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「 Real Teams. Real Insights.  
Real Results. ● REC 」

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# Francis Choi

Products Specialist – MDD  
Asia Pacific South



Real Teams. Real Insights.  
Real Results. ● REC

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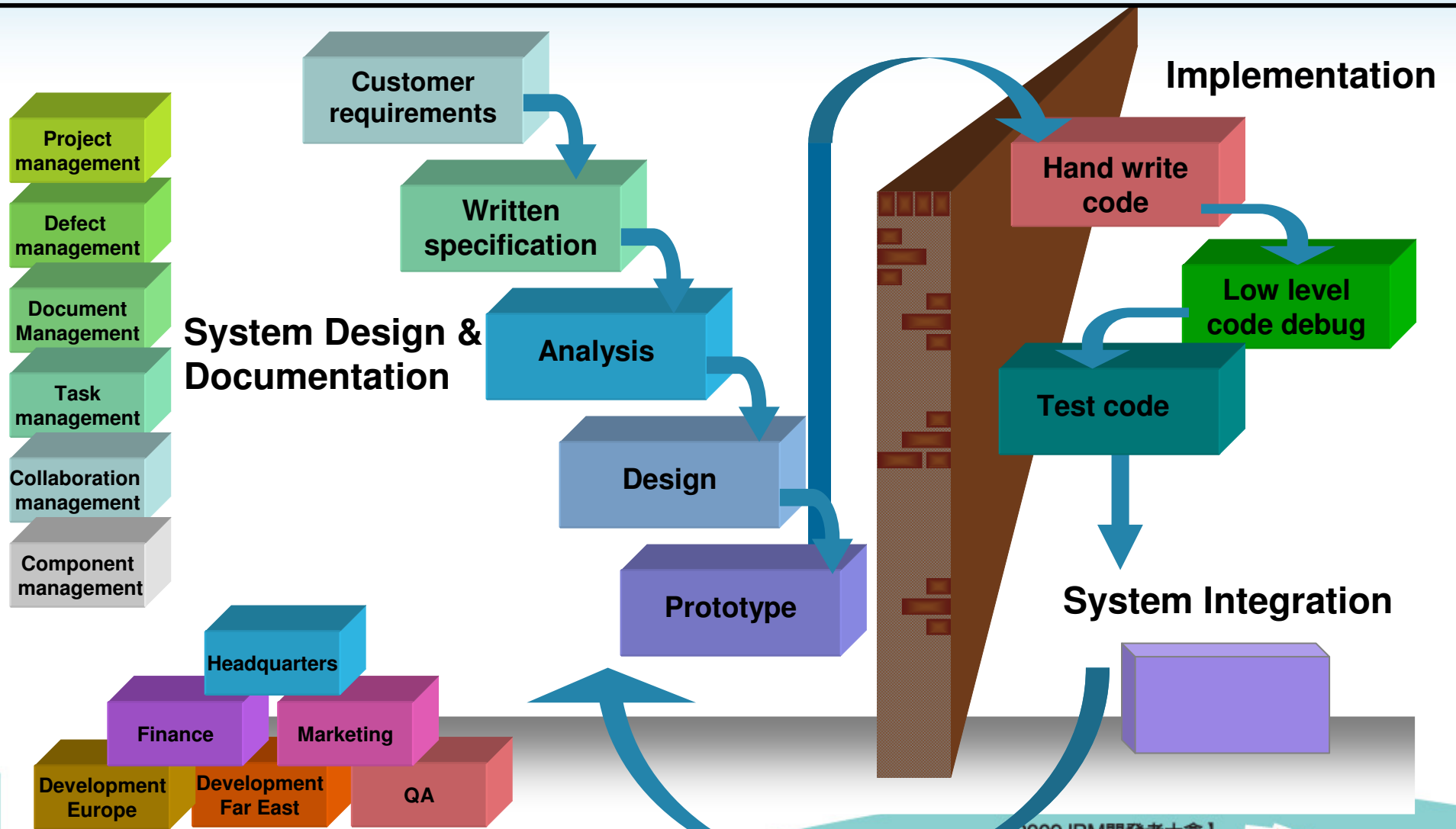
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# 嵌入式軟體 模型驅動開發



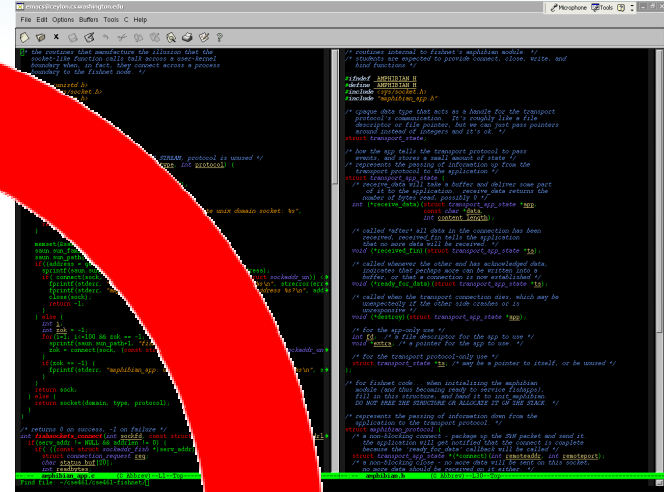
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# The traditional design process



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Visual Modeling



하와이

The Korea Times Hawaii Edition

당뇨저혈당 하와이 공급업자 모집

하와이 공급업자 모집... 당뇨저혈당 하와이 공급업자 모집... 당뇨저혈당 하와이 공급업자 모집...

