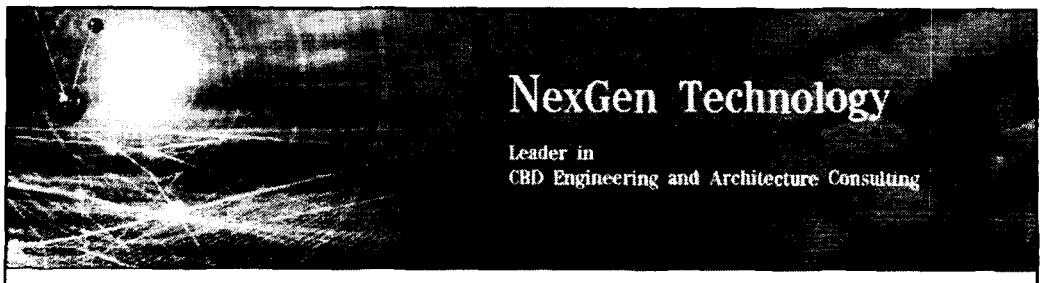


# MDA기반 개발 전략

- Model Driven Architecture를 이용한 실용적 아키텍처 적용 -

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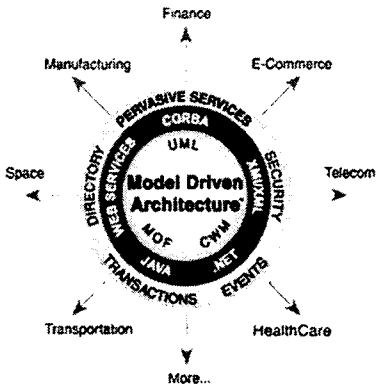
- MDA 개요
- MDA 기반 개발 기술 적용
- MDA 도구를 활용한 구현 사례

## • The Architecture of choice for a changing world®




- OMG에서 정의한 S/W 개발의 새로운 Paradigm
- Open, vendor_neutral approach to the challenge of business and technology change
- MDA와 Standards를 이용하여 플랫폼 독립적인 모델(PIM: Platform Specific Model)을 기술하고 모델 변환을 통한 플랫폼 종속적인 모델(PSM) 변환하는 방법에 대한 것
- PIM과 PSM의 모델 변환을 통한 모델 중심 개발

Key standards : MDA suite of standards(Unified Modeling Language (UML); Meta-Object Facility (MOF); XML Meta-Data Interchange (XMI); Common Warehouse Meta-model (CWM))

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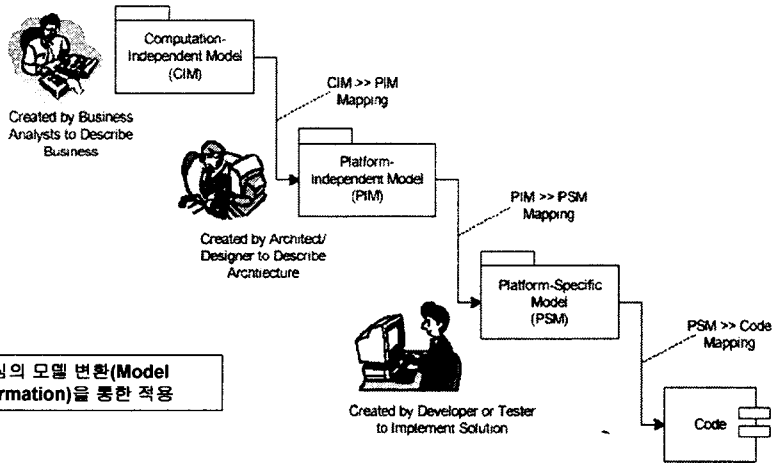
## MDA Viewpoints and Level of MDA models




모델 중심의 모델 변환(Model Transformation)을 통한 적용

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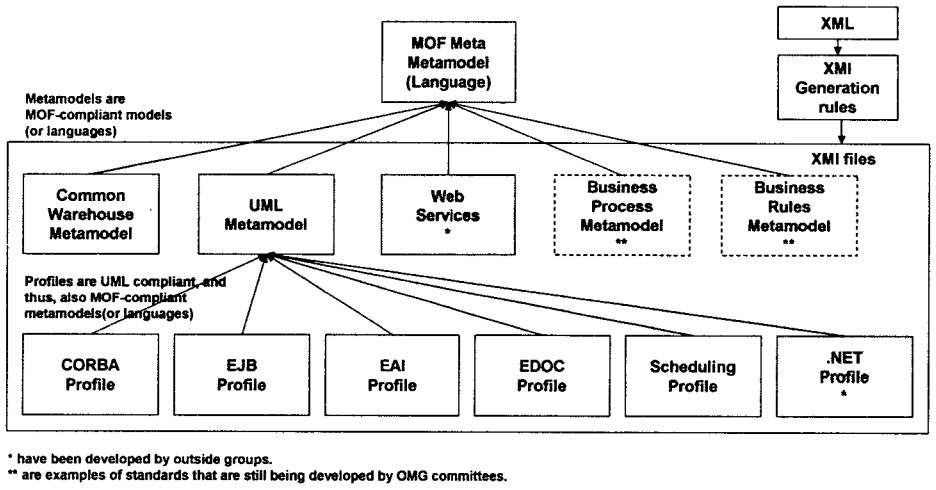
# Relationships to Other Modeling Technologies




* have been developed by outside groups.
** are examples of standards that are still being developed by OMG committees.

