



Education

# Enterprise Architecture and the Cloud

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- ◆ This SNIA tutorial will explore the impact public, private, or hybrid Clouds will have on existing enterprise architecture and also show ways that established enterprise architecture processes can help align Cloud deployments to business requirements. Cloud technologies have promise for organizations to adopt pay-as-you-use operating models either from service providers (public Cloud), internal customers (private Cloud), or a combination of the two (hybrid Cloud). Enterprise architecture is a tool organizations leverage to ensure mapping of IT solutions to business or organizational requirements. Deployed too loosely an organization may not receive noticeable value and conversely if enterprise architecture is deployed too rigidly it can be actively avoided.
- ◆ If IT does not alter existing enterprise architectures to allow for Cloud deployments internal users may choose to adopt services from Cloud providers independently of their internal IT departments and organizations without established IT enterprise architectures can receive benefits from not only exploring cloud options but also adopting established best practices.
- ◆ The Open Group Architecture Framework (TOGAF) and the Federal Enterprise Architecture (FEA) are the most popular enterprise architecture methodologies found in US IT end users and are also the basis for proprietary vendor and consultancy derivatives. Cloud deployments can specifically impact the Architecture Vision, Opportunities and Solutions, Migration Planning, and Implementation Governance phases of TOGAF's Architecture Development Method (ADM) and the Service Component, Data, and Technical Reference Models in the FEA methodology.
- ◆ Enterprise architecture's should leverage vendor neutral standards such the Cloud Data Management Interface (CDMI) that is designed to enable interoperable cloud storage and data management while allowing users to avoid lock-in by proprietary solutions. CDMI can specifically impact an organizations enterprise architecture strategy by:
  - ◆ Creating the option of federating data across multiple public Cloud providers, or a combination of public and internal/private Clouds (TOGAF Architecture Vision, Opportunities and Solutions, and Migration Planning phases & FEA Technical Reference Model phase)
  - ◆ Ensure data integrity so an outage at a public Cloud provider does not bring down an organization's IT resources (TOGAF Architecture Vision and Implementation Governance phases & FEA Service Component and Data Reference Models)
  - ◆ Allow data to be moved into or out of a public or private Cloud seamlessly (TOGAF migration planning phase & FEA Data and Technical Reference Models)



## ➤ NIST Definition:

- ◆ Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models.

### 5 Essential Characteristics

- On-demand self-service
- Resource pooling
- Rapid elasticity
- Measured service
- Broad network access

### 3 Service Models

- SaaS
- PaaS
- IaaS

### 4 Deployment Models

- Public Cloud
- Private Cloud
- Community Cloud
- Hybrid Cloud

Source: DRAFT "NIST Cloud Computing Definition", NIST SP 800-145

## ➤ Enterprise Architecture:

- ◆ An enterprise architecture (EA) is a rigorous description of the structure of an enterprise. EA describes the terminology, the composition of subsystems, and their relationships with the external environment, and the guiding principles for the design and evolution of an enterprise.
  - › [en.wikipedia.org/wiki/Enterprise\\_architecture](http://en.wikipedia.org/wiki/Enterprise_architecture)

## ➤ Popular Enterprise Architecture Frameworks

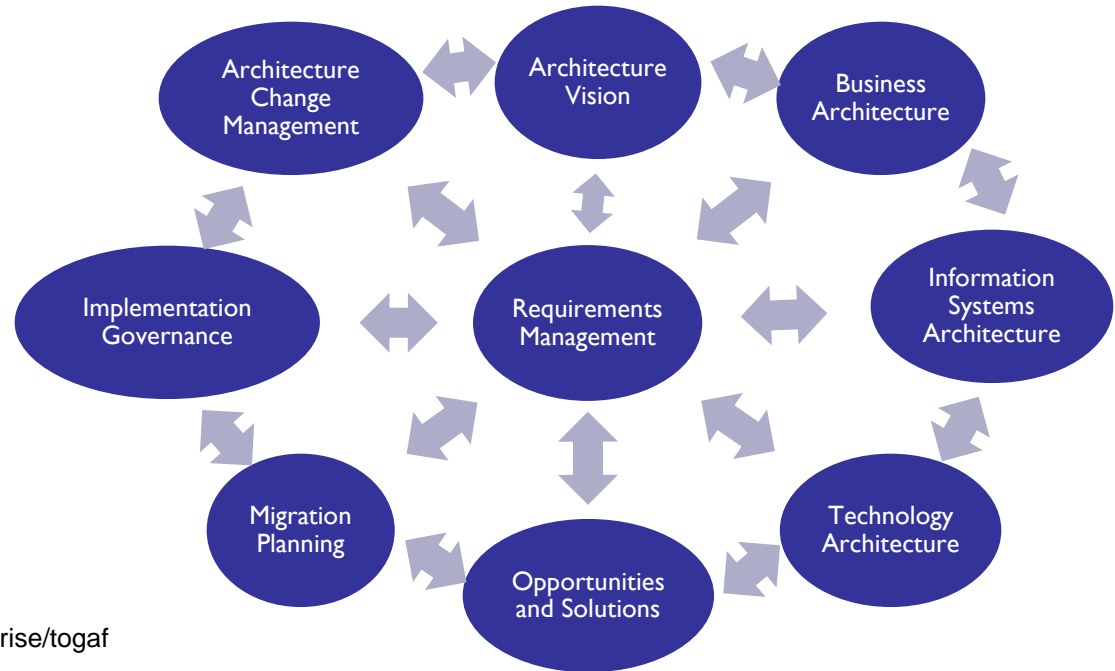
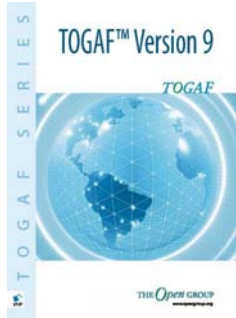
- ◆ TOGAF is an industry standard architecture framework that may be used freely by any organization wishing to develop an information systems architecture for use within that organization.

