



Why Intel and Other Developers Are Taking the Platform Approach to Converged Solutions





Converged Application Platforms

Providing a common, scalable architecture for accelerating the delivery of converged solutions

Executive Summary

Convergence is quickly becoming the hottest topic in networking. As technologies like Voice over IP (VoIP) blur the once-distinct boundaries between voice and data networks, providers are racing to bring out “triple play” or “Internet Communications,” where voice, video and data are distributed via a common network.

The scope of change is dizzying. Converged applications require new infrastructure, premise and end user equipment. Adding further to this complexity is the idea that the configuration and features of each network may be a little bit different, including a customized set of applications and equipment that can vary according to the needs of the business or service provider. The question facing telecom equipment manufacturers (TEMs) and service providers today is this: What is the best way to capitalize on these opportunities?

Converged Application Platforms (CAP) can help TEMs more quickly deliver the infrastructure needed to power converged applications. Intel offers a variety of CAP reference designs that are open enough to allow TEMs to build solutions that span the residential, home office, small to medium business (SMB) and distributed enterprise environments (composed of multiple geographically dispersed offices connected to a central business network). These highly scalable, versatile design recipes will help manufacturers build highly custom solutions in a fraction of the usual time and at a reduced cost, even while integrating new features and services not available via traditional voice and data networks.

The Intel® reference design for CAP for the distributed enterprise includes both software and hardware components from third party developers, all of which have been optimized for use with Intel® processors and chipsets. TEMs can choose from a variety of converged applications that serve up IM with presence, web-based messaging, and more. And because they are modular applications, TEMs can choose the application features that best meet the needs of their customers.

This paper explains the purpose of a CAP for the distributed enterprise and what goes into one. It also offers an abbreviated look at some of the third-party applications that can be used to deliver converged services.

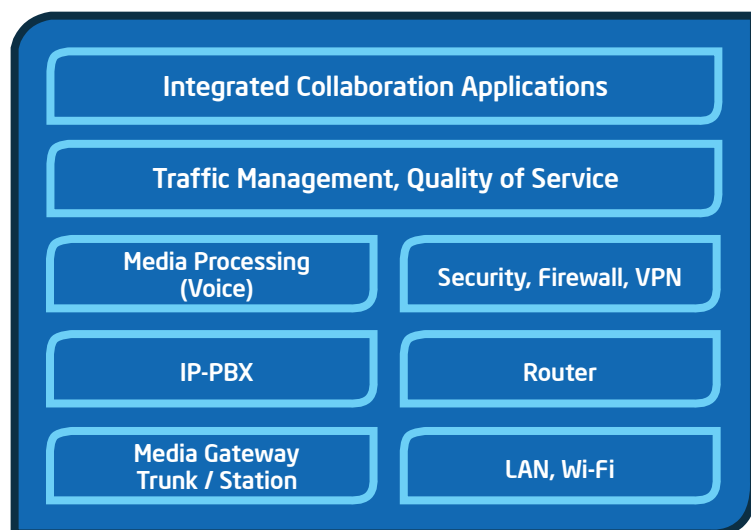
Executive Summary	1
The CAP Defined	2
The Elements of a CAP	2
Hardware Platform Development	
SMART Modular Technologies.....	5
WIN Enterprises.....	5
Platform and Application Software	
CommuniGate Systems	6
Cymphonix Corporation.....	6
Intoto, Inc.	7
Jungo Ltd.....	7
LignUp Corporation.....	8
Evaluating the Merits of a CAP	9

The CAP Defined

A CAP provides a common scalable architecture that supports telephony, video, and data services. As shown in figure 1, it brings together multiple functions such as voice switching, enterprise routing, firewall and VPN, quality of service, application services, WAN and Wi-Fi* access, and more – all in a single device accessible by a wide range of clients. Multi-function devices based on the CAP architecture simplify installation and operation, while providing over-the-wire manageability.

