IBM Software Group

嵌入式軟體模型導向開發
--*以視覺化方式開發系統和軟體*
Rational Rhapsody

Rational. software

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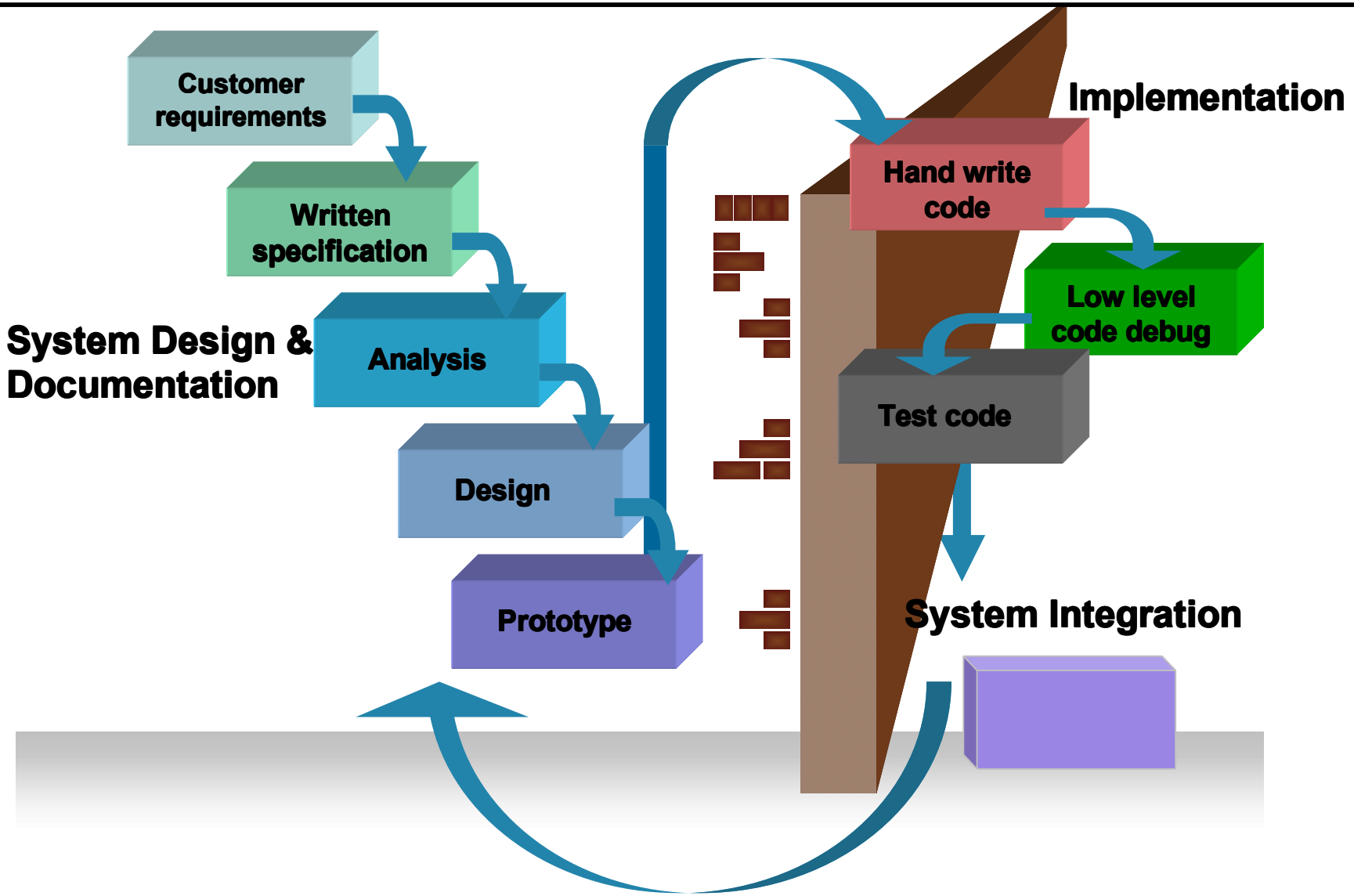
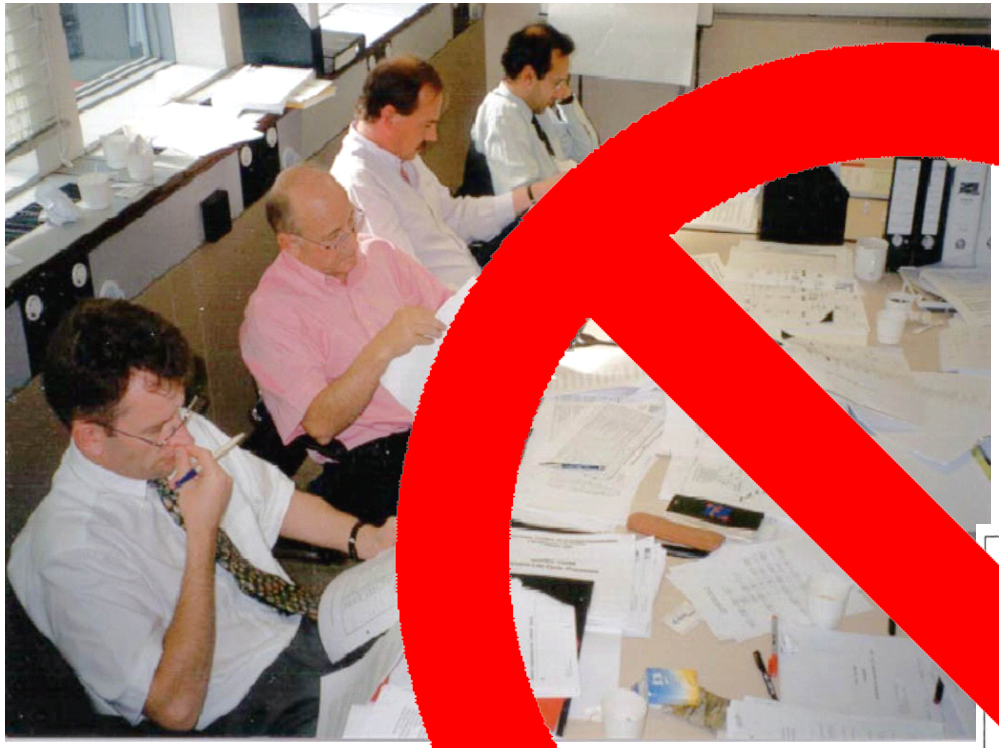
現況分析:

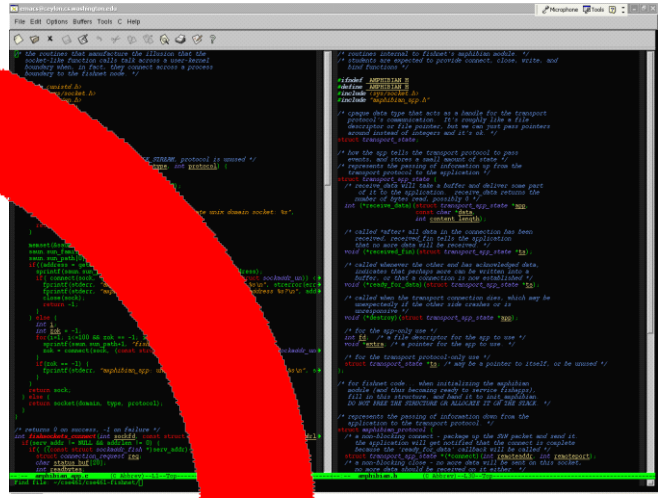
- 遇到問題
  - 作業系統與應用程式無法分開獨立，只能針對某一作業系統平台開發應用程式。
  - 嵌入式軟體開發過程中系統分析、設計文件與程式碼無法保持一致性。
  - 部署到target system才發現問題，除錯困難，耗時費力。
  - 拿到一個需求規格就立即撰寫程式，無法事先做好規劃與設計。
  - 若應用程式部署到不同的作業系統環境，必須做大幅度的程式碼修改，耗時費力且增加除錯時間。
  - 需求規格無法做有效的追蹤，以驗證所開發的系統功能符合需求。

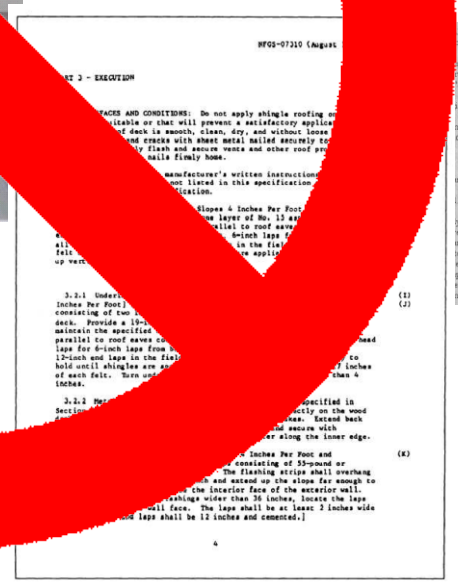
The traditional design process

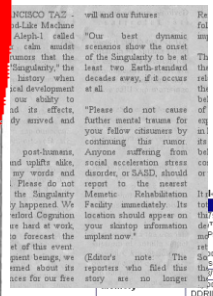


Visual Modeling







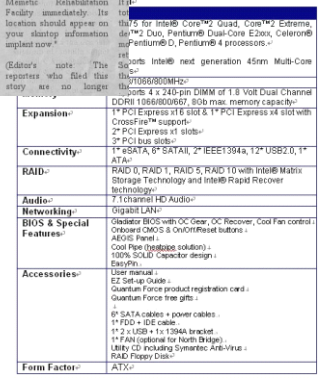


全国日本語学校データベースにようこそ!

