

**A Primary Matters Total Cost of Ownership
And Business Analysis**

**Analyzing the Business Value of Hewlett
Packard's Open Call Media Platform on
Today's Voice Service Architectures**

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Summary

Today's Enhanced Voice Services market is growing and forecasted to be the one of the major catalysts that reinvigorates the Telecom industry. This market includes services ranging from messaging, custom greetings and ring tones, information acquisition, customer support, voicemail and mass alerting. It provides current and future business opportunities for Service Providers, as illustrated by certain early adopters, whom are already profiting from new generation voice service deployments.

This white paper focuses on the business and financial value HP's OpenCall Media Platform (OCMP) can bring to voice service deployments, and the impact it has on a Service Provider's (SP's) voice services business. HP's platform provides a foundation to significantly reduce the underlying costs of creating a voice services business, but more importantly, is the foundation for the change from monolithic, application specific platforms to truly distributed, multi-application, multi-network architectures. Without question, this transition to standards-based, open system architectures will transform the voice services industry.

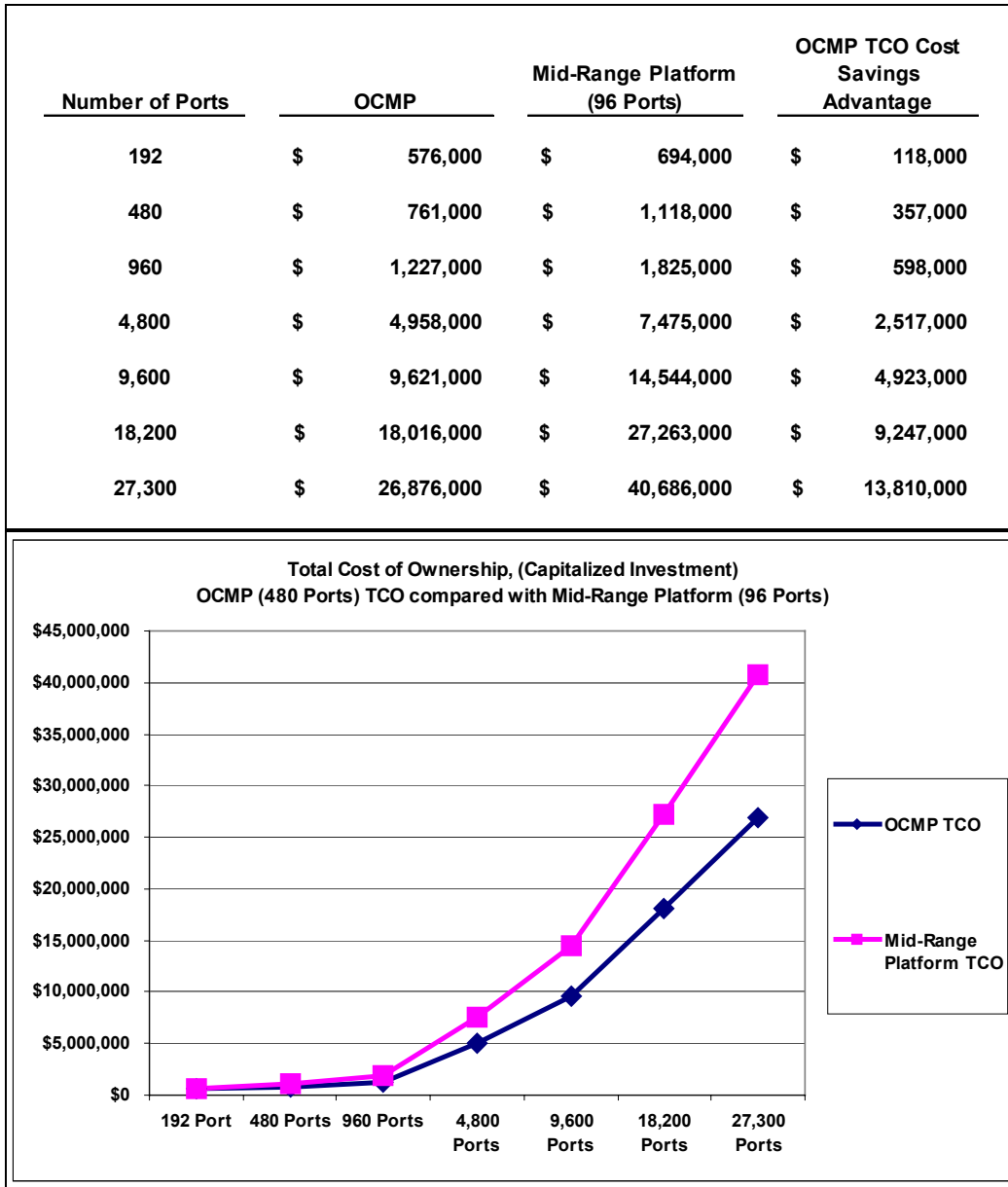
HP's OpenCall Media Platform provides scalability of voice ports, low operations and maintenance costs, and a high level of availability. This analysis concludes that Full Time Equivalent operations personnel can be reduced up to 1/3 of current levels, while Central Office space can be reduced by 3 to 5 times due to the high-end network connectivity options. OCMP utilizes the most current computing architectures and includes a VXML 2.0 compliant interpreter, software signal processing and multi-network connectivity, thus offering significant flexibility and investment protection to Service Providers planning to utilize packet-based networks. Lastly, the upfront investment in OCMP is very competitive with other platform options. These attributes translate into benefits for a Service Provider's voice service business and its customers, in particular:

- **A Lower Total Cost of Ownership (TCO)**, in the range of 34%, is provided by HP's OpenCall Media Platform; significantly lower than that available from platforms that do not offer the same degree of sizing, standards and reliability. This is driven by the fact that the entire solution uses standard commercial IT servers, without any specialized DSP processors, and is highly scalable.
- **The Ability to evolve to a true distributed, voice service architecture** from current platform-bound applications, enabling SPs to quickly and cost effectively benefit from this emerging business paradigm.
- **An Increase in the revenues, profits, customer add-on sales and lengthening of the Customer Life Cycle** in the range of 13%, through the inclusion of voice-enablement in mainstream enterprise and consumer applications, allowing for voice to be a common access method.

The above points, especially those driving the cost and financial analyses, are discussed in detail in this white paper. In addition, an example business and financial plan for a typical Service Provider Voice Services business is provided, illustrating the impact on business results due to changes in platform costs and the evolution to distributed voice service architecture.

In summary, the result of this analysis can be seen in the following table. A HP OCMP-based voice services business will enable lower operating costs, increased revenues and greater profitability.

**Annual Platform Total Cost of Ownership Comparison of OCMP
 And Mid-Range VXML Solutions at Different Port Sizes**



NOTES:

On Software Not Included:

The analysis in this chart above only addresses voice services platform costs that vary between solutions. It does not include the costs of the voice recognition and text-to-speech software. These costs are identical across both solutions. It does include central office & operations costs.

On High Availability:

The above chart is not focused on high availability configurations. If this is desired, the costs of both solutions will increase. Due to the high availability features built into the HP OCMP environment, the incremental cost of addressing high availability will be lower than that of alternative platforms.

