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Welcome

Welcome to the Case Communications 2007 Newsletter. This month we look at take a serious look at bandwidth requirements for Voip and look at another security flaw in the Cisco Comms platforms. We also look at how take up of Broadband accross the UK is developing and then look at Google possibly moving into the Telecomms market.

We also have a few light hearted articles one being the development of a Robotic fly, by Harvard University.

We welcome any feedback or comments or contributions from our readers.

Bandwidth requirements for Voice Over IP

This article takes a look at the CODECS and bandwidth required for Voice in VoiceOver IP Networks
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Cisco Comms Platform vulnerable to attack

Security vulnerabilities have been discovered in Ciscos Unified Communications Management platform.
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The Computer Virus turns 25

The computer virus has just reached its quarter century this month.
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At long last a computer that can play draughts

A team of Canadian scientists has created a draughts-playing computer programe which they say can win or draw any game, against any player.

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Offcom report on Broadband Britain

A recent Offcom report indicated that Half (50%) of all UK adults lived in households with a broadband internet connection in Q4 2006 - up from 39% a year ago and

seven times the 2002 penetration level. In total, there were 13 million residential and SME (small and medium size enterprise) broadband connections at the end of 2006, up 31% over the year.
[More]

Harvard University develops Robotic fly
A life-size, robotic fly has taken flight at Harvard University. Weighing only 60 milligrams, with a wingspan of three centimeters, the tiny robot's movements are modeled on those of a real fly. While much work remains to be done on the mechanical insect, the researchers say that such small flying machines could one day be used as spies, or for detecting harmful chemicals.
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Swedish scientists develop liveness-detection system
Scientists in Sweden have developed a liveness-detection system that they say should help reduce the chances of face-biometrics systems being fooled by photographs.
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Google looking to move into telecomms market
Google will move into the telecoms market by spending $4.6 billion (£2.2 billion) on mobile phone spectrum in the United States if certain conditions are met when the airwaves are auctioned.
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Mobile Wimax will emerge into early adopter phase in 2008
A new report issued by WTRS forecasts that mobile WiMAX will emerge into the early adopter phase of market expansion in the 2008 time frame. Markets for emerging wireless Broadband technologies WiMAX, WiBRO, BPL, and others are updated, contrasted, evaluated and forecast.
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Case Communications — Voice and data integration — NEWSLETTER

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Bandwidth requirements for Voice Over IP

Two Classes of protocol

Voice over IP (VoIP) is the descriptor for the technology used to carry digitised voice over an IP data network. VoIP requires two classes of protocols:

1. A signalling protocol such as SIP, H.323 or MGCP that is used to set up, disconnect and control the calls and telephony features;
2. A protocol to carry speech packets. The Real-Time Transport Protocol (RTP) carries speech transmission. RTP is an IETF standard introduced in 1995 when H.323 was standardized. RTP will work with any signalling protocol. It is the commonly used protocol among IP PBX vendors.

Time between packet generation on an IP Soft Phone.

An IP phone or softphone generates a voice packet every 10, 20, 30 or 40ms, depending on the vendor's implementation. The 10 to 40ms of digitised speech can be uncompressed, compressed and even encrypted. This does not matter to the RTP protocol. It takes multiple packets to carry a single word.

Voice requires Short packets.

End-to-end (phone-to-phone) delay needs to be limited otherwise we tend to get echo effects. Data packets have a number of overheads and if the packet is large the overheads become a smaller percentage of the total packet size and are therefore more efficient than smaller packets. However long packets are not very good for voice, typically if a file arrives at a router just before a voice packet, that file will hold the voice packet up and create a delay, and hence an echo which is not suitable for voice. If we make all packets small that's good news for voice, but then data packets are being transmitted very in efficiently.

Most Voice Over IP Routers, like the Case Vipers send data in long packets until such time as they detect packets carrying voice, and then they fragment the data packets into smaller packets and insert the voice packets in between the voice packets, thus removing any possible delays.

