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Modeling Business Processes for SOA: Designing the Service Oriented Enterprise

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EDS Technology Policy, Processes and Standards

1. Introduction

This tutorial is based on a convergence of business process management (BPM) and service oriented architecture (SOA) from a business perspective.

It describes how business process management supports the design of a service oriented enterprise that will drive the design and alignment of supporting IT systems.

This is a work in process

Evolution of BPM and SOA: Deja Vu

- Business processes driven by flow of paper forms
- Organizations accept request forms for work or authorization
- Workflow management systems to automate document management
- Large, monolithic applications encode business processes
- Applications integrated with file and message flow
- Distributed computing incorporates technical services
- Enterprise applications unbundled with more flexible processes
- Web services technology enables B2B exchanges
- Service oriented architecture concept emerges
- Service concept applied to application composition/integration
- BPMS enable flexible applications and B2B exchanges
- Choreography defines exchange agreements
- SOA enables better alignment of business and IT systems

The Changing Business Landscape that Drives BPM and SOA

- The marketplace is global and evolving
- Business transformations occur with increasing frequency (re-engineering, acquisitions, divestitures)
- Business functions may be outsourced or operate in a remote country
- Increased concerns about government regulation
- Business changes must be deployed throughout the enterprise quickly and efficiently
- The enterprise must be event-driven and agile for optimal performance

Agenda

- The relationship between BPM and SOA
- Business process modeling

  Break
- Service oriented analysis
- Organizational design
- Service Interfaces Design
- Integration of business rules

  Break
- IT Infrastructure Requirements
- Enterprise agility
- Model Based Management vision

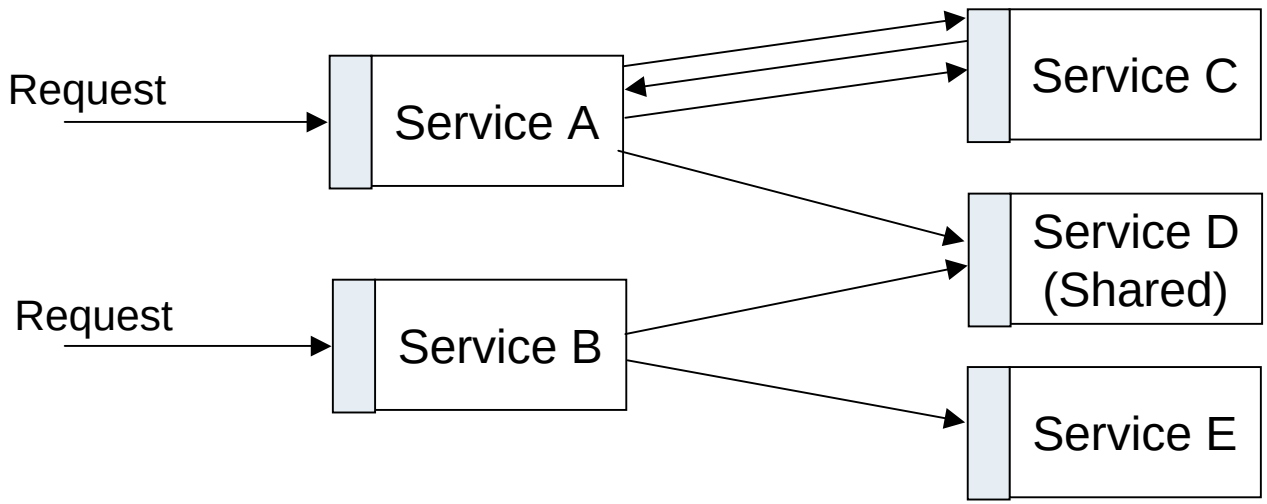
Relationship of BPM and SOA

- BPM: Business processes are the orderly execution of activities that achieve defined objectives.
- SOA: Services offer capabilities that can be used in a variety of contexts.
- Business processes may use services to achieve their objectives.
- Services implemented with explicit business processes can be more quickly adapted to business changes.

Service Oriented Architecture

Offer capabilities so they can be used in a variety of contexts

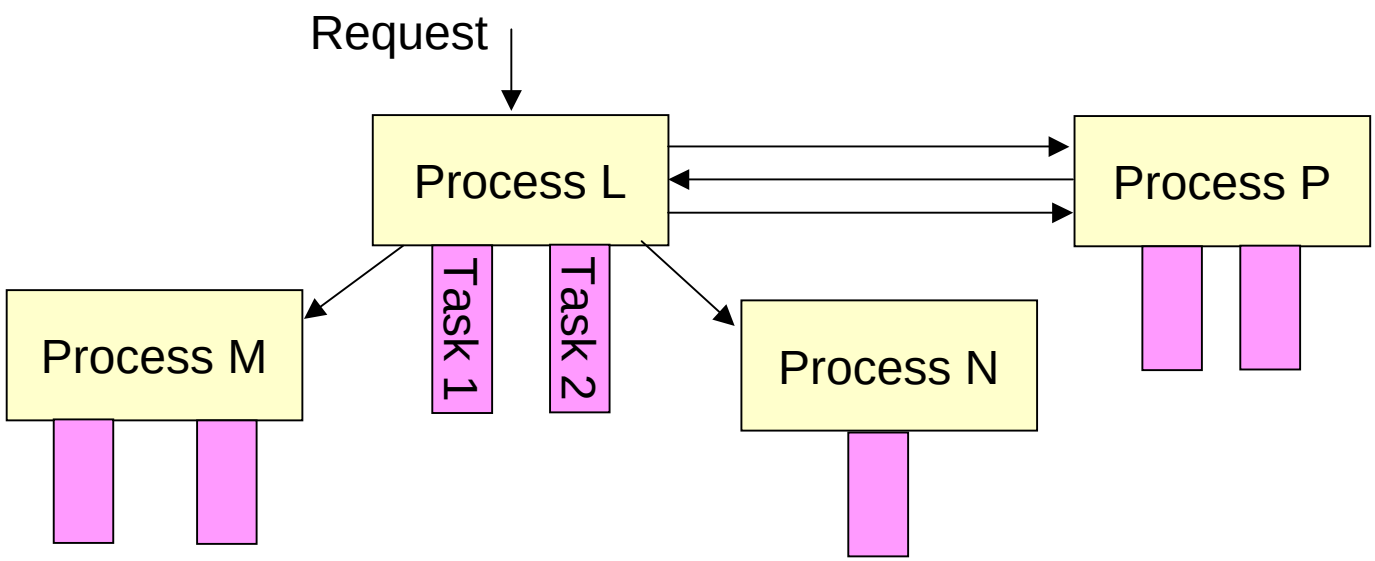
- Leverage shared resources
- Ensure consistency of results
- Provide well-defined interfaces
- Preserve implementation flexibility
- Ensure clear responsibility
- Compose solutions from shared services



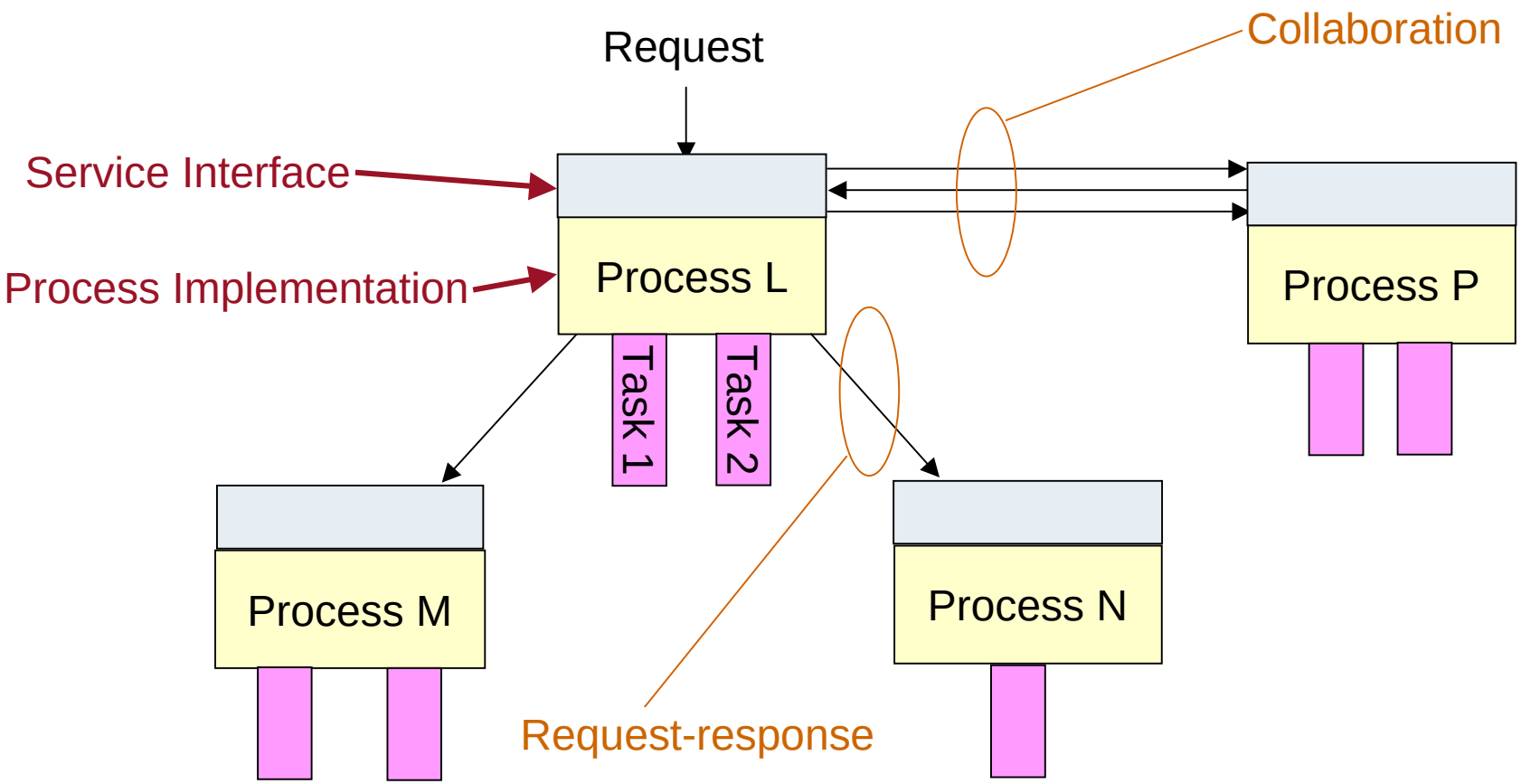
Business Process Management

An ordered set of activities that achieve a desired business objective.

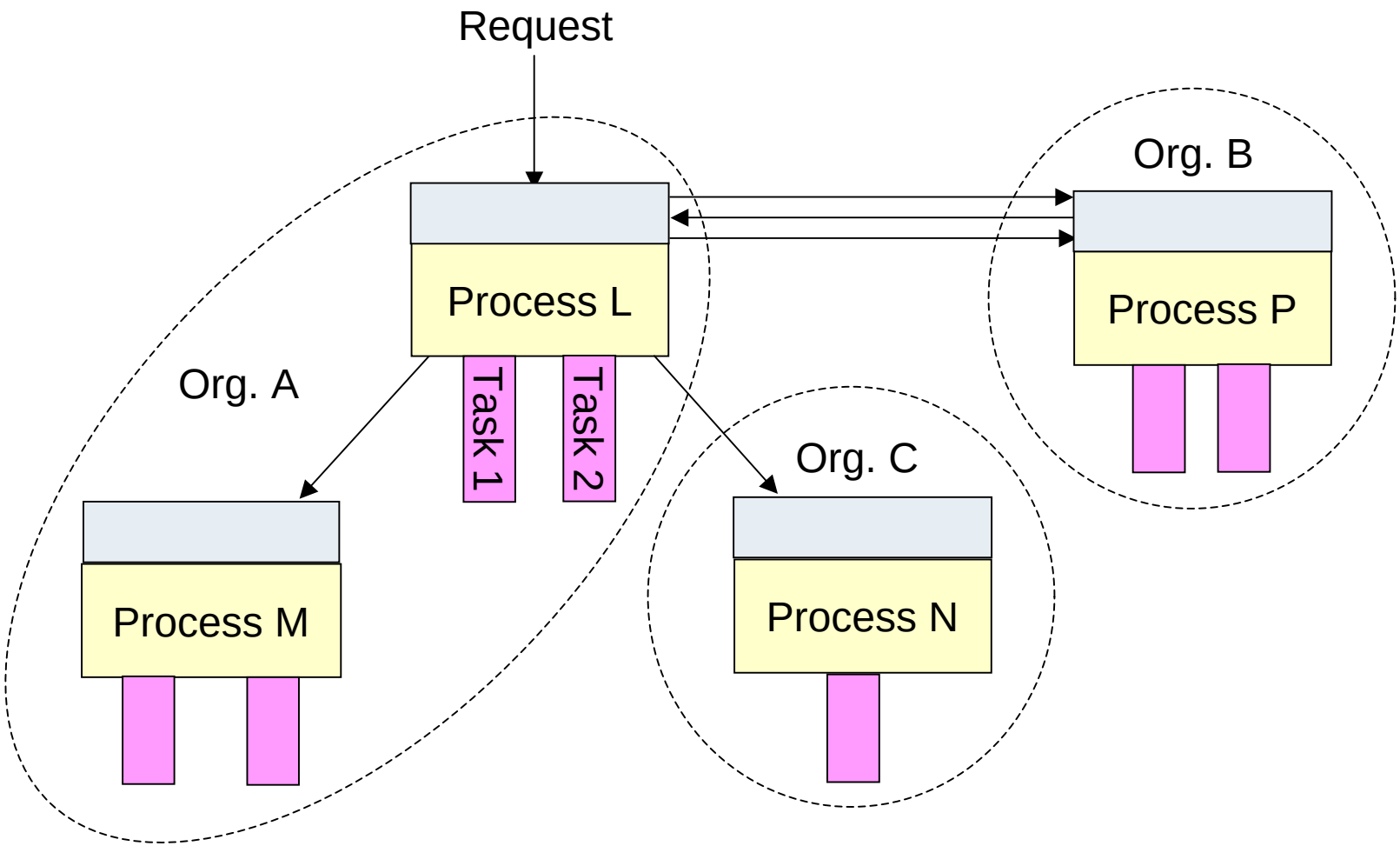
- Each execution transforms inputs to result
- May be automated or performed by humans
- Defined process is used many times
- May perform tasks directly or use other processes
- May respond to a request, or collaborate



Processes as Services



Organizations as Service Providers



Why BPM and SOA?