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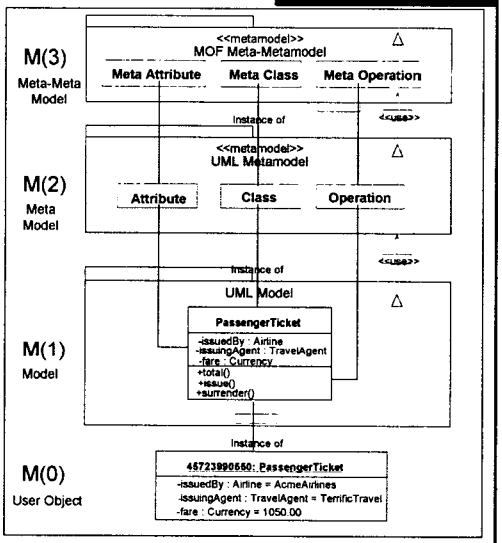
# 4 Layer Metamodeling Architecture

- **Meta-Metamodel :**
  - 메타모델링 아키텍처의 기반구조(Infrastructure)
  - Defines the language for specifying metamodels
- **Metamodel :**
  - Meta-Metamodel의 인스턴스
  - Defines the language for specifying a model
- **Model :**
  - Metamodel의 인스턴스
  - Defines a language to describe an information domain.
- **User Object(User data) :**
  - Model에 대한 인스턴스
  - Defines a specific information domain

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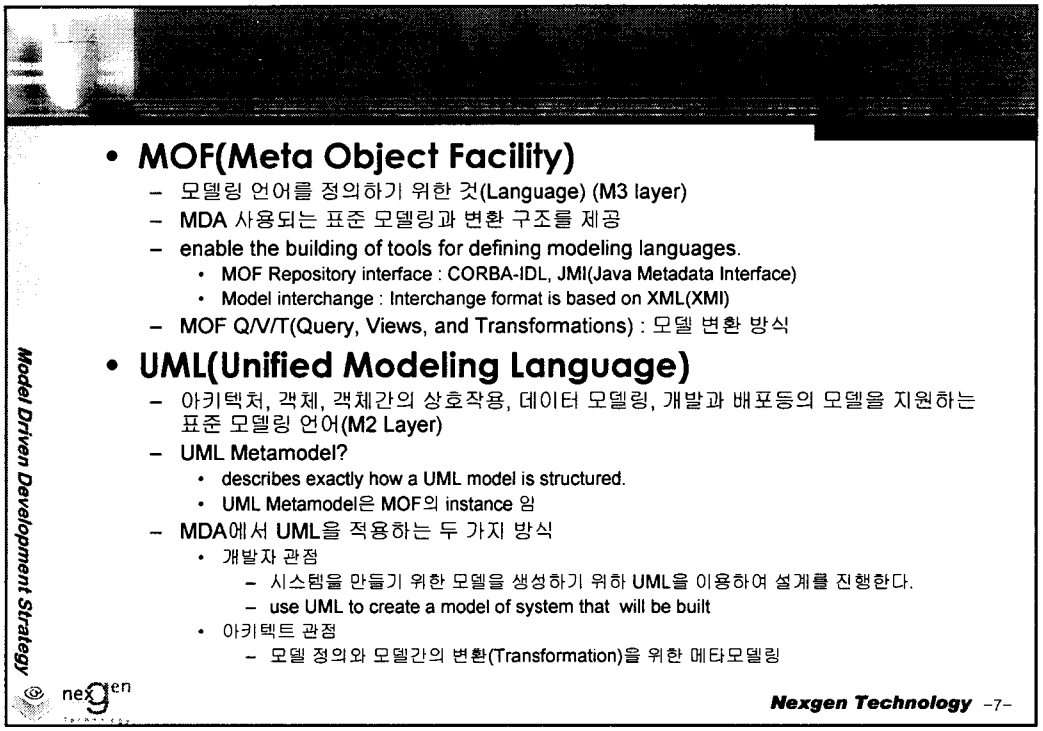
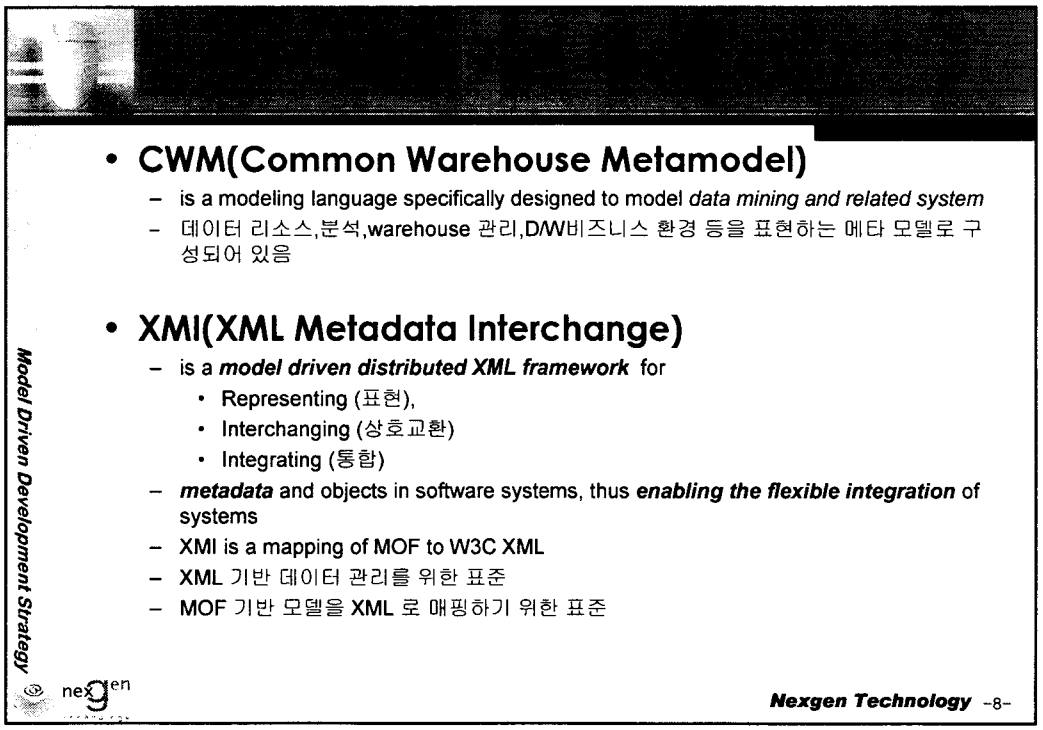


