

Automated Encapsulation of UML Activities for Incremental Development and Verification

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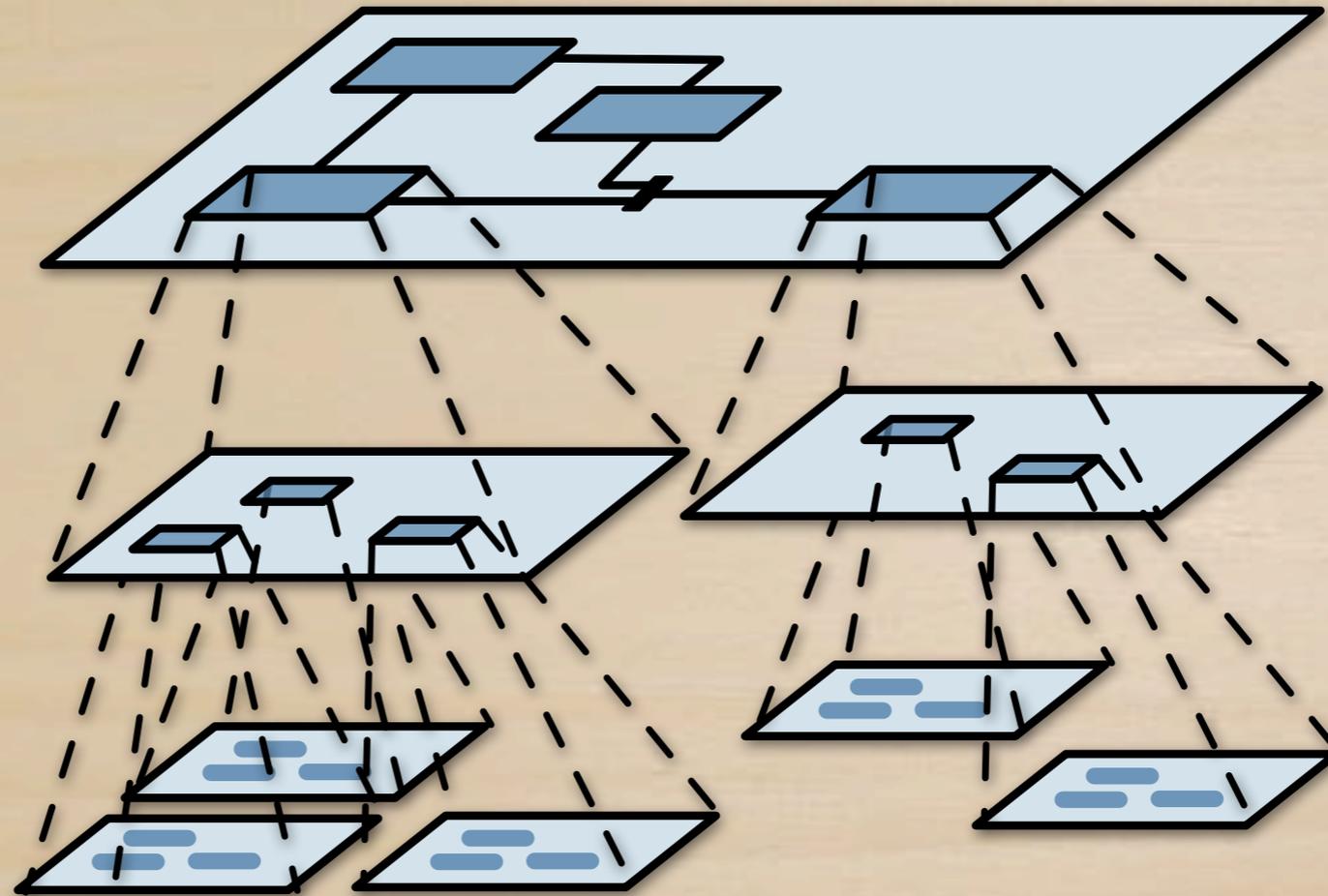
Norwegian University of Science and Technology