- Economies of scale
  - Resources shared in multiple contexts
- Consistency
  - Same process used for same capability
- Service metrics
  - Basis for comparison/evaluation of service providers
- Timeliness
  - Respond to needs as they occur—transaction based
- Outsourcing option
  - Services may be acquired elsewhere
- Agility
  - Service selection and process changes at different levels of granularity

Agility through Business Process & Service Granularity

- Primary impact of business transformation is on business processes and organizational structure
- The actual work (basic services) and data of the business tend to remain the same.
- Business process changes enable adaptation to significant business changes

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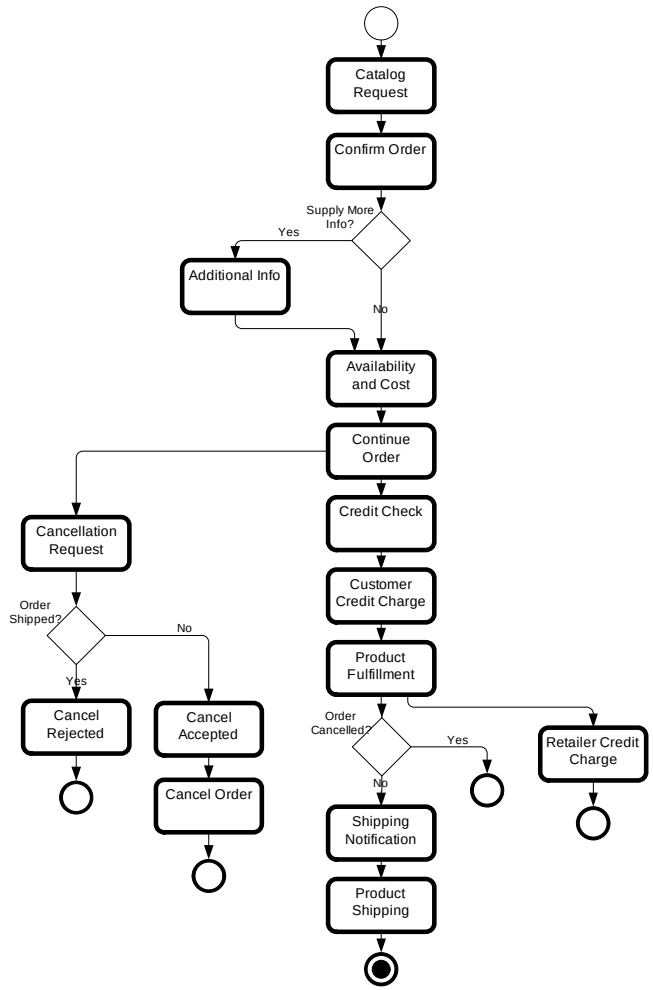
Business Process Modeling Languages

- Proliferation of business process languages.
- Business process modeling for business (OMG standards)
  - BPMN (Business Process Modeling Notation)
  - BPDM (Business Process Definition Metamodel)
- Support deployment to alternative platforms

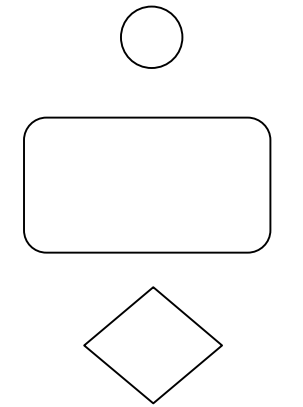
Business Process Modeling Notation (BPMN)

- Graphical notation for process modeling
- Designed for business users
- Platform independent
- Proof of concept mapping to BPEL
- Implemented in a number of process modeling products
- Adopted by OMG through merger with BPMI

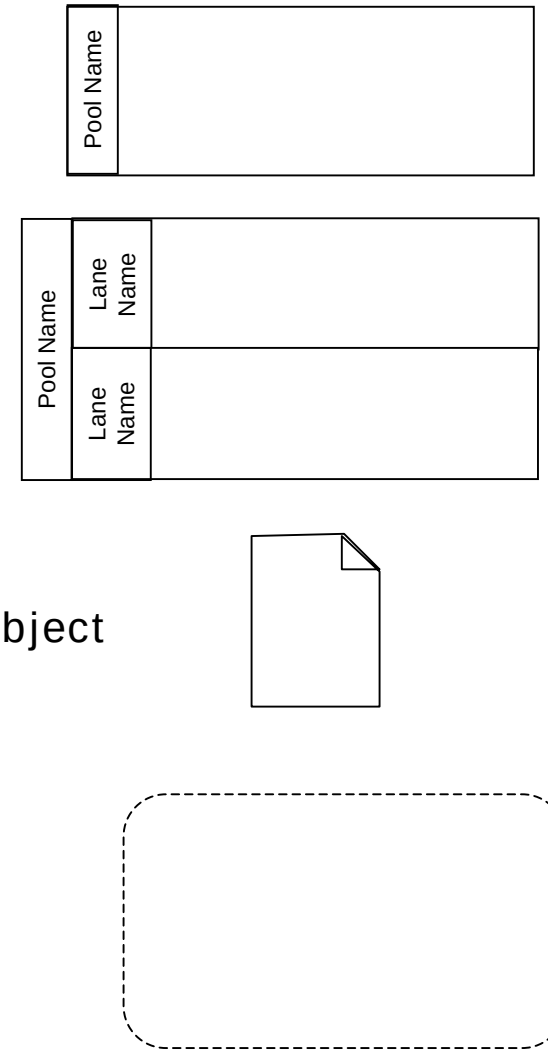


BPMN Core Components

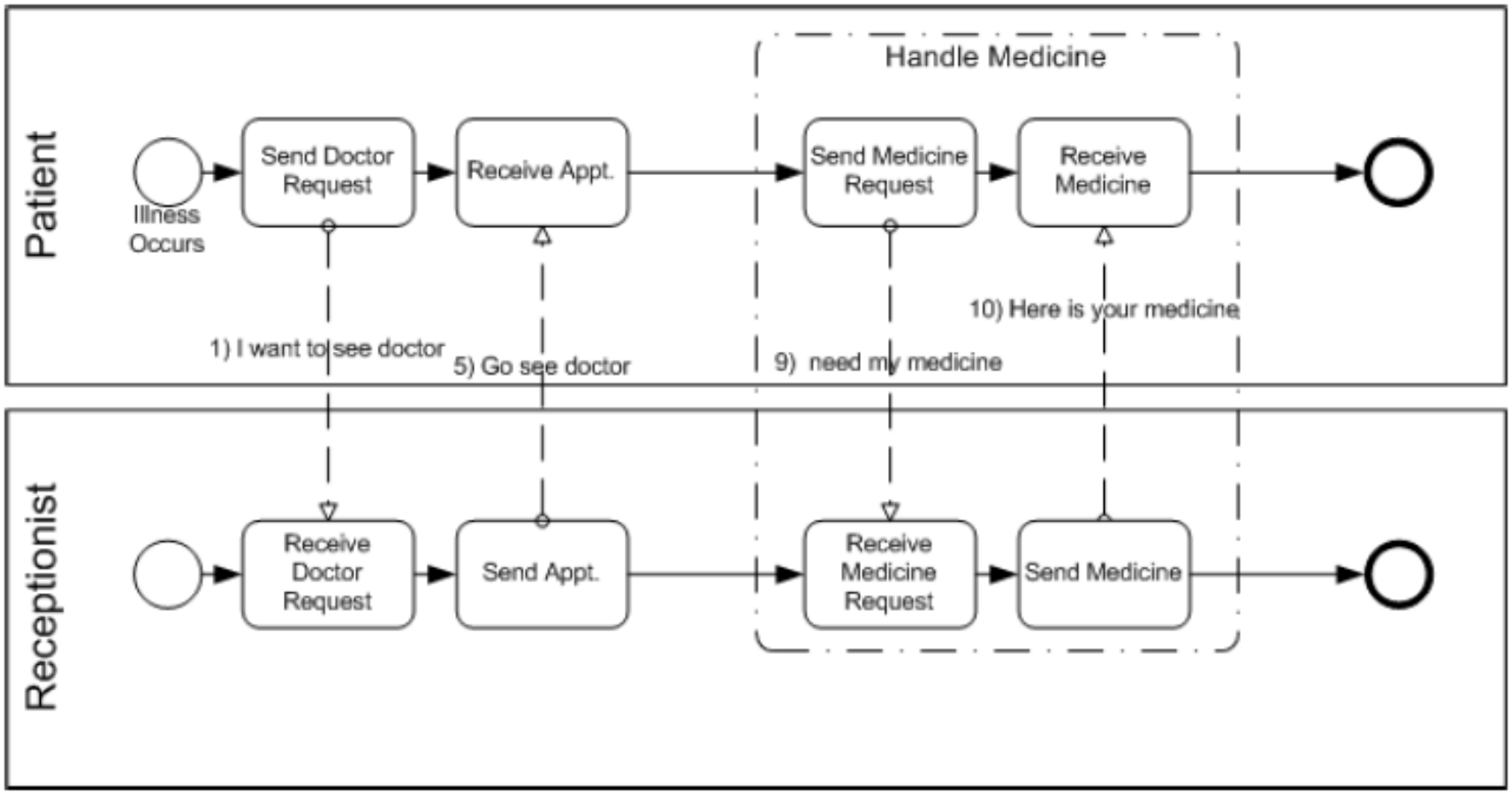
- Event
- Activity
- Gateway
- Sequence Flow
- Message Flow
- Association
- Text annotation



- Pool
- Lane
- Data object
- Group



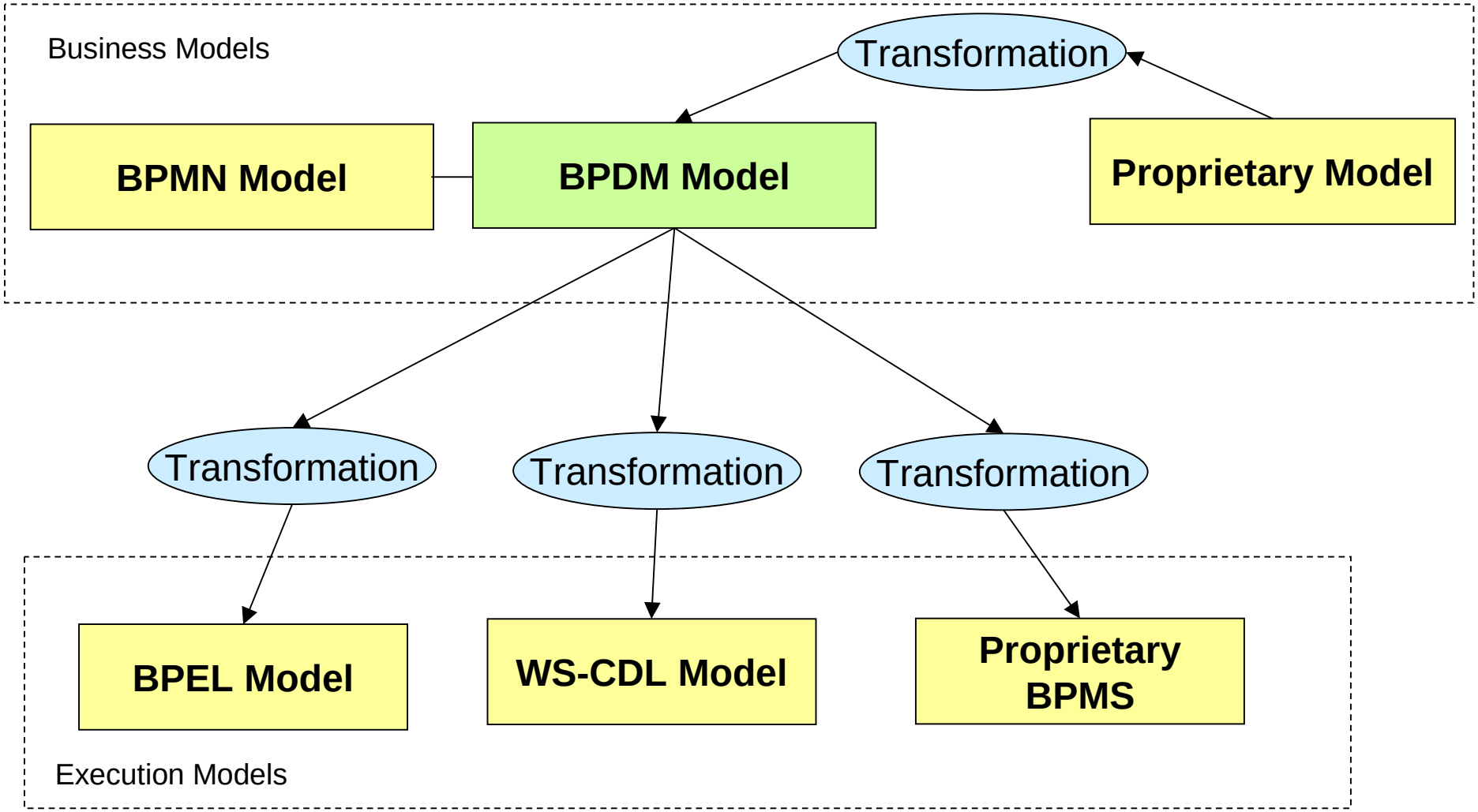
BPMN Example



Business Process Definition Metamodel (BPDM)

- Specification under development by OMG
- BPMN notation
- Multiple viewpoints
- XMI for standard exchange format
- QVT for model transformation
- Includes manual processes
- Platform independent
- Orchestration and choreography
- UML profile for UML tools

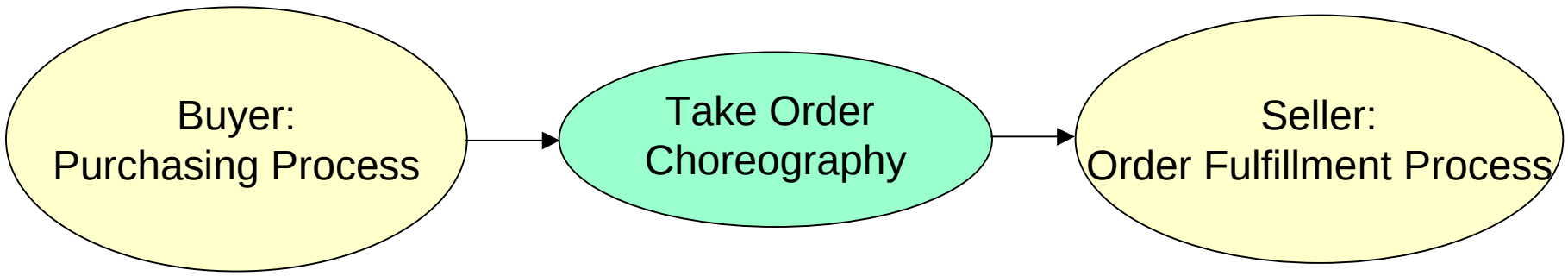
Business Process Definition Metamodel (BPDM)



BPMS – Business Process Management System
BPEL – Business Process Execution Language

