

Business white paper

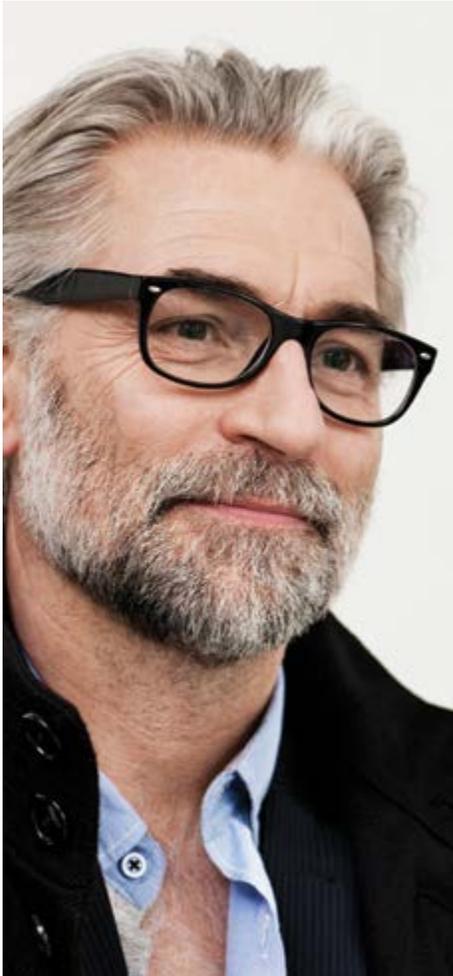
# From big data to knowledge



# From big data to knowledge

## Executive summary

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### Executive summary

Big data is an opportunity for communications service providers (CSPs) to create the intelligence for operating network more efficiently, to analyze the success of the services that CSPs are offering, and to create a better personal experience for their customers. Chief Marketing Officer, Vice-President Network Operations, and Line of Business Managers are equally eager to exploit the large amount of information to achieve better business decisions. They expect their Chief Marketing Officer to provide end-to-end analytic solutions based on the data available in their IT and network infrastructure. This white paper analyzes the complete value chain that can transform CSPs' data to knowledge. It covers the sources of information, the data collection tools, the analytic platforms providing quick data access, and finally the business intelligence use cases with the presentation and visualization of the results and predictions. We will also cover four use cases that demonstrate the potential of an analytic platform implementation such as HP Vertica: Subscriber Network Usage Analytic, HP Mobile Experience Personalization, HP Ad Experience Personalization, and machine to machine (M2M).

# From big data to knowledge

## Introduction

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### Introduction

CSPs know an inordinate amount of personal information about their customers, such as who their contacts are and their phone numbers, addresses (home, work, email), Internet usage, applications downloaded, travel history, even how long it takes them to commute to work each morning. A customer's smartphone usage becomes a snapshot of their daily lives, data that any social media company would love to possess.

Over the years, your large communication network and their associated switches, billing systems, and service departments may have generated hundreds of millions of individual call details records (CDRs) daily. Terabytes of dynamic customer data will continue to grow exponentially as carriers add new services and as IP-based traffic increases.

### Why now?

What we have seen in the last five years is an evolution of the technology that has turned the data explosion into an opportunity to transform and monetize. The analytics equation described in [figure 1](#) has made possible solutions and approaches that were impossibly expensive and complex just a few years ago.

- The cost of processing data and doing analytics on it in real time has gone down, making it increasingly possible for live data to trigger system actions, rather than just generate static reports for human consumption.
- The commoditized access of the information from multiple systems, network elements, sensor data that could outstrip all others, and Internet data that have equal value to internal data, has facilitated the explosion of the data you can analyze.

# From big data to knowledge

## Introduction

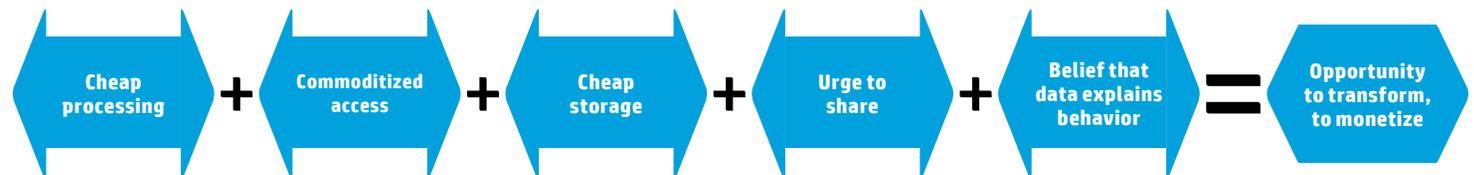


### Introduction (continued)

- The cost of data storage has fallen dramatically. This, coupled with the application of new data processing techniques, is enabling far larger datasets to be captured, stored, and analyzed.
- New sources of user data and urge to share from smartphones and social networks, have come on stream, potentially enabling a multidimensional view of the customer.
- Data can explain behavior interest—for this belief, many operators apply statistical techniques, complex relationships across data and graphs, social network analysis, and their own business problems.

From a strategic point of view, you want to be able to reconnect with customers with a full understanding of their needs, detect business trends and opportunities, timely detect fraud, and comply with regulatory requirements.

**Figure 1.** The analytics equation



# From big data to knowledge

## Strategic priority



### Strategic priority

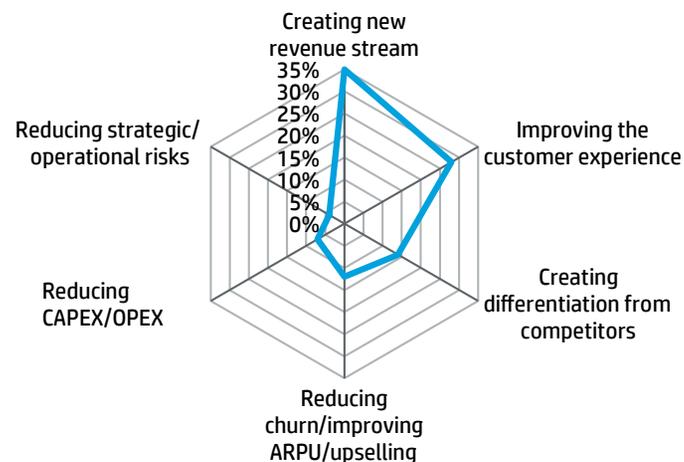
According to a survey over 140 senior Telco managers, just 54 percent of operators says that big data was a current strategic priority in their organizations, 24 percent said they did not know and 22 percent said it definitively wasn't.<sup>1</sup> That's mean that a short majority of CSPs are ready to embrace big data as more of the executives understand the possibilities it provided.

