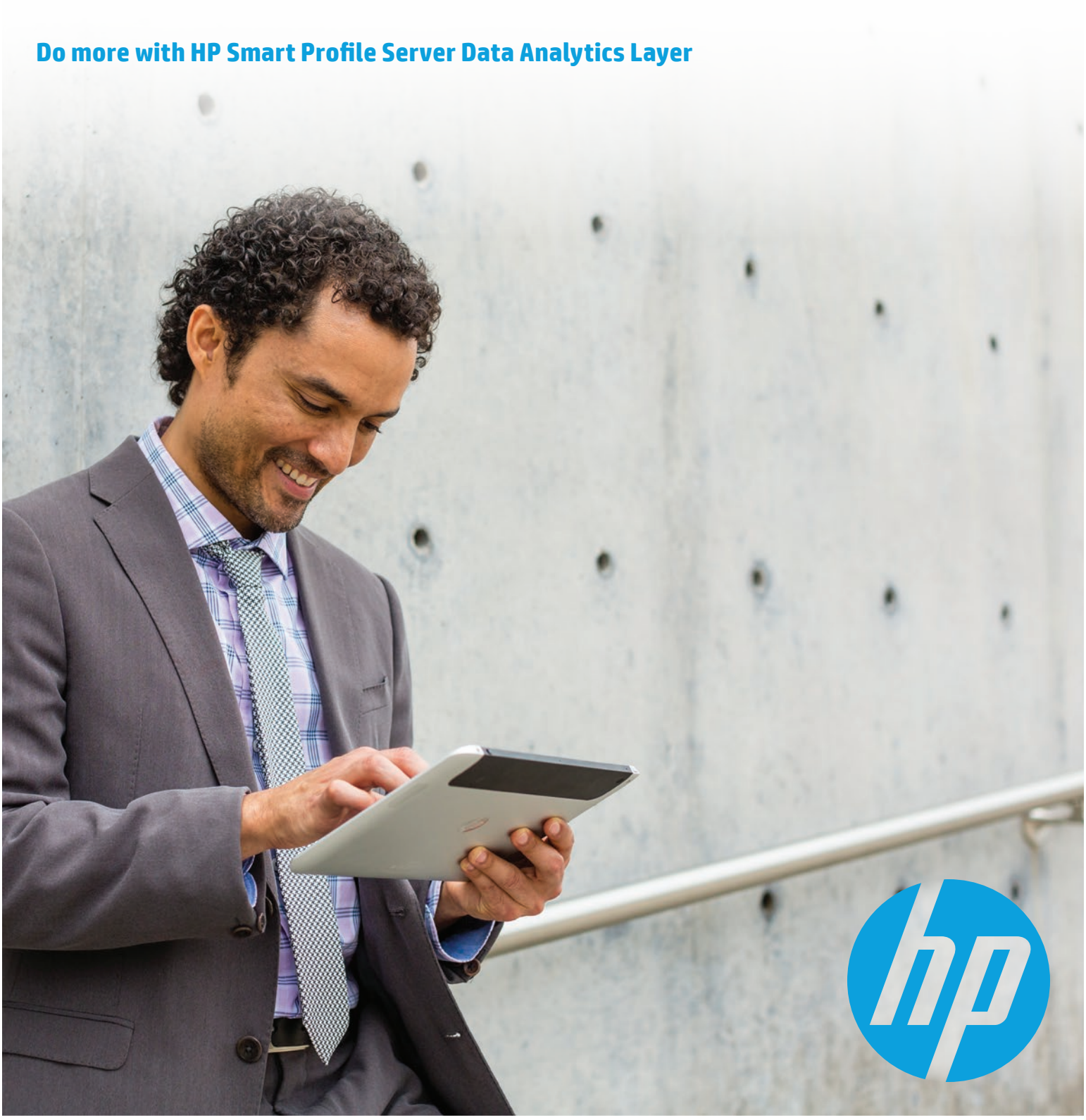
Solution overview

360-degree telco view

Do more with HP Smart Profile Server Data Analytics Layer



HP Smart Profile Server Data Analysis Layer comes with a proven industry data model, helping communications service providers build a true 360-degree view of subscribers.

