

# Chapter VI

## R<sup>2</sup>–IBN:

### Argumentation Based Negotiation Framework for MAIS–E<sup>2</sup> Model

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#### ABSTRACT

*In the age of information proliferation, openness, open information management, **interconnectivity**, **collaboration** and communication advances, **extended enterprises** must be up to date to the new strategic, economic and organizational structures. Consequently, intelligent software based on **agent** technology emerges to improve system design, and to increase enterprise competitive position as well. The competitiveness is based on the information management, **cooperation**, **collaboration** and **interconnectivity**. Thus, within these **interconnectivity** and **cooperation**, conflicts may arise. The automated negotiation plays a key role to look for a common agreement. Argumentation theory has become an important topic in the field of **Multi-Agent Systems** and especially in the negotiation problem. In this chapter, first, the proposed model **MAIS-E<sup>2</sup>** (Multi-**Agent** Information System for an **Extended Enterprise**) is presented. Then an **argumentation based negotiation** framework: Relationship-Role and Interest Based **Negotiation (R<sup>2</sup>-IBN)** framework is presented, and within this framework, the authors focused mainly on, argument generation module via inference rules and argument selection module via **fuzzy logic**.*

## INTRODUCTION

Nowadays, a number of new concepts have been proposed, e.g., Virtual Organization, Supply Chain Management, Virtual and **Extended Enterprise**, etc (Tsung-Yi , 2008; Martinez, Fouletier, Park & Favrel, 2001). An **extended enterprise** is the **cooperation, collaboration and interconnectivity** of legally independent enterprises, institutions, or individuals. The **extended enterprise** will be characterized by intensively concurrent engineering based on open information both in management and technologies such as digitalization, computer network, and artificial intelligence (Tsung-Yi, 2008). The intelligent software **agent** technology provides a natural way to overcome such problems (Martinez, Fouletier, Park & Favrel, 2001). **Agents** help to capture individual interests, local decision making using incomplete information, autonomy, responsiveness, robustness, modular and distributed. A **Multi-Agent System (MAS)**, as a society of autonomous **agents**, is an inherently open and distributed system. It is made up of a group of **agents** combined with each other to solve a common problem cooperatively. In addition, **negotiation** is a key form of interaction in systems composed of multiple autonomous **agents** (Bench-Capon & Dunne, 2007). The automated **negotiation** plays a key role in sharing information and resources to look for a common agreement. The research literature proves that **Argumentation Based Negotiation (ABN)** is an effective means of resolving conflicts in **MAS** (Bench-Capon & Dunne, 2007; Hsairi, Ghédira, Alimi & Ben Abdelhafid, 2008). Besides, the **fuzzy logic** of Zadeh (1965) opens new horizons in the vast world of information analysis and treatment. One of the present tendencies in the **fuzzy** modeling is generating models that take into consideration two fundamental conditions at the same time: interpretability (which is the description capacity of the modeled systems behavior) precision and fidelity of model towards the original system (Casillas, Cordón, Herrera & Magdalena, 2003). In this chapter, in the first place, we present our research efforts in developing a **MAS** architecture named **Multi-Agent Information Systems for an Extended Enterprise (MAIS-E<sup>2</sup>)**. Then, we define the Relationship-Role and Interest Based **Negotiation (R<sup>2</sup>-IBN)** framework. **R<sup>2</sup>-IBN** framework is an extension of an existing one namely IBN (Rahwan, Sonenberg & Dignum, 2004). In this chapter, we present mainly the extensions made in two modules: the argument generation module via inference rules and argument selection module via **fuzzy** rules based system as an intelligent method in order to better estimate the desirability degree of the argument to send.

The remainder of this chapter is structured as follows: the *background* section describes **extended enterprises**, reviews **negotiation** approaches and related works. The *MAIS-E<sup>2</sup>: An Intelligent Model Toward An Inter-Enterprise Cooperation* section presents our research efforts and experiences in developing a **multi-agent** model for an **Extended Enterprise**. The *R<sup>2</sup>-IBN: Argumentation Framework* section describes our proposed **argumentation based negotiation** framework. *Future Trends* section presents emerging tendencies. Finally, in the *conclusion* section remarks and perspectives are given.

## BACKGROUND

In this section, we first describe **extended enterprises**, then, we review **negotiation** approaches and finally, we review related works.

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