In general the shorter the packet creation delay, the more network delay the VoIP call can tolerate. Many vendors have chosen 20 to 30ms sized packets

RTP packet format

The RTP header field contains the digitised speech sample (20 or 30ms of a word) time stamp and sequence number and identifies the content of each voice packet. The content descriptor defines the compression technique (if there is one) used in the packet. The RTP packet format for VoIP over Ethernet is shown below.

Ethernet Trailer	Digitized Voice	RTP Header	UDP Header	IP Header	Ethernet Header

RTP can be carried over frame relay, ATM, PPP and other networks with only the far right header and left trailer varying by protocol. The digitised voice field, RTP, UDP and IP headers remain the same.

Each of these packets will contain part of a digitised spoken word. The packet rate is 50 packets per second for 20ms and 33.3 packets per second for 30ms voice samples. The voice packets are transmitted at these fixed rates. The digitised voice field can contain as few as 10 bytes of compressed voice or as many as 320 bytes of uncompressed voice.

The UDP header carries the sending and receiving port numbers for the call. The IP header carries the sending and receiving IP addresses for the call plus other control information. The Ethernet header carries the LAN MAC addresses of the sending and receiving devices. The Ethernet trailer is used for error detection purposes. The Ethernet header is replaced with a frame relay, ATM or PPP header and trailer when the packet enters a WAN

RTP and UPD Overheads

The RTP plus UDP plus IP headers will add on 40 bytes. The Ethernet header and trailer account for another 18 bytes of overhead, for a total of at least 58 bytes of overhead before there are any voice bytes in the packet. These headers, plus the Ethernet header, produce the overhead for shipping the packets. This overhead can range from 20% to 80% of the bandwidth consumed over the LAN and WAN. Many implementations of RTP have no encryption, or the vendor has provided its own encryption facilities. An IP PBX vendor may offer a standard secure version of RTP (SRTP).

As discussed earlier shorter packets have higher overhead. There are 54 bytes of overhead carrying the voice bytes.

Calculating bandwidth consumption for VoIP

The bandwidth needed for VoIP transmission will depend on a few factors:

- The compression technology,
- The packet overhead,
- The network protocol used
- Whether silence suppression is used.

There are two primary strategies for improving IP network performance for voice:

1. Allocate more VoIP bandwidth (reduce utilization)
2. Implement QoS.

How much bandwidth to allocate depends on:

- Packet size for voice (10 to 320 bytes of digital voice)
- CODEC and compression technique (G.711, G.729, G.723.1, G.722, proprietary)
- Header compression (RTP + UDP + IP), which is optional
- Layer 2 protocols, such as point-to-point protocol (PPP), Frame Relay and Ethernet

Silence suppression/voice activity detection

Calculating the bandwidth for a VoIP call is not difficult once you know the method and the factors to include. The chart below, "Calculating one-way voice bandwidth," demonstrates the overhead calculation for 20 and 40 byte compressed voice (G.729) being transmitted over a Frame Relay WAN connection. Twenty bytes of G.729 compressed voice is equal to 20 ms of a word. Forty bytes of G.729 compressed voice is equal to 40 ms of a word.

Voice Digitisation and Compression

G.711 – 64Kbps or 8,000 Bytes per second

At 20 Bytes per packet this requires= 50 Packets per second G.711

G.729 – 8Kbps or 1, 000 Bytes per second

At 50 Bytes per packet this requires = 25 Packets per second using G.729

Protocol Overhead using Frame Relay

Frame Relay	6 Bytes (Header and Trailer)
IP	20 Bytes (Header)
UDP	8 Bytes (Header)
RTP	12 Bytes (Header)

For G.729 20 byte packet (20ms)

20+46 Bytes/Packets x 50 packets per second 3,300 Bytes / sec x 8 bits= 26.4Kbps voice overhead

For G.729 40 byte packet (40ms)

20+46 Bytes/Packets x 25 packets per second= 2,150 Bytes / sec x 8 bits= 17.2Kbps voice overhead

The results of this method of calculation are contained in the next table, "Packet voice transmission requirements." The table demonstrates these points:

- Bandwidth requirements reduce with compression, G.711 vs. G.729.
- Bandwidth requirements reduce when longer packets are used, thereby reducing overhead.
- Even though the voice compression is an 8 to 1 ratio, the bandwidth reduction is about 3 or 4 to 1. The overhead negates some of the voice compression bandwidth savings.

