Technische Universität Braunschweig

Institut für Verkehrssicherheit und Automatisierungstechnik iVA

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Coloured Petri Nets and CPN Tools

OpenETCS Workshop: “Formal Modelling and Tools“

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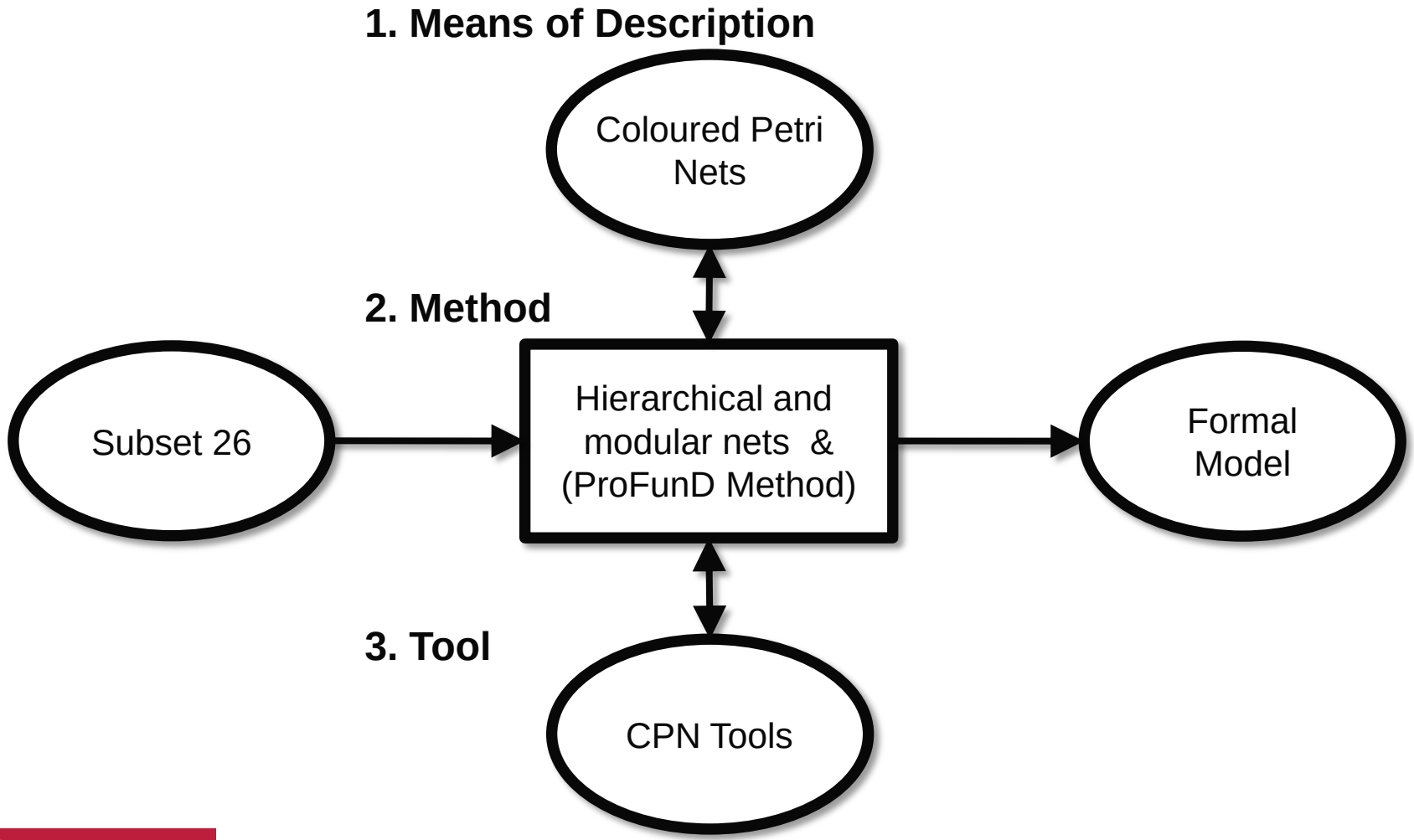
19.04.2013

