TOGAF®

Version 9.1 Enterprise Edition

Module 7
TOGAF Content Metamodel

THE Open GROUP

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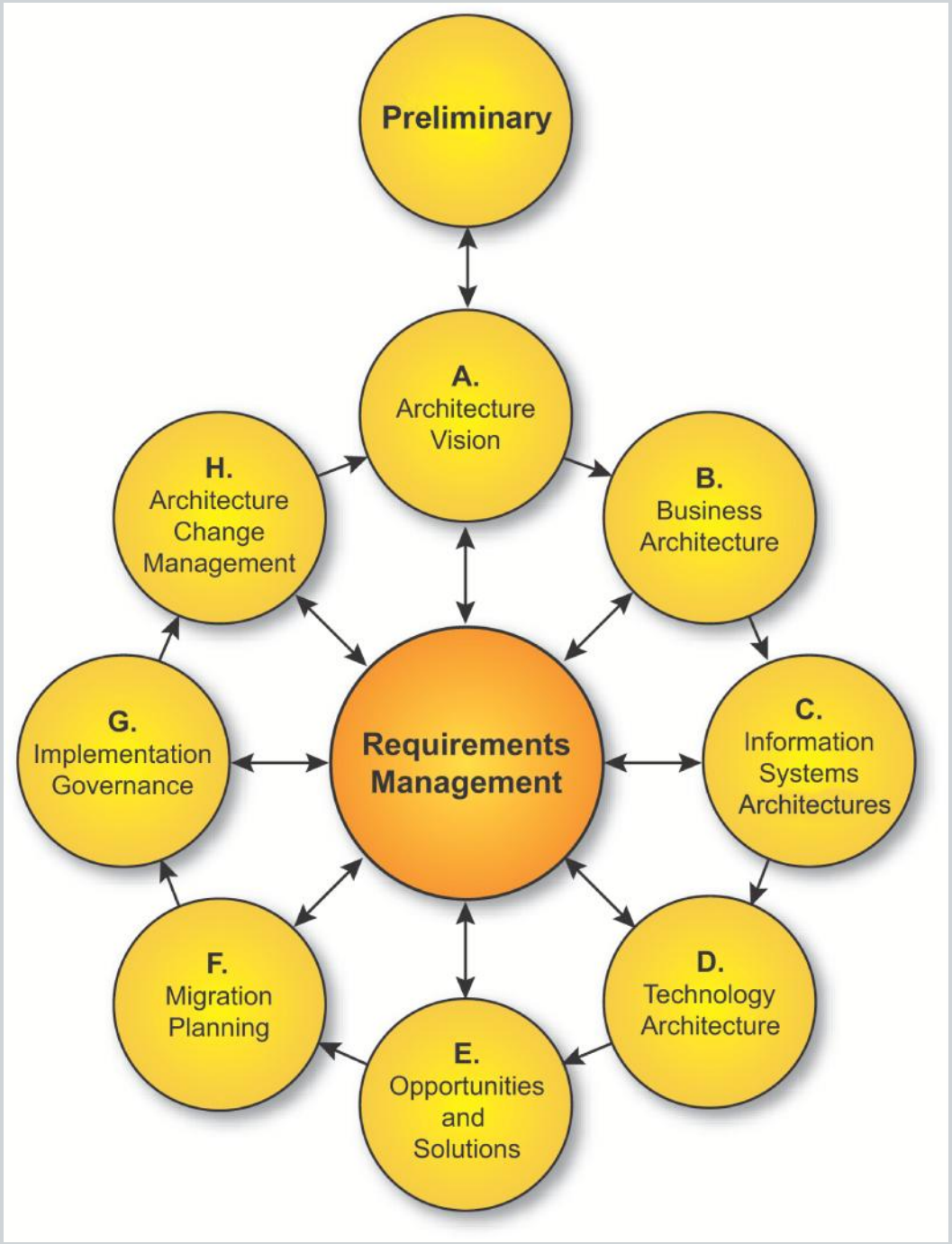

TOGAF Content Metamodel

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Roadmap

Part I - Introduction
Preface, Executive Overview, Core Concepts, Definitions and Release Notes
Part II – Architecture Development Method
Introduction to ADM
ADM Phase Narratives
Part III – ADM Guidelines and Techniques
Guidelines for Adapting the ADM Process
Techniques for Architecture Development
Part IV – Architecture Content Framework
Content Metamodel
Architectural Artifacts
Architecture Deliverables
Building Blocks
Part V – Enterprise Continuum and Tools
Enterprise Continuum
Architecture Partitioning
Architecture Repository
Tools for Architecture Development
Part VI – Reference Models
Foundation Architecture: Technical Reference Model
Integrated Information Infrastructure Reference Model
Part VII – Architecture Capability Framework
Architecture Board
Architecture Compliance
Architecture Contracts
Architecture Governance
Architecture Maturity Models
Architecture Skills Framework

- Part IV, Architecture Content Framework, Chapter 34

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Module Objectives

The objectives of this module are to describe:

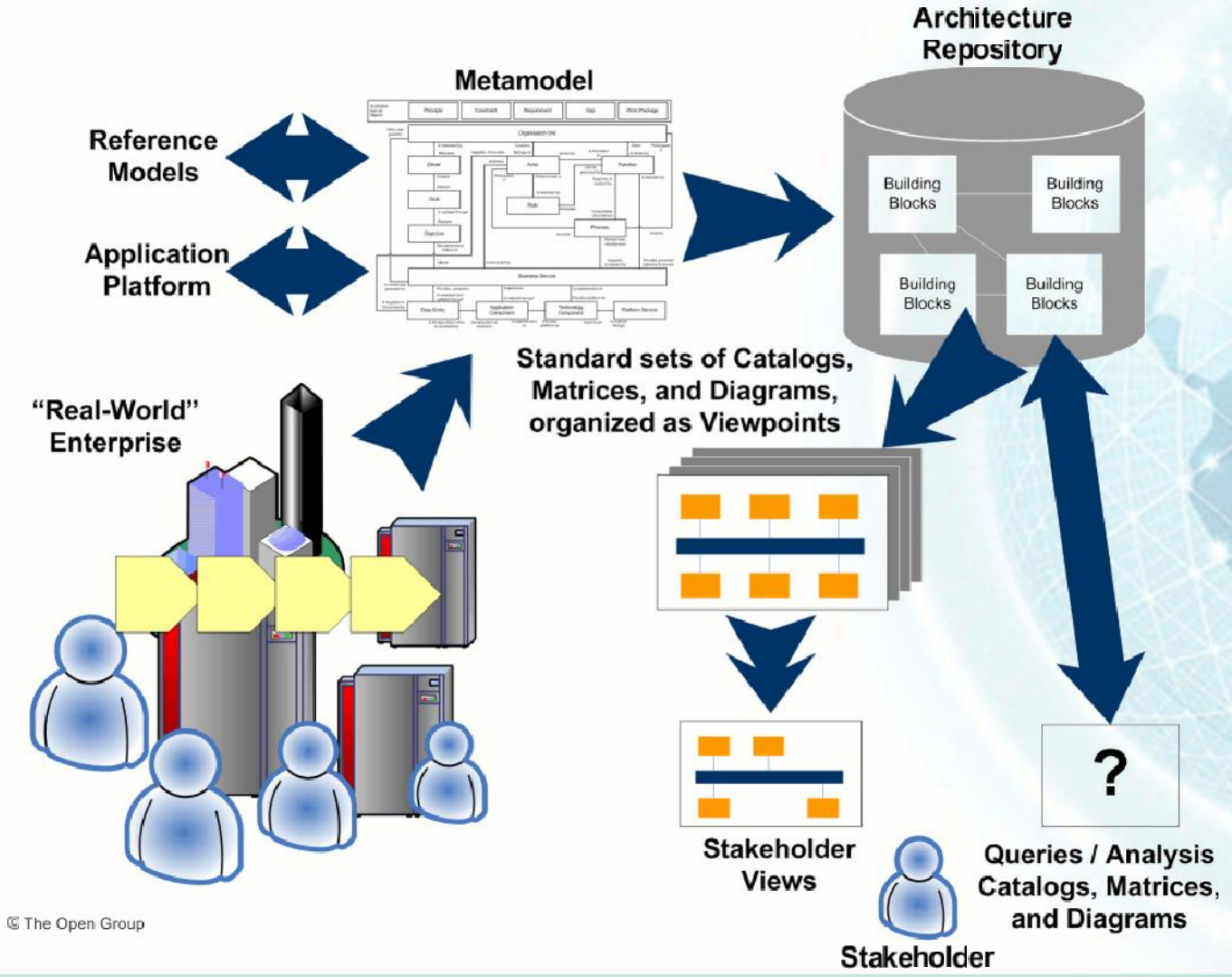
- What a *metamodel* is and why it is needed
- Key concepts of the Core Metamodel
- The division of the metamodel into Core and Extensions
- Key concepts of the Core Metamodel Entities
- The components of the TOGAF Content Metamodel

What is a metamodel?

- A metamodel is a precise definition of the constructs and rules needed for creating models
  - Source www.metamodel.com

- A model that describes how and with what the architecture will be described in a structured way.
  - TOGAF 9 *definitions*

Why a metamodel?



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Benefits of the Metamodel

The content metamodel provides a number of benefits:

- It formalizes the definition of an Enterprise Architecture
- It formalizes the relationship between objects
- It enables an EA tool mapping

Formal and Informal Modeling

- When defining architecture content there are choices to be made on the level of structure and formality
- In some cases very formal specific language is needed in order to articulate and govern in a precise or detailed way
- In other cases the use of formal engineering discipline will result in architecture content that is:
  - inappropriate for the audience
  - difficult to communicate

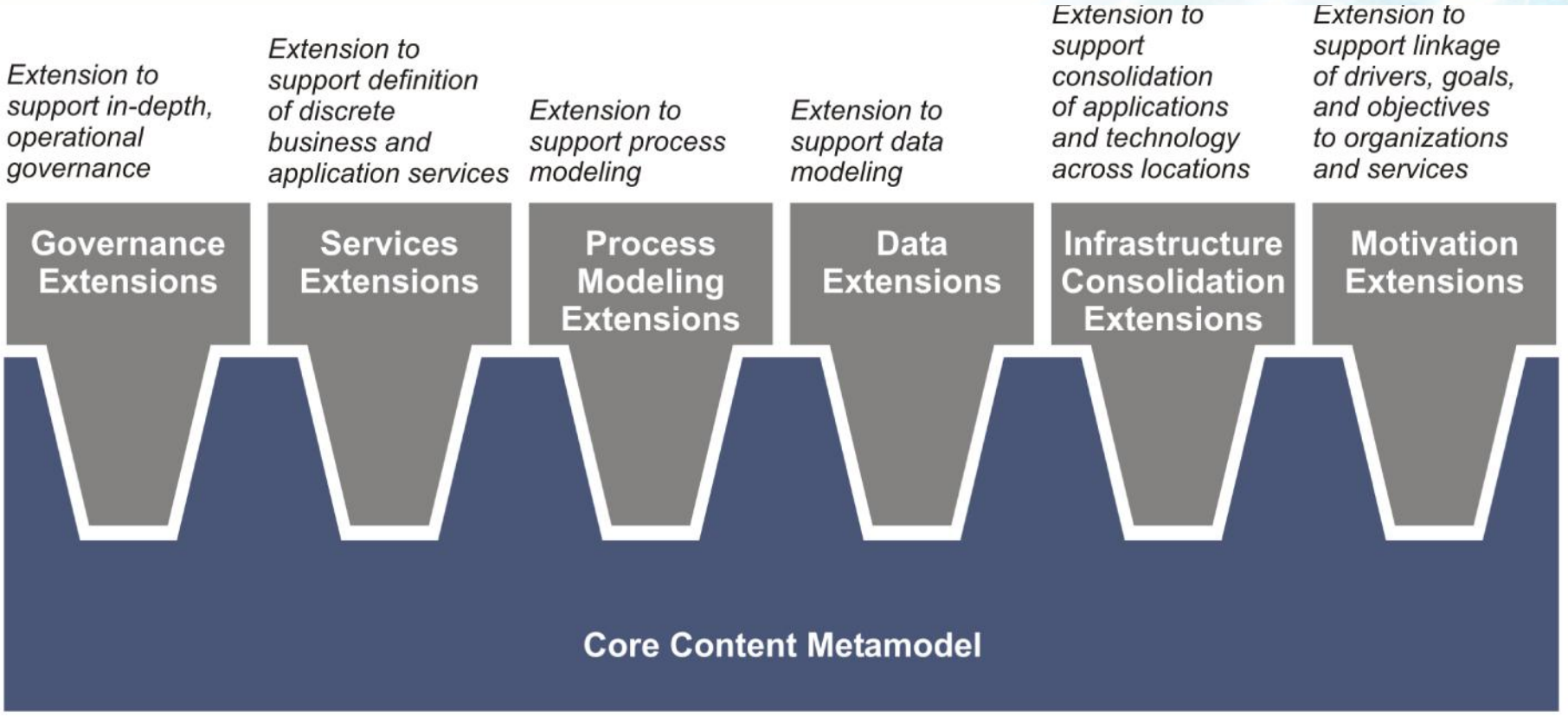
Core Content Metamodel Concepts

- A TOGAF architecture is based on
  - Defining architectural building blocks within architecture **catalogs**
  - Specifying the relationships between those building blocks in architecture **matrices**
  - And presenting communication **diagrams** that show in a precise way what the architecture is
- The metamodel is structured into **Core** and **Extension** content
  - Core content is designed not to be altered

Core and Extension Content

- In order to support many scenarios the metamodel has been partitioned into **core** and **extension** content
- The **core** provides a minimum set of architectural content to support traceability across artifacts
- The **extension** content allows for more specific or more in-depth modeling

