Architecting The Cloud

Srinivasan Sundara Rajan
MASTER Architect / Cloud Evangelist / Cloud Computing Journal Author

Cloud Definition

Definition

- Cloud Computing is a model for enabling convenient, on-demand network access to shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction

Key Characteristics

- On Demand Self Service
- Automated Self Healing Platform
- Elasticity and Scalability
- Pay Per Use
- Resiliency
- Workload Management
- **My one word is .....Taking Complexity Out Of IT**

Source: National Institute of Standards and Technology – Information Technology Lab

Key Cloud Attributes

Dynamic Computing Infrastructure	• Underlying software and hardware can respond dynamically to changing levels of demand • Leverages server virtualization as a basis for running services • Highly utilized
Elasticity & Pay Per Use	• A user can create, launch and terminate resources as needed • Optimize Resource Utilization • Supports the Pay Per Use Model
Self-Service Based User Model	• Ability to upload, build, deploy, manage and report on their business services on demand. • Self-service provides significant business agility
Minimally or Self-Managed Platform	• A provisioning engine for deploying services • Mechanism for scheduling and reserving resource capacity • Capacity for configuring, managing and reporting • Tools for controlling access and enforcing policies
Automation	• Reduced errors caused by manual processes • Standardization and automation for deployment and management of IT Services

Cloud Computing Service Models

- Software as a Service : SaaS eliminates the need to install and run the application on the customer's own computer and simplifying maintenance and support (**For Business)**
- Platform as a Service : PaaS provides a computing platform as a service on which users can build their own applications. (**For Developers)**
- Infrastructure as a Service : IaaS delivers computer infrastructure like a virtualized environment. (**For IT)**

Cloud Deployment Models

Private Cloud

- Enterprise owned or leased

Community Cloud

- shared infrastructure for specific community

Public Cloud

- Sold to the public, mega-scale infrastructure

Hybrid Cloud

- composition of two or more clouds

Role of CTO/EA In Traditional IT

Strategic Planning

- Objectives
  - Provide thought leadership in assessing current IT and Business Strategy
  - Monitor Key Information Technology Trends and Strategies
  - Create and maintain Strategic IT Roadmaps aligned with business strategies
  - Define innovative and transformational, Cross-Domain IT opportunities that drive value to the business
  - Monitor the realization of business benefits

Strategic Planning

- Activities
  - –Provide Perform current state IT assessments
  - – Perform IT and Industry Best Practices assessments
  - – Ongoing monitoring of IT and Industry Trends
  - – Maintain the overall Bill of IT
  - – Plan and coordinate business and IT innovation and transformation efforts

Strategic Planning For Cloud - I

- Understand the Real Value Proposition of Cloud out side of marketing hype and vendor bias
- Mobilize IT and business teams with common understanding and strong alignment
- Understand and get an independent view of various Cloud providers and their offerings
- Assessment of AS-IS IT Architecture and suitability of Cloud Adoption

Strategic Planning For Cloud - II

- Integrate Cloud Service Models into your Enterprise Architecture Road Map
  - **Integrate IaaS into your infrastructure strategy**
  - **Integrate PaaS into your application platform strategy**
  - **Integrate SaaS into your business capability strategy and road map**
- Integrate Cloud Deployment Models into the Data Center Strategy
  - **Private Cloud, Public Cloud and Hybrid Delivery**

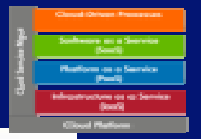
Strategic Planning Typical Output

- Identification of Key business challenges and adopting a Cloud Strategy for them
- For example if provisioning and go to market are the key issues, can a SaaS platform aggregation will enable the enterprise to react to the market demands quickly
- If IT budgets and Capital Expenditure are of a concern aligning the IaaS Strategy as part of infrastructure road map
- Quality Of Service Goals of the Enterprise mapped to Cloud

Strategic Planning Typical Output

- Short listing and Preferred Vendor List among the major categories
- Private Cloud Appliance Providers
- Public Cloud IaaS Providers
- SaaS Offerings and Alignment to Business
- Cloud Enablement Platforms (PaaS)
- Cloud Monitoring / Automation Tools
- ROI plays a role, but more a CFO/CIO terrain

Cloud Service Portfolio Taxonomy



Infrastructure Services

Storage
- Amazon S3 & EBS
- Rackspace Cloud Files
- Nirvanix
- AT&T Synaptic
- Zetta

Cloud Broker
- RightScale
- enStratus
- Kaavo
- Elastra
- CloudKick
- CloudSwitch

Compute
- Amazon EC2
- Serve Path GoGrid
- Rackspace Cloud Servers
- Joyent Cloud
- Flexiant Flexiscale
- Elastichosts
- Terremark
- iTRiCITY
- LayeredTech
- Savvis Cloud Compute
- Verizon CaaS
- AT&T Synaptic
- Sungard Enterprise Cloud
- Navisite

Services Management
- Scalr
- CohesiveFT
- Ylastic
- CloudFoundry
- NewRelic
- Cloud42
- Amazon CloudWatch
- Amazon VPC

Infrastructure Services

Cloud enablement (Platform)

SaaS Data Security
- Navajo
- PerspecSys

Data
- 10Gen MongoDB
- Apache CouchDb
- Apache HBase
- Hypertable
- Tokyo Cabinet
- Cassandra
- memcached
- Clustrix
- FlockDB
- Gizzard
- Redis
- BerkeleyDB
- Voldemort
- Terrastore

Compute
- Globus Toolkit
- Xeround
- Sun Grid Engine
- Hadoop
- OpenCloud
- Gigaspaces
- DataSynapse

File Storage
- EMC Atmos
- ParaScale
- Zmamda
- CTERA
- Appistry

Cloud Software

Cloud Management
- CA Turn-key Cloud
- OpenNebula
- Open.ControlTier
- Enomaly Enomalism
- VMware vCloud
- CohesiveFT VPN Cubed
- Hyperic
- Eucalyptus
- Puppet Labs
- Appistry
- IBM CloudBurst
- Cisco UCS
- Zenoss
- Surgient

CLOUD TAXONOMY

Platform Services

General Purpose
- Force.com
- Etelos
- LongJump
- Rollbase
- Bungee Connect
- Google App Engine
- Engine Yard
- Caspio
- Qrimp
- MS Azure
- Mosso Cloud Sites
- VMforce
- Intuit Partner Platform
- Joyent Smart Platform

Business Intelligence
- Aster DB
- Quantivo
- Cloud9 Analytics
- K2 Analytics
- LogiXML
- Oco
- PivotLink
- Clario Analytics
- ColdLight Neuron
- Vertica

Integration
- Amazon SQS
- Amazon SNS
- Boomi
- SnapLogic
- IBM Cast Iron
- gnip
- Appian Anywhere
- HubSpan
- Informatica On-Demand

Development & Testing
- Keynote Systems
- SOASTA
- SkyTap
- Aptana
- LoadStorm
- Collabnet
- Rational Software Delivery Services

Database
- Amazon SimpleDB
- Mosso Drizzle
- Amazon RDS

Platform Services

Software Services

Financials
- Concur
- Xero
- Workday
- Expensify
- Intuit Quickbooks Online

Content Management
- Clickability
- SpringCM
- CrownPoint

Billing
- Aria Systems
- eVapt
- Redi2
- Zuora

Collaboration
- Box.net
- CubeTree
- SocialText
- Basecamp
- Assembla
- DropBox

Social Networks
- Ning
- Zembly
- Amitive
- Jive SBS

Sales
- Xactly
- StreetSmarts
- Success Metrics

CRM
- NetSuite
- Parature
- Responsys
- Rightnow
- LiveOps
- MSDynamics
- Salesforce.com
- Oracle On Demand

Desktop Productivity
- Zoho
- Google Apps
- HyperOffice
- MS Office Web Apps

Document Management
- NetDocuments
- DocLanding
- Knowledge TreeLive
- SpringCM

Software Services

OpenCrowd

Updated as of June 8, 2010

Role of CTO/EA In Traditional IT

System Architecture

- Objectives

  – Define Architecture Standards and blue print for all architectural layers like, (presentation, business rules, Data, Middleware, and so on)

  –Developing, socializing, and publishing As-Is and To-Be technical architectural environment strategies and system landscapes

  –Develop a variety of tasks relating to Non-Functional Requirements and Standards, including Security Architecture. This is very important as an EA we ensure the QoS of underlying business.

