SAMSUNG SDS

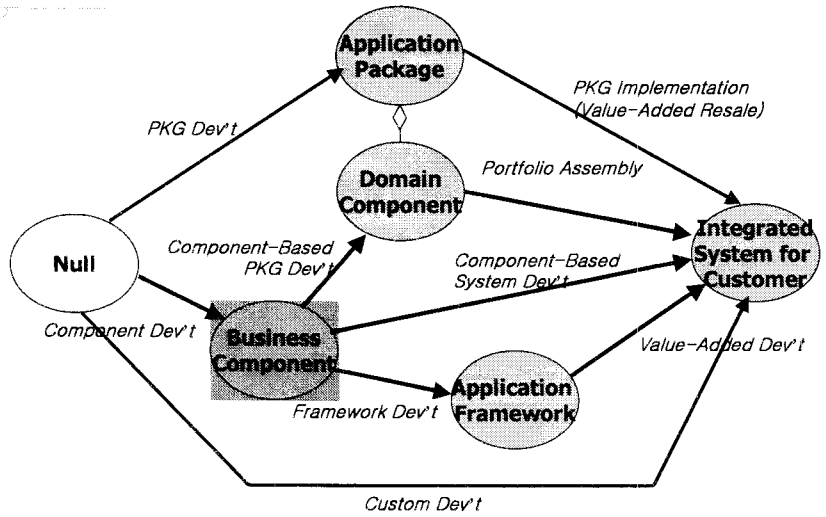
Architecture, Component, and Reuse

Dr. June Sung Park
CTO, Samsung SDS

Objectives of SW Engineering Today

- Greater dependency on SW
  → Quality/Reliability
- Intensifying global competition
  →Time to market
- Continuous business transformation
  →Flexibility
- Expanding virtual enterprises and diversifying platforms
  → Interoperability
- Increasing TCO
  → Shared services

Evolution of SW Industry



IO Matrix of SW Industry

	Component Business	New Biz		Traditional PKG Business	Traditional SI
		Domain Component Business (Web Service)	App Framework Business	Model-Based PKG Business	Model-Based SI
				(Product Assembly)	Component-Based SI
	Reusable SW Asset			Component-Based PKG Business	Portfolio Assembly SI
					FRWK-Based SI
					Solution Consulting

PKG Biz

Solution Based SI

SAMSUNG SDS

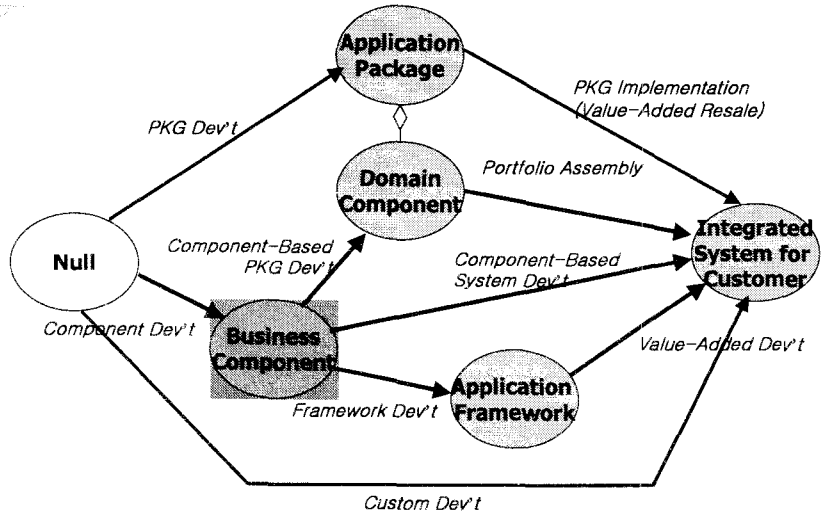
Architecture, Component, and Reuse

Dr. June Sung Park
CTO, Samsung SDS

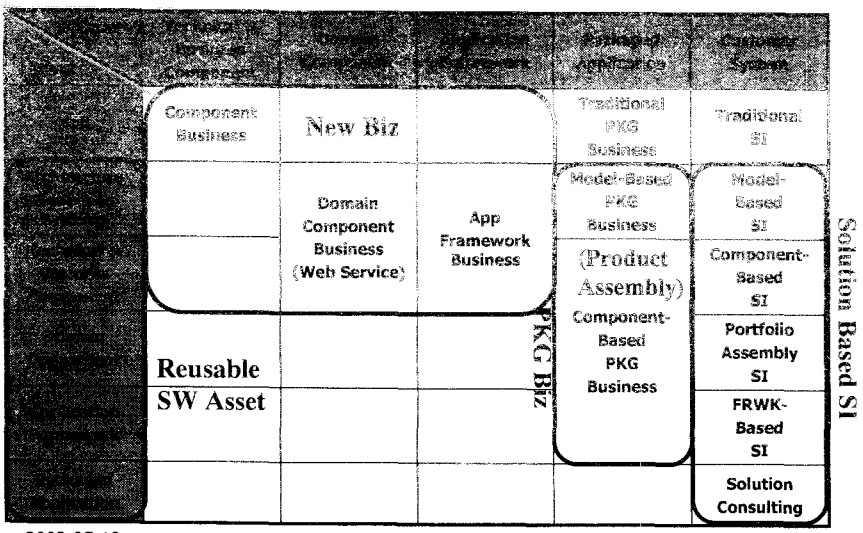
Objectives of SW Engineering Today

- Greater dependency on SW
  → Quality/Reliability
- Intensifying global competition
  →Time to market
- Continuous business transformation
  →Flexibility
- Expanding virtual enterprises and diversifying platforms
  → Interoperability
- Increasing TCO
  → Shared services