The Intel reference design for CAP for the distributed enterprise enables TEMs to build highly versatile, customized solutions for a variety of customers, without the need to develop proprietary technologies or design new platforms. With recommended configurations that enable a converged solution, TEMs need only determine the applications that will be included in the final product and choose the configuration that best meets their customers' requirements.

Figure 1. Converged Application Platform (CAP)



The CAP architecture supports multiple implementation options, including IP Centrex, IP PBX, and hybrid variations of both. It is the ideal platform for service providers that want to reach SMB market segments with value-added services, as well as IT managers that need to efficiently provision small or remote/branch offices with a full range of business services throughout a distributed enterprise.

Service providers and IT managers can take advantage of a powerful, flexible platform to increase control over converged network services (figures 2 and 3). Because the CAP architecture collapses everything into a single network, administration can be simplified greatly. Remote management, provisioning and maintenance also eases administration. With the headroom to enable new services, and the scalability and freedom to distribute services anywhere on the network, the CAP architecture offers service providers the means to customize and differentiate their offering without incurring high development costs or significantly delaying deployment.

The Elements of a CAP

The basic elements of a CAP (figure 4) include the management layer for networked applications, the media server and service applications themselves, QoS and port traffic management, signaling, security, network processing, and the IP gateway to connect it all to the network. In other words, the CAP architecture includes everything necessary to deliver an all-in-one, converged network via a single device.

Most converged solutions today are based on proprietary technology. What is unique about the Intel reference design for CAP for the distributed enterprise is the fact that standards-based, off-the-shelf processors are used to deliver a complete converged solution and the application software also runs on Linux* and Windows* operating systems.

Intel's Contribution

Two kinds of Intel processors provide the performance needed for converged solutions to run in a single system. Intel® Architecture and Intel® Network Processors are specified in the reference design.

