



## Turn Hours into Seconds: BI Paradigm with In-Memory Analytics

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**Abstract:** In-Memory analytics has brought a paradigm shift in storage and data management in facilitating instant reporting for decision making. Revolution in advanced memory technology, drastic decline in price of memory, and evolution of multi-core processors have changed the orientation of business intelligence query and fetching of data long with the way data is stored and transferred. This paper discusses the in-memory technology, its architecture, and few enabling software of in-memory computing. It also discusses the scope and benefits of In-Memory approach.

### I. INTRODUCTION

In-Memory Analytics facilitates querying of data from Random Access Memory instead of physical disk. Detailed data can be loaded from multiple sources into the system memory directly. This technique helps in taking faster business decisions. Performance is improved as storage and operations are performed in the memory. The approach of In-Memory Analytics has brought a paradigm shift in storage philosophy. Here, summarized data are stored in RAM. However, In case of databases, data is stored in tables through relationships and interconnection among tables, and other database objects. Similarly, multidimensional cubes are created and data are stored in traditional business intelligence platforms. In case of In-Memory Analytics, the creation of Multidimensional cubes is avoided [1]. As per Gartner, capabilities of in-memory analytics include faster query and calculation which almost avoids building aggregate and recalculated cubes. Some myths and facts of in-memory approach are described below (Fig. 1).

| Myths                                         | Facts                                                                   |
|-----------------------------------------------|-------------------------------------------------------------------------|
| "In-Memory is just a Hype spread by SAP"      | All major software vendors deliver in memory technology                 |
| "It's new and unproven technology"            | It has been around since 1990s                                          |
| "It is solely about running analytics faster" | It's widely used for transaction and event processing as well           |
| "It's incremental and no disruptive"          | Prediction :In-memory will have an industry comparable to web and cloud |

Source: Gartner

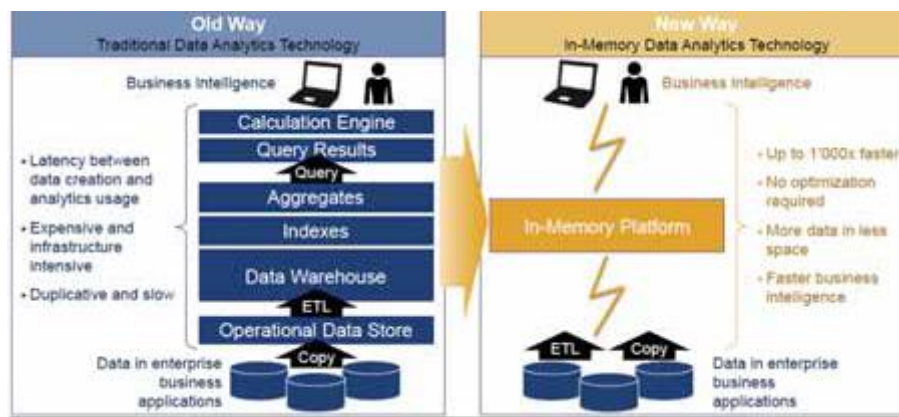
### II. IN-MEMORY ANALYTICS ARCHITECTURE

In-memory technology gives you the power to instantly access and analyze transactional and analytical data. Dramatically improve your planning, forecasting, optimization, and processes while reducing TCO with less hardware, maintenance, and testing.

The key difference between conventional BI tools and in-memory products is that the former query data on disk while the latter query data in random access memory (RAM). When a user runs a query against a typical data warehouse, the query normally goes to a database that reads the information from multiple tables stored on a server's hard disk. With server-based in-memory database, all information is initially loaded into memory. Users then query and interact with the data loaded into the machine's memory. Accessing data in -memory mean it is literally "turbo charged" as opposed to accessing that same data from disk. This is the real advantage of in-memory analysis.

In-memory BI may sound like caching; a common approach to speeding query performance, but in-memory databases does not suffer from the same limitations. Caches are typically subsets of data, stored on and retrieved from disk (though some may load into RAM). The key difference is that the cached data is usually predefined and very specific, often to an individual query; but with an in-memory database, the data available for analysis is potentially as large as an entire data mart.

