

# Optimal Performance with a High-Performance Analytic Engine for BI

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**Abstract—This paper describes a highly scalable and high performance analytic server that processes queries initiated by users of SAP Net weaver BI. SAP Net weaver BI accelerator and its main architectural and technical features and how the accelerator can be used for optimal performance being compatible to any IT industry at lowest operational costs using data splitting concept are further described. The objective is to provide users in any large scale business BI industries across the world with high performance data access environment that is aligned with emerging business and technology architectures.**

## I. INTRODUCTION

The twenty first century has come to be known as the ‘Information Age’, where anybody with a huge source of information and the ability to assimilate and synthesize data at a lightning pace has the ‘POWER’. Making timely business decisions has never been easy, but the increasing volume of available information makes it more difficult than ever.

A number of global companies are scrambling to get SAP BIA implemented to mitigate the poor query response times with burgeoning data. The Business Intelligence Accelerator was developed for deployment in the IT Landscape of any company that stores large and growing volumes of business data in a standard relational database. Currently, most approaches to accessing the data held in such databases confront IT staff with a maintenance challenge. From the standpoint of company decision making, the key benefits of SAP Net Weaver BI with the accelerator are speed, flexibility, and low cost.

SAP Net weaver BI accelerator is a new application that helps to analyse large amounts of critical business information up to hundred times faster than alternate tools that are available in the market. Compared with most previous approaches, this appliance offers an order of magnitude improvement in speed and flexibility of access to the data. This improvement is significant in business contexts where existing approaches impose quantifiable costs [1]. This application benefits business that has high volumes of data enables quick access to any data with a low amount of administrative effort and is especially useful for sophisticated

scenarios with unpredictable query types, high data volumes and high frequency of queries. BIA is also useful when aggregates or database indexes are not sufficient, or when these methods become too costly to maintain.

Large scale businesses handle large data volumes which are being fetched in queries/reports by thousands of users. As the data volume increases, the performance degrades drastically and hence becomes a challenge to boost the business. To address this emerging demand for such large-scale, ad hoc analytic activity, SAP developed the Net Weaver BI Accelerator for the BI users.

Business enterprises are faced with an uphill task of collecting unstructured data from various sources and having to transform that into structured management information to drive sound decision making, targeted action and robust business results. This has resulted in SAP business warehouse solutions to grow to tens of terabyte territory and increasing requirement to report data as close to real-time as possible.

### A. Primary Market Trends

As business analytics gain more mainstream acceptance, two primary trends are driving the technical requirements of software platforms to support decision making.

Growth in the number of end users:

Externally, research shows that already 44% of large companies provide business intelligence reports to external users, such as suppliers, customer, partners, and other stakeholders.

Growth in data volumes:

Thirty percent of companies with \$500 million or more in revenue expect their data warehouses to growth at least 100% over the next three years.

## II. BI ACCELERATOR

SAP BI accelerator (BIA) presents itself like an appliance because it combines in one package software and hardware. To create the BI accelerator appliance, SAP has partnered with Intel, which provides the processors, and HP and IBM, which provide their respective server and storage technologies [2].

SAP Net Weaver BI customers adopting the BI Accelerator can expect radical improvements in query performance through sophisticated in-memory data compression and horizontal and vertical data partitioning, with near zero administrative overhead.

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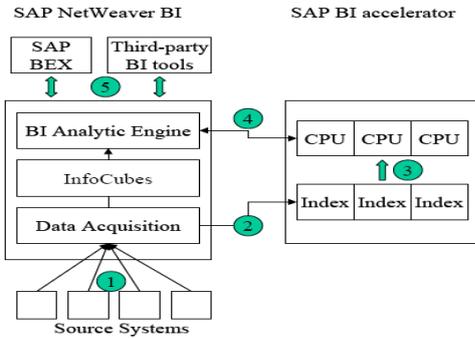


Figure 1. Architecture

**Indexing:** SAP BI accelerator includes indexes that are vertically inverted reproductions of all the data included in Info Cubes (i.e., fact and dimension tables as well as master Data).

**Engine:** The second primary component of SAP BI accelerator is the engine that processes the queries in memory. The software is running on an expandable rack of blade servers. The operating system used for BI Accelerator is 64-bit Linux.

*A. How Bia Works*

- 1) Data is loaded from source systems into an SAP Info Cube.
- 2) An index is built for this Info Cube and stored inside the BI accelerator appliance. These are search engine indexes built using SAP’s TREX search technology. They are stored in a file system using vertical decomposition (a column-based approach as opposed to the row-based approach that requires more read time). This results in highly compressed data
- 3) BI accelerator indexes are loaded into memory where the query is processed. In memory, joins and aggregations are done at run time. Loading of indexes into memory happens automatically at first query request, or it can be set for preloading whenever new data is loaded.
- 4) At run time, query requests are sent to the analytic engine, which reroutes the query to the BI accelerator.
- 5) Query results are returned to the end-user application, in addition to having no database license cost, there is also no OS license cost.

