

Cloud Computing requires Enterprise Architecture and TOGAF® 9 Can Show the Way



Serge Thorn,
CIO, Architecting the Enterprise Ltd.
serge.thorn@architecting-the-enterprise.com



- ▶ If 2010 was the year of the Cloud, then the Cloud computing market will be a brand new beast come 2011.
- ▶ By many accounts, 2011 will be the year that the hype surrounding Cloud computing will become a reality and partners and end users will start realizing the actual value of the Cloud versus determining what it is and where it fits in their organizations, as in 2010

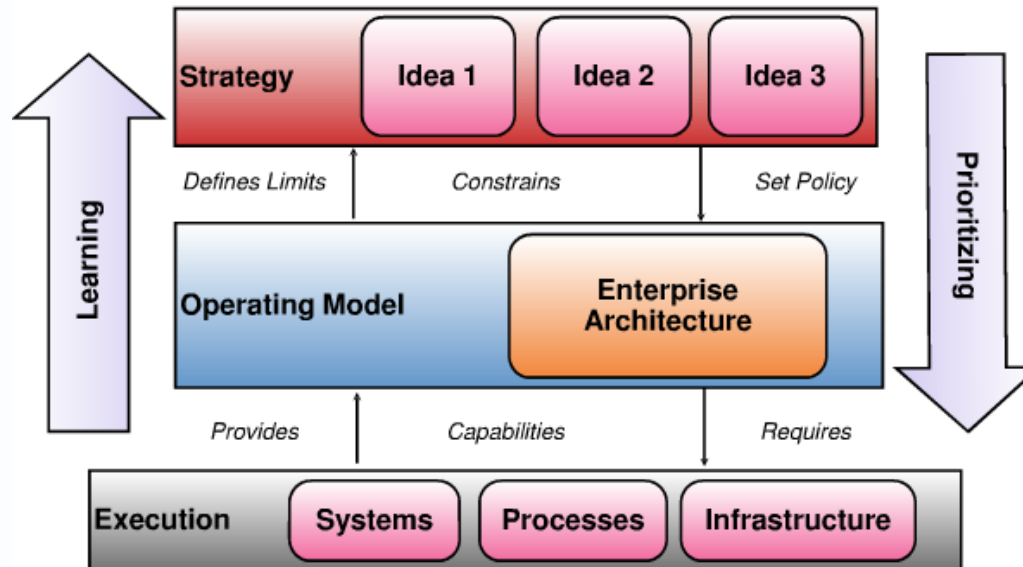
- ▶ There will be an increasing number and diversity of clouds
- ▶ A combination of forces, from regulatory compliance in various industries to the innovative spirit behind developing better business models will usher in different Clouds serving different needs
 - ▶ Healthcare clouds that are HIPAA-compliant (Health Insurance Portability and Accountability Act - www.hipaa.org)
 - ▶ Clouds tailored for financial services
 - ▶ Clouds for various public sector organizations
 - ▶ Clouds for education
- ▶ This diversity will pick up in the coming year, and much of this trend will be predicated on networking's evolution in making Clouds possible regardless of their industry or purpose
- ▶ **However.....**

- ▶ **Enterprise Architecture is at the heart of change and necessary regardless of changes to underlying technologies**
 - ▶ Client – Server
 - ▶ SOA
 - ▶ RFID
 - ▶ **Or...Cloud!**

- ▶ Cloud computing should have little impact on Enterprise Architecture
- ▶ If Cloud computing does not take Enterprise Architecture into consideration, it will result in “spaghetti clouds”

Why Enterprise Architecture?

- ▶ Businesses that want to successfully adopt Cloud computing in a way that aligns to their Business Strategy, Enterprise Architecture is imperative



Adapted from Enterprise as a strategy: Creating a Foundation For Business execution, J. Ross, P. Weill, and D. Robertson, Harvard Business School Press, 2006

Role of the Enterprise Architecture Team

- ▶ Investigate if any style is simply hype or whether it holds real business value
- ▶ Understand the benefits and risks of a specific style
- ▶ Communicate these to Business and IT
- ▶ Develop an adequate governance framework
- ▶ Align the “style” with Business requirements
- ▶ Give guidance for sustainable innovation

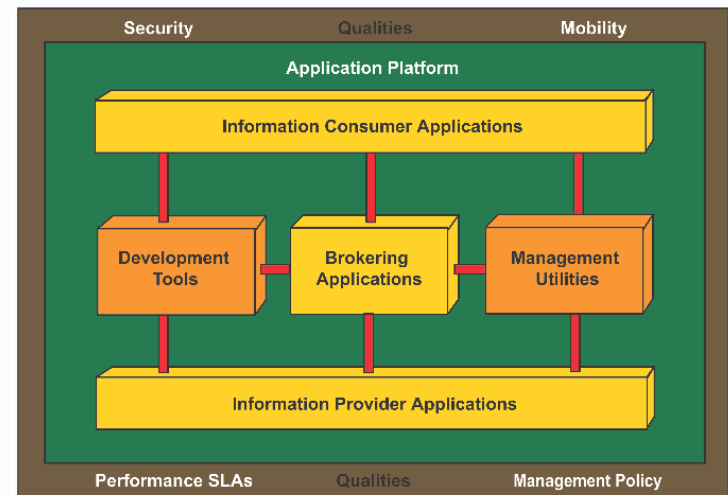
Is it a fit?

- ▶ Cloud computing may be a fit when the core of internal Enterprise Architecture is mature. Which means:
 - ▶ Well defined and layered:
 - ▶ Business Architecture
 - ▶ Application Architecture
 - ▶ Data Architecture
 - ▶ Technology Architecture
 - ▶ Well defined interoperability
 - ▶ Low level of security agreed
 - ▶ Web as a target
 - ▶ Costs issues
 - ▶ New products and services

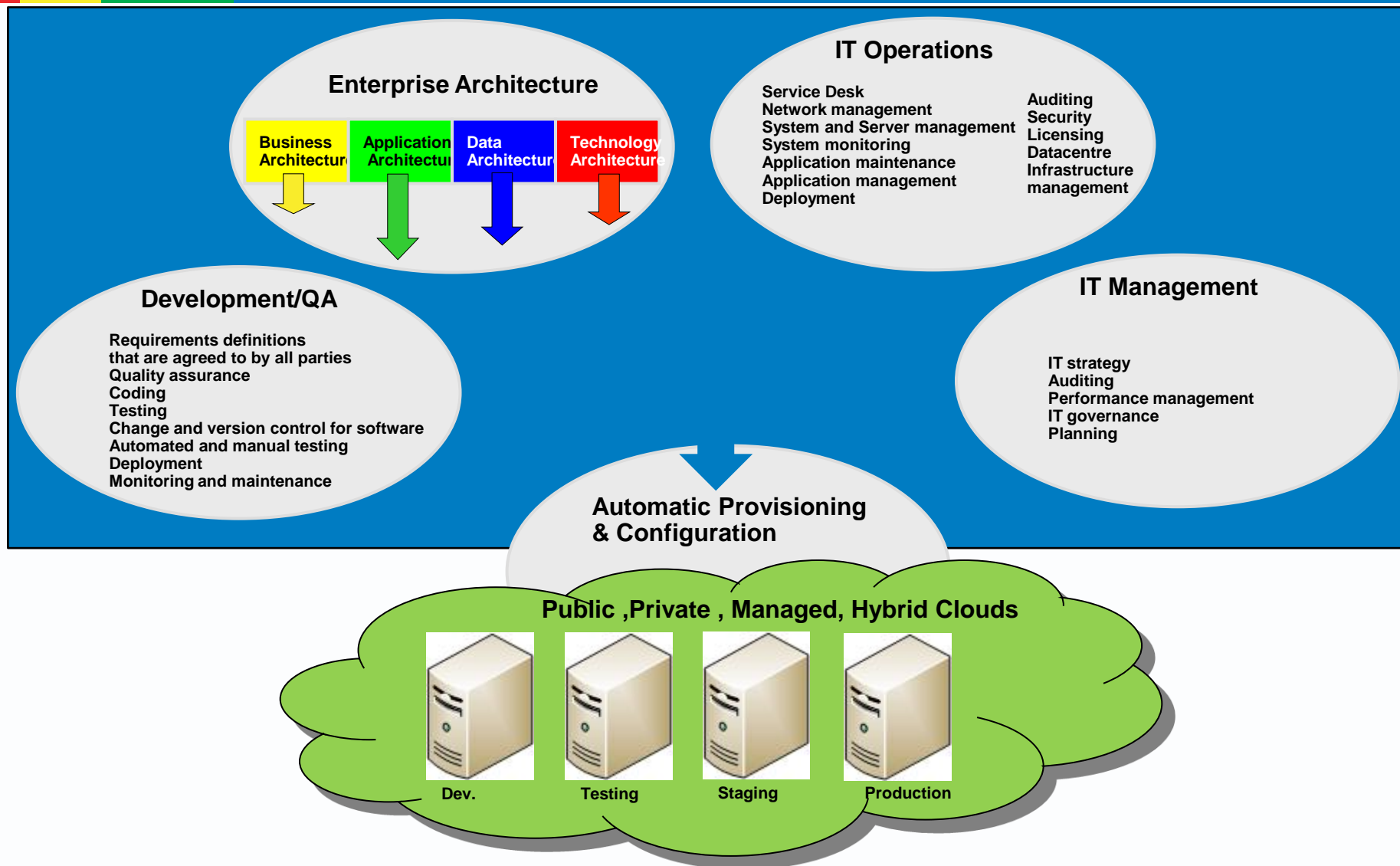
Is it a fit?

- ▶ Cloud computing **may not** be a fit when the core of internal Enterprise Architecture is immature . Which means:
 - ▶ Business, Application and Data architectures are tightly coupled
 - ▶ Low level of interoperability defined
 - ▶ High level of security required
 - ▶ When applications have IPAs which have proprietary interfaces
 - ▶ When solutions are legacy