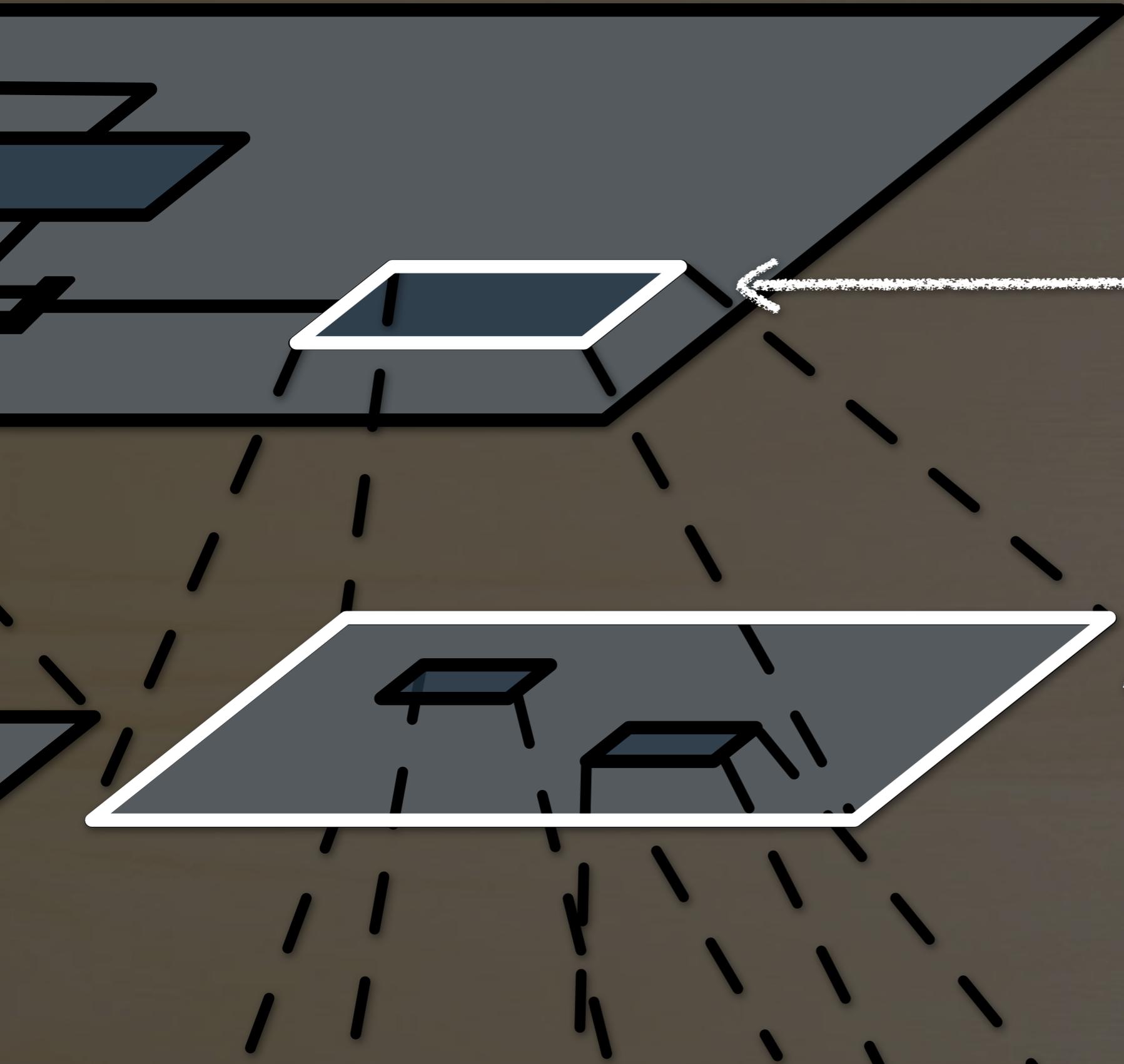
Activities

Abstract



Detailed





Call Behavior Action

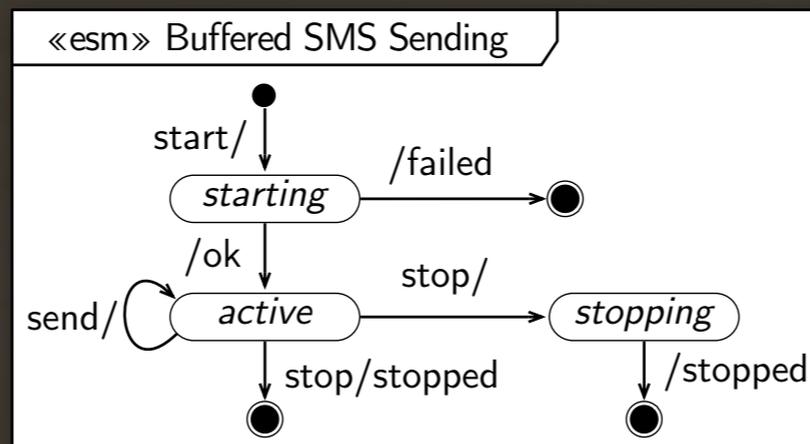
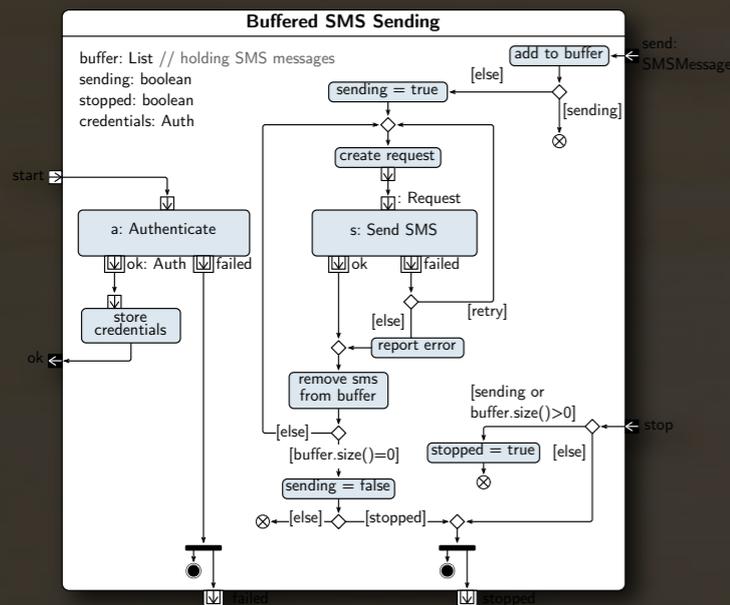
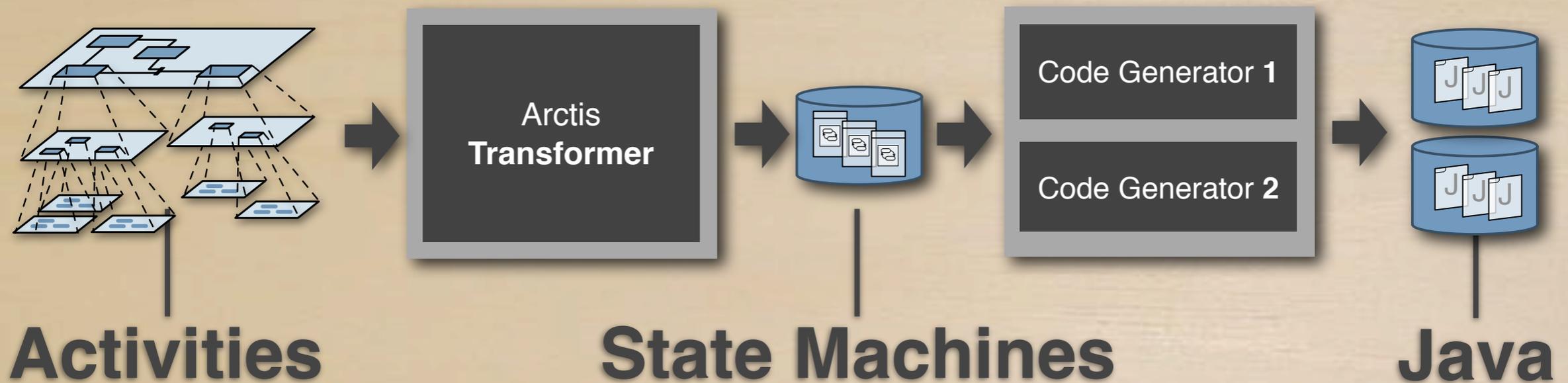
+behavior *
↓ 1

