CPN Tools – Models of Dmitry Zaitsev
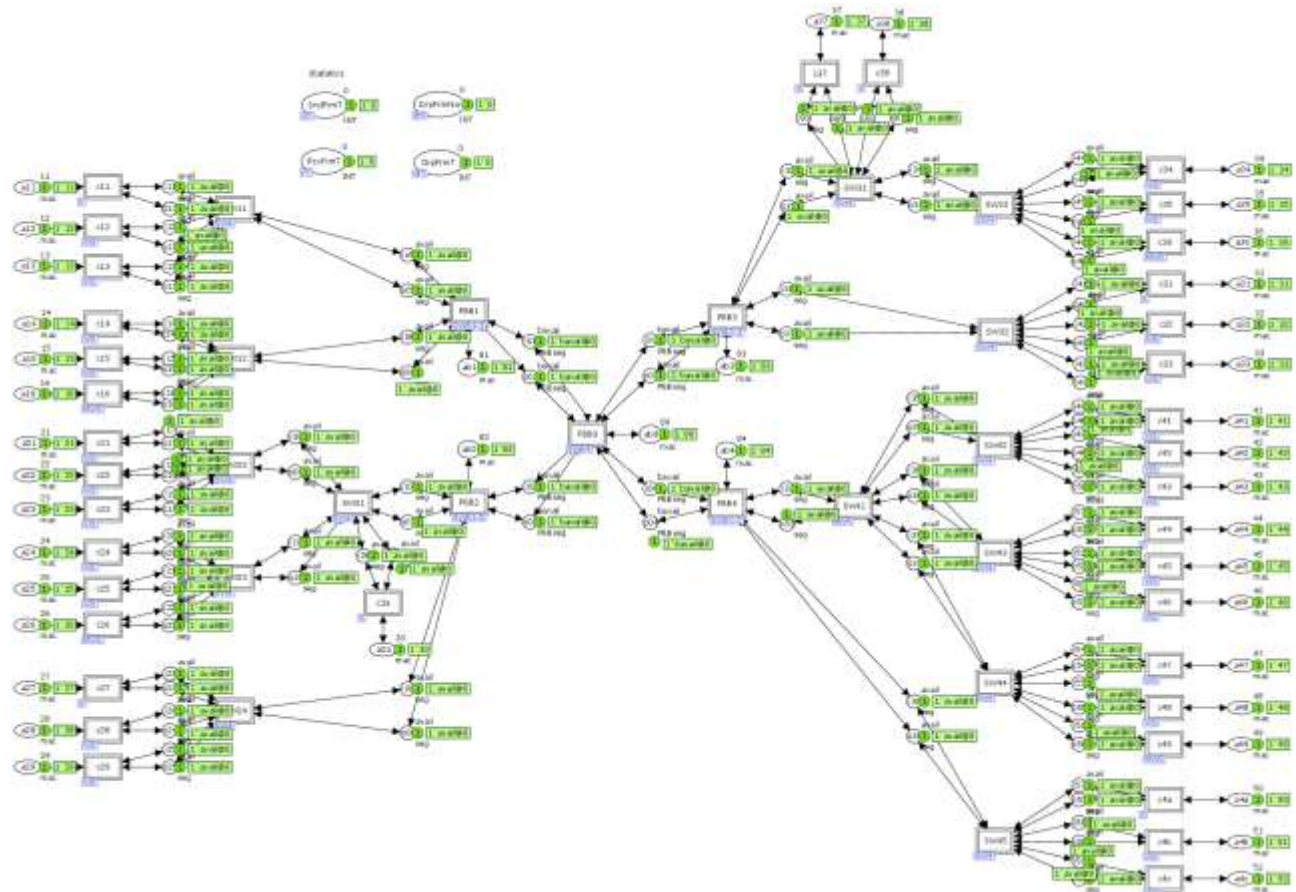
http://cpntools.org

Provider Backbone Bridge

Posted: January 9, 2018/Under: Examples contributed by Dmitry A. Zaitsev, Real-life examples, Sample CPN Models/By: admin

This model is contributed by Dmitry Zaitsev. We list models without going thru them in too much detail, so listing does not imply that we endorse them or any papers listed, only that we provide them as inspiration.

This model implements a Provider Backbone Bridge (PBB) network: PBB interior switch, PBB edge switch—with the dynamic filling up of address tables.