WS-CDL – Web Services Choreography Definition Language

BPDM Overview: Processes and Choreographies

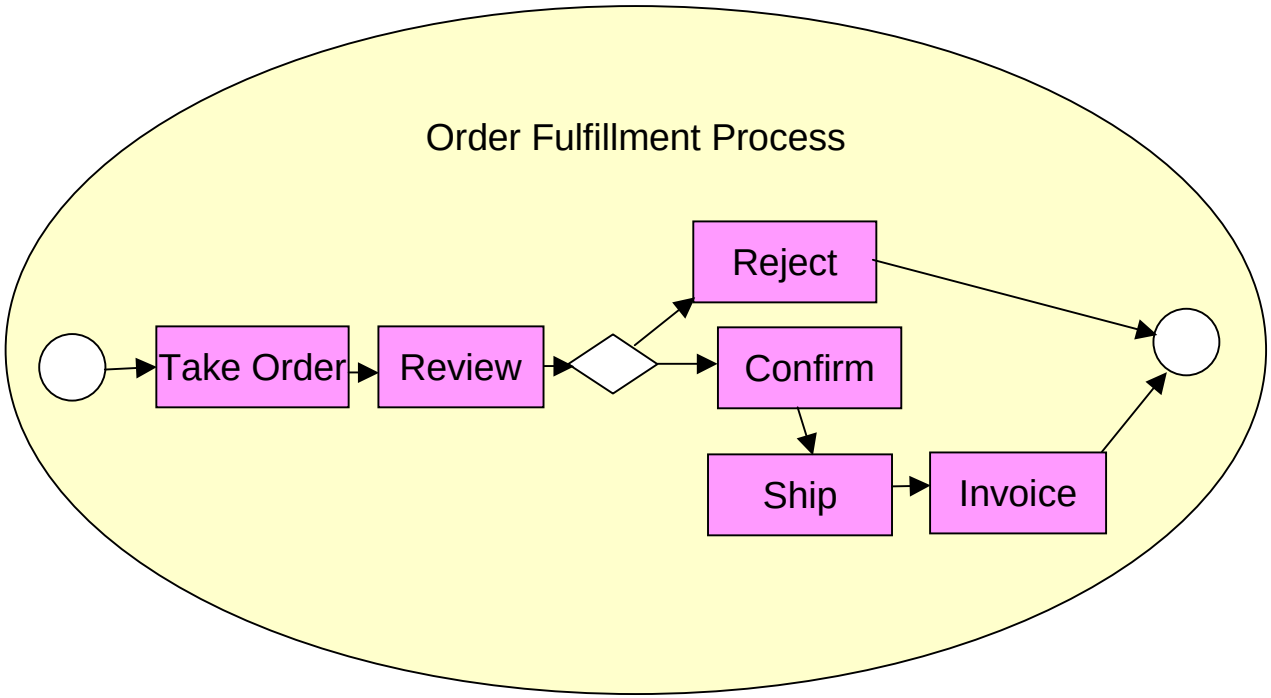


Processes internal to the Buyer

Agreed specification for interaction

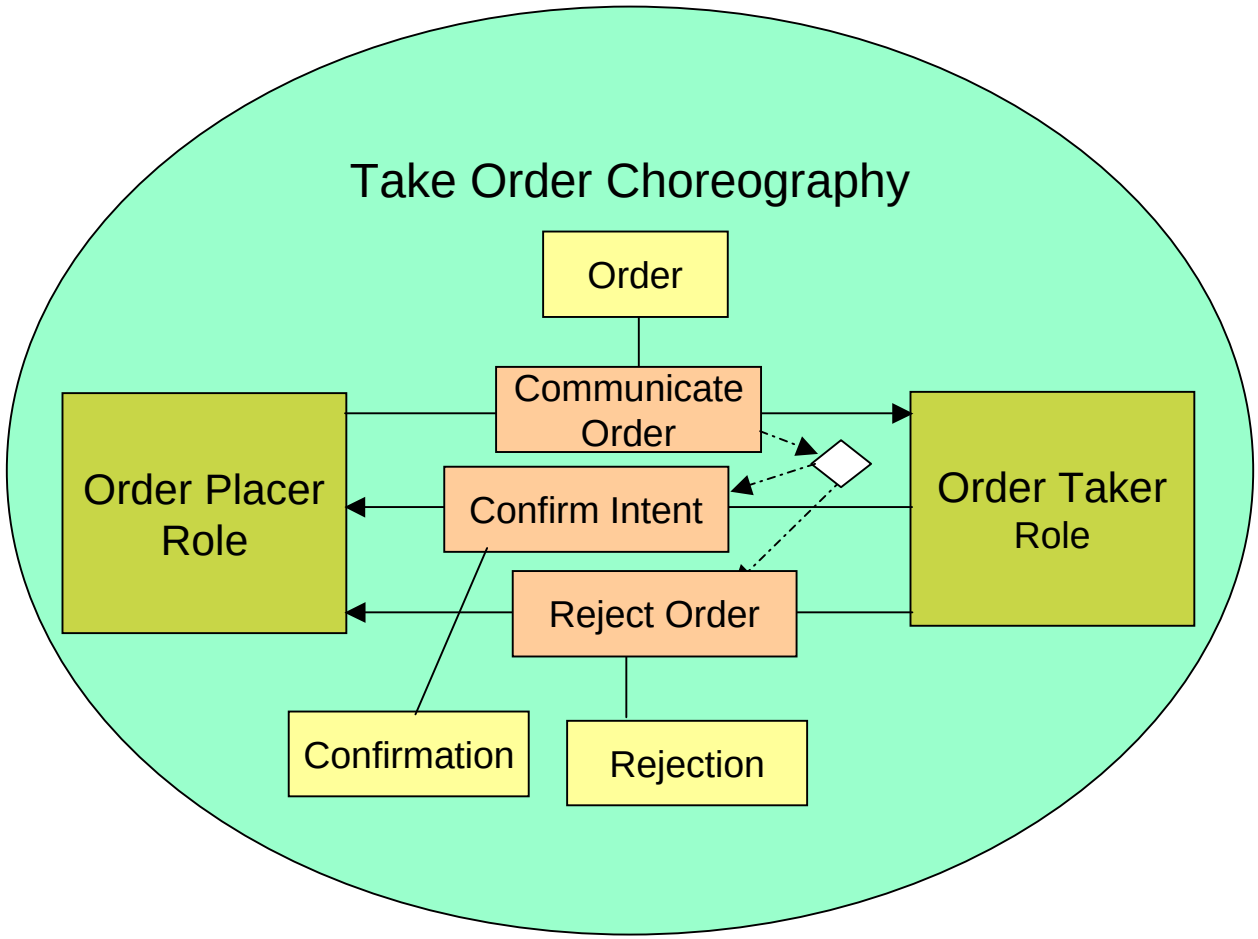
Processes internal to the Seller

Process (Orchestration) Concepts

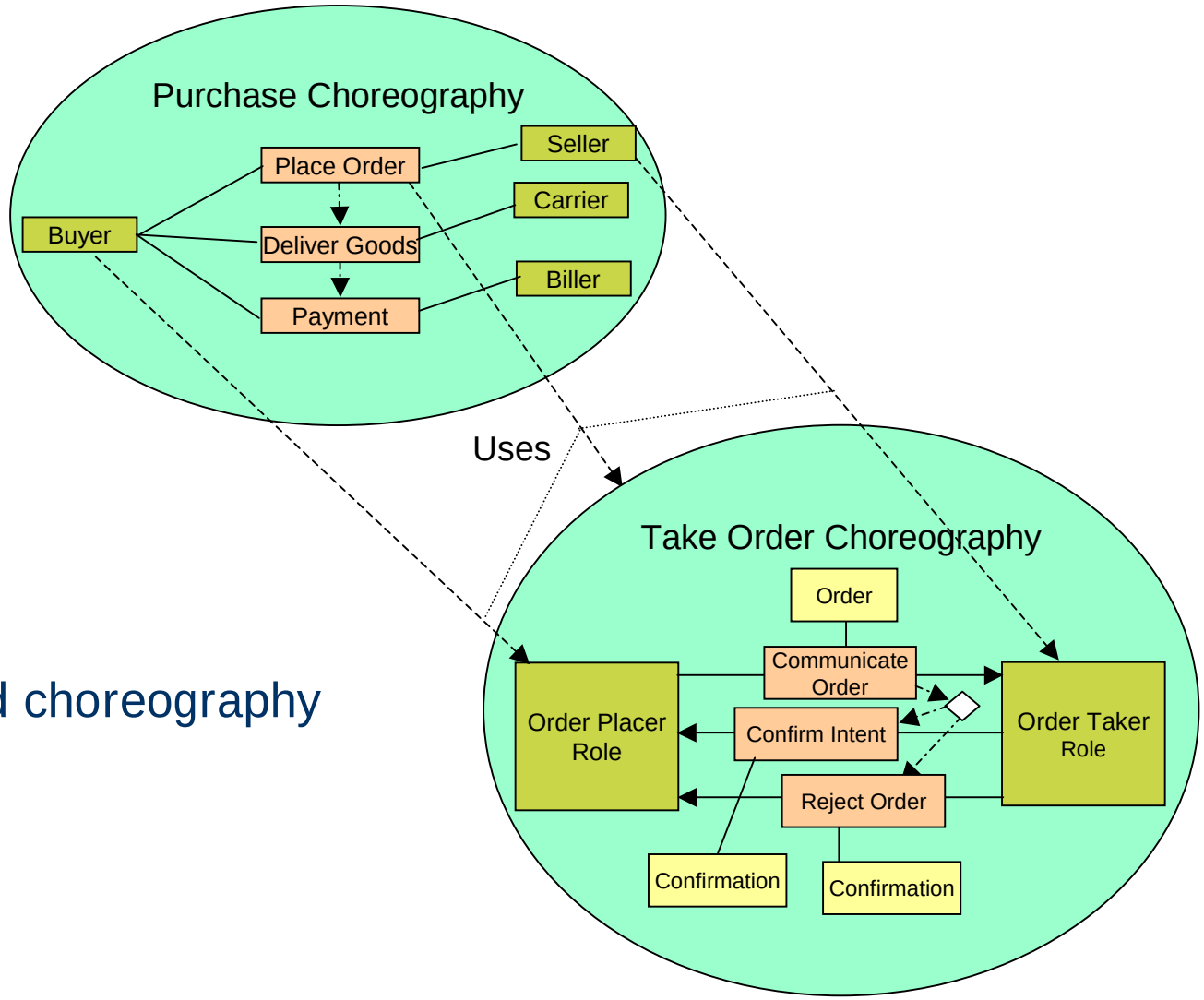


Note: Graphical notation is for illustration purposes only

