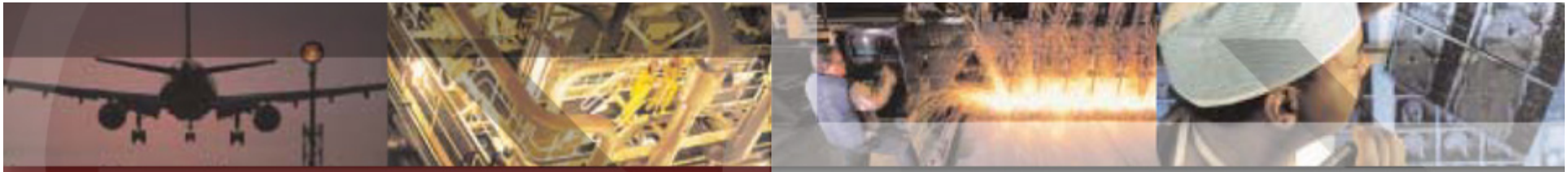


TIBCO®

The Power of Now®

Service-Oriented Architecture

A View From the Field

Paul C. Brown, Ph.D.
Principal Software Architect

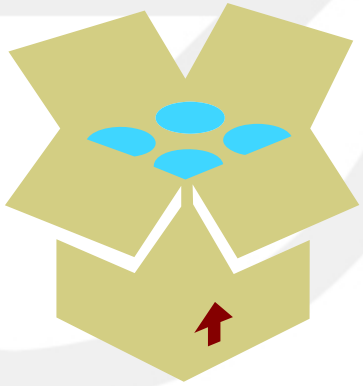
What is a Service?

- **A coherent package of commonly used functionality**
  - e.g. Sales Order Management
    - Place Order
    - Modify Order
    - Cancel Order
    - Get Order Status

- **Packaged for consistent re-use**
  - Readily accessible from many places
- **A de-facto standard in the enterprise**
  - The preferred access mechanism for the functionality
- **Most functionality already exists**
  - In one system, now accessed in many ways
  - Duplicated in multiple systems
- **The goal is to save/make money!**
  - Standardize the functionality so that what the next project needs is already there
    - Reduce IT costs (the “small” ROI)
    - Provide competitive advantage (the “big” ROI)

What's in the Service Package?

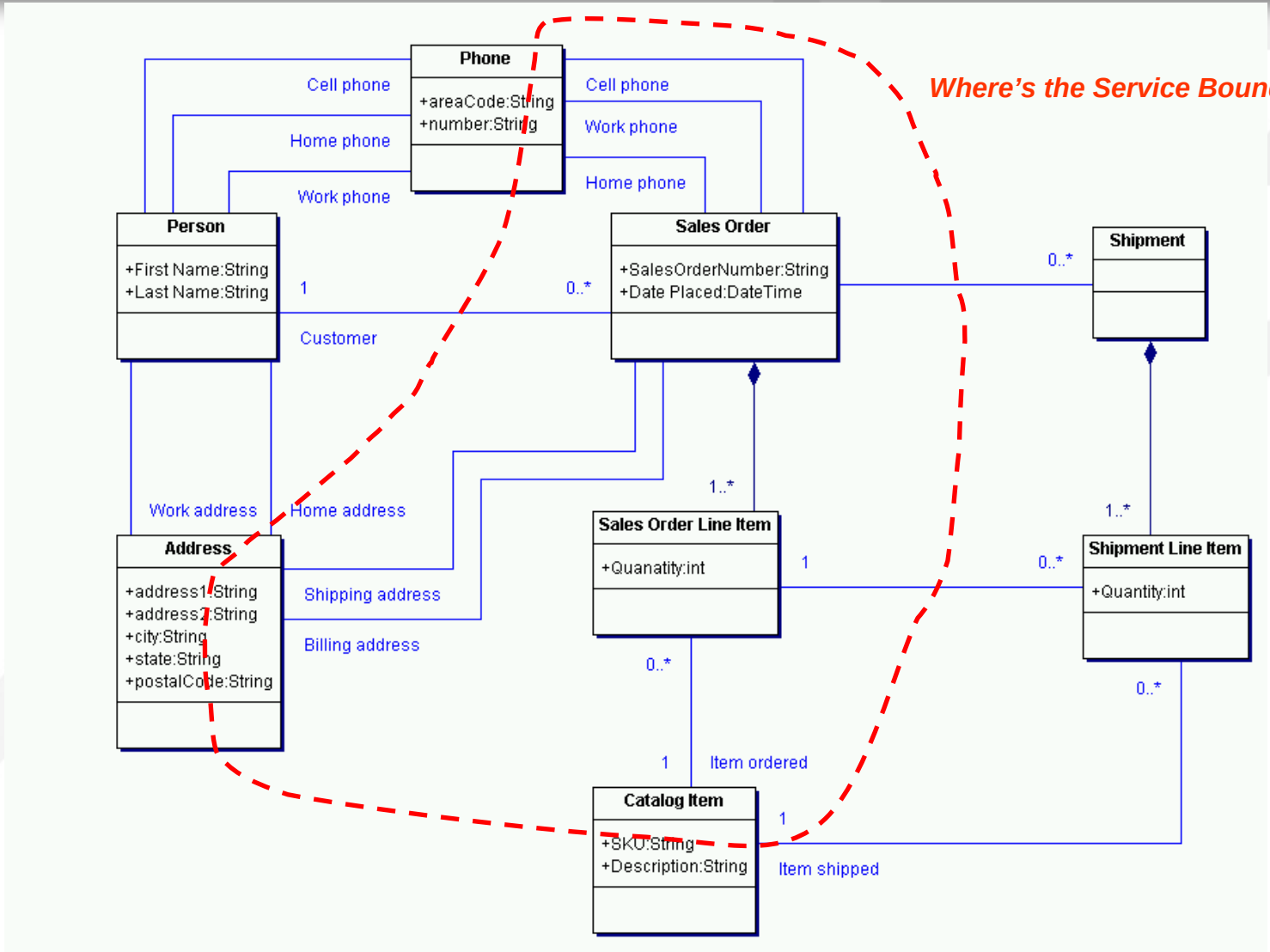
- **Pure functions – computations**
  - Client supplies all input data and receives results
  - Totally stateless
  - Limited value
    - Very few pure functions in the enterprise



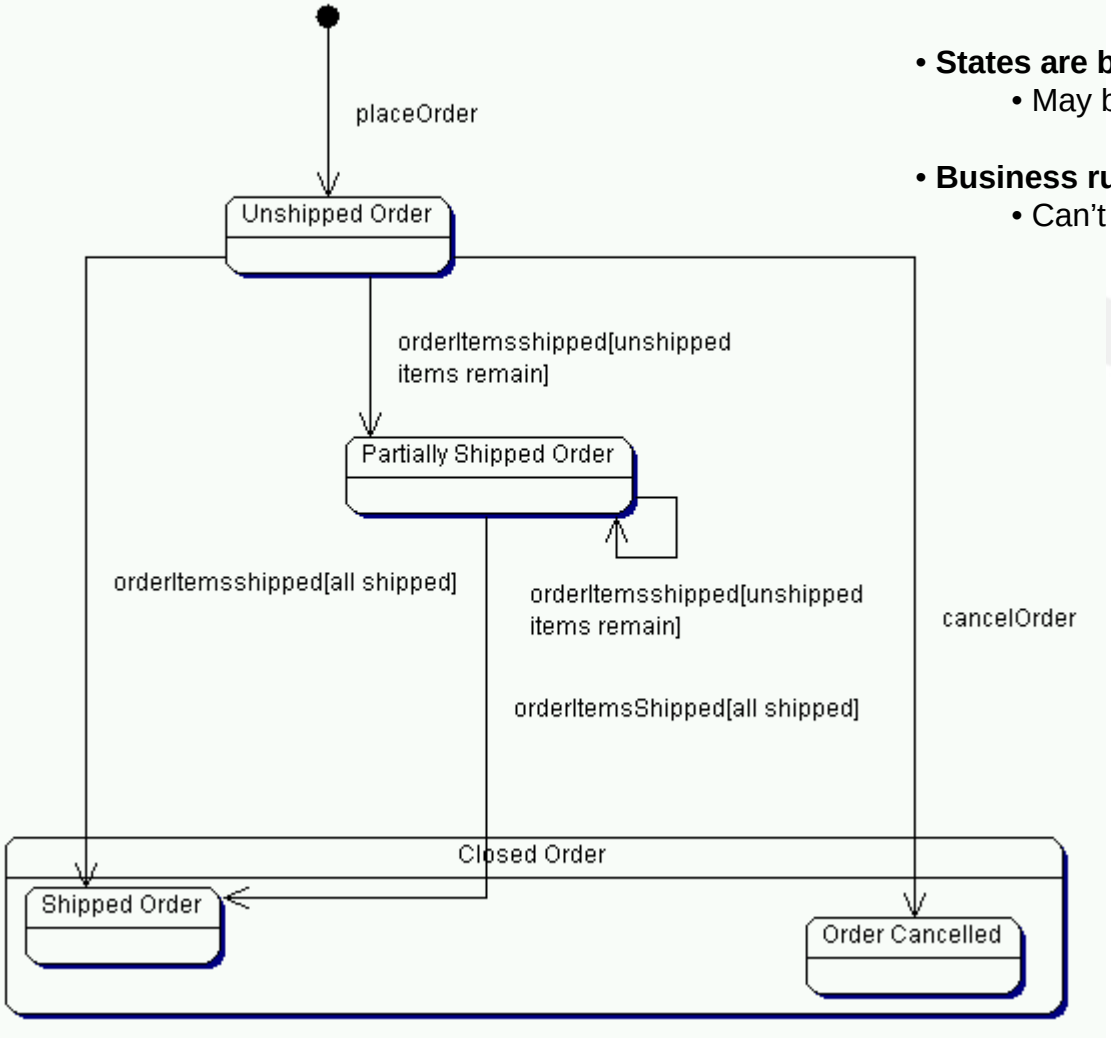
- **Data management – an information repository**
  - Manages data related to a particular concept – including persistence
    - E.g. sales order information
  - CRUD operations mediate access - (create, read, update, delete)
  - Increased value
    - Provides a managed home for a category of information

- **Managed business functionality**
  - Data + Business Rules for its management
  - Operations become business relevant
    - Place order, cancel order, query order status
  - Greatest value
    - Encapsulates the complexity of business rules

