

1.1. Distributed Transactions

- 1.1. In today's business environment of system consolidations, worldwide utilization, and "always-on" availability, enterprises need distributed transaction processing infrastructure to build reliable, sophisticated business applications that can guarantee absolute completion and accuracy of business processes. Transaction services ensure that sequences of database updates have been accurately and reliably committed as a single complete unit of work or that, in the event of failure, the database information is recovered.
- 1.2. Transactions refer to all discreet tasks that must be performed in unison to accomplish a goal. Transactions may involve tasks that are done by one or more participant. When more than one participant is involved, it must be ensured that all the participants do their tasks as promised. To guarantee this, there is some kind of transaction manager that all the involved participants trust, that controls the actions taken by various participants and ensures that either all the participants do what they promise or none of the participants do anything.
- 1.3. Transactions are important because there are some tasks that make sense only if done in unison with other tasks. For example, in a bank transaction, when transferring money from one account to another it is very important to ensure that the task of debiting one account and the task of crediting another account is completed at the same time.
- 1.4. Transactions as described above fall under the category of traditional transactions having ACID properties:
 - Atomicity -- All participants must confirm or cancel.
 - Consistency -- A consistent result is obtained.
 - Isolation -- Effects are not visible until all participants confirm or cancel. Intermittent status of various participants is not visible to the external world.
 - Durability -- Effects of the transaction are stored.
- 1.5. Transactions are short lived. Resources are locked for the duration of the transaction. Participants have a high degree of trust on each other and are willing to cooperate under a transaction manager.
- 1.6. With the advent of the Internet and Web services, the scenario that is emerging requires involvement of participants unknown to each other in distributed transactions. These transactions have the following characteristics:
 - Transactions may be of a long duration, sometimes lasting hours, days, or more.
 - Participants may not allow their resources to be reserved for long durations; reservation is a characteristic of the Isolation property we mentioned earlier.
 - The communication infrastructure between participants may not be reliable; the reliability deficiencies of HTTP are well documented and often experienced by users.
 - A Web-based transaction may need to succeed even if only some of the participants choose to confirm the transaction work and others cancel it.
 - Traditional transaction systems assume a significant level of trust between all interested parties. This assumption does not hold in the Web. One effect of this is that interacting parties within a transaction may choose to have their own transaction coordinator (Transaction Manager), to ensure that they have a level of control over the outcome.

- All activities are logged. Audit trails and non-repudiation are important in Web-based transactions.
- Transactions that have to be undone have the concept of compensation: performing further transactions to attempt to return the system to a previous state.

1.7. These characteristics form the new paradigm for Web services transactioning. As described by analysts, Web services transactions is a crucial piece of technology that is required if real business is to take place over Web services.

"Developers and IT organizations won't implement any important Web services without being able to guarantee that they will be executed in a guaranteed manner."
 – Ronald Schmelzer, ZapThink

"Customers now see lack of security and reliability [transactions] as the main hurdle to the take-up of Web Services" – Gartner, 2005.

1.8. Web Services are for interoperability as much as for the Internet. Therefore, they are being used within the corporate intranet to enable existing infrastructural investments. Many large organizations grow by acquisition and they therefore have to work with many heterogeneous infrastructures. Web Services allow them to ensure that these disparate systems can collaborate. Therefore, Web Services transactions also fit into these two categories: interoperability and internet-scale.

1.9. Interoperability of existing transaction processing systems will be an important part of Web Services transactions: such systems (e.g., CICS, Tuxedo) already form the backbone of enterprise level applications and will continue to do so for the Web services equivalent. Web Services transactions will be used to glue together these existing infrastructural investments both within the corporate intranet and across the internet. Business-to-business activities will involve back-end transaction processing systems either directly or indirectly and being able to tie together these environments will be the key to the successful take-up of Web Services and Web Services transactions.

1.10. Therefore, an important consequence of Web Services transactions is that in order to support them, it is necessary to be able to span both back-end (closely coupled) environments such as CORBA or J2EE, and front-end (loosely coupled) environments. Very few companies will be in a position to do this; the existing trusted transaction system vendors such as IBM, BEA and Oracle are obvious examples.

1.11. "Multimodal Transaction Processing" is the term coined by Gartner to describe this new generation of transactional application required to face the challenges posed by new business requirements, technologies and innovative computing architectures.

"Multimodal transaction processing will emerge. Users' adoption of client/server, the Internet, service-oriented architecture, Web services, mobile and wireless devices, and event-driven architectures means that the next generation of transaction processing applications will have to be implemented in very different ways to respond to new business strategies, including multichannel, the real-time enterprise and business process fusion."

Predicts 2004: Prepare for Multimodal Transaction Processing, M. Pezzini, Gartner, 19 December 2003