System Architecture

- Activities
  - Develop Architectures and Solutions
  - Conduct Detailed Reviews of Architecture Content
  - Active Involvement in Security Architecture development
  - Perform audits of end-user access privileges
  - Provide guidance on the identification and reuse of business architecture artifacts
  - Actively manage the evaluation, selection of application architecture components
  - Conduct timely reviews of solution application architectures

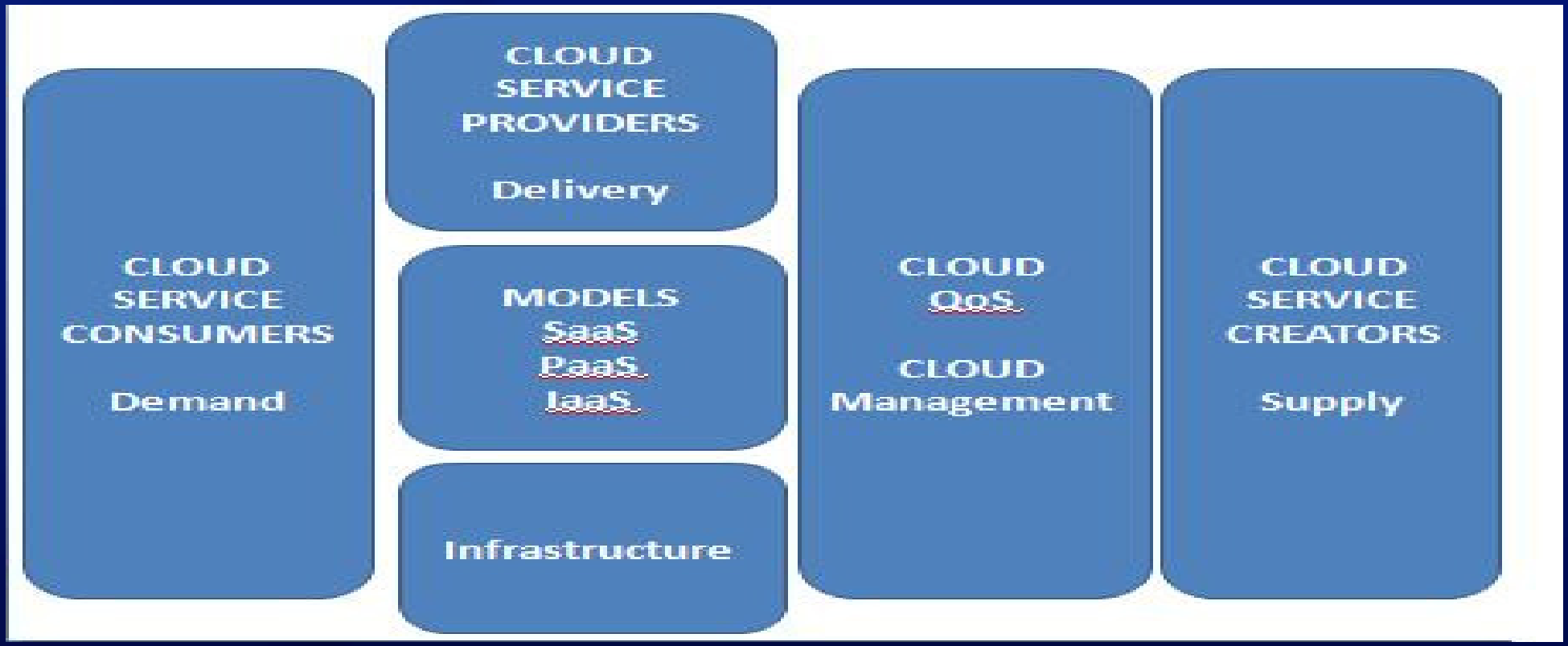
System Architecture For Cloud - I

- Various Vendors have already provided their Cloud Reference Architectures, the same can be analyzed and tailored to the enterprise needs, RA ensures consistency and quality across development and delivery projects.

- The AS-IS Architecture blue print within the data center and the To Be HYBRID model can be established and best of the existing assets can be re used while providing a migration path to Cloud

- Non Functional Requirements hold a important aspect of Cloud adoption, they need to identified and defined for the Cloud Architecture