TOGAF Content Metamodel and its Extensions



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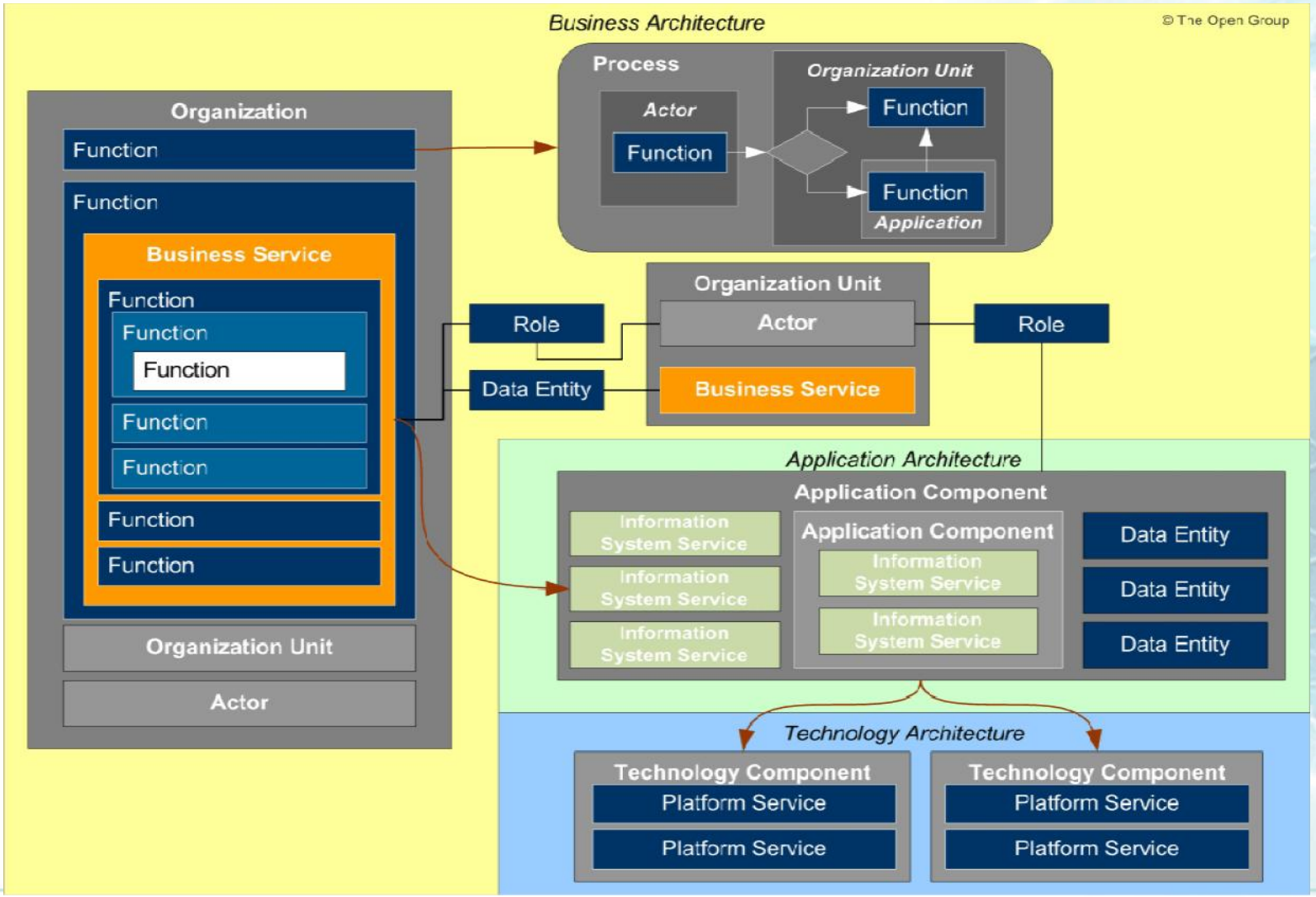
Core Metamodel Entities

- **Actor**: A person, organization, or system that is outside the consideration of the architecture model, but interacts with it.
- **Application Component**: An encapsulation of application functionality that is aligned to implementation structuring.
- **Business Service**: Supports business capabilities through an explicitly defined interface and is explicitly governed by an organization.
- **Data Entity**: An encapsulation of data that is recognized by a business domain expert as a discrete concept. Data entities can be tied to applications, repositories, and services and may be structured according to implementation considerations.
- **Function**: Delivers business capabilities closely aligned to an organization, but not explicitly governed by the organization.

Core Metamodel Entities (Cont'd)

- **Information System Service:** The automated elements of a business service. An information system service may deliver or support all of one or more business services.
- **Organization Unit**: A self-contained unit of resources with line management responsibility, goals, objectives, and measures. Organization units may include external parties and business partner organizations.
- **Platform Service**: A technical capability required to provide enabling infrastructure that supports the delivery of applications.
- **Role**: An actor assumes a role to perform a task.
- **Technology Component**: An encapsulation of technology infrastructure that represents a class of technology product or specific technology product.

Core Entities and their Relationships



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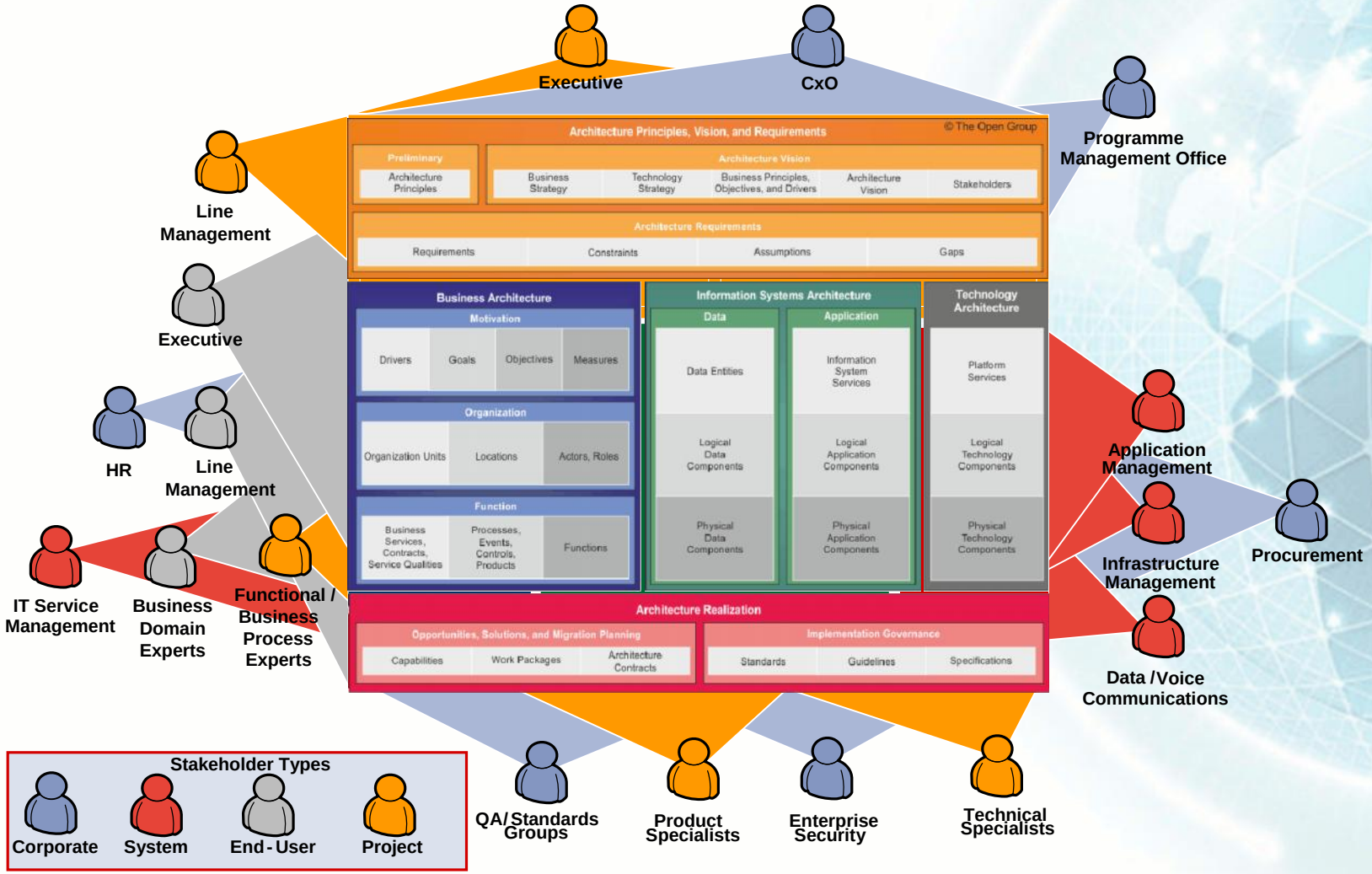
Stakeholder Needs



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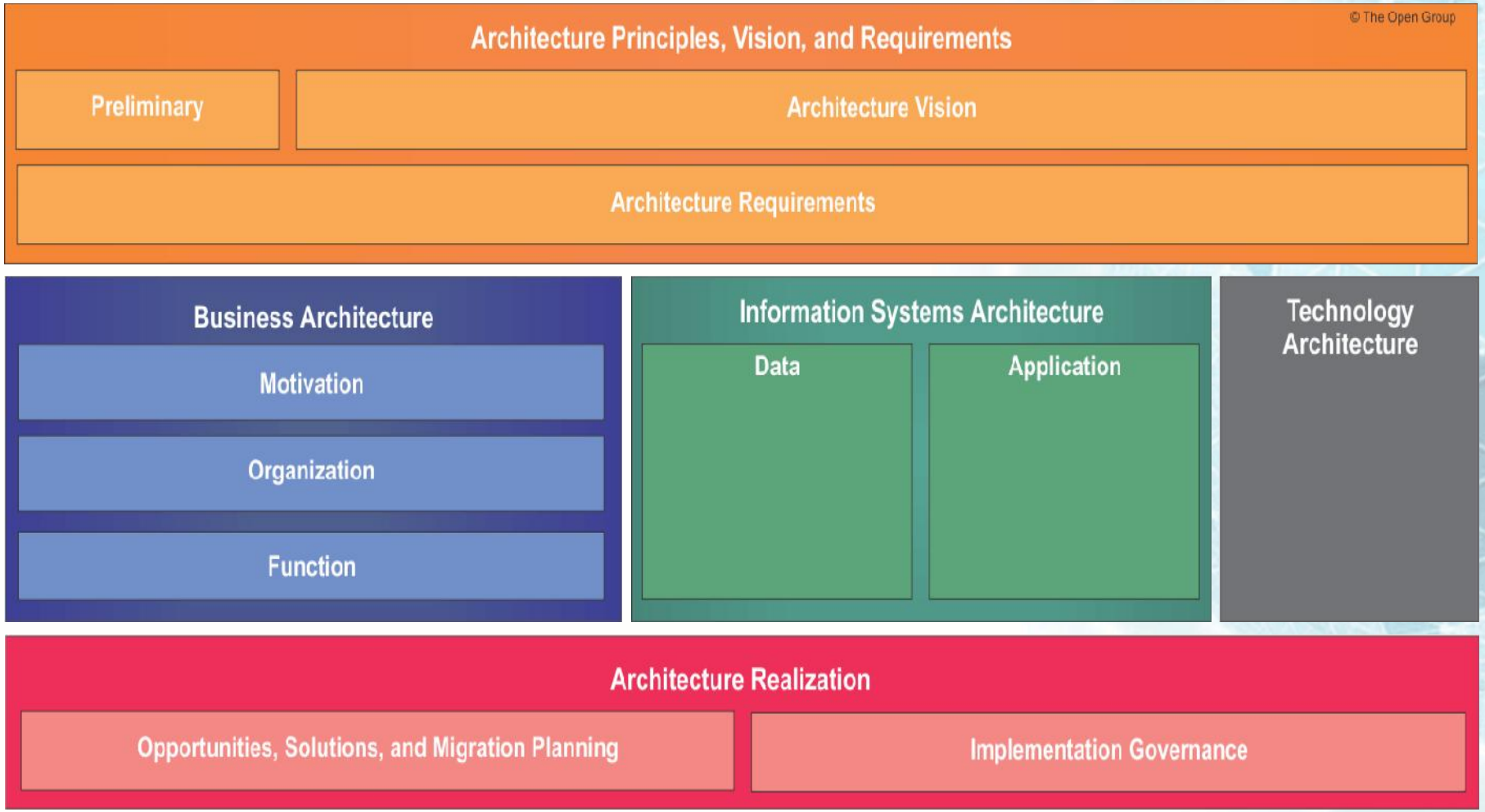
The Content Metamodel

The content metamodel provides definitions of all the types of building blocks that may exist, showing how they can be described and related to one another.

- When creating and managing architectures, it is necessary to consider concerns such as business services, actors, applications, data entities, and technology.
- The metamodel highlights these concerns, shows their relationships and identifies artifacts that can be used to represent them in a consistent way.
- The metamodel can also be used to provide guidance to organizations that wish to implement their architecture using an architecture tool.

