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NTT DoCoMo adds Voice-over-Wireless LAN capabilities to its phones

Japan's premier mobile carrier, **NTT DoCoMo**, has launched a new mobile phone, which works over both local wireless and cellular networks, enabling business customers to combine the features and benefits of these technologies.

The dual network mobile phone, which supports W-CDMA and 802.11b, runs as a cell phone on **NTT DoCoMo's** 3G cellular network and also as a VoIP mobile phone over a wireless LAN.

Using the **NTT DoCoMo** dual mode handset, part of the service provider's series of 3G phones, the customer can access both networks using a single phone. When inside the office (within an enterprise WLAN) users will be communicating through an enterprise VoIP system through a 802.11 connection. Inside the office, 802.11 talks to Access Point, which connects to the enterprise IP PBX. The solution is configured to enable micro mobility. It allows users to move about within the enterprise carrying all the key desk set features with them thereby enabling mobile desktop functionality.

The solution is configured using light Access Points with a WLAN gateway (a WLAN server). Wireless Services Manager, another piece of software, facilitates network mobility and the extension of PBX features outside the enterprise. Through the WLAN gateway, the call is brought to Wireless Services Manager and the IP PBX which work together to route the call.

There are certain glitches in the service though. For example, the phone will switch off if callers move out of the LAN area, requiring them to reinitiate the call using the cellular network. This "delayed handoff" shortcoming is just one of the problems that vendors are trying to solve in order to marry the wireless LAN and cellular networks.

NTT DoCoMo's 3G service supports high-volume, high-speed transmission to enable a range of services such as videophone and video mail. The new 3G handset (N900iL) is the first model that can be used outside of Japan. The service provider partnered with **Motorola** to develop the new handset to allow Japanese business users to access applications, even while travelling outside of Japan.

Other vendors which have contributed technology to N900iL include **NEC Corporation** and **MontaVista Software** with the latter providing a Linux based operating system for the handset. **Texas Instruments** is providing the chipset technology while **McAfee**, the security specialist is contributing an antivirus solution to protect the dual mode handset from attacks.

NTT DoCoMo has more than 45 million 2G customers but has had difficulty convincing them to buy into 3G services. The new dual mode handset allows users to take advantage of many features which **NTT DoCoMo** feels will coax 2G users to switch over to 3G in the

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long run. The service provider has sold 7.3 million 3G phones so far and is targeting 10.8 million by March 31, 2005.

The N900iL handset can connect to public high-speed wireless LAN networks to browse the internet and receive e-mail. Standard phone functions, such as call hold and call transfer, are extendable in the wireless LAN environment. Instant messaging between N900iL handsets on a wireless LAN is also possible.

The capacity for video has also increased for the new handsets, which can send 75 seconds worth of video, up from 15 seconds, according to **NTT DoCoMo**. The handset can also be used to view e-mail attachments created in formats such as Microsoft Word, Microsoft Excel and PowerPoint. It also supports Bluetooth connectivity for remote control via a laptop or PDA.

Although **NTT DoCoMo** was one of the world's first operators to launch a 3G network in October 2001, its service was slow to take off due to the network's limited coverage area and bulky, expensive phones with short battery lives. The service provider even had to withdraw its earlier version of third-generation mobile handsets (N2001), which were being used on a trial basis. Users complained about short battery life, patchy network coverage, and a tendency to suffer software crashes. The company had to recall 1,400 handsets.

Since then, **NTT DoCoMo** has made several improvements to the technology. Battery life was increased to more than 200 hours. In addition, the

price and weight were reduced to be comparable to 2G handsets. **NTT DoCoMo** charges less for 3G services than for 2G. Voice calls cost 44 cents per minute with 2G networks but just 26 cents with 3G. A thousand packets of data cost \$2.53 with 2G but just 17 cents with 3G.

It has also adopted embedded **MontaVista Software's** Linux for its 3G phones. **NTT DoCoMo** apparently hopes the Linux-based handsets will accelerate adoption of its 3G services. Analysts say the earlier phones had frequent software crashes due to less than dependable operating systems.

With most complaints coming from the short battery life, **NTT DoCoMo** paired up with **Fujitsu Laboratories** for prototype micro fuel cells for 3G handsets. **NTT DoCoMo** expects to greatly extend handset usage time once it goes into commercial production.

With all these technological improvements, **NTT DoCoMo** expects to sell more units of the 3G phones than the previous generation 2G phones. It will then, no doubt, be looking to re-launch its worldwide marketing campaign to sell such 3G phones.

