The SOA Yellow Brick Road: Drawing the Curtin on the SOA Wizard

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Acknowledgements

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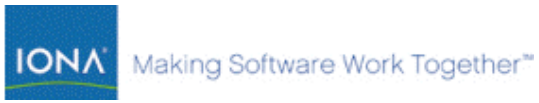
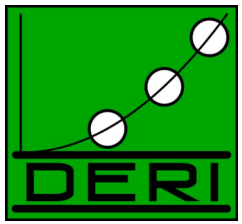




Why SOA at WWW?

- Convergence: Next Generation Platform = SOA + IP
  - SOA replaces pre-SOA
  - Internet - the universal (communications) platform for the digital world
- Realize SOA Promise: MIA
  - Open-ness
  - Federation
  - Scale
- SOA: Enterprise vs. Web 2.0
- Consequences (Disruptions)
  - Sea-change (biggest in IT history)
    - Rethink pre-SOA concepts
    - Competitive battle
  - SOA evolving rapidly but slowing
    - Massive learning curve
    - SOA misrepresented and misunderstood
- A decade to go

Simple SOA Vision

- **SOA =**
  - **Message-based computing**
  - **Global interoperable environment - any service can invoke any service**
  - **Agnostic of language, platform, implementation, …**
  - **Standards-based: SOAP, WSDL, UDDI, …**
  - **Dynamic SOA: discover, select, compose, adapt, negotiate, execute, …**
  - **Solves the "integration" problem**

- **But …**
  - **No "A" in SOA**
  - **SOA products do not interoperate**
  - **Integration far too complex for a simple solution**

- **Simple Web services?**
  - Business Services [Forrester]
    - Transactional business services
    - Query and content business services
    - Analytical business services
  - Application Services
    - Functional services: execute business logic
    - Data services
    - Common (business-oriented) services - used across the enterprise
  - Infrastructure or utility services

Services: An SOA Programming Model

- Connectivity services ✢
  - Event services
  - Transport services
  - Mediation services
- Business logic services ✢
  - Partner services
    - Community services
    - Document services
    - Protocol services
  - Business application services
    - Component services
    - Core services
    - Interface services
  - Application and information access
    - Event detect services
    - On-ramp services

- Control services ✢
  - Interaction services
    - Delivery services
    - Experience services
    - Resource services
  - Process services
    - Choreography services
    - Transaction services
    - Staff services
  - Information services
    - Federation services
    - Replication services
    - Transformation services
      - Search services
- Development Services ✢
  - Model Services
  - Design Services
  - Implementation Services
  - Test services

✢ IBM WebSphere Integration Reference Architecture

Danger

- **Hype at Boiling Point**
  - **Unrealistic promises ➪expectations ➪ confusion ➪ disappointment**
    - **Solution "X" is finally here**
      - **plug and play**
      - **integration**
  - **Technology evolving and diverging**
- **Easy Mistakes**
  - **Chaos without SOA framework or governance**
  - **Under achieve without strategic business objectives**
- **2008 - SOA in the Trough of Disillusionment [Gartner, Feb 2006]**

Outline

- Our View
  - Value of SOA
  - SOA Vision
  - What is SOA?
- IT Workbench: Verizon's SOA
- SOA Evolution
  - Vendor Driven SOA
  - SOA Schisms
  - SOA Adoption
- SOA Research
  - Aspect-Oriented Computing
  - SOA Evolution
  - Semantics and SOA
  - Process vs. Data-Orientation
  - The Economics of Computing

Value of SOA

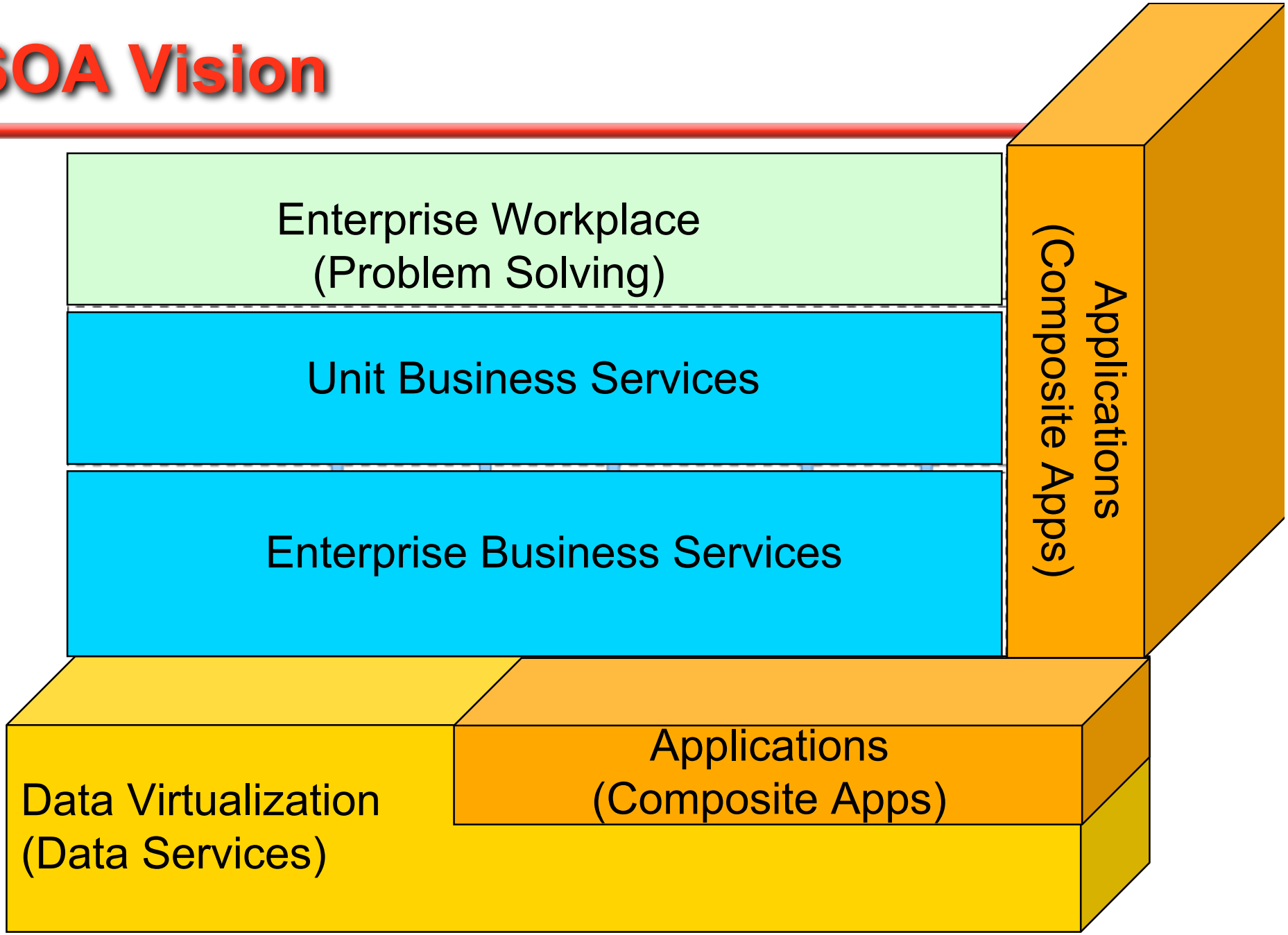
- **Technical**
  - Re-use
  - Flexibility - low cost remote invocation
  - Potential