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。

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。

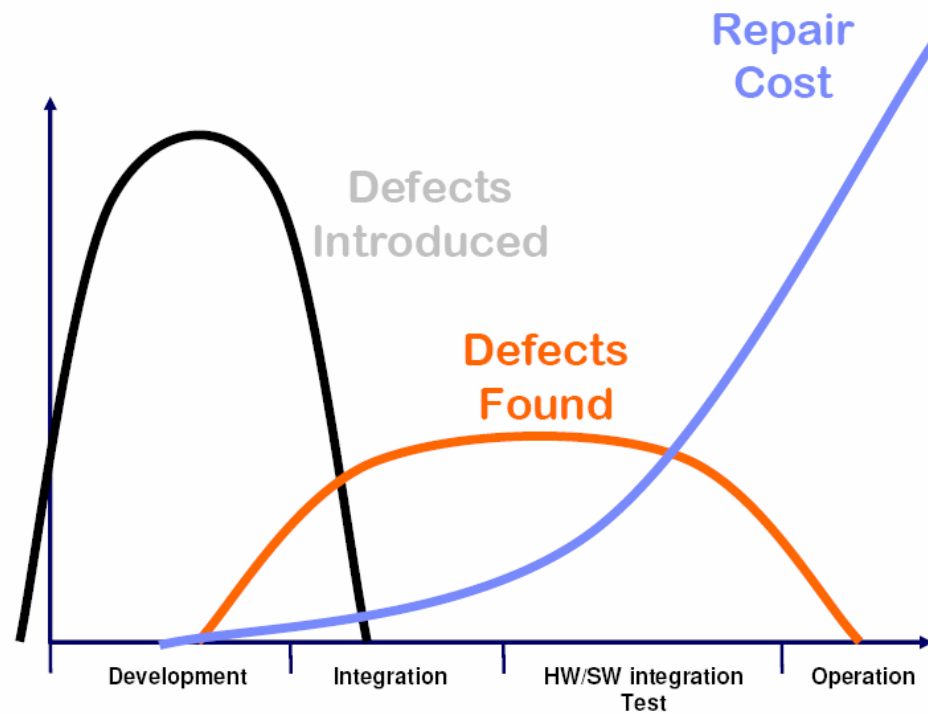
Watch phone



RF08-07310 August... EXECUTION... BACKS AND CONDITIONS: Do not apply shingle roofing... Slopes 4 and 6 inches Per Foot... 3.2.1 Under... 3.2.2...

Table with specifications for hardware components including Expansion, Connectivity, RAID, Audio, Networking, BIOS & Special Features, and Accessories.