Compressing the RTP, UDP and IP headers (cRTP) is most valuable when the packet also carries compressed voice.

Packet voice transmission requirements (Bits per second per voice channel)							
Codec	Voice bit rate	Sample time	Voice payload	Packets per second	Ethernet	PPP or Frame Relay	
						RTP	cRTP
G.711	64 Kbps	20 msec	160 bytes	50	87.2 Kbps	82.4 Kbps	68.0 Kbps
G.711	64 Kbps	30 msec	240 bytes	33.3	79.4 Kbps	76.2 Kbps	66.6 Kbps
G.711	64 Kbps	40 msec	320 bytes	25	75.6 Kbps	73.2 Kbps	66.0 Kbps
G.729A	8 Kbps	20 msec	20 bytes	50	31.2 Kbps	26.4 Kbps	12.0 Kbps
G.729A	8 Kbps	30 msec	30 bytes	33.3	23.4 Kbps	20.2 Kbps	10.7 Kbps
G.729A	8 Kbps	40 msec	40 bytes	25	19.6 Kbps	17.2 Kbps	10.0 Kbps
Note: RTP assumes 40-octets RTP/UDP/IP overhead per packet Compressed RTP (cRTP) assumes 4-octets RTP/UDP/IP overhead per packet Ethernet overhead adds 18-octets per packet PPP/Frame Relay overhead adds 6-octets per packet							

This table provided courtesy of Michael Finneran

The varying designs of packet size, voice compression choice and header compression make it difficult to determine the bandwidth to calculate for a continuous speech voice call. The IP PBX or IP phone vendor should be able to provide tables like the one above for their products. Many vendors have selected 30 ms for the payload size of their VoIP implementations. A good rule of thumb is to reserve 24 Kbps of IP network bandwidth per call for 8 Kbps (G.729-like) compressed voice. British Telecomm on their 'IP Clear Service' allocate and sell their service with breakdowns of guaranteed QoS at 30Kbps breaks, so the entry level purchase provides guaranteed QoS of 30Kbps. If G.711 is used, then reserve 80 Kbps of bandwidth.

If silence suppression/voice activity detection is used, the bandwidth consumption may drop 50% -- to 8 Kbps total per VoIP call. But the assumption that everyone will alternate between voice and silence without conflicting with each other is not always realistic. Its also important to generate some form of background noise if using silence suppression otherwise callers may think the link has failed

CODECS

The CODEC (COder/DECoder) is the component in an IP phone or Voice over IP Routers that digitises the voice and converts it back into an analog stream of speech. The CODEC is the analog-to-digital-to-analog converter. The CODEC may also perform the voice compression and decompression.

There are several voice digitisation standards and some proprietary techniques in use for VoIP transmission. Most vendors support one or more of the following ITU standards and avoid proprietary solutions

- **G.711** is the default standard for IP PBX vendors, as well as for the PSTN. This standard digitises voice into 64 Kbps and is called PCM (Pulse Code Modulation) There is no voice compression.
- **G.729** is supported by many vendors for compressed voice operating at 8 Kbps, 8 to 1 compression. With quality just below that of G.711, it is the second most commonly implemented standard.
- **G.723.1** was once the recommended compression standard. It operates at 6.3 Kbps and 5.3 Kbps. Although this standard further reduces bandwidth consumption, voice is noticeably poorer than with G.729, so it is not very popular for VoIP.

- **G.722** operates at 64 Kbps, but offers high-fidelity speech. Whereas the three previously described standards deliver an analog sound range of 3.4 kHz, G.722 delivers 7 kHz. This version of digitised speech has been announced by several vendors and will become common in the future.

