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Prof. Dr. h.c. Hasso Plattner is a co-founder of SAP AG, where he served as the CEO until 2003 and has since been chairman of the supervisory board. SAP AG is today the leading provider of enterprise software solutions. In his role as chief software advisor, he concentrates on defining the mid- and long-term technology strategy and direction of SAP. Hasso Plattner received his diploma in communications engineering from the University of Karlsruhe. In recent years, he has been focusing on teaching and research in the field of business computing and software engineering at large. In 1998, he founded the Hasso Plattner Institute (HPI) in Potsdam, Germany. At the HPI, approximately 480 students are currently pursuing their Bachelors' and Masters' degrees in IT Systems Engineering with the help of roughly 50 professors and lecturers. The HPI currently has about 100 PhD candidates. Hasso Plattner leads one of the research groups at HPI which focuses mainly on In-Memory Data Management for Enterprise Applications and Human-Centered Software Design and Engineering (see epic.hpi.uni-potsdam.de).

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Glossary

ACID Property of a database management system to always ensure atomicity consistency, isolation, and durability of its transactions.

Active Data Data of a business transaction that is not yet completed and is therefore always kept in main memory to ensure low latency access.

Aggregation Operation on data that creates a summarized result for example, a sum, maximum, average, and so on. Aggregation operations are common in enterprise applications.

Analytical Processing Method to enable or support business decisions by giving fast and intuitive access to large amounts of enterprise data.

Application Programming Interface (API) Aninterface for application programmers to access the functionality of a software system.

Atomicity Database concept that demands that all actions of a transaction are executed or none of them.

Attribute A characteristic of an entity describing a certain detail of it.

Availability Characteristic of a system to continuously operate according to its specification measured by the ratio between the accumulated time of correct operation and the overall interval.

Available-to-Promise (ATP) Determining whether sufficient quantities of a requested product will be available in current and planned inventory levels at a required date in order to allow decision making about accepting orders for this product.

Batch Processing Method of carrying out a larger number of operations without manual intervention.

Benchmark A set of operations run on specified data in order to evaluate the performance of a system.

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Blade Server in a modular design to increase the density of available computing power.

Business Intelligence Methods and processes using enterprise data for analytical and planning purposes or to create reports required by management.

Business Logic Representation of the actual business tasks of the problem domain in a software system.

Business Object Representation of a real-life entity in the data model for example, a purchasing order.

Cache A fast but rather small memory that serves as buffer for larger but slower memory.

Cache Coherence State of consistency between the versions of data stored in the local caches of a CPU cache.

Cache-Conscious Algorithm An algorithm is cache conscious if program variables that are dependent on hardware configuration parameters (for example cache size and cache-line length) need to be tuned to minimize the number of cache misses.

Cache Line Smallest unit of memory that can be transferred between main memory and the processor's cache. It is of a fixed size which depends on the respective processor type.

Cache Miss Afailed request for data from a cache because it did not contain the requested data.

Cache-Oblivious Algorithm An algorithm is cache oblivious if no program variables that are dependent on hardware configuration parameters (for example cache size and cache-line length) need to be tuned to minimize the number of cache misses.

Characteristic-Oriented Database System A database system that is tailored towards the characteristics of special application areas. Examples are text mining stream processing and data warehousing.

Cloud Computing An IT provisioning model which emphasizes the ondemand, elastic pay-per-use rendering of services or provisioning of resources over a network.

Column Store Database storage engine that stores each column (attribute) of a table sequentially in a contiguous area of memory.

Compression Encoding information in such a way that its representation consumes less space in memory.

Concurrency Control Techniques that allow the simultaneous and independent execution of transactions in a database system without creating states of unwanted incorrectness.

Consistency Database concept that demands that only correct database states are visible to the user despite the execution of transactions.

Consolidation Placing the data of several customers on one server machine database or table in a multi-tenant setup.

Cube Specialized OLAP data structure that allows multi-dimensional analysis of data.

Customer Relationship Management (CRM) Business processes and respective technology used by a company to organize its interaction with its customers.

Data Aging The changeover from active data to passive data.

Data Center Facility housing servers and associated ICT components.

Data Dictionary Metadata repository.

Data Layout The structure in which data is organized in the database that is the database's physical schema.

Data Mart A database that maintains copies of data from a specific business area for example, sales or production, for analytical processing purposes.

Data Warehouse A database that maintains copies of data from operational databases for analytical processing purposes.

Database Management System (DBMS) A set of administrative programs used to create maintain and manage a database.

Database Schema Formal description of the logical structure of a database.

Demand Planning Estimating future sales by combining several sources of information.

Design Thinking A methodology that combines an end-user focus with multidisciplinary collaboration and iterative improvement. It aims at creating desirable user-friendly, and economically viable design solutions and innovative products and services.

Desirability Design thinking term expressing the practicability of a system from a human-usability point of view.

