IBM Software Group

IBM Rational Systems Developer

***2007*年制造业研讨会**

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Rational. software

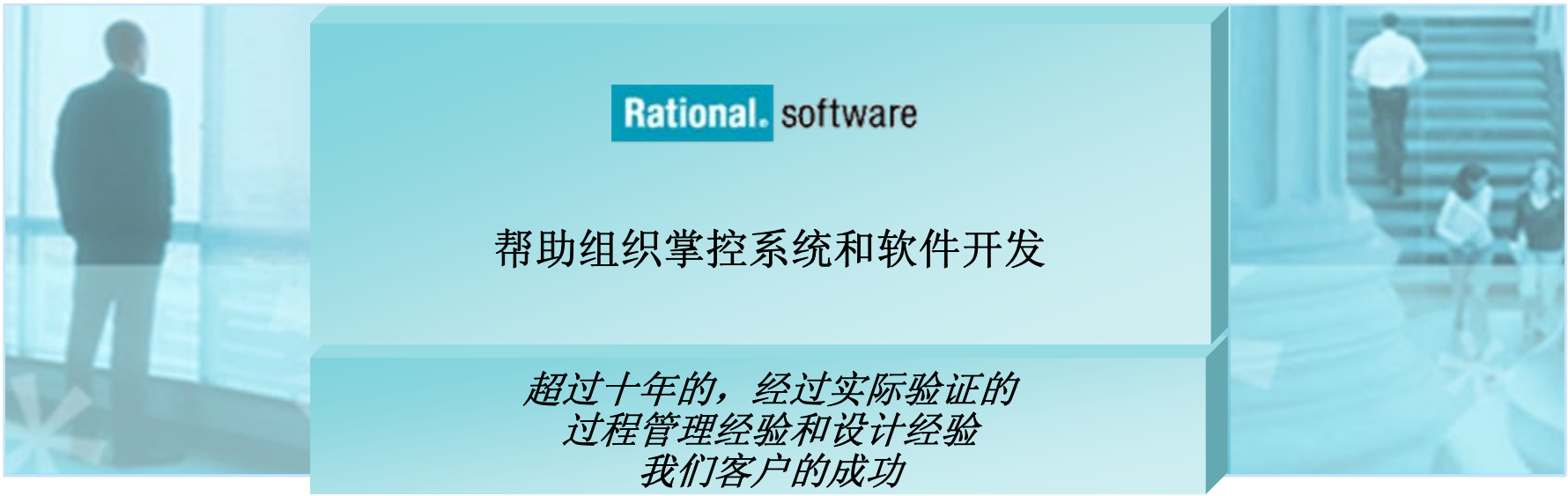
ON DEMAND BUSINESS

议程

- IBM Rational Software
- 系统开发所面临的挑战
- 模型驱动开发MDD
- Rational Systems Developer v7.0
- 总结

IBM Rational software

品牌价值

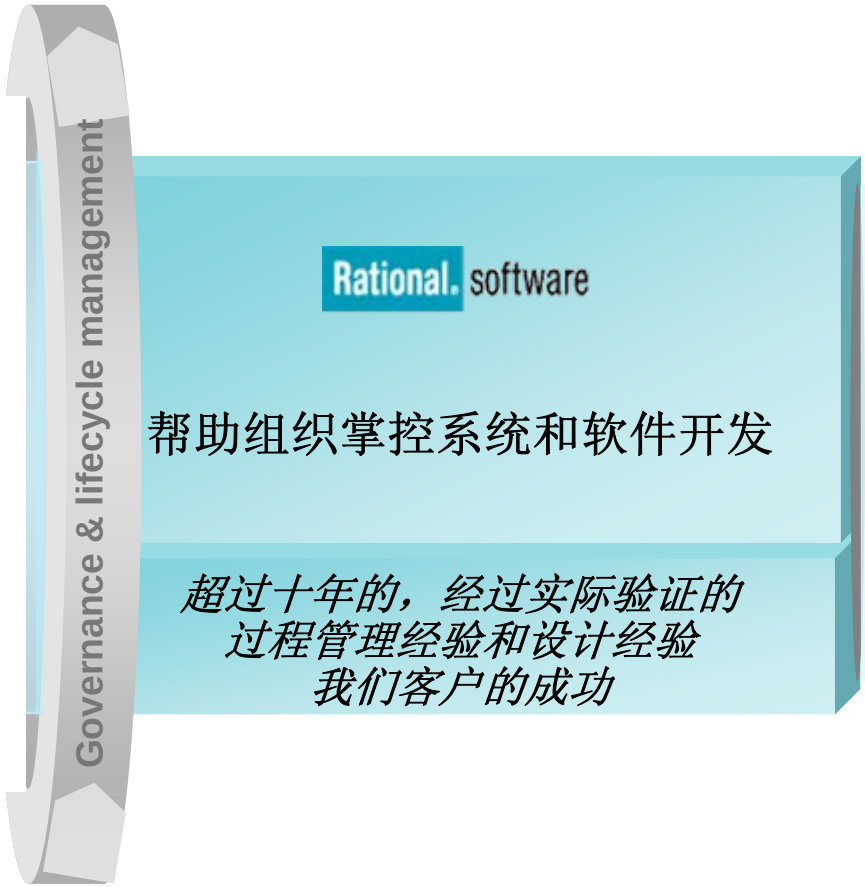


IBM Rational software

组织创新和改革的战略合作伙伴

业务的需要

- 跨地域的协作
- 机构的灵活性
  - 快速完成
- 风险管理和业务规则的管理



组织创新和改革

- 流畅沟通
- 进程可控
- 高效构建

IBM Rational 系统交付平台

我们所能做的

Rational. software

辅助设计、流程改进和实施经验

基于市场领先的系统交付平台

- 提高开发生产率
- 分布式的多团队合作开发和交付
- SOA 掌控全服务生命周期的管理
- 风险管理和业务规则的管理

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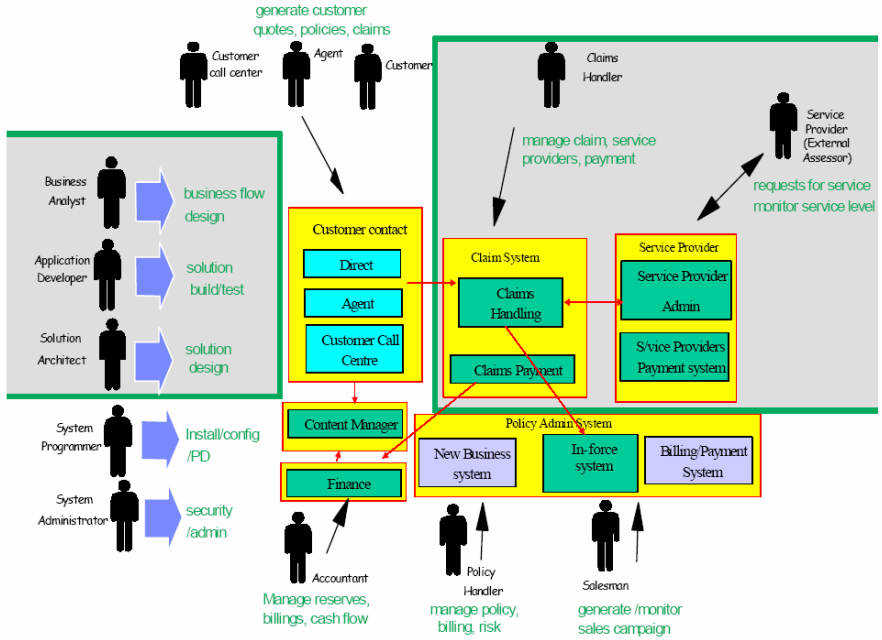
软件开发面临的挑战

- 运行环境的复杂性日益增加
  - C/C++, Java, .Net
  - Web, 手持系统, 离线的系统
  - 与原有系统的集成, 开发更为现代化的系统
- 开发方案面临的选择越来越多
  - 程序设计语言, 脚本语言
  - IDE, 测试工具
- 软件构造的方式日益发生变化
  - 全球分布的开发团队
  - 外包开发
  - 遵从法律、法规、规范

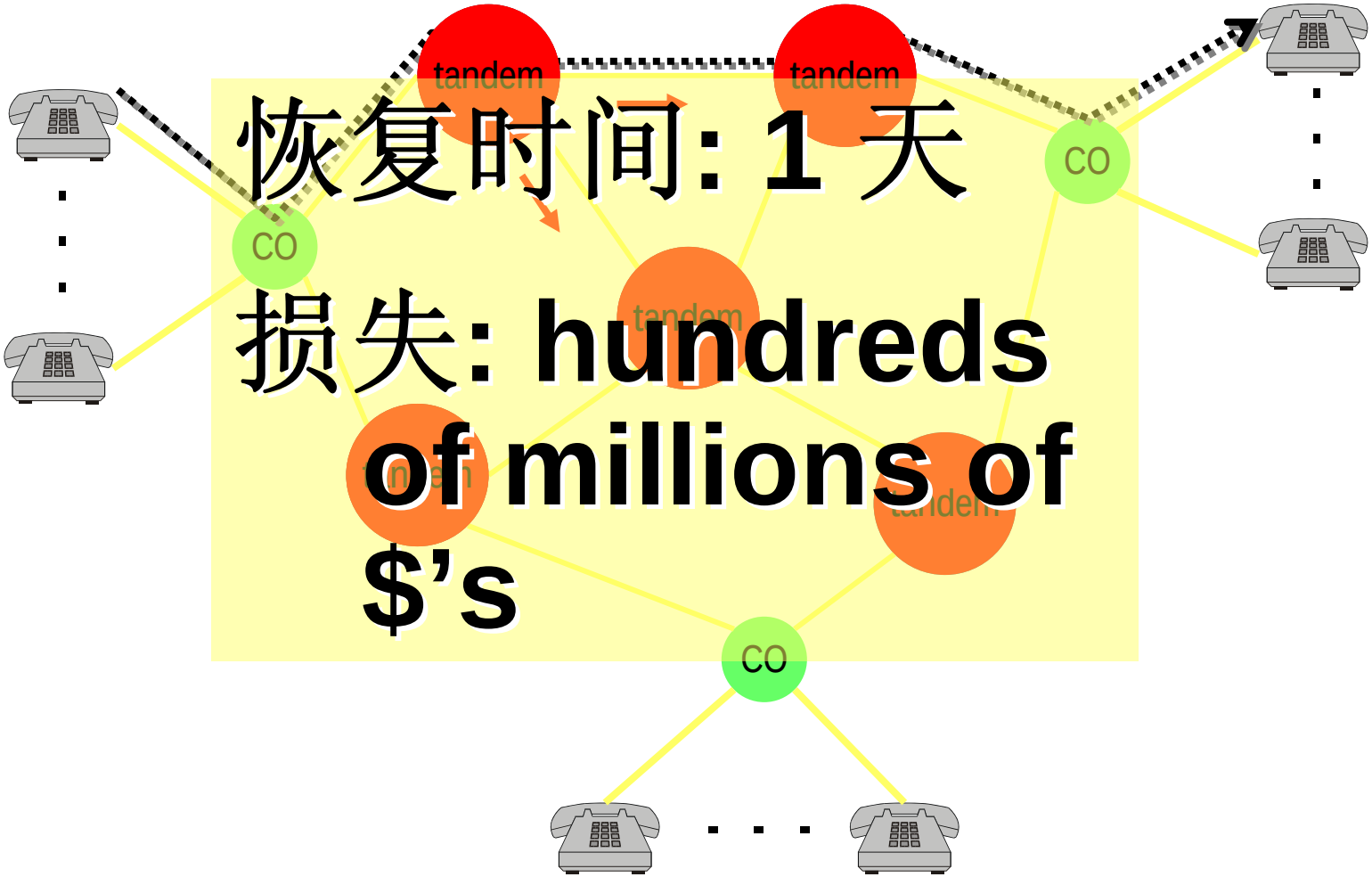


更多的层次,
更多的服务器,
更多的框架,
更多的部分不断变化,

更复杂

一个重大的工程化的灾难

- 1990: AT&T 远距离的传输网络 (美国东北部)



问题的根本原因

- 在一个软件模块中缺少了 “break” 语句
  - 在数百万行(X,000,000)的代码中 缺失了(1)1行代码

```
. . .;
switch (...) {
      case a : ...;
            break;
      case b :...;
            break;
            . . .
      case m : ...;
      case n : ...;
            . . .
};
```

认为执行到这里就应该结束了，没有注意到会执行进入下一个”case”中去

系统开发的进化

- 业务环境的改变
  - 设备只是大型解决方案的一个部分 (e.g., iPod, Tivo, Blackberry)
    - 明确在一个解决方案中所承担的角色
    - 与客户和合作伙伴密切协作
- 技术上的变化
  - 复杂的混杂的技术
    - 即需要能够优化设备的技术，也需要大型的企业级解决方案的相关技术
  - 集成性、互操作性是必然的要求
    - 提高标准化的程度 (e.g., XML)
  - 大型系统的建模能力越发重要 (e.g., SysML, SOA, BPM)

在系统开发中工具的重要性

- 复杂性
  - 范围的扩大导致生产效率的下降 ("范围过大导致了不经济性")
- 上市时间的压力
- 竞争优势
  - 软件就是产品
- 用户的期望值
  - 不只是一台计算机
- 底线
  - 缺陷能够被进一步降低
  - 增减人员不是一个有效的解决方案 (Brooks' law)

Example: 国防领域的软件进化

- 从
- 小规模 (KLOC)
- 平板化的
- 封闭的
- 私密的
- 孤立的
- 单一产品

到

大规模 (MLOC)

架构化的

开放的

标准化的

网络化的

产品线

1980s

2000

嵌入实时软件开发的所面临的挑战

业务驱动的特征日益明显

- 广泛的应用领域
  - 国防科技领域：空间、陆地、海洋、空中、通信……
  - 民用领域：工业生产、电子消费品、智能家电、民用通信……
- 竞争激烈的生存环境
  - 技术的进化的效率将直接影响在某个领域的竞争力
  - 新产品推出的速度将直接影响市场占有率：例如手机市场
- 相对落后的开发手段
  - 基于代码的开发手段：影响开发能力，降低产品进化能力
  - 相对落后的测试手段使得开发的效率和成本居高不下
  - 开发过程需要得到有效的改进
    - 基于资产的开发替代传统方法
    - 需要迅速提高开发管理能力

嵌入实时软件的开发所面临的挑战

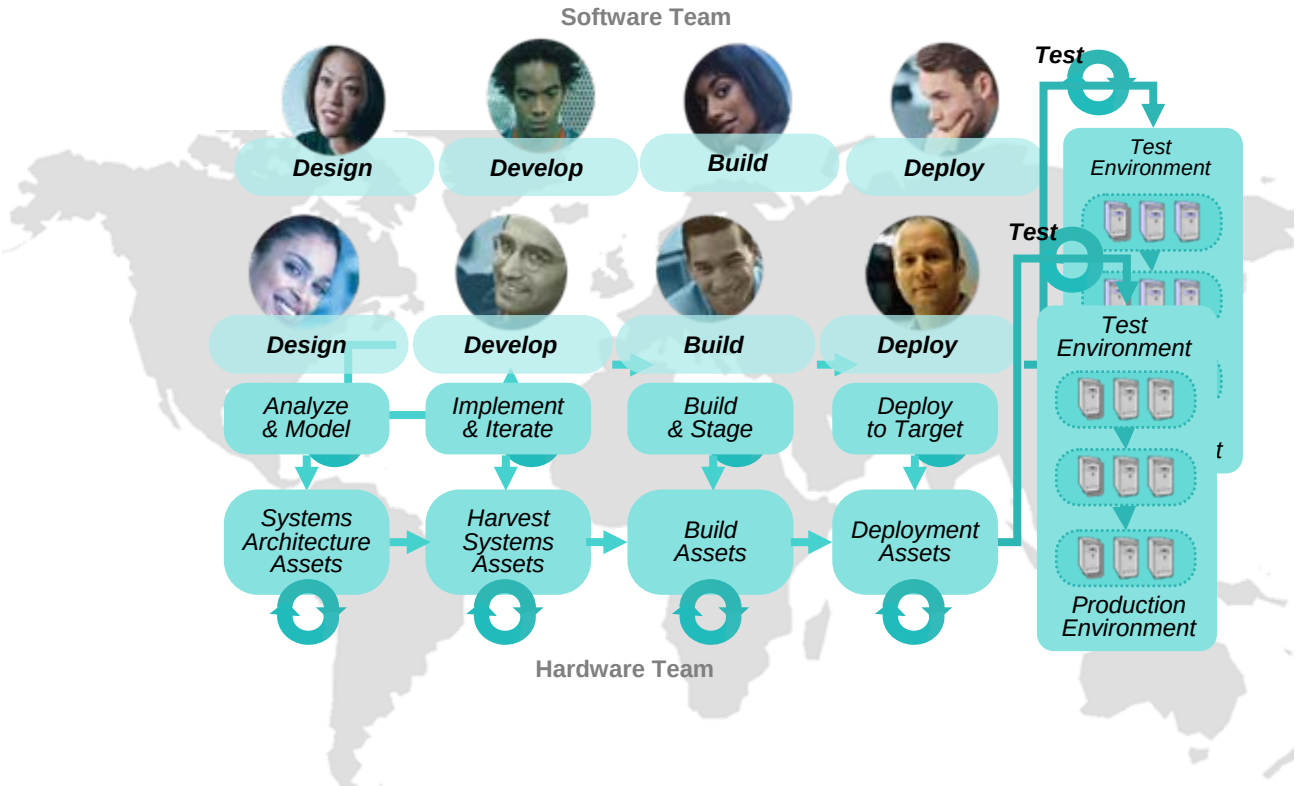
嵌入实时系统与生俱来的复杂性

- 应用的复杂性
  - 时序配合要求高
  - 低内存占用
  - 并发/分布/网络
- 环境的复杂性
  - RTOS/IDE/Chips厂商的多样性
  - 主机和目标平台的连接能力有限
  - 内建的排错能力较弱
- 流程的复杂性
  - 需求和
  - 设计、转换的错误
  - 难于维护
  - 低性能

挑战：*日益增加的系统开发的复杂性*

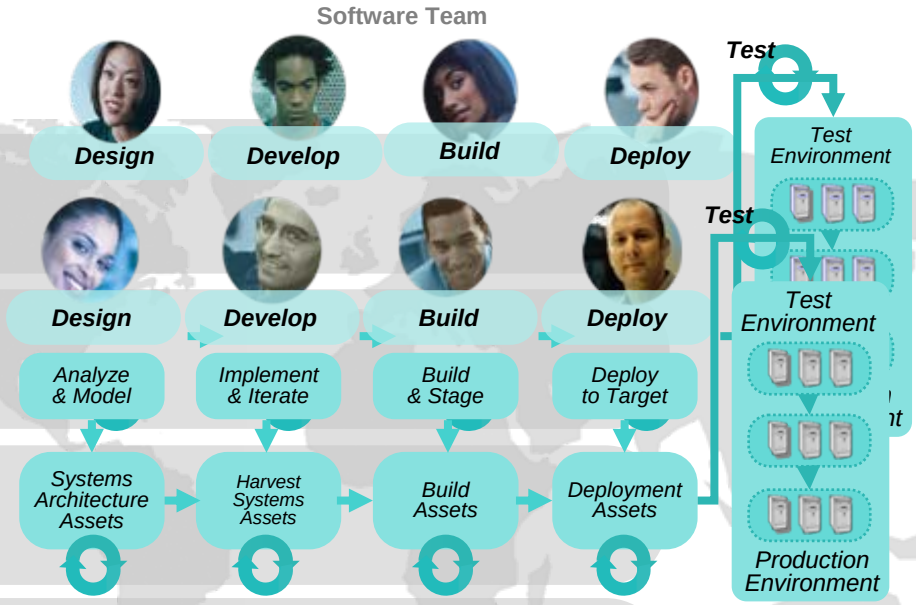
场景：一个大型航天工业机构正在开发一个新的航天器

在机构内部或协作单位之间，用户需要统一管理，并行协同软硬件的开发。系统的买方希望能控制系统的整个构建过程。



挑战：*日益增加的系统开发的复杂性*

- *我应该怎样管理我系统级设计的成果？*
- *系统构架是可靠的，但没有彻底的贯彻！*
- *我应该规划软硬件的设计协同？*
- *我应该如何协调软硬件团队？*
- *我们没有察觉设计中的混乱，直到项目的后期，－ 其实这些问题一开始就存在。*
- *我应该如何保证我的项目的各个方面都符合相关工业标准的要求。*



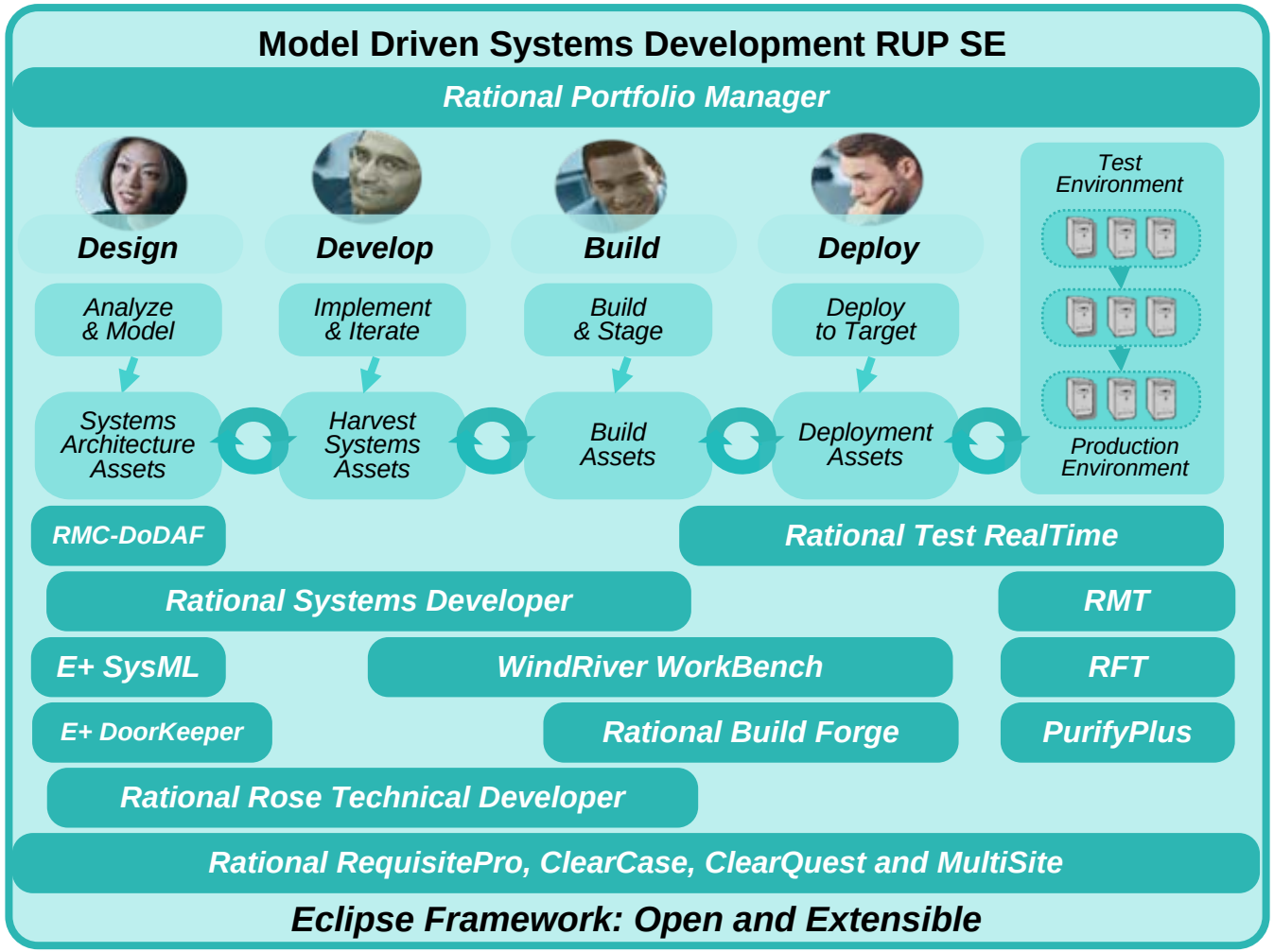
解决: 通过系统建模和模型追踪掌控系统构建的整个生命周期

- ✓ 提供相关的技术，保证设计思想的有效沟通。
  - UML 2 标记语言
  - 将架构设计的成果直接用于开发中
  - 提供跨区域的访问能力，保证开发机构对各方设计成果的恰当访问
- ✓ 提供自动化的方法，用于构架分析
  - 寻找 Anti-Patterns
  - 复杂性可视化
- ✓ 生成基于架构的源码
- ✓ 生成和执行支持架构的构架
  - 流程向导
  - 代码规则
  - 可视化比较模型的变化
  - 从需求到设计的链接

解决: 通过系统建模和模型追踪掌控系统构建的整个生命周期

- ✓ 用单一的建模方法，将软硬件团队联系起来
  - 通过对SysML和UML的支持，能对系统和软件进行混合系统建模
- ✓ 构架追踪和易于贯彻的系统标准
  - 模型和代码的双向追踪
  - 管理和控制系统的系统的构建: DoDAF work products to sub-systems
- ✓ 通过开发标准和Eclipse可扩展的架构，最大限度的保证了投资回报率。例如, Wind River WorkBench
- ✓ 同模型驱动的系统开发最佳实践相结合
  - RUP System Engineering

掌控系统构建的整个生命周期



Building service component architectures in a systems environment

Q: 为什么写正确的软件如此困难?

A: 复杂性!