Figure 2. Enterprise Hosted VoIP Solution

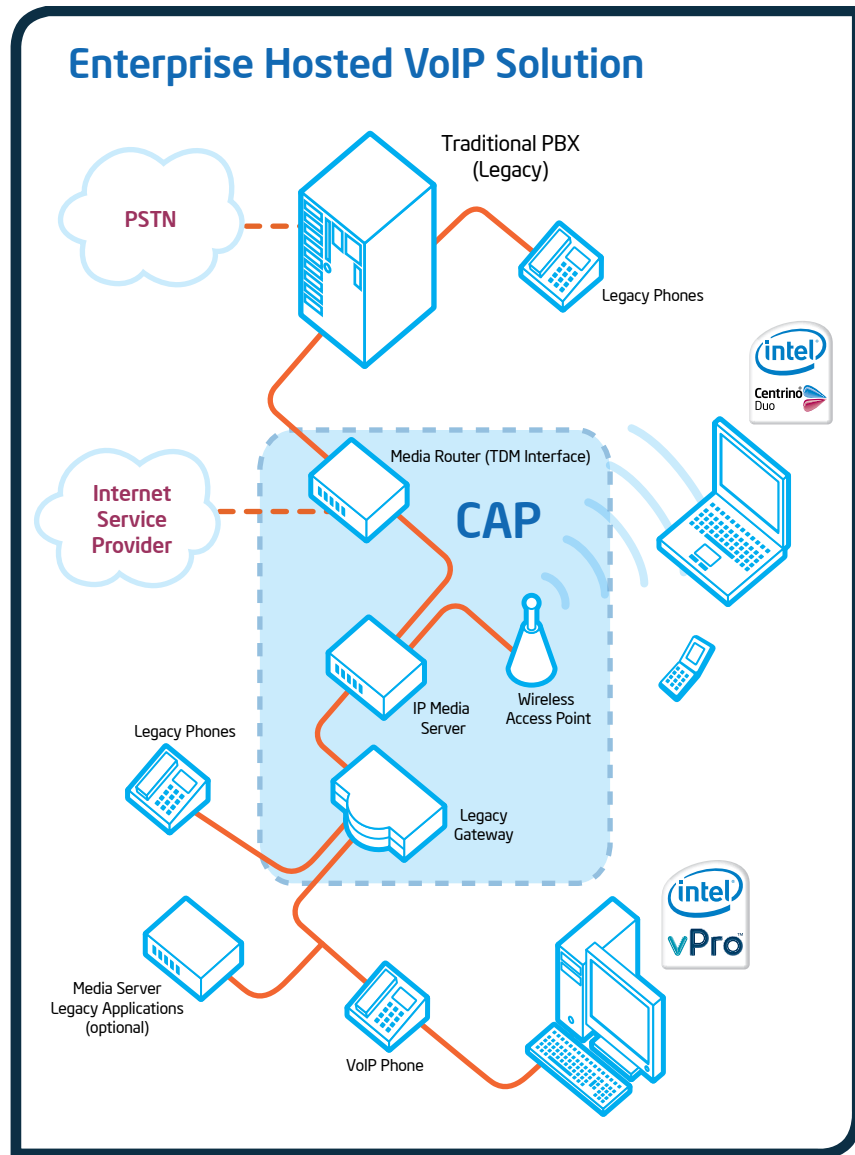
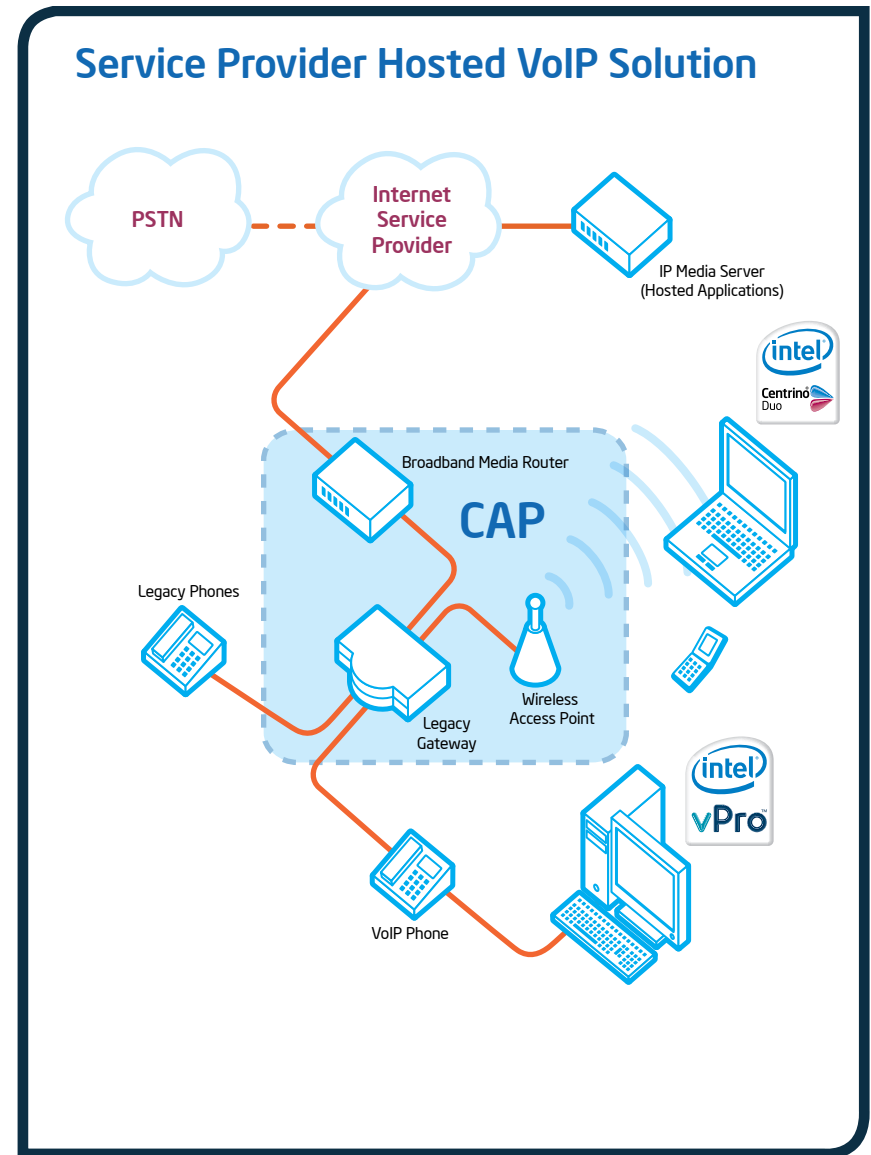