Evolution of SW Industry

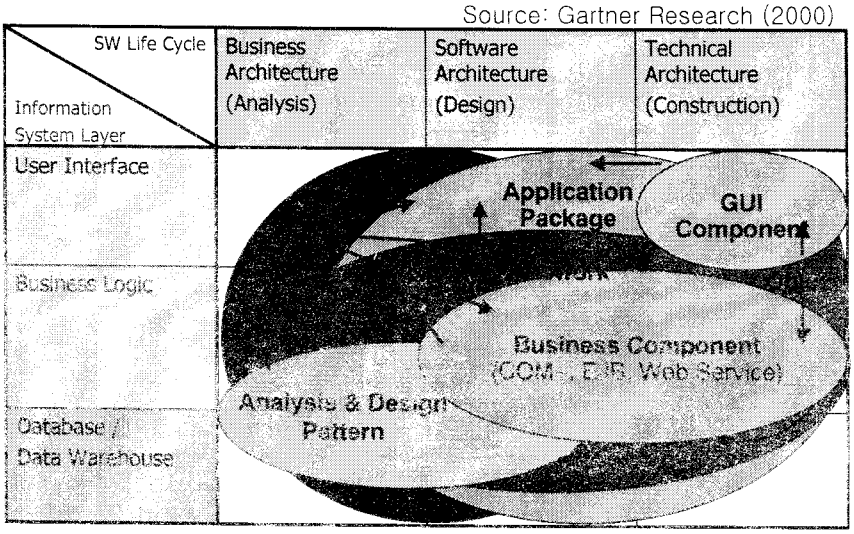


IO Matrix of SW Industry



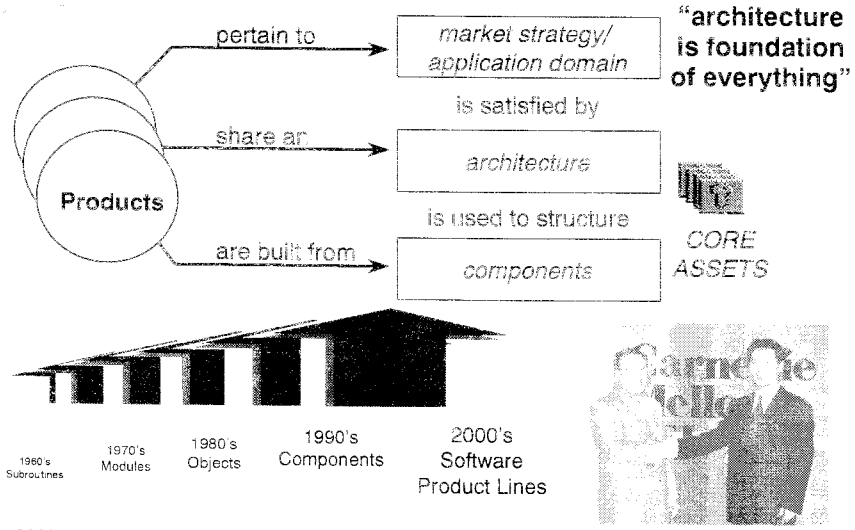
Reusable SW Assets

Source: Gartner Research (2000)



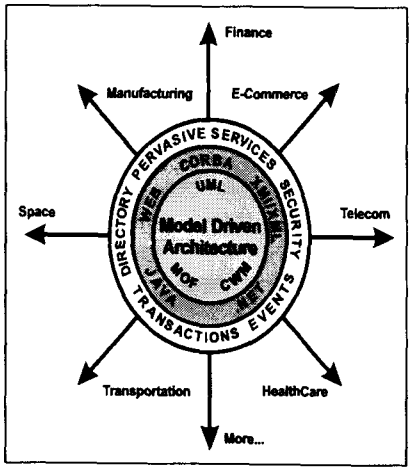
Source: Steve Cross, SEI Director

SEI's View

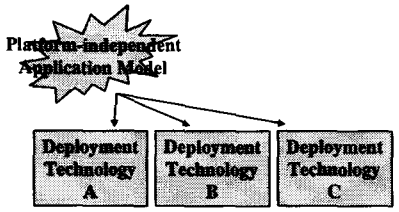


Source: Richard Soley, OMG President

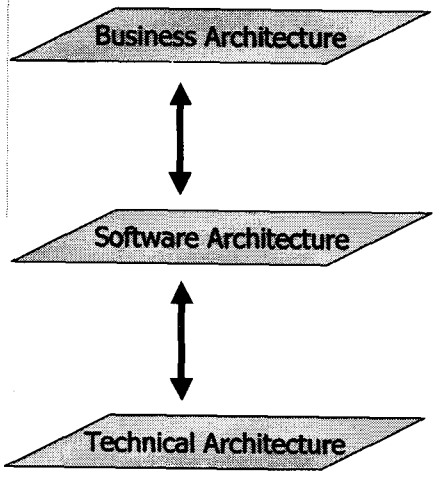
OMG Perspective



- *Web Services* has become the new IT wave this year.
- What comes after XML? Who knows...
- Only real hope for facing the challenge of next years "next best thing" is architecture
- Built on top of proven, industry-wide UML standard technologies
- Deployed today in real applications, it works



