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Business Transaction Protocol

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Tiivistelmä – Referat – Abstract

Business Transaction Protocol is a first developed protocol to handle business-to-business transactions. It loosens up some ACID properties to achieve required environment for loosely coupled system that is often required in transactions between enterprise systems. Nature of the transactions usually different then typical database ACID transactions. The time frame can be very long and communication methods might loose message and so on. BTP attempts to solve these problems.

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1 Introduction

For long time in Internet transactions between supplier and client have been quite short and usually between only two counterparts. As systems and needs have developed more complex there has raised a need to control more specifically how the transactions are coordinated between clients and suppliers. In today's world there can dozens or hundreds of different suppliers for certain type of information and getting this information from each supplier would be tremendous task if there would not be any standardizing for transactions how information is acquired or some service is consumed. Also it is vital for the supplier to provide its service in one unified form to all of its customers instead of making individual transactions for each client.

The nature of many business transactions between clients and suppliers are not straightforward communication between two counterparts that is executed immediately. In business transaction the communication is usually between two different systems (even in different companies) and in these cases you cannot rely to the opposite side that much. To manage these kinds of situations you have to loosen up some of the ACID (Atomicity, Consistency, Isolation and Durability) properties in order to achieve a system that is not stuck for waiting others or resources are not reserved unnecessarily. Time span in these services can be from start to finish from few milliseconds up to several months and they can include numerous different kinds of transactions, but still can be considered as one service.

In this paper we focus to Business Transaction Protocol (BTP) that is designed for these long-term transactions or services. BTP also provides flexibility for the transactions and outputs of the transactions. BTP loosens up some of the ACID properties to achieve the possibility to coordinate and control the workflow of long termed transactions so that resources are not reserved unless its planned to and systems don't stuck while waiting for others.

In chapter two we go through the basic functionality and workaround of BTP. We look in to the basic principles how BTP works and how it addresses these problems. We also look what kind of transactions BTP offers and what is benefit of those. Then we take a quick look of roles and counterparts in BTP and go through the message exchange in BTP.

In chapter three look in some issues and problems that BTP has. We go little through what's coming next in BTP and how does the future look like for BTP. In chapter four we make conclusions about BTP.

2 Business Transaction Protocol

2.1 External Effects

BTP uses two-phase completion protocol to handle and coordinate state changes. In the first phase is sent an application message from consumer to the supplier that determines the characteristics and cause the performance of the Provisional Effect. Then in the second phase in sent a BTP message that either confirms or cancels the Provisional Effect to Final Effect or to Counter Effect. BTP does not define how the change from Provisional Effect to Final Effect or Counter Effect is done. It can be determined in upper level business agreement or left entirely to the supplier applications decision. In table 1 there is some possible ways the state change can be handled and still all solutions have the same outcome in the end.

Provisional Effect	**Final Effect**	**Counter Effect**	**Comment**
Store intended changes without performing them	Perform the changes	Delete the stored changes, unperformed	Provisional Effect may include checking for validity

Perform the changes, making them visible; store information to undo changes	Delete undo information	Perform undo action	One form of compensation approach
Store original state, prevent outside access, perform changes	Allow access	Restore original state; allow access	A typical database approach

Table 1: Some alternatives for state change handling [REF01]

2.2 Transactions in Business Transaction Protocol

There are two types of extended transactions in BTP, atom transaction and cohesion transaction. Both transactions are using open-top two-phase completion protocol.

2.2.1 Atom Transactions

Atom transaction reminds very much typical ACID transactions. Outcome of an atom is guaranteed to be atomic. All participants will have the same outcome; all will be accepted or rejected. But atom is not totally equivalent with atomic transactions. Isolation and durability are not as precisely defined as in atomic transaction should be.