Choreography (Collaboration/Protocol) Concepts

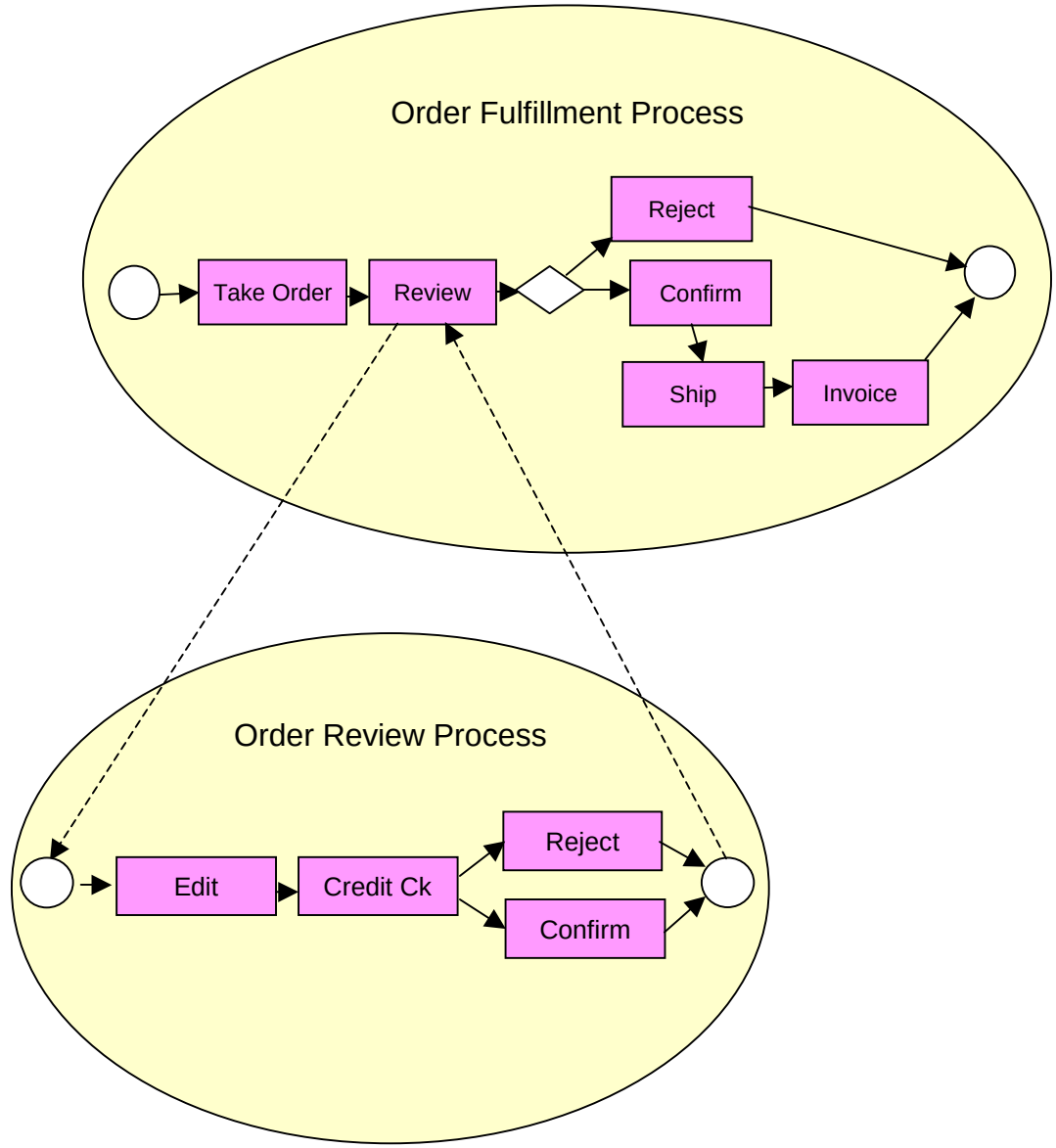


Choreography Composition



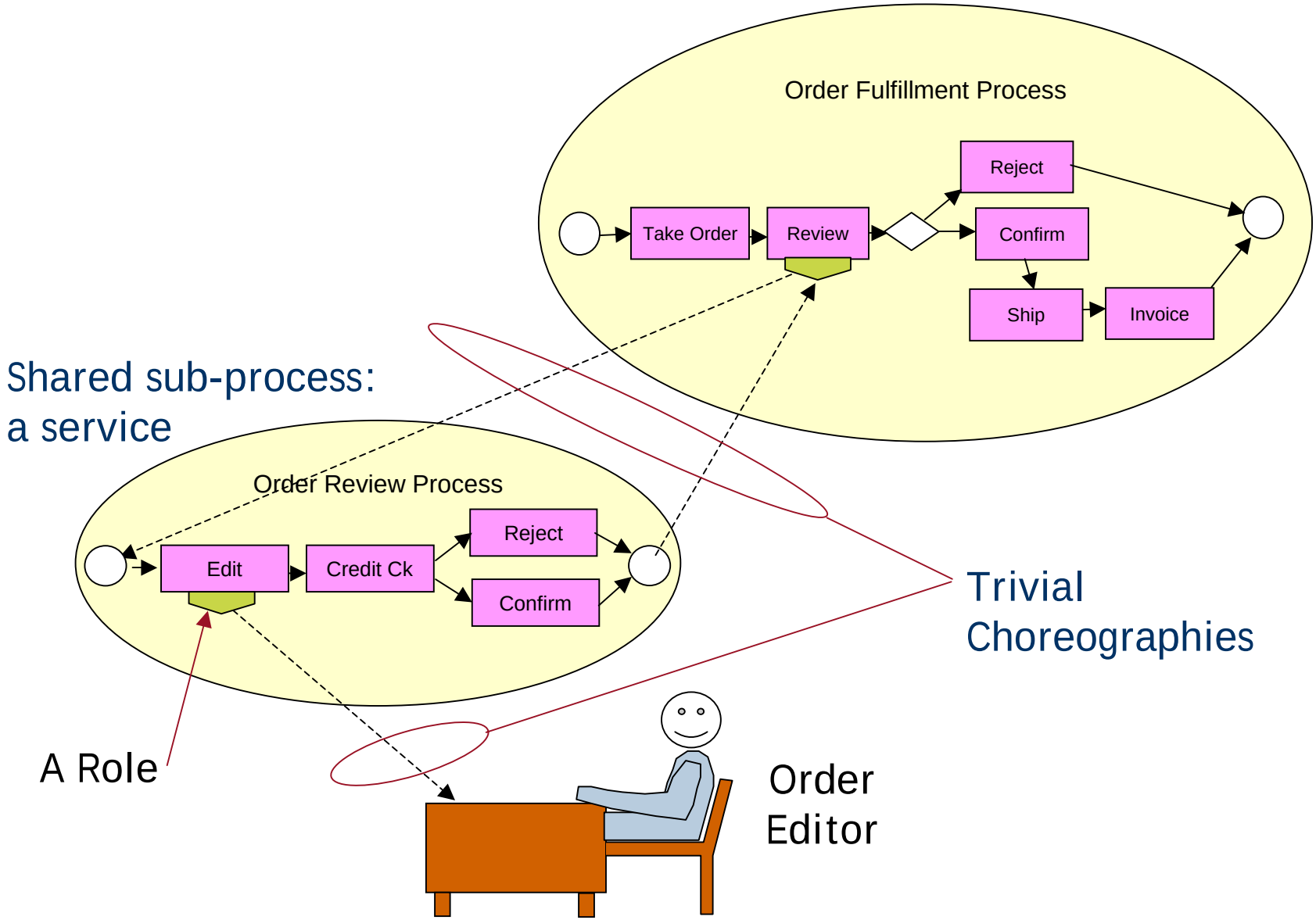
Shared choreography

Process Composition

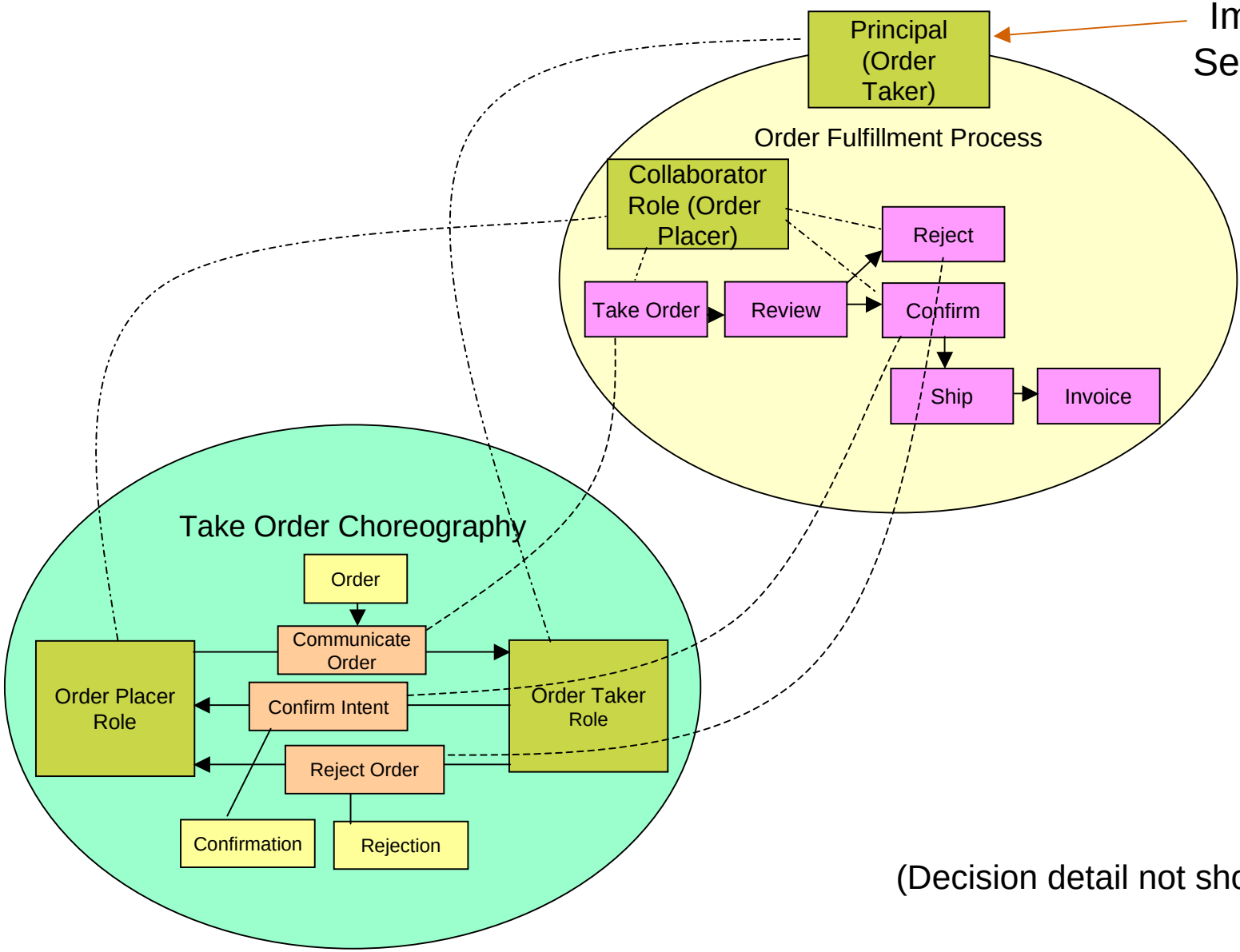


Shared sub-process

Choreography Links Processes

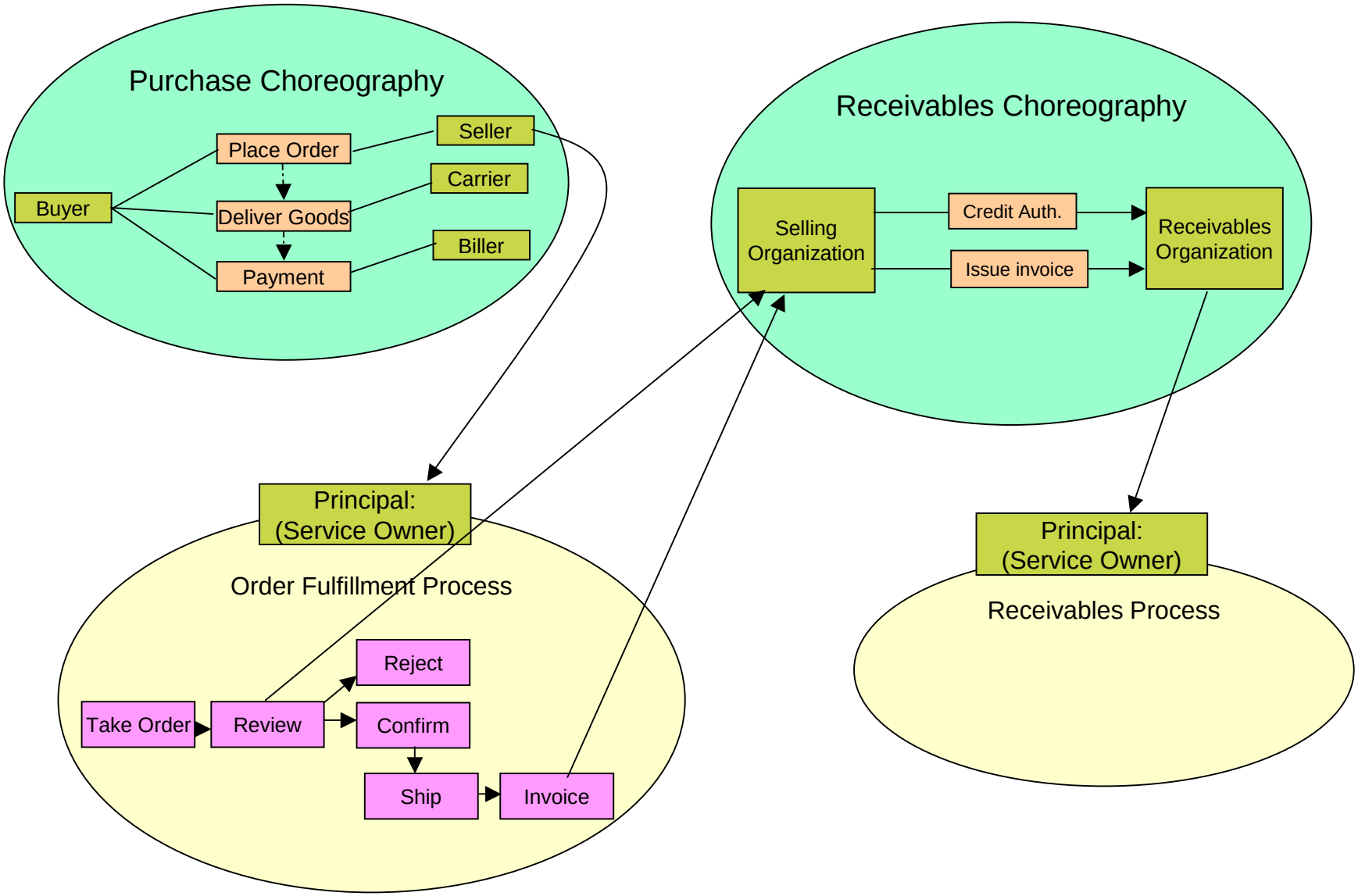


Process Binding to Choreography

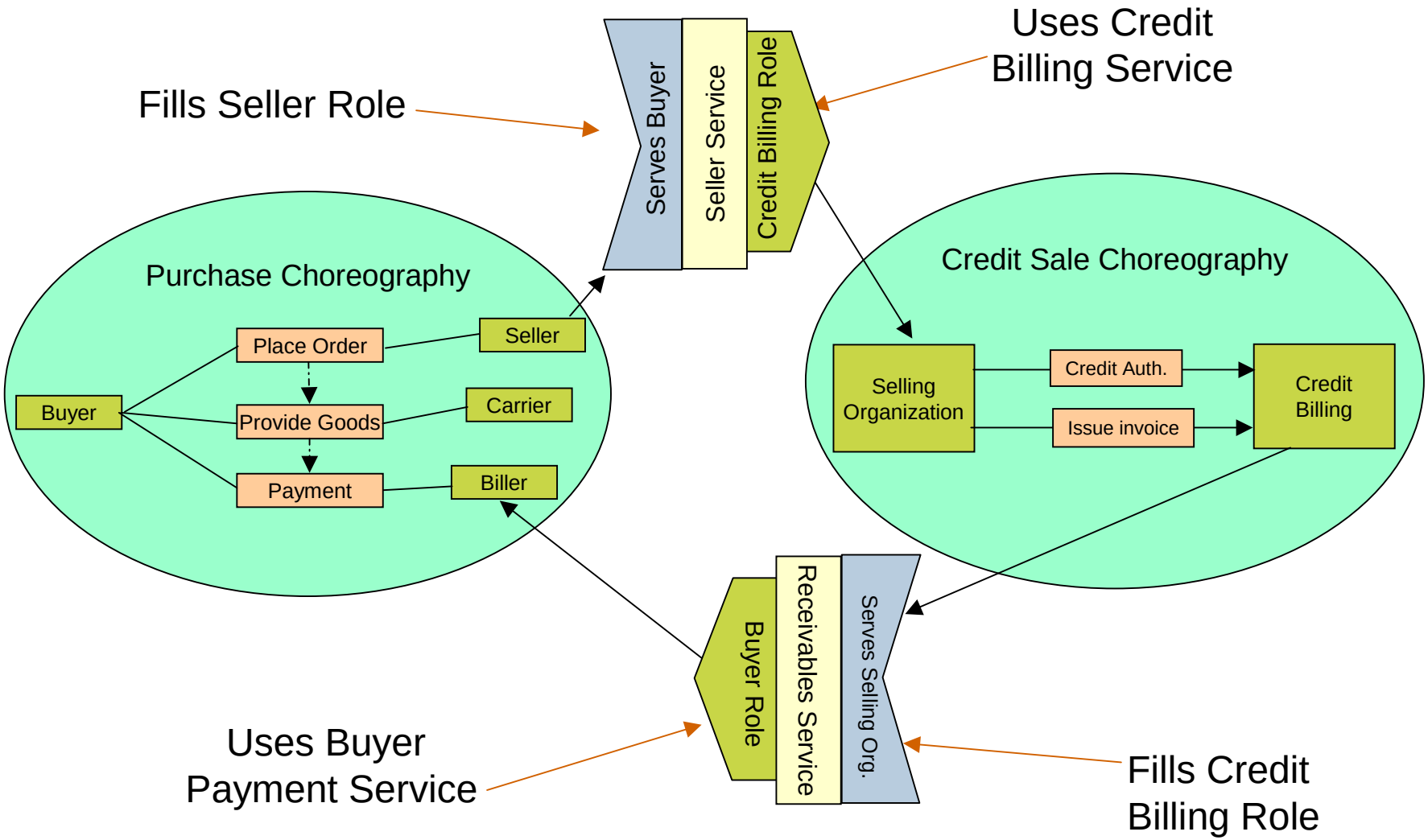


(Decision detail not shown)