Service Data Ownership



Service Business Rules

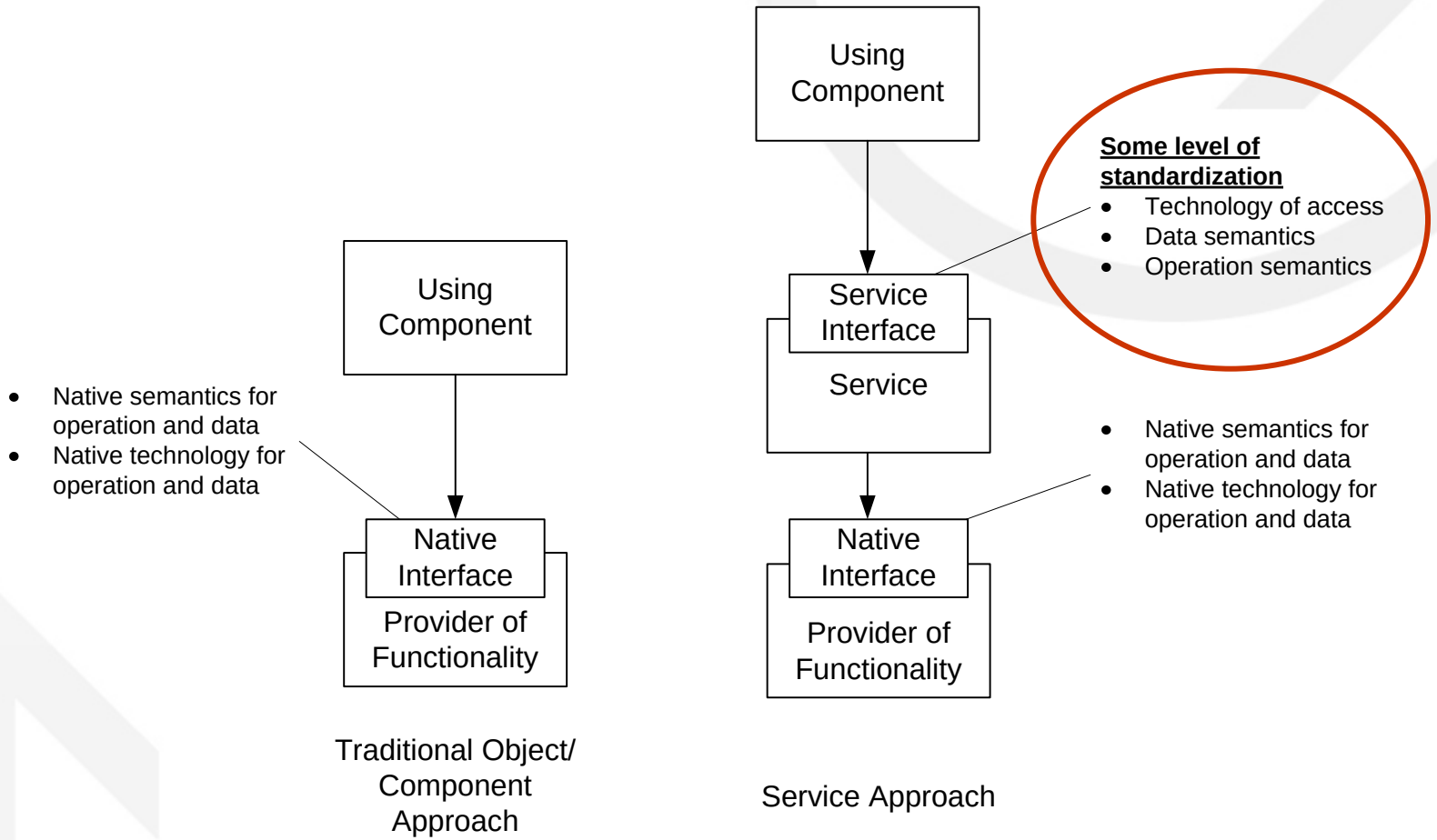


- **States are business process milestones**
  - May be composite states for reporting
- **Business rules govern transitions**
  - Can't cancel an order that has been shipped!

Technical Challenges

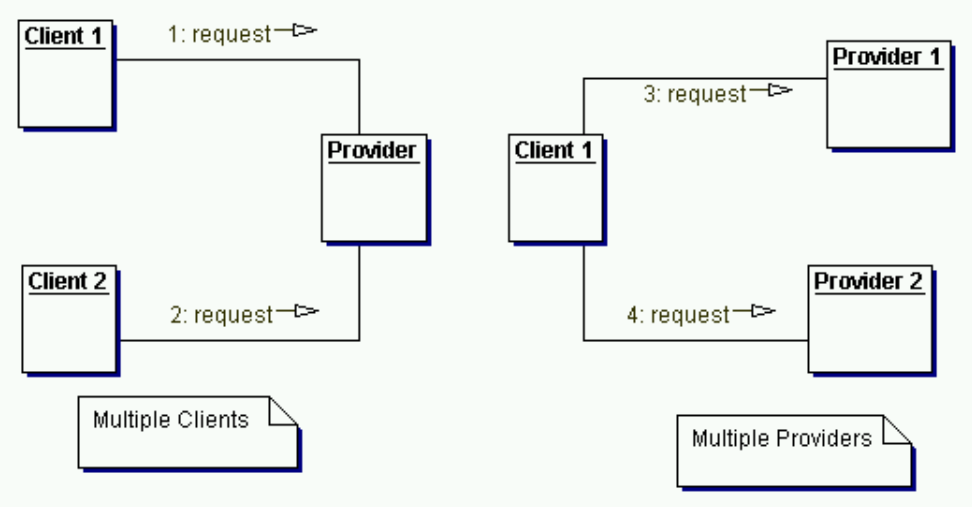
- **Data ownership and management**
  - Which concepts are owned by the service, which are external?
  - Which relationships are owned by the service, which are external?
  - How do we manage relationships that cross the service boundary
    - E.g. what happens to existing orders if a catalog item is deleted?
- **Data representations at service boundaries**
  - Common data models
- **Access technology**
  - Mechanics of how will the service be accessed
    - E.g. SOAP over HTTP or JMS
- **Supporting infrastructure services**
  - Communications and messaging
  - Access control: authentication, authorization, and encryption

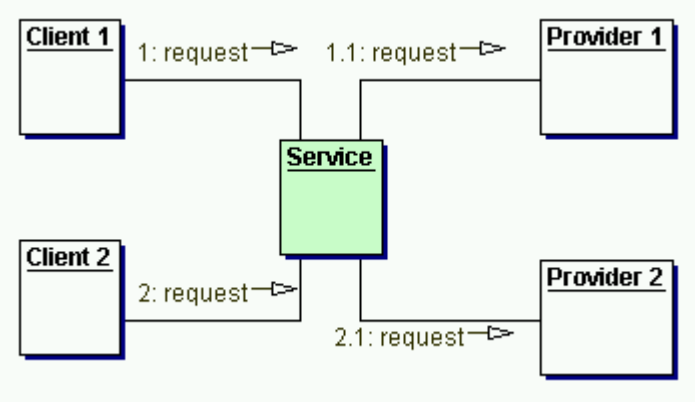
Typical Service Operation Architecture



Where Do Services Make Sense?

- **When there is functionality that is either used in more than one place or is provided in more than one place, particularly when those "places" are different applications**





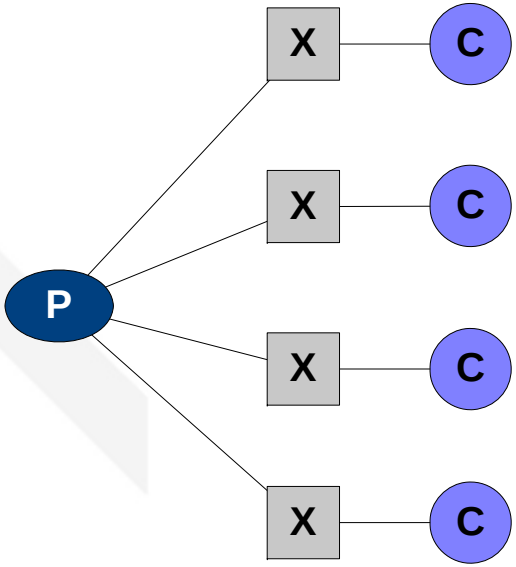
Data Normalization

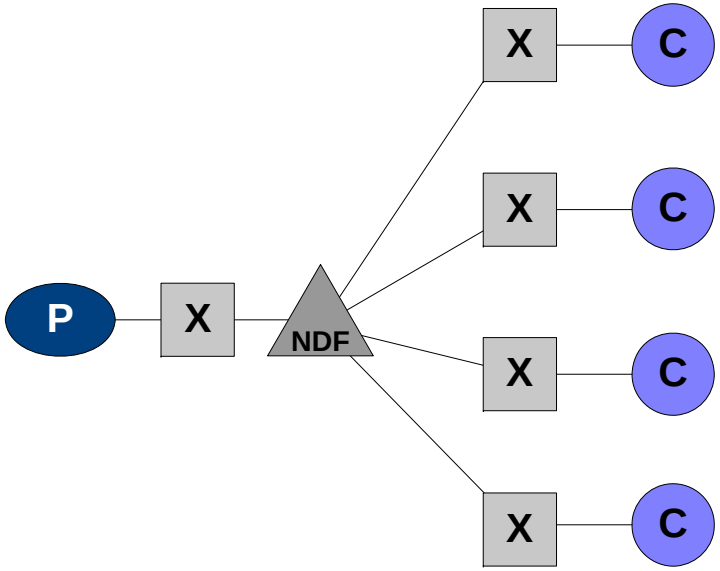
- **Decision must be made whether to use system-neutral data format in communications**
  - Direct transformation (no neutral data format)
    - One component usually sends, the other listens
      - Requires n - 1 transformation definitions
    - Requires n - 1 transformation run-time executions per message
  - Neutral data format
    - Requires n transformation definitions where n is the number of different types of end-points using the message
    - Requires n transformation runtime executions per message

Understanding Data Normalization Tradeoffs

- **Direct transformation always requires fewer runtime transformations**
  - N-1 transformations

- **So why would you want to use a neutral data format?**
  - Replace source system without changing the mappings
  - Makes mapping easier
  - Makes it more accessible (using XML for example)





Determining Data Normalization Policies

- **Selecting a policy is a tradeoff between:**
  - Implementation cost
    - Number of transforms required
    - Complexity of transforms
  - Run-time processing power
    - Number of transforms executed
    - Complexity of transformation
  - Network bandwidth
    - Number of messages appearing on the network
    - Size of messages
  - Cost of evolving data structures
    - Development cost
    - Deployment complexity
    - Maintenance Costs

3 Styles of Service Coordination

- **On-Demand**
  - Service waits for requestor to invoke an interface and then initiates the requested action
- **Event-Driven**
  - Upon receipt of an event, the local service performs its required function
  - Service proactively notifies subscribers when specific events occur
- **Continuous**
  - Service that runs on its own without formal invocation either periodically or continuously