### So why are big data and analytics tools so important for CSPs?

Analytics improves multiple aspects of CSPs' operations such as:

- Enable new business model as CSPs are starting to realize that the information they have is an untapped asset. Choose the potential offered new revenues stream as the biggest opportunity (see [figure 2](#)).

**Figure 2.** What is the biggest opportunity that big data presents to operators?



<sup>1</sup> "European Communications survey," European Communication magazine, March 2012.

# From big data to knowledge

## Strategic priority

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### Strategic priority (continued)

- Provides business optimization capability that helps to increase revenue through more-targeted marketing and to reduce expenses by identifying cost and revenue leakages
- Improve the customer experience, by launching new innovative services quickly and gaining deep customer insights to personalize offerings
- Create differentiation from competition by embracing future market opportunities as connected devices, machine-to-machine (M2M) devices, and oriented sensors are proliferating at an incredible growth rate, fueling the amount of data collected
- Reduce churn with the ability to better segment subscribers, to provide more-targeted marketing spend with the insight to predict churn, cross-sell opportunities, the quality of customer experience and the value of a customer
- Reduce cost with the provision for product managers of a better understanding of which services are most profitable, the impact of competitive offerings and the impact of “cannibalization” caused by a new service launch
- Improve operational efficiencies, allowing network operations’ ability to predict capacity issues and the impact of a new service launch

# From big data to knowledge

## From data to knowledge



### From data to knowledge—better business decisions

To achieve better business decision, CSPs need to consider the complete value chain that can transform their data to knowledge, bringing all components together in one end-to-end solution. It includes (see [figure 3](#)):

- **Data sources:** From network information, billing systems, subscriber profile, devices, or social network
- **Data collections:** Including different technology such as network probe that captures the data
- **Data management and structuring:** The heart of your business knowledge with analytic databases (ADB) providing fast access to that data
- **Data access:** Enabling query sessions to be truly interactive
- **Business intelligence:** The analytics process applied in a number of CSPs specific use cases
- **Presentation and visualization:** Proposing predictions and results to staff in a usable format

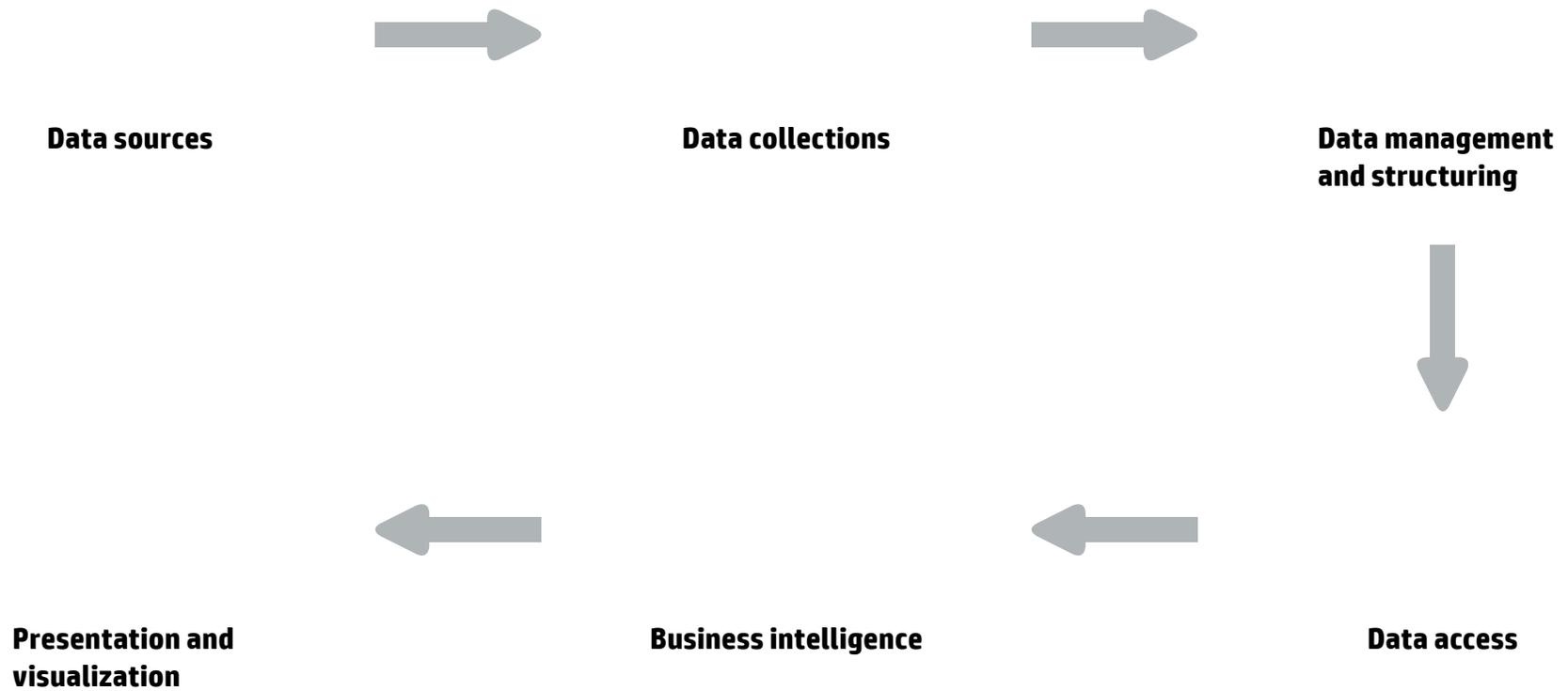
Let's analyze each of these components in more detail.

# From big data to knowledge

## From data to knowledge

**Figure 3.** Big data value chain

Click on each component to read more.



# From big data to knowledge

## From data to knowledge



### Data sources

### Data sources

Success for a big data strategy lies in recognizing the different types of big data sources, using the proper mining technologies to find the treasure within each type, and then integrating and presenting those new insights appropriately according to your unique goals, to enable your organization to make more effective steering decisions. The different sources of information for CSPs include:

- **Network usage:** Such as CDR or Internet Protocol Detail Record (IPDR) and information from business support systems/operational support systems
- **Sensors:** The global market for wireless sensor devices used in end vertical applications totaled \$532 million USD in 2010 and \$790 million USD in 2011. This market is expected to increase at a 43.1 percent compound annual growth rate (CAGR) and reach an estimated \$4.7 billion USD by 2016.<sup>2</sup>
- **Connected devices:** There are nine billion connected devices at present and by 2020 that number is going to explode to 24 billion devices, according to new statistics released by GSMA.<sup>3</sup>
- **Mobile devices:** The total number of mobile connected devices doubles from 6 billion today to 12 billion by 2020.<sup>4</sup>
- **Apps:** Information from the number of applications available and the marketing around the number of apps expected to rise. The number of apps likely to be downloaded worldwide in 2016 is expected to reach to 44 billion, raising the information and the marketing around them. Subscriber profiles come from network systems such as home location register/home subscriber server (HLR/HSS) or provisioning or CRM.

