White Paper

Open Source Telephony:

The Evolving Role of Hardware as a Key Enabler of Open Source Telephony in the Business Market

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**IP COMMUNICATIONS
RESEARCH & ANALYSIS**

July 2006

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Introduction

The business telephony market is undergoing radical transformation due to the advent of disruptive technologies such as Internet Protocol and open source software. Traditional PBX systems have dominated the enterprise market, while Key systems have been the primary solution for small and medium sized businesses. IP-based alternatives are now gaining acceptance, and open source-based telephony solutions are opening up new markets for the functionality that previously required an expensive PBX system.

Open source telephony solutions are largely software-based but require a hardware component for PSTN connectivity. This White Paper addresses the drivers behind open source telephony and how open source solutions are evolving. There is a continuing trend for telephony functions to be software-based, but for now, functions such as PSTN connectivity will be hardware-based. Sangoma Technologies is one such vendor, and this White Paper focuses on its products and how it is enabling open source telephony for businesses of all sizes.

Why Enterprises Are Migrating From TDM to IP

In the enterprise and small business market, telephony has long been the domain of equipment vendors, primarily for PBX or Key systems. Reliability has been the hallmark of these systems, and businesses have come to rely on them for their voice connections to the outside world, one of their most mission-critical functions. In the TDM world, voice was a dedicated service, and telephony systems were built around this one application. Until recently, phone systems were not integrated with data networks, and there were no alternatives to TDM for voice.

While these conditions have given rise to telephony systems that work very well for their intended purpose, businesses have paid a high price. Aside from being costly, these systems were proprietary and closed. Each vendor had their own technology and competing systems were not compatible with each other. Vendors retained full control, leaving customers totally dependent on them for fixes, enhancements and upgrades. In short, acquisition costs were high, support was expensive and hard to find, and feature sets were fixed.

The advent of IP (Internet Protocol) has changed the business telephony market on many levels. First and foremost, it offered an alternative to TDM for voice, and with it, IP-based solutions for telephony systems. One of the reasons large enterprises are drawn to IP telephony is the potential efficiency gained from combining the voice and data functions in an organization. All businesses – both large and small – recognize the economic benefits of IP telephony, especially in areas such as toll bypass, reduced trunking costs and eliminating MAC costs – moves, adds and changes.

By nature, IP is flexible, and has enabled the development of a wide variety of innovative telephony solutions that are gaining acceptance among businesses. It is now possible for businesses to have the richness of a PBX feature set without paying PBX prices. Legacy vendors have introduced less costly IP PBX systems to help their installed base migrate to IP, as well as bring PBX functionality to a new set of customers they could not previously reach with a TDM-based PBX.

Similarly, service providers are now offering IP Centrex as a way for traditional Centrex customers to get more for less. Carriers are also offering IP Centrex on a hosted basis to smaller businesses that could not justify a full PBX system. Getting more features and performance at a lower cost is attractive for any business, and these developments indicate that IP technology has matured to the point where the days of the traditional PBX are now numbered.

The Rise of Open Source Telephony

Most IP-based solutions have been targeted at the PBX market for a number of reasons. The installed base is quite large, and these enterprises have been accustomed to investing significant capital in high performance telephony systems. Eventually, TDM PBX deployments will transition to IP, but this process is expected to take several years.

The enterprise PBX market is substantial, especially in terms of the revenue opportunity for PBX vendors. However, there is another substantial portion of the business telephony market that does not use PBX systems. For these businesses the capital investment is not justified, and less expensive TDM-based systems can provide the functionality they need. IP-based alternatives exist for this market, but both vendors and carriers have yet to develop strong channels to educate and support these businesses with IP.

These conditions set the stage for open source telephony. Over the past two years, open source software has gained considerable acceptance throughout the enterprise environment and more recently has been applied to telephony. The inherent appeal of open source is lower cost, and with the advent of PC-based PBX solutions, the addressable market opportunity is substantial. There are millions of small businesses that cannot afford a PBX but would certainly desire its feature set.

Open source telephony is largely software-based, and is by nature less costly than hardware-based PBX systems. Aside from cost, however, there are several other factors that make open source attractive for business telephony. These are summarized in Table 1 below.

Table 1

Key Features Making Open Source Telephony Attractive to Businesses

Feature	Benefit for Businesses
Lower costs	Larger businesses can replicate their TDM PBX features at a fraction of the cost, while smaller businesses can have the same look and feel as larger businesses at a price they can afford.
PBX-type feature set	By their nature, open source PBX solutions include features added as required by users worldwide. The feature set is much richer than any closed system.
Flexibility	Open source PBX solutions can adapt and integrate with almost any existing telecom infrastructure, whether it be directories, dial plans, billing, etc.
Open system	End users can customize almost any aspect of their telephony software. This allows them to add features or modify existing features where and when they like. Open source puts control in the hands of the customer.
Scalability	Open source telephony systems can be easily and economically expanded. No costly network hardware upgrades are required.

Open source telephony solutions have two primary components – software and hardware. The most widely deployed software platform is Asterisk, and is the most strongly associated with PC-based telephony solutions for business. In addition to Asterisk, SIPX, FreeSwitch and Yate are notable open source telephony software platforms.