当今的软件复杂度已经达到了接近生物系统的程度；有些时候一个系统由多个系统所组成，并且每个系统都包含上千万行的代码

...每一个系统出现问题都会给整个的系统巨大的损失

Fred Brooks 对于复杂性的分析

- [From: F. Brooks, "*The Mythical Man-Month*", Addison Wesley, 1995]
- *Essential 本质的复杂性*
  - 问题本身所固有的
  - 技术和技巧都无法消除的
  - 例如：应对并发的问题
- *Accidental 非本质的复杂性*
  - 由我们处理问题的方法和技术所导致的
  - 例如：建造摩天大楼却只使用手工工具

你的团队如何应对这些挑战？

提升你的以模型为中心的开发流程

- 建立模型驱动开发流程和相关的开发平台
- 在模型的层面进行开发
- 在模型层面进行应用的测试和排错
  - 图形可视化那些测试中达到的或者没有达到的应用状态和转换
  - 在模型环境中的对应用的代码部分跟踪内存错误和性能
  - 采用UML近似的图形格式跟踪应用的执行流

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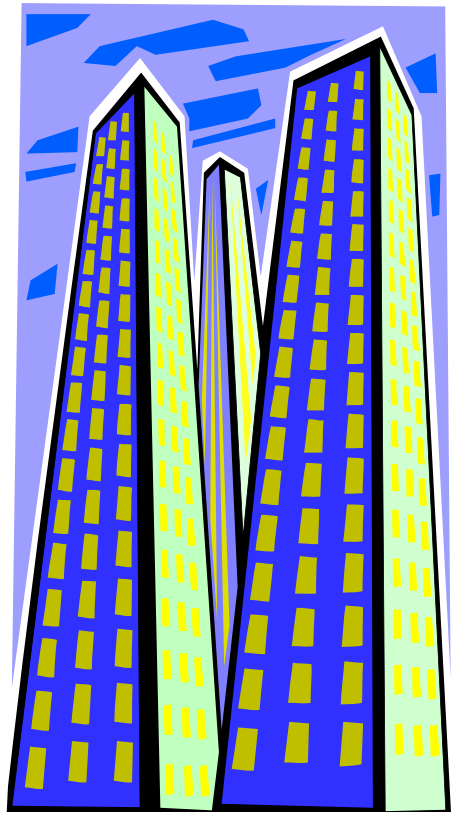
建模: 管理软件复杂度的关键

- 建模是标准的工程化方法，能够让我们：
  - 管理复杂度
  - 降低风险
- 在这个方面，软件开发与其它行业的工程化是相同的

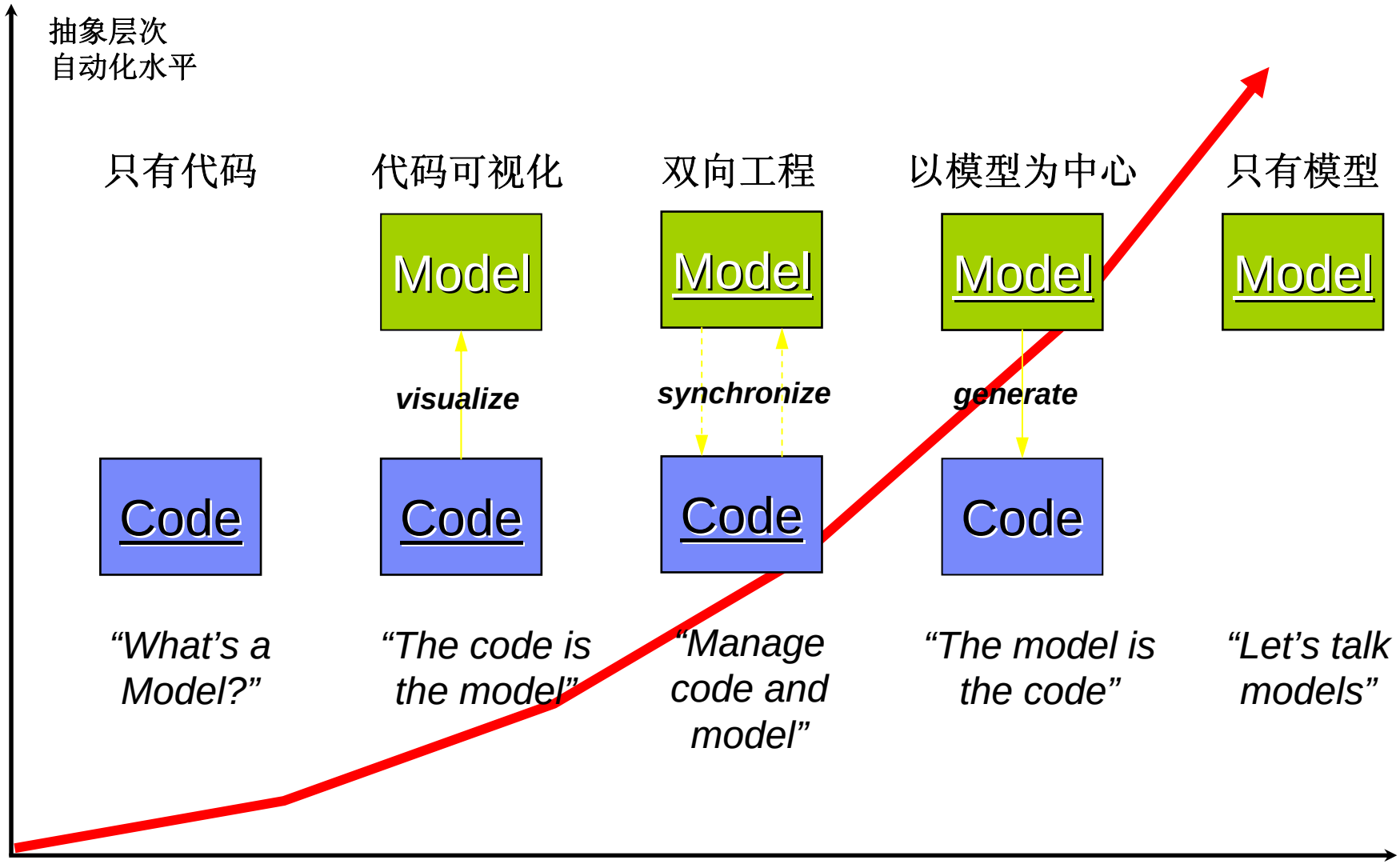
建摩天大楼，
恐怕你不得不……



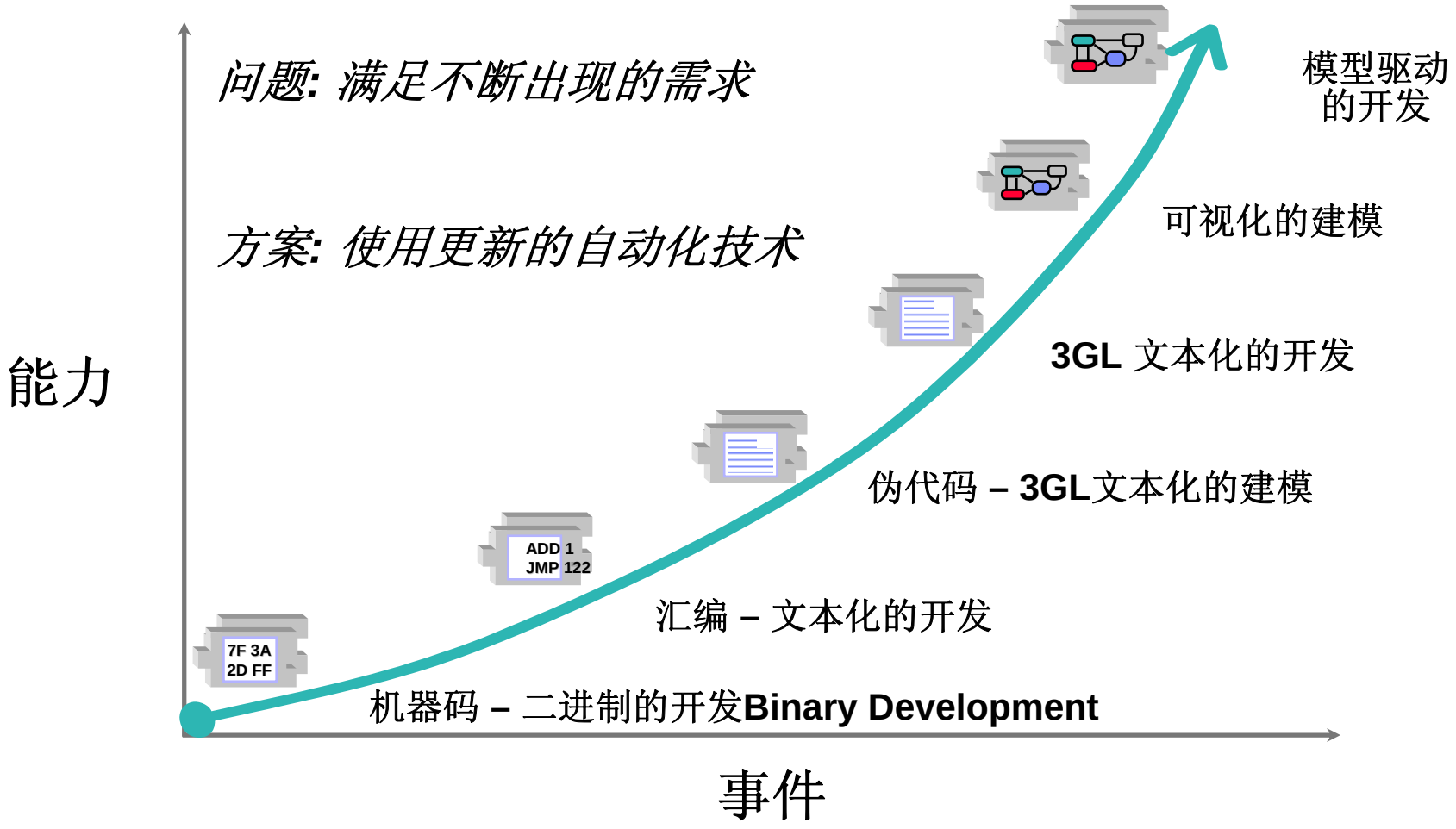
但是建一栋房子，
你应该预先进行设计

建一个小窝吗……
可能你没必要

MDD 的成熟度模型

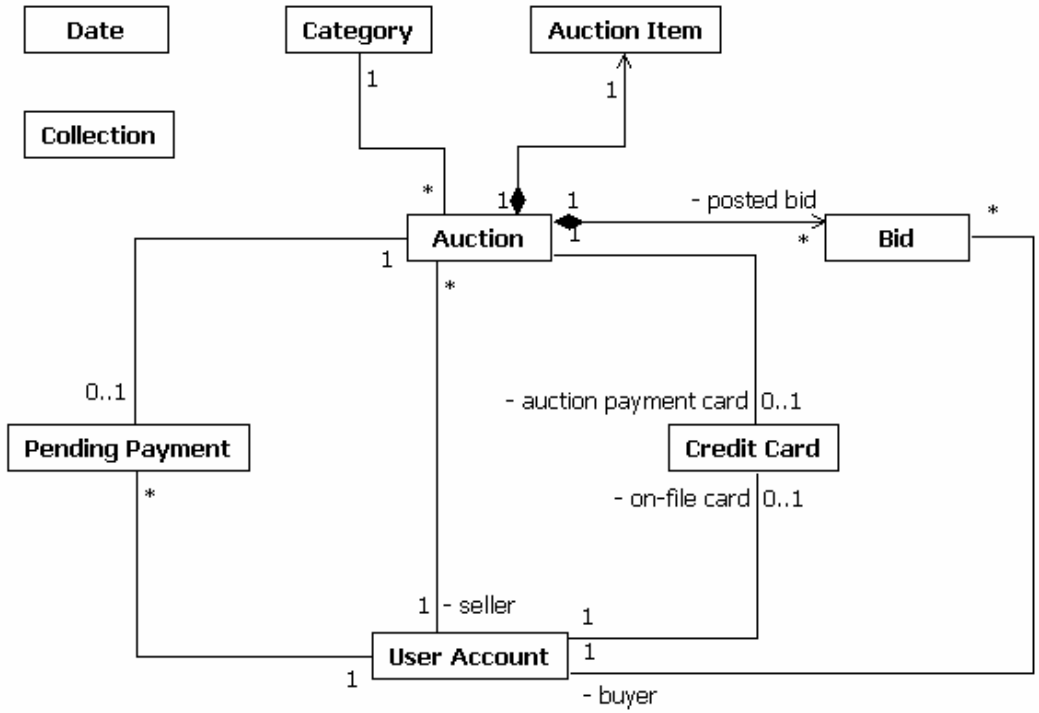

抽象层次
自动化水平
只有代码
代码可视化
双向工程
以模型为中心
只有模型
Model
Model
Model
Model
visualize
synchronize
generate
Code
Code
Code
Code
"What's a Model?"
"The code is the model"
"Manage code and model"
"The model is the code"
"Let's talk models"

软件开发的演化


问题: 满足不断出现的需求
方案: 使用更新的自动化技术
能力
事件
7F 3A
2D FF
ADD 1
JMP 122
机器码 – 二进制的开发Binary Development
汇编 – 文本化的开发
伪代码 – 3GL文本化的建模
3GL 文本化的开发
可视化的建模
模型驱动
的开发

模型....

- 对于事物的抽象表达
  - 业务逻辑
  - 架构
  - 设计
  - 可复用资产
- 允许多视点的相互独立的表达
- 让我们能够
  - 操纵
  - 推理
  - 进行逻辑一致性的检查
  - 自动化
- 成本有效性更高

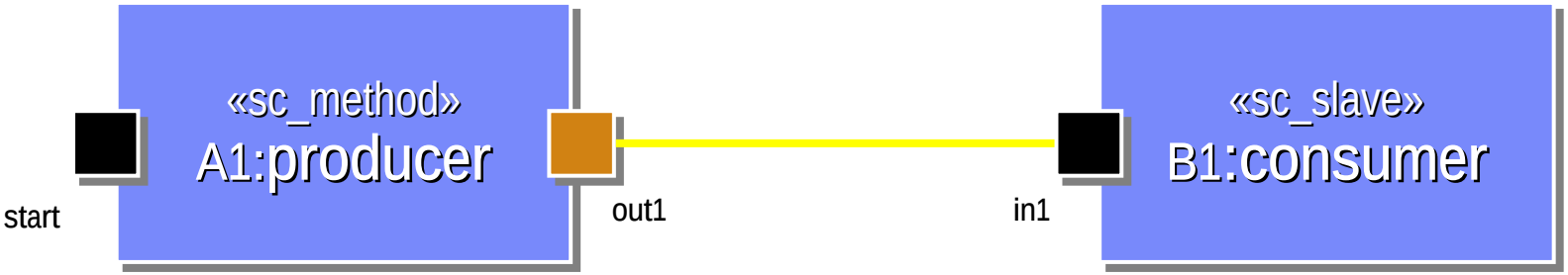


看一个实例...

```
SC_MODULE(producer)
{
sc_outmaster<int> out1;
sc_in<bool> start; // kick-start
void generate_data ()
{
for(int i =0; i <10; i++) {
out1 =i ; //to invoke slave;}
}
SC_CTOR(producer)
{
SC_METHOD(generate_data);
sensitive << start;}};
SC_MODULE(consumer)
{
sc_inslave<int> in1;
int sum; // state variable
void accumulate (){
sum += in1;
cout << "Sum = " << sum << endl;}
SC_CTOR(consumer)
{
SC_SLAVE(accumulate, in1);
sum = 0; // initialize
};
SC_MODULE(top) // container
{
producer *A1;
consumer *B1;
sc_link_mp<int> link1;
SC_CTOR(top)
{
A1 = new producer("A1");
A1.out1(link1);
B1 = new consumer("B1");
B1.in1(link1);}};
```

你能够看出来这个软件做什么吗？

这个软件的模型

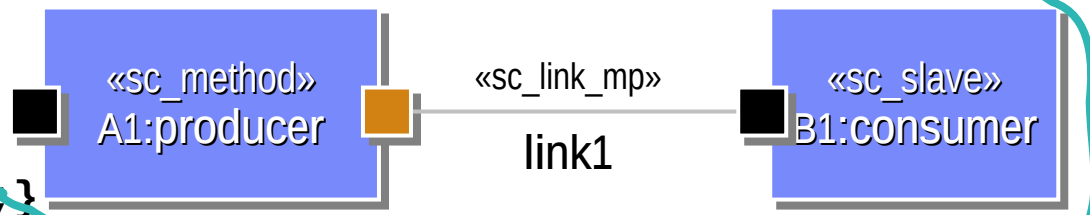


现在能够看出来吗?

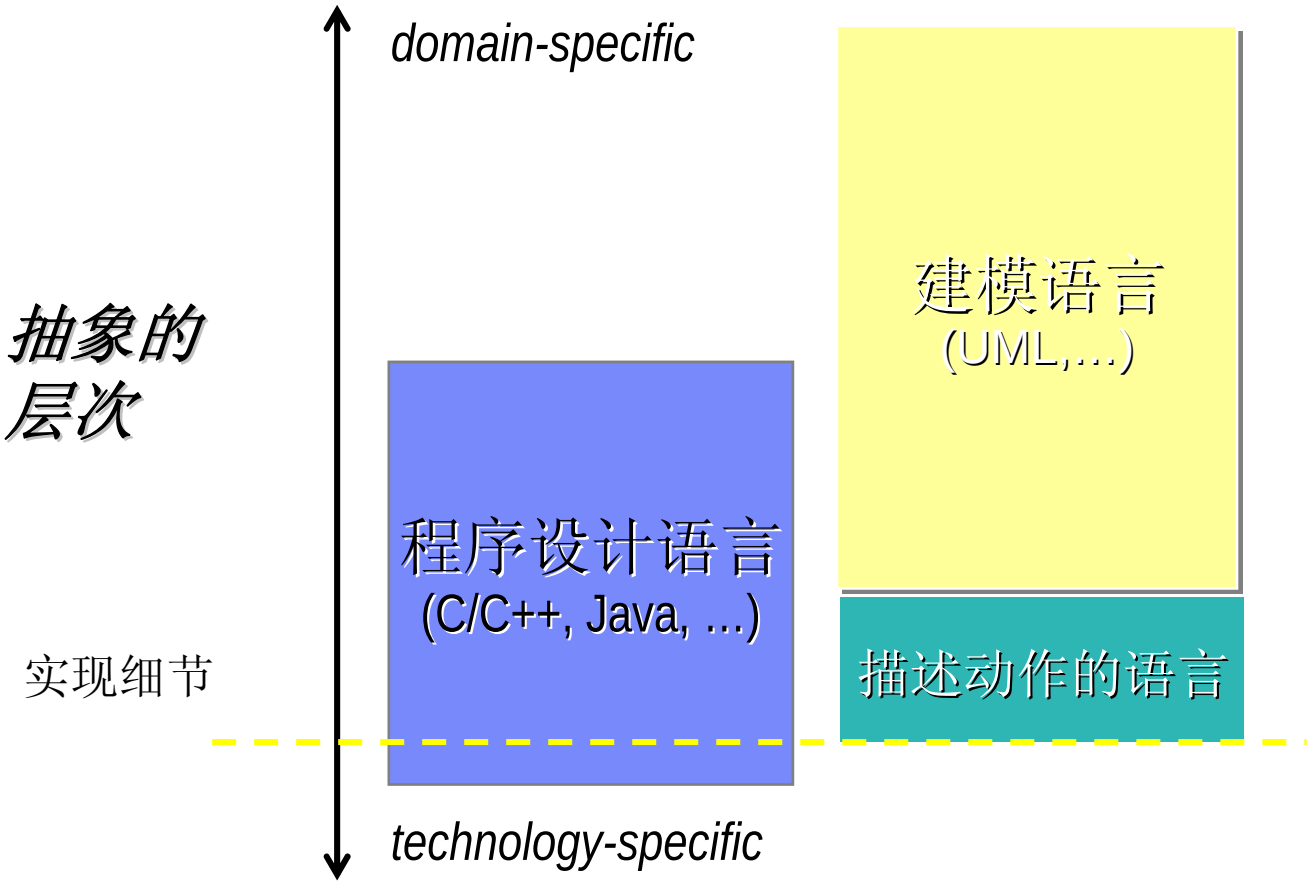
模型与代码

```
SC_MODULE(producer)
{
sc_outmaster<int> out1;
sc_in<bool> start; // kick-start
void generate_data ()
{
for(int i =0; i <10; i++) {
out1 =i ; //to invoke slave;}
}
SC_CTOR(producer)
{
SC_METHOD(generate_data);
sensitive << start;}};
SC_MODULE(consumer)
{
sc_inslave<int> in1;
int sum; // state variable
void accumulate (){
sum += in1;
cout << “Sum = “ << sum << endl;}
```

```
SC_CTOR(consumer)
{
SC_SLAVE(accumulate, in1);
sum = 0; // initialize
};
SC_MODULE(top) // container
{
producer *A1;
consumer *B1;
sc_link_mp<int> link1;
SC_CTOR(top)
{
A1 = new producer(“A1”);
A1.out1(link1);
B1 = new consumer(“B1”);
B1.in1(link1);}};
```

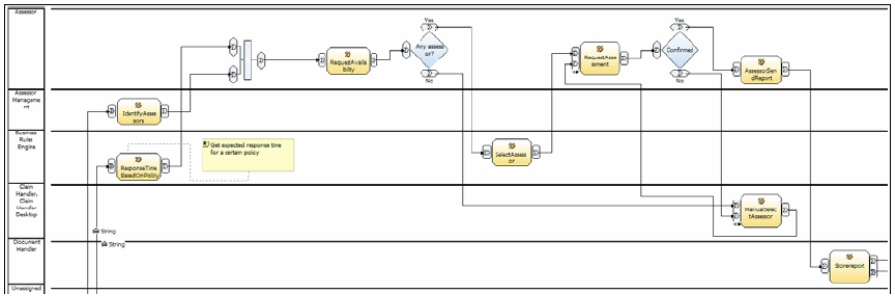


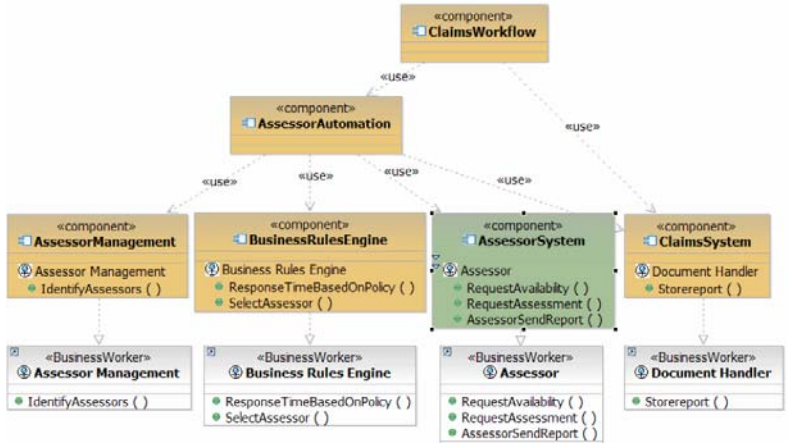
软件模型: 填补必要的细节



什么是模型驱动的开发 (MDD)?

- 将业务逻辑和业界的最佳实践封装在模型中
- 将这些模型用于应用开发，代码生成，测试，维护



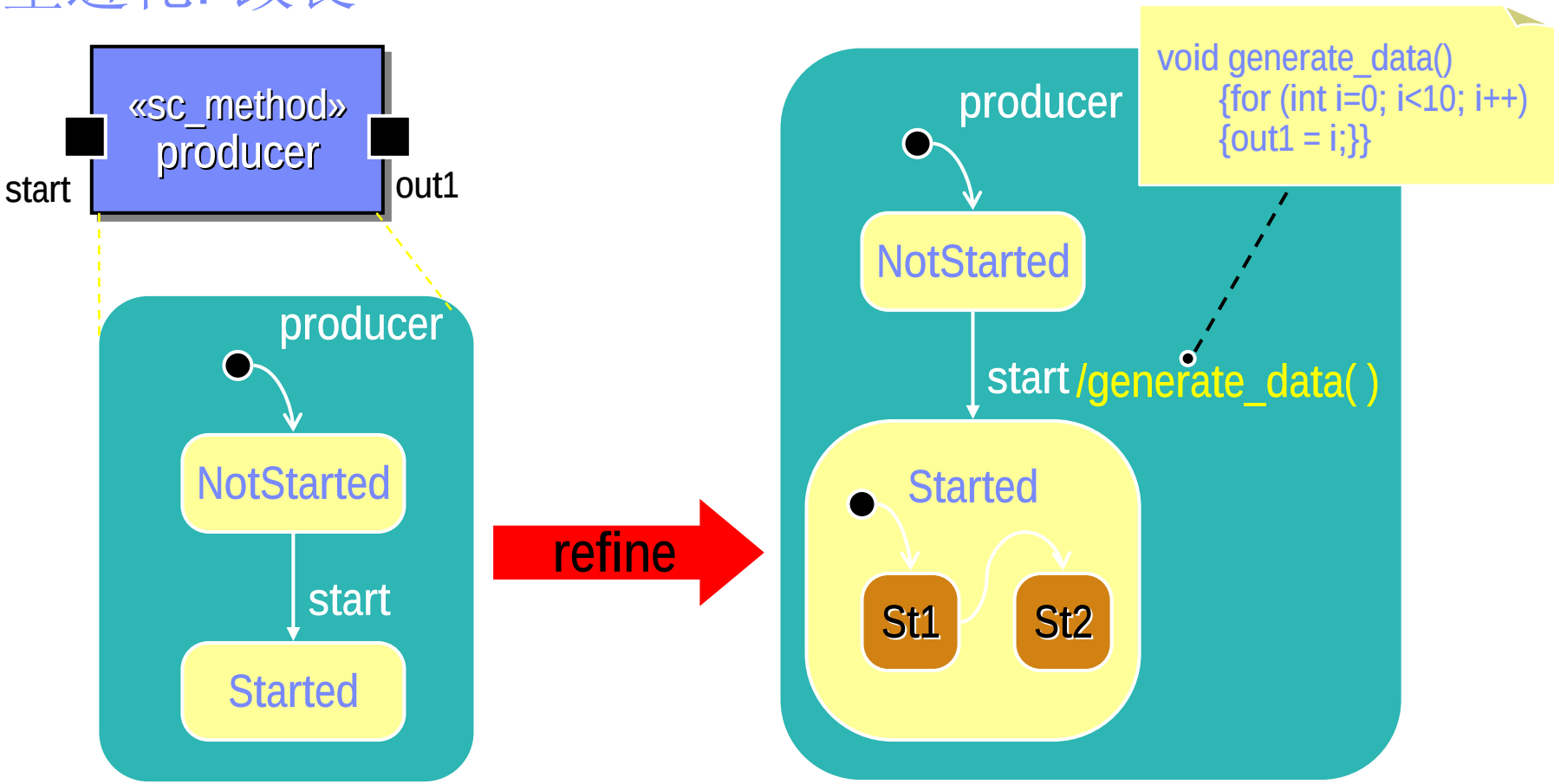


- 建模能够帮助你在更高的*抽象层次*上工作
- 更高的抽象层次带来更高的*生产效率*

什么是模型驱动的开发?
不同的涉众, 不同的模型

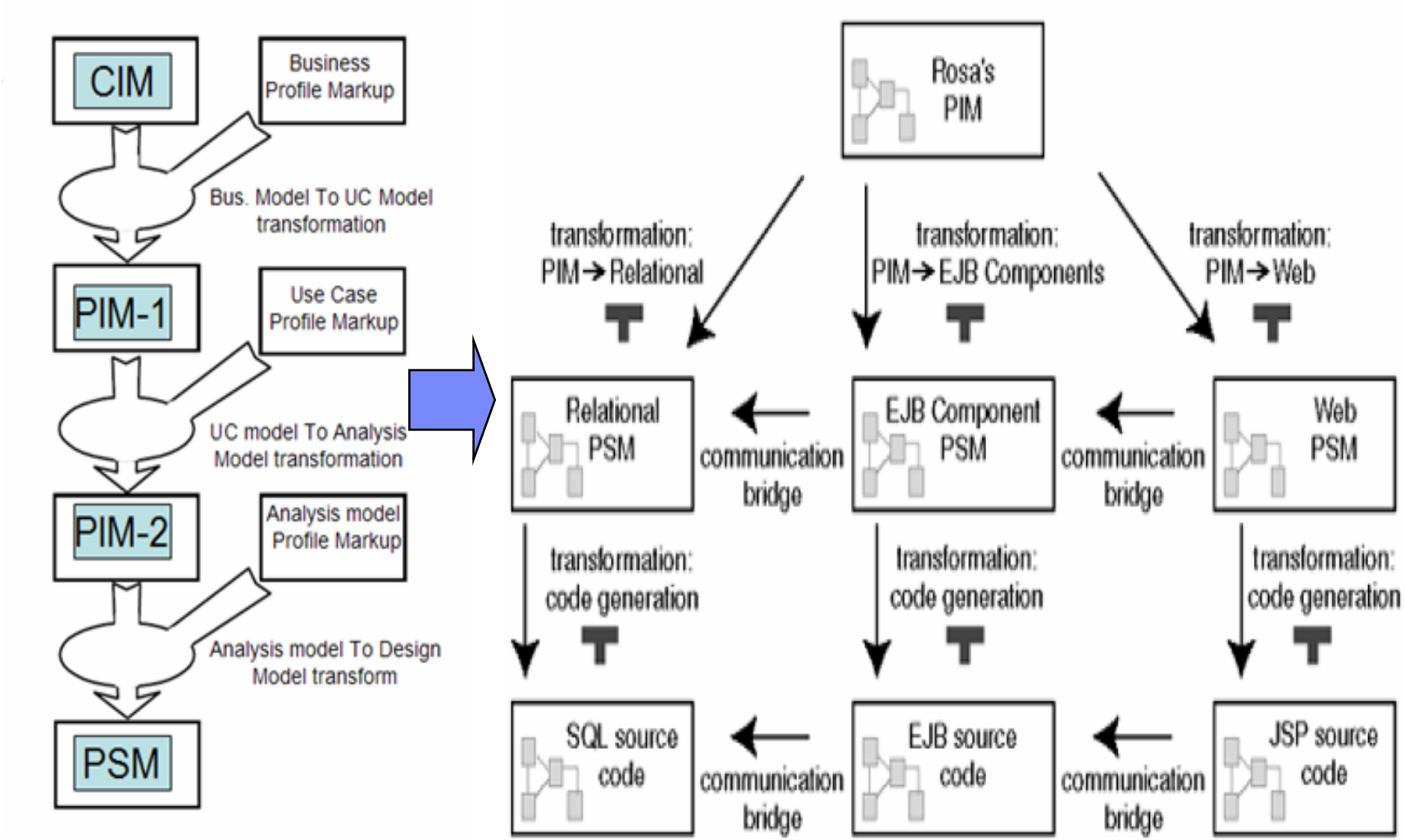
- 业务模型
  - 使业务过程可视化
- 用例(Use Case)模型
  - 使功能性需求可视化
- 分析模型
  - 系统必须做“什么”以实现这些功能性的需求
- 用户体验模型
  - 让用户与系统间的交互可视化
- 设计模型
  - 系统将“如何”实现这些功能性需求
- 数据模型
  - 对持久性的数据存储可视化
- 实施模型
  - 让代码可视化

