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Key opportunities and threats raised by the growing use of Services over IP such as VoIP and IP-TV

1.1 Definition of Services over IP

Internet Protocol (IP) was designed with a vision that it could be scaled indefinitely to provide services, with respect to the applications and number of users it supports. This vision is gradually approaching actualisation. Currently, a variety of services runs over IP, such as e-mail, instant messaging services, file transfer, and the internet. These activities have become a part of daily life. Technological advancement in the last decade makes broadband connections affordable to more business and household users, boosting the use of new services such as video on demand or audio streaming. In this paper we will discuss the key opportunities as well as threats of two prospering services over IP, Voice over IP (VoIP) and IP-Television (IP-TV).

1.1.1 Definition of VoIP

VoIP is the routing of voice conversations over the Internet or any other IP-based network. The voice stream flows over a general-purpose packet-switched network, instead of traditional dedicated, circuit-switched voice transmission lines [4]. This technology was originally used within corporate Local Area Network to facilitate communication between employees. With current technological improvements being heralded everyday, VoIP services are becoming more advanced and have become reliable enough to attract users away from using the traditional Public Switched Telephone Network (PSTN).
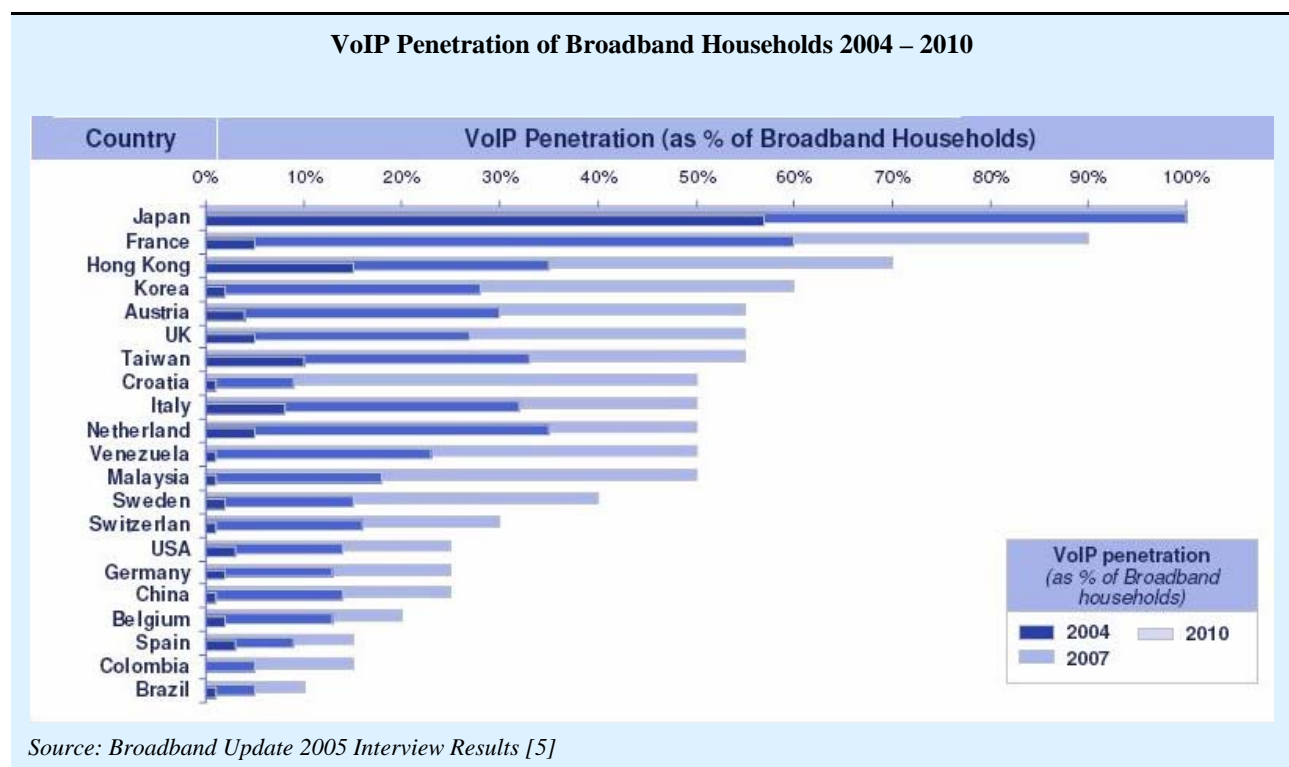

Source: Broadband Update 2005 Interview Results [5]

Figure 1 VoIP Penetration of Broadband Households

1.1.2 Definition of IP-TV

IP-TV describes a system where a digital television service is delivered to subscribing consumers using IP over a broadband connection [6]. It is expected to grow at a brisk pace in the coming years as household broadband accessibility is increasing worldwide. Many major telecommunications providers are exploring IP-TV as a new revenue opportunity from their existing markets and as a defensive measure against encroachment from more conventional Cable Television services.

1.2   Opportunities Emerging

Using of IP Network as a new service platform, both the telecom operators and users foresee new opportunities emerging, as services over IP reduces costs, maximize bandwidth efficiency and introduce to the customer new experiences.

