

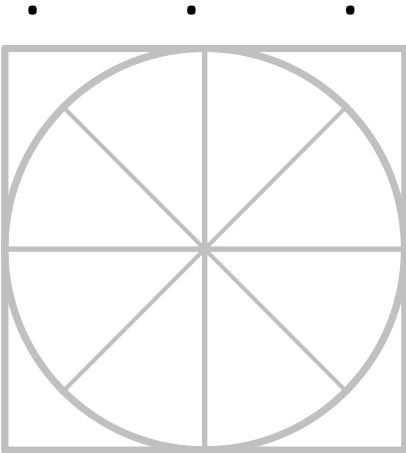
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Why HD Voice?

“The game-changer for Network Operators”



A whitepaper by The Radicati Group, Inc.

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INTRODUCTION

A great deal has been written about Fixed Mobile Convergence (FMC) and the opportunities it provides network operators while also delivering benefits and cost savings to customers. To date, however, there is still little to show in terms of successful FMC offerings that have truly lived up to the expectations of both network providers and their customers. True, in the Internet broadband market operators are bundling together voice, Internet and video services but most of this is really a packaging and pricing exercise rather than a true convergence of technologies for the delivery of enhanced services.

The mobile carrier market is even further behind in terms of embracing FMC models. Little or nothing is being offered in terms of converged voice, data and video technology in order to leapfrog current PSTN or GSM technologies and provide real benefits. In the case of voice in particular, the true opportunity of VoIP has been missed by most operators since most of the services available today offer worse call quality than traditional PSTN voice lines; especially digital systems like those prevalent in Europe. This makes VoIP services difficult to use effectively in many situations. For instance, try speaking to an automated call center through a VoIP connection most likely the voice quality will be so poor that most of your voice commands will be unrecognized. Yet, powerful HD Voice technology is available today at accessible price points that network operators can turn into a significant value-add, and customer retention proposition.

In particular, mobile operators are missing significant revenue opportunities in the SMB market where workers “on the move” need increasingly reliable high-fidelity voice quality to interact more freely with other users and automated systems. It is estimated that the worldwide SMB market for VoIP services will reach \$10.4 billion by 2014¹. Most of this revenue potential, however, will be directly dependent on how well integrated and easy to use various media will be, and to what extent it will deliver quality features not previously available to SMBs at accessible price points.

This whitepaper provides an overview of the HD Voice capabilities provided by CommuniGate Systems’ MobileOffice platform, and how these technologies can bridge both the mobile and fixed IP networks that are commonplace in users’ lives today. MobileOffice provides an easy to

¹ Radicati Group VoIP Estimate 2005-2014

deploy FMC solution for network operators, that enhances the productivity of mobile workers regardless of whether they are connecting from a wireless laptop, office computer, IP phone or a mobile phone. It enables network operators to deliver true FMC solutions combining voice, video and data features to SMBs at attractive price points, in an easy to use interface. The IP networks, both Fixed and Mobile are ready, as we speak, to embrace not just HD Voice, but a wide array of IP services, such as Unified Communications and much more.

1.0 THE IMPORTANCE OF VOICE QUALITY

As Internet communication has gained popularity in the last decade so has the idea of Voice over IP (VoIP). The total worldwide market for VoIP services is estimated to top \$103 billion by 2014². It stands to reason that since Internet broadband connectivity is readily available and quite inexpensive, it can be used for all forms of communication ranging from simple low-bandwidth text communication to sophisticated high-bandwidth real-time multi-media comprising voice and video. In the case of voice communication, VoIP also presents the added advantage of significantly lower cost than traditional wireline voice telephony. This has led to the proliferation of VoIP solutions, such as Skype, Vonage and many others, which deliver low-cost voice communication to consumers and businesses.

Unfortunately, however, the main focus of VoIP to date has been cost reduction rather than quality. In fact, the prevalent attitude that has been promoted to customers has been that of accepting “good enough” voice quality because it’s so “cheap”. So ironically, while the communication bandwidth used for VoIP is far greater than that used by traditional wireline communication, the quality of VoIP calls has dropped significantly compared to wireline calls. This has led many users to back away from VoIP, or at best use it only in situations where the voice quality does not really matter (e.g. with friends and family), and revert back to traditional wireline telephony when voice quality really does matter.