<http://www.opengroup.org/togaf/>

- ◆ The Federal Enterprise Architecture (FEA) describes ways stakeholders can deliver value to the business and improve results in agency mission areas through architecture concepts, descriptions of the content included in architecture work products, and direction on developing and using architecture.

<http://www.whitehouse.gov/omb/e-gov/fea>

- TOGAF is a detailed framework and set of supporting practices developed by The Open Group Architecture Forum
- Leverages industry and vendor best practices



Source: <http://www3.opengroup.org/subjectareas/enterprise/togaf>



## ➤ Business Driven

- ◆ FEA aligns government strategic plans and executive level direction.

## ➤ Proactive and collaborative across the Federal government

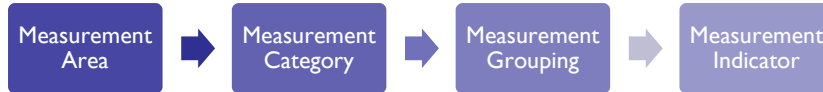
- ◆ Public sector EA's charged with the development, evolution and adoption.

## ➤ Architecture improves the effectiveness and efficiency of government information resources

- ◆ “No IT investment should be made without a business-approved architecture.”

Source: [http://www.whitehouse.gov/sites/default/files/omb/assets/fea\\_docs/FEA\\_CRM\\_v23\\_Final\\_Oct\\_2007\\_Revised.pdf](http://www.whitehouse.gov/sites/default/files/omb/assets/fea_docs/FEA_CRM_v23_Final_Oct_2007_Revised.pdf)

## ➤ Performance Reference Model



## ➤ Business Reference Model



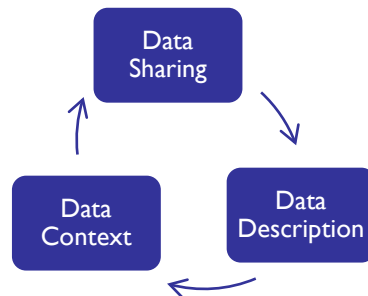
## ➤ Service Component Reference Model



## ➤ Technical Reference Model

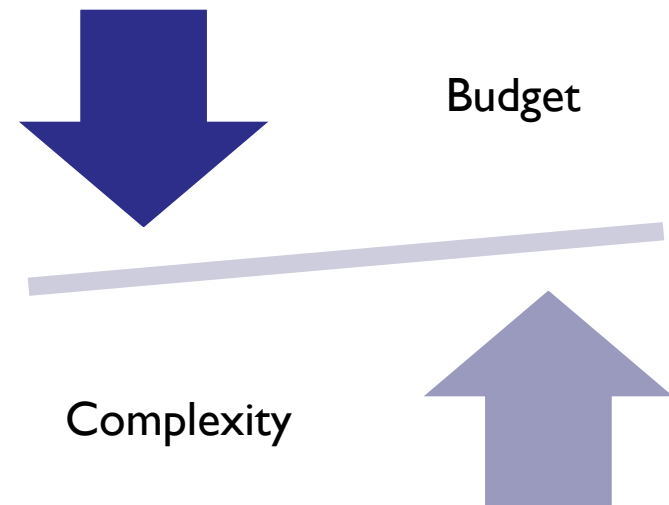
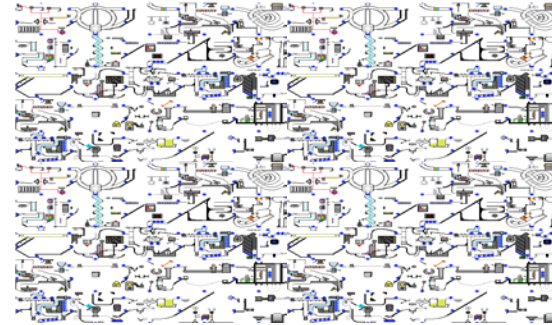