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、入学案内などの情報が含まれています。

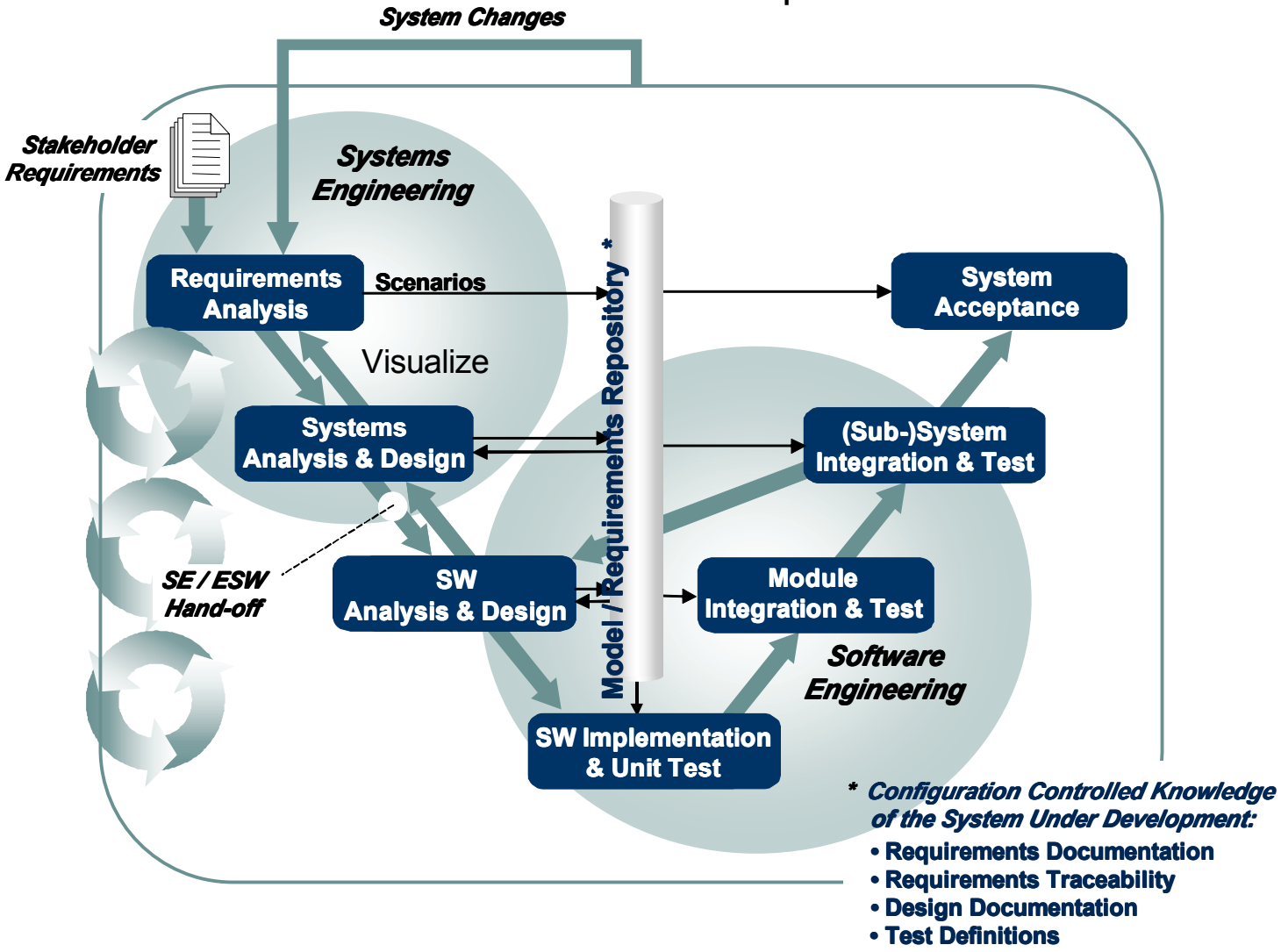
なお、このデータベースに掲載されている日本語学校は、すべて(財)日本語教育振興協会の認定を受けています。

Watch phone

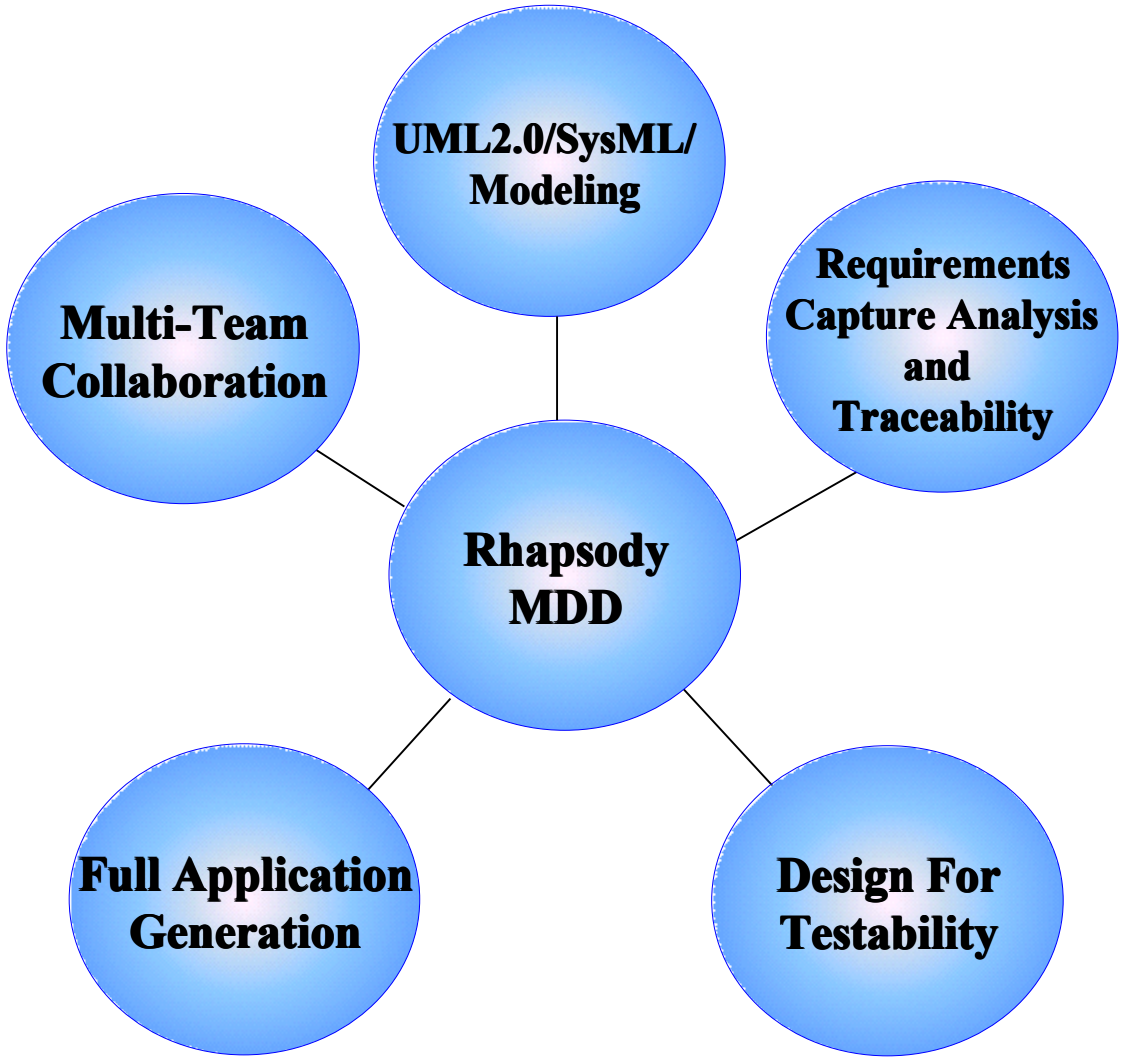


Integrated System / Software Development Process

Model-Driven Development



Marking All These Work



Rhapsody®

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?