So why does voice quality matter? Well a lot of reasons really:

- i. In a world where we have many forms of communication available to us (such as email, Instant Messaging, Social Networks, etc.) we use voice increasingly when we want to convey more feeling, nuances and emotions in our interactions than is possible with other forms of communication. That is when we turn to voice, as it helps us more clearly

² Radicati Group VoIP Estimate 2005-2014

- express our meaning in real time, as well as discuss and resolve complex situations. Voice quality matters in these cases, as garbled phrases or missed syllables can often mean the difference between a successful conversation outcome and a disaster.
- ii. Comprehension of speakers with regional accents or non-native speakers can be particularly affected by low voice quality, which can result in misunderstandings or lost opportunities. Multi-cultural & Multinational teams are commonplace today, and are particularly affected since the use of grammar, pronunciation and word selection may diverge considerably from what the listener expects making the need for high voice fidelity even more critical. For instance, in English consonants such as “t”, “s”, and “f” are commonly misunderstood, as well as “c” and “z”. Also, for example, a Farsi speaker of English may commonly insert extra syllables, so that “store” becomes “istore” or “sitore”. While voice fidelity does not eliminate such pronunciation differences, it does ensure that both the speaker and listener have a natural conversation experience with no additional sound distortion due to the underlying voice equipment.
 - iii. The use of high-fidelity HD Voice is also valuable in text to speech applications where the rendered speech may sometimes be difficult to understand by the software with traditional voice quality (PSTN) or worse, compressed low quality VoIP.
 - iv. Increasingly, automated call centers that rely on speech recognition technology are being deployed in all walks of life to streamline the customer experience and significantly reduce call center costs. It is estimated that calls processed by an automated voice portal costs on average \$0.30 to \$0.50 per call, while the same call processed by a live operator will cost \$5.00 to \$7.00 per call. Yet it is often very difficult to communicate effectively with call centers via much of today’s low-quality VoIP technology.
 - v. Workers today rely increasingly on web conferencing as a way to save costs and increase productivity. HD Voice vastly improves the ability to identify a speaker by their voice (i.e. "speaker identity") in conference calls.
 - vi. Lastly, the younger generation has grown up with a keen sense of good sound quality from high-fidelity sound and video equipment and finds it increasingly difficult to revert back to broken sounds and disrupted conversations when using VoIP.

So yes, voice quality matters more than ever. Consumers and business users alike will only embrace VoIP if the voice quality of the conversation is high-fidelity and reliable, allowing them to have an effective voice communication experience.

This is where HD Voice comes in. Despite the low voice quality expectations set by many VoIP providers, it is actually possible today to achieve very high quality voice communication over the Internet, on dedicated IP networks, such as MPLS, and low latency Mobile networks leveraging HSPA or 4G/LTE. Standards such as ITU G.722 for wideband speech codecs, deliver 7kHz of bandwidth for IP-based communications. This is double the bandwidth provided by today's traditional PSTN networks which operate at 3.3kHz bandwidth and are considered "tool quality" voice. The extra bandwidth provided by G.722 codecs translates into two times the amount of speech data that can be captured and conveyed in HD Voice calls versus a traditional TDM voice call, and translates into much clearer and reliable voice quality. G.722 is only the beginning of what can be achieved with Internet voice as bandwidth increases and costs decrease, voice quality technology will increasingly improve to offer a completely natural and realistic communication experience.

Key VoIP telephone equipment vendors, such as Polycom, SNOM, Aastra and many others, are increasingly incorporating HD codec technology in their products in an effort to remain competitive and provide an extra incentive for customers to migrate to VoIP technology.

