



## **Chapter IV**

# **Electronic Trade Scenario for Global Supply Chains**

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*This chapter introduces the concept of an electronic trade scenario as an aid to the management of (global) supply chains, and other forms of international, business-to-business electronic commerce. The problem addressed is the following. Competition demands that trade transactions be handled efficiently and securely. However, the same competitive environment also demands flexibility, and the ability to redesign the supply chain as conditions change. Current EDI (electronic data interchange) technologies offer efficiencies, but tend to be quite inflexible, often requiring substantial reprogramming for each modification to the transaction. Furthermore, these revisions need to be made not just for a single company, but for every affected company in the supply chain. In cases where some of the companies in the chain are relatively small, with limited computing staff and skills, such changes are even more difficult and disruptive. Electronic trade scenarios are generic, reusable models of the entire trade transaction. They are stored in a on-line repository, where each member of the supply chain can download the transaction component for their role in the transaction.*

*In our proposed solution, the procedural logic of the transaction is designed using a high level, graphical representation called Documentary Petri Nets (DPN). The **InterProcs** system is described as a prototyping environment to support the design and execution of such supply chain transaction models using this DPN representation. A key concern will be the development of trustworthy trade scenarios that have sufficient controls and evidentiary documentation. Various directions of further work are described to improve the quality and flexibility of trade scenario designs.*

## INTRODUCTION

Electronic linkages to support in global supply chains are typically implemented using Electronic Data Interchange (EDI), which provides a standardized format and structure for business documents in electronic form. While this standardization of the electronic documents provides some independence and generality among the trading partners, the actual implementations, nonetheless, tend to involve a high amount of relationship specific investment.

For industries where change is gradual, this is not a serious problem. But in industries that are more dynamic, e.g., the electronics industry, such relationship specific investments can become a hindrance to change. In these cases, there is a need to make these electronic linkages more generic and reusable. Furthermore, the scope of the modeling needs to encompass not only simple two-party links, but the entire trade or supply chain transaction model, which may include as many as a dozen different parties.

The most complex challenges are in the area of global supply chains. In these cases, trading relationships are not only with other companies, who have similar competitive pressures, but also with a variety of governmental agencies involved in the regulation of import and export. In many cases, the transaction costs of dealing internationally are double or triple those for domestic trading, ranging from 7-10 % of the total transaction value. (On a global scale, this is an added cost of over two trillion dollars per year.)

The focus of this paper is to propose a new technology, called electronic trade scenarios, as a means of reducing the transaction costs of global supply chains, while yet providing increased flexibility to quickly modify and re-configure them in response to changing market conditions. The basic idea is to separate out those aspects of the electronic transaction that are not relationship specific, and represent them in the form of trade “scenarios” that are more generic and reusable.

These electronic trade scenarios can then be made available via publicly accessible repositories that are under, for instance:

- a. proprietary control (e.g. a major manufacturer)
- b. controlled by an industry or sector organization (e.g. insurance industry)
- c. controlled by a local or regional sector, e.g. a port authority
- d. made globally available, e.g. by the International Chamber of Commerce (ICC), or United Nations.

A given supply chain application may in fact draw components from several such repositories, and assemble them (with automated tools) to provide a customized transaction model. Current technology developments in wide area networking (e.g. extranets) and related component technologies make this vision increasingly feasible and practical. Needed, however, are effective design representations and methodologies for representing complex trade and supply chain transactions.

In this paper we examine the requirements for such representations. We then present our own solution to this challenge: Documentary Petri Nets (DPNs), which satisfy these representation requirements in a way that supports both bottom-up and top-down design approaches, and also procedural separation of the business roles. Implementation characteristics of the DPN representation are also examined.

A modeling and prototyping environment, called **InterProcs**, is presented that includes a graphical design interface based on Documentary Petri Nets, which automatically

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