## ➤ Data Reference Model

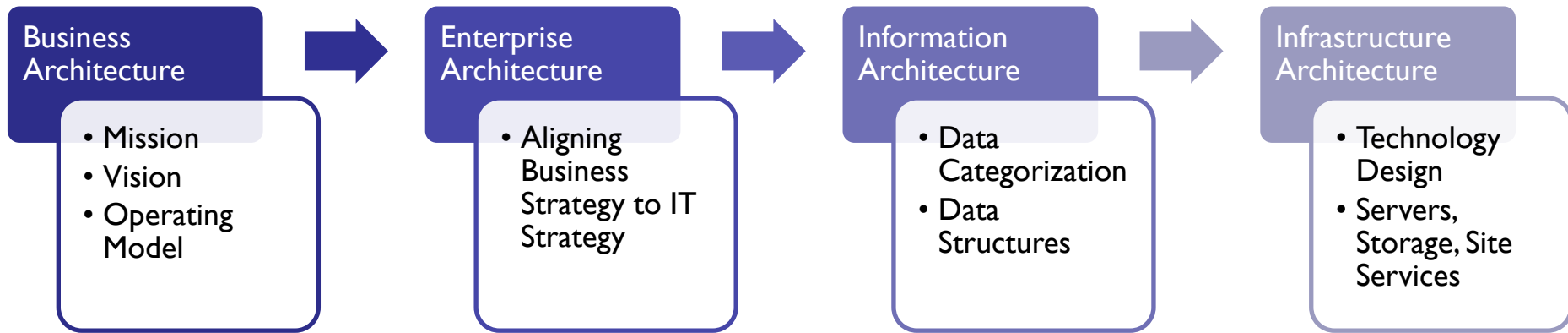


- IT organizations exist to service customers
- Users look to IT to:
  - ◆ Provide essential services
  - ◆ Provide applications
    - › Custom Built
    - › Off the Shelf
  - ◆ Provide IT Security
- Are your users expectations aligned with what they pay?

- More complicated now or 4 years ago?
- Becoming more heterogeneous?
- Getting harder to scale?
- Increasing in operational costs?
- Harder to support?
- Compliance challenged?



# Where Enterprise Architecture Fits



- Technology, IT, Cloud strategies best developed in Enterprise Architecture
- Seeing the forest for the trees

“Would you tell me please, which way I ought to go from here?”

“That depends a good deal on where you want to get to”

*Alice’s Adventure in Wonderland*, Lewis Carroll

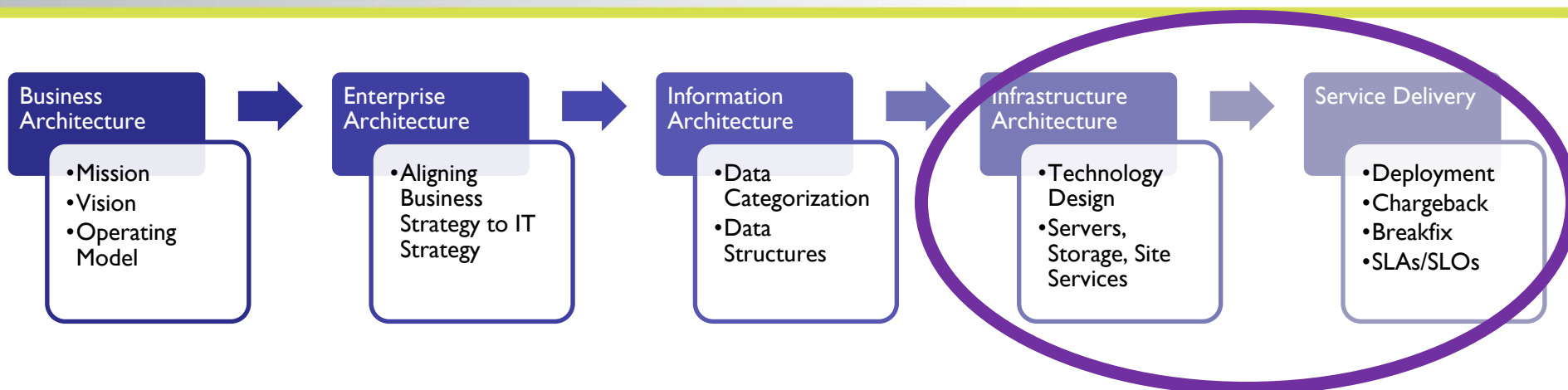
# Enabling Your Enterprise



- Entering New Markets
- Merger / Acquisition
- Providing New Services
- More Responsive to Constituents

- Rapid Application and Infrastructure Deployments
- Standard Based for Optimization / Consolidation
- Leverage Edge Technologies