This model is described in:

P.P. Vorobiyenko, K.D. Guliaiev, D.A. Zaitsev, T.R. Shmeleva: "PBB Efficiency Evaluation via Colored Petri Net Models", In: Volume 2(2) of *Communications and Network*, page 113-124. Scientific Research Publishing Inc, May 2010.

If you use this model for your research, please cite the above paper.

This model demonstrates using the same subpage many times and is suitable for simulation based analysis.

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MPLS Network

Posted: January 9, 2018/Under: Examples contributed by Dmitry A. Zaitsev, Real-life examples, Sample CPN Models/By: admin

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The model of a given MPLS network is composed of submodels of LSR/LER routers and terminal (customer) networks for generating traffic. Static FEC/LSP allocation and label switching tables are used. See also the model IP Network.
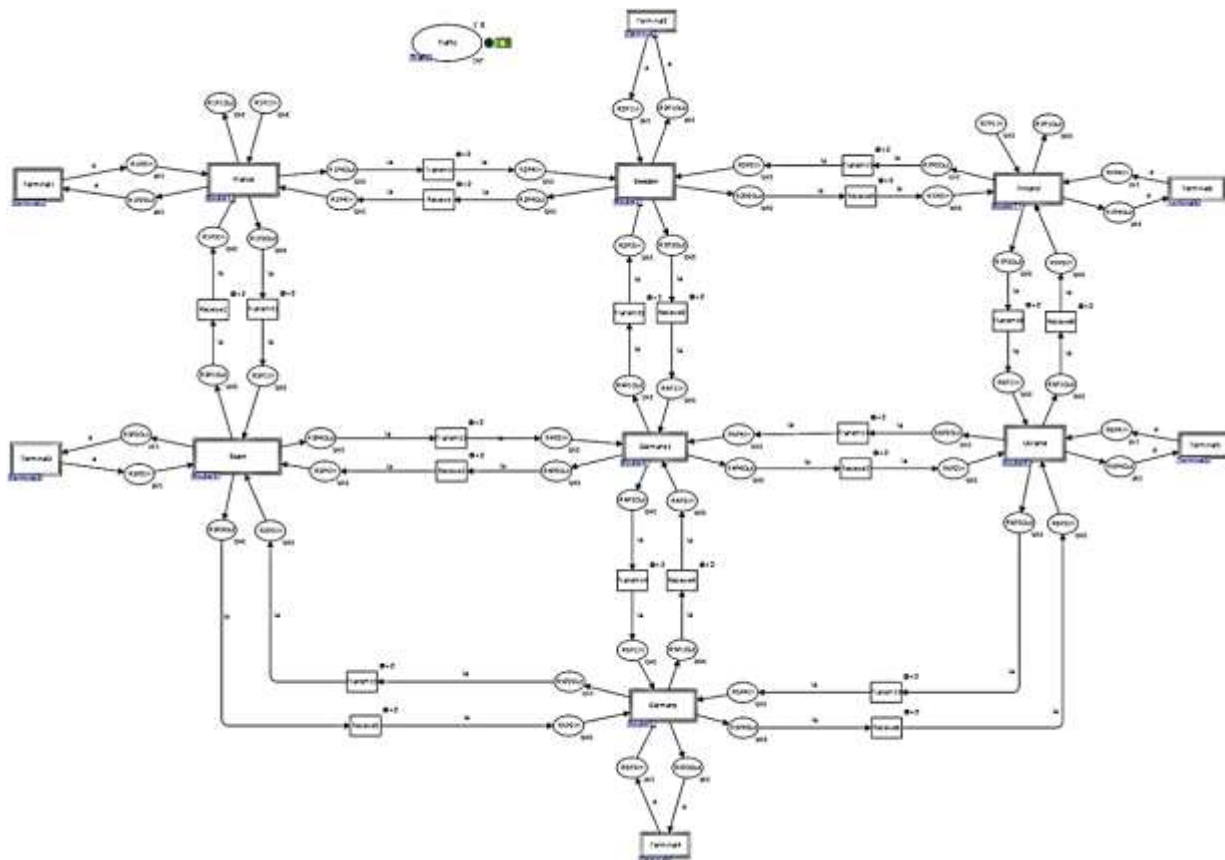
The model is described in

Zaitsev D.A., Sakun A.L: "An Evaluation of MPLS Efficacy using Colored Petri Net Models" In *Proc. of of International Middle Eastern Multiconference on Simulation and Modelling*, page 31-36. Amman (Jordan), August 26-28, 2008.