- **MOF(Meta Object Facility)**
  - 모델링 언어를 정의하기 위한 것(Language) (M3 layer)
  - MDA 사용되는 표준 모델링과 변환 구조를 제공
  - enable the building of tools for defining modeling languages.
    - MOF Repository interface : CORBA-IDL, JMI(Java Metadata Interface)
    - Model interchange : Interchange format is based on XML(XMI)
  - MOF Q/V/T(Query, Views, and Transformations) : 모델 변환 방식
- **UML(Unified Modeling Language)**
  - 아키텍처, 객체, 객체간의 상호작용, 데이터 모델링, 개발과 배포등의 모델을 지원하는 표준 모델링 언어(M2 Layer)
  - UML Metamodel?
    - describes exactly how a UML model is structured.
    - UML Metamodel은 MOF의 instance 임
  - MDA에서 UML을 적용하는 두 가지 방식
    - 개발자 관점
      - 시스템을 만들기 위한 모델을 생성하기 위하 UML을 이용하여 설계를 진행한다.
      - use UML to create a model of system that will be built
    - 아키텍트 관점
      - 모델 정의와 모델간의 변환(Transformation)을 위한 메타모델링





- **CWM(Common Warehouse Metamodel)**
  - is a modeling language specifically designed to model *data mining and related system*
  - 데이터 리소스,분석,warehouse 관리,D/W비즈니스 환경 등을 표현하는 메타 모델로 구성되어 있음
- **XMI(XML Metadata Interchange)**
  - is a ***model driven distributed XML framework*** for
    - Representing (표현),
    - Interchanging (상호교환)
    - Integrating (통합)
  - ***metadata*** and objects in software systems, thus ***enabling the flexible integration*** of systems
  - XMI is a mapping of MOF to W3C XML
  - XML 기반 데이터 관리를 위한 표준
  - MOF 기반 모델을 XML 로 매핑하기 위한 표준

## • UML Profiles

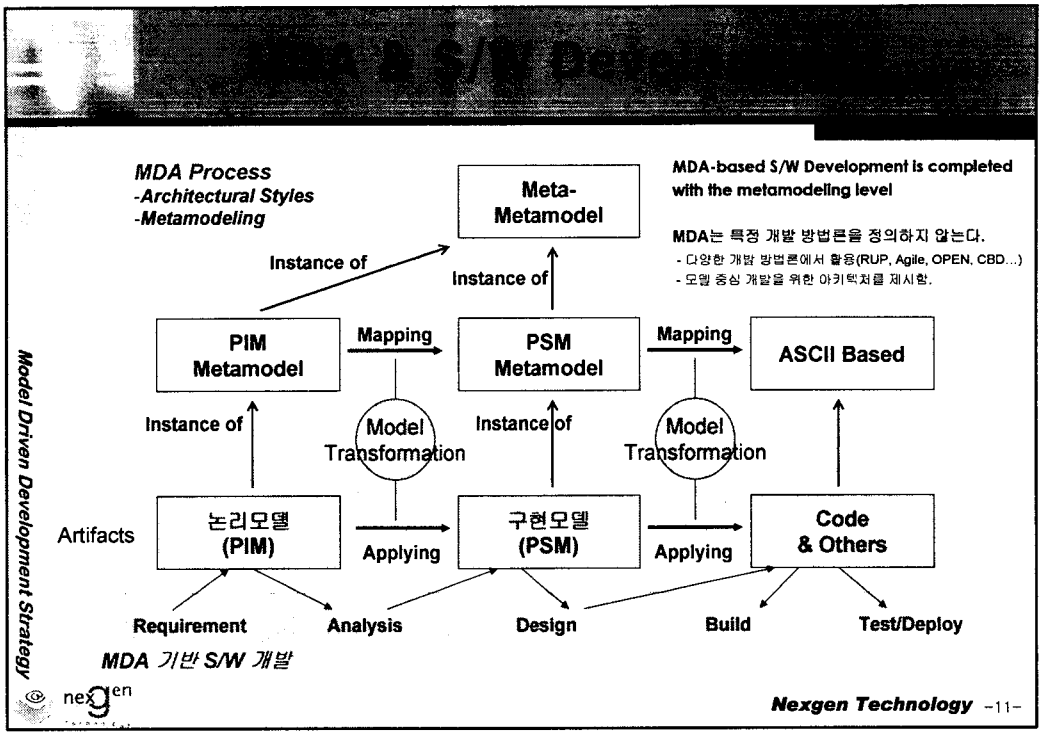
- UML의 일부로서 모델의 확장 메커니즘
- UML을 이용한 특정 방식을 정의할 수 있다.
  - UML Profile for CORBA
  - UML Profile for EDOC
  - UML Profile for EJB
  - UML Profile for WebServices
- stereotype, related constraints, tagged values 정의를 통한 접급
- MDA에서 Profile의 역할
  - defines a specialized Metamodel, which is by definition a subset of the UML Metamodel.
  - Currently, used define languages specific for certain platforms, like CORBA, java, EJB and etc)



