

Innovate2010

IBM開發者大會

*Model-Driven Development
for Systems Design and
Software Development of
Real-Time and Embedded
Systems*

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Rational

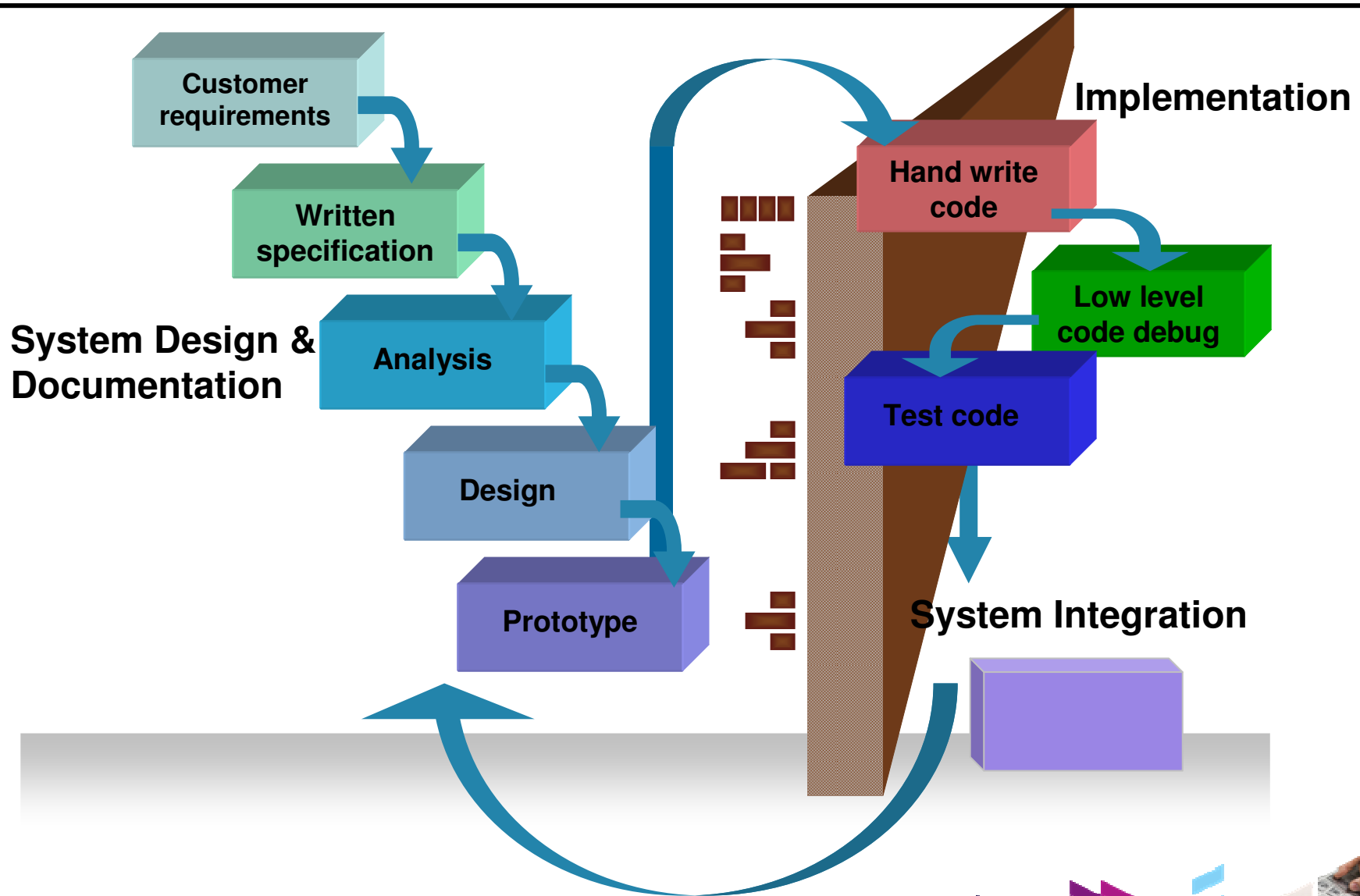
ronaldc@hk1.ibm.com

Let's **build** a smarter planet.

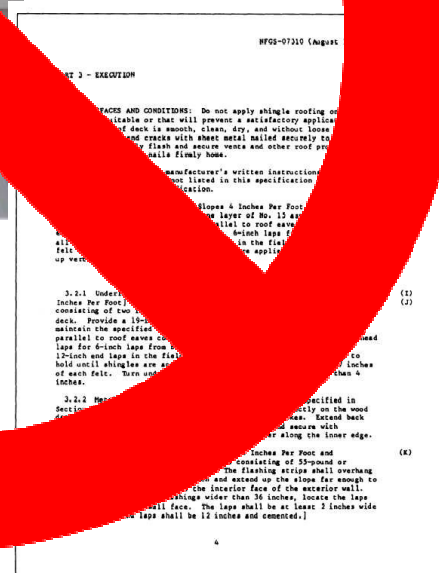
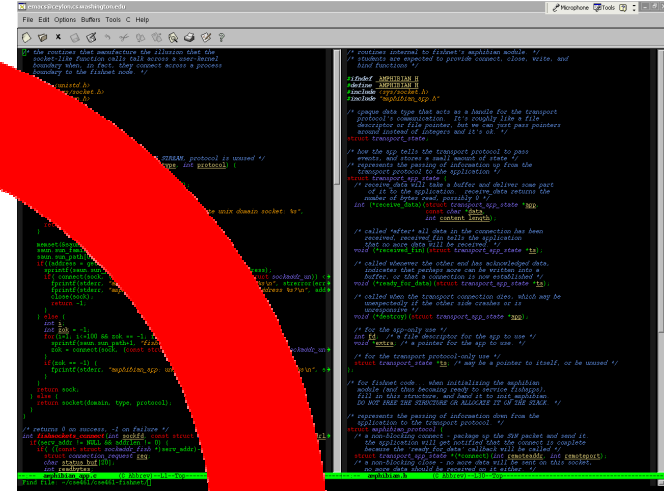
August 31, 2010 台北喜來登



