Sizing SAP Hybris Billing, pricing simulation
Consultant Information for Release 1.1 (et seq.)

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1. INTRODUCTION

High Performance Application SAP Hybris Billing, pricing simulation (SAP CPS), is a cross-industry pricing simulation solution that allows service providers to simulate pricing changes on mass historical data. It allows pricing rules to be configured in SAP Convergent Charging (SAP CC) and these rules to be used to execute pricing simulations on actual master data stored in-memory in SAP HANA

The aim of the SAP CPS is to allow companies to rerate their historical usage data using current or alternative pricing models. This means companies can leverage massive volumes of historical usage data to optimize their existing pricing models or develop new ones. The pricing simulation can also be used to see what would have happened if the usage had been rated using alternative pricing models. This in turn means expected revenues can be forecast and the profitability of certain pricing models can be assessed.

1.1 Functions of SAP SAP Hybris Billing, pricing simulation

Key points of SAP CPS at a glance:

- Rerating real events consumed by customers. This requires handling extremely large volumes of data.
- Complex pricing models compiled as database scripts and executed in the database to allow extremely fast execution
- Give the user a tool that they can use to perform a "What if Analysis", meaning that they can try to evaluate the effects of different pricing models on the usage data in order to determine the ideal pricing strategy
- Give the user a powerful tool to develop innovative new tariffs
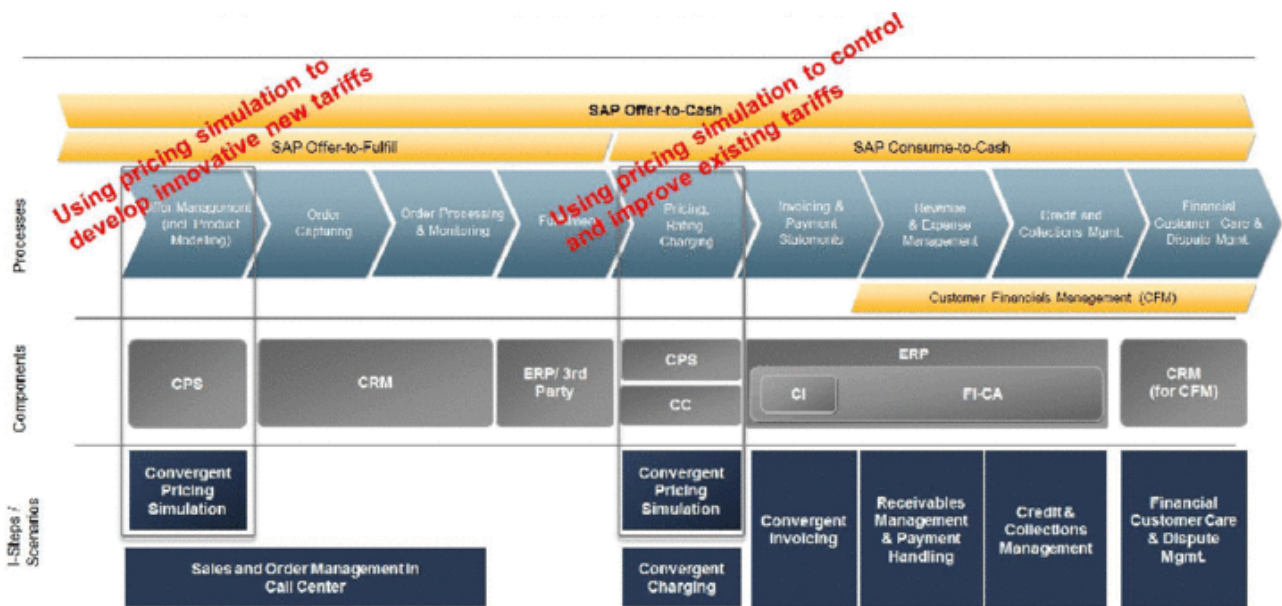
Figure 1: SAP Hybris Billing, pricing simulation – Product Line