## • MDA 개요

## • MDA 기반 개발 기술 적용

## • MDA 도구를 활용한 구현 사례


MDA Process
-Architectural Styles
-Metamodeling
Meta-Metamodel
MDA-based S/W Development is completed with the metamodeling level
MDA는 특정 개발 방법론을 정의하지 않는다.
- 다양한 개발 방법론에서 활용(RUP, Agile, OPEN, CBD...)
- 모델 중심 개발을 위한 아키텍처를 제시함.
Instance of
Instance of
PIM Metamodel
Mapping
PSM Metamodel
Mapping
ASCII Based
Instance of
Model Transformation
Instance of
Model Transformation
Artifacts
논리모델 (PIM)
Applying
구현모델 (PSM)
Applying
Code & Others
Requirement
Analysis
Design
Build
Test/Deploy
MDA 기반 S/W 개발
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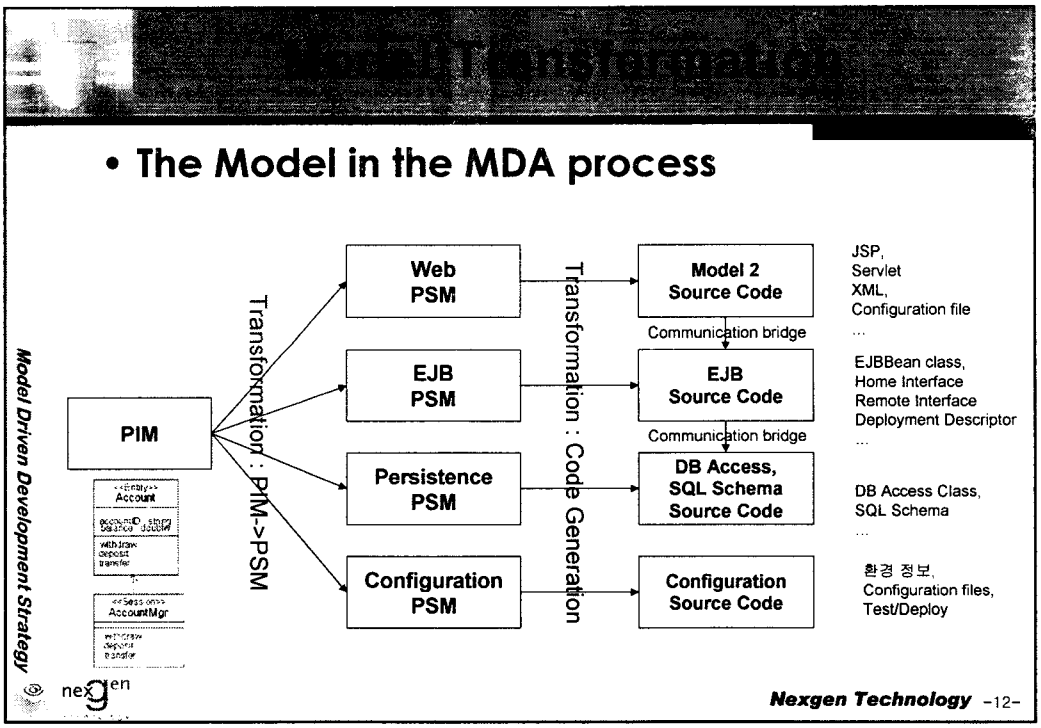
• The Model in the MDA process
PIM
Transformation : PIM->PSM
Web PSM
EJB PSM
Persistence PSM
Configuration PSM
Transformation : Code Generation
Model 2 Source Code
Communication bridge
EJB Source Code
Communication bridge
DB Access, SQL Schema Source Code
Configuration Source Code
JSP, Servlet XML, Configuration file ...
EJBBean class, Home Interface Remote Interface Deployment Descriptor ...
DB Access Class, SQL Schema ...