  NOT integration [I-ESA 2006 Integration Keynote]

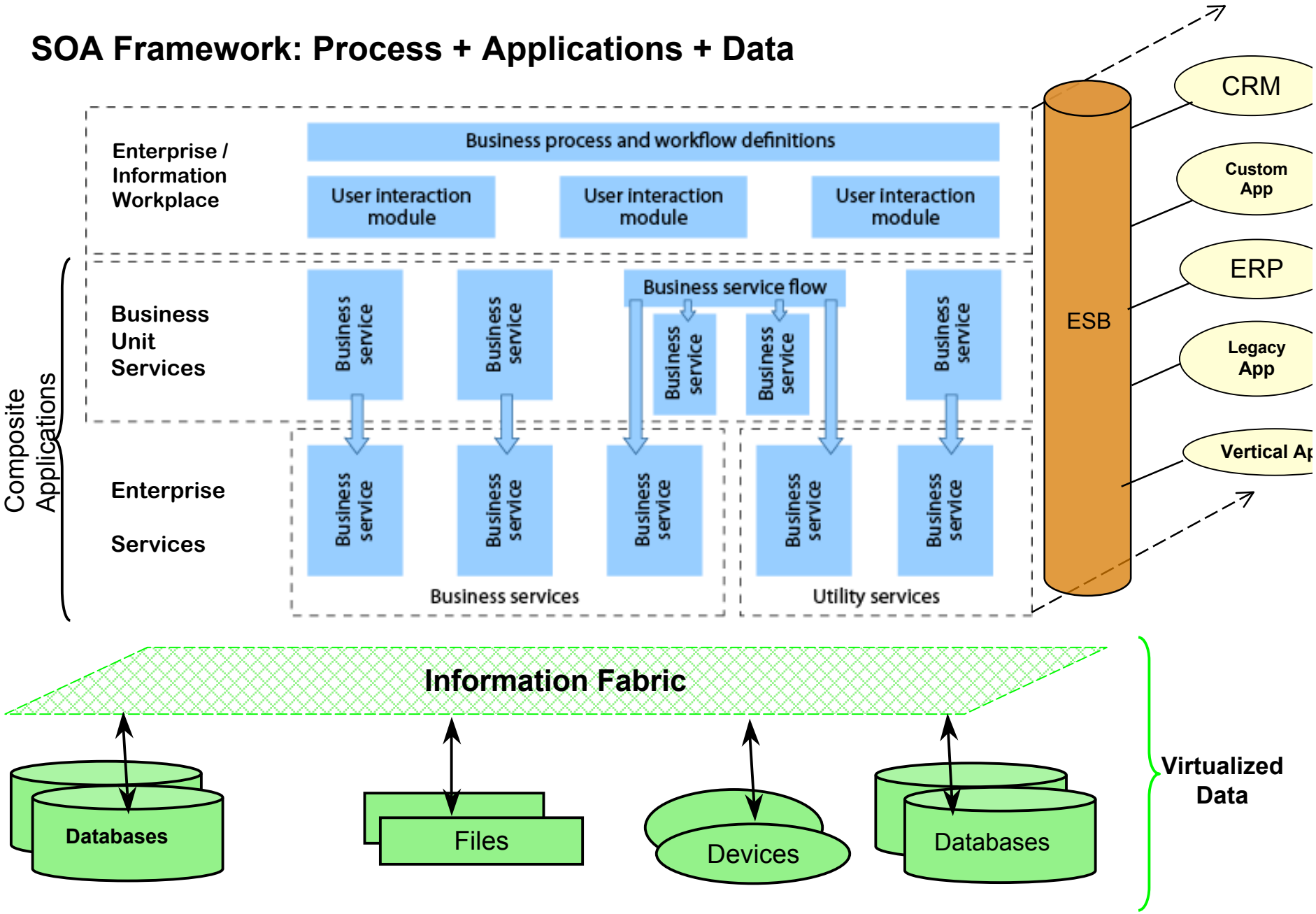
- **Business**
  - Agility / flexibility
  - Strategic business transformation
  - Focus on problem solving [not on technology]
    - Business processes
    - Digitize core business services + processes [Digital Business, Forrester]
    - Malleable business

- **SOA is a long-term investment**
  - Far bigger benefits than claimed, than Dot.com
  - Evolution: technical, business, conceptual, …

SOA Vision


Enterprise Workplace
(Problem Solving)
Unit Business Services
Enterprise Business Services
Applications
(Composite Apps)
Data Virtualization
(Data Services)
Applications
(Composite Apps)

SOA Framework: Process + Applications + Data



What is SOA?