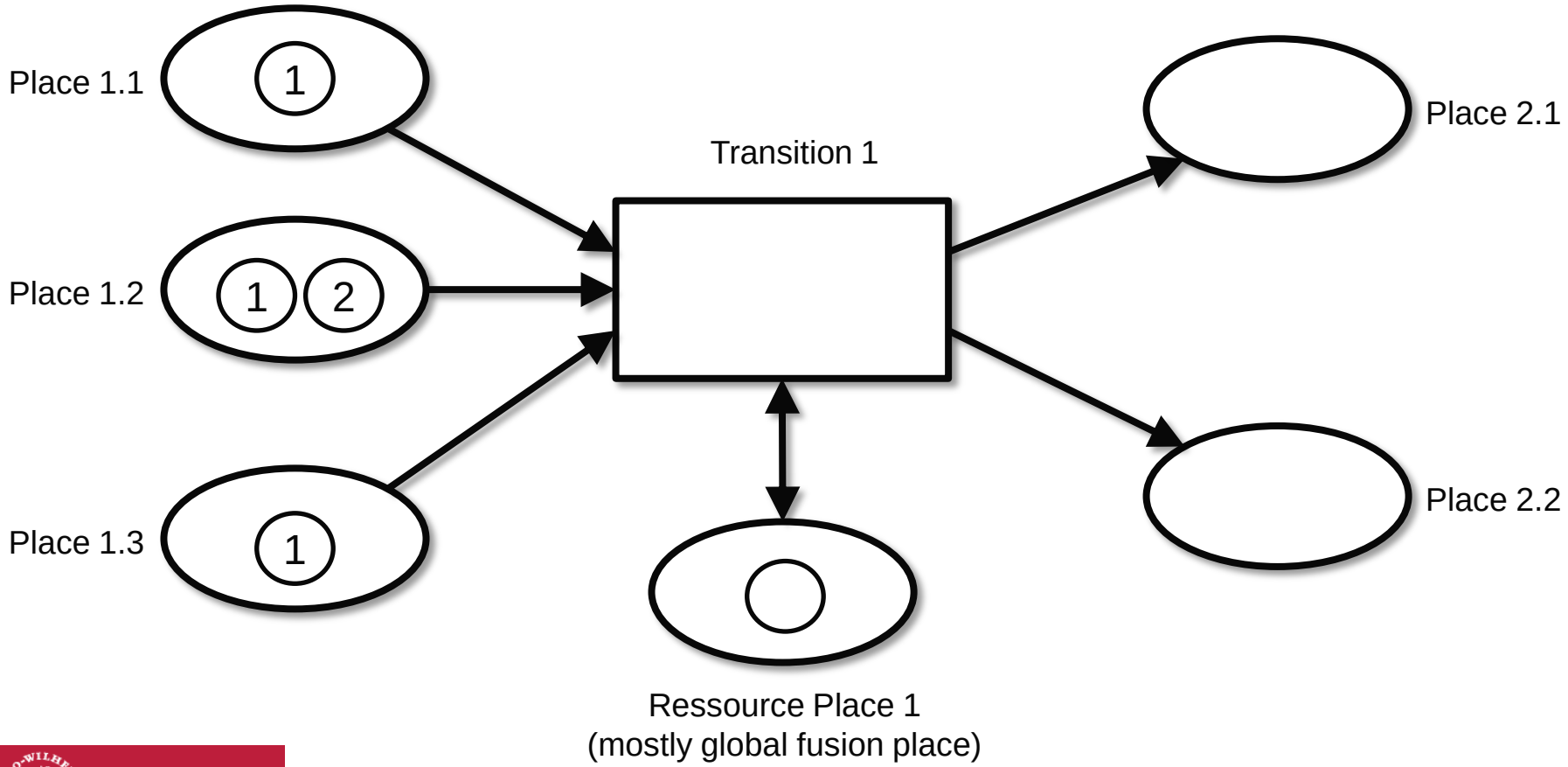
Agenda


1. Means of Description
Coloured Petri Nets
2. Method
Subset 26
Hierarchical and modular nets & (ProFunD Method)
Formal Model
3. Tool
CPN Tools

