

## Service model using Petri nets

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A novel engineering paradigm called *service engineering* is proposed to change our modern society in order to achieve “appropriate production, appropriate consumption, and least waste” rather than “mass production, mass consumption, and mass waste”. A *service* is defined as *an activity that changes the state of a service receiver*. A service model consists of three sub-models: scope model, view model and flow model<sup>[1]</sup>.

We present a research framework for service engineering based on a kind of high-level Petri Nets—Hierarchical Colored Petri Nets<sup>[2]</sup>. In this framework, a flow model is presented in top level net so as to describe the structure of a target service as a chain of agents existing in the service (see Fig.1). Then the sub pages corresponding to the substitution transitions of the top level net give the inner structure, which determines the sub services including all agents as receivers (see Fig.2). Thus the sub pages show a scope model. Moreover, there are also substitution transitions in the scope model; the sub pages corresponding to them give the view models expressing the relationships among the RSPs (Receiver State Parameters), CoPs (Content Parameters), and ChPs (Channel Parameters) (see Fig.3).

In this framework, we can represent information of material flow, and deal with RSPs for the complicated service system with hierarchy and modularity method:

✚ In the top level net, we can give the flow model to describe the whole service structure coarsely and crudely, but in this way we can represent the complicated relationship clearly for a large scale of services.

✚ In the sub-page of a flow model, we can give the scope model to determine sub service which we are interested in.

It will be very helpful in intensifying, improving, and automating the whole service, including service creation, service delivery, and service consumption.

We illustrate the development procedure by studying some service cases — Restaurant Service, Consumer Electronics Rental Service, the optimizing and scheduling problems of material distributing centre of one of the important parts of the supply chain, using CPN—TOOLS simulation software

*Keywords:* service engineering, hierarchical colored Petri nets, modeling

### References

- 1) Shimomura, Y., *et al.*: “A proposal for service modeling,” Proceedings of the 3rd International Symposium on Environmentally Conscious Design and Inverse Manufacturing, pp. 75-80, 2003.
- 2) TIAN Guohui, *et al.*: “A Framework for Service Engineering Based on Hierarchical Colored Petri nets,” International Conference on Machine Automation (ICMA2004), 2004.

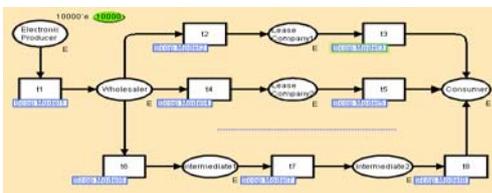


Fig.1 Flow model of Producing-Consuming System

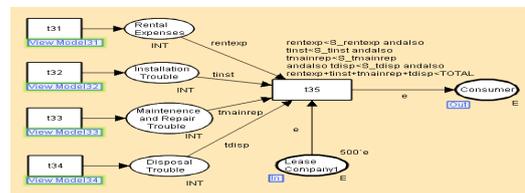


Fig.2 Scope model of Consumer Electronics Rental Service

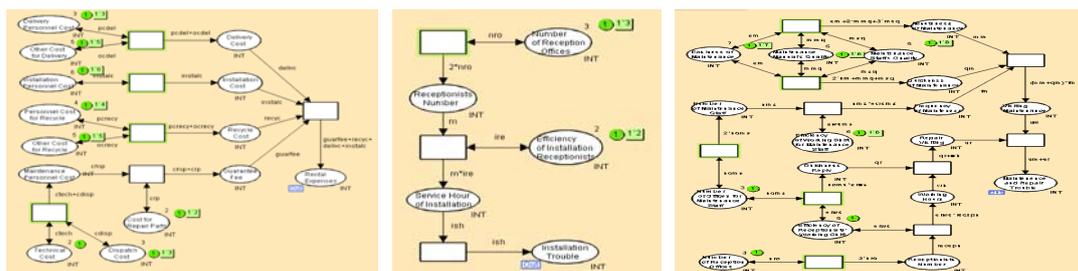


Fig.3 View models of Consumer Electronics Rental Service