# Where Cloud Fits

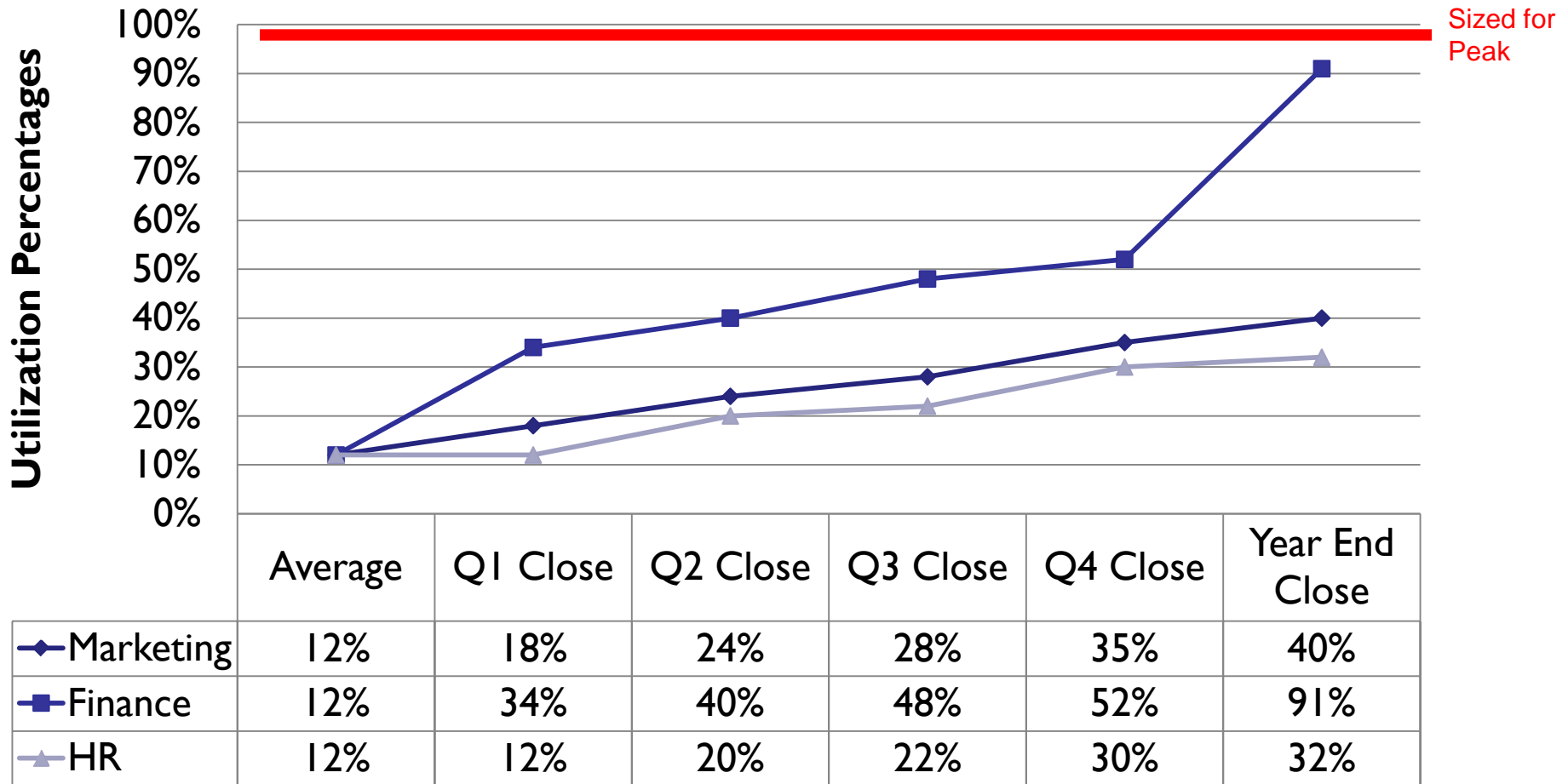


➤ Cloud will not necessarily help map IT to the business but...

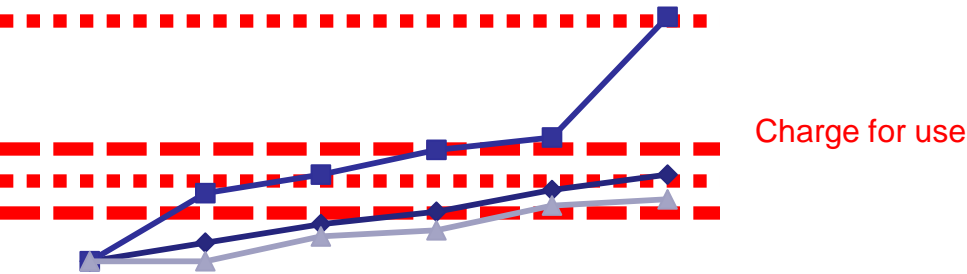
➤ Cloud can:

- ◆ Speed deployments
- ◆ Implement chargebacks
- ◆ Provide SLAs/SLOs
- ◆ Ease break fix support