Means of Description
Petri Nets

Petri Nets are bipartite graphs with places and transitions

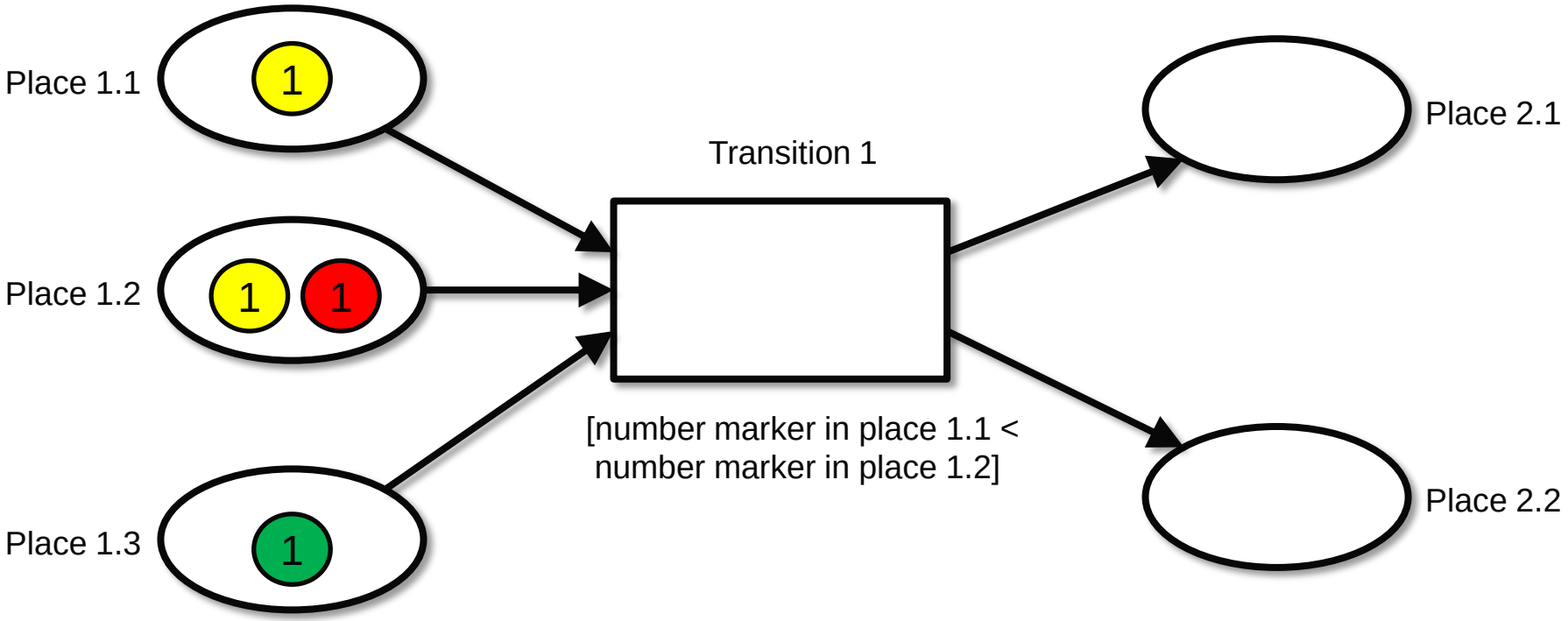
- Firing of transition chances status of states