Configurations:

OCMP including call and resource control, SS7 stack, VXML2.0 interpreter and DS3 card on HP-UX, PA-RISC; Mid-range platform; IA32 Windows, Quadspan T1 and associated hardware DSP boards and 3rd party call and resource control middleware, VXML interpreter

An Example Voice Services Business – The Baseline and Scenarios

To understand the impact of HP's OCMP on a Service Provider's voice service business, a Baseline Business Plan has been established. The Baseline Plan includes a mid-range, 96 port platform based on Intel/Windows environment with quad-span T1/E1 card including hw DSP and 3rd party call and resource control and VXML interpreter. The impact of using the HP solution is determined by comparing the attributes of the Baseline business with those from a business using HP's platform. Two major comparisons are made:

- Differences in the Total Cost of Ownership based on the Voice Services Platform.
- Changes in the NSP's Business Performance, (the operating costs, revenues and profitability) based on changes in the customer relationships, upsell opportunities, and applications revenues.

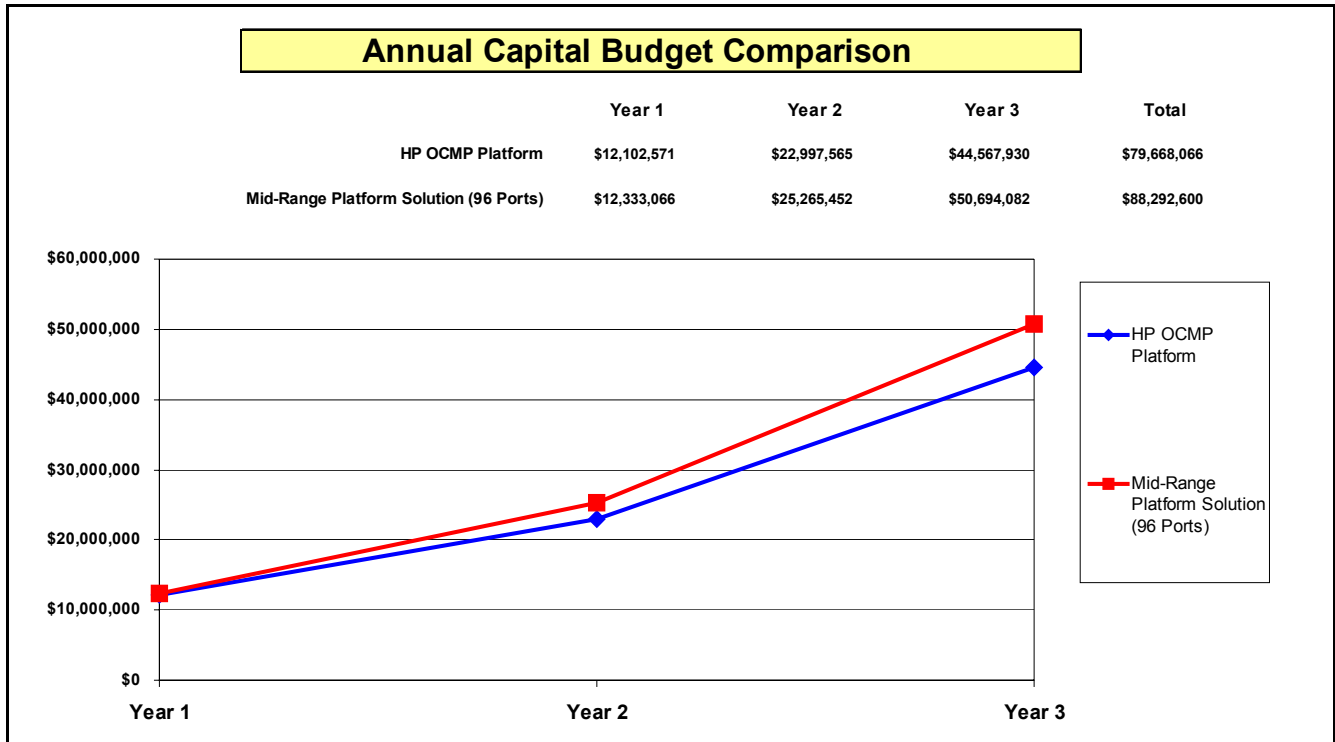
The main assumptions of the business plan for the Service Provider's voice services business are:

- From start-up, the Service Provider acquires customers in the 1st quarter and grows to 3.5 million customers, needing 22,000 voice ports, at the end of a 3-year period.
- The Operations Costs include sales, telesales, marketing, MIS, Voice Platform investment and operations, customer service, technical support personnel and management – a portrait of the entire business unit.
- The average revenue per customer begins at \$8.00 per month, growing to \$9.00 per month, per user.

The details specifying the data underlying the Baseline and Scenarios are in Appendix 1, 2 and 4 of this paper.

Comparing the Service Provider's Business: Total Cost of Ownership of utilizing the HP OpenCall Media Platform compared to that of alternative Platforms

This analysis compares a Service Provider's Total Cost of Ownership of deploying its voice services business based on the HP OCMP versus the cost of ownership associated with the typical mid-range solution currently deployed. If one views the Total Cost of Ownership associated with this alternative platform, the HP OCMP solution provides a significantly lower long-term total cost of ownership as shown in the following table. Appendix 1 provides the detailed assumptions that drive the conclusions shown in this table.



In this table, a narrowly defined Total Cost of Ownership has been used, with the major cost elements being:

- Platform hardware and software investment and maintenance, including development and runtime environment
- As opposed to the platform cost comparisons shown earlier in this article, the costs of voice recognition and text-to-speech software has been included in this TCO comparison to reflect complete voice business scenario.
- Communications links in the central office between the CO Switch and the Voice Platform.
- Central Office rack space.
- Operations Personnel, who directly manage the platforms.
- Erlang traffic requirements. Assuming same Quality of Service levels, less scalable platforms will have fewer port groups dedicated to applications in the same routing pools and lower overall port utilization compared to more scalable platforms. (Erlang traffic models further described in Appendix 2.)
- Voice Service Applications costs are not included.

The following table provides a closer look at the underlying dynamics of these total costs of ownership summaries.

	<u>OCMP Stand-Alone Platform</u>	<u>Mid-Range System</u>
Price of Alternative Voice Services Platforms		
Maximum Ports per Platform	480	96
Investment for 480 Ports of Capacity (excludes voice recognition & text to speech software)	\$ 255,040	\$ 528,500
Investment per Port	\$ 531	\$ 5,505
Total Cost of Ownership per Port, at the end of the Three Year Voice Services Deployment		
Number of Ports Needed at End of Three Years	21,875	21,875
Total Investment in Voice Services Solution	\$ 11,603,791	\$ 24,017,350
Investment per Port for Voice Services Business - includes forward-looking platform price reductions	\$ 530	\$ 1,098
Total Monthly Expenses at the end of Three Years - includes maintenance, CO allocations, communications but not Operations Personnel Costs	\$ 13,078,587	\$ 25,052,739
Total, 3-Year Expenses per Port	\$ 598	\$ 1,145
TOTAL 3 Year Cost, including Cash Investment and Expenses	\$ 24,682,379	\$ 49,070,089
TOTAL 3 Year Cost, per Port	\$ 1,128	\$ 2,243
Operations Personnel Required		
Operations Personnel Required, at end of 3-Year Deployment	4.80	12.62

The large difference in cost is driven primarily by the scalability of the HP OCMP and the softDSP. The high port density available on the HP platform significantly reduces the space, number of communications links, and operations personnel required (up to 1/3 less than alternate platforms). In addition, the large nature of the HP Solution takes advantage of the ability to have very large pools of ports available to handle applications instead of smaller ones; therefore the port utilization is higher by 5% to 6% for the same levels of service compared to the low-end platforms.

