# Chapter 19
# Architecture for Integration and Migration of Information Systems by Using SOA Services across Heterogeneous System Boundaries

**Lars Frank**
*Copenhagen Business School, Denmark*

**Rasmus Ulslev Pedersen**
*Copenhagen Business School, Denmark*

## ABSTRACT

*The objective of this chapter is to describe how it is possible to integrate and/or migrate information system where local heterogeneous databases are involved. ERP (Enterprise Resource Planning) systems are very complex standardized information systems, and they are often vital for the companies that use them. Therefore, the authors use integration and migration of ERP systems as an example. Normally, ERP systems are migrated/converted overnight as it normally is not possible to integrate different ERP modules from different ERP suppliers. This is very risky as many types of industries cannot function without a running ERP system. The main focus of this chapter is to illustrate how it is possible to migrate/convert an ERP system module by module and thus minimizing the risk of staying without a functioning ERP system. In central databases, the consistency of data is normally implemented by using the ACID (Atomicity, Consistency, Isolation and Durability) properties of a DBMS (Data Base Management System). This is not possible if heterogeneous databases are involved and the availability of data also has to be optimized. Therefore, in this chapter, the authors use so called relaxed ACID properties across different database systems or ERP modules. The objective of designing relaxed ACID properties across different database systems is that the users can trust the data they use even if the involved database temporarily are inconsistent.*

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## INTRODUCTION

Database transactions are any logical operation on the data of the database. The ACID properties of a database are delivered by a DBMS to make database recovery easier and make it possible in a multi user environment to give concurrent transactions a consistent view of the data in the database. The ACID properties are consequently important for users that need a consistent view of the data. Information systems that use different DBMS systems can be integrated by using more or less common data and/or by exchanging information between the systems involved. In both situations, the union of the databases of the different systems may be implemented as a database with so called relaxed ACID properties where temporary inconsistencies may occur in a controlled manner. Therefore, the objective of implementing relaxed ACID properties it is that from a user's point of view it must still seem as if traditional ACID properties were implemented in order to keep the local databases trustworthy for decision making.

In the following part of the introduction, we will first give an overview of how relaxed ACID properties may be implemented. Next, we will give an overview of how an ERP system with relaxed ACID properties across its modules may be used to migrate ERP modules one by one. Finally we will describe the objective of the chapter in more details.

### Relaxed ACID Properties

The Atomicity property of a DBMS guarantees that either all the updates of a transaction are committed/executed or no updates are committed/executed. This property makes it easier to make database recovery. In distributed databases, this property is especially important if data are replicated as inconsistency will occur if only a subset of data are replicated. The Atomicity property of a DBMS is implemented by using a DBMS log file with all the database changes made by the transactions. The global Atomicity property of databases with relaxed ACID properties is implemented by using compensatable, pivot and retriable subtransactions in that order. The global Consistency property is not defined in databases with relaxed ACID properties because normally such databases are inconsistent. However, this inconsistency may be managed by using countermeasures in the same way as isolation anomalies may be managed by using countermeasures.

The Isolation property of a DBMS guarantees that the updates of a transaction cannot be seen by other concurrent transactions until the transaction is committed/executed. That is, the inconsistencies caused by a transaction cannot be seen by other transactions. The local Isolation property of a DBMS may be implemented by locking all records used by a transaction. The global Isolation property of databases with relaxed ACID properties may be implemented by using countermeasures against the inconsistencies/anomalies.

The Durability property of a DBMS guarantees that the updates of a transaction cannot be lost if the transaction is committed. The local Durability property of a DBMS is implemented by using a DBMS log file with all the database changes made by the transactions. The global Durability property of databases with relaxed ACID properties is implemented by using the local Durability property of the local databases involved.

Data replication is normally used to decrease local response time and increase local performance by substituting remote data accesses with local data accesses (Frank, 2010). At the same time, the availability of data will normally also be increased as data may be stored in all the locations where they are vital for disconnected operation. These properties are especially important in mobile applications where the mobile user often may be disconnected from data that are vital for the normal operation of the application Kurbel et. al, 2005. See Coratella at al., 2002 for a framework that addressee such challenges. The