

Bridging the gap between Electronic Contracts and RosettaNet Partner Interface Processes

Santosh Shrivastava

School of Computing Science

Newcastle University

email: santosh.shrivastava@ncl.ac.uk

Distributed Systems Research Group

- **We conduct research on design and implementation of realistic distributed systems with ‘interesting’ features, such as:**
 - Reliability/fault tolerance
 - Modular structure
 - Scalability,.....
- **Our past systems include**
 - Arjuna distributed transaction system
 - » now a commercial product of Arjuna Technologies Ltd
- **Our most recent industrial collaboration was with IBM on extended transactions:**
 - This directly led to OMG/CORBA standard on ‘Activity service’
 - Activity service will be part of J2EE middleware
- **We are beginning to take a look at RosettaNet PIPs and how they can be incorporated in middleware for virtual organisations**

Research Group URL: distribution.cs.ncl.ac.uk

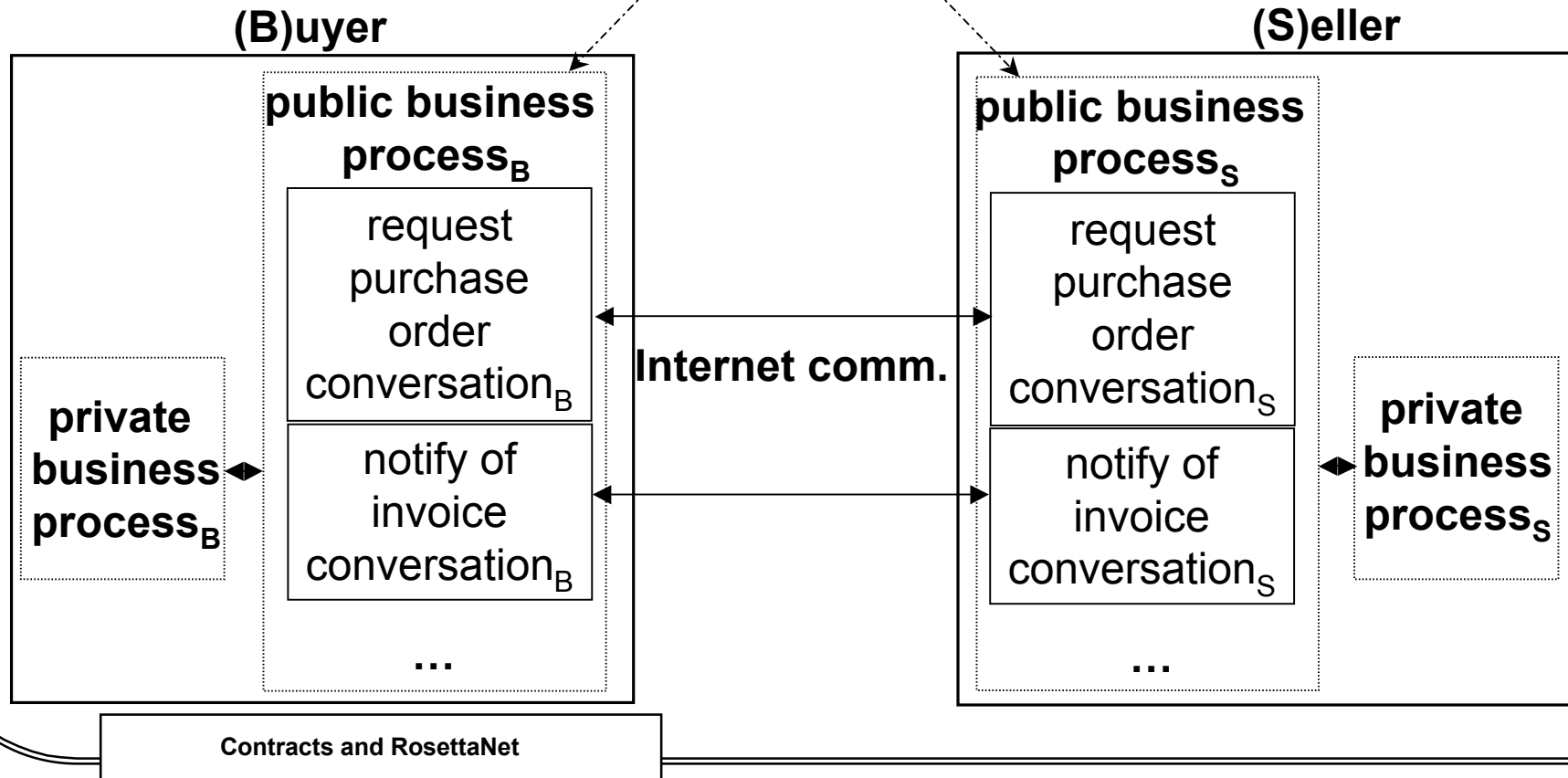
Virtual Organisations

- **Distributed applications are increasingly being constructed by composing them from varieties of existing services**
 - composite service leads to resource sharing across organisational boundaries
 - Such a sharing needs to be encoded as a business relationship (contract) between service providers forming a “virtual organisation (VO)”
 - You need to be able to set up, manage and terminate VOs
 - A central problem in VO management is how partner organisations (service providers within a VO) can regulate access to their services by other partners
 - » An organisation will not normally permit unguarded access to its services
 - » Service usage must be consistent with respect to the contract in force
 - business process interactions need to be regulated by contracts
 - » What does this imply?