HP Smart Profile Server

HP Smart Profile Server (HP SPS) enables communications service providers (CSPs) to collect data from various sources, such as network data or Internet traffic. They can analyze this data, and then build and expose securely an enriched subscriber profile to their third-party partners or internal departments.

HP Smart Profile Server Data Analysis Layer (DAL) comes with a proven industry data model, helping service providers build a true 360-degree view of subscribers.

It is a product of the HP Telco Big Data and Analytics (HP TBDA) solution portfolio. Service providers can use the HP Smart Profile Server to understand users' key metrics in real time, near real time, or batch mode and in multinetwork and multiservice environments while more and more data go through their networks.

HP SPS consists of a tiered architecture made up of three layers:

- Data Collection Layer (HP Smart Profile Server DCL) is responsible for extracting customer data from multiple sources, using real-time and/or batch interfaces. This layer includes HP award-winning mediation platform, HP eIUM, with a large gallery of ready-made connectors and easy-to-develop new ones.
- Data Analysis Layer (HP Smart Profile Server DAL) creates smart attributes and analytics packages, using a high-performance analytics database of unlimited scalability, based on HP Vertica.
- Data Exposure Layer (HP Smart Profile Server DEL) provides a secure access to the unified profiles and smart attributes, offering standard interfaces, such as SQL, REST, and SOAP. It also integrates with interactive reports platforms, such as Tableau.

HP Smart Profile Server Data Analysis Layer

HP Smart Profile Server DAL is designed to augment traditional subscriber profile information with smart attributes. These attributes are derived from analyzing network traffic and other data sources. They enable providers to gain a better understanding of their customers to improve satisfaction and drive new revenue streams.

HP Smart Profile Server DAL runs on top of HP Vertica, our platform designed for business analytics at the scale of Big Data. It drives down the cost of capturing, storing, and analyzing data. And thanks to its massively parallel processing (MPP) architecture, it produces answers 50 to 1,000 times faster. This speed enables an iterative, conversational analytics approach needed to support fast business decisions.

HP Smart Profile Server DAL provides a rich environment to create and run analytics packages and value packs, which fosters and simplifies the analytics creation lifecycle. This is done by providing core services and libraries to build these value packs, which can be developed by HP or custom value packs, developed by service providers and delivery teams. Smart attributes are implemented as part of different HP Smart Profile Server DAL value packs.

Supports analytics creation in minutes

Analytics value packs rely on SQL or R, which includes HP Vertica extensions, such as time-series analysis, sessionization, geospatial, and pattern-matching query types. They enable analysts to create user-defined statistical and predictive analytics inside the database or custom algorithms, developed by HP.

Analysis functions are in charge of querying the analytic dimensional data in HP Vertica. They form a logical model (star/snowflake schema), and apply either advanced Vertica SQL or R language statistical operations (through user-defined functions) on it, and produce results, such as scores, key performance indicators (KPIs), probabilities, or new facts.

Those analyses may be of several kinds:

- Rollup facts aggregating measures along one or several dimensions ,such as web-usage scores per categories and subscribers along a hierarchy of time range (two days, 60 days, and one year), or KPIs, such as daily successful login rate to a service or an average jitter/delay, measured hourly. A rollup is a typical and easy way to perform dimensional analysis. HP Smart Profile Server DAL comes with a designer module to create analytics functions and aggregate a result on whatever dimension, such as time, location, devices, subscriber IDs, network access type, and more.
- KPI analysis: This analysis may be applied to KPIs to report or clear alarms, based on configured criteria (thresholds on KPI values). Those alarms state change may be pushed to a service quality manager, which may trigger corrective actions attempts.
- Those rollups can serve as input for new analysis but also as a way to speed up reporting and online analytical processing (OLAP) creation. Indeed, stable and repeatable reporting requirements or an OLAP analysis model—combining aggregated metrics and analysis dimensions—can benefit preaggregated data structure to avoid recalculation at runtime, even if corresponding atomic data are available. This improves the overall throughput. Usual tools require additional effort to design and maintain aggregation procedures and data structures. With our Smart Profile Server, it becomes transparent. An analytics package may simply be designed to prepare a cube and be run regularly through the HP Smart Profile Server Orchestrator.
- In some specific cases, the HP Smart Profile Server Analytics Layer also embeds prepackaged logic. This could include web-categorization engine, recommendation algorithms library, and in-database analytics functions to handle complex analytics and support for the R programming language.