The softDSP translates into lower cost of ownership for two reasons. First, there is no need for specialized DSP chips and boards in the servers since the standard CPU handles the voice processing. Thus there is less

HP's OpenCall Media Platform is designed especially for Service Providers. In particular, it uniquely offers:

- Significant scalability in terms of port capacity per system, upwards of 2,000 ports/platform depending on the application.
- SoftDSP, meaning standard HP computing platforms and processors are used for voice processing – no specialized Digital Signal Processing hardware
- Due to the high density of ports, OCMP offers upwards of 3,000+ ports per central office rack. This is 3 to 5 times more than competitive solutions addressing the use of this very expensive central office real estate.
- DS3 and OC3 transport, in addition to traditional T1 and E1, meaning fewer cards and slots in the Central Offices are required resulting in more economic connectivity
- Support for open standards at network, application and speech resources interfaces
- 99.99% availability due to N+1 architecture
- HP's services and support enable complete integrated end-to-end solutions with 24x7 worldwide support.

complexity in the platform and lower operations, support and upgrade costs. Second, the softDSP, running on standard computer server technology, can take advantage of Moore's Law and the rapidly dropping costs associated with commodity servers.

These factors result in a significant advantage over traditional media platforms in creating a cost effective, high-end voice services business with literally millions of dollars being saved for other business functions.

The Consequences of HP's OpenCall Media Platform on a Service Provider's Revenues and Profits

By adopting a distributed voice service architecture, therefore changing the way an application is deployed, a Service Provider's business opportunities are transformed. In particular, the Service Provider is able to:

- **Support a very large number of applications from multiple vendors.** This greatly expands the potential sources of revenue to the Service Provider without needing to install separate hardware platforms for each of the different applications.
- **Easily perform market trials.** Trying a new application can be accomplished by creating a link over an IP network to the media server and offering it to test groups.
- **Simplify the hardware topology,** thus reducing both operations and central office space costs. The application can reside anywhere, in a central data center or even an Application Service Provider site, making deployment faster and use of valuable central office space less expensive.
- **Pursue additional lines of business** leveraging the investment in the Voice Platforms, such as hosting services, in addition to offering applications that open up additional sources of revenues to the Service Provider.
- **Transform the customer relationship** by increasing the average customer life cycle and average revenue per customer.
- **Have Low Cost Supplier Pricing Flexibility,** enabling the ability to offer services at very competitive prices if such a strategy is required to maintain or gain market share.

These business attributes change the way a Service Provider is able to approach its voice services business, providing major improvements to the Service Provider's customer relationship, revenue and profitability.

The potential impact of these themes is captured in the following table describing this business scenario. Here, the same Service Provider Interactive Voice Services Business is used to compare platform total value of ownership as the foundation of these scenarios (growing from start-up to slightly over 22,000 voice ports and 3.5 million users over a 3-year period for the Baseline). In capturing the influence of these platform advantages, the following assumptions are made about the impact of an OCMP hosted voice services environment.

**Total Value of Ownership Scenario Assumptions:
 Business Impact of HP's OCMP High End Platform on a Voice Services Business**

Attributes of HP's Platform that affect the Service Provider's Customer Relationship	Affect on Customer Relationship	Data used in Scenario Comparing Impact of Platform on Voice Service Business	
		Mid-Range System as Voice Services Platform	HP OCMP Platform based business
HP's Platform enables a business to lead the market in terms of: <ul style="list-style-type: none"> - Range of applications - Speed to market for new applications - Reliability and availability at lower cost, thus leading to higher customer satisfaction 	Increases Average Customer Life Cycle	30 months	Increases steadily to 33 from 30 months over the planning period, leading to an increase in total customers from 1.29 to 1.41 million at the end of the planning period
Due to the enhanced ability to pilot applications and the lower deployment costs, a Service Provider can target more market niches and increase usage	Greater Number of Applications per Customer	At start of business, 1.0 applications per user, growing to 1.1 over the planning period.	At start of business, 1.0 applications per user, growing to 1.3 over the planning period.
Since a portion of users will use more than one application, and the HP solution makes it easier to offer many applications, users will acquire multiple applications more often.	Higher Average Revenue per Customer	At the start of business, \$8.00 per month per user, growing to \$9.00 over the planning period	At the start of business, \$8.00 per month per user, growing to \$10.00 over the planning period

All of these factors result in the evolution or creation of a voice services business that has an improved chance of success, with greater revenues and profits.

As shown in the following table, the impact of the above listed assumptions on the customer relationship leads to a large positive improvement in the performance of a Service Provider's business. Due to the scalability of the platform, and its ability to easily market test and deploy many different applications, a Service Provider has the flexibility to move quickly in the market taking advantages of business opportunities and turning them into revenues.

Voice Services Business Performance Comparison
Comparing a Mid-Range (96 Port) Platform with HP's Open Call Media Platform
 (All Numbers in 000's)

	Year 1		Year 2		Year 3	
	Mid-Range Platform (96 Ports)	HP OCMP	Mid-Range Platform (96 Ports)	HP OCMP	Mid-Range Platform (96 Ports)	HP OCMP
Customer Base	379	380	1,561	1,576	3,487	3,567
Revenue						
Revenue	\$ 16,927	\$ 17,168	\$ 92,755	\$ 98,489	\$ 264,059	\$ 294,408
Cost of Goods & Bad Debt	\$ 2,257	\$ 2,262	\$ 11,889	\$ 12,022	\$ 32,501	\$ 33,337
Net Revenue	\$ 14,670	\$ 14,906	\$ 80,866	\$ 86,467	\$ 231,558	\$ 261,071
Operations Costs						
Platform	\$ 2,308	\$ 2,091	\$ 10,024	\$ 7,784	\$ 26,562	\$ 20,464
All Other Costs	\$ 10,025	\$ 10,012	\$ 15,241	\$ 15,214	\$ 24,132	\$ 24,104
Total Operations Costs	\$ 12,333	\$ 12,103	\$ 25,265	\$ 22,998	\$ 50,694	\$ 44,568
Contribution	\$ 2,337	\$ 2,803	\$ 55,601	\$ 63,469	\$ 180,864	\$ 216,503

Notes:

- 1 Cost of Goods includes Telecommunications Services Fees supporting services and other customer-based payments to 3rd Parties.
- 2 All Other Operations Costs vary due to differences in operations personnel, size of customer base, etc.

HP's OpenCall Media Platform, designed specifically for the Service Provider marketplace, makes a major difference in the ability of a business to increase its revenues and quickly reach profitability.

In Conclusion, Business Performance Comparisons show that the Platform makes a Difference

Platform sizing, standards, the capacity to rapidly deploy applications, and increased reliability combined with the vision to turn these advantages into better customer relationships are paramount to a Service Provider's ability to capitalize on business opportunities available in the voice services market.

HP's development efforts, which are focused on platforms and solutions for the Service Providers marketplace, enables the provider to experience the following:

1. Lower Total Cost of Ownership for interactive media servers:
 - a. Reduced support costs
 - b. Increased platform reliability
 - c. Lower telecommunications and central office costs
 - d. One stop shopping from HP

2. Increased revenues from value added services and flexibility to address new markets:
 - a. Increased choice of applications to test and offer to the market
 - b. Time to market for new services
 - c. Increase minutes of use
 - d. Create new streams of revenue (mobile advertising)

3. Increased customer loyalty:
 - a. Reduced churn due to high service availability
 - b. Easier to react to customer needs
 - c. Increased reliability, service continuity and service offerings

For service providers who are looking to increase their revenue streams through the introduction of enhanced voice-enabled services, HP's OpenCall Media Platform is an open (adheres to current industry standards, VXML, MRCP), flexible (utilizes HP's SoftDSP technology), carrier grade platform which provides the greatest scalability in terms of voice access and lowest Total Cost Of Ownership unlike alternative solutions in the marketplace. In addition, HP's OpenCall Media Platform allows rapid creation and secure deployment of new services directly in the carrier's network. These are fundamental platform benefits that will allow exponential growth in the voice services market.