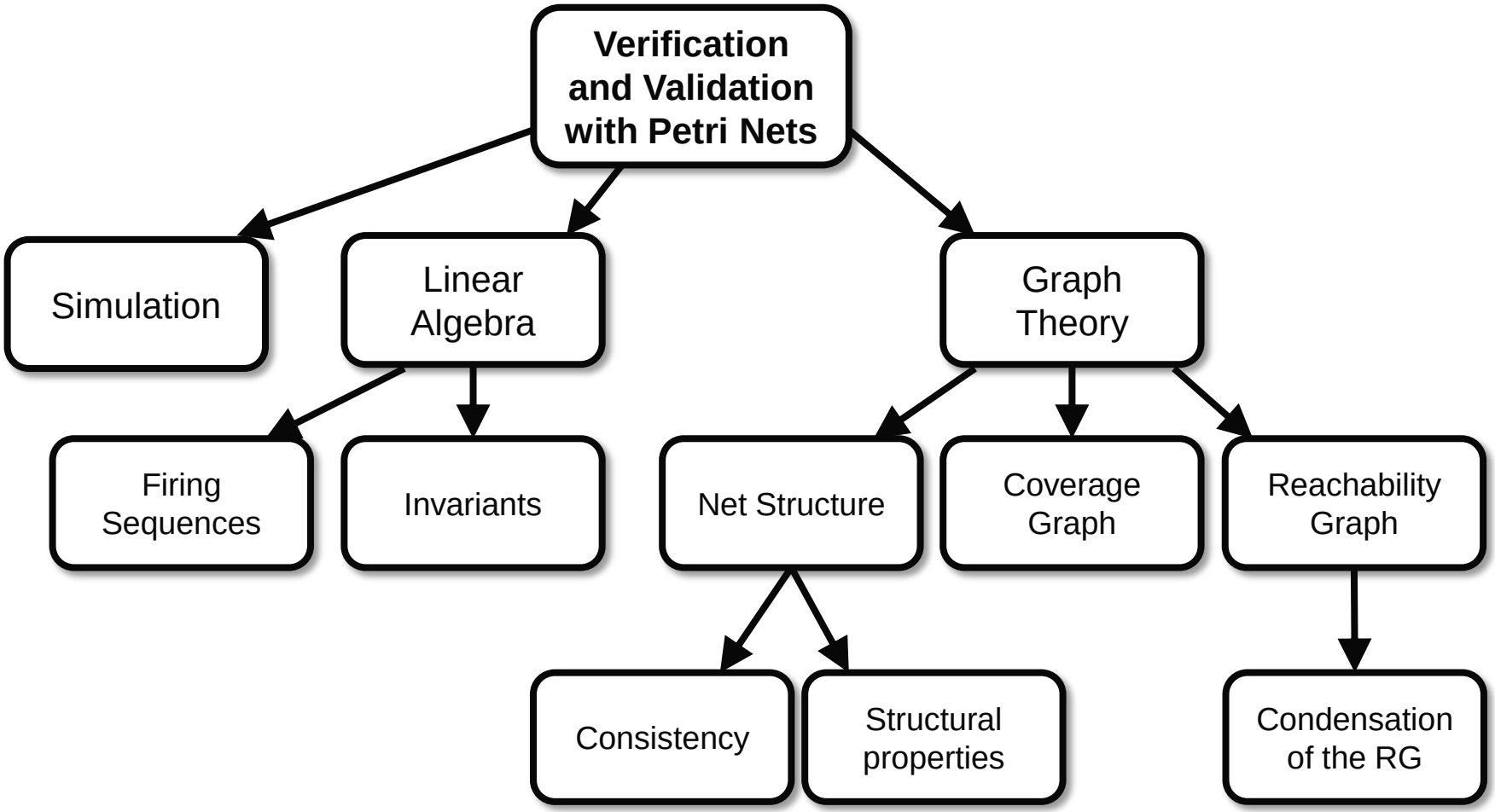
Means of Description
Coloured Petri Nets

Variation of Petri Nets

- Colour sets are a space convolution used to reduce size of net



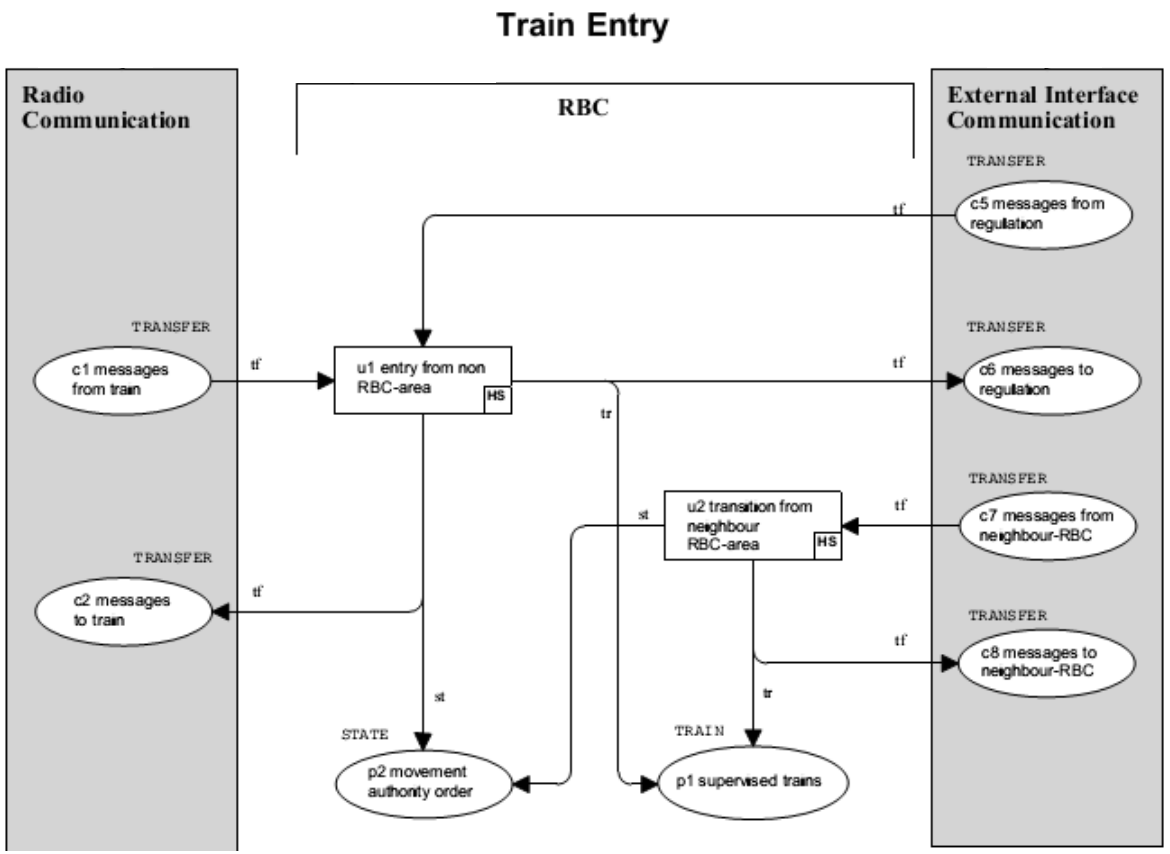
Means of Description
Analysis of Petri Nets



