Capability Based Approach to Microservices Design

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Agenda

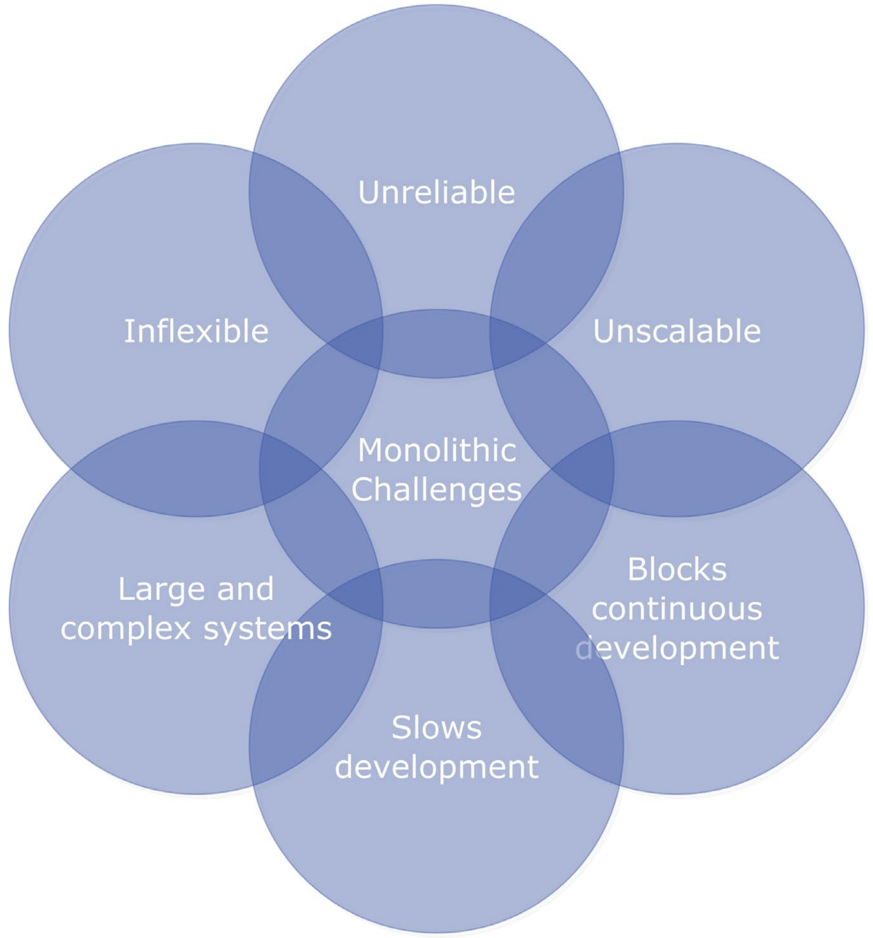
- Problem Definition
- Monolithic Architecture and Challenges
- Characteristics of Microservices Architecture
- Domain Driven Design Approach to Microservices Composition
- Business Architecture Approach to Microservices Composition
- Case Study and Approach

Problem Definition

- Microservice architecture is being utilised to create enterprise software systems that are flexible, agile, robust, and scalable. It's a method of building a single software system as a collection of services, each of which runs in its own process and communicates using lightweight protocols.
- However, in order for the microservices approach to properly solve this issue while avoiding a worsening of the situation, it must employ an effective method for componentizing the software system into stable services composition.
- The issue is that determining exactly where the component borders should be is difficult.
- This note addresses this issue by defining a method for designing robust microservices composition utilising the business capabilities.

Monolithic Architecture

- *The monolithic architecture is an architectural style that structures the application as a single executable component*



Composition Design Principles

01

Modularity

Reduced complexity
Decentralised system design
Improved stability, adaptability, and maintainability

02

Information Hiding

Hide as many details as possible behind a module boundary
Communicate through interfaces

03

Cohesion

Relatedness of module components
Core function and is indivisible
Changes made in as few places as possible

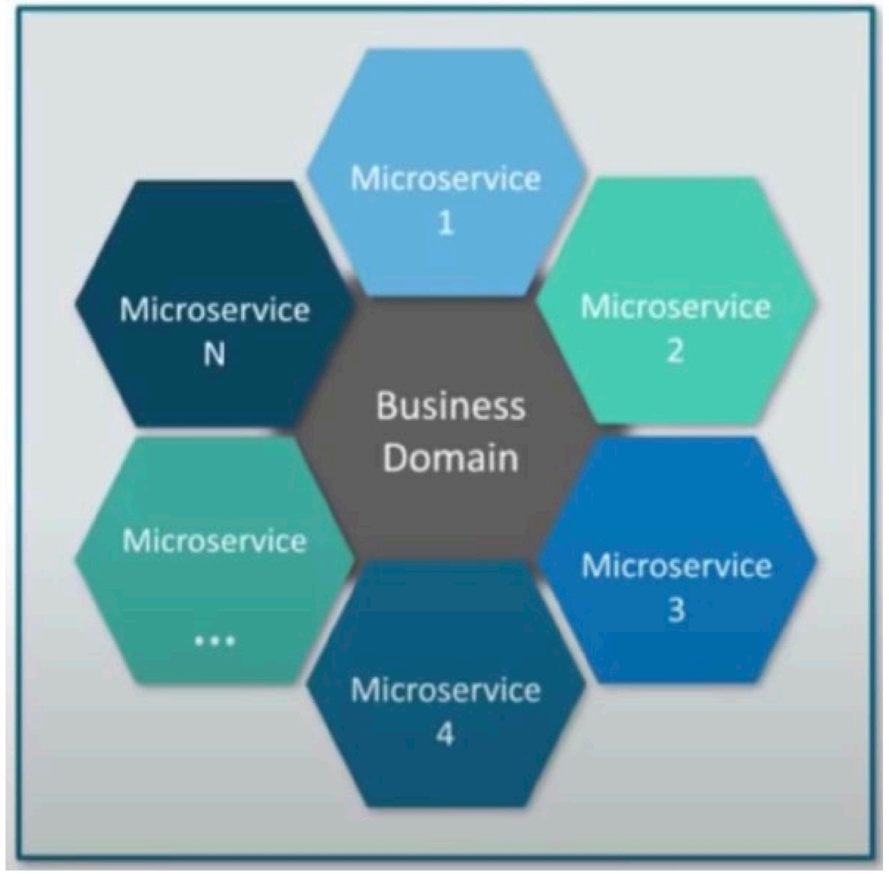
04

Coupling

Degree of interdependence between pairs of modules
Low coupling

Microservice Architecture

- The microservice architecture is an architectural style that structures an application as set of deployable/executable unites called services
  - A service is:
    - Highly maintainable and testable
    - Minimal lead time (time from commit to deploy)
    - Loosely coupled
    - Highly coherent
    - Fault Isolation
    - Independently deployable
    - Mixed technology staks
    - Implements a business capability
    - Owned/developed/tested/deployed by small team