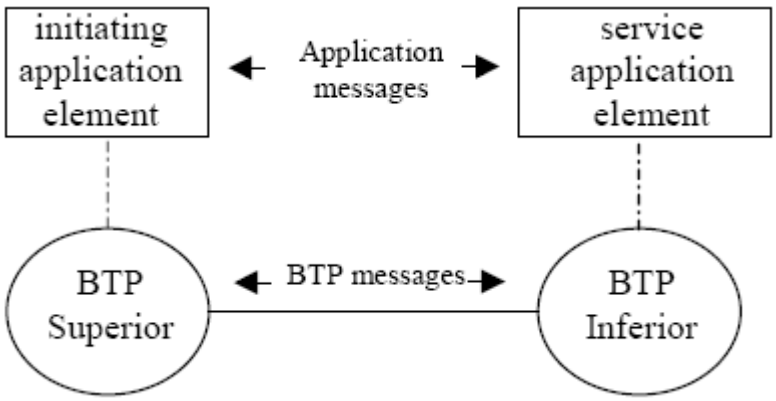
2.2.2 Cohesion Transactions

In cohesion transaction the main idea was to relax the atomicity. Atomicity has been relaxed so that it is possible to select what participants are accepted and what

rejected. Unlike atom transaction different participants in cohesion transaction can have different kind of outcomes depending on the higher-level business rules.

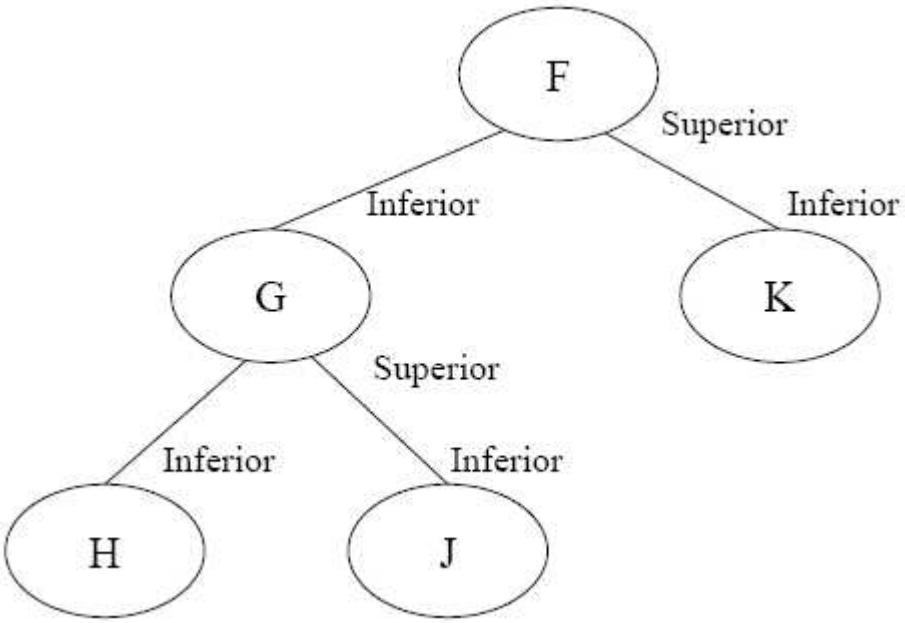
2.3 Roles and Relationships in BTP

In BTP there is only type of relationship between consumer and supplier. They are always in Superior-Inferior type of relationships, which roles any actor is playing transactions depends in the place of each actor within the transaction. In BTP the Superior always guides the Inferior. In picture 2 is shown the Superior-Inferior relationship in BTP.



Picture 2: Basic Superior-Inferior relationship in BTP

There can be hierarchies of Superior-Inferior roles in BTP. Inferior always has one Superior, but Superior can have several Inferiors. Inferior can also be Superior for some sub actor. The hierarchies can be wide and deep in BTP. Simple hierarchy is shown in picture 3.



Picture 3: Simple hierarchy in BTP

Superior collects response messages from Inferiors and decides which are accepted and which are rejected. If Superior if Inferior to some other Superior it will deliver its message upwards and waits for decision from there before giving its decision to its Inferiors. Depending on the transaction type, is it atom or cohesion, Superior will give out decisions to Inferiors.

2.4 Message exchange in BTP

In BTP there are several types of actors in the transaction. We will go here through them shortly and look how the message exchange is done in a BTP transaction.

2.4.1 Players in BTP Transaction

2.4.1.1 Initiator

Initiator begins business transaction according to some programs request. It sends required information to the coordinator that controls the process of the transaction. The initiator initiates the coordinator by using a factory.

2.4.1.2 Factory

Factory creates the context of the business transaction. It also initiates the coordinator of the transaction.

2.4.1.3 Coordinator

Coordinator is one of the most important player in BTP. Its task is to make sure that the twp-phase completion protocol finishes properly. It also tells to the supplier sides participants what kind of outcome should they finish. This information the coordinator gets from the terminator.