Benefit Summary	HD Voice
Comfortable, natural sounding voice interaction.	✓
Preserves sound quality for non-native speakers.	✓
Clear, successful interaction with automated call centers and voice portals.	✓
Successful interaction with automated machine and instrument interfaces.	✓
Increased customer satisfaction for new generation customers used to high-fidelity sound quality.	✓

Table 1: Benefits of HD Voice

2.0 CHANGING VOICE USAGE MODELS AND USER DEMOGRAPHICS

Voice communication is changing rapidly as more and more people move away from POTS (Plain Old Telephone Service) to IP-based telephony. AT&T, for instance, is estimated to have lost an average of 1.5 million landlines per quarter in 2009 as customers move to more feature-rich services such as wireless, or broadband services. This shift is occurring worldwide and not only in the US, it is estimated that landline losses over the next four years will cripple the traditional telephone operators while bringing a bonanza of new business activity to wireless operators and all types of IP-based telephony services.

For the purposes of this paper we are looking at FMC as the bridge of two “HD capable” networks; the mobile and the Broadband IP Network (Internet) delivered through fixed connections such as Cable, ADSL, Fiber, or otherwise a dedicated fixed link. However, it is our belief that the Mobile network, especially with 4G/LTE will also become another fully IP based Network itself, intimately connected to the internet, and thus propelling the collapse of the Legacy “Fixed Network” or PSTN. It is worth noting the PSTN has no realistic possibility for evolution to HD Voice, both technically and economically. Both the current mobile network based largely (globally) on GSM/3G and soon 4G, LTE, and the Broadband fixed networks hold the only viable potential for HD Voice and true FMC.

For end-users, IP telephony allows the use of various end-point devices. This includes IP desktop phones, Wi-Fi phones, softphones, and mobile phones. In particular softphones, in other words, software that sits on the end-user computing device and allows to make and receive calls, as well as manage calls and contacts, are quickly growing in popularity. Softphones support increased functionality on the end-user side as they provide a simple graphical interface for accessing a contact list or directory, as well as the ability to integrate IP telephony with email clients, instant messaging, social networking and a range of other collaboration capabilities.

Key growth drivers for IP telephony in the corporate market include reduced operational costs and increased productivity:

- Reduced costs for companies that deploy IP telephony come from cost savings related to routing of calls over the IP network, rather than the PSTN. Long distance calls between branch offices are much more cost effective through VoIP telephony. Consolidation of the administration of two separate departments, often the “IT Department” and the “Facilities Department” have responsibilities over the two networks, IP and Telephonic.

- Increased productivity stems from the ability of telecommuters and mobile employees to more easily keep in contact. Corporate IP telephony allows these users to extend their telephony network to their home phone as well as their mobile phone. Corporate gains in productivity also come from the various applications available for IP telephony, such as IVR, contact center integration, unified communications and more.

Also, more and more workers today are no longer tethered to a desk in an office but rather work “on the go” from home, cars, trains, cafes’, etc. Increasingly these workers are using their computer devices including netbooks and tablet devices, not just PCs, as a telephone. Whether they are using their telephony for work or personal use they want high quality voice functionality that “moves” with them and is readily accessible wherever they are in a way that integrates fully with the rest of their communication experience across different devices and different media.

The SOHO and SMB market, in particular, is made up of mobile workers who need quick access to the high-fidelity that HD Voice provides from a broad range of computing devices and mobile phones while on the go and as they switch between their work and their personal lives. Table 2, below, shows the demand growth for VoIP services in the SMB market worldwide from 2009 through 2014.

Worldwide VoIP Revenue Forecast 2009-2014						
	2009	2010	2011	2012	2013	2014
SMB sector revenue (\$B)	1.0	1.6	2.5	4.1	6.5	10.4

Table 2: SMB VoIP Revenue Forecast

3.0 THE HD VOICE OPPORTUNITY FOR NETWORK PROVIDERS

Network operators have a great deal to gain by providing their customers with HD Voice technology. In particular, business customers are clamoring for low cost voice solutions that can be readily adopted in their businesses with minimal impact and greater automation potential. HD Voice offers just that, it allows customers to leverage the full power of the Internet to achieve a more productive business environment.