▶ III-RM



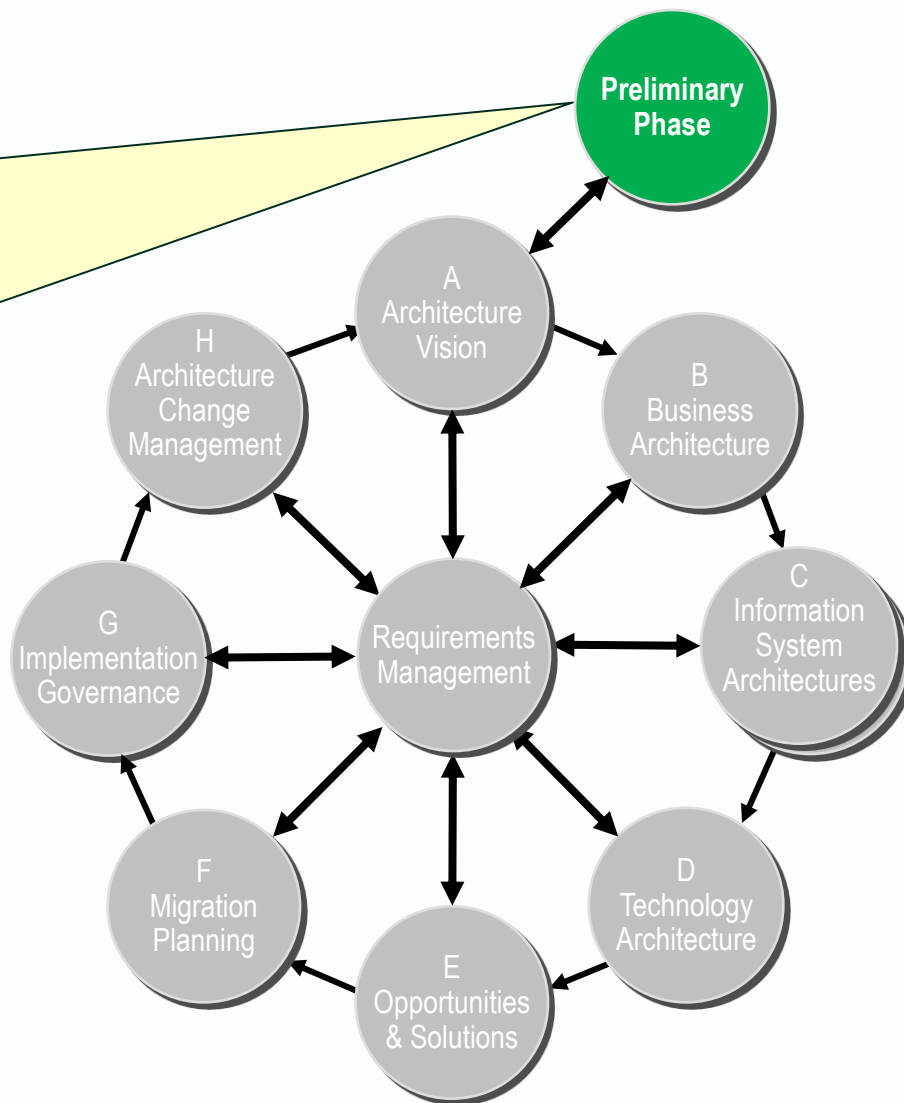
Use of TOGAF 9!



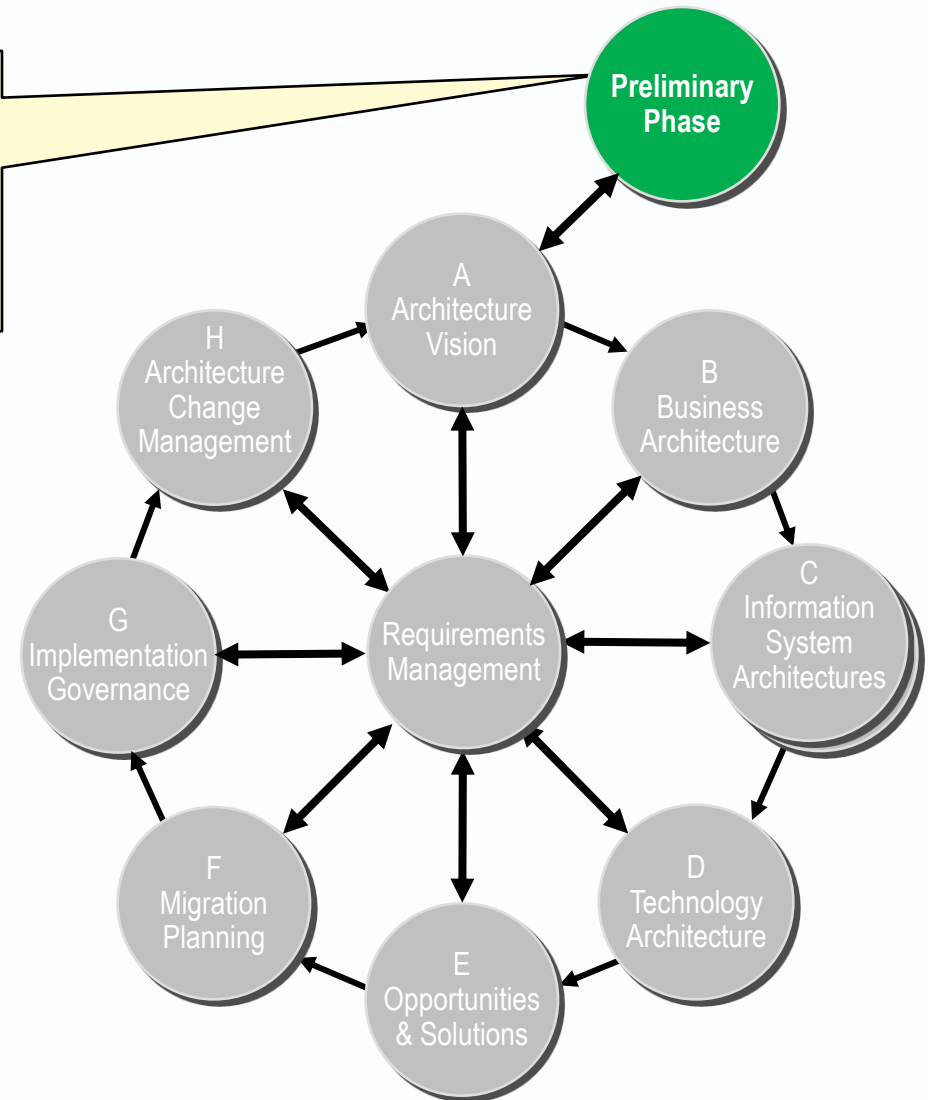
➤ The Preliminary phase is about defining “where, what, why, who, and how” Enterprise Architecture will be done

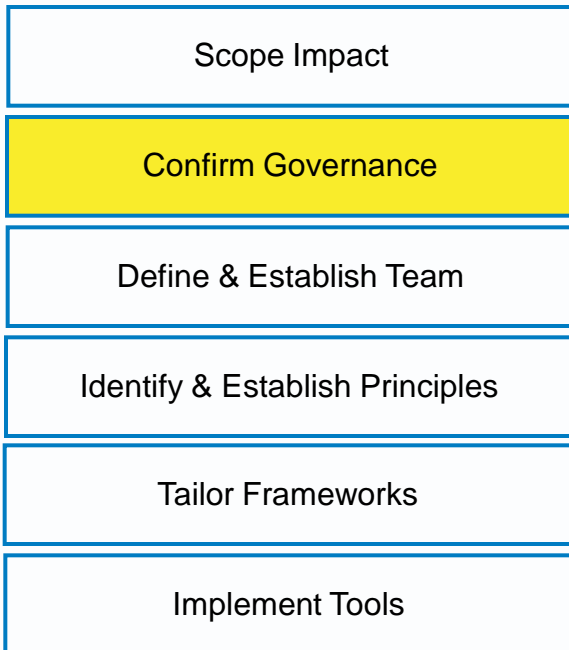
- Establishing the Business context
- Customizing the framework
- Defining the architecture principles
- Establishing the Architecture Governance structure

And.....



➤ Creation of a strategy for the consumption and management of cloud services



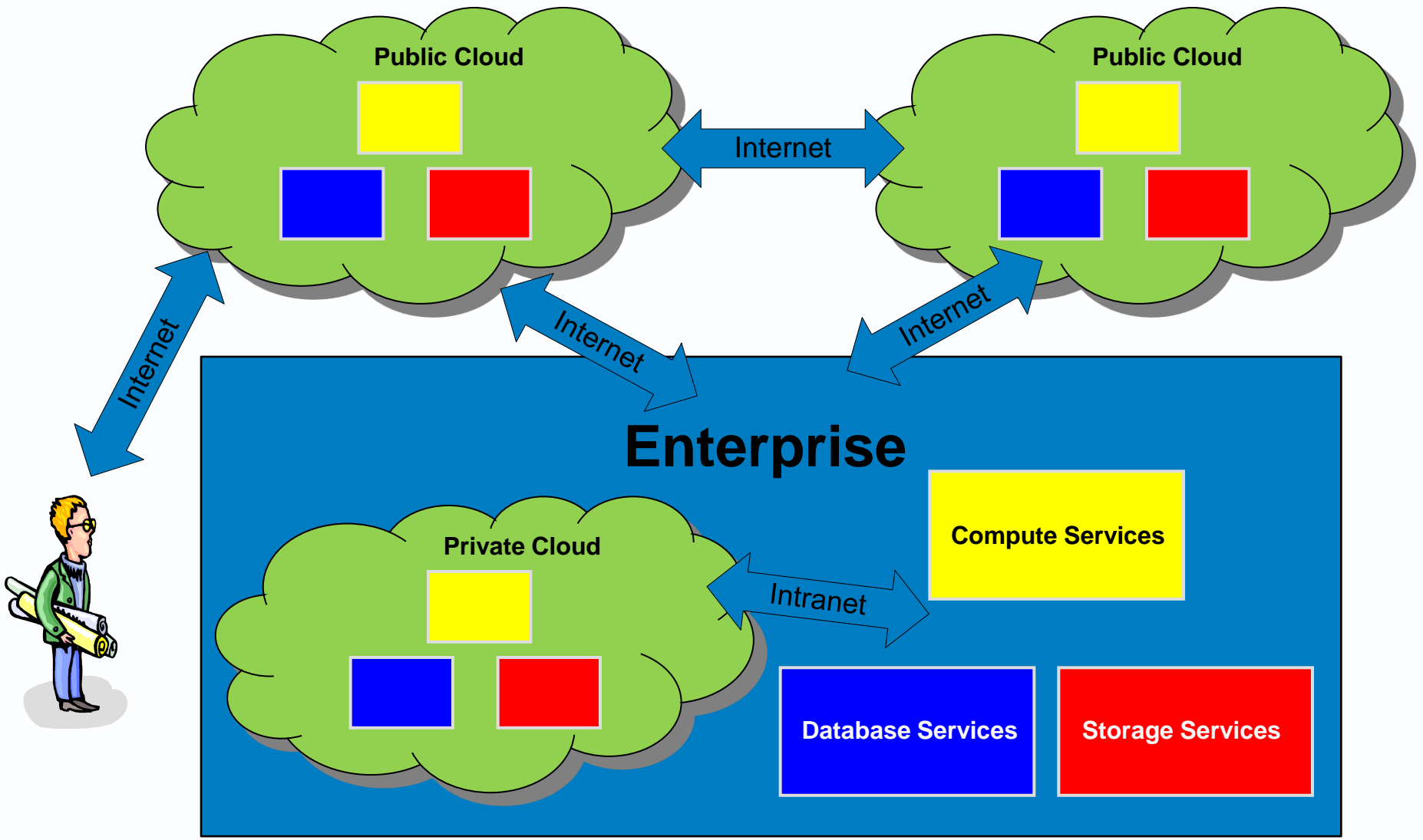


- ▶ The tailored framework form the keystone to the flavor architecture governance organization and guidelines that need to be developed
 - (centralized or federated, light or heavy, etc.)
- ▶ A key output of this Phase is the framework for architecture governance
 - All governance activities related to the Consumption and Management of Cloud Services should here be addressed
 - This will include IT Service Management (ITIL), Security Management, Risk Management, etc.
- ▶ At completion, touch-points and impacts should be understood and agreed by relevant stakeholders

- ▶ This strategy must address several topics

- ▶ Public Cloud vs Private Clouds vs Hybrid Clouds
 - ▶ A public Cloud is one in which the consumer of Cloud services and the provider of cloud services exist in separate enterprises. The ownership of the assets used to deliver cloud services remains with the provider.
 - ▶ A private Cloud is one in which both the consumer of Cloud services and the provider of those services exist within the same enterprise. The ownership of the Cloud assets resides within the same enterprise providing and consuming cloud services.
 - ▶ A hybrid Cloud combines multiple elements of public and private cloud, including any combination of providers and consumers

What does the Business want to consider? Hybrid Clouds?