Architecture for e-Enterprise

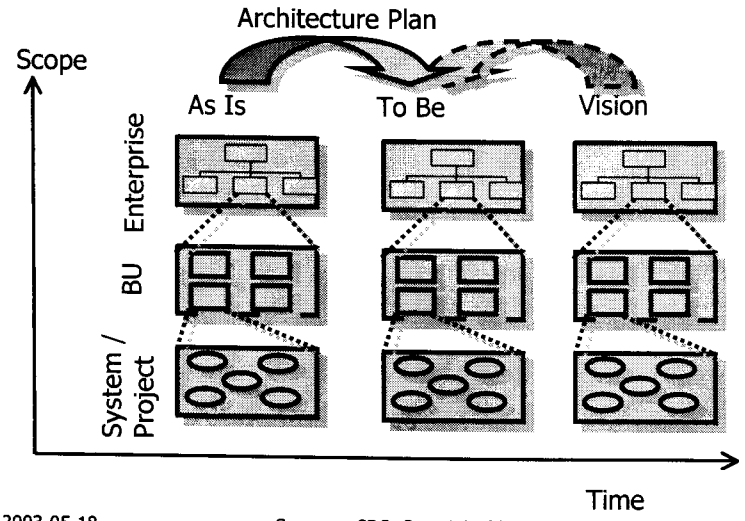


- Invention of killer apps using the next generation technologies (e.g. Web services)
- Creation of new Web-based businesses
- E-transformation of existing interenterprise business processes (e.g. CRM, PRM, SCM, e-procurement)
- Shared services

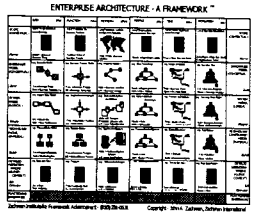
- MVC architectural pattern
- Flexible Web-based work flows
- Encapsulated process logic
- Integrated data model
- Rule-based process automation
- Component and XML based interoperability and portability
- Reuse of patterns and components

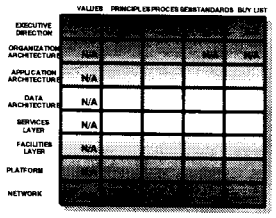
- *Platform and Middleware*
- Enterprise Application Integration
- Distributed components
- Wireless communications
- Web Services

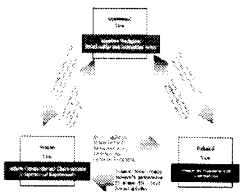
Architecture Classification

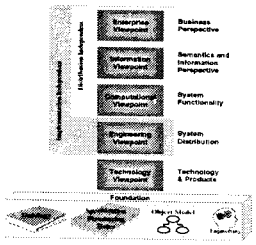


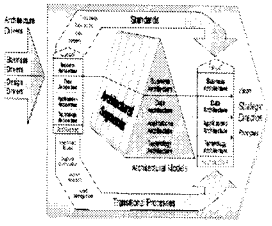
Enterprise Architecture Frameworks



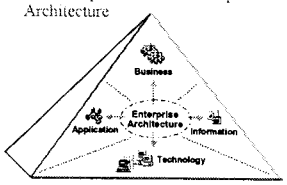




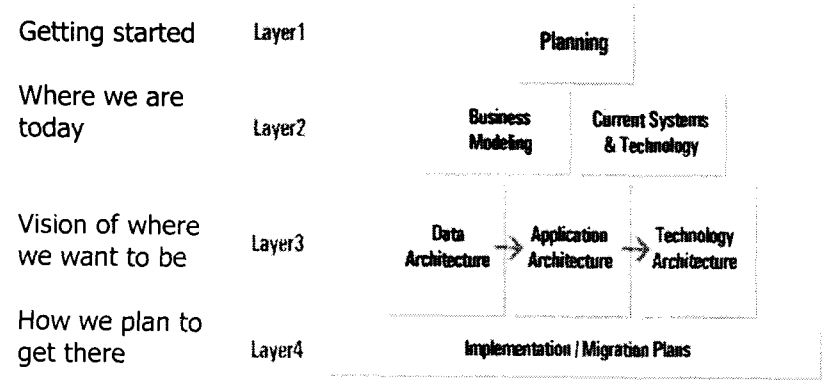




Four Perspectives of an Enterprise Architecture



Enterprise Architecture Planning



Source: S. Spewak and S. Hill (1992)

Architecture and Component

Source: June S. Park, A New Revolutionary Paradigm of Software Dev't for Mainstream Business Operations, *Int'l J. of Tech. Mgmt* (2000)

SW Life Cycle / Information System Layer	**Business Architecture** (Analysis)	**Software Architecture** (Design)	**Technical Architecture** (Construction)
User Interface	**Actor** **Biz Event**	**User Event** **UI Layout** **Navigation**	**Event Script** **GUI Component** **(ActiveX, Java)** **Client device**
Business Logic	**Biz Process** **Biz Rule** **Query/Update** **Shared Service**	**Operation** **Class*** **Collaboration** **Reusable Subsystem***	**Biz Component*** **(COM+, EJB, Web Service)** **Server Platform** **(WAS, MW, OS)** **Computer Network**
Database	**Biz Terminology** **Concept Frame**	**Entity** **Relationship** **Attribute**	**View, Table, Index** **DBMS, DW**