模型进化: 改良



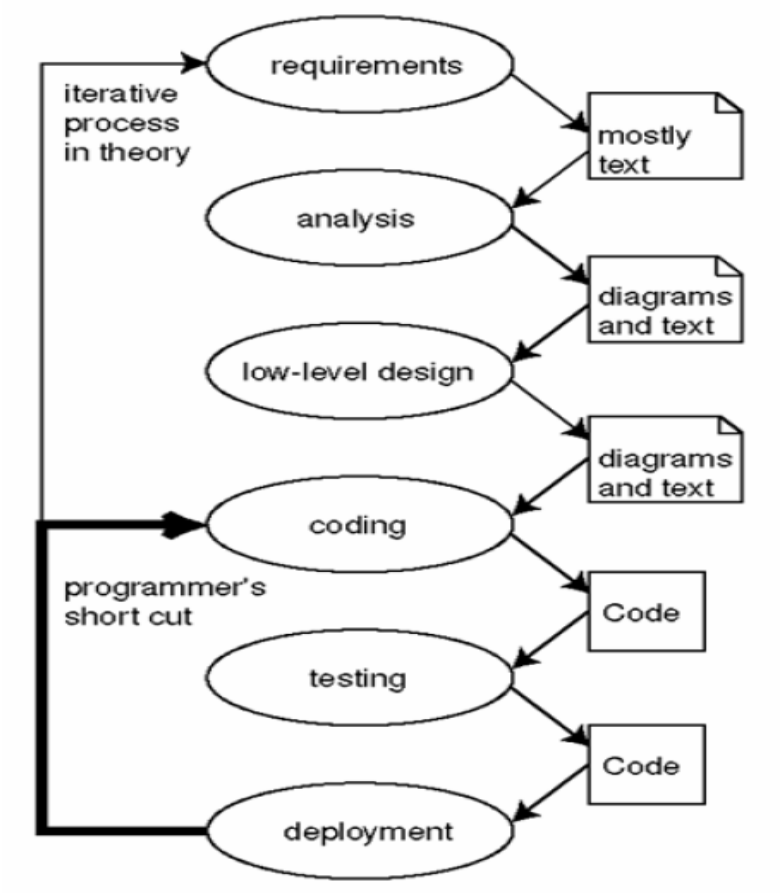
- 模型能够被不断地改良指导应用被完整地描述出来 ⇒ *模型也由此变成了你正在建模的系统!*
- *软件是一个唯一的通过对于模型的改良最后能够直接获得最终产品的*

模型驱动开发（MDD）

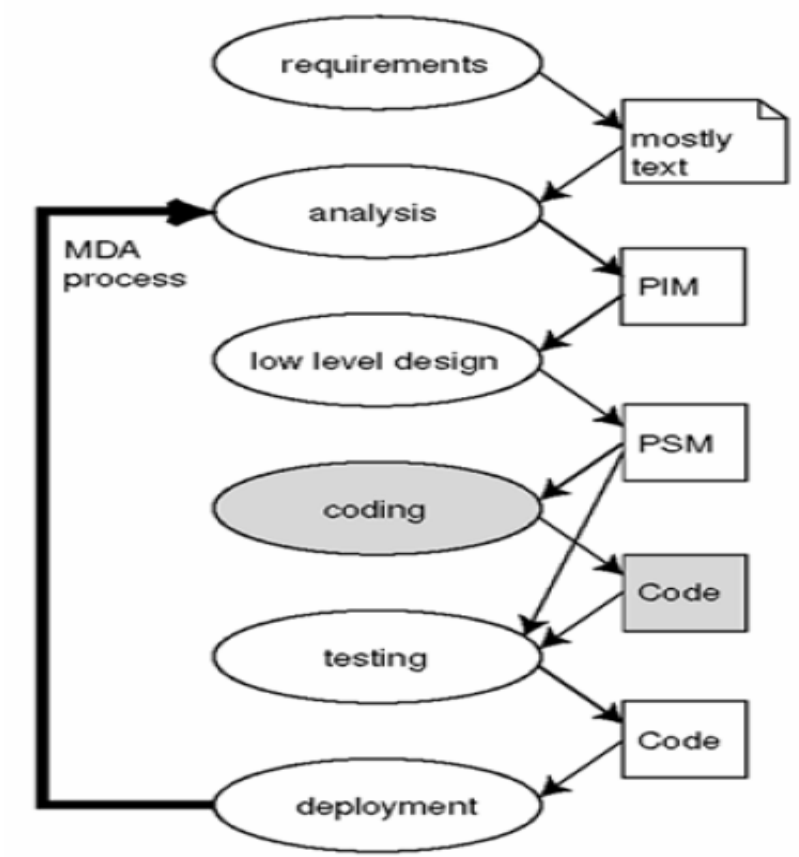

CIM
Business Profile Markup
Bus. Model To UC Model transformation
PIM-1
Use Case Profile Markup
UC model To Analysis Model transformation
PIM-2
Analysis model Profile Markup
Analysis model To Design Model transform
PSM
Rosa's PIM
transformation: PIM→Relational
transformation: PIM→EJB Components
transformation: PIM→Web
Relational PSM
communication bridge
EJB Component PSM
communication bridge
Web PSM
transformation: code generation
transformation: code generation
transformation: code generation
SQL source code
communication bridge
EJB source code
communication bridge
JSP source code

模型驱动开发（MDD）

传统软件开发过程



模型驱动开发过程

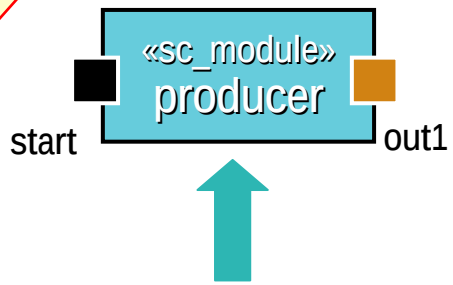


模型驱动的开发 (MDD)

- 一个软件开发的方法，在这个方法中开发所关注的并且是最关键的工件就是模型（不同于程序）
- 基于两个经过长期验证了的方法:

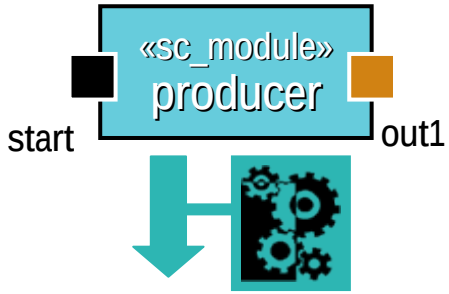
(1) ABSTRACTION

关系到
建模语言




```
SC_MODULE(producer)
{sc_inslave<int> in1;
int sum; //
void accumulate (){
sum += in1;
cout << “Sum = “ << sum <<
endl;}
```

(2) AUTOMATION



关系到
工具

```
SC_MODULE(producer)
{sc_inslave<int> in1;
int sum; //
void accumulate (){
sum += in1;
cout << “Sum = “ << sum <<
endl;}
```

UML – 模型驱动开发所使用的语言

- 模型驱动开发需要一种所有涉众都掌握得公共语言来辅助
  - 统一建模语言 (UML) 是用于对软件系统的工件进行可视化、规格描述、构建和文档化的标准语言
  - UML 允许软件架构师、软件设计人员和软件开发人员对于软件系统进行规格化描述、可视化、构建、和文档化全部特征

议程

- IBM Rational Software
- 系统开发所面临的挑战
- 模型驱动开发MDD
- Rational Systems Developer v7.0
- 总结

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IBM Systems Development

- 工业，包括
  - 航天航空、核能、国防
  - 汽车、电子
  - 高安全或关键性领域(例如，需要符合 DO-178B、MISRA或IEC 61508标准).
  - …
- 系统开发，包含硬件、软件、数据、机械、液压、人等因素为设计目标。 最典型的就是实时嵌

用户案例：

汽车工业中的复杂的系统

IBM Rational Systems Developer v7.0

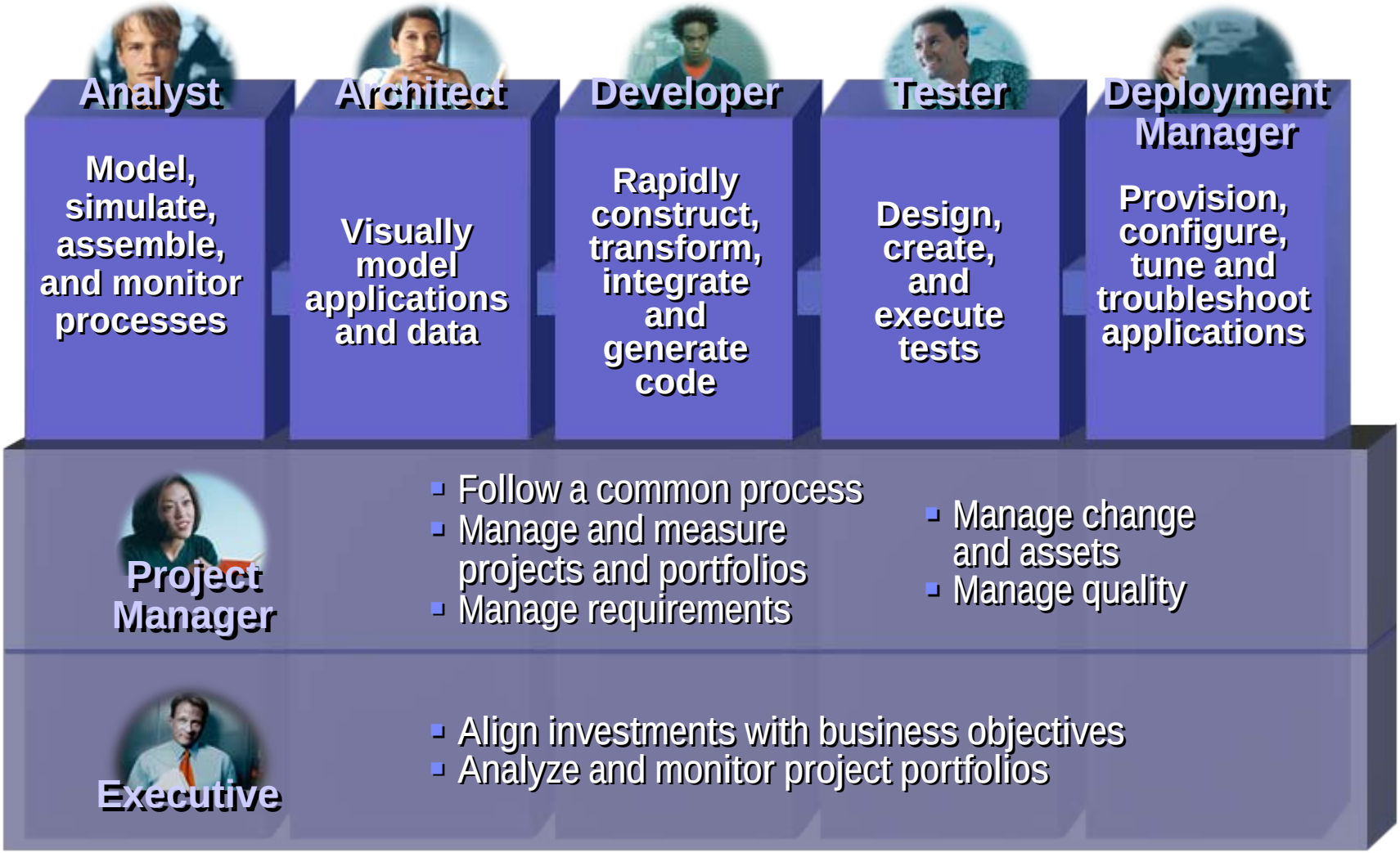
IBM Rational Systems Developer v7.0是一个基于Eclipse的系统设计和开发工具。由一个合作伙伴的生态环境支持，包含各种插件，以支持系统和软件架构师，以及模型驱动开发人员来创建架构良好的C/C++, Java, J2SE 和 CORBA等各种应用。其中应用了UML 2、分析和开发能力。同时也支持用户创建并管理DoDAF（Department of Defense Architecture Framework）视图和工作产品。

IBM Rational Systems Developer v7.0

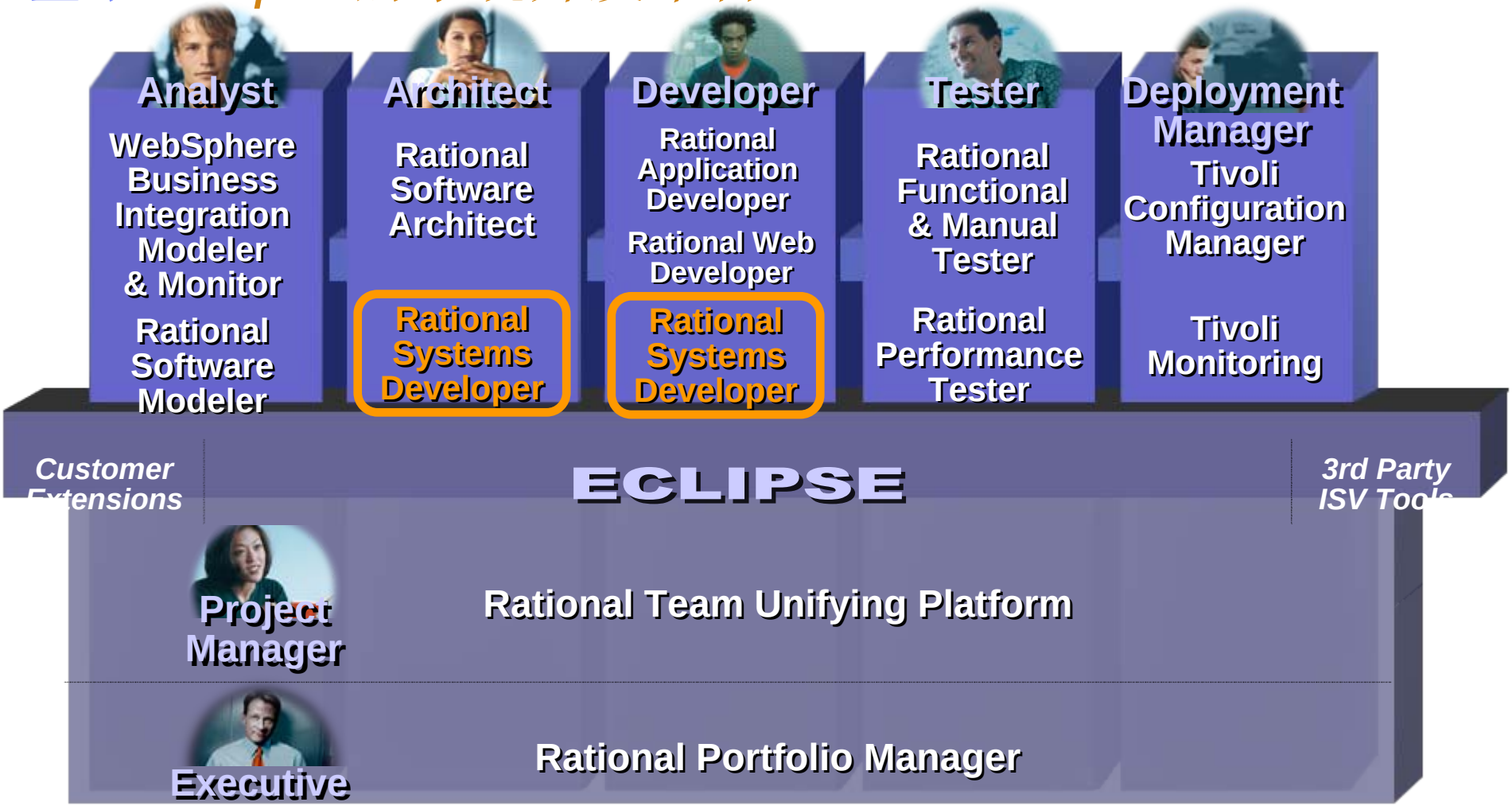
"… …With the release of Rational Systems Developer in January 2006, Rational has re-ignited its presence in the systems development space. "

"… … real-time, embedded or systems development … …"

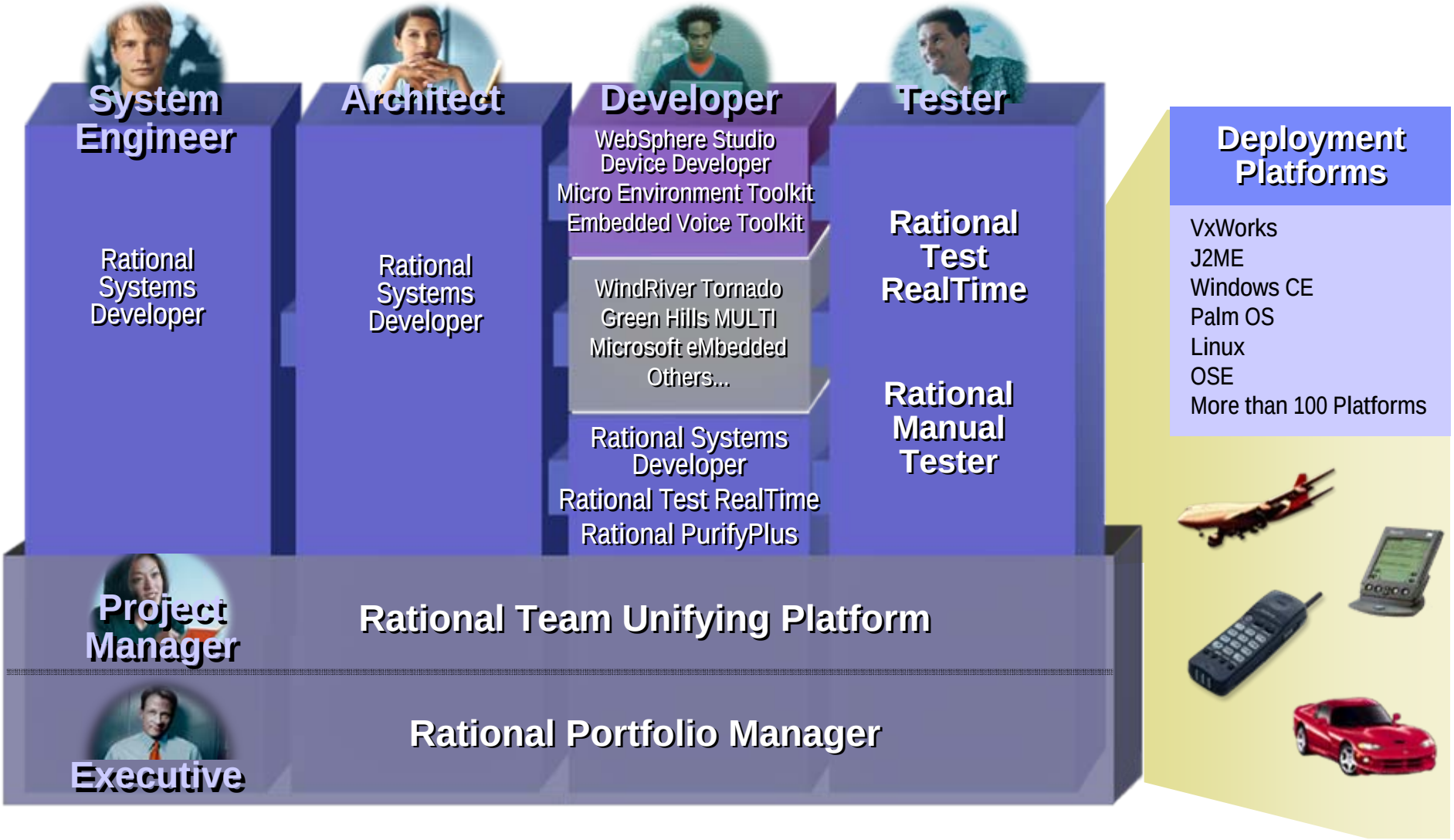
IBM Rational System Development Platform
一个完整的，开放的，模块化的，久经验证的解决方案



The IBM Rational System Development Platform
基于 *Eclipse*的系统开发平台



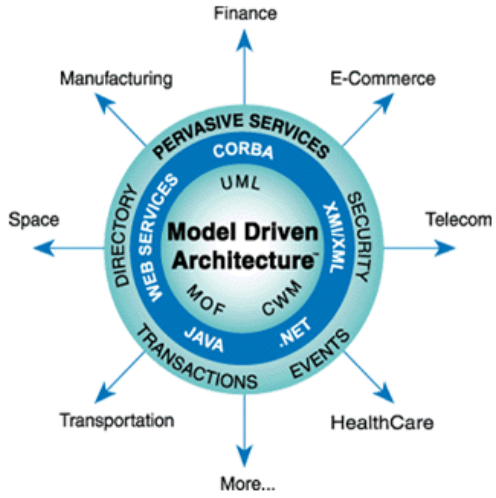
支持嵌入式软件的开发


System Engineer
Rational Systems Developer
Architect
Rational Systems Developer
Developer
WebSphere Studio Device Developer
Micro Environment Toolkit
Embedded Voice Toolkit
WindRiver Tornado
Green Hills MULTI
Microsoft eMbedded
Others...
Rational Systems Developer
Rational Test RealTime
Rational PurifyPlus
Tester
Rational Test RealTime
Rational Manual Tester
Deployment Platforms
VxWorks
J2ME
Windows CE
Palm OS
Linux
OSE
More than 100 Platforms
Project Manager
Rational Team Unifying Platform
Executive
Rational Portfolio Manager

IBM Rational Rose Technical Developer

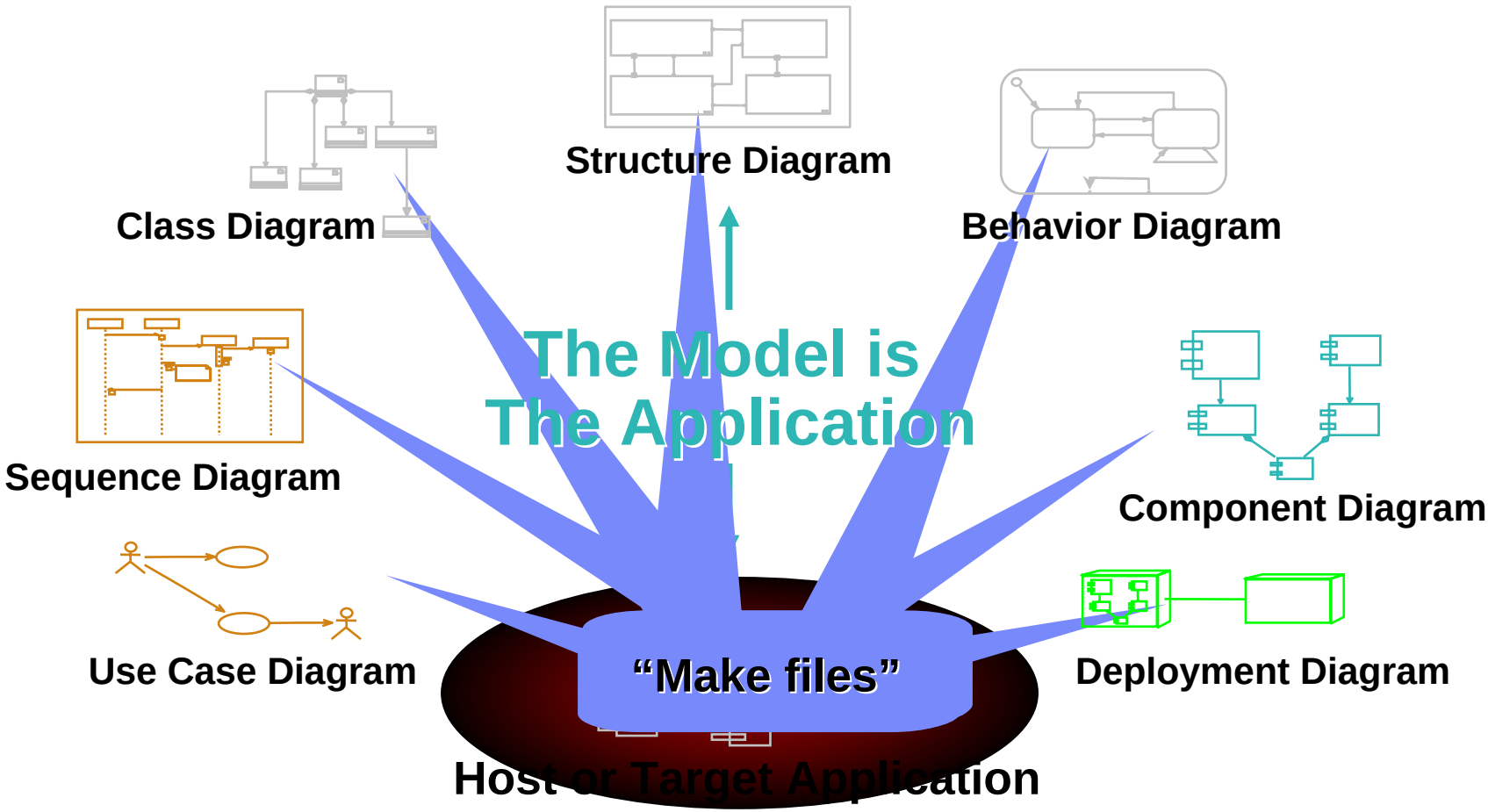
- Industry-leading visual modeling tool: IBM Rational Rose
  - Most widely used UML modeling tool in industry
  - De facto standard for interchange
  - Base for MDA tool construction