Content Metamodel (Simplified)



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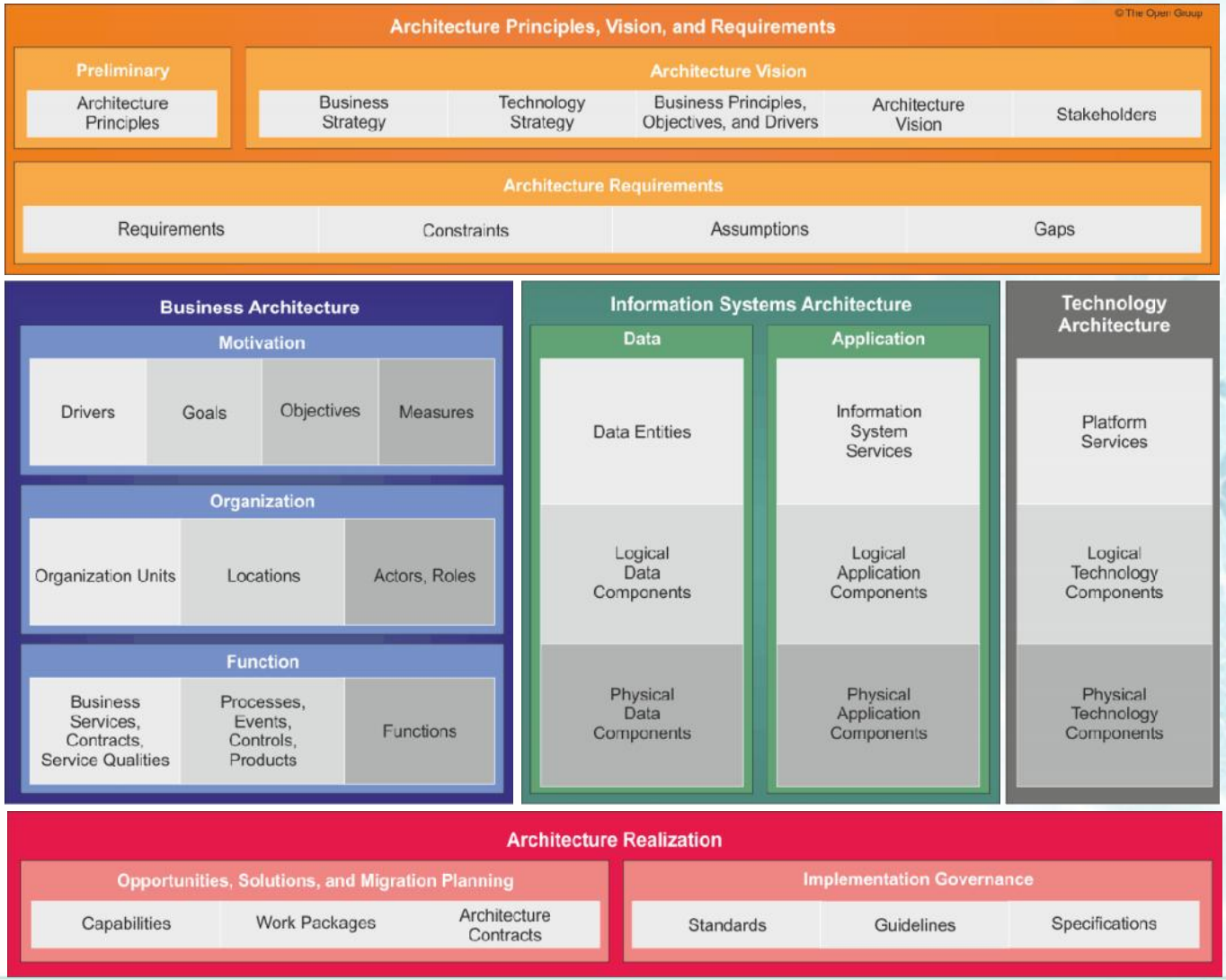
Content Metamodel (Detailed)



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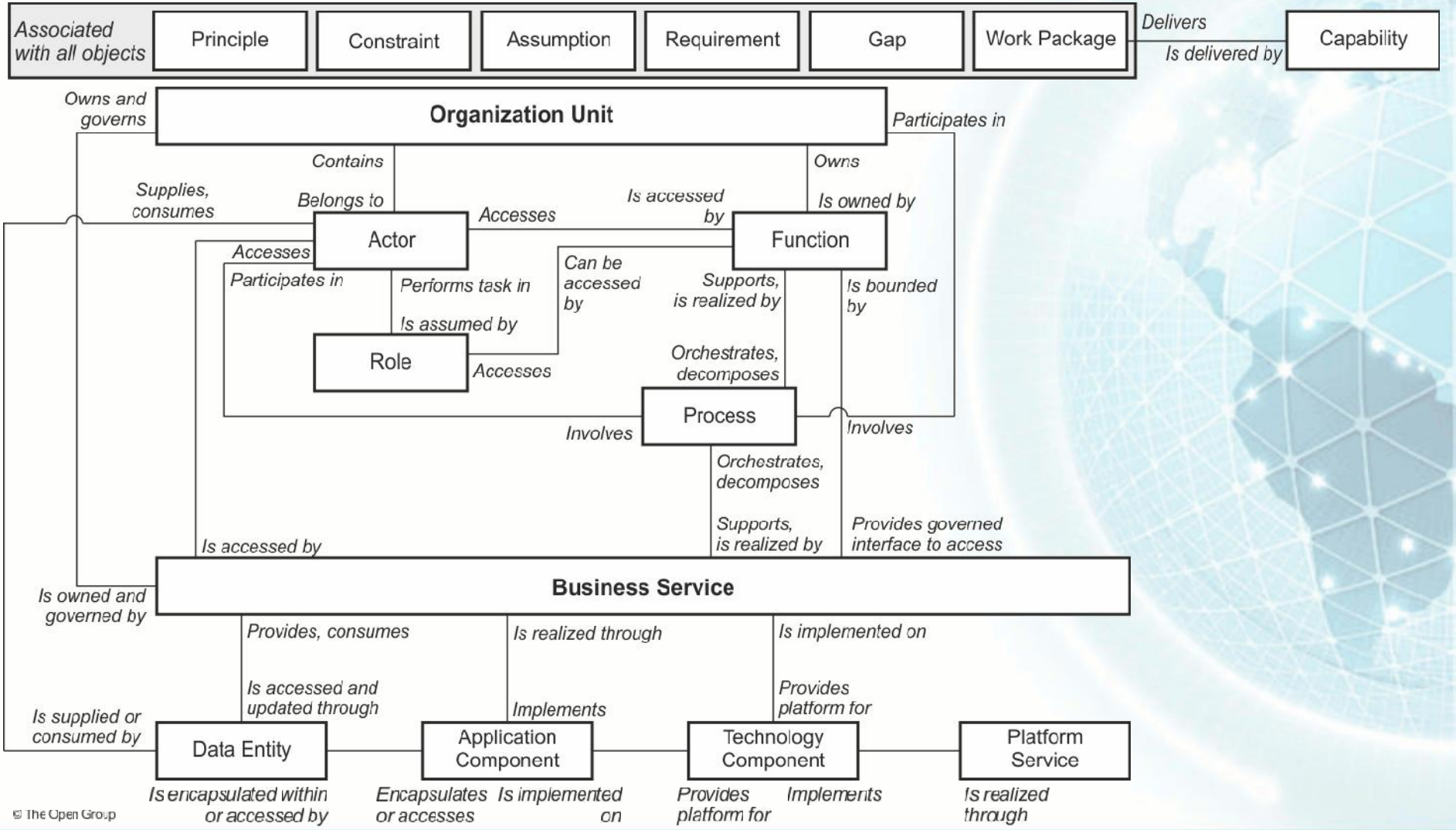
Core Content Metamodel



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Preliminary Phase • Principles catalog	**Phase A, Architecture Vision** • Stakeholder Map Matrix • Solution Concept diagram • Value Chain diagram		
Requirements Management • Requirements catalog			
Phase B, Business Architecture • Organization/Actor catalog • Driver/Goal/Objective catalog • Role catalog • Business Service/Function catalog • Location catalog • Process/Event/Control/Product catalog • Contract/Measure catalog • Business Interaction matrix • Actor/Role matrix • Business Footprint diagram • Business Service/Information diagram • Functional Decomposition diagram • Product Lifecycle diagram	**Phase C, Data Architecture** • Data Entity/Data Component catalog • Data Entity/Business Function matrix • Application/Data matrix • Logical Data diagram • Data Dissemination diagram	**Phase C, Application Architecture** • Application Portfolio catalog • Interface catalog • Application/Organization matrix • Role/Application matrix • Application/Function matrix • Application Interaction matrix • Application Communication diagram • Application and User Location diagram • Application Use-Case diagram	**Phase D, Technology Architecture** • Technology Standards catalog • Technology Portfolio catalog • System/Technology matrix • Environments and Locations diagram • Platform Decomposition diagram
Phase E. Opportunities & Solutions • Project Context diagram • Benefits diagram			

Core TOGAF 9 Artifacts

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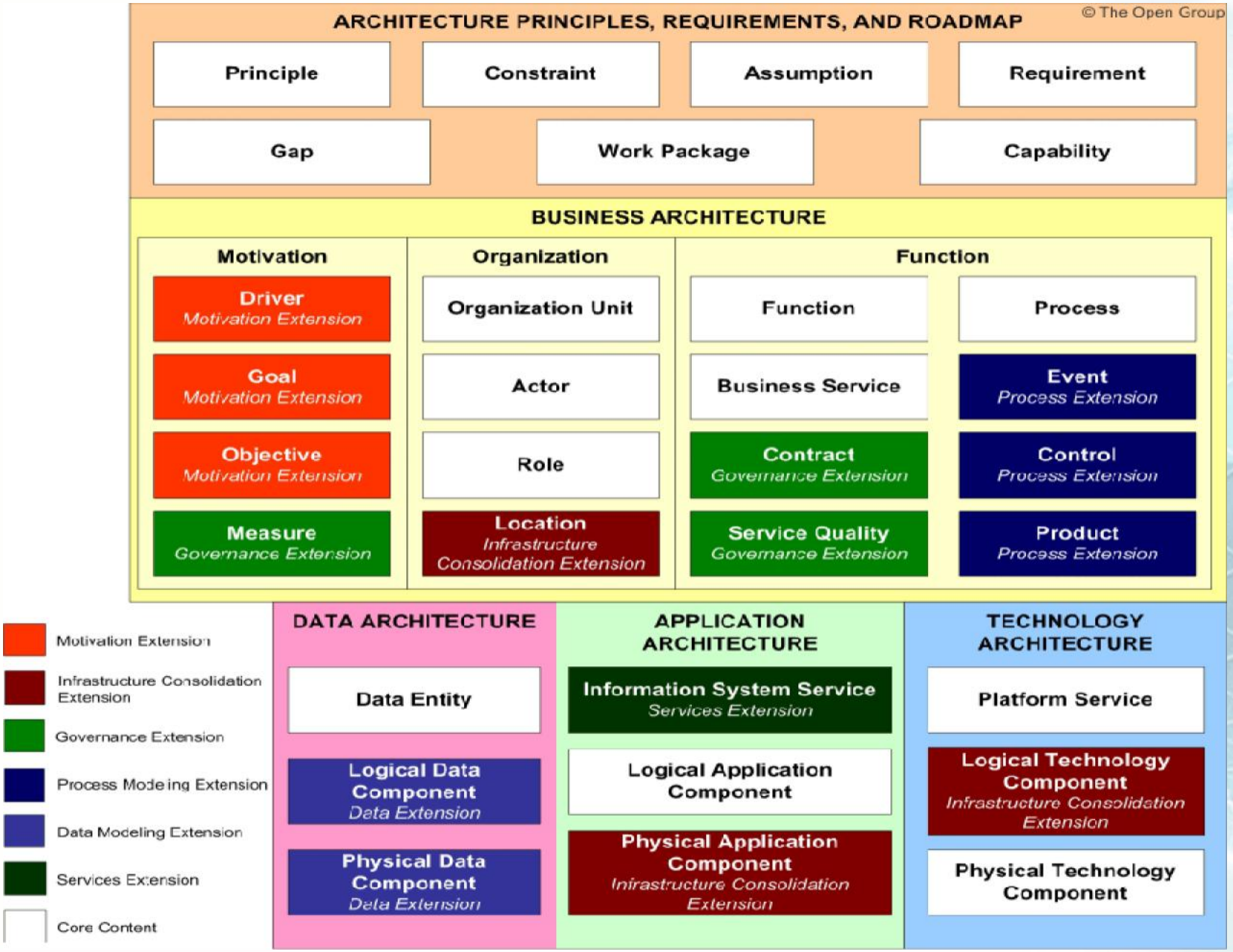
ARCHITECTURE PRINCIPLES, REQUIREMENTS, AND ROADMAP
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Principle
Constraint
Assumption
Requirement
Gap
Work Package
Capability
BUSINESS ARCHITECTURE
Motivation
Organization
Function
Driver
Motivation Extension
Goal
Motivation Extension
Objective
Motivation Extension
Measure
Governance Extension
Organization Unit
Actor
Role
Location
Infrastructure Consolidation Extension
Function
Process
Business Service
Event
Process Extension
Contract
Governance Extension
Control
Process Extension
Service Quality
Governance Extension
Product
Process Extension
Motivation Extension
Infrastructure Consolidation Extension
Governance Extension
Process Modeling Extension
Data Modeling Extension
Services Extension
Core Content
DATA ARCHITECTURE
Data Entity
Logical Data Component
Data Extension
Physical Data Component
Data Extension
APPLICATION ARCHITECTURE
Information System Service
Services Extension
Logical Application Component
Physical Application Component
Infrastructure Consolidation Extension
TECHNOLOGY ARCHITECTURE
Platform Service
Logical Technology Component
Infrastructure Consolidation Extension
Physical Technology Component