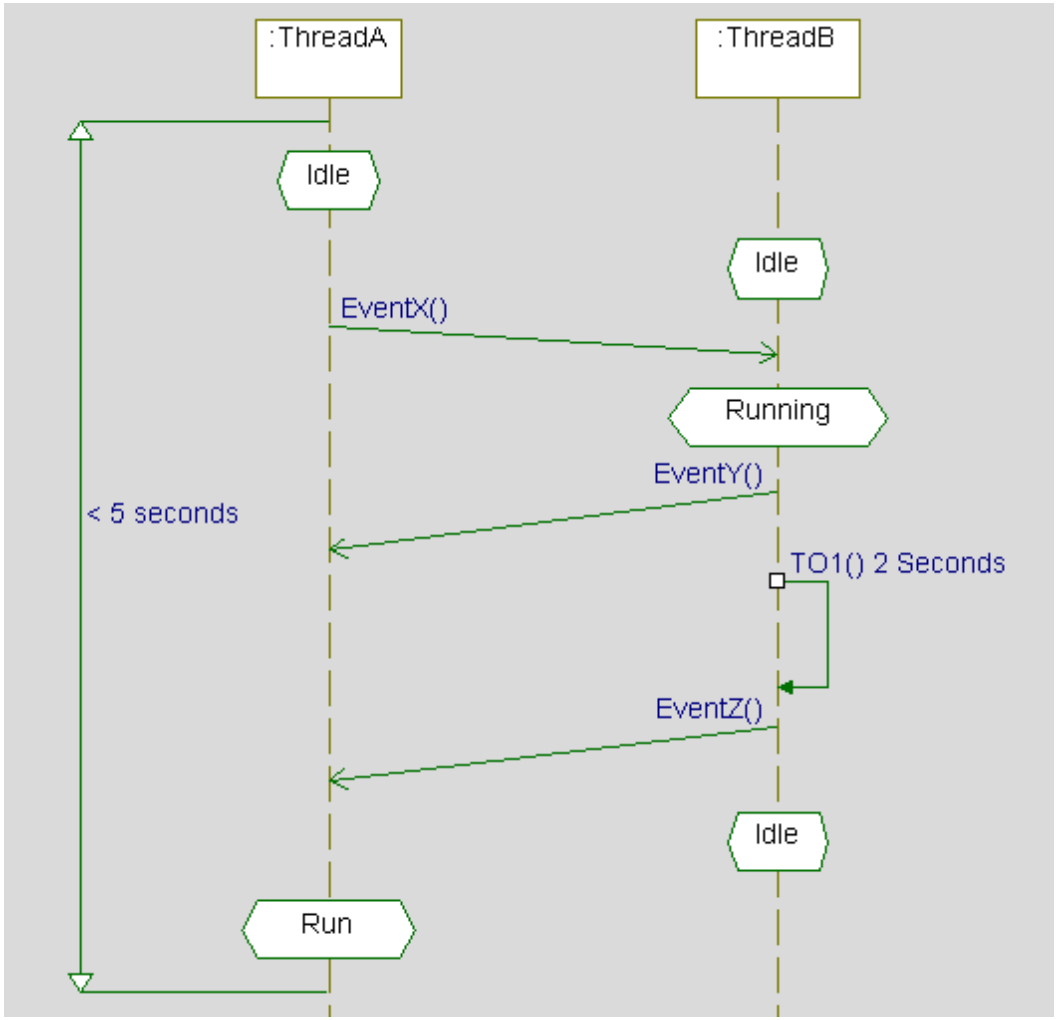
Conceptual Collaboration in Models

Developer 1

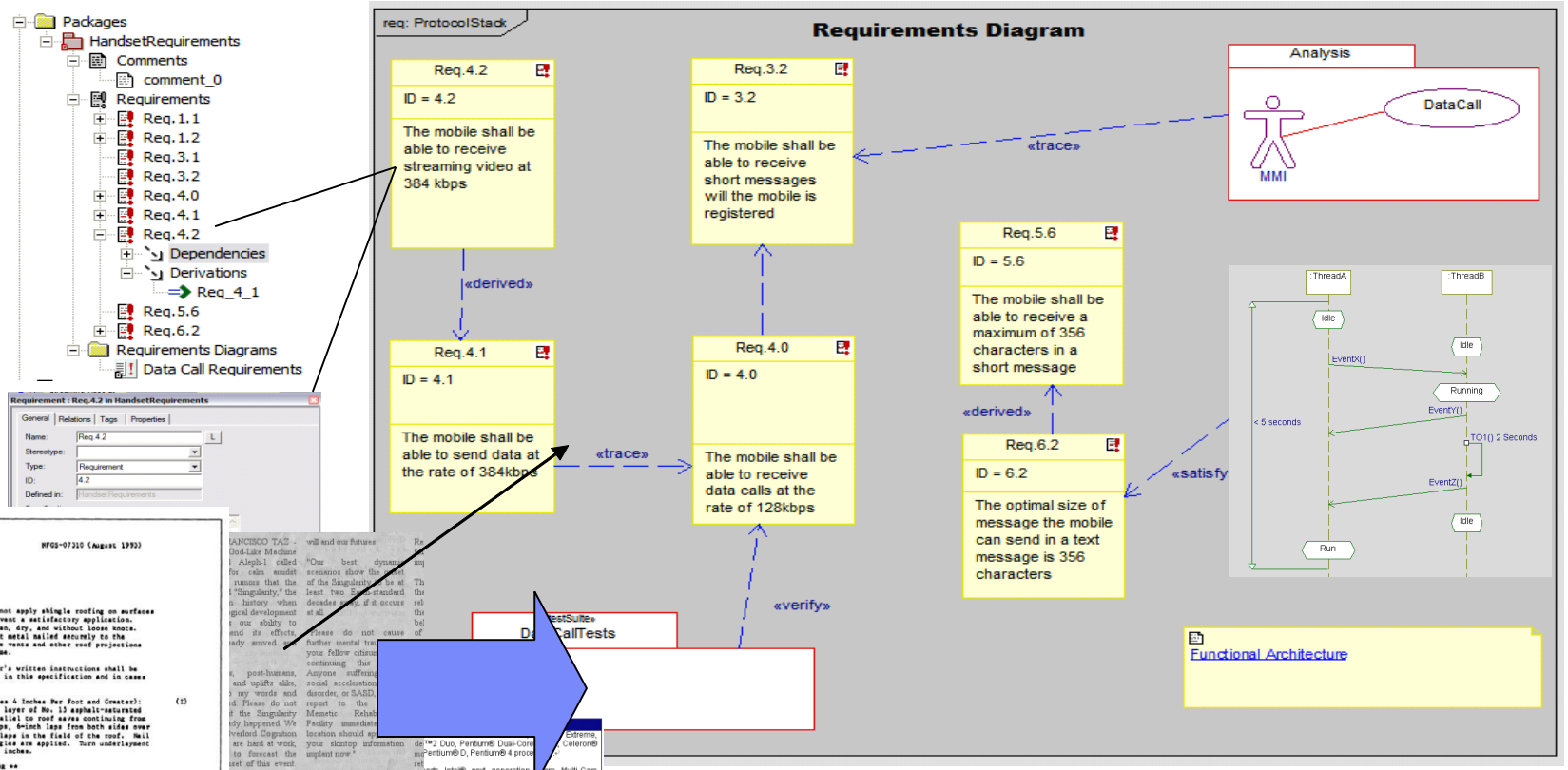
"Here look at this Sequence Diagram."

Developer 2

"Ahhh, now I see!"



Requirement Traceability

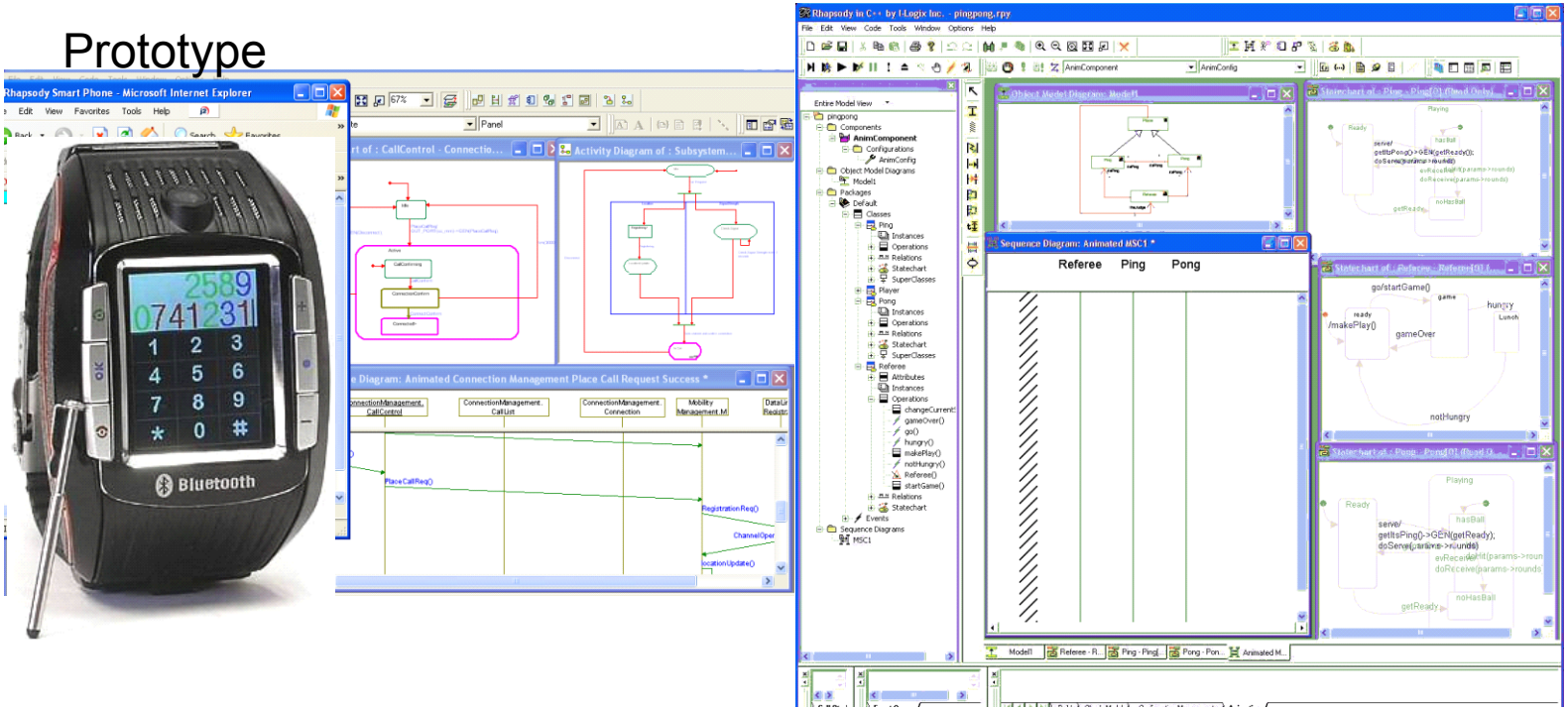


Coverage Analysis
Impact Analysis

Executable models (Simulation and Animation)