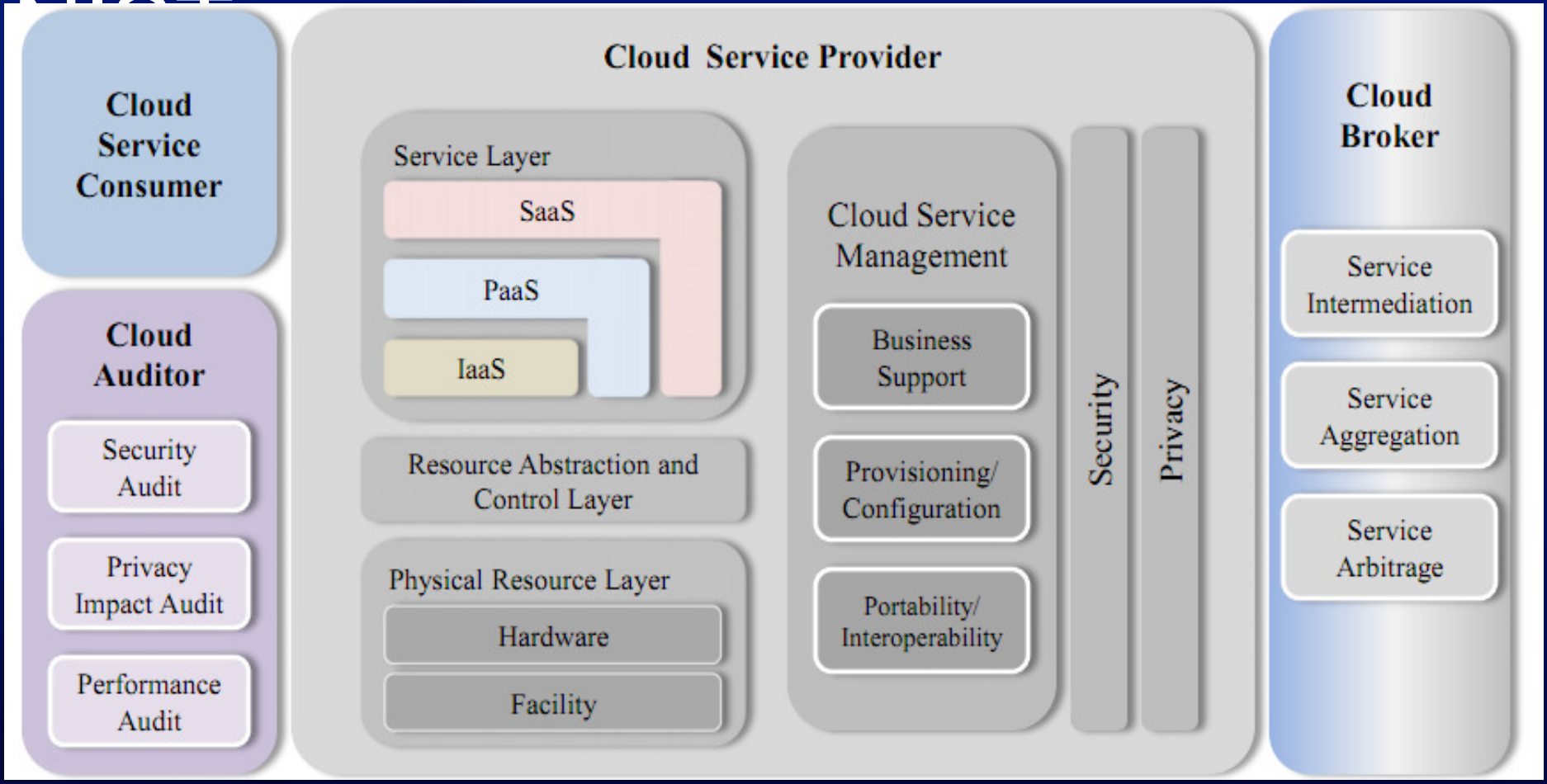
Cloud Reference Architecture



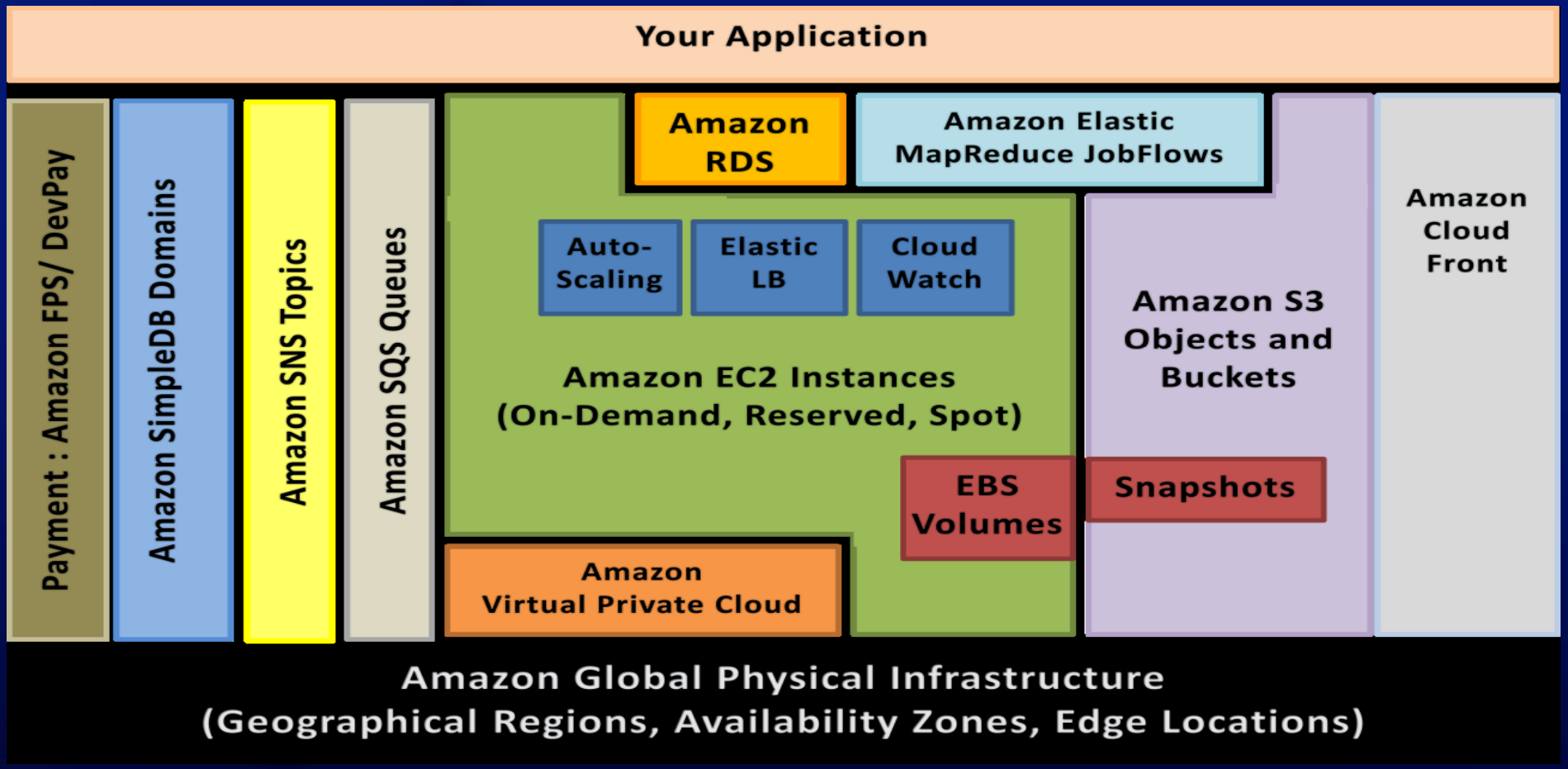
Refer To My Article Cloud Reference Architecture From Big 3