1.2 Architecture
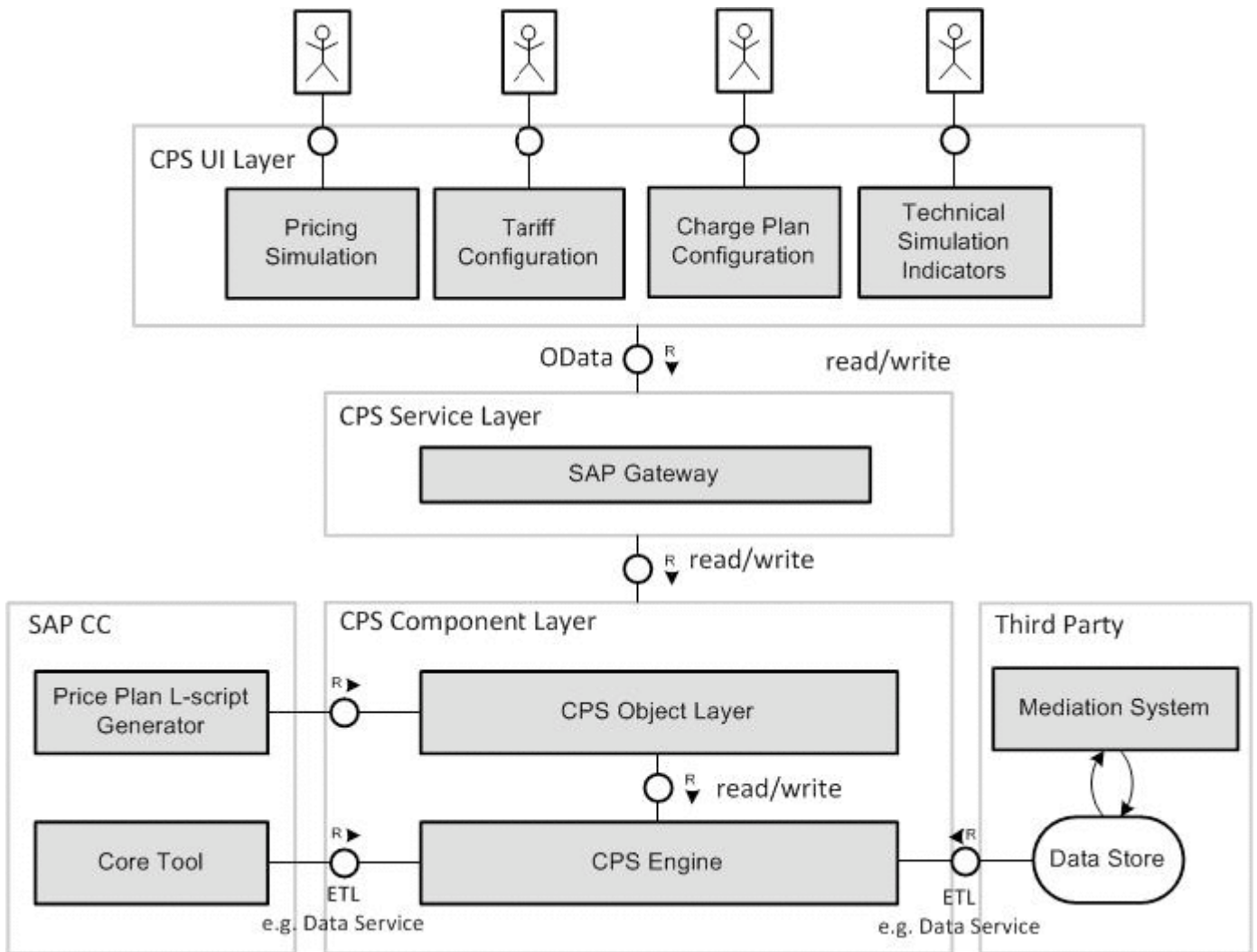
The SAP CPS application is:
- An own application (SAP Add-On)
- Based on SAP NetWeaver and SAP HANA as a database
- Browser-based UI (SAPUI5, Javascript and HTML5)
- An application using SAP Convergent Charging (SAP CC) for price modelling

