

A BUSINESS CONTRACTING MODEL FOR TINA ARCHITECTURE

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ABSTRACT

An architectural framework is defined and is related to TINA architecture to incorporate the semantics of contracting and negotiation. This contracting aspects is still missing in TINA architecture. The meta-broker is introduced and discussed. It represents a meta-layer that provides control over the reference points of TINA business model. Related issues are discussed.

INTRODUCTION

Until recently, electronic business operations have been the privilege of large companies which had the knowledge, technology and sufficient capital to invest in an electronic infrastructure that supports business transactions (e.g. a private network). Examples are financial institutions, airline carriers, some manufacturing companies and large retail distributors.

The rapid penetration of new technologies, in particular the Internet as a transport facility, and new open distributed environments has revealed the lack of a consistent architectural support for business contracts. Presently, there is the absence of a legally valid framework which would support all types of business dealings, both for simple electronic transactions and also for more complex inter-organizational business dealings, including international contracting. Until now, inter-organizational issues have not been extensively addressed in current business process modelling paradigms. One important ingredient that is still missing is electronic support for business contract operations such as contract negotiation, fast establishment of contractual agreements and the operations associated with contract performance.

To support such advanced concepts, an intelligent architecture should be adopted. TINA (Telecommunication Information

Networking Architecture) is being considered as the next generation of intelligent networks. A TINA system is a world wide information networking system, that is made up of a large number of interconnected computers, from servers controlling huge databases to workstations, desktop PCs, lap-tops, set-top-boxes and wireless hands-sets.

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An architectural framework should be defined and integrated with TINA and needs to incorporate the semantics of contracting and negotiation. Because electronic commerce is naturally interacting with virtual catalogues, this framework should make such interaction possible. Electronic commerce involves parties that may belong to different domains, administrations, with different ontologies. This framework should enable manipulation of such information and enable converting between ontologies. The architecture considered includes the Meta-broker concept added to TINA business model. The Meta-broker agents acts on behalf of the customers. The meta-broker ensures the correct

negotiation protocols, validation, and enforcing the constraints and the contracts, and also interacting with the virtual catalogues.

TINA BUSINESS MODEL

TINA is an architecture that is based on the concept of distributed computing, i.e. that implies, for example, that location transparency is provided to the TINA application programmer in a certain phase of application construction. TINA uses the ODP (Open Distributed Processing) modeling concepts to describe its architecture. The ODP model states that one can view distributed applications from five viewpoints, these are the enterprise viewpoint, the information view point, the computational viewpoint, the engineering viewpoint and the technology viewpoint. Each of these viewpoints describes a distributed application in a particular way taking into account a specific set of properties. Viewing an application in one viewpoint reduces the amount of information that has to be considered. The viewpoints are used to reduce the complexity in description/specification (design) of distributed applications. The viewpoints have been used to describe the TINA service architecture and the TINA network resource architecture.

In the enterprise viewpoint, the business requirements upon a TINA system are captured. The enterprise viewpoint describes/specifies the various aspects of collaboration between stakeholders in a TINA system, that is; collaboration between entities in a TINA systems that are owned by different stakeholders. The relationships between the stakeholders (and the roles) are modeled in this viewpoint. The language used in TINA to describe the enterprise viewpoint is natural language (English) and is called business model. The information viewpoint is concerned with the information that need to be stored and processed in the system. It gives a view of the information without concerns of the design of the functions that actually manage/handle this information. The computational view point is concerned with the