The traditional design process



Visual Modeling



Expansion	<ul style="list-style-type: none"> 1* PCI Express x16 Slot 1* PCI Express x1 slot with CrossFire™ support 2* PCI slots
Connectivity	<ul style="list-style-type: none"> 1* SATA, 6* SATA II, 2* IEEE1394a, 12* USB2.0, 1* ATX RAID 0, RAID 1, RAID 5, RAID 10 with Intel® Matrix Storage Technology and Intel® Rapid Recover technology 7.1 Channel HD Audio
Audio	<ul style="list-style-type: none"> Digital LAN
BIOS & Special Features	<ul style="list-style-type: none"> Quantum BIOS with OC Genie, OC Recovery, CoolFan control, onboard CMOS & OnVIM Reset buttons ASUS Fan Xpert Cool Pipe (heatsink solution) 100% SMD Capacitor design Flashback
Accessories	<ul style="list-style-type: none"> User manual 2* Setup Guide Quantum Force product registration card Quantum Force free offer 6* SATA cables + power cables 1* FDD + IDE cable 1* 2.5" + 1.5" SATA bracket 1* Fan (optional for North Bridge) Library CD including Symantec Antivirus RAID Floppy Disk
Form Factor	ATX

Watch phone



하와이

The Korea Times Hawaii Edition
1998.7.14 (수요일)

당뇨치료제 하와이 공급업자 모집

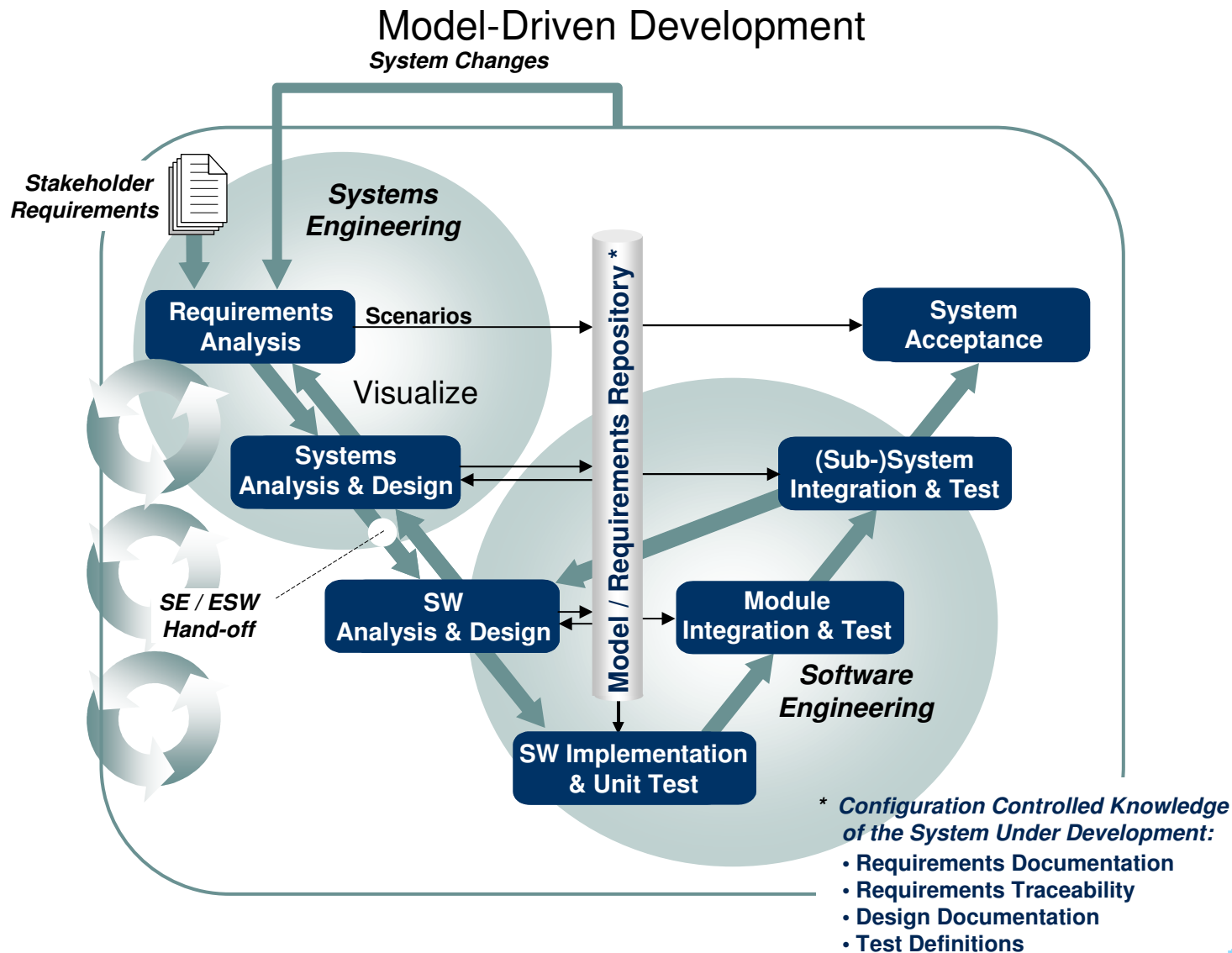
하와이 당뇨병 치료제 공급업자 모집... (text continues with details about the recruitment for diabetes treatment products in Hawaii)

全国日本語学校データベースによるこそ!