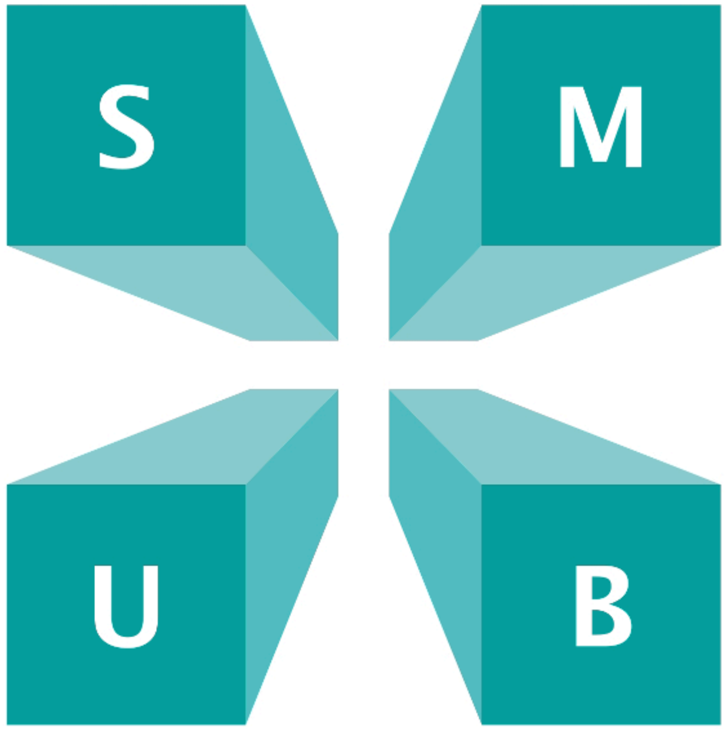
Domain Driven Design

Subdomain

- Subdomains resemble sets of interrelated, coherent use cases. Such sets of use cases usually involve the same actor, the business entities, and they all manipulate a closely related set of data.
- Core, Generic and Support

Ubiquitous Language

- Language of the business domain.
- The ubiquitous language must be precise and consistent. It should eliminate the need for assumptions and should make the business domain's logic explicit.



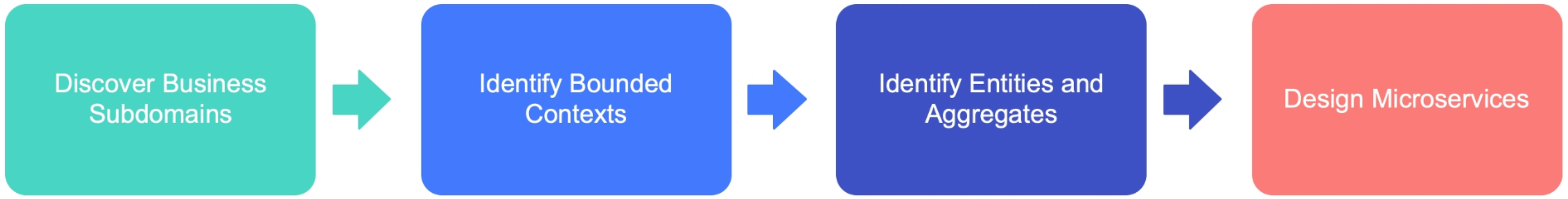
Model

- A model is a simplified representation of a thing or phenomenon that intentionally emphasizes certain aspects while ignoring others. Abstraction with a specific use in mind.

Bounded Context

- Bounded contexts are the consistency boundaries of ubiquitous languages.
- A language's terminology, principles, and business rules are only consistent inside its bounded context.

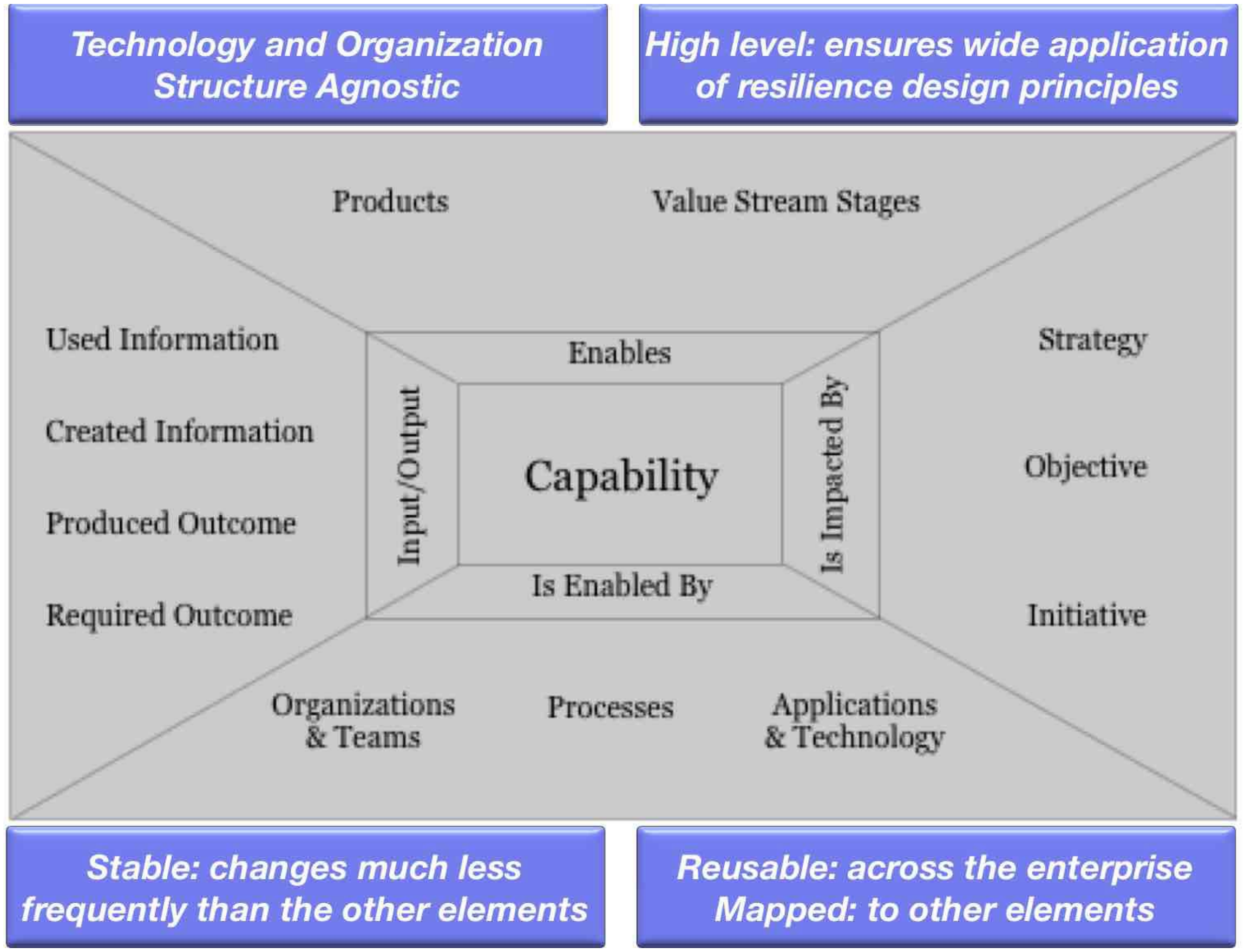
DDD approach to Microservices Composition


Discover Business Subdomains
Identify Bounded Contexts
Identify Entities and Aggregates
Design Microservices

The problem with this approach is how to identify the business subdomains and bounded context. DDD describes a tactical technique for defining these notions known as "Event Storming." However, this method is unconnected to a larger company framework of strategy, business model, and operating model. Consequently, the resulting microservice decomposition will be vulnerable to strategy misalignment, limited business reusability, and a reduced ability to adjust to strategic changes.