Business interactions

conventional business contract

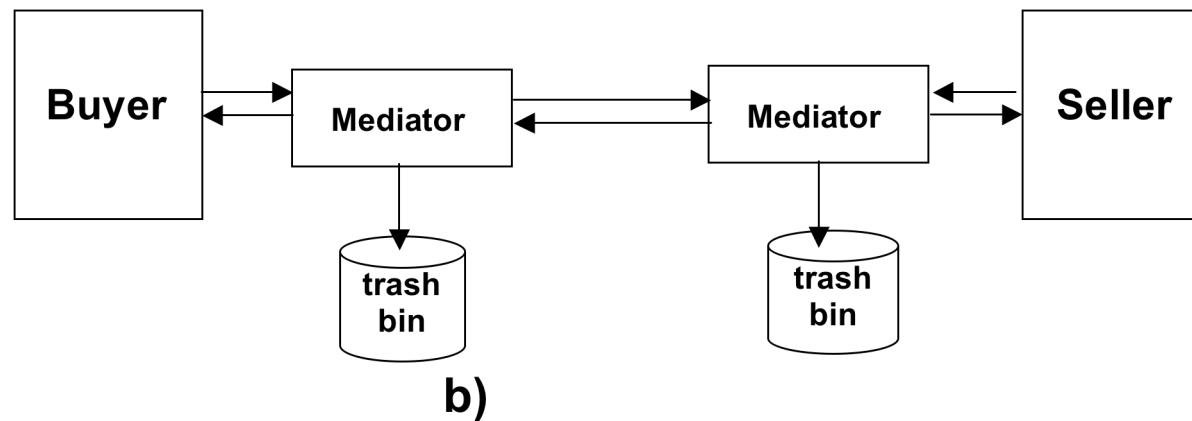
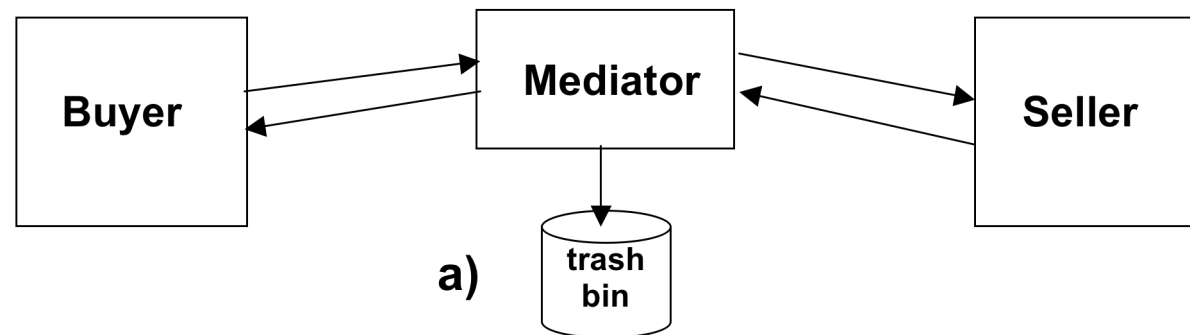
This deed agreement is entered ...
1.1 The buyer can send a request purchase order...
2.1 The seller shall send invoice three days ...



Bridging the Gap....

- **Contract regulated interactions:**
 - we need an electronic representation of contract
 - » stating ‘terms and conditions’ (obligations, permissions, prohibitions etc) of service provision and consumption
 - Suppose basic business interactions are being performed using RosettaNet PIPs
 - Then, we need some way of relating PIP executions to contract clauses
 - This is ‘bridging the gap’
- **We are developing a contract mediation service that performs such regulation**
 - Conceptually speaking, the mediation service is placed in between the business partners so that it can observe their business interactions
 - » If the service acts as a monitor, it will flag contract violations
 - » If the service acts as an enforcer, then it will permit only valid interactions