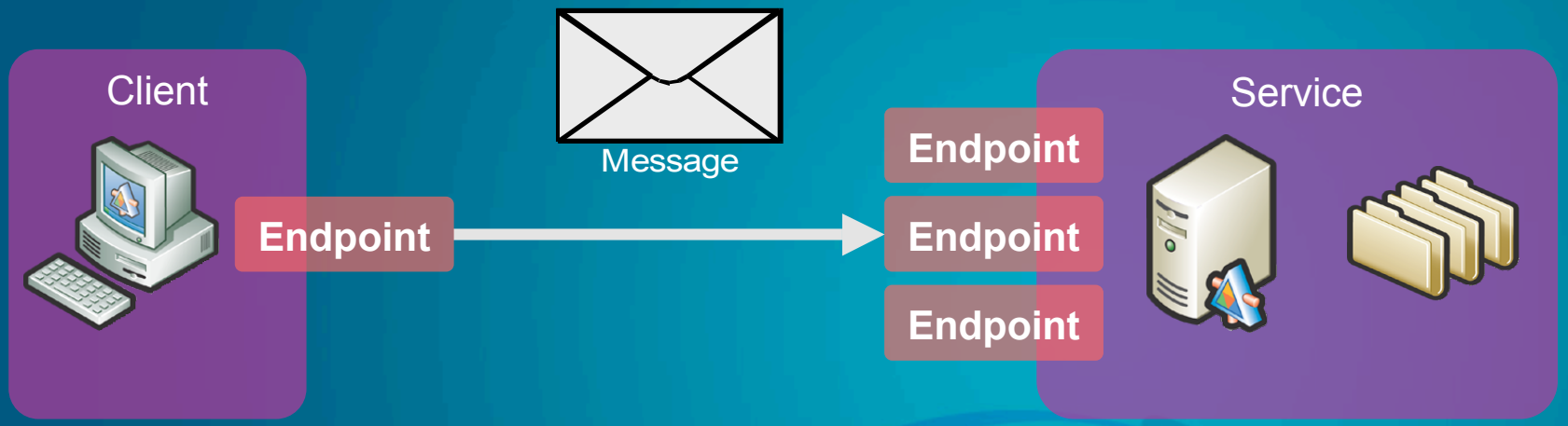
- ***Service-oriented architecture (SOA)*** *is a style of design, deployment, and management of software infrastructure and applications to create a more flexible digital embodiment of your business. [Hefner et al Forrester]*
  - *standards-based environment*
  - *Loosely coupled connections to ease change*
  - *shared services and federated control*

- **Some SOA plumbing**
  - **Services (not SOAP)**
  - **Method libraries**
  - **Composite application**
  - **SOA Infrastructure (framework), e.g., Enterprise Service Bus**
  - **Data Services**

Clients and Services

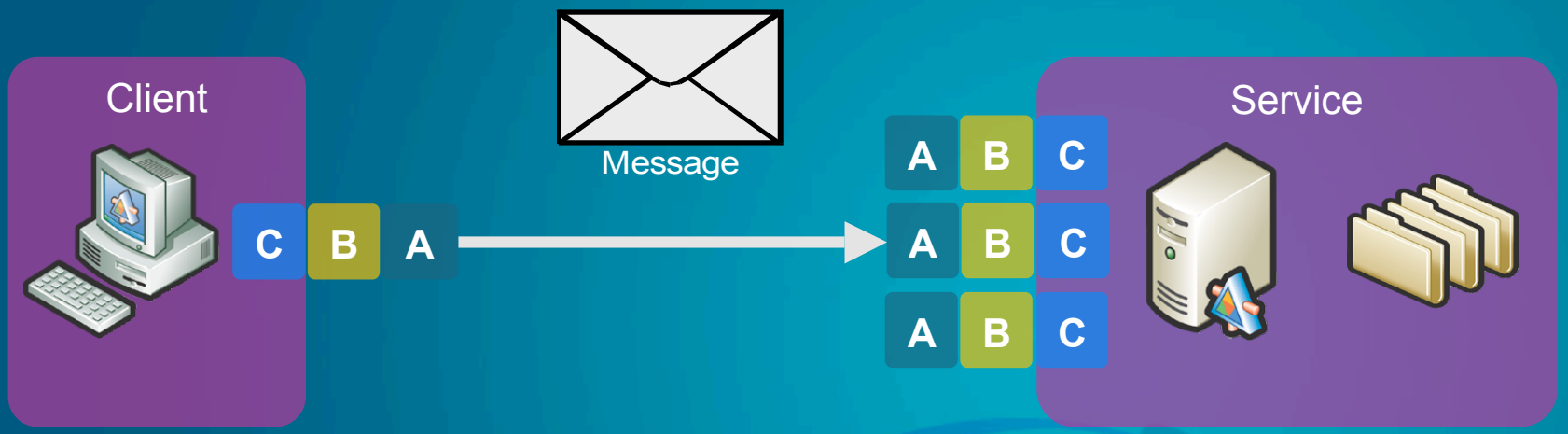
Microsoft

Endpoints



Microsoft

Address, Binding, Contract



Address

Where?

Binding

How?