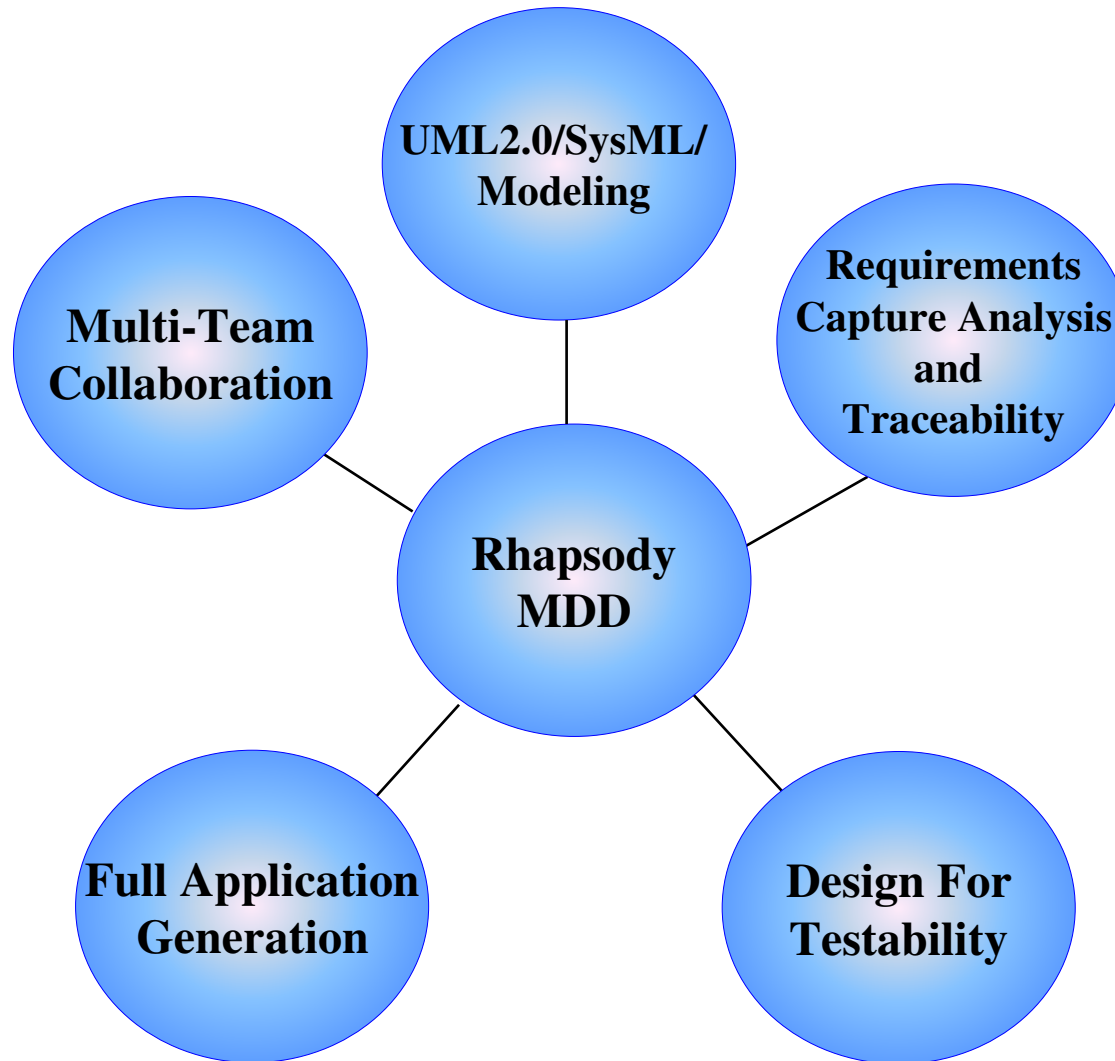
このデータベースでは、全国にある400校以上のすべての日本語学校と日本語教育を行っている大学、短期大学、専門学校の情報を提供しています。データベースには、学校名や、コース、授業料、入学生内などの情報が含まれています。

なお、このデータベースに掲載されている日本語学校は、すべて(財)日本語教育振興協会の認定を受けています。

Integrated System / Software Development Process



Marking All These Work



Conceptual Collaboration in Text



Developer 1

“Ok. Here’s how it works. Thread A will p... and that will change B’s state to Running from v... was Init. When B changes to Running it will send back an event Y to A and then wait for 2 second and then go back to Idle. Thread A will have started in Idle also and will go to Run after B sends back event Z which happens after the 2 seconds before going to Idle. All this should happen in less then 5 seconds.”



Developer 2:

“Huh ?” What are you talking about?



