Temporal Database Concepts

Temporal Databases encompass all database applications that require some aspect of time when organizing their information.

- Healthcare system, the patient histories need to be maintained.
- Insurance system, where claims and accident histories are required.

Majority of database applications have some temporal information. However users often attempt to simplify or ignore temporal aspects because of the complexity that they add to their applications.

Time representation, calendars, and time dimensions

For temporal databases, time is considered to be an ordered sequence of points in some granularity that is determined by the application.

- A second is a period, not a point.
- Some applications do not need time units less than second.

Temporal database researchers use the term CHRONON for point in time – that is a discrete and indivisible "unit" of time as part of a hypothesis that proposes that time is not continuous.

A calendar organizes time into different time units for convenience.Most calendars group 60 seconds into a minute, 60 minutes into an hour, 24 hours into a day, 7 days into a week, and so on.

A day is based on the physical time of earth's rotation.

Furthermore, grouping of days into months and months into years either follow solar or lunar natural phenomena and are generally irregular.

In SQL2, temporal data types include DATE, TIME, TIMESTAMP, INTERVAL, and PERIOD.

Use of time in events has two dimensions:

1. Valid TimeDimension: Time that the event occurred or the period during the fact was true in real world.
2. Transaction TimeDimension: Time when the information was actually stored in the database.
3. Bi-temporal Time Dimension: When used both.

Incorporating time in relational databases using tuple versioning

Different ways for incorporating temporal dimensions in relational database are:

1. Valid Time Relations: Convert the relations into VT relations by adding VST and VET columns, VST contributing to primary key.
2. Transaction Time Relations: Convert the relations into TT relations by adding TST and TET columns, TST contributing to primary key.
3. Bi-temporal Time Relations: Convert the relations into BT relations by adding all four columns, VST and TST contributing to primary key.

Incorporating time in object-oriented databases using attribute versioning

In attribute versioning, only the attributes that are supposed to change over time are maintained as temporal values. Whenever an attribute is changed, the current attribute version is closed and a new version is appended to the list.

Time Series Data

Mostly used in financial, sales and economics applications. Involve data values that are recorded according to a specific predefined sequence of time points. Special type of valid event data, where the event time points are predetermined according to a fixed calendar.

- Closing daily stock prices of stock exchange
- Daily sales amount or a chain retail store

Time series management systems: store time series values in sequential order in a file, and apply specialized time series procedures to analyze the information.

Informix Universal Server offer time series extensions such as time series data blade.