## Economics of Defects

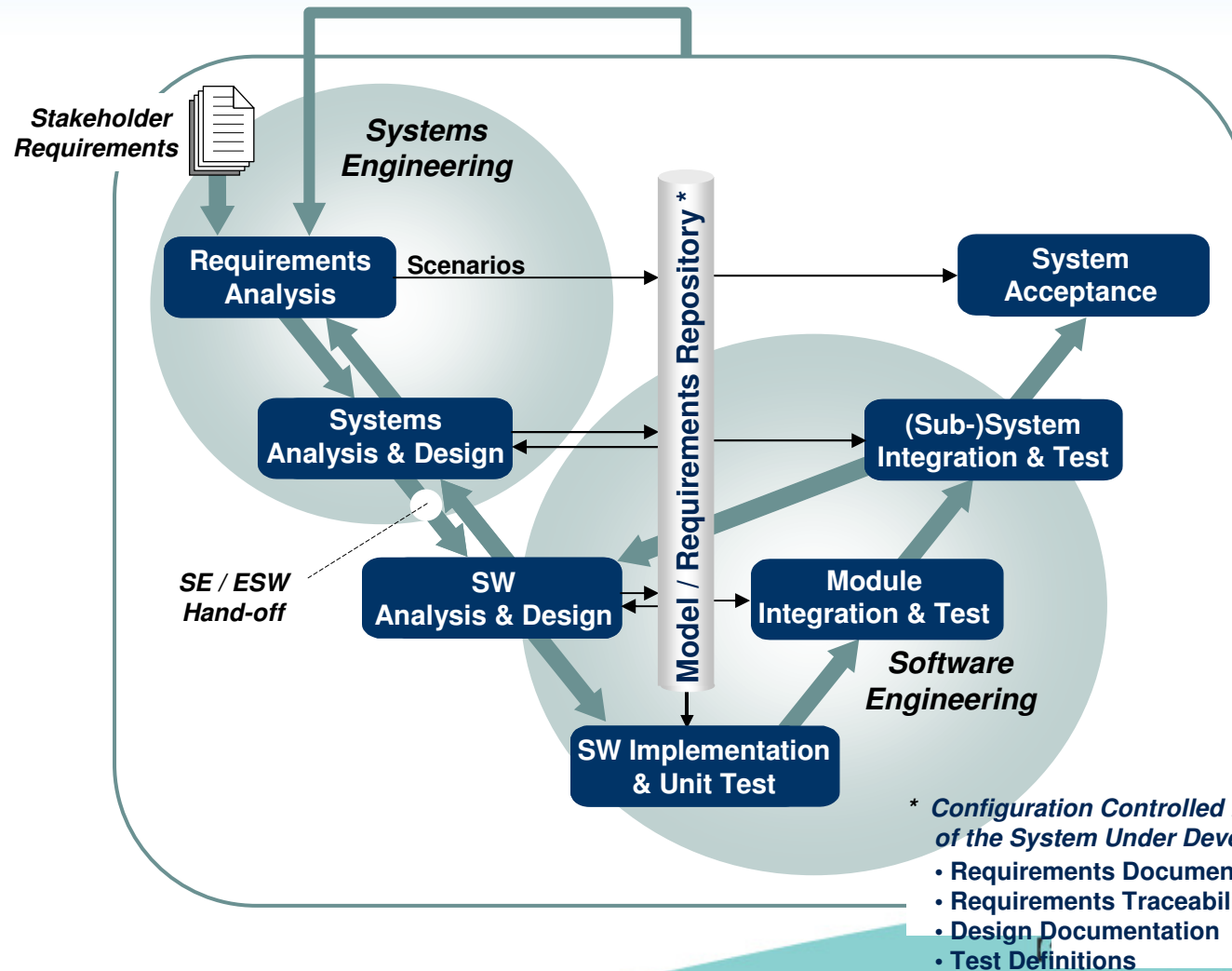


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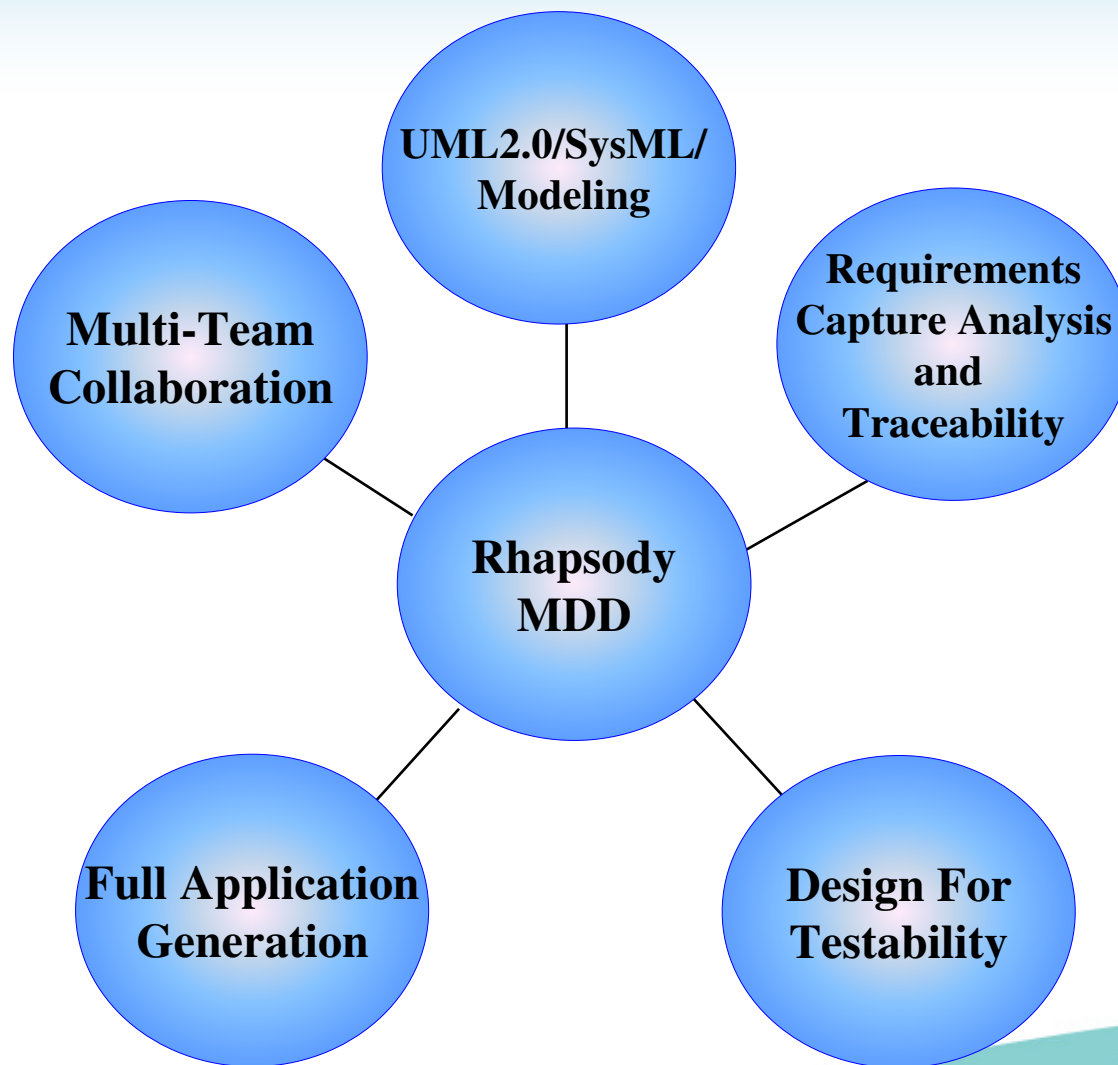
# Integrated System / Software Development Process

## Model-Driven Development System Changes



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## Marking All These Work



*Rhapsody*<sup>®</sup>

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## Conceptual Collaboration in Text



## Developer 1

“Ok. Here’s how it works. Thread A will pass event X to thread B and that will change B’s state to Running from what it was before which 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?