SAP CPS consists of the following major component blocks:
- CPS UI Layer
  SAPUI5-based user interface for access to CPS
- CPS Service Layer
  OData services as an interface for the UI consumption data (and to write data back)
- CPS Component Layer - CPS Engine
  Core component is the SAP HANA database that provides the main pricing simulation function.
  All components and parts that are required for the pricing simulation in SAP HANA are combined in the engine, such as:
  ○ stored procedures used to execute the pricing simulation, based on the usage data
  ○ CC master data, such as the contract
  ○ the pricing model
- CPS Component Layer - CPS Object Layer
  The CPS object layer contains all of the objects and services required to configure and manage the pricing simulation and communicate this with other CPS components (CPS UI, CPS Engine) or those

that are integrated with the CPS, such as SAP CC. The CPS object layer uses NW services such as user and authorization management, gateway, and SOA manager, which are provided by ABAP AS 7.40.

- SAP CC
  SAP CC provides the necessary environment to run the CPS.
- The CC for SAP CC L-script compiler and the SAP CC master data tables are required for the pricing simulation. The pricing models are created and changed in the SAP CC core tool and transferred to SAP HANA as Lscripts by the compiler. In SAP HANA, these L-scripts are executed on the usage data when the pricing simulation is triggered. The SAP CC master data and customer usage data is used as the basis for the pricing simulation. This data must be replicated to SAP HANA (for example using SAP BusinessObjects data services)
- Data Store
  The data source for the usage data, such as the mediation system, any external data stores such as a database table in which they are stored, or the billing system.

1.3 Factors that Influence the Performance

Complexity of Pricing Models
A pricing model is the rule that contains business logic from the pricing configuration for the enterprise and which is applied to the usage data by the SAP Convergent Pricing Simulation (SAP CPS). The complexity of price models, compiled as database scripts and executed within the database, is an important factor that influences the performance of the SAP CPS. As a commercial unit that is sold to the customer, a pricing model is also known as a tariff. It contains the full range of services offered to customers by the service provider. The complexity of pricing models can vary from very simple (such as flat rate tariffs) to very complex ones.

Amount of Usage Data
Usage data is the event-based fine granular data that results from the customers using the service the company offers to them. Examples of usage data can be a single phone call or a single multimedia service (MMS) in a telecommunications company, or a single ticket from a truck passing a control point for tollage fee rating. All of these usage events generate the historical usage data. The usage data volume can increase to millions and billions of records. A single event record (Consumption Detail Record - CDR) is stored in a data store and replicated to SAP HANA. If a single event is used as the starting point for the pricing simulation, the usage data volume can increase to a huge number of records.

Complexity and Amount of Result Queries
The SAP CPS application for the user to interact with the pricing simulation is based on SAPUI5. The simulation result is analyzed with a set of result queries. Since the result of the SAP CPS is represented as rated events at the finest granularity level for a single CDR record, the amount of result data records can be immense. Queries (SQL select statements) are built on the result set for this to retrieve a subset of the result set.

2. SIZING FUNDAMENTALS AND TERMINOLOGY

SAP provides general sizing information on the SAP Service Marketplace. For the purpose of this guide, we assume that you are familiar with sizing fundamentals. You can find more information at service.sap.com/sizing → Sizing Guidelines → Presentations and Articles.

This section explains the most important sizing terms, as these terms are used extensively in this document.

Sizing
Sizing means determining the hardware requirements of an SAP application, such as network bandwidth, physical memory, CPU processing power, and I/O capacity. The size of the hardware and database is influenced by both business aspects and technological aspects. This means that the number of users using the various application components and the data load they put on the server must be taken into account.