Behavior

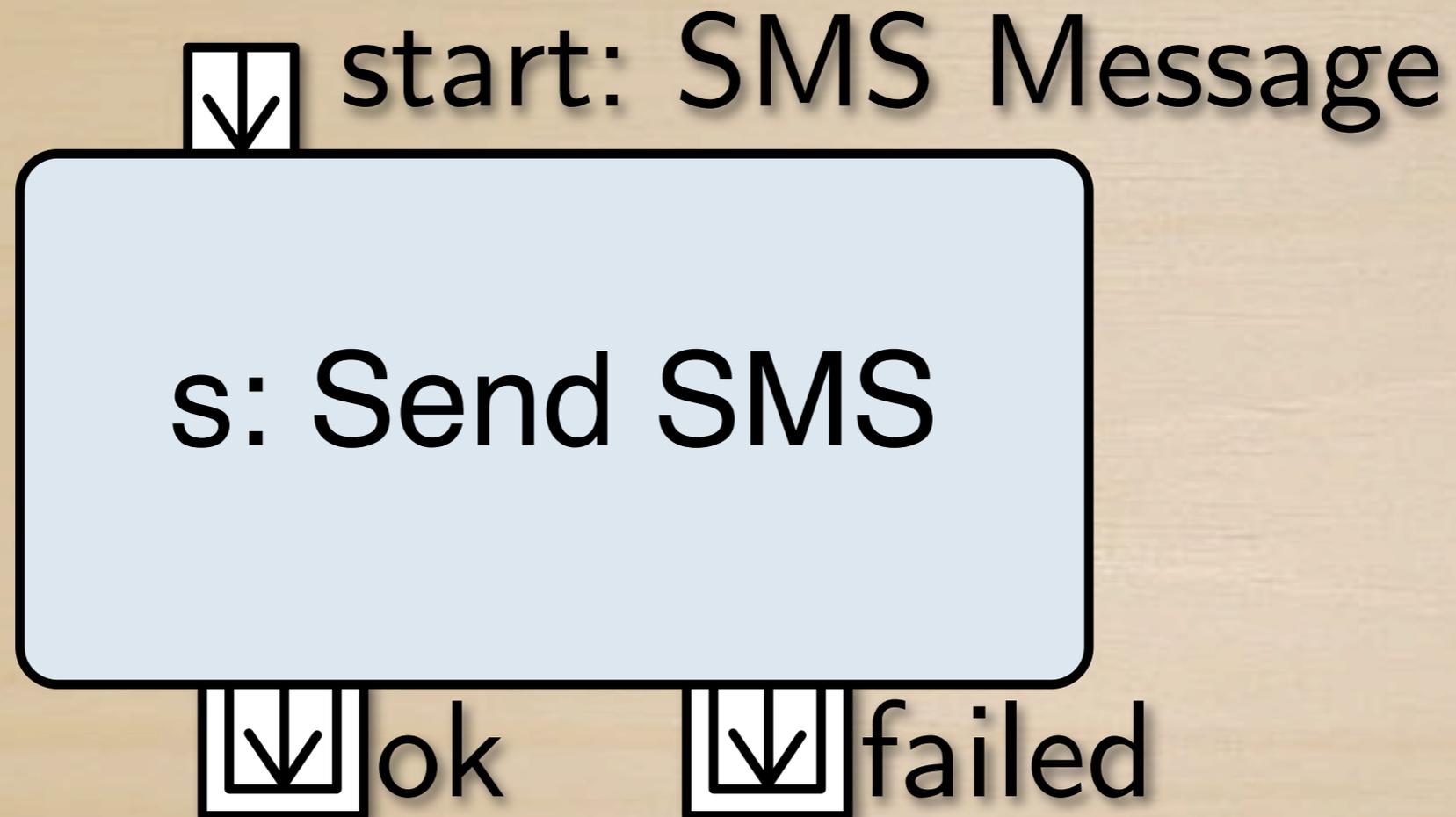
Activity

The SPACE Method

Supported by the Arctis tools, www.arctis.item.ntnu.no



Call Behavior Actions



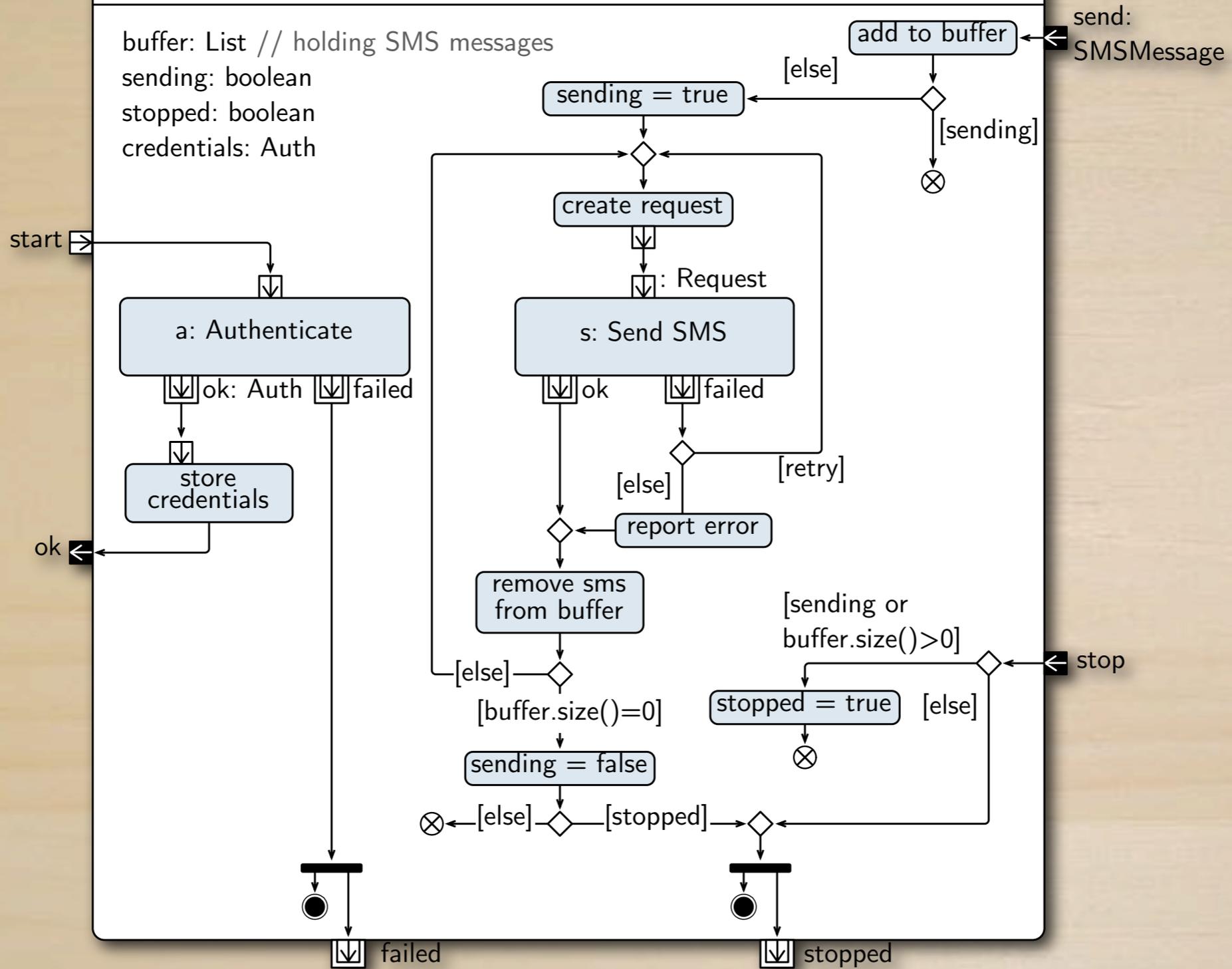
Streaming Parameters



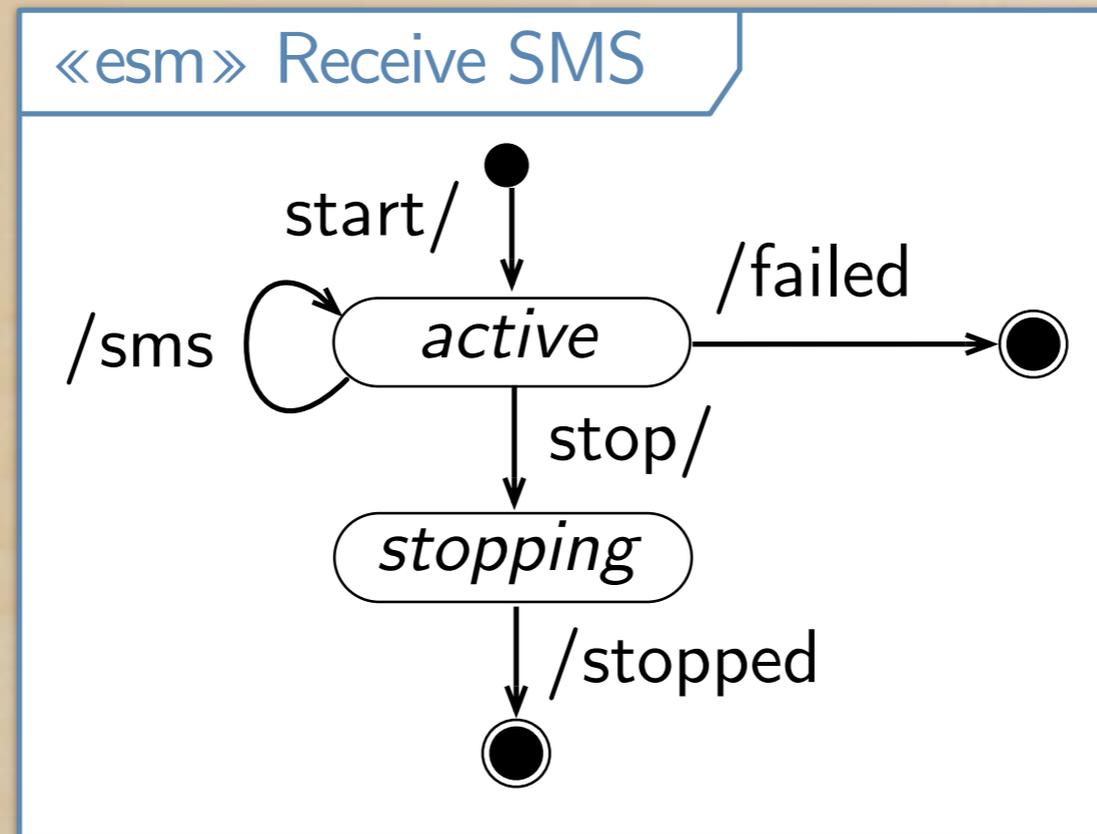
65 %

Buffered SMS Sending

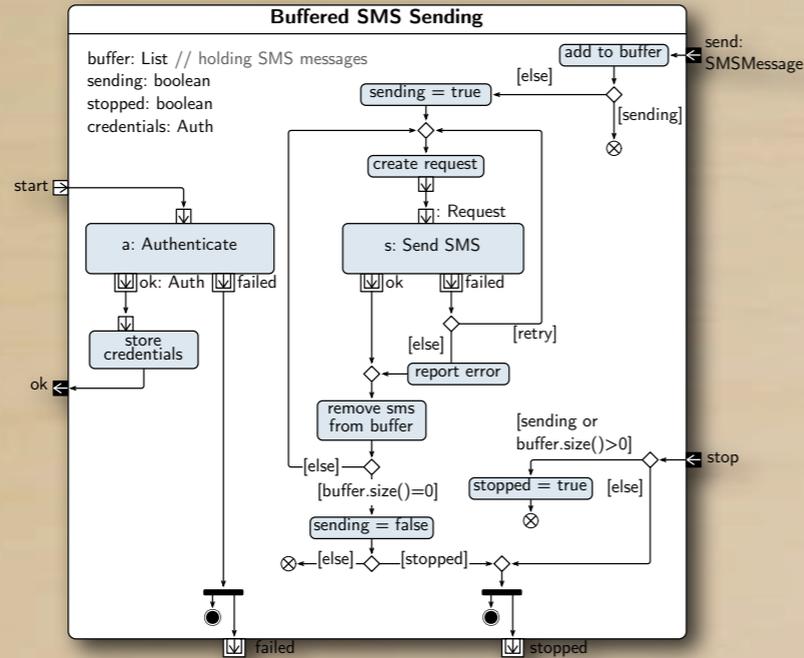
buffer: List // holding SMS messages
 sending: boolean
 stopped: boolean
 credentials: Auth



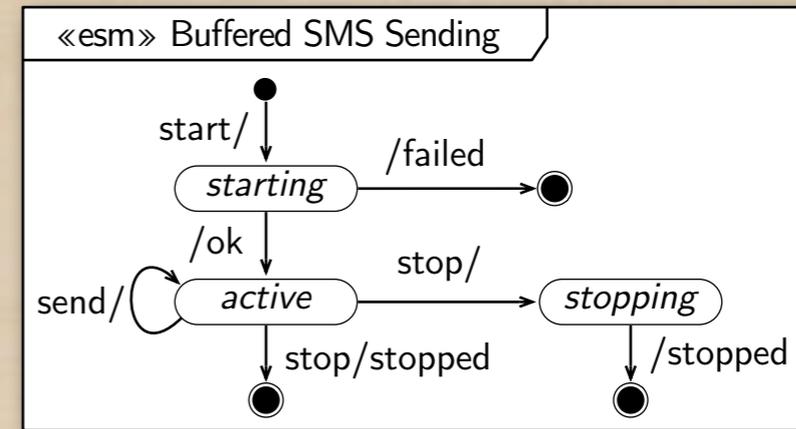
External State Machines



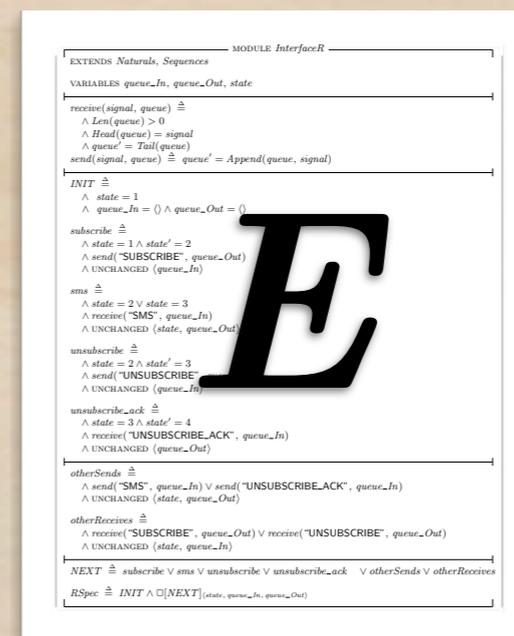
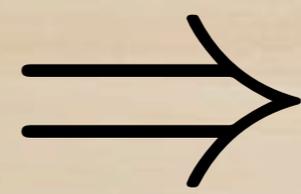
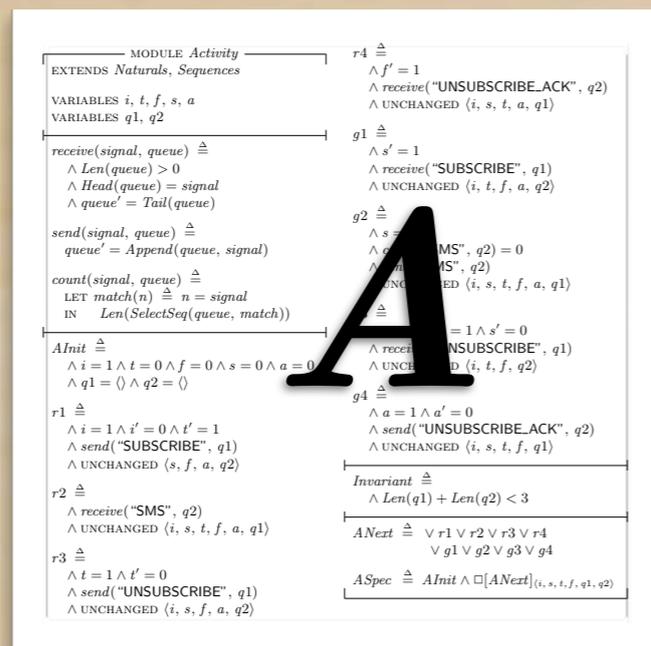
Formal Relationship



