Modelling Mobility and the AGILE Case Study

Jane Hillston
LFCS, University of Edinburgh

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Outline

Modelling mobility

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Such a formalism is available in PEPA nets.

Petri nets and process algebras

- Petri nets provide a graphical presentation of a model which has an easily accessible interpretation.
- Stochastic process algebras have an explicit compositional structure — useful both for model construction and decomposed solution.
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- PEPA nets bring Petri nets and process algebras together as a single, structured performance modelling formalism.

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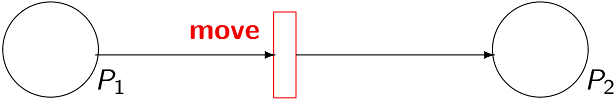

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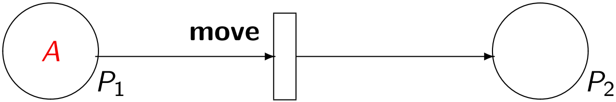

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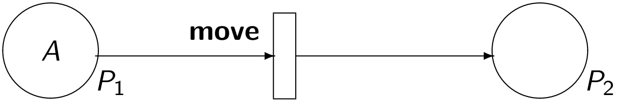

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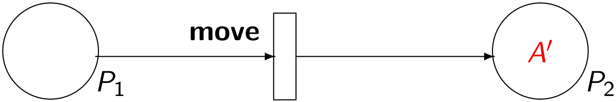

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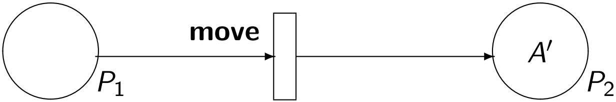

$$
\begin{aligned}
A &\stackrel{\mathit{def}}{=} (\mathbf{move}, m).A' \\
A' &\stackrel{\mathit{def}}{=} (\mathit{report}, r).A'' \\
\mathit{Sensor} &\stackrel{\mathit{def}}{=} (\mathit{collect}, \kappa).(\mathit{report}, \top).\mathit{Sensor}'
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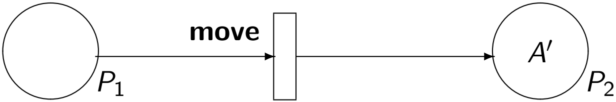

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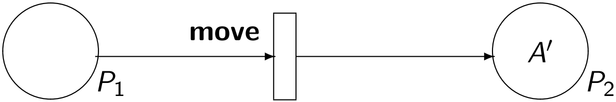

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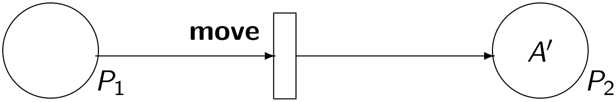

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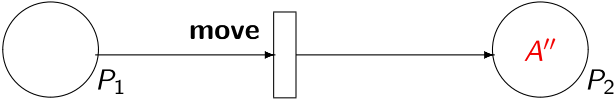

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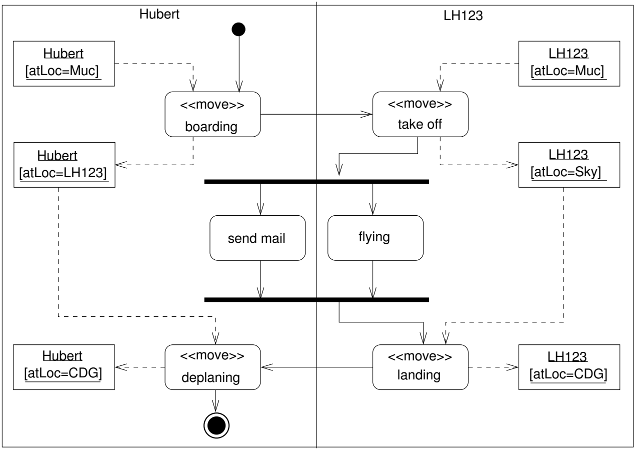

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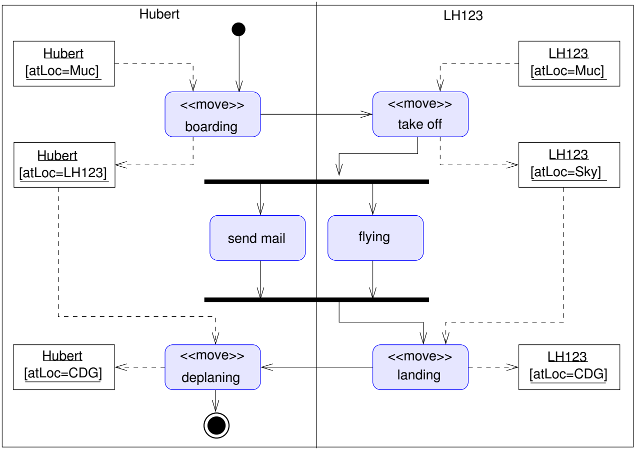