Contract

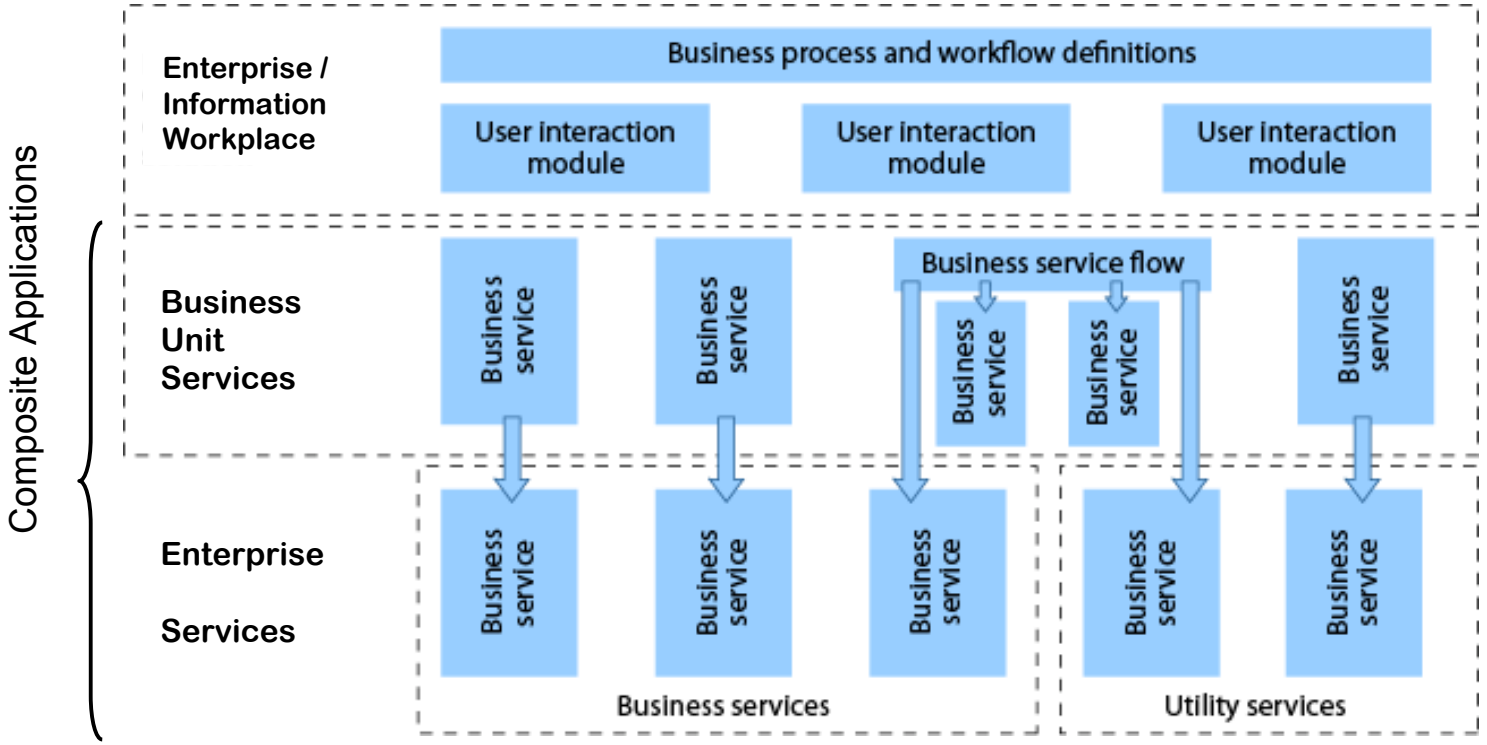
What?

Endpoint

Microsoft

Composite Applications: Fundamental SOA Concept

- **Integration pattern: define an application, service, or process from existing elements that automatically supports change**
  - **Composite: process behavior, user interaction, …**
  - **Component services: add, delete, modify**
  - **Meta-data, business rules, policies, events, …**



Inherent Complexity of SOA

- 1995: Longhorn - Vista (2007?)
- 1999: Web service - *simple*, core concept
- 2000: SOA evolved
- 2002: SOA computing model to replace pre-SOA
  - ➪ Full SOA computation model - replace every pre-SOA concept

- SOA Evolution (a.k.a. research)
  - Policy-driven
  - Meta-data driven
  - SOA framework
  - Integration
  - Service development life cycle
  - Governance
  - Software delivery
  - Data Services (Data Virtualization)

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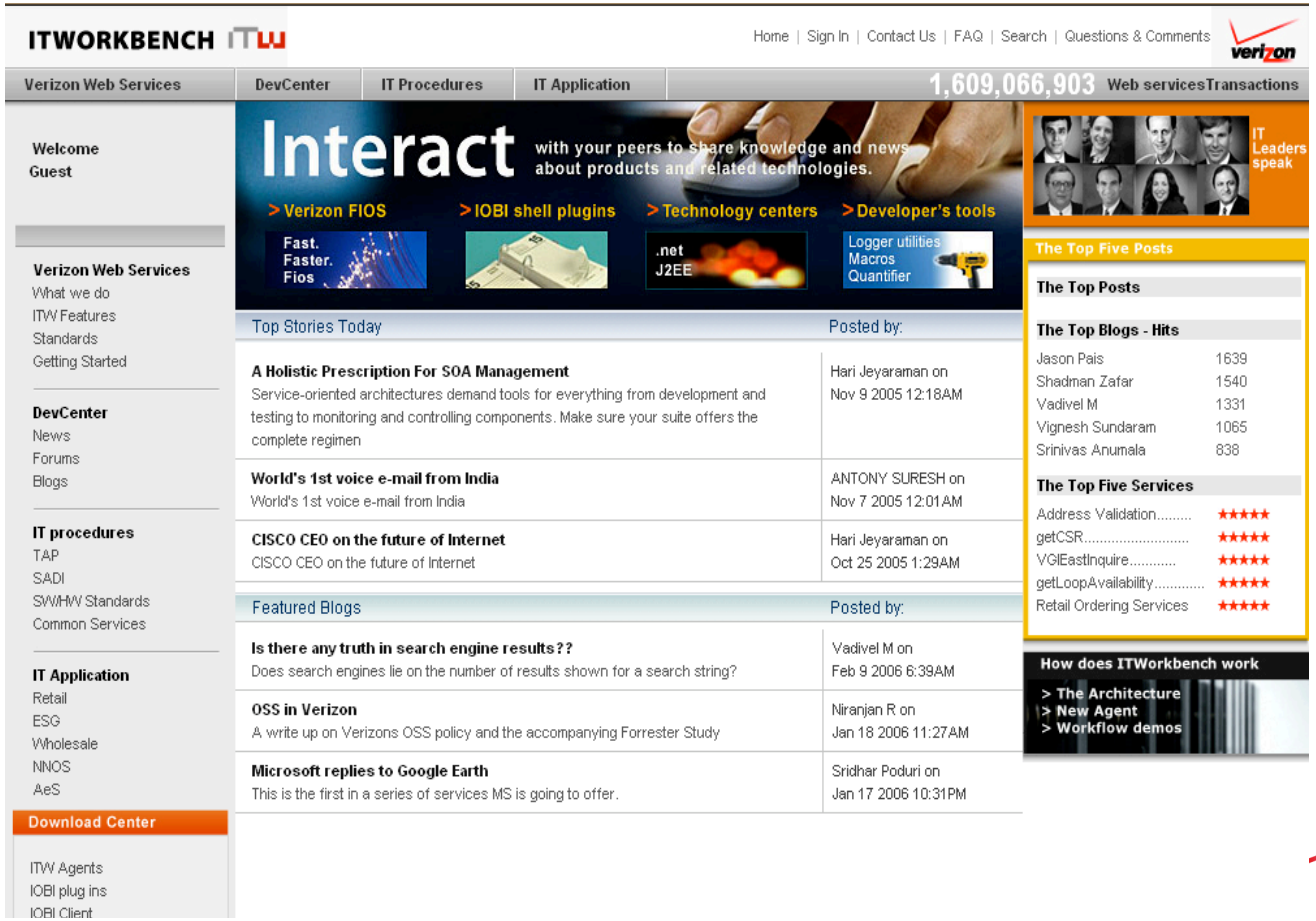
IT Workbench: Verizon's SOA