Softphones also allow a user to have a phone wherever they are. Users can install one at home, on their laptop, on their work desktop, and they can take it with them when they travel and make

calls “as if” they were at home, but might be 5,000 miles away. While softphones are not yet replacing desktop phone technology, it is estimated that 16% of business professionals use softphones as part of their daily activity³.

Skype, for instance, is now a leading international VoIP provider widely in use among business professionals “on the go”. While international telephone traffic is increasing at a modest pace, Skype's international traffic has soared: TeleGeography, a leading Telecommunications analyst firm, estimates that Skype's cross-border traffic grew approximately 41% in 2008, to 33 billion minutes - equivalent to 8% of combined international telephone plus Skype traffic. Skype has emerged as the largest provider of cross-border voice communications in the world⁴.

Whilst the usage patterns and growth of “Skype like” public domain services are mainly driven by “toll evasion” the business services market for VoIP has massive potential. Web to Mobile Audio Conferencing, virtualized contact center, single number or simultaneous ring across home, office, and mobile phones, offer new values to telephony with IP technology. Clearly, the growing popularity of softphone technology drives an increased need for high-fidelity HD Voice quality, which the operator can brand, and monetize. All of these services are ripe for delivery in the SaaS or Centrex models, especially for the SMB sector that often times has zero IT administration resources on site.

Businesses, particularly SMBs, are also increasingly deploying web conferencing as a low-cost way of holding meetings and cut down on travel expenses. More and more business, today, is conducted via inexpensive web conferencing technology that combines voice, video and screen sharing as a way to communicate across geographically dispersed work teams, as well as with customers, partners and suppliers. Based on our research, business users spent an average of 9% of their workday using web conferencing software in 2009⁵. This represents a significant amount of time and clearly is another strong driver for high-fidelity HD Voice technology.

As the use of voice in the workplace evolves, network operators should look at the opportunity HD Voice provides for several reasons:

Differentiation of services – Most HD Voice offerings to date have been targeted mainly at the high-end of the market at fairly hefty price points under the guise of sophisticated conferencing solutions. However, HD Voice codec technology can be added to mainstream voice and data

³ Radicati Group – “Business User Survey, 2009”

⁴ TeleGeography – CommsUpdate 19 January, 2010

⁵ Radicati Group – “Business User Survey, 2009”

services to provide a unique experience to mobile workers irrespective of whether they access the service from their laptops or from their mobile devices.

Customer growth and retention – Operators are struggling with customer growth and retention in a mobile market where most services are differentiated primarily by price rather than by features. By adding HD Voice as a native value-added application to their services mobile operators can easily show some clear differentiation and attract SMB customers that are looking for leading edge services at affordable prices.

More effective network utilization – HD Voice provides an application, which drives usage of network services and stimulates customers to make greater use of voice capabilities, such as HD enabled audio conferencing. By making natural-sounding voice quality a basic part of their offering, mobile operators provide more reasons to use their network for business-critical conversations vs. fixed line services.

Greater customer satisfaction – By providing high-quality HD Voice services at an affordable price point, mobile operators also ensure greater customer satisfaction, which in turns means customers will be less likely to switch to alternative services merely on the basis of price.