환경 정보, Configuration files, Test/Deploy
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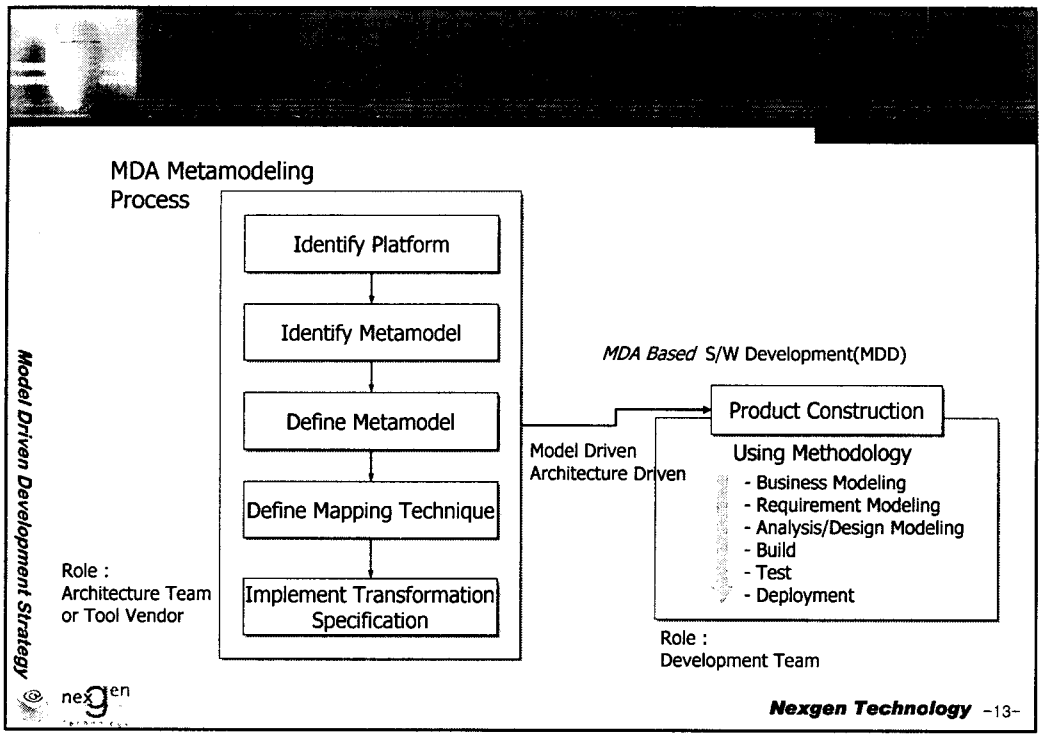
MDA Metamodeling Process
Identify Platform
Identify Metamodel
Define Metamodel
Define Mapping Technique
Implement Transformation Specification
Role : Architecture Team or Tool Vendor
MDA Based S/W Development(MDD)
Model Driven Architecture Driven
Product Construction
Using Methodology
- Business Modeling
- Requirement Modeling
- Analysis/Design Modeling
- Build
- Test
- Deployment
Role : Development Team
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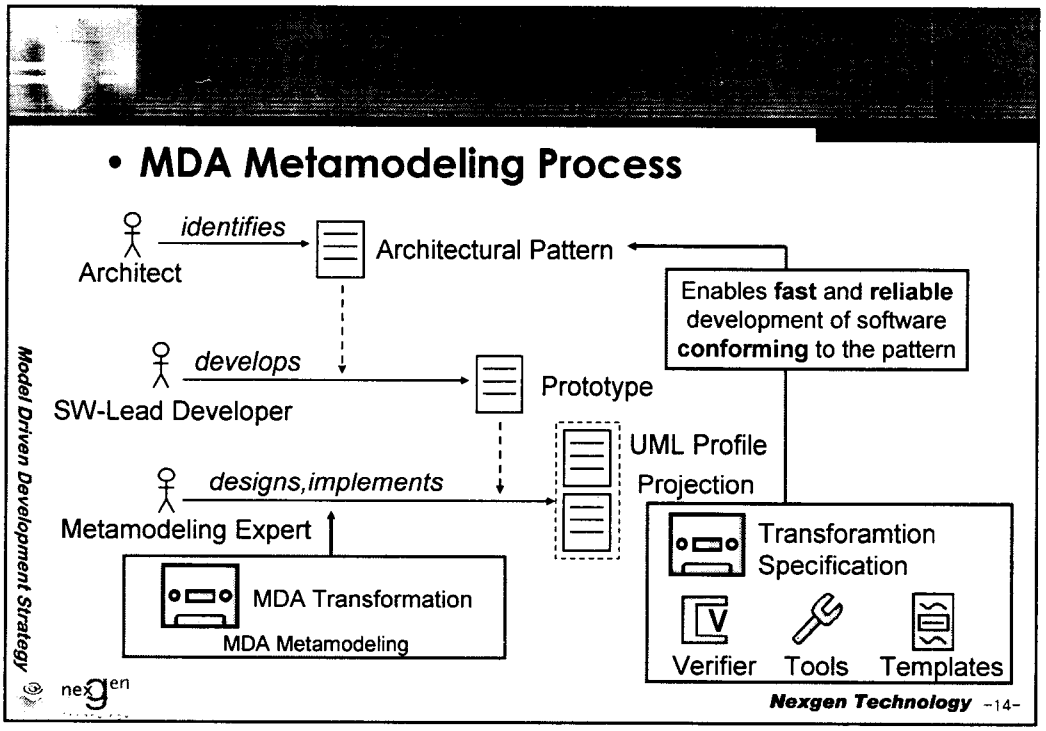
• MDA Metamodeling Process
identifies
Architect
Architectural Pattern
Enables fast and reliable development of software conforming to the pattern
develops
SW-Lead Developer
Prototype
UML Profile
Projection
designs,implements
Metamodeling Expert
MDA Transformation
MDA Metamodeling
Transforamtion Specification
Verifier
Tools
Templates
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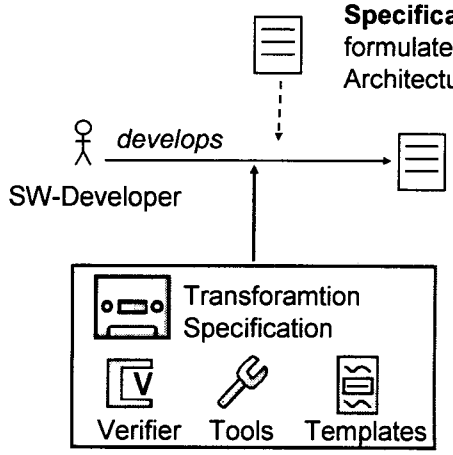
## • S/W Development with MDA(MDD)

