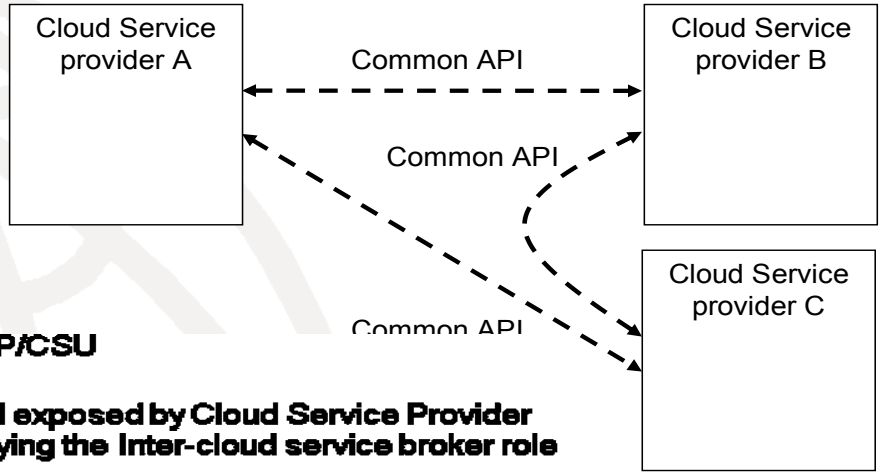


Inter-cloud Scenarios

Peering

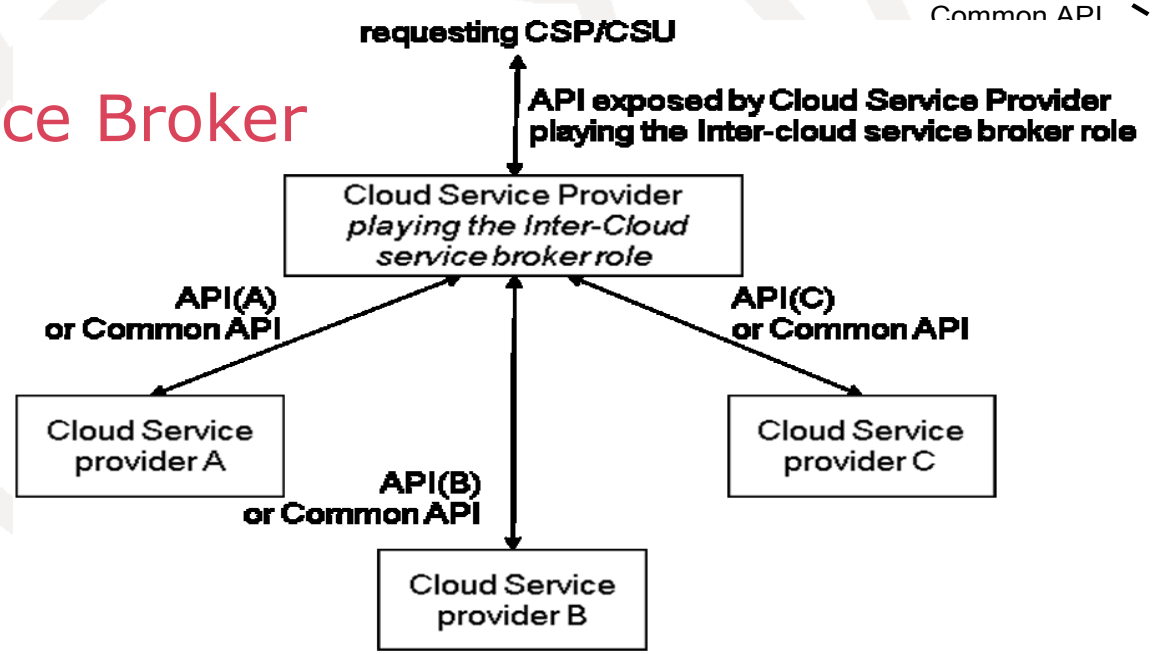


Federation



API(X): API provided by Cloud Service provider X

Service Broker



API(X): API provided by Cloud Service provider X

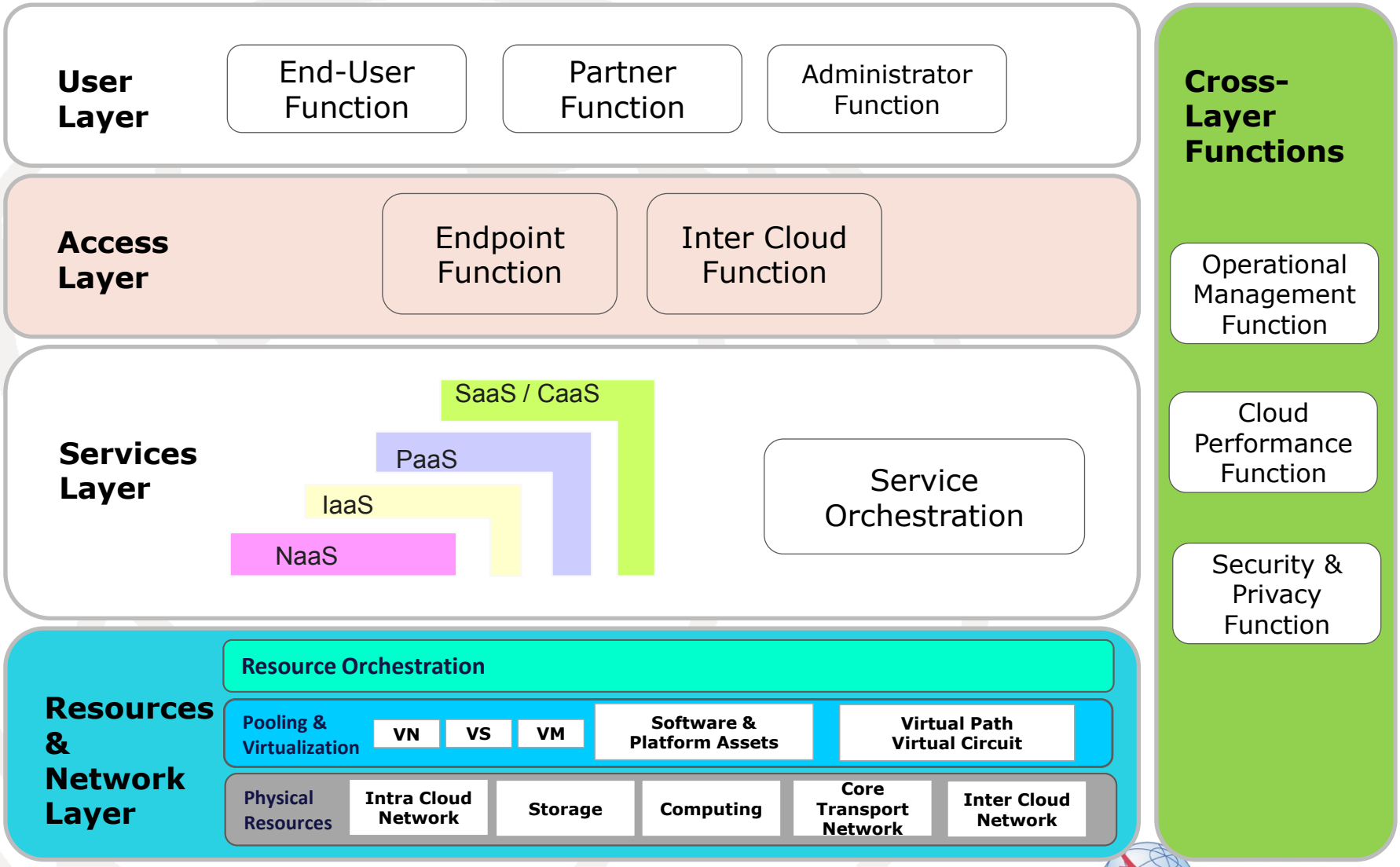
2
Functional Requirements & Reference Architecture

Functional Requirements & Reference Architecture

- Cloud Architecture Requirements: integration with Network resources, Automation & Mobility, Multiple Deployment model, Security and Audit…
- Introducing 4 Layers Cloud architecture: User, Access, Services, Resources & Network
- Functional blocks of cloud computing architecture: First cloud ICT architecture
  - Endpoint Function
  - Inter-Cloud Function: Peering, Federation & Brokering
  - Service Orchestration (Business Process)
  - Resources Orchestration
- Examples for DaaS, SDPaaS, User access, Multimedia/Internet TV, Inter-Cloud…