* Has an interface that is a collection of public operations

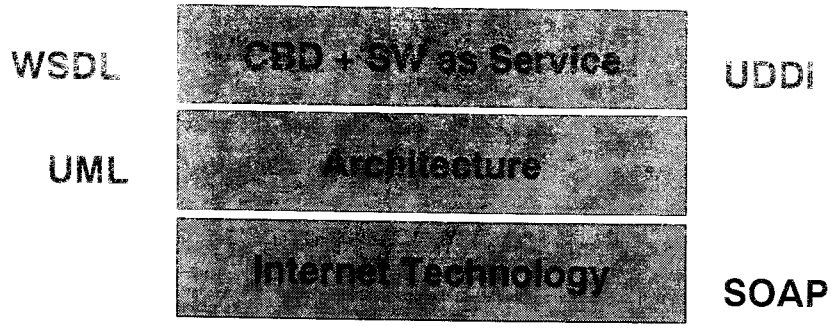
UML-Based Architecture Description

Source: Jacobson et al. USDP (1999)

SW Life Cycle / Information System Layer	Business Architecture (Analysis)	Software Architecture (Design)	Technical Architecture (Construction)
User Interface	• Use Case Diagram • Activity / State Diagram • Analysis Package (Service Package)	• Spec-level Class Diagram • Sequence / Collab. Diagram • Design Subsys. (Service Subsys.) • Component / Deployment Diagram	Event Script GUI Component Client Device
Business Logic			Biz Component Server Platform (WAS, MW, OS) Computer Network
Database		Entity Relationship Attribute	View, Table, Index DBMS, DW

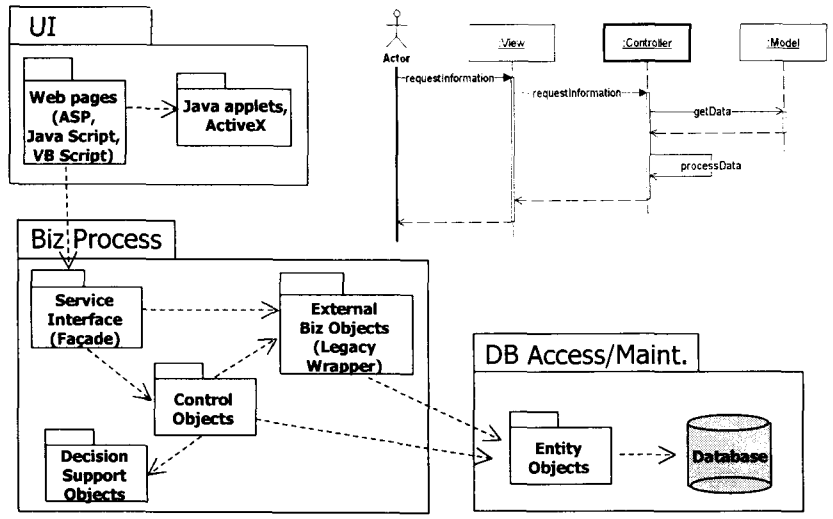
Web Service

Biz component delivered as XML-wrapped service

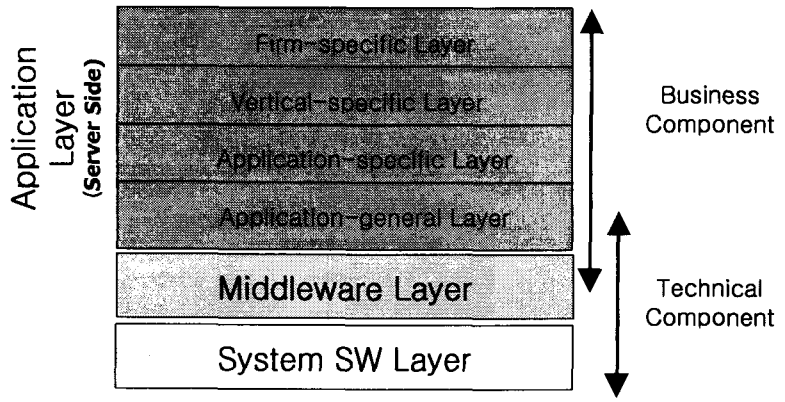


- WSDL: Language to describe Web service interfaces
- UDDI: Public (or private) repository to publish and locate Web services
- SOAP: Protocol to call a Web service