Benchmarking
Sizing information can be determined using SAP Standard Application Benchmarks (www.sap.com/benchmark). Released for technology partners, benchmarks provide basic sizing recommendations to customers by placing a substantial load upon a system during the testing of new hardware, system software components, and relational database management systems (RDBMS). All

performance data relevant to the system, user, and business applications are monitored during a benchmark run and can be used to compare platforms.

SAPS
The SAP Application Performance Standard (SAPS) is a hardware-independent unit that describes the performance of a system configuration in the SAP environment. It is derived from the Sales and Distribution (SD) Benchmark, where 100 SAPS is defined as the computing power to handle 2,000 fully business processed order line items per hour. For more information about SAPS, see www.sap.com/benchmark Measuring in SAPS.

Initial Sizing
Initial sizing refers to the sizing approach that provides statements about platform-independent requirements of the hardware resources necessary for representative, standard delivery SAP applications. The initial sizing guidelines assume optimal system parameter settings, standard business scenarios, and so on.

Expert Sizing
This term refers to a sizing exercise where customer-specific data is being analyzed and used to put more detail on the sizing result. The main objective is to determine the resource consumption of customized content and applications (not SAP standard delivery) by comprehensive measurements. For more information, see service.sap.com/sizing → Sizing Guidelines → Presentations and Articles → Expert Sizing.

Configuration and System Landscaping
Hardware resource and optimal system configuration greatly depend on the requirements of the customer-specific project. This includes the implementation of distribution, security, and high availability solutions by different approaches using various third-party tools. In the case of high availability through redundant resources, for example, the final resource requirements must be adjusted accordingly.

There are "best practices" available which may be valid for a specific combination of operating system and database. To provide guidance, SAP created NetWeaver configuration guides. For more information, see service.sap.com/instguides → SAP NetWeaver.

3. INITIAL SIZING FOR SAP CONVERGENT PRICING

3.1 Assumptions and Constraints

This SAP CPS sizing guide was created based on the assumptions and constraints described below.
The resource requirements depend on the following input parameters:
- Number of usage events (CDRs)
  We assume that a user has an average of about 12 events per day. Our usage data selection time frame comprises three months; accordingly a typical user has 1000 events in this time frame, including 500 phone calls, 200 SMS, and 300 download events.
- Number of provider contracts
  We assume a relationship of 1:1000 between provider contracts and usage events in a time frame of three months
- Number of subscriber accounts (customer or business partner)
  We assume a relationship of 1:1 between provider contracts and subscriber accounts, meaning that each customer only has one contract.

According to these assumptions, typical data volumes in a customer system are estimated as shown in the following table:

Category for Enterprises	Number of Usage Events (CDRs)	Number of Provider Contracts	Number of Subscriber Accounts
Small	1.000.000	1.000	1.000
Medium	10.00.000	10.000	10.000
Large	50.000.000	50.000	50.000

X-Large 100.000.000 100.000 100.000

Category for Enterprises (CDRs)	Number of Usage Events	Number of Provider Contracts	Number of Subscriber Accounts
Small	1.000.000	1.000	1.000
Medium	10.00.000	10.000	10.000
Large	50.000.000	50.000	50.000
X-Large	100.000.000	100.000	100.000

The following additional assumptions are made for initial sizing which influence the performance of CPS:

- Number of tariffs in parallel execution
  A maximum of three simulation tariffs are executed in parallel.
- Complexity of simulation tariffs
  We exclude the tariffs with very low complexity (for example, using only flat rates) and very high complexity (for example, using several very complex mapping tables) and use tariffs with medium and high complexity for our measurements. There are 3 complexity levels of tariffs used in the measurements for this sizing guide - with simple, medium and high complexity.
- No multi-user execution of simulation
- Measurements include only SAP HANA database layer
  Communication to the user interface layer and network traffic sizing are not a part of these measurements.