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## • MDA 개요

## • MDA 기반 개발 기술 적용

## • MDA 도구를 활용한 구현 사례

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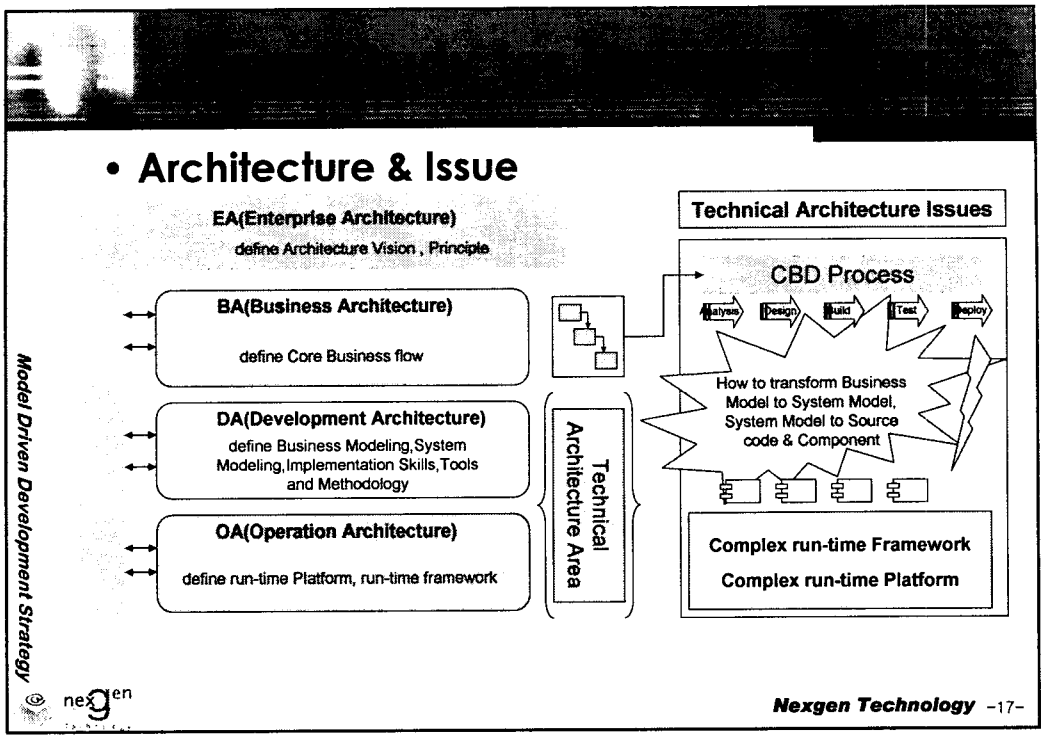
• Architecture & Issue
EA(Enterprise Architecture)
define Architecture Vision , Principle
BA(Business Architecture)
define Core Business flow
DA(Development Architecture)
define Business Modeling,System Modeling,Implementation Skills,Tools and Methodology
OA(Operation Architecture)
define run-time Platform, run-time framework
Technical Architecture Area
Technical Architecture Issues
CBD Process
Analyse
Design
Build
Test
Deploy
How to transform Business Model to System Model, System Model to Source code & Component
Complex run-time Framework
Complex run-time Platform
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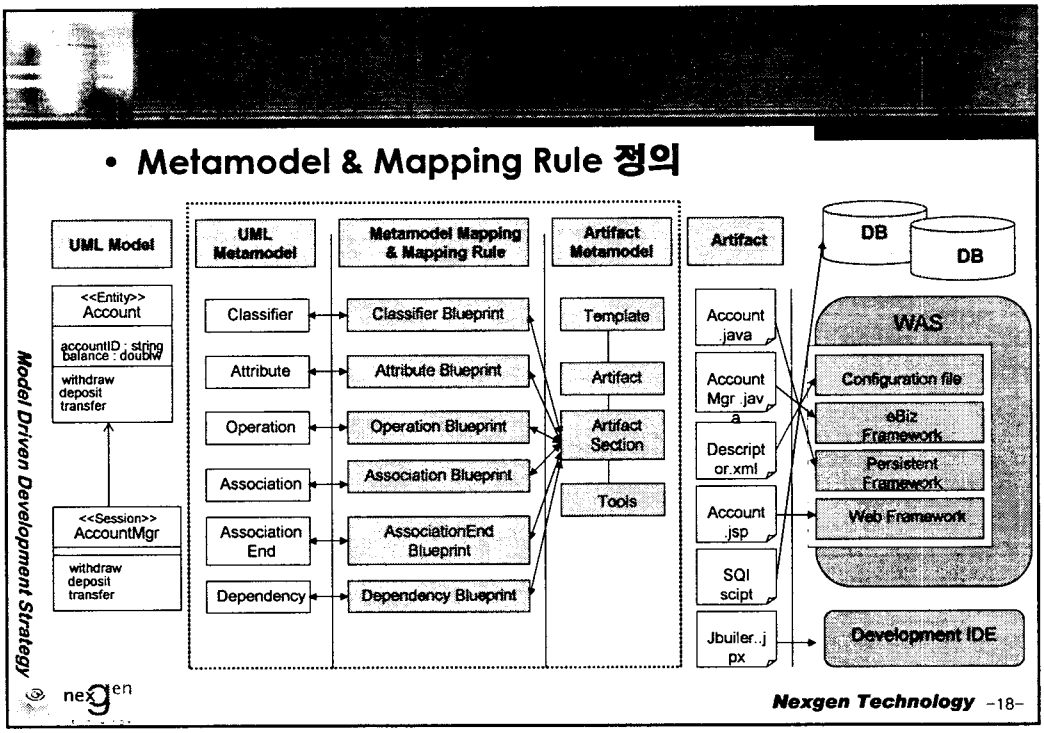
• Metamodel & Mapping Rule 정의
UML Model
<<Entity>>
Account
accountID : string
balance : double
withdraw
deposit
transfer
<<Session>>
AccountMgr
withdraw
deposit
transfer
UML Metamodel
Classifier
Attribute
Operation
Association
Association End
Dependency
Metamodel Mapping & Mapping Rule
Classifier Blueprint
Attribute Blueprint
Operation Blueprint
Association Blueprint
AssociationEnd Blueprint
Dependency Blueprint
Artifact Metamodel
Template
Artifact
Artifact Section
Tools
Artifact
Account .java
Account Mgr .java
Descript or.xml
Account .jsp
SQl scipt
Jbuiler..jpx
DB
DB
WAS
Configuration file
eBiz Framework
Persistent Framework
Web Framework
Development IDE
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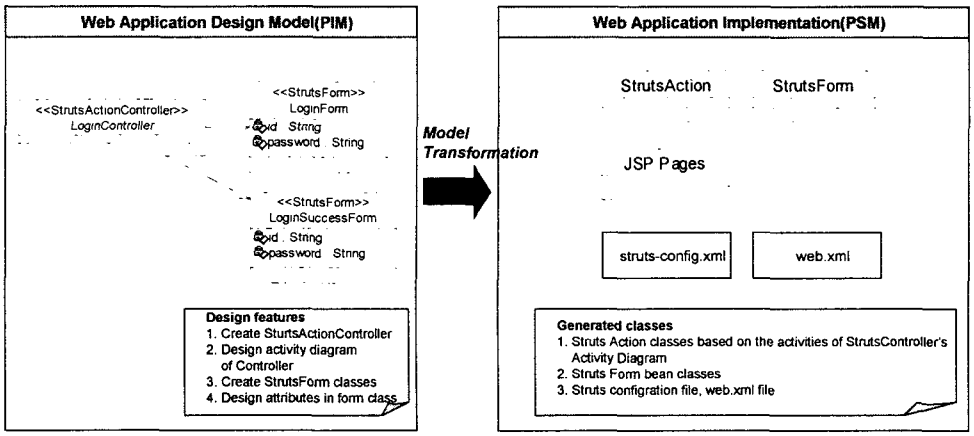
## Case Study for Metamodeling (Cont'd)

