Pan MingHui Hsu LienYin et. al.

SAP HANA

In-memory Computing Technology

Project Implementation Guide

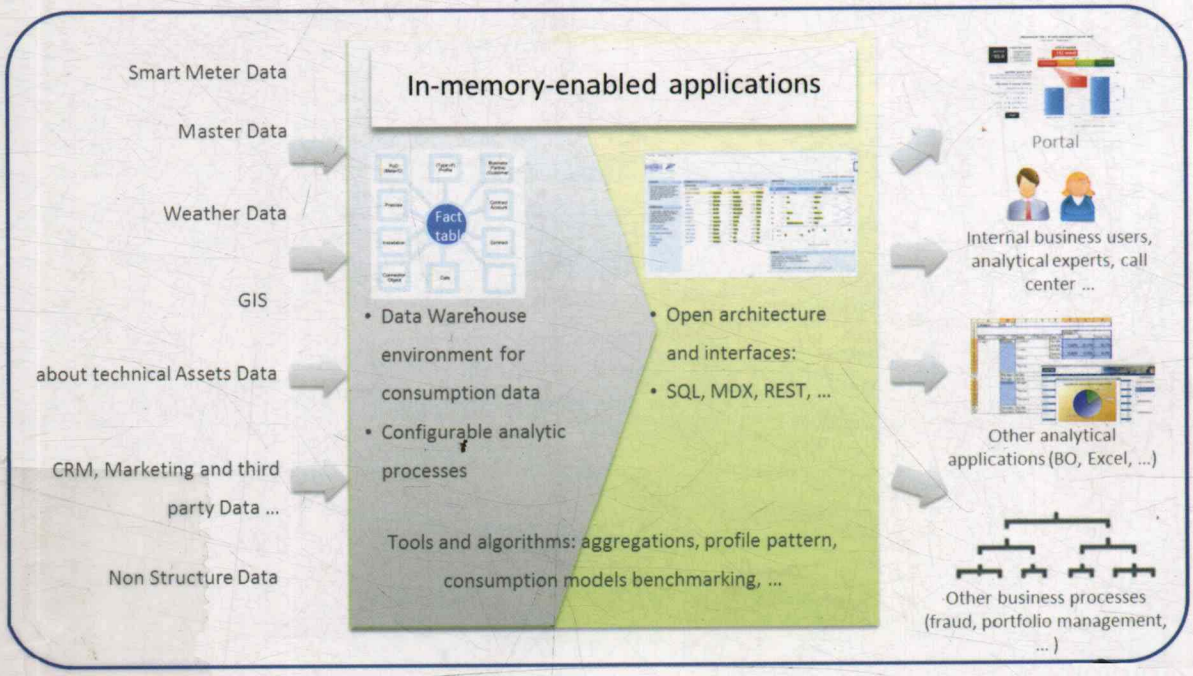
"By 2012, 70% of the Global 1000 companies will load detailed information in memory as the primary method for optimizing their BI applications"

New breakthrough in computing technology

Significant revolution in database technology

Innovative tools for massive data processing

Accelerator for Enterprise Information Application



TSINGHUA UNIVERSITY PRESS

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Beijing

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图书在版编目（CIP）数据

SAP HANA 内存计算技术项目实战指南：英文/ 潘明惠，徐莲荫等编著. —北京：清华大学出版社，2012
ISBN 978-7-302-30634-4

Ⅰ. ①S… Ⅱ. ①潘… ②徐… Ⅲ. ①企业管理－应用软件－指南－英文 Ⅳ. ①F270.7-62

中国版本图书馆 CIP 数据核字（2012）第 265272 号

Published by
Tsinghua University Press
R&D PLAZA
Tsinghua University
Beijng, 100084
China
www.tup.com.cn

Preface

This book extracts from lots of experience of enterprise information theory research and application, to which the author and his IT team have devoted many years. The book bases on the latest technology of modern research theory, and tries to reflect the up-to-date development of the information technology and theory and combine the application and preparation.