- Industry-leading MDA® (Model-Driven Architecture) tool: IBM Rational Rose Technical Developer
  - Most advanced UML MDA tool



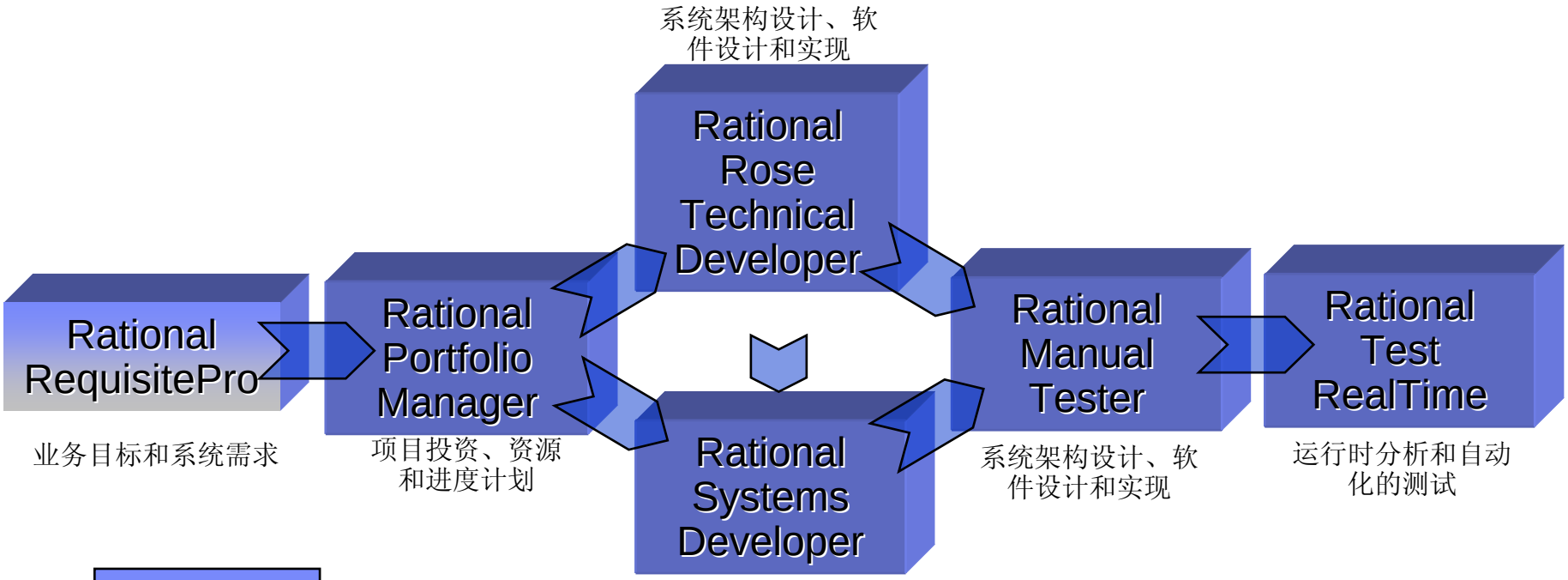
- Hosted on Windows, Unix and Linux

模型驱动开发



Develop at the model level with IBM Rational Rose Technical Developer

掌控系统开发的生命周期



Rational Unified Process/ Method Composer

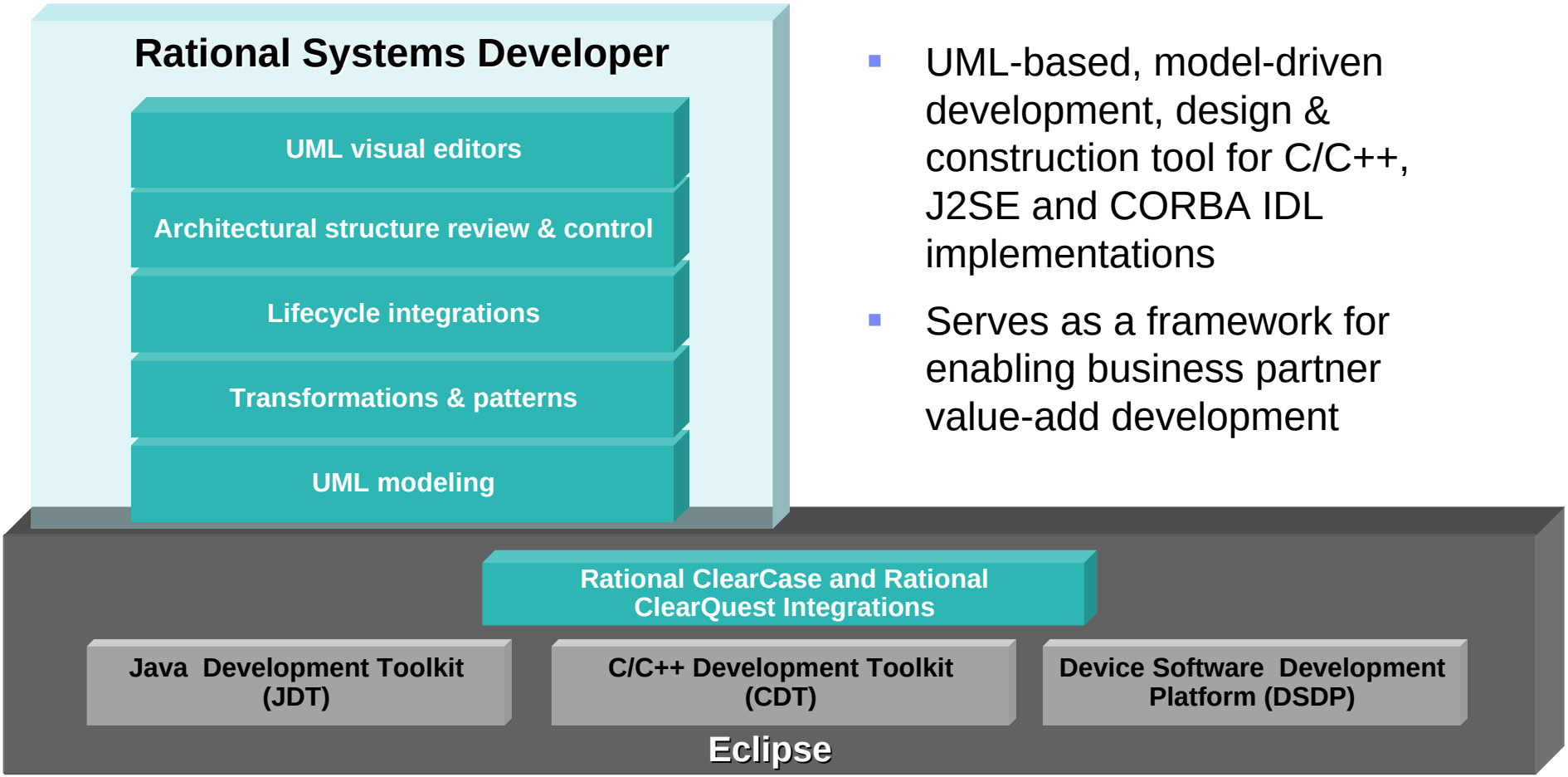
系统工程化的方法和过程指导 (RUP SE)

Rational ClearCase, Rational ClearQuest

对于所有类型的资产提供变更管理，从电子设计到软件设计到测试资产

IBM Rational Systems Developer v7.0

利用Eclipse平台…
提供一套完整的系统开发解决方案

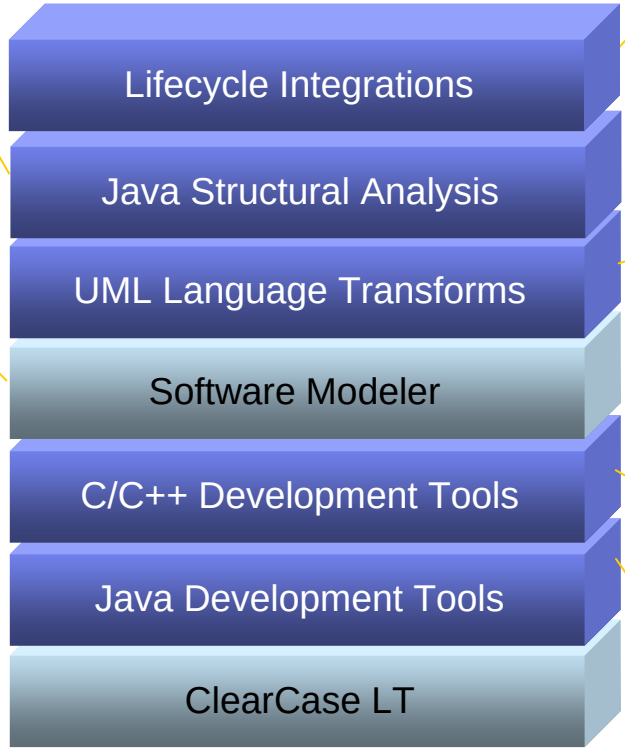


- UML-based, model-driven development, design & construction tool for C/C++, J2SE and CORBA IDL implementations
- Serves as a framework for enabling business partner value-add development

IBM Rational Systems Developer 产品浏览

"Architectural Discovery"
- Automatic anti-pattern and pattern detection
- Architectural discovery, analysis, metrics, and stability reporting
- Implementation level architectural rules

"Modeler"
- UML 2.0 Diagrams for Class, Communication, Component, Composite Structure, Deployment, Activity, Sequence, State, and Use Case
- OCL Support
- Automatic diagram generation
- Pattern content
- Extensive open API
- Java-based "scripting" for extensibility
- HTML and XML based data extraction and reporting
- Extensive printing (Windows Only)
- RAS tools
- Rose/XDE Model Import
- Traceability Analysis
- Visual Compare/Merge



Operating Environments

eclipse V3.1.1

Microsoft Windows

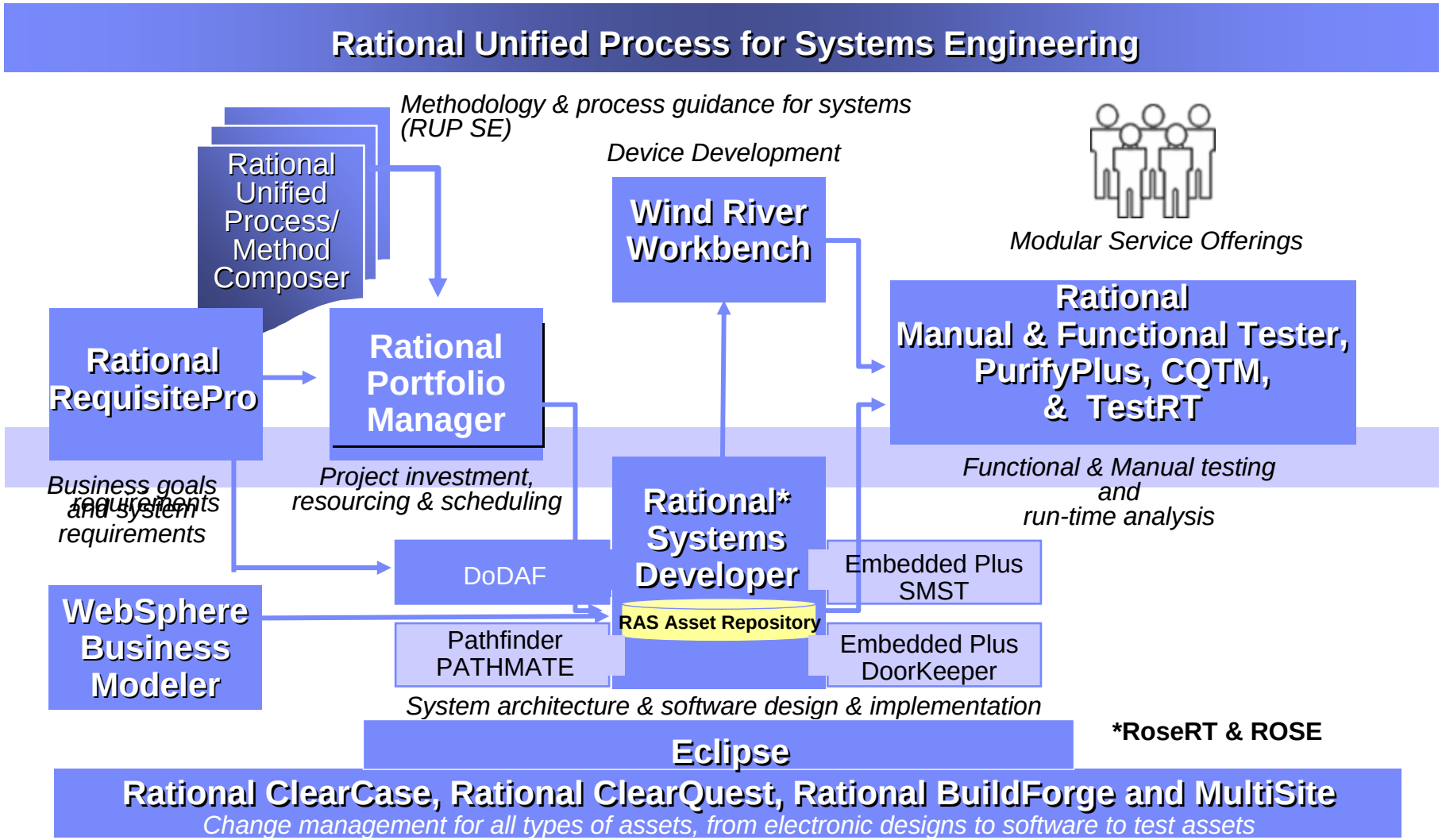
"Lifecycle Integrations"
- ClearCase
- ClearQuest
- Requisite Pro
- SoDA
- RUP

"UML Language Transforms"
- Pattern/Transform authoring framework and services
- UML-to-code transforms for Java and C++
- Selective language to UML harvesting
- UML-to-CORBA IDL transformations

"C/C++ Development Tools"
- C/C++ editors and build management
- Compiler and debugger integration
- UML code editors for C/C++

"Java Development Tools"
- Advanced Java tooling - editors, projects, refactoring, etc.
- UML code editors for Java
- Code Review

掌控系统开发的整个生命周期



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  - Consumability
  - Architecture
  - Development
  - Integrations
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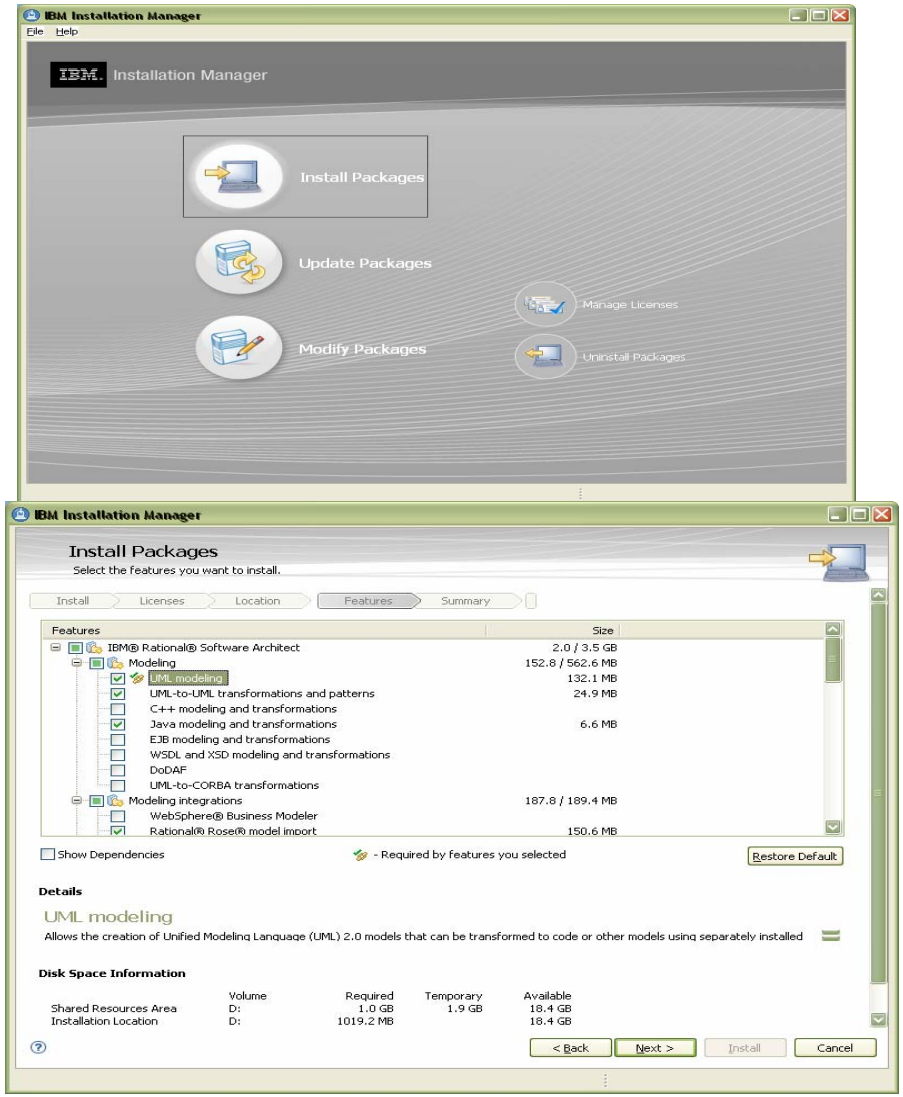
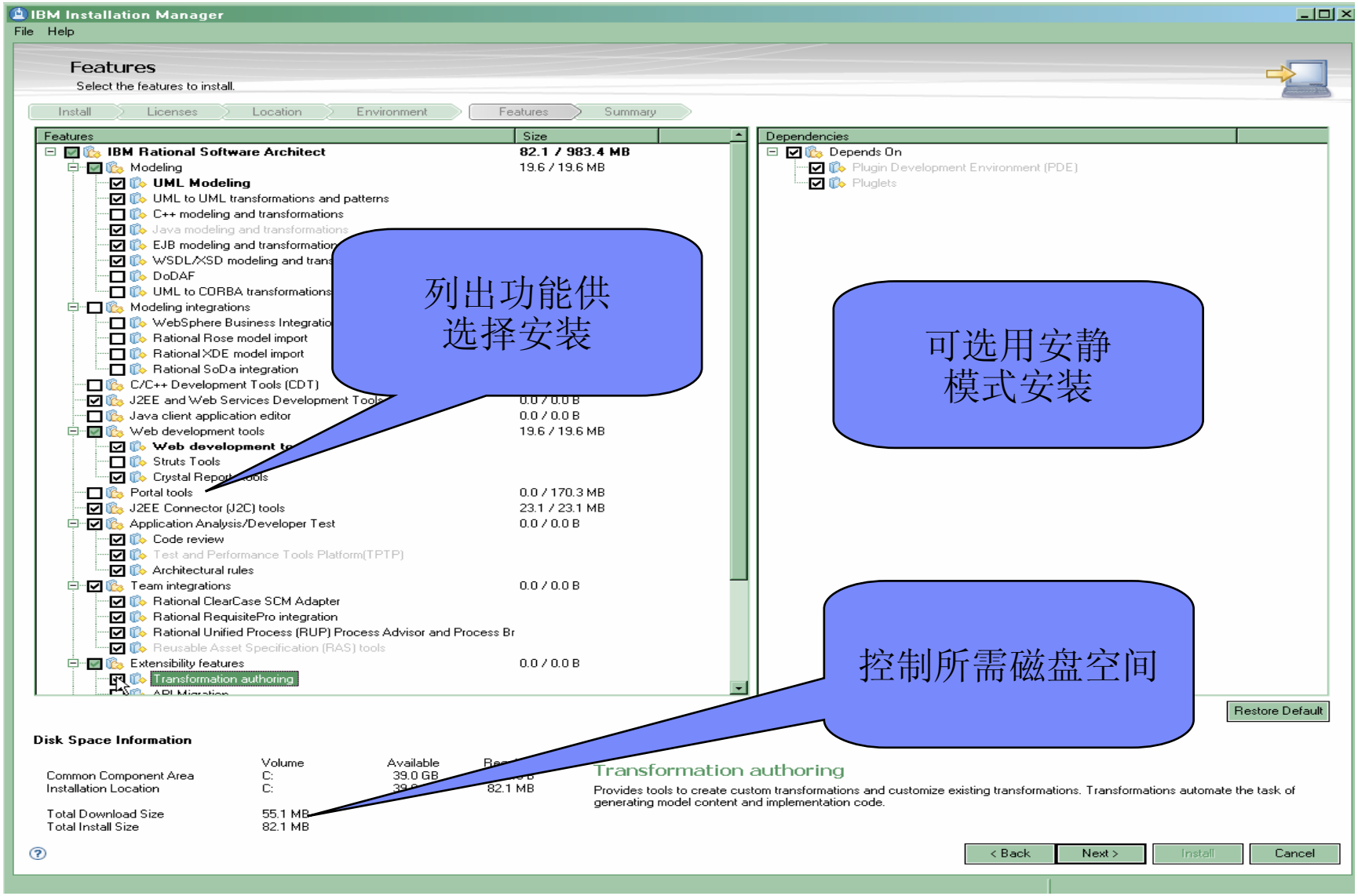
易于安装和部署



- 可选择安装到现有的Eclipse平台之上
  - 自动检查插件的版本及兼容性
- 供安装的是粒度更细的功能
- 管理插件功能的更新
- 从试用版转向正式版本时不需要重新安装
- 充分满足了beta版本用户的要求

IBM Installation Manager



初步入门：用户助手

- New User Assistance model to enable users of all skill levels
- Leverages Product Tours to assist with the discoverability of capabilities
- Tutorial Gallery leverages tutorials as learning aids
  - “Watch and Learn”
  - “Play and Learn”
  - “Do and Learn”
- Samples gallery provides completed assets for reference purposes
  - Showcase
  - Application
  - Technology
- All user assistance can be launched from a Welcome perspective

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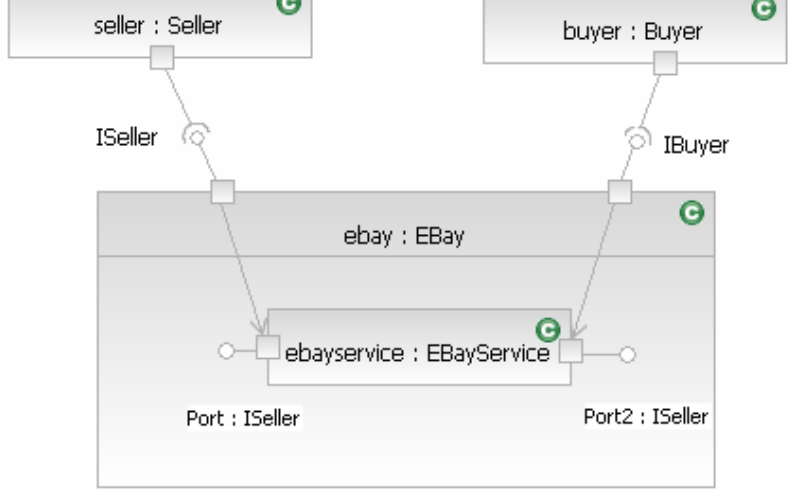
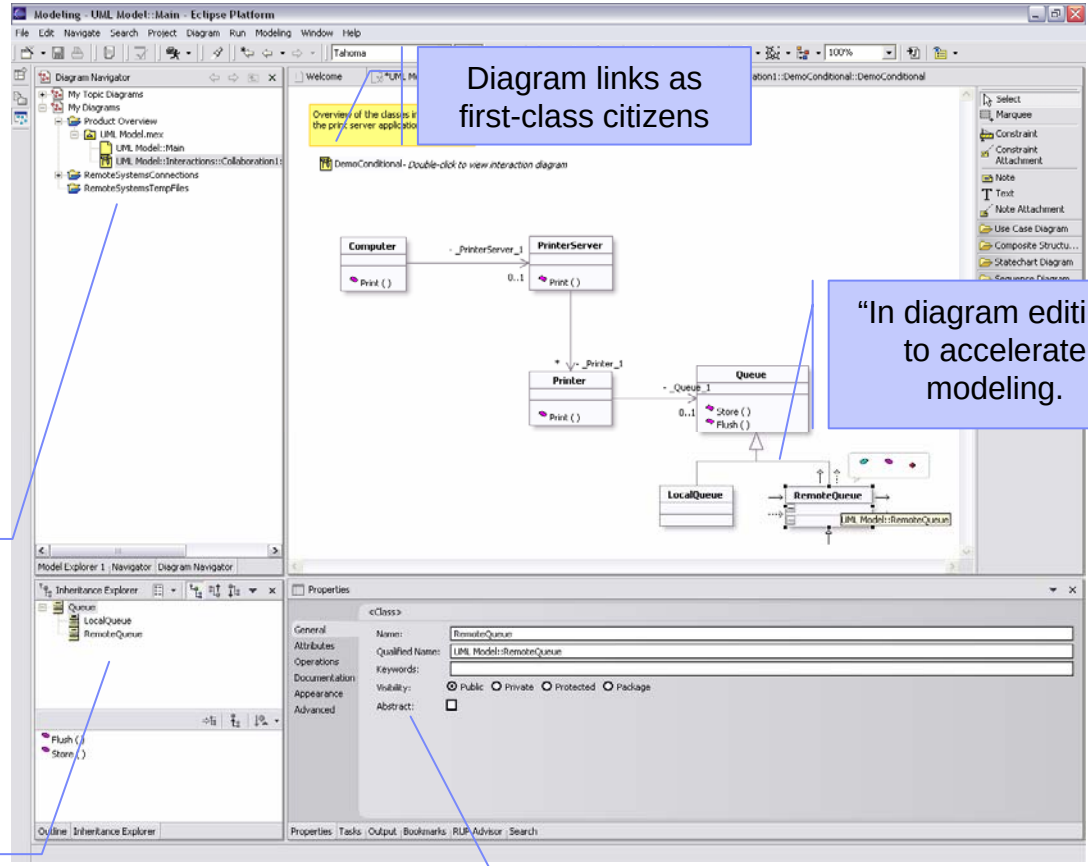
Unified Modeling Language (UML) 2.1 支持

- Rational Systems Developer基于最新的开放标准 Unified Modeling Language (UML) v 2.1.
- Supports 构架图和设计规格书
  - 类，信息，组件，混合结构，部署，活动，顺序，状态，对象和用例图
- 自动图例生成



