ENTERPRISE INTEGRITY

BY DAVID McGOVERAN

Understanding Business Transactions: Part VI

Last month, I formulated a generalization of the traditional ACID (Atomicity, Consistency, Isolation and Durability) properties of transactions. I explained briefly that the more familiar statements were clearly special cases. With some thought, it should have been equally clear to you that these generalizations meet the logical intent of the ACID properties. One motivation for these generalizations was the recognition that the traditional statement of the ACID properties and the common experience of business transactions were incongruent, leading many business folks to conclude that computer transactions, and many IT folks to conclude that business transactions, were not real transactions. A little history explains how this came to be and helps identify key missing elements in the OASIS Business Transaction Protocol (BTP) standard and its variants (e.g., WS-Transactions).

Automated transaction processing developed at a time when two conditions still dominated business: limited computing resources and slowly changing business operations. The first condition meant that computerization would usually be restricted to highly repeatable, mission-critical operations. The second condition meant that, of those repeatable operations that were computerizable, most could be pre-analyzed and predefined. Of course, any sub-operations that were not well-defined were either coerced to a programmer's more computable interpretation or left behind as manual operations. Our traditional conception of automated transactions has been one in which the objectives, consistency conditions, component steps, resources and, most important, cumulative effects, could all be determined in advance and controlled.

The resulting formal and computerized transaction conception is unintentionally differentiated from the business concept. It clearly fails to cover all of what a business would refer to as its transactions, where transactions are often formulated on-the-fly. More decisively, it breaks down as soon as multiple business entities, probably having competing or conflicting objectives, contribute as peers to the transaction, and where the transaction often requires resources not controlled by any single entity. The transaction is negotiated, being given specificity in hindsight. BTP addresses this later conception of a business transaction in terms of a protocol for how participants communicate.

The stated goal of BTP is to provide definite "... completion or cancellation of a business interaction with rules that need not ... be understood by all, with unreliable and potentially asynchronous communications and infrastructure, without requiring one participant to reserve resources for another ..." BTP defines two key entities, atom and cohesion. A *BTP atom* supports the atomicity, consistency and durability transaction properties, but permits weakened isolation. This is somewhat analogous to running distributed database transactions in which some component transactions are not serializable, with all the dangers discussed in earlier parts of this series.

A *BTP cohesion* supports negotiation through a coordinator of both atomicity (what work must be included at commit) and consistency (what constitutes consistency), with weakened isolation and durability (some volatile work). Cohesion participants control local resource locking, determine consistency by agreement, and can use asynchronous communication. Its protocol will lead to a global outcome as agreed upon among participants, assuming each does as agreed locally. This is merely an abstraction of B2B processes, where parties negotiate a business exchange. The participants may not, in advance, know the final result, the work each will do along the way, the resources they will use, their private objectives (or how rigid they are), or even whether they will continue participation. Nonetheless, an exchange can often be negotiated to the satisfaction of the final participants.

Note that the BTP does adher, somewhat abstractly, to the unit of audit property I introduced as a definition of business transactions. However, BTP supports weakened (not generalized) ACID properties without any supporting theory. Provisional effects can be visible, so there can be unintended and unpredictable consequences. A sequence of BTP cohesions will not predictably propagate any single concept of consistency. Although some kind of verifiable consistency of the transaction is known after commit, it can and probably will vary from transaction to transaction. Without the underpinning of a single transaction management theory, we cannot prevent an arbitrary mix of BTP atoms and cohesions from producing unacceptable states of the business.

While some business transactions can use BTP with impunity, it is only as well-behaved as participants in it. But nothing in BTP dictates or even defines this behavior, since it does not define or even rely on a formal theory for processing business transactions. Next month, I'll address these problems via a disciplined approach called *collaborative transactions*, which preserve *enterprise integrity* while enabling a BTP compatible approach to business transactions. **bij**

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