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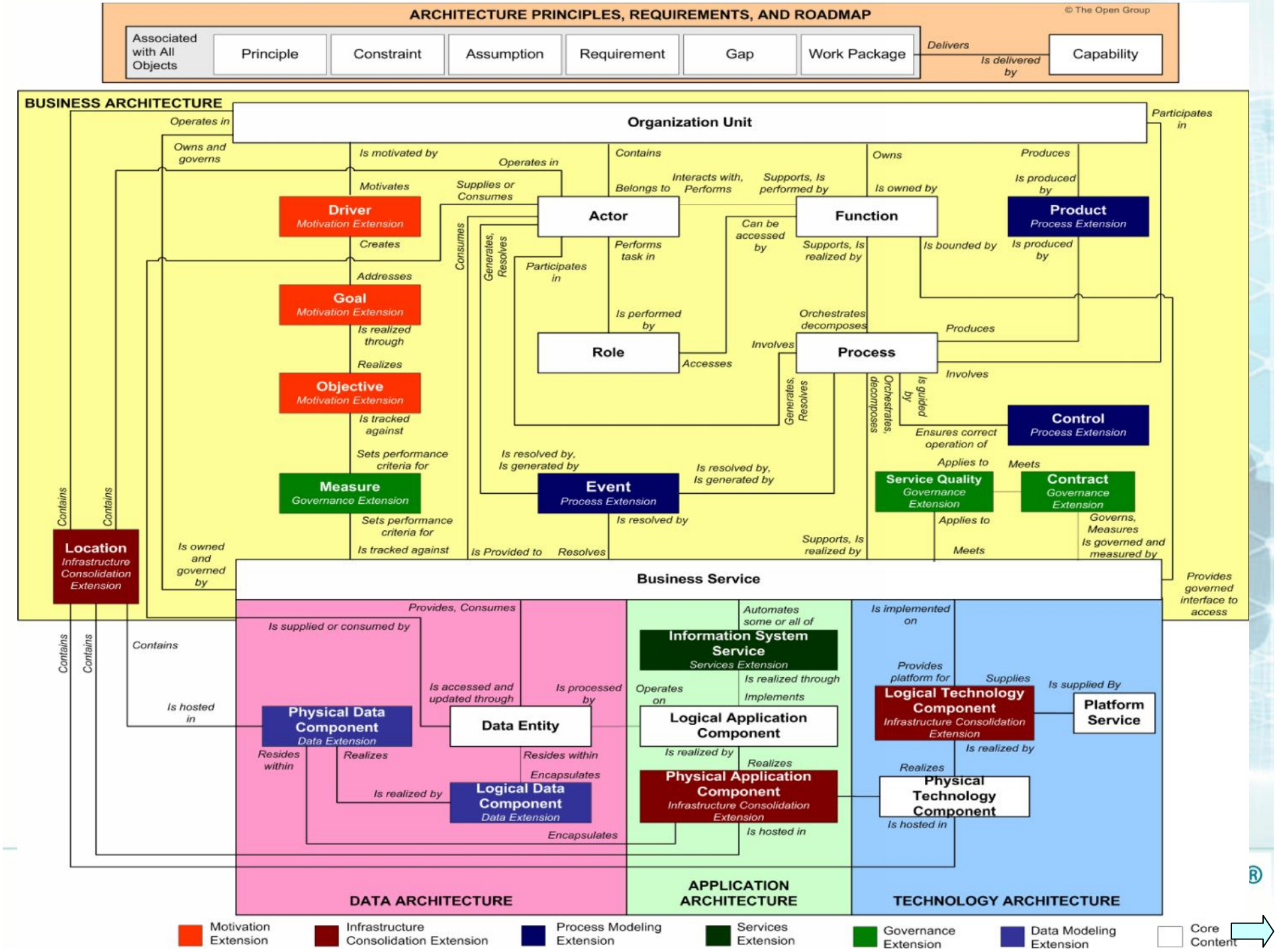
ARCHITECTURE PRINCIPLES, REQUIREMENTS, AND ROADMAP
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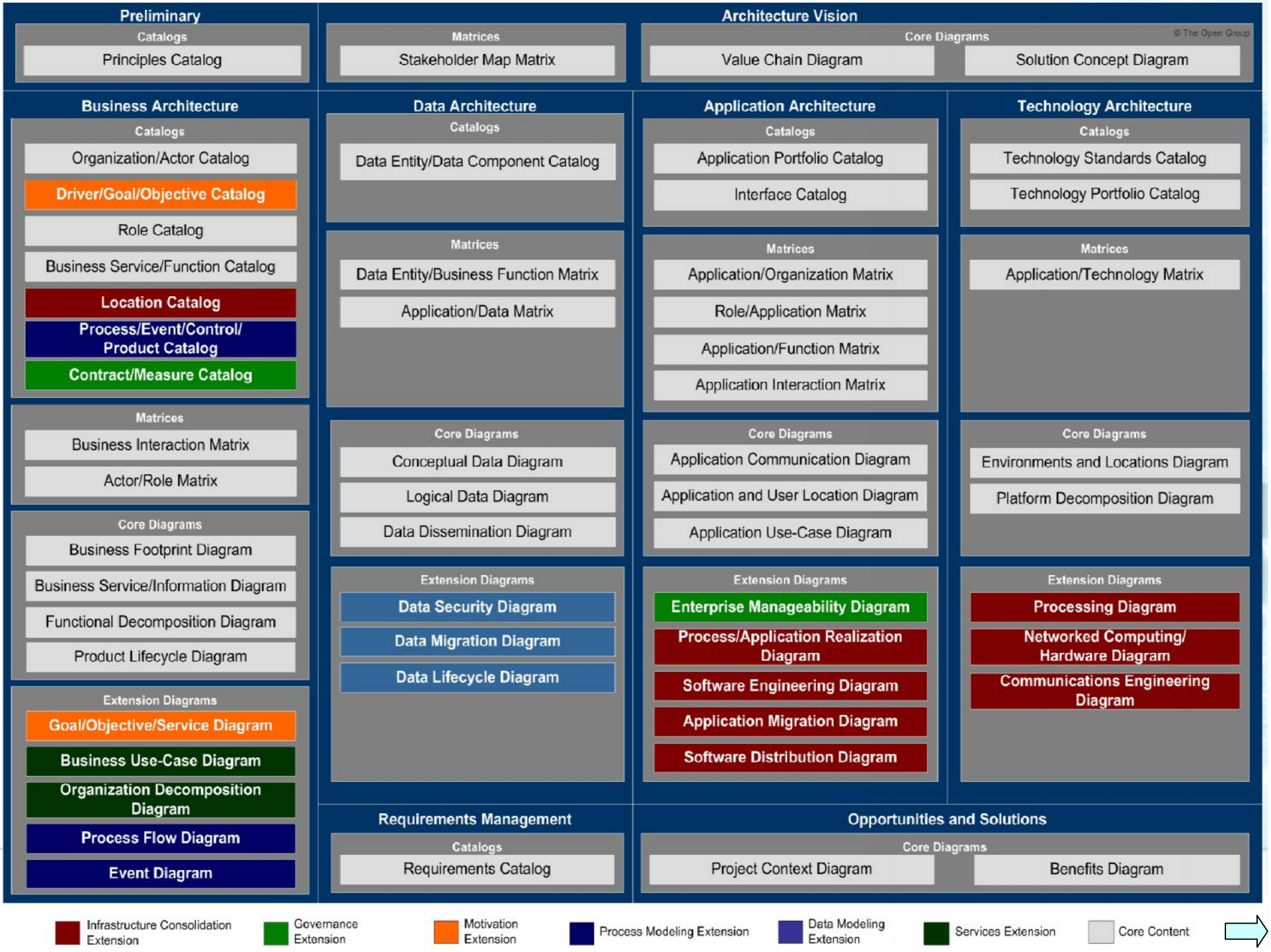
Associated with All Objects
Principle
Constraint
Assumption
Requirement
Gap
Work Package
Delivers
Is delivered by
Capability
BUSINESS ARCHITECTURE
Organization Unit
Operates in
Participates in
Owns and governs
Is motivated by
Operates in
Contains
Owns
Produces
Motivates
Supplies or Consumes
Belongs to
Interacts with, Performs
Supports, Is performed by
Is owned by
Is produced by
Driver
Motivation Extension
Actor
Function
Product
Process Extension
Creates
Consumes
Generates, Resolves
Performs task in
Can be accessed by
Supports, Is realized by
Is bounded by
Is produced by
Addresses
Participates in
Goal
Motivation Extension
Is realized through
Is performed by
Orchestrates decomposes
Produces
Role
Involves
Process
Realizes
Accesses
Involves
Objective
Motivation Extension
Is tracked against
Generates, Resolves
Orchestrates, decomposes
Is guided by
Control
Process Extension
Sets performance criteria for
Is resolved by, Is generated by
Ensures correct operation of
Applies to
Meets
Measure
Governance Extension
Event
Process Extension
Is resolved by, Is generated by
Service Quality
Governance Extension
Contract
Governance Extension
Contains
Contains
Sets performance criteria for
Is resolved by
Applies to
Governs, Measures
Location
Infrastructure Consolidation Extension
Is owned and governed by
Is Provided to
Resolves
Supports, Is realized by
Meets
Is governed and measured by
Business Service
Provides governed interface to access
Provides, Consumes
Is supplied or consumed by
Automates some or all of
Is implemented on
Contains
Contains
Contains
Information System Service
Services Extension
Provides platform for
Supplies
Is supplied By
Is accessed and updated through
Is processed by
Operates on
Is realized through
Implements
Logical Technology Component
Infrastructure Consolidation Extension
Platform Service
Is hosted in
Physical Data Component
Data Extension
Data Entity
Logical Application Component
Is realized by
Is realized by
Resides within
Realizes
Resides within
Realizes
Realizes
Encapsulates
Physical Application Component
Infrastructure Consolidation Extension
Physical Technology Component
Is realized by
Logical Data Component
Data Extension
Is hosted in
Is hosted in
Encapsulates
DATA ARCHITECTURE
APPLICATION ARCHITECTURE
TECHNOLOGY ARCHITECTURE
Motivation Extension
Infrastructure Consolidation Extension
Process Modeling Extension
Services Extension
Governance Extension
Data Modeling Extension
Core Content


Preliminary
Catalogs
Principles Catalog
Architecture Vision
Matrices
Stakeholder Map Matrix
Core Diagrams
Value Chain Diagram
Solution Concept Diagram
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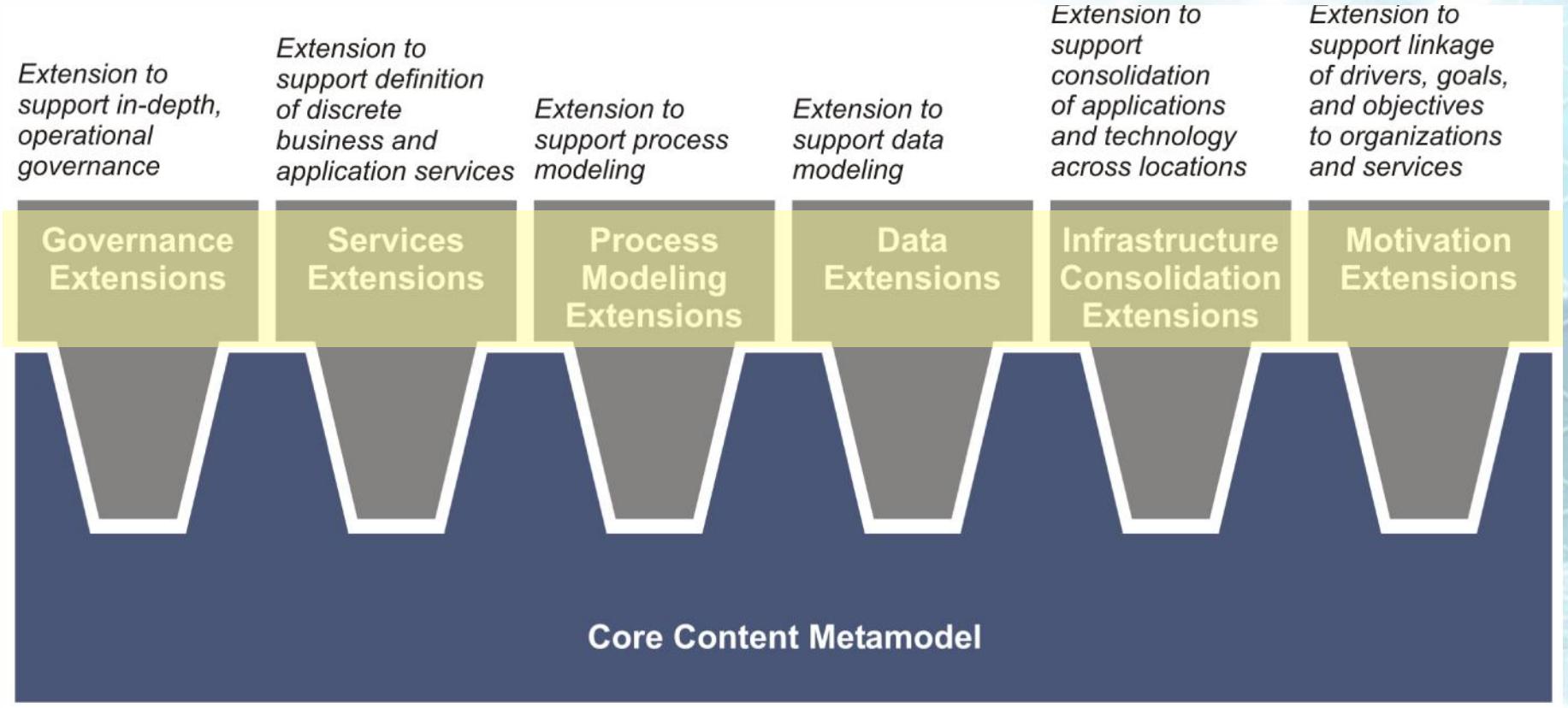
Business Architecture
Catalogs
Organization/Actor Catalog
Driver/Goal/Objective Catalog
Role Catalog
Business Service/Function Catalog
Location Catalog
Process/Event/Control/ Product Catalog
Contract/Measure Catalog
Matrices
Business Interaction Matrix
Actor/Role Matrix
Core Diagrams
Business Footprint Diagram
Business Service/Information Diagram
Functional Decomposition Diagram
Product Lifecycle Diagram
Extension Diagrams
Goal/Objective/Service Diagram
Business Use-Case Diagram
Organization Decomposition Diagram
Process Flow Diagram
Event Diagram
Data Architecture
Catalogs
Data Entity/Data Component Catalog
Matrices
Data Entity/Business Function Matrix
Application/Data Matrix
Core Diagrams
Conceptual Data Diagram
Logical Data Diagram
Data Dissemination Diagram
Extension Diagrams
Data Security Diagram
Data Migration Diagram
Data Lifecycle Diagram
Application Architecture
Catalogs
Application Portfolio Catalog
Interface Catalog
Matrices
Application/Organization Matrix
Role/Application Matrix
Application/Function Matrix
Application Interaction Matrix
Core Diagrams
Application Communication Diagram
Application and User Location Diagram
Application Use-Case Diagram
Extension Diagrams
Enterprise Manageability Diagram
Process/Application Realization Diagram
Software Engineering Diagram
Application Migration Diagram
Software Distribution Diagram
Technology Architecture
Catalogs
Technology Standards Catalog
Technology Portfolio Catalog
Matrices
Application/Technology Matrix
Core Diagrams
Environments and Locations Diagram
Platform Decomposition Diagram
Extension Diagrams
Processing Diagram
Networked Computing/ Hardware Diagram
Communications Engineering Diagram
Requirements Management
Catalogs
Requirements Catalog
Opportunities and Solutions
Core Diagrams
Project Context Diagram
Benefits Diagram
Infrastructure Consolidation Extension
Governance Extension
Motivation Extension
Process Modeling Extension
Data Modeling Extension
Services Extension
Core Content