It is important to note that all of the voice digitisation transmission speeds are for voice only. The actual transmission speed required must include the packet protocol overhead.

The quality of a voice call is defined by the Mean Opinion Score (MOS). A score of 4.4 to 4.5 out of a possible 5.0 is considered to be toll quality. Voice compression will affect the MOS. An MOS below 4.0 will usually produce complaints from the callers. Cell phone calls average about 3.8 to 4.0 for the MOS. The following table presents the voice MOS for different standard CODECs

Standard	Speed	MOS	Sampling delay per phone
G.711	64 Kbps	4.4	0.75 ms
G.729	8 Kbps	4.2	10 ms
G.723.1	6.3 Kbps 5.3 Kbps	4.0 3.5	30 ms

This table illustrates two points. First, as the voice is compressed, the voice quality (MOS) decreases. The MOS in the table does not include network impairments such as jitter and packet loss. These impairments will further reduce the voice quality. The

VoIP network designer should choose a compression technique with a higher MOS so the network impairments will not reduce the voice quality to an unacceptable level.

Second, voice compression also adds delay to the end-to-end call. The table shows the sampling delay for one phone. This delay is doubled for the two phones of a call. This end-to-end delay needs to be limited. As compression increases, the delay experienced in the IP network needs to decrease, which increases the cost of transmission over the WAN, but not the LAN. The delays shown in the table are the theoretical minimum. The actual delays experienced will probably exceed 30 ms, no matter what compression technology is implemented. This delay will vary by vendor.

The conclusion is that digital voice compression is worth pursuing for VoIP transmission on a WAN, but it comes with some costs in voice quality reduction and increased end-to-end delay.

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Cisco Comms Platform vulnerable to attack

Security vulnerabilities have been discovered in Ciscos Unified Communications Management platform. The flaws could allow buffer overflow attack and unauthorised access, potentially allowing an unauthorised user to cause a denial of service condition or execute arbitary code.

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The Computer Virus turns 25

Users may think viruses began with the PC and unsecured Internet connections, but the first computer viruses appears as far back as 1982, about one yearafter IBM unveilled its first PC.

The first virus as Elk Cloner, apparently created by a High-school student from Pittsburg, which was spread between Apple II computer via floppy disks.

Elk Cloners destructive potential was limited to a couple of verses of poetry, probably complaining of the difficult of securing a girls affection and the apalling unfairness of parents. In typical teenage fashion, however, the poem only appeared on every 50th booting of the computer.

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At long last a computer that can play draughts

Draughts may seem a simple game, but the scientists say it took an average of 50 computers nearly 20 years to sift through the 500 billion billion possible draughts positions

Jonathan Schaeffer, lead author of the programe, told the BBC ' This was a huge computational problem to solve - more than a million times bigger than anything that had ever been solved before'

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Offcom report on Broadband Britain

The Report went on to provide an interesting array of Broadband Figures, the key points of which were;

Revenues from broadband access services continued to grow, reaching an estimated £1.8bn in 2006, an increase of 18% over the year and fifteen times 2001 revenues.

In Q4 2006, over 40% of all adults with broadband at home took broadband alongside other communications services from the same provider; around 32% combined broadband with landline, and a further 12% combined it with landline and TV services

In Q3 2006, 63% of adults with broadband at home used it daily, while 30% went online at least once a week. Broadband users spent an average of 9.1 hours a week online compared to 4.4 hours for narrowband users.

Around half (51%) of adults with broadband at home had accessed online video clips, with 26% saying they did this weekly, according to Ofcom's February 2007 survey. 43% of adults with broadband at home had uploaded images, while 15% had uploaded video content at least once.

At the end of 2006 the estimated average headline connection speed was 3.8Mbit/s, up from 1.6 Mbit/s in 2005. Headline speeds of over 2Mbit/s were used by 31% of homes and SMEs, compared to only 2% a year earlier. However, almost half (48%) of residential consumers were unaware of their headline connection speed.Up to 2Mbit/s headline speed connections were available for £15 a month in 2006, down from £50 in 2003.