Method
Hierarchical and Modular Nets

3 Types of nets have been used for the modelling

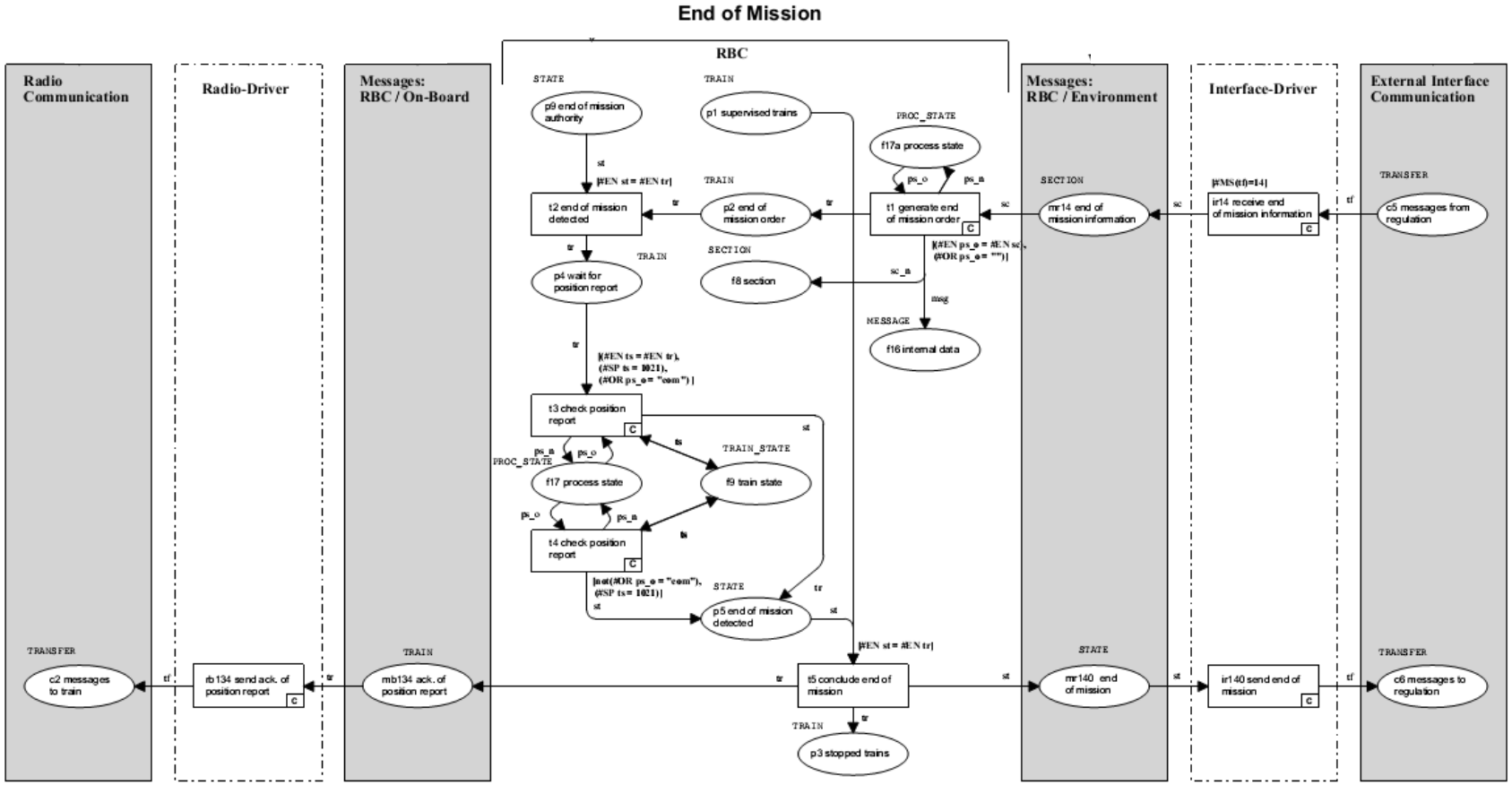
1. **Process Nets –** Operation Logic and Interfaces