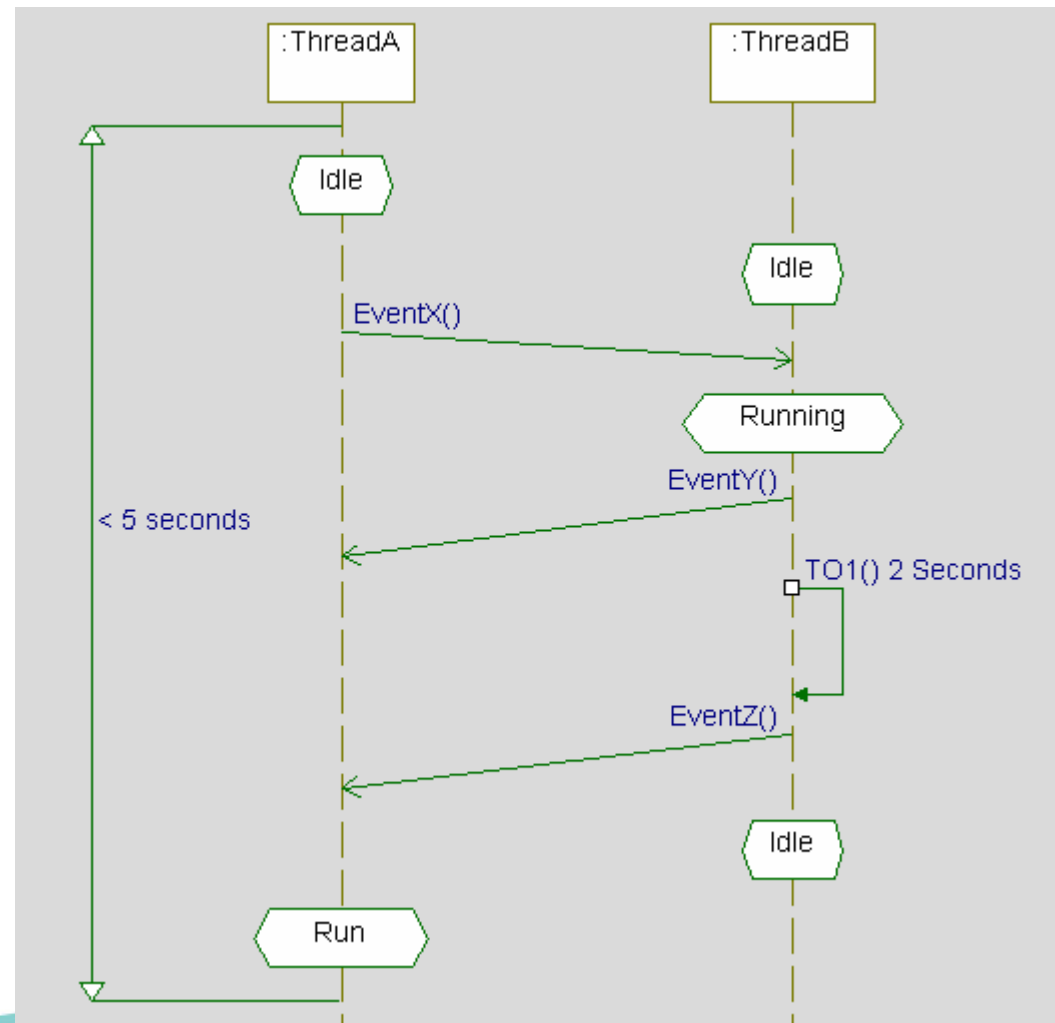
# Conceptual Collaboration in Models

Developer 1

“Here look at this Sequence Diagram.”

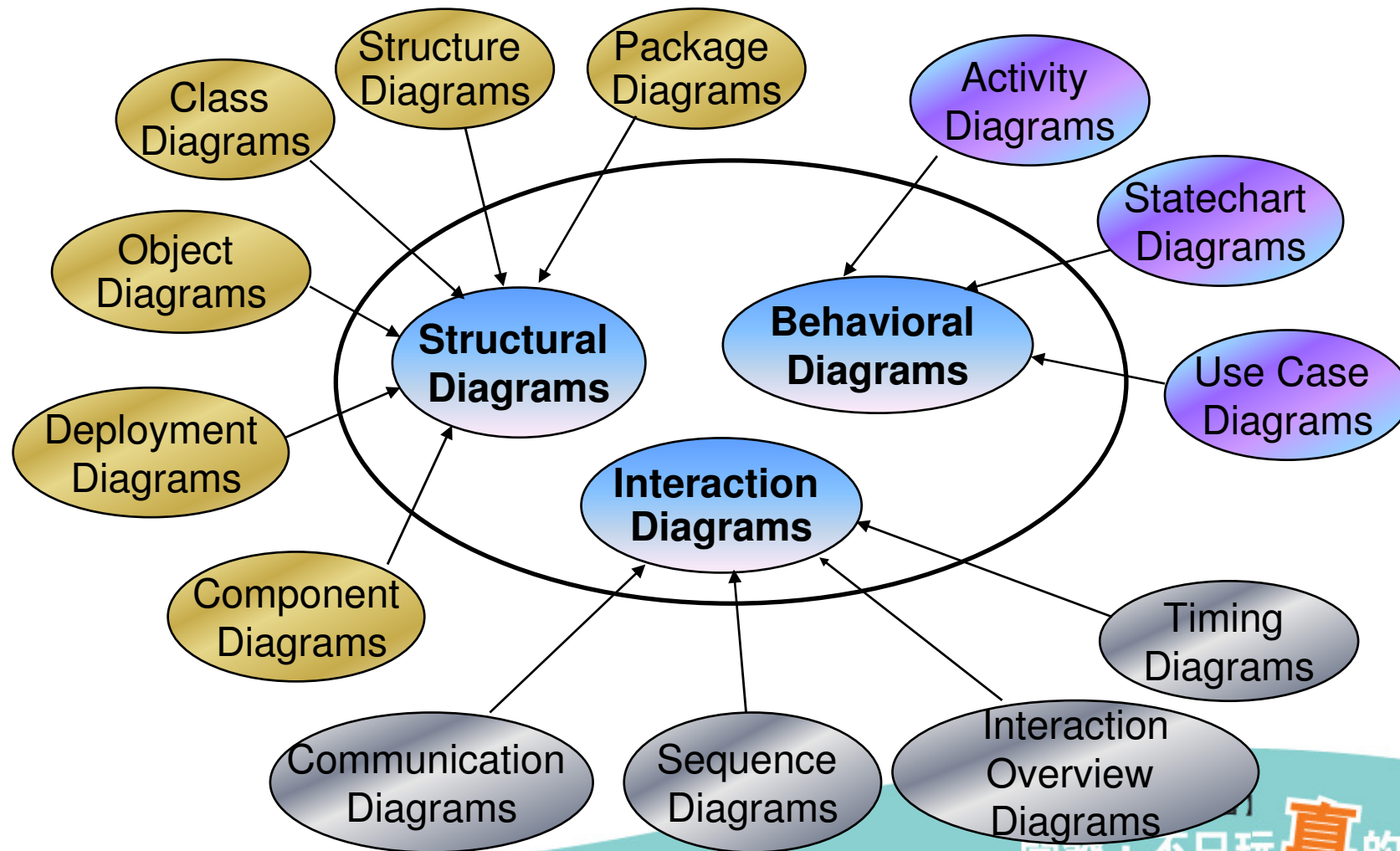
Developer 2

“Ahhh, now I see!”



## Conceptual Collaboration in Models

UML2 - a common graphical language enabling conceptual collaboration



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# 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

Analysis  
MMI  
DataCall

ThreadA  
ThreadB  
Idle  
Event(X)  
Running  
Event(Y)  
Event(Z)  
Run  
< 5 seconds  
TO(1) 2 Seconds

CALLER  
SYSTEM  
OPERATOR  
AMBULANCE

3.1 SURFACES AND CONDITIONS: Do not apply shingle roofing on surfaces that are unworkable or that will prevent a satisfactory application. Ensure that roof deck is smooth, clean, dry, and without loose knots. Cover knots 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.

3.2.1 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 continuing from eaves to ridge, using 1/2-inch head laps, 4-inch laps from both sides over all hips and ridges, and 4-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.

3.2.1 Underlayment (for Roof Slopes Between 2 Inches and 4 Inches Per Foot) (4 Inches Per Foot and Greater): Apply underlayment consisting of two layers of No. 15 asphalt-saturated felt to the roof deck. Provide a 1/4-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 continuing 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.

3.2.2 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 eaves. Extend back from the edge of the deck not more than 3 inches and secure with fasteners spaced not more than 10 inches on center along the inner edge.