Activity

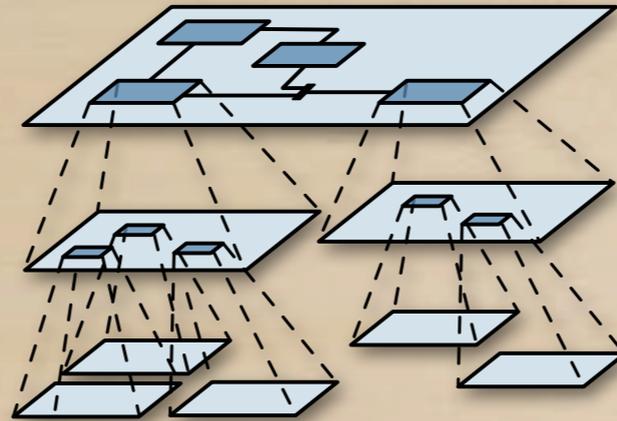


ESM



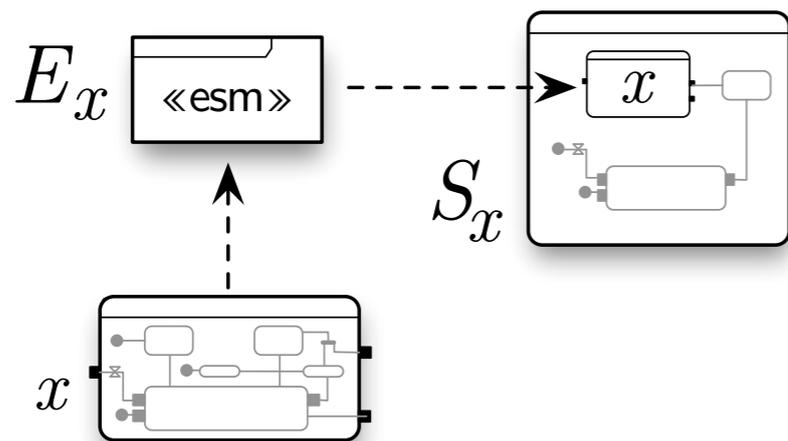
Incremental Development

bottom-up

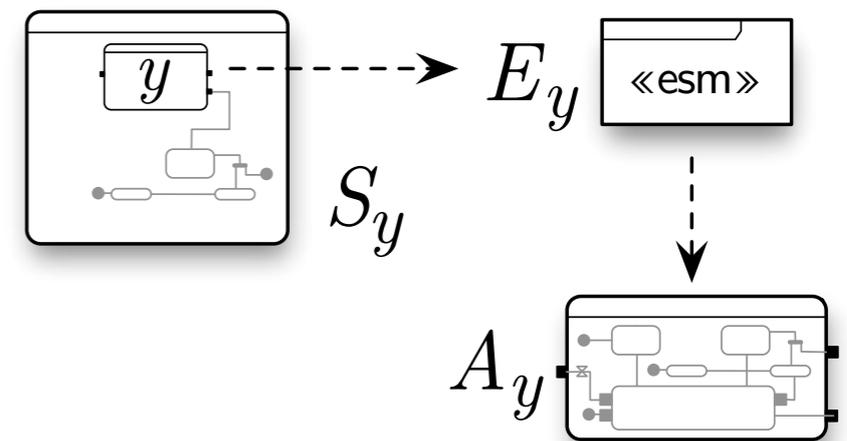


top-down

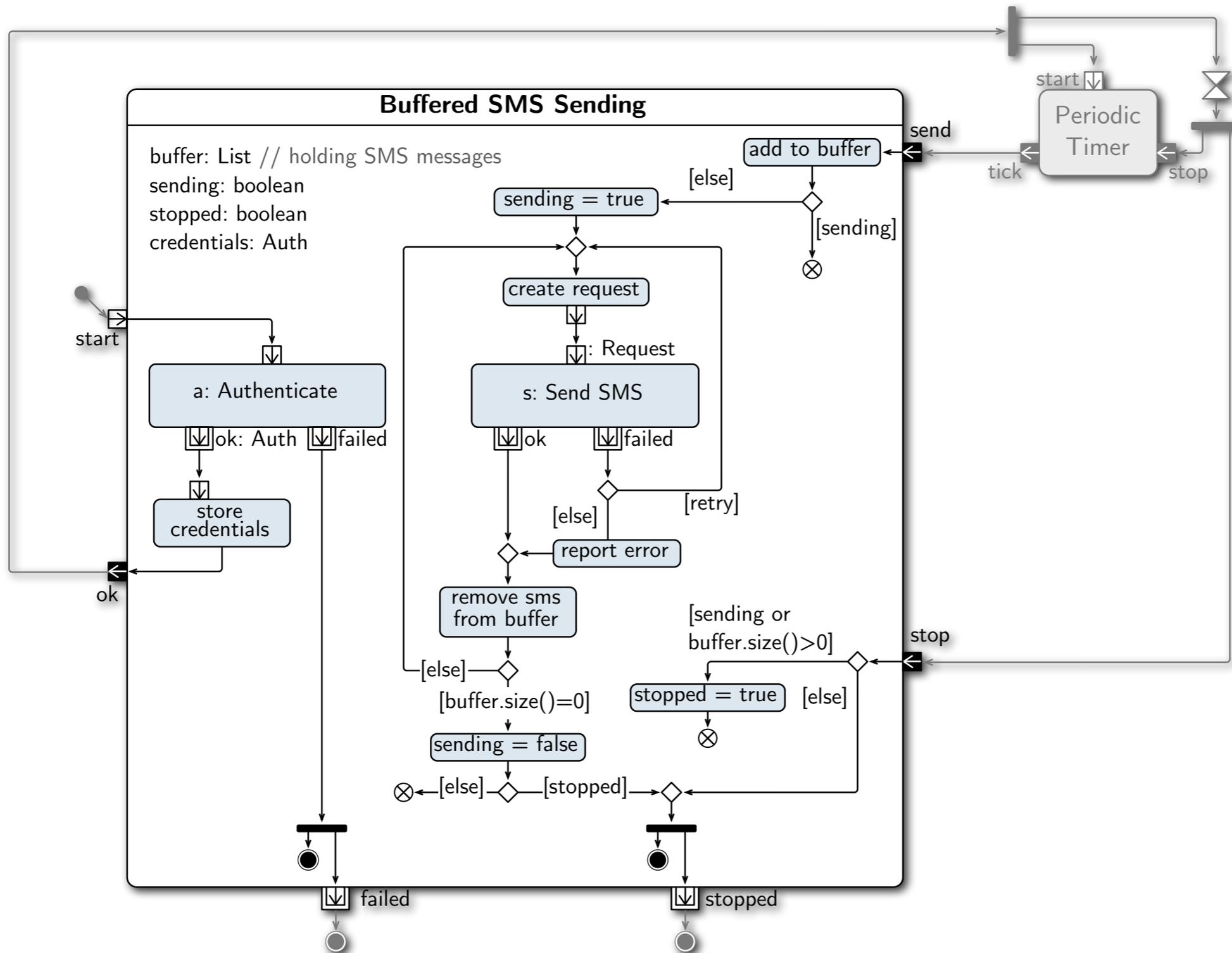
Encapsulation



Refinement

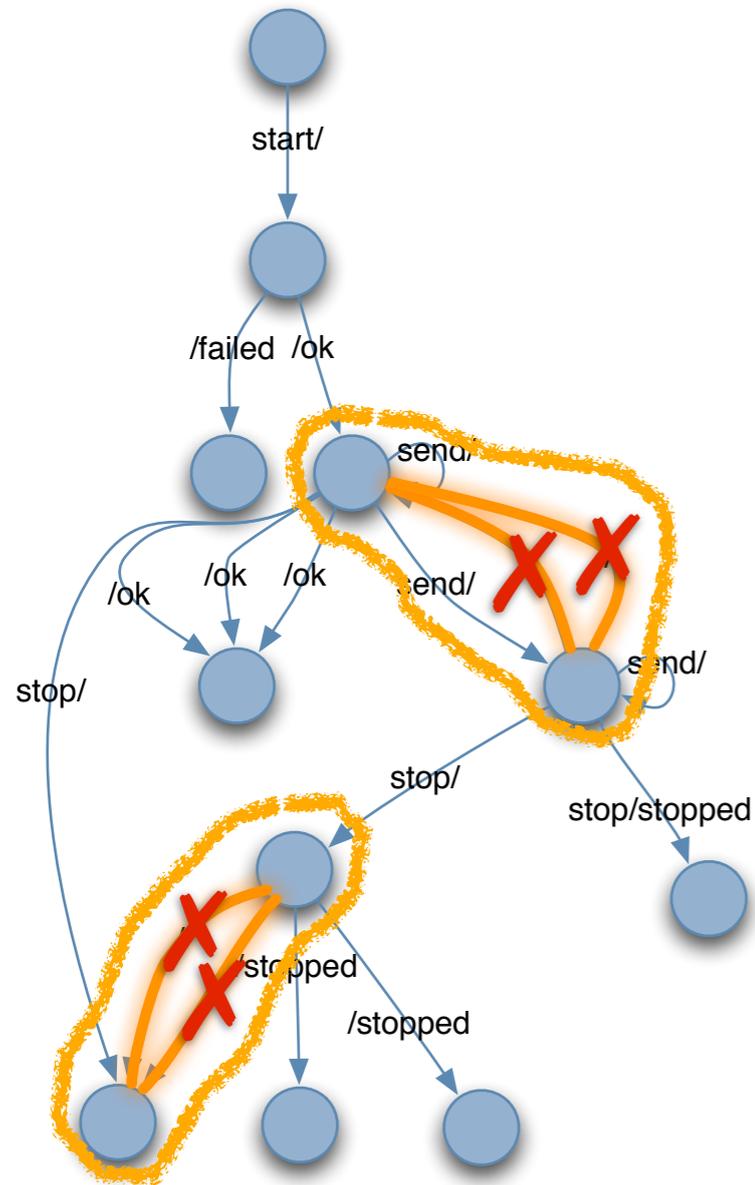