Dictionary In the context of this book the compressed and sorted repository holding all distinct data values referenced by SanssouciDB's main store.

Dictionary Encoding Light-weight compression technique that encodes variable length values by smaller fixed-length encoded values using a mapping dictionary.

Differential Buffer A write-optimized buffer to increase write performance of the SanssouciDB column store. Sometimes also referred to as differential store or delta store.

Distributed System A system consisting of a number of autonomous computers that communicate over a computer network.

Dunning The process of scanning through open invoices and identifying overdue ones in order to take appropriate steps according to the dunning level.

Durability Database concept that demands that all changes made by a transaction become permanent after this transaction has been committed.

Enterprise Application A software system that helps an organization to run its business. A key feature of an enterprise application is its ability to integrate and process up-to-the-minute data from different business areas providing a holistic real-time view of the entire enterprise.

Enterprise Resource Planning (ERP) Enterprise software to support the resource planning processes of an entire company.

Extract-Transform-Load (ETL) Process A process that extracts data required for analytical processing from various sources then transforms it (into an appropriate format, removing duplicates, sorting, aggregating, etc.) such that it can be finally loaded into the target analytical system.

Fault Tolerance Quality of a system to maintain operation according to its specification even if failures occur.

Feasibility Design thinking term expressing the practicability of a system from a technical point of view.

Front Side Bus (FSB) Bus that connects the processor with main memory (and the rest of the computer).

Horizontal Partitioning The splitting of tables with many rows into several partitions each having fewer rows.

Hybrid Store Database that allows mixing column- and row-wise storage.

In-Memory Database Adatabase system that always keeps its primary data completely in main memory.

Index Data structure in a database used to optimize read operations.

Insert-Only New and changed tuples are always appended already existing changed and deleted tuples are then marked as invalid.

Inter-Operator Parallelism Parallel execution of independent plan operators of one or multiple query plans.

Intra-Operator Parallelism Parallel execution of a single plan operation independently of any other operation of the query plan.

Isolation Database concept demanding that any two concurrently executed transactions have the illusion that they are executed alone. The effect of such an isolated execution must not differ from executing the respective transactions one after the other.

Join Database operation that is logically the cross product of two or more tables followed by a selection.

Latency The time that a storage device needs between receiving the request for a piece of data and transmitting it.

Locking A method to achieve isolation by regulating the access to a shared resource.

Logging Process of persisting change information to non-volatile storage.

Main Memory Physical memory that can be directly accessed by the central processing unit (CPU).

Main Store Read-optimized and compressed data tables of SanssouciDB that are completely stored in main memory and on which no direct inserts are allowed.

MapReduce A programming model and software framework for developing applications that allows for parallel processing of vast amounts of data on a large number of servers.

Materialized View Result set of a complex query which is persisted in the database and updated automatically.

Memory Hierarchy The hierarchy of data storage technologies characterized by increasing response time but decreasing cost.

Merge Process Process in SanssouciDB that periodically moves data from the write-optimized differential store into the main store.

Metadata Data specifying the structure of tuples in database tables (and other objects) and relationships among them in terms of physical storage.

Mixed Workload Database workload consisting both of transactional and analytical queries.

Multi-Core Processor A microprocessor that comprises more than one core (processor) in a single integrated circuit.

Multi-Tenancy The consolidation of several customers onto the operational system of the same server machine.

Multithreading Concurrently executing several threads on the same processor core.

Network Partitioning Fault Fault that separates a network into two or more subnetworks that cannot reach each other anymore.

Node Partial structure of a business object.

Normalization Designing the structure of the tables of a database in such a way that anomalies cannot occur and data integrity is maintained.

Object Data Guide A database operator and index structure introduced to allow queries on whole business objects.

Online Analytical Processing (OLAP) see Analytical Processing.

Online Transaction Processing (OLTP) see Transactional Processing.

Operational Data Store Database used to integrate data from multiple operational sources and to then update data marts and/or data warehouses.

Padding Approach to modify memory structures so that they exhibit better memory access behavior but requiring the trade-off of having additional memory consumption.

Passive Data Data of a business transaction that is closed/completed and will not be changed anymore. For SanssouciDB it may therefore be moved to non-volatile storage.

Prefetching A technique that asynchronously loads additional cache lines from main memory into the CPU cache to hide memory latency.

Query Request sent to a DBMS in order to retrieve data manipulate data, execute an operation, or change the database structure.

Query Plan The set and order of individual database operations derived by the query optimizer of the DBMS, to answer an SQL query.

Radio Frequency Identification (RFID) Wireless technology to support fast tracking and tracing of goods. The latter are equipped with tags containing a unique identifier that can be readout by reader devices.

Real Time In the context of this book defined as, within the timeliness constraints of the speed-of-thought concept.

Real-Time Analytics Analytics that have all information at its disposal the moment they are called for (within the timeliness constraints of the speed of thought concept).

