GENERALIZED NET MODEL OF ABSTRACT MACHINE FOR CONNECTION ESTABLISHMENT

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1. Introduction

Open systems interconnection (OSI) conception of International standard organization (ISO) is used by developers at the field of telecommunications as a base for realization, investigation and development of the systems of information exchange. The processes in such systems are characterized by parallelism and asynchrony, and their structure - by a high level of complexity. For to obtain expected results the processes have to posses corresponding properties [2]. To guarantee them are used different formal techniques of modeling and analyzing of interconnections [3].

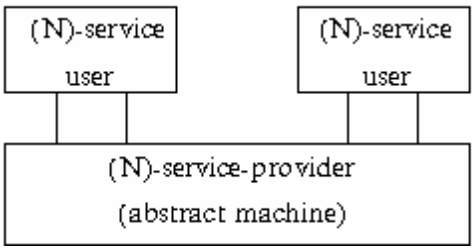
Petri nets [4] are used for such tasks because of us possibilities to model as the structure of the investigated object, as the dynamics of the flowing in it processes. The Generalized nets (GN) [5] are contemporary their development, suggesting more detail reflection of the structure and time relation in parallel processes, and a more compact graphic visualization. To reach a good balance between these two aspects in GN-models we suppose is important its priority, having in mind the other their advantages.

The GN apparatus, like a new and speedy developing formalism, is not yet so systematized to determine clear and unambiguously the technology of the "direct" building of the complex systems at different subject area. To determine which part of the processes to be reflected in the structure of the transition, and which in its predicate conditions in common case is nontrivial question, requiring complex formalized knowledge's (expert evaluation). One of the possibilities is to use already developed models on the base of PN. On their base are building GN models, too. So the larger part of uncertainty refine since the PN models contains a strict formulation of the task. The transformation of PN in GN model will allow, if it is necessary to reflect the parameters, which was not possible to be included in the classical PN. We also expect to make easy "extending" of the GN-model aiming to approach with the required rate of details to the real interconnections.

To prove these possibilities, on the base of concrete examples, is devoted the presented paper. We shall use GN apparatus for modeling of one of the basic mechanism in OSI - request for service at connection establishment, on the base of the existing PN-model.

2. The service as a element of OSI

The reference model of OSI order to divide the architecture of each communication system into seven layers on the principle of stratified hierarchy. Operations on any layer are presented by interconnecting protocol objects, supporting in the process of functioning the required service. The abstract providing machine (AM) is specified in Recommendation X.210 [6] of CCITT (now International telecommunication union ITU-T) as is present on fig.1.



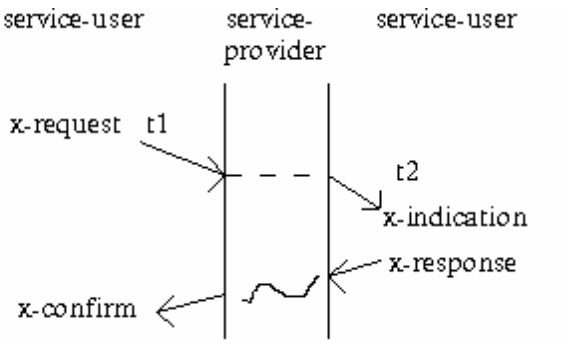


Fig.1 Service model Fig.2 Service primitives

The service is provided on the boundary between the user and AM through the so named Service-access points (SAP) using four service primitives. Bounds between them are showed on fig.2.

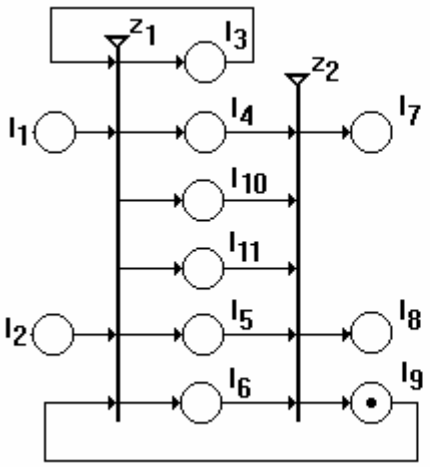
It is required a model, presented building of interconnection between peer objects - each of them may request and receive service (there is duplex connection between them). Such PN model is presented in [7] where through applying a tensor approach is synthesized a balance scheme of interconnection. The obtained PN is living and boundedness with 12 transitions and 16 conditions. On its base we build GN model of symmetric interconnection.

3. GN-model

Our aim is to obtain of model of interconnection between peer objects In GN-view, saving source model properties. I.e. on the request of service each object will obtain service (if it is possible) without useless cycles.

The graphical view of synthesized GN model is presented on fig.3.

The token α will be in position l_1 with input characteristic “request for connection of x-service-user”. The token β in position l_2 is with input characteristic “request for connection of y-service-user”. The token γ in position l_3 have input and flowing characteristic “state of AM”.



$$Z_1 = < \{l_1, l_2, l_3, l_9\}, \{l_3, l_4, l_5, l_6, l_{10}, l_{11}\}, r_1, \wedge (\vee (l_1, l_2, l_3), l_9) >$$

$$Z_2 = < \{l_4, l_5, l_6, l_{10}, l_{11}\}, \{l_7, l_8, l_9\}, r_2, \wedge (\vee (l_4, l_5, l_{10}, l_{11}), l_6) >$$

Fig.3 GN model

The transition conditions are defined as follows:

r_1 =

	l_3	l_4	l_{10}	l_5	l_{11}	l_6
l_1	$W_{1,3}$	$W_{1,4}$	$W_{1,10}$	false	false	false
l_2	$W_{2,3}$	false	false	$W_{2,5}$	$W_{2,11}$	false
l_3	false	$W_{3,4}$	false	$W_{3,5}$	false	false
l_9	false	false	false	false	false	true

r_2 =

	l_7	l_8	l_9
l_4	true	false	false
l_{10}	true	false	false
l_5	false	true	false
l_{11}	false	true	false
l_6	false	false	true

where

$W_{1,3}$ ="there is a token in position l_5"

$W_{1,4}$ ="there is a token in position l_2 and no token in position l_5"

$W_{1,10}$="there is no token in position l_2 and l_5"

$W_{3,4}$="there is no token in position l_2 , l_5, and l_{11}"

$W_{2,3}$ ="there is a token in position l_4"

$W_{2,5}$ ="there is a token in position l_1 and no token in position l_4"

$W_{2,11}$="there is no token in position l_1 and l_4"

$W_{3,5}$="there is no token in position l_1 , l_4, and l_{10}"

The constructed model has the necessary properties.

4. Conclusion

The constructed GN-model can be used as a basis for researches of a more complex interconnections. Making that, we will utilize the power of the GN apparatus.

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