Metamodel Extensions



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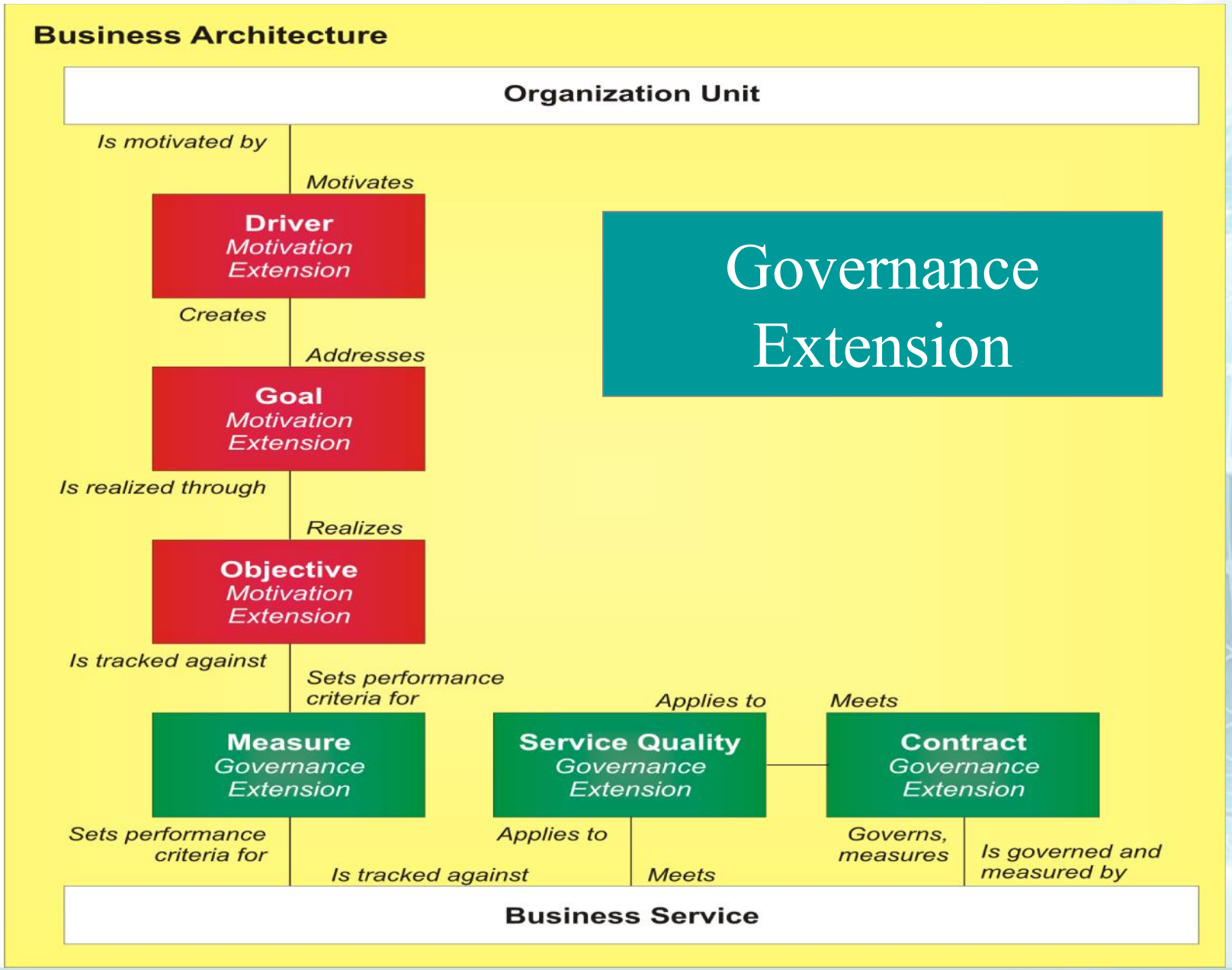

Governance Extension

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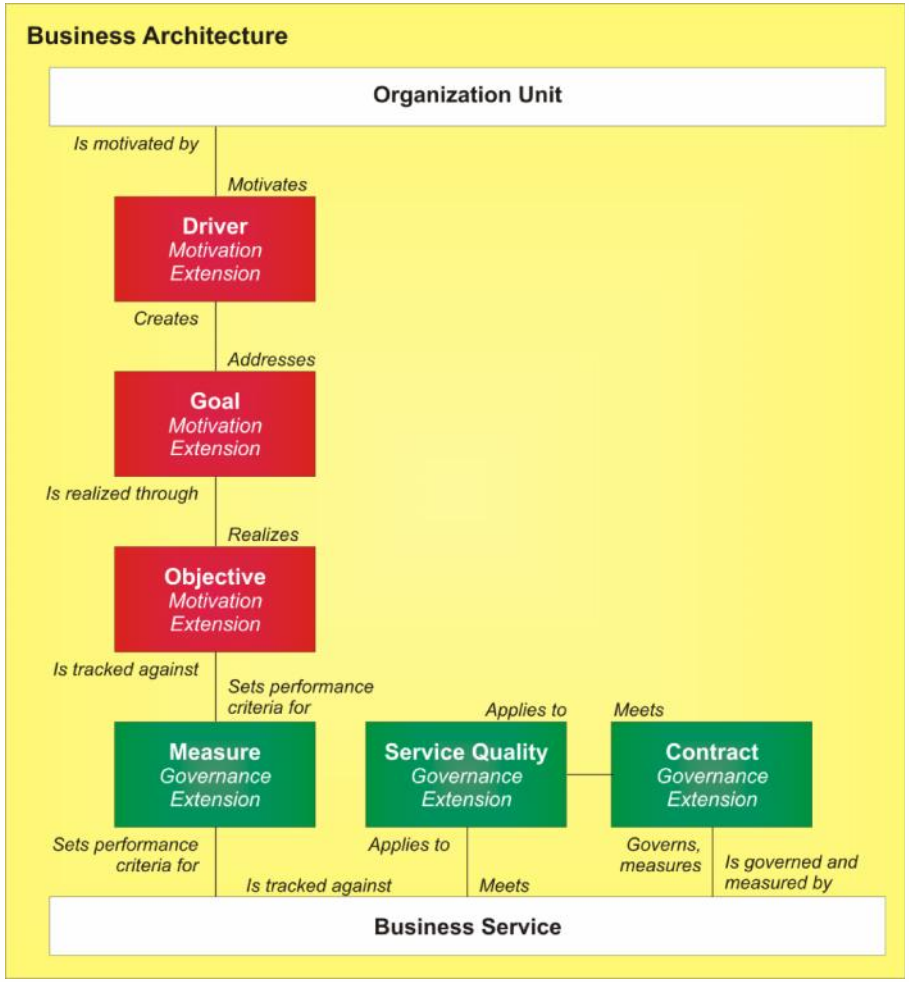
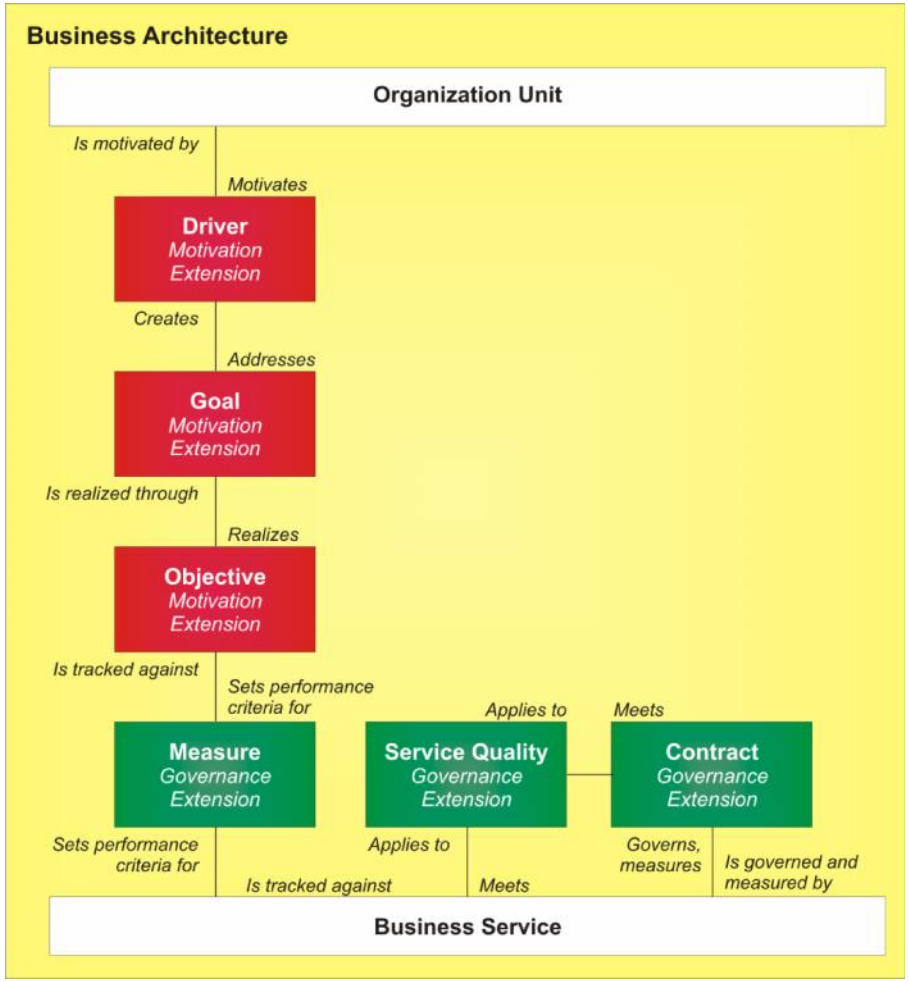
Governance Extension



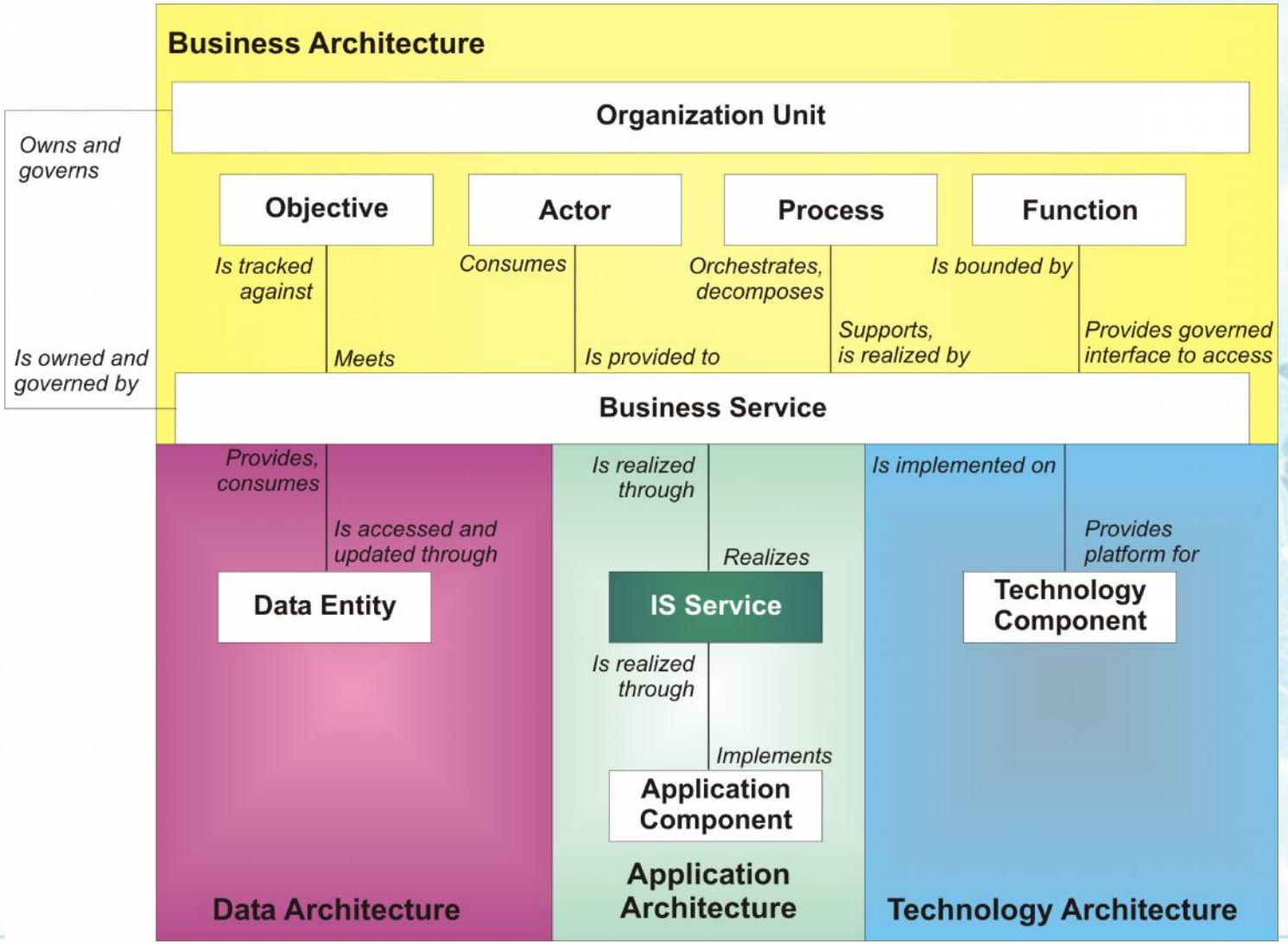
- Scope:
  - The ability to apply measures to objectives and then link those measures to services
  - The ability to apply contracts to service communication or service interactions with external users and systems
  - The ability to define re-usable service qualities defining a service-level profile that can be used in contracts
  - Creation of additional diagrams to show ownership and management of systems
- Additional diagrams to be created:
  - Enterprise Manageability diagram

Governance Extension



- This extension should be used in the following situations:
  - When an organization is considering IT change that will result in a significant impact to existing operational governance models
  - When an organization has granular requirements for service levels that differ from service to service
  - When an organization is looking to transform its operational governance practice