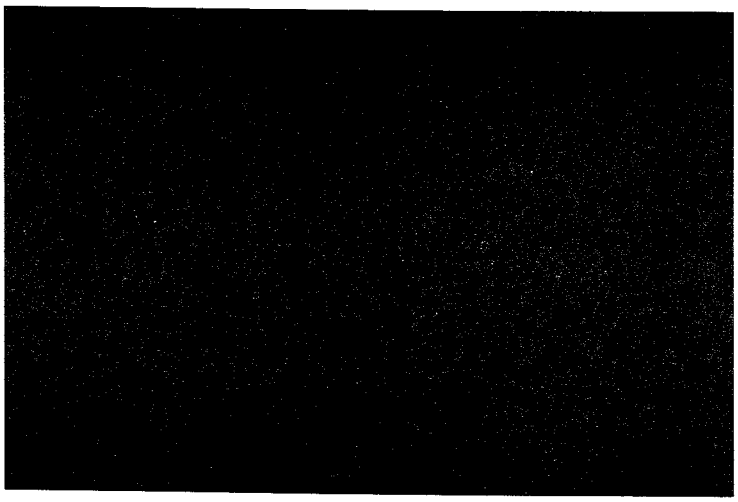
MVC Software Architecture Pattern



Reuse Scope of Business Components



U.S. e-Gov't App Architecture

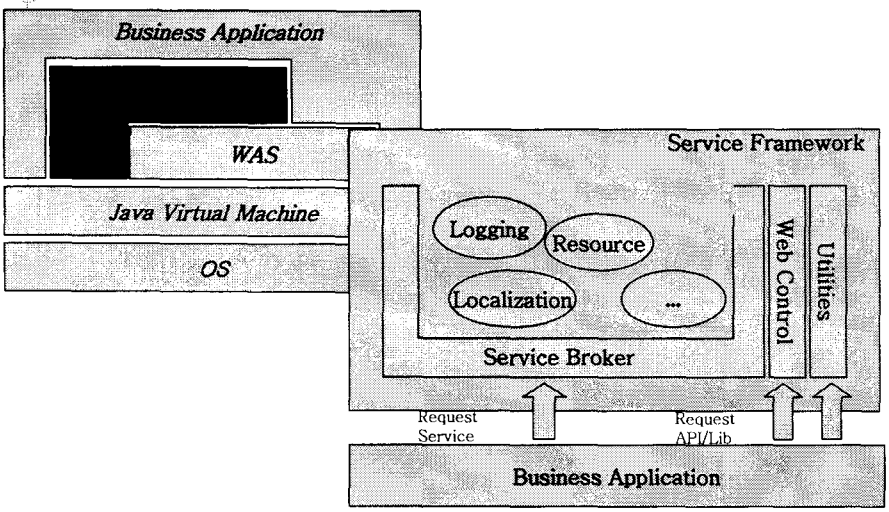


Appli-
cation

U.S. e-Gov't Components

User interface components	**Web, wireless, telephony, digital TV**
Portal components	**customer relationship mgmt, intelligent agent**
App-specific components	**license, permit, tax, ERP, e-procurement, benefits, health, employment, education, public safety, justice, environment, ...**
Shared service components	**Directory service, PKI, Web form, payment, EDI, GIS, ...**
Infrastructure components	**message brokering, session mgmt, authentication, logging, ...**

SDS Shared Service Framework



SDS Shared Service Components

Services

- Logging Service
- Naming Service
- JNDI Service
- Resource Service
- Localization Service
- Factory Service
- Pool Service
- Unique ID Service
- Upload Service
- ID Generator Service
- Message Service
- Cache Service
- FTP Client Service
- DB ConnectionPool Service
- XMLParser Service

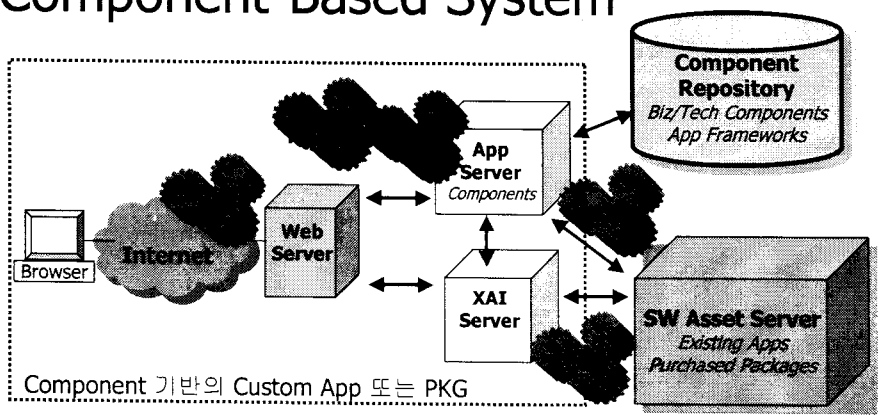
Utilities

- String Utility
- Date Format Utility
- Number Format Utility
- Type Converter Utility
- File Handler Utility

Presentation

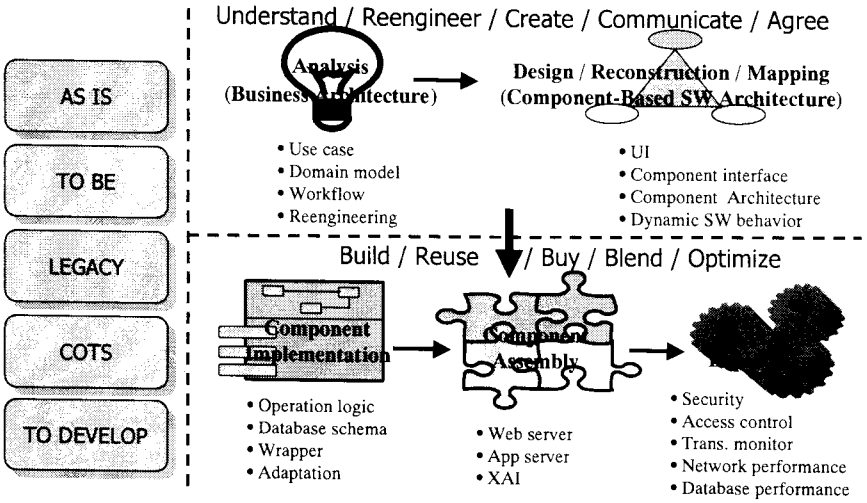
- Tag library(from Struts)
- Web Framework (from PDSS)
- Menu Applet,
- Javascript