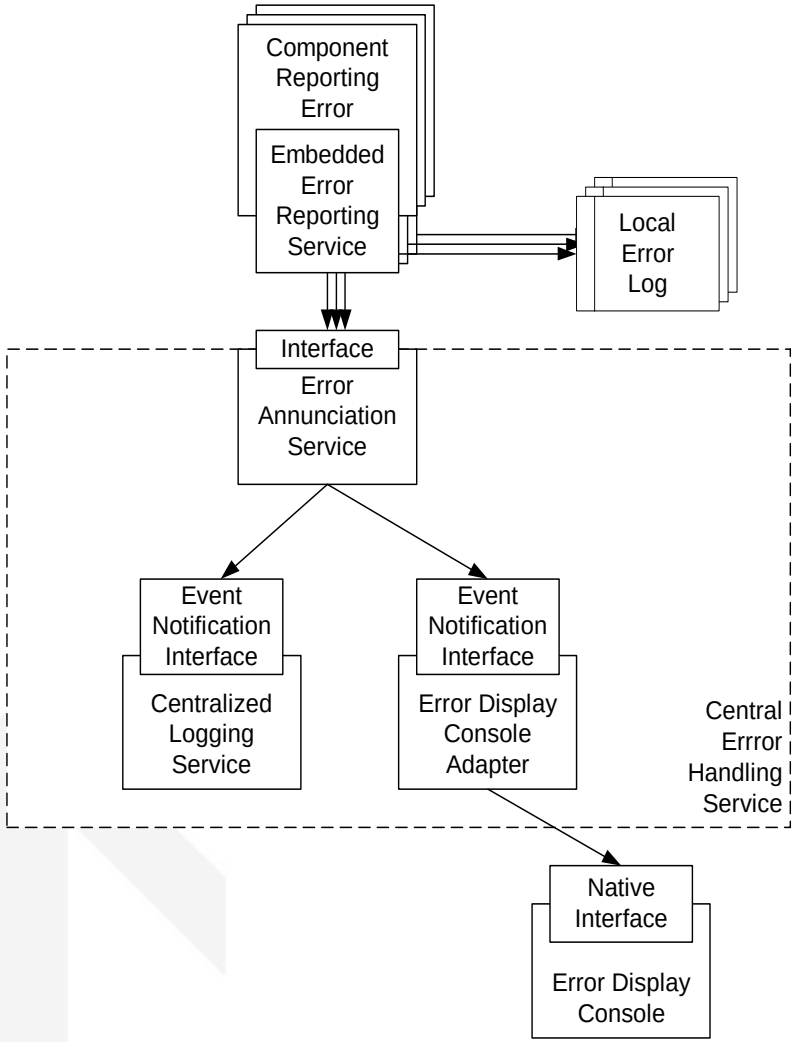
Services Levels of Abstraction

- **Services can exist at many levels of abstraction, but generally they can be broken into four broad categories:**
  - Infrastructure Services
  - Point-to-Point Services
  - Business Services
  - Composite Business Services

Infrastructure Services

- **Services for use by technologists!**
- **Building blocks that provide commonly required infrastructure in a standardized way**
- **Exposing infrastructure as services significantly reduces the level of effort required to build higher level services**
- **Common infrastructure services include:**
  - Messaging Services
  - Event Services
  - Audit and Logging Services
  - Error Notification Services
  - Security Services
  - Portal Services

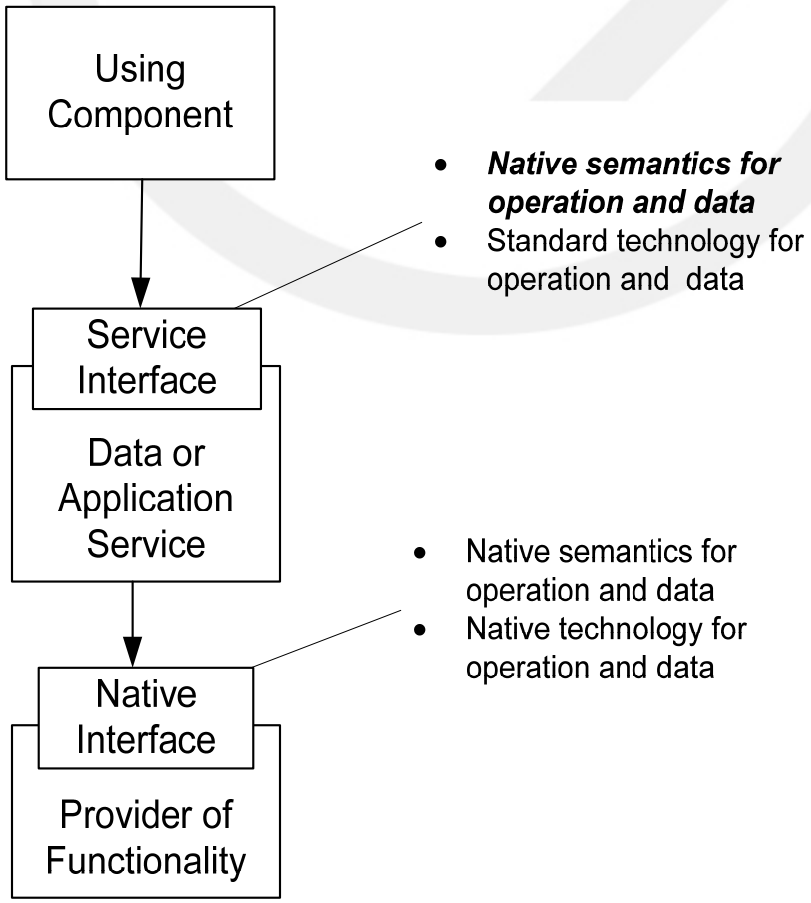
Complete Uniformity is Not Always Possible



- **Sometimes a re-usable component (library) needs to be provided in the user's technology and embedded**
- **Examples:**
  - Local interface for error logging
  - Security access

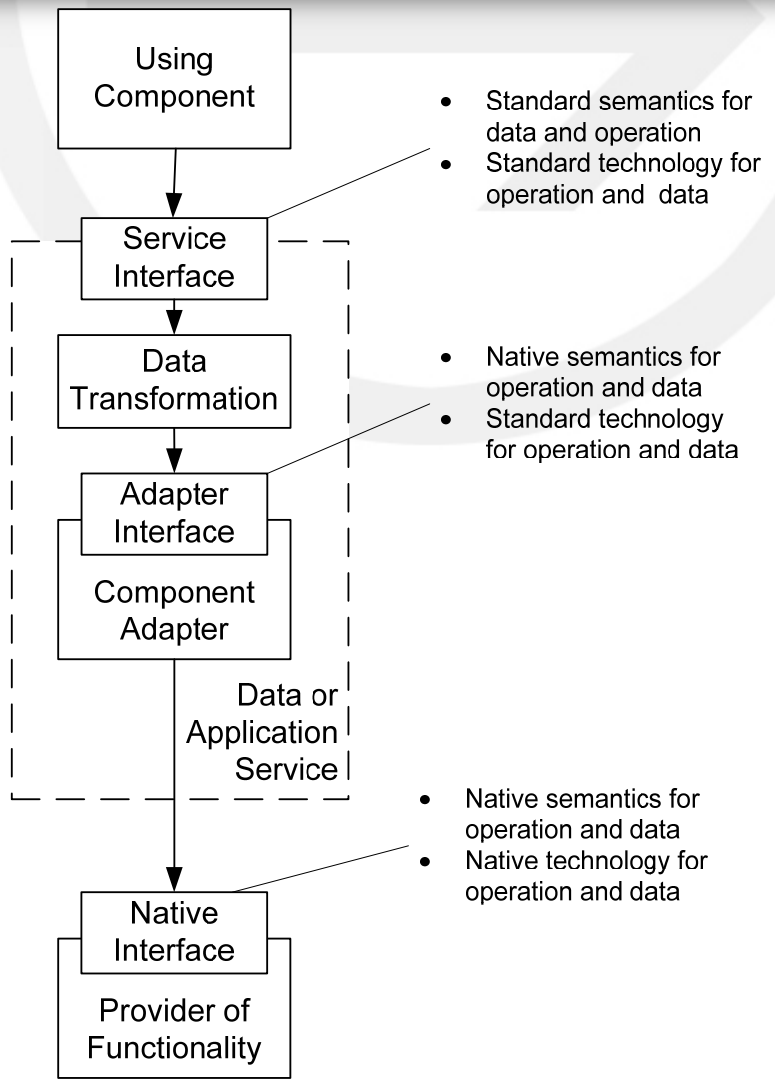
Point-to-Point Services

- **Point-to-Point Services standardize the *technology* used to access operations and represent data**
- **Point-to-Point services do not standardize the *semantics* of the operation or the data.**



Business Services

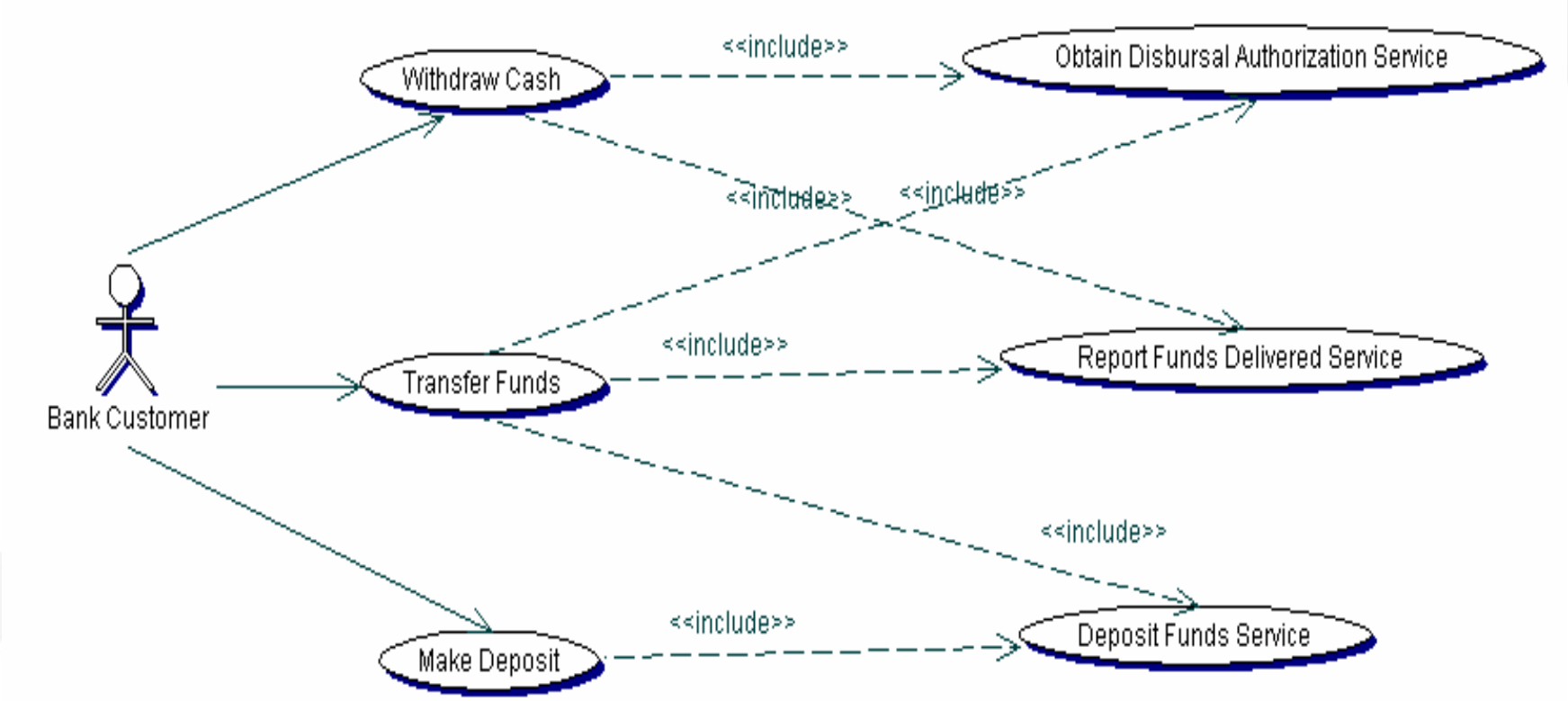
- **Business services standardize both the semantics and the access technology**
- **The standardization greatly simplifies the reuse of the functionality in many contexts**
- **This standardization also makes it easier to construct or modify composite business services**