Services Extension



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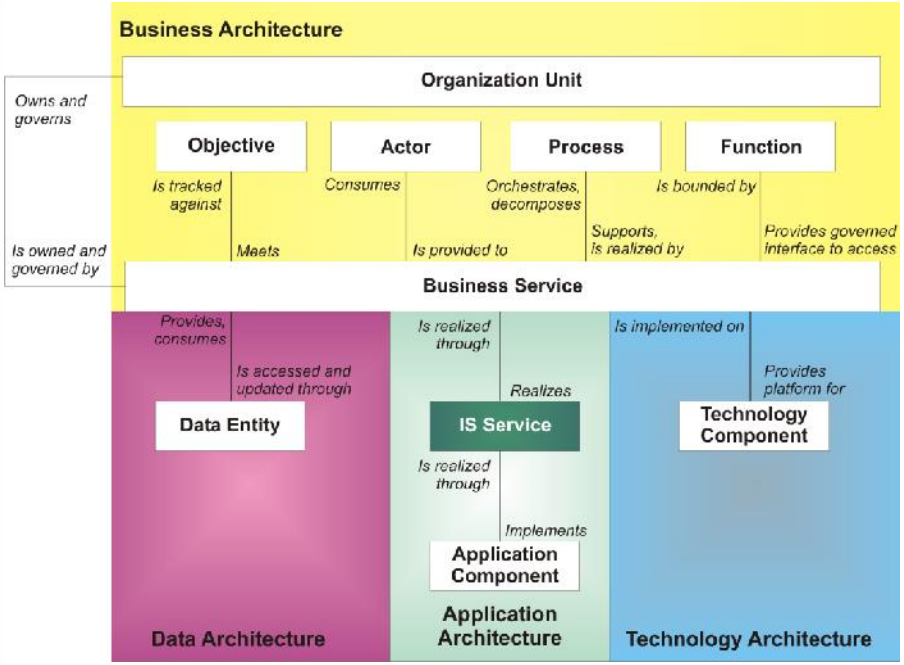
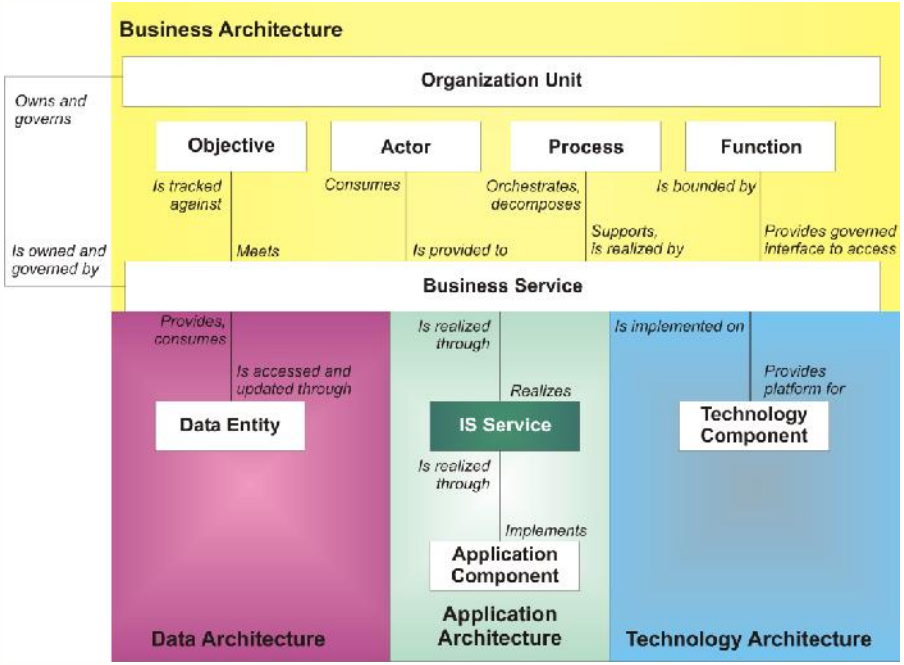
Services Extension



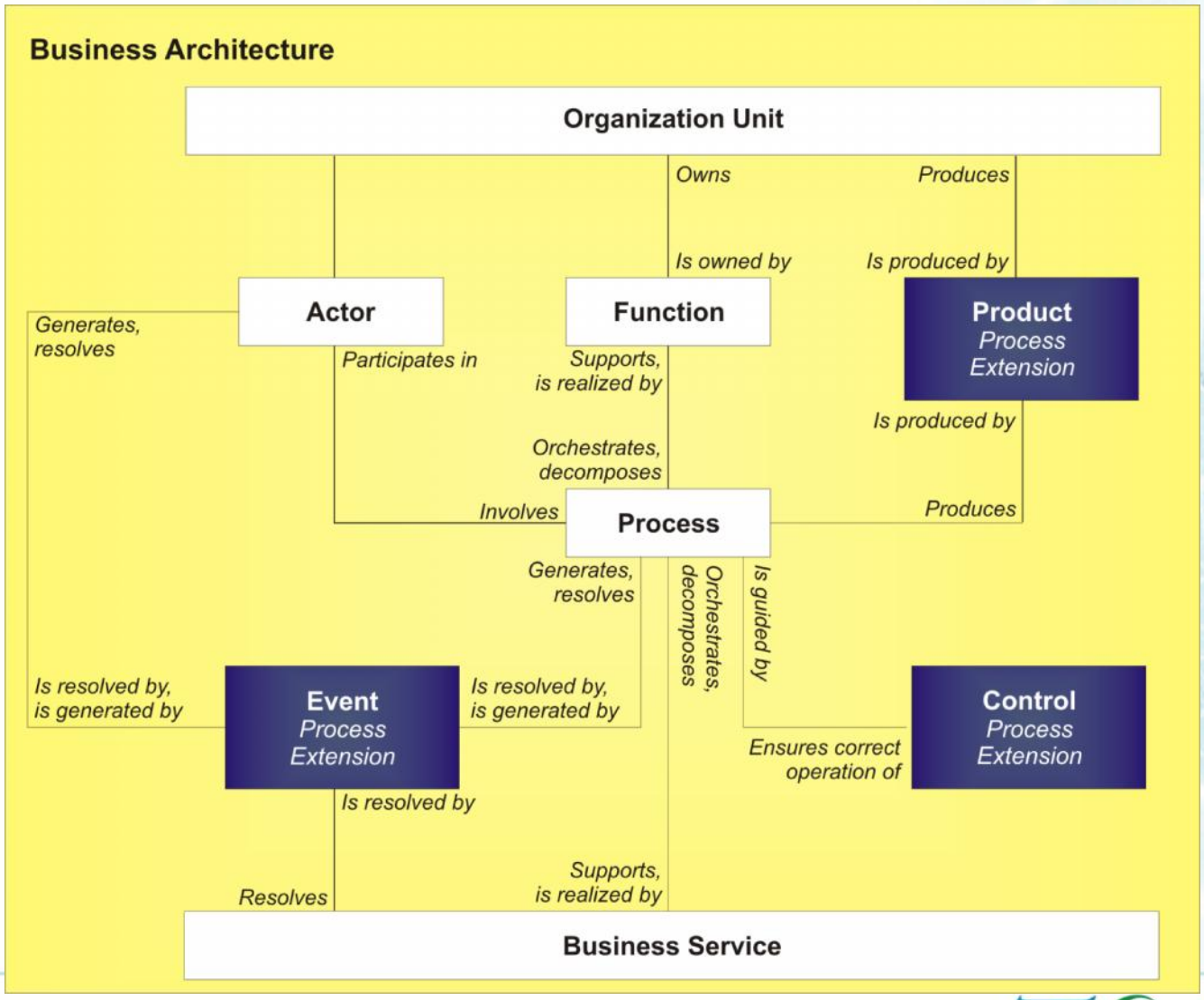
- Scope:
  - Creation of IS services as an extension of business service
- Additional diagrams to be created:
  - Business Use-Case Diagram
  - Organization Decomposition Diagram

Services Extension



- This extension should be used in the following situations:
  - When the business has a preset definition of its services that does not align well to technical and architectural needs
  - When business and IT use different language to describe similar capabilities
  - Where IT service is misaligned with business need, particularly around the areas of quality of service, visibility of performance, and management granularity
  - Where IT is taking initial steps to engage business in discussions about IT architecture

Process Modeling Extension



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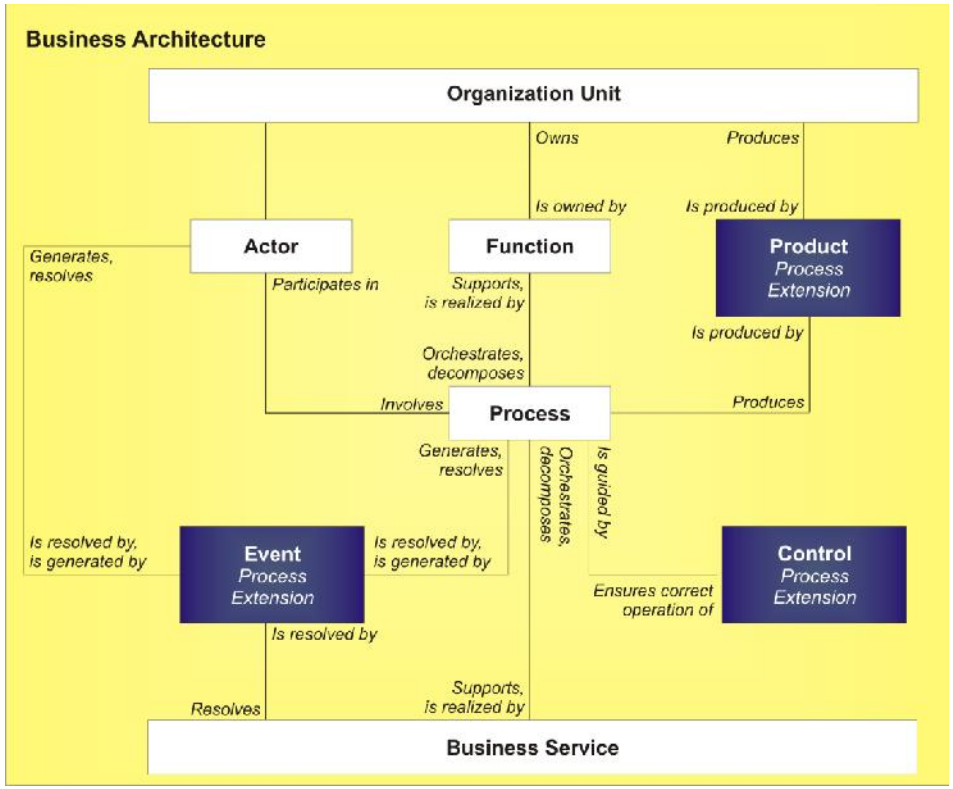
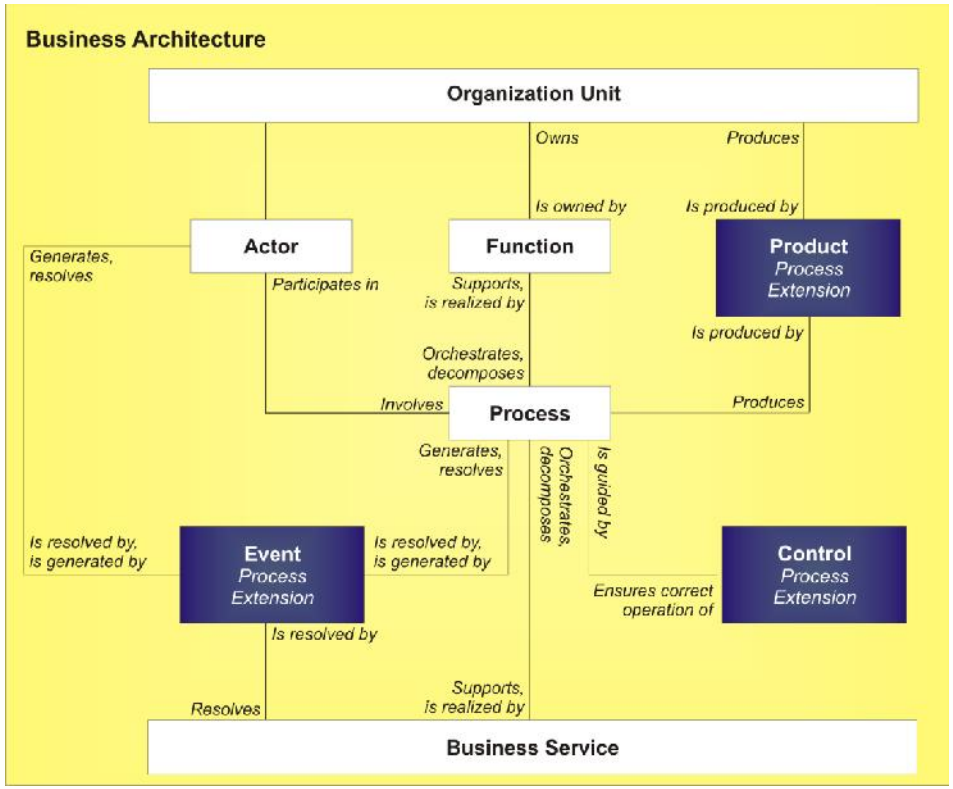
Process Modeling Extension



