Overview of International Standards for Cloud Computing

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Establishment of cloud activity

• 2010:

• 2012: SG 13
  o Set up a dedicated WP in SG13 for Cloud Computing with 3 Questions:
    o Requirements, Architecture and Management
    o Set up 2 Collaborative Teams with ISO/IEC (terminated in July 2014):
      o Overview and vocabulary and reference architecture
  o 2014: Extending the scope to cover Big Data and Trusted cloud
  o Since 2012:
    o Delivery of 20 Recommendations on Cloud Computing and Big Data
Cloud Computing activities in ITU-T

- SG 13 WP2 cloud computing:
  - Q.17: Requirements, ecosystem and general capabilities for cloud computing and Big data
  - Q.18: Cloud functional architecture, infrastructure and networking
  - Q.19: End-to-end Cloud computing management and Security

- Joint Rapporteur Group between SG 13 and SG 2 on cloud management

- SG 17: Q.8 Cloud computing security

- SG 11: Q.14 Cloud interoperability testing

- FG on Aviation Applications of cloud computing for Flight Data Monitoring (terminated in 02 2016)
Cloud Recommendations (Requirements and Architectures)

1. **Y.3500 (ISO/IEC 17788)**: Cloud computing - Overview and Vocabulary
2. **Y.3501 (2nd edition)**: Cloud computing framework and high-level requirements
3. **Y.3502 (ISO/IEC 17789)**: Cloud Computing - Reference architecture
4. **Y.3503**: Requirements for Desktop as a Service
5. **Y.3504**: Functional architecture for Desktop as a Service
6. **Y.3510**: Cloud Computing Infrastructure Requirements
7. **Y.3511**: Framework of inter-cloud computing
8. **Y.3512**: Cloud Computing - Functional requirements of NaaS
9. **Y.3513**: Cloud Computing - Functional requirements of IaaS
10. **Y.3520 (2nd edition)**: framework for end to end Cloud resource management
11. **Y.3521 /M.3070**: Overview of end-to-end cloud computing management
12. **Y.3522**: End-to-end Cloud Service Lifecycle Management Requirements
13. **Y.3600**: Big data – cloud computing based requirements and capabilities
Cloud Recommendations (Security and Testing)

1. **X.1601 (2nd edition):** Security framework for cloud computing
2. **X.1602:** Security requirements for SaaS
4. **X.1641:** Cloud computing security – Cloud computing security best practices and guidelines
5. **X.1642:** Operational security for cloud
6. **Q.4040:** Framework and overview of cloud computing interoperability testing
"Paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand”

NOTE – Examples of resources include servers, operating systems, networks, software, applications, and storage equipment.

**On-demand self-service:** Feature where a cloud service customer can provision computing capabilities, as needed, automatically or with minimal interaction with the cloud service provider.
Y.3500: Cloud Computing Overview

- 6 Characteristics
  1. Broad network access
  2. Measured Service
  3. Multi-tenancy
  4. On-demand self-service
  5. Rapid elasticity and scalability
  6. Resource pooling

- 3 Main Cloud Computing Roles: Customer, Provider and Partner

- 4 Deployment models: public, private, hybrid, community

- 7 Cloud services categories: SaaS, PaaS, IaaS, CompaaS, DSaaS, NaaS, CaaS

- 3 Data categories: customer, provider and derived.
Y.3500: 3 main Cloud Roles

- Cloud service customer (CSC)
- Cloud service provider (CSP)
- Cloud service partner (CSN)

Roles are sets of activities implemented by functional components.

- Role that makes cloud services available
- Role that is in a business relationship for the purpose of using cloud services
- Role in support of, or auxiliary to, activities of either the CSP or the CSC, or both
Y.3502: Functional architecture

Support Customer activities

Access to cloud services

Provides cloud services plus administration and business capabilities

Resources for the support of cloud services

User layer

Access layer

Service layer

Resource layer

Multi-layer functions

Integration

Security systems

Operation support systems

Business support systems

Development support

Message routing and exchange within the cloud architecture

Authentication, Authorization, Security policies

Development of service implementations, build and test management

Administration, monitoring, provisioning, maintenance

Business related management dealing with customers

Provides cloud services plus administration and business capabilities

Resources for the support of cloud services

Support Customer activities

Access to cloud services
Y.3502: example of use a cloud service
Y.3502: Cloud Cross Cutting aspects

Cross Cutting: behaviors which need to be coordinated across roles and implemented consistently in a cloud computing system:

- Auditability
- Availability
- Governance
- Interoperability
- Maintenance and versioning
- Performance
- Portability
- Privacy
- Regulatory
- Resiliency
- Reversibility
- Security
- Service levels and service level agreement
Y.3512: Network as a Service

