



2009

Mini-

Conference

So you have Use Cases, Now What?

- **Biography - Malcolm Currie**

UCLA: Control Systems Engineering Ph.D.

Engineering Consultant - Aerospace and Commercial:

Lear Seigler, Rockwell, Hughes, Boeing,
Rocketdyne, Schindler Elevator, ...

Missile/Aircraft guidance, navigation, and control systems; Military Systems requirements; Elevator and Security Systems control software, ...

Member of IEEE, GNSS, INCOSE ...

- **Over 14 years experience in UML**



2009

Mini-

Conference

Why have Use Cases?

- Many organizations have adopted Use Cases.
- Good start: but do they also build executable models of the Use Cases?
- Executable models clearly define the interfaces between the system and its environment in each one of its intended uses.
- Is this done functionally before allocating the functions to specific parts?



2009

Mini-

Conference

What is a Use Case?

- A Use Case has a description sufficient to build an executable model of the system.
 - A Use Case describes how the “system” will be used – before the “system” exists.
 - Use Cases apply to “systems” at many levels of detail during phases of system development.
- A Use Case is much more than a UCD (Use Case Diagram).
- A UCD is one of 13 diagrams in UML (Unified modeling Language)
 - 6 that describe system structure and
 - 7 that describe system behavior.
- A Use Case describes the test descriptions of a planned system.
 - It allows management and customers to understand what they will be building.
 - It is a means to understand what development progress.
- An executable model of the system and of its environment can evolve into a test harness of the system.



2009

Mini-

Conference

How is a Use Case elicited?

- To elicit the set of Use Case for a system,
 - Ask the customer what he will do with the system.
 - Imagine the system exists and after he has it up and running (one of the Use Cases is to do this), what do you want to do?
- Let's use an elevator as an example to get a list of possible Use Cases assuming the elevator is installed:
 - **What are the possible Use Cases?**
- We will then experience developing one of these UCs.



2009

Mini-

Conference

How do I describe the Use Case? (1 of 2)

- The Use Case is a functional description of the system from a user's viewpoint: e.g., **Transport Passenger**.
- How would a Passenger use and elevator?
 - Request a car
 - Monitor indications of car status until it arrives and the doors open
 - Enter the car and perhaps interact with the car from inside
 - Monitor the car doors closing
 - Monitor indication of the car progress to the destination floor
 - Monitor the car doors opening
 - Exit the car.
 - Car doors close



2009

Mini-

Conference

How do I describe the Use Case? (2 of 2)

- The description must also include the preconditions for the Use Case – e.g., the elevator must be operating in the Passenger Service Mode.
- The description should also include some post-conditions for the Use Case – e.g., the elevator doors are closed and system is waiting for another passenger request (in the Passenger Service Mode).
- This Use Case description (not complete – needs some more formality) is for the Primary Scenario of the Use Case.
 - What if the power fails at any of these steps?
 - What if a fire alarm overrides the passenger request?
 - These are analyzed with Secondary Scenarios
 - not discussed here.



2009

Mini-

Conference

The Use Case is described – Now what?

- One of two UML Diagrams are usually used to describe the scenarios:
 - SD (Sequence Diagram) or an Activity Diagram.
 - SD will be described here because it is executable in many tools
 - An executable Activity Diagram is only recently becoming available.
- The SD uses interactions between Objects – in this case a passenger and the elevator is the primary concern.
- The passenger is external to the system (and in UML terminology is referred to as an Actor – the passenger plays a role in the scenarios of a Use Case).
 - The system, at the top level, is the elevator.
 - Later, the system can be divided into objects that are
 - functional (for conceptual analysis or
 - physical (when a design is known) – this is not addressed here.
- In the session, we will **draw a SD for the Primary Scenario**
 - Transport Passenger Use Case.
 - I will introduce some variations in the scenario as an exercise for the attendees as time permits.



2009

Mini-

Conference

Why did I choose a Sequence Diagram?

- Many UML tools have executable SDs
 - I was using them in 1994 to reduce integration test times to hours for a several month project - even before UML 1.0 was released.
- The desired SD can be put into a UML tool.
 - Then the system model can be entered with objects and
 - executed to generate a SD.
 - Any differences between the executed SD and the desired SD are shown in an exception report.
 - The stakeholders are thus assured that the desired behavior is captured in the model.
- SDs are easy to understand, especially by hardware people
 - they have always used objects in their designs.

[See notes that are with this presentation.]



2009

Mini-

Conference

Questions?

- Malcolm Currie
 - SEC_Services@Earthlink.net; 310 821-3081
- Special Thanks to Track Chairs
 - Track 2 Right-sizing Systems Engineering: Partitioning the Process, Trading Cost, Performance, Schedule and Risk, and Predicting Cost and Schedule Growth
 - Ed Conrow (ehcrisk@yahoo.com),
 - Harvey Soldan (Harvey.Soldan@jpl.nasa.gov)
- And to Conference Organizers
 - Technical Manager—Richard Emerson
 - r.emerson@computer.org, tel. 818.790.7017
 - Conference Manager—Shah Selbe
 - (Shah.Selbe@boeing.com)