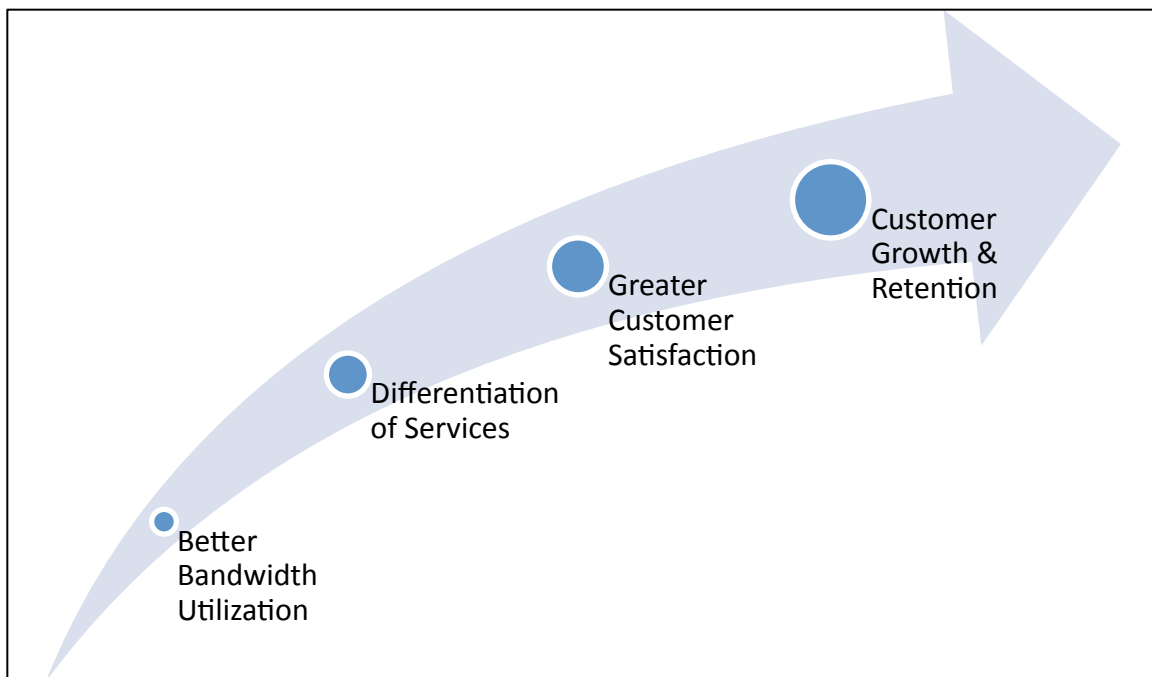


Figure 1: The HD Voice Opportunity for Network Providers

4.0 COMMUNIGATE SYSTEMS' HD VOICE OFFERING

CommuniGate Systems' MobileOffice is designed to help network operators truly harness the FMC opportunity. MobileOffice is a powerhouse suite of applications designed for the ever-so sought after SOHO and SMB sector that everyone talks about. Unlike the "scale-down" approach of the many "Enterprise solutions" that were never designed to be a hosted platform nor designed to be delivered to the SOHO, Micro or SMB environments, MobileOffice is designed to "scale-up", supporting businesses from as small as one user, and up. MobileOffice is a two-fold offering, by first providing a BlackBerry-like solution, which allows operators to deliver a rich business-class email experience to SMBs at affordable prices. MobileOffice enables SMB users with access to email, instant messaging, and groupware functionality, such as shared calendars and address books, from their mobile device in an easy to use model similar to RIM's popular Blackberry device.

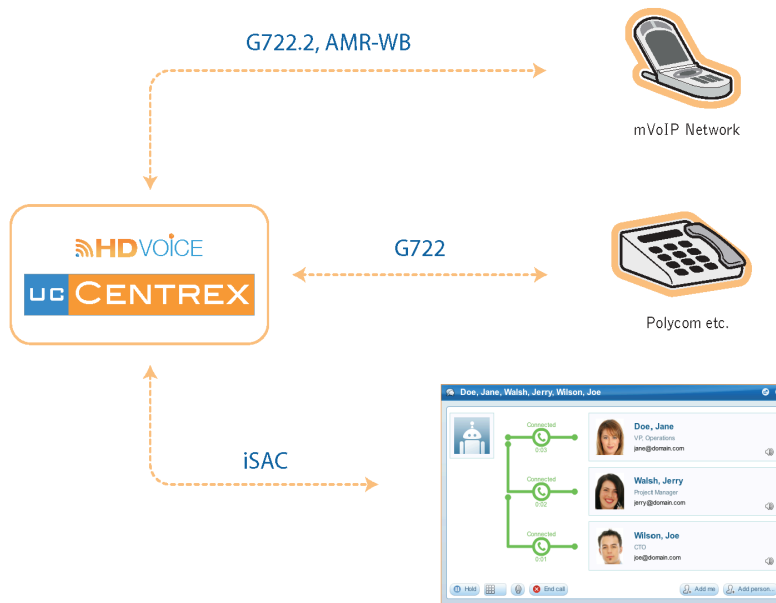
Secondly, MobileOffice includes an Adobe Flash-based desktop client called Pronto!, which can run on any laptop, or netbook device and seamlessly brings together powerful features such as HD Voice, conferencing, shared folders, media management, social media, instant messaging and presence, email and much more. By pre-installing Pronto! on operator-branded wireless-enabled devices (ranging from laptops, to netbooks) network operators can offer an FMC package that is simple to sell and use by providing a set of truly compelling features to SMB customers.