2.4.1.4 Service

Service player is communication application on the Inferiors side. It receives the request message and context from initiator and forwards it to enroller for further processing.

2.4.1.5 Enroller

Enroller reminds little bit of coordinator in the Inferior side. It actually can be a sub coordinator if the Inferior is Superior for some other transactions in the next level of the hierarchy.

2.4.1.6 Participant (Inferior)

Participant is the actual part that does the requested work. It receives the context of the request from Enroller and acts according to that.

2.4.1.7 Terminator

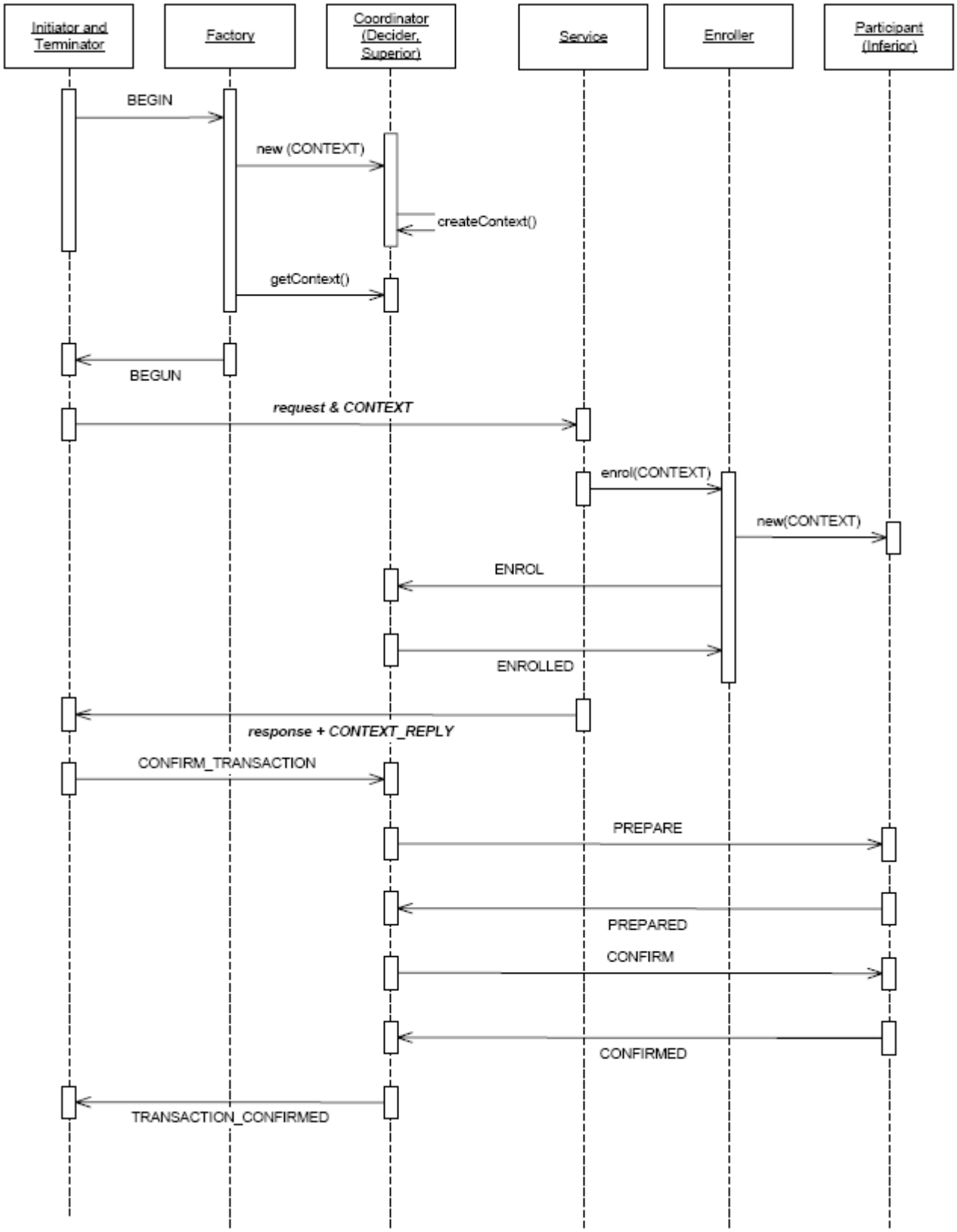
Terminator is usually same player as the initiator. It gives out final decision to the coordinator is the transaction confirmed or cancelled. Coordinator then gives out the decision to Inferiors.