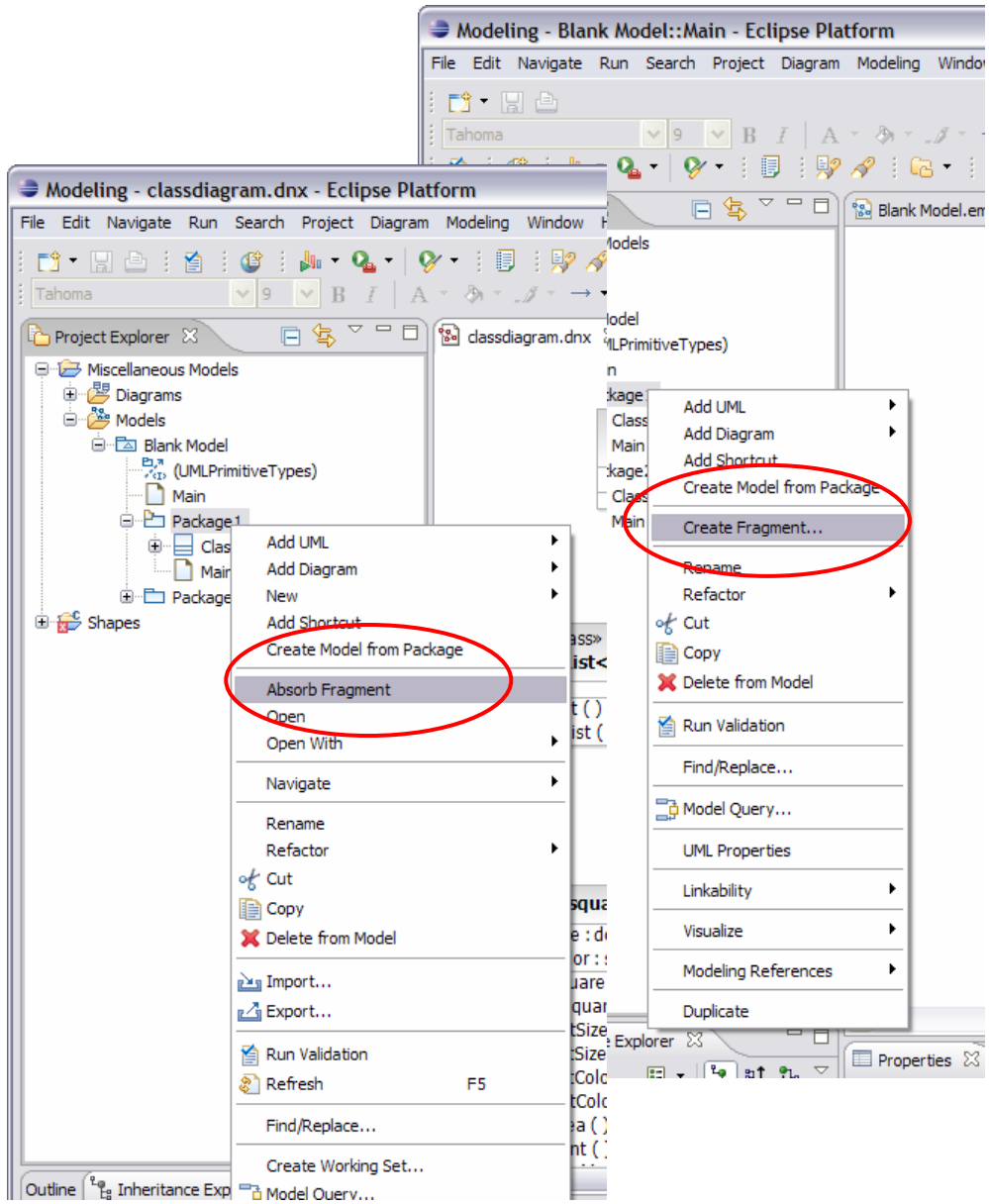
建模助手

- Simplify the capture of UML models during Analysis and Design
- Make modeling more accessible to a broader audience
- New custom views improve the editing experience



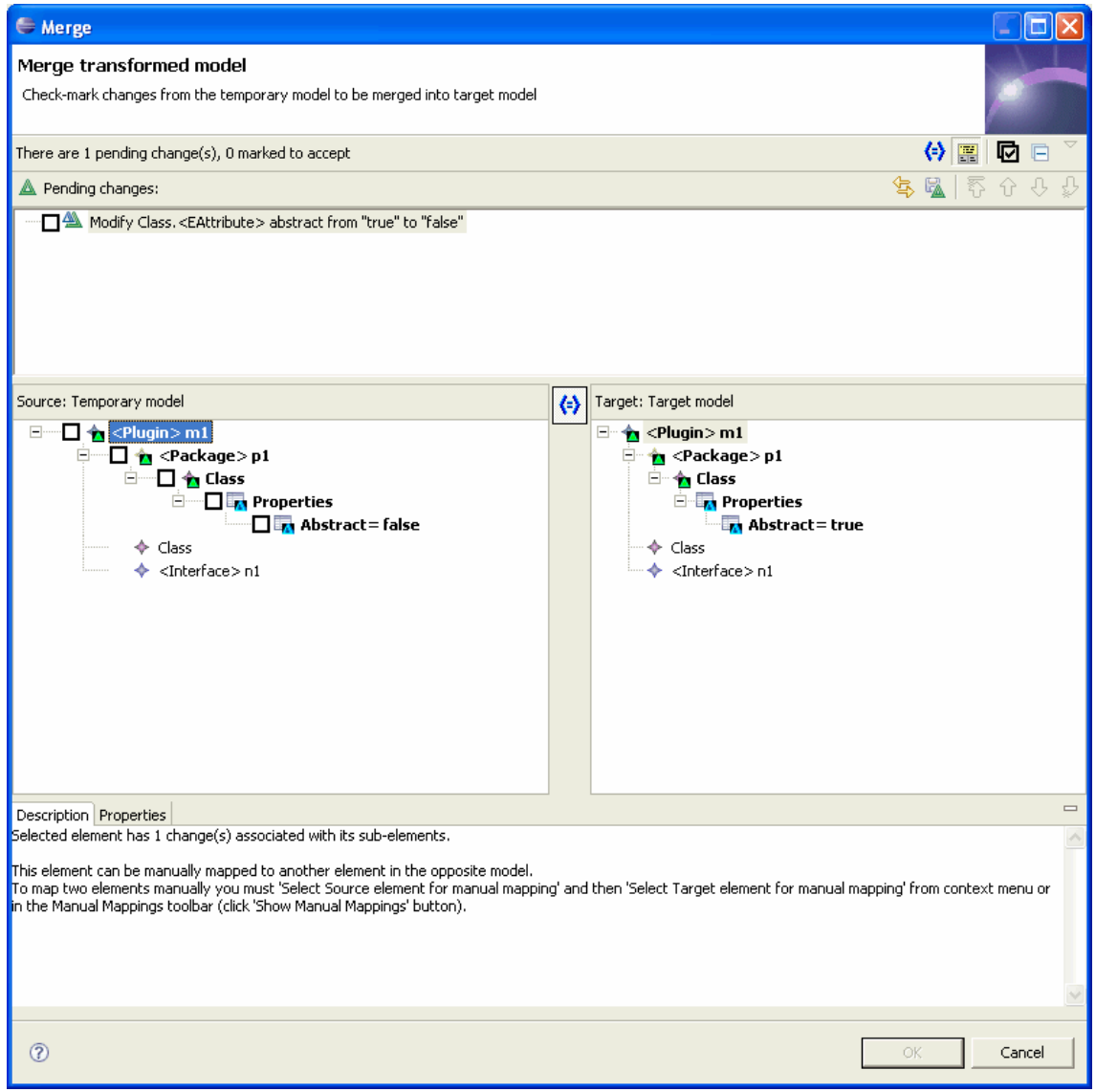
模型子单元的支持

- Create model fragments (Sub-units) from existing model elements (packages & classes)
  - Allows for independence of physical structure from logical structure
- Model fragments can be version controlled
  - Provides for better team development support
- Model fragments can also be absorbed back into a model at a later point



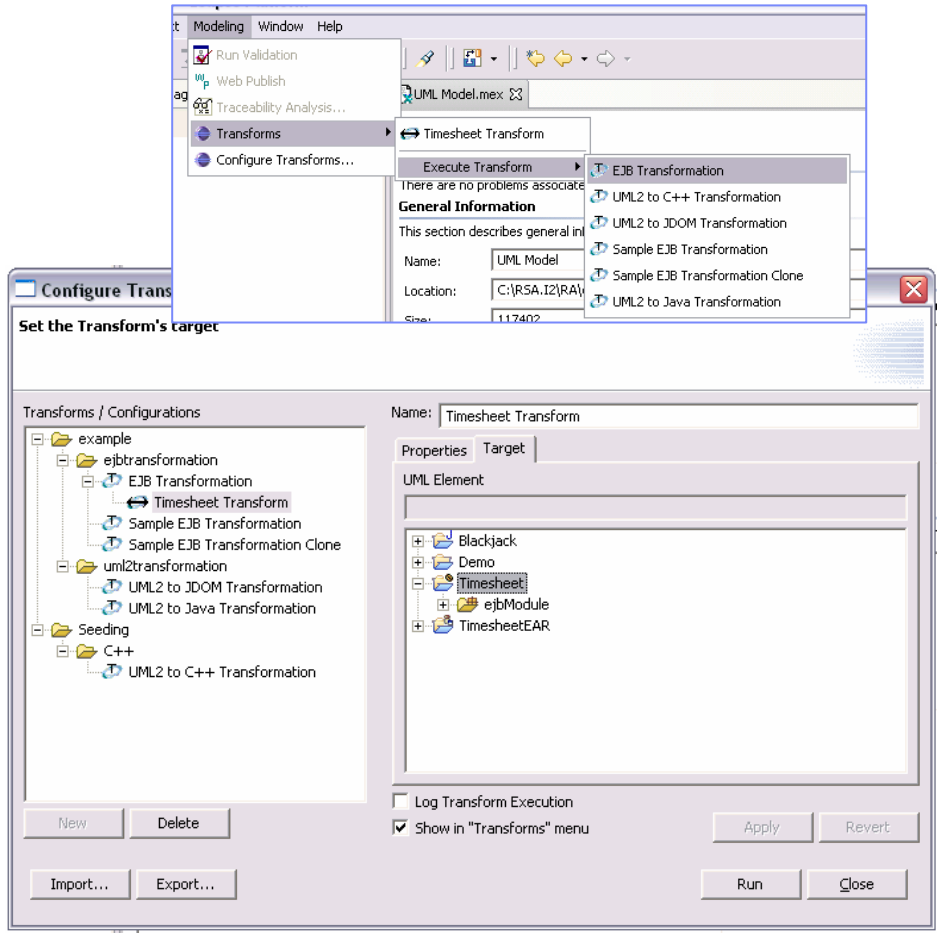
模型的合并

- Merge two arbitrary models into one
- Compares by qualified name instead of identity
- If only add deltas are encountered, it will run silently
- Manual matching allows model trees to be realigned where the user knows a match should exist
- Pluggable
- Extensible



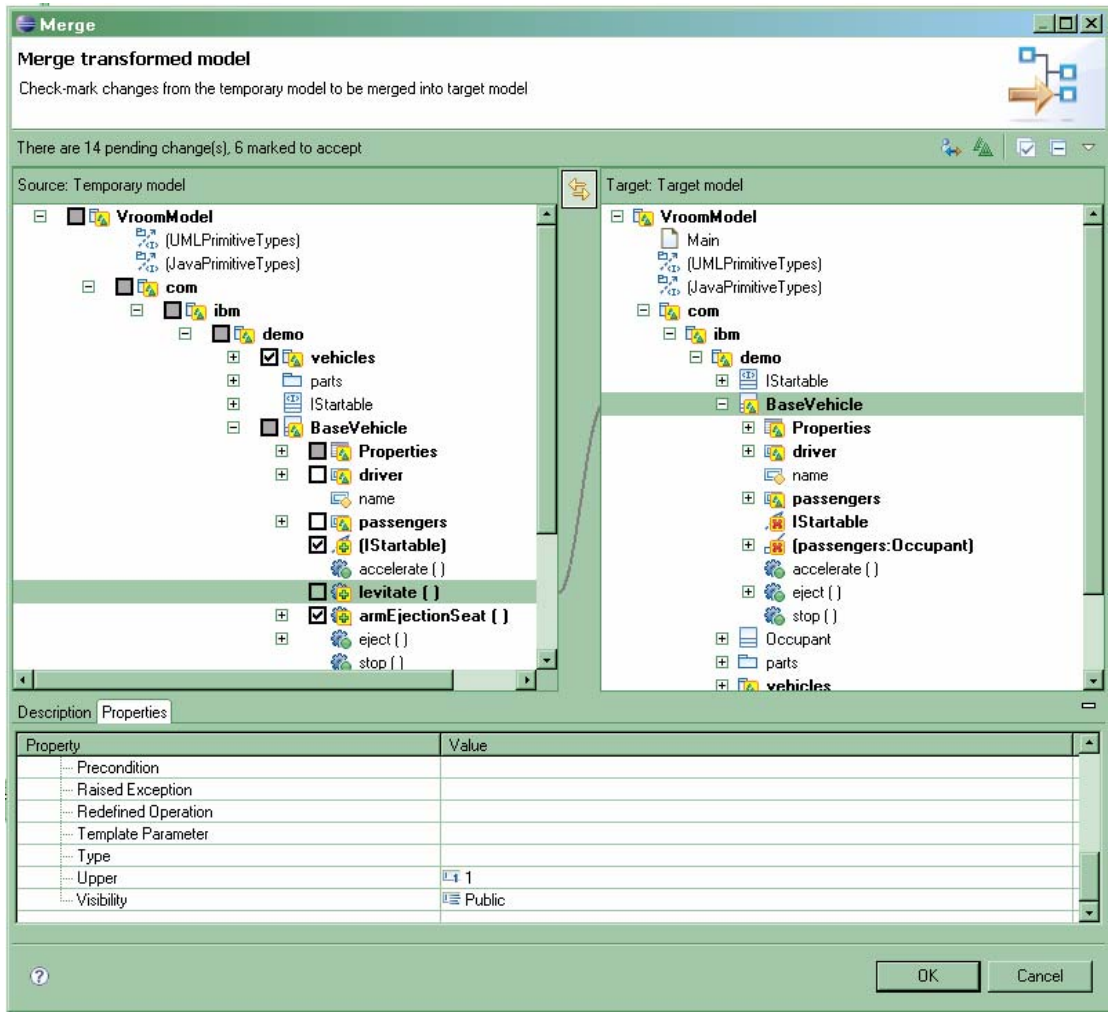
转化

- 对于批处理风格的计算密集型的操作，转换是最佳的方式。
  - 模型到模型
  - 模型到代码
- 代码转换
  - Java (including Java 5)
  - Java inverse / reconciliation
  - C++ (non-destructive re-apply, inverse / reconciliation)
  - CORBA IDL
  - C, Rose-RT
- 转化能通过IBM developerWorks 上的RAS库来更新



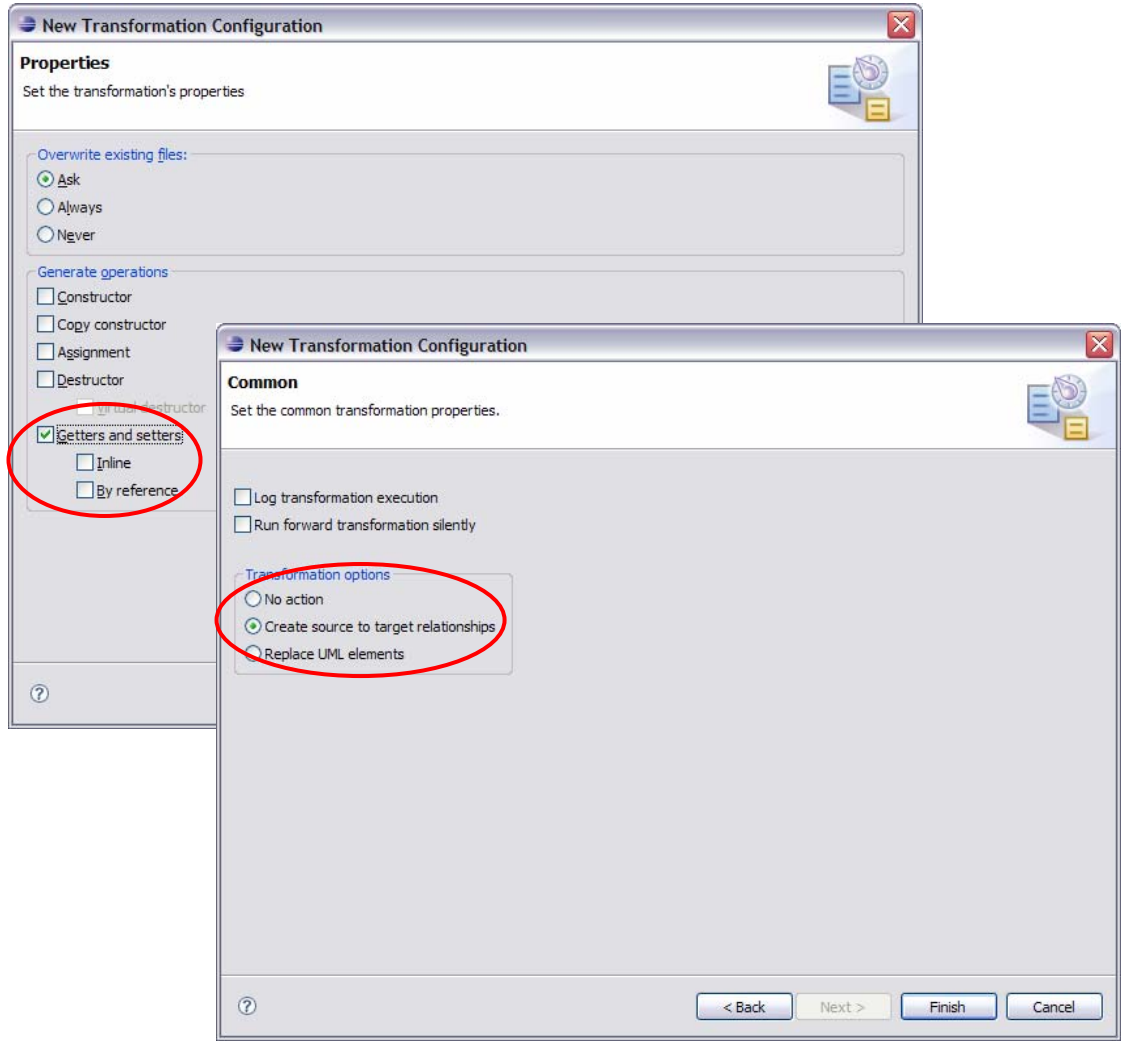
模型和代码的正逆向工程

- Benefits:
  - Allow Globally Distributed teams to work on design and implementation and reconcile results
- Enhanced Diff/Merge capabilities in Version 7.0
  - Reverse transform code to model
  - Reconcile models
  - Merge resulting model
  - Forward transform model to code
- Reverse Engineering for code-to-model transformation
  - Reverse transformations for Java, C++



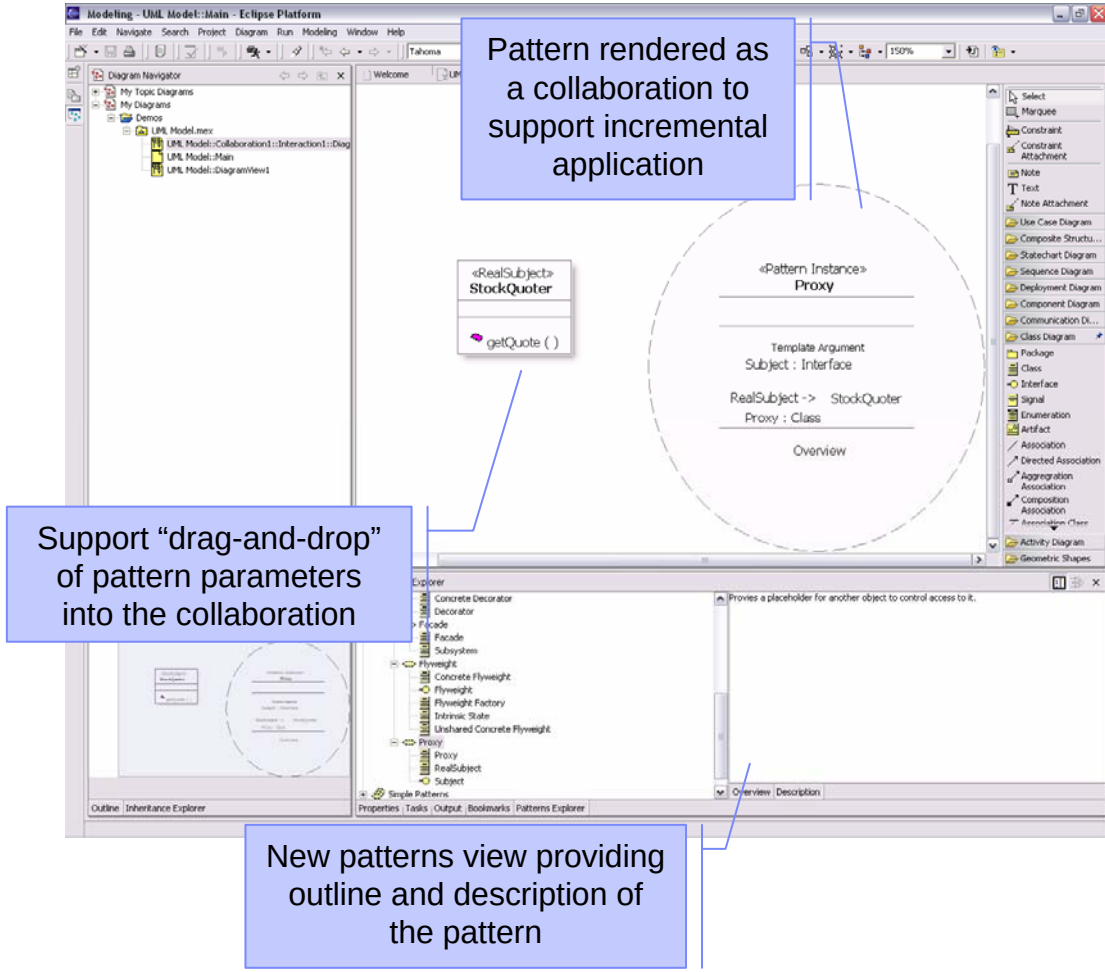
UML到C++ 转化

- Transform & Replace support
- Generate Getters & Setters
  - Also generate Inline or By reference
- Transform Re-apply support
  - Removal of @generated tag preserves user code
- Reverse Transform and Merge
- Model to source traceability
  - Creates <<derived>> relationship



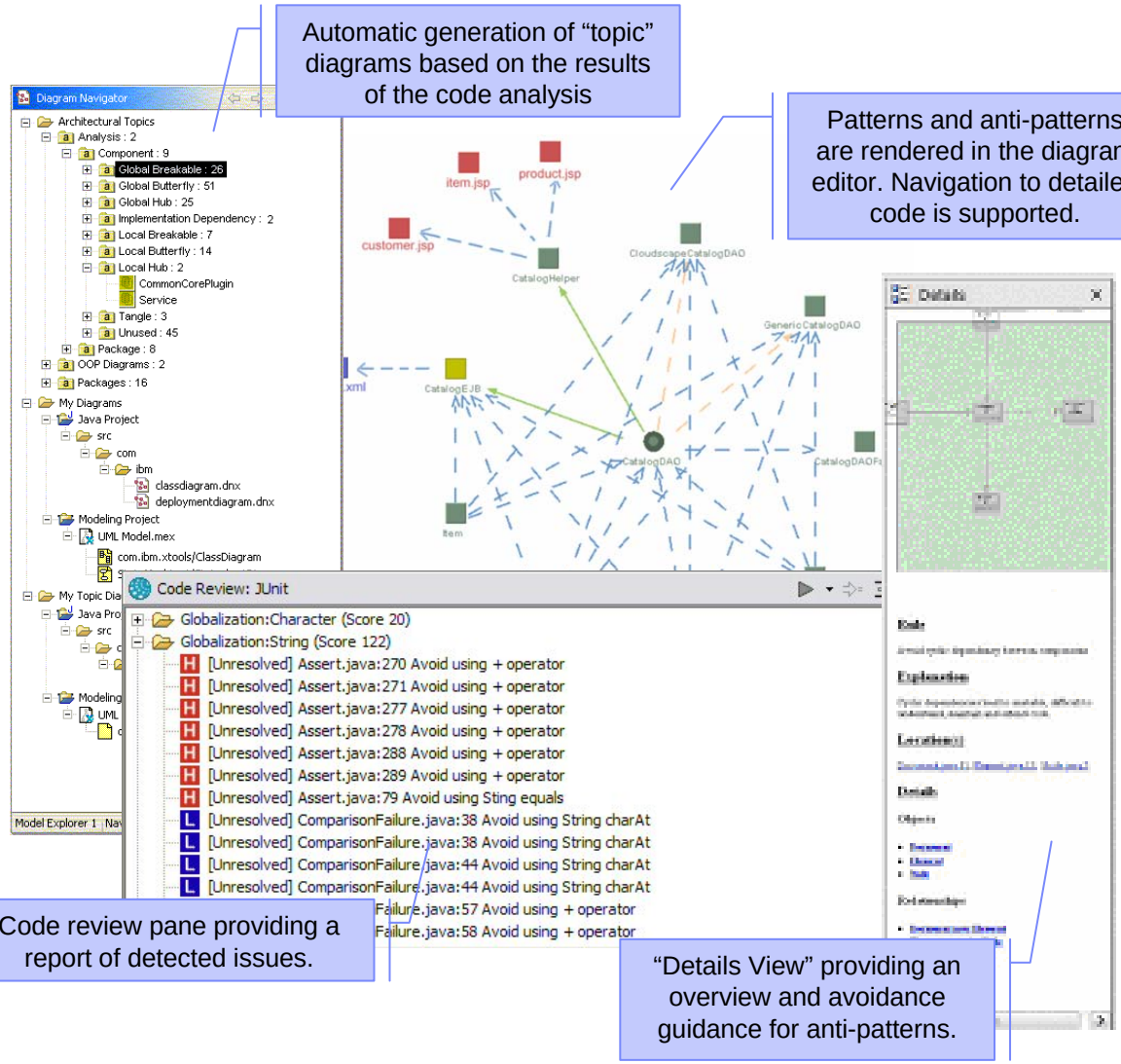
模板

- 模板的应用是很简单的
  - 模板演化的经验基于错误的积累
- 通过使用开发的API, 模板的构建者提供了很大的适应性
- 四个设计模板的所有的Gang都提供
- 在IBM developerWorks中，以RAS文件的形式提供了附加的模板提供