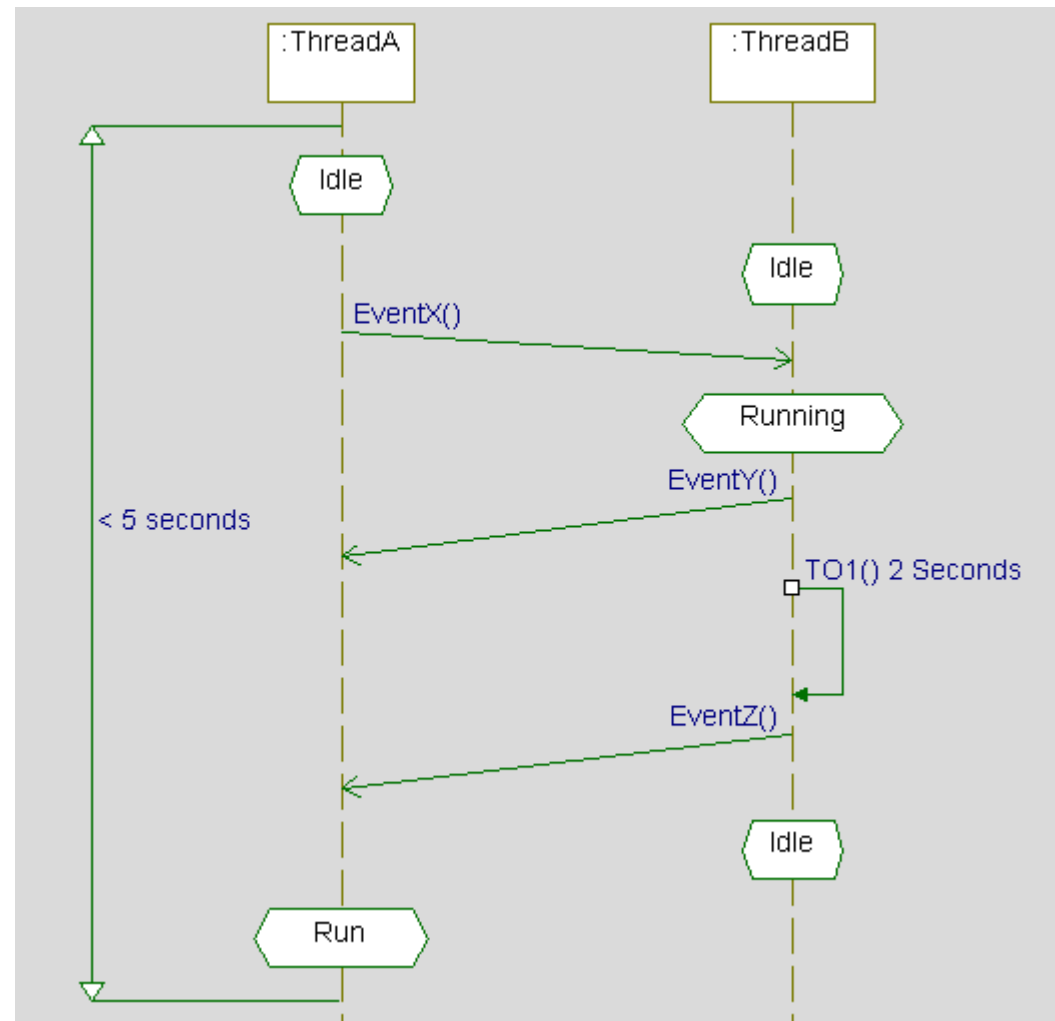
Conceptual Collaboration in Models

Developer 1

“Here look at this Sequence Diagram.”

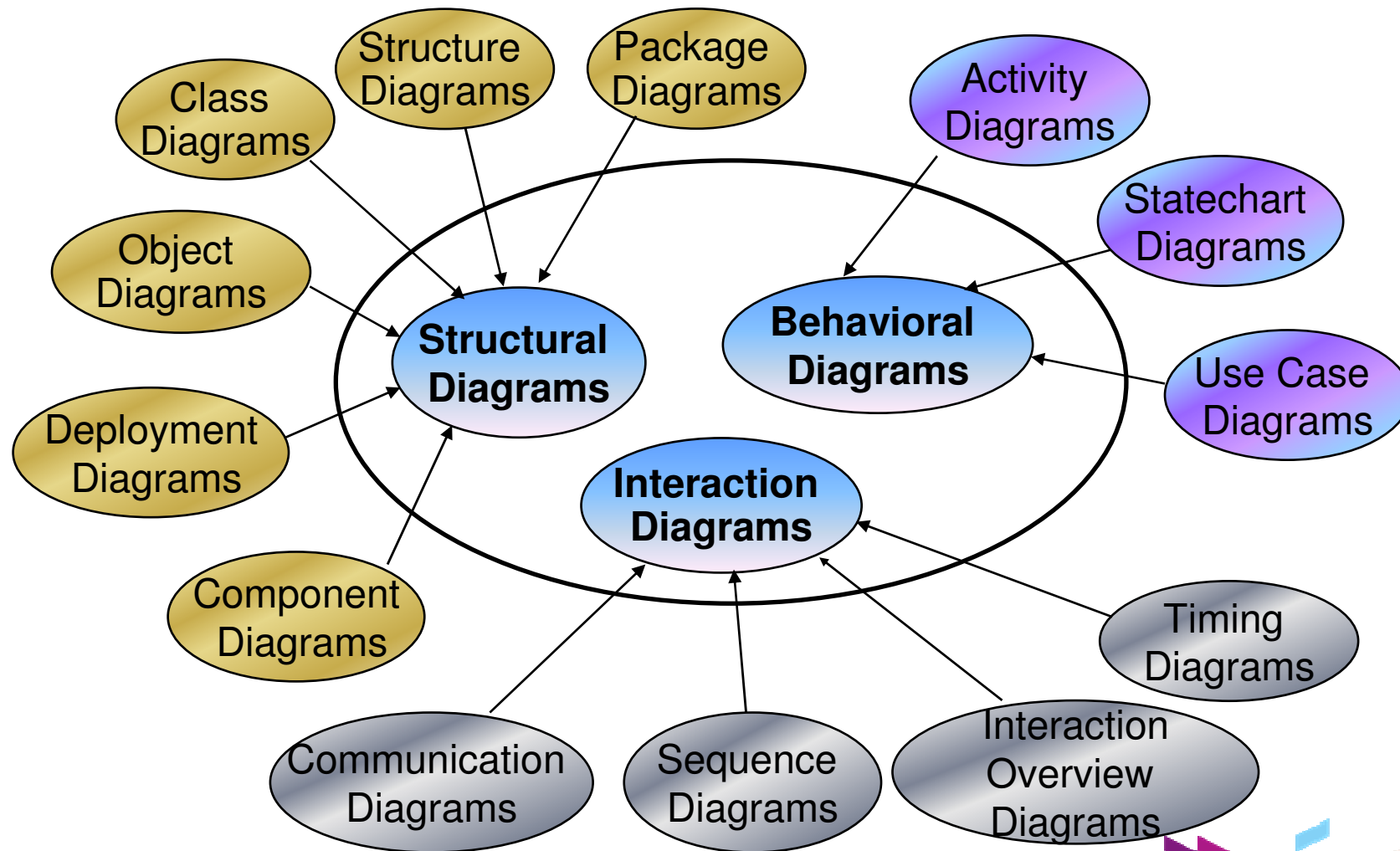
Developer 2

“Ahhh, now I see!”




Conceptual Collaboration in Models

UML2 - a common graphical language enabling conceptual collaboration



Requirement Traceability



HandsetRequirements

- Comments
- comment_0
- Requirements
 - Req. 1.1
 - Req. 1.2
 - Req. 3.1
 - Req. 3.2
 - Req. 4.0
 - Req. 4.1
 - Req. 4.2
- Dependencies
- Derivations
 - Req_4_1
- Req. 5.6
- Req. 6.2
- Requirements Diagrams
- Data Call Requirements

Requirements Diagram

req: ProtocolStack

- Req. 4.2 (ID = 4.2): The mobile shall be able to receive streaming video at 384 kbps
- Req. 3.2 (ID = 3.2): The mobile shall be able to receive short messages will the mobile is registered
- Req. 4.1 (ID = 4.1): The mobile shall be able to send data at the rate of 384kbps
- Req. 4.0 (ID = 4.0): The mobile shall be able to receive data calls at the rate of 128kbps
- Req. 5.6 (ID = 5.6): The mobile shall be able to receive a maximum of 356 characters in a short message
- Req. 6.2 (ID = 6.2): The optimal size of message the mobile can send in a text message is 356 characters

Relationships: Req. 4.2 <trace> Req. 3.2, Req. 4.1 <derived> Req. 4.2, Req. 4.0 <trace> Req. 4.1, Req. 5.6 <derived> Req. 4.0, Req. 6.2 <satisfy> Req. 5.6, Req. 6.2 <verify> Req. 4.0

Analysis

MMI actor connected to DataCall use case.

