Enterprise Architecture Layer Model

Overview

This document outlines a foundational enterprise architecture approach built on four distinct layers, each with specific responsibilities and quality attributes. The model emphasizes how architectural decisions flow both upward (requirements) and downward (constraints) through the technology stack.

The Four-Layer Model

The architecture is structured as a dependency stack where each layer builds upon the capabilities of the layer below while defining constraints for the layer above.

Architecture Visualization:

```
┌─────────────────────────────────────────────────────────┐
│ Common Data Layer                                         │
│ Taxonomies, Data Models, Shared Language                │
│ • Consistency  • Interoperability  • Usability         │
└─────────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────────┐
│ Business Architecture Layer                             │
│ Features, Rules, Capabilities                           │
│ • Agility  • Flexibility  • Testability                 │
└─────────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────────┐
│ Orchestration Layer                                     │
│ APIs, Workflows, Coordination                           │
│ • Maintainability  • Observability  • Composability    │
└─────────────────────────────────────────────────────────┘
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┌─────────────────────────────────────────────────────────┐
│ Infrastructure Layer                                    │
│ Compute, Storage, Network                               │
│ • Scalability  • Performance  • Reliability             │
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```

Layer Breakdown

1. Infrastructure Layer (Foundation)

Purpose: Establishes the physical and virtual foundation of the enterprise

- **Core Components**: Compute resources, storage systems, network infrastructure, cloud/on-premises environments

- **Key Quality Attributes**:
    - **Scalability**: Ability to handle growing workloads automatically
    - **Performance**: 99.9% uptime and response time guarantees
    - **Reliability**: Five-nines availability targets
- **Impact**: Determines environmental constraints and non-functional requirements for all upper layers

2. Orchestration Layer (Coordination)

Purpose: Enables coordination and communication between system components

- **Core Components**: APIs, workflows, integration patterns, service meshes, message queues
- **Key Quality Attributes**:
    - **Maintainability**: Simplified system management and updates
    - **Observability**: 360-degree visibility into system behavior
    - **Composability**: Ability to combine services into new capabilities
- **Impact**: Transforms isolated infrastructure into coordinated, manageable systems

3. Business Architecture Layer (Capability)

Purpose: Translates organizational intent into system behavior

- **Core Components**: Domain models, business rules, capability maps, policy enforcement mechanisms
- **Key Quality Attributes**:
    - **Agility**: Rapid response to changing business requirements
    - **Flexibility**: Dynamic adaptation to new business models
    - **Testability**: Validation of business logic and rules
- **Impact**: Bridges business strategy with technical implementation

4. Common Data Layer (Language)

Purpose: Provides semantic coherence across the entire enterprise

- **Core Components**: Taxonomies, ontologies, data models, metadata management, schema registries
- **Key Quality Attributes**:
    - **Consistency**: Uniform data representation across systems
    - **Interoperability**: Seamless data exchange between domains
    - **Usability**: Optimized data access and comprehension
- **Impact**: Ensures organizational alignment through shared vocabulary and data standards

Critical Success Factors

Bidirectional Dependencies

- **Upward Flow**: Business requirements drive technical decisions
- **Downward Flow**: Technical constraints limit architectural possibilities

- **Alignment Imperative**: Misalignment between layers creates technical debt

Quality Attribute Propagation

Each layer's quality attributes directly influence the layers above and below:

- Infrastructure performance limits orchestration throughput
- Orchestration patterns affect business process efficiency
- Business flexibility requirements drive data model design
- Data consistency needs influence infrastructure choices

Governance Implications

- **Layer Responsibility**: Clear ownership and accountability for each architectural layer
- **Cross-Layer Coordination**: Mechanisms to ensure decisions consider impact across all layers
- **Evolution Management**: Coordinated approach to architectural changes and upgrades

Implementation Considerations

Assessment Questions

1. **Current State**: How well do our existing systems align with this layered model?
2. **Gap Analysis**: Where are the most significant misalignments between layers?
3. **Priority Areas**: Which layer requires immediate attention to support business objectives?
4. **Integration Points**: How do our current systems map to these architectural boundaries?

Strategic Benefits

- **Clarity**: Clear separation of concerns across technical and business domains
- **Scalability**: Modular approach enables targeted improvements
- **Risk Management**: Isolated layer changes reduce system-wide impact
- **Vendor Strategy**: Layer-specific vendor relationships and technology choices

Next Steps

1. **Current State Mapping**: Inventory existing systems against the four-layer model
2. **Gap Identification**: Assess misalignments and technical debt across layers
3. **Roadmap Development**: Prioritize improvements based on business impact and technical feasibility
4. **Governance Framework**: Establish layer-specific ownership and decision-making processes

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This architecture model provides a foundation for strategic technology decisions while ensuring business-technology alignment across the enterprise.

Elastic Enterprise Architecture Model

Executive Digest

Overview

This document outlines an elastic enterprise architecture approach built on four foundational layers with both **vertical dependency management** and **horizontal federation capabilities**. The model supports multiple lines of business while enabling enterprise-wide reuse through strategic sharing and autonomy balance.

The Elastic Four-Layer Model

The architecture combines traditional vertical layering with horizontal elasticity to support enterprise scale and business agility.

Architecture Visualization:

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──┐
│ Enterprise Data Layer (FEDERATED GOVERNANCE)
│
│ Shared Taxonomies • Cross-Domain Models • Federated Catalog
│
│ Consistency: FEDERATED • Interoperability: ENTERPRISE • Governance:
DISTRIBUTED │
└───────────────────────────────────────────────────────────────────────
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                         ↓              ↓              ↓
┌──────────────────┐ ← → ┌─────────────────────┐ ← →
┌──────────────────┐
│ LOB A Business   │     │ Shared Business     │     │ LOB B Business
│
│ Autonomous       │     │ Enterprise Services │     │ Autonomous
│
│ Domain Logic     │     │ Customer • Payment  │     │ Domain Logic
│
│ Agility: RAPID   │     │ Identity • Compliance│     │ Agility: RAPID
│
└──────────────────┘     └─────────────────────┘
└──────────────────┘
                         ↓              ↓              ↓
┌───────────────────────────────────────────────────────────────────────
──┐
│ Federated Orchestration Layer (CROSS-LOB COORDINATION)
│
│ Enterprise API Gateway • Cross-LOB Workflows • Service Mesh
│
│ Maintainability: FEDERATED • Observability: UNIFIED • Composability:
CROSS_LOB │
└───────────────────────────────────────────────────────────────────────
──┘
                                    ↓
┌───────────────────────────────────────────────────────────────────────
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```