In fact, **NTT DoCoMo** has already been signing partnerships across the world in order to spread its 3G technology. To bring its mobile phone technology and services to the United States, the company took a 16 percent stake in **AT&T Wireless**, which has pledged to bring 3G service to San Francisco, Seattle, Dallas and San Diego by the end of December 2004.

SBC to offer residential Voice-over-Broadband Service

SBC has announced the launch of residential Voice over Broadband (VoB) service that will expand the **SBC** IP service portfolio and give DSL customers an option for communicating with friends and families. The VoIP service rollout will take place in early 2005. It will use IP and a DSL

Internet connections to deliver voice and other features, such as a web-based portal and call-management capabilities. **SBC** recently won several VoIP service contracts including a deal to create and manage a VoIP network for 50,000 Ford employees located in 110 different facilities.

SBC joins **Qwest** and others in providing VoB.

It could happen to you

PBXs are programmed to feed you with music when you are put on hold. However, if you are on speakerphone, you may not always hear the music and believe you are disconnected. This is probably due to the echo canceller doing a bad job in the network.

Following a lead from an IP PBX vendor that discovered this problem, Montreal based **Octasic** came up with a 'Music Protection' solution that distinguishes between the 'good' (natural habitat) and the 'bad' noise. As a result, **Octasic's** solution cuts off the bad noise and allows the music to come through as part of the natural habitat.

Similar problems exist in everyday life. A good example is when we are holding a phone conversation in our car and hear the voice breaking up. Our immediate reaction is that we must be in a bad cell zone or that we are being handed off to another cell.

What could actually be happening is some sort of background noise such as a radio playing in our car or wind blowing past the car as we drive. Such noise can cause an echo effect in our handset, which the echo canceller on the carrier side misjudges. The echo canceller misrepresents the background sound as someone else's voice or something that it needs to cancel out and injects artificial noise to mask it. So it is actually a case of bad interpretation by the echo canceller on the carrier side which sometimes causes a screeching noise as if the conversation or the connection is breaking up.

So how does the **Octasic** solution distinguish between background noise and music. According to the vendor, it is the type of algorithm used inside the echo canceller. A typical algorithm that is used in the DSP today is LMS(Least Mean Squares). Octasic uses LS(Least Squares) as the algorithm.

The difference in these two algorithms gives the desired result. The algorithm that most vendors use (LMS) shortcuts a lot of true mathematical formulas that are required to take away the good echo from the bad echo or the background noise.

The **Octasic** solution, in a way, recognizes that the background noise is music, records it and replays it for the user as part of the "natural habitat" but at a lower volume than the user's voice. So if we are talking on cellphone and have radio playing in the background, **Octasic's** algorithm is intelligent enough to lower the background radio volume, allow it to pass and increase the volume of our voice.

Echo cancellation and voice quality type solutions have been around for the last 25 years. Typically they were to cancel noise that occurred in long distance calls because of the distance. Noise originating from the caller environment was less of a problem because calls were relatively expensive and typically made in low noise environments where there were fewer interruptions and less background noise. Today, calls are cheap and made everywhere, in train stations, in public places, and in cars with cellphones. Echo cancellers of the past, which are still being implemented in DSPs today, are not really up to the requirements of today's environments.

According to **Octasic**, its echo cancellation solution is "so good that it is able to compete in a lot of cases with standalone echo cancellation boxes" from companies such as **Ditech**, **NMS** and **Tellabs**. **Octasic** has about 60 customers. Out of those, nearly all use the echo cancellation device. Nearly half of them are using the echo device in conjunction with the packet device that **Octasic** makes. The company is focused on Voice-over-Packet and counts four of the leading seven Tier 1 telecom vendors as its customers. Apart from those, certain emerging nextgen vendors using its silicon solutions include **Tekelec** and **Cirpack**.

Voice enabled 802.11 chipsets become available off-the-shelf

The voice enabled 802.11 chipset, which makes Voice-over-Wi-Fi possible, is slowly developing into an industry sub-sector within the telecommunications market. This off-the-shelf component level technology has only just arrived. However, the potential seems enormous if we are to believe what industry players are touting.

We estimate a modest number of 100,000 to 150,000 voice-enabled chipsets to have been shipped so far. Vendors that have introduced such component level technology include **Intersil, Broadcom, Intel, Atheros, Texas Instruments** and **Agere**. These same vendors have been dominating the 802.11 data chipset market for last few years.

Until today, handset vendors have relied primarily upon their internal DSP development or have used softphones as a software-based alternative to circumvent the problem of packetization of voice in a Wi-Fi environment.

There are several issues that these vendors face after voice-enabling their wireless data chipset. They include QoS, security, roaming and power management. These issues have been addressed by vendors in their own methods and also by adhering to some basic standards that have been ratified by the Wi-Fi Alliance.