Functional Architecture

ThreadA and ThreadB with events Event(X), Event(Y), Event(Z). Timing: < 5 seconds, TO(1) 2 Seconds.

Coverage Analysis Impact Analysis

CALLER -> SYSTEM -> OPERATOR -> AMBULANCE

Requirements Detail

Req. 4.2 in HandsetRequirements

Name: Req. 4.2, ID: 4.2, Type: Requirement, Defined in: HandsetRequirements

3.1 SURFACES AND CONDITIONS: Do not apply shingle roofing on surfaces that are unshailable or that will prevent a satisfactory application. Ensure that roof deck is smooth, clean, dry, and without loose knots. Cover knotholes and cracks with sheet metal nailed securely to the sheathing. Properly flash and secure vents and other roof projections and drive projecting nails firmly home.

3.2 APPLICATION: The manufacturer's written instructions shall be followed for applications not listed in this specification and in cases of conflict with this specification.

3.3.1 Underlayment (for Roof Slopes 4 Inches Per Foot and Greater): Apply underlayment consisting of one layer of No. 15 asphalt-saturated felt to the roof deck. Lay felt parallel to roof eaves containing from eaves to ridge, using 1/2-inch head laps, 4-inch laps from both sides over all hips and ridges, and 1/2-inch end laps in the field of the roof. Nail felt sufficiently to hold until shingles are applied. Turn underlayment up vertical surfaces not less than 4 inches.

3.3.2 Underlayment (for Roof Slopes Between 2 Inches and 4 Inches Per Foot) (to Inches Per Foot and Greater): Apply underlayment consisting of two layers of No. 15 asphalt-saturated felt to the roof deck. Provide a 1/2-inch wide strip of felt as a starter sheet to maintain the specified number of layers throughout the roof. Lay felt parallel to roof eaves containing from eaves to ridge, using 1/2-inch head laps for 6-inch laps from both sides over all hips and ridges, and 1/2-inch end laps in the field of the roof. Nail felt sufficiently to hold until shingles are applied. Confine nailing to the upper 17 inches of each felt. Turn underlayment up vertical surfaces not less than 4 inches.

3.3.3 Metal Drip Edges: Provide metal drip edges as specified in Section 07600, "Flashing and Sheet Metal," applied directly on the wood deck at the eaves and over the underlayment at the rakes. Extend back from the edge of the deck not more than 2 inches and secure with fasteners spaced not more than 10 inches on center along the inner edge.

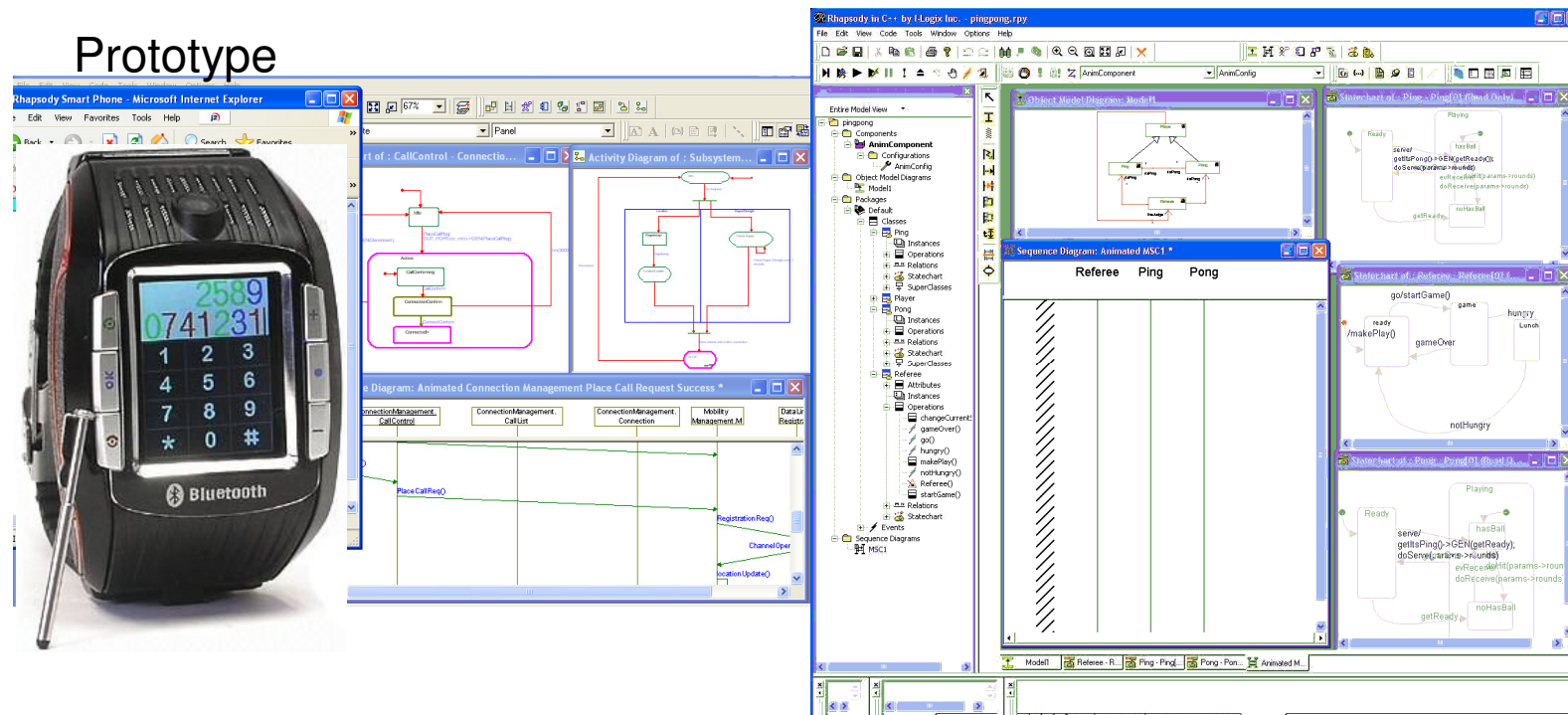
3.3.4 Gable Flashing (for Roof Slopes 4 Inches Per Foot and Greater): Provide gable flashing strips consisting of 25-gauge heavier smooth-surface roll roofing. The flashing strips shall overhang the metal drip edge 1/4 to 3/8 inch and extend up the slope far enough to cover a point 12 inches inside the interior face of the exterior wall. Where overhangs require flashings wider than 36 inches, locate the laps outside the exterior wall face. The laps shall be at least 2 inches wide and cemented. End laps shall be 12 inches and cemented.