Headline speeds of 8Mbit/s were available for around £10 per month from some operators, compared to £40 when first offered in 2004. In addition, several providers offered a broadband service at no extra cost to consumers who also took other services in a bundle.

At the end of 2006 there were 1.3 million residential and SME broadband unbundled lines, accounting for 10% of all connections compared to only 2% a year earlier. LLU growth continued in early 2007, reaching 1.7 million lines in February.

There were around 12,000 commercial wireless hotspots across the UK in September 2006, an increase of 32% over twelve months. In February 2007, of the 21% of adults owning a WiFi-enabled laptop, over one in three (34%) had used it to access the internet via a WiFi hotspot.

One in three UK adults said they owned an internet-enabled mobile phone in February 2007; however, only half had ever used it to go online. Lack of need or interest was the main reason cited (by 43% of users), with cost second (31%).

Almost two-thirds (62%) of SMEs were connected to broadband in 2006, while 9% used dial-up internet access. Broadband penetration was higher among larger SMEs with 50-250 employees, at 70%.

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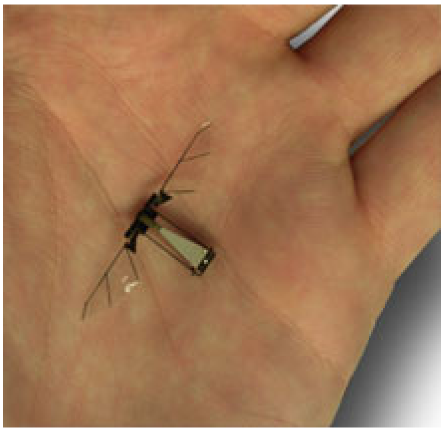
Harvard University develops Robotic fly

A life-size, robotic fly has taken flight at Harvard University. Weighing only 60 milligrams, with a wingspan of three centimeters, the tiny robot's movements are modeled on those of a real fly. While much work remains to be done on the mechanical insect, the researchers say that such small flying machines could one day be used as spies, or for detecting harmful chemicals.



"Nature makes the world's best fliers," says Robert Wood, leader of Harvard's robotic-fly project and a professor at the university's school of engineering and applied sciences.

The U.S. Defense Advanced Research Projects Agency is funding Wood's research in the hope that it will lead to stealth surveillance robots for the battlefield and urban environments. The robot's small size and fly-like appearance are critical to such missions. "You probably wouldn't notice a fly in the room, but you certainly would notice a hawk," Wood says.

Recreating a fly's efficient movements in a robot roughly the size of the real insect was difficult, however, because existing manufacturing processes couldn't be used to make the sturdy, lightweight parts required. The motors, bearings, and joints typically used for large-scale robots wouldn't work for something the size of a fly. "Simply scaling down existing macro-scale techniques will not come close to the performance that we need," Wood says.

Some extremely small parts can be made using the processes for creating microelectromechanical systems. But such processes require a lot of time and money. Wood and his colleagues at the University of California, Berkeley, needed a cheap, rapid fabrication process so they could easily produce different iterations of their designs.

Ultimately, the team developed its own fabrication process. Using laser micromachining, researchers cut thin sheets of carbon fiber into two-dimensional patterns that are accurate to a couple of micrometers. Sheets of polymer are cut using the same process. By carefully arranging the sheets of carbon fiber and polymer, the researchers are able to create functional parts.

For example, to create a flexure joint, the researchers arrange two tiny pieces of carbon composite and leave a gap in between. They then add a sheet of polymer perpendicularly across the two carbon pieces, like a tabletop on two short legs. Two new pieces of carbon fiber are placed at either end of the polymer, as a final top layer. Once all the pieces are cured together, the resulting part resembles the letter H: the center is flexible but the sides are rigid.

By fitting many little carbon-polymer pieces together, the researchers are able to create rather complicated parts that can bend and rotate precisely as required. To make parts that will move in response to electrical signals, the researchers incorporate electroactive polymers, which change shape when exposed to voltage.