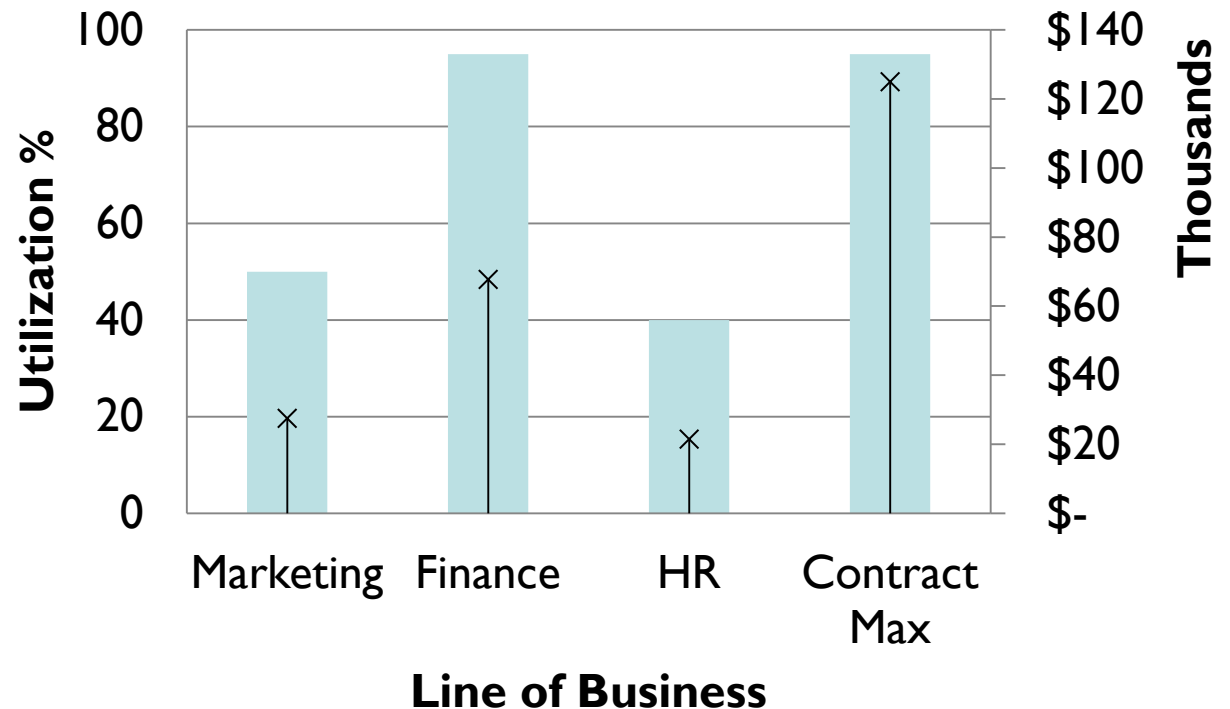
## Sample System Utilization



# The Promise of the Cloud



## Hypothetical Cloud Billing Model

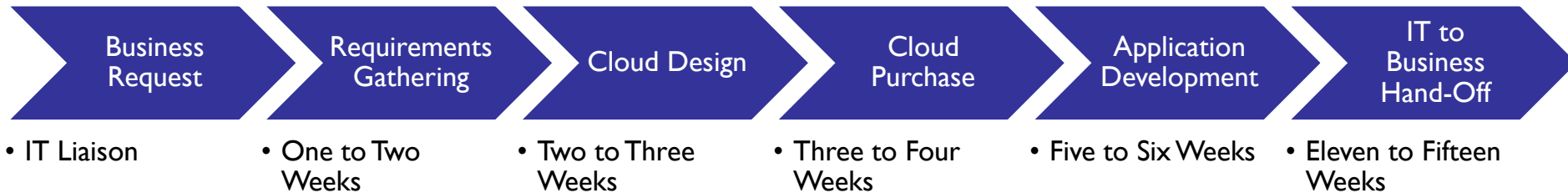


# The Promise of the Cloud

## Traditional



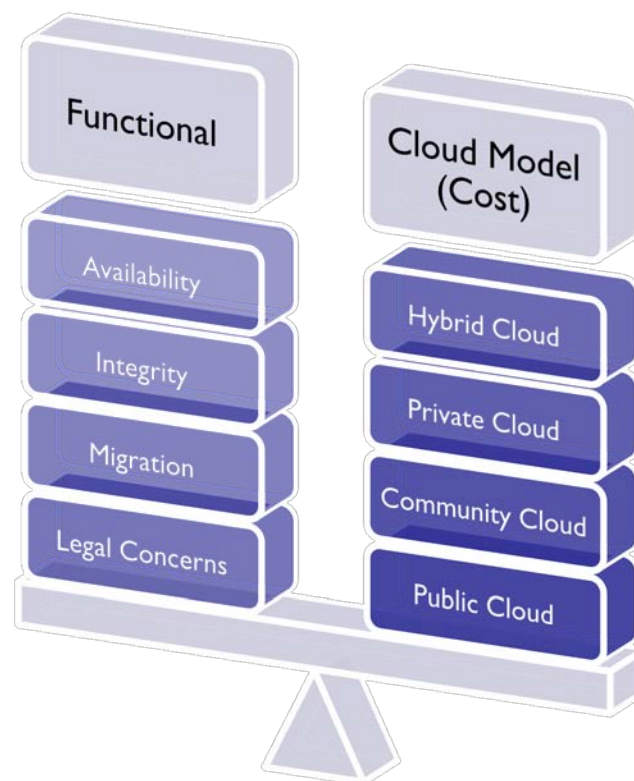
## First Cloud Deployment



## Additional Cloud Deployments

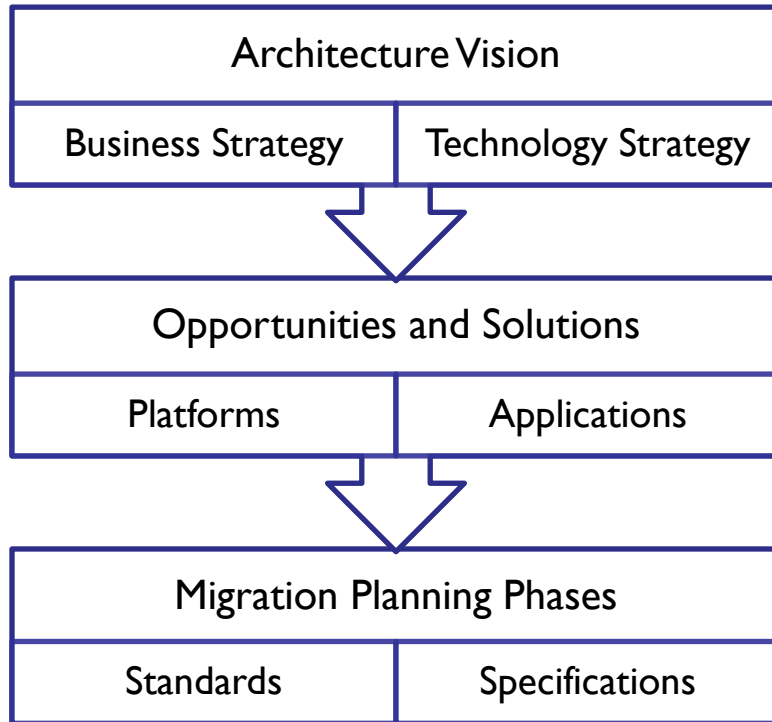


- Time To Market
  - ◆ Provisioning, deployment, self service
- Simpler Scalability
  - ◆ Predictable cost / performance
- Predictable Performance
  - ◆ SLA/SLO
- Avoiding Vendor Lock-In
  - ◆ CDMI
- Balancing Trade Offs