The following KPIs are most relevant for a typical pricing simulation user:

- Average Runtime (in minutes)
  We use the granularity of half minutes.
- Average Memory Consumption (in GB)
  The memory consumption peak amount of SAP HANA index server used memory (for example, total amount of memory currently in use by SAP HANA) during the entire core simulation process (such as execution of pricing simulation with a certain set of pricing models) is determined.
- Average CPU Time
  To estimate the CPU sizing, we calculate the average CPU time needed for a simulation process

Note
'CPU Time' is the amount of processing power available during a period of time. For example, if a system has 10 CPUs and the workflow to be measured takes 60 seconds, the system sitting idle would be assumed to have 60 x 10 = 600 seconds of CPU time available. The number can be converted into SAPS values.

The following KPIs are also estimated:

- Average Disk Space Requirement (in GB)
  Disk persistence required for all HANA tables in use during the simulation
- Runtime and Memory Consumption Change Ratio (in %)
  This ratio should provide an indication of average runtime and memory consumption behavior change if the configuration of SAP HANA server is reduced from 80 to 40 CPU/Cores All performance estimations presented below are executed using an example internal SAP HANA performance test system from IBM/Intel with a total memory of 512 GB and 4 CPUs (40 cores), which corresponds to SAP Certified Appliance Hardware for SAP HANA. The measurements with a reduced number of CPU cores are executed with 2 CPUs (20 Cores) and 512 GB total memory.

3.2 Sizing Guideline

This sizing guideline relates to the SAP HANA system requirements for execution of SAP CPS. The massive volume of usage data can only be rerated within a realistic time frame using the powerful capabilities of SAP HANA - fast data access, parallel processing on multiple cores, and fast script language (L-Script) for imperative logic. SAP CPS performs a large number of calculations, therefore the demand for CPU and memory from the SAP HANA Index server is generally very high.

The ABAP server initialization memory for buffers, caches, and so on is not considered - please check the latest recommendations for minimum ABAP server memory, usually above 4 GB. The resource consumption on the ABAP Server can be ignored for the typical SAP CPS scenarios.

Note
The measurements represented in the following tables are only intended to provide an indication of the average resource consumption of SAP HANA during the pricing simulation. No formula for specific customer scenarios can be automatically derived from these measurements.

Runtime Sizing
Average runtime for three tariff complexity categories (simple, medium and complex). The following tables contain the average runtime estimations for 1- 3 tariffs in parallel execution (in a single user simulation).

Average runtime (in minutes) for a simple simulation tariff:

Category for Enterprises	OneTariff	TwoTariffs in Parallel Execution	ThreeTariffs in Parallel Execution
Small	< 0,5	< 0,5	< 0,5
Medium	< 0,5	< 0,5	< 0,5
Large	< 1	< 1	< 1,5
X-Large	< 1	< 1,5	< 2,5

Average runtime (in minutes) for a medium simulation tariff:

Category for Enterprises	OneTariff	TwoTariffs in Parallel Execution	ThreeTariffs in Parallel Execution
Small	< 0,5	< 0,5	< 0,5
Medium	< 0,5	< 0,5	< 0,5
Large	< 1	< 1,5	< 1,5
X-Large	< 1	< 2,5	< 3,5

Average runtime (in minutes) for a complex simulation tariff:

Category for Enterprises	OneTariff	TwoTariffs in Parallel Execution	ThreeTariffs in Parallel Execution
Small	< 0,5	< 1	< 1
Medium	< 2	< 3,5	< 5,5
Large	< 9	< 20	< 35
X-Large	< 20	< 35	< 50

Memory Sizing
Average additional memory amount needed for calculations during a runtime of a simulation run.

Average memory consumption (in GB) for a simple simulation tariff:

Category for Enterprises	OneTariff	TwoTariffs in Parallel Execution	ThreeTariffs in Parallel Execution
Small	0,5	1	1
Medium	4	6	10
Large	15	40	45
X-Large	60	95	90

Average memory consumption (in GB) for a medium simulation tariff:

Category for Enterprises	OneTariff	TwoTariffs in Parallel Execution	ThreeTariffs in Parallel Execution
Small	0,5	1	1,5
Medium	3	6	10
Large	20	45	45
X-Large	65	100	110

Average memory consumption (in GB) for a complex simulation tariff:

Category for Enterprises	OneTariff	TwoTariffs in Parallel Execution	ThreeTariffs in Parallel Execution
Small	1	1	1,5
Medium	8	10	15
Large	45	45	60
X-Large	40	105	120

CPU Sizing
Average CPU consumption (SAPS) for three tariff complexity categories.