- **History**
  - **2002 .Net development environment**
  - **Enterprise-wide management / development portal**
    - **Common Services Program**
    - **Self-funded**
    - **Governance**

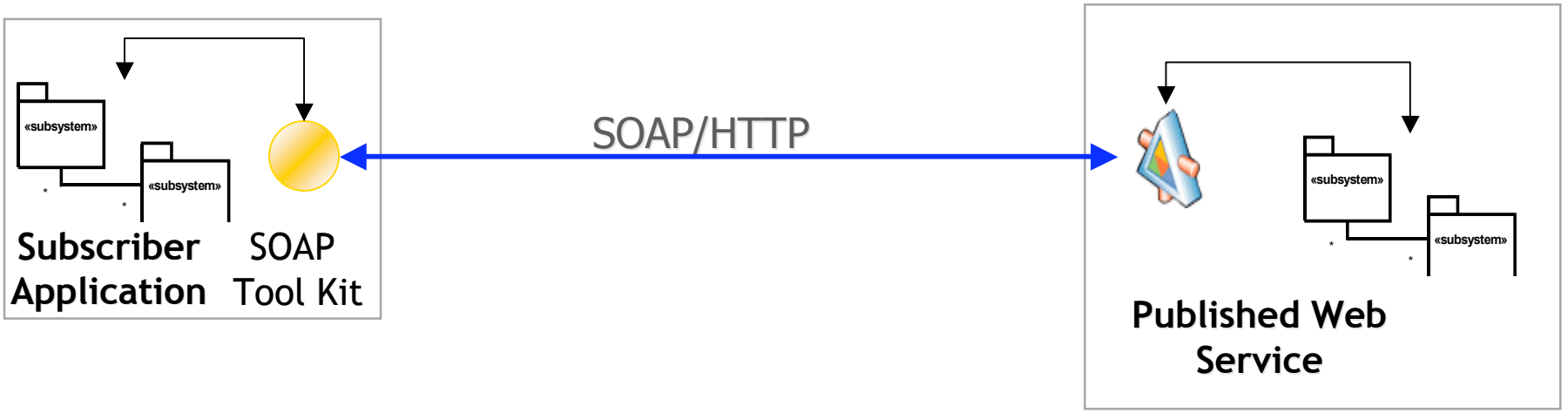


IT Workbench: Service Life Cycle

- **Publish**
  - Develop / compose
  - Test
  - Certify
    - Security
    - Performance
    - SLA
    - Etc.
  - Publish
- **Subscribe**
  - Discover
  - Select
  - Compose
  - Adapt
  - Negotiate
  - Invoke
- **Manage**
  - Monitor
    - Security
    - Performance
    - SLA
    - Etc.
  - Maintain
  - Accounting
  - Optimize

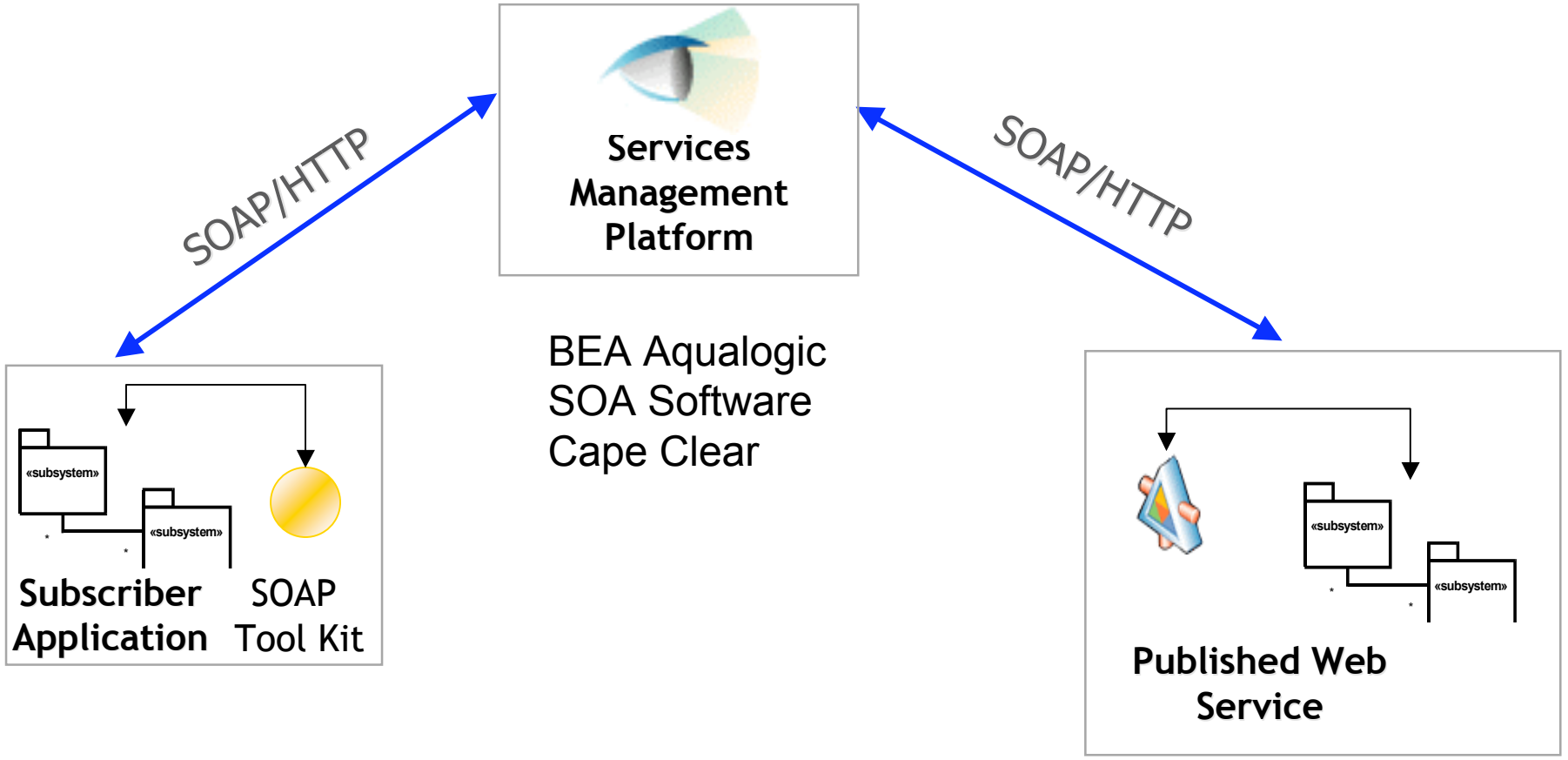
SOA Architecture Options

Basic Publish-Subscribe Model:
- No Service Management Features
- Partners provide security and monitoring, if any