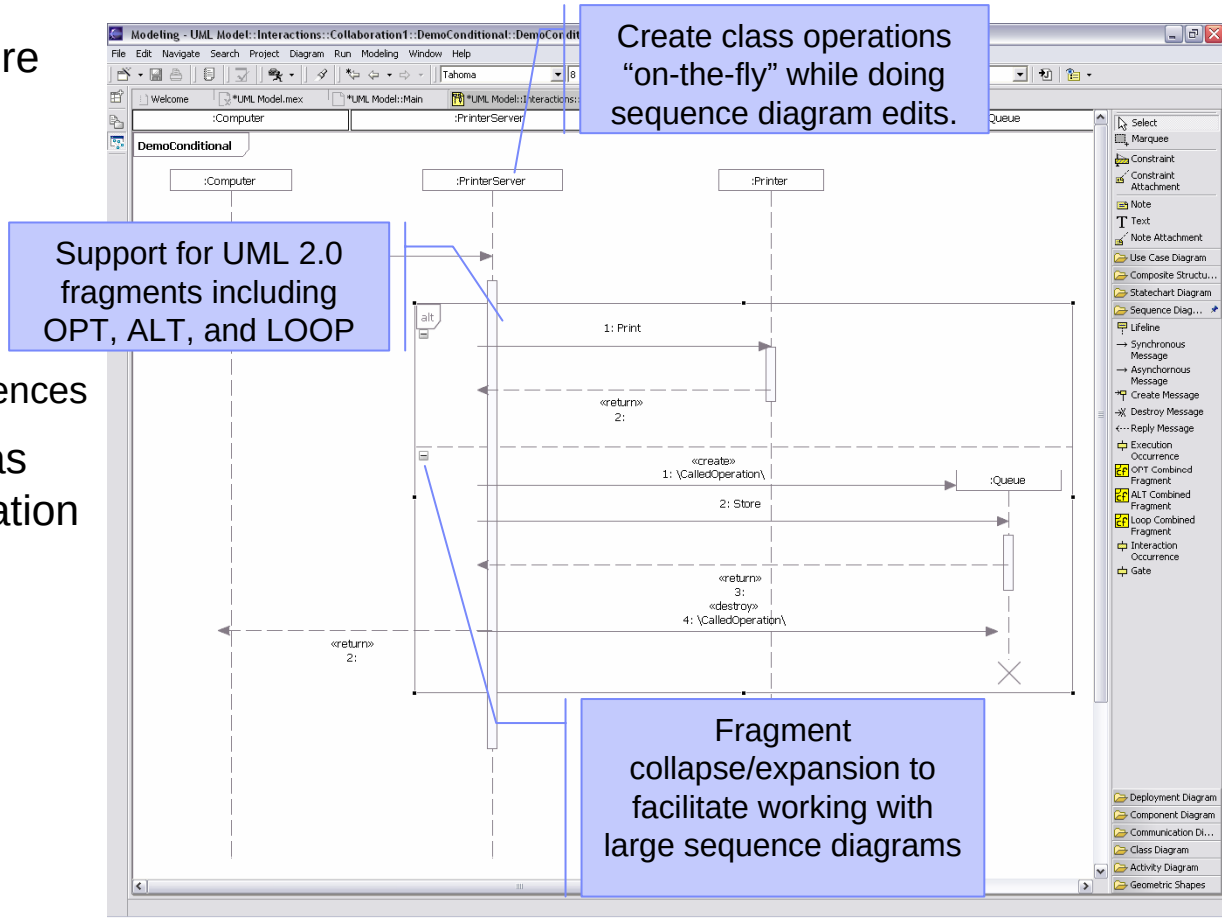
构架的分析，理解和控制

- Architecture discovery for J2SE
  - High-level software visualization
- Application architecture is reflected in the running code
  - Analyzing code can help assess its maintainability
- Govern the architecture with the assistance of rules
  - Template-based rule authoring
- Anti-pattern and pattern detection
  - Detection of cyclic dependencies, hubs, breakable, etc.
  - Wizard assisted automated quick-fix

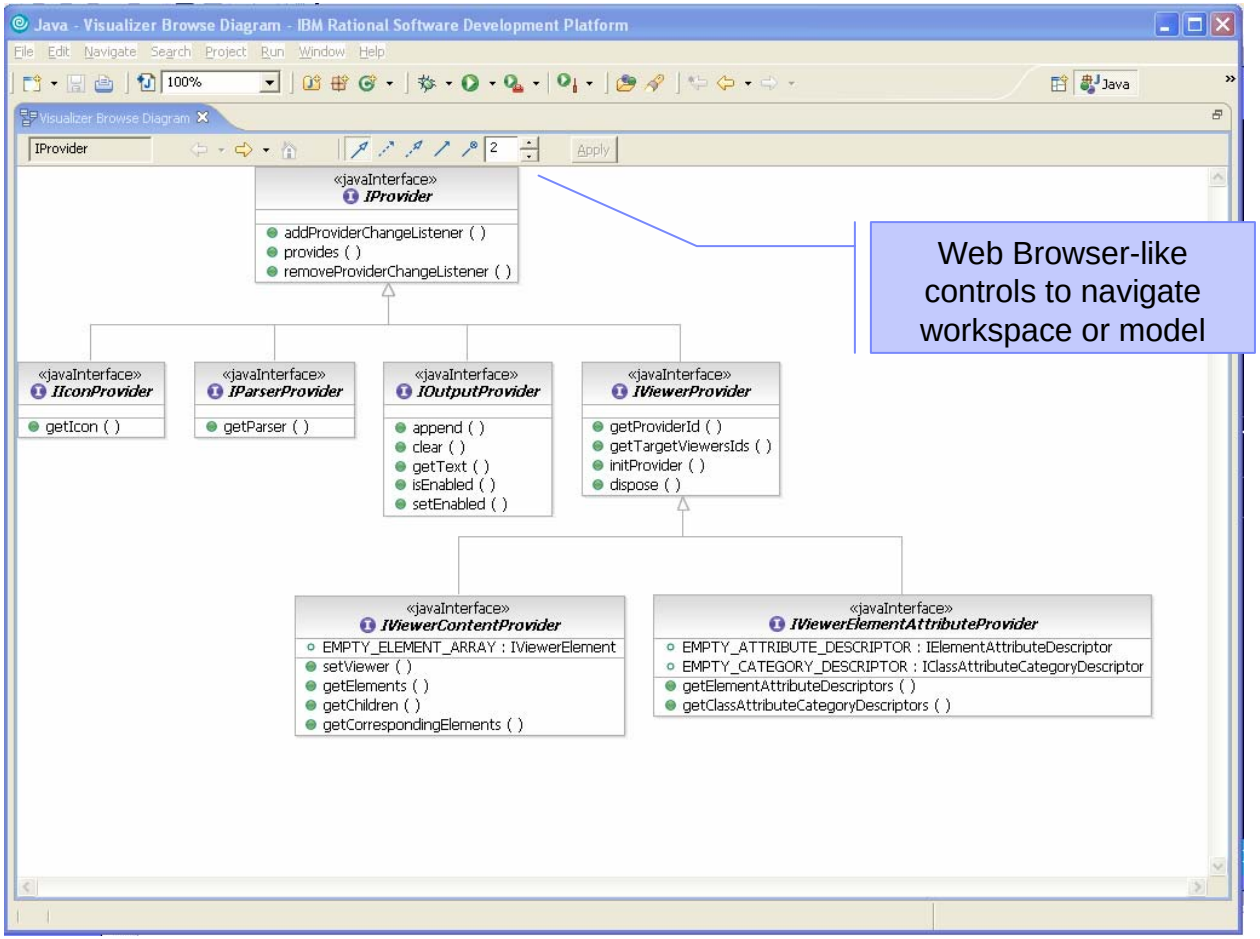


交互建模

- Interactions are expressed more effectively using UML 2.0 constructs
  - Support specification of test scenarios
    - Loop, alt, opt
    - Interaction fragment references
- Interactions can be rendered as either sequence or communication diagrams
- Sequence diagram editing improvements
  - Ordering and reordering



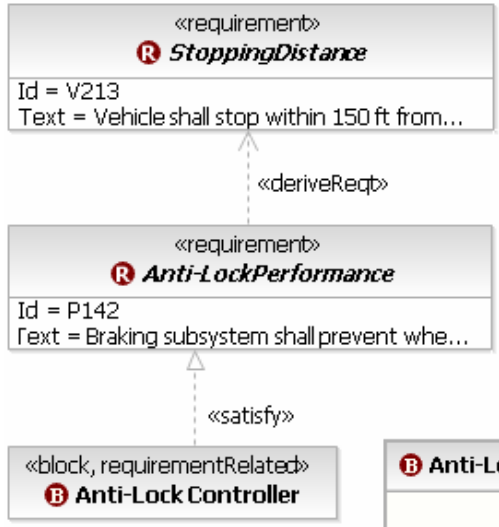
浏览图

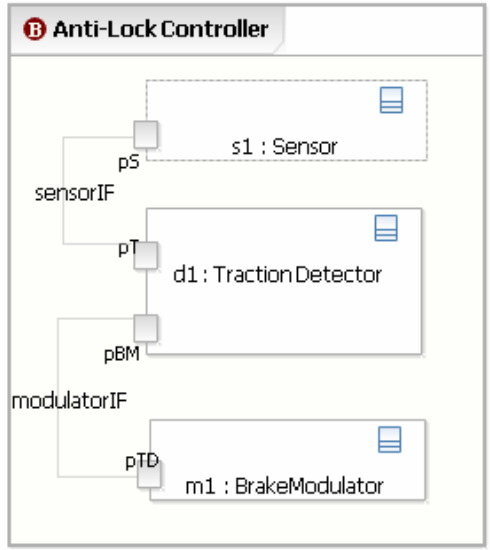


Enables users to understand and discover models and applications without having to create or maintain diagrams

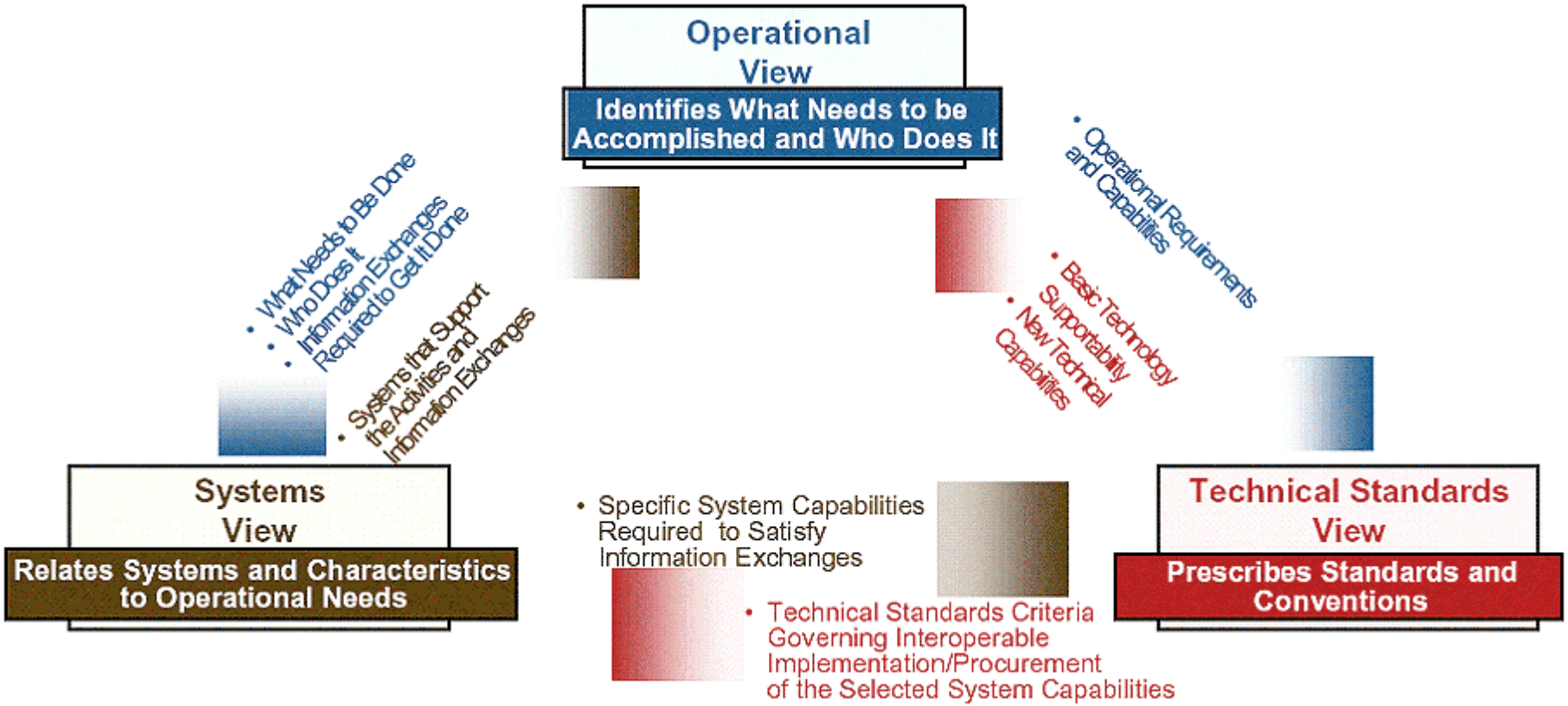
SysML和模拟工具包

- 通过支持SysML 1.0，使用户实现对硬件、软件、数据、人员、过程和设施等系统的建模
- 运用精巧的查询和验证机制保证SysML模型的完整和准确
- SysML的需求可与Requisite Pro和Telelogic DOORS®集成
- 在建造系统之前执行和模拟UML和SysML模型以检验其架构
- 通过一致的设计环境，减少系统和软件工程师之间的沟通障碍





DoDAF: 一个构架－四个视图

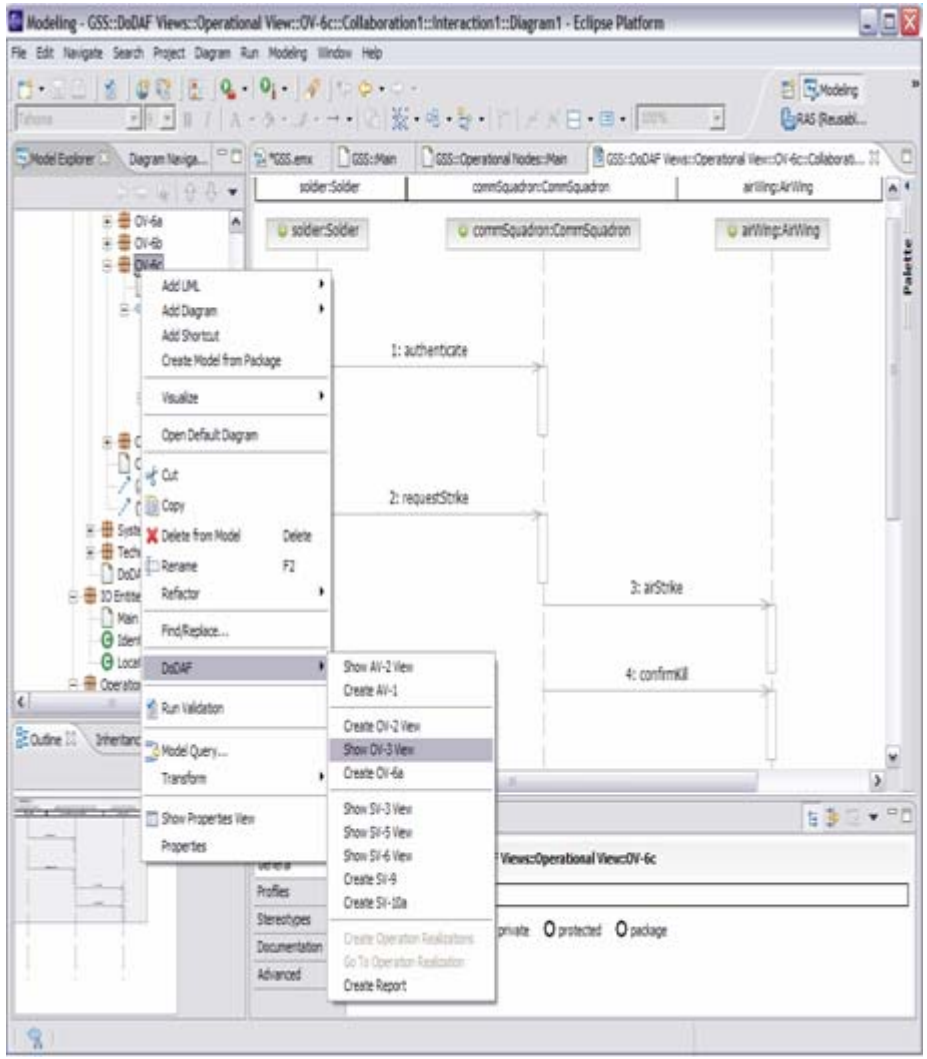


All Views

Source: DoDAF Volume I

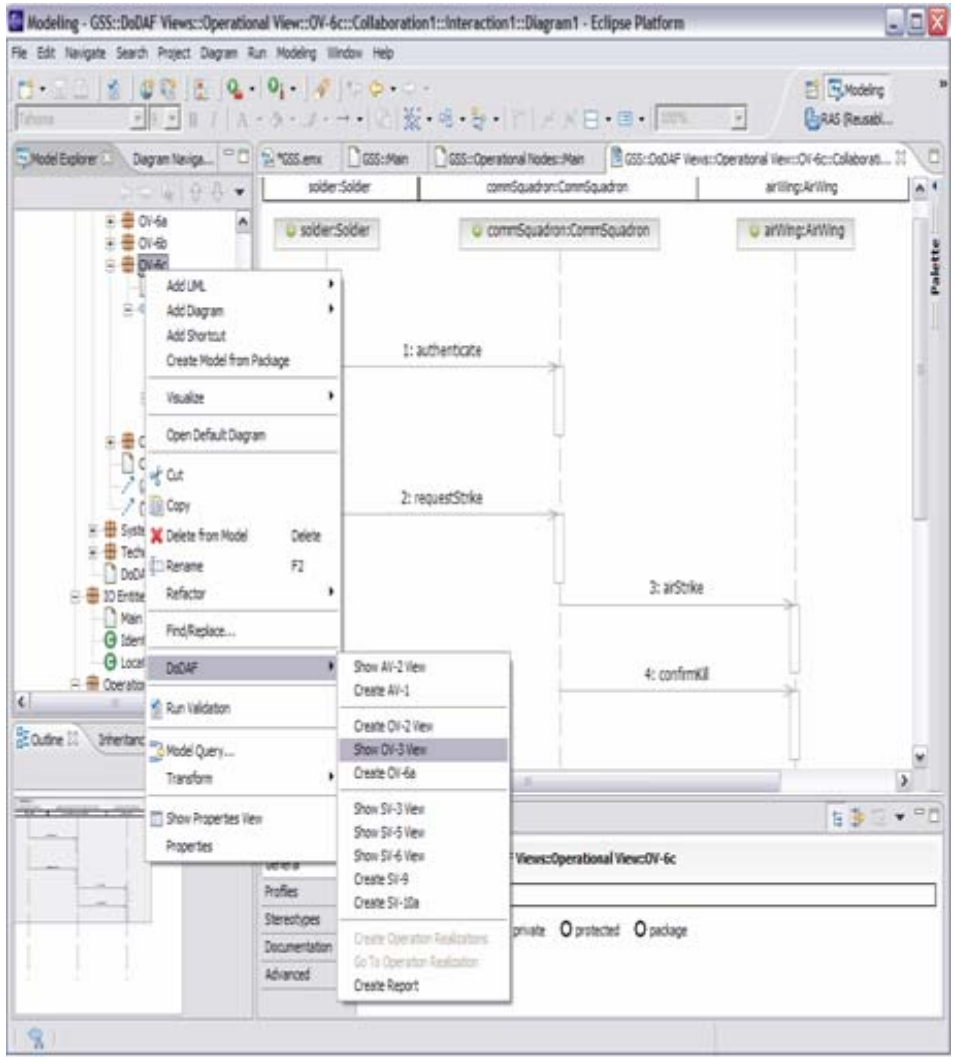
DoDAF 在 Rational Systems Developer好处

- 以可重用的资产的形式，鉴别，分类，创建DoDAF内容
- 自动的度量，确保一致性
  - AV-2, OV-3, SV-3, SV-4, SV-5, SV-6
- 所用的DoDAF视图的报告
  - 生成Word文档
- 导入用户自定义的图 (OV-1)
- DoDAF模型框架，用于产生产品和视图
- 集成模型的生成和运行 (OV-6b)
  - 用Ready For Rational Partner (RFRP) Pathfinder Solutions Pathmate products，用UML 2.0 和架构确认，生成可运行的架构
  - 用RFRP E+ ，SysML 支持



扩展!: RSD 对DoDAF的支持

- Eclipse/EMF 3.2 支持UML 2.1
- 包含在RSD的基础安装之中
- SV-5支持活动到功能或功能到活动的映射关系
- 用户界面的多国语言支持
- 提供跟据DoDAF视图上下文相关的帮助
- 增强了DoDAF图的扩展布局
- 可用性增强
- 自动生成与MS Office XP和2000兼容的报表



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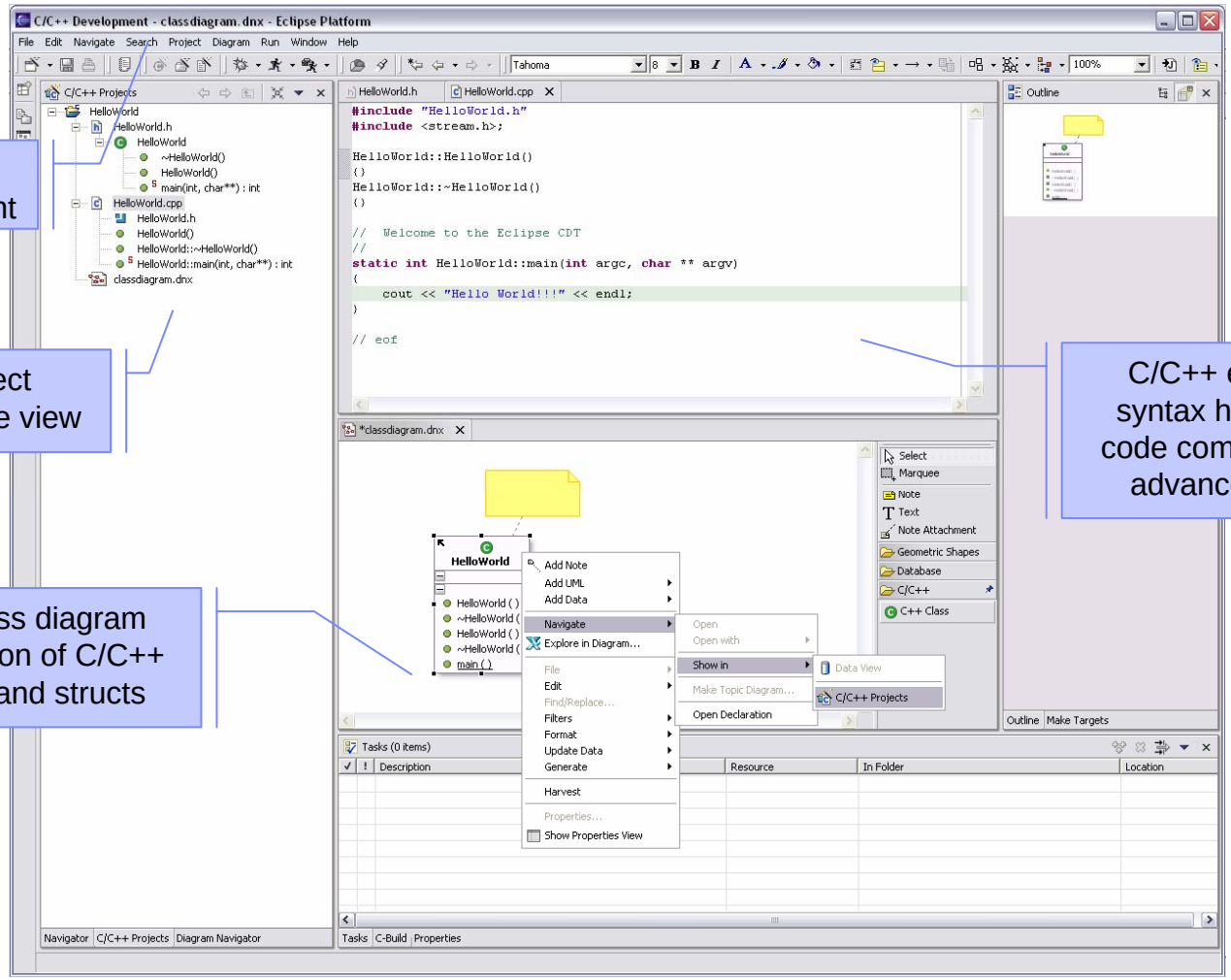
C/C++ 开发环境CDT

Perspective for C/C++ Development

C/C++ project hierarchical tree view

UML class diagram visualization of C/C++ classes and structs

C/C++ editor with syntax highlighting, code completion, and advanced search



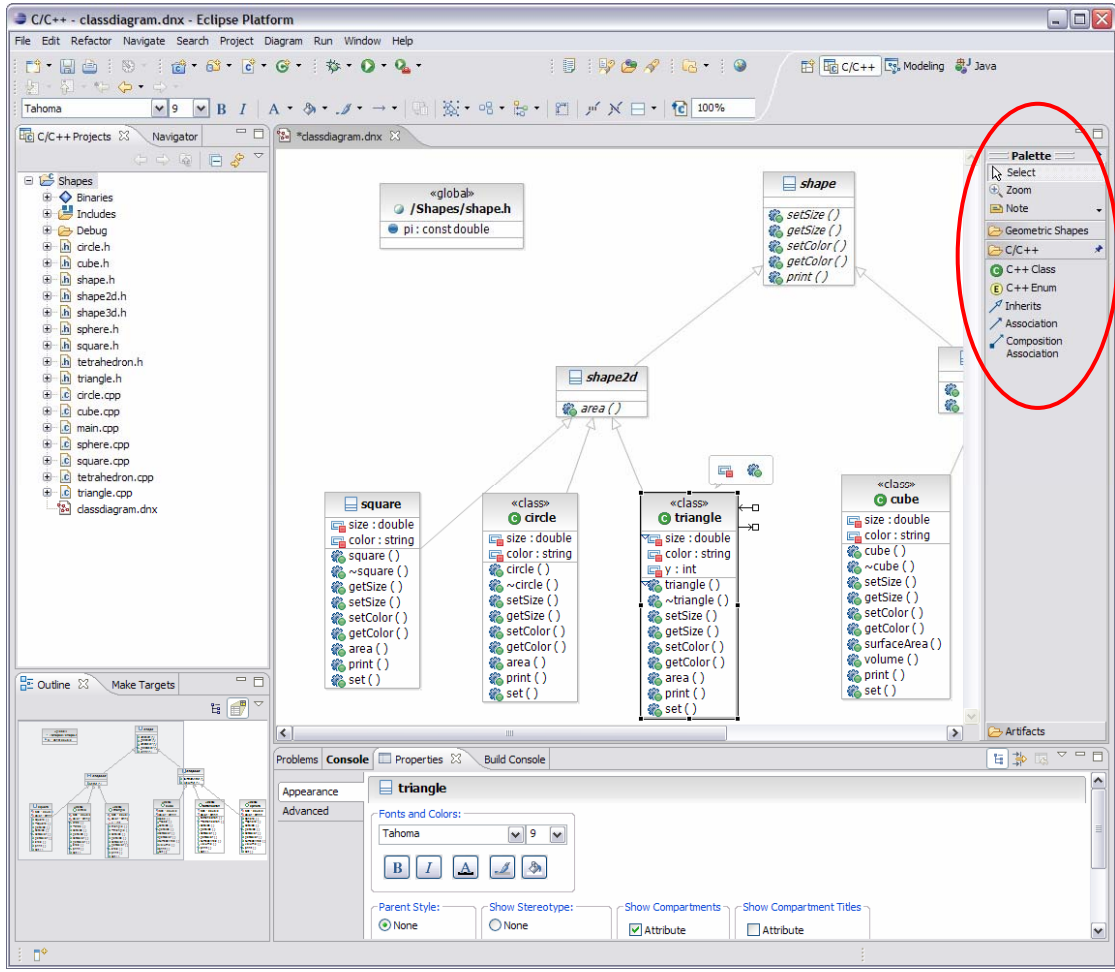
C/C++ 开发环境

Built on Eclipse CDT v3.1

- Editing and Navigation
  - C/C++ Syntax Highlighting, Outline View
  - C++ Class Browser (Hierarchy View)
  - C/C++ Search
  - C/C++ Content Assist
- Project Import
  - Automated assistance in setting up CDT for search and content assist.
- UML C/C++ Code Editor
- Debug
  - GDB Integrated
  - Extensible Debug Interface
- Build
  - Standard Make for projects with existing build infrastructure
  - Managed Build
    - Automatic makefile generation
    - GNU tools supported out of box
    - Managed build is extensible, build tools can be plugged-in and build tools options selectable
- Meets Internationalization and Accessibility requirements
- Extensibility
  - Provides extension points for managed build, debuggers, …