<sup>2</sup> "Global markets and technologies for wireless sensors," report code: IAS042A, BCC Research, February 2012.

<sup>3,4</sup> "Internet of things will have 24 billion devices by 2020," GigaOM Pro, October 2011.

# From big data to knowledge

## From data to knowledge



### Data sources

### Data sources (continued)

- **Services:** Where we are engaging with a service to buy something, sell something, and others; ultimately creating an opportunity to analyze behavior, target a pattern, and so on.
- **Social network profiles:** Tapping user profiles from Facebook, LinkedIn, Yahoo, Google™, and specific-interest social or travel sites, to cull individuals' profiles and demographic information, and extend that to capture their hopefully like-minded networks.

Information collected from data sources: caller, called party, jitter, packet loss, latency, call duration, setup time, codec, throughput, mobile ID (IMSI, IMEI), phone number, user login, IP address, MAC address, date and time of login/logoff, subject of email/chat/webmail, sender, receiver, attached documents, response time, data transfer sessions (type, content, time), visited website, page content, time spent on visit, basket share, referent, and so on.

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### Data collections

Network probe is a technology that decodes protocols, extracts information embedded in the traffic or transmitting over the traffic. Then it delivers this information in the form of metadata and content feeds to an application developed by the user that leverages the information provided by the network probe.

The probe makes an acquire specifying what information is required. The network probe delivers this information in a tabular format, just like in a database to a storage engine. This technology can also deliver packets and packets contents. The process of extracting and delivering the information from the network is done in real time and scale up to 10 gigabit per second. Different protocols are supported such as: network protocols; application protocols such as webmail, email database, or any kind of network application. For each protocol tens of metadata are delivered, which make at least thousands of metadata in your application. These protocols are regularly updated and new protocols are added to protocol plug-in library.

Network probe intelligence is designed to be embedded into your application, so you can rely on the real-time visibility provided by network probe to develop application, processing the traffic information, or storing this information, for some reporting or traffic shaping.



### Data collections

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# From big data to knowledge

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### Data management and structuring

ADB's provide fast access to that data and allow the logical progression of the communications analyst to drive much deeper into root cause analysis and deliver more in their analysis window than would be permissible with a row-based database. Many analytic databases differ in the way the data is stored on disk. In those that have adapted a "columnar" orientation, disk files are occupied by the values of a single column, instead of complete rows. This physical division allows more frequently used data to be assigned to faster storage tiers. It also ensures that columns not pertaining to a query are excluded from access. This "column elimination" results in improved (sometimes dramatically improved) performance for an important class of query in an enterprise. The clustering of similar values in a column also makes columnar databases much more disposed to a new class of compression capabilities. Column elimination and compression help to alleviate the I/O problems that have been plaguing analytic queries for years. Techniques include:

- Run-length encoding, whereby column values that repeat across consecutive rows can be stored once
- Dictionary compression, which abstracts the real values and stores only tokens in the record
- Delta compression, which stores only offsets from a set value

In addition, some analytic databases, such as the one HP Vertica offers, are "hybrid" in the way they store data, allowing for multiple columns to be stored in a single disk file. When you access columns together, you could place them in the same disk file. This would streamline the process at the end of the query where the result set columns are brought together for presentation. When a table has a large number of columns, like CDRs do, it is frequently a candidate for effective multiple-column disk files.



### Data management and structuring

# From big data to knowledge

## From data to knowledge

### Data management and structuring (continued)

#### HP Vertica Analytics Platform

The HP Vertica Analytics Platform enables communications service providers to analyze and make informed decisions in near real time with unparalleled efficiency, performance, and scalability.

Our CSPs customers and partners routinely address the following challenges:

- Determine behaviors that may ultimately create either customer or product churn
- Understand customer experiences at a transactional level and determine investment criteria
- Optimize offerings and portfolio in a highly competitive market targeting high-value, high-margin infrastructure and applications based upon empirical data
- Analyze volumes of data in near real time that eclipse the capabilities of legacy infrastructures

Leveraging the HP Vertica Analytics Platform, our CSPs customers and partners derive benefits relating to capacity management, performance, scalability, and availability. A few examples include:

- Deliver significantly higher customer satisfaction, retention, and profitability
- Optimize portfolio by focusing on alleviating high cost, low value products, and services
- Manage and scale portfolio dynamically, without sacrificing details of any individual customer, transaction, or product
- Store, access, analyze, and monetize the vast amounts of customer and network data without sacrificing time, scale, or detail



#### Data management and structuring

# From big data to knowledge

## From data to knowledge

### Data management and structuring (continued)

During the last 30 years, there has been little database management system (DBMS) innovation to keep pace. Performing ad hoc queries on such large data volumes does not come naturally for existing DBMSs, which use a row-oriented design optimized for write-intensive transaction processing workloads rather than for read-intensive analytical workloads. Desperate for better performance, row-oriented DBMS customers spend millions of dollars annually on stop-gap measures such as adding DBA resources, creating and maintaining online analytical processing (OLAP) cubes, or replacing their DBMS with expensive, proprietary data warehouse hardware.

HP Vertica has been specifically designed to support analytic workloads, which primarily include querying (often ad hoc) existing data and inserting new data (in bulk or on a constant “trickling” basis for real-time analytics). By featuring an innovative architecture that drastically reduces disk I/O, HP Vertica delivers orders of magnitude faster performance and much lower cost of ownership. The [figure 4](#) performance benchmark results conducted by an HP Vertica telecom customer (based on their real-life data set), in March 2011, helps illustrate the HP Vertica advantage.

HP Internet Usage Manager (IUM) is the industry-established, real-time charging, convergent mediation solution that supports a huge variety of billing and charging services. HP IUM handles data for convergent mediation, real-time charging as well as IMS-based voice and data services across wireline, wireless, cable, and broadband networks. HP IUM has a vast array of collection techniques that support both real-time and batch event collection. HP IUM provides retrieval mechanisms such as FTP, SCP, HTTP, GTP, FTAM, Radius, Diameter, SIP, CSG, Cisco SCE (P-Cube) and local file collection techniques. All of these components are configurable entities in the application, and IUM customers get the entire spectrum with the product, which is immediately ready to use.