Recoverability Quality of a DBMS to allow for recovery after a failure has occurred.

Recovery Process of re-attaining a correct database state and operation according to the database's specification after a failure has occurred.

Relational Database A database that organizes its data in relations (tables) as sets of tuples (rows) having the same attributes (columns) according to the relational model.

Response Time at the Speed of Thought Response time of a system that is perceived as instantaneous by a human user because of his/her own mental processes. It normally lies between 550 ms and 750 ms.

Return on Investment (ROI) Economic measure to evaluate the effciency of an investment.

Row Store Database storage engine that stores all tuples sequentially that is each memory block may contain several tuples.

Sales Analysis Process that provides an overview of historical sales numbers.

Sales Order Processing Process with the main purpose of capturing sales orders.

SanssouciDB The in-memory database described in this book.

Scalability Desired characteristic of a system to yield an efficient increase in service capacity by adding resources.

Scale-out Capable of handling increasing workloads by adding new machines and using these multiple machines to provide the given service.

Scale-up Capable of handling increasing workloads by adding new resources to a given machine to provide the given service.

Scan Database operation evaluating a simple predicate on a column.

Scheduling Process of ordering the execution of all queries (and query plan operators) of the current workload in order to maintain a given optimality criterion.

Sequential Reading Reading a given memory block by block.

Shared Database Instance Multi-tenancy implementation scheme in which each customer has its own tables and sharing takes place on the level of the database instances.

Shared Machine Multi-tenancy implementation scheme in which each customer has its own database process and these processes are executed on the same machine that is several customers share the same server.

Shared Table Multi-tenancy implementation scheme in which sharing takes place on the level of database tables that is data from different customers is stored in one and the same table.

Shared Disk All processors share one view to the non-volatile memory but computation is handled individually and privately by each computing instance.

Shared Memory All processors share direct access to a global main memory and a number of disks.

Shared Nothing Each processor has its own memory and disk(s) and acts independently of the other processors in the system.

Single Instruction Multiple Data (SIMD) A multiprocessor instruction that applies the same instructions to many data streams.

Smart Grid An electricity network that can intelligently integrate the behavior and actions of all users connected to it—generators consumers and those that do both in order to efficiently deliver sustainable, economic and secure electricity supplies.

Software-as-a-Service (SaaS) Provisioning of applications as cloud services over the Internet.

Solid-State Drive (SSD) Data storage device that uses microchips for nonvolatile high-speed storage of data and exposes itself via standard communication protocols.

Speed-Up Measure for scalability defined as the ratio between the time consumed by a sequential system and the time consumed by a parallel system to carry out the same task.

Star Schema Simplest form of a data warehouse schema with one fact table (containing the data of interest for example, sales numbers) and several accompanying dimension tables (containing the specific references to view the data of interest, for example, state, country, month) forming a star-like structure.

Stored Procedure Procedural programs that can be written in SQL or PL/SQL and that are stored and accessible within the DBMS.

Streaming SIMD Extensions (SSE) An Intel SIMD instruction set extension for the x86 processor architecture.

Structured Data Data that is described by a data model for example, business data in a relational database.

Structured Query Language (SQL) A standardized declarative language for defining querying, and manipulating data.

Supply Chain Management (SCM) Business processes and respective technology to manage the flow of inventory and goods along a company's supply chain.

Table A set of tuples having the same attributes.

Tenant (1) A set of tables or data belonging to one customer in a multitenant setup. (2) An organization with several users querying a set of tables belonging to this organization in a multi-tenant setup.

Thread Smallest schedulable unit of execution of an operating system.

Three-tier Architecture Architecture of a software system that is separated in a presentation a business logic, and a data layer (tier).

Time Travel Query Query returning only those tuples of a table that were valid at the specified point in time.

Total Cost of Ownership (TCO) Accounting technique that tries to estimate the overall life-time costs of acquiring and operating equipment for example, software or hardware assets.

Transaction A set of actions on a database executed as a single unit according to the ACID concept.

Transactional Processing Method to process every-day business operations as ACID transactions such that the database remains in a consistent state.

Translation Lookaside Buffer (TLB) A cache that is part of a CPU's memory management unit and is employed for faster virtual address translation.

Trigger A set of actions that are executed within a database when a certain event occurs for example a specific modification takes place.

Tuple A real-world entity's representation as a set of attributes stored as element in a relation. In other words a row in a table.

Unstructured Data Data without data model or that a computer program cannot easily use (in the sense of understanding its content). Examples are word processing documents or electronic mail.

Vertical Partitioning The splitting of the attribute set of a database table and distributing it across two (or more) tables.

Viability Design thinking term expressing the practicability of a system from an economic point of view.

View Virtual table in a relational database whose content is defined by a stored query.

Virtual Machine A program mimicking an entire computer by acting like a physical machine.

Virtualization Method to introduce a layer of abstraction in order to provide a common access to a set of diverse physical and thereby virtualized resources.

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