Method
Hierarchical and Modular Nets

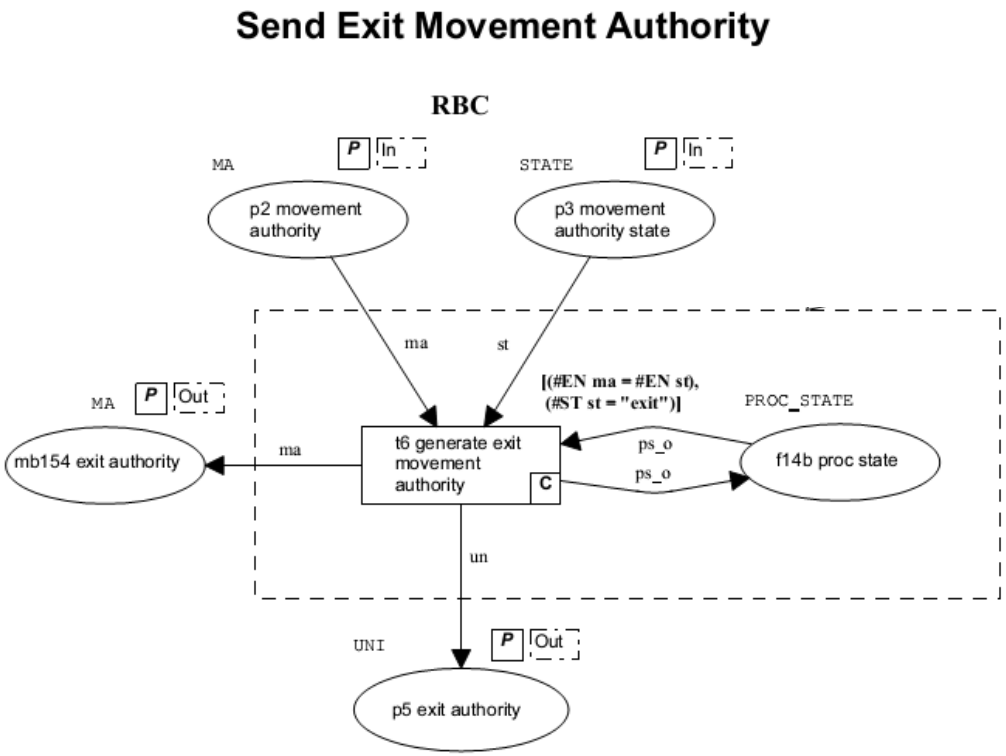
3 Types of nets have been used for the modelling