Figure 3. Service Provider Hosted VoIP Solution



While the reference design initially calls for the use of the Intel® Pentium® M processor and the Intel® IXP46X product line, the architecture is open enough to allow TEMs to use virtually any Intel Architecture Processor, including Intel® multi-core processors. TEMs can use the reference design exactly as prescribed, or choose to redesign the basic architecture using other Intel Architecture Processors, Intel chipsets and other processors in the Intel IXP46X and Intel® IXP42X product line to scale the solution according to the needs of their customers.

The combination of application and packet processing to enable services is a unique grouping in a reference design. While some vendors are developing custom platforms using such combinations, the Intel reference design for CAP for the distributed enterprise is the first to incorporate both elements into a solution-ready design. The pre-integration work allows developers to utilize the software tools and extensions to achieve faster, more cost-effective development of innovative converged solutions.

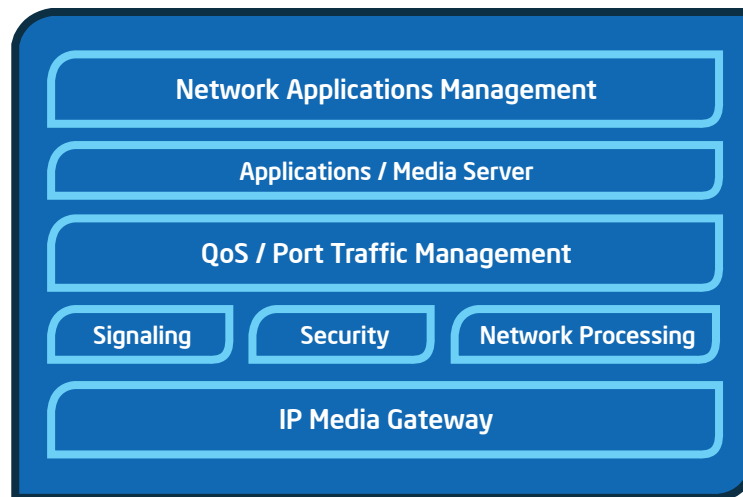
TEMs will also find that the Intel processors work together to deliver maximum power efficiency, with the optimum combination of low power consumption, low thermal output, and high performance available in an off-the-shelf, solution ready platform. Each component offers essential features that in tandem provide a powerful platform from which to build a CAP.

The Intel reference design also can make use of the Host Media Processing (HMP) software, to provide a cost-effective, software-based alternative to the traditional specialized digital signaling processors (DSPs). The HMP software delivers scalable, high-quality voice, data, and video on standards-based platforms.

Ecosystem Contributions

The reference design architecture is only possible because of the support and enrichment offered by several third-party hardware and software developers. Members of this computing and communications ecosystem are committed to working with Intel in order to accelerate time to market with new solutions.

Figure 4. CAP Architecture



Some of these vendors are members of the Intel® Communications Alliance, a community of developers that share Intel's vision for standards-based platforms to speed development of more versatile solutions. Intel and its unique community of third-party vendors provides better marketing opportunities to TEMs and their end customers by delivering a vast selection of components and platforms that are all interoperable and integrated to help lower the cost of building new systems.



Several third-party vendors have been actively working with Intel to develop the reference design for CAP for the distributed enterprise. These vendors do not represent the entire range of compatible, suitable options that are available to TEMs. However, their products are being tested and integrated into a CAP architecture, a step that further reduces the amount of development work and testing required to deliver converged solutions.

Hardware Platform Development

SMART Modular Technologies Electronic Subsystems for CAP Designs



"Modularity enables flexibility and scalability, which are very important to meeting our customers' needs in terms of both performance and cost. The Intel® reference design for CAP for the distributed enterprise provides all of these ingredients."