- ▶ Quality Management
 - ▶ Test planning and test asset management from requirements to defects
 - ▶ Project governance and release decisions
 - ▶ Data quality (all data uploaded to a Cloud computing service provider must ensure it fits the requirements of the provider)

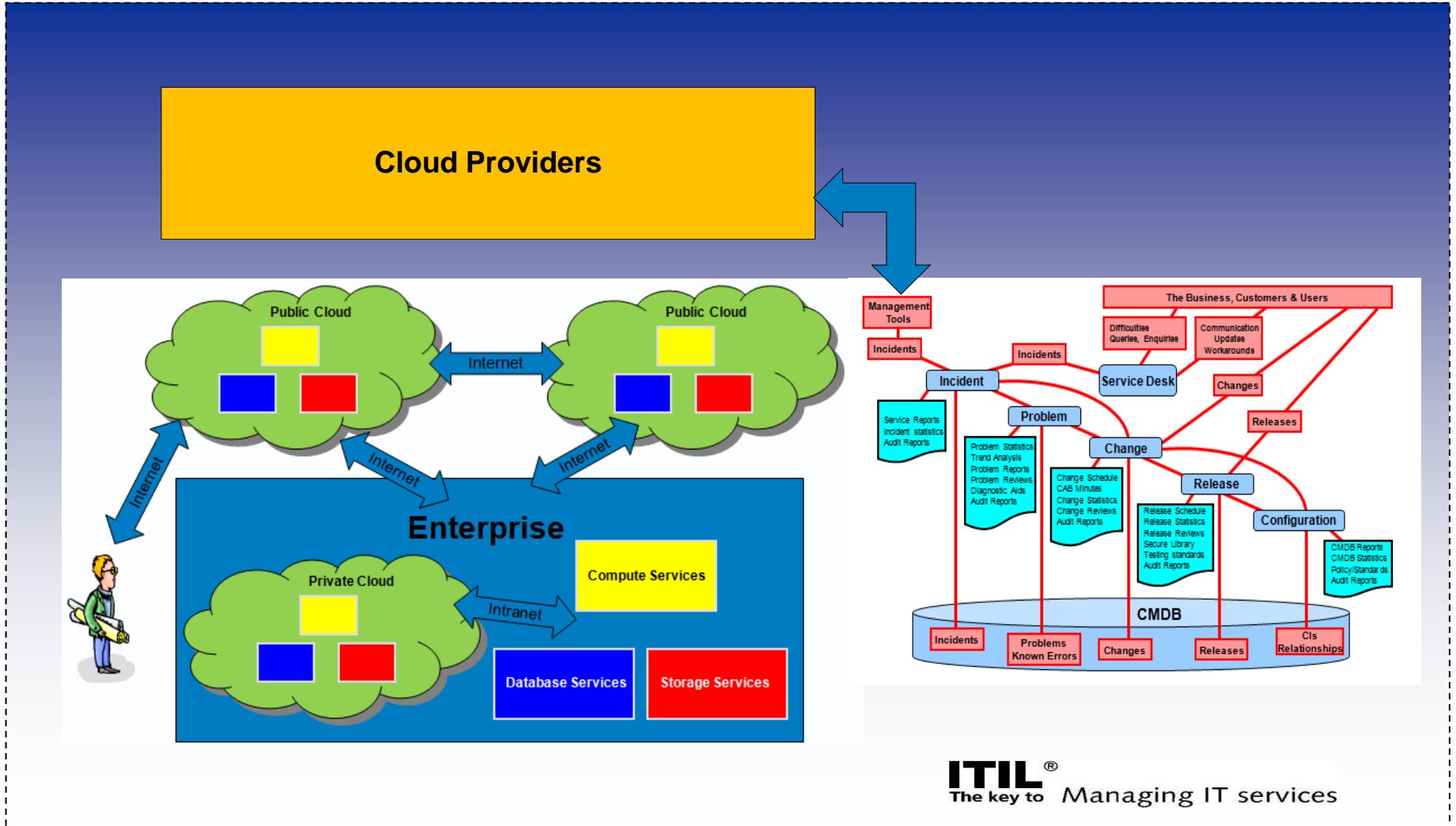
- ▶ Security Management
 - ▶ Eliminating the need to constantly reconfigure static security infrastructure for a dynamic computing environment
 - ▶ Services are able to securely connect and reliably communicate with internal IT services and other public services

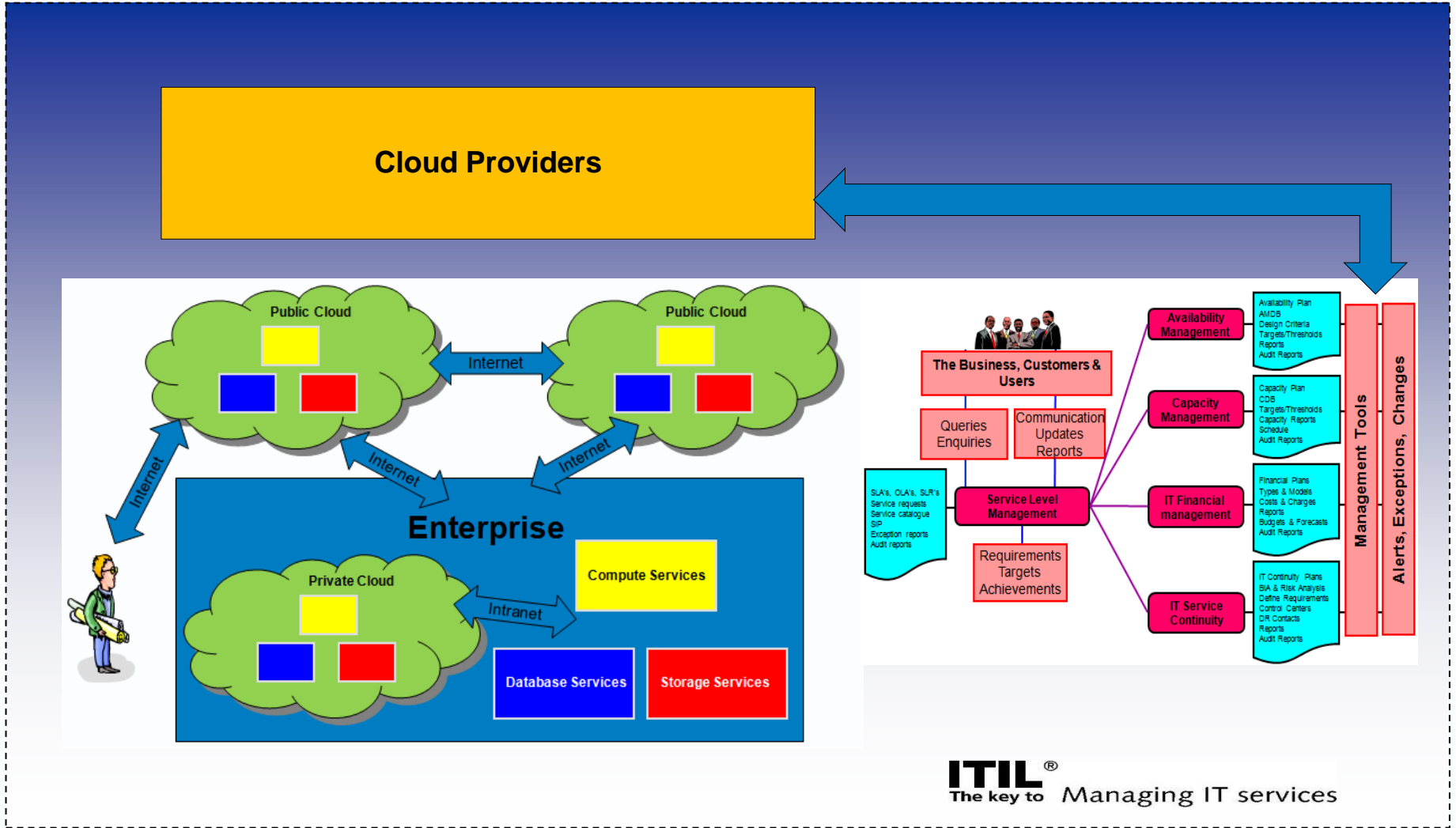
- ▶ IT Service Management (ITIL)
 - ▶ Incident Management
 - ▶ The Cloud provider must ensure that all outages or exceptions to normal operations are resolved as quickly as possible while capturing all of the details for the actions that were taken
 - ▶ Change Management
 - ▶ This process becomes critical. Provider whose revenue is based upon the delivery of a highly available and stable environment. Strict change management practices must be adhered to and all changes implemented during approved maintenance windows must be tracked, monitored, and validated.

- ▶ IT Service Management (ITIL) (2)
 - ▶ Configuration Management
 - ▶ Companies who have a CMDB must provide to the Cloud providers with a deep understanding of the relationships between configuration items (CI)
 - ▶ CI relationships allows to determine relationships empowers change and incident managers to determine that a modification to one service may impact several other related services and the components of those services
 - ▶ This provides more visibility into the Cloud environment, allowing consumers and providers to make more informed decisions not only when preparing for a change but also when diagnosing incidents and problems
 - ▶ The Cloud provider needs to identify the root cause analysis in case or problems

- ▶ IT Service Management (ITIL) (3)
 - ▶ Monitoring
 - ▶ Resource usage and consumption must be monitored and managed in order to support strategic decision making
 - ▶ The Cloud providers will furnish the relevant tools for management and reporting and take away the onerous tasks of patch management, version upgrades, high availability, disaster recovery and the like
 - ▶ IT Service Continuity
 - ▶ Consumption and costs
 - ▶ Service usage (when and how) to determine the intrinsic value that the service is providing to the Business, and IT can also use this information to compute the Return On Investment for their Cloud computing initiatives and related services
 - ▶ IT Financial Management