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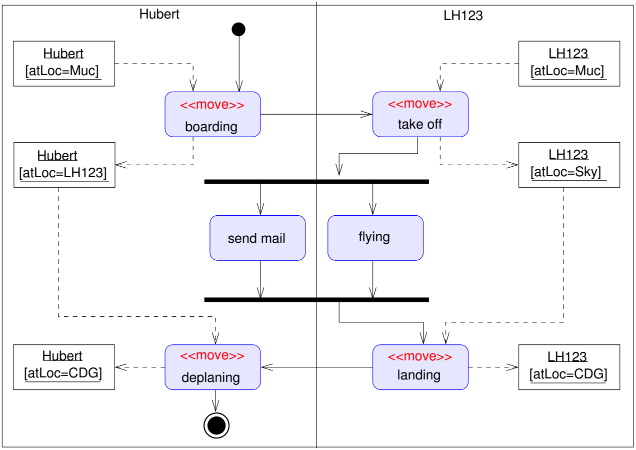

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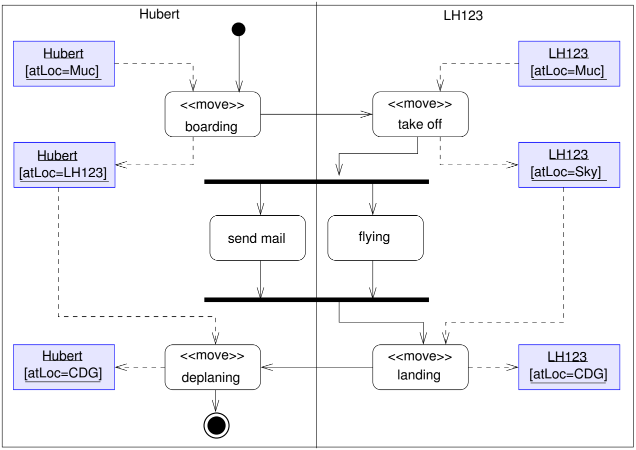

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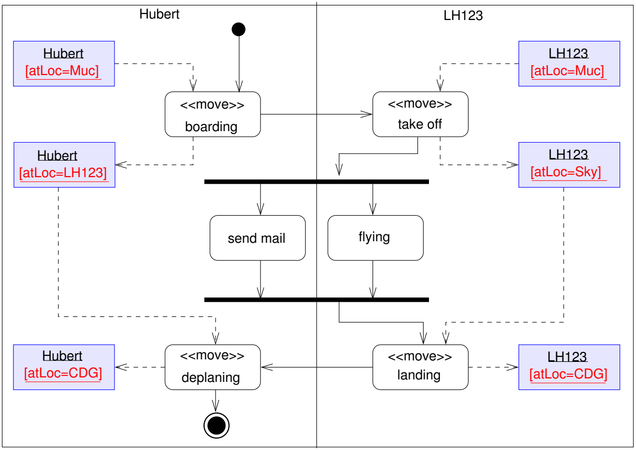

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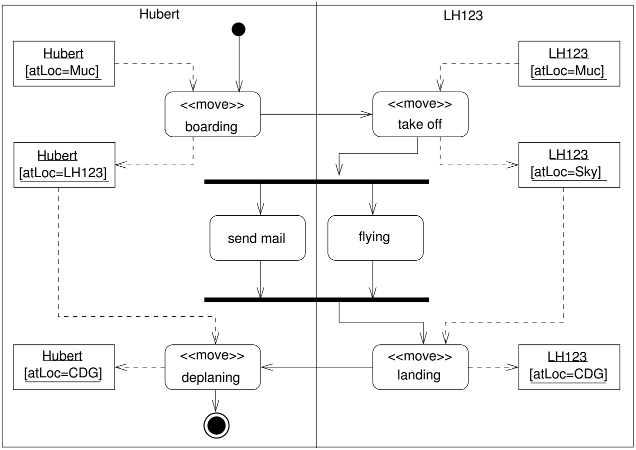