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

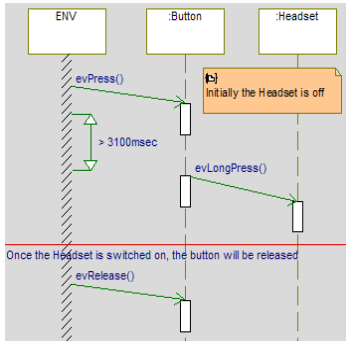
Prototype



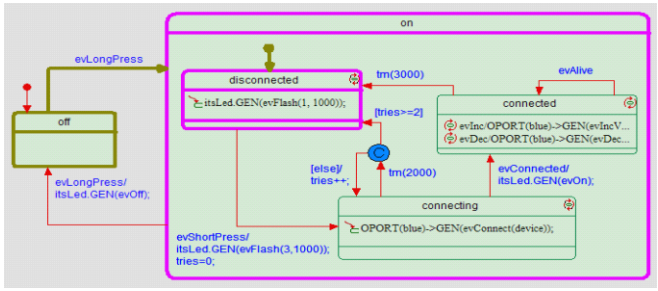
Requirements Based Testing

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

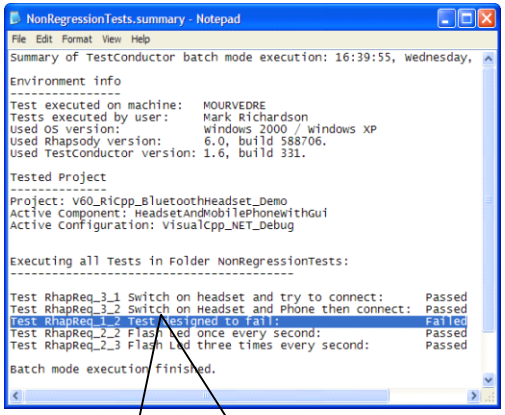
Test Scenario



Stimulate & Monitor the Model



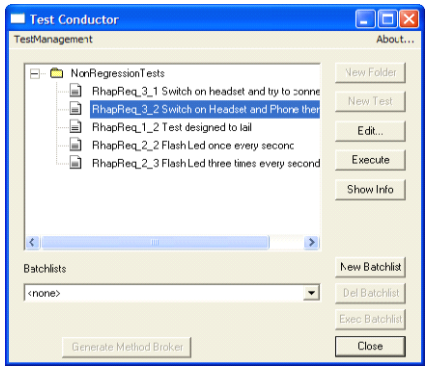
Test Results



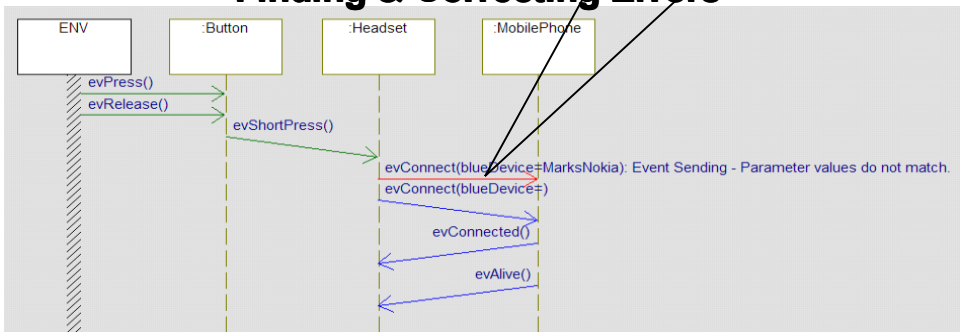
Failed Test

Unexpected result

Test Configuration



Finding & Correcting Errors



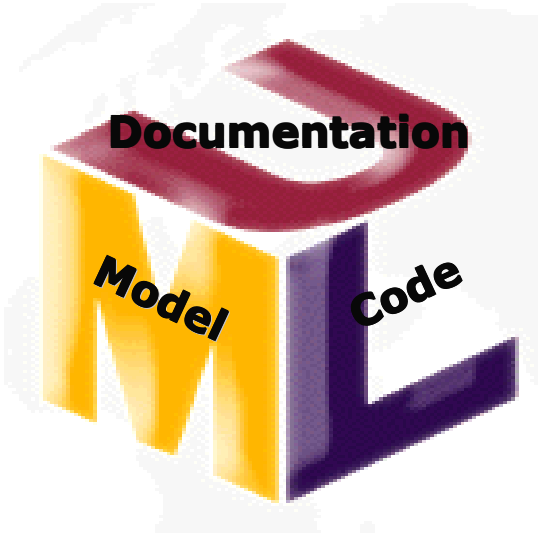
Full Application Generation

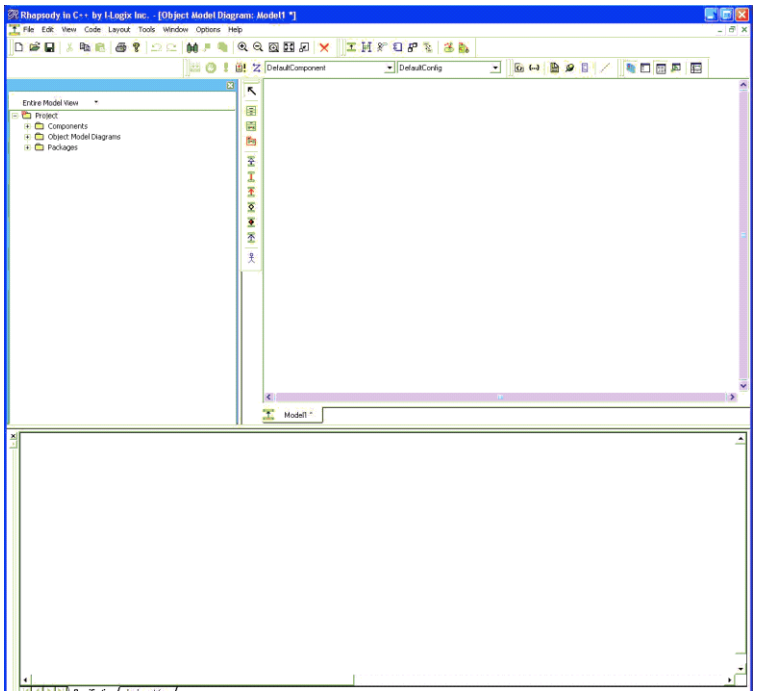
- Rhapsody leverages *all* structural and behavioral model views to produce an executable application
  - State machines: event driven behavior
  - Activity diagrams: algorithms and process flows
  - Generates all construction artifacts (e.g. Makefiles)
- Support for
  - C, C++, Ada and Java
  - Size/Speed 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

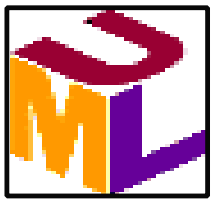
Model Code Associativity

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*



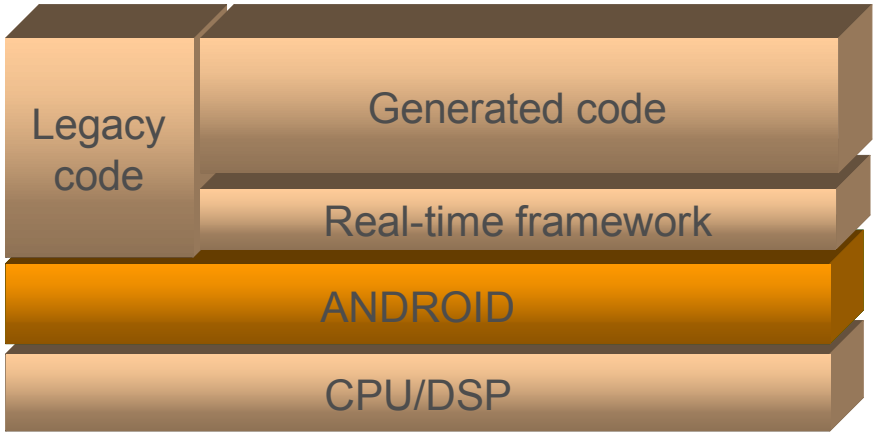




The Rhapsody Real-Time Framework

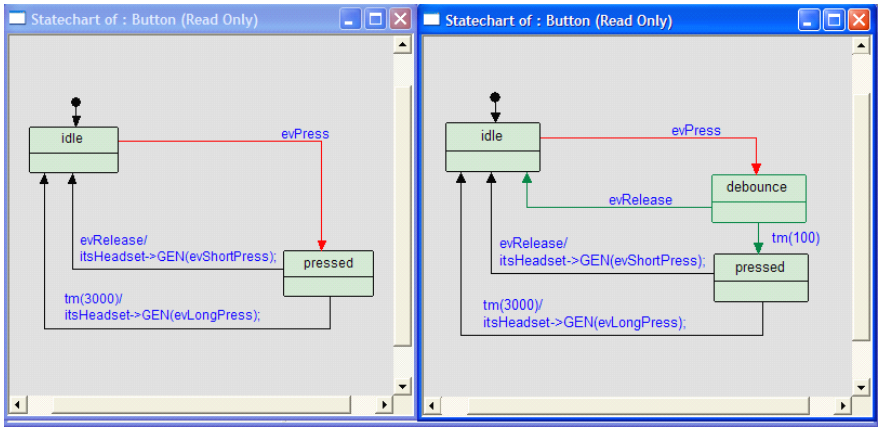
Rhapsody provides an executable real-time framework

- 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



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 Jazz

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

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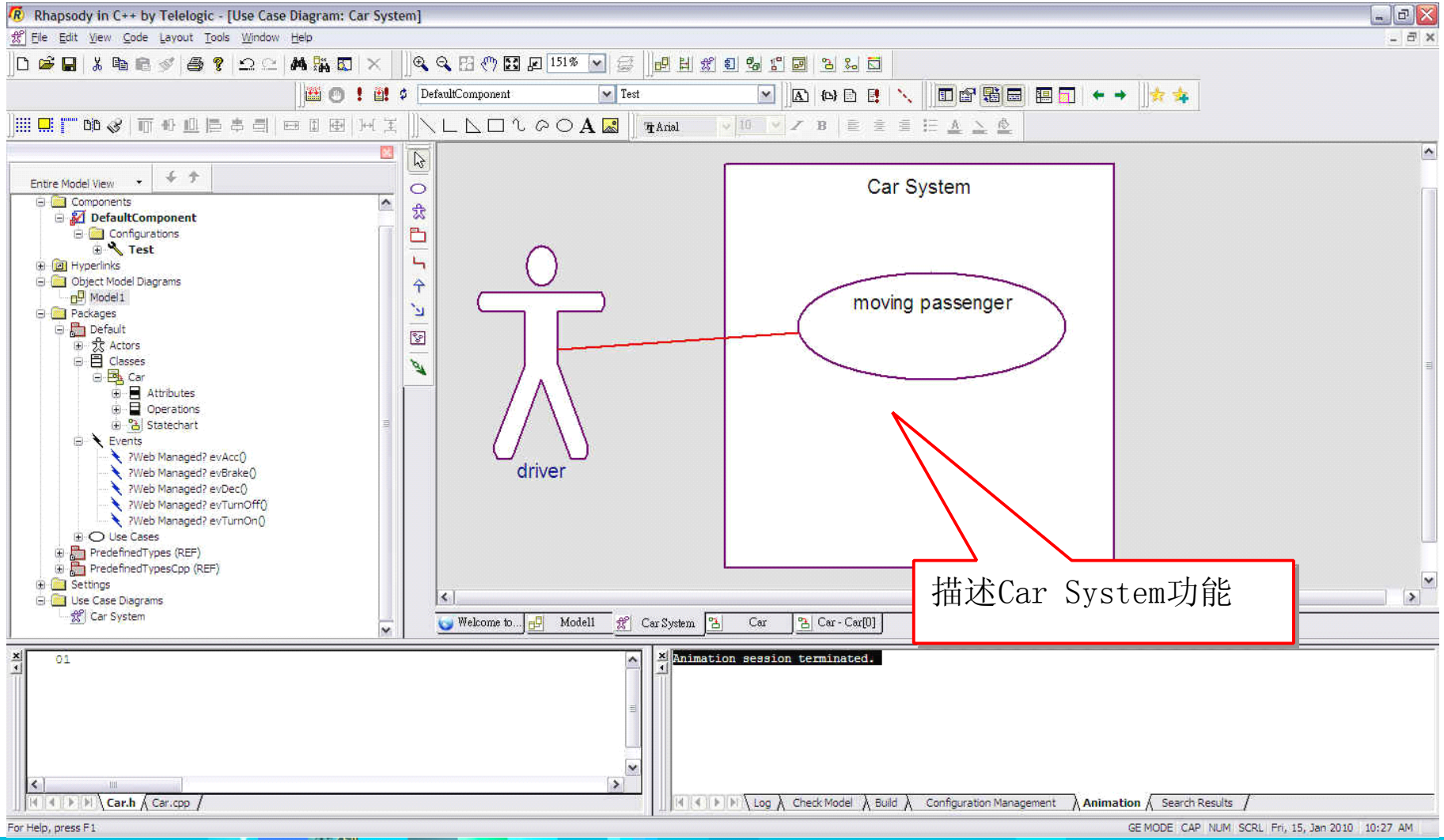
Business Value 商業效益:

- 提高嵌入式軟體開發的生產力，開發人員可以專注於模型的設計與應用程式的邏輯設計，而非底層與作業系統相關的設計工作。
- 確保需求規格的涵蓋度，提高客戶滿意度。
- 視覺化的建模方式，有效提升專案開發人員的溝通能力，而非以往傳統用程式碼做為討論的方式。
- 模型可重複使用，自動產生出程式碼，節省開發時程，降低人工撰寫程式的錯誤率。
- 加速在不同作業系統環境的部署時間，反應市場快速變遷，提升競爭力。
- 系統分析、設計文件與程式碼永遠維持同步一致性，減少人員異動的困擾與維護的困難。
- 提早於模型設計階段透過模型的模擬執行發掘系統的問題，有效降低上線的風險。