If you use this model for your research, please cite the above paper

The model is used for the performance evaluation of MPLS networks especially comparing IP networks as well as for the debugging label switching tables. It could be employed in the automated design of MPLS networks. A case study is provided on the example of European backbone network.

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IP Network

This model is contributed by Dmitry Zaitsev. We list models without going thru them in too much detail, so listing does not imply that we endorse them or any papers listed, only that we provide them as inspiration.

The model of a given IP network is composed of submodels of IP routers and terminal (customer) networks for generating traffic. Terminal networks provide random pairs of sender and receiver IP addresses into the specified address space. Static routing tables are used. See also the model MPLS Network.
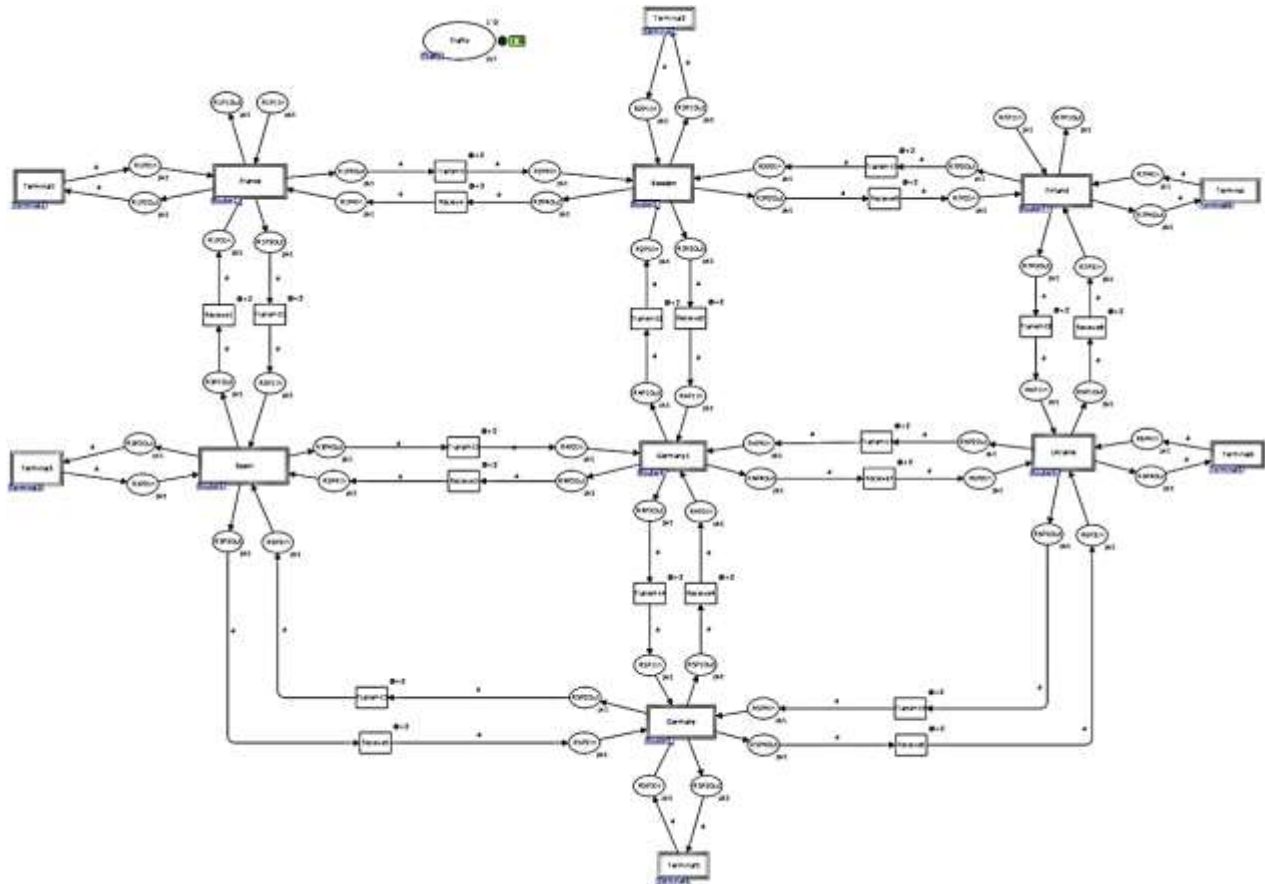
The model is described in

Zaitsev D.A., Sakun A.L: "An Evaluation of MPLS Efficacy using Colored Petri Net Models" In *Proc. of of International Middle Eastern Multiconference on Simulation and Modelling*, page 31-36. Amman (Jordan), August 26-28, 2008.