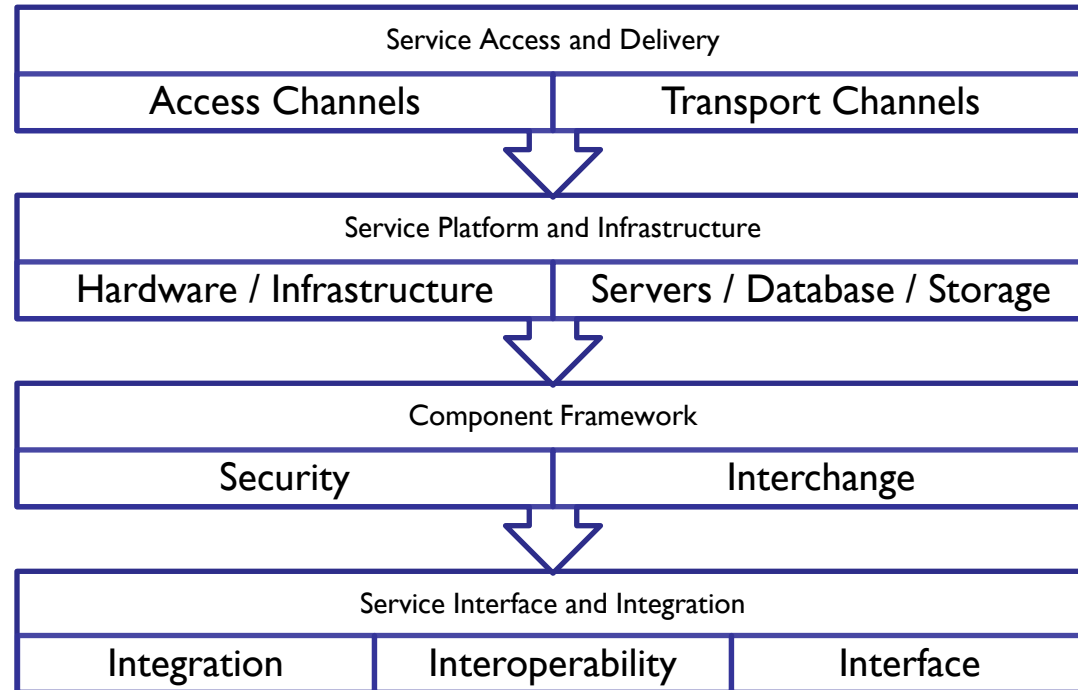


## ➤ Some aspects of existing EA frameworks change

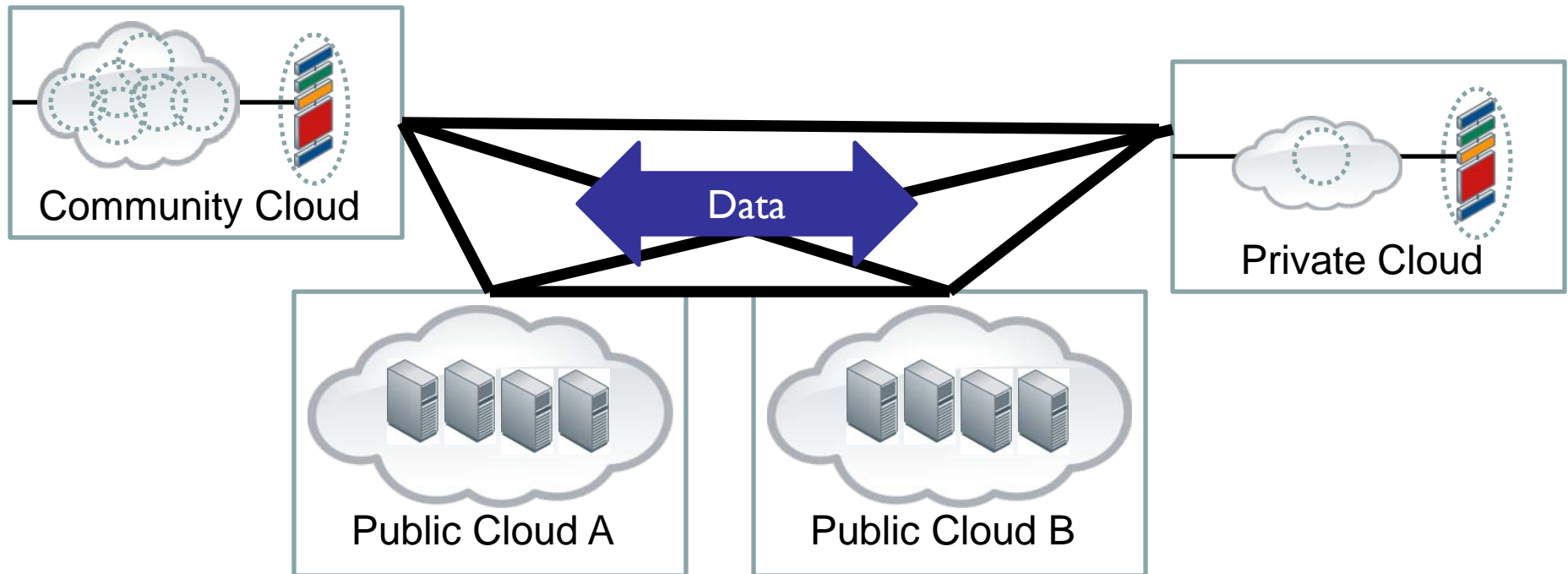
### TOGAF



### FEA



- Federating Services between Public, Private, and/or Community Clouds to create a Hybrid Cloud