— Joe Kotas, Vice President of Business Development, Embedded Products Division, SMART Modular Technologies

Company Background:

SMART Modular Technologies' Embedded Products Division designs and builds hardware to serve the needs of a wide range of customer applications, including traditional embedded CPU blades and mezzanine cards for telecom equipment; high-performance appliances for network security applications and converged application platforms; and ruggedized embedded PCs for display-related applications.

Product Attributes:

The SMART XceedNP* product portfolio is designed for use in the high-performance appliances used for security applications and CAP architecture. XceedNP products are modular by design and use two boards, one based on the Intel IXP46X product line, and the other built with an Intel Architecture Processor. The modular approach provides maximum flexibility and scalability, allowing SMART to deliver a range of products that satisfy the performance, management and security demands of VoIP and triple play.

Benefits to a CAP:

SMART uses its two-module CAP design to quickly deliver custom solutions and accommodate systems that need to scale. The network processing module is equipped with a PCI bus and Gigabit Ethernet chip to communicate with almost any Intel architecture-based module. "This flexible design gives SMART the ability to add the application processor that most closely matches a customer's need," explains Kotas.

Optimized for Intel® Platforms:

The XceedNP network processing module takes full advantage of the three network processing engines (NPEs) in the Intel® IXP465 network processor. With two WAN ports, customers have a choice to increase bandwidth or provide failover protection. The third NPE interfaces with a fully-managed Gigabit Ethernet switch. These features combine to provide enterprise-class management functionality in a form factor and price point for the SMB customer—a key objective of the SMART design.

For more information, please visit: www.smartm.com

WIN Enterprises

Systems Manufacturing and Integration for CAP Designs



"There are a lot of really visionary people in telecom. The Intel® reference design for CAP for the distributed enterprise allows those visionaries to more quickly deliver their ideas using common, standards-based architecture, instead of relying upon proprietary solutions. Now that's revolutionary."

— Matt Stevenson, Senior Design Engineer, WIN Enterprises

Company Background:

WIN Enterprises is a 15-year-old company well known for its high quality, speedy design and manufacturing capabilities, including custom engineering. The company worked closely with Intel to develop and produce the Intel reference design for CAP for the distributed enterprise, and is now building prototypes based on the design.

Product Attributes:

The WIN Enterprises prototype platforms are complete CAP solutions, including board, chassis, and all application-level software that TEMs may deploy "as is," or modify to meet unique customer requirements. The prototype board itself is highly scalable and can be extended in hardware and software as needed to support multiple converged services. Using the system from WIN as a starting point, TEMs can deliver a feature-rich IP PBX solution, adding unique attributes without much additional effort or cost.

Benefits to a CAP:

"The Converged Application Platform design that WIN Enterprises is building is not just a PBX," insists Stevenson. "It's a media control center. It can do multimedia services, phone calls, Internet data, and so forth. It can be a phone system, firewall, or low-end data center. All of the hardware elements are there to make it function in a variety of ways. All that's left is the software, which the manufacturer chooses to complete the solution."

Optimized for Intel® Platforms:

The unique architecture of the Intel reference design integrates application and packet processing on one platform. This allows manufacturers to utilize strong security features and high performance capabilities for maximum value in a converged network. "Because we specialize in working with both Intel® architecture and Intel XScale® technology, WIN Enterprises can deliver new designs without a lengthy development cycle. Our first pass at the board based on the CAP architecture ran perfectly," says Stevenson.

For more information, please visit: www.win-ent.com

Platform and Application Software

CommuniGate Systems

Converged Communications Services Application



"CommuniGate Pro allows TEMs to offer a choice of clients – IP phones, soft clients, traditional telephony, mobile devices, browsers and IM agents – all through a single subscriber account. The Intel® reference design for CAP for the distributed enterprise offers enough headroom to run our communications software suite in one system, and chain many together for clustered scaling."

— Jon Doyle, VP Business Development,
CommuniGate Systems

Company Background:

CommuniGate Systems develops carrier class Internet Communications software for broadband and mobile service providers, enterprises and TEMs worldwide.