*B. Bi Accelerator Installation*

- 1) During the ramp-up of SAP Net Weaver 2004s the BI accelerator will only be available “in a box” (= BI accelerator appliance).The box will be delivered with the complete BI Accelerator preinstalled.
- 2) The box may be standalone or fit into an existing customer rack.
- 3) The box will contain blade servers with 64-bit Intel Xeon CPUs in Hewlett-Packard or IBM hardware.
- 4) The OS for the blades is Linux SLES 9.
- 5) Initial Settings: Communication between the BI system and the BI accelerator server takes place using RFC modules. In order to connect a BI accelerator server to the BI system, the following settings for the RFC destination are maintained.
- 6) Set up the RFC destination for the BI accelerator server

(transaction SM59).

- 7) Set the RFC destination for the BI accelerator server transaction RSADMIN, the parameter HPA RFC Destination” has to correspond to the above RFC destination.
- 8) Communication between the BI system and the BI accelerator server takes place using RFC modules. In order to connect a BI accelerator server to the BI system, first you have to maintain the following settings for the RFC destination.
- 9) Set up the RFC destination for the BI accelerator server (transaction SM59).
- 10) Set the RFC destination for the BI accelerator server transaction RSADMIN, the parameter HPA RFC Destination” has to correspond to the above RFC destination

*C. Purchase and implementation:*

Prerequisites	Upgrade to SAP Netweaver 7.0, Perform Sizing via QuickSizer (recommendation: Use services provided by SAP AGS "SAP Quality Check")
Purchasing	Contact SAP Account Executive for BWA license
Process	Contact hardware partner's AE for ordering BWA hardware
Installation by Hardware Vendor	Hardware partner ships and installs BWA appliance some on-site configuration might be necessary
Post-installation	Identify infocubes an index them
set in	Recommendation: Configuration check for BWQ

Figure 2 Implementation

*D. Indexing*

Similar to aggregate maintenance via context menu for a particular Info Cube or direct Access via transaction RSDDV.

- 1) A BI Accelerator index is a redundant data store of a BI Info Cube on the BI Accelerator server.
- 2) The BI Accelerator server is a specific part of the server for the SAP Net Weaver Search and Aggregation Engine (TREX).With the new BIA index maintenance wizard you can create, activate, fill and delete BI Accelerator indexes.
- 3) Consider deleting and rebuilding of Indexes on a regular basis to ensure a good reporting performance.
- 4) Monitor the performance over a period of time with the normal activities and decide how often index rebuild needs to be done. It varies for info cubes.
- 5) This can be automated in process chains by process type initial activation and filling of BIA Indexes.
- 6) If many requests are compressed or deleted over time there will be a growing discrepancy between the number of records in the BIA fact index and the Info cube fact table which impacts query performance.
- 7) Reorganisations of indexes should be executed or scheduled periodically. This will optimally redistribute the indexes across all the blades.
- 8) To Switch off a BIA Index for all queries to transaction RSDDBIAMON2 > BI A> Index settings > Switch on/off BIA indexes for queries. Enable the check box corresponding to info cube that must have the index switched off for all queries.
- 9) Use /DS1/MI\_BIA\_SWITCH TO switch off a BIA index. The index will only be inactive but will be populated with data during data loads. Hence queries that are run on this info cube will not receive the

advantage of BIA.

- 10) As the delta index is smaller than main index, the roll up or change run will be faster. A delta index is required to be created for a BIA index when the roll up or hierarchy or attribute change run process needs to be optimized.
- 11) As Read performance tends to deteriorate with the growing delta index, regular merge of delta index with main index should be scheduled.
- 12) Size of fact tables (E and F) for the info cube can be compared with the number of records in the fact index of BIA Index.
- 13) If the number of records in the BIA index is significantly greater than the number in the info cube you can rebuild the BIA Index there by improves Query performance.



Figure3. Index Maintenance

- 14) There may be a situation like this which can result in differences in the number of records:
- 15) a) Info cube was compressed after index was built. Since the BIA index is not compressed it may contain more records than info cube.
- 16) b) Requests were deleted from the info cube after the BI Accelerator index was built. The requests are deleted from the BIA index in the package dimension only. The records in the fact index are therefore no longer referenced and no longer taken into account when the query is executed but actually they are not deleted.
- 17) Data in BI Tables and BIA Indexes can be compared. The content of each individual table with the content of the corresponding index of each record. This check is only suitable for tables or indexes that do not contain a large amount of data, such as dimension tables, certain SID tables and attribute tables.

*E. Data Access Performance*

As Info cube volume grows or when dimension complexities increase (e.g., navigation attributes, time dimensions, or multiple hierarchies), the data access performance of BI queries starts to degrade rapidly. Performance challenges can prevent companies from meeting service levels related to query performance. In such situations, you can consider how much data will grow and what this means for sizing. Plan to size the application for 1 or 2 years and follow a rolling model where unused cubes are deleted from the BI Accelerator.