Appendix 1

A Guide to the Total Cost of Ownership Components and Assumptions Used in Creating the Total Cost of Ownership Comparisons

The following tables and explanations specify the assumptions used in this Total Cost of Ownership analysis.

Platforms used in this comparison:

- HP's OpenCall Media Platform (OCMP) in a Stand-Alone configuration. OCMP is an integrated platform offering a highly scalable port count/platform, call control, software-based voice processing environment and is ready for installation at the central office. OCMP can run on PA RISC/HP-UX or IA32/Linux/ environments. For the purposes of this paper PA RISC/HP-UX platforms were used, Linux IA-32 would even further improve Cost of Ownership results.
- The Mid-Range VXML System referred to is a Windows/Intel based solution utilizing quad-span E1/T1 cards with specialized DSP hardware and necessary call and resource control middleware and VXML interpreter.

Summary Port Sizes and Total Platform Investment:

Total Investment for 480 Ports: This is the investment in the voice service platform (not including central office expenses) required to acquire 480 ports of voice services capacity.

Ports per Platform: This represents the maximum number of ports that can be supported for a typical configuration.

Number of Platforms for 480 VXML Ports: The number of platforms that must be acquired in order to have 480 ports of capacity.

Total Investment per Port: This is the sum of the hardware and middleware software investment. The middleware software performs the call control, runs the DSP processing environment and provides the VXML interpreter. The cost of the Voice Recognition and Text-to-Speech are included in this price.

	OCMP Stand-Alone Platform	Mid-Range VXML System
Total Investment for 480 Ports	\$ 567,040	\$ 840,500
Ports per Platform	480	96
Number of Platforms required for 480 Ports	1	5
Total Investment per Port	\$ 1,181	\$ 1,751

Hardware, Middleware and VXML Software Costs:

	OCMP Stand-Alone Platform	Mid-Range VXML System
Hardware Investment per Platform	\$ 51,200	\$ 35,000
Percent Uplift for Spares	10%	10%
Platform Price Change per Year	-10%	-5%
Hardware Maintenance Percent	10%	10%

Hardware Investment per Platform: This is the cost of the servers and operating system, DSP boards and communications boards required to support the voice processing software.

Percent Uplift for Spares: Most SPs ensure that they have provisioned spare parts to reduce any downtime that may be caused by failures. This percent allocates an additional investment for maintaining such spare components.

Platform Price Change per Year: This shows the change in platform price per year into the future. Since the HP solution is using standard processor platforms, the change in price is quite aggressive. Since the non-OCMP product require addition DSP boards and other communications equipment, the price change is not as aggressive.

Hardware Maintenance Percent: This is the annual maintenance contract expenses paid to the suppliers for hardware support and service.

Software Investment: Middleware, VXML API and Voice Recognition and Text-to-Speech

	OCMP Stand-Alone Platform	Mid-Range VXML System
Platform Software Investment per Port	\$ 414	\$ 700
TTS License per Port	\$ 300	\$ 300
Percent of Ports with TTS	50%	50%
ASR License per Port	\$ 500	\$ 500
Percent of Ports with ASR	100%	100%
Total Software Investment per Port	\$ 1,064	\$ 1,350
Software Maintenance Percent	5.00%	5.00%

Platform Software Investment per Port: This software controls the voice processing hardware, thus playing the role of middleware software, and provides the VXML interpreter. It is used by the voice services applications as well as the voice recognition and text-to-speech software resources.

TTS License Fee per Port: The software license fee for Text to Speech features.

Percent of Ports with TTS: When one configures a solution, the ports are only using the TTS function part of the time, so one acquires fewer port licenses than the total number of ports. This percent varies by the application that is being supported.

ASR License Fee per Port: This is the software license fee for the Automated Speech Recognition software.

Percent of Ports with ASR: Again, licenses are not necessarily acquired for the all the ports depending on the application.

Total Software Investment per Port: The software investment per port combines the Platform Software Investment with the weighted average of the voice recognition and text-to-speech software licenses.

Software Maintenance Percent: This represents the percent of the software investment on which the annual maintenance fee is assessed by the software suppliers.

Non-Platform Central Office and Communications Costs:

These costs are incurred by a Service Provider who installs the solution in a central office environment.

Central Office Foot Print Costs/Sq Foot: This is the monthly cost per square foot assigned to resources for using central office rack space.

Square Foot/Platform: This identifies the number of square feet required for each voice service platform. It is used to determine the monthly cost assigned by the central office to each platform.

Switch Communications Resource Type: This is the type of data communications resource linking the platform to the central office.

Ports per Communications Resource: The number of voice conversations, each requiring a port, that are carried by the communications resource type.

Switch Communications Resource Cost/Month: This is the monthly cost assigned to the voice services platform for the central office switching activities for each of the communications resources used.

Monthly Telecom Cost per Resource Type: This is the monthly cost assigned for the bandwidth and the communications resource linking the central office and the voice services platform.

	OCMP Stand-Alone Platform	Mid-Range VXML System
Central Office FootPrint Costs/Sq Ft/Platform	\$ 1,000	\$ 1,000
Sq Ft per Platform	9	9
Switch Communications Resource Type	DS3	T1
Ports per Communications Resource	672	24
Switch Communications Resource Cost/Mo	\$ 1,000	\$ 100
Monthly Telcom Cost per Resource Type	\$ 22,500	\$ 1,300

Operations Personnel for Supporting the Voice Services Platform

This represents the Operations Personnel Full Time Equivalent (FTE), i.e. cost of one full-time personnel resource assigned to managing, maintaining, operations and performing back-ups and updates to the voice processing solution. In determining the FTE, the complexity of the platform, in terms of the number of components, software drivers and data communications connections, is the primary factor. The HP OCMP is a very simple configuration, since there are no special-purpose DSP cards required, there is one high bandwidth data connection, and all of the software runs on standard processors. In addition, only a few platforms make available a very large number of ports, thereby reducing the number of Central Office sites required to house voice platforms and minimizing operations personnel required to support the platforms in the CO.

The typical mid-range platform is more complex. The hardware system consists of a number of specialized boards, the solution can be provided by several different vendors, there is a requirement for a greater number of platforms, data links and data communications cards in order to provide an equivalent number of ports. Software updates are more complex and time consuming. These platforms require significantly more skills and knowledge to successfully operate and support.

Minimum Number of FTE: This is the minimum Full Time Equivalent operations people required to fully deploy, manage and support the solution on a 24x7 basis.

Minimum FTEs per Site: This is the allocation of personnel required to handle all of the operations tasks at each site where the voice services platforms are installed.

FTE per Platform: This is the time allocated for handling the operations issues for each platform. For instance, .05 FTE represents 1/20th of a full time operations personnel allocated per platform.