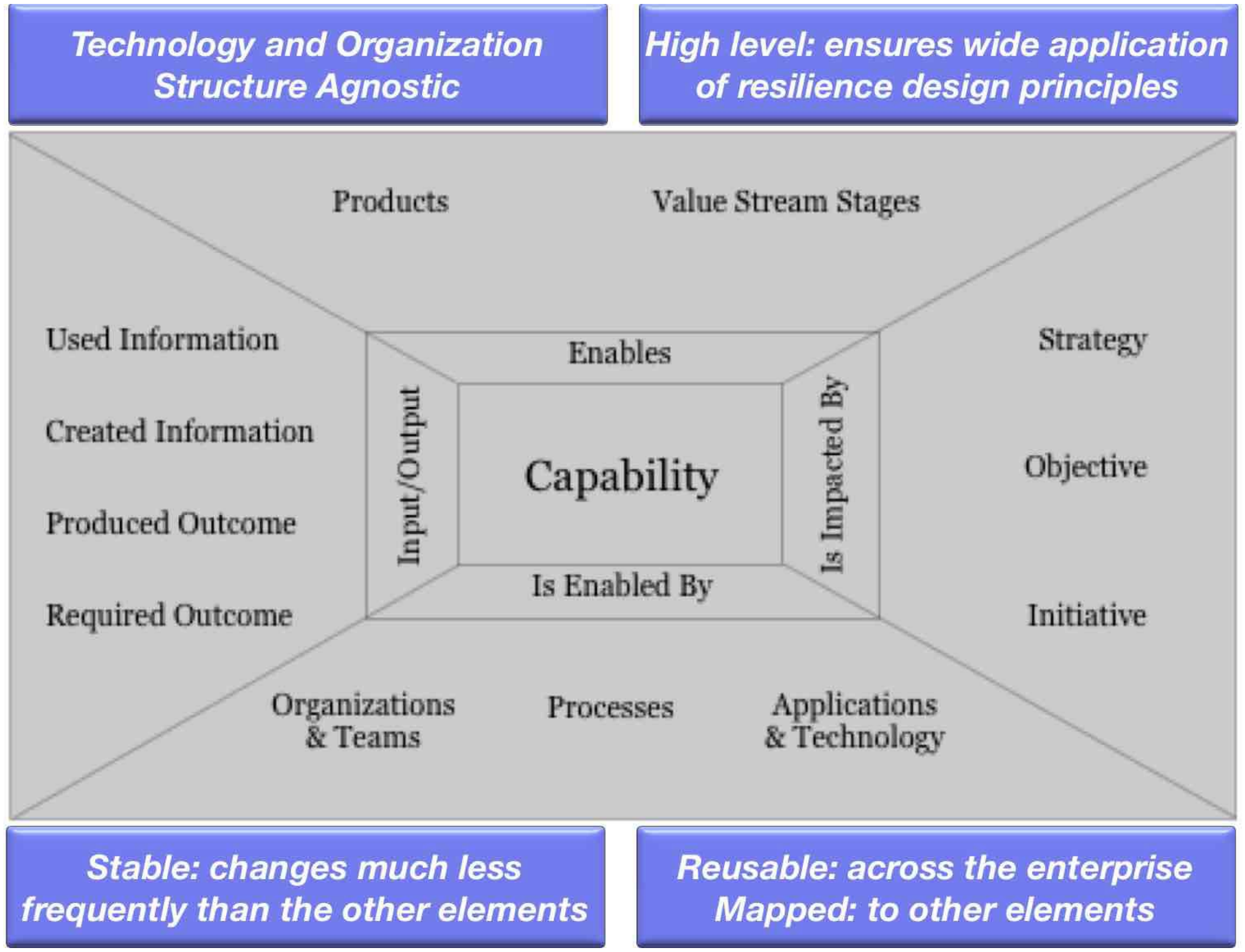
Business Capability as Context for Microservices Composition

- Business capability has various properties that make it a good context for the microservices decomposition:
  - In comparison to other aspects of the business, it is stable. A one-hundred-year-old insurance firm, for example, would have had capabilities comparable to those available today: Customer Management, Policy Management, and Claim Management. While these capabilities, would not have had automation a century ago, they still existed.


Technology and Organization Structure Agnostic
High level: ensures wide application of resilience design principles
Products
Value Stream Stages
Used Information
Created Information
Produced Outcome
Required Outcome
Enables
Input/Output
Capability
Is Impacted By
Is Enabled By
Strategy
Objective
Initiative
Organizations & Teams
Processes
Applications & Technology
Stable: changes much less frequently than the other elements
Reusable: across the enterprise Mapped: to other elements

Business Capability as Context for Microservices Composition

- Business capability has various properties that make it a good context for the microservices decomposition:
  - It is technology and organization structure agnostic. This means the underlying technology and organization structure can change for the same capability. This creates a stable border for the microservices, allowing them to change their implementation without affecting the boundary itself.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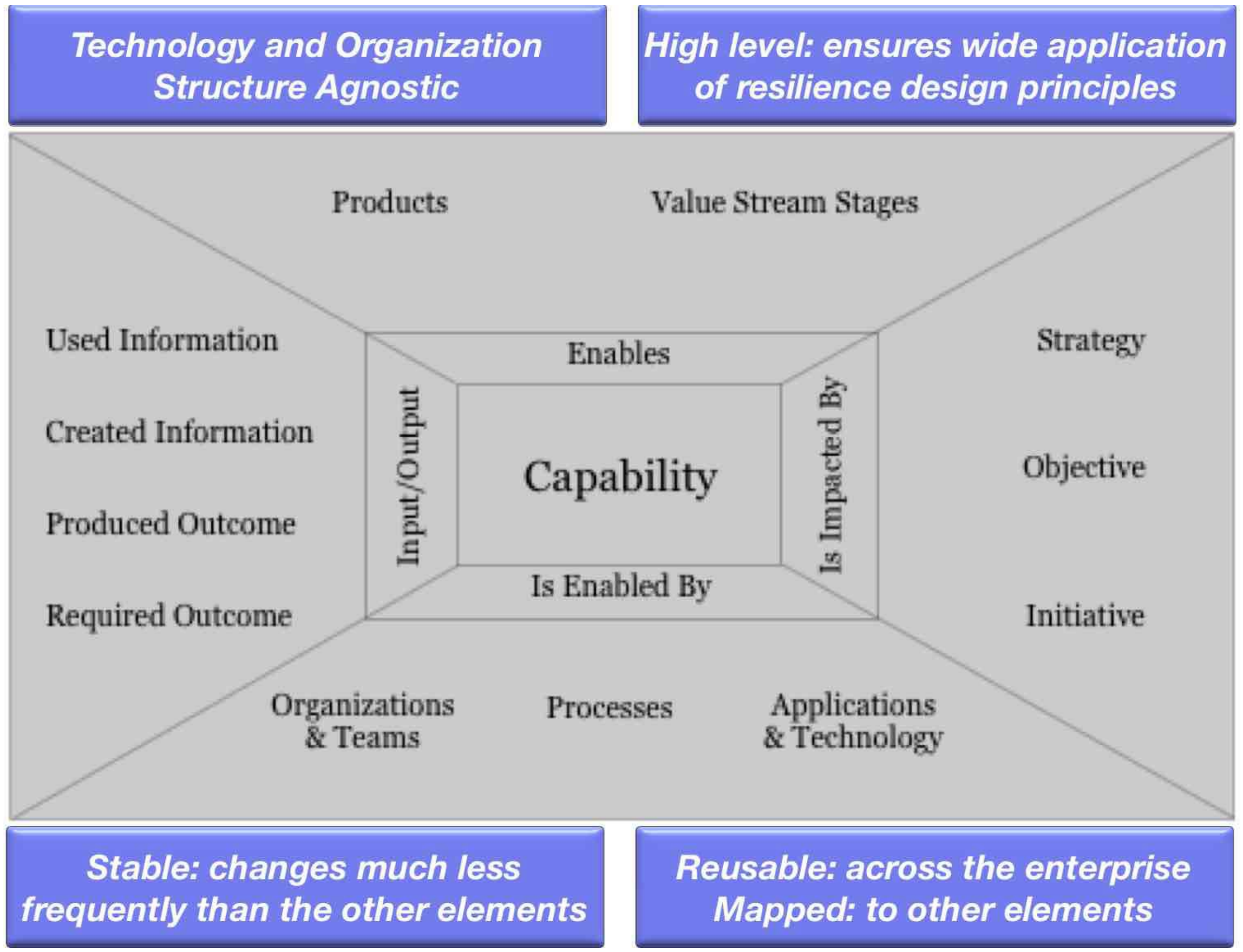
Business Capability as Context for Microservices Composition