According to the research and applications, the authors think that memory computing technology is a breakthrough of database technology and a revolution of information analysis technology. This book systematically explores the latest memory computing theory and applications at home and abroad, and illustrates with 36 technical verification scenarios within 10 business domains. It describes in a detailed way how to use SAP HANA to meet query and analysis needs from business application systems after ERP fully covers the main business; how to choose business and capture real-time data for decision-making; how to make use of a variety of modelling tools offered by HANA; how to choose a presentation tool to complete analysis report; how to obtain the balance between models and analytical tools for better analytical performance; how to deploy the roll-out; how to manage and maintain the system after the roll-out; and the management priorities of the HANA executive project. By reading this book, readers can experience the high efficiency and the powerful integrated function of SAP memory computing technology.

The book can be used as the supplementary readings for the universities' computer and information technology study, and also can guide the future management and implementation of SAP memory computing technology projects. It is suitable for readers such as college teachers and students of computer and information management major, business leaders, information system architects, project managers, business consultants, implementation consultants, key users and end users within the enterprise.

After Chinese version published, the authors received lots of encouragement from SAP experts at home and abroad and business people involving in-memory computing technology during the SAP Sapphire Congress on July 26, 2012. So again, editors and translators were organized and trying their best to translate the book into English, for readers and friends who want to leverage in-memory computing technology to explore business opportunities, to improve enterprise operating performance, or to upgrade information system performance. With English version published, we hope it can contribute for the popularization of science and technology innovation and the improvement of the social informationization level.

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September 27, 2012

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Chapter 1

Introduction

From the users' perspective, the value of an information system lies not only in its efficacy of providing solutions to complicated questions but also the abilities to proceed interactive queries and to process extensive and profound data; in the likelihood to update information in time or approximately in time, in its responsiveness, as well as in no need of pre-installation, data preparation and/or data merge in advance. Through continuous enhancement on existing database and breakthrough in the computation speed limits, SAP HANA (SAP High Performance Analytic Appliance) fulfills the above-mentioned clients' needs. According to the Gartner Group — ***"By 2012, 70% of the Global 1000 companies will load detailed information in memory as the primary method for optimizing their BI applications."*** All major leading enterprises in various industries worldwide including Adobe Infosys, BASF, Bosch Siemens, Centrica, CISCO, Colgate, Deloitte, Hilti, P&G, Intel, Lenovo Medidata, Nomura Research Institute, T-Mobile (as shown in Table 1.0.1) have been devoted themselves to the research, development, implementation, and/or application of HANA. Such trend suggests that SAP HANA has become the primary development platform of application systems for the information industry.

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Table 1.0.1 SAP HANA Customer Testimonials Highlighting Value and Benefits

User	Purpose
Adobe	Adobe has made use of SAP HANA for analysis of massive and complex data to obtain business insights into software piracy, and for development of preventive strategies to explore important sources of revenue and revenue recovery opportunities.
BASF	BASF, a chemical company in Germany, has availed itself of SAP HANA for acceleration of the response time from by minute to by second, and for enhancement of data credibility to optimize their business.
Bosch Siemens	BSH has played upon SAP HANA to enhance the customer satisfaction. SAP In-memory Computing enables BSH to complete the data prediction and simulation in seconds, not like several days before.
Centrica	Centrica supplies gas and electricity for hundreds of millions of households and corporate users and offers a wide range of energy services. Centrica has turned to account SAP HANA to query and analyze the massive data obtained by smart ammeters.
CISCO	SAP has worked with Cisco to provide customers with fast and high-quality decision support tools. In-memory technologies, especially SAP HANA, empowers users to offer high-quality information to decision-makers in a simple way.
Colgate	The Mexico-based subsidiary of Colgate has taken advantage of SAP HANA to manage sales profitability and develop analytical statements. Sales representatives of Colgate can perform reports and obtain real-time information on line 100-300 times faster than before.
Deloitte	Deloitte has used SAP HANA to obtain clear and timely information on corporate liquidity ratio and cash flow.
Hilti	HILTI has taken advantage of SAP HANA to provide reports and analyses based on millions of data and crossing multiple business areas, improving their flexibility and operational performance.
Infosys	Infosys has used SAP HANA to understand the profitability of each project and to perform "what-if" analysis. With SAP HANA, Infosys is able to identify all the critical factors that affect project profitability and interact with them in real-time.
INTEL	SAP and Intel have jointly developed in-memory computing technology on the Intel processor. On the Intel Xeon processor 7500, the query time of SAP HANA database is reduced from 77min to 13s, representing 355 times of running performance improvement.
Lenovo	Lenovo is using CRM of SAP and planning to take advantage of SAP HANA to process 1.8 million of multi-attribute contract records in less than 1 second, to simplify IT infrastructure and reduce TCO.
Medidata	SAP HANA helps Medidata with improving the customer management process of clinical trials, enabling customers to conduct timely analysis and enhancing the value of clinical trial management process.
Nomura Research Institute (NRI)	The research and consulting service provider NRI has capitalized on SAP HANA to analyze traffic flow information in Tokyo. SAP HANA enables NRI to obtain 360 million of research data in less than one second.
P&G	P&G, manufacturer of consumer products, will use SAP HANA to build the next generation of financial planning and reporting systems with the fastest running speed.
T-Mobile	T-Mobile is planning to run the strategic human resource planning application system on HANA platform, to make decision-making analysis timely and faster and get the calculation results on 66 million of data in less than one second.

