IBM Cloud Architecture and Strategy

Selected Topics
Mobility, big data, analytics, social collaboration and cloud are creating a new wave of business opportunities and IT challenges.

1. **Technology factors**
2. People skills
3. Market factors
4. Macro-economic factors
5. Regulatory concerns
6. Globalization
7. Socio-economic factors
8. Environmental issues
9. Geopolitical factors

IBM Global CEO Study

1 Billion

**Extended Reach**

Smartphones and 1.2 billion mobile employees by 2014

**Speed Value**

90%

view cloud as critical to their plans

**Responsiveness**

20B+

Intelligent business assets

**New Insights**

2.7ZB

of digital content in 2012, up 50% from 2011
A layered and open cloud architecture is emerging
The IBM Common Cloud Reference Architecture (CCRA)

CCRA Adoption Patterns

Cloud-enabled Data Center (building private IaaS)
- Monitoring, Event & Capacity Mgmt
- Data Resiliency
- Image Mgmt
- Self-service automation (VMs)
- Metering & Accounting
- Storage & NW Virt Mgmt
- Self-service automation (NW)
- Self-service automation (Storage)
- Hybrid Cloud Integration
- IT Service Management
- Security Management

Platform Services (building private PaaS)
- Management & deployment of middleware, including license mgmt, etc.
- Application Lifecycle Mgmt DevOps
- Cloud Service Integration (private-to-private, public-to-public, public-to-on-premise, private-to-on-premise)
- “Southbound” integration with CEDC / IaaS

Cloud Service Provider (building commercial XaaS)
- Storefront
- Business Support Services
- Customer, User & Partner Management
- White-labeling of cloud services hosted by other providers
- Billing integration
- Order Management
- Integrates with “cloud-enabled data center” content

Building SaaS
- Exploit IaaS and PaaS for building a SaaS
- Address ISV space
- Use of hosted offerings
- Multi-tenancy options & design considerations
- Cost considerations
- Security aspects such as identity federation
- 3rd party tools recommended where appropriate

Common Reference Architecture Foundation

Use cases
Architecture Overview & Introduction
Security
Standards
Non-functional requirements
Architectural Decisions
Performance & Scalability
TOSCA Standard enables

• Portability and Interoperability of Cloud Services
• Model Driven Cloud Service Management
• "Appstore" for Cloud Services
• Open Hybrid Clouds

OASIS Standardization driven with

More than 100 participants from over 40 companies
A language for defining Service Templates ...

... including a Topology Template describing the structure of a service

TOSCA defines a packaging format (CSAR) for packaging models and all related artifacts.

... including the definition of building blocks for services

... including the definition implementation artifacts for manageability operations

... including the definition deployment artifacts for components

... including the definition plans for orchestrating the application

Cloud Service ARchive (CSAR)
Orchestration of Cloud Services based on a Common Cloud Stack

Leveraging Topology and Orchestration Specification for Cloud Applications (TOSCA)

Workload-driven Patterns

With Flexible and extensible deployment choices

SmartCloud Orchestration

SmartCloud Provisioning
Automate Optimized Workloads

SmartCloud Entry
Automate IT Delivery

Customer integrated hardware

Exploiting an open infrastructure base

PureFlex System

PureApplication System

Hybrid Cloud Interaction

Automate Optimized Workloads
Step 1: Cloud Admin: Import or define the structural model of the Cloud Service

A typical scenario: create a new cloud service to deploy and manage SAP
Step 1 cont.: Cloud Admin: Import or define the process model of the Cloud Service

- Access to rich libraries (toolkits) of reusable automation assets that enable to speed automation creation.
- Palette of library assets enable easy workflow composition through drag and drop.
- Tooling to edit, version, debug, and optimize workflows.
- Graphical editor for composing and connecting workflows.
- Actions types, flow control, data handling primitives that simplify creation of complex automations.
- Easy workflow action editing for managing: data mapping, error recovery options, implementation details, etc.
Step 2: Cloud Admin: Publish service in the catalogue

My Favorites
The service offerings which you marked with the label favorites.

Network Services
These service offerings allow you to manage network services.

Storage and Backup Services
These service offerings allow you to manage storage and backup services.

Customer Onboarding Services
These service offerings allow you to manage customer onboarding services.

Development and Test Services
These service offerings allow you to define new development and test services.

SAP Applications
These service offerings allow you to use applications on SAP.

Database Servers
These service offerings allow you to add additional database in an existing environment.

Software Installation
These service offerings allow you to install software on a server.

