



Critical Review

Voice over Packets

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Talk given by Kevin McIntyre¹
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1 INTRODUCTION.

Zarlink Semiconductor is a provider of TDM voice/data switching chips, with the broadest line of TDM switches in the industry establishing a leadership in timing chips for T1/E1 equipment. “Zarlink holds a strong portfolio of intellectual property, numbering about 2,100 patents and pending applications in key technologies such as voice and packet processing, optical, RF, and digital design. In Fiscal 2002, R&D spending was US\$83.5 million or 38% of revenue” (www.zarlink.com, March 2003).

The rapid growth, increasing bandwidth and the availability of low-cost multimedia end systems has made it possible to use the Internet for multimedia applications ranging from telephony to conferencing. Due to the tremendous financial gains, IP has become the

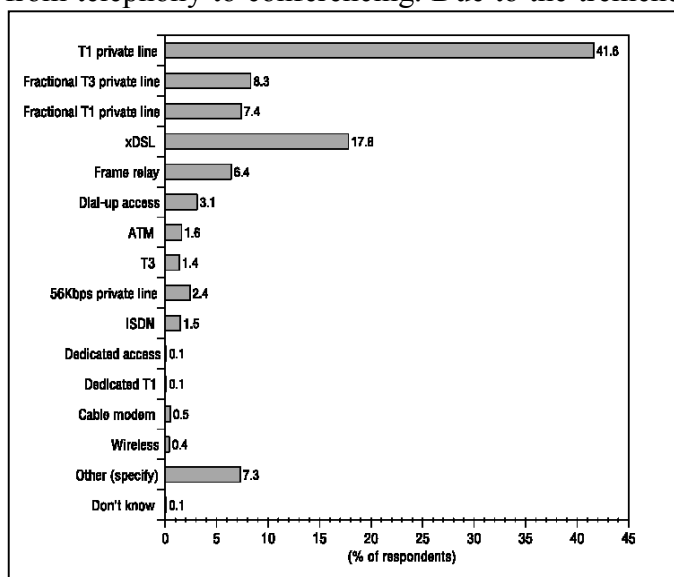


Figure 1 Percentage of usage for Access Technologies

Source: Internet Service Provider Market Forecast and Analysis, Steven Harris

de-facto protocol for multimedia communications. Voice over the Internet Protocol (VoIP) or IP telephony, involves the real-time delivery of voice between two or more parties, across networks using the Internet protocols. On the other hand, next generation networks can be divided into the access network i.e. cable, dial, Ethernet, wireless, xDSL, ISDN. And the core network based on packet switching, which can guarantee an efficient use of bandwidth and higher bit rates i.e. ATM and IP networks such as the Internet. The intelligence of these networks will sit in the “Edge” between the access and the core network. However there is a lot of TDM equipment and lines (as

shown in figure 1) that are still been used by companies and service providers. Which means that TDM will be around for a long time. However by using Circuit Emulation Services (CES), packets can be sent using the existing TDM infrastructure for point-to-point connections.

2 KEY ELEMENTS O THE TALK.

Kevin McIntyre’s talk was focused in three main approaches for transmitting voice over packets: Voice over the Internet Protocol, Voice over Circuit Emulation Service and VoWLAN.

2.1 Voice over the Internet Protocol (VoIP)

VoIP introduces the challenge to save cost in long distance calls and to integrate voice and data in the same network. VoIP represents a real threat to Public Switched Telephone Networks (PSTN) operators, which still have high tariffs for international calls. However, the negative side of VoIP is that is difficult to guarantee any Quality of Service (QoS), since the IP protocol was initially designed non-real time traffic, compared to traditional circuit-switched networks. This problem can be overcome using private managed networks, where a certain QoS can be guaranteed, instead of the Internet.