Source: SAP(2011), SAP rapid-deployment solution for customer segmentation with SAP HANA™ Detailed Overview, Germany: SAP.

In-memory computing technology is considered to be an advanced and important application in the future to enhance the level of enterprises informatization and to increase the satisfaction of business internal users toward informatization. With this in mind, Liaoning Electric Power Company Ltd.(LNEPC) has accomplished six stages of milestones including piloting implementation, promotional implementation, agricultural electricity promotion, and reconstructed units promotion ...etc., which involved 36 branches/ subsidiaries and 71county-level companies ever since LNEPC launched the ERP project and implemented related piloting plans on September 28, 2008.

After the launch of ERP project, LNEPC organized and implemented enhanced application, and has activated ERP advanced application(SAP BW & EP, business planning and consolidation BPC, unitary running, simplification of user interface, material intensification, finance intensification, human resources intensification, grid GIS platform, and various master data standardization services. This makes the digital database grow larger and larger, more profound and more excessive in accordance with the increase in the system's enhanced application. Moreover, as the degree of users' informatization increases, their demand on information system becomes more advanced and sophisticated as well. To fulfill such refined demand resulted from enhanced application in information system, LNEPC initiates on-site authentication under real business scenarios, continuously enhances and refines the analytical functions with digital database due to mass entries of business transactions, improves the responsiveness based on up-to-dated database, provides clients with timing and supportive information for making decisions, and improves its capability and efficiency in data processing.

The SAP HANA authentication and application adopted by LNEPC is based on research and survey analysis covering 10 categories of tightly coupled services application, namely, sales and marketing business and analysis, cash flow and financial analysis, logistics analysis and procurement control, plan implementation and budget monitoring, project execution monitoring and analysis, assets monitoring and mo(manufacturing order) status analysis, fixed assets queries and cost analysis, human resources basic information queries and analysis, GIS application status and information confirmation and analysis, and queries and evaluation analysis provided for agricultural and electricity equipment. Operational issues resulted from mass information processing are set to be of first priority. Up to December 31, 2011, the accomplishments include 10 application systems range from Human resources, Finance, Assets, Materials, Planning, Projects, Equipment, Marketing, Production, and Geo-Spatial data, 36 business scenarios involving 5 major information sources namely ERP, BW, PMS, Geo-Spatial database, as well as the publication of this book.

This book consisting of 12 chapters describes in a detailed way how to use SAP HANA to meet query and analysis needs from business application systems; how to choose business and capture real-time data for decision-making analysis and business information

query under the underserved circumstance; how to make use of a variety of modelling tools offered by HANA for modelling; how to choose a presentation tool to complete analysis report; how to obtain the balance between models and analytical tools for better analytical performance; how to deploy the roll-out; how to manage, run and maintain the system after the roll-out; and the management priorities of the HANA executive project. Each chapter is organized as follows:

Chapter1 Introduction: This chapter explores the status and development of the existing memory computing technology in IT industry at home and abroad.