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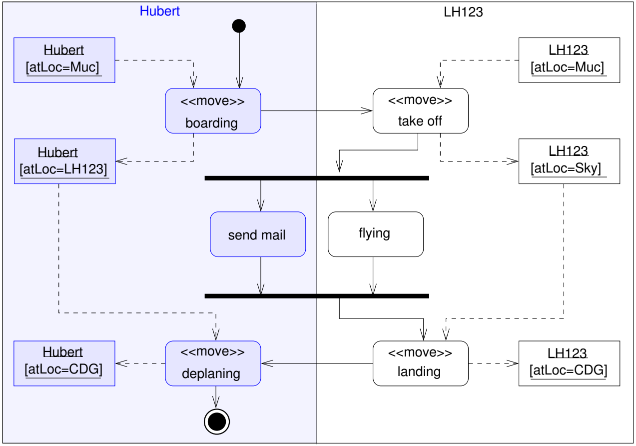

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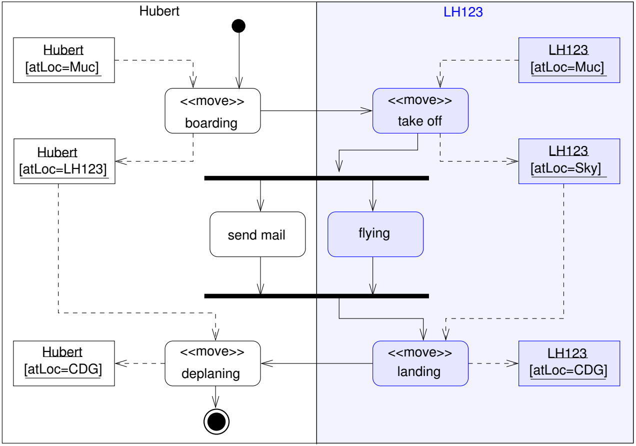

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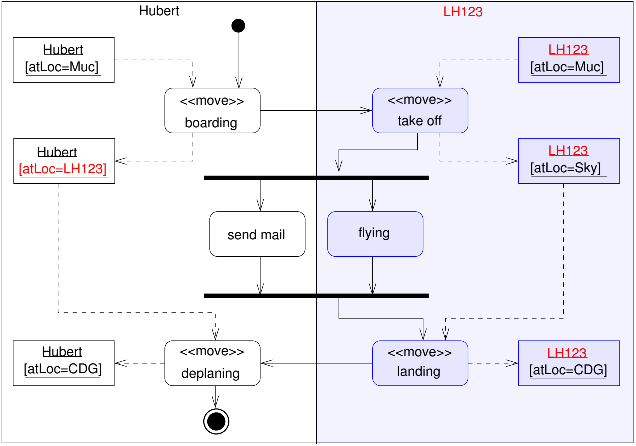

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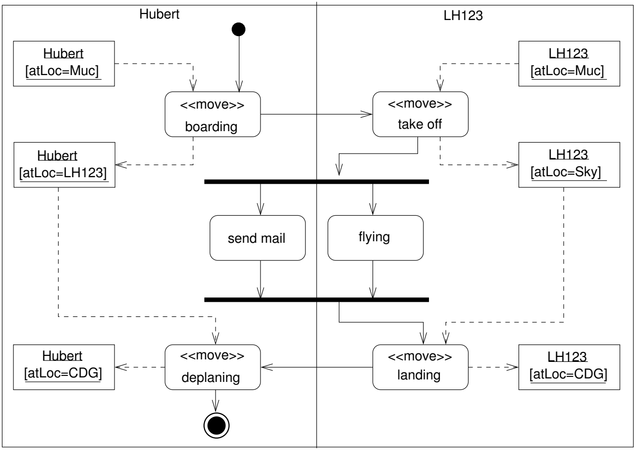

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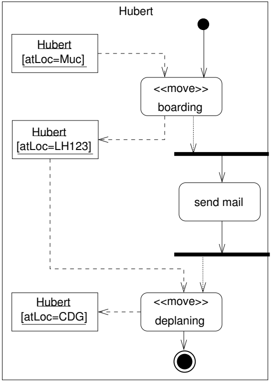

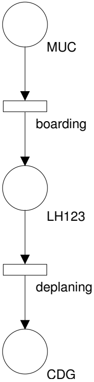

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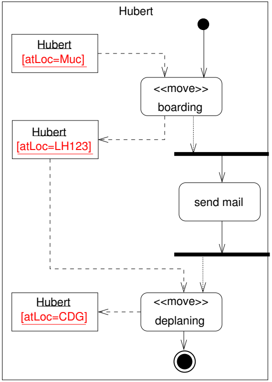