	OCMP Stand-Alone Platform	Mid-Range VXML System
Minimum Number of FTE	2.00	3.00
Minimum Number of FTE per Site	0.25	0.25
FTE per Platform	0.05	0.04

Impact of Size of Port Pools to be used for Applications

See the discussion in Appendix 2 on traffic engineering and efficiency of port usage due to Erlang principles. This factor focuses on the typical network configurations used for providing access to voice applications. As a result of the significantly higher port size and simplicity of configurations supported by OCMP, assuming the same Quality of Service level, the total port sizes available for dialing applications will be higher than for the mid-size platforms, leading to slightly higher efficiencies due to network traffic characteristics. This factor is **ONLY** used in the TCO analysis of a business, not in comparing the TCO of platforms with the same port size.

	OCMP Stand-Alone Platform	Mid-Range VXML System
Maximum Port Pools for Applications	2,400	960

Appendix 2

VXML Voice Portals provide significantly more efficient Port Utilization than non-Portal configurations based on Traffic Engineering Principles

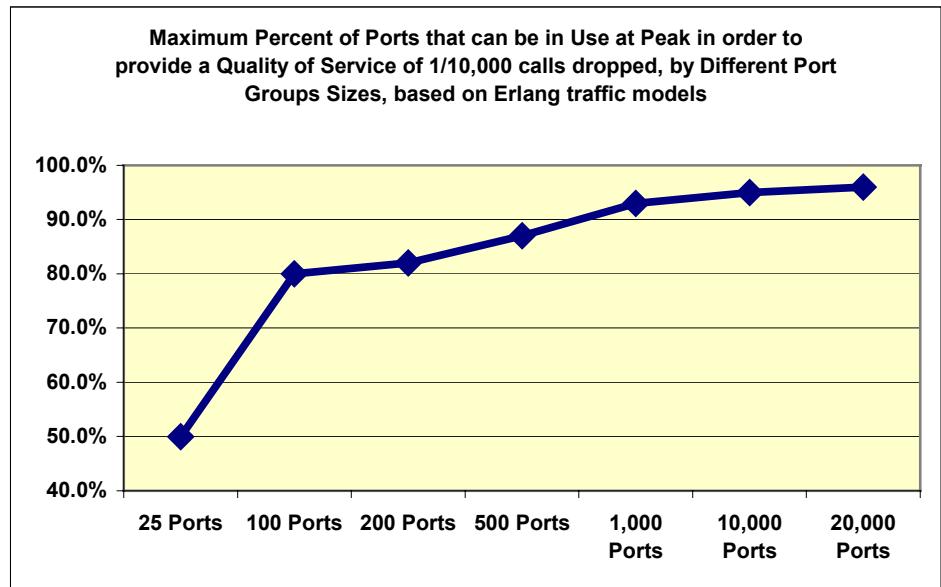
Currently, most SP's acquire a voice services application, to offer to the market, from an application supplier. In doing so, the voice platform comes with the application and it can be used only for that application. The SP estimates the demand and peak usage and then calculates how many ports are going to be required to meet the Quality of Service goals.

The result of this calculation is determined by the size (for instance in number of ports) of the peak demand and the Quality of Service needed by the callers. The Quality of Service (QOS) measure is defined as the percent of callers that, when dialing in, are able to obtain the service they want instead of getting a 'busy' or 'not available' signal. For example, when a SP configures their solution, the decision may state, "I want 99.8% of my calls to be able to obtain service when they dial and only 0.2% to receive a busy signal."

There is a class of equations, Erlang, which enables a SP to determine how many voice ports it needs to meet the desired QOS. If a SP has only a small number of ports providing a service, a voice platform of 96 ports providing access to a single application for example, only 80% of those ports can be in use at peak in order to meet the Quality of Service goals stated in this example of 1 in 10,000 calls receiving a busy signal. If the application specific configuration supports 500 ports, there need to be roughly 60 extra ports in order to meet the quality of service level (a maximum of 88% of the ports can be in use and 12% must be 'waiting for the next call').

VXML-based portals provide access to multiple applications from any port, i.e. voice ports are no longer bound to a particular application. Service Providers benefit from using voice infrastructure that can scale. High end configurations allow upwards of 96% to 97% port usage during peak demand; only 3% or 4% of the ports are 'waiting for the next call' to achieve the same QOS levels as described above (1 in 10,000 calls receiving a busy signal).

For any SP moving from application-bound platforms to a distributed VXML Portal environment, Cost of Ownership will decrease as platform size increases because of efficiencies gained through Erlang traffic models.



Appendix 3 - Market Primer

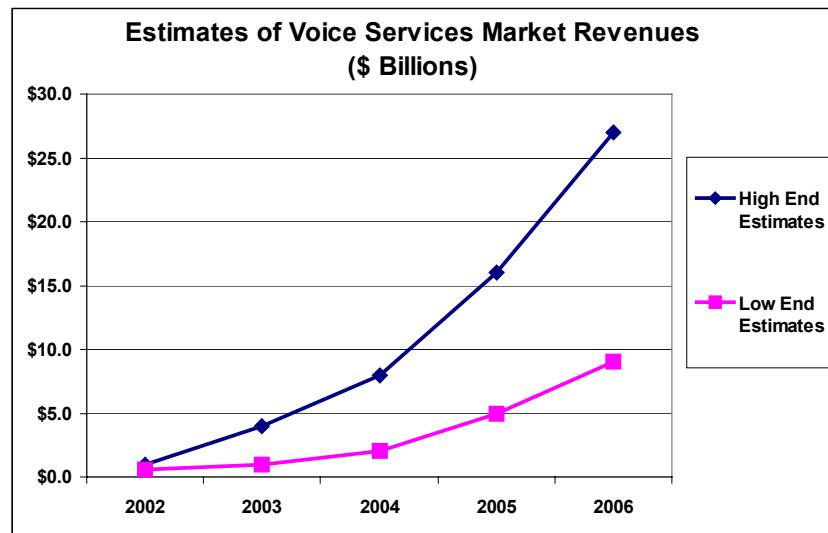
Introduction – An emerging market driven by the confluence of Voice and IVR Applications, Voice Recognition, the Web and the Wireless Phone

There is a wonderful excitement surrounding Voice Services. These services, ranging from messaging, custom greetings and ring tones, information acquisition, customer support, voice mail, and mass alerting, are on the cusp of mass adoption and major growth. The confluence of many different technologies, arriving from different places, is being incorporated into standards-based platforms able to support many different solutions for a variety of users.

Some of the excitement results from the fact that the model of the Web is being used to direct the platforms and standards for creating voice services. Today, someone can create a voice services-based 'web-site', or add voice access to existing Web Sites, within a business framework resembling the Web. The necessary changes in platform architectures are being embodied in products that are available to Service Providers (SPs) as a foundation for new business opportunities.

Two major applications established an industry and foundation

Two major 'killer applications' were the foundation of a market explosion establishing the automated voice services market. Voice Mail and Integrated Voice Response (IVR) customer service moved from R&D and early adoption into industry-wide deployment in the mid-1980s. After battling the sales issues of "Who would want to talk to a machine?" that confronted voice mail in the early 1980s, this communications service became a basic requirement of all white collar workers and most homes by the latter half of the 1990s.



A similar objection faced Touch-Tone user interfaces as well. However, financial pressures on companies in the early '90s forced companies to no longer ignore the cost savings available from automating as many customer interactions as possible. The promised savings were exceeded in most cases.

These markets continue to grow, and there are still aggressive deployments of Integrated Voice Response platforms and applications. As a result, there is now a solid marketplace sized at more than \$1 billion a year for equipment and software manufacturers, making investments in automated voice technology and services viable.