If you use this model for your research, please cite the above paper.

The model is used for checking and debugging IP routing tables, the performance evaluation of routers and the estimation of the network bandwidth and productivity. It could be employed in the automated design of IP networks. A case study is provided on the example of European backbone network.

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Ethernet Network Parametric Models

Posted: January 9, 2018/Under: Examples contributed by Dmitry A. Zaitsev, Real-life examples, Sample CPN Models/By: admin

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Parametric model has constant structure for any given switched Ethernet network. It contains one copy of each component: switch, workstation, server. A given topology is put as the marking of dedicated places as well as the characteristics of hardware and software. Special tag is added to each token which reflects the location of the token within Ethernet network.
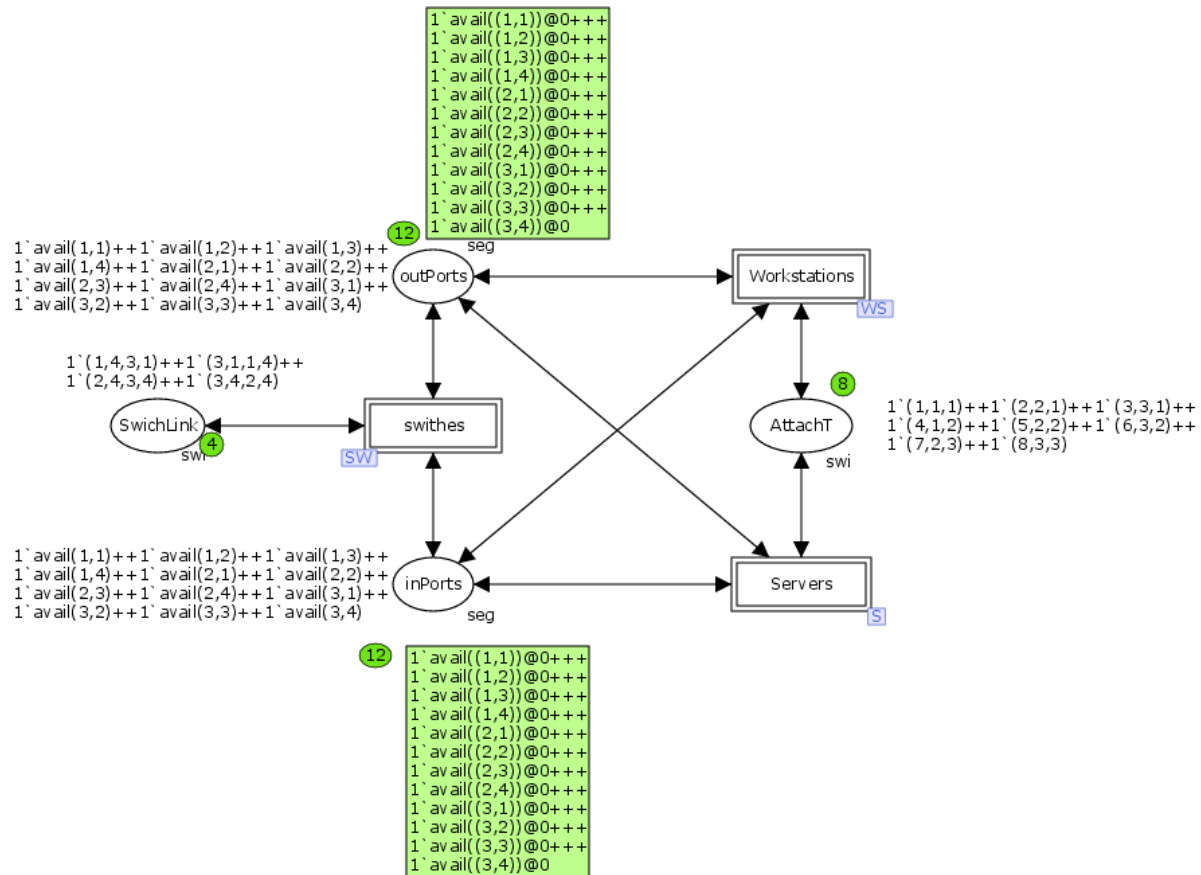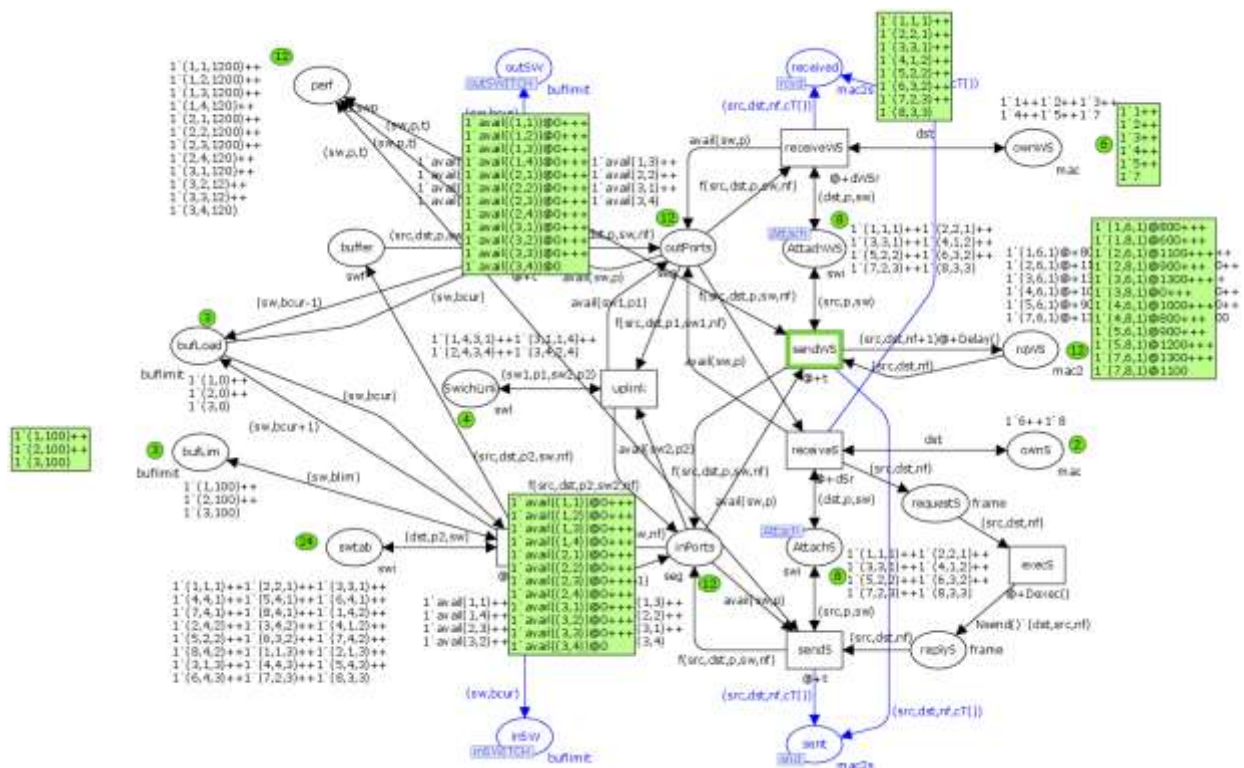
The models are described in

