What was the motivation for SAP Sybase IQ 16?

**Marketplace**

Exploding Data Volumes

The need for Speed

Rising IT Costs and Complexity

**Business Challenges**

Lost revenues due to lack of insight

Slow Performance

High Costs & Complexities

Data Management Challenges

**SAP Sybase IQ 16...**

Cost-effective petabyte-scale EDW platform

Quickly handles and shares all the data in your world

High performance and efficiency for user-driven analytics workloads

Secure

Ensures your data is always available, day or night
SAP Sybase IQ 16

SAP Sybase IQ transforms the way companies compete and win through actionable intelligence delivered at the speed of business to more people and processes.
Value of SAP Sybase IQ 16

1. Exploits the value of Big Data

2. Transforms businesses through deeper insights

3. Extends the power of analytics across the entire enterprise
SAP Sybase IQ 16
Path to Actionable Intelligence

- 2009: v15.0
- 2009: v15.1
- 2010: v15.2
- 2011: v15.3
- 2011: v15.4
- 1H 2013: v16

**Very large database (VLDB) platform foundation**

- Full text search; Web 2.0 API
- PlexQ MPP Foundation
- MapReduce API
- In-database analytics
- XLDB Analytics
SAP Sybase IQ 16
What’s New!

SAP Sybase IQ 16 Engine

- **Web-enabled analytics**
  - Role-based access control
  - LDAP authentication

- **Communications and security**
  - Enterprise-grade RBAC authorization and LDAP authentication
  - Hash partitioned tables and data affinity

- **Query engine**
  - Fully parallel
  - Aggressive scale out
  - Hash partitioned tables and data affinity
  - Text search
  - In-database analytics

- **Loading engine**
  - Low latency, write optimized store

- **Column indexing subsystem**
  - N-bit and tiered indexing

- **Column store**
  - New Generation PETABYTE SCALE store
  - Low latency, write optimized store

- **Storage area network**

- **Resilient Multiplex grid architecture**
  - Resilient Multiplex grid withstands network interrupts and server failures
  - Aggressively scaled out query engine
  - Intelligent query engine with data affinity for “shared nothing” performance on a flexible “shared everything” architecture
  - Low latency, concurrent write optimized delta store

- **Web based administration and monitoring**
  - Comprehensive web-based monitoring and administration
  - Enterprise-grade RBAC authorization and LDAP authentication
  - High performance, fully parallel bulk loading
  - New indexing technology for increased compression and fast, incremental batch loads
  - Re-engineered column store for extreme data volumes

- **Information lifecycle management**

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SAP Sybase IQ
A comprehensive analytics platform

Ecosystem
Application services
DBMS

Sybase PowerDesigner, Sybase Replication Server, SAP and Panopticon
Bradmark, Symantec, Whitesands, Quest, and ZEND
SAS, SPSS, KXEN, Fuzzy Logix, Zementis, and Visual Numerics
BMMSSoft, SOLIX, and PBS

Optimized BI and EIM to model and replicate
Development and administration tools
Predictive analytics
Packaged ILM applications

SQL
Comprehensive ANSI SQL with OLAP
Built-in full-text search
In-database analytics with MapReduce and simulator
Web 2.0 APIs
Hadoop and R

Comprehensive
Most mature lifecycle tiering
MPP queries, virtual marts, and user scaling
High-speed loads
Structured and unstructured store

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SAP Sybase IQ is a Key Component in the SAP Real-Time Data Platform
Unified open software platform for real-time business

SAP Real-Time Data Platform foundations
- Cross-paradigm data access for new models of value discovery.
- Hyper-performance on all classes of application and usage scenarios
- Price-Performance value across all use cases

Benefits
- Execute, record, analyze, and optimize without system limitations
- Embrace and extend across variations of data forms and processing models
- Common modeling, integrated development environment, shared systems management infrastructure, and deployment-independent solutions
- Trusted and unified data environment
SAP Sybase IQ 16
Architectural Details
SAP Sybase IQ 16
Innovations for extremely large databases (XLDB)

Storage Architecture
- New generation column store
- New partitioning and compression

Loading Engine
- Fully parallel bulk loading
- Real-time loading into delta store

System Reliability
- Grid resiliency
- LDAP and role-based security

Query Processing
- Data affinity
- Aggressively parallel and distributed
Value proposition
Enhanced compression
Storage savings
Improved I/O bandwidth

Architectural considerations
Support variable number of cells per page
Support various page formats within a column
High performance access paths
Even with variable length data, insert/update/delete efficiently into an existing page
Richer metadata

Before

NOW…
Value proposition
Reduced memory footprint
Improved effective I/O rates
More efficient table scans
Reduced disk space

Architectural considerations
N-bit FP, instead of 1, 2 and 3-byte FPs
Different data pages for same column can have different values of “N” for N-bit
• No more requirement to rollover FP format for all column data
Column is N-bit by default, unless otherwise specified to be flat
Options provided to set threshold for rollover to flat (to prevent large dictionaries)
Options provided to prevent rollover to flat (to prevent long rollover time)
Compatibility mode allows the database to mimic IQ 15 rollover behavior