2.4.2 Message Exchange in One Transaction

The transaction begins with initiative from the Initiator creates a new Coordinator to its context by using a Factory to do it. After the Coordinator is created with the context Factory informs the Initiator that the transaction has begun. The Initiator then sends the request and the context to the Service of the Inferiors side.

Service then enrolls a new Enroller for the transaction with provided context. The Enroller then forwards the context to the Participant that actually performs the request task. If everything works out fine the Enroller then informs to Coordinator that it will enroll for the transaction. Coordinator then informs the Enroller that it has been accepted. Then the Service player can respond to the Initiator with the response context.

Next the Terminator will give out its decision to the Coordinator is the transaction confirmed or cancelled in atom type transaction or in cohesion type transaction give out the confirmed and cancelled participant sets. After this the Coordinator asks for each confirmed participant is it prepared and if prepared answer received from all required participants it confirms the prepared participants and cancels all others. After Coordinator gets confirmed message from all participants it sends out a transaction confirmed message to the Terminator and that finishes the transaction.



Picture 4: Message sequence for simple transaction

3 Issues in BTP

BTP was the first attempt to create an XML standard for business-to-business transactions. When the standard was made there where very high hopes that it would become the glue that binds already existing enterprises together. Unfortunately BTP was not able to achieve this.

3.1 One Model for Everything

In BTP there is two types of transactions, atom and cohesion. Actually cohesion is nothing more then a set of atom transactions. Lot of the problems that occur in B2B transactions cannot be solved without the possibility to effect to the business semantics in the protocol itself. In BTP is presumed that nearly all semantics of the business are handled in upper level business agreements. This flexibility can good in certain cases (specially there are only few suppliers), but it can be a nightmare if business agreements are different with dozens of different suppliers. For comparison in WS-Tx each model clearly defines semantics for every type of transaction. The basic idea in WS-Tx was not to try solve everything with one global model, but to make model for each problem domain.

3.2 Business Logic

In BTP the business logic is encoded to the transaction protocol. It is for example possible that the participant sends out validity information with the confirm message to coordinator: this seat reservation is kept reserved for 24 hours, but in the protocol itself is nothing about delivering this information to the terminator that is suppose to make the decision about it. In this case the user and coordinator must very close or even be the same player.

3.3 Participants Work

As mentioned in chapter 2.1 how the participant (Inferior) actually does its work is entirely up to the participant, at least in the protocol point of view. If some kind of behaviors how participant implements ACID in its actions is defined it must be done in upper level business agreements. This causes a problem for the user or the coordinator since it cannot have any effect how the transaction is handled in the participants end. This means that if some properties of ACID is wanted to achieve it cannot be achieved (atom transaction is not ACID for example).

3.4 Development of BTP

First version of BTP (version 1.0) was approved in 2002 OASIS. Also an update was approved for BTP (version 1.1) in 2004, which made smaller adjustments to the protocol according to feedback from the users.

For the moment there is not any plans to further develop to protocol. Also many of the developers of BTP (companies and developers) are changing their focus more to WS-C/WS-Tx standards. Specially when very big players like IBM, Microsoft and BEA are now developing WS-C/WS-Tx standards to their systems it will be apparent that BTP will be solutions only for the agent based business transactions, where it is already very popular.

4 Conclusions

As demands for business transactions increase all the time and more different kind of problem domain arise, it is coming obvious that BTP is not the global solution for cases in the business transactions. Lack of certain features very much drive towards the situation that BTP will concentrate on agent type business transactions. Although it has been ground breaking standard the competing standards

like WS-C/WS-Tx and WS-CAF have many advantages in different kind of scenarios other then agent type.

Also the fact that coordinators must be exposed to other side in the two-phase protocol is something that enterprises are not willing to do. The hope in the beginning was that BTP would create Web services transaction that could connect already existing enterprise infrastructures. Unfortunately this BTP could not solve, usually changes must be made to already existing enterprises in order to get BTP working.

Still the importance of BTP in the development of business transaction protocols has been remarkable. It most likely still is the most popular protocol standard for business transactions used at the moment.

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