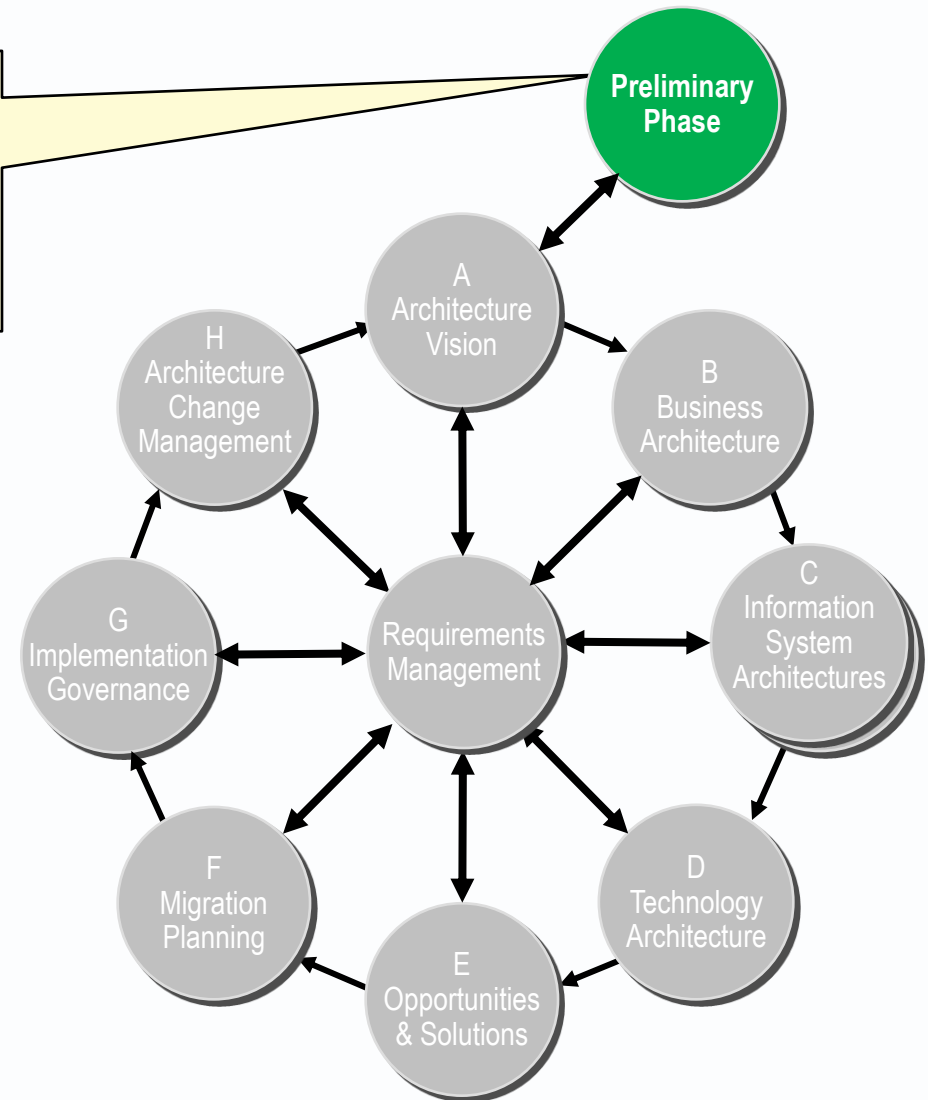
- ▶ IT Service Management (ITIL) (4)
 - ▶ Service Level Management
 - ▶ Underpinning contracts must be established between the Business or service consumer and the service provider
 - ▶ Service Level Agreements must be transparent and accessible to the end users
 - ▶ Performance and Capacity Management
 - ▶ Availability Management



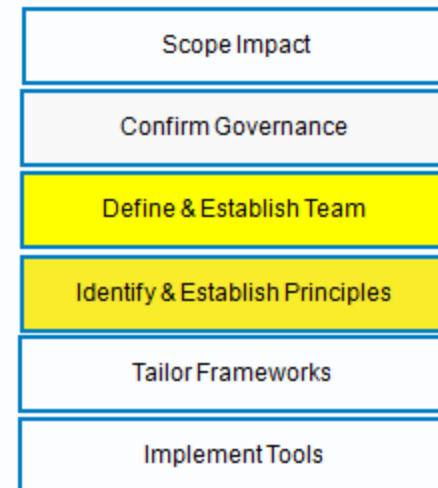


- ▶ Risk Management
 - ▶ Ownership, Cost, Scope, Provider relationship, Complexity, Contractual, Client acceptance, etc
- ▶ Asset Management and License Management
 - ▶ When various cloud approaches are considered (services on-premise via the Cloud), hardware and software license management to be defined to ensure companies can meet their governance and contractual requirements.
- ▶ Vendors Management
 - ▶ Relationship between a vendor and their customers changes
 - ▶ Contractual arrangements
- ▶ Transactions
 - ▶ Safety
 - ▶ Electronic signatures
- ▶ **Create a proof of concept!**

- Creation of a strategy for the consumption and management of cloud services
- Identify who owns the Cloud in the business from a user perspective and a service provider management perspective



- ▶ Someone within the organization still needs to
 - ▶ own the service
 - ▶ ensure that it's meeting the Business requirements
- ▶ That they have the right level of transparency into what's happening inside the Cloud (or inside other provider environments) to quickly resolve issues
- ▶ The Enterprise Architecture governance framework also needs to include the processes, roles and responsibilities related to Cloud services and operations
- ▶ New Architecture principles may be created referring to the Cloud





Outputs

- Organizational Model for Enterprise Architecture
- Tailored Architecture Framework
- Initial Architecture Repository
- Organization's strategy, plans, principles, goals, and drivers possibly restated
- **Strategy for the Consumption and Management of Cloud Services**
- Governance Framework
- Request for Architecture Work



- Cloud categories definitions
- Transactions

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Preliminary Phase - Outputs



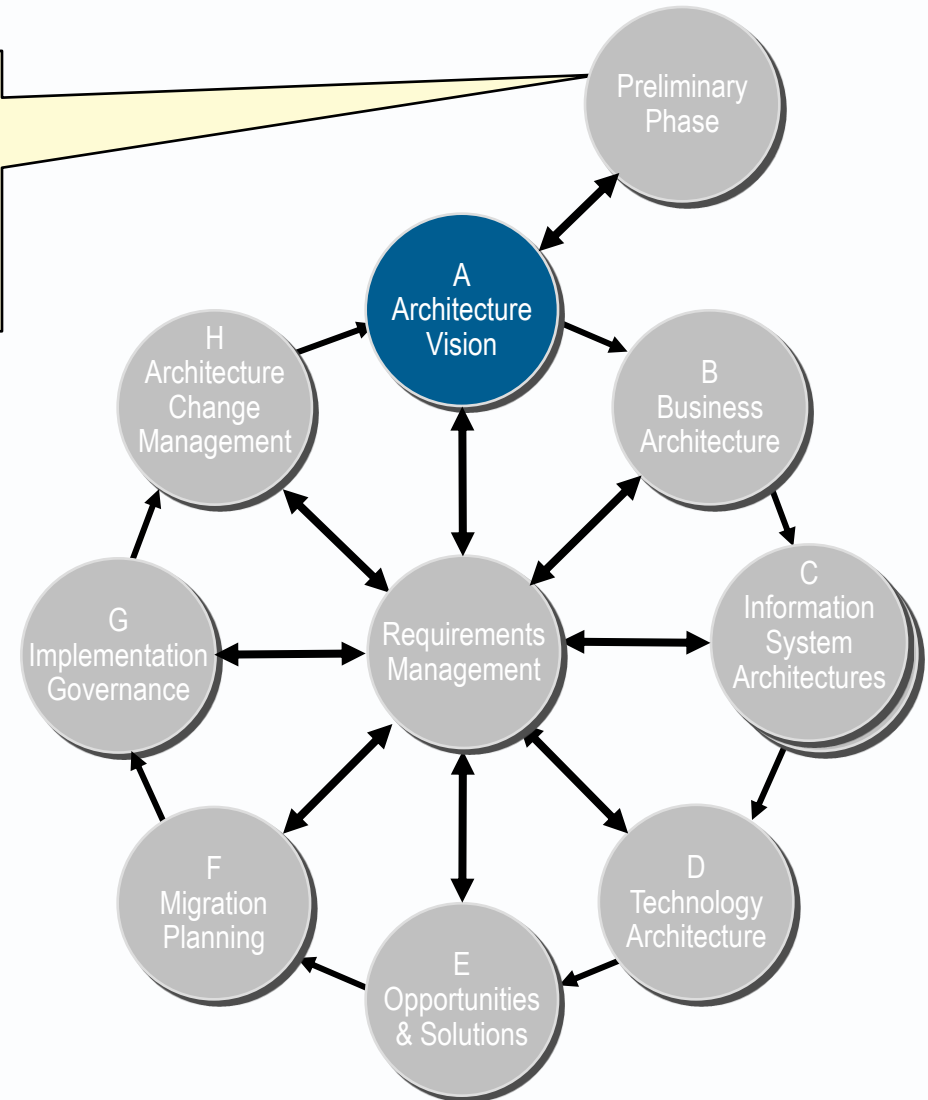
- Cloud related
 - IT Service Management
 - Risk Management
 - License and Asset management
 - Vendors Management
 - Quality Management

Outputs

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Phase A: Architecture Vision

- Creation of a strategy for the consumption and management of cloud services
- Identify who owns the Cloud in the business from a user perspective and a service provider management perspective



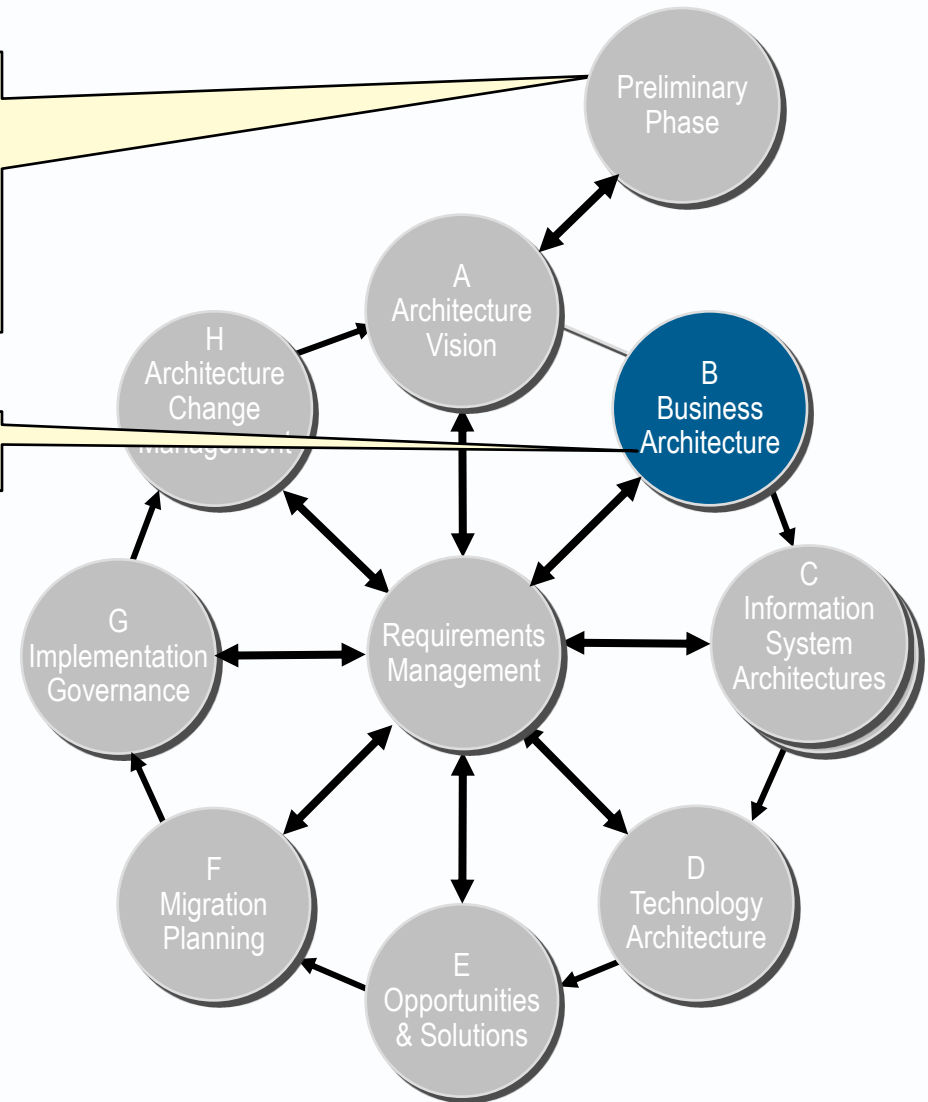
Phase A: Architecture Vision

- ▶ Use of a Business Scenario
 - ▶ Identification of the Business problems, business Requirements and identify a potential business solutions
 - ▶ Address Interoperability requirements
 - ▶ Address Security requirements
 - ▶ Address Availability requirements
 - ▶ Identify the scope
 - ▶ Identification of a potential business solutions without referring to any architecture style (as this will be discussed during Phase E)
 - ▶ Sign off

Phase B: Business Architecture

- Creation of a strategy for the consumption and management of cloud services
- Identify who owns the Cloud in the business from a user perspective and a service provider management perspective

- Consider a Cloud Reference Model



Phase B: Business Architecture

- ▶ Consider a Cloud Reference Model (Or during the Preliminary Phase!)
 - ▶ Description of the appropriate Cloud industry standards, the dimensions of the Cloud problem space, and the decisions and choices that apply to a Cloud computing for an organisation.
 - ▶ A Cloud Reference Model, reference architecture and reference implementation approach is an accepted approach for planning and implementing Cloud computing
 - ▶ The Open Cloud Consortium
 - ▶ The Cloud Security Alliance
 - ▶ The Cloud Computing Reference Model (CC-RM) and Reference Architecture framework from AgilePath
 - ▶ The Accenture Cloud Reference Model for Application Architecture
 - ▶ and...**The Open Group Cloud Computing Architecture Meta-Model**

Cloud Reference Models

- ▶ “The Open Cloud Consortium (OCC) is a member driven organization that supports the development of standards for cloud computing and frameworks for interoperating between clouds.”