As the open source community has become more focused on the telecom market, these solutions have become more complete in their ability to meet the needs of businesses on many fronts:

- Feature support – voice mail, fax, conferencing, etc.

- Operating system support – Linux, Windows, Unix, Solaris, etc.

- Hardware interfaces – analog, digital, PRI, etc.

- IP telephony vendor support – Nortel, Avaya, Cisco, Polycom, etc.

- Protocol support – TDM, ISDN, SIP, H.232, IAX, MGCP, etc.

In an all-IP world, telephony systems could be completely software-based. Today, however, businesses still need PSTN connectivity, and for that, a hardware component is required. Traditionally that function was performed by a standalone media gateway, which housed the DSPs necessary to enable carrier-grade VoIP. As PC-based processors become more powerful, processing cards have recently been developed that can enable real time voice communication without costly DSPs. The leading providers of these DSP-free processing cards for telephony are Sangoma, Digium and Varion. Combined with open source software, this has led to the development of PC-based IP telephony systems, where no external hardware is needed. For the first time, businesses had an alternative for telephony that was not based on costly, purpose-built hardware components.

Figure 1 below illustrates the basic components of an open source telephony system.

Figure 1 – Open Source Telephony Topography
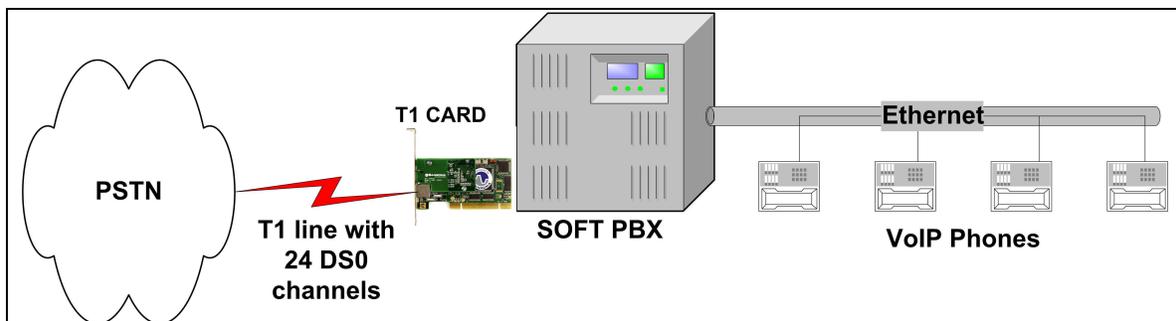
How Open Source Telephony is Evolving

The evolution from DSP-based media gateways to DSP-free processing cards is an important one in the open source continuum, but is really just one of many. On a broader scale, open source is really moving along a path where the starting point for telephony was a system based on hardware-based components. These components were expensive, closed and proprietary. As software expertise developed, and as IP technologies matured, more and more hardware-based functions have become software-based, and telephony solutions have come to support a mix of both.

At this time, PSTN connectivity still requires a hardware interface, and the PSTN is still the dominant mode for voice traffic. However, much of the PSTN voice processing is software-based, including signaling, switching, conferencing, voice-mail handling and compression. Only the functions that are very dependent on hardware are done on the voice card itself. These include HDLC handling, voice channelization and sometimes echo cancellation and voice compression.

Many aspects of telephony are becoming software-based, and open source is continuing to reshape what is possible in telephony, especially so long as PC processing power continues to increase and costs continue to fall.

One example of the mainstream embrace of the software model is Intel's Host Media Processing software. General purpose computer platforms can use Intel's DSP-free software to enable a wide range both voice and video applications such as IVR, unified messaging, video mail and video caller ID. These tools are enabling innovative, lower cost alternatives to hardware-based solutions, and increasingly, businesses will be less dependent on traditional vendors for their telephony and networking solutions.

The business IP telephony market has clearly progressed since the days of purpose-built hardware for DSPs and media processing. Vendors such as Dialogic (now Intel), BrookTrout (now Cantata), AudioCodes and NMS developed high performing telephony components that interfaced with the PC only for control functions, all the voice processing being handled on board. Their technologies were proprietary and expensive, being priced generally beyond the reach of PBX customers and being used mostly for Interactive Voice Response and call center applications.

PBX systems themselves have followed the same path, and the legacy telecom vendors have long controlled the market. That began to change with the advent of IP PBXs, and the entry of data vendors such as Cisco into the market. The open source movement has further accelerated the transition by introducing software-based PBX systems that bypass the hardware PBX vendors altogether. In terms of components, the market has also seen the rise of alternatives to purpose-built boards in the likes of Sangoma and Digium, who can provide PTSN connectivity using hardware built on general purpose computing platforms.

New companies such as Fonality, with its low cost, do-it-yourself PBX model based on open source software, are showing the way towards highly integrated and easy to use PBX systems that never existed before. Open source has been the real catalyst behind this trend, and we feel it is one of the most important indicators as to where IP telephony is headed.

Furthermore, we also view voice as the entry point for open source communications platforms. Once IP telephony becomes proven in open source, we anticipate more advanced voice applications such as text to speech and speech recognition. Building on that, video applications and mobility via WiFi and WiMax are logical extensions, all of which can be enabled with open source software.