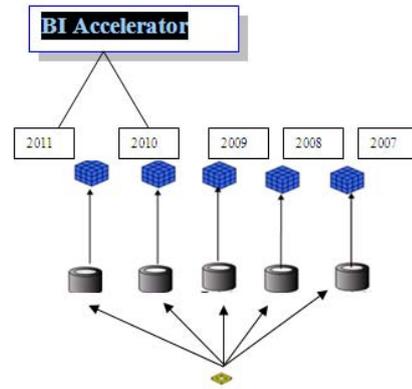


Figure 4. Rolling model of Info cubes in BIA.

- 1) If too much data is load into BIA or if the user loads is so high that the temporary memory consumption becomes too large, this may affect the stability of the BIA server and lead to queries terminating.
  - 2) Implement the enhancement in the system so that warning message will be thrown in advance if the BIA data storage becomes too large. This enhancement checks the current data storage of the BIA server for each indexing process that increased the data quantity in the BIA.
  - 3) The system also carries out the check on the BIA load each time the BIA monitor is called.
  - 4) If the accelerator becomes overloaded, performance will degrade as there won't be enough memory for building temporary data structures while processing BW query requests.
  - 5) The more blades, the more widely distributed the data becomes across those blades, effectively taking advantage of parallel processing.
- F. Benefits:*
- 1) Faster query processing and response time.
  - 2) Easy Installation and reduced administration. Hence results in lower total cost of ownership.
  - 3) No need of change run in aggregates , i.e. aggregate change runs due to master data changes are handled by the BI – accelerator rather than on top of info cubes.
  - 4) High potential scalability. As demands grow, system scales up by adding blades.
  - 5) Lower Maintenance Costs
  - 6) Faster load times, as aggregate change runs due to master data changes are
  - 7) handled by the BI accelerator rather than on top of Info Cubes
  - 8) Lower maintenance costs:
  - 9) BI accelerator eliminates the need to create relational aggregates.
  - 10) BI accelerator may eliminate the need to deal with an OLAP Cache.
  - 11) BI accelerator may decrease the need for logical partitioning on the Net Weaver BI side. However, there are other benefits beyond improving query processing speeds to having logical partitions.
  - 12) Attractive packaging as an appliance that is preconfigured for analytic processing using SAP software and partners' hardware, which allows non

intrusive implementation.

G. Test Results

Performed various Lab tests with real SAP Net Weaver BI customer data on Multi Providers with Info cubes and DSO's about 850 million records together, executed important business critical queries and tested with BIA, with out BIA and with aggregates and no BIA. Noticed drastic improvement in performance.

Query Name	Data Matches	Time (Secs) with BIA	Time (Secs) With Out BIA
BCS ACNT FIN Query	Yes	9	56.29
Supply and Purchase Query	Yes	14	64

Figure 5. Test Results

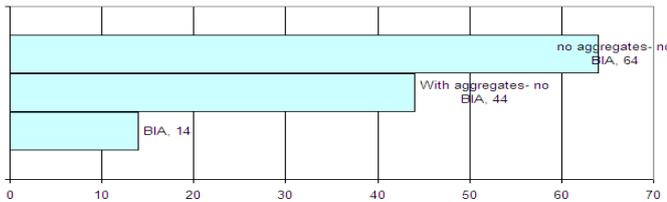


Figure6 Performance Comparison for Supply and Purchase Report

III. CONCLUSIONS

SAP Net Weaver BW Accelerator is hardware and software based optimization method for increasing SAP Net Weaver BW query performance. BIA extends the traditional environment, crunching through terabytes of data in seconds, enabling faster business insight and turbo-charging your business intelligence solution. It allows quicker access to data that has been warehoused for varying periods of time which, in the past, has been too complicated to retrieve and utilize effectively. Enables clients to deploy SAP Net Weaver BI Accelerator in an easy, cost-effective way.

The solution architecture mentioned is more beneficial because the total cost of operations is reduced by avoiding aggregate maintenance.

As each blades of BIA have cost with the increase in data volume users need to implement more blade server hence more cost. So this method gives good results.

BI Accelerator a very user friendly computer appliance

which has preinstalled software on a predefined hardware and thus speeds up queries performance. Gives confidence to the customer that they can buy themselves out of performance bottlenecks by adding inexpensive hard ware (blade racks).

This software runs on an expandable rack of blade servers. The operating system used for BW Accelerator is 64-bit SUSE Linux Enterprise Server (SLES). The software is optimized for specific hardware and operating system combinations.

The Hard ware partners delivered the appliance is: IBM BW Accelerator Solution, HP, Fujitsu Siemens, Sun Bi Accelerator Offering.



Figure 7 Some of SAP reference clients.

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