- **Mediator acting as contract enforcer**

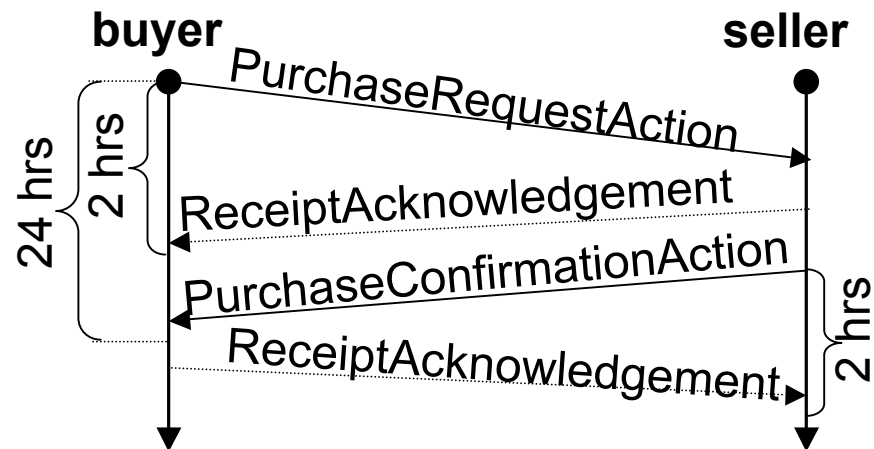


a): centralised deployment b): distributed deployment

- **A sample PIP**

- Seller's obligation is that ReceiptAck must be sent within 2hrs of receipt of Purchaserequest msg
- What if the seller sends Ack within 2hrs, but it is lost or arrives late? Buyer and seller will get divergent views
- Contract mediated interaction is intended to prevent such divergence

PIP 3A4: request purchase order conversation

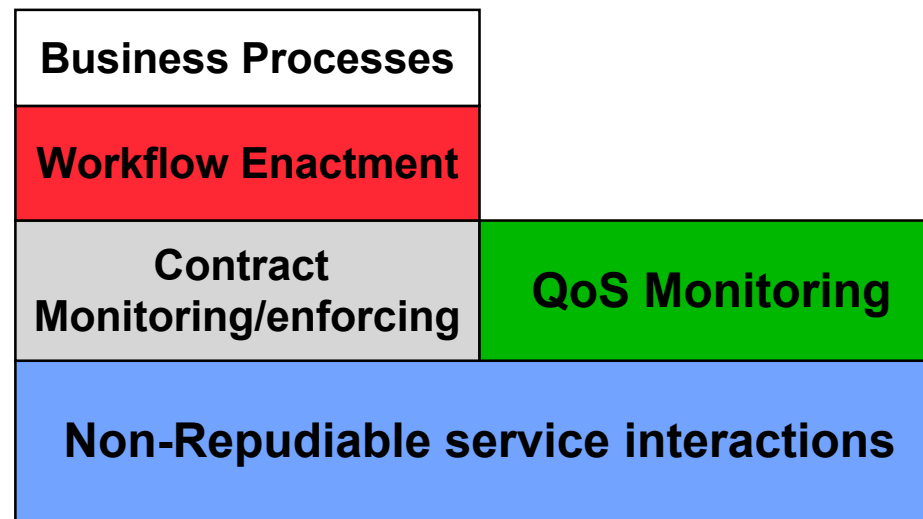


Mediation Service provides very important trust management procedures as a part of 'contract management:

- **Service provider needs assurances that:**
 - its service operations are being invoked in the specified order
 - » conformance to 'sequencing constraints'
 - service invoker has been authenticated
 - service invoker has the right to invoke the operation
 - » access is being performed by the approved role player
 - service invoker is meeting its obligations
 - evidence of interaction is being maintained (non-repudiation)
- **Service consumer needs complementary assurances**

- **What we have achieved so far:**
 - We can take simple contracts and represent them as compositions of elementary business conversations (e.g., PIPs)
 - We can use model checking tools to verify liveness, safety properties of the electronic contract
 - We have developed middleware services for performing non-repudiable business interactions
 - We are about to embark on the design of the mediation service that will glue the above
- **A test case will be the use of the service in a VO in the arena of chemical product development**
 - Details at e-science project Gold: www.goldproject.ac.uk

- **Mediation service: a Virtual Organisation Coordinator**



A hypothetical contract

1 Offer to buy

1.1 The buyer may use his discretion to send a purchase order to the seller.

1.2 The seller is obliged to confirm acceptance or rejection of the purchase order within 24 hrs of receiving the purchase order.

1 Payment

1.1 The seller is obliged to send an invoice to the buyer within 7 days of accepting the purchase order.

2 Invalid messages

3.1 The buyer and the seller are forbidden to send invalid messages.

4 Sanction

4.1 Failures to honour obligations and prohibitions will result in fines equal to 20% of the cost of the item. The offended party shall be granted permission to issue an invoice notification to the offending party.

4.2 Failure to respond to a fine shall be sorted out outside this contract.

*Synchronization and handling of transaction failures
Should the buyer and/or the seller detect a technical failure that prevents them from continuing the normal course of a transaction, they are obliged to send a failure notification message by any other means*

| Permissions | Subject | Beneficiary | Sanction |
|--|---------|-------------|-------------------|
| P1.1 Send purchase order. | buyer | seller | none |
| P4.1 _B Issue invoice to fine. | buyer | seller | none |
| P4.1 _S Issue invoice to fine. | seller | buyer | none |
| | | | |
| Obligations | | | |
| O1.2 Send confirmation within 24 hrs. | seller | buyer | P4.1 _B |
| O2.1 Send invoice within 7 days. | seller | buyer | P4.1 _B |
| | | | |
| Prohibitions | | | |
| F3.1 _B Send invalid messages. | buyer | seller | P4.1 _S |
| F3.1 _S Send invalid messages. | seller | buyer | P4.1 _B |

Table 1. Permissions, obligations, prohibitions and sanctions.