2. **Scenario Nets -** include Sending and Receiving Logic

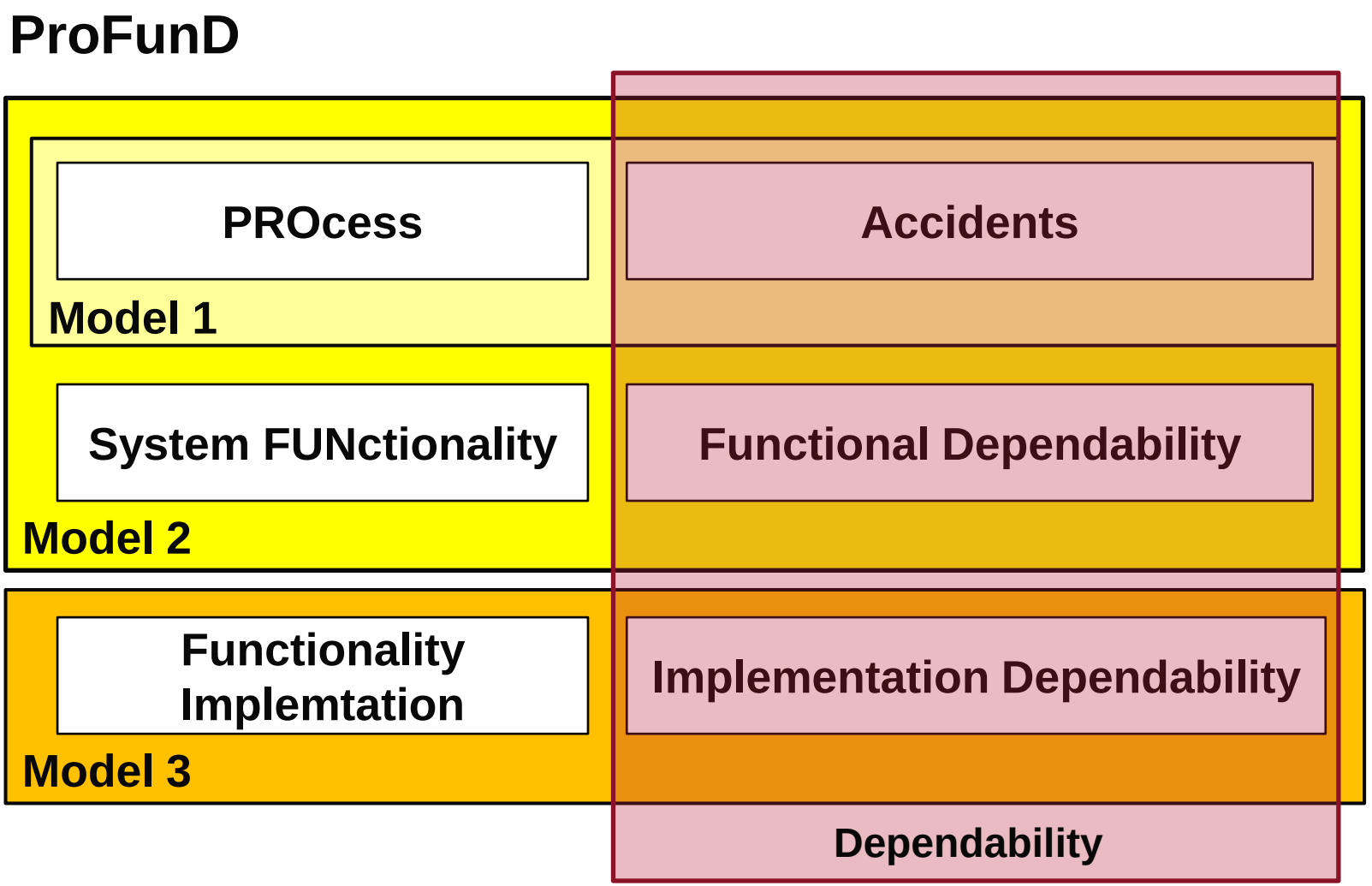


3 Types of nets have been used for the modelling

- **Function Nets –** detailed Modelling of a Transition



Method
ProFunD Method according to IEC 62551



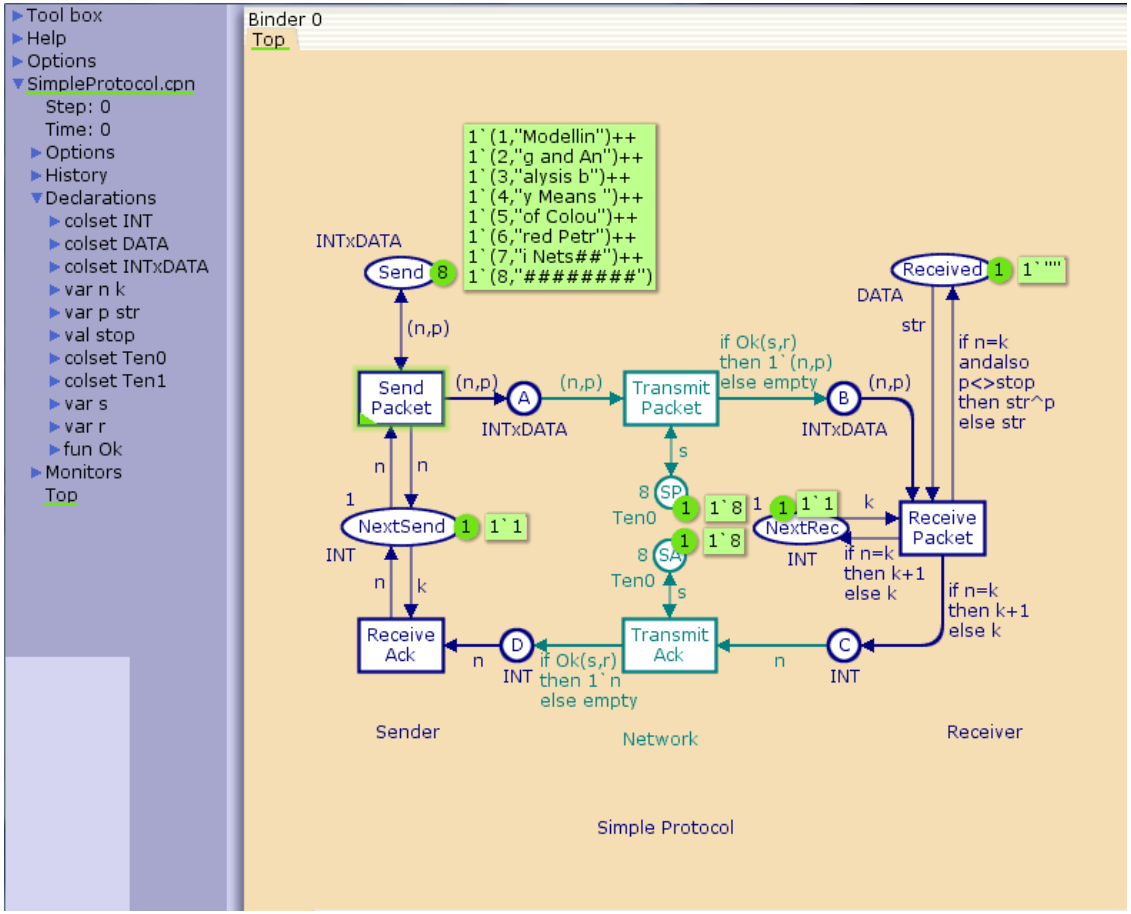
Tool
CPN Tools (Latest Version 3.4.0 from June 2012)