MobileOffice delivers the following HD Voice features for business subscribers:

- *Native, built-in HD Voice capabilities* which allow for truly natural sounding voice quality irrespective of whether the user is speaking through a laptop, desktop or a netbook device.
- *On the Fly HD Audio conferencing* with up to 256 participants; including drag and drop capabilities for a "Skype like" usability experience, but with business grade HD Voice quality.
- *Voice recording* for archival compliance.
- *Voicemail to inbox.*
- *Compatibility with desktop and mobile.*

Support for the latest HD Codec Technologies:

Pronto! supports several HD Voice technologies to ensure the best performance with maximum compatibility. Let’s look at the three areas of technology and potential usage models as:



Scenario 1 - Peer to Peer softclient using CommuniGate Pronto! – In this model, all users are connected using the same client. The advantage here is that Pronto! can select an optimal codec. Pronto! uses iSAC, an adaptive VoIP codec, from Global IP Solutions, a specialist in HD technology and part of their MediaWare™ voice processing software suite. iSAC performs as a VBR (Variable Bit Rate) engine, meaning it changes its bandwidth usage on the fly automatically adjusting transmission rates from a low of 10 kbps to a maximum of 32kbps, which is great for softphones like Pronto! which might be used over unreliable network conditions such as WiFi in hotels or airports, or areas of poor 3G/HSPA coverage. iSAC can perform HD quality at the same bitrates as the G729 codec, so, it can be used in regions where bandwidth is tight, such as North Africa.

Scenario 2 - Pronto! softclient + IP Phones – these situations are where an softclient is used, such as Pronto! with maybe one or more Polycom phones at the office. The most widely adopted HD Voice codec in IP Phones is G.722 and Pronto! will “negotiate” to use this codec as required.

G722 provides excellent voice quality, however, is generally not going to provide a lot of the “techniques” iSAC delivers in adverse conditions.

Scenario 3 – Pronto! softclient + Mobile HD Voice (mVoIP, IMS and VoLTE)– While still nascent today, Pronto! also supports the specification for Mobile HD Voice. This codec is “G722.2” a.k.a. AMR-WB (Adaptive Multi-Rate WideBand). So, if a user is using Pronto! on their laptop and they call somebody on a Mobile Network they will want that conversation to be in HD Voice too. In order for all this to work, Pronto! will “adapt and negotiate” to use the AMR-WB codec.

Additional Benefits & Features of CommuniGate Systems’ MobileOffice:

HD Voice support at a fraction of the cost of SIP platform vendors – ideal for mobile operators, Pronto! is able to communicate with the latest handsets that support advanced HD Voice codec technology, at 1/5th the price and 3x the performance typically provided by SIP application platform vendors.

Push email, calendar and contacts for all business class smartphones – “Push Email” is a defacto requirement in today’s business world for mobile communications. MobileOffice allows subscribers to aggregate emails from various accounts (both business and personal), check, share, and update calendar schedules on the go, plus access and modify contact information as though they were sitting at their desktop computer.

Protection in case of device loss – MobileOffice stores a complete up-to-date copy of all device contact and calendar information, which inherently provides an excellent backup solution in case a device is lost or stolen. MobileOffice has powerful security features such as remote wipe and PIN code enforcement.

Zero-installation, platform agnostic desktop client – the hosted MobileOffice product also provides the Flash based desktop client, Pronto! Being Flash based it requires no software installation and can be up and running in seconds on any platform, be it Mac, PC, or Linux.