### Data management and structuring

# From big data to knowledge

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### Data management and structuring (continued)

**Figure 4.** HP Vertica reduced query time from hours to minutes and hardware cost by over \$500,000 USD

CDR data warehouse	HP Vertica Analytics Platform	Row-store DBMS	HP Vertica advantage
<b>Benchmark data set</b>	1.2 TB call detail records		
<b>Production data set</b>	50 TB call detail records		
<b>Hardware benchmark</b>	3 Dell servers—2x dual-core Opteron 2220 16 GB RAM, 1 TB local disk	24-CPU SMP server, large SAN	Over \$500,000 USD hardware savings
<b>Mean query time (4 queries)</b>	5.4 minutes	2 hours	22x faster
<b>Load time</b>	5.5 hours	82 hours	15x faster
<b>Database size (1.2 TB raw data)</b>	220 GB	4 TB	18x less storage (82% compression)



**Data management and structuring**

# From big data to knowledge

## From data to knowledge

### Data access

The vendor's usual statement for analytic query performance seems to be "soldier on" or that the users are not fully exploiting their existing technology. The only real answer to the problem, if you are sticking with the stack, is more hardware. However, a reality is that most systems are already fully optimized for the hardware in place. If there were a way to attack query performance in business intelligence without resorting to hardware, it would allow revolutionary leaps in information dissemination in multiple ways:

- Enable query sessions to be truly interactive, not limited by poor performance that causes analysis to stop at three interactive queries instead of 10, 20, or 100 to achieve actionable insight into business
- Facilitate rollout of the analytic environment to all knowledge workers of the company as well as customers, supply chain partners, and broad potential users of the data
- Allow for years of history to be kept, knowing that high volume data can be queried
- Add the possibilities for CDR, text data clickstream, and other volume-intensive data to be kept at the detail level for analysis
- Add the possibilities for analysis of complex data types such as flat files, XML, graphics, and spreadsheets



### Data access

You can meet compliance deadlines, improve lifecycle analysis, prevent fraud, extend appropriate offers to customers in real time, provide detail data analysis, and yield pattern-improving results to the customers—all of this, just from an improvement in query performance time.

# From big data to knowledge

## From data to knowledge

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### Business intelligence

Analytics brings together statistics, operational research, and computational knowledge to solve business challenges by analyzing data held within information systems. From patterns in data, you can use statistical methods to create models and algorithms that forecast future events. The analytics process can be described as two distinct activities: modeling and prediction.

The modeling starts with the process of mining data to identify patterns and relationships, with the intention of explaining a set of actions or of looking for anomalies that identify a sector or cluster. After patterns and relationships have been identified, a model is created that describes the behavior, for example the likelihood of churning, the impact of the video on network bandwidth, the likelihood of services adoption through new bundles.

The frequency with which the model is run depends on the application, computational power, the amount of data, and the complexity of the model. There may also be limitations on how quickly new data is fed from source data points. With the advent of more-powerful database analytics technology, such as HP Vertica, the time required to run an analytics model is decreasing.



**Business  
intelligence**

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# From big data to knowledge

## From data to knowledge

### Business intelligence (continued)

Figure 5. Analytics use case for CSPs<sup>5</sup>

Sales and marketing	Network	Products and services	Supplier	Customer management	Operational and resource management	Enterprise
<ul style="list-style-type: none"> <li>• Partner analysis</li> <li>• Channel analysis</li> <li>• Campaign analysis</li> <li>• Customer insight analytics</li> <li>• Sales analytics</li> <li>• Social network analytics</li> <li>• Customer segmentation</li> <li>• Customer network analysis</li> <li>• Customer churn analysis</li> <li>• Customer cross-sell and upsell</li> <li>• Customer lifetime value</li> <li>• Customer profitability</li> <li>• Customer acquisition</li> </ul>	<ul style="list-style-type: none"> <li>• Capacity management</li> <li>• Performance management</li> </ul>	<ul style="list-style-type: none"> <li>• Performance analysis</li> <li>• Margin analysis</li> <li>• Pricing impact and stimulation</li> <li>• Cannibalization impact of new services</li> <li>• What-if analysis for new product launch</li> <li>• Impact of supply chain</li> </ul>	<ul style="list-style-type: none"> <li>• Cost and contribution analysis</li> <li>• Quality control</li> <li>• Regulatory requirements</li> <li>• Fulfillment analysis</li> <li>• Quality analysis</li> <li>• Roaming analytics</li> <li>• Settlements</li> </ul>	<ul style="list-style-type: none"> <li>• Customer churn (retention)</li> <li>• Customer experience</li> <li>• Service level agreements</li> <li>• Credit scoring</li> <li>• Customer retention analysis</li> <li>• Customer problem case analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Operational analysis of key processes</li> <li>• Mean time from order to cash</li> <li>• Trouble ticketing resolution</li> <li>• Performance management</li> <li>• Facility profitability analytics</li> </ul>	<ul style="list-style-type: none"> <li>• Fraud management and prevention</li> <li>• Revenue assurance</li> </ul>



**Business intelligence**

<sup>5</sup> "Defining analytics: optimizing business processes with existing data in CSPs," Analysis Mason, January 2012.

# From big data to knowledge

## From data to knowledge

### Presentation and visualization

Presentation and visualization functions allow your staff and automated systems that require predictions and results to receive them in a usable format. Traditionally, delivery has been to a staff member who then acts on it manually. But this is increasingly being automated, as actions are required in near real time, including the use of customer data for real time personalized on-device customer interaction (see figure 6). In this case, CSP and subscriber jointly manage their relationship through direct engagement on mobile to strengthen customer intimacy, enhance experience, and open new revenue streams.

Figure 6. Analytics visualization through customer mobile experience personalization



Self-care

Bill shock prevention

Policy control



Presentation and visualization

# From big data to knowledge

## Use cases

1

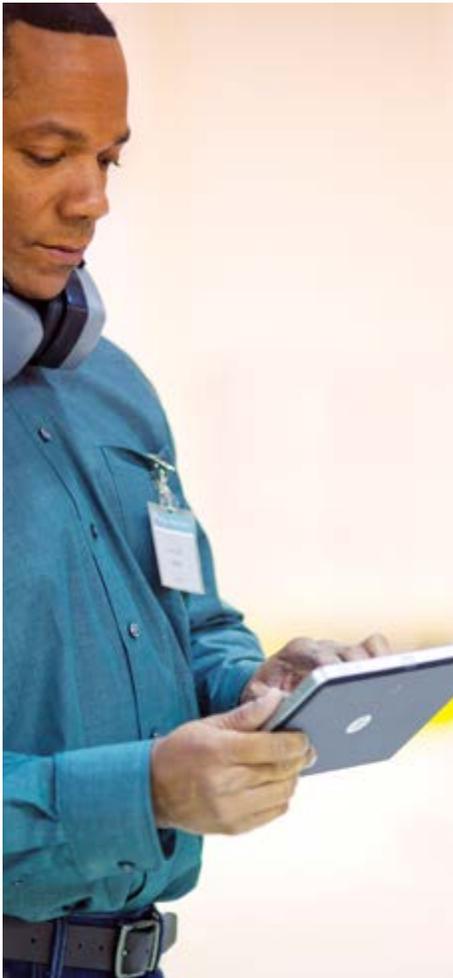
### Use case one: Subscriber Network Usage Analytic

In this first case, we would consider a service provider that wants to collect CDRs or IPDRs from the different operating system support in the network. The first challenge is the quantity of information a service provider may produce 2 billion CDRs per day.