C++ 建模

- Improved diagram editing
  - Create both classes & enums
  - Create association & generalization relationships
  - Change visibility of fields or methods
  - Delete attributes or operations from diagram
- Improve refactoring from diagram
  - Refactor class, attribute & operation names
- C++ Template support
  - Visualized template types now show the template parameters
  - Creation of association & inheritance relations to and from template types is also supported,
    - wizards to help users fill in the template parameters
- Improved “Show Related Elements” support
- Auto-navigate from diagram to code



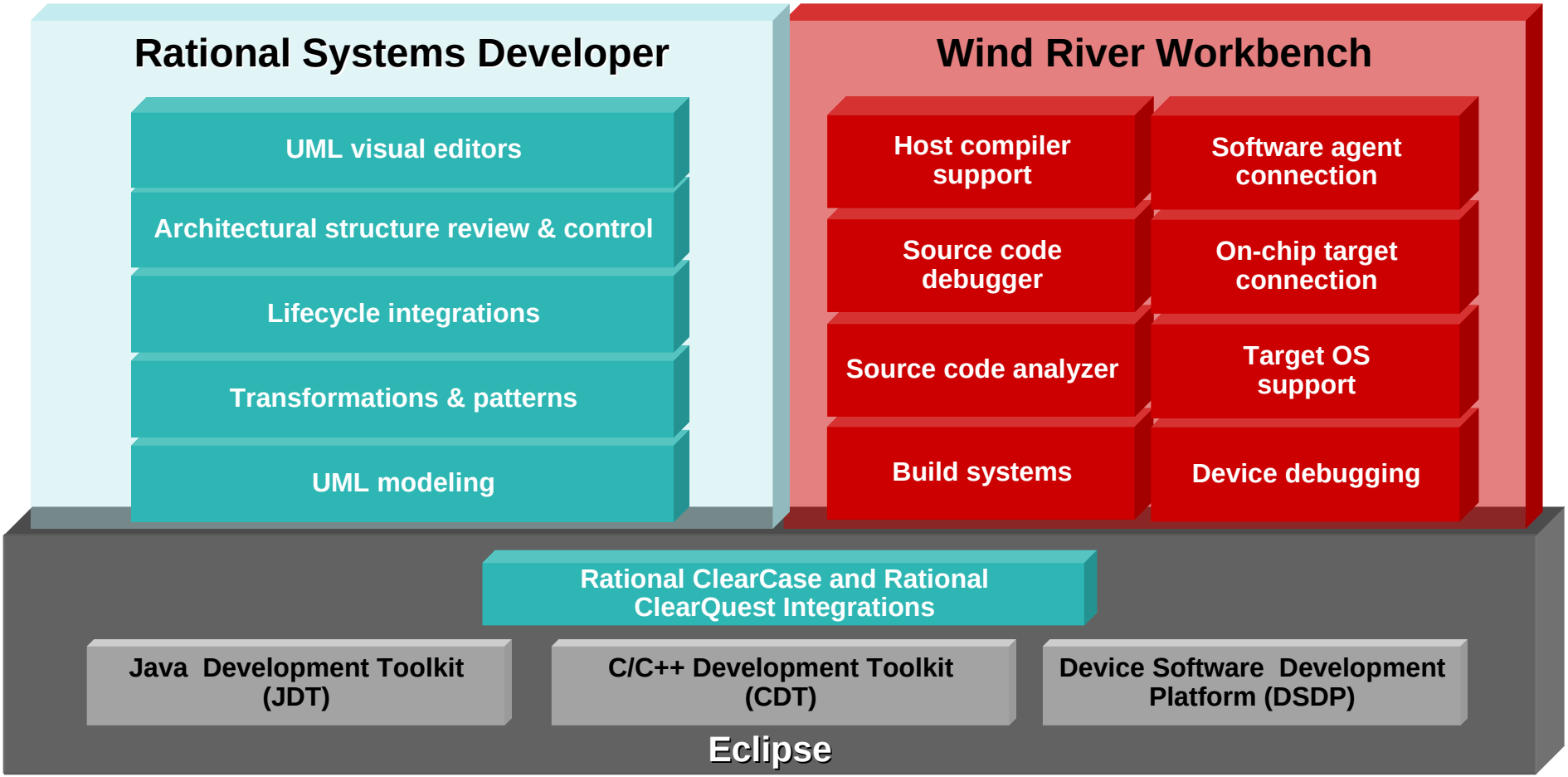
议程

- IBM Rational Software
- 系统开发所面临的挑战
- 模型驱动开发MDD
- Rational Systems Developer v7.0
  - Consumability
  - Architecture
  - Development
  - Integrations
- 总结

集成嵌入式的开发环境

利用Eclipse平台…
提供一套完整的系统开发解决方案

WIND RIVER



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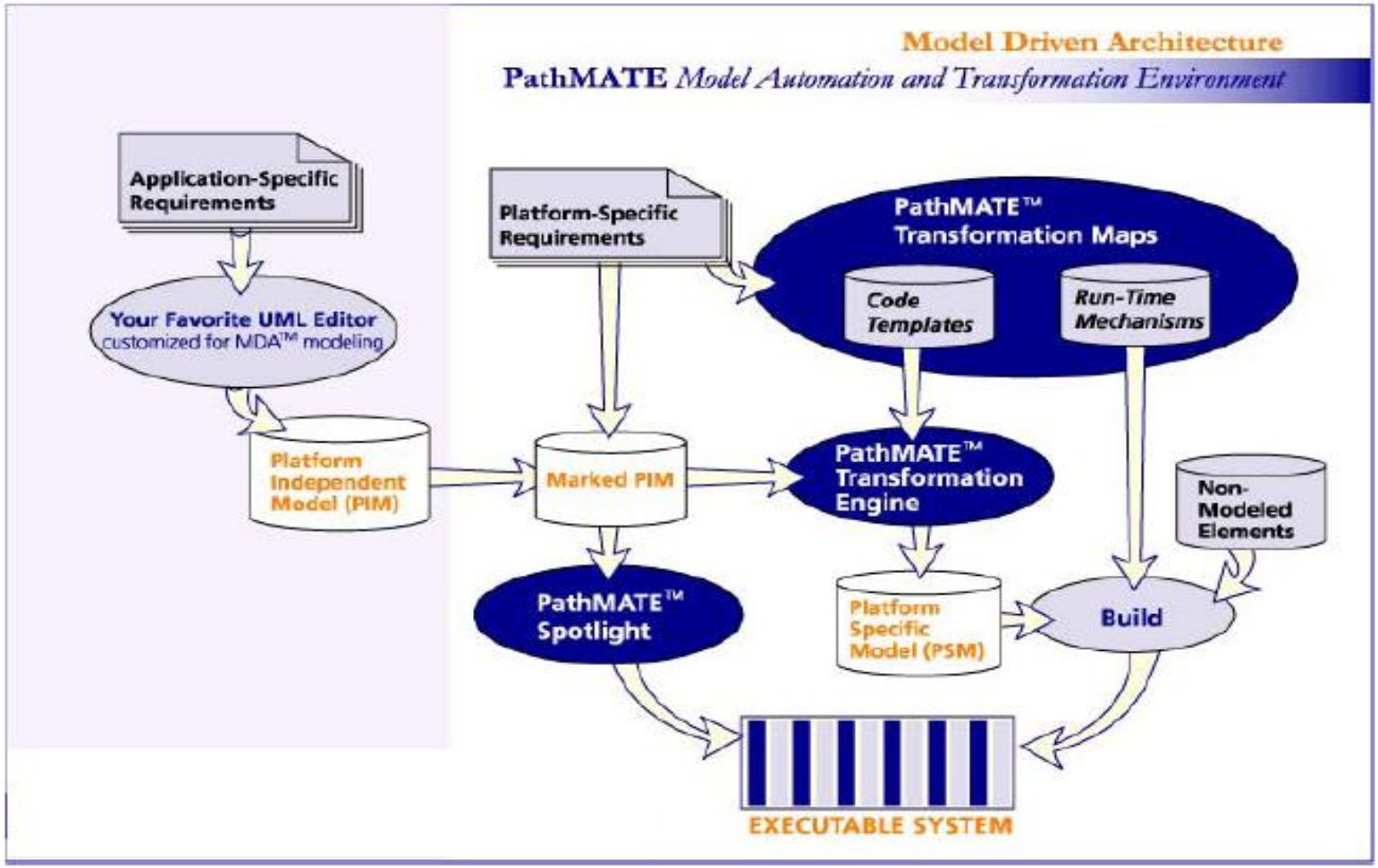
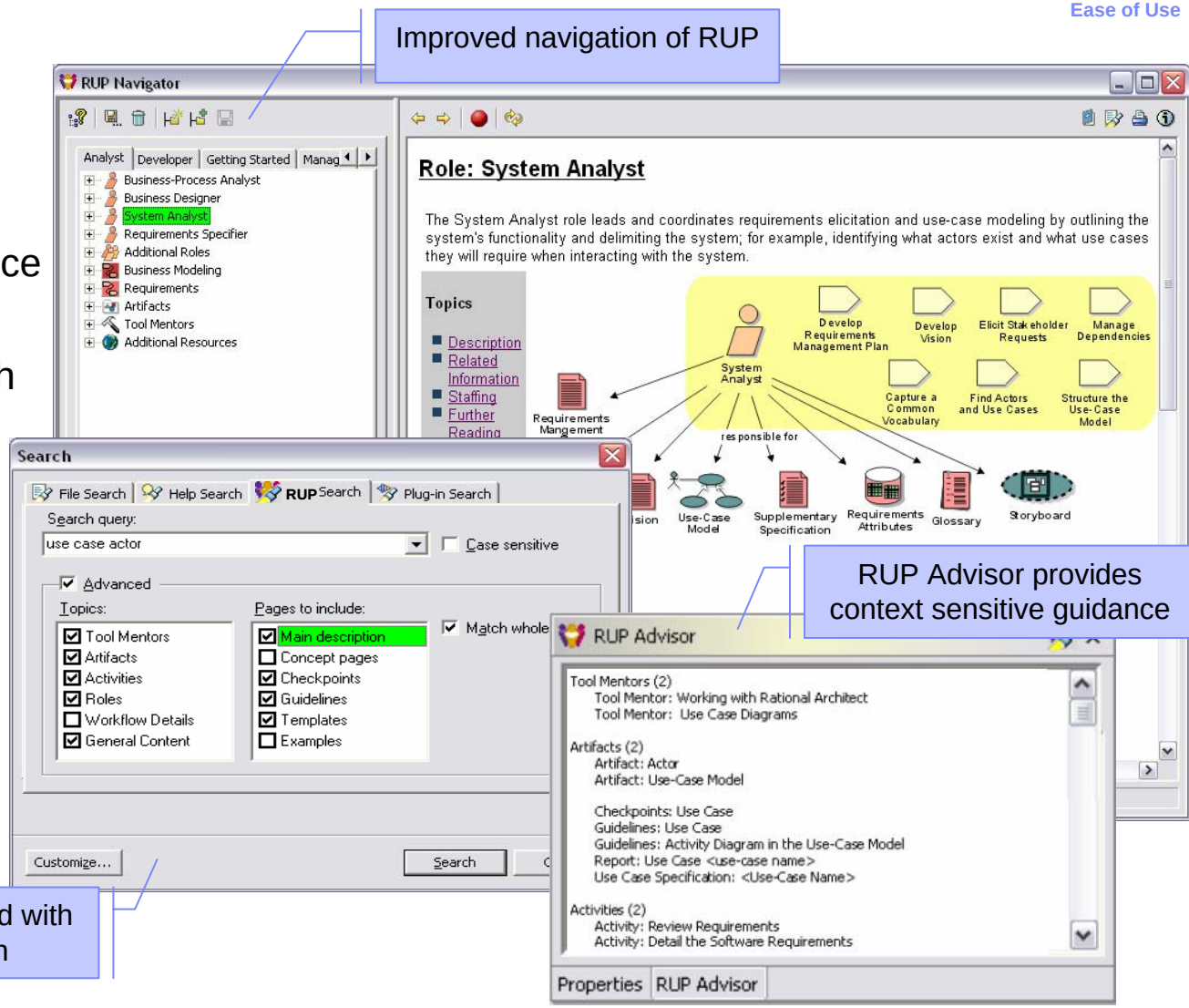


团队开发：过程向导

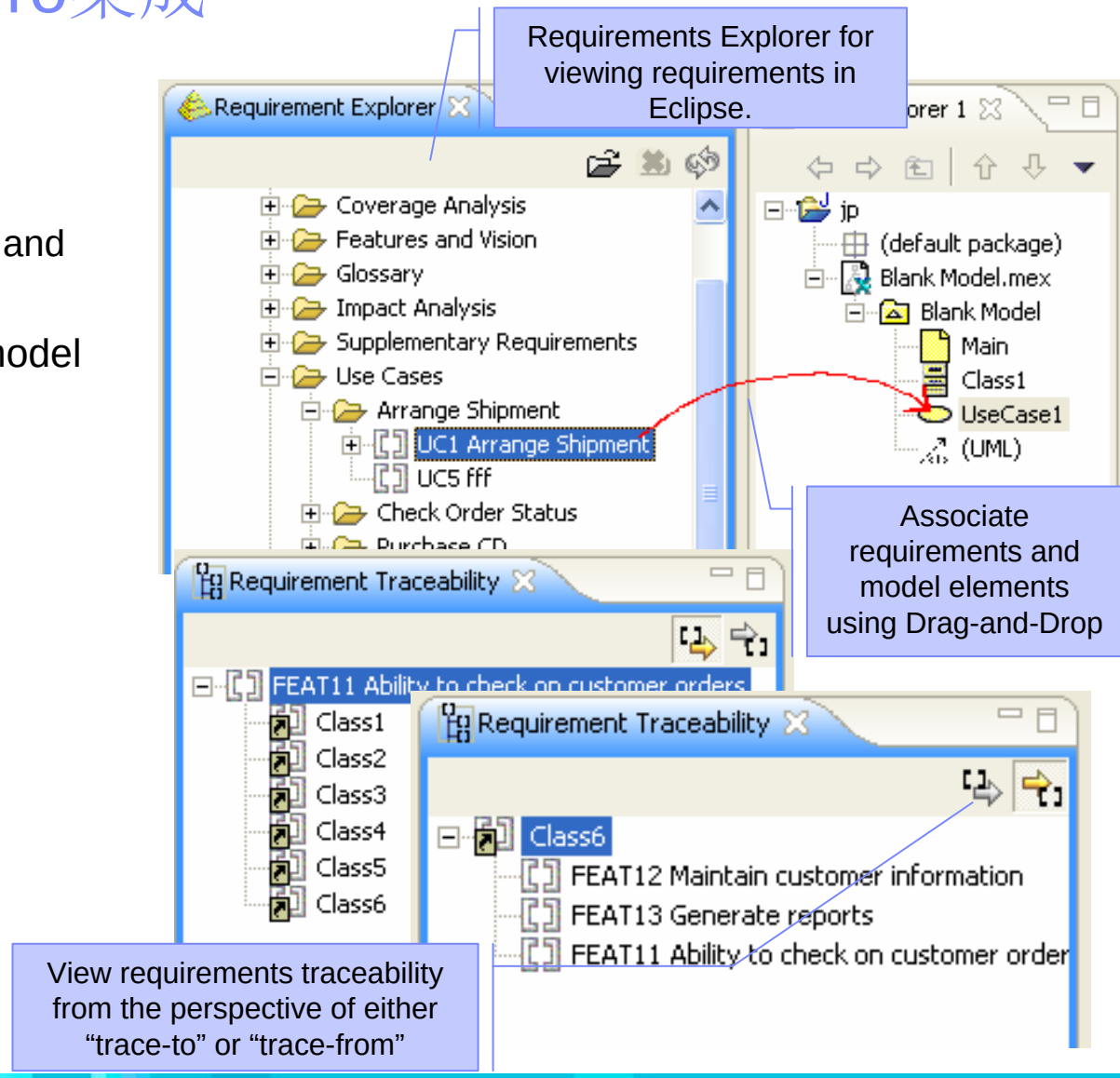
Ease of Use

- Integration with Rational Unified Process for Systems Engineering (RUP-SE)
- Tool Mentors provide guidance for activities
- User customizable views with user defined content

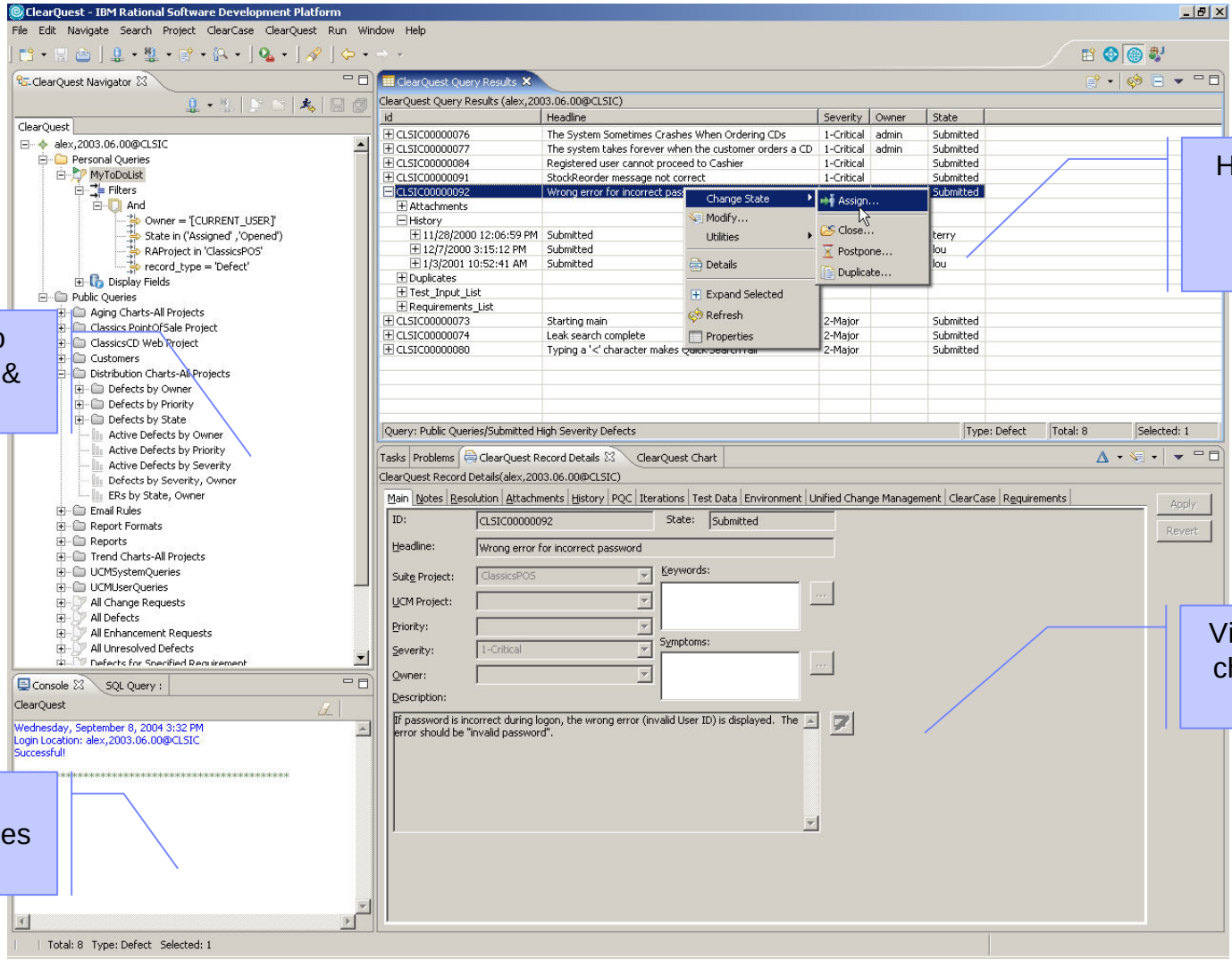


团队开发: RequisitePro集成

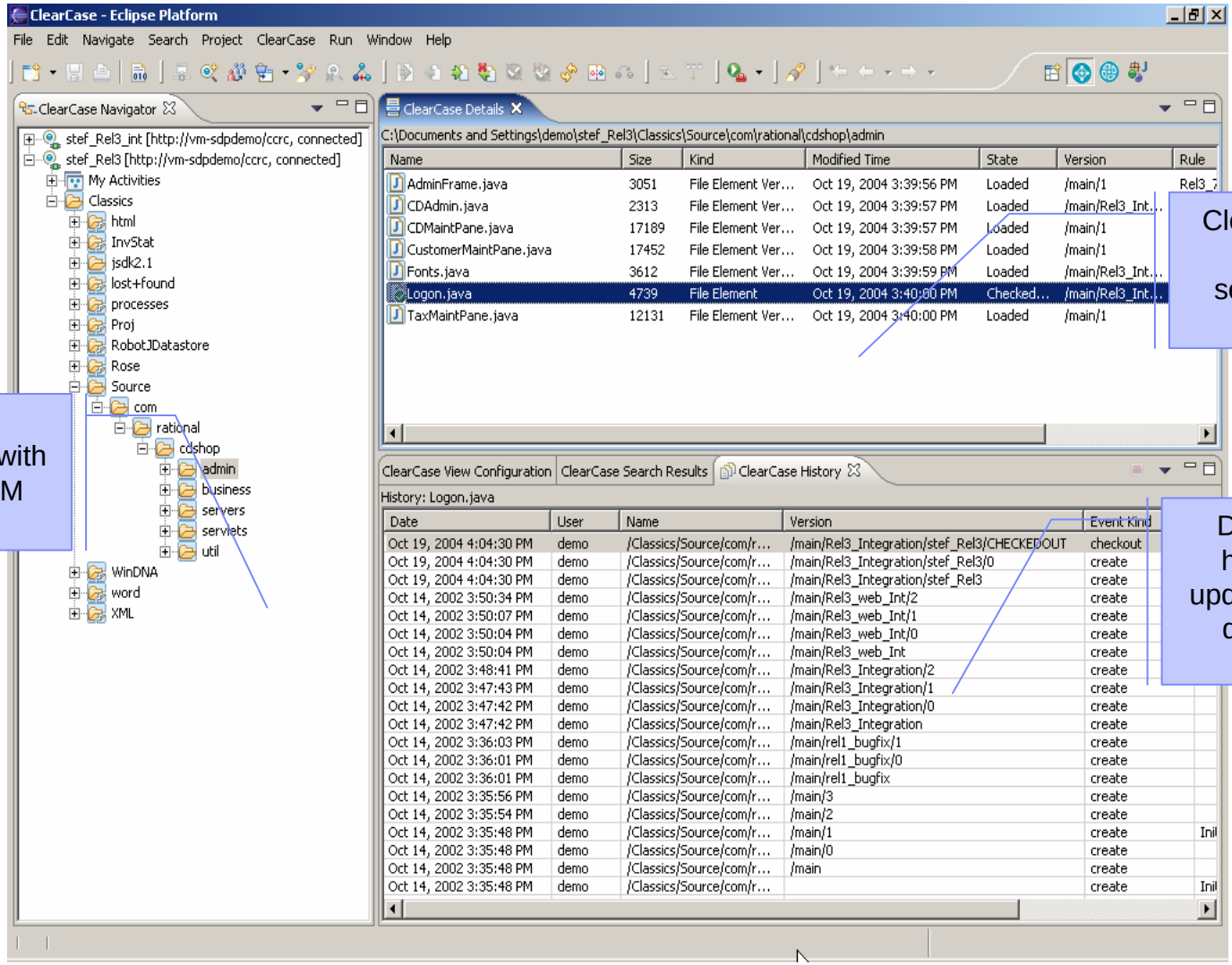
- Open and browse multiple RequisitePro projects
  - See requirements, packages, and views
- Associate requirements with model elements via drag and drop
- Create model elements from requirements
- Customizable synchronization