1.2.1   Cost Reduction and Easy System Setting-up

VoIP falls into two categories: those run by commercial operators, such as Vonage and Verizons, and "free" services such as Skype [1]. The commercial systems connect to the PSTN. The well-established IP network infrastructure around the globe allows the operators to provide VoIP services at a very low rate because they no longer need to purchase expensive circuit switching equipments and build up their own telephone networks in the start. Installation of IP phone devices is simplified and flat-rate schemes are usually applied even for long distance calls. The "free" VoIP services only require the download of special software, but typically only let you contact other users of the same service. This is much like a telephony archipelago, with limited ferry services between the islands and none to the mainland, i.e. the PSTN [1].

IP-TV utilises the existing IP network to provide TV programs and Video on Demand services at reduced costs to operators and subscribers alike. Without investing in launching satellites or laying out cables, the operators will charge the subscribers at a flat rate for a bundle of channels and additional fee for other channels.

1.2.2   Network Efficiency Enhancement, Interactive TV and Voice-Data-Video Triple play

Technological advancements enable Services over IP to exploit the network bandwidth. Firstly, advanced voice and video compression technique have reduced the data rate of transmission. VoIP calls have a data rate of 10kb/s and a 64-kb/s channel in a PSTN call can accommodate several IP-based calls [3]. Secondly, in PSTN, a channel is reserved for a conversation entirely even during the silence period. In VoIP, since the voice data are in packets, the channel transmits whenever a voice packet is generated. When one conversation is in silence, the channel transmits voice packets of the other conversation. The user capacity can be increased without expanding the network, leading to higher network efficiency.

The introduction of IP-TV, besides bringing television programs online, utilizes the Internet Protocol to provide two-way interactive television and opens the door to real-time participation from people watching at home [6]. An application would be the ability to turn on multiple angles of a sport event and watch it from two angles simultaneously using picture-in-picture viewing. Voice, data and video and can be offered in a bundle: one can also receive incoming email and instant messages while watching IP-TV and Caller ID might pop up on screen if you get a VoIP call.

1.3   Threats Looming Up

Forward-thinking service providers are seeking to capitalize on the opportunities of providing services over IP, but the real world is not a friendly place for IP networks. Network Congestion, privacy and security issues and reduced revenue dilemma are looming up.

1.3.1   Network Traffic Congestion Affects Quality

The quality of Services over IP is easily affected by the network performance. As more services and users are using IP Network, congestion can arise at any moment and reduce the data rate to almost nothing, resulting in latency as data packets arrive too slowly [3]. Jitter is a variation of packet delay – some arrive on time and some arrive much later. The slightest hiccup in the connection, at any point, can result in dropped packets when the packets arrive extremely late. The same problem means nothing in data transmission like e-mail, where a delay of several seconds is unnoticeable. However, in VoIP or IP-TV, this can result in gaps in the conversation or a black screen, which is unacceptable as voice and video are delay-sensitive.

1.3.2   Privacy and Security

Packet networks depend on many configurable parameters such as IP and MAC addresses of devices and routers. Many of them are established dynamically each time a network component or VoIP/IP-TV device is added, giving intruders a long array of potentially vulnerable points [2]. Protection is imperative.

However, delay-sensitive voice or video traffic cannot be compromised by processing-intensive security measures. Introducing firewalls to an IP network complicates several aspects of VoIP, most notably dynamic port trafficking and call-setup procedures [2]. Moreover, firewalls cannot defend against internal hackers and do not protect the data packets when they traverse across the Internet. Even though encryption can make the packets unintelligible to all but the intended recipients, the encryption process can be detrimental to the quality of services, resulting severe bottlenecks [2]. A trade-off between security and quality is routine in IP networks and services over IP are no exception.

1.3.3   Telecom Operators' Reduced Revenue Dilemma

The increased Broadband penetration rate and the available end-user devices drive up the usage of VoIP services. As a result, telecom operators suffer from a loss in minutes and diminished revenue in their original income source, the fixed network [5]. A decrease in usage stipulates an increase in incremental costs, resulting profit loss. However, the general perception of the public that VoIP is "free" imposes pressure on the operators to restructure their tariff schemes into a one with a flat-rate. Operators, who spent a huge sum on PSTN network expansion or on the recent bidding of 3G licenses may face even more severe financial problems if they begin deploying VoIP services. Even though Services over IP encroaches on the profit gradually, operators will still feel obliged to provide integrated services over IP, such as Interactive TV, to remain competitive. Since only the fittest survive, a new wave of mergers or takeovers among Telcos is foreseeable in the near future.

1.4   Regulatory Issues

Neither national nor international regulatory authority has overcome substantial regulatory issues in Service over IP. Take VoIP as an example. It neither fits into the "sender-pays' model of classic voice interconnection nor into the "receiver-pays" model of data interconnection [5]. The business models therefore vary widely and change yet too quick for regulatory authorities to develop and maintain solid solutions. Emergency services are as yet not uniformly implemented. Origination of a call can not be traced to a geographic location and increases the emergency complexity. Last but not least, the lawful interception of VoIP conversations is only partially possible since routing is not clear in peer-to-peer networks or the IP network.

1.5   Conclusion

This paper has outlined a number of opportunities and threats raised by the growing use of Services over IP with an emphasis on VoIP, as it has a higher usage than IP-TV at this stage. Despite the opportunities Services over IP seem to offer, we should also pay attention to the threats looming over IP Network as our voice and video streams traverse it. Agreements in regulations and standards should be discussed among the countries to facilitate the process of services over IP. In conclusion, despite the perceived threats, more services will be integrated and offered to the customers over IP network in the future.

References

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