Sangoma Technologies – Enablers of Open Source Telephony

Sangoma Technologies has been in the data and voice hardware business for more than 20 years. This is a considerable history for any company in the IP telephony market, and its pedigree is reflected in how it has approached open source PBX. Prior to open source, Sangoma was – and remains - well established in the data world, primarily in the area of WAN connectivity hardware.

For the open source PBX market, Sangoma produces a family of PCI cards that support both T1/E1 and analog environments. Ranging from 2 to 240 channels, these cards are built around Sangoma's AFT architecture – Advanced Flexible Telecommunication. AFT reflects its approach towards building an integrated family of similar, carrier grade cards that take advantage of today's higher capacity processors. This allows Sangoma's cards to handle some PSTN functions on board at low or no cost, hence reducing the workload for voice communication on the host CPU.

Our research indicates that Sangoma's long experience in the data hardware market has translated well into the voice market. It understands the engineering issues related to making high performance PCI interfaces work reliably, while providing the software drivers for both voice and data environments. In addition, Sangoma has paid close attention the nuances of open source software, and it understands the value its cards bring in making open source PBX a viable alternative to hardware-based PBX solutions.

In our view, it is the overall quality of the AFT architecture that is making Sangoma successful in the open source PBX market. Its experience results in products that work reliably in all types of systems and software environments. There is no singular feature that stands out, and that is perhaps its virtue, which should bode well as the market becomes more competitive. Sangoma's key points of differentiation are summarized below.

- Very high level of compatibility with the many thousands of different motherboard and peripheral combinations for their entire range of AFT cards

- Supports a wide range of PC operating systems – Linux, Windows, Unix, Solaris, FreeBSD and OpenBSD

- Support across multiple open source telephony platforms – Asterisk, FreeSwitch, Yate and others

- Ability to support both voice-only and voice and data environments – Sangoma's Wanpipe router enables the server to better manage mixed traffic by streaming off the data, leaving the open source PBX platform free to focus its resources solely on voice

- Design to the 2U form factor so that cards can be deployed in quantity on any PC configuration

- Hardware firmware is field-upgradeable – this provides critical reliability that businesses need from their telephony systems

- Carrier class echo cancellation that does not degrade as the scale increases – Sangoma has partnered with Octasic for best-of-breed capability

- Forward-thinking architecture – both multiple and single channel SS7 support for Linux as well as Windows

- Strong customer support – approachable, responsive and knowledgeable

The Customer Experience

Several of the strengths cited above have been validated through direct contact with Sangoma customers. Most of its customers are resellers and distributors who develop open source PBX solutions for direct use by business customers, either as their internal system or in their call centers. They also build these solutions for service providers who are offering hosted PBX solutions to their enterprise, small business and SOHO customers.

A common strength heard from customers is Sangoma's ability to deliver reliable, high quality connectivity across all sizes of deployment. Its boards "don't fail", "they just work", and the voice quality is "consistently good" for both large and small solutions. For resellers focused on larger customers, Sangoma makes it easy for them to offer a scaled down version, allowing them to sell into new markets and expand their business. Conversely, Sangoma gives other resellers the confidence they need to go upmarket and offer larger scale solutions for higher-end customers (typically 2 T1s or more).

"Sangoma's configuration tools are more complete than those of other vendors, and the performance and reliability of their boards is better, as is the support. Another plus is that its boards also work for data connections."

"They are really friendly, collaborative and competent, both commercially and technically speaking. Regarding their support, we can say it is really good, because your problem involving their hardware becomes immediately their problem. We think this is one of the most important characteristics for a vendor of hardware."

Dimitri Osler, Project Manager, Wildix

"We're seeing a migration away from expensive, proprietary telephone systems. Sangoma's boards are helping us meet this demand, for larger deployments with multiple T1s as well as smaller systems."

William Boehlke, CEO, Signate

Conclusions

Open source has made significant advances in telephony, and its developer community has proven that PC-based solutions can be viable alternatives to existing PBX systems. These platforms are not perfect, but in the right hands, can deliver tremendous value and performance for businesses of all sizes. As open source matures, standards will evolve, and the solutions will have more checks and balances to ensure the reliability and quality that businesses need for larger scale deployment. PC processing power will continue to improve as well, but for the time being, functions such as PSTN connectivity still need to be hardware-based.

In that regard, it is our view that Sangoma Technologies offers industry-leading solutions that complement all the major open source telephony platforms. At this point in the evolution of open source, Sangoma has a key role to play as an enabler of reliable, carrier-grade telephony. The company is setting the standard for performance, and until software-based alternatives emerge that are on par or better, we see Sangoma maintaining this position. Given its extensive history in the data connectivity world, and the much shorter tenure of other vendors in this market, we have good reason to believe this will be the case.

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J Arnold & Associates, an independent telecom consultancy, produced this White Paper. The contents herein reflect the conclusions drawn based on general research about Sangoma Technologies, as well as interviews with open source experts, and Sangoma customers. For more information please contact us at: www.jarnoldassociates.com