Group scheduling and contact lists – MobileOffice can easily connect with a external calendar by subscribing to it or the user can publish their calendar to other users using products like Apple iCal, IBM Lotus Notes or Microsoft Exchange Server. MobileOffice allows the user to define personal address books and subscribe to Global Address lists. This is an especially important

function for most business professionals as contacts and scheduling are totally intertwined with email activity on the go.

Business grade instant messaging – MobileOffice also provides, secure, business-grade Instant Messaging, which offers a more reliable alternative to the myriad of consumer-oriented Instant Messaging solutions that are not always secure or reliable. IM conversations can be archived for compliancy requirements. Federation is possible with GTalk, Exchange with XMPP services enabled, and other compliant XMPP or SIP/Simple servers and services.

Shared folders & eDisc – MobileOffice provides the ability for subscribers to store and share information easily with co-workers. Sharing is done with simple Access Control Lists and secure links which are lightweight and can be quickly emailed or sent by SMS. eDisc is a powerful way to create a special account, for example “FileServer”, whereby the shares become a “virtual storage disc” which can be “mounted” on the desktop of any Mac, Windows or Linux computer.

Remote security and remote lock-down/device wipe – security is clearly a top concern where any business device is concerned. As a hosted service where all controls are managed directly by the network operators, it is easy to assure subscribers that if their devices are lost or stolen, a quick phone call to their network operator will immediately lock-down or wipe out the device information. This is increasingly important for all professionals on the go, who tend to store much of their business-critical information on their mobile devices.

Customer self-care and administration interfaces – MobileOffice provides an easy to use administration interface for the end customer to manage their virtualized instance or domain. Simple tasks like adding accounts, managing features like disc space, or checking usage, can be performed by the customer reducing support impacts on the call center of the operator.

Open API support for 3rd party application development – MobileOffice also comes with open APIs, which facilitate the integration with 3rd party applications and allows network operators to leverage both existing and new applications to further drive added value.

4.1 CommuniGate Systems, the Company

Founded in 1991 CommuniGate Systems is headquartered in Mill Valley, California. The company develops carrier-grade unified communications software for broadband and mobile network operators to deliver value-added services as SaaS, or Cloud-based services to business

subscribers.

Over 150 million users across 12,000 companies around the world put their trust in CommuniGate Systems every day, with customers ranging from the largest broadband, wireless and wire-line service providers, to enterprises of all sizes.

CommuniGate Systems is a global company with subsidiaries, regional offices and research facilities located in Germany, Russia, Singapore, Taiwan, Japan and Latin America.

CommuniGate Systems' core technology platform, CommuniGate Pro™, is a highly scalable Unified Communication platform for on-premises and hosted SaaS deployments. Providing IMS core, backplane, and application server capabilities, the ultra-efficient technology powers the company's products, MobileOffice™, UC Centrex™, VoicePlus™ and MessagePlus™.

The use of CommuniGate Systems' hosted platform offers mobile operators:

- A mature technology relied on by over 150 million users across 12,000+ companies worldwide.
- A Hosted, ASP solution with simplified in-house migration options.
- Carrier-grade 99.999% availability.
- World-record holder for scalability.
- Proven IMS compatibility and unparalleled performance at 25 million subscribers.
- Highly Efficient, high-density server technology delivering maximum profitability.

5.0 CONCLUSIONS AND RECOMMENDATIONS

CommuniGate Systems' MobileOffice offers HD Voice capabilities at an affordable price point that truly brings the power of innovation and all the benefits of FMC to the SMB subscriber. Whether a user is working from home, or from a taxicab, or in a busy airport they will have easy access to people, and business information at unprecedented level of voice quality with just the click of a mouse.

This creates an exciting new business opportunity for network operators by enabling them to finally offer a distinct FMC service that truly captures the need of the SMB worker on the move. It also provides some excellent leverage in retaining customers and a valuable platform upon which to promote additional value-added services in the future.

The key for network operators, in leveraging CommuniGate Systems's MobileOffice, will be to target the growing SMB sector of professional users, which want access to robust business-quality communication services without sacrificing their choice of mobile device or lifestyle, as they move from home, office, or traveling situations.