After more than seven years of work studying flight dynamics and improving various parts, Wood's fly finally took off this spring. "When I got the fly to take off, I was literally jumping up and down in the lab," he says.

Other researchers have built robots that mimic insects, but this is the first two-winged robot built on such a small scale that can take off using the same motions as a real fly. The dynamics of such flight are very complicated and have been studied for years by researchers such as Ron Fearing, Wood's former PhD advisor at the University of California, Berkeley. Fearing, who is building his own robotic insects, says that he was very impressed with the fact that Wood's insect can fly: "It is certainly a major breakthrough." But Fearing says that it is the first of many challenges in building a practical fly.

At the moment, Wood's fly is limited by a tether that keeps it moving in a straight, upward direction. The researchers are currently working on a flight controller so that the robot can move in different directions.

The researchers are also working on an onboard power source. (At the moment, the robotic fly is powered externally.) Wood says that a scaled-down lithium-polymer battery would provide less than five minutes of flying time.

Tiny, lightweight sensors need to be integrated as well. Chemical sensors could be used, for example, to detect toxic substances in hazardous areas so that people can go into the area with the appropriate safety gear. Wood and his colleagues will also need to develop software routines for the fly so that it will be able to avoid obstacles.

Still, Wood is proud to have reached a major project milestone: flight. "It's quite a major thing," he says. "A lot of people thought it would never be able to take off."

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Swedish scientists develop liveness-detection system

Scientists in Sweden have developed a liveness-detection system that they say should help reduce the chances of face-biometrics systems being fooled by photographs.

"Liveness is going to be a major issue for biometrics," says Josef Bigun, a professor of signal analysis who led the research at Halmstad University, in Sweden. This is particularly the case with face recognition. "[Today's systems] cannot tell the difference between a picture and a face," he says.

While some systems have rudimentary defences designed to spot photographs, a crook can easily foil them just by bending the picture, says Bigun. Detection systems need to be "a little bit more sophisticated," he says.

Most face-recognition systems assume that the users will always be accompanied by an official to monitor the process.

But as face biometrics becomes more ubiquitous, this will not always be an option. Some companies, such as the Japanese firm Fujitsu, are already using unattended hand geometry readers to enable people to withdraw cash at ATMs. Face biometrics is likely to follow a similar path, says Bigun.

Michael Jones, a face-recognition researcher at the Mitsubishi Electric Research Laboratories, in Cambridge, MA, believes that face recognition will be more prone to fraud: "It's so easy to get a photo of a face. You can't get someone's irises or fingerprints off the Internet."

Bigun is trying to combat the problem by using an algorithm that measures the optical flow--a measurement of the 3-D movement of two-dimensional information--to detect how parts of a real face should move in 3-D relative to each other.

Face biometrics currently use two much simpler processes to try to detect liveness. One is to measure how similar the face being presented is to the stored face template of a particular person. Since no two presentations of the same face will look exactly the same, biometrics systems are, somewhat ironically, designed to reject faces that too closely match the original template. So in theory, it may detect a picture if it looks too similar to the original template. But there's an easy way to get around this, says Bigun: "You simply add statistical noise to an image." This could be done using a digital copy of the image and basic photo-manipulation software: a user could randomly add dots to the image to introduce small errors.

The second approach uses optical flow to measure the movement of key parts of the face--such as the nose, eyes, and ears--relative to each other. The aim here is to detect slight movements of a photo as the fraudster holds it in front of the camera. If all regions of the image move in a perfectly linear fashion--that is, the nose, eyes, and ears all move in precisely the same way--then the system recognizes that a photo is likely being used.

However, this approach runs the small risk of rejecting a legitimate person if he or she happens to be holding his or her facial expression very still. Also, as mentioned, simply bending a photo can fool these algorithms because it will cause different points of the photo to move at slightly different trajectories from the point of view of the camera, since they are not on the same two-dimensional plane.