Automatic Encapsulation

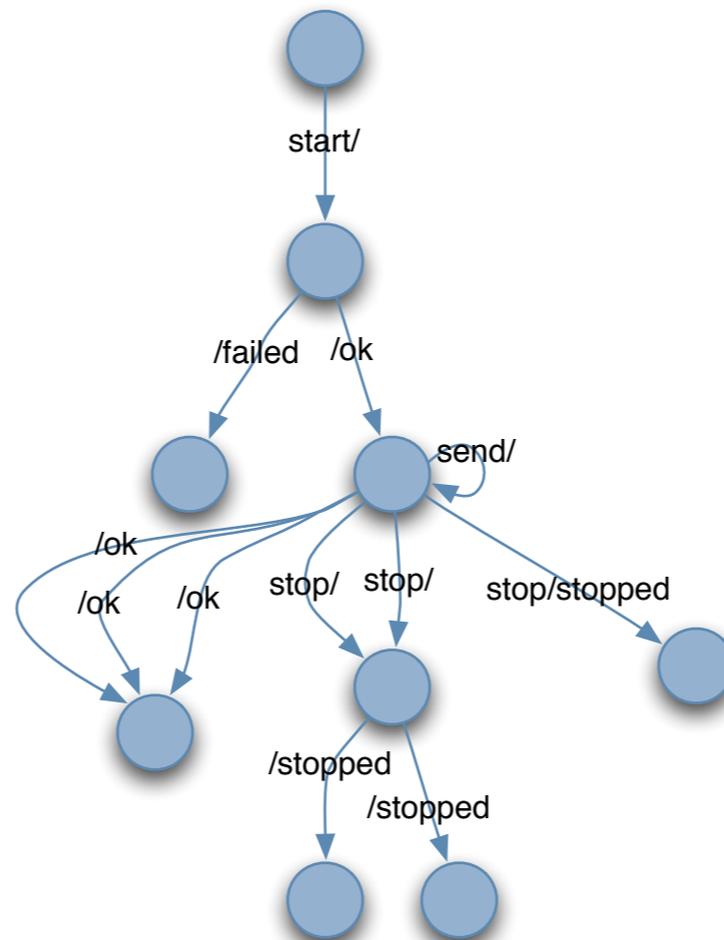


Automatic Encapsulation

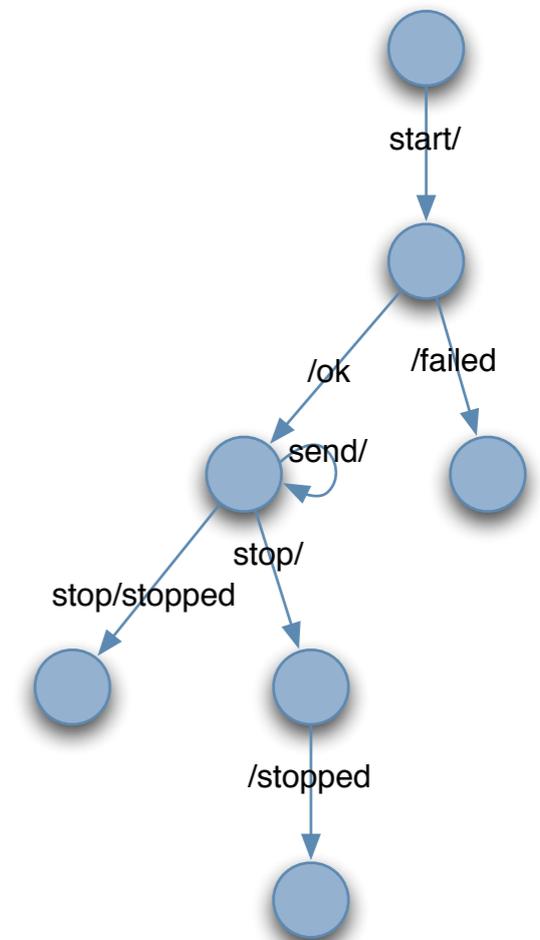
State Space



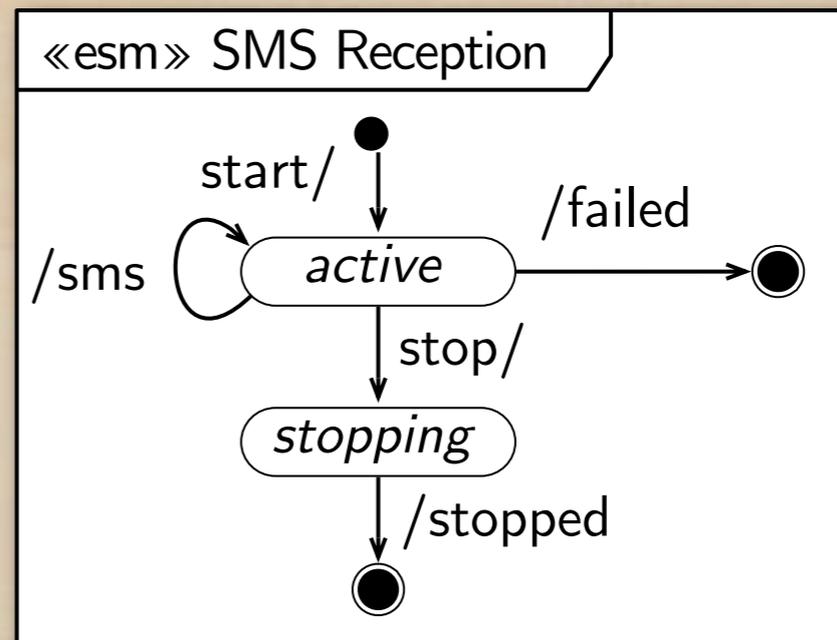
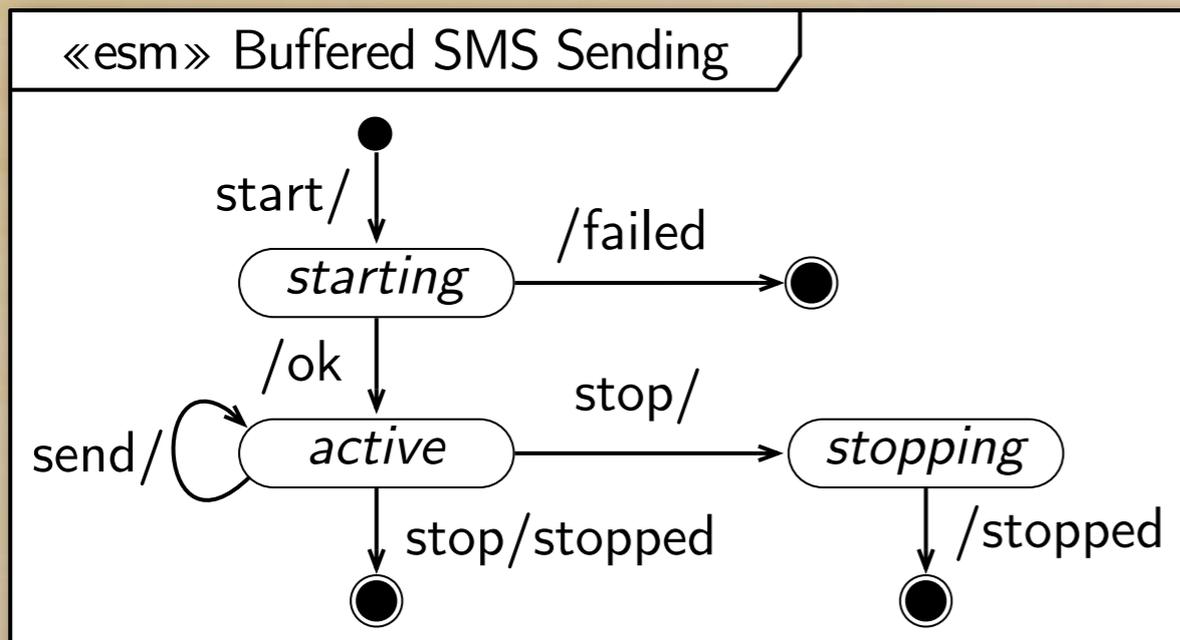
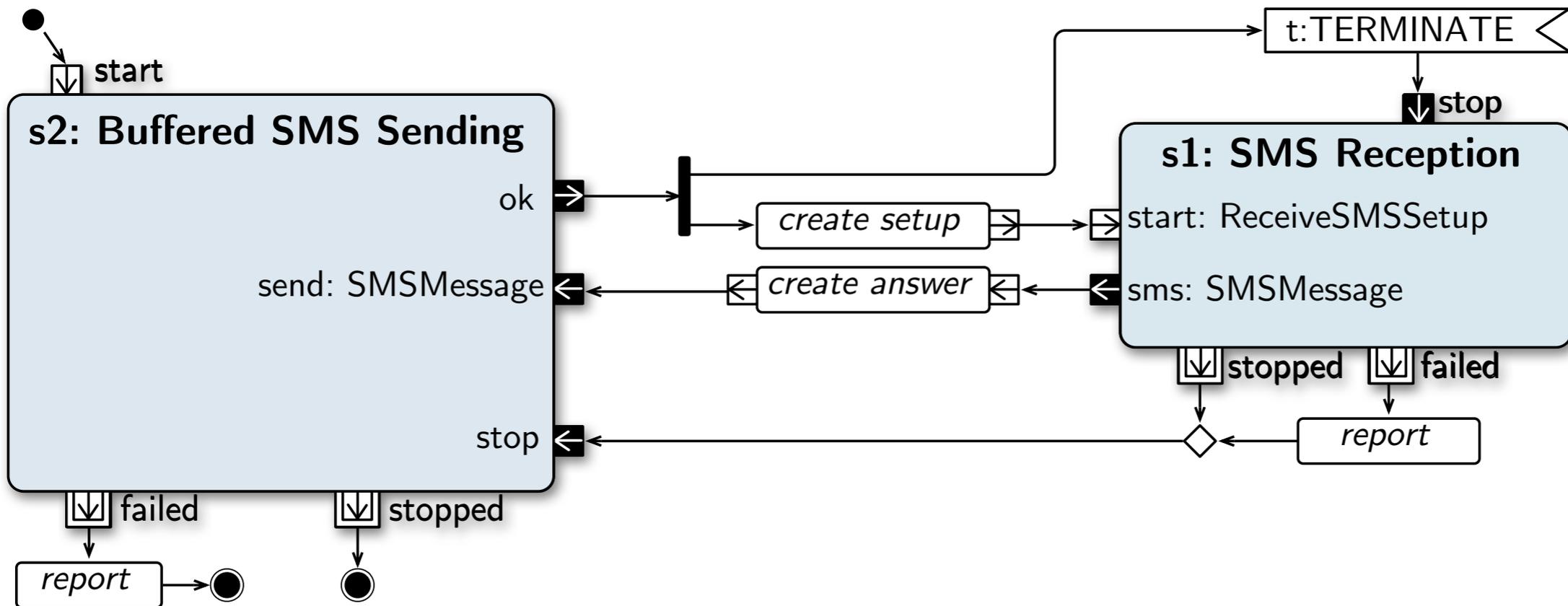
T-Removed