Product Attributes:

The company's flagship product is the CommuniGate Pro* IP Communications server, which is a highly scalable, feature-rich, converged application server based upon open standards like SIP/XMPP for voice and data communications. The software suite provides applications for the infrastructure, like SIP Proxy and presence server, as well as IP communications applications like messaging, VoIP, video, IM, and voicemail.

CommuniGate Pro software can run across multiple machines to create an active dynamic cluster architecture for 99.999% uptime. The multi-node, all-active SIP Farm technology makes it possible to host millions of voice subscribers.

Benefits to a CAP:

Because CommuniGate Pro is modular, TEMs can choose which of the individual features of the IP communications suite they wish to deploy

—all, some or just one. These modular features include IP PBX, SIP Proxy, SBC (Session Border Controller), clustered voice via SIP Farm, as well as audio conferencing, voicemail and XMPP support. TEMs can also use the CommuniGate Pro programming language to develop their own custom converged applications. With XIMSS - an XML Interface for Messaging, Scheduling and Signaling, TEMs can create light-weight applications with fast time-to-market to gain maximum versatility and flexibility in their converged solutions.

Optimized for Intel® Platforms:

CommuniGate Pro was developed using a multi-threaded architecture, which enables TEMs to get the maximum benefit out of systems that use multiple processors or new multi-core processors. The unique architecture of the CommuniGate Pro software can be distributed to run on different components of the Intel®-based CAP to allow maximum throughput and ensure optimum use of system resources.

For more information, please visit: www.communiGate.com or email partners@communiGate.com

Cymphonix Corporation

WAN Data Stream Management and Event Correlation Software



"Clearly one of the biggest challenges to implementing a converged network is the likelihood that there will be frequent and recurring event conflicts, as users, applications and threats all compete for network resources."

— Mitch Weight, Director of Marketing,
Cymphonix Corporation

Company Background:

Cymphonix Corporation develops WAN data stream management solutions that integrate Unified Threat Management (UTM), application performance and network analytics technologies to maximize Internet data flow through event correlation. This unique approach makes it easy for administrators to identify and solve the problems created when users, applications and threats fight for network resources.

Product Attributes:

Cymphonix's unique Cross-Layer Intelligence* (XLI*) technology scans deep into the packet payload to identify mission-critical, non-critical and detrimental packets. The technology then prioritizes throughput based on administrator-determined settings. Cymphonix's XLI technology is unique in its ability to scan all seven layers of networking communications passing through the CAP. By scanning inside the packet payload – not just the headers - the technology allows administrators to "see" the users, the applications they are using, and the attacks themselves.

Benefits to a CAP:

TEMs that wish to use Cymphonix's XLI technology in their own CAP designs can choose either the application shaping component, threat

blocking component, or analytics component—or get all three elements together to obtain the full data stream management functionality. The scalability and modularity of the solution allows for maximum versatility.

When deployed as an all-in-one event correlation/Internet management solution on a CAP, Cymphonix's XLI technology is very efficient. It allows for the management of all Internet data flow on one device with one application, thereby increasing the performance of the network, and improving efficiency and accuracy of the managerial function.

Optimized for Intel® Platforms:

Cymphonix recently optimized its software to run on the Intel IXP46X product line. "Our technology can perform much more efficiently using the combined application and packet processing architecture in the Intel® reference design for CAP for the distributed enterprise," explains Weight. "This architecture maximizes performance and our software can utilize that to really optimize event correlation."

For more information please visit: www.cymphonix.com/intelplatform

Platform and Application Software

Intoto, Inc.

Unified Threat Management (UTM)
Application Software



"We optimized our software for the Intel® reference design for CAP for the distributed enterprise by separating the data processing functions from the application processing. This allows the Intoto software to support many voice channels simultaneously, all with the same packet rate. Voice and VPN throughput is quite impressive."

— Ramana Mylavarapu, Chief Architect for VoIP Products, Intoto, Inc.