HP Smart Profile Server DAL supports three kinds of analytics processes:

- Descriptive analysis
- Predictive analysis
- Prescriptive analysis

Key aspects of HP Smart Profile Server DAL are:

- **Truly 360-degree view of subscribers**: With its Industry Data Model, HP Smart Profile Server supports all types of analytics and enables fast creation of a single, point-of-customer intelligence serving all service provider departments—from operating support systems (OSS) and business support systems (BSS) to call centers to marketing.
- **Ease of use and short learning curve**: HP Smart Profile Server Designer is a set of graphical user interfaces (GUIs). Intuitive and flexible, it enables users to create day-to-day analytics. This results in productivity gains and time savings for business and data scientists and expert users. Business analysts are able to create analytics, without advanced knowledge of SQL. HP Smart Profile Server Designer helps to specify and create complex analytics workflows and rollups, combining them with predictive models in minutes. Data scientists are involved in advanced analytics creation.
- **Integrated statistical/predictive analytics**: HP Smart Profile Server enables integrated R-based analytics while data stays into the repository (HP Vertica). You can build more accurate models with larger data sets, with no need to move a partial data sample in memory like with traditional R. Predictive analytics tasks simply take the form of a user-defined function called through SQL queries. Data scientists then can concentrate on advanced mining activities with their preferred tools, create advanced model predictive models, and easily run them on HP Smart Profile Server, along with other analytical tasks.
- **Automated query generation**: From designer-based activities, HP Smart Profile Server generates automatically all needed SQL queries, sequences, and combination of queries representing the real job to execute. Those generated queries are preoptimized for Vertica to avoid the most repetitive and costly parts of the tuning activities. Business users, with no SQL knowledge, get all the power of advanced HP Smart Profile Server analytics functions. As an example, HP Smart Profile Server enables creation of multidimensional rollups in minutes, which usually takes hours to develop and debug for skilled SQL users.
- **Ease analytics governance**: Within the production environment, it is common to see hundreds of parallel analytics jobs and tasks being run from near-time KPI calculations, churn models execution, recommendations, and large-batch clustering activities. HP Smart Profile Server Orchestrator eases the management of large sets of varied analytics, providing thin scheduling, fine-grained jobs monitoring, and auditing.

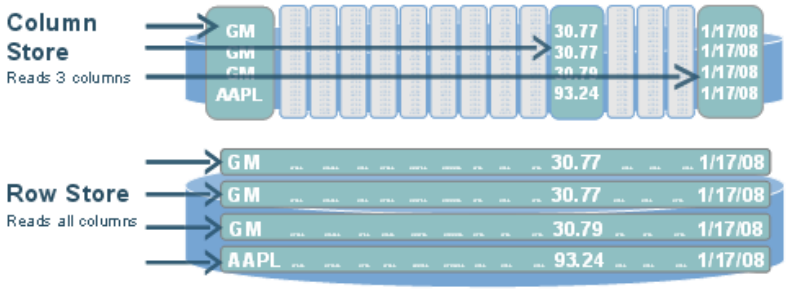
- **Ease of integration**: It includes an integrated, extract transform load (ETL) capability, which enables collecting raw data—CSV files, log files, xml files, and xdrs—as they are loading them into the HP Vertica database and performing the needed data transformations to map these data into a dimensional analytics model. It makes HP Smart Profile Server more agnostic to data sources changes, and reduces number of people needed to execute ETL projects by shortening the path from raw data to target data model.
- **Dataset optimization for high-performance analytics**: HP Smart Profile Server Designer features some filtering capabilities that enable analysts to preselect relevant data before processing with analytics tasks and to post sort results. This is helpful to facilitate highly interactive visualization and fast root-cause and drilldown activities.
- **Advanced housekeeping**: It enables the management of multiple retention policies simultaneously and automatically, keeps the latest valid results, destroys aborted analysis intermediate data, and preserves needed historical data.

HP Vertica

HP Smart Profile Server DAL supports analytics creation in minutes.