Minimized

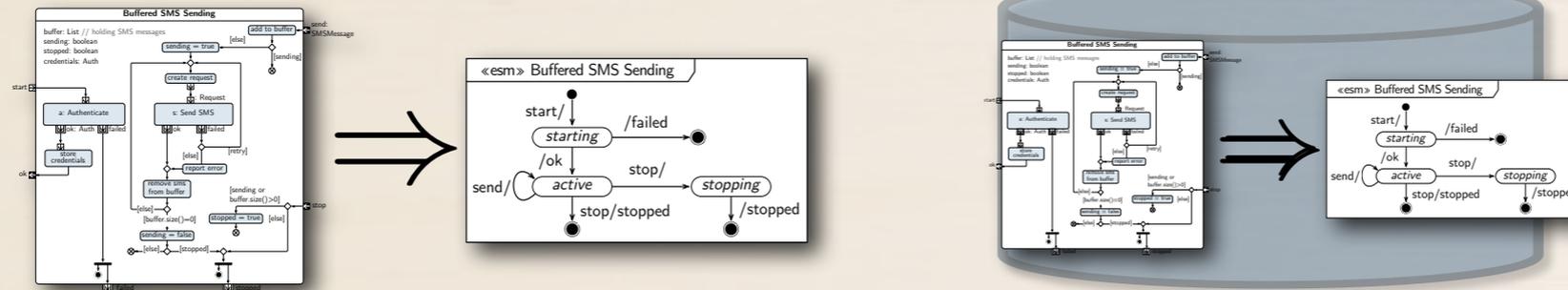


SMS Inquiry Service



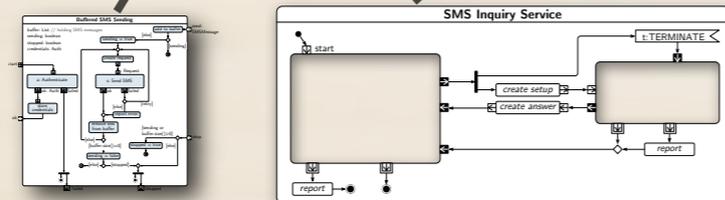
Incremental Verification

1



2

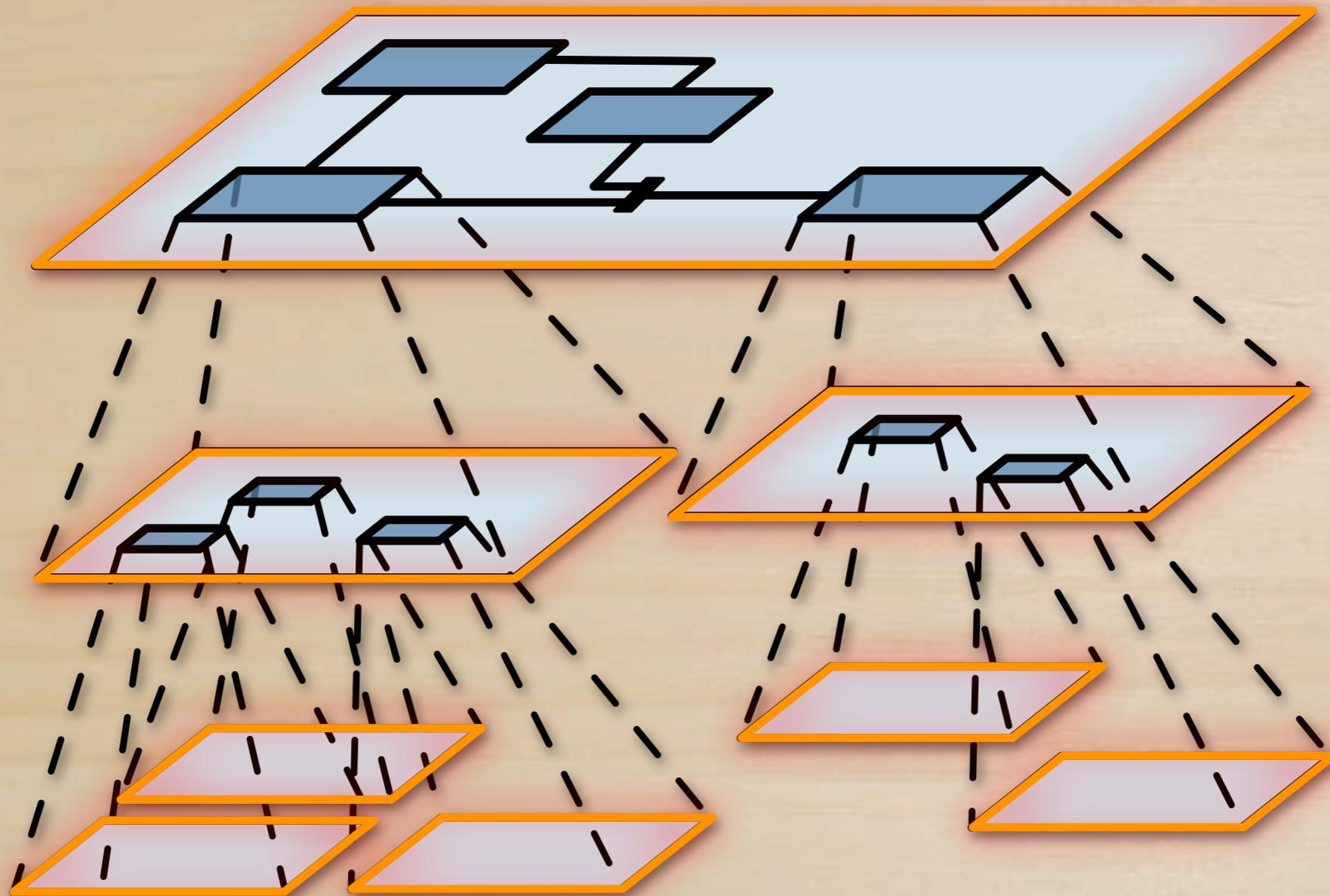
$$S \triangleq A_x \wedge N$$



$$P_A \triangleq S \Rightarrow \square I$$

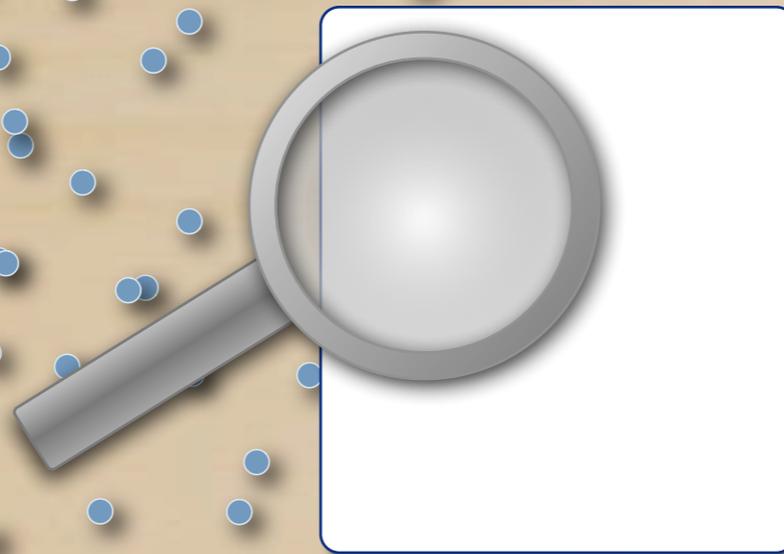
$$P_E \triangleq E_x \wedge N \Rightarrow \square I$$

Incremental Verification



Incremental Verification

Case Study: Mobile Game System [1]



575 states

[1] **Tool Support for the Rapid Composition, Analysis and Implementation of Reactive Services.**
Frank Alexander Kraemer, Vidar Slåtten and Peter Herrmann.
Journal of Systems and Software, Elsevier, 2009. (to appear)

Incremental Verification

Case Study: Mobile Game System [1]