For example, Wi-Fi is a 'power-hungry' technology and causes a quick battery drain. The expectations from end users are that a phone should behave very much like a cell phone or like a cordless phone they use at home. They want a phone that has several hundred hours of standby time and four to six hours of talk time.

In wireless networking, a 'Beacon' is sent (in the form of a data packet) by a connected device to inform other devices of its presence and readiness. The Access Point on the network sends a signal (called a DTIM) as part of a Beacon to a client device in sleep mode, alerting the device to a

packet awaiting delivery. In order to operate on the network, the client must 'wake up' at such times to receive either a Beacon or DTIM to understand whether or not there is traffic queued for it. Access Points and Wi-Fi devices have to constantly keep looking for some element trying to make contact. In effect, they are 'turned on' as far as power consumption is concerned, resulting in a quick battery drain. Such devices are engineered to expect data every 30ms.

Some of the vendors are handling this issue by shutting off blocks of the technology that are not required at particular times. Doing this dynamically results in some power saving. **Agere** has come up with a solution called Deep Sleep Connected (DSC) that essentially puts the device to sleep between beacon intervals. By doing so, **Agere** has been able to achieve up to 100 hours of standby time and up to four hours of talk time.

Perhaps the most challenging task for the vendors is how Wi-Fi and cellular technologies can be merged into a single mobile handset. In other words, users would like to carry a single device when they roam between Wi-Fi and cellular networks. Demand for dual mode Cellular /Wi-Fi handsets, and the ability for these handsets to roam between these two networks is expected to increase as Voice-over-Wi-Fi gains momentum.

Convergence of Wi-Fi technology with cellular devices does provide an opportunity to address a large market because players will be operating on a large base of cell phones to start with. However, the companies have to be able to solve billing, roaming, and security issues with cellular/ Wi-Fi phones. There is a lot of work that needs to be done in the cellular protocol stack to make sure that call is handled seamlessly.

Motorola is one of the first handset vendors that is now offering a converged dual mode handset. **Motorola** uses **Texas Instrument** component technology. According to **Broadcom**, they also

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possess various ingredients which when put together can form the basic component to develop a dual mode handset that works over cellular networks as well as Wi-Fi networks.

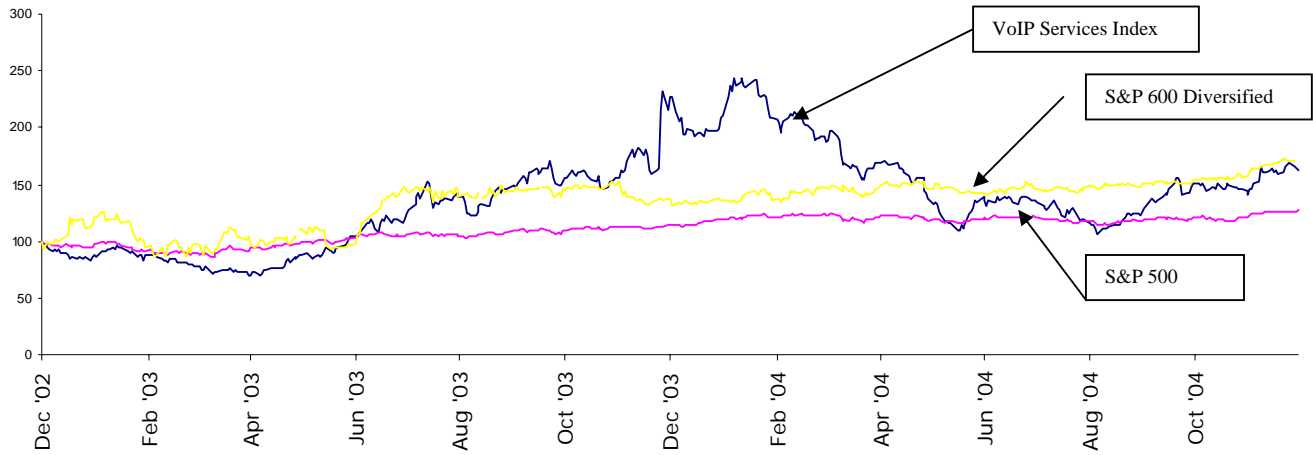
Texas Instruments	Announced in September this year voice enabled 802.11 chipset solution. The company has already announced two customers for this chipset which include Motorola and Ascom . Ascom 's product is in development stage. The product will be a VoIP/Wi-Fi handset. The vendor has also been working with certain service providers (directly as well as through the handset vendors), some of them being AT&T and the start-up Vonage .
Broadcom	Broadcom announced their voice enabled product in October this year. For this chipset, Broadcom has not announced any customers yet. Customers that the company is presently engaged with are at various stages of development. Some of the customers include cordless phone manufacturers looking into Wi-Fi phones.
Agere	Agere started shipping voice enabled 802.11 chipset product in Q3 2004. Agere 's WLAN offering consists of two pieces. One is the 802.11b chipset portion and the other is a VoIP engine or the portion that handles the call setup and the call control called T8307. Unit pricing for the complete set is \$30. Chipset will be exclusively used in handsets.
Atheros	Sunnyvale, CA based Atheros is also planning to announce VoIP/802.11 chipset. There will be three categories of customers that will be targeted by Atheros . These include manufacturers of home gateways, carriers looking to introduce backhaul type application (whether for data or for voice), and obviously the handset manufacturers.