http://hp.sys-con.com/node/1752894

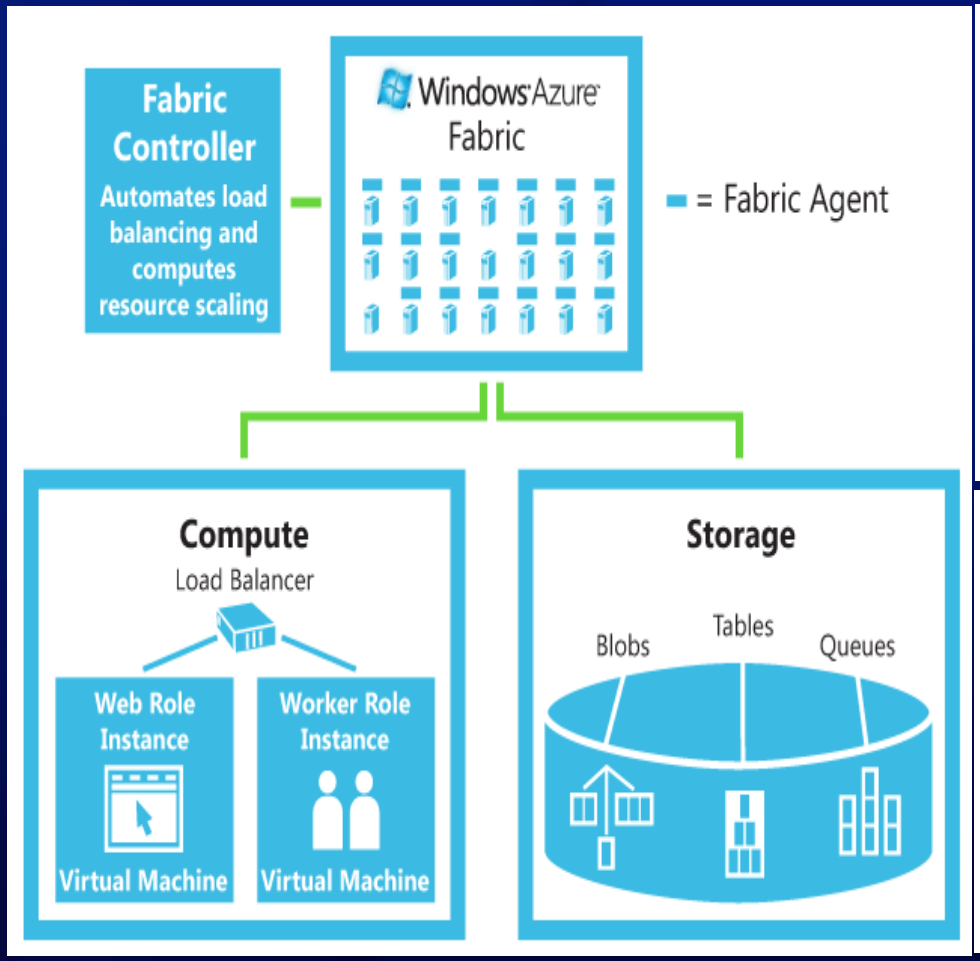
Cloud Reference Architecture - NIST

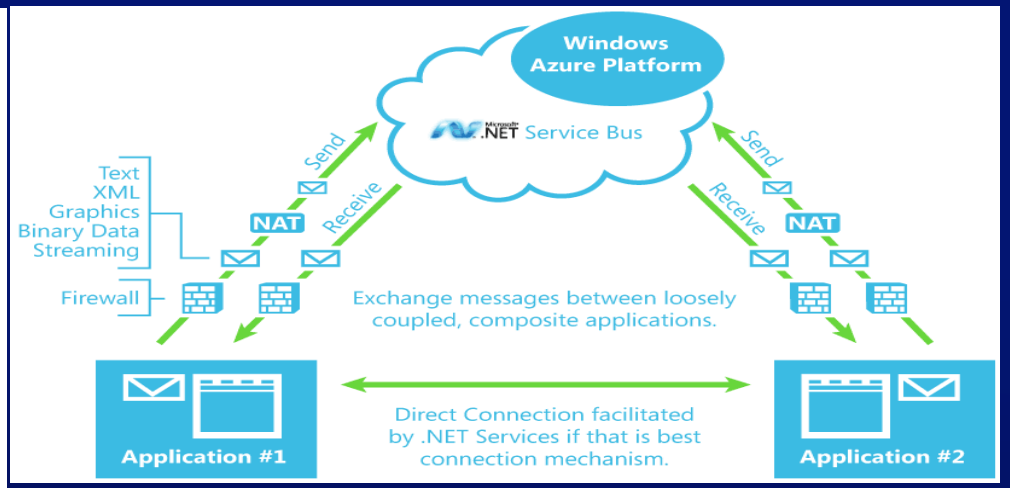


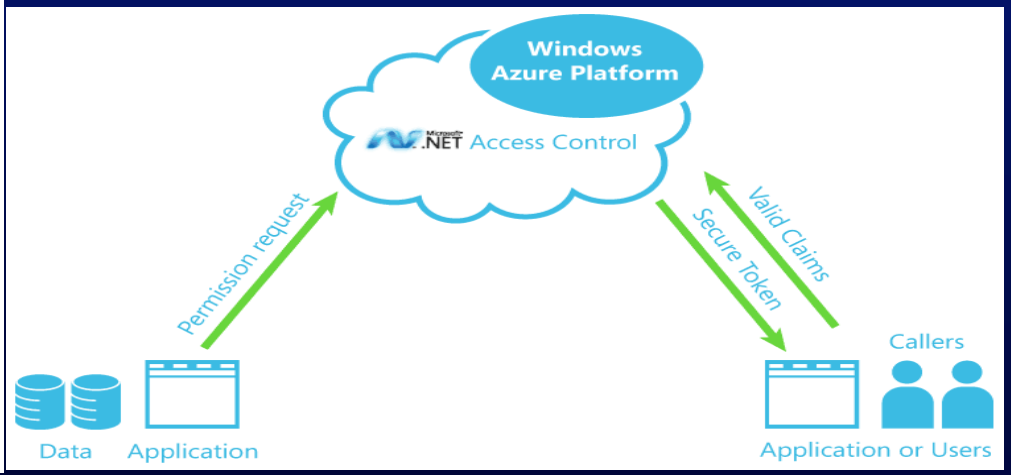
Cloud Product Mapping – Vendor I



Cloud Product Mapping – Vendor II







Non Functional Requirements - Cloud

- Major Cloud Fears Expressed In Various Surveys
  - 70% have security top of mind
  - 79% concerned about vendor lock-in
  - 75% demand high SLA guarantees for performance and availability
  - 63% prefer integration of cloud IT services and on-premises services
- As evident the Non Functional needs holds the major concern and where the EA needs highest level of concentration
  - Security
  - Scalability
  - Availability

Cloud NFR - Security

- EA should concentrate on the common standards for Authentication, Authorization of applications inside a hybrid and cloud delivery context

- EA should concentrate on isolation of organization data especially in a public cloud scenario about network and data isolation
- EA should concentrate on Security and Data Privacy standards and check on the audits for compliance on
  - ISO 27001 Standard for Security Compliance
  - There are specific legislations like, **Safe Harbor Certification Applies to Transfer of Personal Information from Europe to the U.S.**
  - **HIPAA ,** HIPAA is a U.S. Federal law enacted in 1996

Cloud NFR - Security

- In 2001, Congress enacted the Sarbanes-Oxley (SOX) Act of 2002.This act affects how public companies report financials, and significantly impacts IT.

- EA should ensure SOX compliance of the Cloud applications with the following controls, including cloud providers

  - SOX COBIT Control / Changes To Application Configuration & Business Logic
  - SOX COBIT IT Control / Security Violation Report
  - SOX COBIT IT Control / Changes To Application Data
  - SOX COBIT IT Control / Fine Grained Access To Data

Cloud NFR - Security

- Few of the public Cloud Vendors have provision for federated security and support identify providers like
  - Active Directory Federation Services
  - Windows Live ID
  - Face Book
  - Google
  - Yahoo
- These options should be part of the Cloud Security requirements that is built as part of the Enterprise wide blue print
- Some Cloud Providers do have an option for **Virtual Private Cloud and even Federal specific Cloud to take care all regulatory and compliance needs**

Cloud NFR - Scalability

- Whole value proposition of the Cloud is built around dynamic scaling
- However this does not mean that the enterprise should leave all the Scalability to the options provided by the Public Cloud provider or the private Cloud Appliance
- EA should lay out the various design patterns for the applications to support the scalability needs of the application
- The conditions i.e the rules on which a application can perform a Cloud Burst to utilize the extended Cloud infrastructure should be defined by EA

Cloud NFR - Scalability

- EA should also provide classifications for the applications with respect to their Load patterns so that appropriate Scaling options can be chosen.