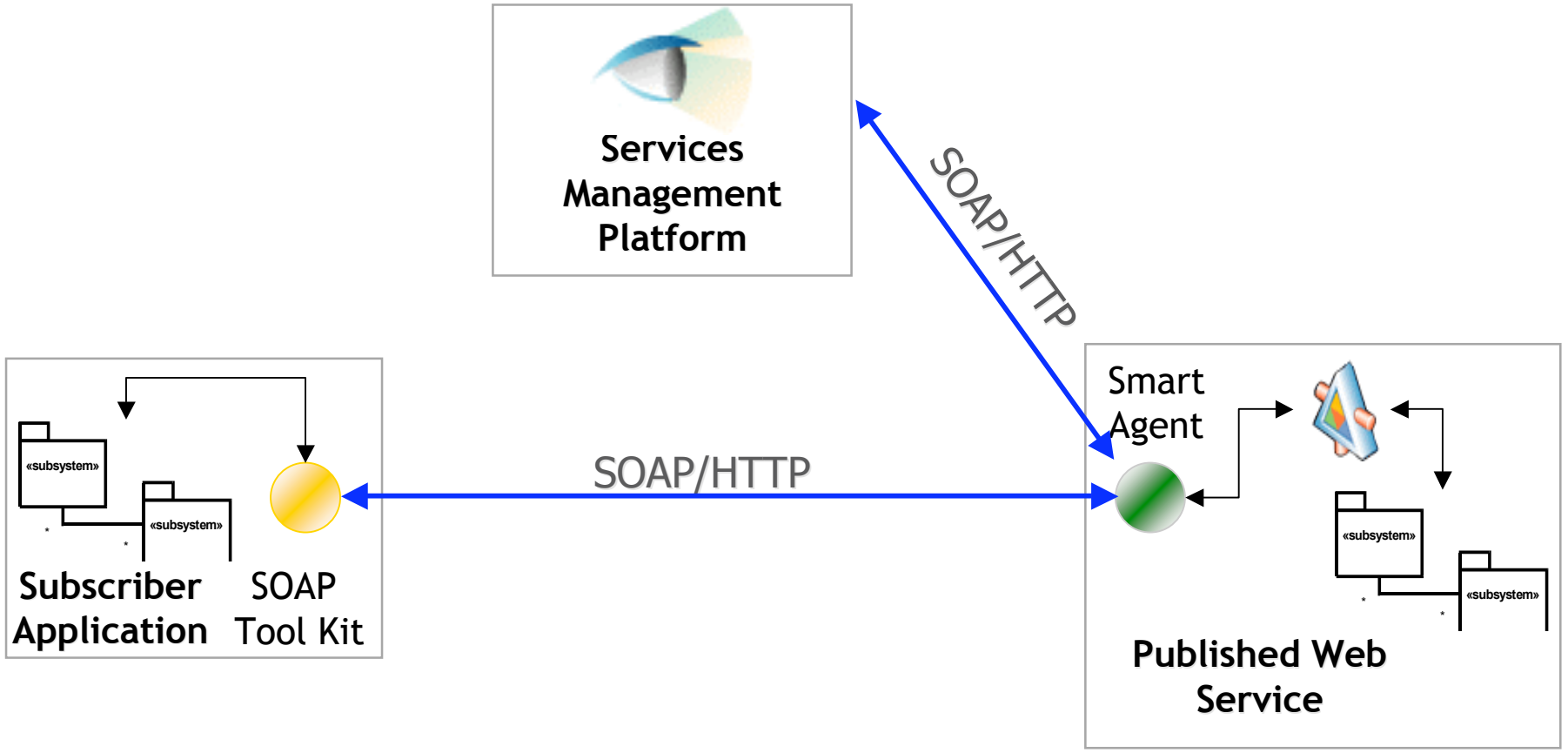
SOA Architecture Options

Brokered Service Model:
Intermediate platform provides Service Management Features (most SOA products)



SOA Architecture Options

Distributed Agent Model (Current ITW):
Agent / central infrastructure combine to provide Service Management Features



IT Workbench – Components

- Services Registry
- User management System
- Security
- SLA Management
- Logging
- Reporting

IT Workbench Scale

- Published service types
  - Internal: 600+
  - B2B: 50+
  - Growth rate/month: 20 / month
- Subscribers
  - Internal: 800+
  - B2B: 70+
  - Growth rate/month: 30 / month
- Service instances / transactions per day
  - Internal: 10 MM/day
  - B2B: 500K/day
  - Since inception: 2+ BN

SOA Scale

- Large SOA application (CRM)
  - 100% re-written in ASP .Net C# using SOAP and STMP
    - 50% code reduction
    - Asynchronous, reliable method libraries
    - Policy driven - next step
  - Service layering
    - User interactions
    - Business services
      - Fine grained: < 2K lines of C#
      - SOA Re-write of 2 applications: 60 + 36
      - Converge to one: reduce to 30
    - Infrastructure services
    - Data services
      - Like stored procedures
      - 1,000-1,200 major, 600 minor
- SOA Enterprise
  - Internal: ~1 MM (e.g., multiply above by at least 5,000)
  - B2B: thousands
- SOA Internet: ~ MM to BN

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Vendor Driven SOA

- **Vendors compete for unknown territory**
  - Vendors stake future on SOA
  - Competitive chaos: markets and expertise
    - Pre-SOA well defined
    - SOA uncharted
  - SOA scope and scale require
    - Standards
    - Partners
    - Coalitions
    - Acquisitions