Chapter2 Evolution of Computer and Origin of In-memory Computing Technology: This chapter elaborates the development of computer and application origin of memory computing technology.

Chapter3 Features of SAP HANA In-memory Computing Technology: This chapter describes those features including efficient parallel processing mechanism of memory computing technology; memory-based efficient data reading and processing; efficient data compression to optimize memory use; mixed mode of row and column memory; virtual modelling to reduce data redundancy; and data-intensive computing at the database level.

Chapter4 Basic Knowledge of SAP HANA In-memory Computing Technology Application: This chapter first introduces the system architecture and applicable hardware server of SAP HANA, and then HANA studio (SAP HANA Studio), tools that can present HANA, as well as some application constraints of the current version of HANA (HANA 1.0 SPS3).

Chapter5 Data Extraction Mechanism of SAP HANA: The current version of HANA provides three different ways to synchronize data to IMDB, including Trigger-Based Replication, ETL (ETL tools)-Based Replication and Log (database substrate log)-Based Replication. The details of the three data replication technologies above are explained, such as their own characteristics, strengths and applicable scenarios.

Chapter6 System Security and Privilege Management of SAP HANA: In this chapter, those contents will be stated including user management and authentication, authorization, network and communications security, data storage and security, security logs and tracking.

Chapter7 SAP HANA Modelling Techniques: SAP HANA provides SAP HANA Studio modelling and HANA data modelling with BW, two modelling ways directly calling data in HANA database with ABAP and one way without ABAP. This chapter will present the three ways of techniques.

Chapter8 Applications of SAP HANA In-memory Computing Technology: The chapter puts forth the application directions of SAP HANA in grid companies for reader

reference based on principles advised by experts and focusing on their five major businesses.

Chapter9 SAP HANA PoC Project Conducted by LNEPC: The chapter presents the scope, execution process and achievement of SAP HANA PoC plan in Liaoning Electric Power Company Limited.

Chapter10 Project Management of SAP HANA Implementation: The application of a new technology-SAP HANA in China remains in its early stage, which means only a few have experience in the execution. The chapter studies the methodology to carry out HANA, aspects that should be noticed during the execution comparing with others and conditions that might affect the execution effect besides the methodology used as the guideline. It also combines the real case that Liaoning Electric Power Company Limited carried out HANA project, allowing readers to have a full understanding on the whole execution process of SAP HANA.

Chapter11 SAP HANA System Building: The chapter uses a real case to allow those interested in execution of SAP HANA to experience the specific work covering everything from installation and management to modelling, roll-out strategy and migration, operation and maintenance of SAP HANA system.

Chapter12 Experience and Recommendations on SAP HANA System Deployment and Application: In this chapter, the experience and recommendations are presented that Liaoning Electric Power Company Limited has during the execution and application of HANA as of the publication, which will provide reference for readers when using HANA memory computing technology to improve the operational efficiency of business.

Appendix: This part contains very useful user manual of SAP HANA, includes:

Appendix 1: Manual for HANA System Server Installation
Appendix 2: Manual for Installation of HANA Studio and BO4.0 Client
Appendix 3: Manual for HANA-SLT data provisioning training
Appendix 4: Manual for HANA Modelling Operation
Appendix 5: Manual for Excel on SAP HANA
Appendix 6: Manual for System Deployment – Production System Preparation

Chapter 2

Evolution of Computer and Origin of In-memory Computing Technology

It only takes 60 years from the birth of the world's first computer to current in-memory computing technology as demand is the invisible power to drive technology development. This chapter first describes the evolution of computer from changes of generations of computers to the development of processor and memory and how the development of hardware technology becomes a solid foundation for in-memory computing technology. And then the chapter will explore the origin of in-memory computing technology by analyzing the drivers such as the real-time business needs and software technology innovation.