- ▶ “The Cloud Security Alliance is a non-profit organization formed to promote the use of best practices for providing security assurance within Cloud Computing, and provide education uses of Cloud Computing to help secure all other forms of computing.”

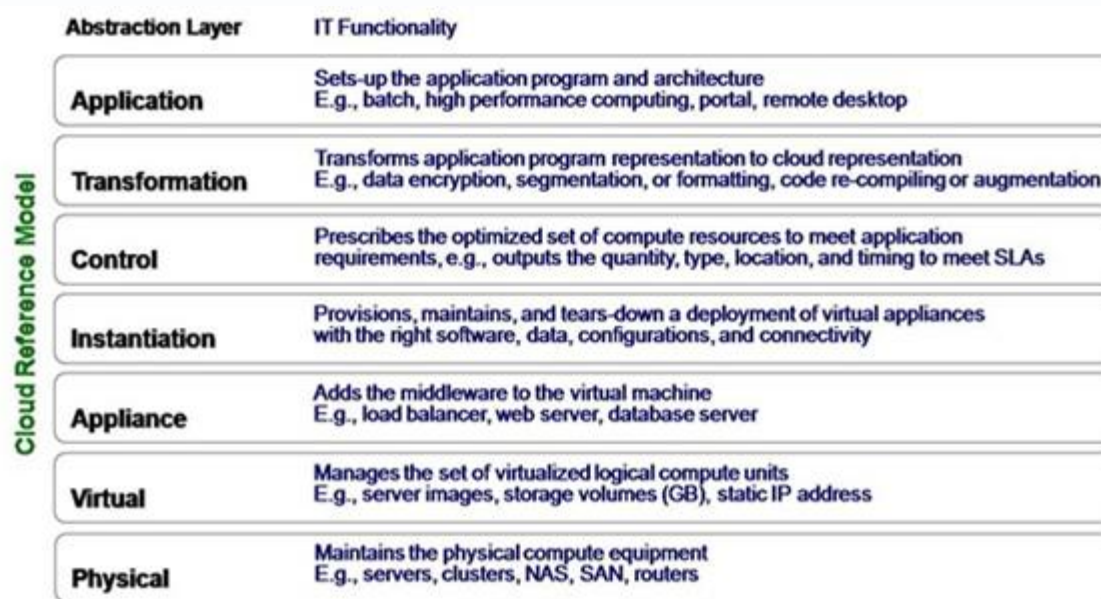


- ▶ “AgilePath's Cloud computing practice focuses on the full lifecycle of Cloud Computing – from strategy and planning, through Cloud modeling, architecture and design, to implementation and support. “



Cloud Reference Models

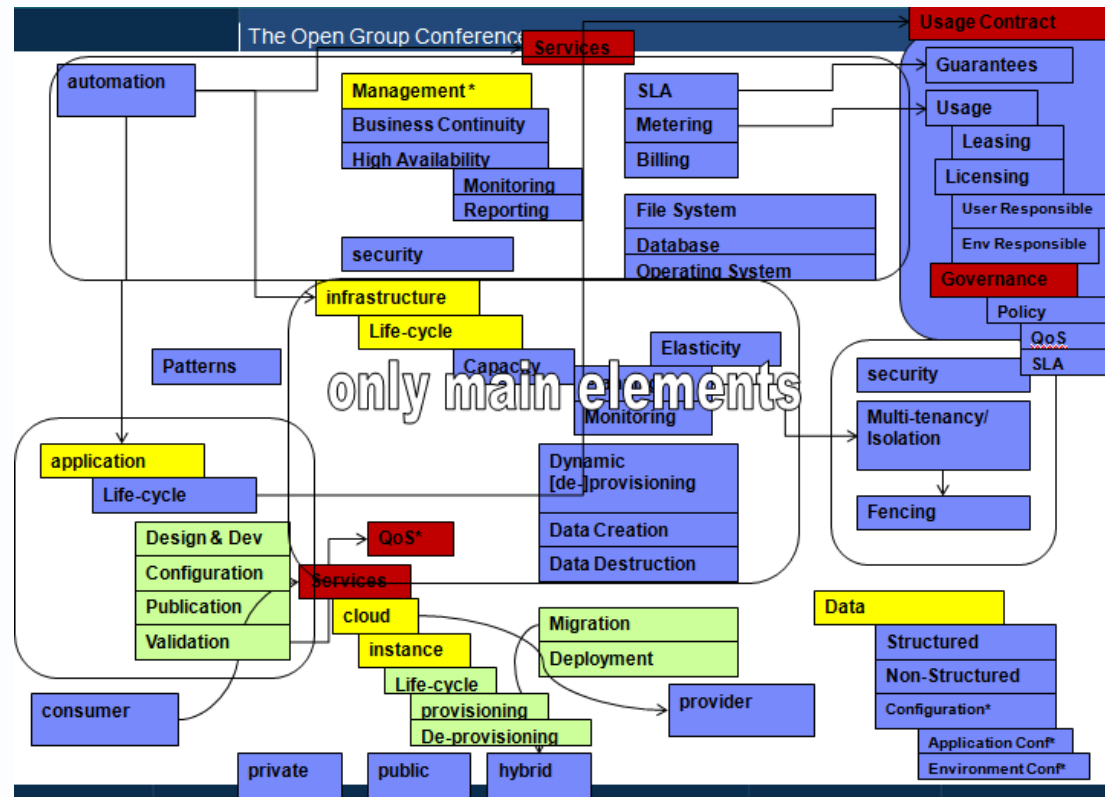
- ▶ “The Accenture Cloud Reference Model for **Application Architecture** with its 7-layers. Like the OSI Model for networks, this Cloud Model is layered to separate concerns and abstract details”



**image courtesy of [Noel Coates](#).*

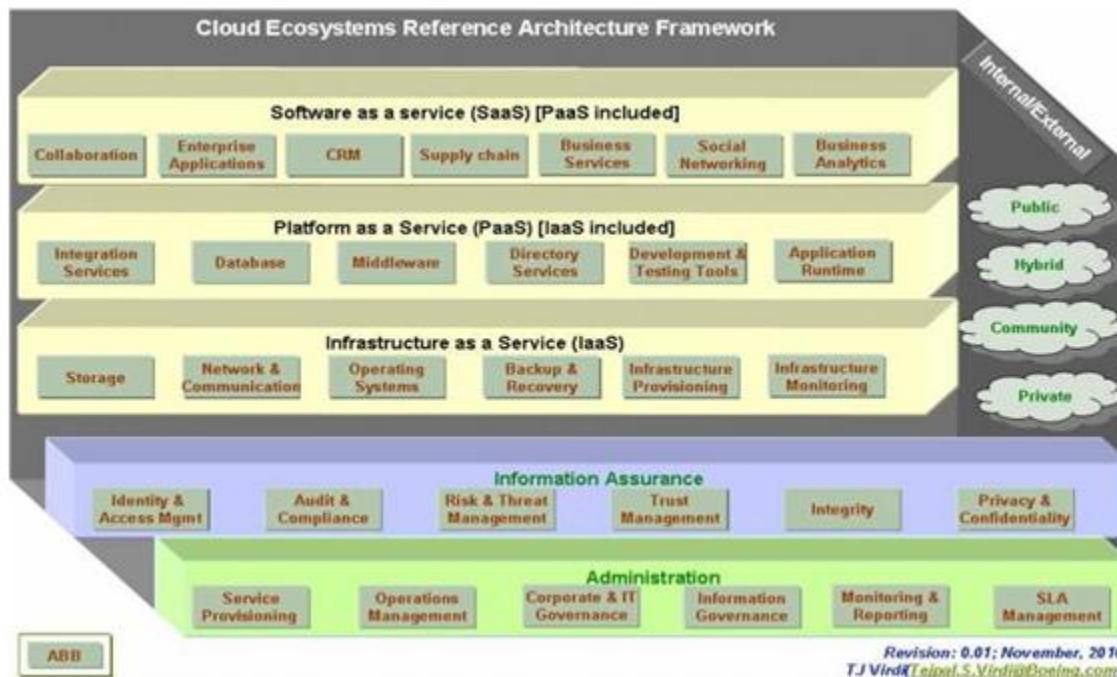
Cloud Reference Models

- ▶ The Open Group Cloud Computing Architecture Meta-Model (work in progress)
- ▶ Used to define the foundational elements of the Cloud computing architecture



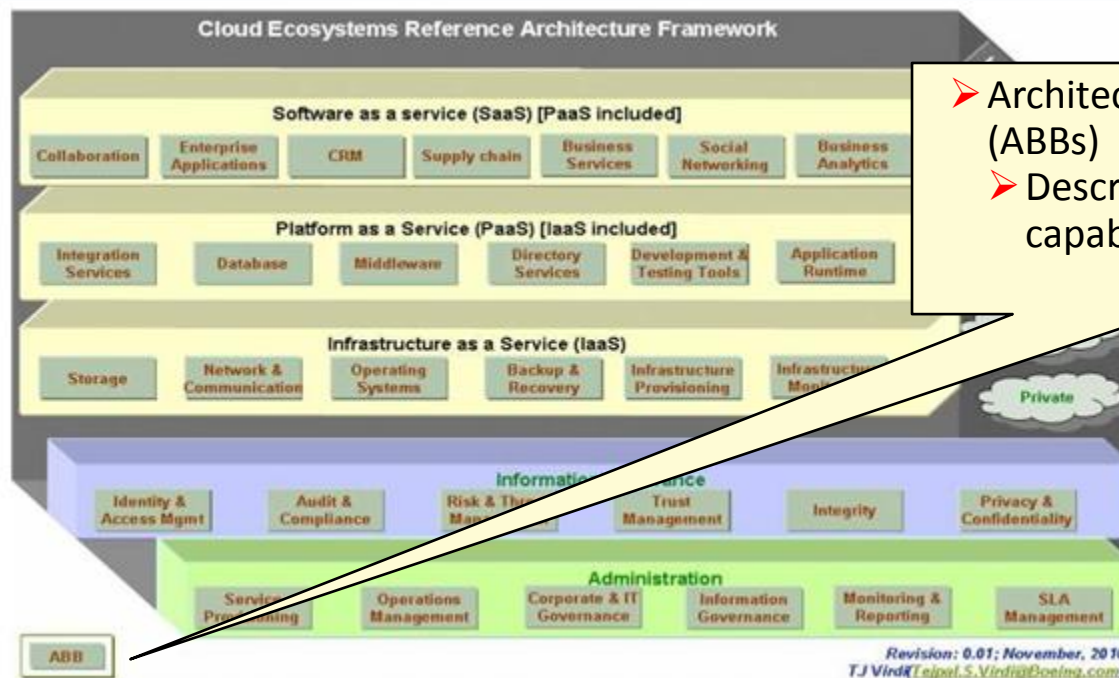
Cloud Reference Models

- ▶ The Open Group Cloud Ecosystems Reference Architecture Framework (work in progress)
- ▶ Provides a conceptual view of overall Cloud services delivery model. It highlights ABBs (Architecture Building Blocks) that collectively define the overall capabilities of Cloud ecosystems