Choreographies Connect Participant Processes

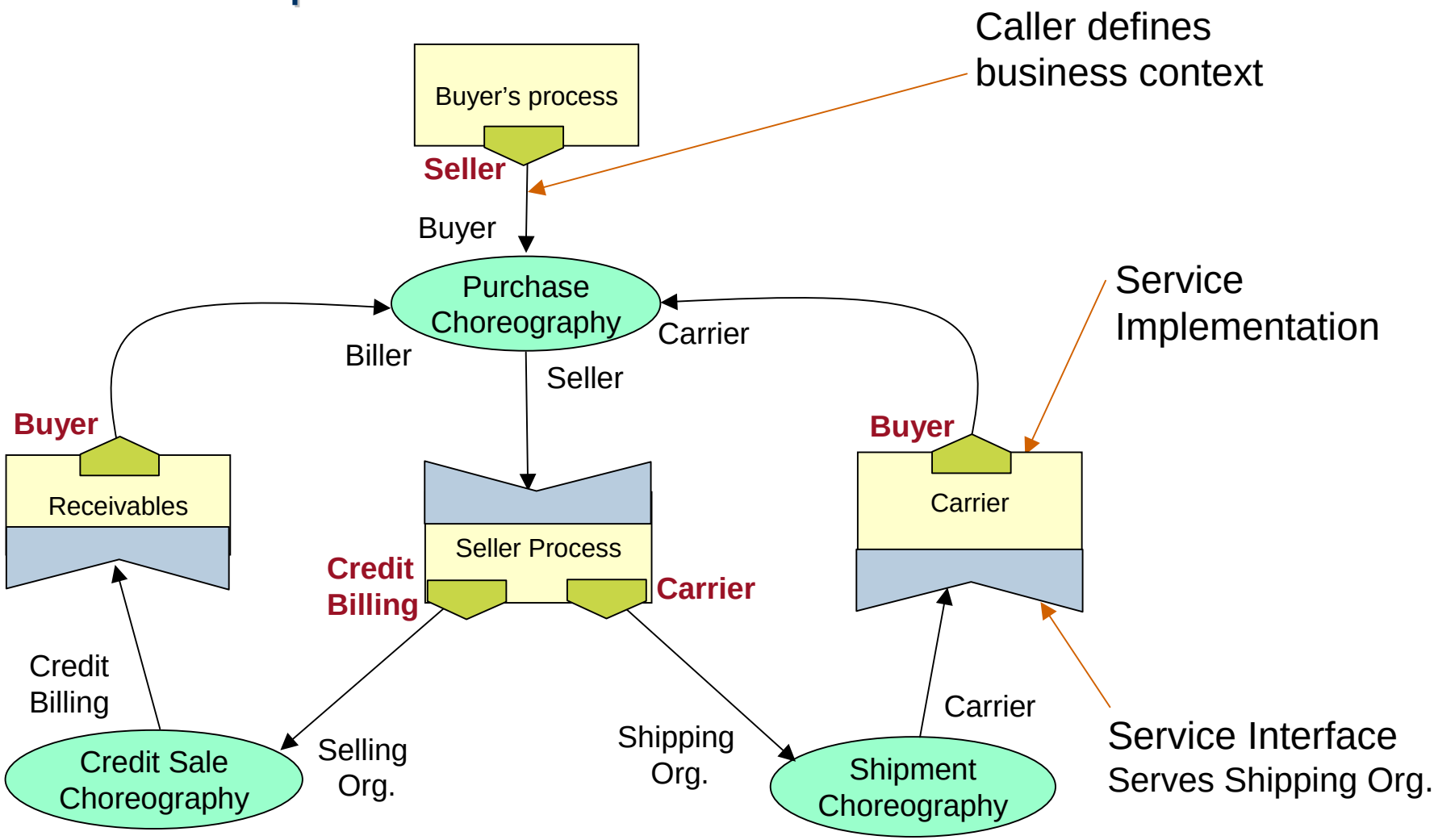


Choreography with Roles



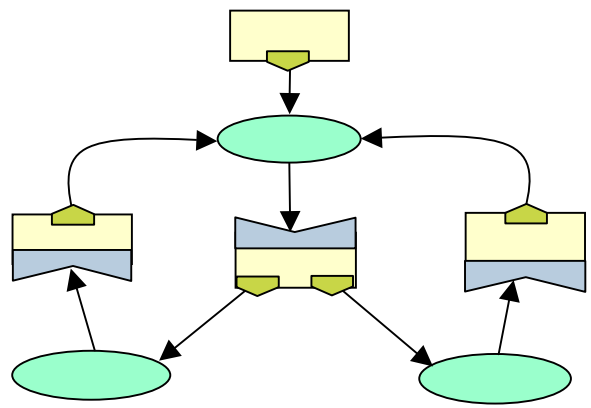
Service User establishes service link and defines context for service

Roles Viewpoint

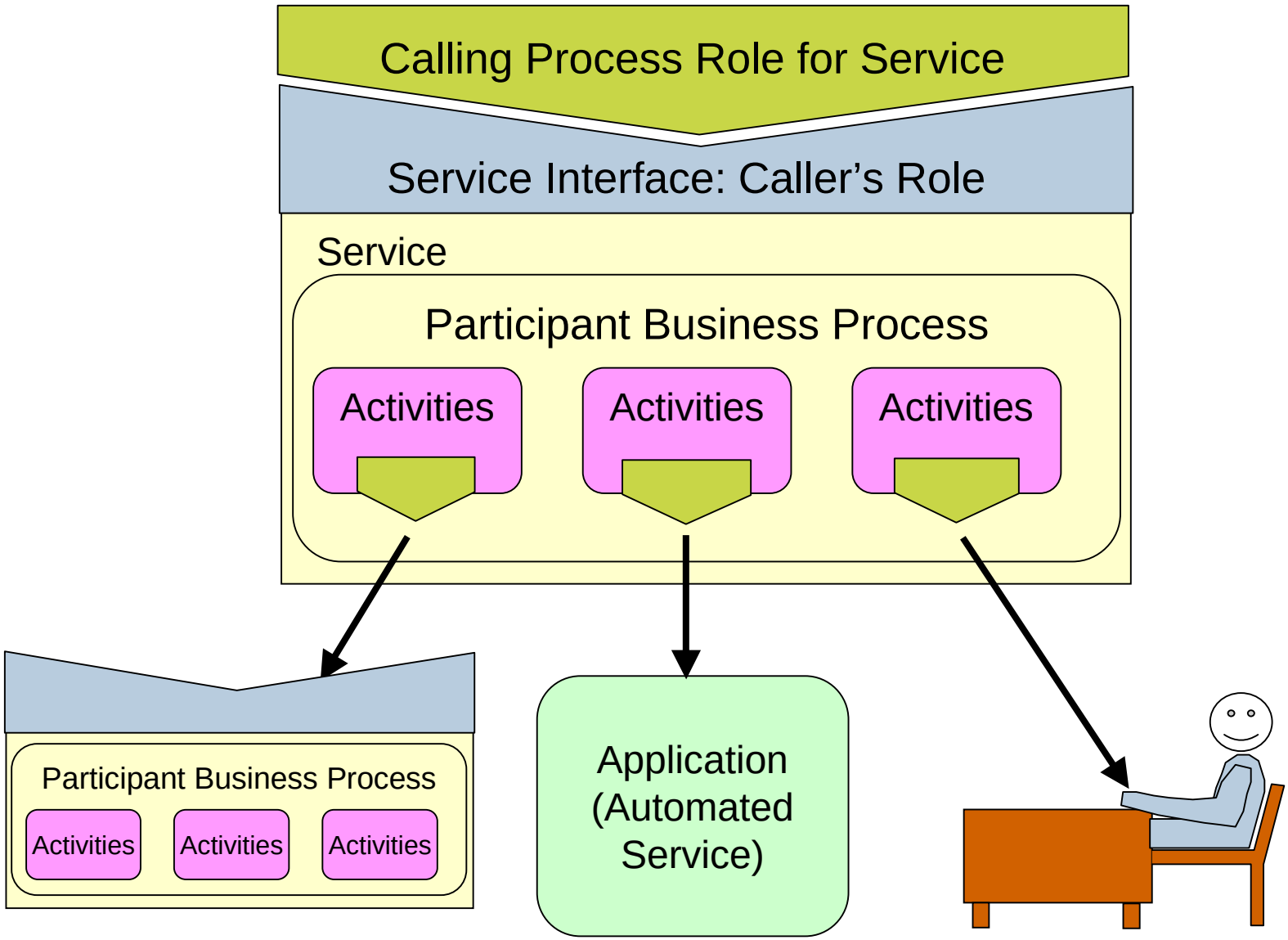


Process Role: Definition

- Participation of a business entity (person or organization) in a particular type of business activity.
- The entity in the process role is expected to fulfill a specific responsibility
- Participation is defined by a choreography
- The availability to participate may be characterized as a service offer
- A business entity may define other process roles to fulfill portions of its the responsibility



Services, Processes and Roles (Choreography Omitted)



Break

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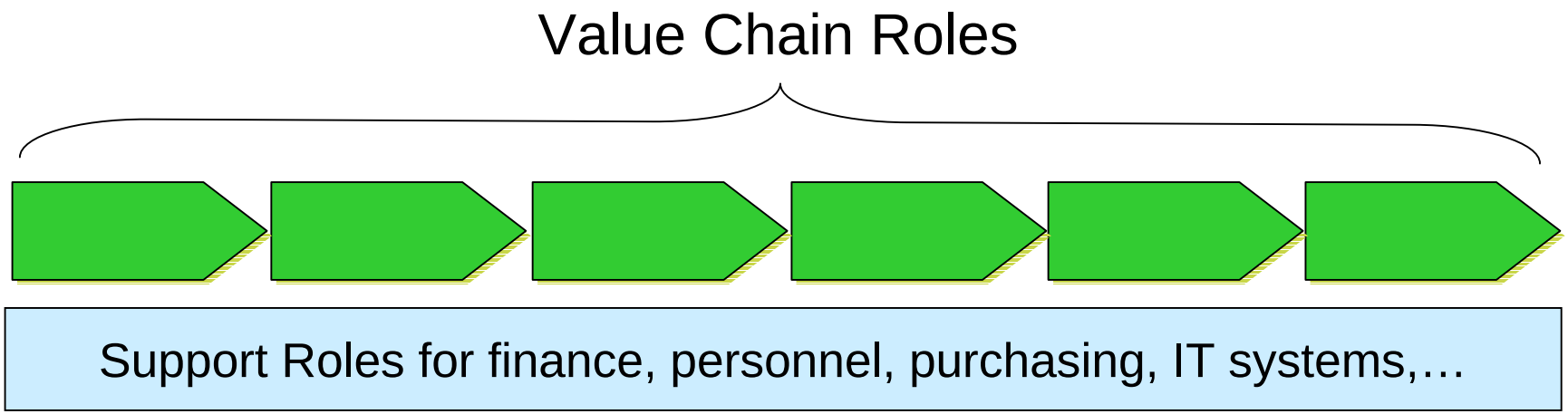
Top Down Services Oriented Analysis



- Value chain composed of services to add value—perform transformations
- Support roles support the value chain operation
- Could be corporate or departmental value chain

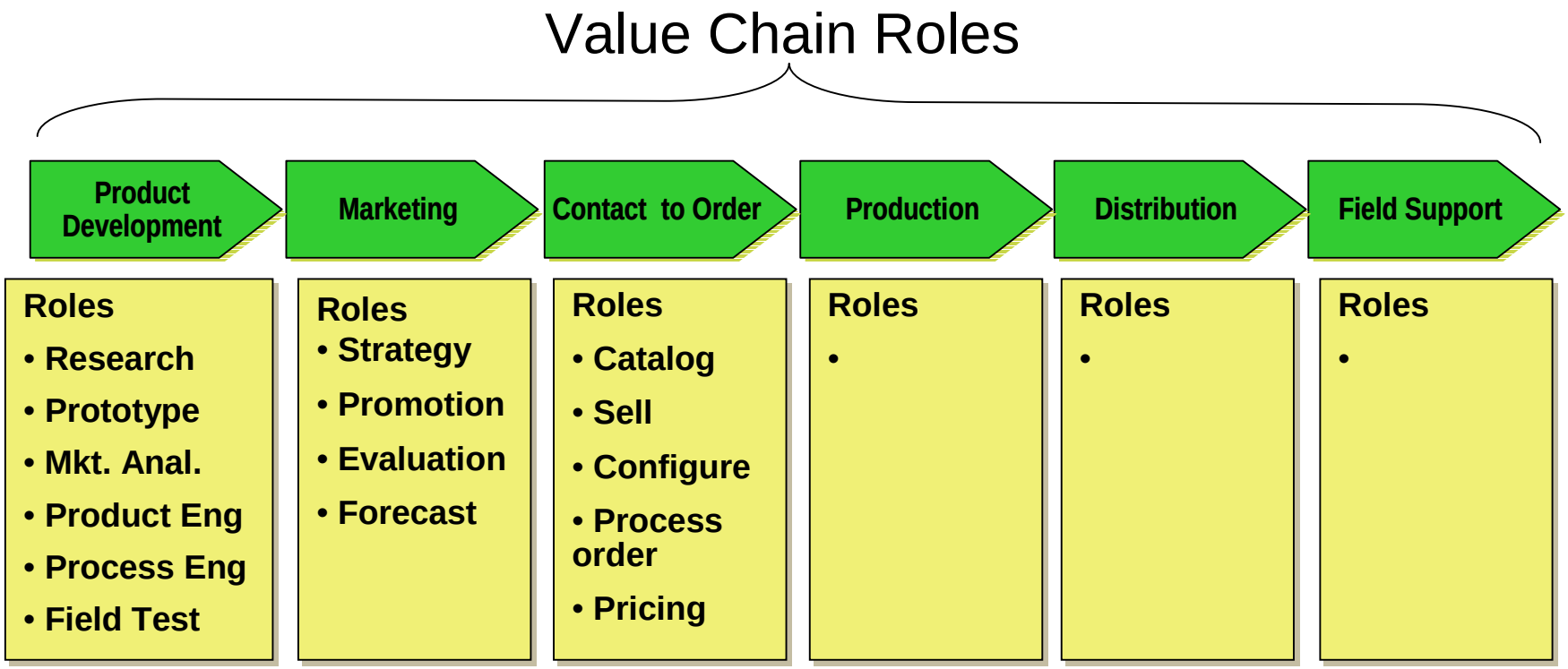
Service Oriented Analysis Phases

Roles define needs for service providers

- Define value chain role hierarchy
- Consolidate roles to define shared services
- Assign services to organizations
- Define service interfaces and choreography
- Define service processes

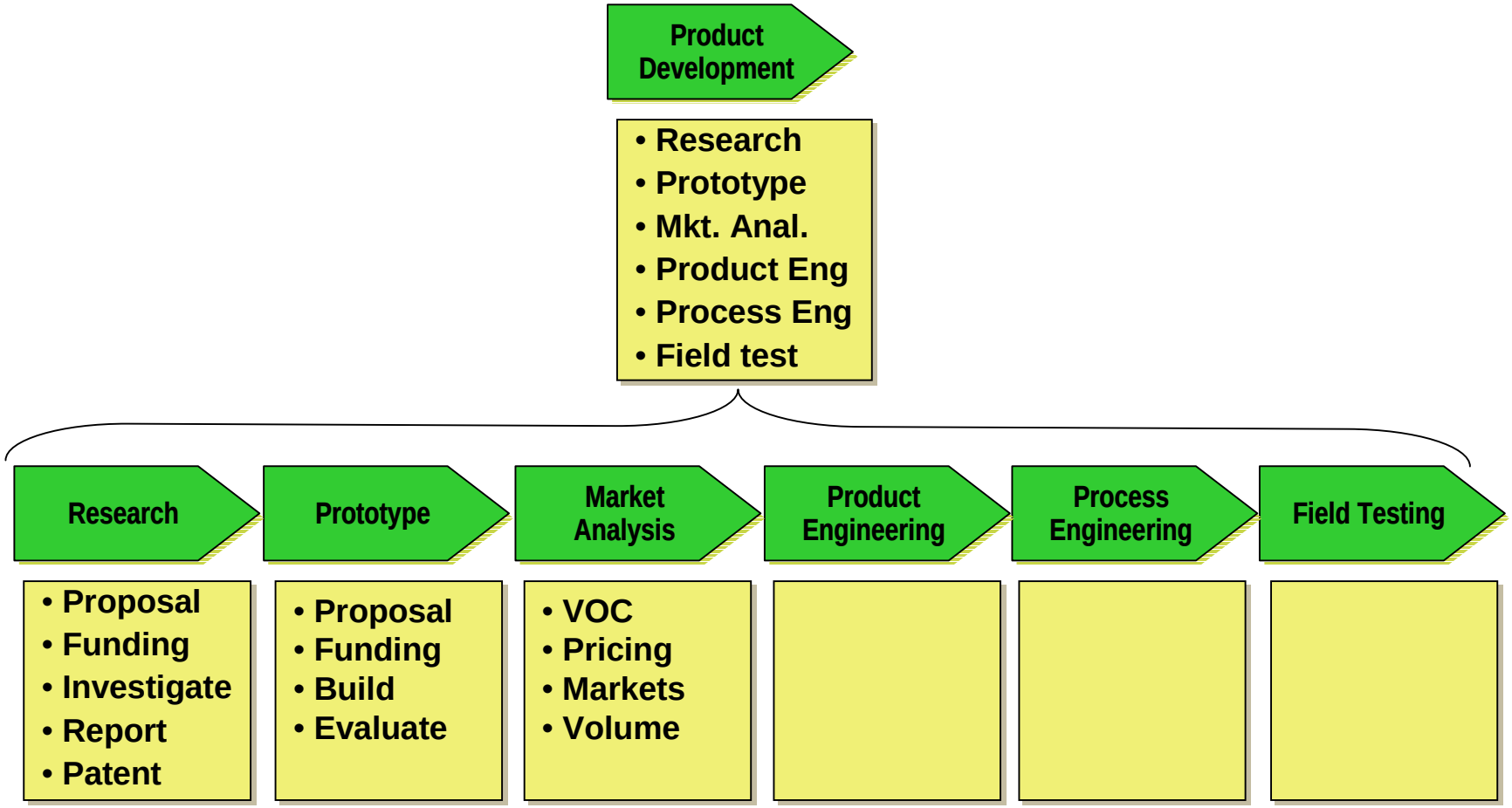
An iterative process

Role Hierarchy



- Roles define usage of services
  - Independent of specific organizations
  - Without detailing how service is performed
  - Without defining how roles interact

Recursive Role Decomposition



Continue until roles are performed by people, applications, support functions (e.g., accounting, purchasing) or external services. These are leaves of the tree.