- NaaS concept is based on 3 capabilities types of service:
  - NaaS Application (VNF)
  - NaaS Platform
  - NaaS Connectivity (SDN)

![Diagram showing layers and connections between NaaS Application, Platform, Connectivity, and Resource layers]
Y.3511: Inter cloud computing (3 scenarios)

**Peering**

```
CSC 1 → Service X → CSC 2
CSC 2 → Service Y → CSC 1
```

**Federation**

```
CSC 1 → Service X → CSP A → Service Y → CSP B → Service Z → CSC 3
```

**Intermediary**

```
CSP A → Common API → CSP B, CSP C → Service X → CSC 1
CSP A → Common API → CSP D, CSP E → Service Y → CSC 2
```

*Primary CSP*

*Secondary CSP*
Y.3521/M.3070: Overview of end-to-end cloud computing management

End to End common Model management functionalities
- Functionalities for cloud **customer** management
- Functionalities for cloud **product** management
- Functionalities for cloud **service** management
- Functionalities for cloud computing **resource** management
Y.3600: Cloud computing based big data

**Cloud Service Partner (CSN)**
- CSN: Data provider
  - Generate data
  - Publish data
  - Brokerage data

**Cloud Service Provider (CSP)**
- CSP: Big data application provider
  - Visualize data
  - Analyze data
- CSP: Big data infrastructure provider
  - Perform data collection
  - Provide data pre-processing
  - Perform data storage
  - Manage data protection
  - Provide data integration
  - Manage data provenance

**Cloud Service Customer (CSC)**
- CSC: Big data service user
  - Use big data service

Roles, Sub Roles, Activities
ISO/IEC and ITU-T Cloud Standards

- ITU-T Y.3500 ISO/IEC 17788
- ITU-T Y.3502 ISO/IEC 17789 Architecture
- ISO IEC 27018 Cloud privacy
- ITU-T X.1631 ISO/IEC 27017 Security
- ISO/IEC 19086-4 SLA Security
- ISO/IEC 19086-1-3 Cloud SLA
- ISO/IEC 19944 Data Flow
- ISO/IEC 19941 Interop
- ISO/IEC 19941 Interop
Standards & Specifications by other SDOs

- **CSA:** Trusted Cloud security architecture, Cloud Control Matrix, Cloud Audit and Open Certification Framework

- **DMTF:**
  - Open Virtual Format (OVF), published as ISO/IEC 17203
  - Cloud Infrastructure Management Interface (CIMI), published as ISO/IEC 19831
  - Cloud Audit Data Federation (CADF)

- **ETSI:** ISG NFV Network Function Virtualization related to NaaS, published several Group Specifications on requirement and functional architecture

- **OASIS:**
  - Topology and Orchestration Specification for Cloud Applications (TOSCA),
  - Cloud Application Management for Platforms (CAMP)

- **SNIA:** Cloud Data Management Interface (CDMI) extension to cloud Storage in 2015, published as ISO/IEC 17826
Recommendations under Development in ITU-T SG 13

1. NaaS architecture
2. Functional Architecture of inter-cloud computing
3. Requirements for containers and micro-services
4. Trusted inter-cloud computing framework and requirements
5. *Supplement on cloud computing standardisation Roadmap*
6. Big Data as a Service architecture
7. Big Data exchange framework and requirements

➢ Next meeting February 2017 Geneva (under new study period 2017-2020)
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Y.3502: Cloud Computing user view (activities)
Y.3502: Cloud functional architecture

- **User layer**:
  - User function
  - Business function
  - Administrator function

- **Access layer**:
  - Access control
  - Connection management

- **Service layer**:
  - Service capabilities
  - Business capabilities
  - Administration capabilities
  - Service orchestration

- **Resource layer**:
  - Resource abstraction and control
  - Physical resources

- **Multi-layer functions**:
  - Integration:
    - Security integration
    - Monitoring integration
  - Security systems:
    - Authentication and identity management
    - Authorization and security policy management
    - Encryption management
  - Operational support systems:
    - Service catalogue
    - Provisioning
    - Monitoring and reporting
    - Service policy management
    - Service automation
    - Service level management
    - Incident and problem management
  - Business support systems:
    - Product catalogue
    - Account management
    - Subscription management
    - Billing
  - Development support:
    - Build management
    - Test management
Y.3503: Desktop as a service

DaaS: ability to build, configure, manage, store, execute and deliver users' desktop functions remotely

person/enterprise
Y.3513: Infrastructure as a Service

- **Computing service functions** allow CSC to provision and use processing resources.
- **Storage service functions** allow CSC to use storage resources.
- **Network service functions** allow CSC to use networking resources.