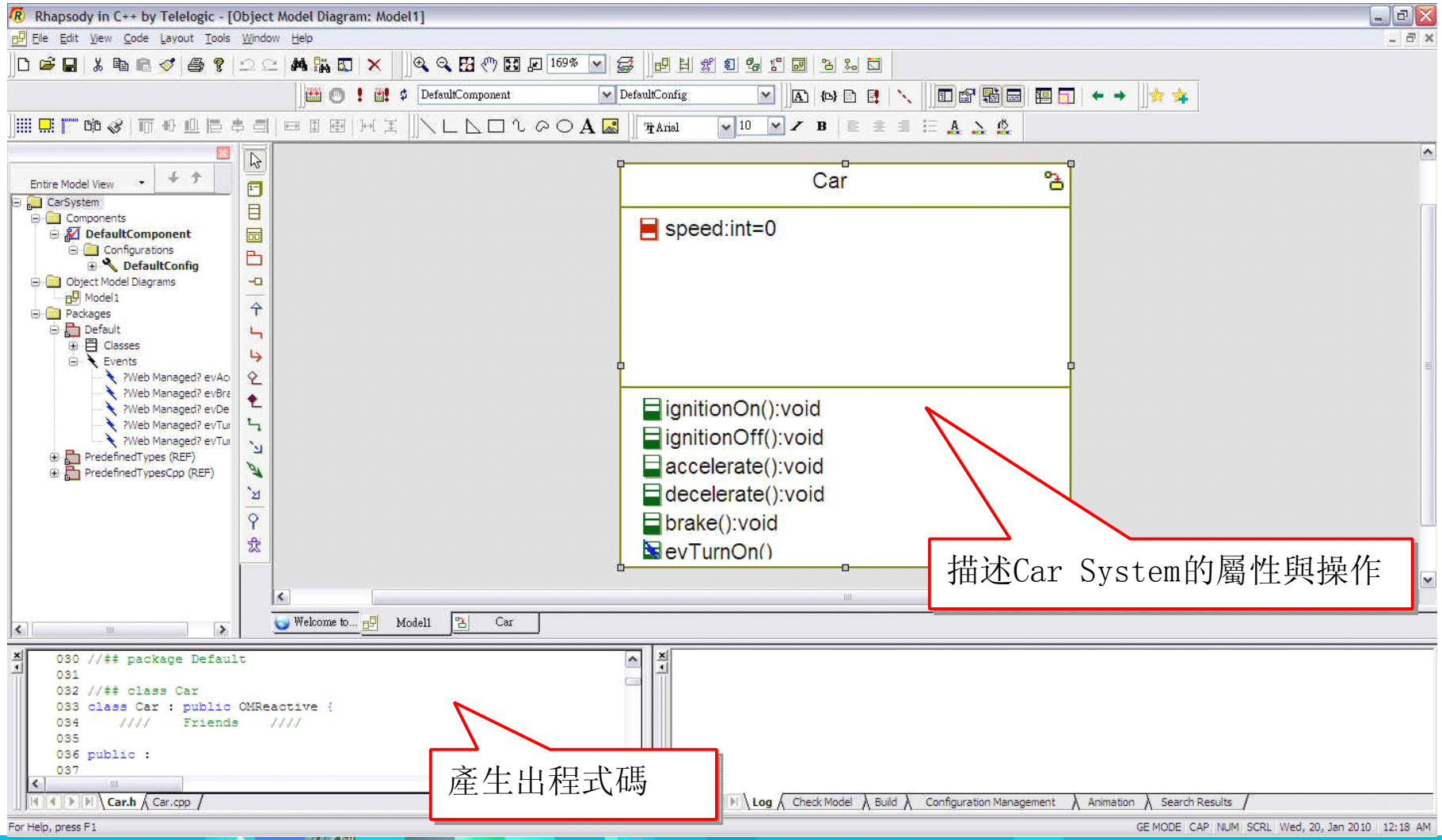
範例展示 – Car System

- Attribute
  - 速度
- Operation
  - 點火
  - 熄火
  - 加速
  - 減速
  - 踩煞車

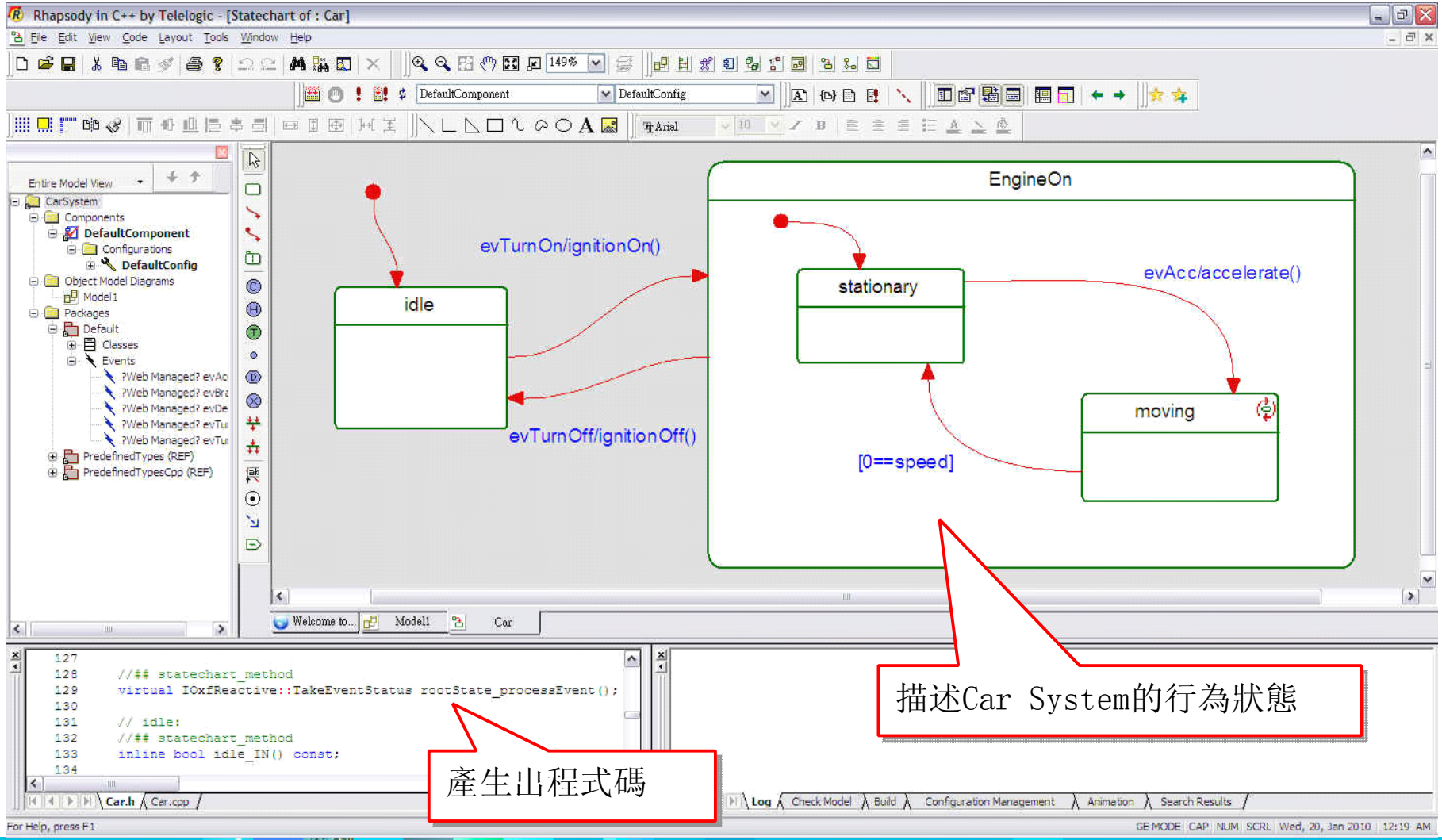
範例展示 - 建立 Use Case Diagram



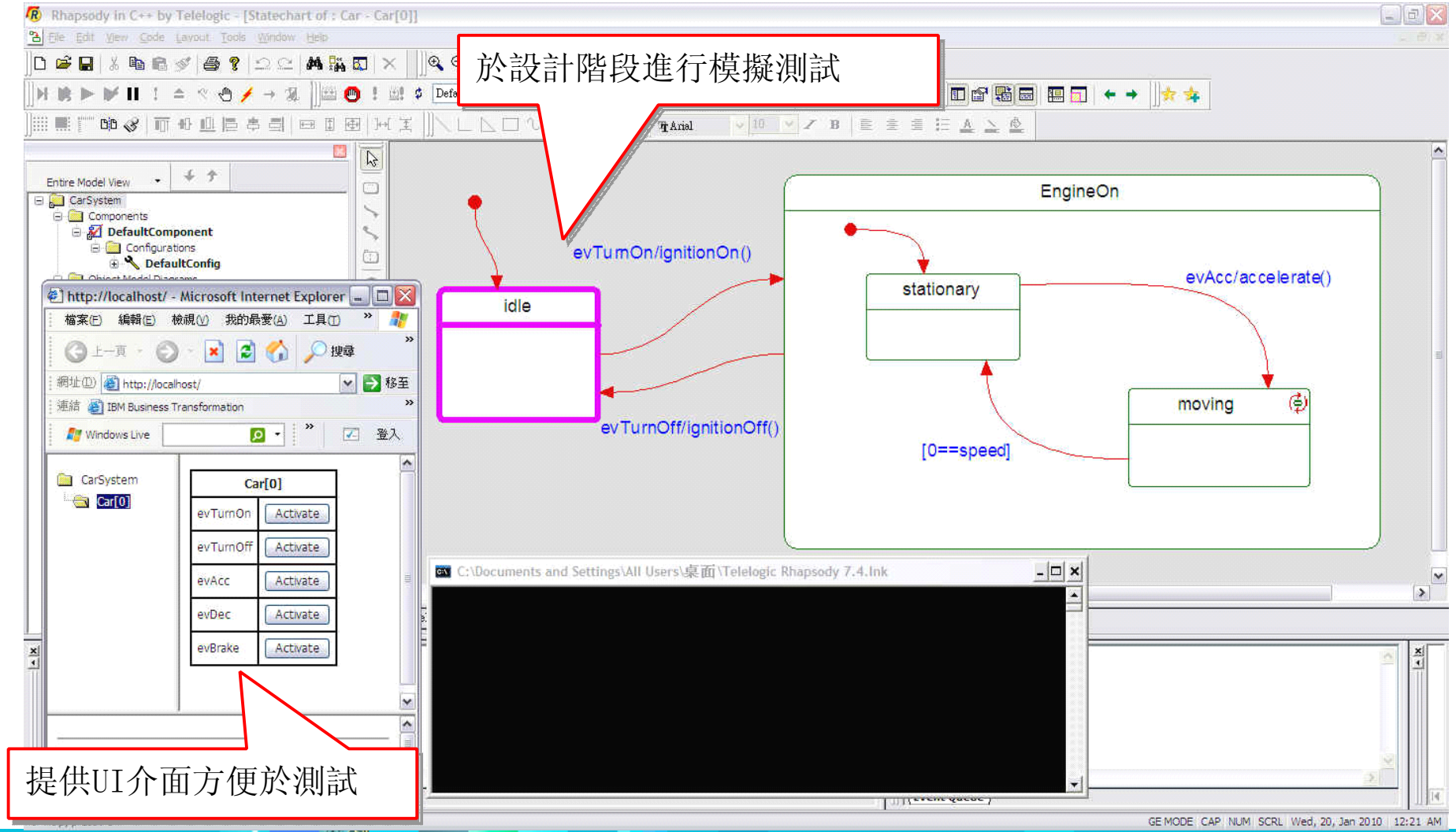
範例展示 - 建立 Class diagram



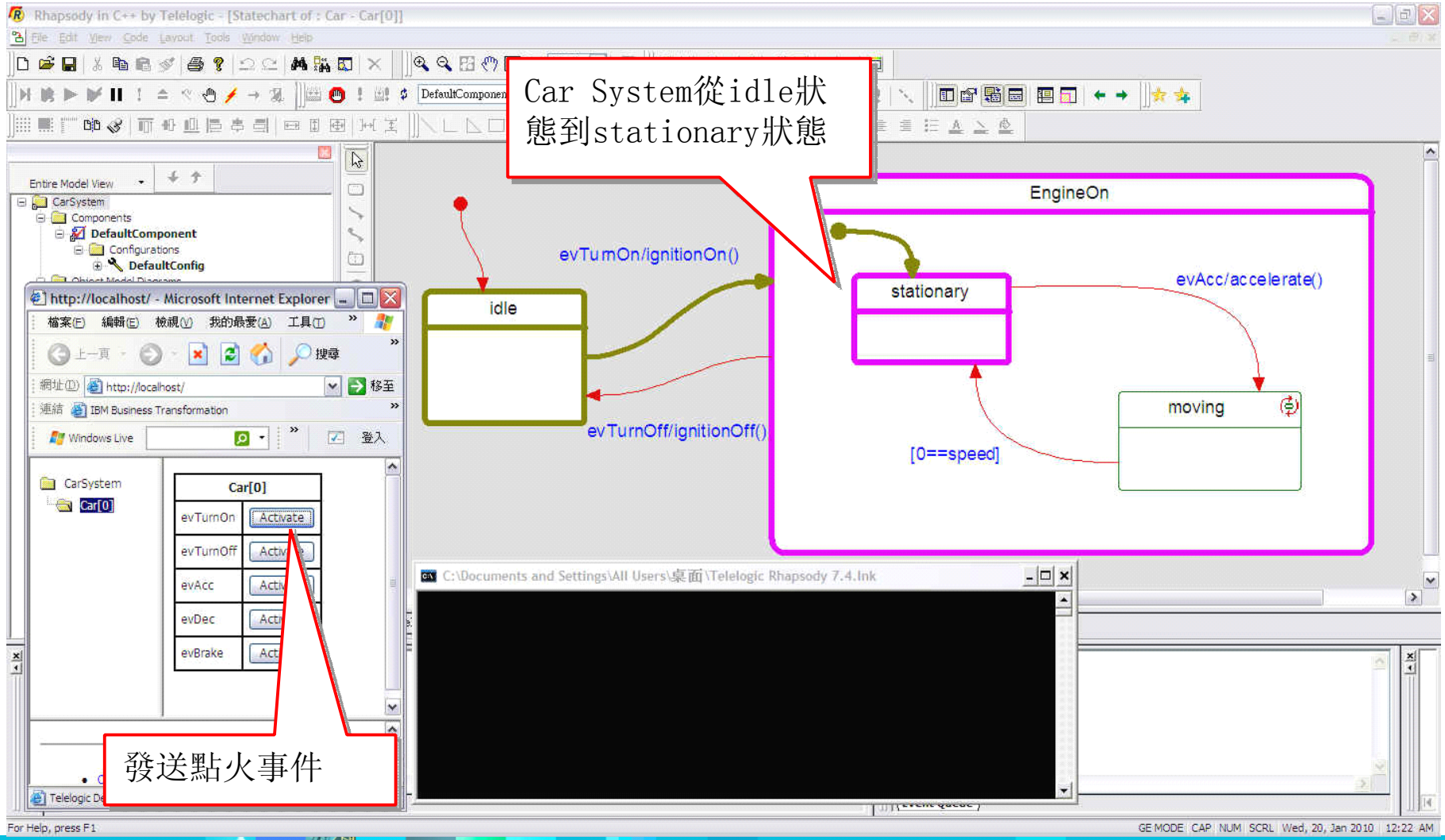
範例展示 - 建立 Statechart Diagram



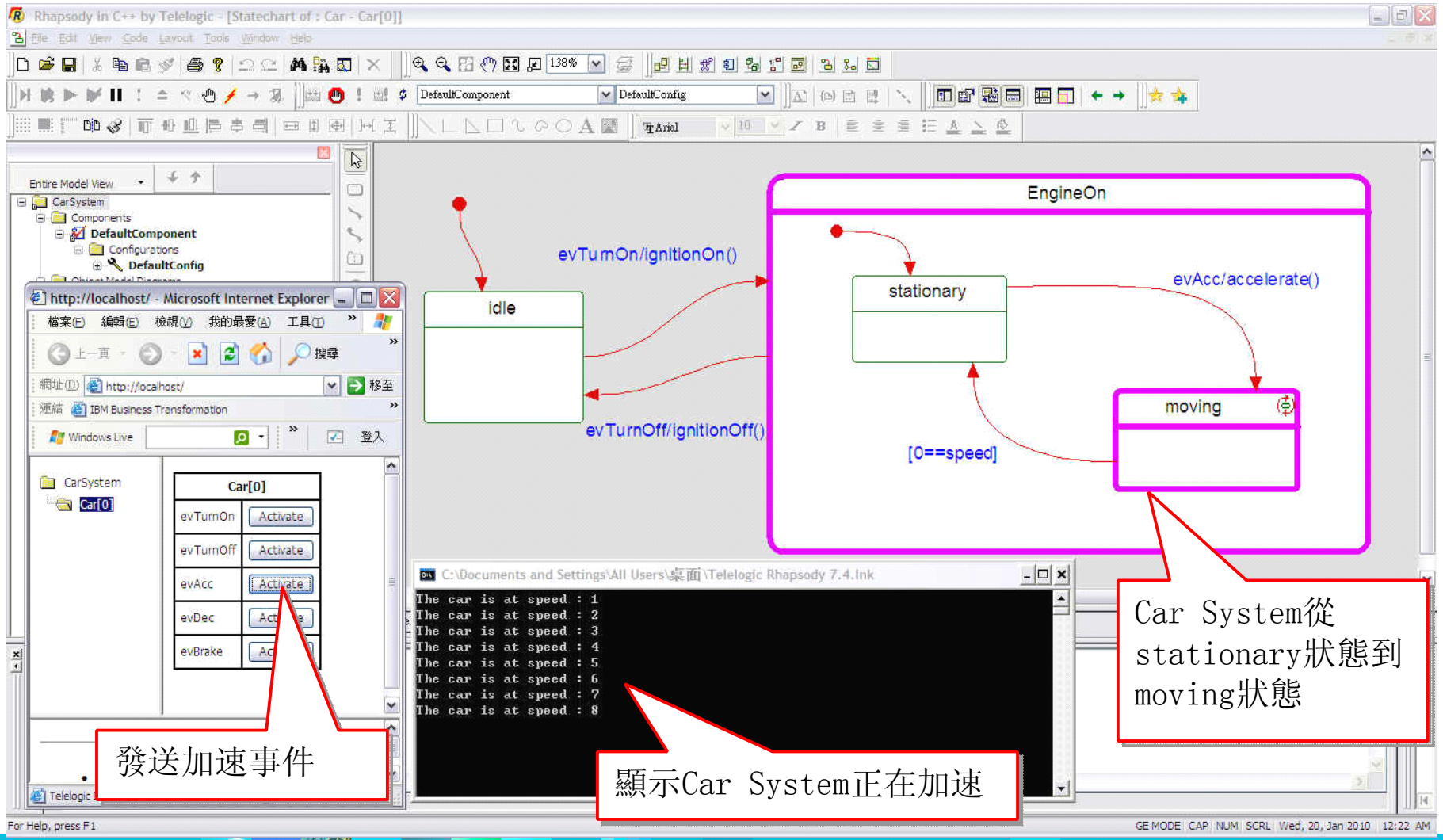
範例展示 - 執行模擬測試


於設計階段進行模擬測試
Rhapsody in C++ by Telelogic - [Statechart of : Car - Car[0]]
Entire Model View
CarSystem
Components
DefaultComponent
Configurations
DefaultConfig
http://localhost/ - Microsoft Internet Explorer
CarSystem
Car[0]
Car[0]
evTurnOn
Activate
evTurnOff
Activate
evAcc
Activate
evDec
Activate
evBrake
Activate
idle
evTurnOn/ignitionOn()
evTurnOff/ignitionOff()
EngineOn
stationary
evAcc/accelerate()
moving
[0==speed]
C:\Documents and Settings\All Users\桌面\Telelogic Rhapsody 7.4.lnk
提供UI介面方便於測試