Component-Based System



*"By the end of 2001, most Global 2000 companies will use a '**software factory**' model to implement new application systems, requiring developers to move from 'craftsman' approach to a **culture of assembly and reuse**. These applications will be **component-based**, message-based, and event-driven, using a multi-tier design ..."*(META Group, 2000)

CBD Process

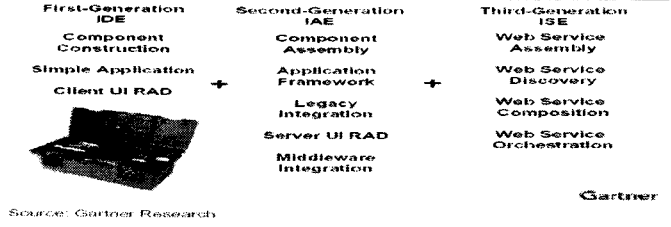


SDS Innovator/CBD

- Biz Req't Analysis
  - Context and high-level function analysis using package diagrams
  - Domain dictionary: term catalog of key business concepts
  - Activity diagram for business process modeling
  - Conceptual-level class diagrams for semantic modeling
  - Event analysis
- SW Req't Analysis
  - Use case analysis for process decomposition and shared service discovery
  - Life cycle model of key objects using state diagram
  - Specification-level class diagrams
  - Matrix analysis
  - UI prototyping
  - Sequence diagrams for each atomic use case specifying work flows and business automations
  - Technical architecture
- SW Design
  - Component modeling and type models
  - Server-side reuse plan
  - UI design
  - Specification of operations
  - Software architecture using collaboration and component diagrams
  - Deployment diagram

App Dev't Tool

	Client/Server	eBusiness	Web Service
Dev't Method	**RAD**	**CBD**	**SODA**
Dev't Tool	**IDE**	**IAE**	**ISE**

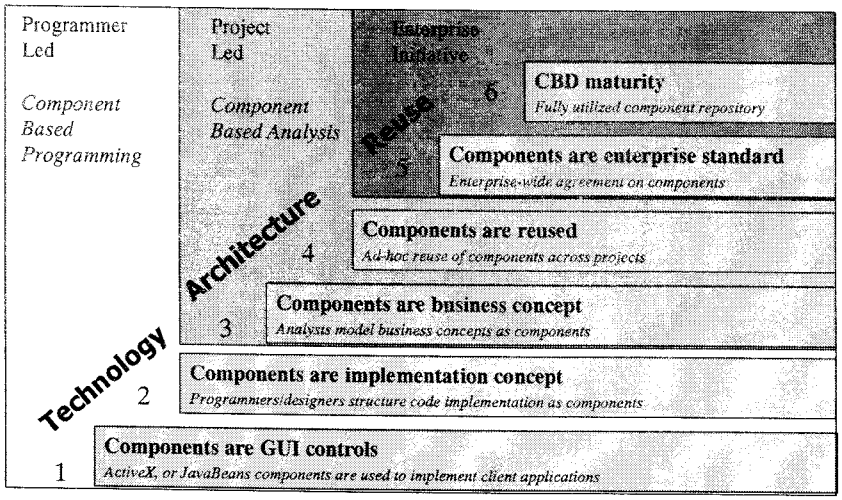


Source: Gartner Research

80% of IAE will have evolved into ISEs focused on Web service development by 2003 [Gartner]

CBD Maturity Model

Source: Butler Group (1999)



해외 선진사 현황

Gartner 조사보고*

Gartner Research가 02년 8월 600여 SI 업체에 설문 조사한 결과에 따르면 **수익성 극대화**를 위해 아래의 전략을 채택하였음

- **최적의 개발방법론과 재사용 기법의 적용**
- 최신 기술 습득
- 고객에게 새로운 수입을 제공해 줄 수 있는 기술을 적용할 수 있는 능력의 활용
- 정해진 시간과 예산으로 프로젝트 수행
- 수직적이거나, 특화 된 기술 보유
- ROI가 실증된 비즈니스 Case에 가치를 부가하여 보여줄 수 있는 기술역량 제공

* Gartner Research, "IT Services: Gross Margin Benchmarking and Profitability Report," 2002.8