- **SOA Product Announcements**
  - Longhorn (Vista) 1995
  - Start-ups 2002
  - First “full SOA solutions” 2003
  - SAP NetWeaver+ESA: 2004 - 2007?
  - Oracle Fusion: 2008-2010?
  - Major SOA infrastructure vendors (IBM, BEA, Sun, …)
    - Announce mid-2005
    - New products and acquisitions continuously

Vendor Driven SOA: Schisms

❑ Schism 1: Competing Standards

- OASIS (Organization for the Advancement of Structured Information Standards)
- WS-* (World Wide Web Consortium)
- .Net

❑ Schism 2: Competing Consortia

- Service Component Architecture (SCA) / Service Data Objects (SDO): IBM, BEA, IONA, Oracle, SAP, Siebel, Sybase
- Java Business Integration (JBI): Sun, Tibco, IONA, Fiorano, Sonic, 19? (IBM and BEA dropped out)
- LAMP: open source SOA (Linux, Apache, MySQL)
- Microsoft ?

• Schism 3: Vendors vs. Implementers (simple web)

- Web 2.0: Plain old XML (POX), AJAX, REpresentational State Transfer (REST), RSS, ATOM
- Web 2.0 is for web-oriented architecture (WOA) vs. Enterprise SOA: WOA requires flexibility, light-weight, simplicity; SOA requires robustness, control, security.

❑ Schism 4: Old-school vs. New-School

- Old: Achieve SOA on top of pre-SOA with as little change as possible for compatibility
- New: Build SOA from scratch using pure SOA principles

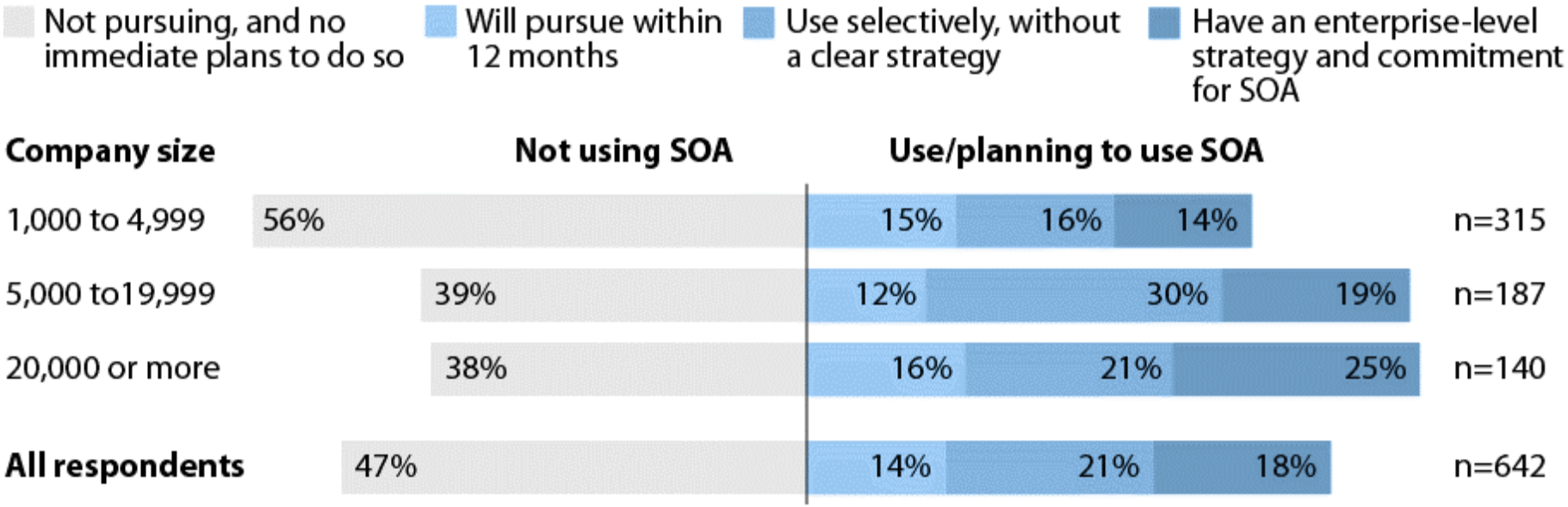
SOA Adoption

- IDC SOA Adoption Survey, March 2006
  - 75% CIOs say SOA critical
  - 24% claim to have / be adopting; IDC corrected to 10%
- Survey of surveys
  - Web services adoption
    - 10% of budgets
    - 7 WS projects / enterprise
    - 10 services / project, 50% reuse
    - Slow adoption of WS-*
    - 70/76% J2EE, 57/21% .Net, 95% mixed (conflicting sources)
  - SOA
    - 62% of large to medium businesses
    - 44% of small enterprises

April 2006, Trends **"Survey Data Says: The Time For SOA Is Now"**

Strong SOA Adoption Continues

"Which of the following best describes your firm's approach to or status of SOA?"



Base: North American and European software and services decision-makers

Source: Forrester's Business Technographics® November 2005 North American And European Enterprise Software And Services Survey

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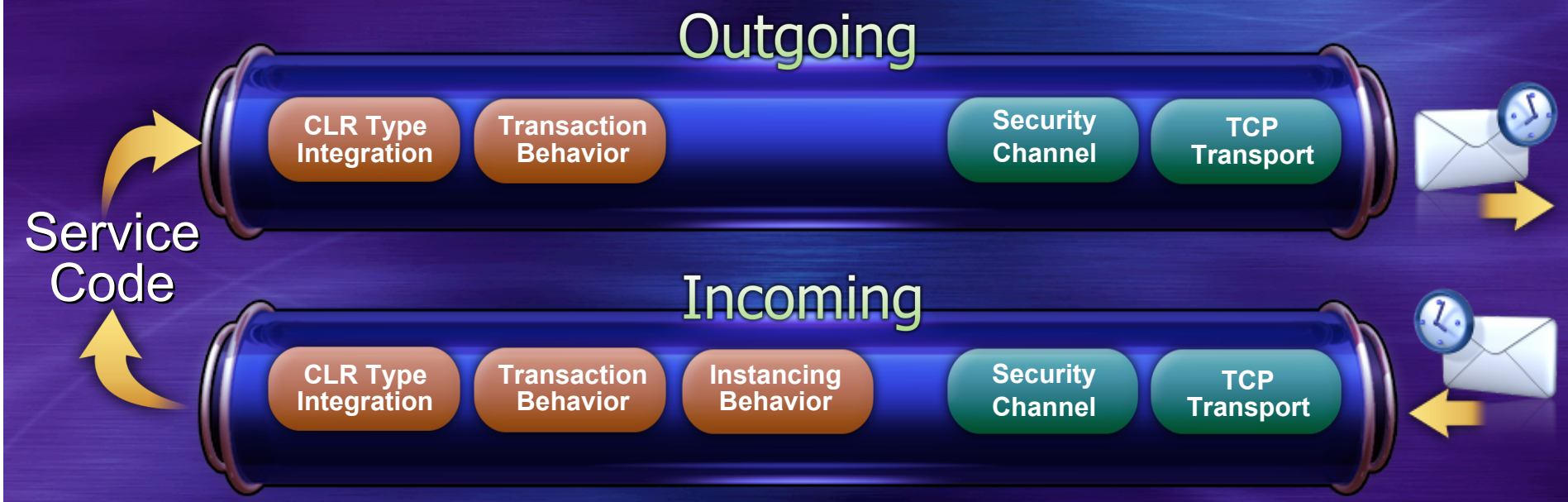
Aspect-Oriented Computing