Zaitsev D.A., Shmeleva T.R.: "A Parametric Colored Petri Net Model of a Switched Network" *Int. J. Communications, Network and System Sciences*, page 65-76, 2011.

If you use this model for your research, please cite the above paper

The model is used for the evaluating the performance and quality of service (QoS) via special measuring fragments attached to the models of hardware and software. They provide the estimating such characteristics as the frame delivery time, the network response time, the average size of the switch internal buffer etc directly during the process of simulation. It is devised for CAD of real-time systems and was applied at railway dispatcher center.

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Ethernet Network

This model is contributed by Dmitry Zaitsev. We list models without going thru them in too much detail, so listing does not imply that we endorse them or any papers listed, only that we provide them as inspiration.

The model of a given network is composed of submodels of Ethernet switches, workstations and servers. It reflects the process of frames delivery by switches using the address table and the forwarding procedure.
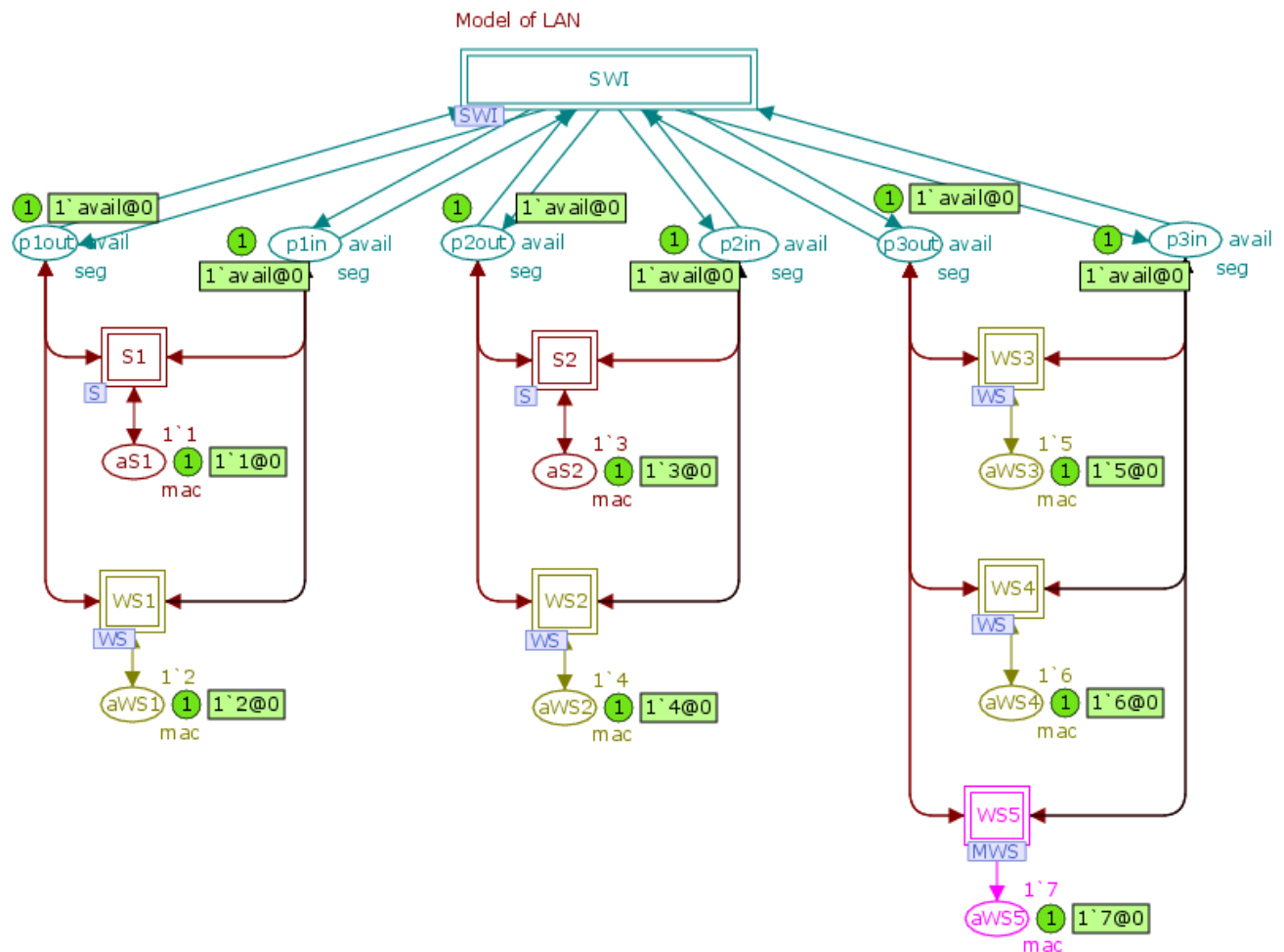
Zaitsev D.A: "Switched LAN simulation by colored Petri nets" In volume 65(3) of *Mathematics and Computers in Simulation*, page 245-249, 2004.

If you use this model for your research, please cite the above paper.

The model is used for the evaluating network response time directly during the process of simulation. The special submodel of measuring workstation calculates the individual response times for each query and the average network response time. The model is devised for the developing real-time systems and was applied on railway dispatcher center.

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E6 Network Dynamic Routing

This model is contributed by Dmitry Zaitsev. We list models without going thru them in too much detail, so listing does not imply that we endorse them or any papers listed, only that we provide them as inspiration.