Company Background:

Intoto develops network security software for Unified Threat Management (UTM) security appliances and secure converged Business Gateways. Intoto's products provide a scalable, highly customizable architecture that spans customer needs from very high-performance systems to broadband customer premise equipment (CPE) devices.

Product Attributes:

Intoto's CAP solution has two components. First is Intoto's iGateway EX SecureCP* software platform, which runs on the Intel IXP46X product line and performs core functions for the CAP, such as routing, VoIP, security, WAN and QoS. Second is Intoto's new secure VXML software platform that provides a VXML-based rapid application services development framework and runs on Intel Architecture Processors. It includes VXML-based applications like auto-attendant, voicemail, multi-party conferencing and locate me.

Benefits to a CAP:

Intoto's iGateway EX and VXML convergence application suite is modular and scalable. TEMs can choose among any of its features and

services—licensing any combination of one or more. This versatility is very important. But what's most beneficial to the CAP design is the way the Intoto software has been optimized to utilize the performance characteristics of Intel Architecture and Network Processors. Separate DSP and application processing ensures that converged applications will be able to sustain maximum throughput—an essential service for voice applications especially.

Optimized for Intel® Platforms:

Intoto ensures that packet processing, digital signal processing and application processing all run concurrently and most efficiently with Intel Architecture and Network Processors. Intoto's VXML software uses this architecture to support a high number of voice channels—all with the same packet rate. Having worked with Intel for several years, Intoto engineers learned a lot about how to optimize the software for Intel XScale® technology to achieve maximum performance efficiency.

For more information, please visit: www.intoto.com

Jungo Ltd.

Residential and Business Gateway
Software Platforms



"Convergence is a dynamic market trend—one that opens up a wide array of new opportunities and ideas for everyone. Bringing integrated converged services to the residential and SMB market segments is what sets Jungo apart from others."

—David Messina, Vice President of Product Management and Marketing, Jungo Ltd.

Company Background:

Jungo develops residential and business gateway software, including OpenRC* for residential deployments, and OpenSMB* for small and medium business environments.

Product Attributes:

The Jungo software platforms include all of the features and functions needed to develop a converged "office-in-a-box" solution or a residential gateway optimized for carrier-grade IP-TV deployments. Features include: routing, security, Wi-Fi, email/file/web/ftp servers, network-attached storage, VoIP and IP-PBX functionality.

Benefits to a CAP:

Jungo's comprehensive software platforms are designed to allow TEMs to deliver manageable, feature-rich converged solutions in volume, quickly and cost-effectively. The open nature of the Jungo platform means that TEMs can add their own features on top of the Jungo software modules, simplifying a very complex development effort and saving months off the

normal time it takes to get to market with new solutions. The openness of the Jungo software modules also means that third party applications can be integrated quickly and easily, for additional flexibility.

Jungo software combined with the other elements of the Intel reference design for CAP means that product concept to product completion can be measured in months instead of quarters.

Optimized for Intel® Platforms:

Jungo's software solutions are optimized for the Intel IXP42X product line with specific hooks tied to VoIP support as well as measurable performance highlights. For example, firewall and network address translation have been tested at line rate for 100Mbps broadband connections.

For more information, please visit: www.jungo.com

Platform and Application Software

LignUp Corporation
Converged Communications Solution



"LignUp extends the versatility of the Intel® reference design for CAP for the distributed enterprise by providing a suite of development tools and turnkey applications that enable TEMs to easily build IP telephony applications customized to their specific business needs."

— Monica Pal, Vice President of Marketing, LignUp

Company Background:

LignUp provides a converged communications solution that includes a SIP application server, development tools and sample web-based applications that together enable highly customized development of voice and voice-enabled applications for enterprises and service providers.

Product Attributes:

The unique LignUp architecture gives developers the tools needed to deliver highly customized IP telephony services. TEMs can deploy LignUp's sample applications out of the box, customize them with certain features, or develop entirely new applications based on customer needs. Plus, developers can work with LignUp's tools in any web environment (Java*, ASP*, Perl*, PHP*, etc.). LignUp's SIP server combines call control and media server capabilities.