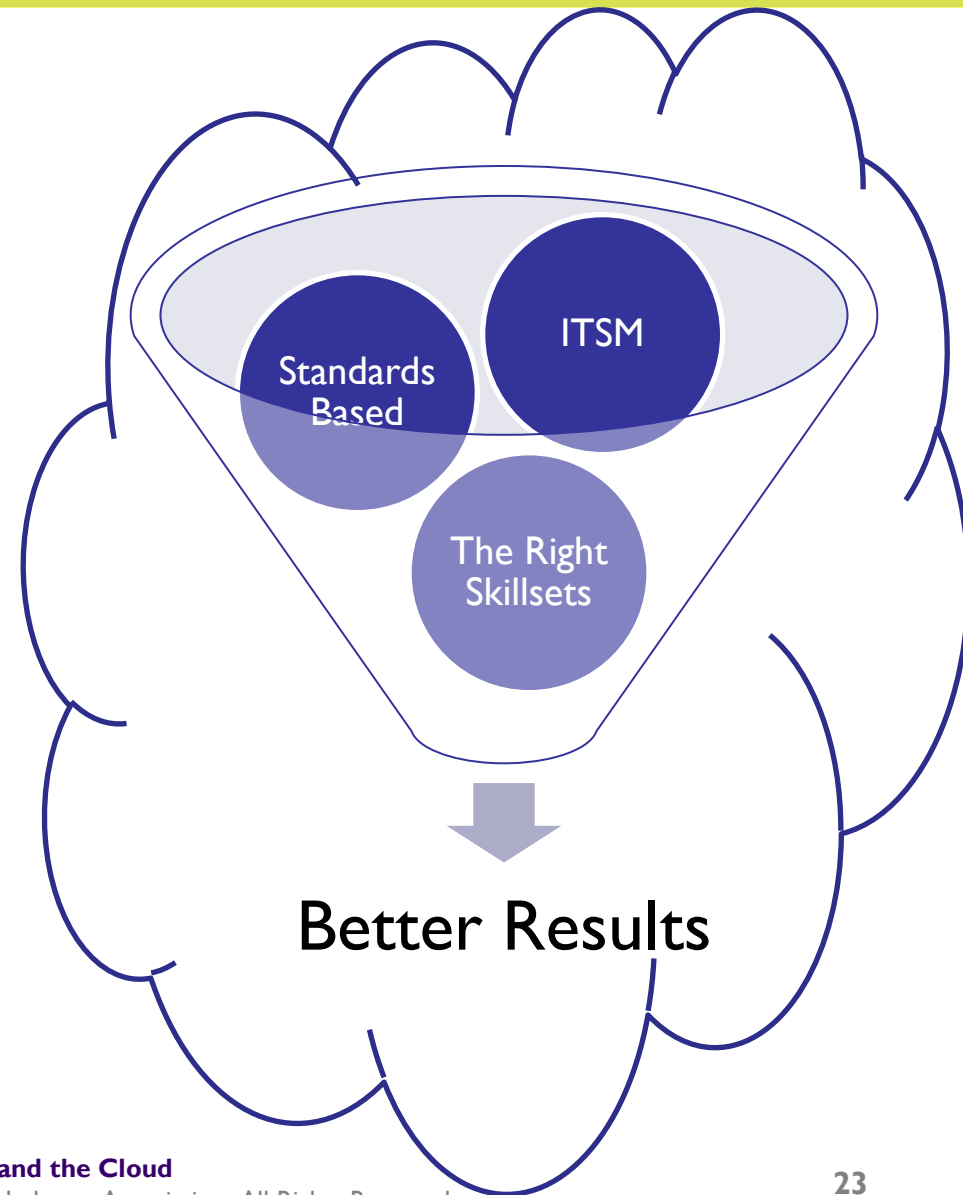


- If Data is in a Cloud, multiple Clouds, or federated between Clouds how can you ensure Integrity?
  - ◆ Immutability
  - ◆ Persistence
  - ◆ Simultaneous read/writes