해외 선진사 현황*

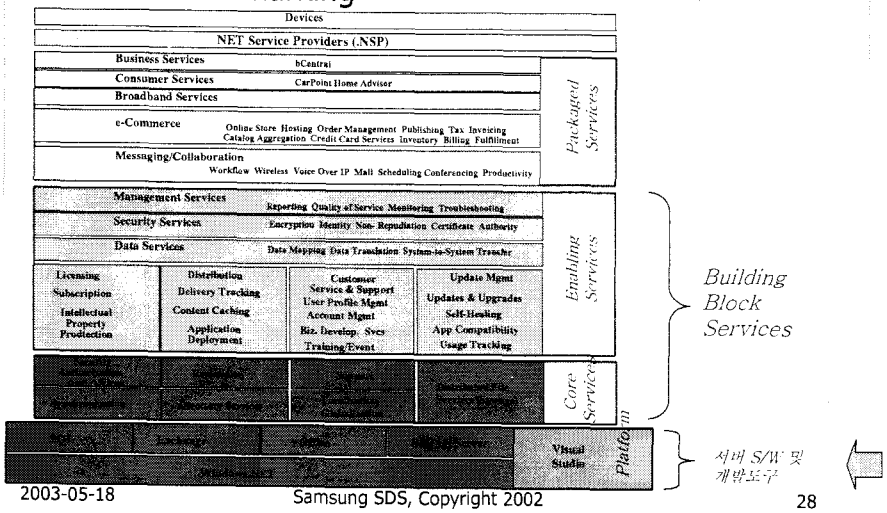
- Accenture와 Deloitte & Touche는 SI, SM, PKG 전 부문에 대해 Rational Unified Process(RUP)로 전사 SW개발 프로세스 통일
- Bank of America, Charles Schwab 등 금융사 들도 CBD 및 Reuse 체제 구축을 최우선 과제로 추진
- EDS는 해외개발센터를 포함하여 전사적 표준 SW개발 프로세스 및 개발 툴을 CBD로 통일
- Unisys는 RUP로 개발프로세스를 통일하고 업종별 SI 생존전략을 Business Architecture와 Application Framework 확보에 둠
- IBM도 Websphere 개발환경에 CBD 툴인 Rational XDE를 Bundling하고, SI 개발프로세스로 RUP 확산 중이며, 10년간 개발 생산성을 측정하여 년 15% 증가율을 실현
- Cisco는 1천7백만 Line에 달하는 IOS시스템을 Component 구조로 재구축하고 있으며, 2002-3년도 중 50% 생산성 향상을 추진 중임

* Rational Executive Summit(2002. 8)에 참석한 각 사 CTO의 보고내용

해외 선진사 현황

Microsoft Benchmarking

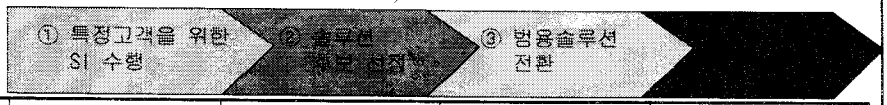
"MS e-Service Delivery Infrastructure", 2001.6



해외 선진사 현황

IBM Benchmarking "IBM Global Services 솔루션 프로세스", 2001.7

SI PJT의 결과 중 솔루션 후보선정하여 상품화
(예: 뱅킹업계 선도고객을 위해 개발한 e-Banking시스템을 반복사용 가능한 범용 솔루션으로 개조)

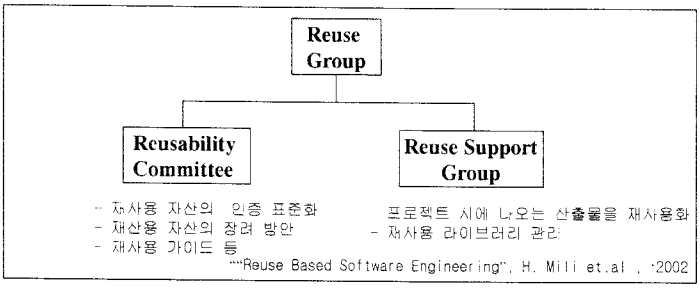


	프론트-엔드	솔루션 선정 및 운영 위원회	백-엔드	프론트-엔드
개발단계	스칸디나비아에 위치한 뱅킹업계 선도고객 대상 전자상거래 시스템 개발	성공적인 1회성 제품을 솔루션후보로 선정 후, 우선순위를 정하여 팀을 조직하고 자원을 배분	은행별 요구에 쉽게 customizing할 수 있도록 범용 e-뱅킹 솔루션 개발	유럽 뱅킹업계의 사업혁신 수요에 부응 수주 확대
주도조직	Global Industries └ 금융 서비스 업종 └ 고객 담당 팀	Cross-unit geographic leadership team for Europe, middle East, Africa	Global services └ Cross-unit team (H/W, S/W, Services, 금융서비스 unit 포함)	Global Industries └ 금융 서비스 업종 └ 고객 담당 팀

해외 선진사 현황

NTT 사례

- SW 재사용을 관리의 관점에서 접근 함
  (4년간 총 100명의 엔지니어와 500명의 스텝이 참여함)
- 성과 (4년 후)
  - 재사용 라이브러리의 활용 빈도수는 연평균 0.28에 이름
  - 800 여 개의 자산 축적 (각 모듈은 평균 300 ~ 2000 라인)
  - 강제적이고 측정적인 자산 확보보다는 적절한 보상체계와 체계적이고 계획적인 도메인 엔지니어링을 통해서 확보 필요



해외 선진사 현황

회사	Reuse Focus	재사용율	인력절감	일정단축	품질향상	ROI
IBM	Family of product	High	High	High	High	NA
HP	Family of product	50-70%	Average	Average	High	2-4 배
Texas Instrument	Family of product	High(67%)	High(61%)	Avg.(33%)	High(33%)	NA
Raytheon	Vertical / Horizontal	Average	Average	Average	Average	Averag e
3M	Family of product	50-90%	50-90%	50-90%	50-90%	Low
Unisys	Vertical / Horizontal	Low	Average	Average	Average	NA