The modular architecture supports redundancy, scalability and high availability. All LignUp modules can run on a single server, two servers for redundancy, or scale up to become a larger implementation across numerous servers—all depending on an organization's budget and business needs.

Benefits to a CAP:

The LignUp software platform complements the Intel reference design by allowing TEMs to easily customize LignUp-powered voice applications to meet the varying needs of specific businesses and industries. The modular, standards-based architecture of the LignUp platform provides flexibility today and future scalability, allowing TEMs to quickly and cost-effectively bring out highly customized solutions, as well as build on those LignUp-based designs over time.

Optimized for Intel® Platforms:

The LignUp software architecture was developed and optimized specifically to run on standards-based Intel platforms. This further reduces the time and complexity of developing customized CAP solutions. "The combination of the LignUp platform, other CAP components and Intel® processors and chipsets provides TEMs with all of the ingredients needed to differentiate their converged communications solutions, without incurring the high cost of custom development" says Pal.

For more information, please visit: www.lignup.com

Evaluating the Merits of a CAP

The platform approach to development is quickly becoming the preferred method of delivering new, industry leading solutions. Because today's technologies are multifaceted and interdependent, modular components and applications that enable quick development of converged platforms can help jump-start the new wave of innovation that can bring about new methods of computing and communications.

Intel's platform approach to the CAP design offers these benefits to industry and end users alike:

For TEMs:

- **Enabling Innovation.** The Intel reference design for CAP for the distributed enterprise offers a ready-made framework for innovation, with a complete menu of pre-integrated ingredients that address the specific needs of converged communications. It sets the design parameters by which end users can best experience convergence, yet also allows for enormous flexibility on the part of TEMs and independent software vendors (ISVs) to define their own solutions. Additional system headroom is provided for further product differentiation.
- **Reducing Time to Market.** By building common capabilities—such as security and device management—into base components, Intel is reducing the burden on TEMs to deal with the issues that are common in a particular platform. With the Intel reference design for CAP for the distributed enterprise, Intel is addressing the performance and processing requirements of a converged platform. Instead of spending months working to integrate separate processing architectures, TEMs can now use their innovation and development budgets to create new products faster and get those innovations to market more quickly.

For Service Providers and End Users:

- **Creating New Services and New Revenue Streams.** New business models and new sources of revenue are made possible through the technologies that are enabling convergence. These new capabilities benefit both service providers and end users. Consider how video conferencing, messaging and information sharing might be enhanced by convergence.
- **Reaching the Next Billion.** With capabilities like wireless and security now being incorporated into the base platform at a lower cost, the benefits of converged communications services can now be realized by more businesses. Economies of scale come into play for companies of all sizes worldwide. Intel's platform approach allows service providers to deliver solutions targeted to specific market segments, regardless of size and location.

For the Ecosystem:

- **Expanding Business Opportunities.** The platform approach offers a number of avenues for solutions providers in the computing and communications ecosystem to reach new markets and expand their business opportunities. As a community of developers working to solve common problems, the ecosystem as a whole is much more valuable to OEM/TEM customers and end users than any one individually.
- **Improving Profitability.** The development work that goes into the platform needs to be done just once, with the idea that multiple products are produced off a single development effort. The economies of scale can be significant, resulting in improved profitability for the entire ecosystem.
- **Training and Support.** Why go it alone? When Intel offers worldwide technical support, training, software development tools and hardware platform design support that helps reduce trial and error, it enables more efficient use of engineering resources, and speeds time to market.

Learn More about the Intel® Reference Designs for CAP

The merits of developing solutions based on a platform are clearly significant. Using readily available, pre-integrated hardware and software to deliver innovative solutions more quickly and at less cost is obviously a good idea.

But don't take Intel's word for it alone. Talk to the third party developers that make up the computing ecosystem and find out what they think. The momentum gathering behind the platform approach is truly inspiring.

For More Information:

Voice and Converged Communications:
www.intel.com/go/voip

Converged Application Platform:
www.intel.com/go/cap





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