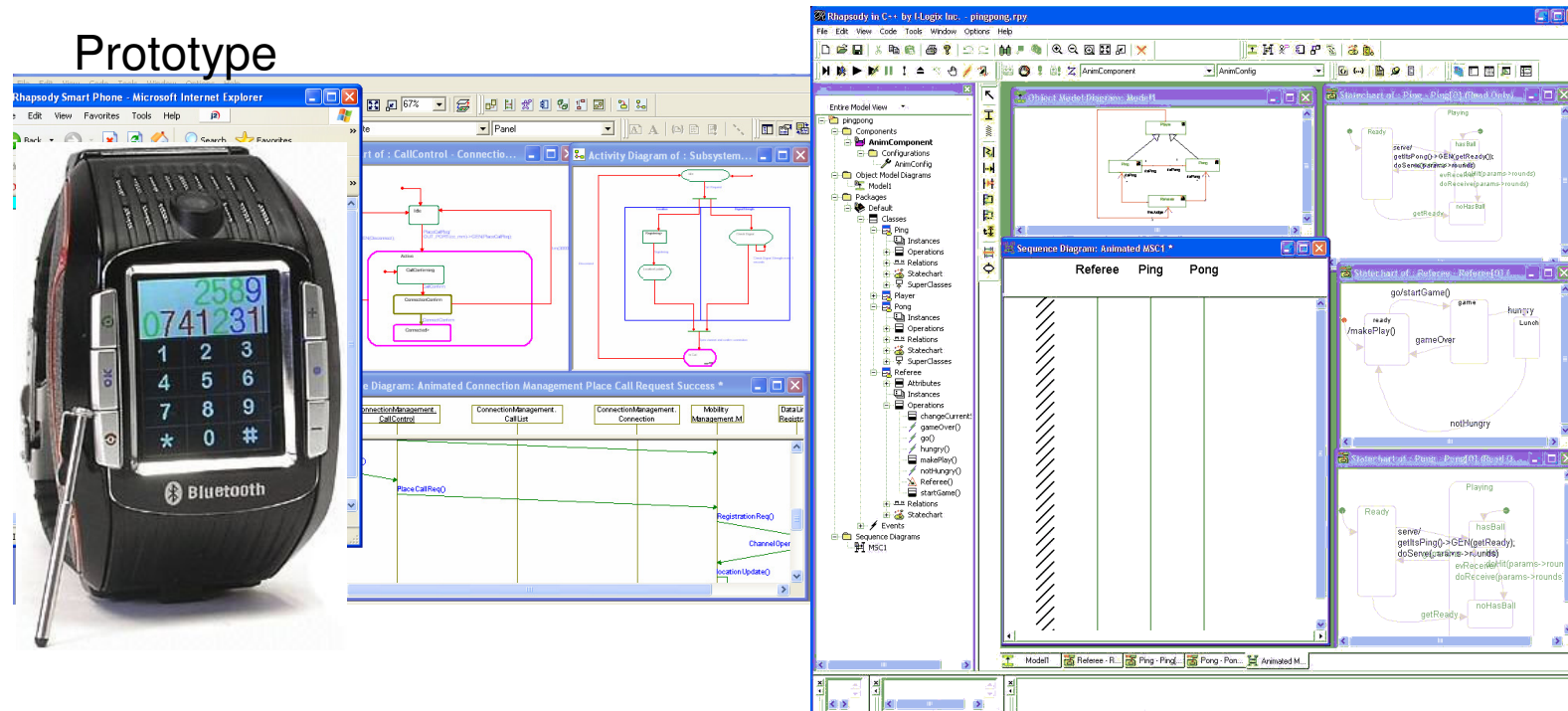
3.2.3 Gutter Flashing (for Roof Slopes 4 Inches Per Foot and Greater): Provide gutter flashing strips consisting of 20-gauge heavier smooth-surface roll roofing. The flashing strips shall overlap the metal drip edge 1/4 to 3/8 inch and extend up the slope far enough to cover a point 12 inches inside 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.

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:	GIGABYTE.
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.

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# Executable models (Simulation and Animation)

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



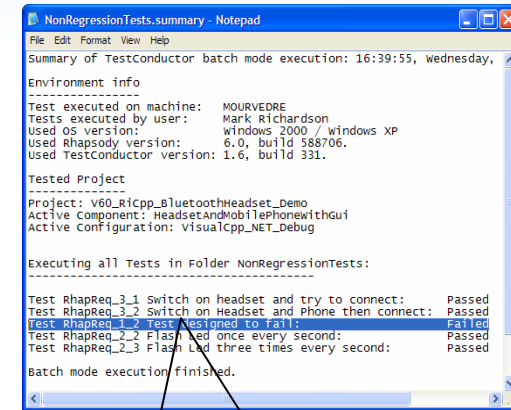
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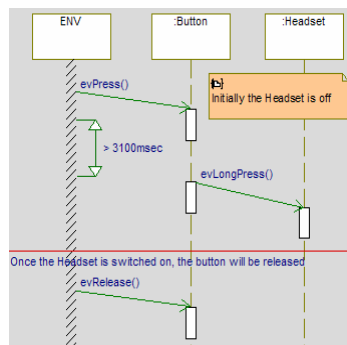
# Requirements Based Testing