- 모델 사이의 관계 매핑 식별
- **(Struts Framework Metamodeling – Class Model)**

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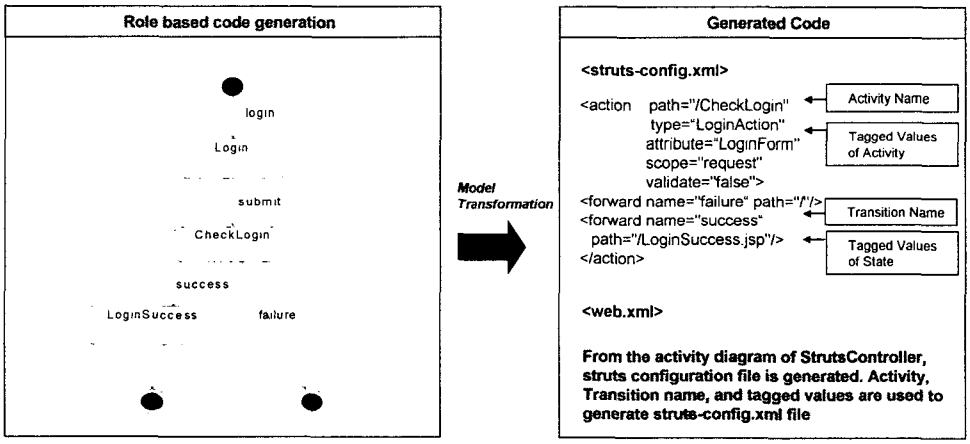
## Case Study for Metamodeling (Cont'd)