Cloud Reference Models

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- ▶ Provides a conceptual view of overall Cloud services delivery model. It highlights ABBs (Architecture Building Blocks) that collectively define the overall capabilities of Cloud ecosystems



▶ Architecture Building Blocks (ABBs)
 ▶ Describe required capability

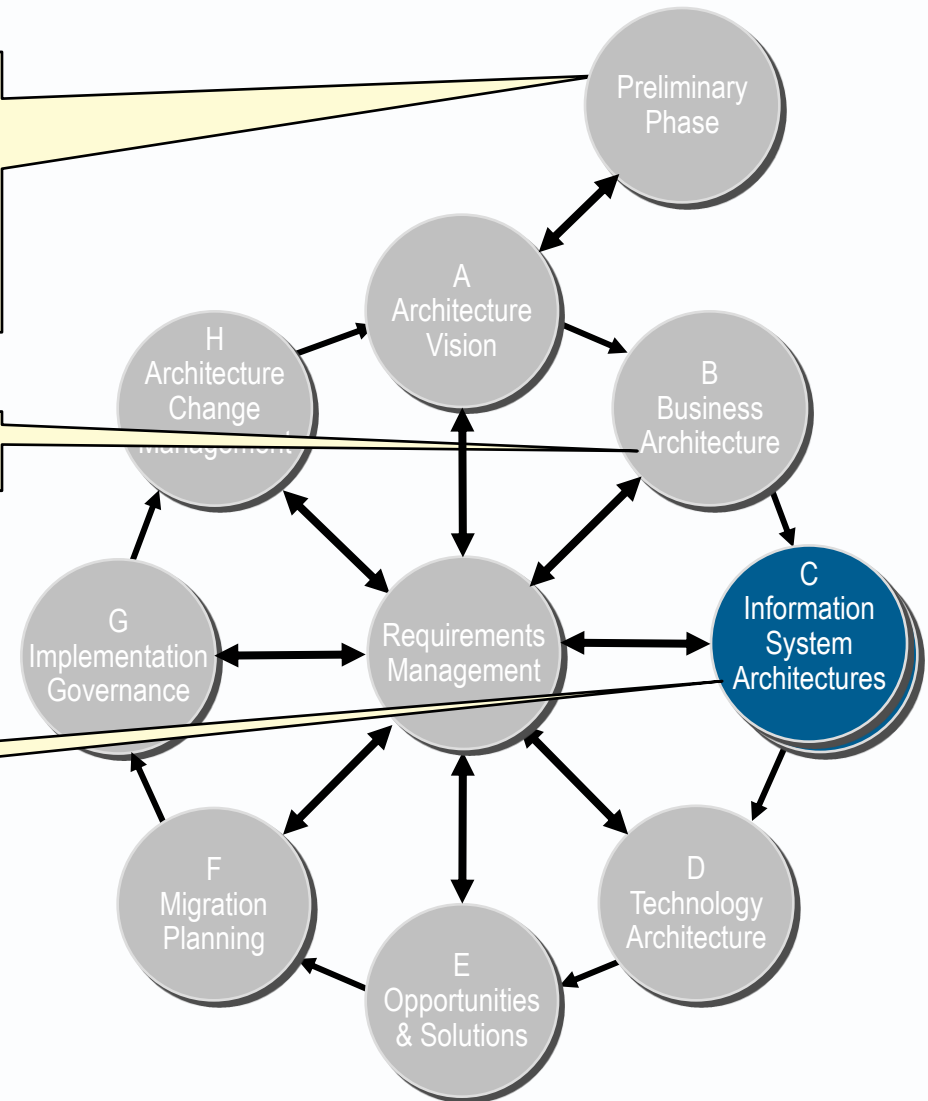
Revision: 0.01; November, 2010
 T.J. Virdi (t.virdi@open.com)

Phase C: Information Systems Architecture

- Creation of a strategy for the consumption and management of cloud services
- Identify who owns the Cloud in the business from a user perspective and a service provider management perspective

➤ Consider a Cloud Reference Model

➤ Determine data and privacy classification

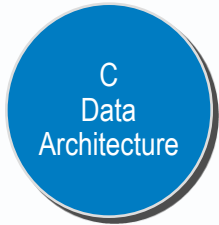


Phase C: Data Architecture

- ▶ Data integration, in particular may be an issue for Cloud computing as it pushes information back into siloes, that IT may not have direct access to
- ▶ It is also recommended to determine Data and privacy classification and to prioritise the risk criteria of what goes in the Cloud and what stays on-premise
- ▶ Data quality (refer to the Quality Management slide)
- ▶ Determine data and privacy classification
 - ▶ Fundamental problem in data analysis
 - ▶ Definition of appropriate procedures and protection requirements for the information
 - ▶ Security classification (e.g. Public, Sensitive, Private, Confidential, etc.)
 - ▶ Access controls

Data and Privacy Classification

System Security Measure	Apply to This Data Category?		
	General Access	Restricted	Confidential
Access control	Only as needed for system administration	Yes	Yes
System and application maintenance	Yes	Yes	Yes
Logging	Yes	Yes	Yes
Antivirus measures	Yes	Yes	Yes
Backup and retention	Yes	Yes	Yes
Firewalls and IDS	Recommended	Recommended	Yes
Encryption (during transmission)	No	Recommended	Yes
Encryption (storage)	No	Optional	Optional
Authentication	Only as needed for system administration	Yes	Yes (two-factor minimum)
Physical security	Recommended	Yes	Yes



Outputs

- Refined and updated versions of the Architecture Vision phase deliverables (where applicable)
- Draft Architecture Definition Document
- Draft Architecture Requirements Specification
- Data Architecture components of an Architecture Roadmap
- **Data and Privacy Classification**

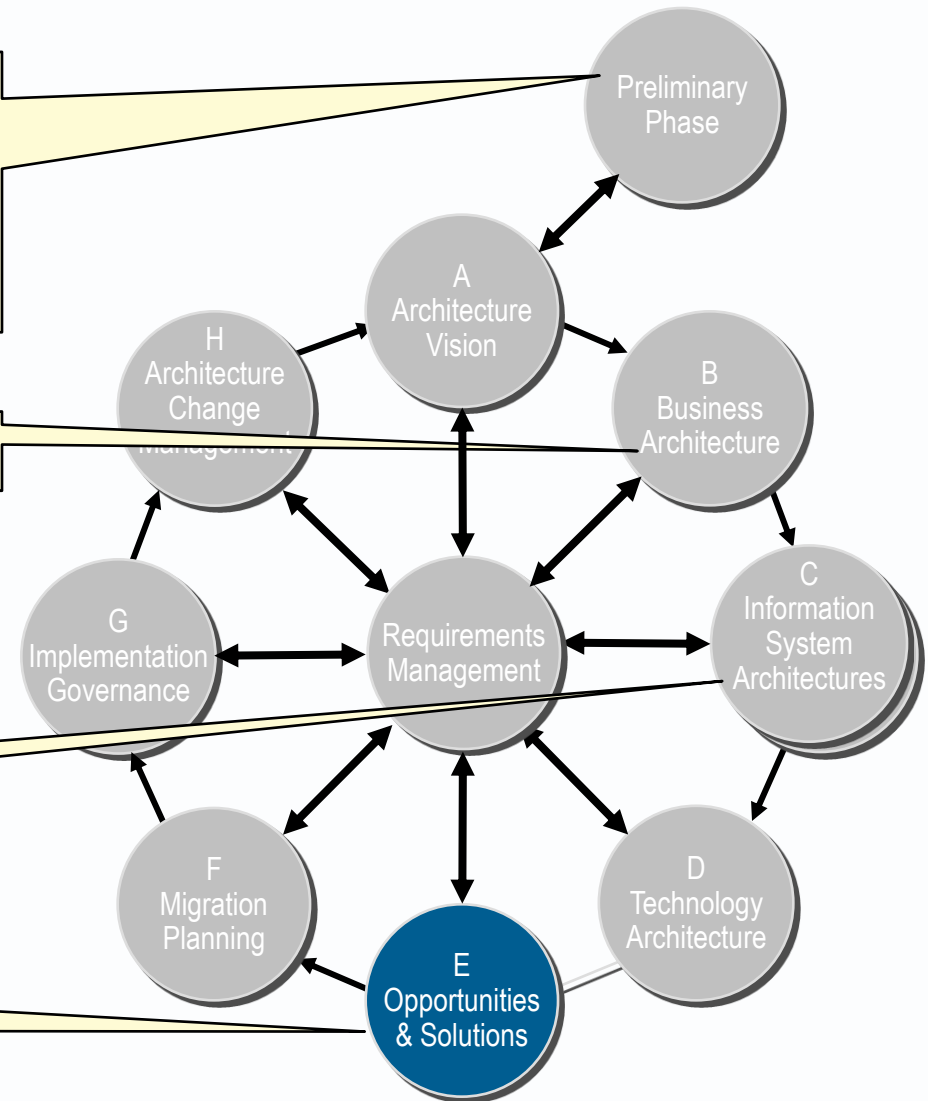
Phase E: Opportunities & Solutions

- Creation of a strategy for the consumption and management of cloud services
- Identify who owns the Cloud in the business from a user perspective and a service provider management perspective

➤ Consider a Cloud Reference Model

➤ Determine data and privacy classification

➤ Identify candidates services in the Cloud



Phase E: Opportunities & Solutions

- ▶ Need to understand the Cloud resources which may exist or not
- ▶ A new step will also be dedicated to identify candidates' services in the Cloud.
- ▶ Different models are used

Phase E: Opportunities & Solutions

- ▶ The following is a model that is used by several large organizations, is a starting point to evaluate applications and systems, but organizations should take into account their individual organizational differences

Type	Comments
Proprietary and mission-critical systems	<p>Systems that are proprietary or mission-critical in nature or that provide competitive advantages are often considered too important to risk outsourcing to an off-premises service provider.</p> <p>As a result, these systems are usually designed, developed, operated, and managed by the existing IT department of an organization.</p>
Non-proprietary and mission-critical systems	<p>Systems that are non proprietary yet still mission-critical might be developed by another company, but might still be designed, operated, and managed by the existing IT department an organization.</p>
Non-proprietary systems	<p>Systems that are non proprietary and deliver standardized functionality and interfaces are often good candidates for outsourcing to a cloud-service provider if appropriate service-level agreements (SLAs) can be established with the service providers.</p> <p>E-mail, calendaring, and content-management tools are examples of such systems</p>