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

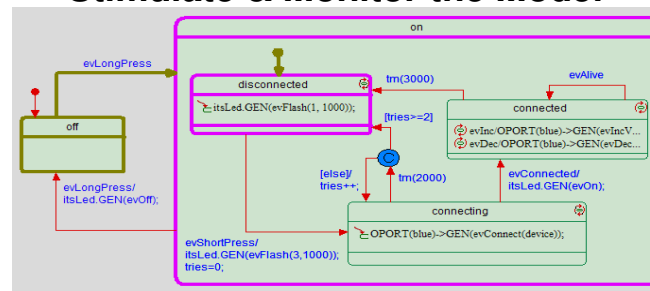
## Test Results



## Test Scenario

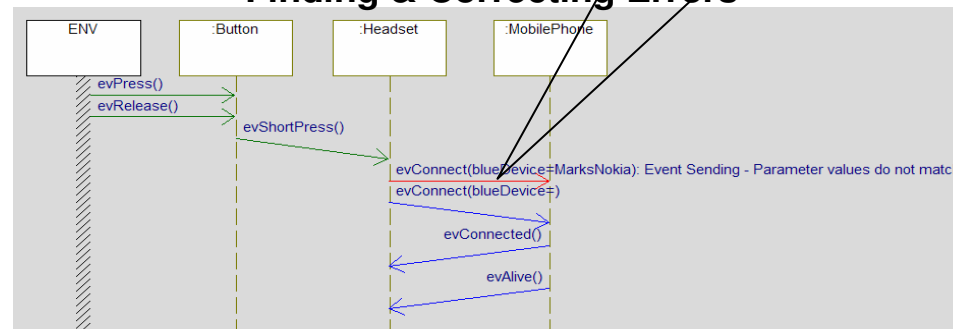


## Stimulate & Monitor the Model

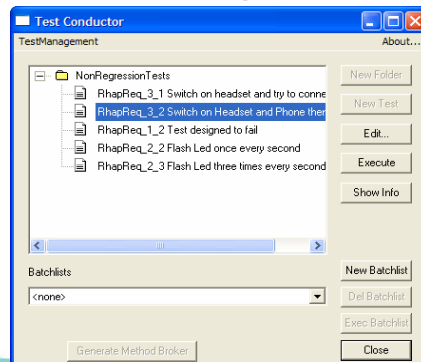


Unexpected result

## Finding & Correcting Errors



## Test Configuration



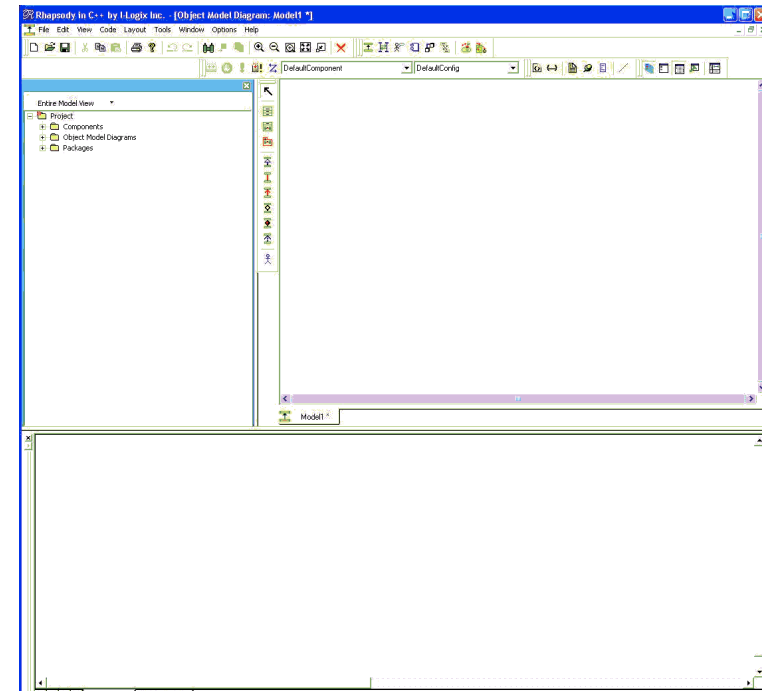
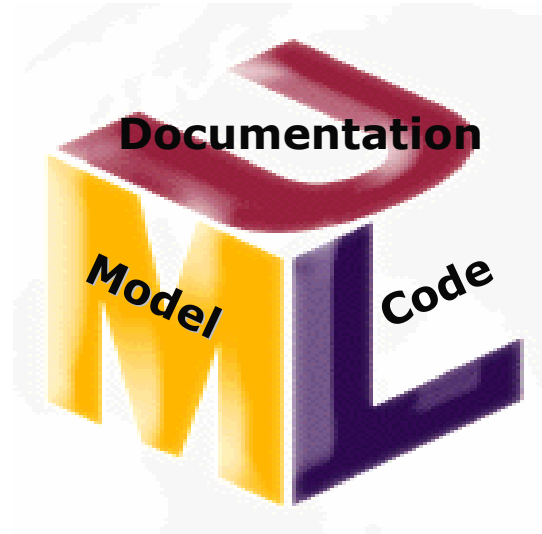
## Full Application Generation

- 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*



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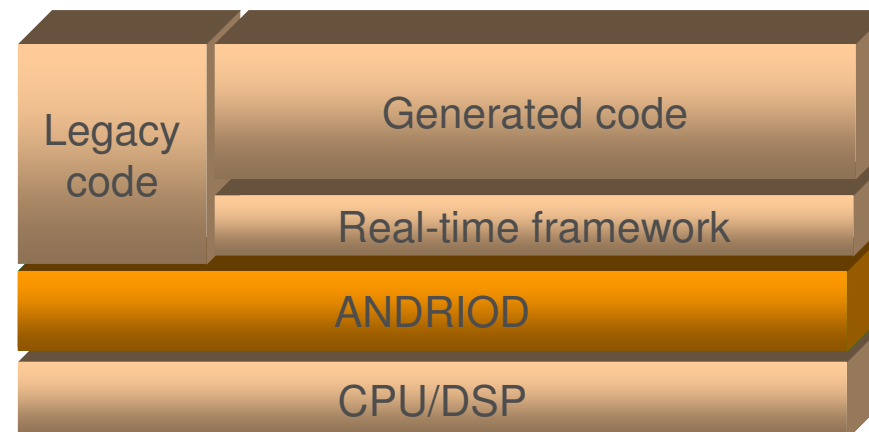
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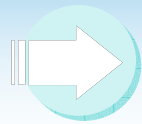


## The Rhapsody Real-Time Framework

### *Rhapsody provides an executable real-time framework*

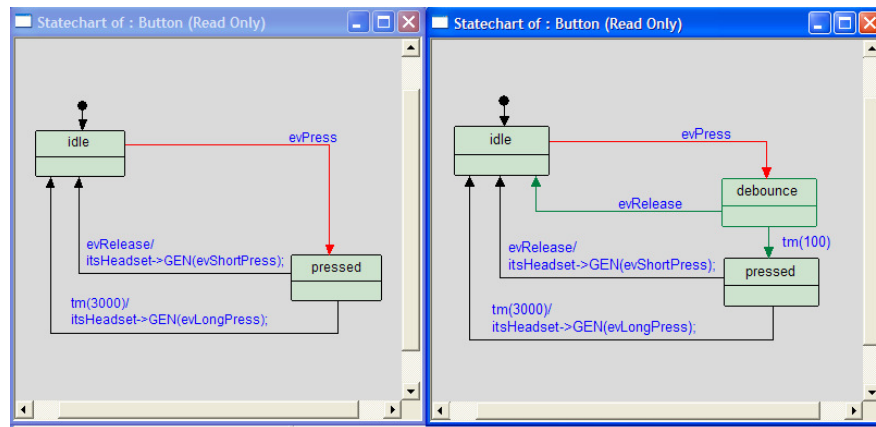
- Most applications are over 50% “housekeeping code” which is redeveloped every time you create a system.
- A *framework* is a partially completed application.
  - **you** customize and specialize for **your** application.
  - All source code is provided.
- A *real-time framework* is an:
  - integrated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