It is a massively scalable database platform, custom-built for real-time analytics on petabyte-sized datasets. HP Vertica supports standard SQL and R-based analytics, and offers support for all leading business intelligence and ETL vendors.

HP Vertica is built from the ground up on the 4 C's:



Column storage
Stores data the way it is typically queried for best performance. Column storage is ideal for read-intensive workloads because it can dramatically reduce disk input and output.

Compression
Stores more data, provides more views, and uses less hardware, which lets you keep much more historical data in physical storage.

- When similar data is grouped, you have even more compression options.
- HP Vertica applies more than 12 compression schemas:
  - Dependent on data
  - System chooses which to apply
  - NULLs take virtually no space
- Typically see 50%–90% compression
- HP Vertica queries data in encoded form

Clustering
Lets you scale out your database cluster easily by adding more hardware.

- Columns are duplicated across cluster nodes. If one machine goes down, you still have a copy:
  - Data warehouse log-based recovery is impractical.
  - Instead, you can store enough projections for K-safety.
- New cluster node queries existing nodes for the data it needs:
  - Rebuilds missing objects from other nodes.
  - Another benefit is multiple sort orders.

Continuous performance
Queries and loads data 24x7, with virtually no database administration.

- Concurrent loading and querying means you get real-time views and eliminate nightly load windows.
- On-the-fly schema changes mean that you can add columns and projections, without database downtime.
- Automatic data replication, failover, and recovery provides for active redundancy, which increases performance. Nodes recover automatically by querying the system.

Analytics supported in HP Smart Profile Server DAL

We consider analytics as a process, which transforms raw data, and uncorrelated and unmodeled data into a useful insight.

HP Smart Profile Server DAL supports three kinds of analytics processes:

- **Descriptive analysis**: This kind of analysis typically will try to answer questions, such as: **What did happen? Why did it happen?** This kind of analytics can be executed in batch, near real time, or real time over structured or unstructured data. Typical outcomes of these analysis are customer experience-related KPIs, user behavior, and preference scores.
- **Predictive analysis**: This analysis will rely on an analysis of the past correlation. Findings that may result from this analysis build a predictive model. This model, which is most of the time based on statistical functions (regressions) of theory of probabilities, will answer questions such as: **What is likely to happen now?**
- **Prescriptive analysis**: These analytics are also extremely popular. They are used to answer questions, such as: **What should I do now?** Typically, they help provide better automated answers during a support call or determine a set of actionable recommendations or actions, such as pushing a promotion, subscription upgrade, or new service bundle to a customer as a function of its behavior, usage, context, or experienced issues.

Important note: All of these analytics can be combined and executed simultaneously in coordination within the HP Smart Profile Server DAL platform.

HP Smart Profile Server DAL Telco industry data model

HP Smart Profile Server relies on a CSP industry data model, which enables fast creation of new analytics packages. This baseline data model covers all key aspects to analyze subscriber usage, behavior, and perceived experience. It is a truly dimensional model designed to support analytical activities, which can be extended to support new analysis needs.

Table 1.

	Date /time	Customer (ID, Demographics)	Product	Rate Plan	Applications	Location (GIS, Cells-ID)	Protocols (TCP/IP, FTP, SMTP, HTTP...)	Switch/NE	Service Line	Vendor	Device	Service Call status, type	Organization/POS	Employee
Customer Billing	X	X	X	X	X									
Call Detail Traffic	X	X	X	X	X		X	X	X		X			
Purchasing	X		X							X			X	
Distributor Inventory	X		X		X					X			X	
Network Operations	X	X					X	X	X		X			
Chanel sales/rep/POS	X		X						X				X	X
Marketing	X	X	X	X	X	X			X	X	X			
Service Calls/CRM									X		X	X		

The Smart Profile Server industry data model is built on years of HP experience in the telecommunications industry. It models many operations, business processes, and subscriber-related activities. The previous table provides a nonexhaustive overview of the HP Smart Profile Server DAL industry data model.

In essence, the industry data model is a physical dimensional model, which can be expanded with new custom dimensions and fact tables as new networks, services, and applications are being introduced.