- 모델 사이의 관계 매핑 식별
- **(Struts Framework Metamodeling – Activity Model)**

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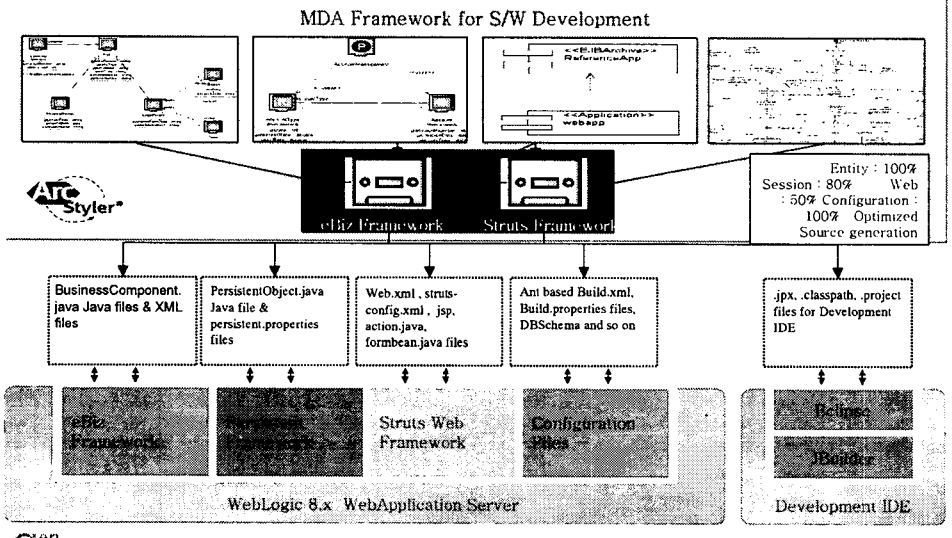
- **UML Profile 정의**
  - UML tagged Values for StrutsController and StrutsForm stereotype are as the following properties:

| Category | Properties | | GUI Type |
|---|---|---|---|
| | Key | Values | |
| Class | stereotype | StrutsController | Default |
| Activity Diagram - State | JSPPageName | N/A | Default |
| Activity Diagram -Activity | StrutsActionName | N/A | Default |
| | StrutsFormName | N/A | Default |
| Transition | name | N/A | Default |
| Class | stereotype | StrutsForm | Default |

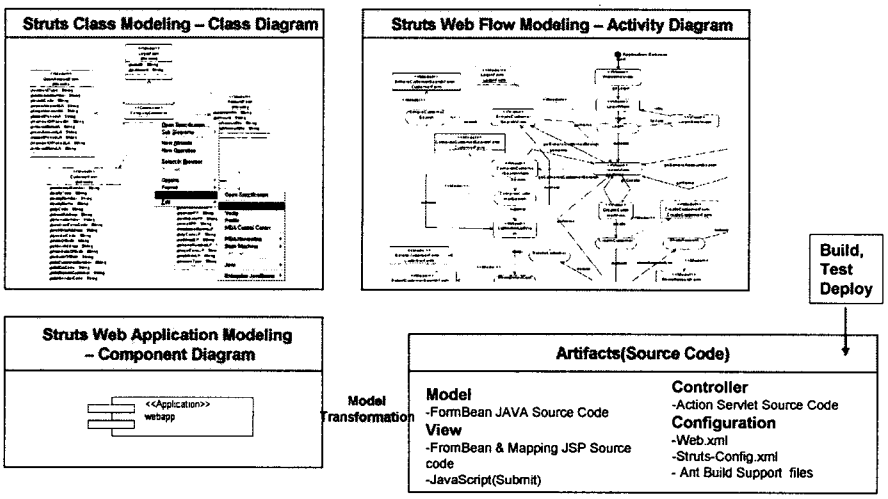








- S/W Development with MDA Framework

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- MDA기반 S/W 개발의 장점

- 새로운 어플리케이션에 대한 개발 시간 단축
- 어플리케이션 라이프사이클 전반에 걸칠 비용 감소
- 모델에 대한 재사용성 증대
- 어플리케이션의 품질 향상
- 유지보수의 용의성
- 기술투자에 대한 수익 증대**(ROI)**
- 기존 시스템에 새로운 기술의 빠른 적용

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- Annerke Kleppe, Jos Warmer, Wim Bast : MDA Explained - The Model Driven Architecture : Practice and Promise, Addison-Wesley, 2003
- David S.Frankel, Model Driven Architecture : Applying MDA to Enterprise Computing, WILEY, 2003
- Rechard Hubert, Convergent Architecture : Building Model-Driven J2EE Systems with UML, WILEY, 2002
- Object Management Group, ormsc/02-04-02 (latest ormsc guide)
- Object Management Group, ormsc/02-01-04 (Interactive Objects Position Paper)
- Object Management Group, MOF 2.0 Queries / Views / Transformations RFP
- Object Management Group, MDA Guide(Version 1.0.1), 2003
- MODA-TEL Consortium, Assessment of the Model Driven Technologies – Foundations and Key Technologies(Deliverable 2.1), 2002
- Other papers from http://www.omg.org/mda




# Thank you!

Question?