Cloud Functional Architecture

First Cloud ICT architecture



Main Cloud Layers and functions

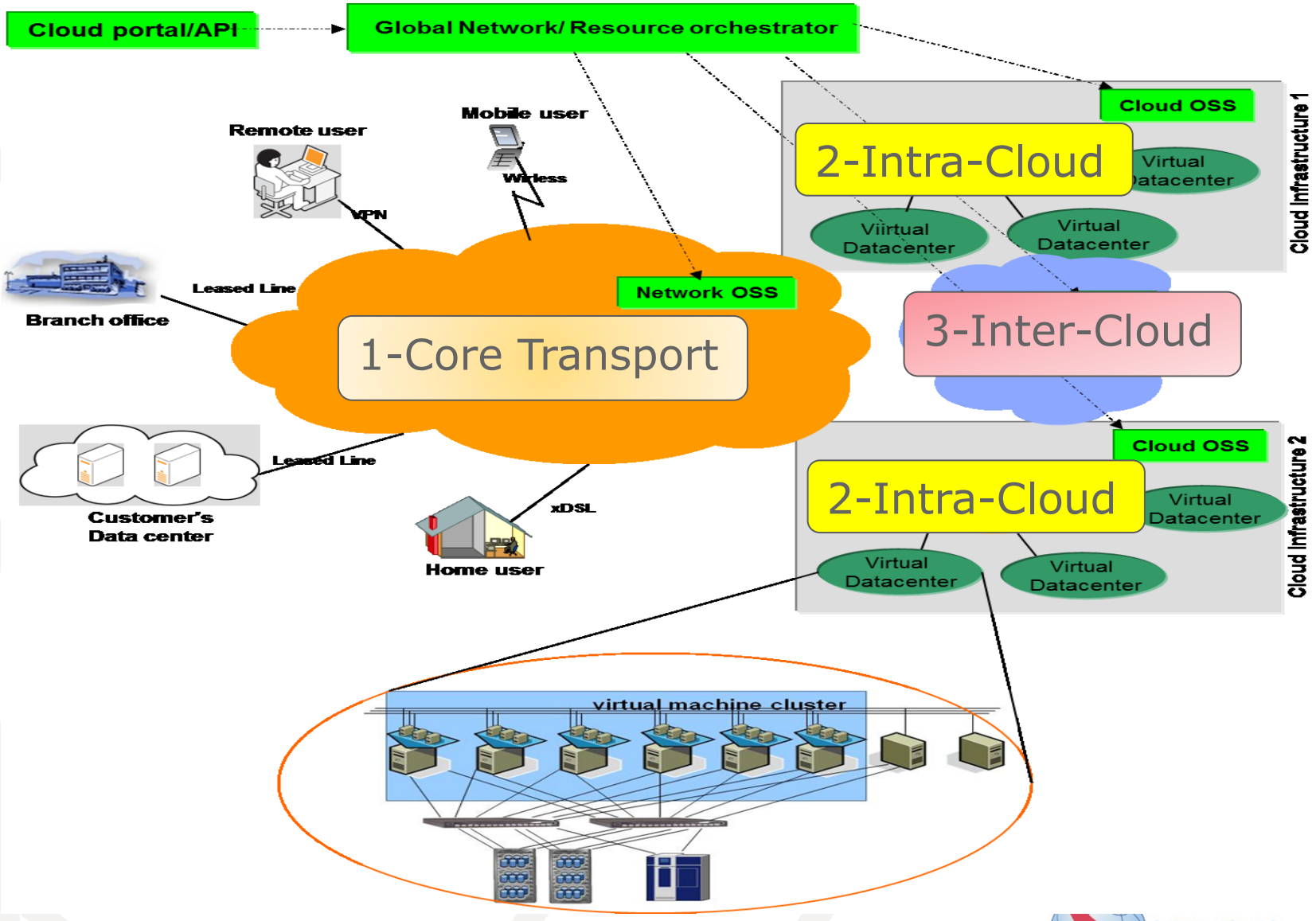
- Access layer:
  - Endpoint : controls cloud traffic and improves cloud service delivery
  - Inter Cloud: addresses delivering any cloud service across two or more CSPs
- Services layer:
  - Service Orchestration: is the process of deploying and managing "Cloud Services"
  - Cloud Services: provides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

3
Cloud Infrastructure: Requirements and framework architecture

Cloud Infrastructure: Requirements and framework architecture

- General requirements, Framework & Network Model for cloud infrastructure
- Functional requirements for
  - computing capability
  - cloud network
  - storage capability (& architecture)
  - resource management
- Power management

Network Model for cloud infrastructure



Functional requirements for Cloud Network

- Scalability
- Performance
- Agility and flexibility
- Convergence of Data & Storage Networks
- Network interface card virtualization
- Dynamic & Seamless migration of Virtual machine
- IPv4/IPv6 Support