Average CPU time consumption (in seconds SAPS) for a simple simulation tariff, measured with 40 CPU cores:

Category for Enterprises	OneTariff	TwoTariffs in Parallel Execution	ThreeTariffs in Parallel Execution
Small	85.000 SAPS	135.000 SAPS	170.000 SAPS
Medium	500.000 SAPS	250.000 SAPS	1.000.000 SAPS
Large	2.000.000 SAPS	3.500.000 SAPS	4.750.000 SAPS
X-Large	3.500.000 SAPS	6.250.000 SAPS	9.000.000 SAPS

Average CPU time consumption (in seconds SAPS) for a medium simulation tariff, measured with 40 CPU cores:

Category for Enterprises	OneTariff	TwoTariffs in Parallel Execution	ThreeTariffs in Parallel Execution
Small	85.000 SAPS	135.000 SAPS	170.000 SAPS
Medium	680.000 SAPS	950.000 SAPS	1.200.000 SAPS
Large	2.500.000 SAPS	4.000.000 SAPS	6.000.000 SAPS
X-Large	11.500.000 SAPS	8.150.000 SAPS	11.500.000 SAPS

Average CPU consumption (in seconds SAPS) for a simple simulation tariff, measured with 40 CPU cores:

Category for Enterprises	OneTariff	TwoTariffs in Parallel Execution	ThreeTariffs in Parallel Execution
Small	7.500.000 SAPS	1.350.000 SAPS	2.000.000 SAPS
Medium	7.000.000 SAPS	13.000.000 SAPS	20.000.000 SAPS
Large	33.000.000 SAPS	6.500.000 SAPS	100.000.000 SAPS
X-Large	77.000.000 SAPS	125.000.000 SAPS	200.000.000 SAPS

Disk Space Sizing
Disk space requirements for each enterprise category mainly depend on the customer usage record (CDR) structure. We estimate from 16 GB (Small enterprise) to 28 GB (X-Large enterprise) for an example CDR structure.

Tuning Options
We recommend to configure the SAP HANA server regarding the SAP CPS data and SAP HANA server (hardware)constellation to achieve optimal performance results for the simulation process.

In the SAP CPS software, the configuration is done by defining the number of sequential batches to be Executed Partitions are used in SAP Convergent Charging (SAP CC) to parallelize the execution. There is a customizable partition size of 1 to 480 to determine the grade of parallelization. In an environment with a huge amount of usage data, it is unlikely that all partitions can be executed in parallel. If this is the case, the partitions are executed in several batches sequentially. Both the number of sequential batches and the partitions size are customizable and the best values for the system can be determined automatically using a report. It is recommended to determine the partition size after additional CPU cores have been added to the SAP HANA server or when the data amount in the system (such as CDRs, contracts) increases or decreases evidently.

For more information, see the installation guide for SAP CPS 1.1, under http://help.sap.com → Installation Information.

By reducing the number of CPU cores of the SAP HANA server, there is significantly increasing runtime of a simulation expected. There is no relevant memory consumption increase and higher number of SAPS expected. Although, no formula for resource consumption of specific customer scenarios can currently be provided and the performance of a customer system should always be evaluated during the SAP CPS implementation project.

4. MISCELLANEOUS

For more information about available hardware configurations, see http://go.sap.com/index.html →Partner → SAP Partner hardware certified for SAP HANA → View Listings.

5. COMMENTS AND FEEDBACK

We would appreciate any feedback from users of guides such as this. Help us improve the document by sending us your comments by opening an OSS message on component IS-PSI, or sending an email to marit.rams@sap.com.