CDRs and IPDRs are still the core of the customer profile. CDRs are an important resource for a CSP, and the complete record must be stored and made available across the company. CDRs and IPDRs provide comprehensive information on each and every call occurring on the data circuits, including: complete signaling information, categorization of the call, disruptive alarms and errors occurring during the call, detailed voice band event information or main Internet protocols information (email, webmail, Web browsing, file sharing, peer-to-peer sharing, chat, and others)

An analytic database is ideal for analyzing CDR data, because the data is characterized by two key properties:

1. Massive quantity of data: Calls produce readings at regular rates—sometimes thousands of times per second, over long time periods. Communications devices are “always on,” generating data. Consider the packets in a streaming video going to and from the device.
2. Need for scan queries: A common use of CDR data is to study historical trends and compare time periods and regions. For example, region managers may want to query all the data in their region and surrounding regions. This requires a series of aggregate queries over large amounts of historical data.



# From big data to knowledge

## Use cases

1

### Use case one: Subscriber Network Usage Analytic (continued)

CSPs will have to rely on fast, complex analysis of CDR and IPDR data, for implementing critical functions such as:

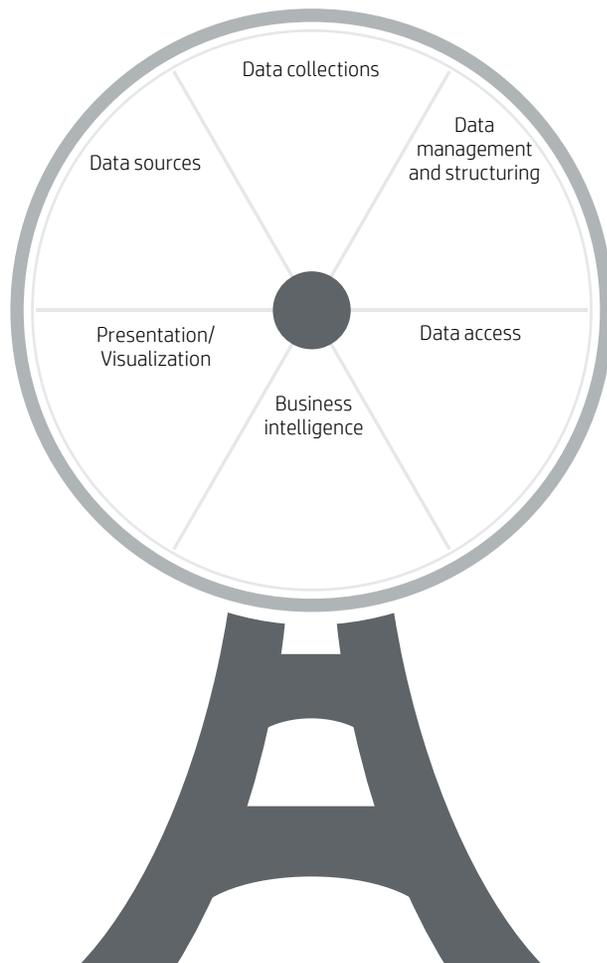
- Customer Relationship Management—analyzing behavioral data to optimally target services and reduce churn
- Billing—ensuring complete and accurate billing and avoiding fraud
- Revenue assurance—modeling call behavior
- Network performance—optimizing network operations using operations management programs



# From big data to knowledge

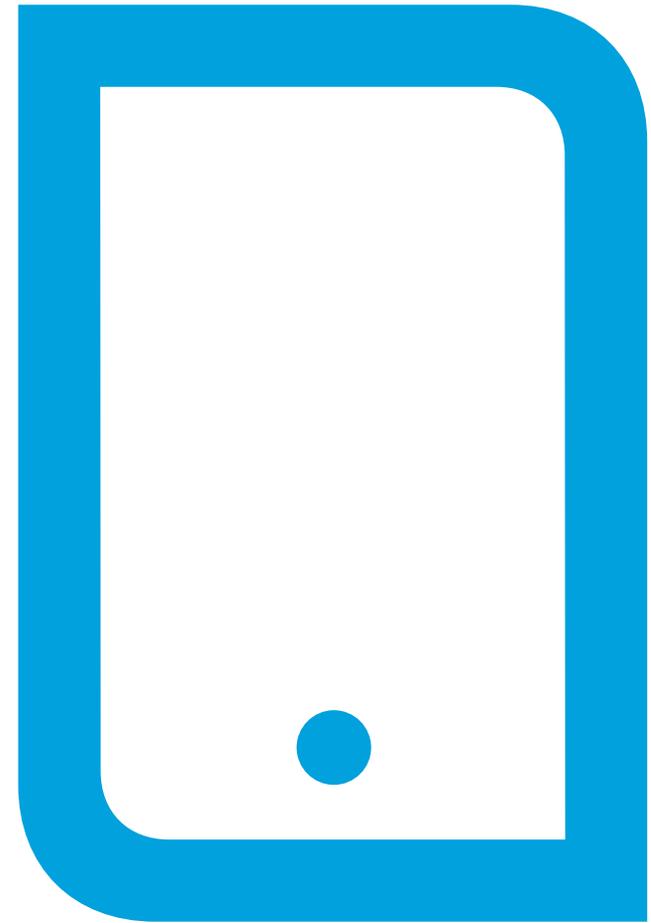
## Use cases

### Use case one: Subscriber Network Usage Analytic (continued)



Click on each icon to read more.

1



# From big data to knowledge

## Use cases

2

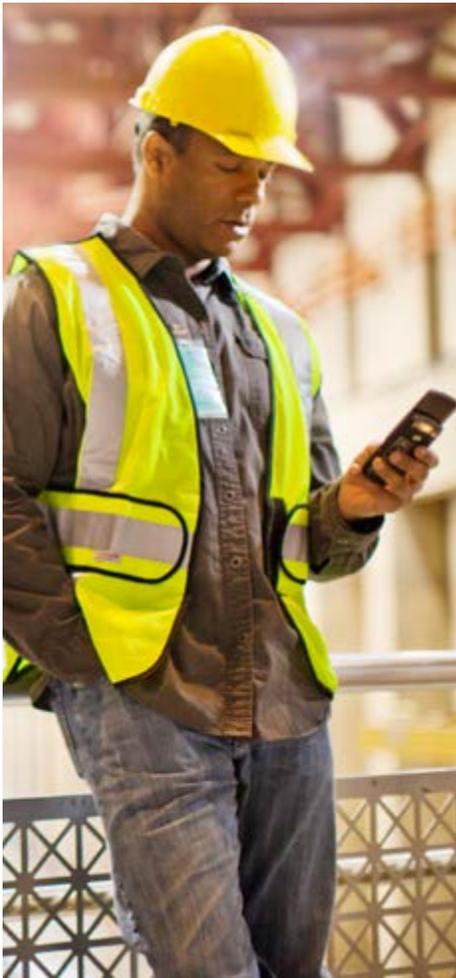
### Use case two: HP Mobile Experience Personalization

Harvesting customer data provides you with the opportunity to strengthen your customer relationships and gain a competitive advantage. Designed to promote a highly personalized customer experience, HP Mobile Experience Personalization solution is targeted at reducing churn, intelligently upselling telecom products and services, and creating new revenue streams.