- Business capability has various properties that make it a good context for the microservices decomposition:
  - Business capability is a high-level concept and can be linked unambiguously to the business strategy.
  - This provides a strategic context for the microservices composition. The development of business capabilities, as well as their deployment to produce value, can be impacted by business strategy. This makes the microservices composition strategically agile. It can be linked to the strategy through the business capability. So, strategy can either change the implementation of the microservices or change the its wiring, without changing the microservices' boundaries. This makes the microservice composition both stable and agile.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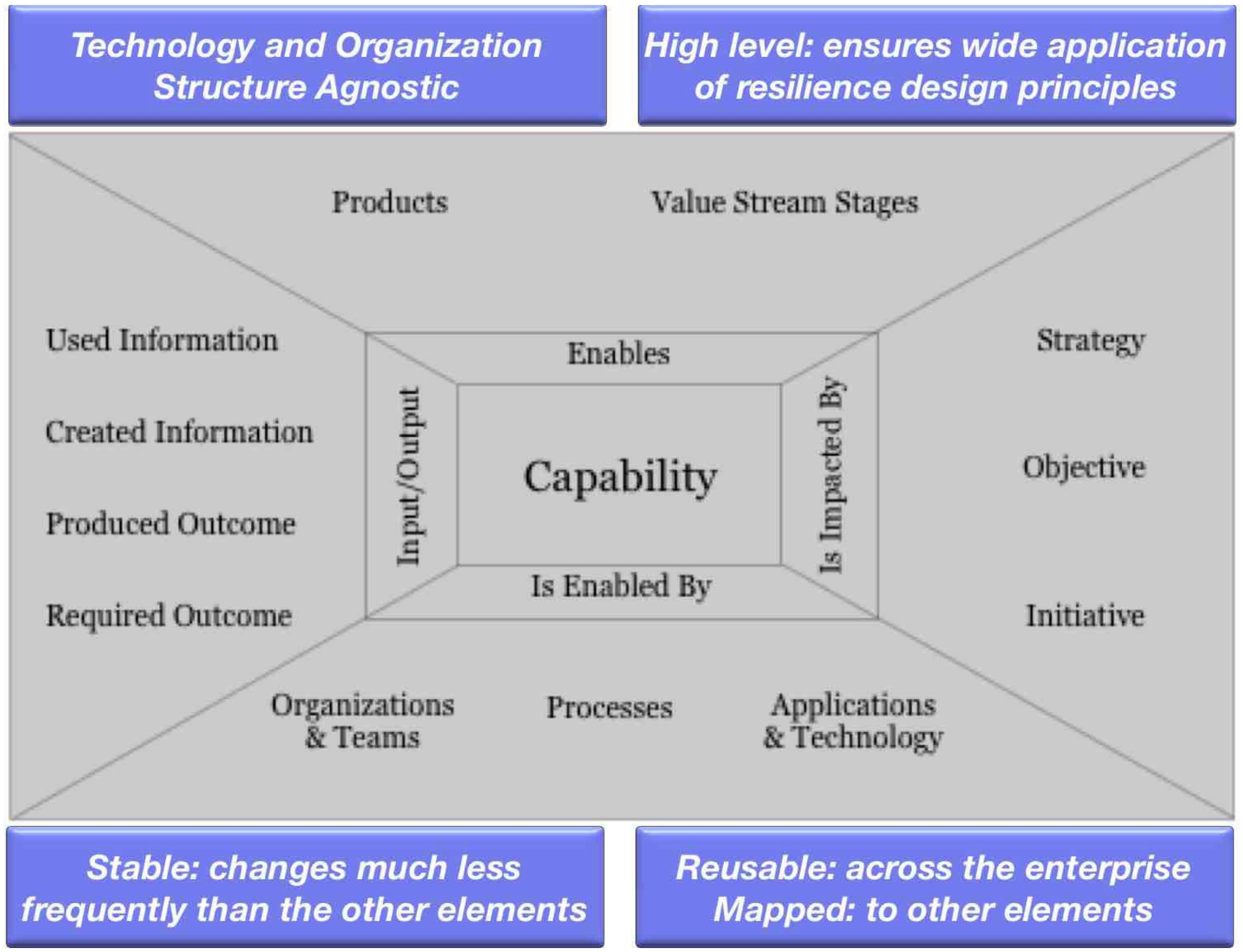
Business Capability as Context for Microservices Composition

- Business capability has various properties that make it a good context for the microservices decomposition:
  - Business capabilities are applied in a variety of business scenarios and value generation contexts, making them a reusable notion across the firm. This allows microservices to be utilized across the organization and results in a simple microservices decomposition.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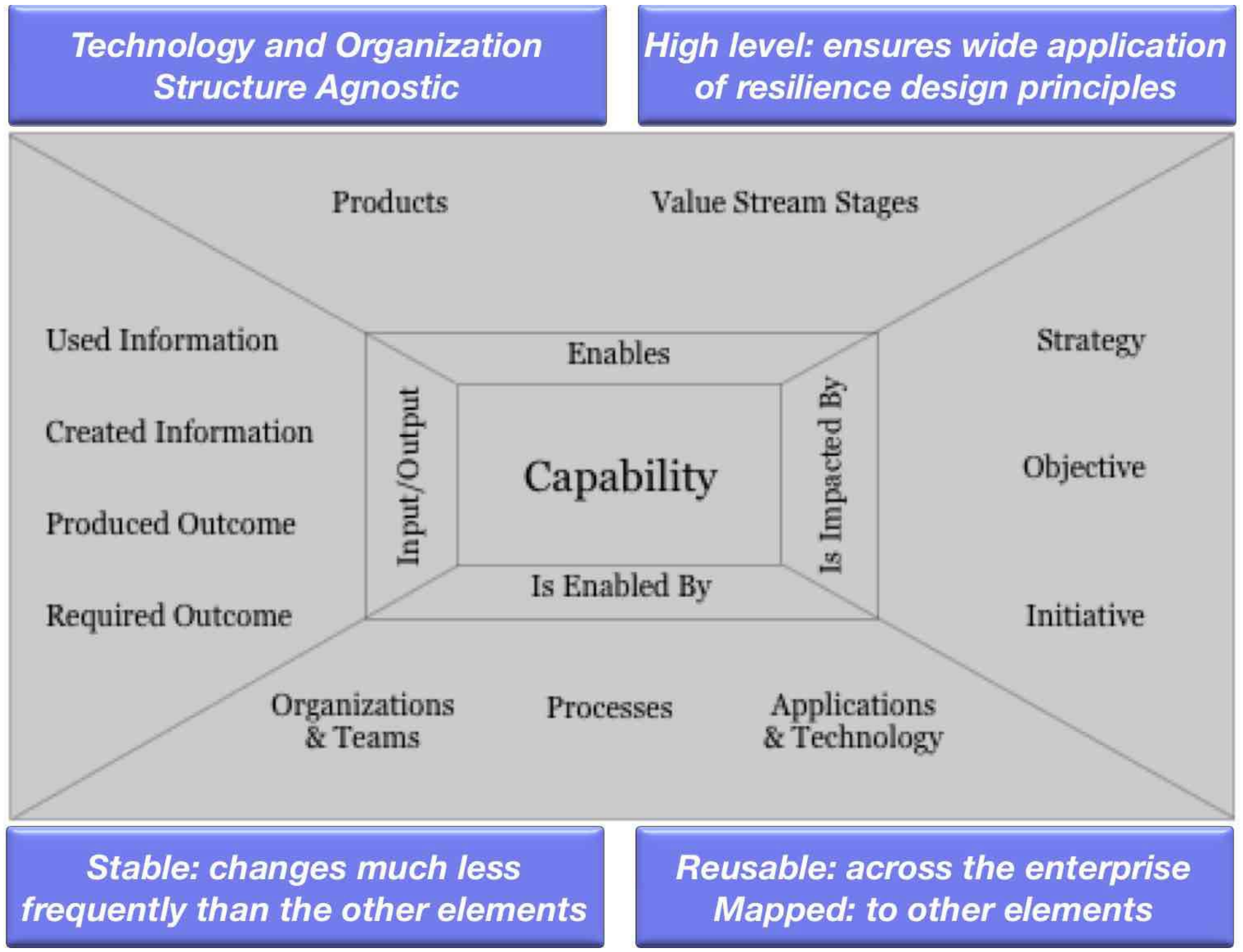
Business Capability as Context for Microservices Composition