Improvements in voice recognition technology is now making it a deployable solution

Many view the Touch Tone User Interface as difficult. Even with its spectacular success, it pales in comparison to talking directly with someone. In the last several years, voice recognition has reached a new peak of quality and cost that, for the first time, makes it a viable technology for industry-wide deployment. Although there has been availability of voice recognition systems since the 1970s, there has been very little deployment. The two major reasons for low penetration have been the limited ability of these solutions to provide speaker-independent speech recognition over the phone, and the high processing requirements needed to support this technology.

Breakthroughs in the quality of speaker independent, speech recognition via the phone have been significant recently, as well as the ability to interpret the caller's queries and link these with relevant responses. These breakthroughs have been significant enough to result in quality voice recognition with accuracies exceeding 98%, with solutions currently in production. In addition, the ability to uniquely identify the caller through name identification and authentication have reached a level of accuracy such that account access is protected to the same degree as is available in other methods. With these two issues solved, and continuing to improve, voice recognition is now at a very acceptable level for major deployment.

Evolving from Specialized Voice Processing Platforms to Standard Servers – the SoftDSP

On the computing side, specialized Digital Signal Processing (DSP) chips, which are dedicated processors used for interpreting voice, have been the norm. These are expensive not only to acquire but also to own, maintain and upgrade, thus leading to a expensive voice services platforms.

The most recent innovations in processing voice are focused on removing the need for the specialized DSPs, instead relying on the power of the host processor (PA-RISC, IA-32 and IA-64 2004) on the computer server for handling these compute intensive tasks. The Soft DSP eliminates the requirement to install specialized DSP chips and boards, thus enabling general purpose servers to handle the processing of voice. This means that speech processing is accomplished using standard "off-the-shelf", high-volume computer platforms leveraging Moore's Law and the continued industry trend of increasing CPU power at lower costs. Thus the underlying economics for voice processing are becoming more and more attractive.

HP's R&D efforts are at the leading edge of voice processing using industry standard servers and commodity processors for voice processing with its **SoftDSP**. This technology enables a company to acquire standard servers, running either UNIX or LINUX, to fully support its voice processing requirements, no longer needing to acquire, support and maintain specialized processors for these tasks.

Building and Acquiring Voice Services Applications for Deployment

In creating a business to address opportunities in the voice services market place, typically the SP surveys its market and chooses the applications that it wants to use to address the market. These applications are provided by an Application Vendors. Occasionally, an SP will acquire and platform and build their own application.

The Current Approach to Building and Deploying Service Provider Voice Solutions

Currently, voice applications are created, via Voice Application Programming Interfaces (APIs), specific to the underlying voice processing hardware platform chosen. These applications are typically written using telephony-specific, proprietary Service Creation environments which shield developers from these voice specific APIs. However, to enable an application to run on a different hardware platform, it requires development and testing to link the Application Solution to a different hardware

platform and set of proprietary APIs. This has led to the stovepipe, monolithic, voice services architecture so commonly seen in today's incumbent service providers.

The Voices Services “Killer Application” may be a successful VMXL Services Environment with Supporting High-End Platforms

VXML facilitates SP's ability to leverage voice resources in their network by enabling the separation of application/service logic from the underlying media resources. Thereby facilitating the reuse of these resources for many applications and reducing the need for application specific voice hardware. VXML enables voice applications to be written in an industry standard language rather than to proprietary API's. The advantage being that application vendors will be able to more easily place their solutions on a variety of platforms, picking either those that are used by the Service Provider as well as those that perform best in the application developer's view. In addition, because VXML enables the use of standard IT development tools, the community of developers creating voice-enabled applications is growing significantly.

HP's OCMP supports this distributed voice services architecture discussed above, so that:

- A call can arrive on any port in an array of voice processing platforms.
- With the information provided by the call, the appropriate application is notified so that it can support the requirements needed by the caller.
- There can be many applications, from many different developers, available to support the call.
- Applications no longer run on the voice platform. Rather, they are on separate servers, which can be located anywhere, linking over an IP network to the voice platform via VXML.

Impact of Platform Size and Port Density on Total Cost of Ownership

When a Service Provider's goal is to create a business that requires tens of thousands of ports to support a user base of several million subscribers, the size of the platform makes a very big difference.

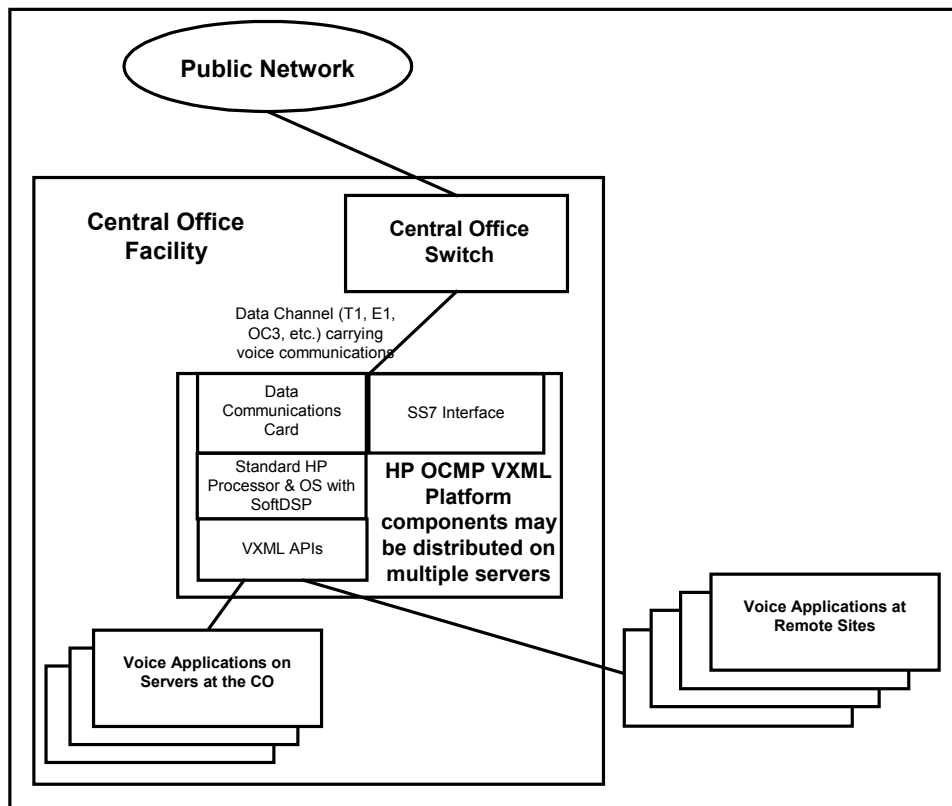
Impact of Port Size and Communications Density on interactive voice platforms

	HP OCMP	A Low End Solution	A Mid-Range Solution
Number of Ports	Up to 2,000 per Platform	24 Ports per Platform	96 Ports per Platform
Components to maintain	Typical standard multi-processor server components	Large number, including DSPs	Large number, including DSPs
Communications Links	High Speed DS3 or OC3, or E1/T1, supporting all ports with one link from the CO	T1 or E1	T1 or E1
Density	Very high, due to both high speed communications link	Low Density, requires many servers	Moderate Density
Rack-mounting	Can rack up to 5 Servers on 1 central office rack, up to 10,000 ports/rack depending on application	Depending on applications, between 14 and 48 servers per rack, or 336 to 1,152 ports/rack	Typically, about 14 Servers per rack, supporting up to 1,344 Ports