Composite Business Service

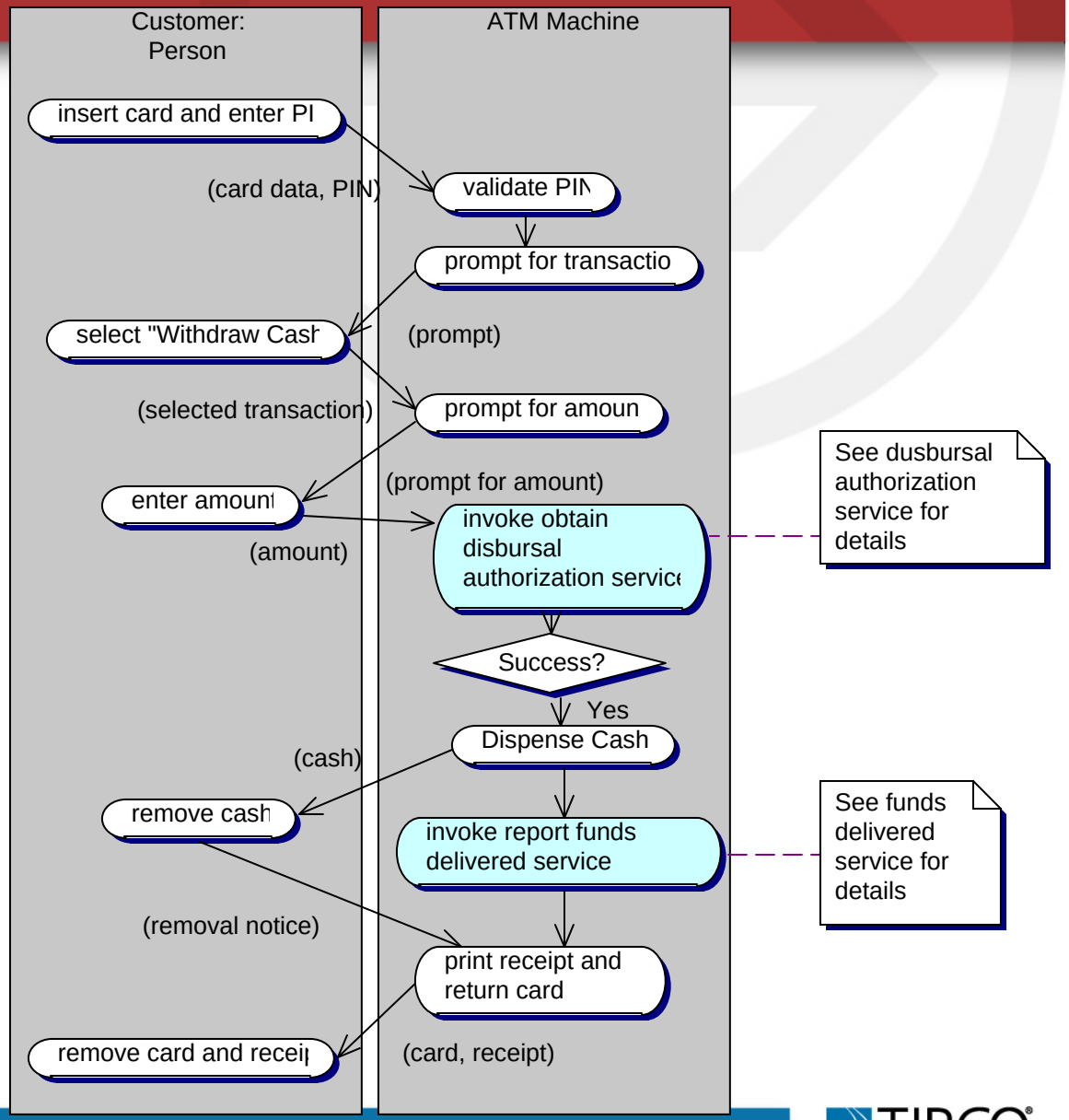
- **Composite business services orchestrate the use of other services to create a new higher-level service**
- **A composite business service may be a complete business process, giving us Business Process Management**
  - BPM and Business Works can be viewed as tools for creating composite business services
- **Composite business services make possible the overall management of the encapsulated business process including monitoring and error reporting**

ATM Example Services

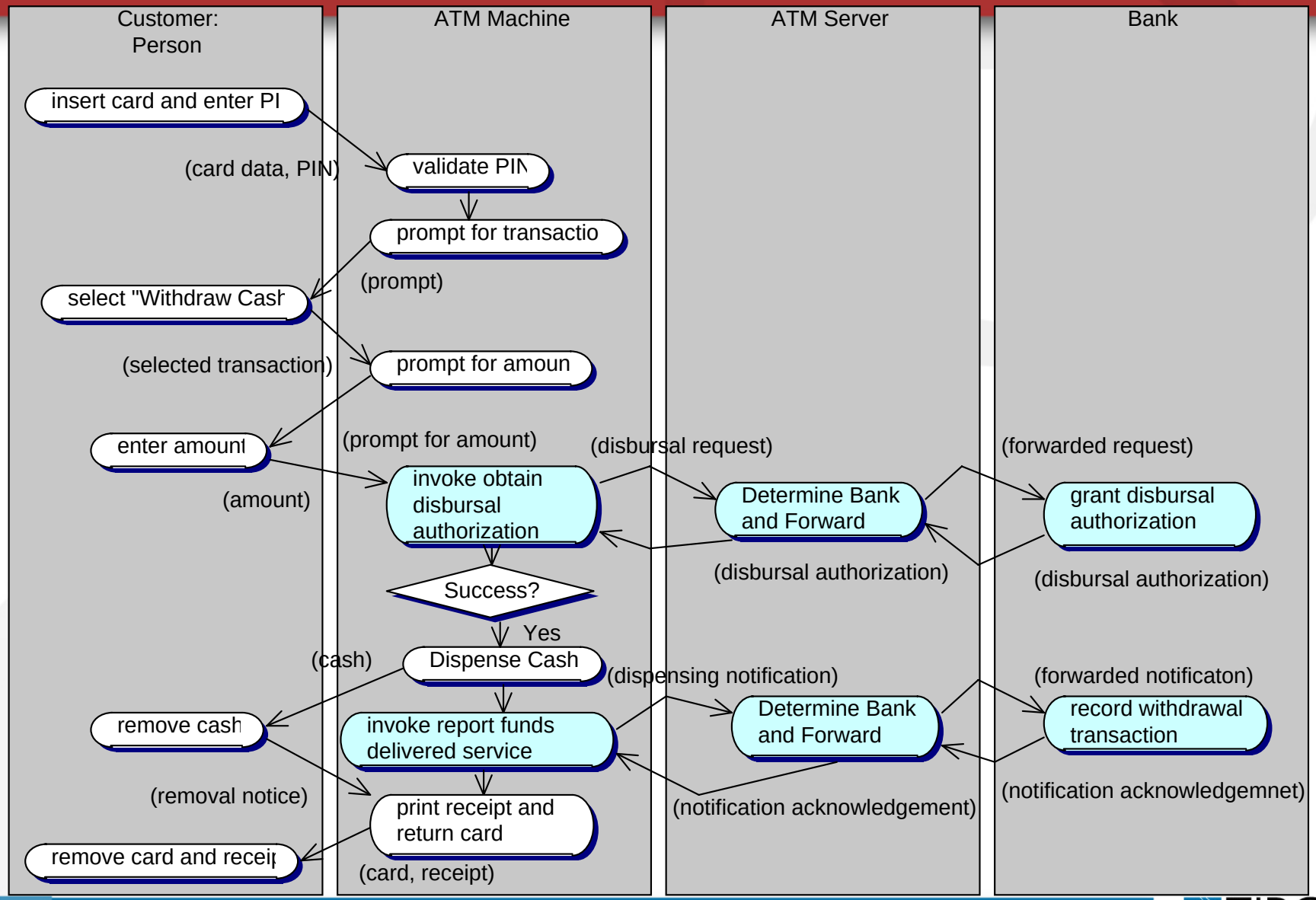


Scenario Showing Use of Service

- **The disadvantage of this approach is that you lose the big picture of how all the components interact to carry out the function**



Scenario Showing Service Design in Context



Mindset Issues

- **Services are not about technology**
  - Services are about cost-effectiveness
  - Focus should be on what reusable functionality is needed
  - Technology issues are secondary
- **Every interface isn't a service!**
  - Services involve overhead, both at design and run-time
    - Adapters, mappings, authentication, authorization, encryption, etc.
    - Granularity of work must outweigh the overhead
  - Must demonstrate potential for reusability (common need)
    - Identify the multiple users of the service
    - Make sure that the functionality is, indeed, the same!
- **There's more to using services than just orchestration**
  - BPEL assumes all functionality is encapsulated as a web service
    - Exposing functionality as a service forces access control for critical functions
  - Real business processes require non-service functionality as well
    - Data structure transformation, complex condition evaluation