Source: Microsoft

Phase E: Opportunities & Solutions

- ▶ The following is a model that has been developed by the Open Group:
- ▶ [“The Cloud Buyer Decision Tree”](#)
 - ▶ *“This White Paper describes a Decision Tree that could be used to help you discover where Cloud opportunities and solutions might fit in your organization. It is put forward for discussion, with the intention that this discussion, and validation in the field, will result in a practical tool for use by enterprises.”*
 - ▶ <https://www2.opengroup.org/ogsys/jsp/publications/PublicationDetails.jsp?publicationid=12235>

Phase F: Migration Planning

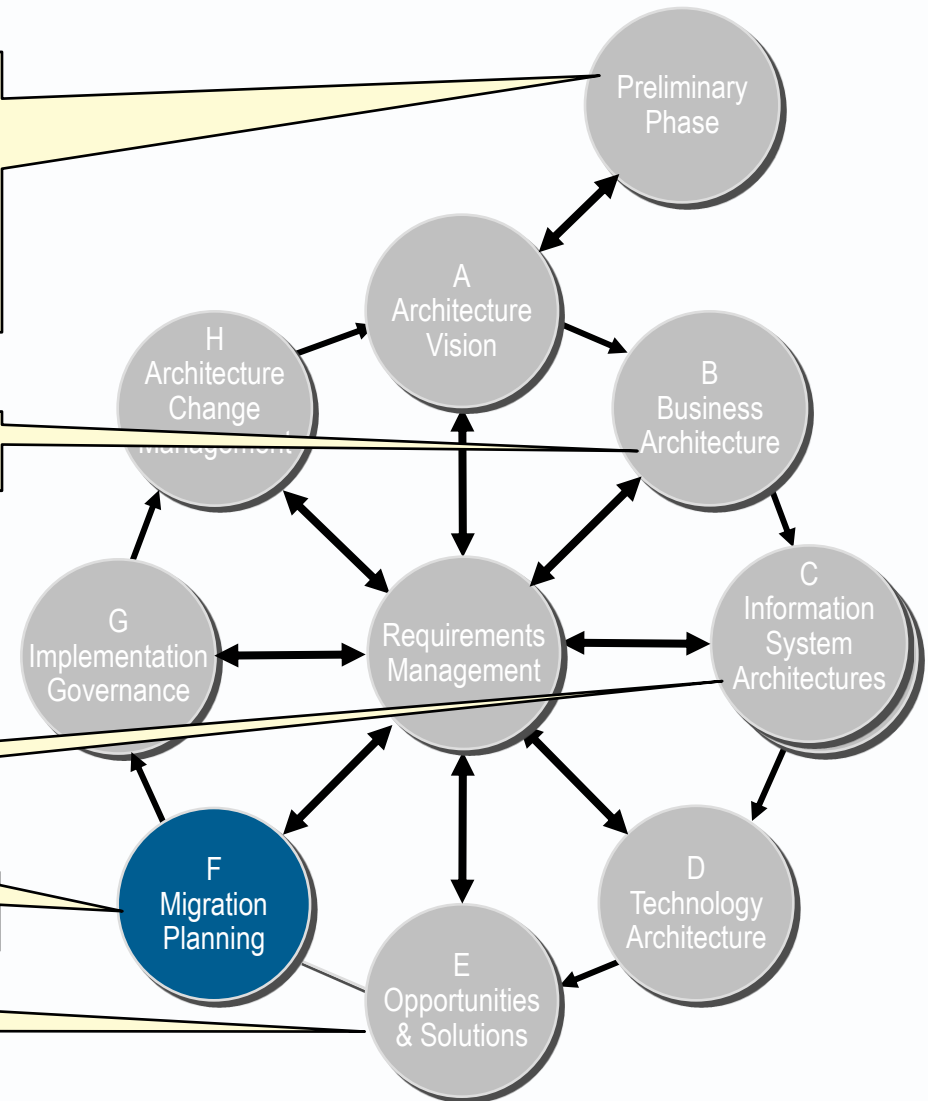
- Creation of a strategy for the consumption and management of cloud services
- Identify who owns the Cloud in the business from a user perspective and a service provider management perspective

- Consider a Cloud Reference Model

- Determine data and privacy classification

- Provide operational expenditure outlines

- Identify candidates services in the Cloud



Phase F: Migration Planning

- ▶ Instead of now having to provide standardized ROI or cost-benefit analysis justifying the products that need to be bought or charge-backs that need to be agreed upon upfront for shared assets, the Business can provide operational expenditure outlines and may go out to the Cloud to source their requirements
- ▶ No surprises with CapEx, decreased new product introduction training line item expenditures (many products are “standards “which means, lots of documentation and books available, e-learning, etc.), different charge-back agreements between Finance and Business Units (the organisation may have accesses to the service independently from his internal structure), in short, no need to conform to existing enterprise-wide Reference Architectures to meet individual project needs
- ▶ In relation to this, the recent Open Group white paper “[Building Return on Investment from Cloud Computing](#)” is a valuable source of information.
 - ▶ <https://www2.opengroup.org/ogsys/jsp/publications/PublicationDetails.jsp?publicationid=12229>

Phase G: Implementation Governance

- Creation of a strategy for the consumption and management of cloud services
- Identify who owns the Cloud in the business from a user perspective and a service provider management perspective

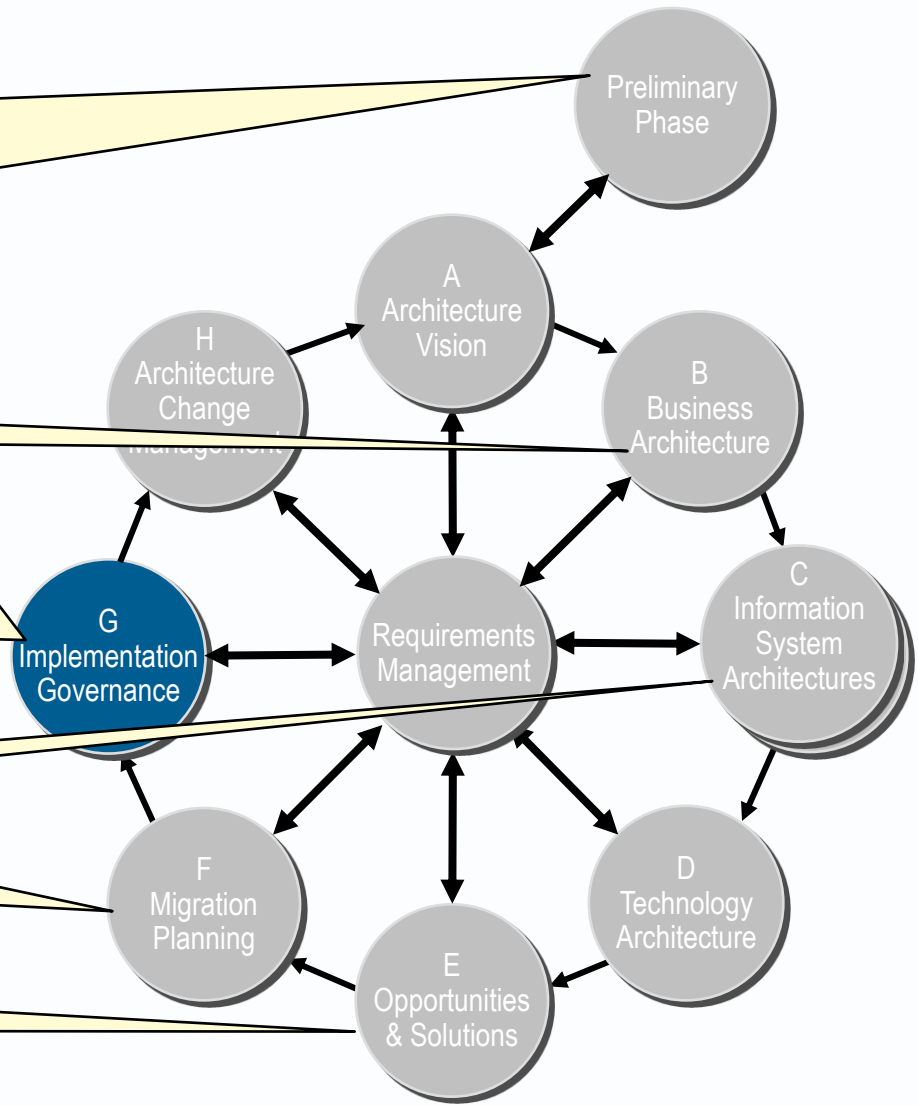
- Consider a Cloud Reference Model

- Relocation of Business processes, applications, data, technical services
- Implement security