In addition to the sizing benefits available from a scalable platform, HP's OpenCall Media Platform meets the requirements of a true distributed voice architecture and is specifically designed for Service Providers. It does this by:

- Supporting VXML 2.0 interpreter enabling applications to run on separate servers, anywhere in the network, communicating with OCMP where calls are taken.
- Offering a SS7 signaling layer for carrier class "in-network" deployments
- Providing significant scalability and network connectivity options (T1/E1 to Sonet/SDH) and the ability to support over 1000 simultaneous calls on one platform.
- Supporting next generation architecture, enabling the user to distribute functions across a network
- Utilizing a N+1 architecture to provide no loss of call capacity on server failure and no single point of failure for any system element thereby enabling greater levels of service availability
- NEBs server option provides the rigorous flame-proof, earthquake-proof packaging and -48VDC power options that service providers require

An Example Configuration using the HP OCMP VXML Voice Services Platform



Appendix 4
Detailed Tables Describing the Service Provider's Business Plans used in this
White Paper

Baseline Service Provider Voice Services Business Unit Cash Budget: Mid-Range Voice Services Platform

Three-Year Quarterly Capital Budget

(\$000's)

Total Budget

	Q1FY03	Q2FY03	Q3FY03	Q4FY03	Year 1	Q1FY04	Q2FY04	Q3FY04	Q4FY04	Year 2	Q1FY05	Q2FY05	Q3FY05	Q4FY05	Year 3
Revenue	304	2,736	5,517	8,370	16,927	12,547	17,452	26,068	36,688	92,755	46,932	57,088	71,583	88,456	264,059
Bad Debt	3	27	55	84	169	125	175	261	367	928	469	571	716	885	2,641
Cost of Goods	38	342	684	1,025	2,088	1,517	2,085	3,078	4,282	10,962	5,414	6,511	8,072	9,864	29,861
Net Revenue	263	2,367	4,778	7,262	14,670	10,904	15,192	22,729	32,040	80,866	41,048	50,006	62,795	77,708	231,558
Employee Expenses															
Employee Comp	757	1,247	1,471	1,514	4,988	1,624	1,678	2,167	2,266	7,736	2,526	2,609	3,132	3,255	11,523
Empl Benefits & Taxes	284	475	560	575	1,893	616	636	825	861	2,938	957	987	1,188	1,232	4,363
Discretionary Empl Costs	50	84	51	50	234	60	56	94	73	283	93	82	121	103	398
TOTAL Empl Exp	1,091	1,806	2,081	2,139	7,116	2,301	2,370	3,086	3,201	10,958	3,576	3,678	4,441	4,589	16,285
External Labor Exp															
Temp Help/Contractors	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Consultants Fees	60	60	120	120	360	120	120	120	120	480	240	240	240	240	960
Outsourcing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	60	60	120	120	360	120	120	120	120	480	240	240	240	240	960
TOTAL LABOR EXP	1,151	1,866	2,201	2,259	7,476	2,421	2,490	3,206	3,321	11,438	3,816	3,918	4,681	4,829	17,245
Equipment/Software	615	874	910	1,115	3,514	1,676	2,187	3,065	4,084	11,012	5,309	6,256	7,654	9,197	28,415
Utilities	9	14	18	23	63	27	36	45	54	162	72	90	108	126	396
Telecom Services	4	6	8	9	27	9	10	11	12	43	14	14	16	17	61
Offices/Infrastructure	142	143	144	197	626	305	306	307	388	1,306	548	549	551	552	2,199
Marketing Exp	30	60	90	120	300	120	150	180	180	630	240	240	240	240	960
Travel/Entertainment	26	34	38	40	138	42	43	50	51	187	58	58	67	67	249
Misc. Exp	12	18	24	30	84	36	48	60	72	216	96	120	144	168	528
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GRAND TOTAL EXP	1,999	3,041	3,468	3,825	12,333	4,677	5,319	7,007	8,262	25,265	10,270	11,380	13,641	15,403	50,694
CONTRIBUTION	(1,736)	(674)	1,310	3,437	2,337	6,227	9,873	15,723	23,777	55,600	30,779	38,626	49,155	62,305	180,864

Baseline Service Provider Voice Services Platform Capital Budget: Mid-Range Voice Services Platform

Three-Year Quarterly Capital Budget

(\$000's)

Total Budget

	Q1FY03	Q2FY03	Q3FY03	Q4FY03	Year 1	Q1FY04	Q2FY04	Q3FY04	Q4FY04	Year 2	Q1FY05	Q2FY05	Q3FY05	Q4FY05	Year 3
Employee Expenses															
Employee Comp	72	77	84	91	324	100	111	130	154	495	175	197	228	264	865
Empl Benefits & Taxes	25	26	29	31	110	34	38	44	52	168	59	67	77	89	292
Discretionary Empl Costs	7	6	6	6	25	8	8	12	13	42	14	15	20	21	70
TOTAL Empl Exp	104	109	119	128	460	142	158	187	219	705	249	279	325	374	1,227
External Labor Exp															
Temp Help/Contractors	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Consultants Fees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Outsourcing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL LABOR EXP	104	109	119	128	460	142	158	187	219	705	249	279	325	374	1,227
Equipment/Software	76	297	593	879	1,844	1,293	1,781	2,610	3,628	9,312	4,575	5,516	6,850	8,384	25,325
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Telecom Services	1	1	1	1	4	1	1	2	2	6	2	2	3	3	10
Offices/Infrastructure	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Marketing Exp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Travel/Entertainment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Exp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GRAND TOTAL EXP	181	407	713	1,007	2,308	1,436	1,940	2,798	3,849	10,024	4,826	5,797	7,177	8,762	26,562

Baseline Service Provider Voice Services Business Unit Personnel Forecast: Mid-Range Voice Services Platform

Average Quarterly Headcount

Variable Headcount Based on Activity Demand

	Q1FY03	Q2FY03	Q3FY03	Q4FY03	Q1FY04	Q2FY04	Q3FY04	Q4FY04	Q1FY05	Q2FY05	Q3FY05	Q4FY05
Variable Personnel												
Inbound TeleSales	5.1	16.4	17.2	13.8	18.2	18.5	35.9	38.8	39.1	41.7	61.9	66.3
Customer Support	1.0	8.9	16.9	18.8	22.7	29.3	43.3	60.2	76.2	91.6	113.5	138.7
Supervisors	0.7	2.9	3.8	3.6	4.6	5.2	8.8	10.9	12.5	14.4	19.1	22.2
Technical Support	0.1	1.0	1.9	2.1	2.5	3.3	4.8	6.7	8.5	10.3	12.7	15.5
Total Variable Personnel	7.0	29.3	39.8	38.3	48.1	56.3	92.9	116.6	136.3	157.9	207.3	242.7
Fixed Personnel												
Management Group	5.0	5.0	5.0	5.0	5.0	5.0	6.0	6.3	7.0	7.0	8.0	8.0
Marketing	3.0	7.0	9.7	12.0	14.0	15.0	15.0	15.0	18.0	18.0	21.0	21.0
MIS	7.0	13.0	15.0	15.0	15.0	15.0	20.0	20.0	22.0	22.0	25.0	25.0
Finance	7.0	13.0	15.0	15.0	15.0	15.0	20.0	20.0	22.0	22.0	25.0	25.0
Admin	3.0	4.7	6.0	6.0	6.0	6.0	8.0	8.0	8.7	9.0	10.0	10.0
Total Fixed Personnel	25.0	42.7	50.7	53.0	55.0	56.0	69.0	69.3	77.7	78.0	89.0	89.0
System Operations Personnel	4.0	5.7	9.3	9.9	10.6	11.6	13.6	15.9	18.0	19.9	22.8	26.1
TOTAL Personnel	36	78	100	101	114	124	175	202	232	256	319	358