functions needed in a system. It describes the system in an object-oriented fashion as a set of interacting objects. The objects encapsulates the sub-functions of the TINA system without taking into account the actual distribution/deployment of objects on various computing nodes. The engineering viewpoint is concerned with the actual distribution/deployment of the computational objects in a distributed processing environment. Different technologies may be used to design the required equipment. All equipment is owned by heterogeneous stakeholders. In order for a stakeholder, of any type, to properly become a part of the TINA system, some conformance requirements have to be fulfilled. The conformance requirements are expressed in terms of reference points. A stakeholder (e.g. operator) can claim conformance to a certain set of inter-domain reference points. A stakeholder can also use inter-domain reference points as specifications of interoperability within its administrative domain. The major types of interactions (functional) that are performed over the reference points include the access and service usage invocations. The non-functional requirements include Real-time constraints, fault tolerance, availability, scalability. Also the specifications of information that needs to be made visible between the business administrative domains in order to fulfill the requirements for both business roles in the business relationship. In our architecture the control architecture for contracting is applied to these reference points. This will affect indirectly the stakeholders.

The initial set of TINA business roles are identified by analyzing the current business relationships in Telecommunication and Information Services. The separations are driven by the following types business separations:

- ◆ Technical: areas of different development speed of technology are placed in different business roles (e.g. separation between retailer and connectivity provider = speed of service development vs. speed of network development).

- ◆ Economic: business roles which are considered consumers and producers of services in today's information market are assigned to different business roles (e.g. separation between consumer and other business roles and separation between the retailer and third party service provider).
- ◆ Regulatory: due to regulatory constraints certain separations of business roles are induced (e.g. between broker and other business roles to allow fair and equal access to retailers).

The following types of business roles were identified for the initial set in TINA:

- ◆ The consumer business role is introduced through economic considerations, as it is the only business role consuming the TINA services and not trying to make money of them. All other types of business roles are characterized as producers or middlemen.
- ◆ The broker business role is introduced through regulatory considerations to allow all business roles to have fair and equal access to the information that allows them to find services and other stakeholders in the TINA system.
- ◆ The connectivity provider business role is introduced through technical considerations, since the pace of technological development in the transport resources (mainly hardware based) will be different from that in the services resources (basically software based).
- ◆ The retailer is separated from the third party service provider business role through economic as well as technical considerations. Using present day models (e.g. supermarkets) as an example. The production of services (e.g. a movie) requires a different business setup and technical skills than the offering of this movie (e.g. a videoshop). The retailer business role is oriented towards customer management and value adding, while the third party service provider is oriented towards production.

While TINA business model has defined fairly the roles of the players, a framework for contracting is still missing deal-

ing with more semantics for contract operations.

CONTRACT PERSPECTIVES

Contracts have the purpose of facilitating some exchange or regulating one of many interactions between people in economies and societies which are based on labour specialisation. They are created to minimise transaction costs between specialised factors of production. Generally, a contract can be defined as an agreement entered into voluntarily between two or more parties who promise to exchange money, goods or services according to a specified schedule. This is the promise enforceable by law. In simple exchanges (e.g. purchases), contracts are not necessary. However, more complicated and time consuming transactions call for an agreement consisting of reciprocal promises that form the contract and that will remain in force until all parties are satisfied. If one of the parties fails to keep the promise, the other is entitled to legal recourse against him. Enforcement of good faith in matters of contract is considered among the most important functions of legal justice Economic perspective.

The understanding of contracts from an economic standpoint can be used to:

- ◆ clarify the purpose of contracts
- ◆ explain different kinds of contracts appropriate for different types of inter-organizational transactions. provide more insight into the contract negotiation process. It is now recognised that different kinds of contracts can explain different types of economic governance structure within which commercial transactions take place. These contract types are determined by three critical dimensions of contracts namely uncertainty, asset specificity and the frequency with which transactions recur.

Various governance structures impose different architectural requirements, while the related categories of contract laws can elucidate the legal requirements needed to support different commercial contracting interactions which will take place within

a global distributed systems. The governance structures and the corresponding categories of contract law are discussed as follows.