Functional requirements for Computing & Storage capability

Computing

- CPU virtualization & scheduling
- Memory virtualization
- I/O Device virtualization
- Duplication of VM
- Static migration of VM
- Multi-tenancy Self-Service
- Automation

Storage

- Storage space
- Storage Interface
- Management
- Availability
- Scale-out storage

4
Cloud Security: Threats & Requirements

Cloud Security: Threats & Requirements

- Threats for Cloud Computing Security are identified for :
  - Cloud Service User and
  - Cloud Service Provider
- Requirements for Cloud Computing are captured:
  - Cloud Service User and
  - Cloud Service Provider
- Study Subjects Proposal

Threats for Cloud Computing

Users

- Responsibility Ambiguity
- Loss of Governance
- Loss of Trust
- Service Provider Lock-in
- Cloud Service User Remote Access
- Lack of Information/Asset Management
- Data loss and leakage
- Loss of Account/Service management

Providers

- Responsibility Ambiguity
- Protection Inconsistency
- Evolutional Risks
- Business Discontinuity
- Supplier Lock-in
- License Risks
- Bylaw Conflict
- Bad Integration
- Unsecure Administration API
- Shared Environment
- Hypervisor Isolation Failure
- Service Unavailability
- Data Unreliability
- Abuse Right

Requirements for Cloud Computing

Users

- Method to trust cloud providers' security level
- Information/asset management.
- Confidentiality/integrity of data
- Proper account/identity management
- Service interoperability, portability & reversibility
- Interoperable Service interface & virtualization mechanisms
- Secure Virtual Machine

Providers

- Hypervisor Protection
- Storage & Network Isolation
- Protection for Network Elasticity
- Interoperability
- Identity Management
- Disaster Recovery
- Data Traceability
- Secure VM Migration
- Trusted Compute Pools
- Different Security Models
- Multi-tenancy
- IP, License management & Jurisdictional Compliance
- Segregation of Role, Resource & responsibility
- Information & Data Quality Assurance

Security Study Subjects proposal

- Security architecture/model and framework
- Security management and audit technology
- Business Continuity Planning /disaster recovery
- Storage security
- Data and privacy protection
- Account/identity management
- Network monitoring and incident response
- Network security management
- Interoperability and Portability Security
- Virtualization Security
- Obligatory predicates

5
Cloud Resource Management Gap Analysis

Cloud Resource Management: Requirements & Gap Analysis

- Overview of Cloud Resource Management SDO activities
- Cloud Resource management Capabilities
- Vision for ITU-T
  - To develop service delivery management frameworks, architecture, design patterns and best practices
  - To provide guidance to build manageable end-to-end service mashups
- Gap analysis
- Future study areas on Cloud Computing resource management

Cloud Computing Resource Management capabilities

- Resource and service status monitoring
- Resource performance estimation and selection
- Resource discovery and reservation
- Resource setup and service activation
- Alteration and reversion of the user access to the cloud service
- Releasing resources
- Inter-Cloud Resource Management

Resource Management Study Subjects proposal

- To build and maintain dynamically reconfigure multi-cloud based OSS/BSS systems
- To develop best practices, architectural guidelines and frameworks to further expose diverse, application defined service / resource management interfaces
- To provide flexible cloud application to expose desired service / resource management interfaces
- To use cloud computing environment to enable flexible, end-to-end management of composed services
- To take into consideration the Service Creation Lifecycle Management
- To audit the security controls and implementation

Focus Group Cloud Computing TOR & Results

TOR	Results
• Leverage expertise within the ITU-T in building telecom networks to take advantage of cloud concepts and capabilities	• Proposal of ICT Cloud Ecosystem with 3 main players "Users, Partners & Provider" • Finalization of first 4 layers Telecom/ICT Cloud Functional Architecture (User, Access, Service & Resource & Network)
• Terminology and taxonomy and to develop new definition when necessary	• Introducing Cloud services definitions with 2 new telecom related categories CaaS (Communication) & NaaS (Network)
• Analysis of telecommunication/ICT networking requirements functions and capabilities to support cloud computing services/applications	• Requirements for Cloud infrastructure including network compute and storage • Threats & Requirements for Security • Requirements for Resource Management
• Use cases of services and reference models for telecommunication/ICT to support cloud computing	• Exploring Telecom /ICT use cases for Service Delivery Platform as a Service, Desktop as a Service, Call center, Cloud migration and portability, Inter-cloud (Peering, Federation & Broker)

Thank You

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