With CPN Tools Coloured Petri Nets can be

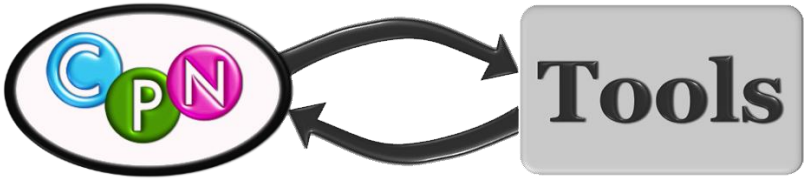
- **edited**
- **simulated**
- **analysed**

The tools feature

- incremental syntax checking (during modelling)
- code generation (during modelling)
- simulator for untimed and timed nets
- state space analysis



Tool
CPN Tools License



- Originally developed by the CPN Group at Aarhus University
- Today handled by the AIS group from Eindhoven University of Technology

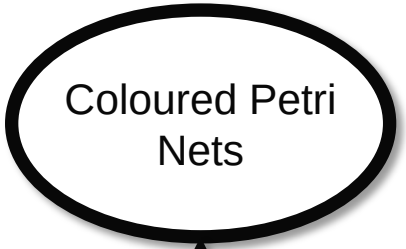
Licensing

- GUI - GNU General Public License version 2
- Simulator - GNU General Public License version 2 and a 4-clause BSD license
- Access/CPN - GNU Lesser General Public License version 2.1
  (CPN Tools is currently in process of releasing the source)

CPN Tools uses the CPN ML language (extension of Standard ML).
Access/CPN allows interaction with Eclipse.
Documentation can be found on **cpntools.org** and the tool can be downloaded

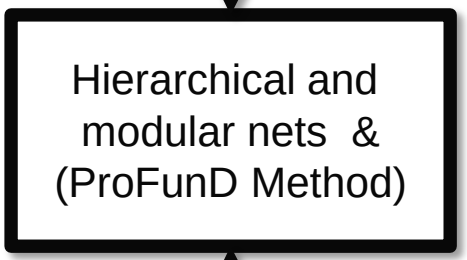
Conclusion
Independence between Method and Means of Description

1. Means of Description



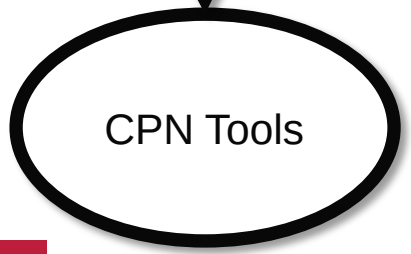
- Coloured Petri Net are suited to model ETCS
- Analysis of Petri Nets is can be used to proof functionality

2. Method



- Hierarchical and modular modelling is mandatory
- Dependability has to be modelled to allow a model-based safety analysis
- ProFunD can be used for most means of description

3. Tool



- CPN Tools are a mature tool, providing most needed functionalities

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