<table>
<thead>
<tr>
<th>N</th>
<th>Token Size</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>(1B * 2) / 8 = 250MB</td>
<td>93.75%</td>
</tr>
<tr>
<td>3</td>
<td>(1B * 3) / 8 = 375MB</td>
<td>90.6%</td>
</tr>
<tr>
<td>4</td>
<td>(1B * 4) / 8 = 500MB</td>
<td>87.5%</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>(1B * 24) / 8 = 3000MB</td>
<td>25%</td>
</tr>
</tbody>
</table>
Value proposition
Improved performance of frequent, small batch loads
Predictable performance of small batch loads:
• performance is proportional to the size of the data being loaded, not the table being updated

Architectural considerations
Inserting into a large High Group (HG) b-tree index is costly
HG index will have a tiered structure with a small tree component and a large tree component
Small, batch loads into the HG index are written to the small tree component quickly and synchronously
The small tree component is periodically merged into the large tree component as a background task
SAP SYBASE IQ 16

FULLY PARALLEL BULK LOAD

Value proposition
Improved performance
Maximize use of existing cores on the machine
Dynamic load balancing

Architectural considerations
Load an index/column concurrently with multiple threads
Remove all bottlenecks which contribute to inefficient use of CPU and storage
Dynamically scale up and down degree of parallelism depending on the workload

Before...

Serial and parallel two phase load process
Raw data and bitmapped indexes – partly parallel: mixture of horizontal and vertical processing
B-Tree based indexes (HG, TEXT, WD) – fully parallel

Numerous bottlenecks:
Complex thread scheduling
Expensive synchronization points
Steps that are executed too infrequently to keep threads busy

NOW

Fully parallel two phase load process
Raw data – fully parallel
All secondary indexes – fully parallel
SAP SYBASE IQ 16

HIGH VELOCITY DATA LOADING

Value proposition
Continuous analytics over operational data
High velocity, concurrent data modifications
Exploit large memory and core footprints

Architectural considerations
Write optimized in-memory In-memory RLV (Row-level versioned) store
Row level locking, and statement snapshot isolation
Low latency micro operations
In-memory RLV store has reduced compression, no sorting, no indexing
Fully recoverable with dedicated transaction log
Asynchronous data transfer from In-memory RLV store to IQ main store
Users choose which tables are In-memory RLV tables
**Value proposition**

Gives best of both worlds of shared everything and shared nothing

Decreases hardware needs and localizes processing

**Architectural considerations**

Data is automatically partitioned during loading with built-in hash algorithms

Data is divided into persistent subsets

- Reduces results sharing
- More efficient CPU usage
- Reduces instantaneous temp usage

Optimizer will use hash partitions for join and group by when available
Value proposition
Provides efficient utilization of cluster-wide cache resources such as shared temp
Achieves ultra low-latency data access while preserving elastic multiplex capabilities
Group by and Order by benefit

Architectural considerations
Affinity is automatically configured and used in multiplex
Adapts to query workloads and self manages
Data must be hash or logically partitioned
Each partition is assigned to a specific node
Value proposition
Eliminates SMP (single node) and DQP (distributed query processing) bottlenecks
Leverages large memory and scale out
Lowers shared temp and interconnect bandwidth

Architectural considerations
Takes place automatically as optimizer selects best plan based on cost
For non-partitioned data, new Join and Group algorithms reduce the amount of intermediate results exchanged
SAP SYBASE IQ 16

LDAP AUTHENTICATION

Value proposition: Reduced TCO and improved security
Enable customers to hook into existing enterprise infrastructures for managing users and passwords
Enable central management of password complexity policies
Multiple domains and multiple LDAP servers

Architectural considerations:
Secure communication with LDAP server using TLS
Deployable across various vendor’s Directory Service that support Lightweight Directory Access Protocol (LDAP)
Support 24x7 operation: Automatic failover and failback
Efficient design for frequent, short-lived connections
No client side changes needed
SQL Anywhere, Sybase IQ, and ASE can share common user repository
**Value Proposition**

Support separation of duties and principle of least privilege

Breakdown privileged operations into fine grained sets that can be individually granted

Control over propagation of privileges

Who can grant which privileges

Complete backwards compatibility and clean migration

Stay competitive

**Architectural Considerations**

Support ANSI SQL role semantics, system defined roles and user defined roles

Minimum number of role administrators

Grantable system privileges for privileged database operations

Secure system stored procedures with SQL SECURITY INVOKER

Minimize performance impact by adding connection level cache mechanism

Restrict impersonation through SET USER to adhere to RBAC model
SAP SYBASE IQ 16
MULTIPLEX ENHANCEMENTS

• Shared System Temp
  - Reduces the size of local temporary store
  - Simplifies sizing requirements for temp stores
  - DQP_ENABLED_OVER_NETWORK allows DQP to use the network instead of the shared system temp DBSpace

• Logical Server – Login redirection
  - Zero changes on client side on dynamic changes to logical servers
  - Single point to connection “redirector”
  - HA with multiple servers in the connection string to prevent a single point of failure

• Cache Ejection Policy improvements for better cache hits
  - Better infrastructure to track on disk changes and maximize cache hits to increase performance

• Global Transaction Resiliency
  - Suspend/resume global DML transactions, with a timeout, during INC disconnect/reconnect, coordinator downtime
Global R/W INC Connections automatically reconnect and resume transaction after a coordinator failover. In most cases long-running loads will transparently resume.
Summary

• Market-Leading product with tremendous momentum
• 96%+ customer satisfaction rates
• Pioneering Column-store with 10+ patents
• IQ is used by twice as many companies as the next leading provider
• Focused sales and support teams
• SAP commitment to product leadership
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