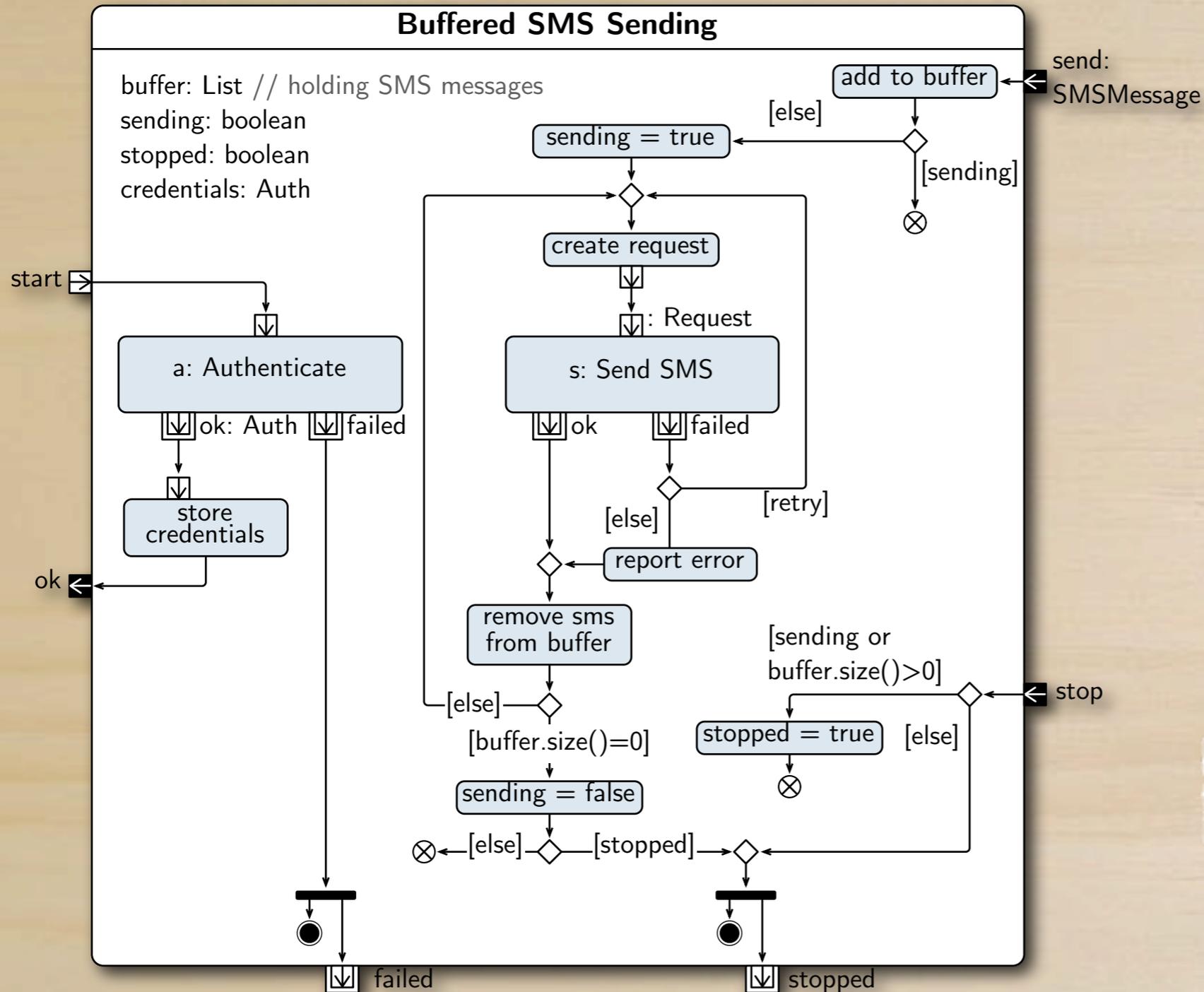


[1] Tool Support for the Rapid Composition, Analysis and Implementation of Reactive Services.

Frank Alexander Kraemer, Vidar Slåtten and Peter Herrmann.

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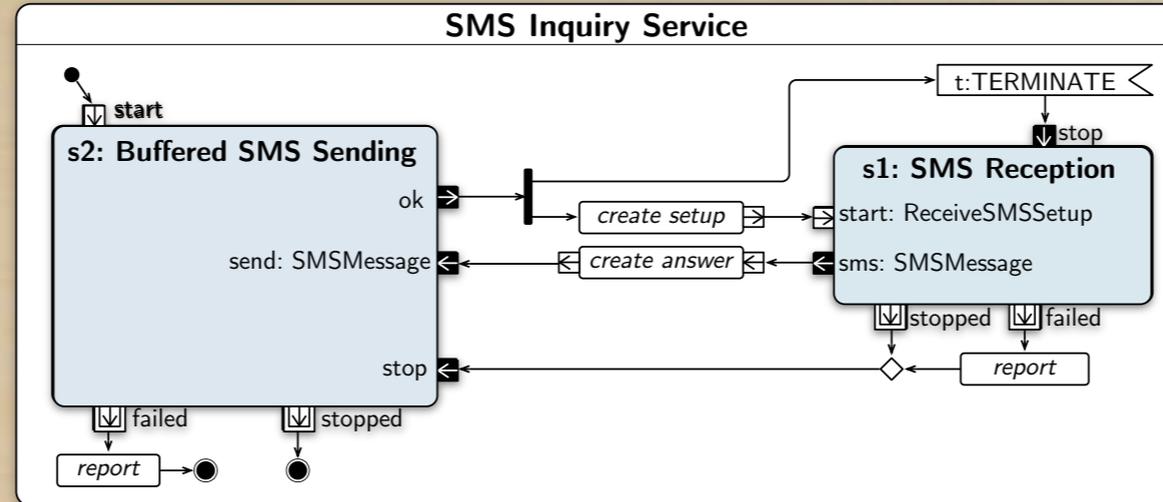
Reuse Metrics



28 edges
+ 27 nodes

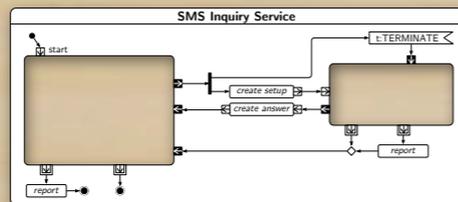
= 55

Reuse Metrics



Specific

Reused



$n=42$



$n=60$



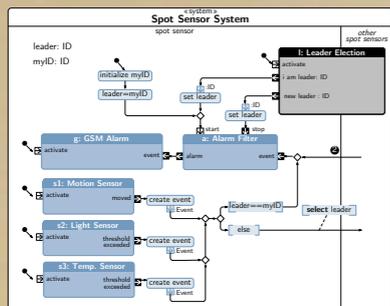
$n=55$

$n=42$

$n=115$

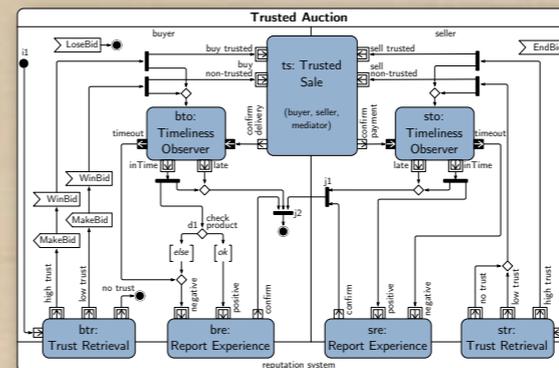
$$R = \frac{115}{115 + 42} = \underline{\underline{73\%}}$$