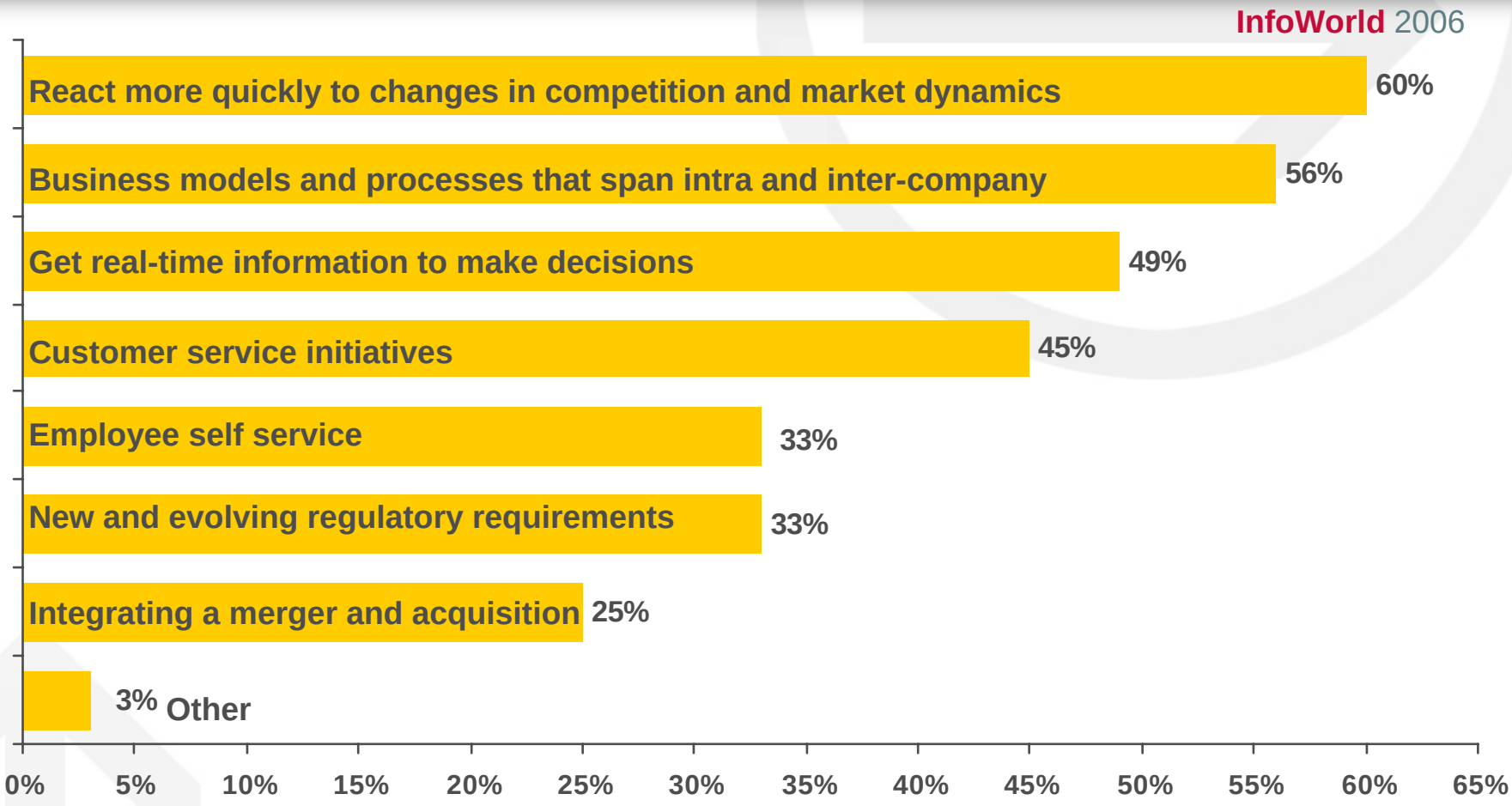
The Reusability Challenge

- **How do we design for future usages?**
  - Today we enter orders in person, via paper, by phone, on-line, …
    - What's next – via Blackberry? Automatic re-order?
  - Your CPG firm decides to sell branded clothing as a promotion!
    - Orders now need sizes, colors, etc.

- **Insight is required when conceptualizing a service**
  - What might change in the future?
    - Evolutionary changes – organic growth
    - Revolutionary changes – buying your biggest competitor, new markets
  - How do these changes challenge existing functionality?
  - Which alternatives are worth investing in?

Who can provide this insight in your organization?

What's Driving SOA?



Q: What are the business problems your company hopes to address using SOA?

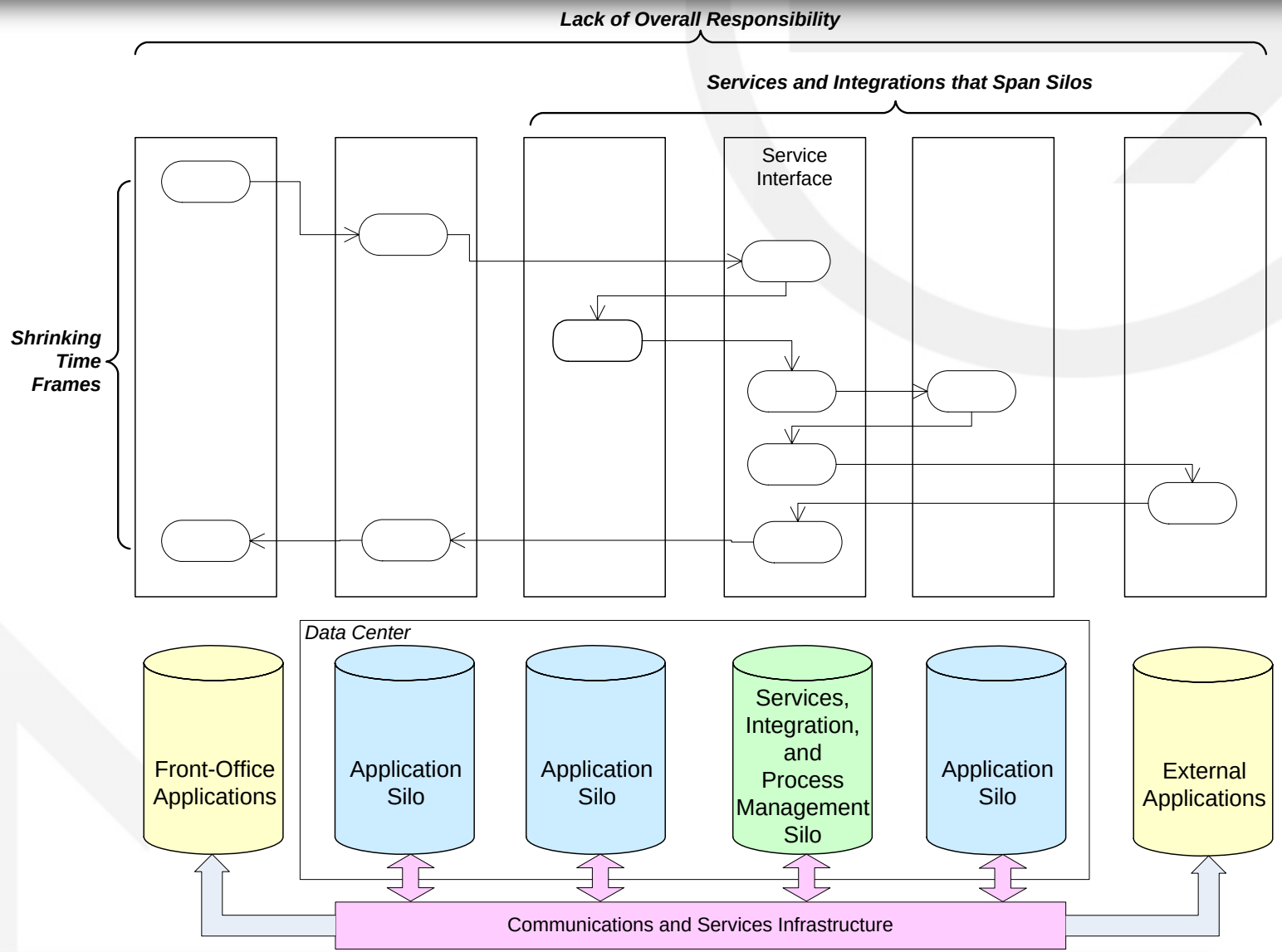
Base: Base: 521 (Among qualified respondents)

Source: InfoWorld Research Report: Service Oriented Architecture (SOA), March 2006