团队开发: ClearQuest 集成



团队开发: ClearCase 集成



ClearCase Navigator view with integrated UCM activities

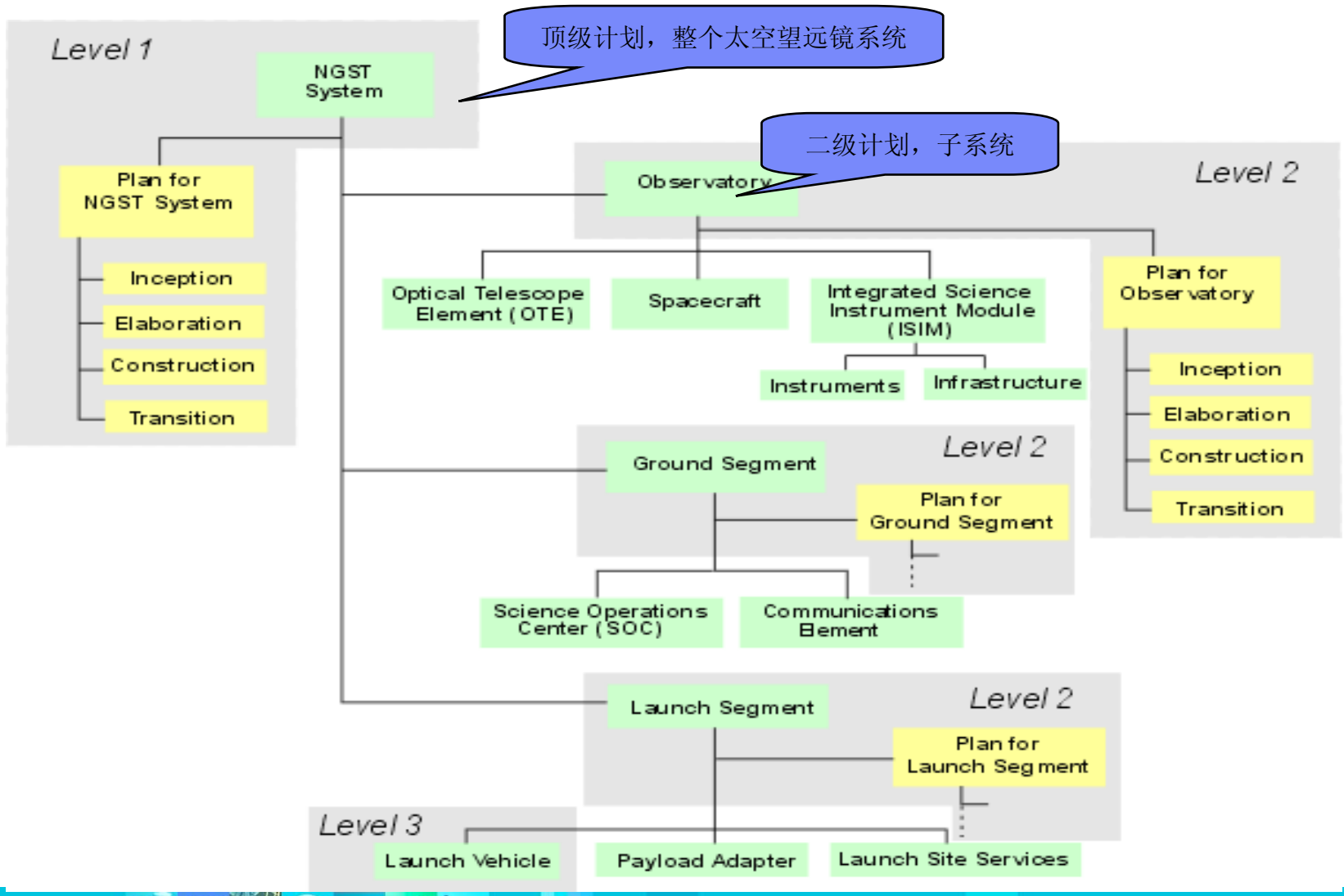
ClearCase Details view shows selected version information

Display version history, view & update config spec, display search results

NASA下一代望远镜使用Rose Real-time

- 2007/1/19
- IBM今天宣布NASA(美国航天航空局)选用IBM的软件来开发James Webb太空望远镜(JWST)的软件和系统。JWST将在2013年发射，接替哈勃望远镜
- 其中，IBM Rational Rose Real-time将其中的建模工作

NASA's Next Generation Space Telescope




DEMO

议程

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- 模型驱动开发MDD
- Rational Systems Developer v7.0
- 总结

议程

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总结：Rational Systems Developer的关键特性

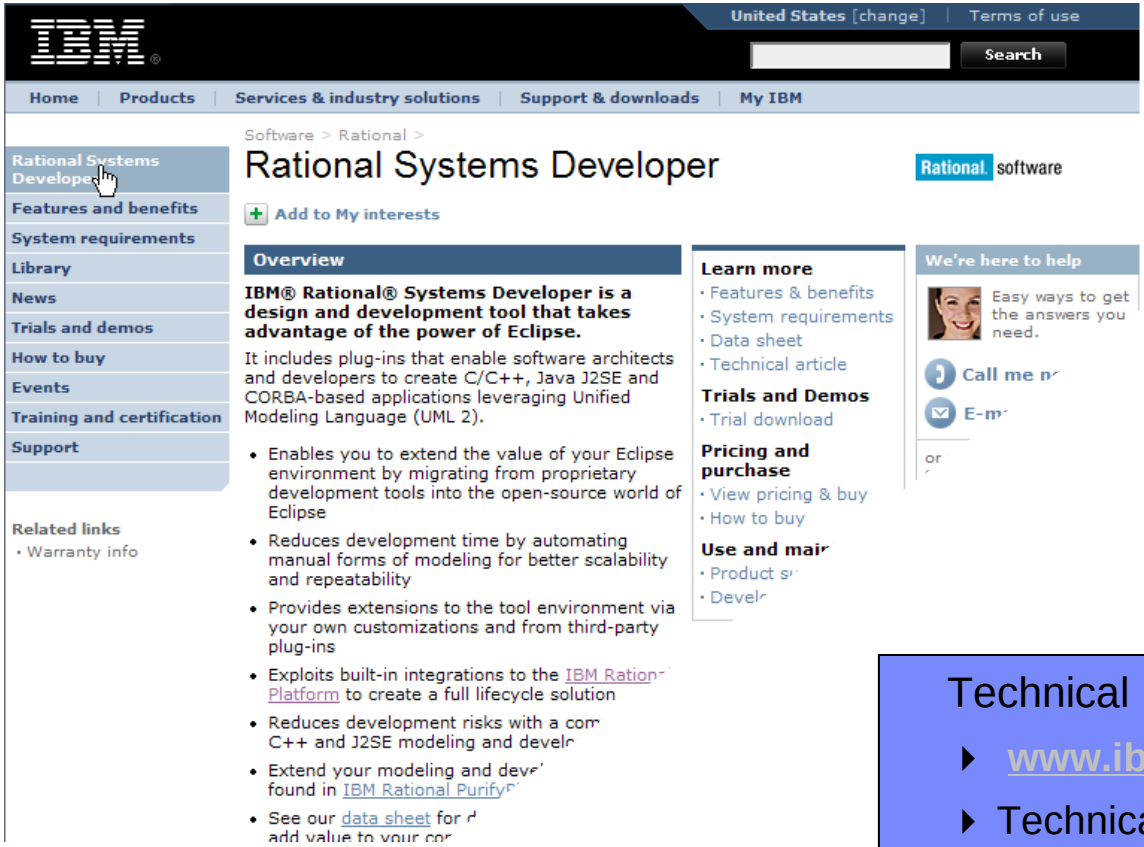
- **Architecture Support**
  - Java, J2SE, C++
  - UML2 Modeling
  - Architecture Discovery via Application Analysis
  - Patterns and Transformations
- **Team Environment**
  - Enhanced Compare / Merge
  - Integrated RequisitePro Views
  - Process Advisor
  - ClearCaseLT included
    - CC and CQ fully integrated
- **Open Platform**
  - Based on Eclipse 3.2 Shell
  - Broad support for third-party tools
  - Testing and Team tools work together

合作伙伴

- EmbeddedPlus
  - DOORKeeper - DOORs integration for Rational Systems Developer/Rational Software Modeler
  - SYSMT – plug-in to Rational Systems Developer/Rational Software Modeler that provides support for SysML extension of UML 2.0 and model simulation and execution
- WindRiver
  - WindRiver Workbench – leading Eclipse-based IDE for C/C++/Java development for RTOS
- Pathfinder
  - PathMate - High-performance, configurable, MDA code generation for embedded platforms based on Rational Systems Developer/Rational Software Modeler UML 2.0 Models
- Coverity
  - Prevent - Static analysis tools for C++
- Galorath
  - SEER-SEM - SEER estimation from Rational Systems Developer/Rational Software Modeler use-case models

* - all partners will validate to RFRS 生态系统

更多的信息...



- Systems Developer on ibm.com:
  - http://www-306.ibm.com/software/awdtools/developer/systemsdeveloper/index.html
- Contacting your IBM representative
  - http://www.ibm.com/contact/us
  - Call 1 800 728 1212

Technical Resources on IBM developerWorks

- www.ibm.com/developerworks/rational
- Technical library of whitepapers, utilities, betas
- Downloadable demos
- Discussion forums


Questions


Thank
You

Optional additional slides to be included at your discretion

What is Eclipse?

- An Open Source Project
  - eclipse.org
  - Delivers and supports the technology
- A Technology Offering
  - Universal platform for integrating development tools
  - Open, extensible architecture based on standards
  - Licensed for royalty free world-wide distribution
- A Community
  - Commercial vendors, educators and individuals contribute to the project and technology
  - Vendors bring commercial offerings to market
  - Vendors work together to agree on standards and deliver integrated solutions

Eclipse: Who's Shipping or Supporting It?

IBM

Rational. Software Development Platform

WIND RIVER

WIND POWER IDE 2.0

IBM WebSphere software

WebSphere Studio Device Developer

intel

QNX SOFTWARE SYSTEMS

QNX® MOMENTICS®
PROFESSIONAL EDITION

TimeSys®

TimeStorm® Integrated Development Environment (IDE)

Texas Instruments

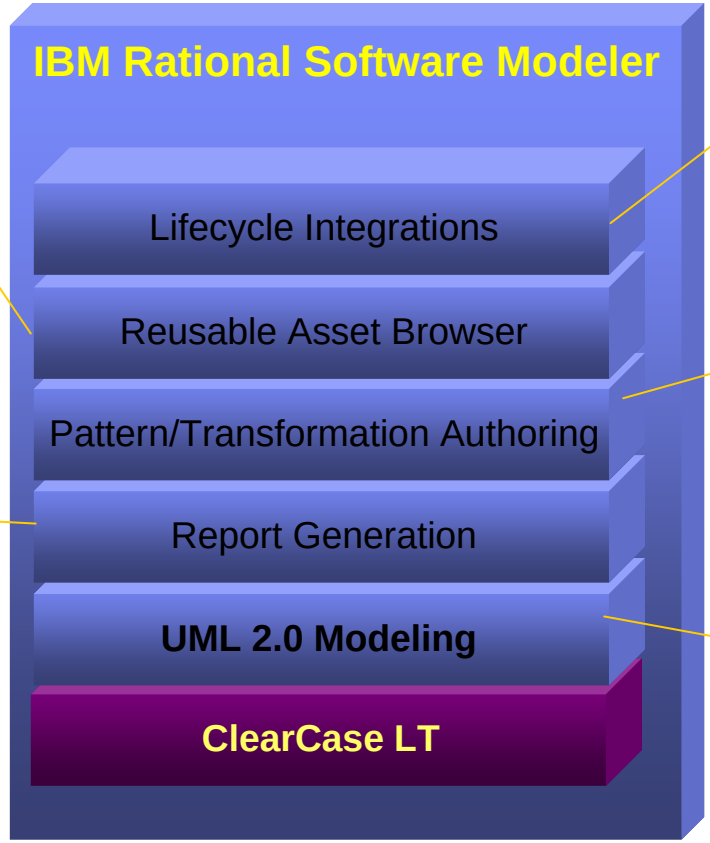
Code Composer Studio™ IDE
Platinum Edition

MontaVista SOFTWARE

MontaVista DevRocket

Novell. SUSE LINUX Professional

IBM Rational Software Modeler Product Overview



"Reusable Asset Browser"
- Browse and import assets from a repository
- Package model and development artifacts into a RAS bundle

"Report Generation"
- HTML and XML based data extraction and reporting
- Extensive printing
- Model traceability reporting and custom queries

"Lifecycle Integrations"
- Drag-and-drop association of RequisitePro requirements with models
- Interface to CM tools
- Visual compare/merge
- Document generation with SoDA

"Pattern/Transform Authoring"
- Sample UML-to-code transforms for EJB, Java, and C++
- Selective language to UML harvesting
- Pattern content
- Pattern/Transform authoring framework and services

"UML 2.0 Modeling"
- UML 2.0 Diagrams for Class, Communication, Component, Composite Structure, Deployment, Activity, Sequence, State, and Use Case
- UML Profile Editor
- OCL Support
- Automatic diagram generation
- Extensive open API
- Java-based "scripting" for extensibility leveraging the Eclipse JDT

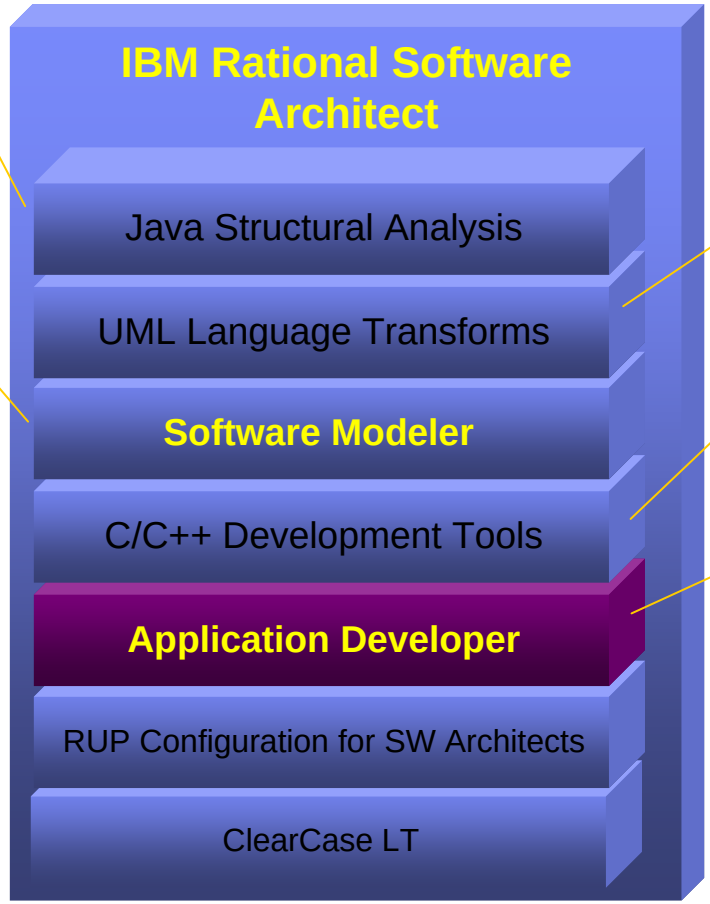
IBM Rational Software Architect Product Overview

"Application Analyzer"

- Automatic anti-pattern and pattern detection
- Architectural discovery, analysis, metrics, and stability reporting
- Implementation level architectural rules

"Modeler"

- UML 2.0 Diagrams for Class, Communication, Component, Composite Structure, Deployment, Activity, Sequence, State, and Use Case
- OCL Support
- Automatic diagram generation
- Pattern content
- Pattern/Transform authoring framework and services
- Extensive open API
- Java-based "scripting" for extensibility
- HTML and XML based data extraction and reporting
- Extensive printing
- RAS tools



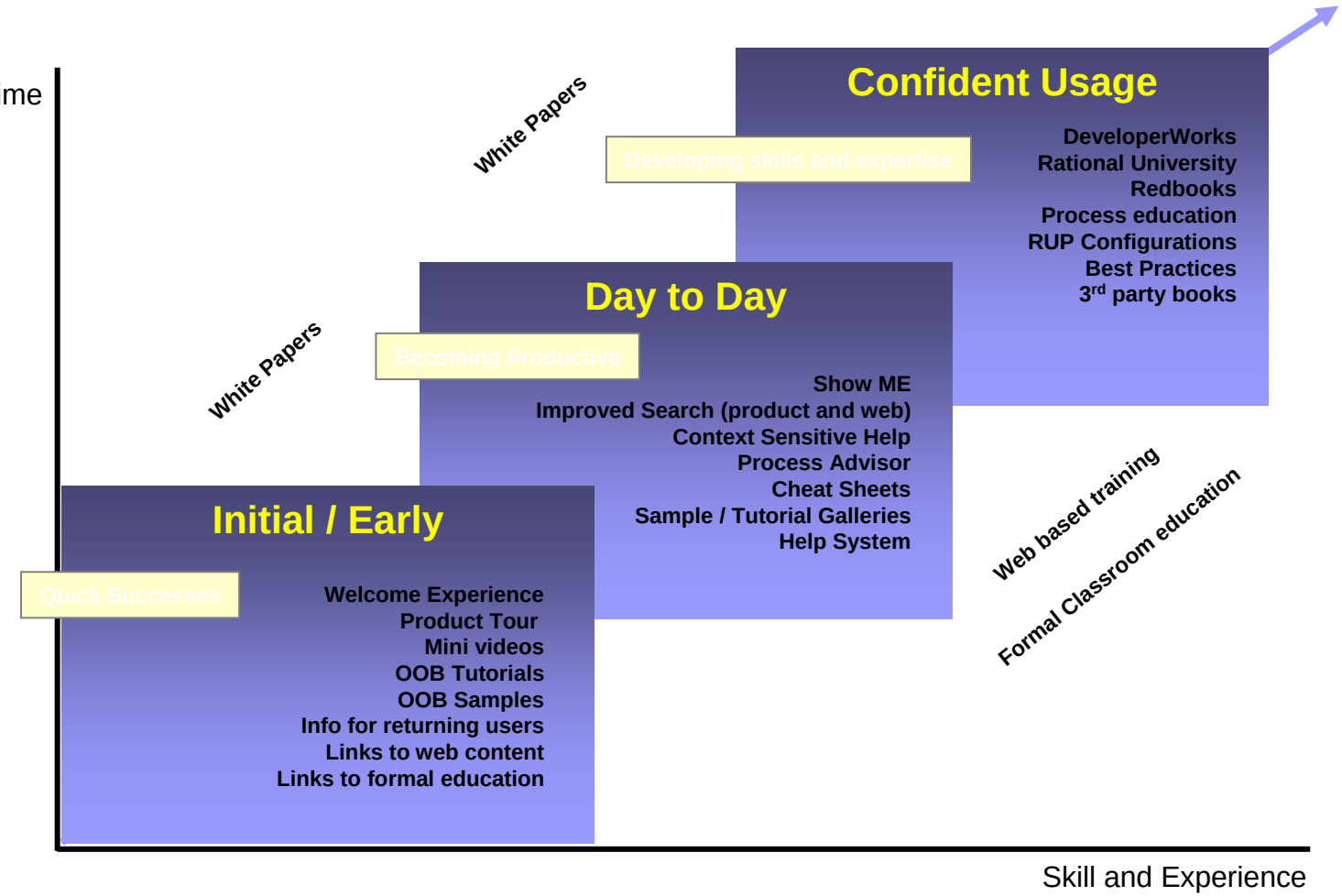
- Sample UML-to-code transforms for EJB, Java, and C++
- Selective language to UML harvesting

- C/C++ editors and build management
- Compiler and debugger integration
- UML code editors

"WSAD v6"

- JSF, SDO, Struts
- Java GUI editor
- Web diagram editor
- Site designer
- Web Services development tools
- Database editing tools
- EGL
- EJB development tools
- UML code editors for EJB, Java, and Data
- Static Analysis
- Runtime Analysis
- Component test automation
- Portal/Portlet development tools

Highlights: User Assistance - Managing the Learning Curve



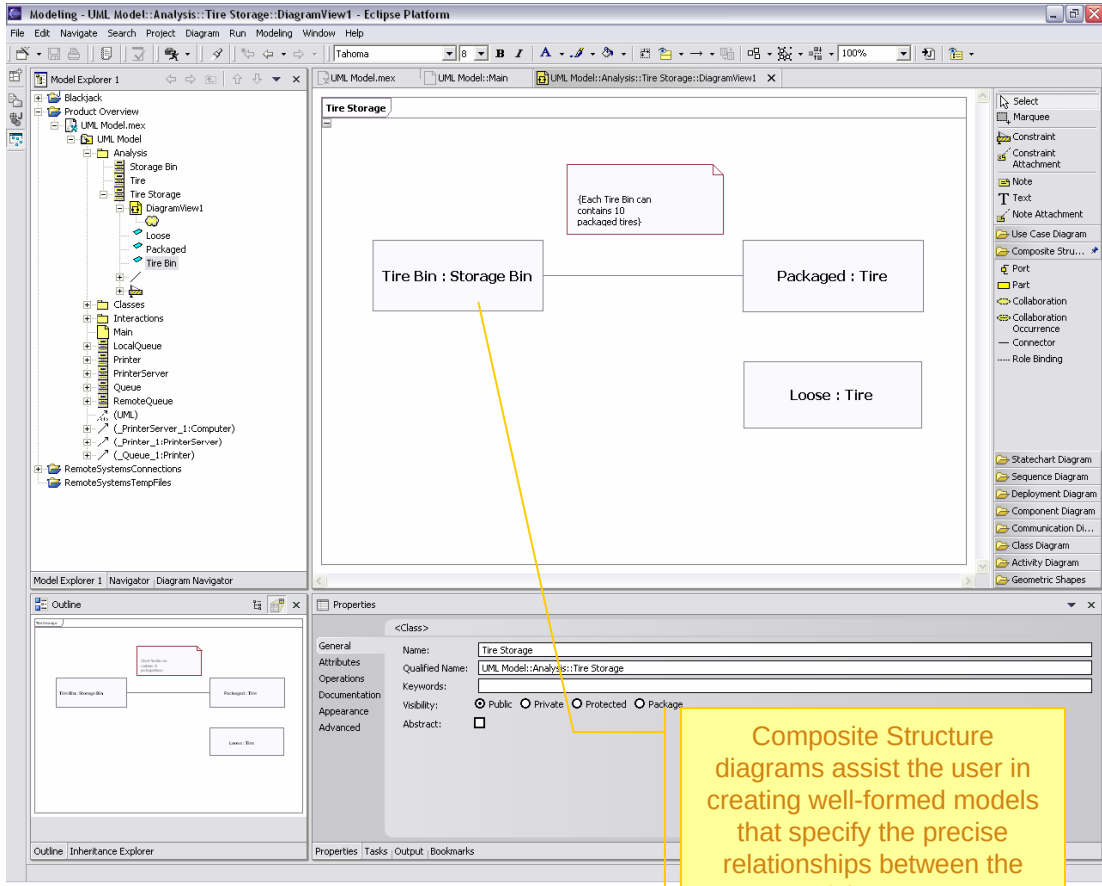
Information designed to take the user from early successes….then helping them become productive…..and then helping them develop appropriate skills and expertise

Information designed to take the user from early successes….then helping them become productive…..and then helping them develop appropriate skills and expertise

Highlights: 加入结构图

Ease of Use
Architectural Specification

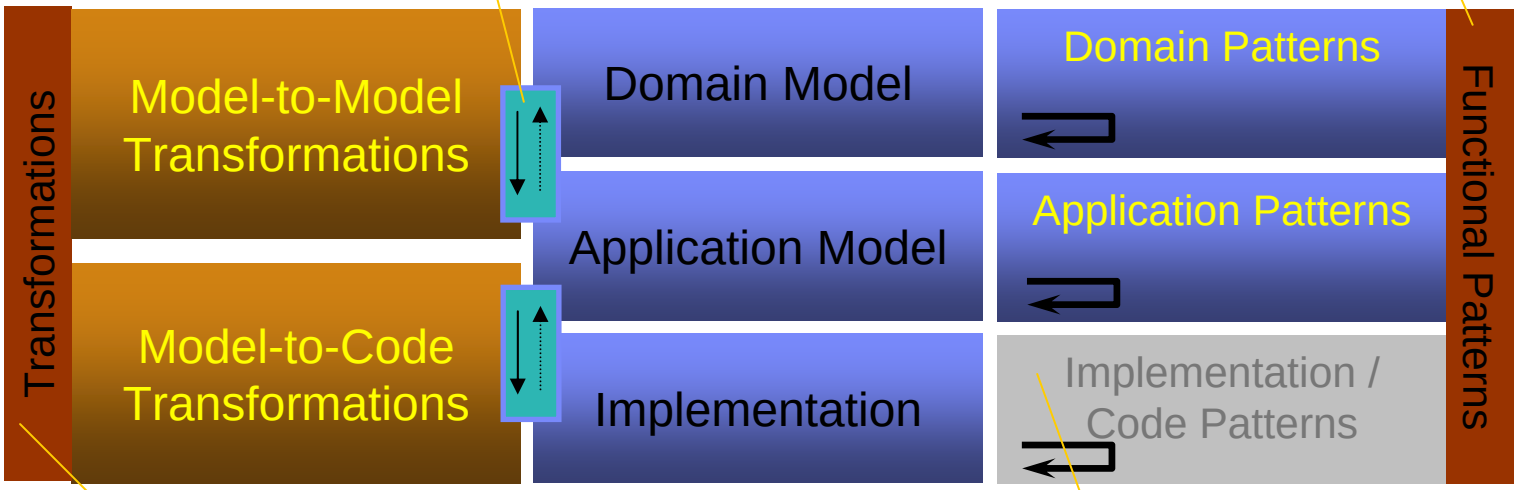
- Contributes to completeness of models by supporting the definition of the role-based aspects of a model
- Supports capturing an application's logical architecture
  - Application for SOA development



模板和转化

Transformations can be authored to create traceability links between the source and the target of the transformation.

Patterns can be authored/applied and used as recipes or building blocks to refine a model or implementation at its level of abstraction.



Rule/constraints-based transformations can be authored to transform models in a batch style operation. Transformations are authored using Java and the Eclipse PDE.
Transformations can leverage functional patterns when they execute.

After the Atlantic release, the patterns story will be extended to be inclusive of implementation level patterns that are relevant at the implementation level (ex.: Sun J2EE patterns).

Product Capabilities: C/C++ Development Environment

Built on the Eclipse CDT project (http://www.eclipse.org/cdt)
"The CDT project provides a set of plug-ins that implement a C/C++ IDE. It adds a C/C++ Perspective to the Eclipse Workbench that supports C/C++ development with a number of views, wizards, a powerful editor, and a debugger. The CDT is designed to provide an extensible architecture, that will provide support for integration of tools provided by independent software vendors (ISVs)."

- Editing and Navigation
  - C/C++ Syntax Highlighting, Outline View
  - C++ Class Browser (Hierarchy View)
  - C/C++ Search
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- Meets Internationalization and Accessibility requirements
- Extensibility
  - Provides extension points for managed build, debuggers, …

Overview: Team Development and SCM

- Standard Eclipse capabilities supported
  - Multiple team providers supported
- Model compare merge tool
  - Allows merging of models at model semantic level—not raw XML / text
  - Facilitates parallel development
- Model refactoring support
  - Similar to that supported for code
  - Allows easy partitioning and reassembly of models
- Model hierarchy support
  - Arrange models into a hierarchy by using shortcuts
- Easily track your To Do Lists in the same IDE
- Submit defects for architectural problems in a model

Extensibility Summary

- Eclipse Platform framework is extended to be inclusive of MDA
  - Common infrastructure and framework for partners and end-users
  - Extensions created in Java
    - Eclipse plug-ins
- “Pluglet” support for lightweight scripting using Java
- Leverages Open Source API and frameworks
  - UML 2.0, EMF, GEF
- Extends Open Source with Public API, frameworks, and services
  - Patterns and transformations
  - Extension points for UI, menu, layout,
  - Command management, query
  - UML 2.0 profile editing
  - OCL
- User assistance using wizards and samples

Product / Lifecycle Integrations

- ClearCase 5.0 and higher, including ClearCase Remote Client
- CVS v1.11.1p1
- RequisitePro (v2003.06.12 and higher)
- ClearQuest (v2003.06.13 and higher)
- SoDA (v2003.06.14 and higher)

Operating Environments

Microsoft Windows	XP Professional SP1, SP2 2000 Professional SP3, SP4 2003 Server, Standard Edition 2003 Server, Enterprise Edition 2000 Server, SP3, SP4 2000 Advanced Server, SP3, SP4
 redhat SuSE A NOVELL BUSINESS	RedHat Enterprise Linux Workstation version 3 (all service packs) SuSE Linux Enterprise Server 9.0 (all service packs)