- Business capability has various properties that make it a good context for the microservices decomposition:
    - Microservices architecture style takes on a strategic dimension when they're aligned with business capabilities. Through the line of sight from business strategy to business capabilities to microservices that enable those capabilities, the impact of strategy on software systems becomes obvious and clear. From another perspective, the microservices architecture style's agility and adaptability make the strategy easier to implement.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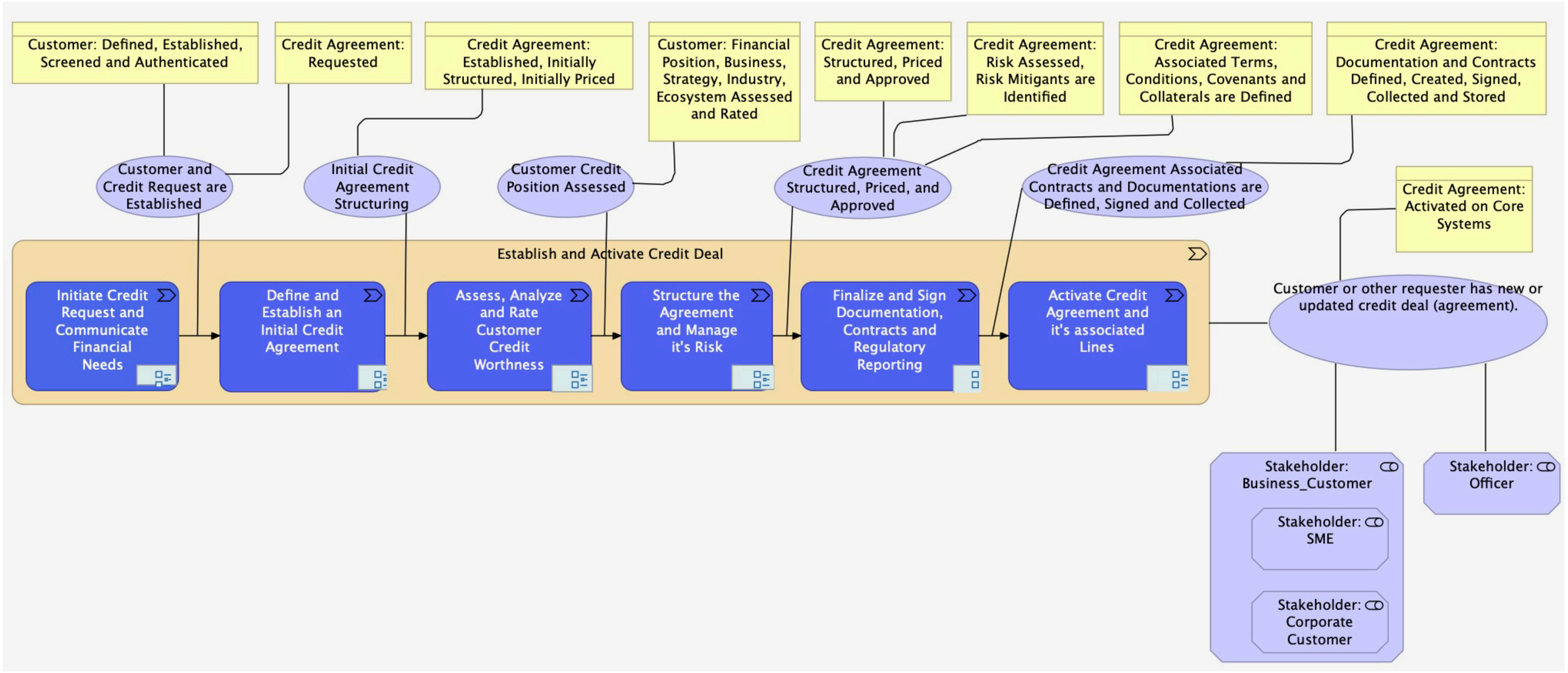
Case Study