In-Memory accelerator approach improves query performance within an existing business environment. This accelerator functions by loading data into memory and leveraging pre built indexes to support super fast query response times[2]. There are many In-Memory computing enabling software like In-Memory analytics and event processing, In-Memory messaging, In-Memory application platforms, and In-Memory data management. These softwares provide new business ideas and IT challenges. A comparison of traditional data analytics technology and in-memory data analytics technology is given below (Fig. 2).



### III. IN-MEMORY APPLICATION VENDORS

#### SAP HANA (High Performance Analytics Appliance)

As per Gartner's study on information explosion, data of enterprises will grow 650% over past five years, with 80% of that data unstructured, which means that the data explosion spans both traditional sources like point of sale and shipment tracking records along with non traditional sources like emails, web content, and documents[8]. In-Memory technology allows processing of huge quantities of data in real time to provide instant result for decision making. SAP HANA provides a foundation for building new generation applications, which facilitates processing of huge quantities of data in the main memory of the server from any source virtually to provide results from analysis. SAP HANA is a technology, which permits the processing of massive quantities of real time data in the main memory of the server by providing instant result from analysis and transactions. As per SAP, SAP HANA Technology will drastically improve query performance and speed up data loads. The reduced data layers will also simplify system administration and reduce operating costs. This software platform is specifically prepared to support operational and analytics operations. This platform also helps SAP Partners and customers to develop their own applications.

#### Oracle Exalytics

Organizations need analytics for gaining insight, so as to take correct decision. However, due to budgetary pressure, time sensitivity, and extensive requirement, IT firms usually face challenges to produce actionable analytics. The task even becomes more complex due to involvement of multiple hardware, networking, software, storage vendors, and expensive resources are wasted integrating software and hardware components to generate complete analytics solution. Oracle Exalytics is an optimized system, which provides solution to all business related issues without compromising speed, simplicity, manageability, and intelligence. Oracle Exalytics is built with market leading BI software, in-memory database technology, and industry-standard hardware. Oracle claims that Exalytics uses a new interface designed to produce quick result regardless of the query, location, and device types.

#### Olikview

One of the QlikView's primary differentiators is the associative user experience it delivers. QlikView is the leading Business Discovery platform. It enables users to explore data, make discoveries, and uncover insights that enable them to solve business problems in new ways. Business users conduct searches and interact with dynamic dashboards and analytics from any device. Users can gain unexpected business insights because QlikView, Works the way the mind works With QlikView, users can navigate and interact with data any way they want to.

#### IV. ADVANTAGES OF IN-MEMORY ANALYTICS

In-memory analysis offers the extraordinary benefit of eliminating a large amount of repetitive and expensive processing that would normally burden the database servers. By creating In -memory databases for analysis, the source database engine only needs to populate the in-memory database once instead of processing a query each time a report or dashboard is run.

The in-memory database can be scheduled to populate, either as a batch or incremental load, overnight during off -peak hours, thus freeing up database capacity during the peak interactive hours of the day. By offloading the database server with in-memory analysis, companies can deliver faster performance, deliver more reports per hour, and free up capacity on the source database servers for operational purposes.

In-memory technology is that ease of use allows business analysts and line-of-business managers can build their own reports and dashboards with very little training or technical expertise. This encourages higher levels of user adoption due to the autonomy that users have to explore their own data. The value of data shifts away, then, from those that manage the data to the stakeholders who use and own the data, allowing them to make better decisions.

Finally, in-memory analysis gives companies a very easy mechanism to carve out subsets of the enterprise BI environment for convenient departmental or workgroup usage. Analytic applications for different subject areas can be created for different workgroups by a centralized IT group, and those workgroups can operate autonomously using in-memory databases without impacting the data warehouse workload.