# 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

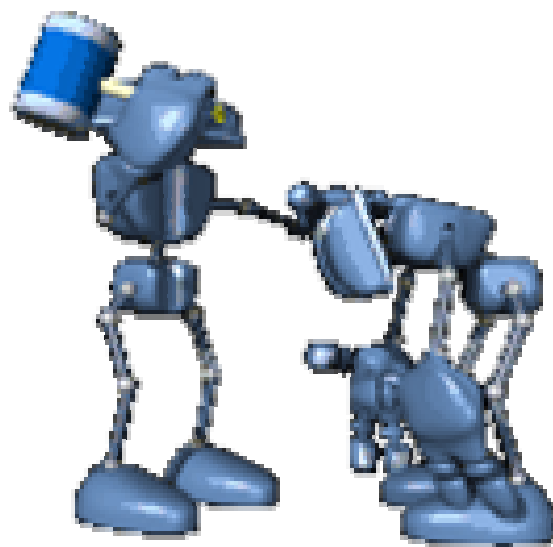


transparent *integrated presence*  
 wikis OPEN real-time reporting  
 chat automated hand-offs Web 2.0  
*custom dashboards* automated data gathering  
**EXTENSIBILITY** Eclipse plug-ins services  
 architecture **FREEDOM TO CREATE**

JAZZ TEAM SERVER

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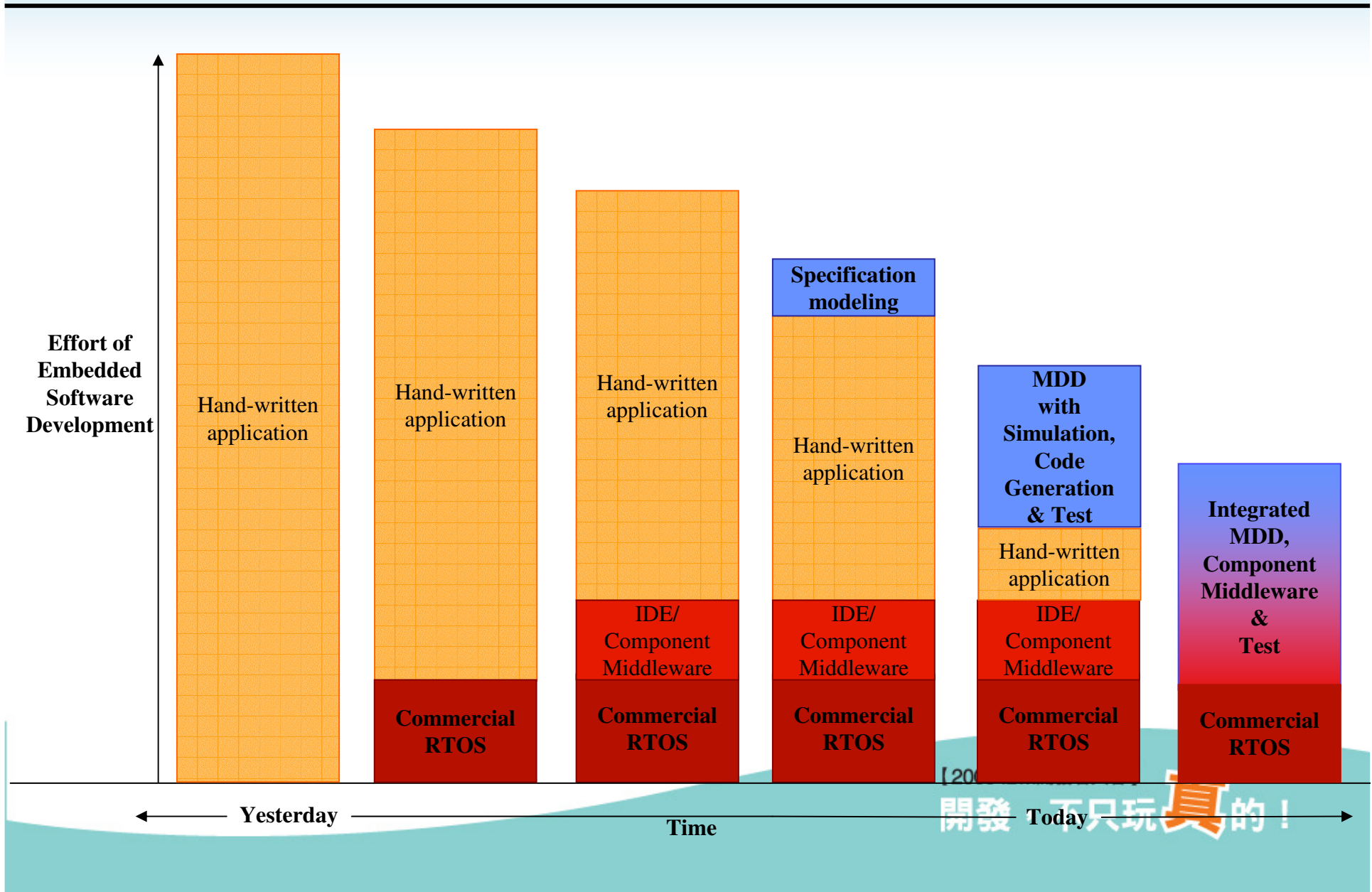
# Technologies