Information Capture for Roles

- Role context and name
- Role responsibility
- Request data
- Result data

} Service Order Data

- Vocabulary for roles and data

For efficiency, some role specifications will be shared where the use of a shared service is “obvious.” However, each role represents a usage of a service in a context.

Concrete Roles

Filled by people, applications, support functions or external services

- Specific responsibility
- Appropriate set of capabilities
- Well-defined work product
- Real work

Include roles to update key business records

Typical Support Roles

- Financial Management
- Human Resources Management
- Supplier Management
- Information Systems Management
- Facilities Management

Apply similar recursive role decomposition

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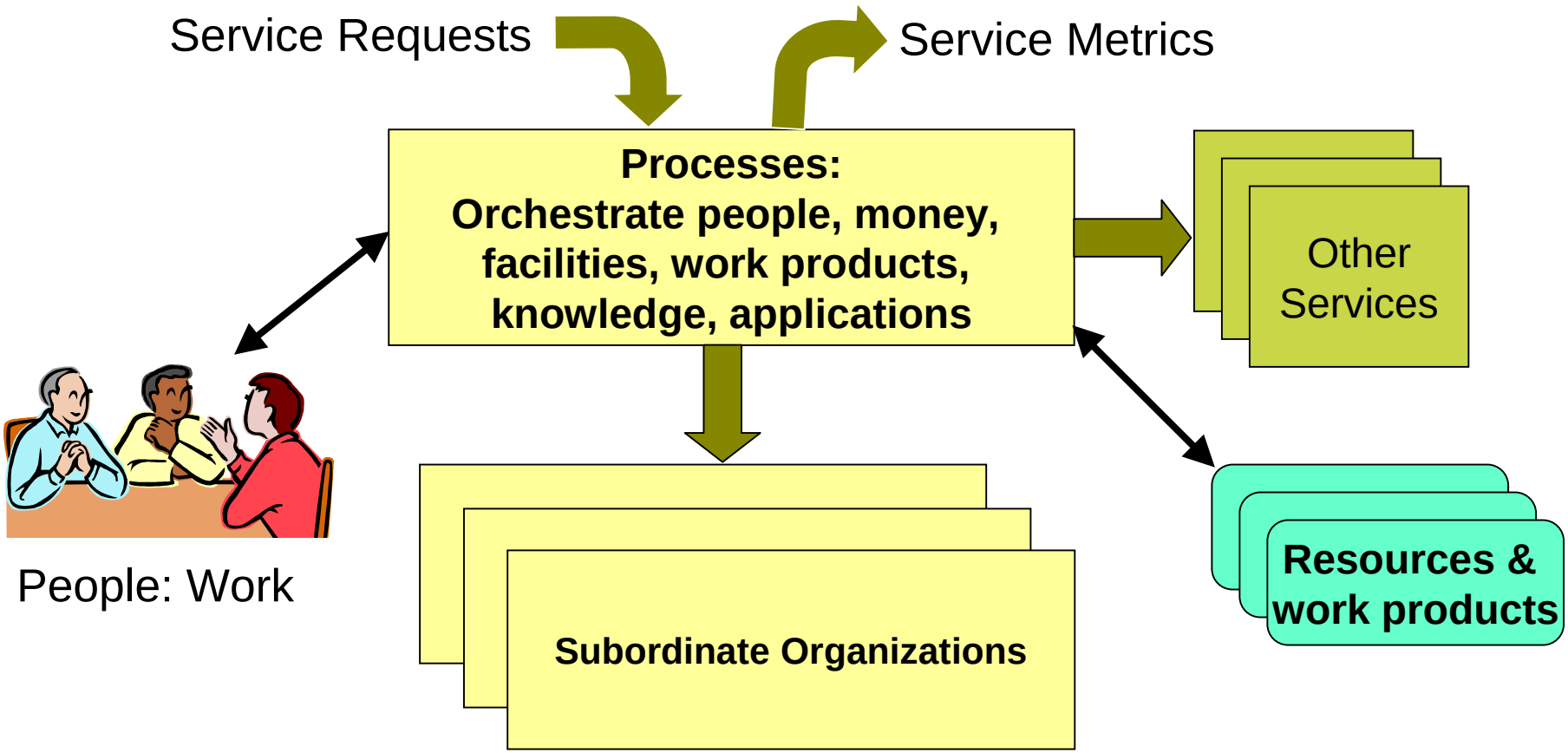
Roles, Services and Organization Units

- Role: defines need for a service
- Service: fills a role and produces a result—may be a process, a human or an application
- Organization unit: manages the operation of one or more services

Organization Unit: Manage Services



Role Consolidation

- Assign each concrete role to a service
- Assign similar roles to the same service based on
  - Responsibility
  - Skills
  - Work product
  - Nature of work
  - Facilities required

Data Management Services: Data as a Resource

Data for each major business record subject area should have a data management service

- Primary source
- Responsible for data security and integrity
- Control updates
- Distribute updates to subscribers
- Subject area examples
  - Customer
  - Dealer
  - Inventory
  - Product specifications
  - Money/accounts
  - Personnel
  - Service orders

Data services have affinity for the organizations where updates are recognized or originate

Current Situation Analysis

- Map concrete services to
  - Organizations
  - Applications
- These services are
  - Fundamental to the business
  - Will generally survive changes in the business
- Identify
  - Overlaps: multiple implementations of same service
  - Gaps: service not being performed (usually a new business requirement)

Specify Concrete Services

- Determine existing concrete services to be retained
  - Teams
  - Applications
- Determine new concrete services to be created
- Map services to organizations, bottom up, based on
  - Geography
  - Economies of scale
  - Authority
  - Data ownership
  - Motivation
  - Skills
  - Coupling
- May expose the need for to delegate to additional roles

Service Alignment Factors

- Geography
  - Location of services based on resources, suppliers, customers, facilities. Same service may be replicated at multiple locations.
- Economies of scale
  - Consolidation of similar functions to achieve efficient user of resources and adapt to shifts in demand
- Authority and Responsibility
  - Appropriate exercise of control and separation of responsibility
- Ownership of resources
  - Ability to control key resources needed to perform the service
- Motivation
  - Management hierarchy mission is consistent with service objective
- Skills
  - Management hierarchy has appropriate experience to manage the service
- Coupling
  - Association with other services that require close interaction

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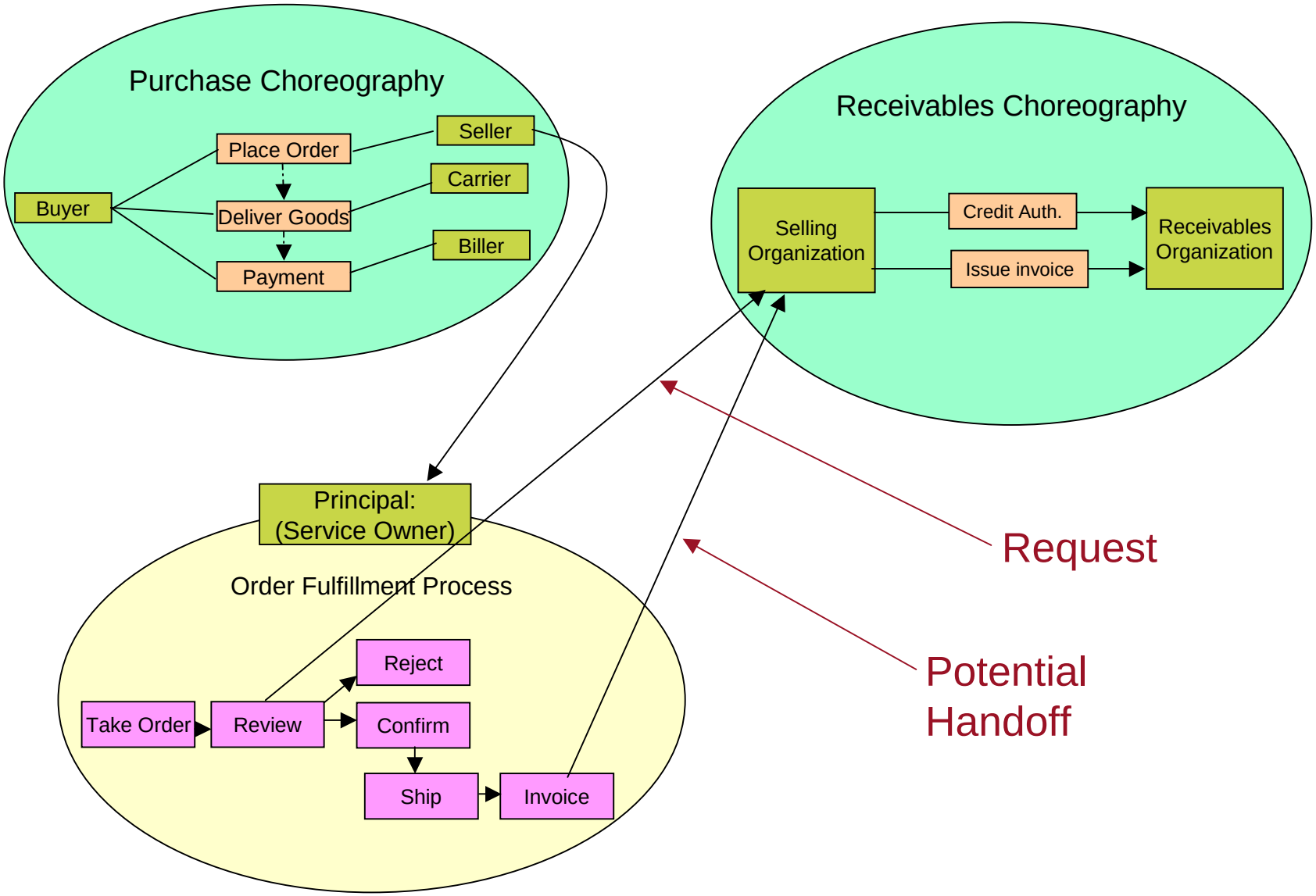
Define Service Interfaces: Choreography

Modes of Interaction between Roles

- Request
  - Delegate part of responsibility
  - Wait for completion
  - Within scope of responsibility
- Handoff
  - Transfer on-going responsibility
  - Potential collaboration
  - Receiving service not within scope of responsibility

Modes of Interaction



Service Operations

Example: Order Fulfillment

- Receive order
- Change order
- Cancel order
- Confirm order
- Report order status

Each may require a separate process

Develop Initial Business Process Models for Services

- Primary processes
  - Requests
  - Handoffs
- Review organizational alignment factors
- Identify needs for additional roles
- Refine choreography

Define Initial Service Metrics

- Internal—Owner view
  - Cost
  - Repeatability
  - Resource utilization
  - Market share
  - Exceptions
- External—Customer view
  - Flexibility of requirements
  - Ease of use
  - Cost
  - Availability of service
  - Timeliness of result
  - Quality of result
  - Response to changes, cancellations, queries,…

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Enterprise (Business) Rules

- Constraints
  - An order will not be accepted if the customer credit limit will be exceeded
- Derived facts
  - A priority order is one that has not been filled five days after the date ordered
- Computations
  - Cost of inventory is based on last in first out
- Events
  - Payment will be made 30 days from date of invoice

Distinguish from executable rules that specify an action to perform when a condition occurs in a context

Semantics of Business Vocabulary & Rules (SBVR): an OMG Specification

Rule: It is obligatory that each driver of a rental is a qualified driver.

- Declarative expression of intent
- Provides for levels of enforcement
- Model represents concepts independent of business vocabulary
- Alternative vocabularies support different communities (e.g., English, German)
- Rules expressed as structured natural language
- Actions depend on context of application

Application of Enterprise Rules

- A rule is relevant where the condition could be violated
- Violation can only occur in processes that affect the relevant entities
- Not all rule violations occur in the context of formal business processes (e.g., “wear safety glasses on factory floor”)

Integration of Enterprise Rules into Processes

Current

- Rules implemented as process decisions
- Process invocation of rule engine with action rules
  - Point of application designed into process
  - Action rules are context specific
- Multiple implementations of individual rules

Future

- Enterprise rules applied to processes
- Immediate operational effect
- Consistent application throughout the enterprise

Vision of Rules for Regulatory Compliance

- Regulations as formal rules
  - Unambiguous expression
  - Consistency analysis
  - Multiple vocabularies (e.g., European Union)
- Mapping of regulations to enterprise rules
  - Determine implications to specific business
  - Determine enforcement policies