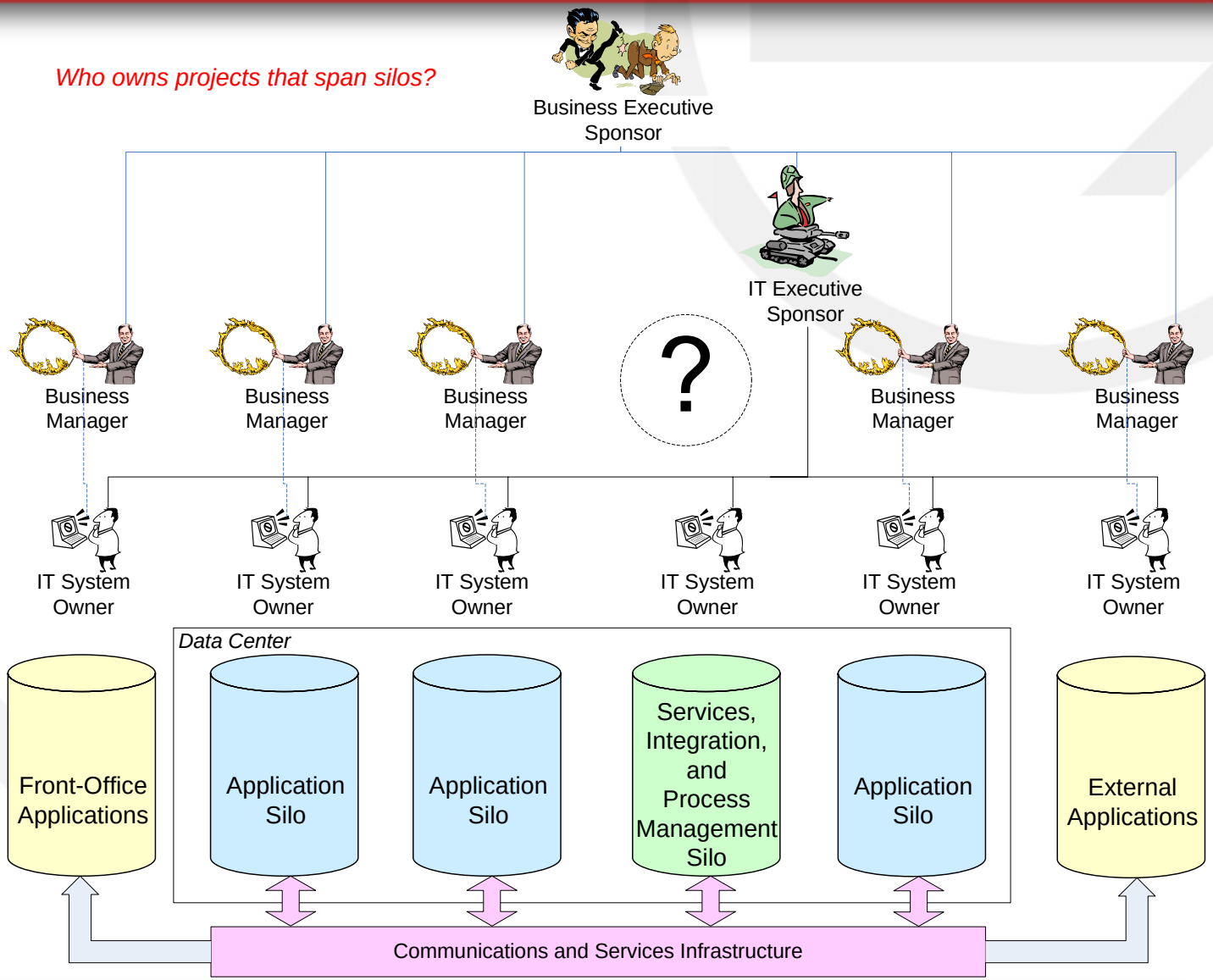
24

TIBCO The Power of Now®

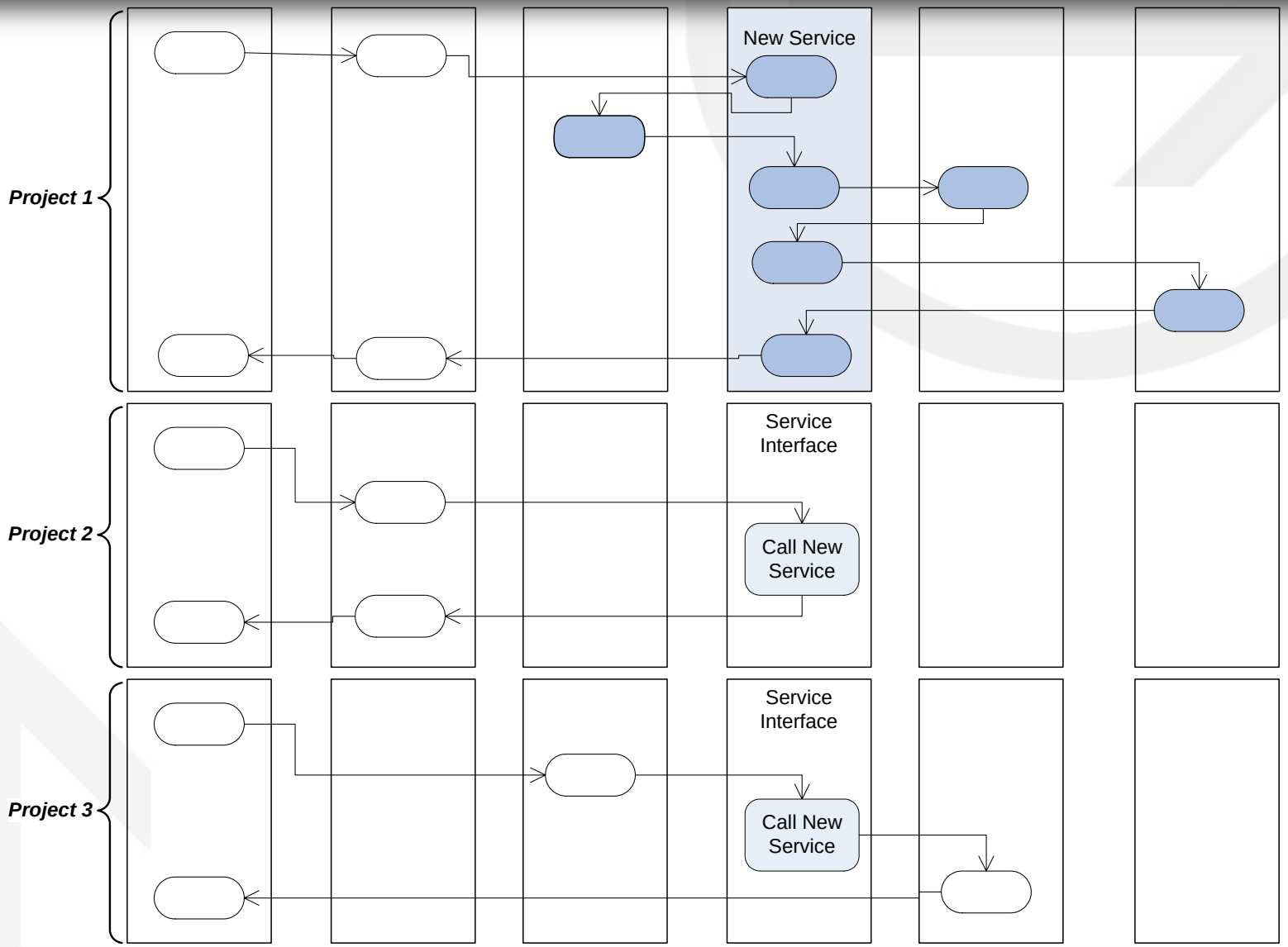
These Pressures Require Multi-Silo Responses



No Cross-Silo Ownership in Current Organizational Structures



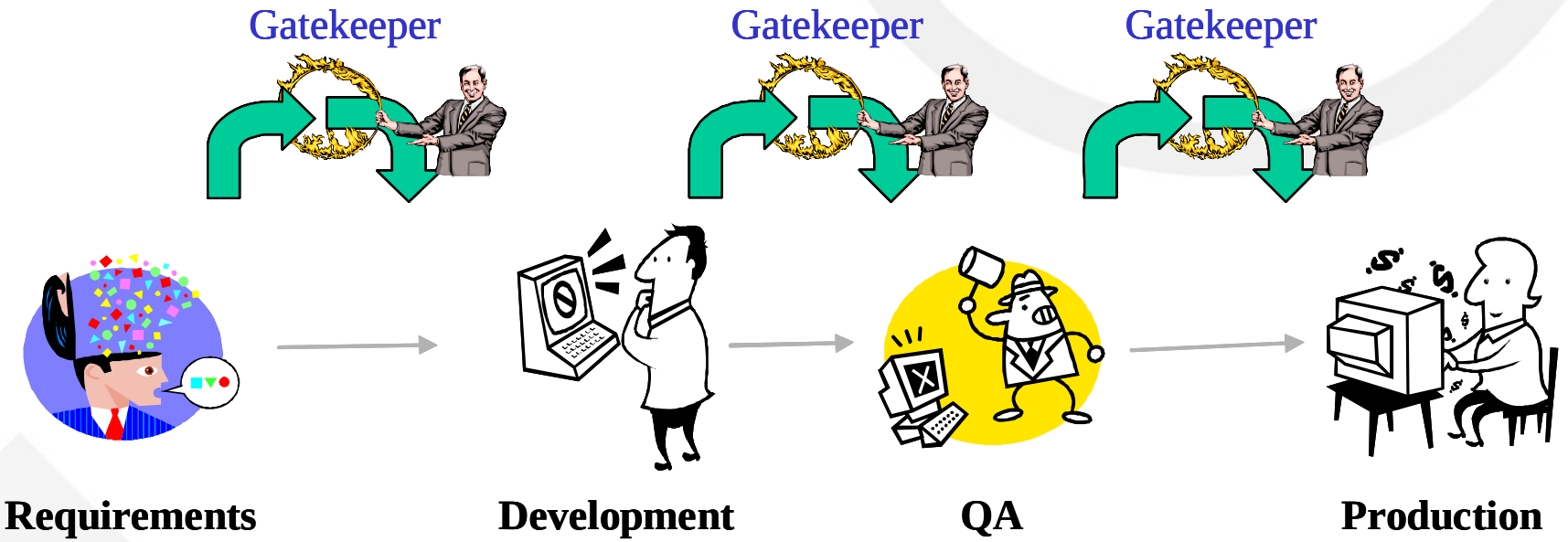
Services Span Both Silos AND Projects!



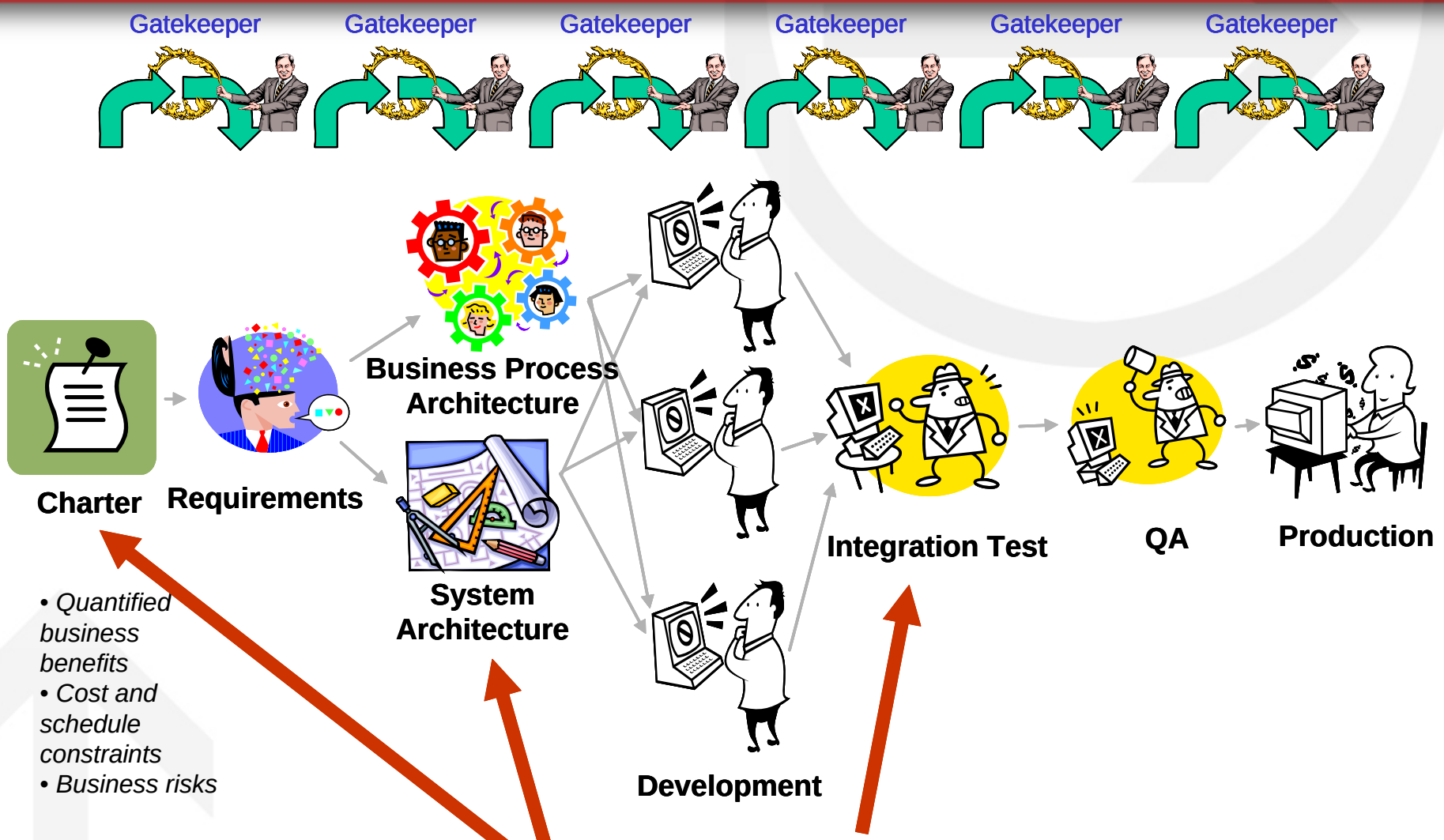
Other Potential SOA Risks

- **Services will not be re-used**
  - Technical or business design not suitable
  - Potential users unaware of existing services
  - Lack of governance to ensure reuse
- **Service development will be difficult**
  - Lack of support for accessing services in different end-point system technologies
  - Lack of support for events as well as request-reply
- **Services will be hard to manage**
  - Inconsistent implementation technologies – too many variations create complexity
  - Inconsistent design and utilization patterns
    - FT, HA, load distribution
    - Security