```
│ Shared Infrastructure Layer (ELASTIC FOUNDATION)
│
│ Multi–Tenant Compute • Shared Storage • Enterprise Network
│
│ Scalability: HORIZONTAL • Performance: MULTI_TENANT • Reliability:
FEDERATED │
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```

Enhanced Layer Architecture

1. Shared Infrastructure Layer (Elastic Foundation)

Purpose: Provides scalable, multi-tenant foundation serving all lines of business

- **Core Components**: Multi-tenant compute, shared storage, enterprise network, hybrid cloud platforms
- **Elasticity Features**:
  - **Horizontal Scaling**: Auto-scaling across multiple LOBs
  - **Resource Sharing**: Optimized utilization across business units
  - **Federated Management**: Distributed operational responsibility
- **Key Quality Attributes**:
  - **Scalability**: Horizontal expansion to support new LOBs
  - **Performance**: Multi-tenant optimization with SLA guarantees
  - **Reliability**: Federated resilience across business domains

2. Federated Orchestration Layer (Cross-LOB Coordination)

Purpose: Enables coordination within and across lines of business

- **Core Components**: Enterprise API gateway, cross-LOB workflows, federated service mesh
- **Elasticity Features**:
  - **Service Federation**: Services discoverable and reusable across LOBs
  - **Workflow Orchestration**: Cross-business-unit process coordination
  - **Unified Observability**: Enterprise-wide monitoring and governance
- **Key Quality Attributes**:
  - **Maintainability**: Federated service management across domains
  - **Observability**: Unified visibility with domain-specific insights
  - **Composability**: Cross-LOB service composition and reuse

3. Business Architecture Layer (Autonomous + Shared)

Purpose: Balances business autonomy with enterprise-wide capability sharing

Autonomous LOB Components:

- **Domain-Specific Logic**: Independent business rules and processes
- **Rapid Deployment**: Autonomous release cycles and feature development

- **Specialized Capabilities**: Industry or function-specific features

Shared Enterprise Components:

- **Cross-LOB Services**: Customer management, payments, identity, compliance
- **Enterprise Standards**: Shared business rules and policies
- **Reusable Capabilities**: Common business functions across domains
- **Elasticity Features**:
  - **Selective Sharing**: Strategic choice of shared vs. autonomous capabilities
  - **Capability Reuse**: Enterprise services available to all LOBs
  - **Independent Evolution**: Autonomous domains can evolve independently
- **Key Quality Attributes**:
  - **Agility**: Rapid response to LOB-specific requirements
  - **Flexibility**: Dynamic composition of shared and autonomous capabilities
  - **Testability**: Independent testing of domain-specific and shared services

4. Enterprise Data Layer (Federated Governance)

Purpose: Provides semantic coherence while enabling domain autonomy

- **Core Components**: Shared taxonomies, cross-domain data models, federated metadata catalog
- **Elasticity Features**:
  - **Federated Data Governance**: Distributed ownership with enterprise standards
  - **Cross-Domain Interoperability**: Seamless data exchange between LOBs
  - **Conceptual Stretch**: Unified data language with domain-specific extensions
- **Key Quality Attributes**:
  - **Consistency**: Federated consistency with domain flexibility
  - **Interoperability**: Enterprise-wide data exchange capabilities
  - **Governance**: Distributed governance with centralized standards

Elasticity Dimensions

Vertical Elasticity (Traditional Layer Dependencies)

- **Constraint Flow Down**: Infrastructure capabilities limit orchestration options
- **Requirement Flow Up**: Business needs drive technical architecture decisions
- **Quality Propagation**: Layer-specific 'ilities' influence adjacent layers

Horizontal Elasticity (Cross-LOB Federation)

- **Capability Sharing**: Strategic reuse of enterprise services across business units
- **Autonomous Domains**: Independent business logic and deployment cycles
- **Federated Governance**: Distributed decision-making with enterprise standards
- **Resource Optimization**: Shared infrastructure with domain-specific configurations

Strategic Benefits

Business Value

- **Time to Market**: Reuse of enterprise capabilities accelerates LOB initiatives
- **Cost Optimization**: Shared infrastructure and services reduce duplicate investments
- **Risk Management**: Centralized compliance and security with business flexibility
- **Innovation Enablement**: Autonomous domains can experiment while leveraging enterprise assets

Technical Advantages

- **Scalability**: Horizontal expansion supports business growth and new LOBs
- **Maintainability**: Clear separation between shared and autonomous components
- **Observability**: Unified monitoring with domain-specific insights
- **Composability**: Mix-and-match of enterprise and LOB-specific capabilities

Implementation Strategy

Phase 1: Foundation Establishment

1. **Shared Infrastructure**: Establish multi-tenant platform capabilities
2. **Enterprise Data Standards**: Define federated governance model
3. **Core Shared Services**: Implement foundational cross-LOB capabilities

Phase 2: Federated Orchestration

1. **API Gateway**: Deploy enterprise-wide service discovery and routing
2. **Service Mesh**: Implement cross-LOB communication infrastructure
3. **Unified Monitoring**: Establish observability across all domains

Phase 3: Business Layer Federation

1. **Capability Mapping**: Identify shared vs. autonomous business functions
2. **Service Migration**: Move shared capabilities to enterprise layer
3. **Autonomous Enablement**: Provide self-service capabilities for LOB teams

Governance Framework

Decision Rights

- **Enterprise Level**: Shared infrastructure, data standards, core services
- **LOB Level**: Domain-specific business logic, specialized capabilities
- **Federated Level**: Cross-LOB workflows, integration patterns, shared governance

Success Metrics

- **Reuse Rate**: Percentage of LOB initiatives leveraging enterprise services

- **Time to Market**: Speed of LOB feature delivery using shared capabilities
- **Infrastructure Efficiency**: Resource utilization across multiple LOBs
- **Compliance Consistency**: Standardization of enterprise requirements across domains

Next Steps

1. **Current State Assessment**: Map existing systems to elastic architecture model
2. **Capability Inventory**: Catalog shared vs. autonomous business functions
3. **Federation Roadmap**: Plan migration to federated governance model
4. **Pilot Implementation**: Start with one LOB pair sharing a core capability

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This elastic architecture model enables enterprise scale while preserving business agility through strategic balance of autonomy and sharing.