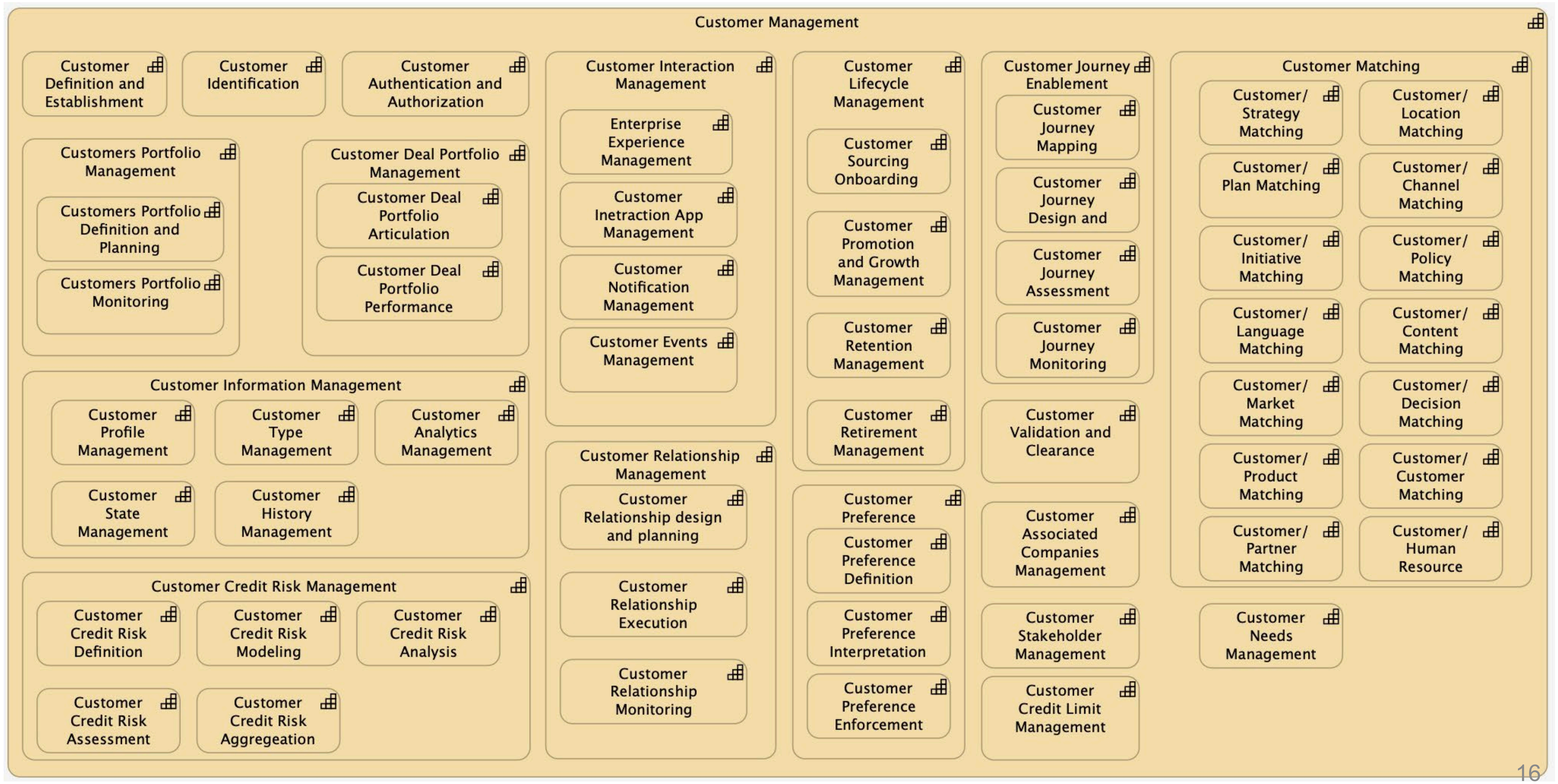
- A business scenario in the banking industry was used to test this microservices decomposition approach. Banks offer credit to many types of consumers, including retail and business customers. The bank does numerous operations to onboard the customer, screen the consumer, structures a deal, undertake risk due diligence, give limits, authorize the deal, collect paperwork, sign contracts, activate lines, and utilize facilities in order to establish a credit arrangement with the customer.

Establish and Activate Credit Deal

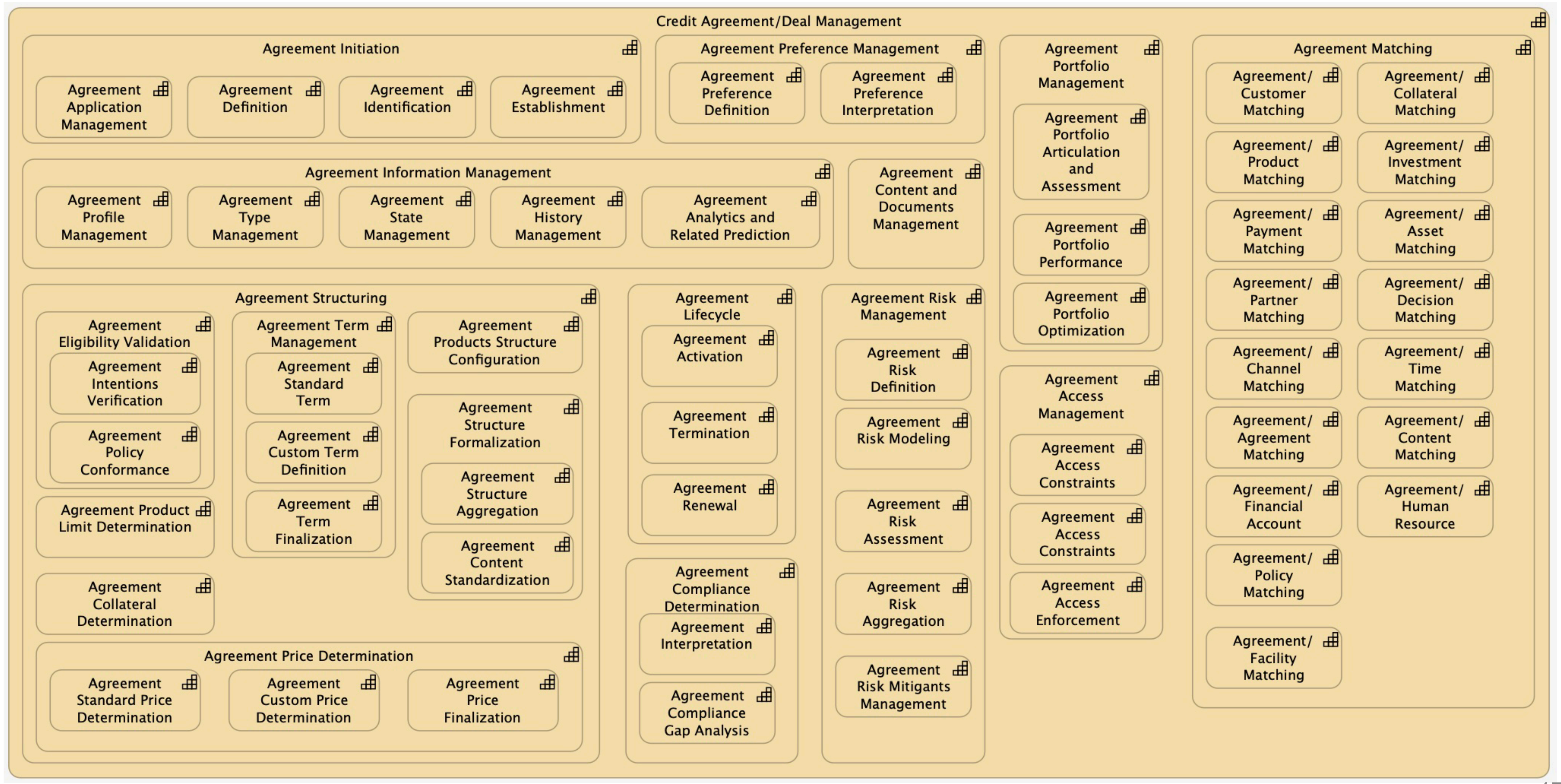


Customer: Defined, Established, Screened and Authenticated
Credit Agreement: Requested
Credit Agreement: Established, Initially Structured, Initially Priced
Customer: Financial Position, Business, Strategy, Industry, Ecosystem Assessed and Rated
Credit Agreement: Structured, Priced and Approved
Credit Agreement: Risk Assessed, Risk Mitigants are Identified
Credit Agreement: Associated Terms, Conditions, Covenants and Collaterals are Defined
Credit Agreement: Documentation and Contracts Defined, Created, Signed, Collected and Stored
Customer and Credit Request are Established
Initial Credit Agreement Structuring
Customer Credit Position Assessed
Credit Agreement Structured, Priced, and Approved
Credit Agreement Associated Contracts and Documentations are Defined, Signed and Collected
Credit Agreement: Activated on Core Systems
Establish and Activate Credit Deal
Initiate Credit Request and Communicate Financial Needs
Define and Establish an Initial Credit Agreement
Assess, Analyze and Rate Customer Credit Worthness
Structure the Agreement and Manage it's Risk
Finalize and Sign Documentation, Contracts and Regulatory Reporting
Activate Credit Agreement and it's associated Lines
Customer or other requester has new or updated credit deal (agreement).
Stakeholder: Business_Customer
Stakeholder: SME
Stakeholder: Corporate Customer
Stakeholder: Officer

