

UML Statechart Diagrams

UML Statechart Diagrams

- ▶ *Statechart Diagram Semantics*
- Statechart Diagram Notation
- Statechart Diagram Examples
- Statechart Diagram Issues

Statechart Diagram Semantics

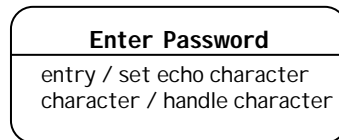
- **What are statechart diagrams?**
 - *Member of the Behavioural group*
 - *Graph of states and transitions*
 - *showing the response of an object to external stimuli*
 - *attached to a class or a method*
- **States**
 - *objects remain in states for finite time*
 - *is one of : satisfies a condition; performs an action; waits for an event*
 - *actions cannot be interrupted - they are 'atomic'*
 - *can be nested*
 - *can be concurrent with other states*

UML Statechart Diagrams

- **Statechart Diagram Semantics**
 - ▶ *Statechart Diagram Notation*
- **Statechart Diagram Examples**
- **Statechart Diagram Issues**

Statechart Diagram Notation

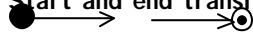
- **State diagram is a rounded rectangle**
- **states are rounded rectangles with at least one section**
 - *mandatory: name*
 - *optional: list of internal actions (with optional guards)*
 - **format:** event-name argument-list | [guard condition] / action-expression
 - **special actions:** 'entry /' and 'exit /' (these cannot have arguments or guards)
 - *optional: invoking a nested state machine*
 - **format:** do / machine-name
 - 'machine-name' must have initial and final states
- **Example**



Transitions Notation

- **transitions are shown as labelled arrows**
 - *labels will contain an event signature which triggers the transition*
 - *labels will contain an action expression (preceded by '/')*
 - *labels can include guards (enclosed in square brackets)*
 - *labels can include a 'send expression'*
 - asynchronous signals which are sent to one or more objects

- **Start and end transitions**



- **Example:**
 - select-mouse-click (location) [location in window] /
object := pick-object (location) ^ object-highlight()
 - *when the select mouse button is clicked the location is identified, and provided that is inside the window, the object is selected, and a object highlight signal is sent*
 - usually this signal will result in another action elsewhere

UML Statechart Diagrams

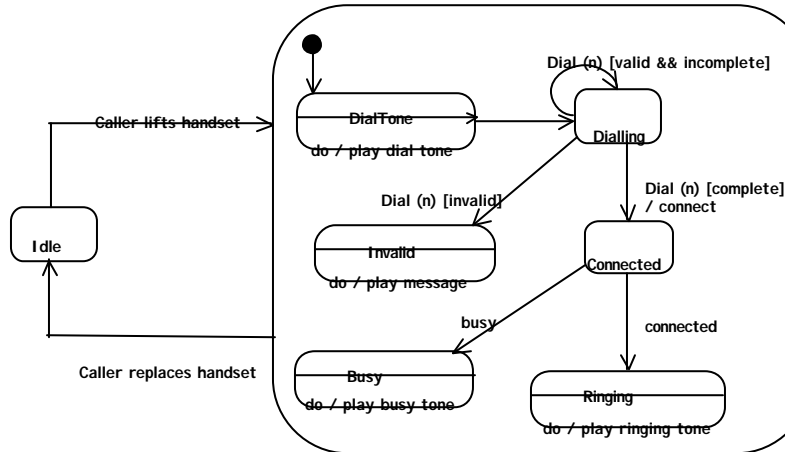
- Statechart Diagram Semantics
- Statechart Diagram Notation
 - ▶ *Statechart Diagram Examples*
- Statechart Diagram Issues

Michael Jones

UML Statechart Diagrams

7

Dialling a Telephone Number



Michael Jones

UML Statechart Diagrams

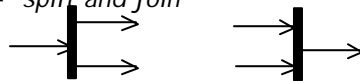
8

UML Statechart Diagrams

- Statechart Diagram Semantics
- Statechart Diagram Notation
- Statechart Diagram Examples
- ▶ *Statechart Diagram Issues*

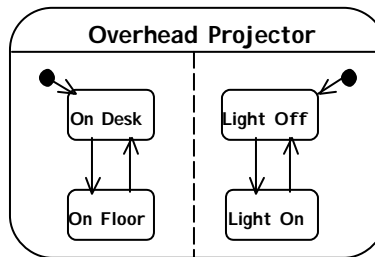
Statechart Issues

- Complex transitions
 - *split and join*
- Composite states
- Nested states
- Messages between states
- Internal transitions



Composite States

- **Composite states**
 - *concurrent substates - using -and- relationship*
 - each substate separated from others by dotted line
 - *disjoint substates - using -or- relationship*
 - transitions between substates
- **Example of concurrent substates**



Nested States

- **What it means when a nested state is entered**
 - *representation: line drawn from outside to boundary of state*
 - *meaning: the state is initialised, as is every substate within*
 - to any level of nesting
 - the initialisation code of each state is executed
- **What it means when a nested state is completed**
 - *representation: line is drawn to boundary of state*
 - *variation: end state is drawn outside the state*
 - line drawn over boundary to end state
 - *meaning: state is terminated, as are all states within*
 - to any level of nesting
 - the finalisation code of each state is executed
 - if drawn to end state, state ceases to exist

Other Issues

- **Internal Transitions**
 - *Within a state, internal transitions (typically a sequence of actions) are represented by a sequence of lines*
 - *each line consists of a transition signature*
 - *transition name / action*
- **Messages between states**
 - *a substate in one state sends a message to another state*
 - *e.g., a combined TV/VCR remote control can send signals to power on either device*
 - *representation: arrow with dotted line*

Summary

- **Statechart Diagram Semantics**
 - *used to represent reactions to external stimuli*
- **Statechart Diagram Notation**
 - *rounded rectangles for states*
 - *vertical sections for name, purpose, etc.*
 - *transitions with event signatures, guard, actions, send clauses*
- **Statechart Diagram Issues**
 - *nested states*
 - *composite states*
 - *complex transitions*