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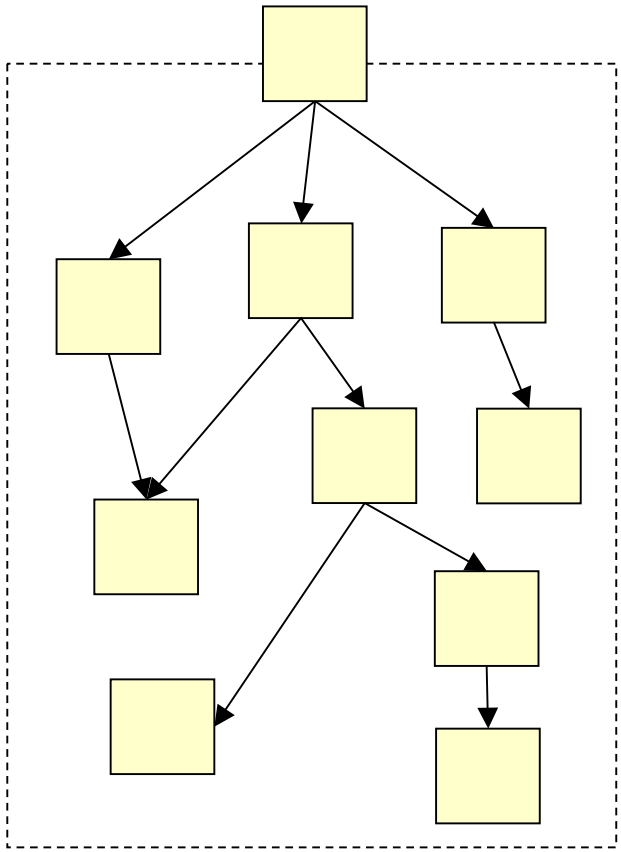
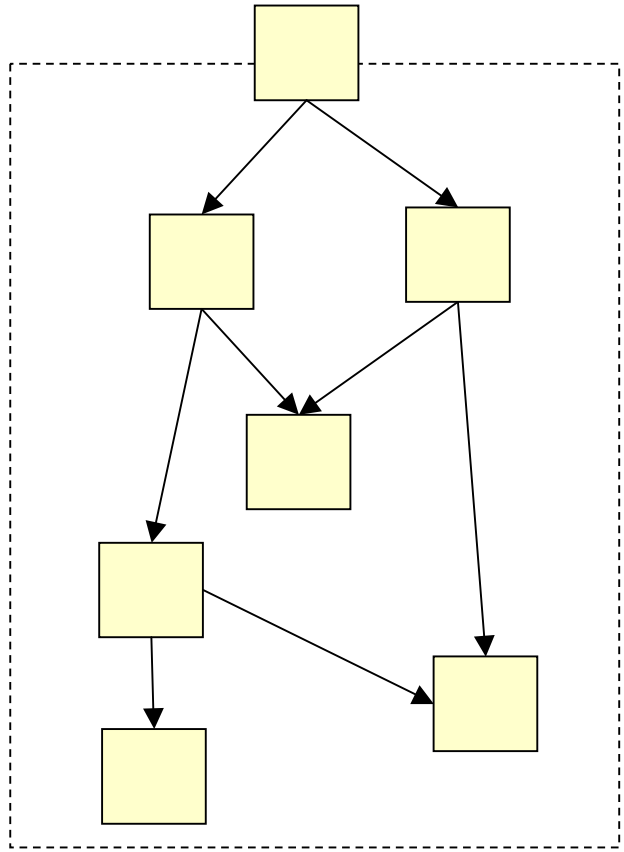
IT Infrastructure Requirements

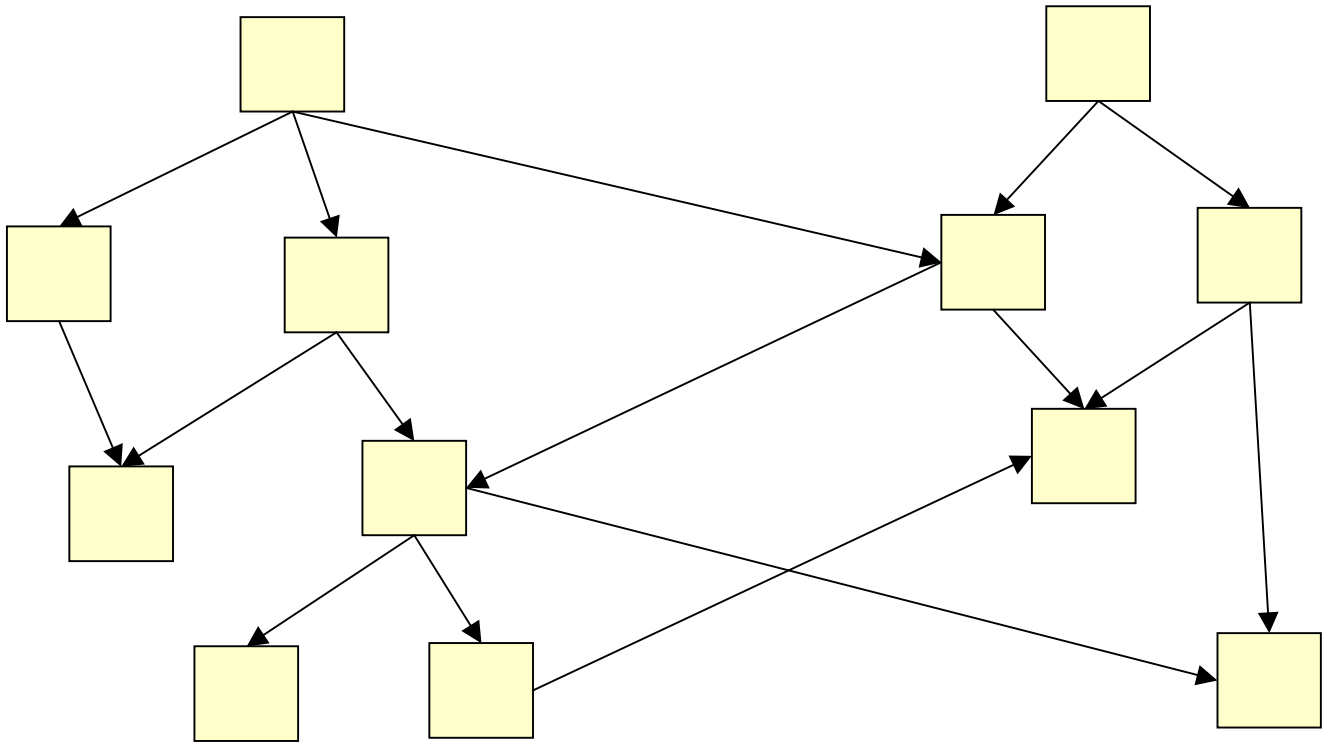
- Business process management system(s)
- Single sign-on security and access credentials
- Enterprise data model
- Simulation—workload analysis
- Enterprise Services Bus (ESB)
- Enterprise Information Integration (EII)

Conventional Application Silos



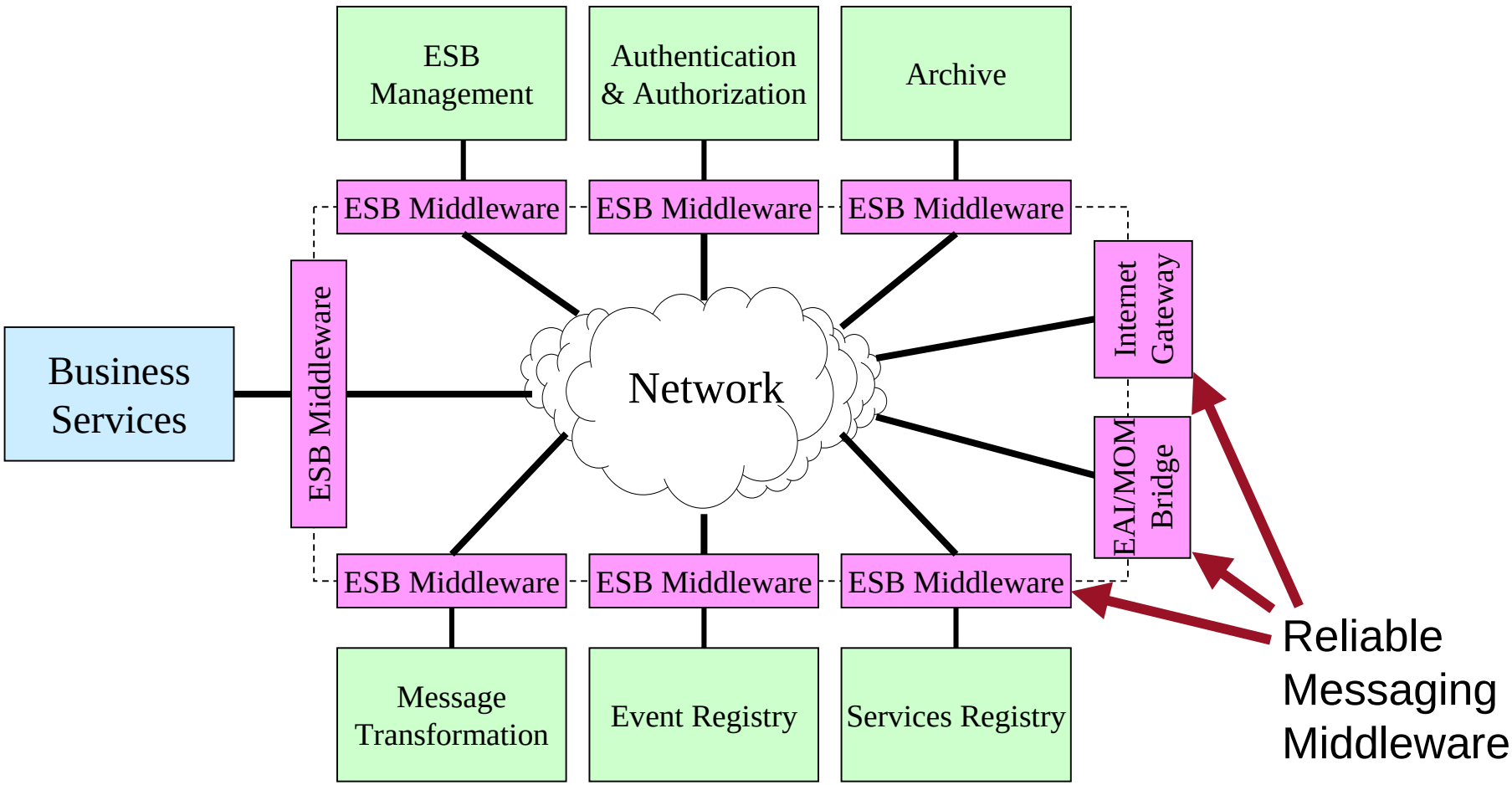


Integration of Shared Services



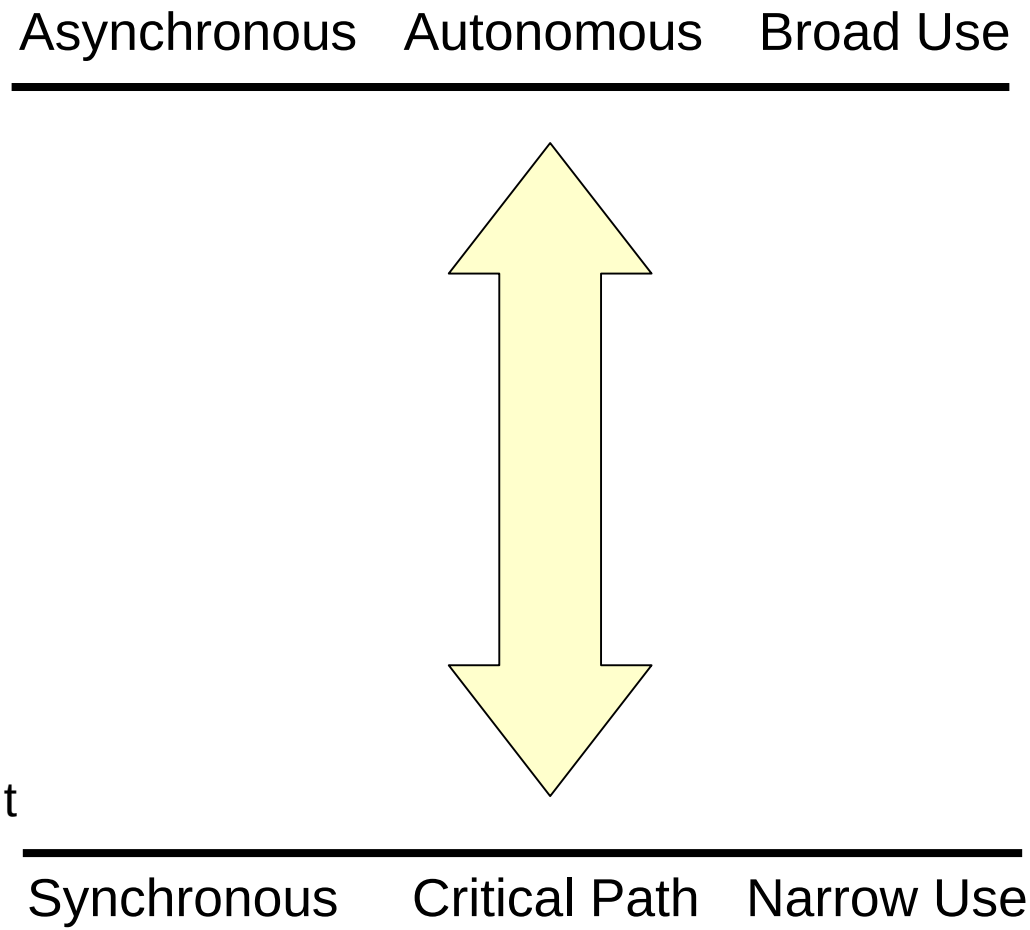
- Identity and access authorization cross organization boundaries
- Data format and semantics must be compatible
- Interactions driven by Business Process workload

Enterprise Services Bus



Services Granularity and Coupling

- B2B (remote)
- Inter-org
- Inter-process
- Human activity
- Data services (entity access)
- Computation activity
- Shared computation service
- Technical service
- Application component/object



Data Management: Data as a Shared Resource

- Data model driven by service orders
- Identify primary sources and ownership
- Implement read-only replicas for performance
- Restrict distribution of sensitive data
- Consider local extensions to primary entities
- Establish update notices for replicas
- Establish periodic reconciliation

Enterprise Information Integration (EII)

Visible Enterprise

- Virtual database
  - Common conceptual data model
  - Target for enterprise queries
- Queries transformed for operational schema
- Responses transformed to conceptual schema

Provisioning Considerations

- New business processes
- Specification of services
- Configuration specifications
- Versioning dependencies
- Business process workload projections
  - New processes
  - Old processes
- Service call patterns

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Enterprise Agility

The ability to adapt in a timely manner to events that reflect changing circumstances and demands

- Occurrence of a problem meeting expectations in current business operations
- Recognition of an opportunity to improve operations, expand business or enter a new market
- Variance beyond a threshold that violates operating assumptions
- Occurrence of a deviation or trend that indicates a change in the marketplace—either suppliers or consumers

It's about the ability of management to adapt the enterprise

Agility is Effective Response to Events

- Routine events are handled by normal operating processes
  - Shipment arrives
  - Part passes inspection
  - Employee checks out
  - Customer submits order
  - An activity is completed
- Alert events require action to change operating processes
  - Requires ability to recognize and initiate action
  - Requires management decision
  - May involve processes for change or corrective action
  - Resolution depends on enterprise agility

Service Management Reports

An internal source of alert events

- Service metrics
- Process performance
- Resource management
- Operating costs
- Work product quality
- Exceptions
- Trends