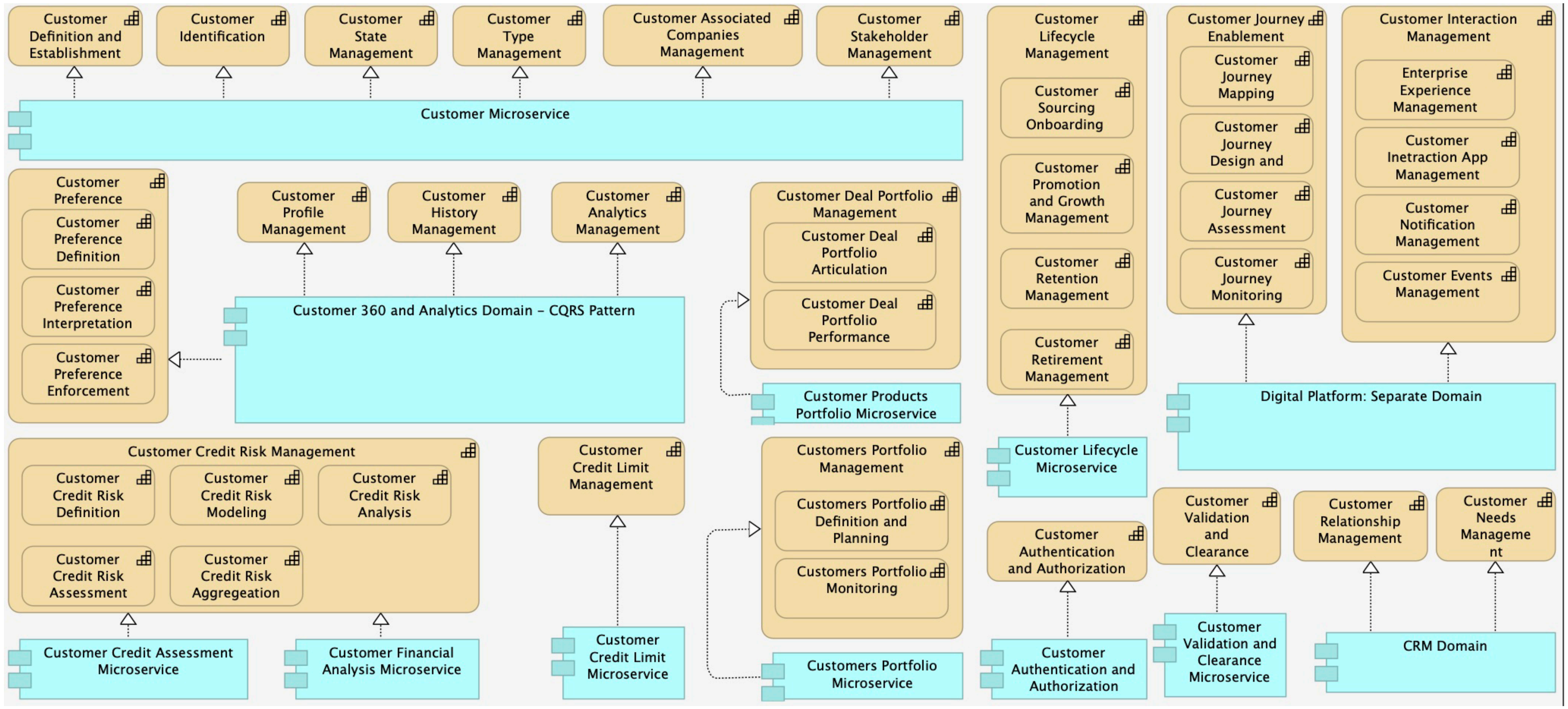
Customer Management Capability


Customer Management
Customer Definition and Establishment
Customer Identification
Customer Authentication and Authorization
Customers Portfolio Management
Customers Portfolio Definition and Planning
Customers Portfolio Monitoring
Customer Deal Portfolio Management
Customer Deal Portfolio Articulation
Customer Deal Portfolio Performance
Customer Information Management
Customer Profile Management
Customer Type Management
Customer Analytics Management
Customer State Management
Customer History Management
Customer Credit Risk Management
Customer Credit Risk Definition
Customer Credit Risk Modeling
Customer Credit Risk Analysis
Customer Credit Risk Assessment
Customer Credit Risk Aggregeation
Customer Interaction Management
Enterprise Experience Management
Customer Inetraction App Management
Customer Notification Management
Customer Events Management
Customer Relationship Management
Customer Relationship design and planning
Customer Relationship Execution
Customer Relationship Monitoring
Customer Lifecycle Management
Customer Sourcing Onboarding
Customer Promotion and Growth Management
Customer Retention Management
Customer Retirement Management
Customer Preference
Customer Preference Definition
Customer Preference Interpretation
Customer Preference Enforcement
Customer Journey Enablement
Customer Journey Mapping
Customer Journey Design and
Customer Journey Assessment
Customer Journey Monitoring
Customer Validation and Clearance
Customer Associated Companies Management
Customer Stakeholder Management
Customer Credit Limit Management
Customer Matching
Customer/ Strategy Matching
Customer/ Location Matching
Customer/ Plan Matching
Customer/ Channel Matching
Customer/ Initiative Matching
Customer/ Policy Matching
Customer/ Language Matching
Customer/ Content Matching
Customer/ Market Matching
Customer/ Decision Matching
Customer/ Product Matching
Customer/ Customer Matching
Customer/ Partner Matching
Customer/ Human Resource
Customer Needs Management

Credit Agreement Management Capability


Credit Agreement/Deal Management
Agreement Initiation
Agreement Application Management
Agreement Definition
Agreement Identification
Agreement Establishment
Agreement Preference Management
Agreement Preference Definition
Agreement Preference Interpretation
Agreement Portfolio Management
Agreement Portfolio Articulation and Assessment
Agreement Portfolio Performance
Agreement Portfolio Optimization
Agreement Matching
Agreement/ Customer Matching
Agreement/ Collateral Matching
Agreement/ Product Matching
Agreement/ Investment Matching
Agreement/ Payment Matching
Agreement/ Asset Matching
Agreement/ Partner Matching
Agreement/ Decision Matching
Agreement/ Channel Matching
Agreement/ Time Matching
Agreement/ Agreement Matching
Agreement/ Content Matching
Agreement/ Financial Account
Agreement/ Human Resource
Agreement/ Policy Matching
Agreement/ Facility Matching
Agreement Information Management
Agreement Profile Management
Agreement Type Management
Agreement State Management
Agreement History Management
Agreement Analytics and Related Prediction
Agreement Content and Documents Management
Agreement Structuring
Agreement Eligibility Validation
Agreement Intentions Verification
Agreement Policy Conformance
Agreement Product Limit Determination
Agreement Collateral Determination
Agreement Term Management
Agreement Standard Term
Agreement Custom Term Definition
Agreement Term Finalization
Agreement Products Structure Configuration
Agreement Structure Formalization
Agreement Structure Aggregation
Agreement Content Standardization
Agreement Price Determination
Agreement Standard Price Determination
Agreement Custom Price Determination
Agreement Price Finalization
Agreement Lifecycle
Agreement Activation
Agreement Termination
Agreement Renewal
Agreement Compliance Determination
Agreement Interpretation
Agreement Compliance Gap Analysis
Agreement Risk Management
Agreement Risk Definition
Agreement Risk Modeling
Agreement Risk Assessment
Agreement Risk Aggregation
Agreement Risk Mitigants Management
Agreement Access Management
Agreement Access Constraints
Agreement Access Constraints
Agreement Access Enforcement