단위 기준 : Low = 25%, Average = 26-60%, High = 61-90%, ROI 수준 : Low = 2-5배, Average = 6-10배, High = 11배 이상
(출처 : Software reuse reference model by Dr. David C.Rine and Dr. Vader Nada at George Mason University. 1998)

해외 선진사 현황

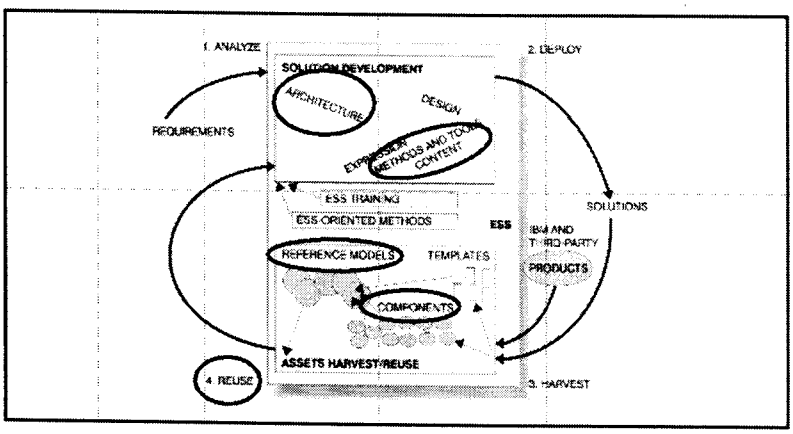
기타 선진업체 재사용 성과 (출처 : MN3309 Session 16, 2001)

- **Software Engineering Laboratory(SEL)**
  - 재사용된 모듈의 98%가 결함이 없었음
  - 코드 재사용으로 20%의 비용감소 효과를 거둠
- **Hewlett-Packard**
  - 51%의 결함 감소
  - 57%의 생산성 향상
  - 42%의 빠른 time to market
- **FAA Advanced Automation System**
  - 재사용 컴포넌트 개발은 일반SW 개발에 비하여 200% 정도의 비용을 소요
  - 재사용 컴포넌트를 이용한 Integration은 보통의 경우에 비해 10~20%의 비용만 소요

※ MN3309 Session 16 : 소프트웨어 획득과 관련된 원칙과 기법에 대한 미 해군의 SW 개발 교육 과정(2001년 자료)
※ SEL : NASA가 출원하였으며, Software Engineering Technology 의 효과에 대해 연구하는 기관
※ FAA(Federal Aviation Administration) : 연방 항공 통제국

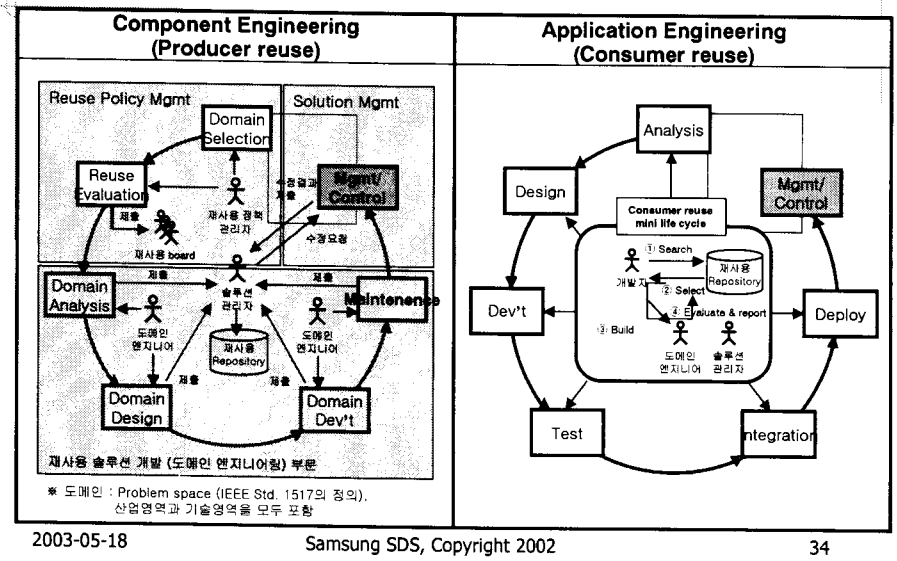
해외 선진사 현황

IBM ESS



IBM Systems Journal, "ESS(Enterprise Solution Structure)", 1998.9

IEEE 1472 Reuse Process



※ 도메인 : Problem space (IEEE Std. 1517의 정의), 산업영역과 기술영역을 모두 포함

Summary

- Enterprise architecture is essential for ROI of e-Enterprise.
- An architecture is described from business, application, data and technical views and these must be complete and consistent.
- UML-based CBD is currently the best approach to obtaining architecture-centric, flexible and interoperable systems.
- Reuse of architecture, components, shared services and app frameworks is key to achieving both quality and productivity.
- Web service, the NBT, cannot be tapped without the architecting capability.
- Architects with world-class domain as well as software engineering knowledge are key to success of Korean software industry.