HP Mobile Experience Personalization implementation includes four functional areas:

1. Drawing subscriber profiles, usage events, and demographic information and identity from all sources of CSP operation: home location register/home subscriber server (HLR/HSS), usage detail record (UDR), CRM, location, network traffic, provisioning, and charging
2. Collecting these events into a power analytics environment such as HP Vertica
3. Applying real-time profiling and analytics on data across IT, network, and Web sources to build an enriched, actionable subscriber profile and insight
4. Exposing the smart profile through CSP mobile portal to enable personalization and subscriber interaction in the areas of self care, social media updates, personalized advertising, and content—premium and news

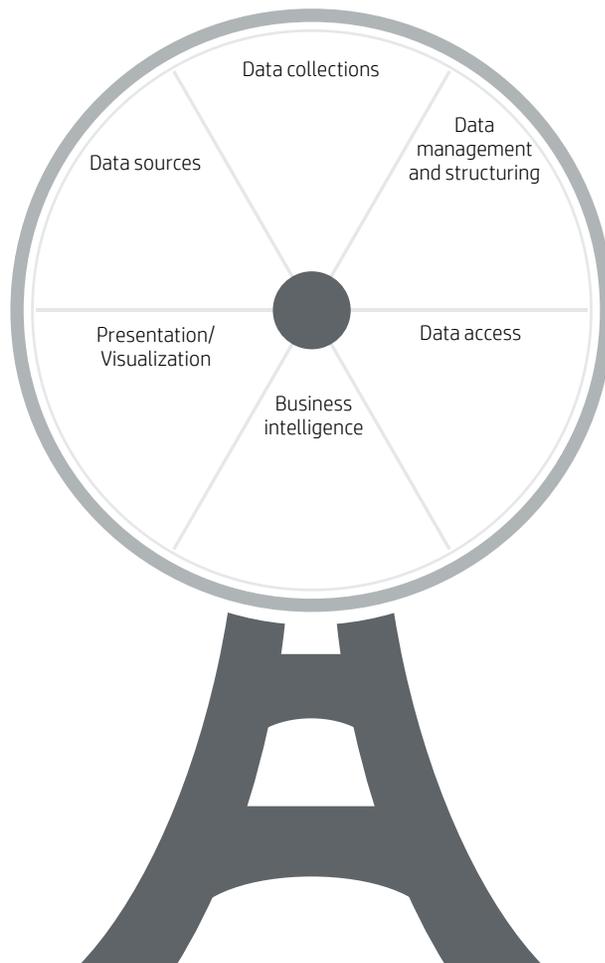
The Mobile Experience Personalization implementation is about enabling CSPs personalizing the service experience to develop subscriber intimacy and stickiness, resulting in reduced churn, relevant recommendations, increased revenue and uptake of data usage and services, and personalized advertising channels.



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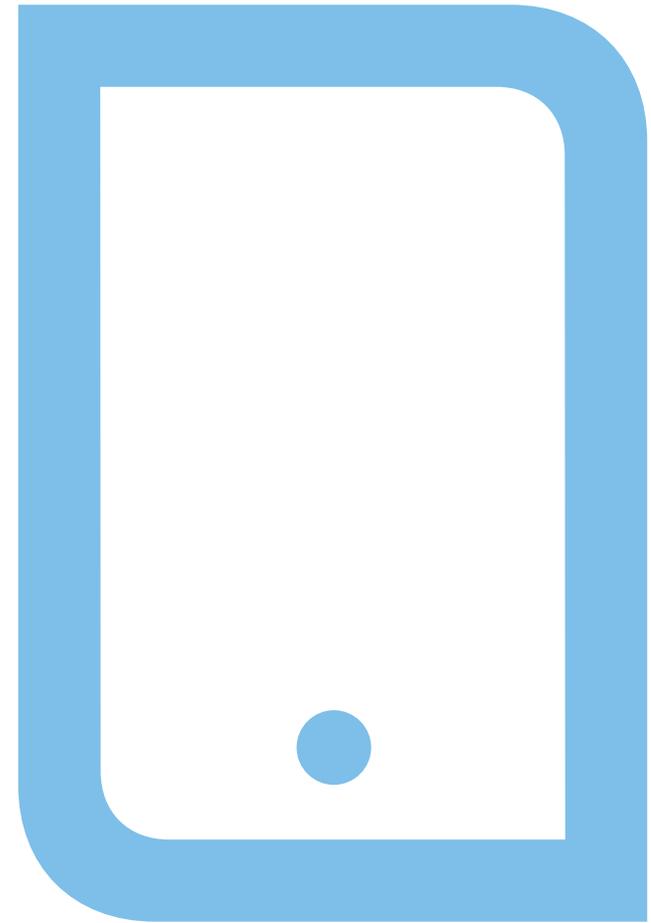
## Use cases

### Use case two: HP Mobile Experience Personalization (continued)



Click on each icon to read more.

2



# From big data to knowledge

## Use cases

3

### Use case three: HP Ad Experience Personalization

You decide to book a plane ticket to New York on the Internet. Few clicks later, when reading the newspaper online, an advertisement displays an attractive offer for a car rental in New York. It's not a coincidence; it is a mechanism for targeted advertisement.

The business model for many leading over-the-top companies like Internet search engines or social media is based on a subscription, apparently "free" to the user, but predominantly, if not exclusively, funded by advertisements. This delivery model for services, backed up by advertisements, has become almost the norm, so that the user, subscribing for these free services, receives an increasing amount of advertisements. Advertising is therefore a strategic issue for all the major players in the digital world. For service providers too, it is a challenge that they need to address. Being able to deliver targeted advertisement as possible to the end-user profile, behavior, and preferences, is a mandatory path to increasing their positioning in the value chain and to the prevention of becoming simple commodities.