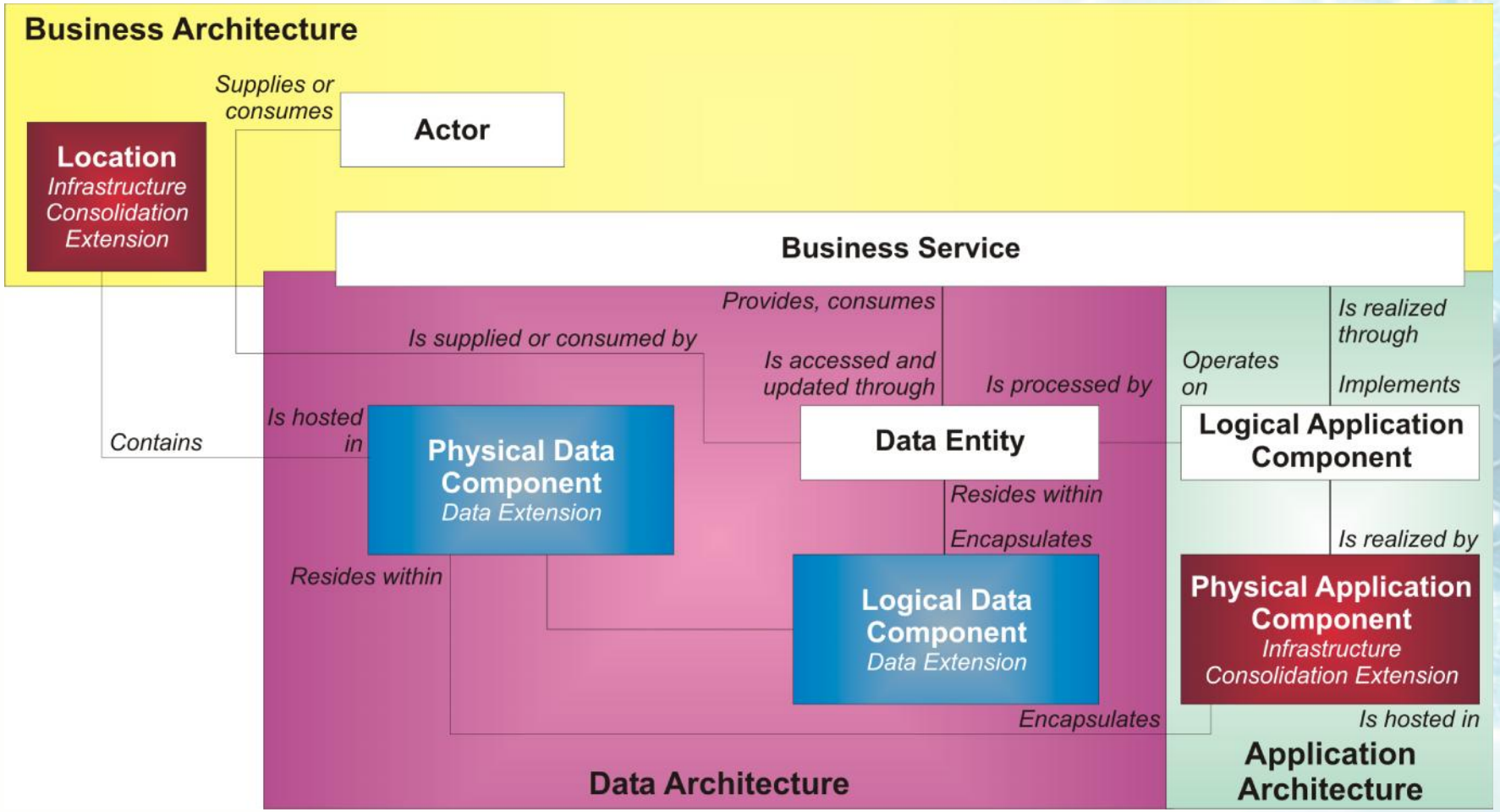
- Scope:
  - Creation of events as triggers for processes
  - Creation of controls that business logic and governance gates for process execution
  - Creation of products to represent the output of a process
  - Creation of event diagrams to track triggers and state changes across the organization
- Additional diagrams to be created:
  - Process Flow diagrams
  - Event diagrams

Process Modeling Extension



- This extension should be used in the following situations:
  - Where the architecture must pay specific attention to state and events
  - Where the architecture is required to explicitly identify and store process control steps; for example, to support regulatory compliance
  - Where the architecture features critical or elaborate process flows

Data Extension



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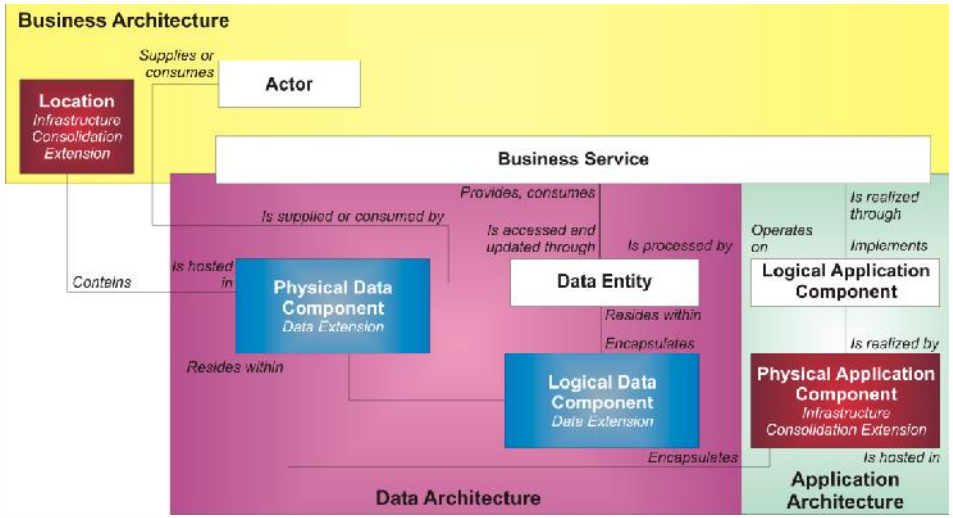
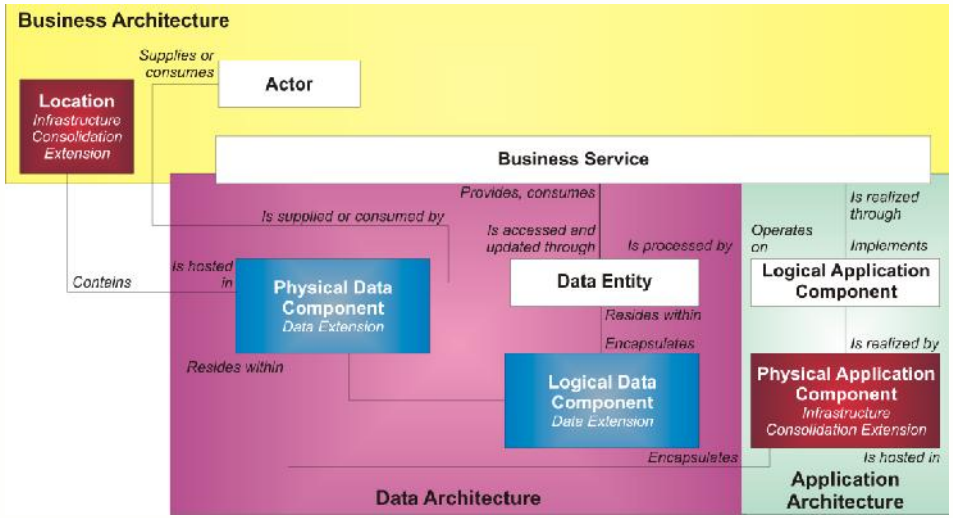
Data Extension



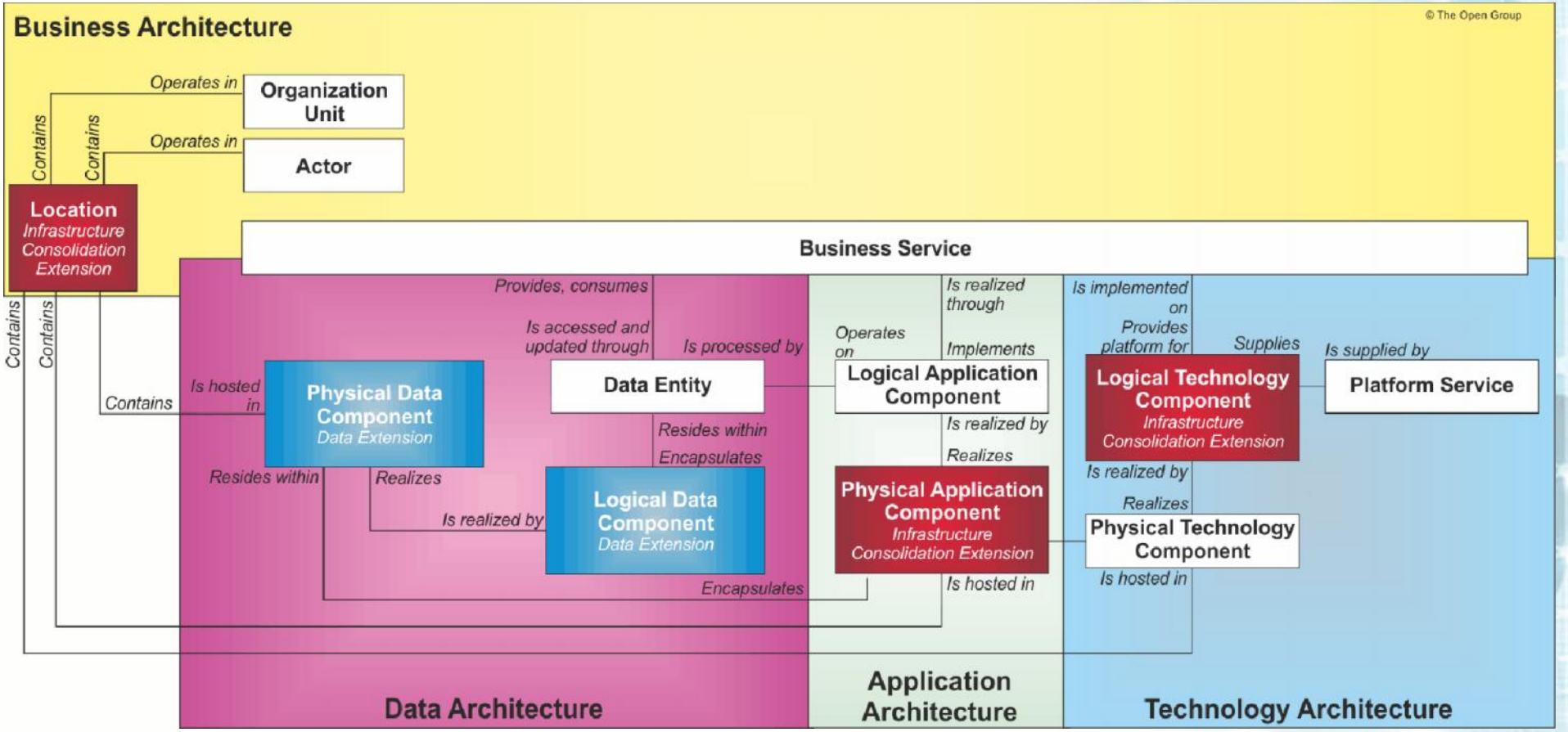
- Scope:
  - Creation of logical data components that group data entities into encapsulated modules for governance, security, and deployment purposes
  - Creation of physical data components that implement logical data components; analogous to databases, registries, repositories, schemas, and other techniques of segmenting data
  - Creation of data lifecycle, data security, and data migration diagrams to show data concerns in more detail
- Additional diagrams to be created: :
  - Data Security diagram
  - Class Hierarchy diagram
  - Data Migration diagram
  - Data Lifecycle diagram

Data Extension



- This extension should be used in the following situations:
  - Where the architecture features significant complexity and risk around the location, encapsulation, and management of or access to data

Infrastructure Consolidation Extension



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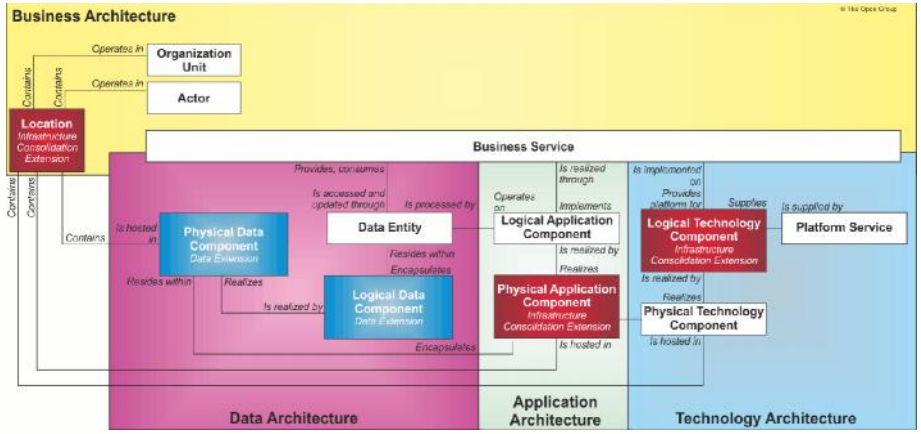
Infrastructure Consolidation Extension



- **Additional diagrams to be created:**
  - Process/System Realization diagram
  - Software Engineering diagram
  - Application Migration diagram
  - Software Distribution diagram
  - Processing diagram
  - Networked Computing/Hardware diagram
  - Communications Engineering diagram

- Scope:
  - Creation of a location entity to hold the location of IT assets and external consumers of service
  - Creation of logical and physical application components to abstract the capability of an application away from the actual applications in existence
  - Creation of logical and physical application components to abstract product type from the actual technology products in existence
  - Creation of additional diagrams focusing on the location of assets, compliance with standards, structure of applications, application migration, and infrastructure configuration