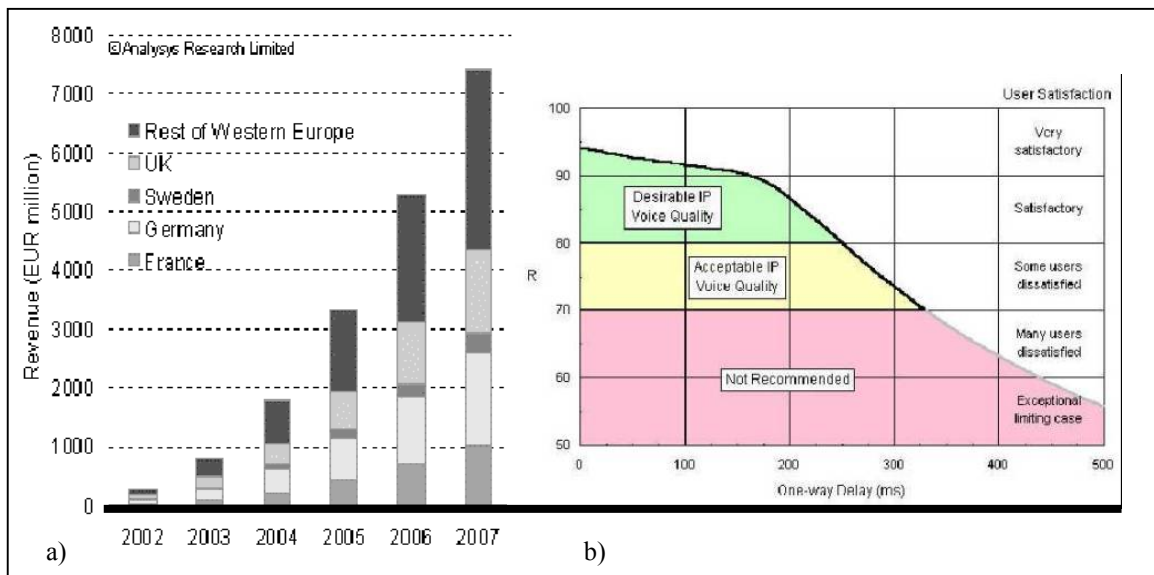


Figure 2.1 a) *VoIP Forecast High case scenario for Europe*, b) *QoS in VoIP*
 Source: Analysis Research Ltd., 2002.

2.2 Voice over Circuit Emulation Service (VoCES)

CES allows T1 and E1 circuits to be transparently extended across an ATM network using constant bit rate ATM permanent virtual circuits (PVCs) or soft PVCs. CES is typically used to transfer voice or video traffic across an ATM network. CES uses virtual

circuits (VCs) of the ATM service category, which guarantees acceptable delay and delay variation. Therefore, it satisfies both voice and video traffic requirements [5].



Figure 2.2 VoCES

Source: Kevin McIntyre, Zarlik Semiconductors.

2.3 Voice over Wireless LANs (VoWLAN)

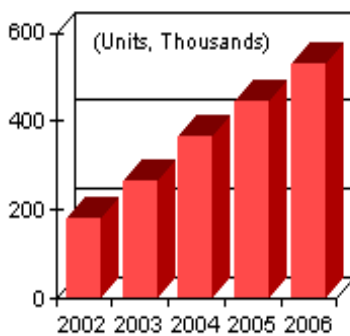


Figure 2.3

802.11x Wireless handsets unit shipment forecast.

Source: In-Stat/MDR

VoWLAN is a particularly new technology, in the sense that has been used in “embedded” WLAN applications for almost two years now. Applications range from the full scale WLANing of airports, i.e. Zurich, to large numbers of warehouses, Starbucks and hospitals (hot spots). *Symbol technologies* and *SpectraLink* dominate the market in terms of handsets [2]. If data access through WLANs is a threat to 3G, VoWLAN is a threat to the mobile operator, especially for public access WLAN hot spots.

3 AUTHOR’S REFERENCES.

- **Adams, Harkness & Hill** is a privately held institutional investment bank who offers financial expertise, real-world expertise industry. Their senior research analysts provide investment research for institutional clients in North America and Europe (www.ahh.com, March 2003).
- **ITU.** The International Telecommunication Union is unique among international organisations in that it was founded on the principle of co-operation between governments and the private sector (www.itu.int, March 2003).
- **Cisco Systems** Cisco Systems, Inc. is the world-wide leader in networking for the Internet. Cisco's Internet Protocol-based (IP) networking solutions are the foundation of the Internet and most corporate, education, and government networks around the world (www.cisco.com, March 2003).
- **Deutsche Bank** Deutsche Bank is one of the leading international financial service providers with than 12 million customers in 75 countries, world-wide. It has a strong position in the European market and especially in the Germany (www.db.com, March 2003).
- **CIBC** is a leading North American financial institution comprising five strategic business units: Retail Products, Retail Markets, Wealth Management, CIBC World Markets (www.cibc.com, March 2003).

- **In-Stat/MDR** offers a broad range of information resources and analytical assets to technology vendors, service providers, technology professionals and market specialists world-wide (www.instat.com, March 2003).
- **IDC** delivers dependable, high-impact insights and advice on the future of e-business, the Internet, and technology to help our clients make sound business decisions (www.idcresearch.com, March 2003).
- **Reuters** is a global information company providing indispensable information tailored for professionals in the financial services, media and corporate markets (www.reuters.com, March 2003).