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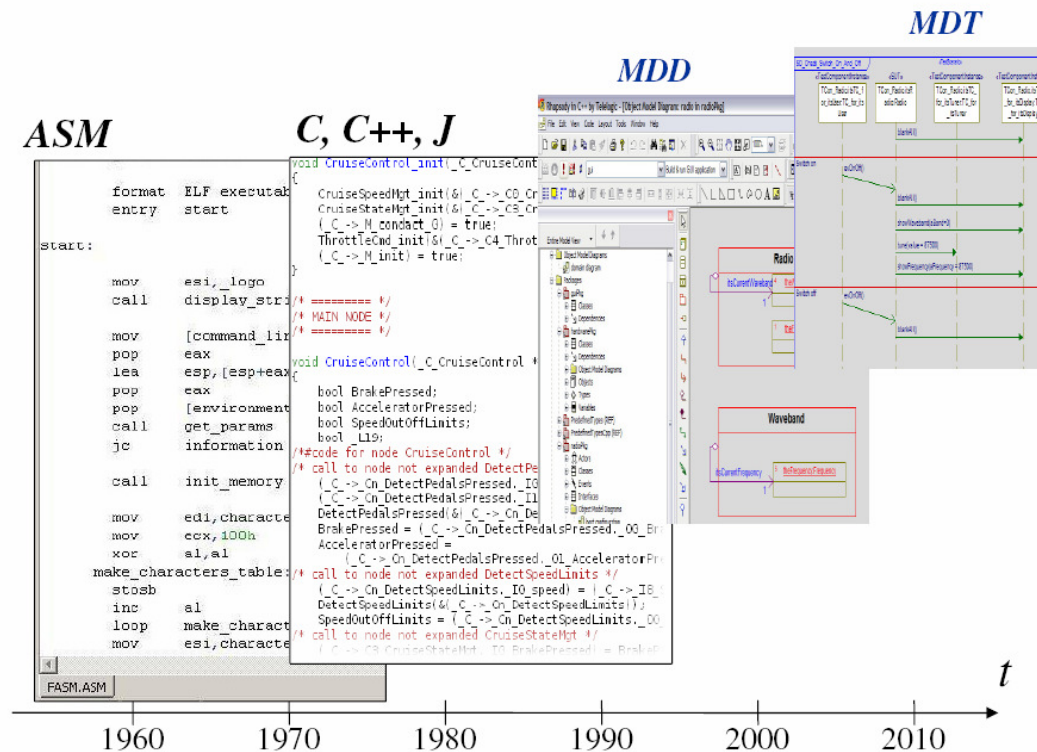
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# Embedded Software Development Efficiency



# Embedded Software Development Efficiency

Development Process is Evolving...



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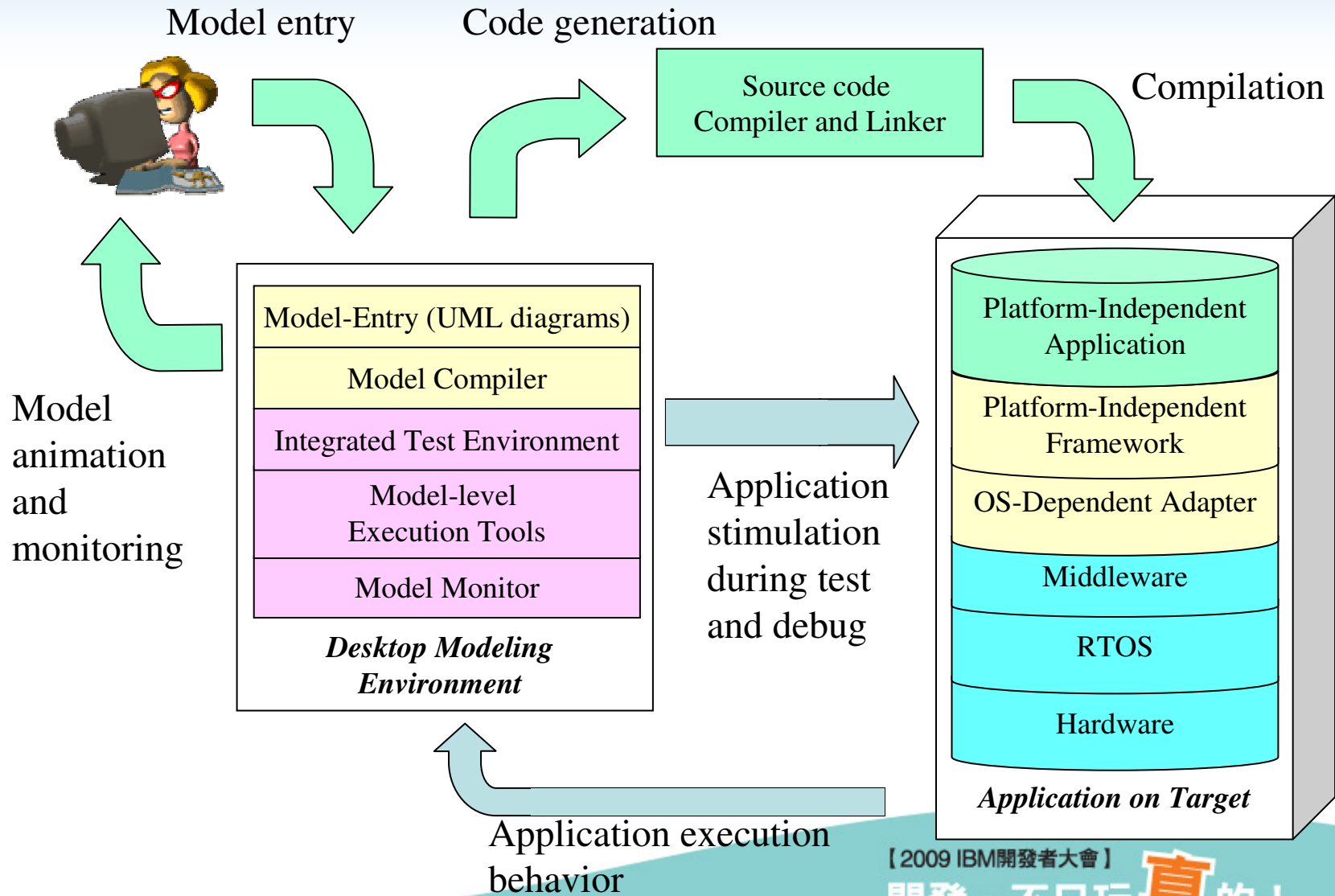
## Platform-Independent Models

- 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

# PIMs In Practice





Thank  
YOU

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