- ◆ Market governance is the main governance structure for non-specific transactions of both recurrent and occasional natures. In the former, both parties to the contract can select an alternative purchase since a product is standardised and easily obtainable from others. In the latter, they can rely on rating services or the experience of other buyers of the same product (as they are less able to count on direct experience to safeguard against opportunism). Non-specific transactions take place within a legal framework of classical contract law, which lays the emphasis on legal rules, formal documents and self-liquidating transactions.
- ◆ Trilateral governance can be applied to occasional transactions of mixed or highly specific nature. Once parties to such transactions have entered into a contract, there are strong incentives to complete the contract, because specific investments have been made. Since market governance is inadequate and since setting up a transaction specific governance cannot be justified for occasional transactions, the assistance of a trusted third party, an arbitrator, can be used in resolving disputes and evaluating performance. This corresponds to neoclassical contracting, in which the assistance of an arbitrator can provide more flexibility than litigation.
- ◆ Transaction-specific governance structures are suited to recurring transactions of a mixed and highly specific kind. Their recurrent nature allows the cost of establishing specialised governance structures to be recovered. Two types of these structures can be identified: i) a unified governance in which the transaction is removed from the market and organised within a firm, subject to some authority relation (vertical integration) and ii) a bilateral governance in which the parties

can maintain their autonomy. The latter structures have recently received attention as they occur in the form of network joint ventures and strategic alliances.

Bilateral governance is characterised by so called relational contracting in which the basis for agreement is not the individual transaction but the entire relationship between the parties as it has developed through time. These contract categories can be used as a starting point to identify fundamental economic contract categories which should be appropriately represented and stored within a TINA system.

LEGAL PERSPECTIVE: GENERAL THEORETICAL CONSIDERATIONS

From a legal standpoint, a contract alleviates mistrust in a world of uncertainty, by constraining the unpredictable activities of the other autonomous parties. Behind any system of contract law is a corresponding legal contract theory. Legal contract theories tell authoritative decision makers how to regulate contracting behaviour. Legal theories have a process aspect and a substantive aspect. The process aspect of a legal theory supplies criteria for dividing regulatory authority among legal institutions. For example, a

legal theory could hold that courts should enforce contracts but that the legislature should develop a disclosure scheme such that people do not contract on misleading information.

We propose in this paper the concept of Meta-broker that is composed of the contract framework and the agency & catalogue facilities. This layer at a meta level is needed to support the contracting requirements on top of TINA business model. The contract framework is composed of validation, negotiation, monitoring and enforcement modules. Because TINA defines the conformance of the systems in terms of the reference point, these points should be the target of meta-broker actions. Indirectly the stakeholders will interact to fulfill the requirements on the reference points.

CONTRACT VALIDATION

The validity of a contract should be considered within a domain or a context. The rules and policies with which members of a particular business contract domain comply normally emanate from statutory or administrative law. In the real world, there are many autonomous countries, sometimes composed of autonomous states or provinces. Each of these has its own