- On/Off Load : In this pattern load typically only occurs at certain periods, telecom billing cycles or year end processing

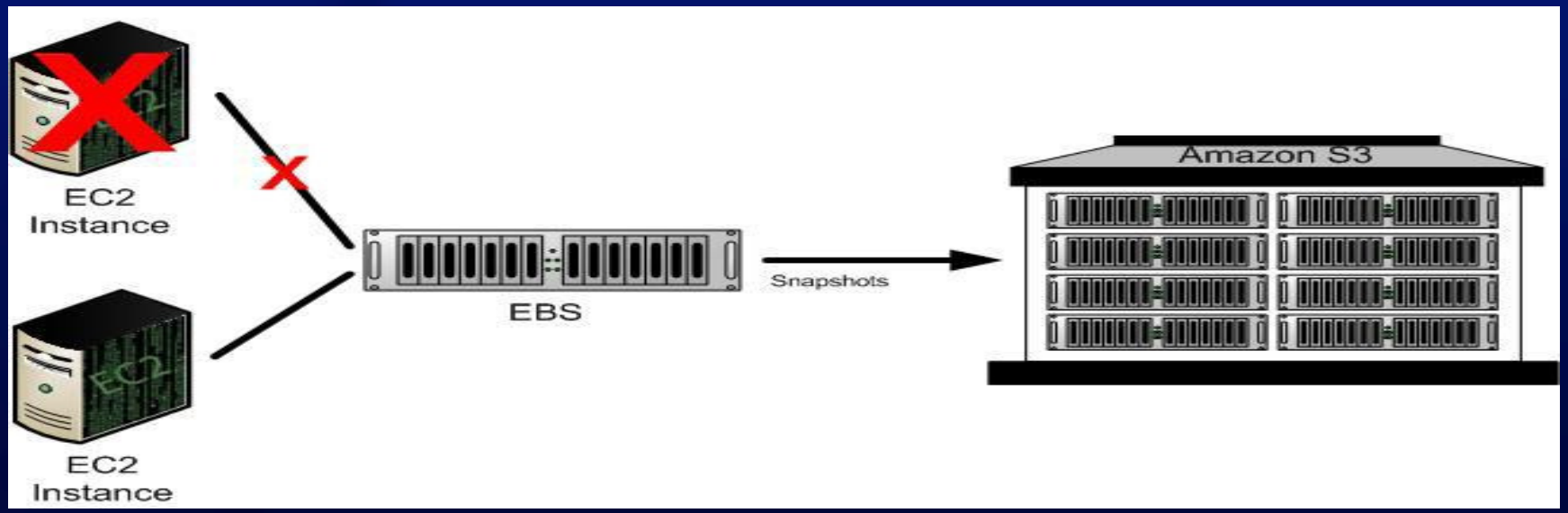
- Predictable Bursting: predictable bursting the application runs the majority of the time at a given load but at certain well known periods of time the load will significantly increase. Like bursting during Christmas times

- Un-Predictable Bursting : All sites are vulnerable to a situation where load massively increases due to factors outside their control.

Cloud NFR - Availability

- Availability is assumed with Cloud, especially with Public Cloud Providers

- Typically the Cloud abstracts the Availability Complexities as explained in Availability options of a Vendor



Cloud NFR - Availability

- Recently, "A networking event triggered a large amount of re-mirroring of storage volumes ... This re-mirroring created a shortage of capacity ... This is an example of man made Availability concern on Cloud
- More recently Lightning strikes at Dublin area, causing disruptions to Cloud Availability of major providers. This is an example of disaster situations outside of our control
- Bottom line Cloud Can Still fail under extra ordinary situations
- EA should define the Availability criteria to the applications as part of NFR strategy

Cloud NFR - Availability

- Common guide lines that can provided by EA as part of their over all Non Functional Strategy are below

- **Avoiding Single Point of Failure across tenants and applications, especially for a multi tenant application**

- **Utilizing the out of the box features provided by vendors**

- **Creating a custom backup strategy**

- **Utilize the data center as alternative backup location**

- **Keep transactions small and recoverable**

Cloud NFR - Availability

- PaaS gives an excellent path to avoid costly outages due to the Upgrades to the system
- **Hence PaaS Usage should be out lined as part of NFR standards set forth by EA**
- Windows Azure guest OS Auto-upgrade feature to help you keep your service running on the latest operating system available for Windows Azure. The platform automatically upgrades your service to use the latest OS (think about a OS Upgrade in traditional data center)
- Windows Azure also supports another upgrade mechanism, called “in-place upgrade,” which enables you to incrementally roll a new version of your service

Role of CTO/EA In Traditional IT

Software Engineering EA Perspective

- Objectives
  - Improve Software Quality
  - Improve Software Development Process
  - Develop, Deploy and Implement standard process and tools for Software Development and technical Software Quality Improvement

Software Engineering In Cloud

- Software Engineering spans across SDLC phases, starting with requirements and extending over to maintenance and support
- Identify re-use opportunities during the solution development process – architecture and design
- Leverage components across different solutions
- Reduce development effort and cost , while at the same time providing better quality
- Use of design patterns in the application layer to promote loose coupling and reuse , as well as better maintainability

Software Engineering In Cloud

- Thinking Of Design Patterns with Existing Cloud PaaS Platforms
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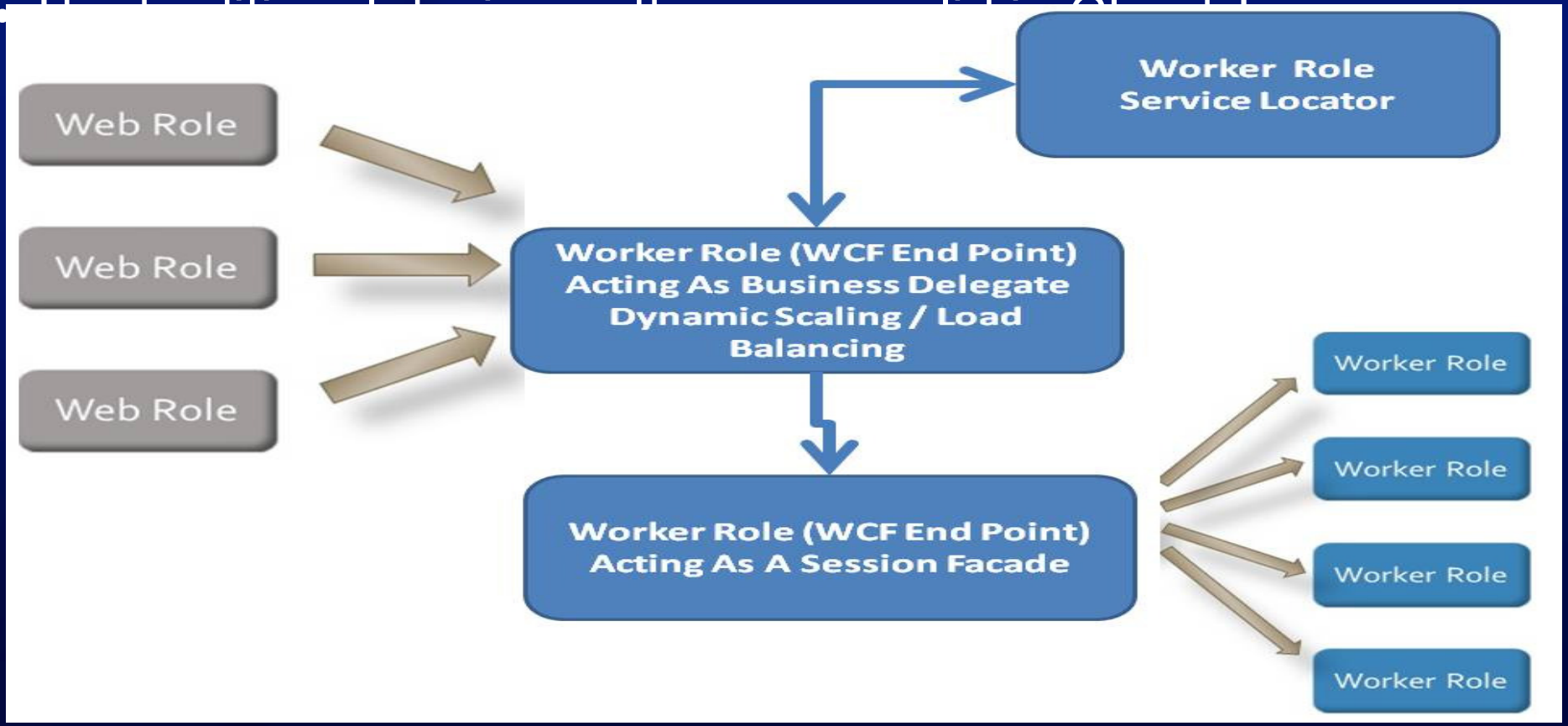