The data model helps create analytics and correlates them across various dimensions:

- Scores representing user behavior (preferred services, apps) across various dimensions, such as location time and devices
- Customer experience management KPIs, representing the perceived (measured) experience with through parameters, such as latency, jitter, delays and network, protocols, applications errors, or anomalies
- Predictions that include customer propensity to buy a new product, use a promotion, and probability to churn

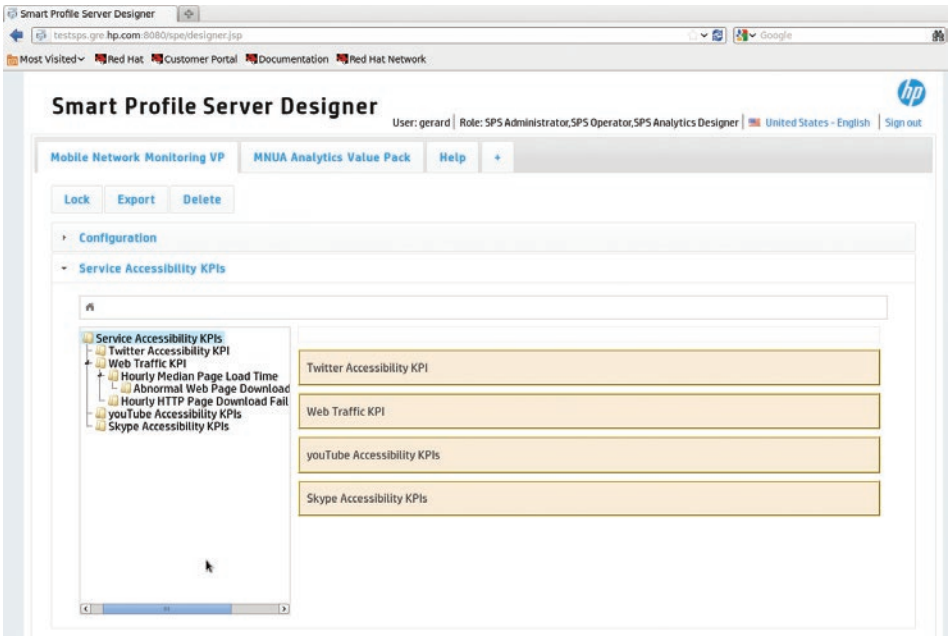
Dimensions and facts can be combined in various ways to represent business processes and operations. To be fast, specific analytical tasks may not need to rely on the entire data model but a subset of it. HP Smart Profile Server Designer enables creation of a dynamic logical model. Here, specific fields of dimensions and facts can be kept, dropped, or renamed to form dynamically a star schema, which will be supporting specific analytics tasks tied to related business process or operations.

HP Smart Profile Server Package Designer

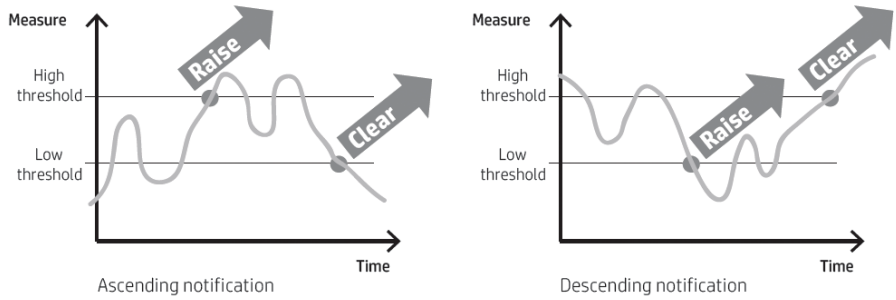
A set of web GUIs enables the creation of analytics packages in a few minutes, without needing in-depth SQL expertise. These interfaces enable people in charge of conceiving analytics logic to define a value pack package, which can be deployed and run on the HP Smart Profile Server DAL engine.