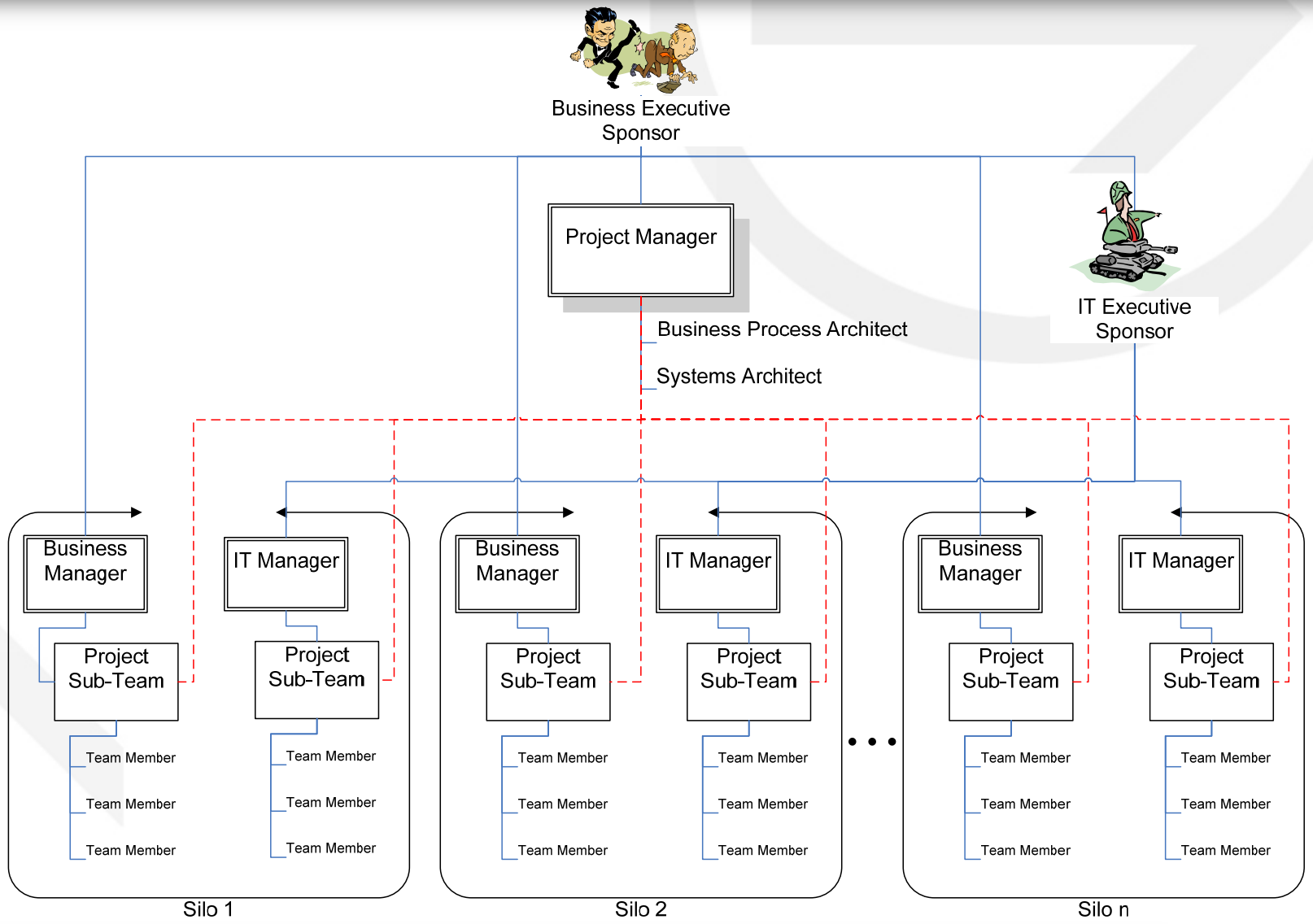
Typical Client-Server Development



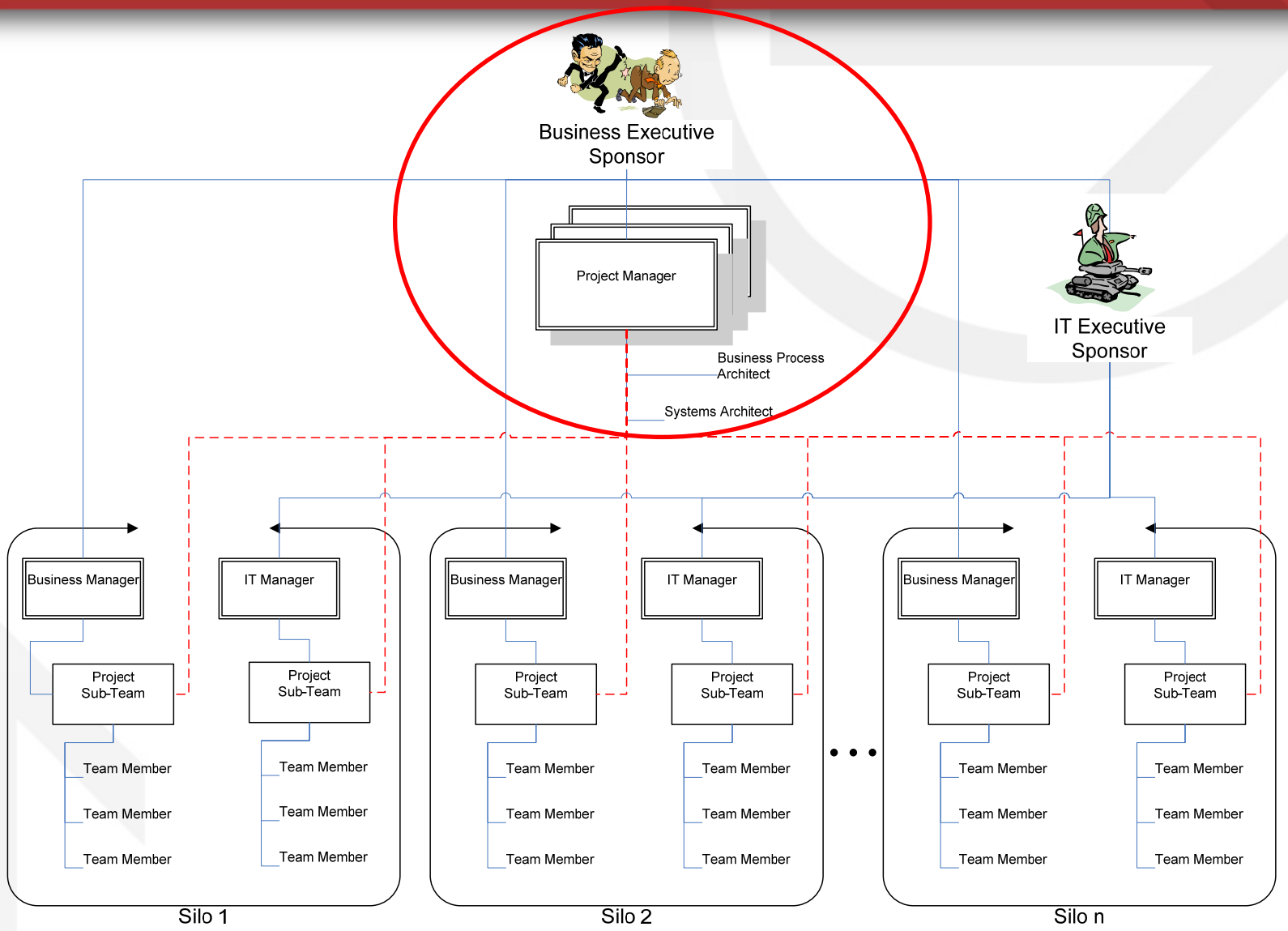
Distributed Systems Development



Multi-Silo Project Organization



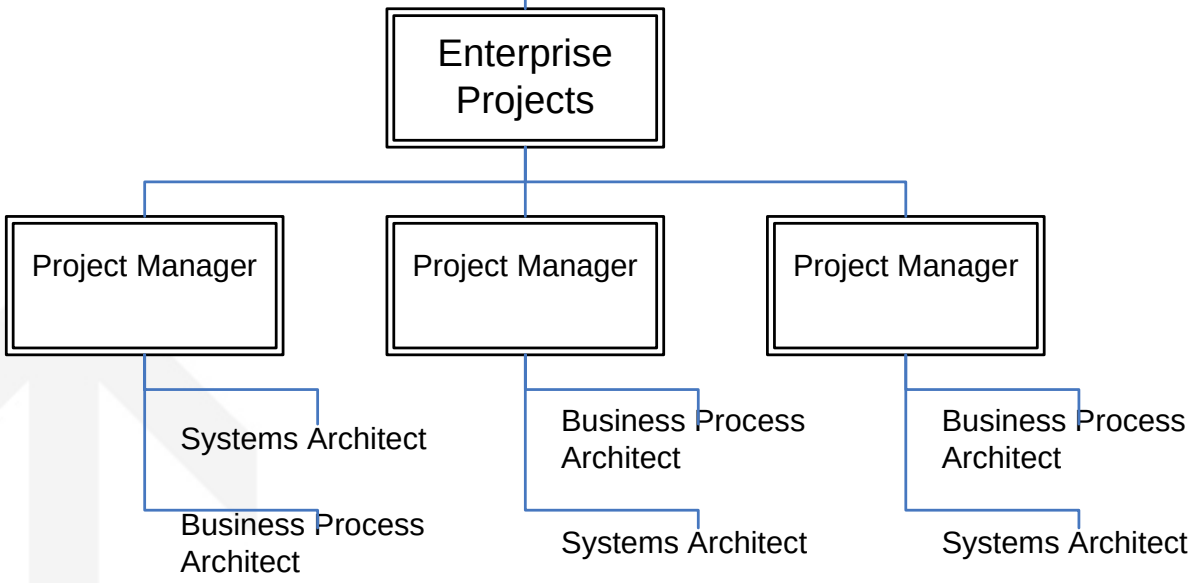
Multiple Projects Require Time for Oversight!