Hardware Specifications

Expansion	1* PCI Express x16 slot & 1* PCI Express x4 slot with CrossFire™ support.
Connectivity	2* PCI Express slot, 3* PCI bus slots.
RAID	RAID 0, RAID 1, RAID 5, RAID 6 with Intel® Matrix Storage Technology and Intel® Rapid Recover technology.
Audio	7 Channel HD Audio.
Networking	GIGABIT LAN.
BIOS & Special Features	Optional BIOS with OC Clear, OC Recover, Cool Fan control; Onboard CMOS 5 On/Off/Reset buttons; AEGIS Panel; Cool Fan (optional solution); 100% Solid Capacitor design; RaySyn.
Accessories	User manual; EC Set-up Guide; Quantum Force product registration card; Quantum Force free gifts.
Form Factor	ATX.

Executable models (Simulation and Animation)

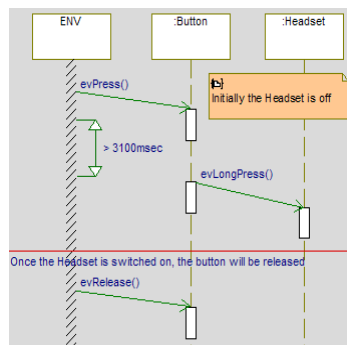
You can't test what you can't execute!



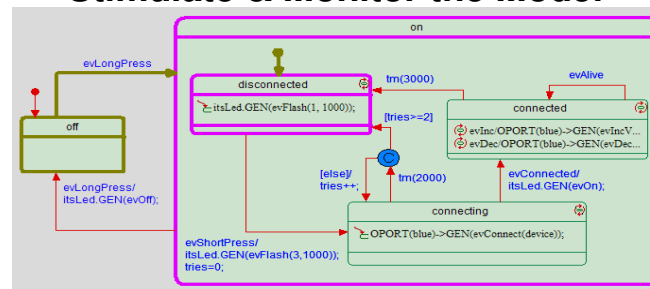
Requirements Based Testing

- Use requirement scenarios to validation the design
- Automatically run multiple scenarios
- Easily identify errors