Software Engineering In Cloud

- Thinking Of SOA Patterns with Existing Cloud PaaS Platforms
- **Adapter Pattern :** It allows to connect to multiple technologies like messaging , databases without knowing much of the internals of them. (RDS, SqS, Azure Queues, Sql Azure)

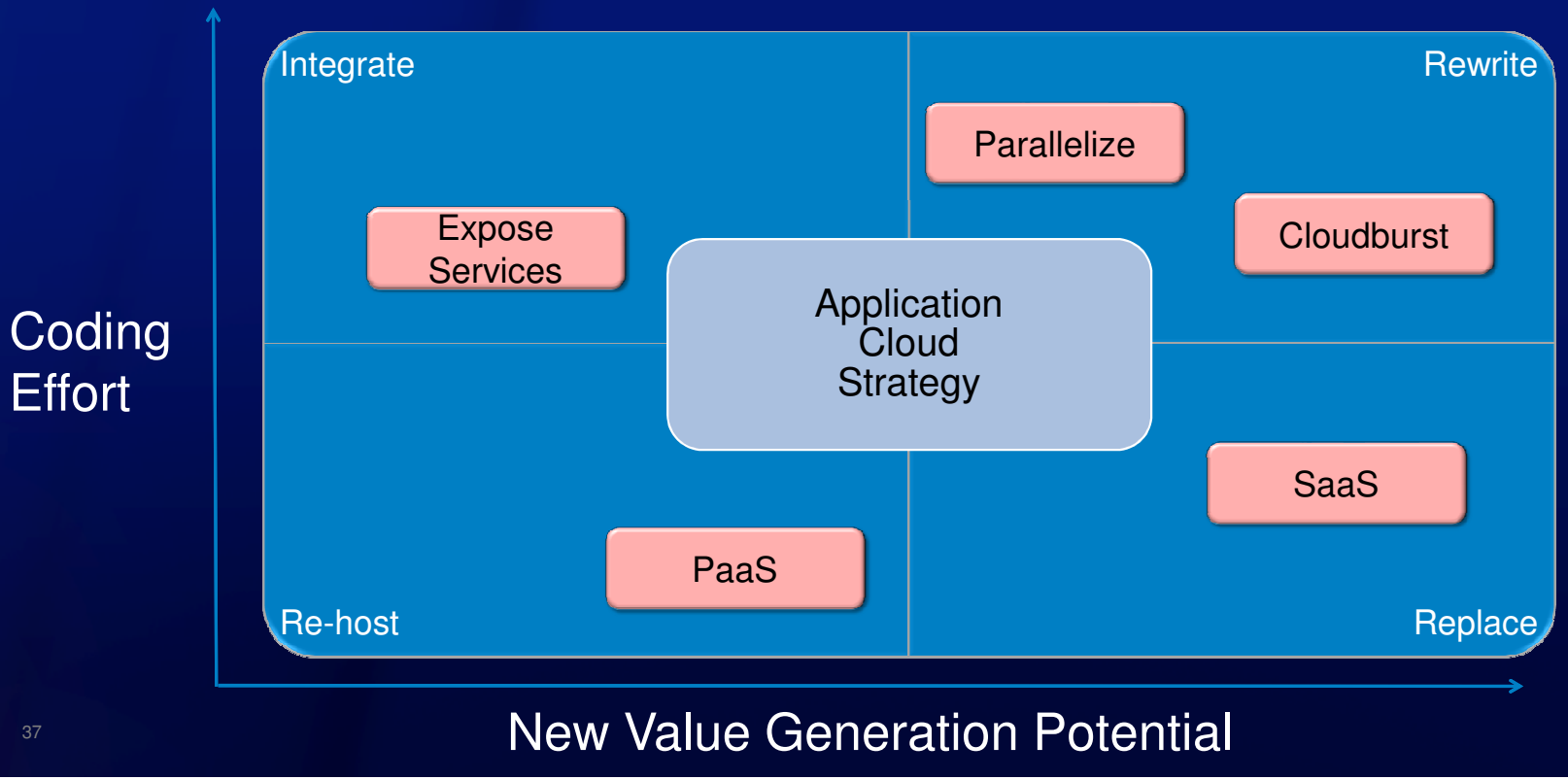
- **Mediator Pattern :** Mediator is the component in charge of interconnecting the other components within a composite application.

- **Business Process Orchestration Pattern :** This pattern aims at realizing long running business process through orchestration of multiple individual services.