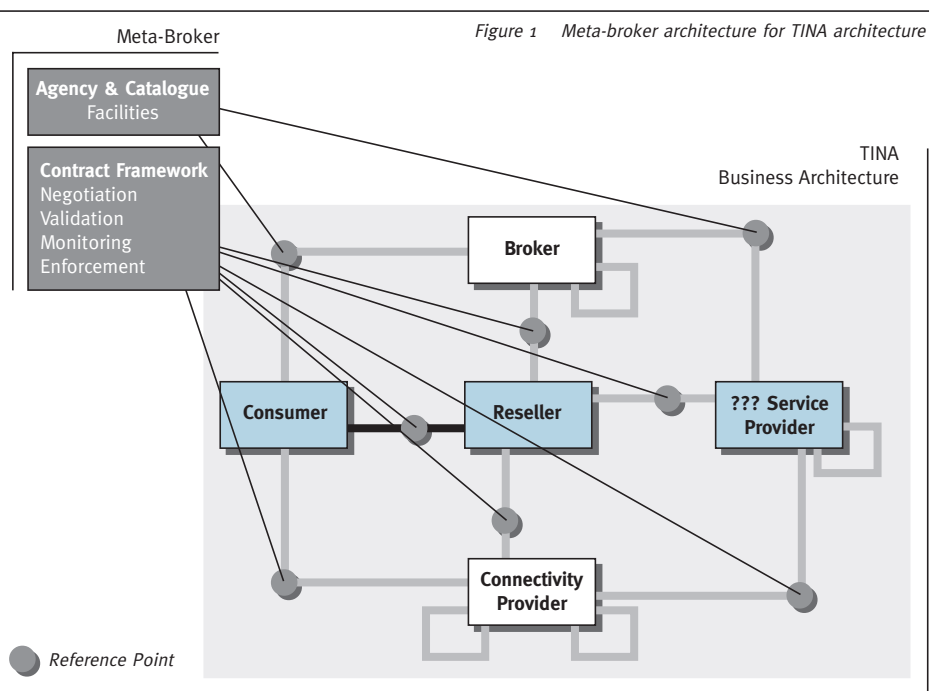


Figure 1 Meta-broker architecture for TINA architecture

legislation and ontology which might place restrictions on the contracts that can be made within their boundaries which define the contract domain.

A contract domain is not necessarily restricted to country or other regional authorities. For example, many professional bodies are responsible for maintaining a register of licensed practitioners in their profession, and these professional bodies can regulate and enforce appropriate behavior of those licensed practitioners. Similarly, in the world of commerce, certain rules and policies are applied to govern specific fields of commerce, e.g. stock market trading rules.

Interactions between parties belonging to different contract domains are normally governed by a set of policies which apply across domains. This could be considered by supporting multiple ontologies and the conversion between such ontologies.

To be valid, a business contract must be aligned with the rules incorporated in the business law of the specific contract domain. In general, a contract must include the following elements:

- ◆ An agreement: an offer seriously and clearly made by one party to another party, who must accept it seriously and clearly and without reservation. In addition, both parties make the agreement voluntarily, without restraint or influence, acting of their own free will.
- ◆ Consideration: This is something of value that each party gets or gives. Each party thus establishes an obligation to each other. With few exceptions it must be shown that both parties intended to bargain and have actually exchanged something for a contract to be enforceable by a court. Consideration can take the form of money, or an act performed or withheld, services rendered, other property or individual rights. In general it need not be tangible or possess an economic value.
- ◆ Competence (or capacity): The ability to incur liability (debt) or to gain le-

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gal rights (e.g. a person who is insane or below a certain age might not be really competent to make a contract).

- ◆ A legal purpose: A contract cannot be enforced unless the actions agreed upon are legal in the jurisdiction where the contract is made. One party cannot bring suit against the other for breach of contract if the act required by the agreement is illegal. A court will enforce a contract if it meets the four requirements. In general, enforcement of contracts will occur only if the contract is breached by a party to that contract.

CONTRACT NEGOTIATION

Contract negotiation is an important business activity because it is inherently competitive. Each party is seeking to maximize the value it obtains from the contract while minimizing its contribution to that contract, i.e. the greatest benefit for the least cost. Negotiation is a process of offer and counter-offer between the parties (perhaps via a broker); each successive offer either gives more or takes less than the previous offer. Ideally, this process iterates towards a compromise position, acceptable to all parties. Once a contract is successfully negotiated, it can be submitted by any party (or parties) to a legal expert or authority for validation.

A contract template may be used first, then further refinement are required to specialize the template into an actual contract.

Generally, a contract template specifies:

- ◆ the roles of parties
- ◆ the period of contract
- ◆ the nature of consideration (what is given or received)
- ◆ the obligations associated with each role, expressed in terms of criteria over the considerations (how much, how many, how often)
- ◆ the domain of contract.

CONTRACT MONITORING

Although a contract is intended to regulate the activities of the parties involved, reality can often fall short of expectations.