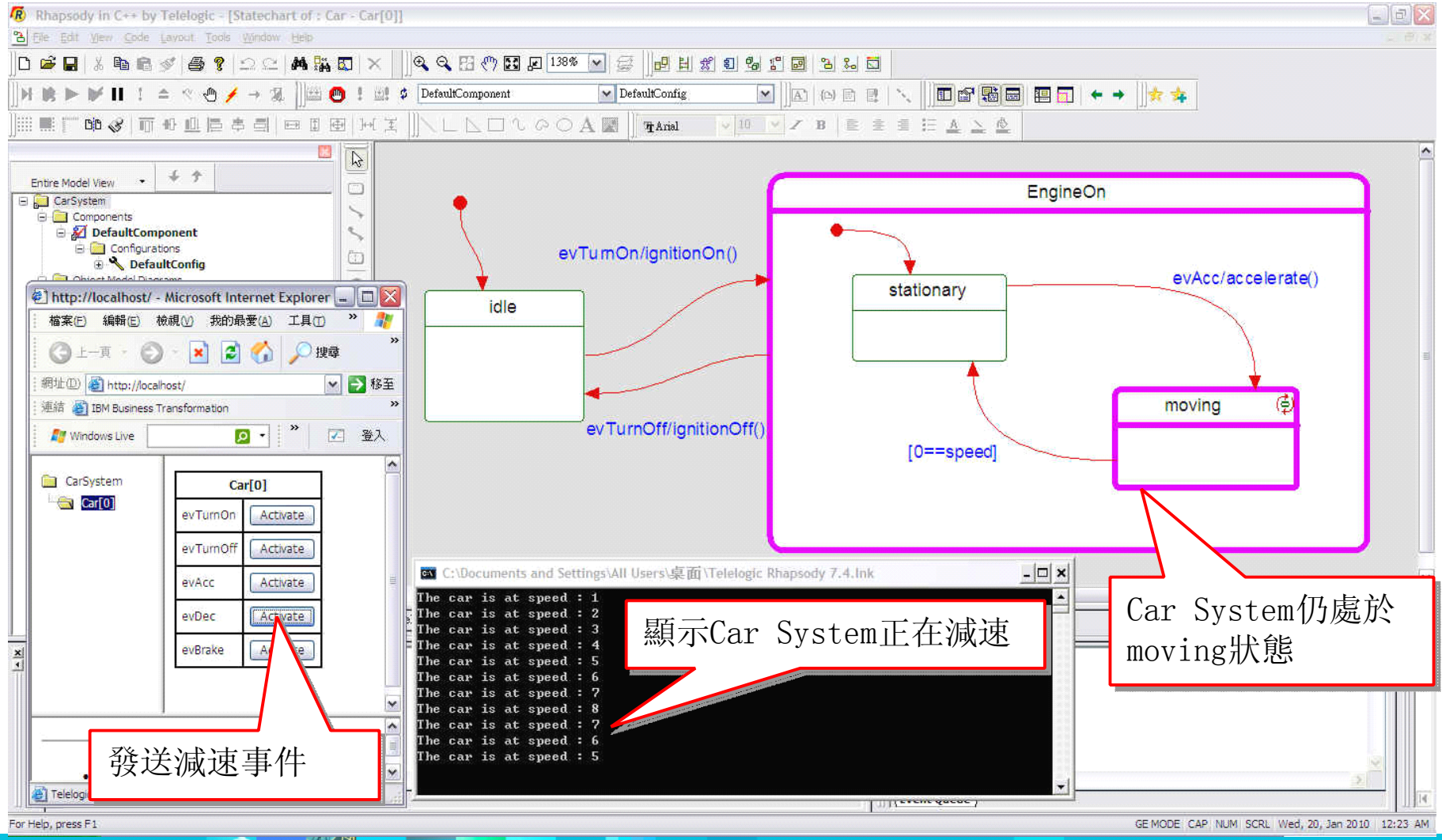
範例展示 - Car System Turn On



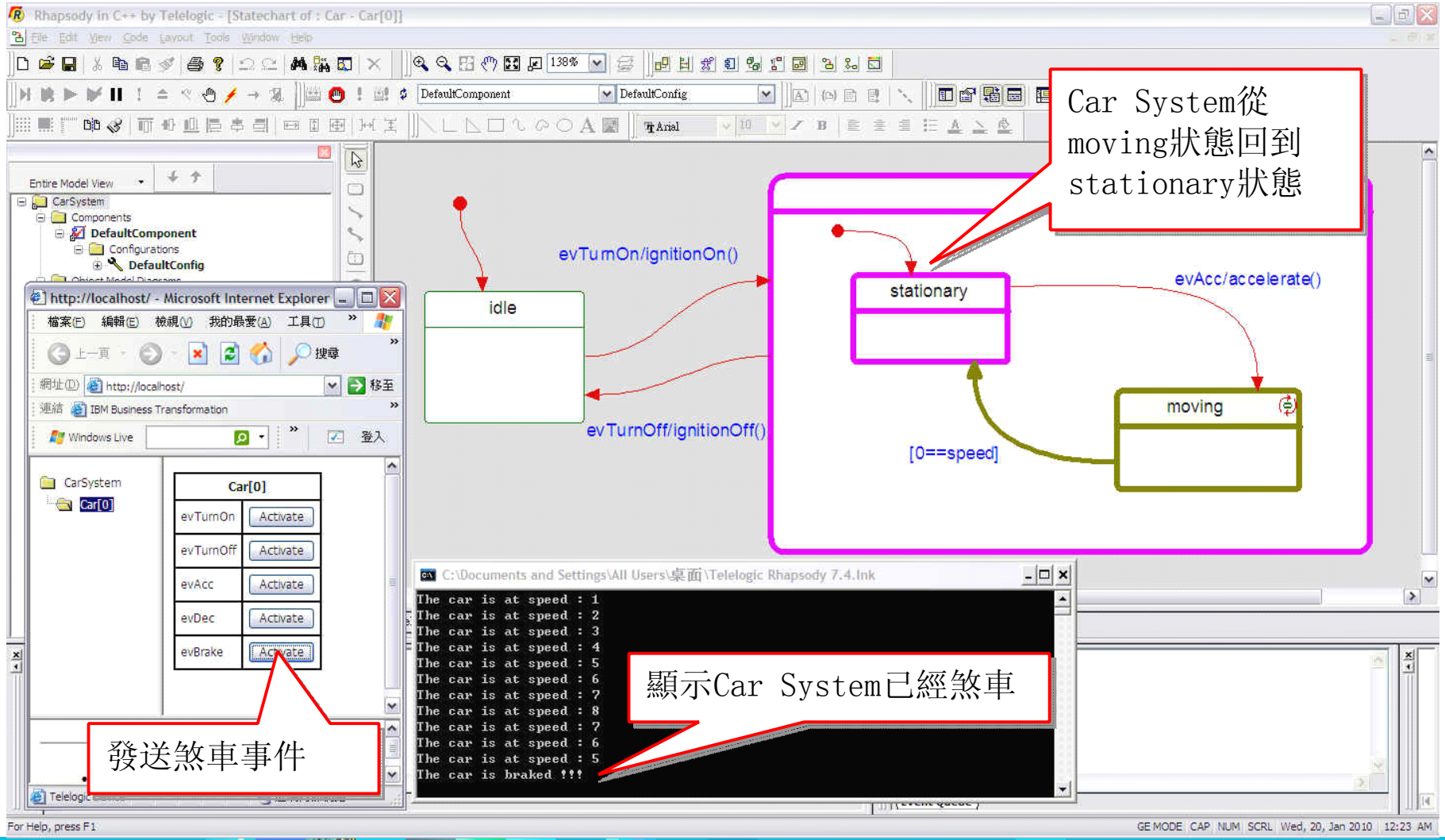
範例展示 - Car System 加速



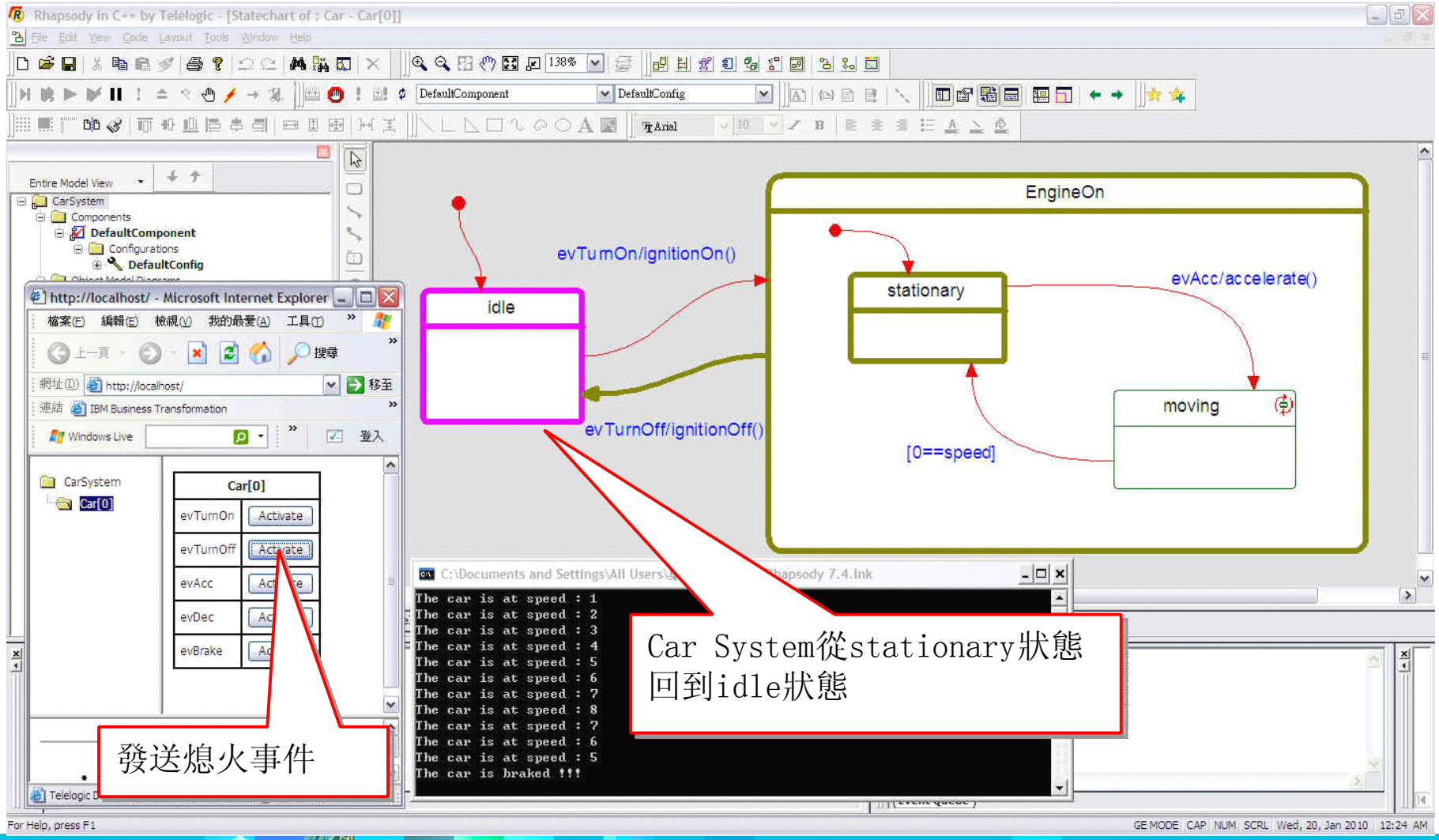
範例展示 - Car System 減速



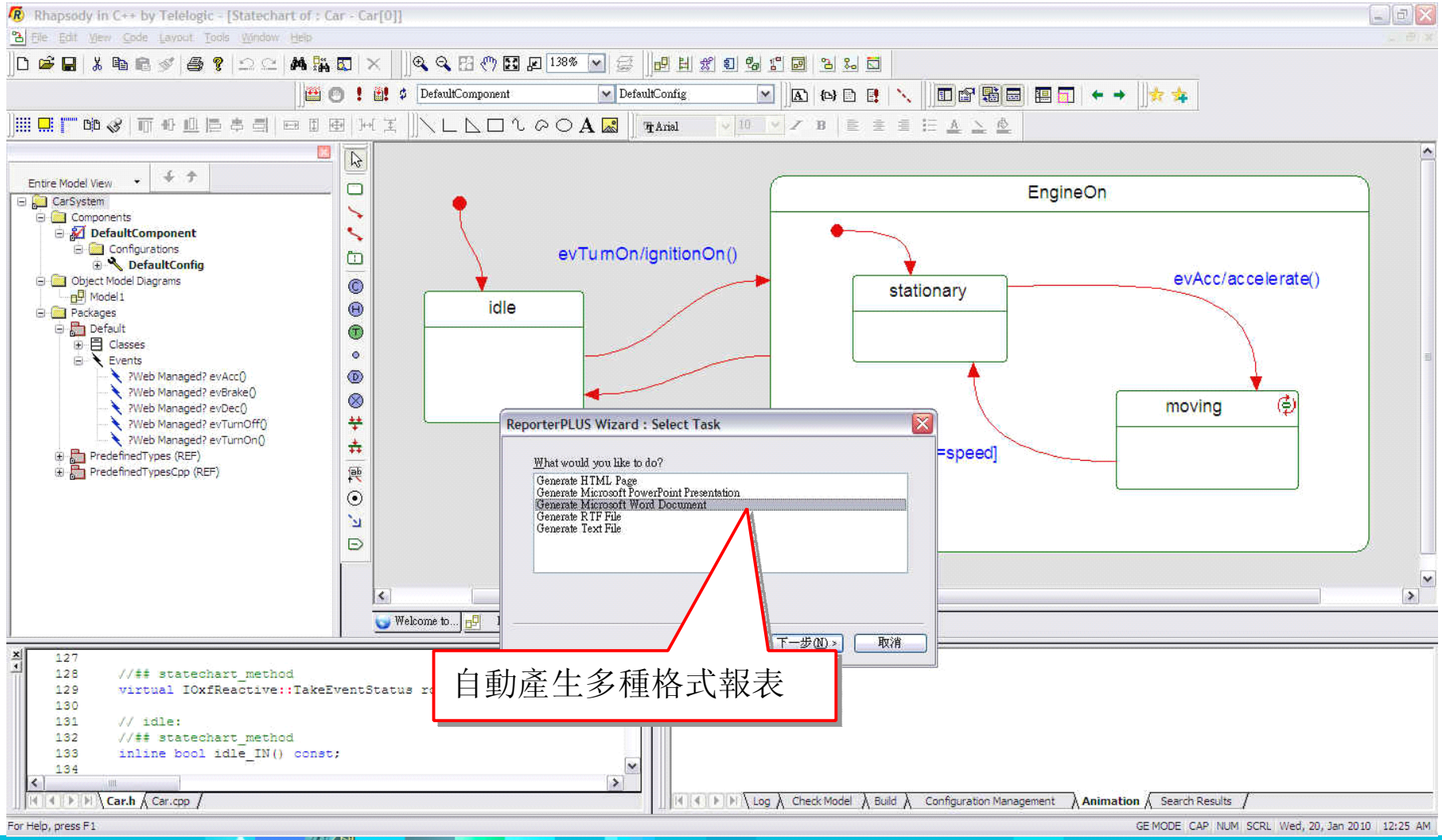
範例展示 - Car System 煞車



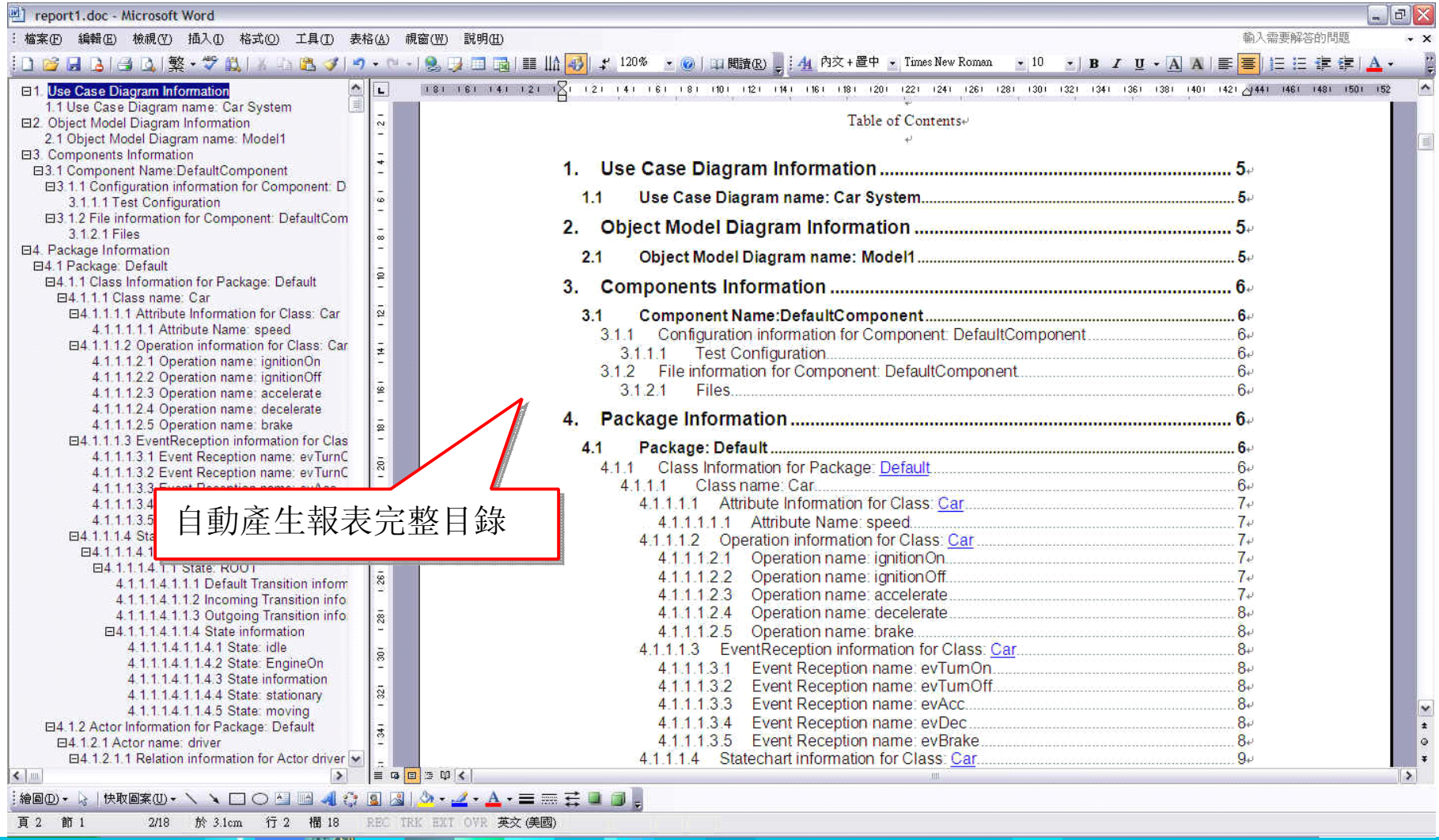
範例展示 - Car System Turn Off



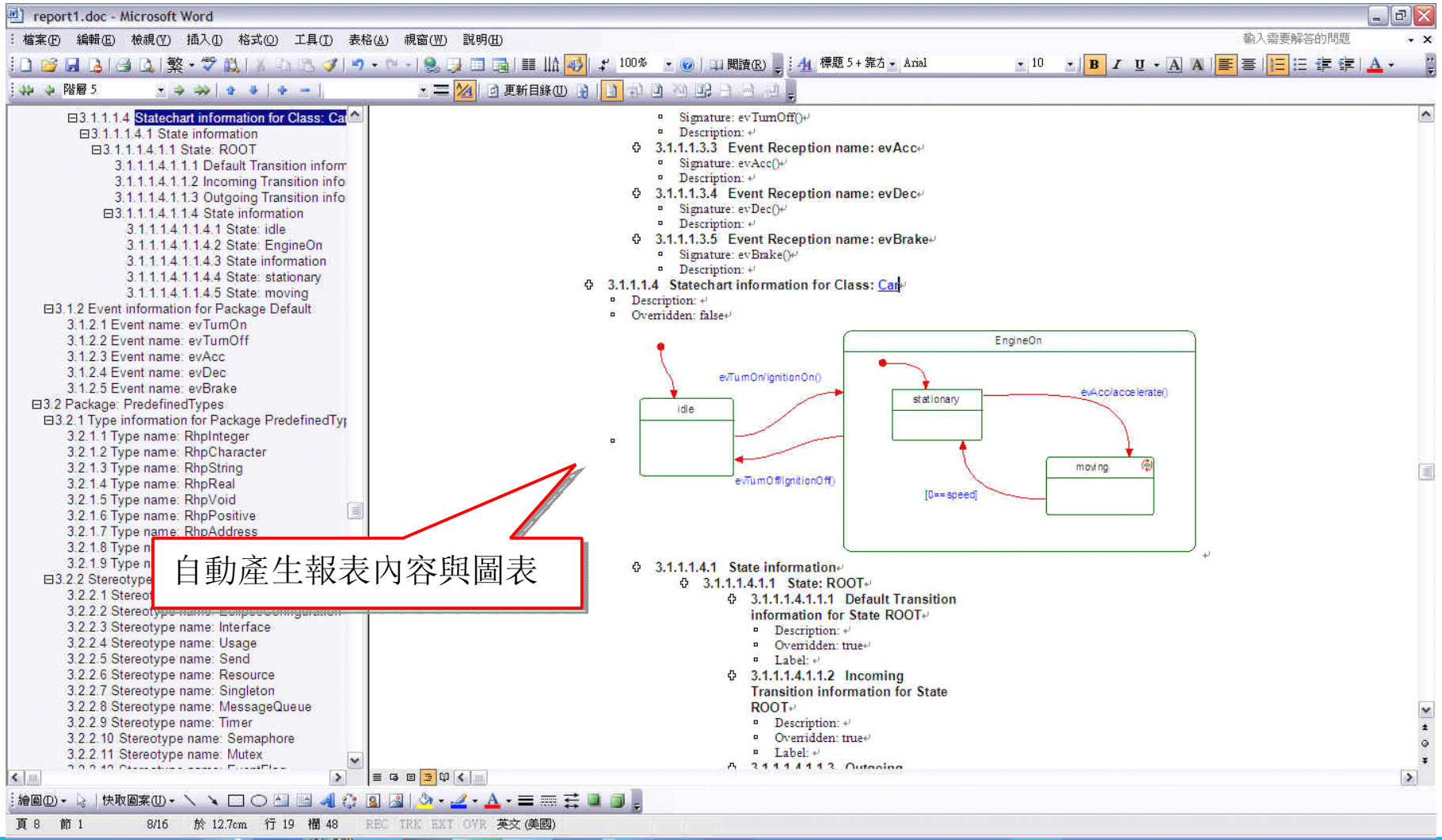
範例展示 - 自動產生報表


Rhapsody in C++ by Telelogic - [Statechart of : Car - Car[0]]
Entire Model View
CarSystem
Components
DefaultComponent
Configurations
DefaultConfig
Object Model Diagrams
Model1
Packages
Default
Classes
Events
?Web Managed? evAcc()
?Web Managed? evBrake()
?Web Managed? evDec()
?Web Managed? evTurnOff()
?Web Managed? evTurnOn()
PredefinedTypes (REF)
PredefinedTypesCpp (REF)
EngineOn
idle
evTurnOn/ignitionOn()
stationary
evAcc/accelerate()
moving
=speed]
ReporterPLUS Wizard : Select Task
What would you like to do?
Generate HTML Page
Generate Microsoft PowerPoint Presentation
Generate Microsoft Word Document
Generate RTF File
Generate Text File
下一步(N) >
取消
自動產生多種格式報表
//## statechart_method
virtual IOxfReactive::TakeEventStatus
// idle:
//## statechart_method
inline bool idle_IN() const;
Car.h
Car.cpp
Log
Check Model
Build
Configuration Management
Animation
Search Results
For Help, press F1

範例展示 - 自動產生報表目錄



範例展示 - 自動產生報表內容



參考資料

- 下載Rhapsody產品簡介：Rhapsody brochure.pdf
- 下載Car System範例展示：Demo.zip
- 產品電子型錄：http://www-142.ibm.com/software/products/tw/zh/ratirhap
- 試用版：https://www-01.ibm.com/software/tw/trials/reg_rhapsody.html

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