

Admission of agents in groups as a normative and organizational problem

Jacques FERBER
ferber@lirmm.fr

Olivier GUTKNECHT
gutkneco@lirmm.fr

Laboratoire d'Informatique, Robotique et Micro-électronique
de Montpellier. Université Montpellier II, France

May 21, 2000

1 Background

We have proposed in [1] a generic model of multi-agent systems based on organizational concepts such as groups, roles and structures. This model, that we have called AALAADIN in [1] and we will refer now as AGR for Agent/Group/Role, defines a very simple description of coordination and negotiation schemes through multi-agent systems. AGR is a generic model of artificial organization by which one can build multi-agent systems with different forms of organizations such as market-like and hierarchical organizations.

In the AGR model, an organization is viewed as a framework for activity and interaction through the definition of groups, roles and their relationships. By avoiding an agent-oriented viewpoint, an organization is regarded as a structural relationship between a collection of agents. Thus, an organization can be described solely on the basis of its structure, i.e. by the way groups and roles are arranged to form a whole, without being concerned with the way agents actually behave, and multi-agent systems will be analyzed from the “outside”, as a set of interaction modes. Thus, the specific architecture of agents is purposely not addressed.

1.1 Agent

The model places no constraints on the internal architecture of agents. An *agent* is only specified as an active communicating entity which plays *roles* within *groups*. This agent definition is intentionally general to allow agent designers to adopt the most accurate definition of agenthood relative to their application. The agent designer is responsible for choosing the most appropriate agent model as internal architecture. We will see in the next section how we can formalize an individual role-based agent architecture.

1.2 Role

The role is an abstract representation of an agent function, service or identification within a group. Each agent can handle multiple roles, and each role

handled by an agent is local to a group. Handling a role in a group must be requested by the candidate agent, and is not necessarily awarded. Abstract communication schemes are thus defined from roles.

1.3 Group

Groups are defined as atomic sets of agent aggregation. Each agent is part of one or more groups. In its most basic form, the group is only a way to tag a set of agents. In a more developed form, in conjunction with the role definition, it may represent any usual multi-agent system. An agent can be a member of n groups at the same time. A major point of AGR groups is that they can freely overlap. A group can be founded by any agent. In [2] we have presented an operational semantics of this model in terms of π -calculus. Figure 1 presents a diagram of this model.

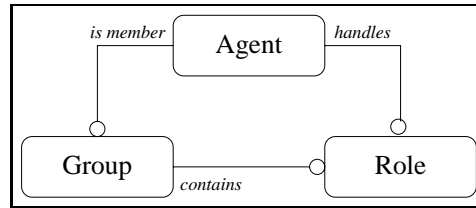


Figure 1: The core model

2 Admission of agents in groups

Some issues have been left over in our previous presentations. In particular, the mere AGR model does not provide any particular mechanism for role access within a group (systematic acceptance or refusal, admission conditioned by skills or by an admission dialog, relation to a group metrics, ...). The relation between an agent, its roles and the groups of which it is a member have raised several questions which can be classified as follows:

Admission issue: How the admission to a group is controlled. How can a group check if an agent is able to play its role and use the corresponding language.

Commitment issue: What happens if an agent that has requested to play a specific role fails in achieving the tasks associated to that role.

Sanction issue: What the group can do if it happens that the agent has failed in playing its role.

These three questions, which are related to each other, are key questions for organization based multiagent systems.

Our solution is based on the following assumption: for an agent, requesting a role within in a group, implies an acceptance of all the constraints (skills, obligations, use of communication language) associated to that role. Failing to do so implies a sanction. The sanction can vary from simple penalties to

rejection from the group. Although this solution seems quite natural with logic based agents, it is quite difficult to realize in an heterogeneous agents. We cannot assume that all agents follow some sort of deontic logic because, as we have said before, we do not place any constraints on the internal architecture of agents.

We plan to use an organizational framework to implements this solution. This framework is based on the use of specific groups and roles which are aimed at detecting the infringer agent and apply the penalty rules.

3 conclusion

The workshop on norms and institution would be an opportunity to learn about the on going researches in this area and to confront our ideas about the use of social concepts in multiagent systems design.

References

- [1] Jacques Ferber and Olivier Gutknecht. A meta-model for the analysis and design of organizations in multi-agent systems. In *3d International Conference on Multi-Agent Systems (ICMAS'98) Proceedings*. IEEE, 1998.
- [2] Jacques Ferber and Olivier Gutknecht. Operational semantics of a role-based agent architecture. In *Proceedings of the 6th Int. Workshop on Agent Theories, Architectures and Languages*. Springer-Verlag, 1999.