According to Michael Bronstein, a computer scientist who works on 3-D face recognition at the Technion Institute of Technology, in Israel, another method used by commercial face-biometrics systems is to try to detect natural movements, such as blinking. However, these systems could be fooled by a video recording, Bronstein says.

Bigun's approach takes the optical-flow concept a step further. "We looked at how a 3-D face moves," he says. By comparing how bent photos of faces and real faces move, the researchers were able to identify differences in the trajectories of key facial points. For example, the movement of an ear and nose as a head turns slightly will be different from those appearing on a bent photo. This is because the parts of the face in the photo are still on a single plane, even if the photo is bent; conversely, the trajectories of 3-D facial features are more complex and follow a particular pattern relative to each other. Using this information, the researchers created a system to detect such discrepancies.

In experiments using 400 high-quality photographs and 400 video recordings of real people, the system was able to achieve an equal error rate--a common standard in biometrics in which the number of false matches is equal to the number of false rejections--of 0.5 percent. The results will be published in a forthcoming issue of the journal Image and Vision Computing.
"It makes sense to do this," says Mark Nixon, a professor of computer vision at the University of Southampton, in the UK. "Liveness is quite an issue." Some other kinds of biometrics already have ways of dealing with it, such as fingerprint biometrics. "You can use infrared and sweat to give a liveness measure," Nixon says.

According to Bigun, the only way of beating the system he helped develop would be to make an accurate 3-D mask of someone's face. While it's feasible that someone with connections to Hollywood makeup artists could do this, it's pretty unlikely, says Mitsubishi's Jones. "It's just not practical for the random criminal."

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Google looking to move into telecomms market

Google the search company have said it will move into the telecoms market by spending $4.6 billion (£2.2 billion) on mobile phone spectrum in the United States if certain conditions are met when the airwaves are auctioned. They went on to say they would spend the money if the Federal Communications Commission (FCC) adopted certain rules for the auction process, such as forcing carriers to lease spectrum to others offering services at wholesale rates.

The announcement is the latest in a series of exchanges over proposed changes to the rules on spectrum auctions between mobile carriers such as Verizon and technology companies such as Google. They want to muscle in on the market for providing so-called 4G wireless services.

Google and others want part of the spectrum to be set aside for “open networks” that would be free of the constraints imposed by existing carriers. Many are unwilling to introduce free web calls to mobile phones and want to lock certain phones to particular networks.

The mobile carriers have said that the draft rules are designed to suit Google’s business model and would limit their ability to deliver new services.

The 700 MHz spectrum, which is due to be auctioned when American TV broadcasts move from analogue to digital, has been the subject of intense interest among technology companies because it is particularly well suited to carrying wireless data. Analysts have estimated that the auction will raise as much $20 billion for the Treasury.

Kevin Martin, the FCC chairman, has indicated that the draft rules respond to many of the concerns raised by a “4G coalition”, of which Google is a member.

Eric Schmidt, chief executive of Google, has told the FCC that the draft rules fell short of what his and other companies had requested. He called for recipients of a spectrum licence to be obliged to open their platform to all software applications and devices. Licensees should lease spectrum on “reasonably nondiscriminatory, commercial terms”, he said.

Mr Martin has said that the draft rules would spur technology companies to introduce new services, such as the ability for mobile phones to route calls via wi-fi. Verizon and other carriers have vigorously opposed any controls on the way they run their networks.

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Mobile Wimax will emerge into early adopter phase in 2008

Mountain View, CA (PRWEB) July 30, 2007 -- A new study, "WTRS Wireless Broadband (WiMAX) Technology Trends Report, Summer 2007" looks closely at the progress of WiMAX and its prospects. Today there is real market opportunity for WiMAX, in both mobile and fixed applications. While HSPA is making inroads in the mobile market, Sprint appears to be single-handedly pushing WiMAX through the early adopter phase of the market.

"The impetus for a WiMAX market development and expansion is the growth of services in end user applications that utilize the expanded mobility and high bandwidth that WiMAX affords," said Kirsten West, PhD, principal analyst with WTRS. "This is exactly what Sprint is doing, the partnership with Google being one example."