- TOGAF's migration planning phase & FEA Data and Technical Reference Models
- Seeding data for initial migration
- Syncing for backup Clouds

# Don't Re-implement Past Mistakes

- Best Practices Based
- Proven Methodology
- Service Delivery Standards
- Right Skillsets at the Right Time



## ➤ Network Dependence

- ◆ Public Clouds could rely on telecom links that are owned by neither you or the Cloud provider
- ◆ Off-line data synchronization

## ➤ Cost vs. Security Requirements

- ◆ The more physical isolation is required the higher the cost of deploying and maintaining the Cloud

## ➤ Cloud Outages

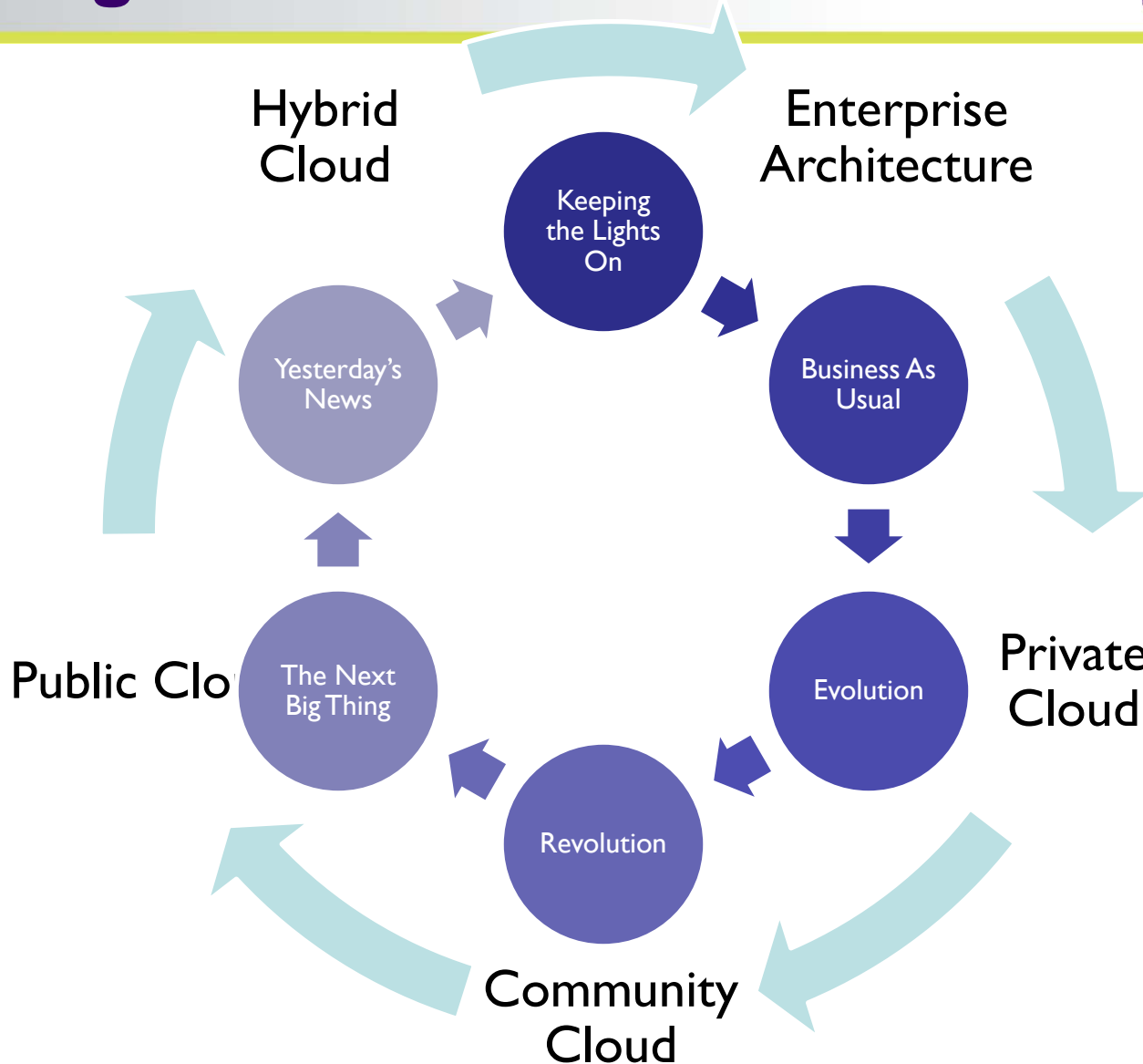
- ◆ Cloud provider, network, or equipment failures

## ➤ Interoperability

- ◆ CDMI, Open Virtualization Format

- My organization has contracted directly with a cloud provider without consulting with IT
  - ◆ If your IT organization is perceived to be broken by your customers they now have more options to side step you
  - ◆ Who will manage your organizations data in a Cloud if IT didn't put it there or doesn't know about it
- My organization doesn't like my Strategy
  - ◆ Mapping IT Strategy to Business Strategy isn't about reacting or dictating – it's partnering

# Delivering Value to Your Customers



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