- Determine data and privacy classification

- Provide operational expenditure outlines

- Identify candidates services in the Cloud



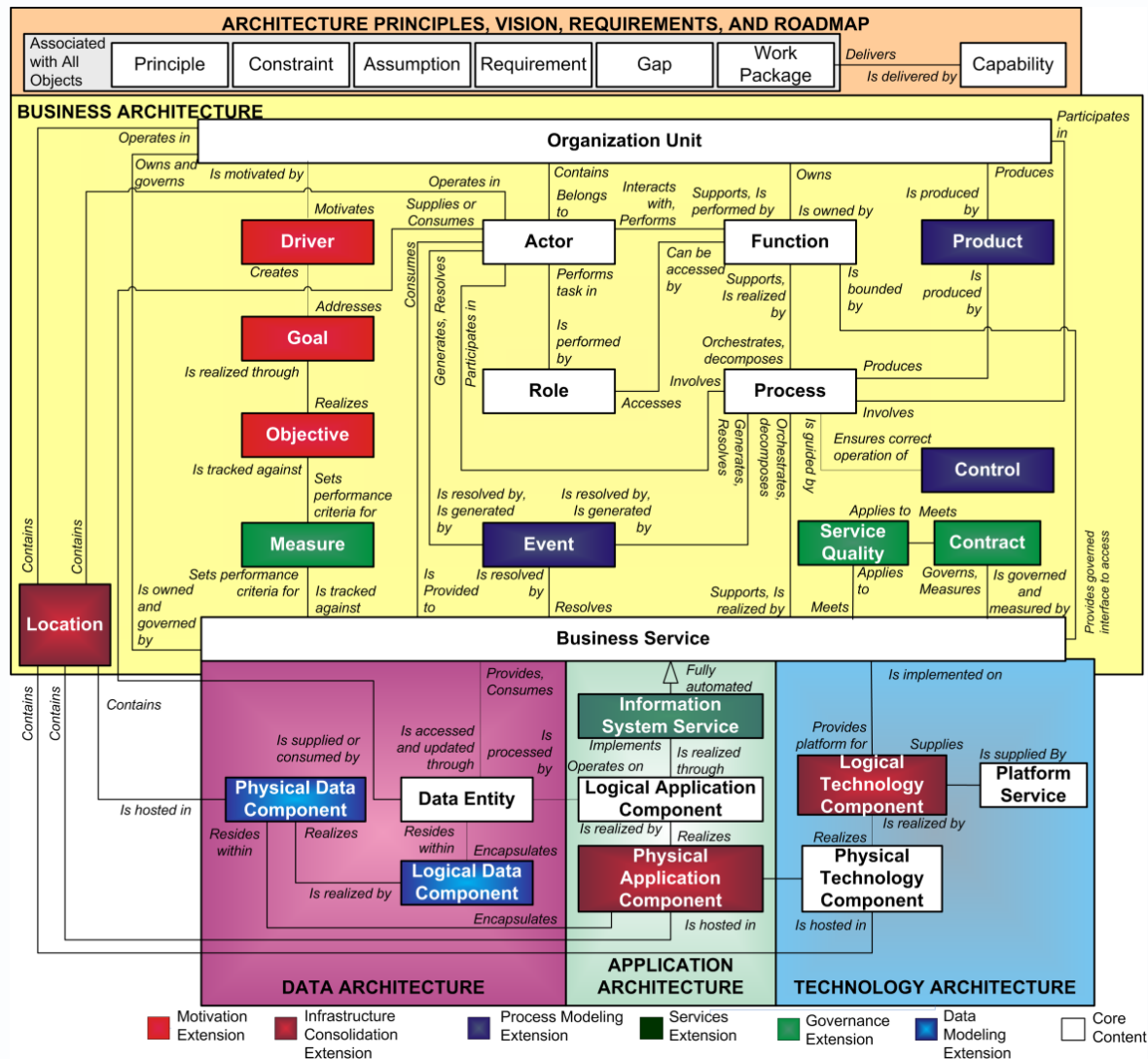
Phase G: Implementation Governance

- ▶ Activities may include the relocation of:
 - ▶ Business processes (Process-as-a-Service)
 - ▶ Applications (Application-as-a-Service)
 - ▶ Data (Information-as-a-Service and Database-as-a-Service)
 - ▶ Technical services (Storage-as-a-Service and Infrastructure-as-a-Service).
 - ▶ Security and operations implementation will have to be taken into consideration during the relocation. Security can also be considered as Security-as-a-Service.
- ▶ The development and deployment teams can now be sourcing from and conforming to the Cloud API and services

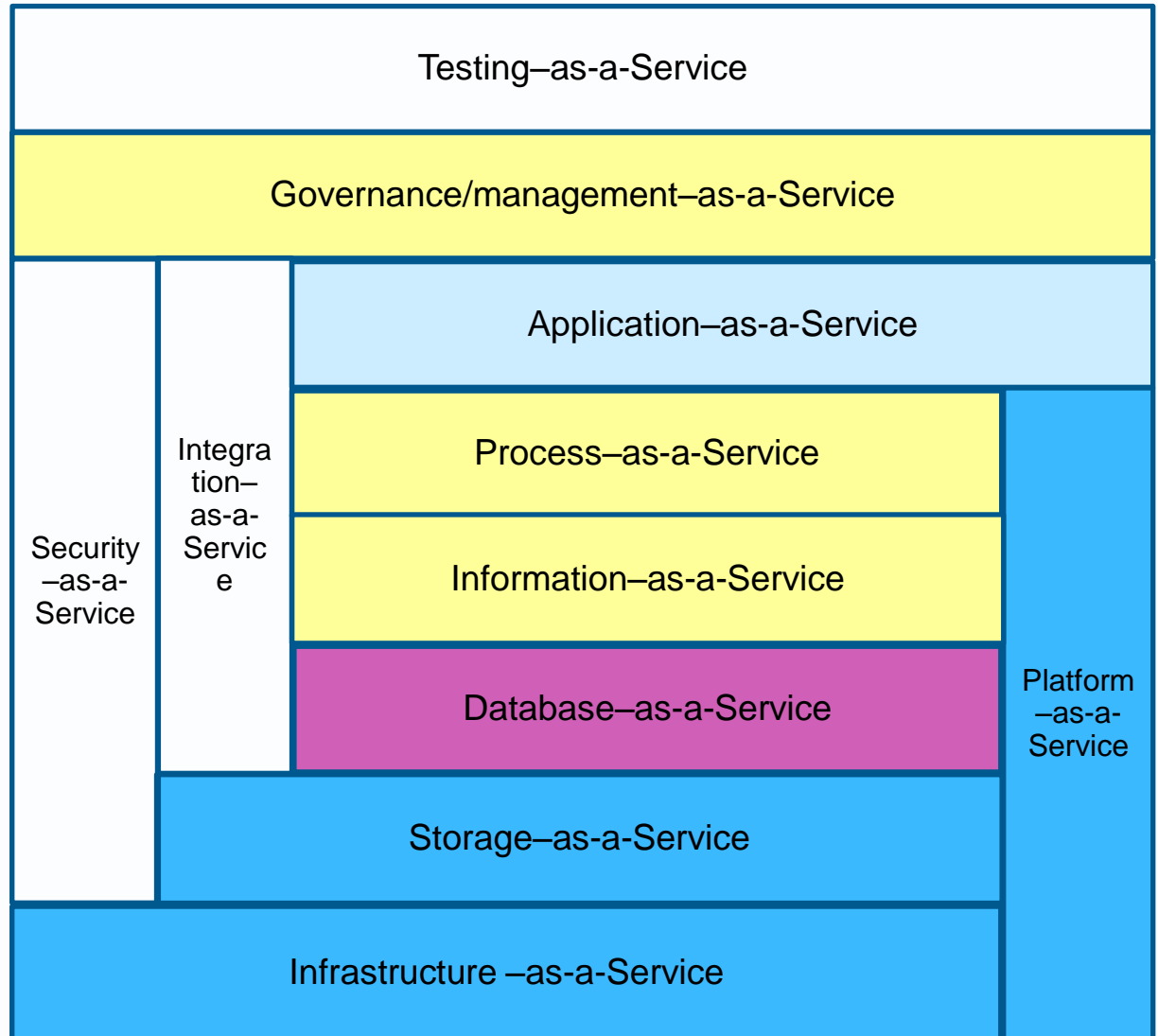
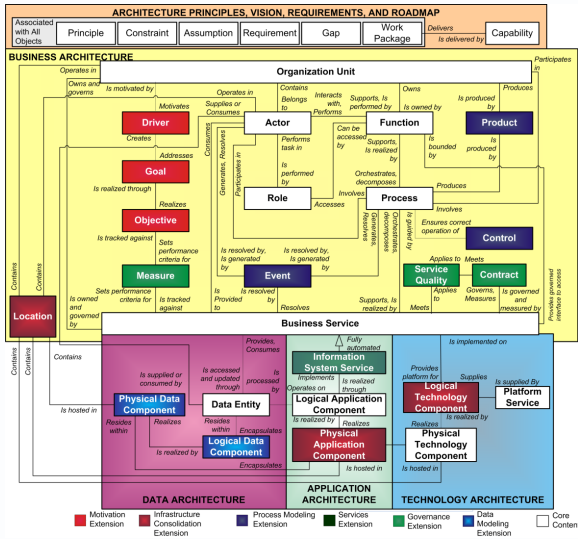
Phase G: Implementation Governance

- ▶ The Enterprise Architecture team does not enforce the reference architectures or corporate standards at various checkpoints (compliance and dispensation activities will remain for internal new systems)
- ▶ The Enterprise Architecture team has not been relevant to the Operation side of the organisation, but with the Cloud, even that seems to be disappearing

Content Meta-model and Cloud Services



Content Meta-model and categorization of Cloud Computing in all its variations



All additional activities within the ADM!

- Creation of a strategy for the consumption and management of cloud services
- Identify who owns the Cloud in the business from a user perspective and a service provider management perspective

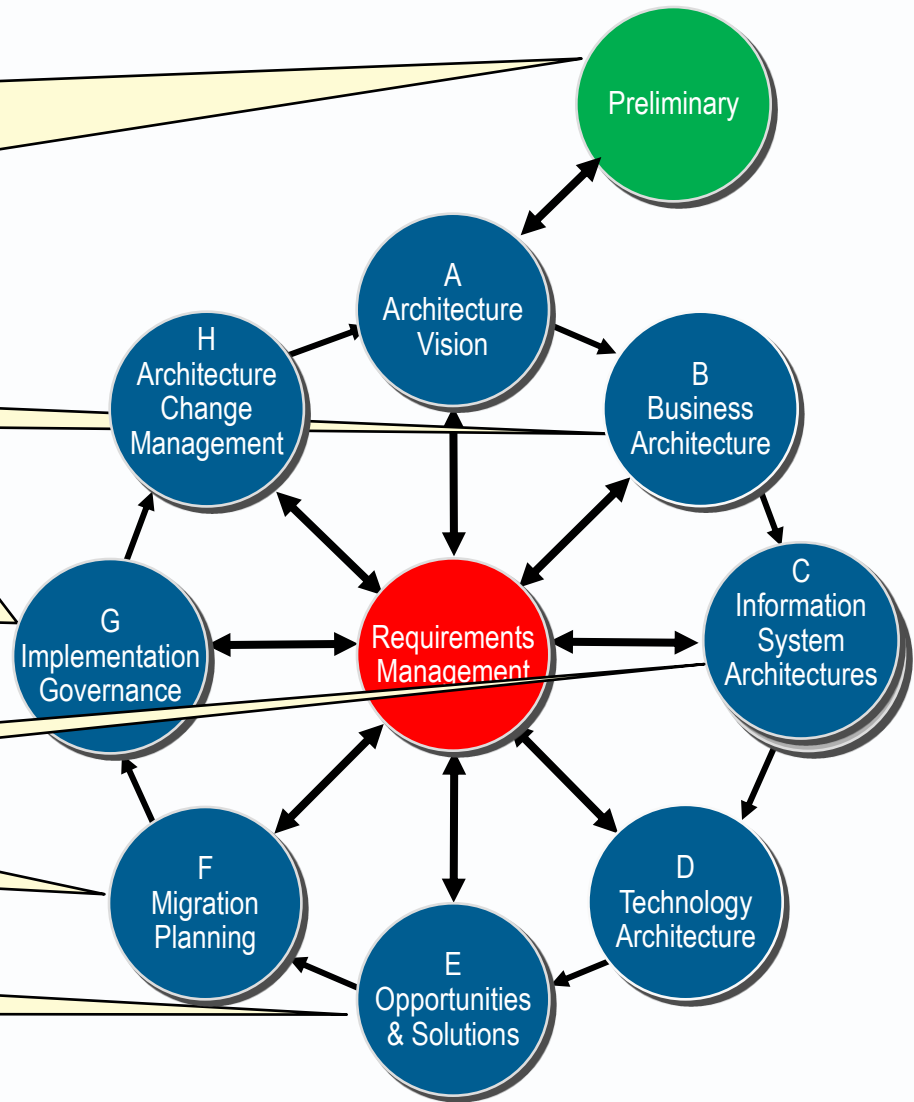
- Consider a Cloud Reference Model

- Relocation of Business processes, applications, data, technical services
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Conclusions

- ▶ New technologies styles are exciting, but using technology styles just for the sake of technology does not bring a real value
- ▶ Technology use should be driven not by its "coolness factor", but rather by business requirements and an underlying Enterprise Architecture such as TOGAF 9
- ▶ Moving some applications to the Cloud can make some infrastructures go away, but badly designed solutions won't be improved by relocating to the Cloud

धन्यवाद

Hindi

多謝

Traditional Chinese

ขอบคุน

Thai

Спасибо

Russian

Gracias

Spanish

شكراً

Arabic

Thank You

Obrigado

Brazilian Portuguese

Danke

German

Grazie

Italian

多谢

Simplified Chinese

Merci

French

நன்றி

Tamil

감사합니다

Korean

ありがとうございました

Japanese

Serge Thorn@architecting-the-enterprise.com