#### V. CHALLENGES

Heterogeneity, scale, timeliness, complexity, and privacy problems with Big Data impede progress at all phases of the pipeline that can create value from data. The problems start right away during data acquisition, when the data tsunami requires us to make decisions, currently in an ad hoc manner, about what data to keep and what to discard, and how to store what we keep reliably with the right metadata. Much data today is not natively in structured format; for example, tweets and blogs are weakly structured pieces of text, while images and video are structured for storage and display, but not for semantic content and search: transforming such content into a structured format for later analysis is a major challenge. The value of data explodes when it can be linked with other data, thus data integration is a major creator of value. Since most data is directly generated in digital format today, we have the opportunity and the challenge both to influence the creation to facilitate later linkage and to automatically link previously created data. Data analysis, organization, retrieval, and modeling are other foundational challenges. Data analysis is a clear bottleneck in many applications, both due to lack of scalability of the underlying algorithms and due to the complexity of the data that needs to be analyzed. Finally, presentation of the results and its interpretation by non-technical domain experts is crucial to extracting actionable knowledge.

#### VI. CONCLUSION

As per a study, around 30% of firms will have one or more critical applications running on an in-memory database in next five years, and by 2014, 30% of analytics applications will use in-memory functions to add scale and computational speed. The companies are seeking to be responsive, insight driven, and more real times. There is a guarantee that in-memory computing will dominate the marketplace in future and grip forward. IDC (2011) report States that in-memory technology in public and private sectors will facilitate these firms to the highest level of competitiveness through "freedom of excess". The in-memory technology platforms that promote innovations reduce IT compromises, and enable access to information by the right people at the right time. Market Research Media

research report stated that the high performance computing market is expected to reach \$200 Billion by 2020. In-Memory computing is one of the fastest growing components of that market. As per Gartner, In-memory Analytics approach is now being used in variety of applications like risk management, inventory forecasting, profitability analysis, fraud detection, algorithmic trading, and areas like sales incentive promotion management. Refactoring existing applications in-memory to utilize the approaches of in-memory can result in better scalability and transactional application performance, lower latency application messaging, drastically faster batch execution, and faster response time in analytical applications. In year 2012 and 2013, cost and availability of memory intensive hardware platforms reach tipping points. So the in-memory approach will enter the mainstream.

## REFERENCES

- [1] yellowfinbi <http://www.yellowfinbi.com/Document.i4?DocumentId=104879>
- [2] Baldwin, T (2008). Don't fold your cubes Just Yet... But In-Memory Analytics is beginning to Mature, available at <http://www.tagonline.org/articles.php?id=298> accessed on 24th October 2012.
- [3] Morriss, H D (2011). Faster, Higher, Stronger: In-Memory Computing Disruption and what SAP HANA means for your Organization, available at [download.sap.com](http://download.sap.com) fetched on 15th March 2013.
- [4] Pezzini, M (2011). The Next Generation Architecture: In-Memory Computing, available at [http://www.slideshare.net/SAP\\_Nederland/the-next-generationarchitecture-in-memory-computingmassimo-pezzini](http://www.slideshare.net/SAP_Nederland/the-next-generationarchitecture-in-memory-computingmassimo-pezzini) fetched on 25th March 2013.
- [5] Gligor, G, Teodoru, S (2011). Oracle Exalytics: Engineered for Speed-of-Thought Analytics. Database Systems Journal, 2(4), 3-8.
- [6] [http://www.swbi.co.uk/pdf/QlikView\\_Architectural\\_Overview.pdf](http://www.swbi.co.uk/pdf/QlikView_Architectural_Overview.pdf), Business Discovery: The Next Generation of BI, January 28 2011
- [7] [http://www.csi-india.org/c/document\\_library/get\\_file?uuid=2b5d426d-f36c-4591-a7a3-22159cb3ccb4&groupId=10157](http://www.csi-india.org/c/document_library/get_file?uuid=2b5d426d-f36c-4591-a7a3-22159cb3ccb4&groupId=10157)
- [8] <http://www.sap.com/india/solutions/technology/in-memory-computing-platform/hana/overview/solutions/smart-meter-analytics/index.epx>