To facilitate the analytics creation process, several kinds of analytics patterns are available:

- **Composite analysis**: It combines several analytics operations, which can be executed in parallel or in sequence. Sequences are often useful when you have multiple stages into an analytics process. Stages include transforming two CSV files being collected from two different deep packet processing (DPI), tapping Gn and Gi interfaces. This creates an hourly KPI, representing the average bandwidth seen by a subscriber chained—with an alarm and notification, if the hourly KPI goes below a threshold value.
- **ELT analysis**: This enables specifying data sources—configuring how data will load (bulk or trickle) into HP Vertica and the transformations required— to map the incoming data to the HP Smart Profile Server industry data model. Transformations can be a simple selection of columns in data sets or more complex, such as correlation of data coming from various sources.
- **Rollup analysis**: It is a central notion of dimensional analysis and is often needed to produce a result into a dimension-like time or date and location. A rollup analysis is outputting results by aggregating measures or creating measures from dimensions. For example, input fact tables—such as a subscriber web-usage fact table—can be rolled up into a monthly subscriber, web-usage fact table, where the data volume of each usage is aggregated per month for each subscriber. Furthermore, the input facts can be filtered, defined as fact views. Rollup fact table measures are sometimes called KPIs when operations and mathematical functions are applied. Typically, a value pack can be created to calculate a number of KPIs, representing the user experience across various data services, such as YouTube or Skype.



- **Continuous KPI analysis**: This is an analysis, based on numeric continuous value that may be monitored using a KPI alarm analysis that raises or clears an alarm, then the value goes above or below for a descending KPI threshold.
- **KPI notifier analysis**: The KPI alarm notification analysis is a particular composite analysis. It collects the output of subordinate KPI alarm analyses and notifies a listener of alarms using a REST interface. The listener then may trigger corrective actions.



KPI and alarm designer

One of the web GUIs of HP Smart Profile Server Package Designer, the KPI Alarm Designer, enables users to specify which table and field has to be continuously monitored so a notification or an alarm can be raised when configured value, thresholds, or ranges are reached. It enables dynamic definition (e-g at runtime) and aggregation of KPIs. It relies on KPI engine to process continuously.

Prepackaged solutions use case example

This HP Smart Profile Server value pack provides a number of KPIs, representing the subscriber usage behavior and perceived experience while using mobile/broadband data services and mobile apps. This is a typical descriptive analytics use case that needs to be executed in near real time.

It complements the traditional OSS fault and performance management functions, which are resources and services oriented by providing a subscriber view of the customer experience, along with the additional customer intelligence built with the HP Smart Profile Server. Because

of the nature of the Smart Profile Server as an analytics creation and execution platform, the KPI set can be extended to comply with recognized ITU-T (E.801, G.1010, E.419, E802) and ETSI (EG 202 057, TS 102 25) standards.

Some examples of KPI analytics are:

KPI	Description
General data service KPIs	• PDP successful creation rate • PDP context activation time
Web-traffic KPIs	• Web pages that take a long time to download • Web pages that do not download completely • Web pages requiring user action for complete download • Web pages from where content is downloaded slowly
Web-browsing KPIs	• General QoS analysis • Max/average throughput • Images download successful rate
YouTube KPIs	• Accessibility KPI • QoS analysis
Mail KPIs	• Mail service accessibility • Per-subscriber, mail-volume upload/download
Twitter KPIs	• Accessibility KPI (successful login rate, login time) • Tweet upload time
Skype KPIs	• Accessibility KPI (successful login rate, login time) • QoS report (analysis of average delay, jitter, and roundtrip time)

Note: All those KPIs can be rolled up over various periods of time, from every minute to multiple months, as well as across other dimensions, such as device type/model, location, and more. This enables a fast drilldown to find the root cause by correlating KPIs with key networks and service-related dimensions.

HP Smart Profile Server DAL summary

HP Smart Profile Server DAL comes with a **proven industry data model**, helping service providers build a true 360-degree view of subscribers. With it, you can:

- Create and execute **all kinds of analytics at large scale**: descriptive, predictive, and prescriptive analytics. HP Smart Profile Server DAL supports analytics creation in minutes.
- **Store structured data from a variety of sources**, such as collected data from all generation networks, including 3G, Wi-Fi and LTE, OSS/BSS, customer relationship management (CRM) systems in batch and in real time at massive scales.
- **Combine** and execute **massive batch analytics, with real-time analytics down to milliseconds of latency**.
- **Create relevant KPIs**, serving day-to-day operations centers and customer and marketing care systems.
- Create sound KPIs, helping decisions-makers adjust their business strategies.

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