- Refer To Article SOA Design Patterns On Cloud By Me

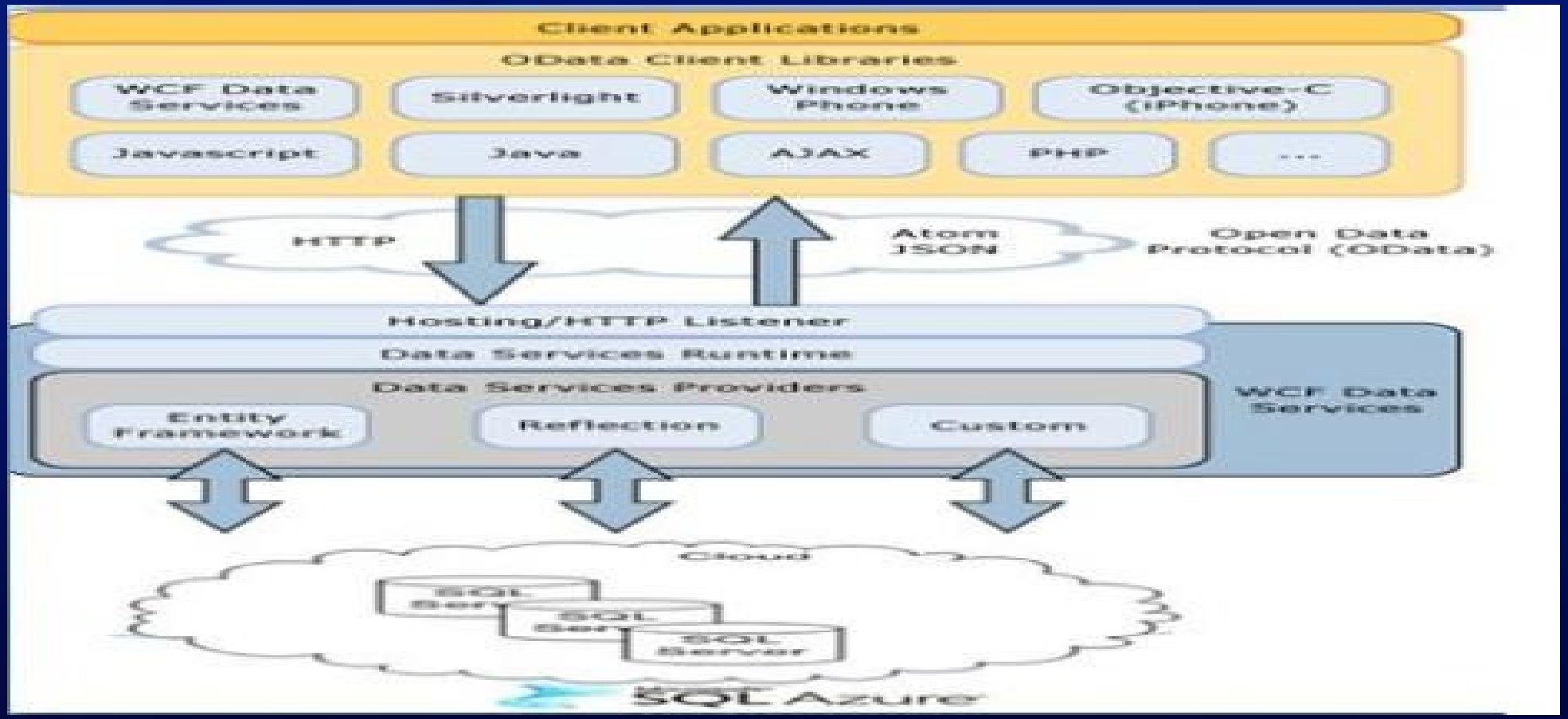
PaaS , SaaS & Coding Efort

- There are huge benefits in decrease in raw coding efforts if appropriately chosen.