Table: Voice Enabled 802.11 Chipset Vendors: Who is Doing What?

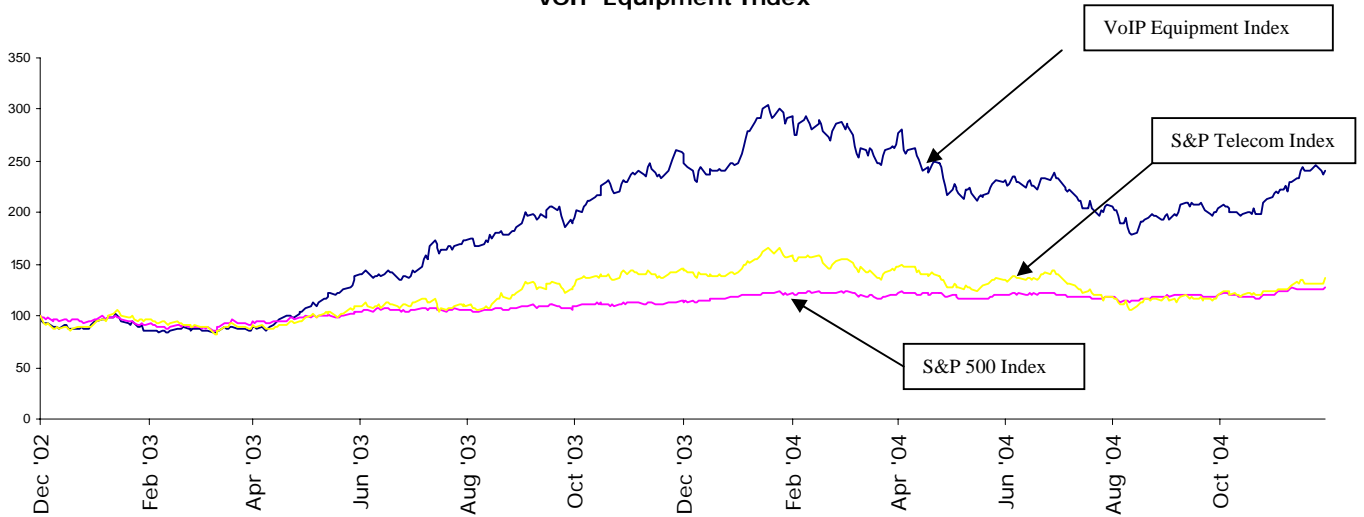
Financial developments November 2004

Company	Products/Services	Development	Details
Net6 Inc	Secure Access Gateways	Acquisition	Bought by Citrix for US\$50 million
Tertio Telecoms	(OSS) software solutions	Acquisition	Acquired by Evolving Systems for \$40.7 million.
CallWave	VoIP enhanced service	3 rd Quarter Results	Revenue of \$11.0 million, an increase of 27%
DTT	Integration services	Acquisition	Acquired by IPtimize . Amount not disclosed.
MeshNetworks	IP Based Wireless solutions	Acquisition	Acquired by Motorla . Amount not disclosed.
StarNet	Service Provider	Acquisition	Acquired by US LEC . Amount not disclosed.
Pipemedia	VoIP service provider	Acquisition	Acquired by Business Serve for £300,000 together with 692,841 ordinary shares of 1p each.

VOIP Services Index



VOIP Equipment Index



	<u>VOIP Services Index</u>	<u>VOIP Equipment Index</u>	<u>Average Returns</u>		
			<u>S&P 500</u>	<u>S&P 600 Diversified</u>	<u>S&P Telecom Index</u>
Last Twelve Months	(39.98%)	(10.61%)	18.65%	40.96%	(6.89%)
30-day Mean Return	12.05%	19.75%	7.98%	11.28%	11.28%

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