4 PLACING THE TALK IN CURRENT LITERATURE

VoIP is handled in the network as just another stream of data. Typically, an IP telephony user dials a toll-free number to connect the user to an IP telephony gateway. The gateway is the key element, as it bridges the public telephone network and the public or private IP network providing the service [1]. The gateway receives telephone signals on one side, converts them to Internet Protocol packets, and outputs the packets to public or private IP networks for routing to the terminating user, and vice versa. The ITU has defined the signalling for VoIP in the ITU's H.323 standard for multimedia gateways, while the IETF has diffident the Session Initiation Protocol (SIP) in the RFC 2543 and the Session Description Protocol in the RFC 2327 to control the signalling. VoIP offers many advantages to Service Providers and corporate customers, especially in terms of price and in the convergence of data and voice. The down turn is that it is still a best-effort service in which QoS cannot be guaranteed. Furthermore here are a few more disadvantages of VoIP:

- Inadequate bandwidth in public and private networks and immature routing and gateway technologies [1].
- Vendors offering solutions that at best comply loosely with a few still-developing standards. This may create incompatibilities between equipment and software from different providers [1].
- Lack of standards makes it more likely that a provider will become locked in to infrastructure that may become incompatible with emerging standards [1].

The Multi-Protocol Label Switching (MPLS) can map an IP address onto a label that can be used by Label Switched Routers (LSRs). This approach has the advantage that traffic can be aggregated into streams with common QoS requirements and a common destination and potentially can be used for header compression within the network.

CES is based on the ATM Forum standard *af-vtoa-0078.0000*. This standard defines the CES Inter-working Function (CES-IWF), which allows communication between non-ATM CBR circuits (such as T1, E1, E3, and T3) and ATM UNI interfaces. CES is typically implemented on ATM switches, but it can be implemented on ATM edge devices (such as routers) as well. CES is mostly used for communication between non-ATM telephony devices (like PBXs, TDM, and channel banks) or video devices (such as CODEC) and ATM devices, or via an ATM up-links. The ATM Forum defined CES-IWF for many types of telecommunication circuits (T1, T3, E-1, E-3, J-1 and J-3), but for CES-IWF, the most common types are T1 service and E1 service. CES-IWF converts the entire

T1 or E1 frame arriving from the customer premises equipment (CPE) i.e. PBX into ATM cells and transmits them across the ATM network using a single VC. ATM switch or router on the remote end converts the ATM cells into a T1 or E1 frame, which is then transmitted to a T1 or E1 CPE device [5].

WLANS are defined by the IEEE standard 802.11. VoWLANS can be seen as a threat to 3G, since it can offer the same advantages as the 3rd generation of mobile phones can offer. However as mention in [3], *Lucent Technologies* has already successfully completed a seamless hand-off of a data call between an 802.11b (WiFi, WLAN) network and a WCDMA network (UMTS). This test also demonstrated the use of Mobile IP, a key standard established by the Internet Engineering Task Force (IETF), which enables seamless inter-technology hand-offs between 802.11 and 3G technology. It intends to offer a complete end-to-end solution, integrating 3G and WLAN technologies

5 CRITICAL APPRAISAL

Kevin McIntyre cover some of the main issues involving the three technologies for transmitting voice over packets (VoIP, VoCES, and VoWLAN), presenting market statistics and forecasts. In general, it was a fair good presentation. He was able to relate to the student's environment by making references to professors and students concerns. He also made some jokes aimed to lighten up the context of the presentation i.e. the way that "router" is pronounce in the U.S. However, from the author's perspective the talk was more focused on the Zarlink's marketing point of view rather that other technical issues i.e. he did not mention the relation between CES and ATM. Nor did he give any information about the network impairments that directly impact QoS in VoIP (such as: Jitter, Latency, and Packet Loss), nor did he mention any mechanisms to deal with these issues (such as: RSVP, MPLS, RTCP). He did comment about the VoWLAN threat to mobile 3G networks, but he did not give any references on how both technologies can co-exist in the near future. Further more, from the author's perspective, the explanation of CES was not comprehensive enough. Having said that, the author feels that the talk was very interesting and useful to point out some of the marketing issues involving those technologies.

6 CONCLUSIONS

The WLANS applications have created quite some controversy as a possible threat to 3G, however, it is possible that both technologies can co-exist in future 3G handsets, as shown in [3]. VoIP had its share of the same when it was introduced in the mid-nineties, representing a real threat to the long distance operator's revenue [1]. VoIP still presents a threat to countries, which still have high tariffs for International, calls through the PSTN. However there is still also the issue of guaranteeing QoS for VoIP over non-controlled environments such as the Internet.

Since there is still a wide spread use of TDM technology by corporate customers, service providers and network operators, VoCES can offer an elegant and efficient solution for transmitting voice over packet networks (ATM, IP) using the existing TDM infrastructure (T1, E1) [4].

7 REFERENCES

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[3] Matt Lewis “**VoWLAN: the WLAN killer app?**”, September 2002
URL: http://www.arcchart.com/wifi/pdf/BluePrint_WiFi_26Sep02.pdf (March 2003)

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