Over the past years, CSPs' advertising systems have reached various levels of maturity. However, there is an increasing demand for introducing personalization in these advertising systems, and the HP Ad Experience Personalization solution provides you with an answer to this new challenge by:

- Building a rich end-user profile by collecting data from across the operator's network
- Analyzing the profile and enrich it by inferring behavior preferences or additional inclinations; the purpose is to make the inferred data actionable to deliver personalized advertisements
- Enabling targeted campaign triggers by allowing searching, filtering queries, and maintaining confidentiality toward third parties when required

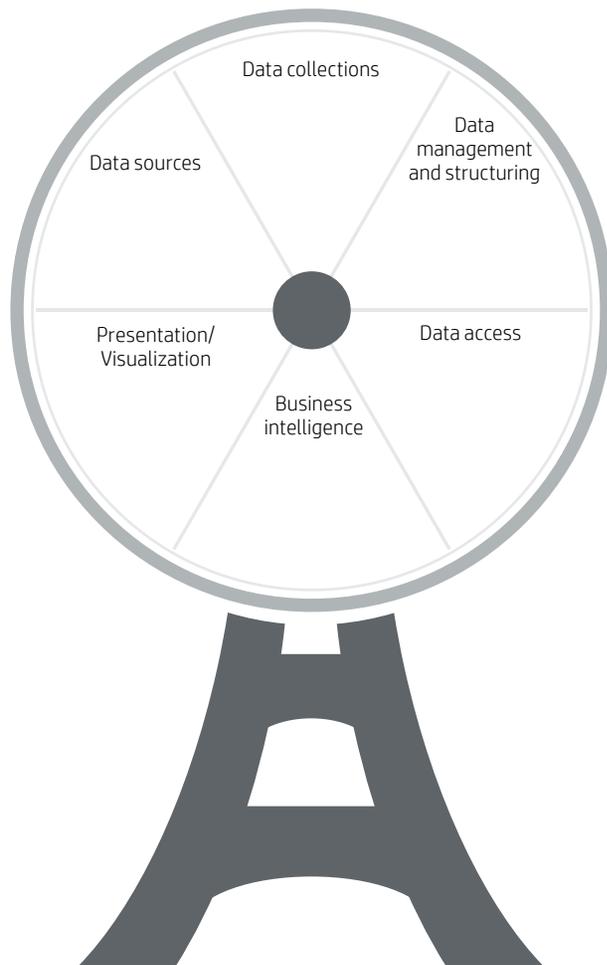
By integrating the power of the HP Vertica Analytics Platform, the HP Ad Experience Personalization solution adds a unique knowledge and intelligence to the simple delivery of advertisements. It brings you into the new dimension of targeted advertising, with tailored offering having unequaled high acceptance rates.



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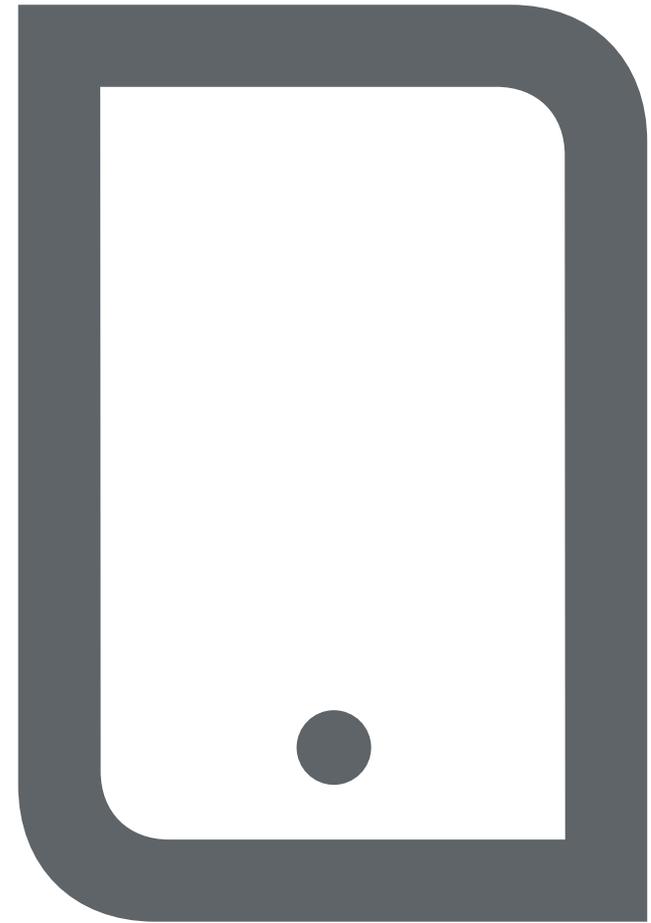
## Use cases

### Use case three: HP Ad Experience Personalization (continued)



Click on each icon to read more.

3



# From big data to knowledge

## Use cases

4

### Use case four: machine to machine

Billions of connected devices start to be deployed in the world with ebook readers, smart meters and connected cars, tracking devices on containers, health monitoring, wearable, home appliances, building infrastructure monitoring, bridge or dam surveillance, environment sensors, and so on. Sensor technology is becoming smaller and smaller; more and more sensitive, and accelerometers are now inserted on chipsets. Communication protocols, especially wireless, have also developed in many directions to enable very diverse scenarios from low bandwidth, low power to high bandwidth, more energy-consuming technologies.

According to the independent wireless analyst firm, Berg Insight, the number of cellular network connections (wireless WAN) worldwide used for M2M communication was 47.7 million in 2008.<sup>6</sup> The company forecasts that the number of M2M connections will grow to 187 million by 2014. This represents an opportunity of more than \$50 billion USD for CSPs alone in 2015, according to Harbor.<sup>7</sup> All those devices need to be connected to “the” network, authenticated, provisioned, and monitored. Data needs to be collected, analyzed, stored, secured, dispatched, presented, or leveraged by some sort of applications or end users.

<sup>6</sup> “The global wireless M2M market—4th edition,” Berg Insight, April 2012

<sup>7</sup> “Creative M2M partnerships drive new value for wireless carriers,” white paper, Harbor Research, Inc., March 2011



# From big data to knowledge

## Use cases

4

### Use case four: machine to machine (continued)

The opportunity is huge for new solutions, new services that combine connectivity, data and service management, and ecosystem management. As a CSP, you are uniquely positioned to serve this market and deliver federated, trusted, and flexible environments for device and application vendors to collaborate and deliver these future solutions.

HP M2M Solution offering covers a broad spectrum of service provider responsibility in this value chain: connectivity and communication, data and service management, and ecosystem management. Communication includes device management; SIM management and self-care portal; device HLR for authentication, security, and location; Unstructured Supplementary Service Data (USSD); and SMS gateway. Data and service management addresses data collection, aggregation, correlation, repository, provisioning, and control as well as monitoring, quality of service and usage tracking without forgetting authorization, authentication, and security. As traffic grows, big data analytics becomes critical, and HP is well positioned with solutions leveraging HP Vertica real-time analytics.