The model of a given E6 network is composed of E6 switching-router (SRE6) submodels supplied with traffic generators. SRE6 model contains submodels of ports and routing procedures: SRE6port, RIPprocess, RIPupdate. Complex recursive functions are used to describe procedures of routing information processing. Routing tables are created and updated automatically.
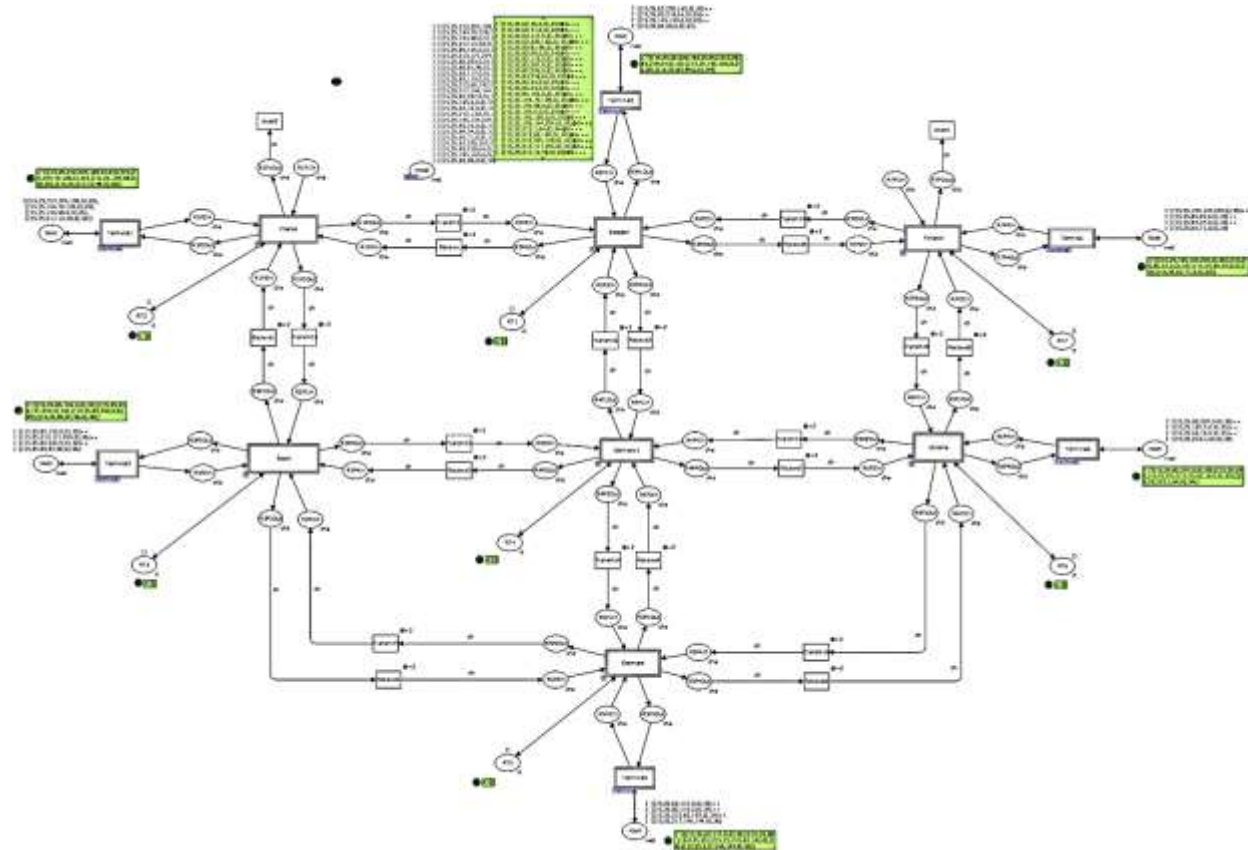
The model is described in