My Service Requests
Today | Since Yesterday | Last Week

- 3 in progress
- 5 pending
- 7 successful
- 2 failed

Recent Activity
- Server Provisioning Request (1067397)
- Storage Request (1067396)
- Network Request (1067395)
- Backup Request (1067394)
- Customer Onboarding Request (1067393)
- Customer Onboarding Request (1067392)
- Customer Onboarding Request (1067391)
- Database Request (1067390)
- Windows 7 Server Request (1067389)
- LDAP Server Request (1067387)

Manage My Service Requests...
Step 3 – End User: Request the service –
Fully automated, standardized, with a simple and intuitive interface
The **CloudCycle** Ecosystem

- **Service Marketplace**
- **Solution Provider**
- **Customer** (e.g. SMB or public)
- **Cloud Provider**
- **Cloud Platform Provider**
- **Added Value Services Provider**

Partners:
- IBM
- Universität Stuttgart
- Fraunhofer SIT
- regio IT aachen
- X-INTEGRATE
- StädteRegion Aachen
- Kommunale Informationsverarbeitung Baden-Franken
Line of Business Expectations

Search Algorithm Release Process at Google

Release Process at Wealthfront

Release Automation at Etsy

Release Automation at flipkart

Very end of 2009

Today
DevOps

Rapid iteration, deployment, testing and promotion to production

Leveraging Open Services for Lifecycle Collaboration (OSLC)

SmartCloud Orchestration

SmartCloud Provisioning
- Automate Optimized Workloads

SmartCloud Entry
- Automate IT Delivery
- Customer integrated hardware

SmartCloud Provisioning
- Automate Optimized Workloads

SmartCloud Entry
- Automate IT Delivery

PureFlex System

PureApplication System

Automate Optimized Workloads
Systems of engagement integrate existing operational systems with rapid delivery of new client-facing apps.
Design Philosophy:

- Simplicity
- Optimize for operational burden
- Continuous updates with continuous availability
- Instrument everything

Development Philosophy:

- Extensive code reviews, unit and functional tests
- Keep it DRY (Don’t Repeat Yourself)
- Loose coupling using notification/signals
- Do most work in Python; C when necessary
- Extensive monitoring

Business Impact:

- Solution evolved & changed with the business
- Architecture re-evaluated constantly in relation to business goals
- Progressive composition of services
- Majority of development focus on creating business value

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<table>
<thead>
<tr>
<th>25 K Users</th>
<th>14M+ Users</th>
<th>50M+ Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 years, 13 staff (development + ops)</td>
<td>+1M Users (single day)</td>
<td>Workload optimized monitoring, tuning, database</td>
</tr>
<tr>
<td>• Python</td>
<td>• Nginx</td>
<td>• Amazon EC2, CDN, ELB, S3</td>
</tr>
<tr>
<td>• Django</td>
<td>• Postgres/Redis</td>
<td>• Munin, statsd</td>
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<tr>
<td>• CouchDB</td>
<td>• Repmgr</td>
<td>• PGBouncer</td>
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Traditional Service Provider

Scale issues

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PGFouine, Dogslow

Gearman, Node2dm

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Next Generation Data Centers will have a hybrid model embracing Systems of Record and Systems of Engagement

- Optimized Performance
- Core data and transactions
- Applications on heterogeneous equipment

- Transactional integrity and QoS
- Dedicated infrastructure
- Continuous system availability
- Scale up Infrastructure

Systems of Record (SOR)

Systems of Engagement (SOE)

- Social and collaborative
- Applications on homogeneous equipment
- Service resiliency
- Shared infrastructure
- Scale Out Infrastructure

Hybrid
SOE Front end
SOR Back end
Summary

- Mobility, big data, analytics, social collaboration and cloud are creating a new wave of business opportunities and IT challenges
- IBM CCRA is the architectural foundation for the entire IBM cloud portfolio IBM providing a layered and open cloud architecture based on emerging standards like OpenStack, TOSCA and OSLC
- IBM SmartCloud Orchestrator enables model driven orchestration, management and optimization of every kind of workloads running on cloud
- New very dynamic cloud-centric approaches are evolving quickly to support new System of Engagement type of applications in internet-scale scenarios
- Next Generation Data Centers will have a hybrid model embracing Systems of Record and Systems of Engagement
- IBM is working on solutions to support rapid composable application development and continuous delivery in these environments
Links:

- CC RA Whitepaper:  

- CC RA Open Group Submission:  

- TOSCA V1 Public Spec draft  
  - [http://docs.oasis-open.org/tosca/TOSCA/v1.0/csprd01/TOSCA-v1.0-csprd01.html](http://docs.oasis-open.org/tosca/TOSCA/v1.0/csprd01/TOSCA-v1.0-csprd01.html)

- TOSCA primer  

- CloudCycle:  
  - [www.cloudcycle.org](http://www.cloudcycle.org)