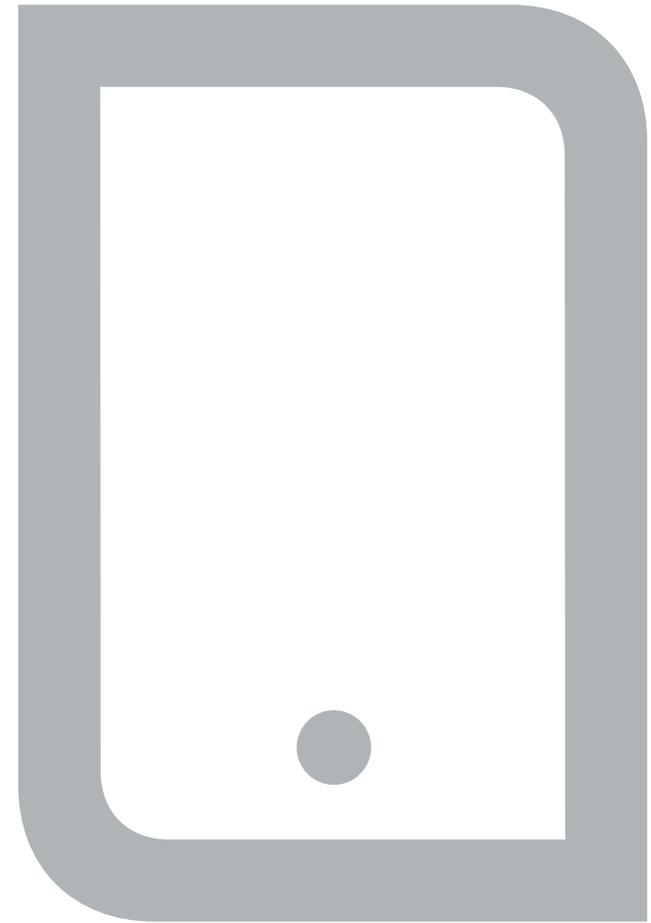
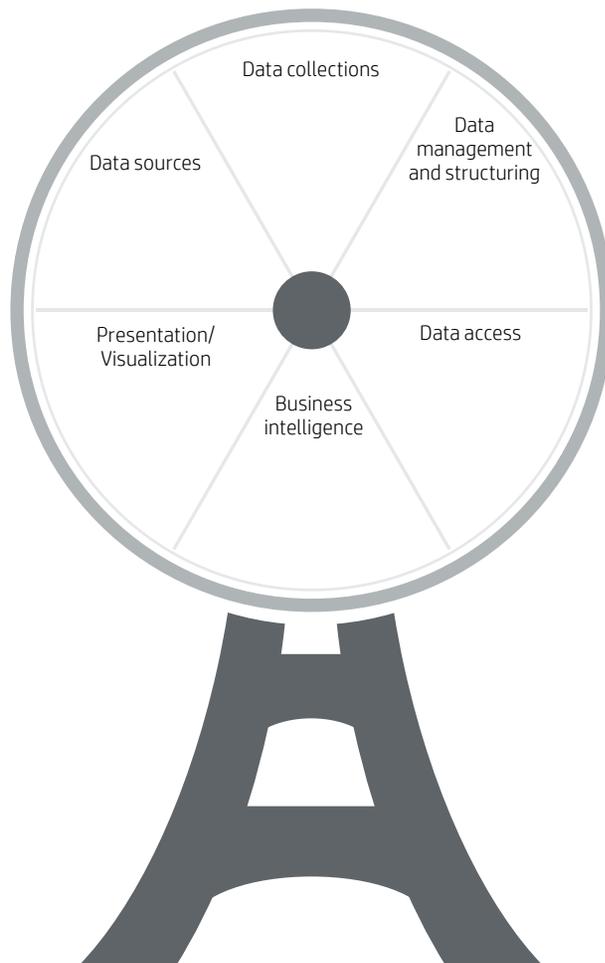


# From big data to knowledge

## Use cases

### Use case four: machine to machine (continued)

4



Click on each icon to read more.

# From big data to knowledge



### HP Vertica Analytics Platform for CSPs

Society becomes more connected daily; SMS, MMS, video on demand, email, and basic mobile conversations are a few examples of the countless ways people interact electronically. All of these experiences create unique, detailed records that if analyzed properly, enable providers to not only understand the behaviors and expectation of their subscribers but also develop services and applications to enhance their customer's experience.

The time for database innovation in telecom is now. The number of subscribers to mobile, fixed line and cable communications services is growing by millions of people every year, and the volume of CDR, IPDR, subscriber profile information, network probe and M2M data that communications companies must store and analyze is also exploding, by terabytes per year.

The HP Vertica Analytics Platform enables telecommunications providers to analyze and make informed decisions in near real time with unparalleled efficiency, performance, and scalability.

Our telecommunications customers and partners routinely address the following challenges:

- Determine behaviors that may ultimately create either customer or product churn
- Understand customer experiences at a transactional level and determine investment criteria
- Optimize offerings and portfolio in a highly competitive market targeting high value, high margin infrastructure and applications based upon empirical data
- Analyze volumes of data in near real time that eclipse the capabilities of legacy infrastructures

# From big data to knowledge



### HP Vertica Analytics Platform for CSPs (continued)

Leveraging the HP Vertica Analytics Platform, our telecommunications customers and partners derive benefits relating to capacity management, performance, scalability, and availability. A few examples include:

- Deliver significantly higher customer satisfaction, retention, and profitability
- Optimize portfolio by focusing on alleviating high cost, low value products and services
- Manage and scale portfolio dynamically without sacrificing details of any individual customer, transaction, or product
- Store, access, analyze, and monetize the vast amounts of customer and network data without sacrificing time, scale, or detail

# From big data to knowledge



## HP Software Services

Get the most from your software investment. We know that your support challenges may vary according to the size and business-critical needs of your organization.

HP provides technical software support services that address all aspects of your software lifecycle. This gives you the flexibility of choosing the appropriate support level to meet your specific IT and business needs. Use HP cost-effective software support to free up IT resources, so you can focus on other business priorities and innovation.

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- Support for: VMware, Microsoft®, Red Hat, and SUSE Linux as well as HP Insight Software
- Fast answers giving you technical expertise and remote tools to access fast answers, reactive problem resolution, and proactive problem prevention
- Global Reach Consistent Service Experience giving global technical expertise locally

For more information go to [hp.com/services/software-support](http://hp.com/services/software-support).

# From big data to knowledge



## Next step

**Discover how our four use cases can help you effectively analyze your big data.**  
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