Guliaiev K.D., Zaitsev D.A.: "Simulating E6 Networks Dynamic Routing" In *9th International Workshop on Performability Modeling of Computer and Communication Systems*, September 17-18, 2009.
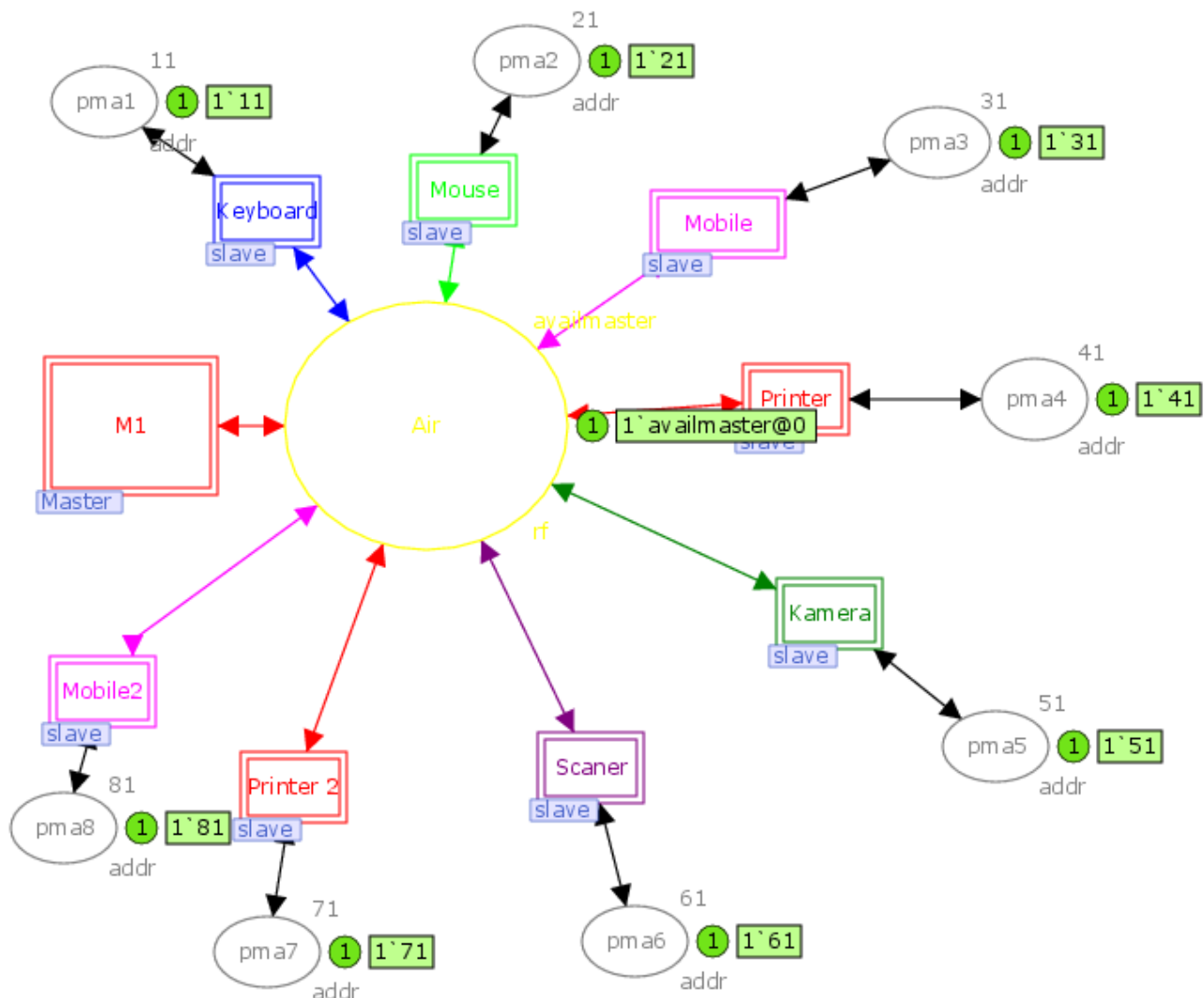
If you use this model for your research, please cite the above paper.

The model is devised for the evaluating E6 networks efficiency and developing E6 dynamic routing distance-vector protocols (analog to IP RIP). Special technique is applied for the periodical turning off the devices to investigate the adaptation abilities of E6RIP to varying network structure and its

parameters choice. The model could be applied at the dynamic routing protocols design and optimal choice of their parameters.

Bluetooth Network

This model is contributed by Dmitry Zaitsev. We list models without going thru them in too much detail, so listing does not imply that we endorse them or any papers listed, only that we provide them as inspiration.

The model of a given Bluetooth network is composed of submodels of the master and slave devices. The process of AMA reallocation is modeled as well as the data transmitting via ether. Static allocation of PMA is employed.

The model is described in

Bereznyuk M.V., Gupta K.K., Zaitsev D.A.: "Effectiveness of Bluetooth Address Space Usage" In *Proceedings of 20th International Conference, Software & Systems Engineering and their Applications*, 4-6 December 2007.

If you use this model for your research, please cite the above paper

The model is used for the evaluating the Bluetooth networks efficiency. It was shown that the process of AMA addresses swapping leads to the considerable decrease of the effective productivity. The anomaly of the information exchange slipping under big number of slave devices was observed.

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