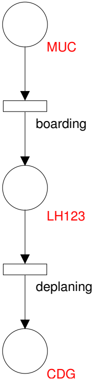

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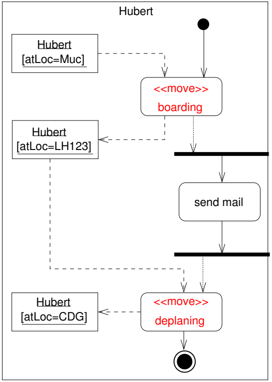

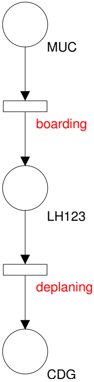

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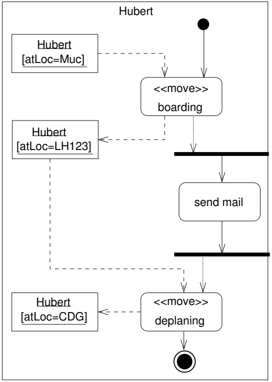

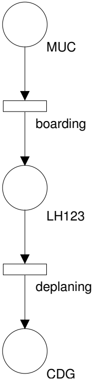

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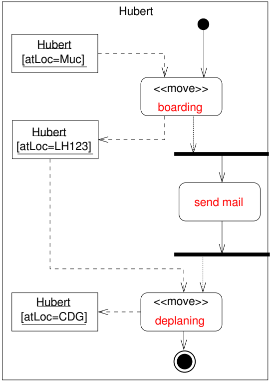

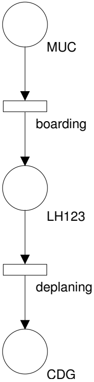

$$Hubert \stackrel{def}{=} (\mathbf{boarding}, b).(send\_mail, s).(\mathbf{deplaning}, d).Nil$$

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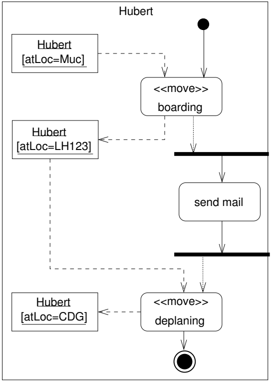

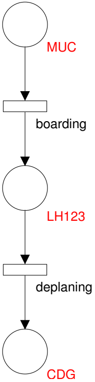

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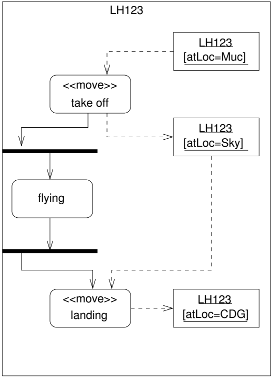
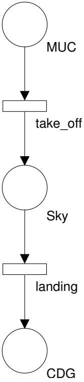
$$\begin{aligned} MUC &\stackrel{def}{=} Hubert\,[Hubert] \\ LH123 &\stackrel{def}{=} Hubert\,[\_] \\ CDG &\stackrel{def}{=} Hubert\,[\_] \end{aligned}$$

As a PEPA net – LH123's perspective





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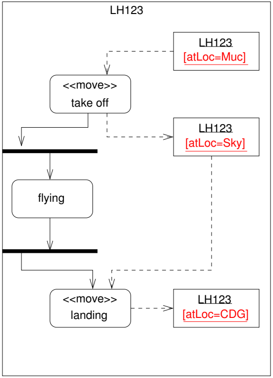

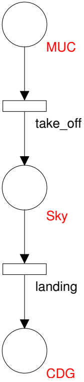

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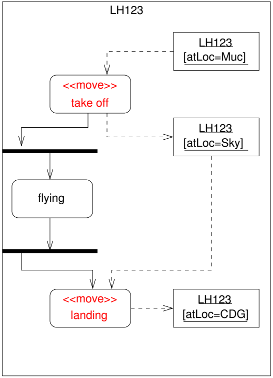

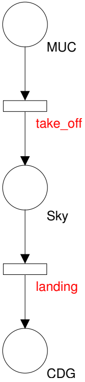

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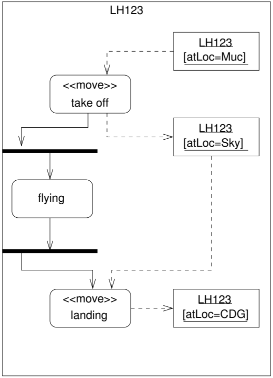