- **What is the core SOA computational model?**
  - How do you receive - unpack - execute - pack - respond a service request?
  - Does it matter?

- **Aspect-Oriented**
  - Programmable SOA computing models
    - Aspect: specific computational task, separable from others
    - Develop “aspect processors”, e.g., information model mapping
  - Separation of concerns - aspects
  - Push to the infrastructure
    - Remove everything but problem solving from a business service
  - Architectural simplification - aspects
    - Each architectural aspect, e.g., information model mapping, dealt with uniformly
  - Optimization
    - Uniform optimization applied in each aspect
    - Optimization hard - can be improved over time
  - Policy driven
    - Each aspect can be policy-driven

Composable Architecture



Service Model Layer

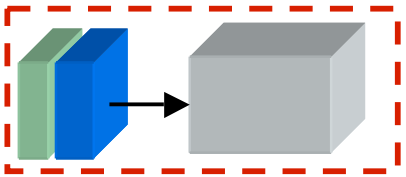
Influences and adds to the programming model based on incoming messages

Messaging Layer

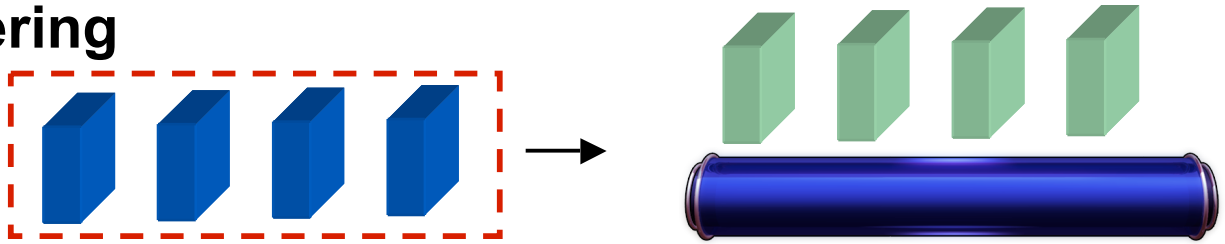
Moves messages back and forth and adds transfer semantics (channels)

SOA Evolution

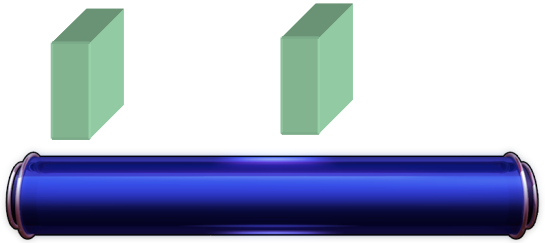
- Wrapping



- Re-Engineering



- Consolidation (Darwinian)



- Emergence of SOA-Based Computation

⇨ Problem Solving Era

- Information Workplace

Semantics and SOA

- **Challenges**
  - SOA scale: millions to billions of business and data services
  - SOA = integration (mapping)
  - Dynamic SOA: discover, select, adapt, compose, negotiate
- **Role of Semantics**
  - Increase automation of modeling, search, integration, mediation, …
- **Opportunities**
  - SOA processing
    - Discover (search)
    - Adapt (mediate, map)
    - Negotiate
  - Data protocol, and process mediation
  - Meta-data management

Run time magic a long way off

Semantically Enabled SOA (SESA)

- **Core SOA Infrastructure**
  - Change: service life cycle management (design time)
  - Control: monitor, manage, govern (run time)
  - Connection: service delivery (run time)

- **SOA Registry and Repository**
  - Semantic technologies (ontologies) for classifying, managing, and processing meta-data

- **Semantics in SOA Research**
  - Deri.org (SESA)
  - BEA and IBM - design time service life cycle support, meta-data management
  - Small firms
    - MetaMatrix: meta-data repositories with semantic capabilities
    - Metallect IQ Server: service discovery for design, maintenance, governance
    - Webify Industry Fabric: data, resource, policy discovery, design, and run-time adaptation
    - Pantero: data and meta-data services, data discovery, mapping, integration, semantic data routing

Process- Vs. Data-Orientation

- Data semantics far easier to define and process than process semantics

- Shift from process-orientation to data-orientation
  - Use a small number of simple, canonical business processes, e.g., one PayBill for the entire enterprise
  - Express rich semantics in data services, e.g., PayBill documents

- Use data semantics to increase automation
  - Data service operations: design time and run time
  - Meta-data management
    - SOA registry
    - SOA repository
  - SOA integration
    - Federated SOA registries

Conclusion: The Evolution is Here!

- **SOA + IP = Next Generation Convergence Platform**
  - Replace everything
  - Benefits
    - Far bigger than projection
    - Business Agility

- **Decade of Evolution to Go**
  - Aggressively promoted
  - Misunderstood
  - Evolving
  - Inherent complexity
  - Adoption slowing
  - Competition
    - Schisms
    - Losing sign of SOA goal - Global Interoperation

- **Start Now**
  - Future benefits are huge
  - Focus
    - Strategic Business Transformation
    - Technology: processes, common services, enterprise-wide
  - Be cautious