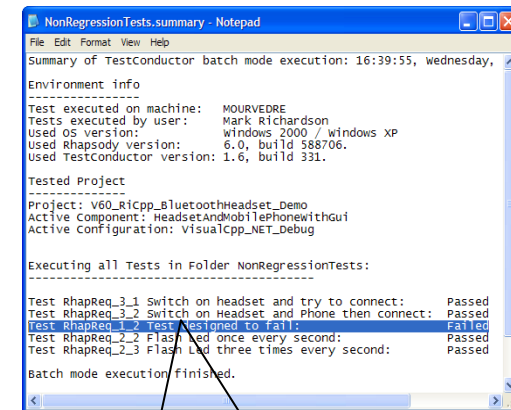
Test Scenario



Stimulate & Monitor the Model

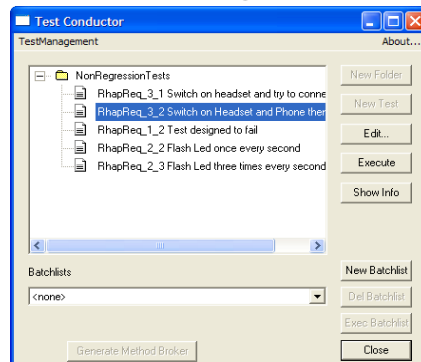


Test Results

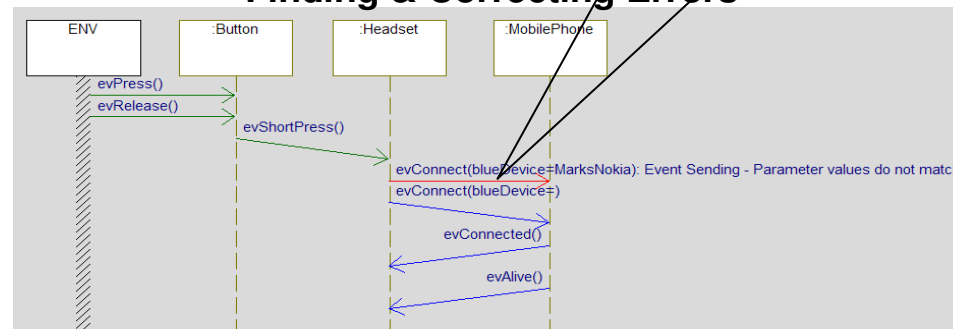


Unexpected result

Test Configuration



Finding & Correcting Errors



Full Application Generation

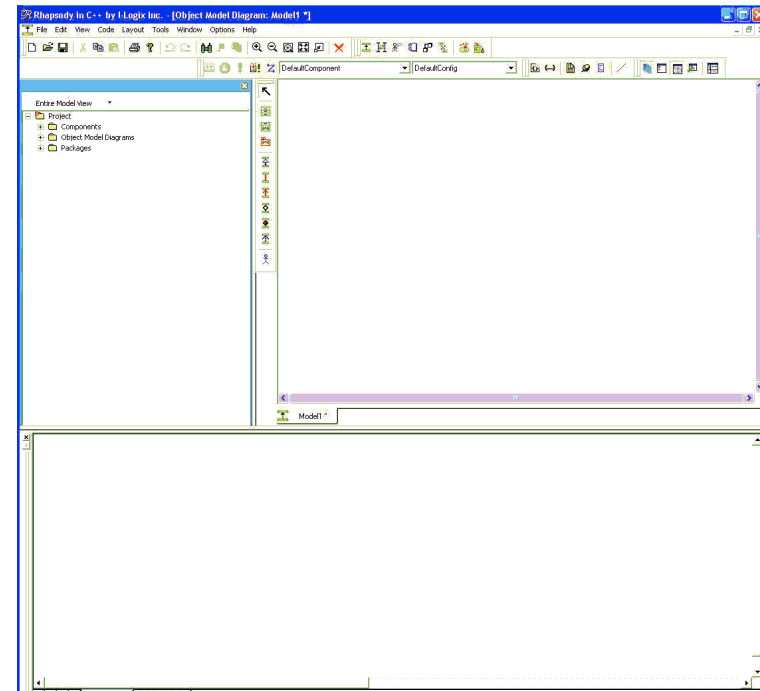
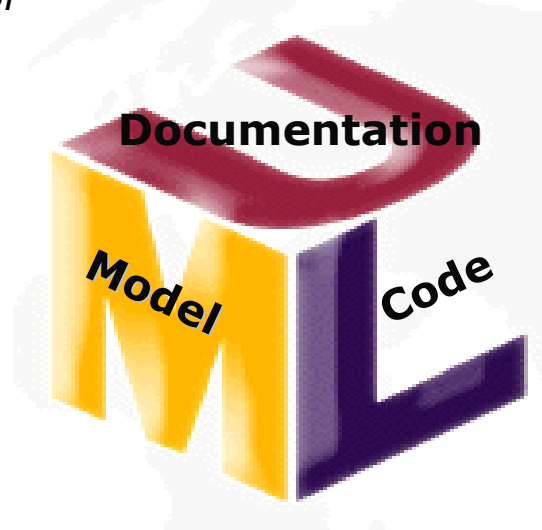
- Rhapsody leverages *all* structural and behavioral model views to produce an executable application
 - State machines: event driven behavior
 - Activity diagrams: algorithms and process flows
 - Generates all construction artifacts (e.g. Makefiles)
- Support for
 - ▶ C, C++, Ada and Java
 - ▶ Size/Speed tradeoffs
 - ▶ Coding style options
- **Seamless Reuse** of existing code and models (IP)
- **Dynamic Model Code Associativity (DMCA)** gives you the ability to work the way you want
- **The Real Time Framework** enables rapid application deployment onto any RTOS or systems with no RTOS



Model Code Associativity

Rhapsody works the way you do

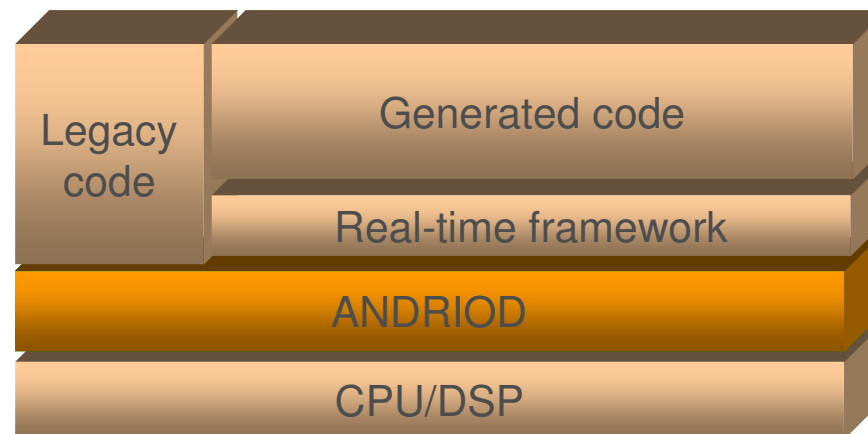
- Design, Code and Documentation are always kept in sync
- Freedom to work at code level or design level
- Change one view, the others ***change automatically***
- *Critical for real-time embedded software development*



The Rhapsody Real-Time Framework

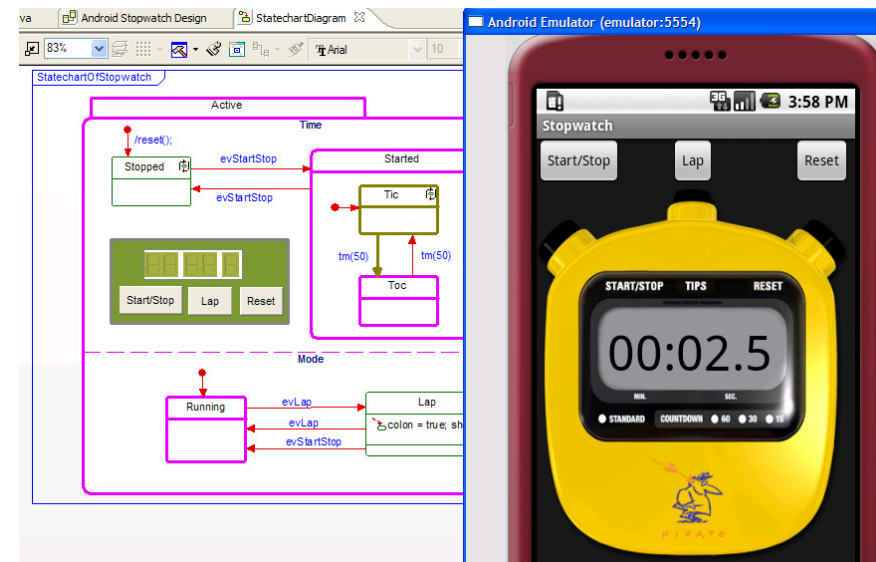
Rhapsody provides an executable real-time framework

- Most applications are over 50% “housekeeping code” which is redeveloped every time you create a system.
- A *framework* is a partially completed application.
 - ▶ **you** customize and specialize for **your** application.
 - ▶ All source code is provided.
- A *real-time framework* is an:
 - ▶ integrated set of design patterns
 - ▶ optimized for embedded applications