Customer Management to Microservices Decomposition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Customer Identification
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Customer Type Management
Customer Associated Companies Management
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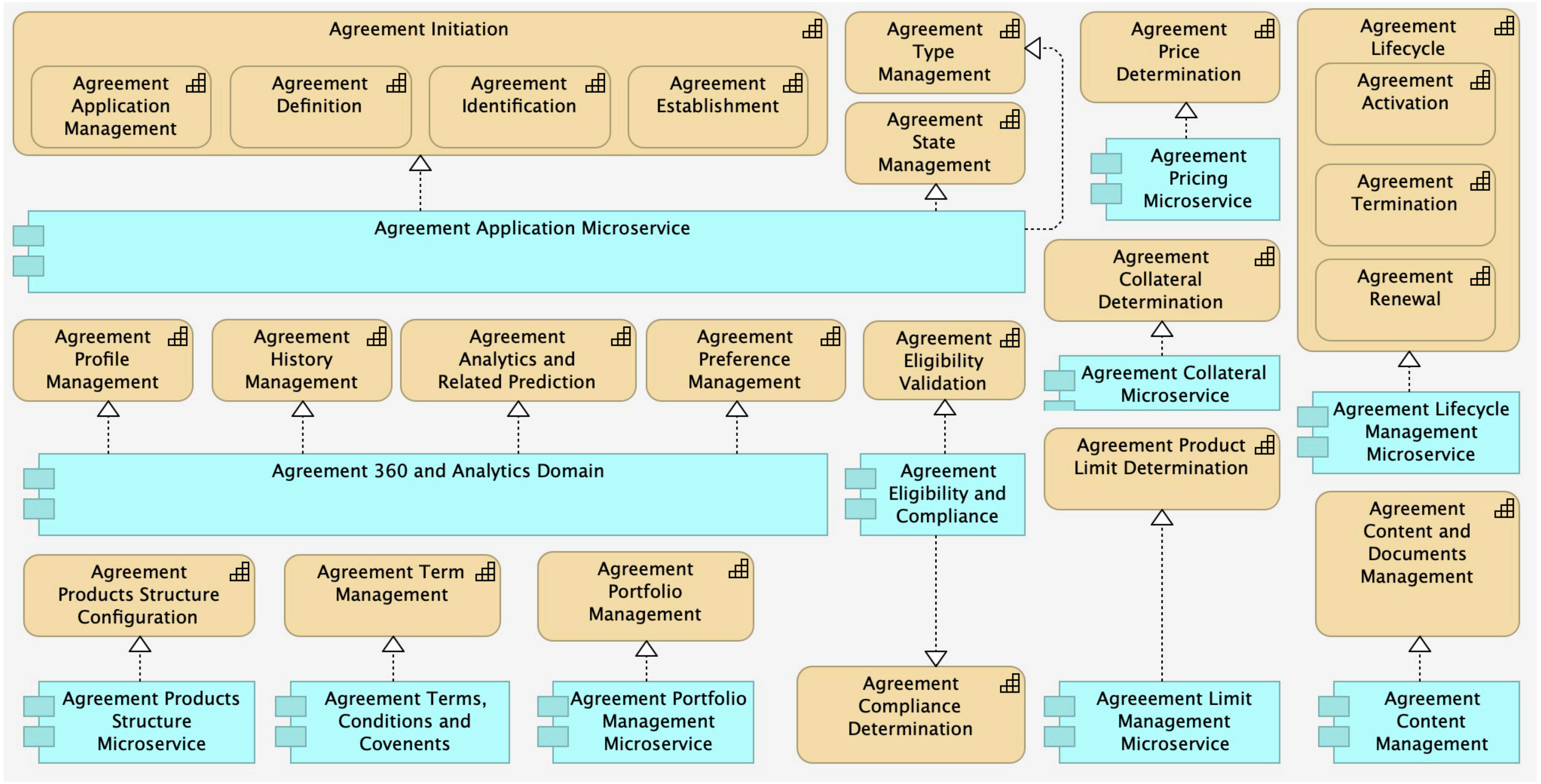
Customer Microservice
Customer Lifecycle Management
Customer Sourcing Onboarding
Customer Promotion and Growth Management
Customer Retention Management
Customer Retirement Management
Customer Journey Enablement
Customer Journey Mapping
Customer Journey Design and
Customer Journey Assessment
Customer Journey Monitoring
Customer Interaction Management
Enterprise Experience Management
Customer Inetraction App Management
Customer Notification Management
Customer Events Management
Customer Preference
Customer Preference Definition
Customer Preference Interpretation
Customer Preference Enforcement
Customer Profile Management
Customer History Management
Customer Analytics Management
Customer 360 and Analytics Domain – CQRS Pattern
Customer Deal Portfolio Management
Customer Deal Portfolio Articulation
Customer Deal Portfolio Performance
Customer Products Portfolio Microservice
Digital Platform: Separate Domain
Customer Lifecycle Microservice
Customer Credit Risk Management
Customer Credit Risk Definition
Customer Credit Risk Modeling
Customer Credit Risk Analysis
Customer Credit Risk Assessment
Customer Credit Risk Aggregation
Customer Credit Limit Management
Customers Portfolio Management
Customers Portfolio Definition and Planning
Customers Portfolio Monitoring
Customer Authentication and Authorization
Customer Validation and Clearance
Customer Relationship Management
Customer Needs Manageme nt
Customer Credit Assessment Microservice
Customer Financial Analysis Microservice
Customer Credit Limit Microservice
Customers Portfolio Microservice
Customer Authentication and Authorization
Customer Validation and Clearance Microservice
CRM Domain

Agreement Management to Microservices Decomposition


Agreement Initiation
Agreement Application Management
Agreement Definition
Agreement Identification
Agreement Establishment
Agreement Type Management
Agreement State Management
Agreement Price Determination
Agreement Pricing Microservice
Agreement Lifecycle
Agreement Activation
Agreement Termination
Agreement Renewal
Agreement Application Microservice
Agreement Collateral Determination
Agreement Collateral Microservice
Agreement Profile Management
Agreement History Management
Agreement Analytics and Related Prediction
Agreement Preference Management
Agreement Eligibility Validation
Agreement Lifecycle Management Microservice
Agreement 360 and Analytics Domain
Agreement Eligibility and Compliance
Agreement Product Limit Determination
Agreement Content and Documents Management
Agreement Products Structure Configuration
Agreement Term Management
Agreement Portfolio Management
Agreement Products Structure Microservice
Agreement Terms, Conditions and Covenents
Agreement Portfolio Management Microservice
Agreement Compliance Determination
Agreeement Limit Management Microservice
Agreement Content Management

Next Actions

- Build the enterprise capability map to at least the third level.
- Build the value stream map and start with the most important cusomer facing one. Map the selected value streams to the enabling capabilities.
- Build the information map.
- Design the microservices boundaries using the capability map and the information map.
- Design the microservices interaction using the valuestream/capability cross mapping.

Conclusion

- The enterprise architecture is introduced in as a framework that provides the appropriate components for abstracting business domains and bounded contexts with characteristics that can be used to define microservices boundaries and good microservices decomposition.
- Business capabilities have the characteristics of being stable, technology and organization structure agnostic, a high-level concept and can be linked unambiguously to the business strategy, and able to transform value generated in wide business scenarios.

Conclusion

- A good microservices decomposition follows the principles of good structural decomposition including modularity, information hiding, high cohesion and low coupling. So, we need a decomposition approach that realizes those principles.
- Domain driven design has been introduced as an approach to microservices decomposition. It’s notions of business domains and bounded contexts within those domains are presented as reasonable guide to create the microservices boundaries. However, this approach lacks the business context of a larger framework of strategy, business model, and operating model.

THANK YOU