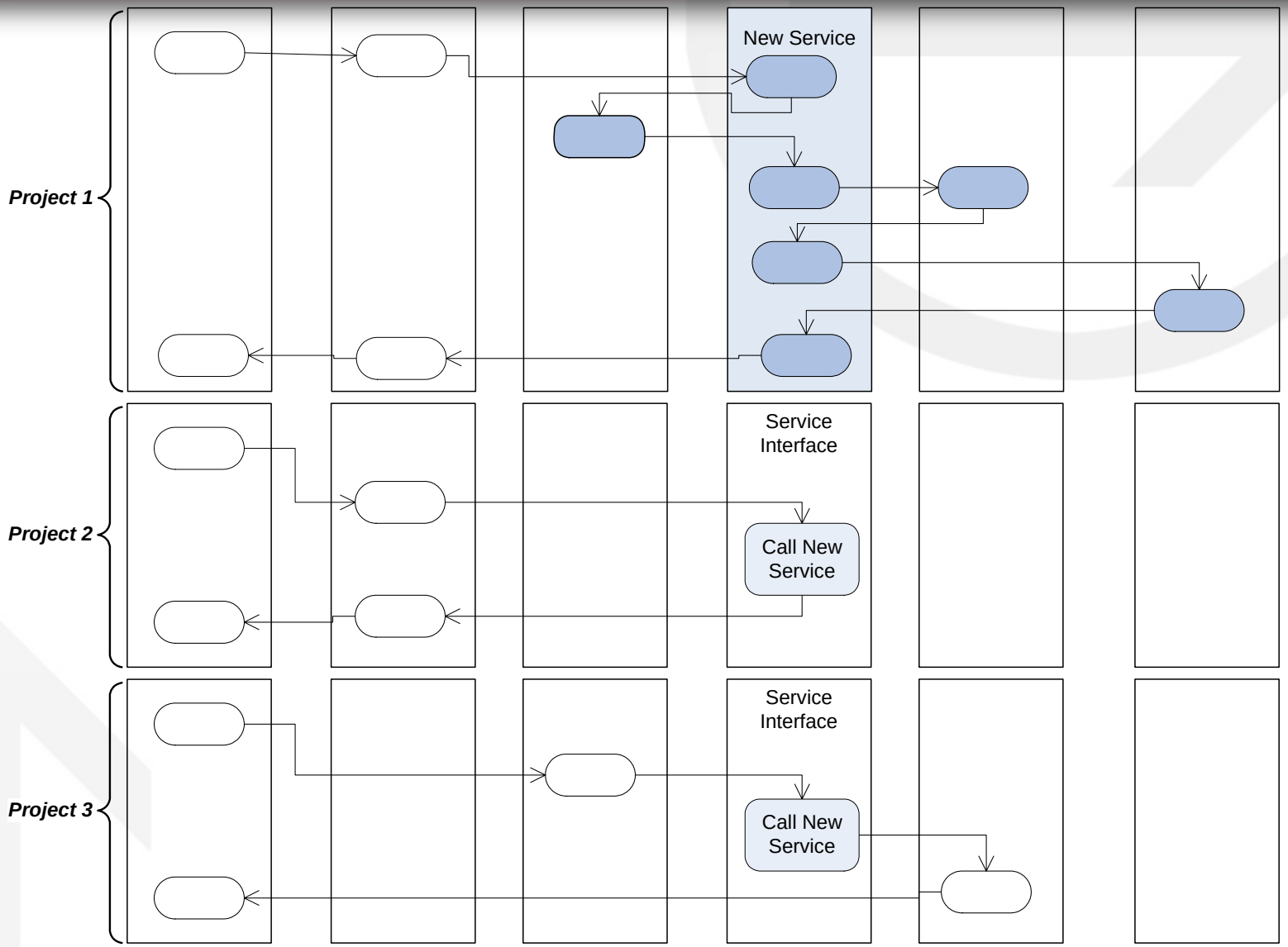
Enterprise Projects Organization

Business Executive Sponsor

- **Enterprise Projects Manager**
  - Manages silo-spanning projects
    - Provides day-to-day oversight
  - Reports to the Business Executive Sponsor (directly or indirectly)

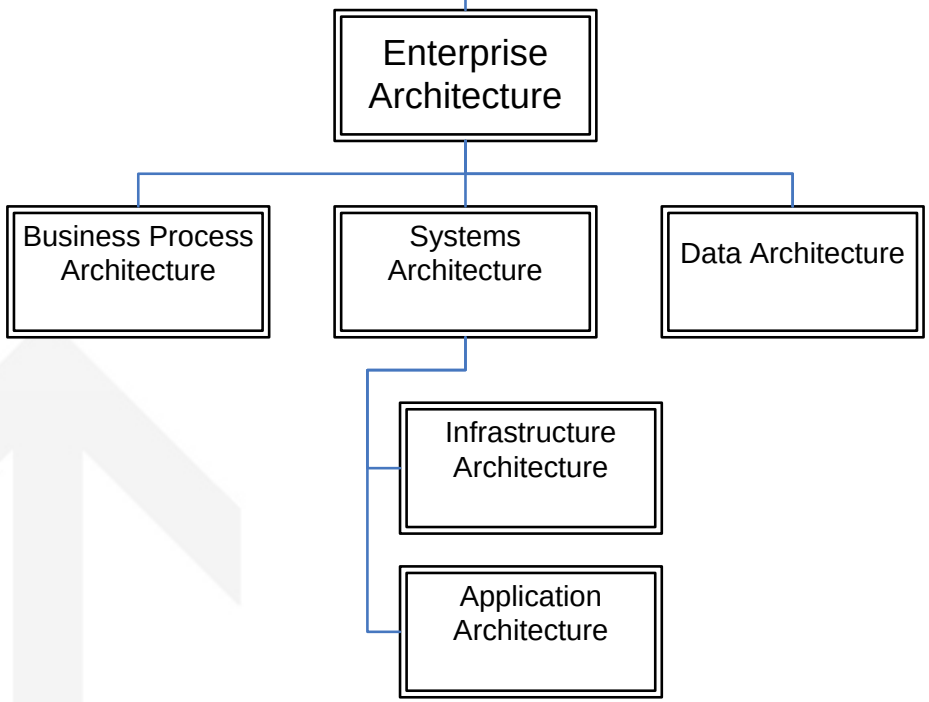


But Services Span Projects – and Involve Business!



Enterprise Architecture Organization

Business Executive Sponsor



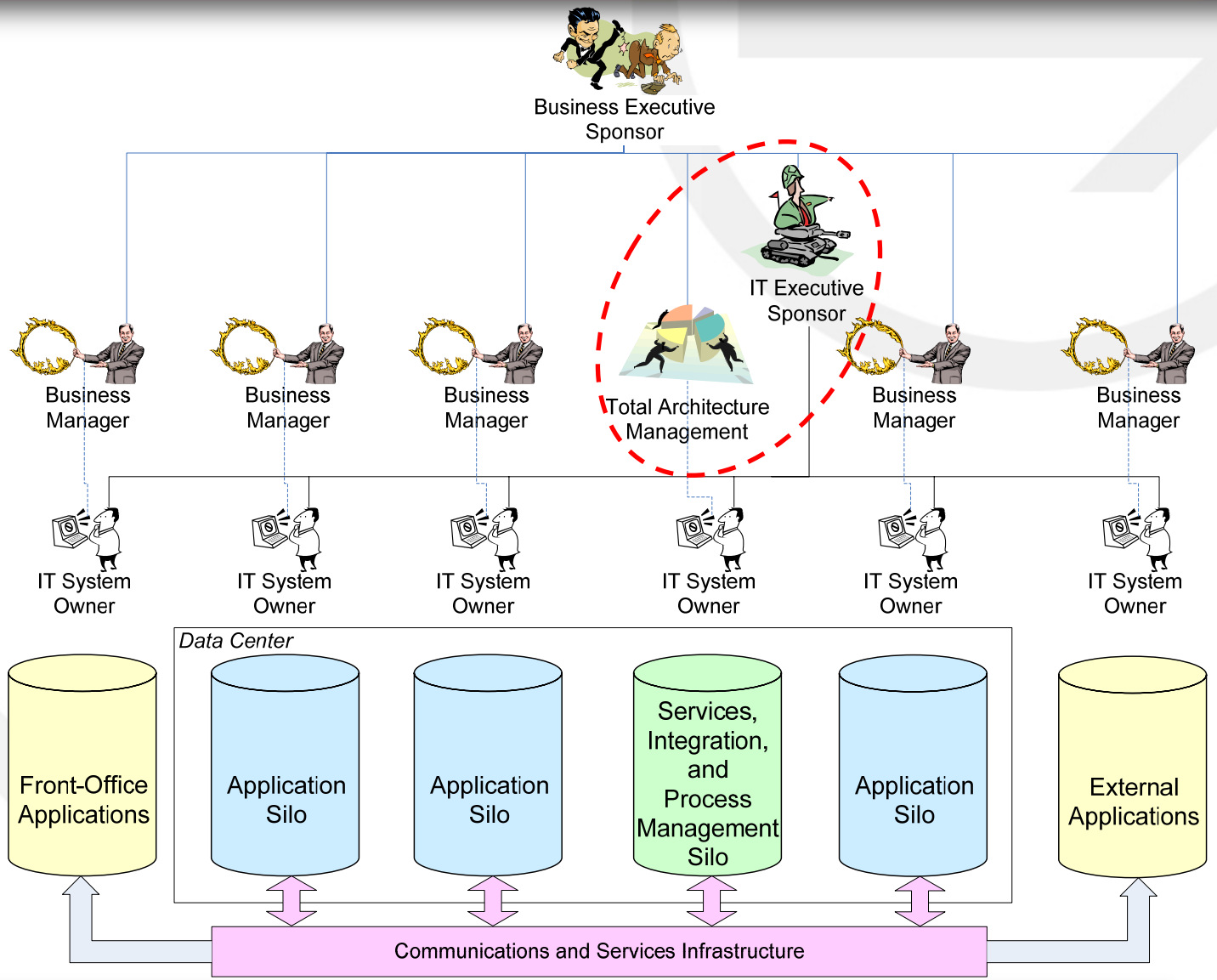
- **Enterprise Architecture Responsibilities**
  - Business Process Architecture
  - Architecture for infrastructure and applications
    - Design patterns
    - Best practices
  - Data Architecture
  - Service validation and specification
  - Architecture to support operations
    - Component monitoring
    - Process monitoring

Total Architecture Management

Business Executive Sponsor

- Total Architecture Management
  - Enterprise Projects
    - Project Manager
      - Business Process Architect
      - Systems Architect
    - Project Manager
      - Business Process Architect
      - Systems Architect
    - Project Manager
      - Systems Architect
      - Business Process Architect
  - Enterprise Architecture
    - Business Process Architecture
    - Systems Architecture
      - Application Architecture
      - Infrastrkucture Architecture
    - Data Architecture

Completed Organizational Picture



Questions?