Event Resolution

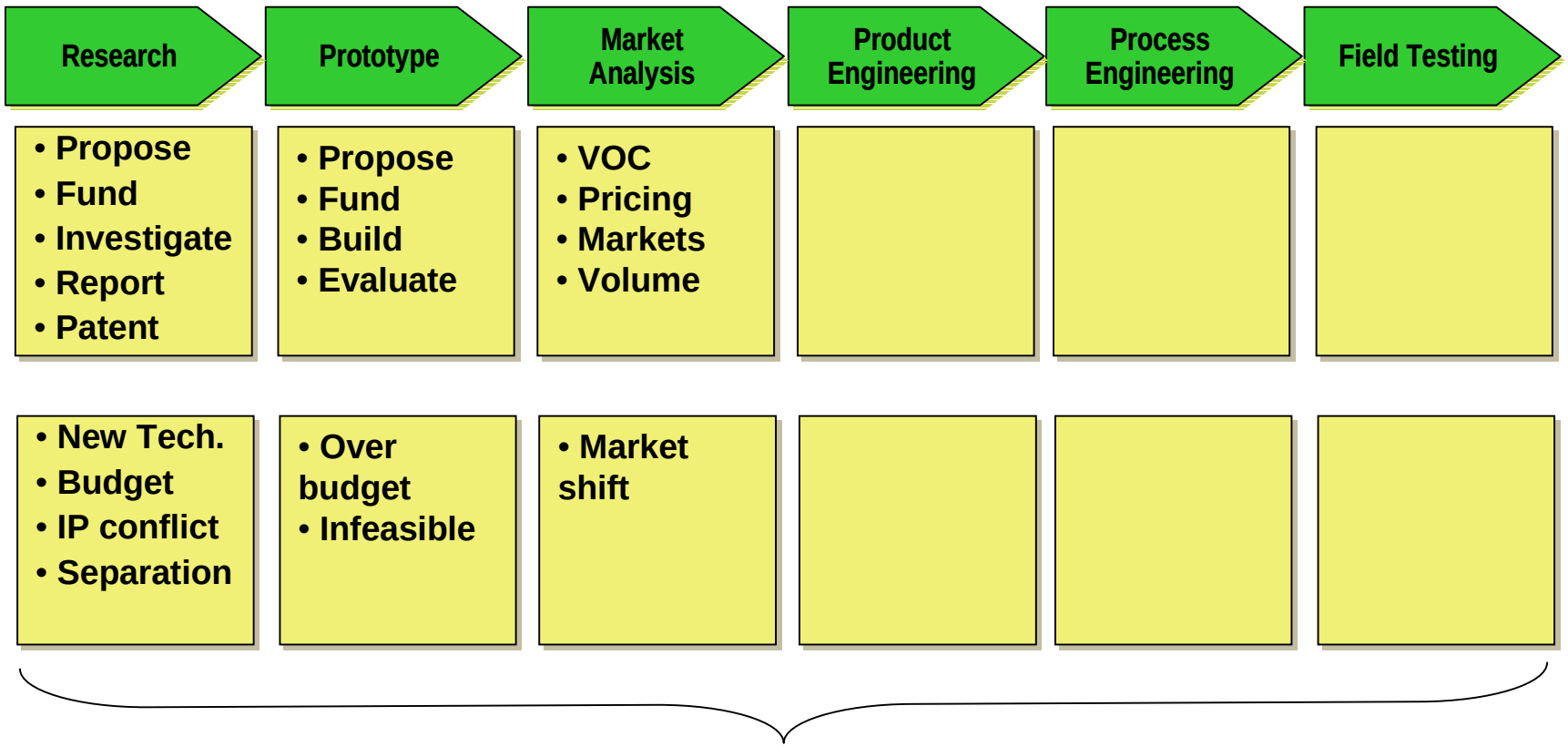
- Recognize events from various sources
  - Operating processes
  - Changes in resources, facilities, operating environment
  - Market changes
  - Political, economic or social changes
- Route notice to responsible entity
- Assess impact—may involve correlation of events
- Escalate attention to appropriate level
- Determine and implement appropriate resolution
- Resolution may involve attention to additional events

Event Driven Architecture: Publish and Subscribe

- An architecture for capture and processing of events
- Event source unaware of interest or impact
- User of event determines need and source
- Events of interest may be combinations of other events and circumstances

Event Discovery

Product Development



Event Service Requirements

- Identify events that can have a direct impact on each process
- Identify preferred source of each event
- Consolidate events with same source
- Determine appropriate event detection mechanism
- Provide mechanism for event publication
- Collect events that have a similar impact on a service and define an event resolution process

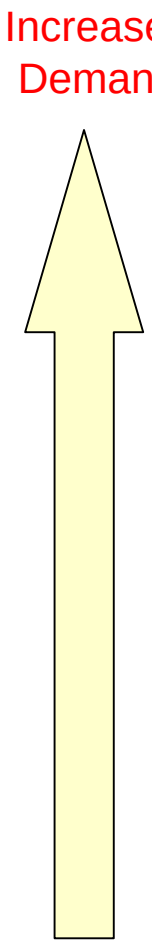
Event Resolution Processes

- Processes that change business operation
  - Monitor
  - Assess
  - Plan
  - Change
  - Monitor
- Change may affect process instances or process definitions

Adapt Operational Services

- Define interfaces of event resolution processes to operational services
- Define change analysis and development processes
- Define change management process(es)

Degrees of Demand on Agility



- New business paradigm
  - Change to processes, organization, services and skills
- Business transformation
  - Change to processes, organization and service objectives
- New product
  - Change to processes and organization
- Process Improvement
  - Change to Processes
- Operating efficiency
  - Changes to resources

Agenda

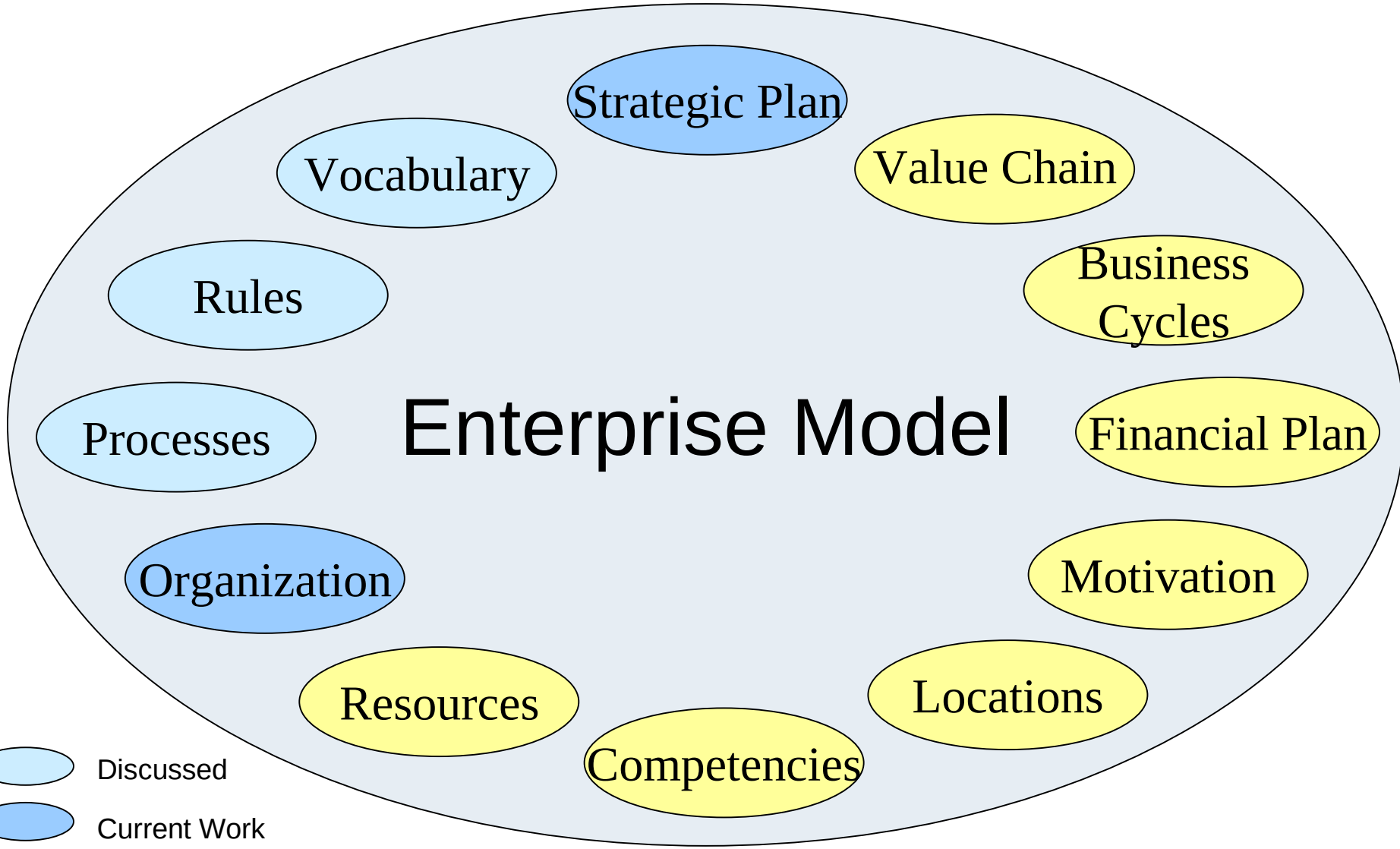
- The relationship between BPM and SOA
- Business process modeling
- Service oriented analysis
- Organizational design
- Service Interfaces Design
- Integration of business rules
- IT Infrastructure Requirements
- Enterprise agility
- Model Based Management vision

Model Based Management

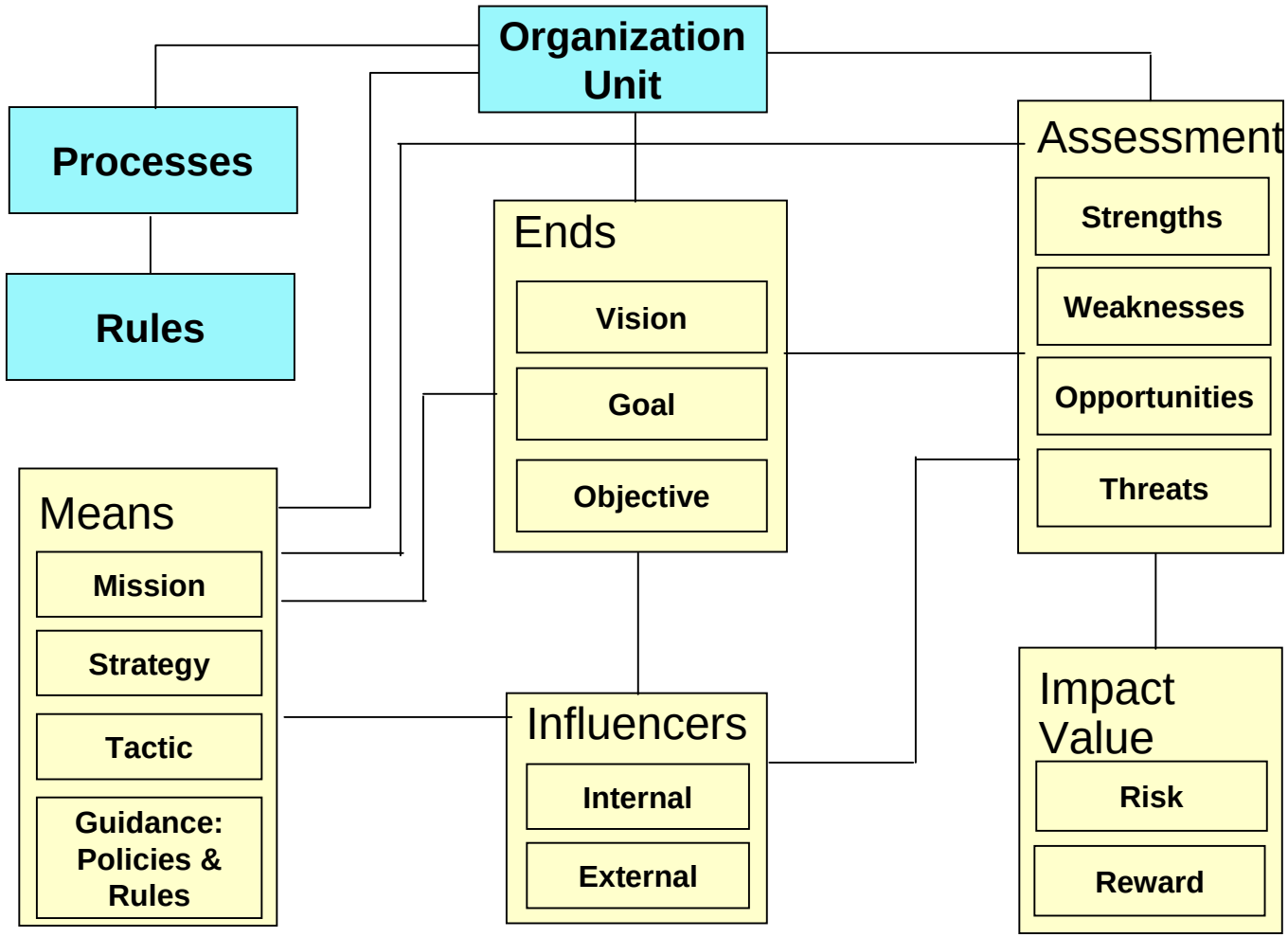
Models as the basis of enterprise management

- Models for enterprise design and transformation
- Models to define solutions and applications
- Models to analyze problems
- Models for views of enterprise operations

Potential Components of Enterprise Modeling

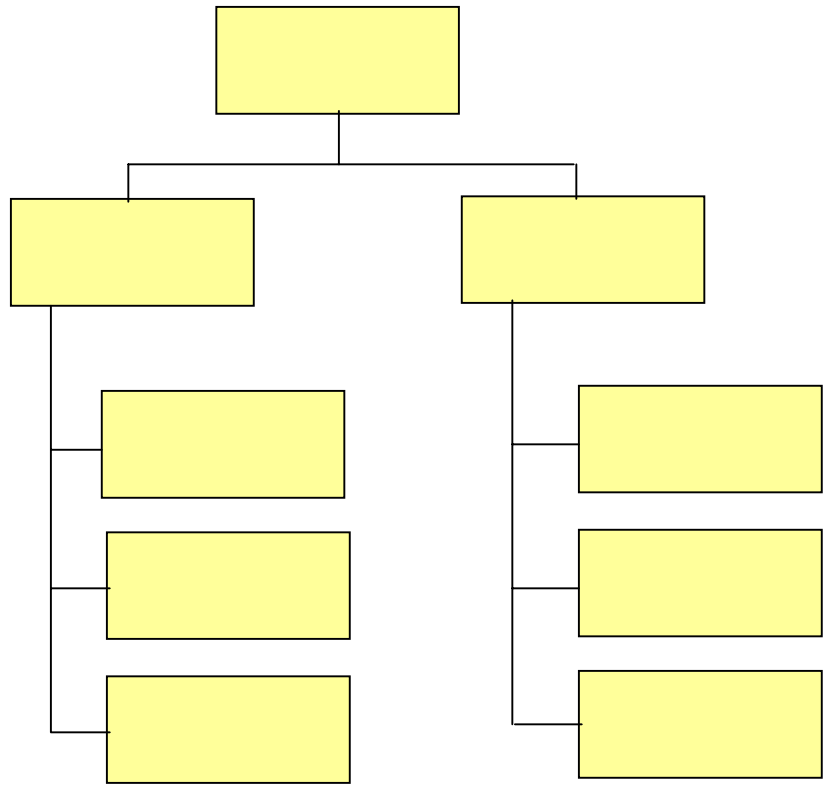


Business Motivation Model



Organization Structure Metamodel

- Organization unit
- Position
- Authority
- Responsibility
- Relationships
- Contact information
- Organization rules
- Modeling vs. runtime



Dynamic Model Based Management

- Rules, processes, services deployed from models
- Models define operational systems (MDA)
- Processes, services, roles aligned to organization
- Model-based meta-processes, meta data, metrics and queries
- Business change analysis models
  - Impact analysis
  - Simulation
- Dashboards: Configurable, personalized views, ad hoc probes

Business Transformation Summary

- Role analysis to define services—may be departmental scope
- Map services to current organization and applications
- Identify and evaluate new services
- Identify redundant services—potential consolidation
- Assess legacy applications for adaptation
- Evolve enterprise data model
- Identify opportunities for competitive advantage
- Identify potential short-term ROI transformations
- Start small
- Build on strategic infrastructure
- Plan for model based management

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