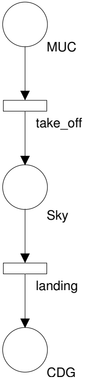

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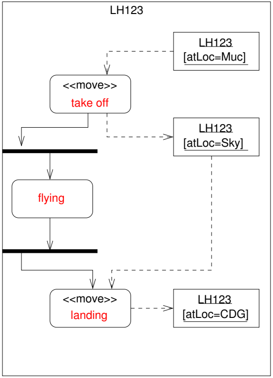

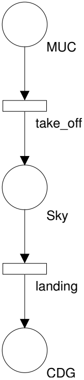

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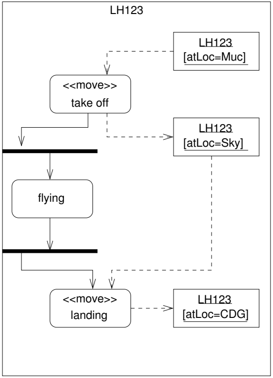

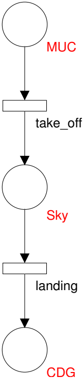

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Combined view

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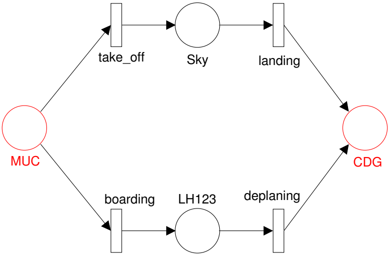

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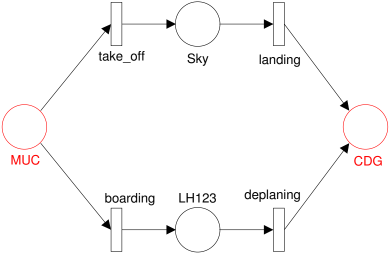

$$MUC \stackrel{def}{=} LH123\,[LH123] \parallel Hubert\,[Hubert]$$

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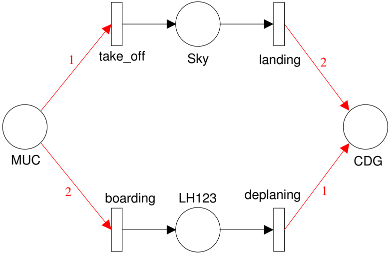
Combined view

1. Superpose common places
2. Use priorities to impose correct ordering



Combined view

1. Superpose common places
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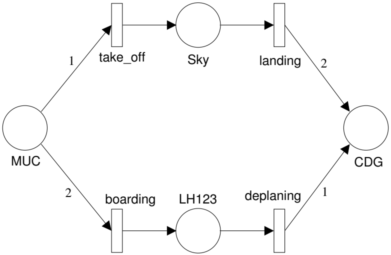
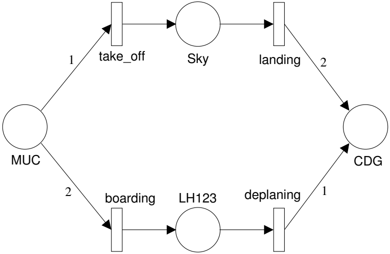


Combined view

1. Superpose common places
2. Use priorities to impose correct ordering
3. Add Hubert's view of the plane's behaviour



$$Plane \stackrel{def}{=} (\mathbf{take\_off}, \top).(send\_mail, \top).(\mathbf{landing}, l).Plane$$

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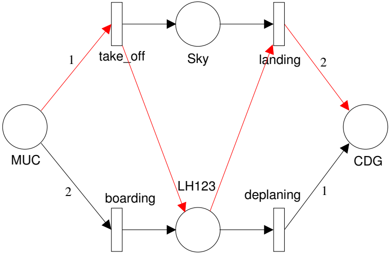

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Combined view

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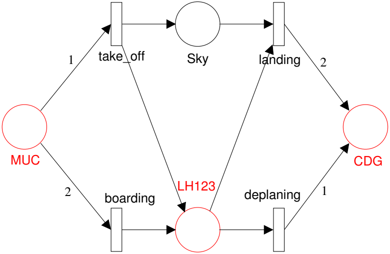

$$MUC \stackrel{def}{=} LH123\,[LH123] \parallel Hubert\,[Hubert] \parallel Plane\,[Plane]$$

$$LH123 \stackrel{def}{=} Hubert\,[-] \underset{\{send\_mail\}}{\bowtie} Plane\,[-]$$

$$CDG \stackrel{def}{=} LH123\,[-] \parallel Hubert\,[-] \parallel Plane\,[-]$$

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  - Stochastic π-Calculus
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- We have demonstrated expressiveness to match the AGILE airport example.
- An extractor/reflector pair for a class of activity diagrams following the AGILE stereotype has been integrated into the DEGAS environment, Choreographer.