Having committed to a contract, a business wishes to ensure that they receive the value they expected from the contract. For this reason, the business might monitor the activities that are governed by the contract to ensure that the other parties comply with the agreed terms. Equally, the business might monitor its own activities to ensure that other parties have no cause for complaint. For example, a business might establish procedures to scrutinize all invoices to check that they receive the discounts agreed in their contract. Some methods of contract monitoring might be carried out irregularly, e.g. customer satisfaction surveys.

After the contract terms are checked for validity and the contract is accepted by all parties (i.e. objects) the interactions between the objects (e.g. service provision) can proceed. In the course of this, either party may check whether the contractual obligations have been met during the contract realization, i.e. the consideration element of the contract is being fulfilled. More specifically, this requires recording of the actions and measurement of the performance of parties, ensuring that they comply with the contract specification.

Contract monitoring can be done by parties themselves (and possibly verified later by contract enforcement activity if needed; similar to maintaining diaries which can be regarded as some sort of legal documents). Alternatively, a trusted third-party Contract Monitor can be used by one or more parties to the contract. The parties employing the contract monitor specify the actions required upon detection of contract non-performance, e.g. it can notify an appropriate contract enforcement component. Then the contract monitor will monitor the activities of parties, record actions and measuring performance, deal with non-performance of parties.

CONTRACT ENFORCEMENT

As a consequence of contract monitoring, an organization might decide that the contract has not been honored by another

party and might wish to take corrective action. This can be done in either of the following ways:

- ◆ pro-actively through constraints implemented within the binding between the representative objects. This can potentially be implemented through dynamic type checking of interactions between objects.
- ◆ reactively, via auxiliary objects, which might or might not be part of the binding, taking corrective action to minimize the deviation from the contract. post-contract, by constraining future activities within the contract domain for parties that have violated contracts. However, the pro-active approach to contract enforcement is not widely used in business contracts.

This process of contract enforcement can take many forms :

- a) to require the other party to conform in the future to the contract (e.g. to ensure that goods are delivered on-time)
- b) to require the other party to correct the previous problems (e.g. to replace damaged merchandise)
- c) to demand compensation for past problems (e.g. to pay interest on outstanding balances)
- d) to terminate the contract.

Contract enforcement might occur through direct discussion between the contract participants. If this does not produce a satisfactory resolution, the dispute can escalate through various levels of mediation or arbitration, ultimately leading to a court case.

CATALOGUE & AGENCY FACILITIES

A major role for catalogue facility is to find suitable information needed for service and contract operations between the relevant stakeholders. The catalogue is a structured object that can be inspected, browsed and transferred through the network. A catalogue facility allows to reorder the catalogue entries in different views, to extend the catalogue by additional entries, to modify existing entries, and to withdraw existing ones. It could support

control over re-ordering, item addition and removal. This includes a formal query interface capability. We need also means for the explicit and non-reputable association of a catalogue with the agency the will operate. The catalogue infrastructure should support the transparent integration and inter-working between catalogues from different sources.

The agency uses some user customized agents that have the capability to manipulate advanced data objects that are provided by a service provider or consumer and describes the service offered or requested. This comprises standardised information that is interpreted by service market infrastructure components. Additionally, these objects may comprise further information that is specific to distinct applications. The objects manipulated by the agents transferred to and processed at the user's local computer. Before engaging in formal contracting, agent could verify first:

- ◆ Tradability: that what is offered is legally tradable by the offerer.
- ◆ Specificifiability: that what is offered has been appropriately described.
- ◆ Suitability: that the purchaser is qualified to own or use what is offered.
- ◆ Availability: that what has been offered can be delivered.
- ◆ Payability: that the purchaser or the credit provider will pay.

CONCLUSION

Presently, there is the absence of a legally valid framework which would support all types of business dealings, both for simple electronic transactions and also for more complex inter-organizational business dealings, including international contracting. This contracting aspects is still missing in TINA architecture. The meta-broker is introduced and it represents a meta-layer that provides control over the reference points of TINA business model.