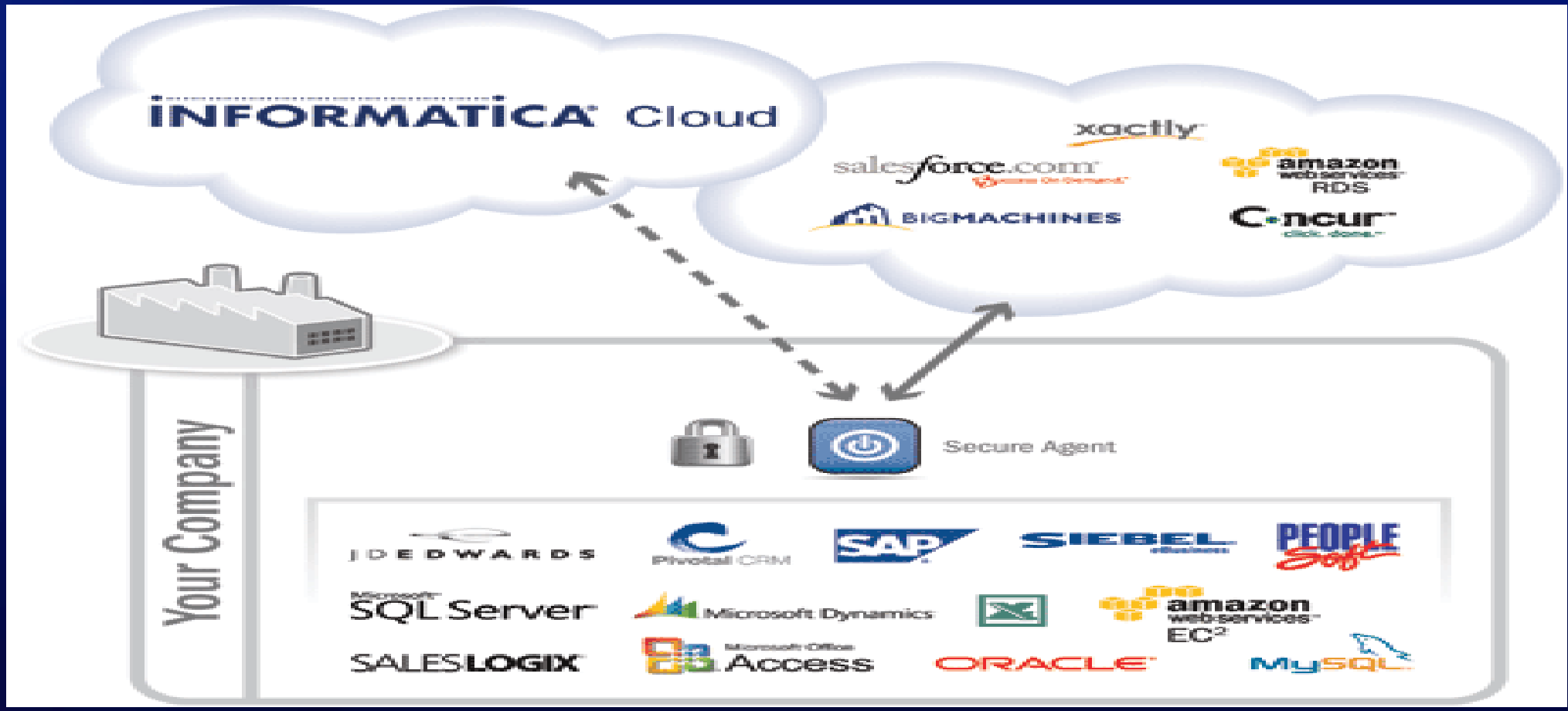
Data Integration Patterns In Cloud

- Getting Dis-Connected and Loose coupling/WCF Data Services



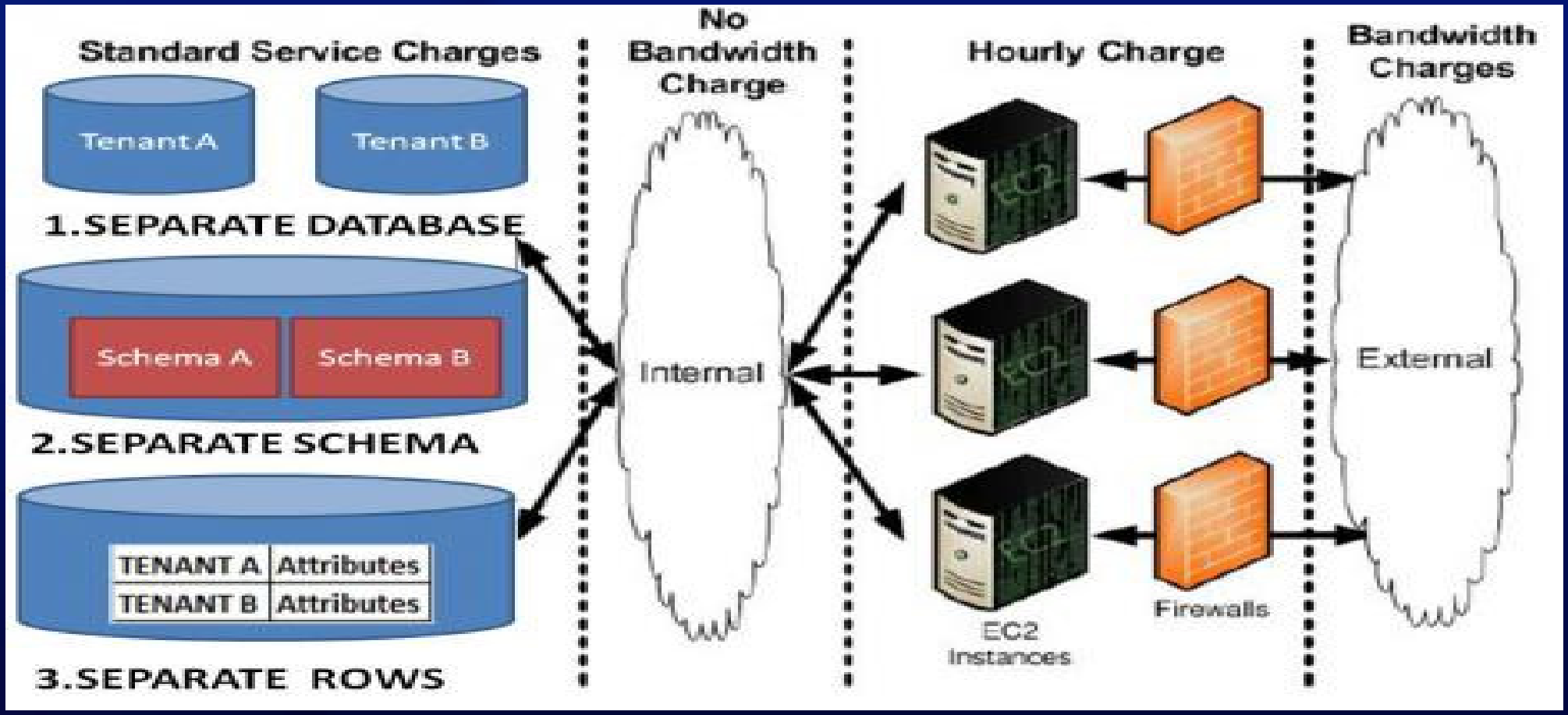
Data Integration Patterns In Cloud

- **Change Data Capture & Cloud Integration**



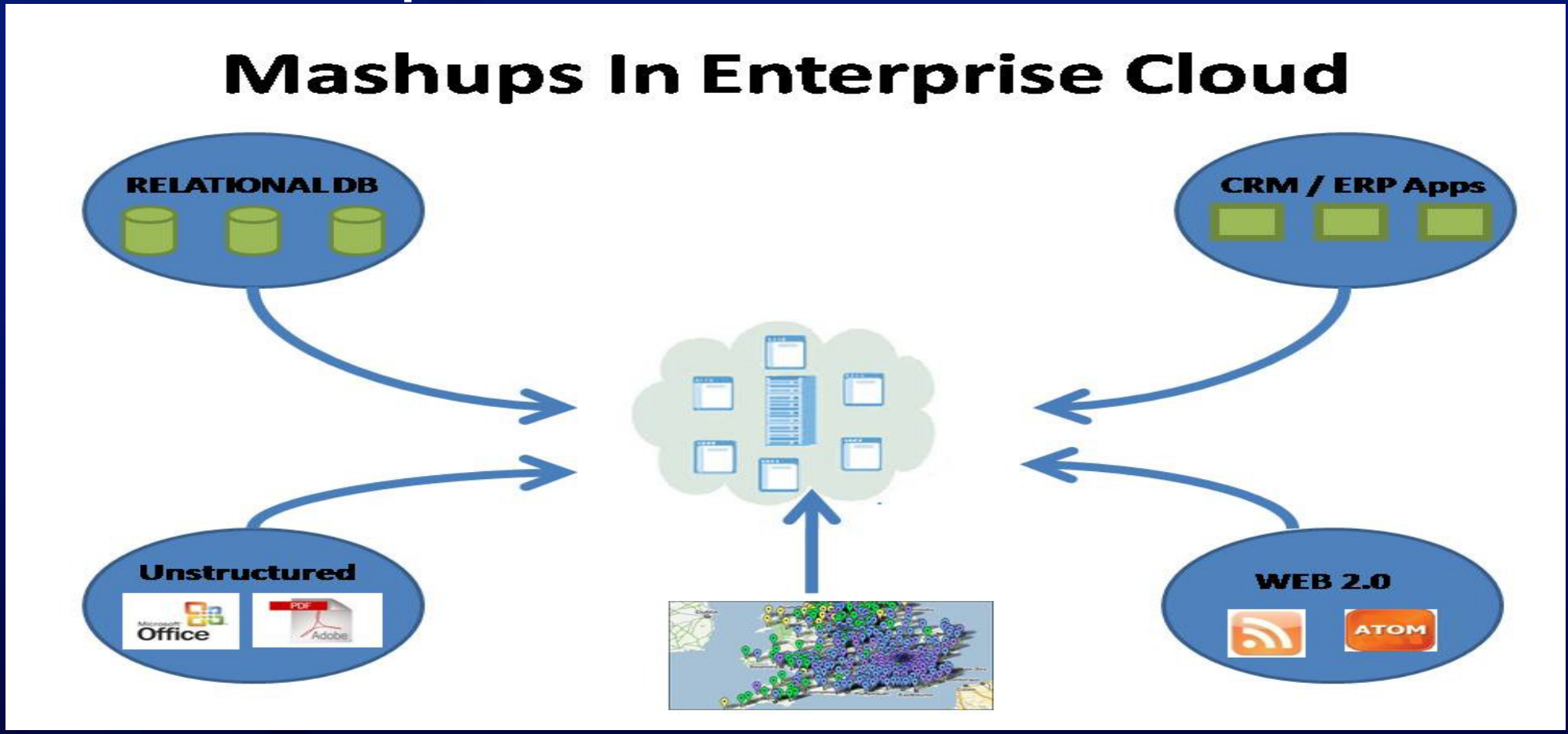
Data Integration Patterns In Cloud

- **Multi Tenant Database Design Patterns**



Data Integration Patterns In Cloud

- **Data Mash up Patterns / Data virtualization**



Role of CTO/EA In Traditional IT

PMO / Quality

- Objectives
  - Provide project metrics and analysis, clear communications and reporting to projects and management about project progress and commitments
  - Develop measures to assess the quality of project deliverables
  - Engage projects to manage deployments to multiple geographic locations and/or multiple business customers
  - Leverage industry best practices to ensure standard execution, communication, and management visibility for decision-making
  - **This activity fairly remains the same in Cloud versus traditional IT**

Summary

- Taking the Enterprises Towards the Cloud for satisfying the much needed business capabilities is a challenging task for Today's CTO/EA

- **There is lot of information flowing around and there is also a Fear, Un Certainty and Doubt**

- **But as we stressed in our slides, this journey is nothing different from what a EA/CTO go through in a traditional IT World**

- **Except that the components, patterns and players are different, the CTO Role is Redefined for the Cloud**

Role of CTO/EA in A Cloud World

Becoming a builder and broker of services From a Traditional way of building every thing from scratch

Transform
legacy infrastructure and applications and processes

Manage and secure
across legacy applications and cloud assets

Build
on-premises cloud services

Consume
off-premises services securely

Traditional

Private

Public

Thanking Every One Who Augmented my Architectural skills with Analytical Thinking