Reuse Metrics



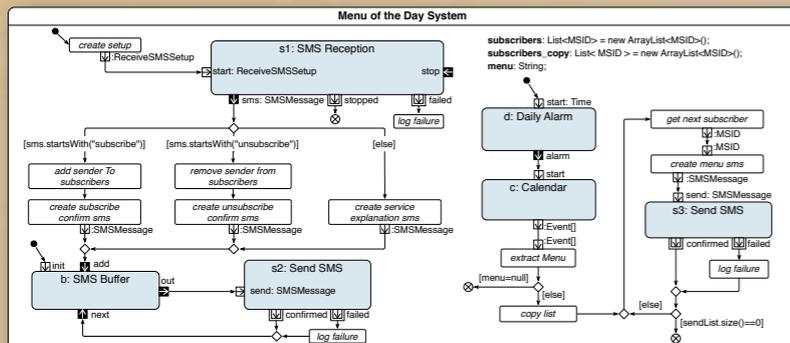
SPOT Sensor System

71 %



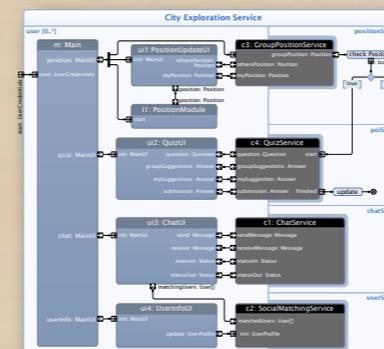
Trusted Auction System

75 %



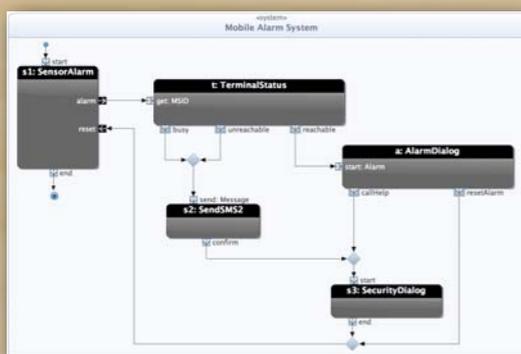
SMS-Based Service

79 %



Mobile Education Game

64 %

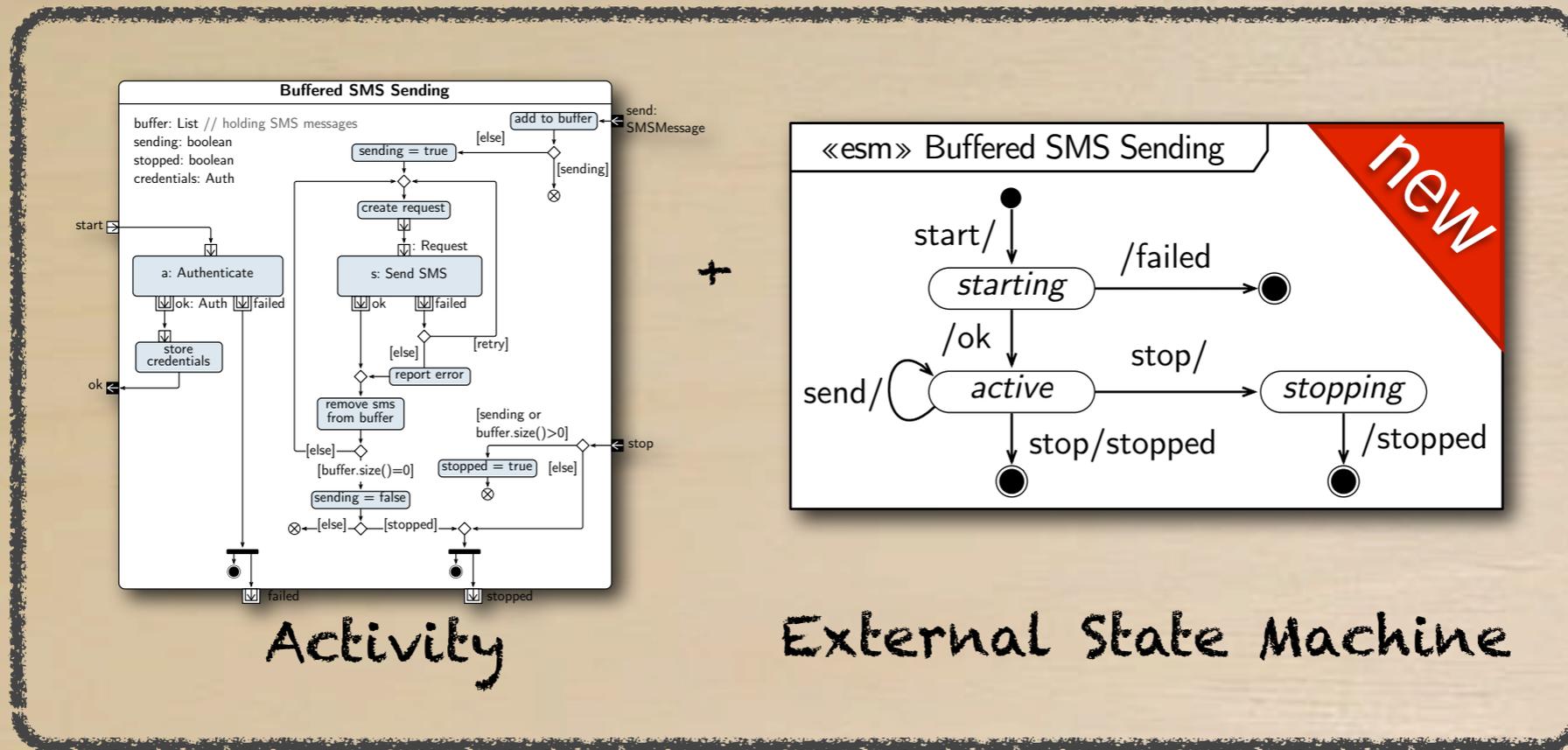


Mobile Alarm System

68 %

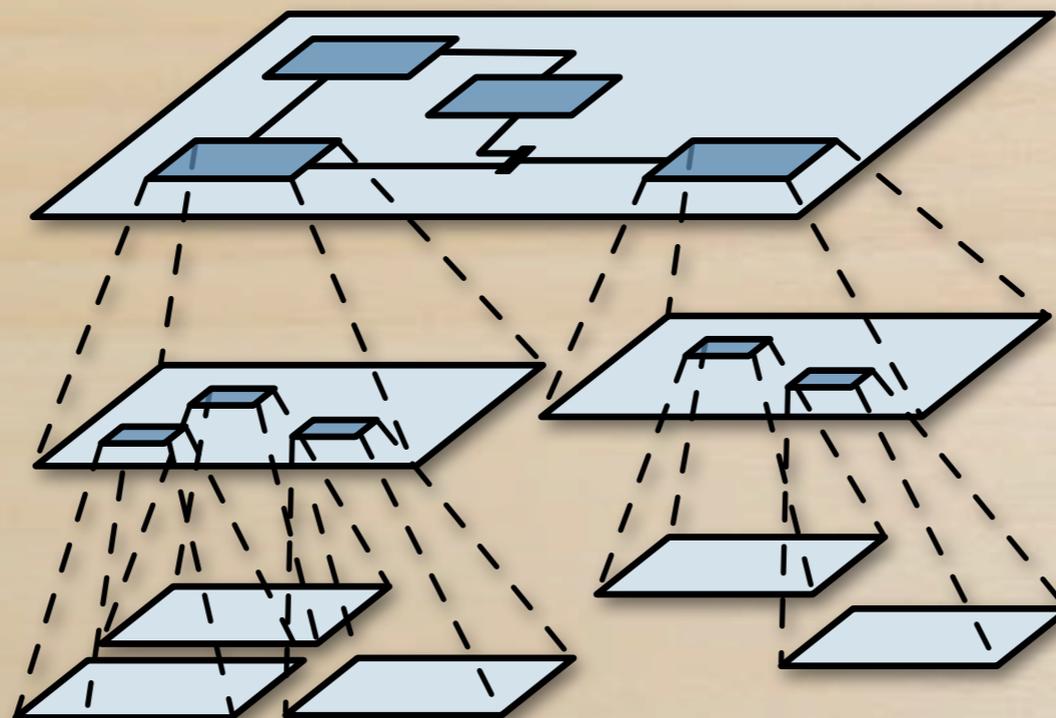
71 %

Summary



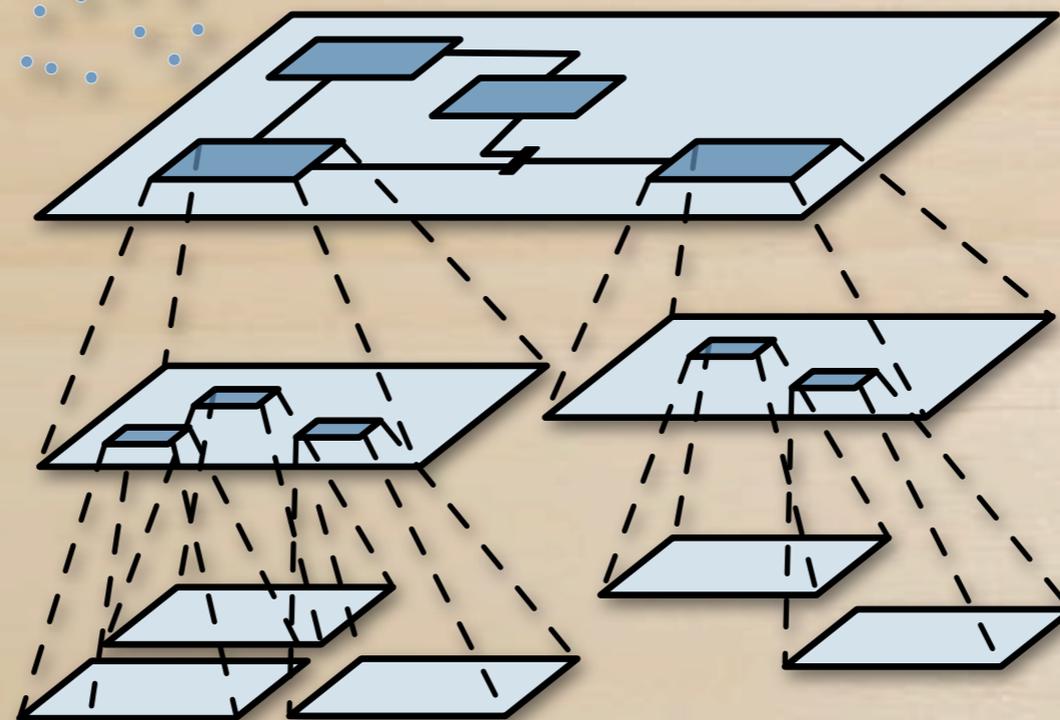
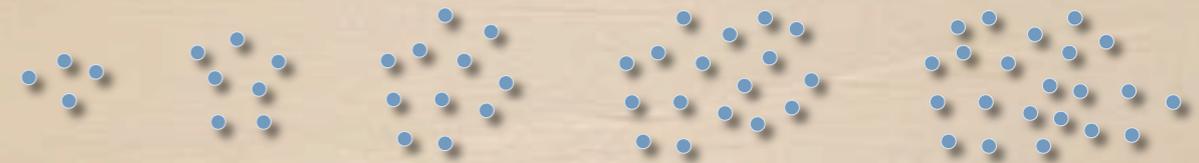
Activity

External State Machine

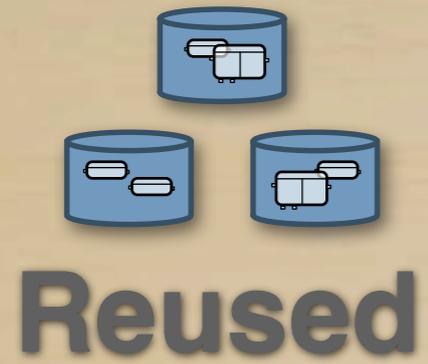


Summary

**Incremental
Verification:**



Summary



~70 %

Specific