Support for Android Development

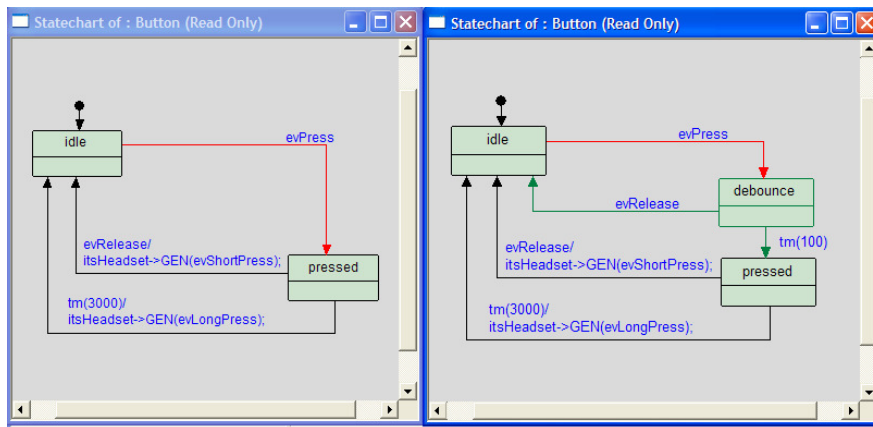
- Android Model Library
 - Subset of the full fledged Android API
 - Help Rhapsody users to utilize Android's API in easy and visual ways
- Android Profile
- Automate integration with Eclipse/Android
 - ▶ Automate the steps in building the eclipse project
- Animation of Android Applications





Rational Team Concert enables distributed teams to perform as one through integrated collaboration, process and tools.

- Real time, in-context collaboration
 - Make software development more automated, transparent and predictive
- "Think and work in unison"
 - Integrated planning, source control, work item and build management



Open and extensible on

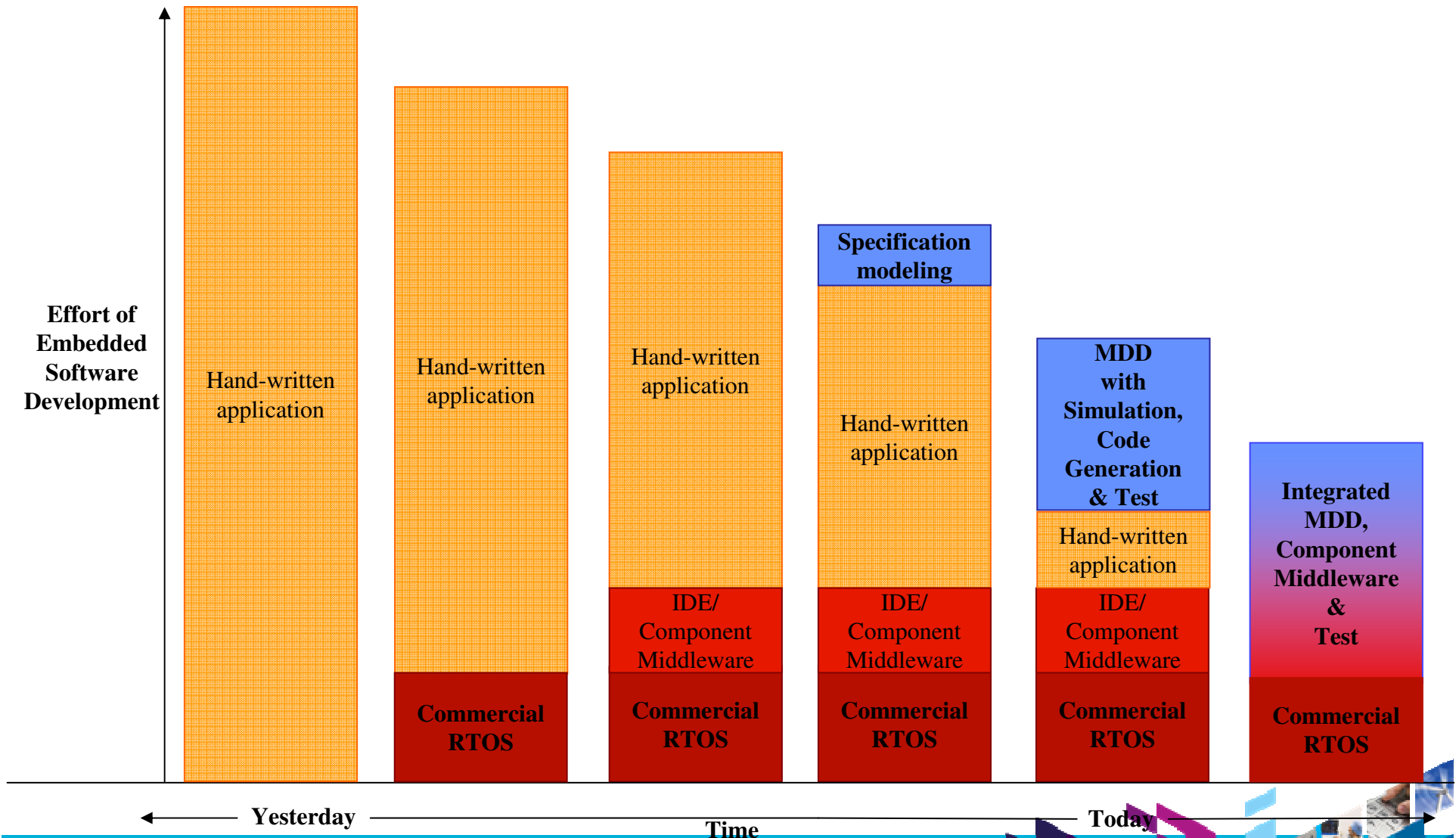
- ✓ Collaborate in context
- ✓ Right-size governance
- ✓ Day one productivity

IBM Rational Team Concert

transparent *integrated presence*
 wikis OPEN real-time reporting
 chat automated hand-offs Web 2.0
custom dashboards automated data gathering
EXTENSIBILITY Eclipse plug-ins services
 architecture **FREEDOM TO CREATE**
 JAZZ TEAM SERVER



Embedded Software Development Efficiency



Platform-Independent Models

- Intellectual property (IP) is expensive to create and maintain yet *crucial*
- Most embedded software must be recreated when moving to a new platform or environment
 - ▶ New Middleware
 - ▶ New source code languages
 - ▶ New Operating Systems
 - ▶ New Hardware
- Further, these systems must interface with massive legacy systems



Platform-Independent Models

- The use of *PIMs* allows systems to be created that can easily be ported to new technologies, infrastructures and frameworks reusing corporate IP
- Intellectual property is then managed in a format more abstract and reusable than source code



Thank
YOU