Scenario Service Provider Voice Services Business Unit Cash Budget Forecast: HP OCMP Platform, leading to Increased Users, longer Customer Life Cycles and Increased Revenues per User

Three-Year Quarterly Capital Budget

(\$000's)

Total Budget

	Q1FY03	Q2FY03	Q3FY03	Q4FY03	Year 1	Q1FY04	Q2FY04	Q3FY04	Q4FY04	Year 2	Q1FY05	Q2FY05	Q3FY05	Q4FY05	Year 3
Revenue	304	2,736	5,568	8,560	17,168	12,999	18,316	27,700	39,473	98,489	51,155	63,054	80,050	100,149	294,408
Bad Debt	3	27	56	86	172	130	183	277	395	985	512	631	801	1,001	2,944
Cost of Goods	38	342	684	1,027	2,091	1,522	2,096	3,099	4,320	11,037	5,479	6,612	8,222	10,079	30,392
Net Revenue	263	2,367	4,829	7,448	14,906	11,347	16,037	24,324	34,759	86,467	45,164	55,811	71,028	89,068	261,071
Employee Expenses															
Employee Comp	736	1,222	1,441	1,480	4,879	1,583	1,629	2,104	2,186	7,501	2,430	2,497	2,998	3,095	11,020
Empl Benefits & Taxes	277	467	549	563	1,856	602	619	804	833	2,859	925	949	1,142	1,178	4,194
Discretionary Empl Costs	49	82	48	47	225	56	51	86	65	259	84	72	109	88	353
TOTAL Empl Exp	1,062	1,770	2,038	2,089	6,959	2,241	2,299	2,994	3,084	10,618	3,439	3,518	4,250	4,360	15,568
External Labor Exp															
Temp Help/Contractors	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Consultants Fees	60	60	120	120	360	120	120	120	120	480	240	240	240	240	960
Outsourcing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	60	60	120	120	360	120	120	120	120	480	240	240	240	240	960
TOTAL LABOR EXP	1,122	1,830	2,158	2,209	7,319	2,361	2,419	3,114	3,204	11,098	3,679	3,758	4,490	4,600	16,528
Equipment/Software	778	887	820	965	3,450	1,472	1,853	2,507	3,268	9,100	4,362	5,038	6,244	7,371	23,016
Utilities	9	14	18	23	63	27	36	45	54	162	72	90	108	126	396
Telecom Services	4	6	8	8	26	9	9	11	11	40	13	13	15	15	56
Offices/Infrastructure	140	141	142	195	618	302	302	304	384	1,291	545	546	548	549	2,188
Marketing Exp	30	60	90	120	300	120	150	180	180	630	240	240	240	240	960
Travel/Entertainment	26	34	38	40	138	42	43	50	51	187	58	58	67	67	249
Misc. Exp	12	18	24	30	84	36	48	60	72	216	96	120	144	168	528
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GRAND TOTAL EXP	2,131	3,017	3,332	3,623	12,103	4,409	4,910	6,352	7,326	22,998	9,183	10,000	12,036	13,349	44,568
CONTRIBUTION	(1,868)	(650)	1,497	3,825	2,803	6,937	11,127	17,972	27,433	63,469	35,982	45,811	58,992	75,719	216,504

Scenario Service Provider Voice Services Business Unit: HP OCMP Platform Capital Budget, including Operations Personnel

Three-Year Quarterly Capital Budget

(\$000's)

Total Budget

	Q1FY03	Q2FY03	Q3FY03	Q4FY03	Year 1	Q1FY04	Q2FY04	Q3FY04	Q4FY04	Year 2	Q1FY05	Q2FY05	Q3FY05	Q4FY05	Year 3
Employee Expenses															
Employee Comp	52	53	55	57	217	60	63	68	75	267	82	87	97	106	372
Empl Benefits & Taxes	18	18	19	19	74	20	21	23	25	90	28	30	33	36	125
Discretionary Empl Costs	6	3	3	4	16	4	4	5	5	18	6	6	8	7	26
TOTAL Empl Exp	76	74	77	80	307	84	89	97	105	375	115	123	137	148	523
External Labor Exp															
Temp Help/Contractors	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Consultants Fees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Outsourcing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL LABOR EXP	76	74	77	80	307	84	89	97	105	375	115	123	137	148	523
Equipment/Software	240	310	502	729	1,781	1,090	1,450	2,053	2,813	7,406	3,630	4,301	5,445	6,560	19,936
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Telecom Services	1	1	1	1	3	1	1	1	1	3	1	1	1	1	4
Offices/Infrastructure	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Marketing Exp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Travel/Entertainment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Exp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GRAND TOTAL EXP	317	385	580	809	2,091	1,175	1,539	2,150	2,920	7,784	3,746	4,425	5,583	6,709	20,464

Scenario Service Provider Voice Services Business Unit Personnel Forecast: HP OCMP Platform with Extended Customer Life Cycles and Increased Revenues per Customer

Average Quarterly Headcount

Variable Headcount Based on Activity Demand

	Q1FY03	Q2FY03	Q3FY03	Q4FY03	Q1FY04	Q2FY04	Q3FY04	Q4FY04	Q1FY05	Q2FY05	Q3FY05	Q4FY05
Variable Personnel												
Inbound TeleSales	5.1	16.4	17.2	13.8	18.2	18.5	35.9	38.8	39.1	41.7	61.9	66.3
Customer Support	1.0	8.9	16.9	18.8	22.8	29.5	43.6	60.8	77.1	93.0	115.6	141.8
Supervisors	0.7	2.9	3.8	3.6	4.6	5.3	8.8	10.9	12.6	14.5	19.3	22.5
Technical Support	0.1	1.0	1.9	2.1	2.6	3.3	4.9	6.8	8.6	10.4	13.0	15.9
Total Variable Personnel	7.0	29.3	39.9	38.4	48.2	56.5	93.2	117.3	137.4	159.7	209.8	246.4
Fixed Personnel												
Management Group	5.0	5.0	5.0	5.0	5.0	5.0	6.0	6.3	7.0	7.0	8.0	8.0
Marketing	3.0	7.0	9.7	12.0	14.0	15.0	15.0	15.0	18.0	18.0	21.0	21.0
MIS	7.0	13.0	15.0	15.0	15.0	15.0	20.0	20.0	22.0	22.0	25.0	25.0
Finance	7.0	13.0	15.0	15.0	15.0	15.0	20.0	20.0	22.0	22.0	25.0	25.0
Admin	3.0	4.7	6.0	6.0	6.0	6.0	8.0	8.0	8.7	9.0	10.0	10.0
Total Fixed Personnel	25.0	42.7	50.7	53.0	55.0	56.0	69.0	69.3	77.7	78.0	89.0	89.0
System Operations Personnel	3.0	4.5	7.9	8.3	8.7	9.4	10.8	12.4	13.7	14.9	16.9	19.2
TOTAL Personnel	35	76	98	100	112	122	173	199	229	253	316	355