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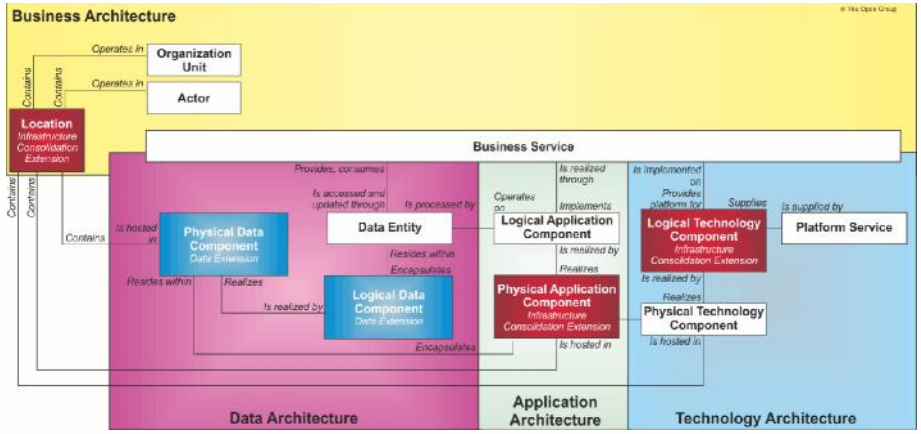
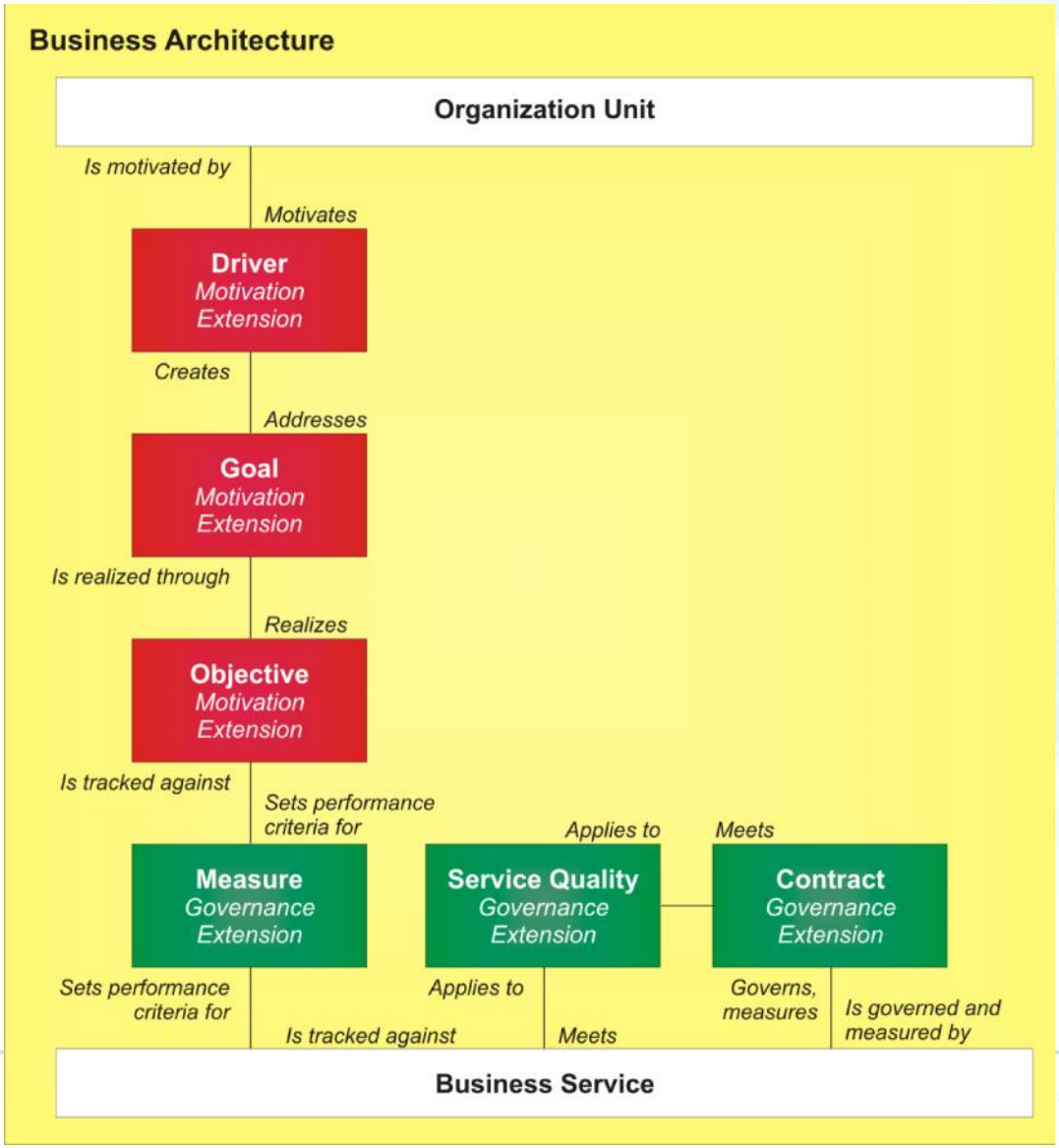
Infrastructure Consolidation Extension



- This extension should be used in the following situations:
  - Where many technology products are in place with duplicate or overlapping capability
  - Where many applications are in place with duplicate or overlapping functionality
  - Where applications are geographically dispersed and the decision logic for determining the location of an application is not well understood
  - When applications are going to be migrated into a consolidated platform
  - When application features are going to be migrated into a consolidated application

Motivation Extension



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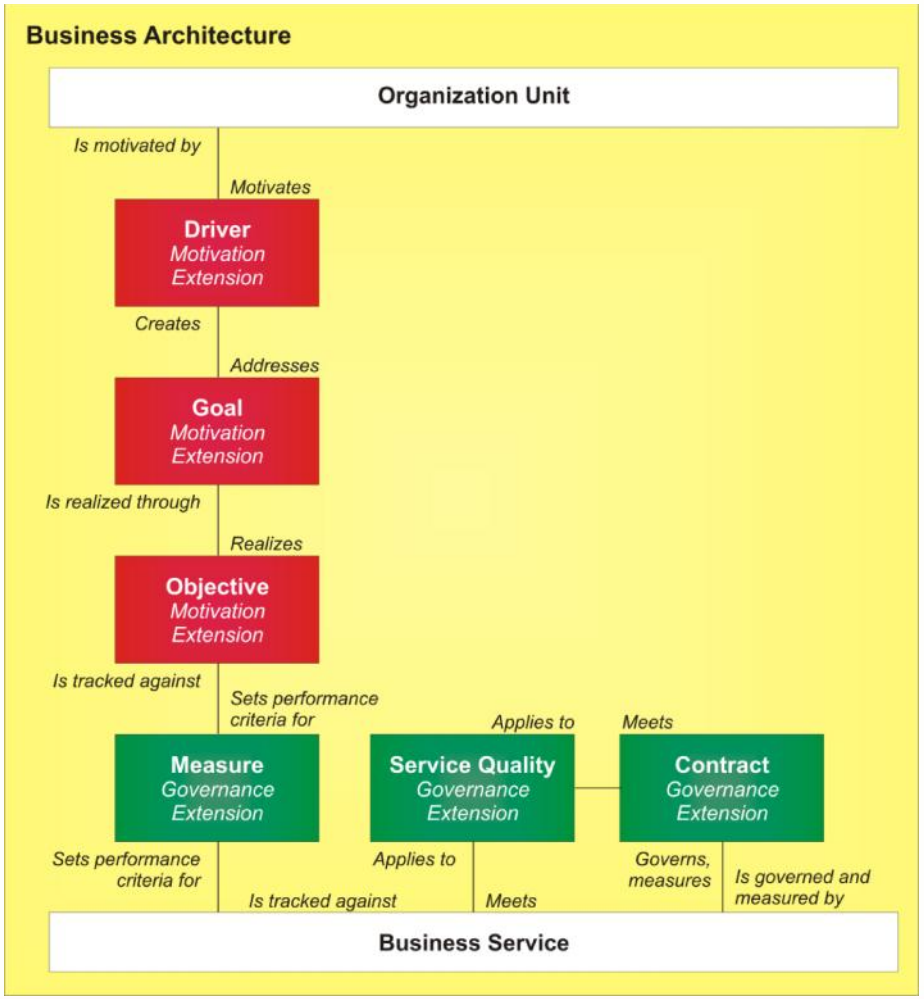
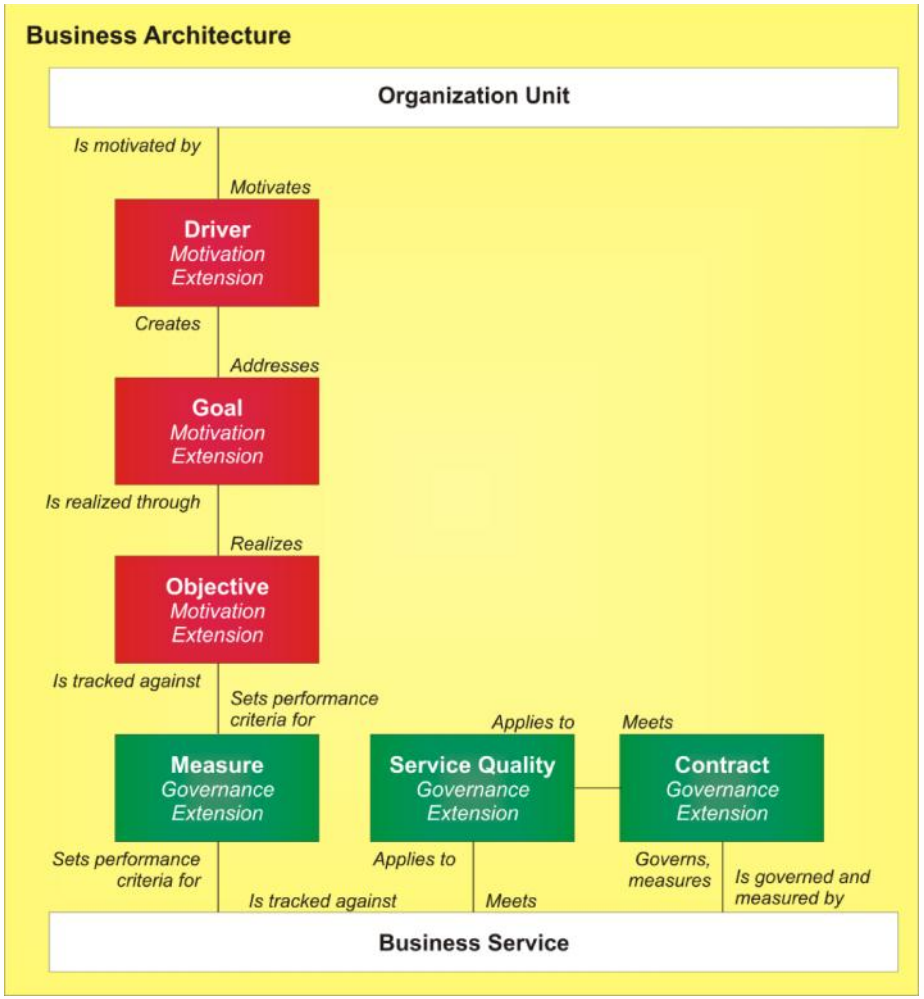
Motivation Extension



- The scope of this extension is as follows:
  - Creation of a new metamodel entity for Driver that shows factors generally motivating or constraining an organization
  - Creation of a new metamodel entity for Goal that shows the strategic purpose and mission of an organization
  - Creation of a new metamodel entity for Objective that shows near to mid-term achievements that an organization would like to attain
  - Creation of a Goal/Objective/Service diagram showing the traceability from drivers, goals, and objectives through to services
- Additional diagrams to be created:
  - Goal/Objective/Service diagram

Motivation Extension



- This extension should be used in the following situations:
  - When the architecture needs to understand the motivation of organizations in more detail than the standard business or engagement principles and objectives that are informally modeled within the core content metamodel
  - When organizations have conflicting drivers and objectives and that conflict needs to be understood and addressed in a structured form
  - When service levels are unknown or unclear

Summary

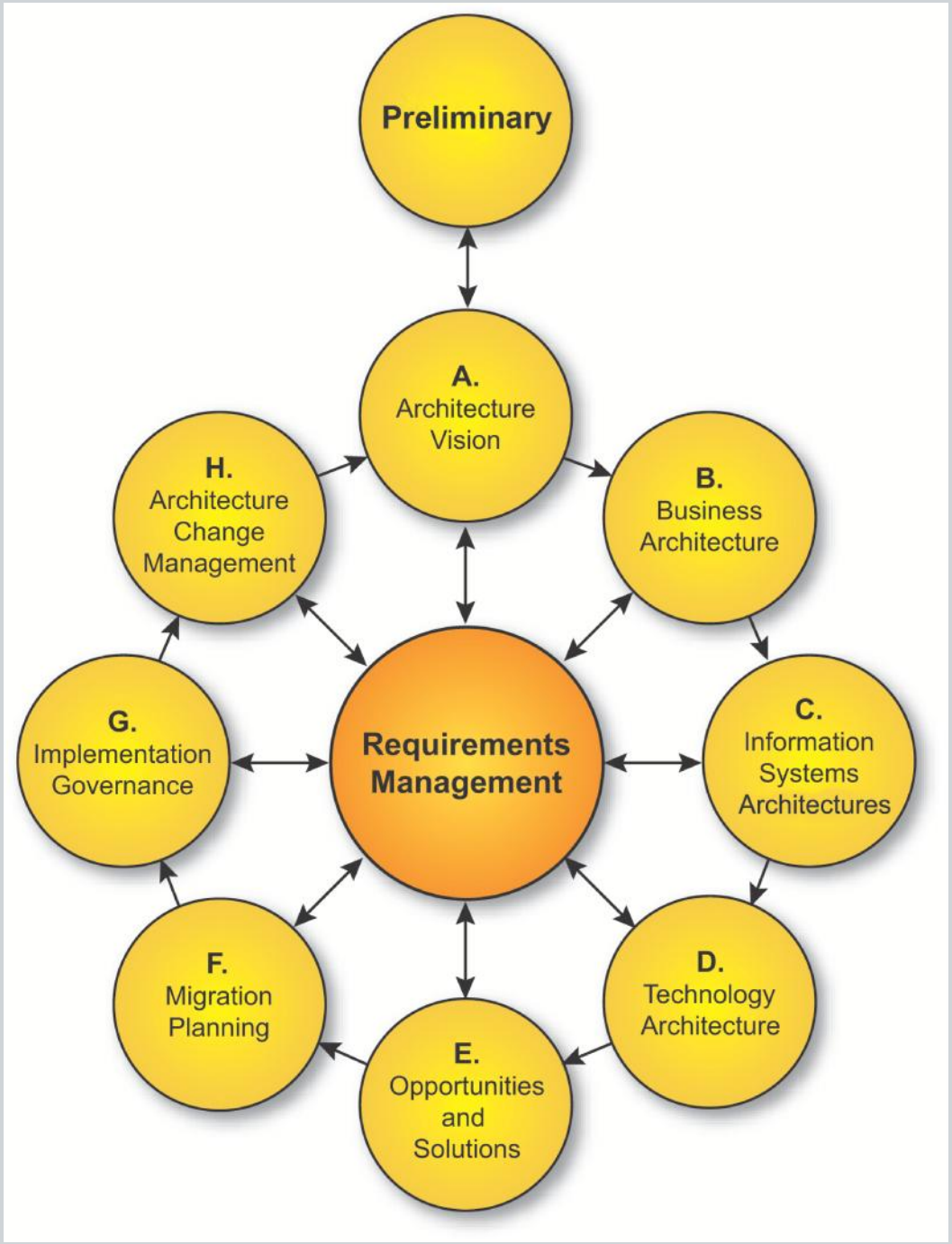
TOGAF provides a rich metamodel

This provides a number of benefits:

- It supports both formal and informal modeling
- It formalizes the definition of an Enterprise Architecture
- It formalizes the relationship between objects
- It enables an EA tool mapping

Exercise

- Determine which of the Metamodel extensions is most appropriate for the following situations:
  1. Where organizations have conflicting objectives
  2. Where service levels are unknown
  3. Where many applications are in use with overlapping functionality
  4. Where management of information is complex
  5. Where business process has to support regulatory compliance



TOGAF Content Metamodel

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