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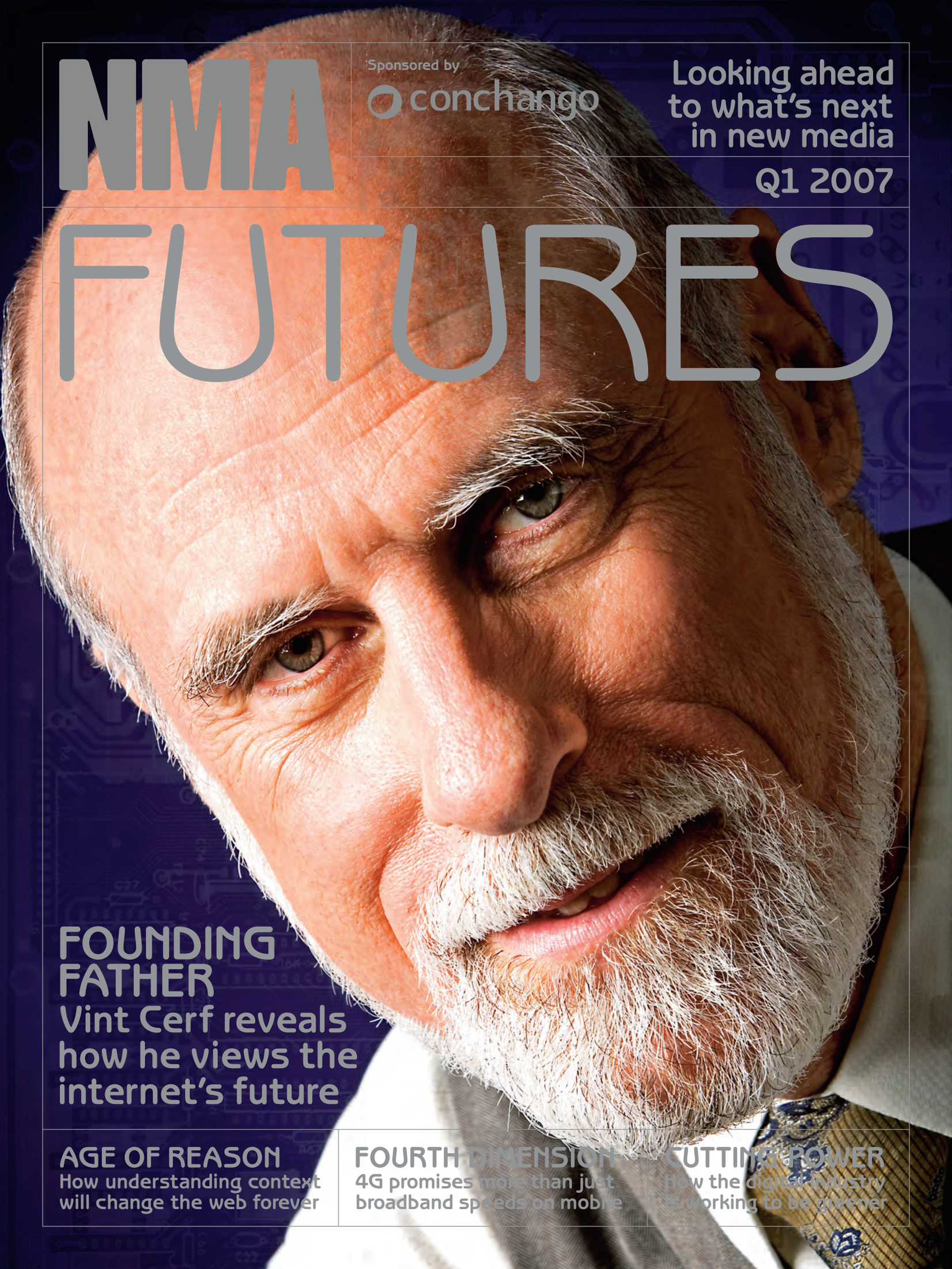
Looking ahead to what's next in new media

Q1 2007

FUTURES



FOUNDING FATHER

Vint Cerf reveals how he views the internet's future

AGE OF REASON

How understanding context will change the web forever

FOURTH DIMENSION

4G promises more than just broadband speeds on mobile

CUTTING POWER

How the digital industry is working to be greener

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WHAT WILL BE THE NEW MEDIA OF TOMORROW?

Welcome to the first issue of **NMA Futures**, a supplement that looks a little further ahead than usual at the ideas and developments that we think are going to have an impact on digital media the day after tomorrow.

As Vint Cerf, one of the founding fathers of the internet, says in our exclusive interview on page 10, "The future happens first in someone's mind." Back in the 1970s, Cerf and his colleague Bob Kahn came up with the idea of TCP/IP, a way of moving data around the internet. Now, as the internet increasingly goes mobile, Cerf is calling for this protocol to be revised.

And if the vision of a truly fast internet accessible anywhere is to become a reality, then we'll need a new generation of mobile technologies to use it. We peer into the alphabet soup of new and competing mobile standards to tease out what 4G means for media on the move.

Another future visionary is Tim Berners-Lee, who back in 1999 came up with a vision of the 'semantic web' – a way of helping computers make sense of all the content that's connected to the internet. As you can imagine, implementing a new system for tagging and combining information is no small task, and it has been a long time coming. But we look at the start-ups and developers that are already preparing for the semantic web.

If computers can be made to reason more like people, does this mean they'll also be able to understand us? Film-makers from Kubrick to Spielberg have been fascinated with how humans might communicate with computers in the future. On page 17 we look at how engineers are already shaping new technologies that go beyond the keyboard.

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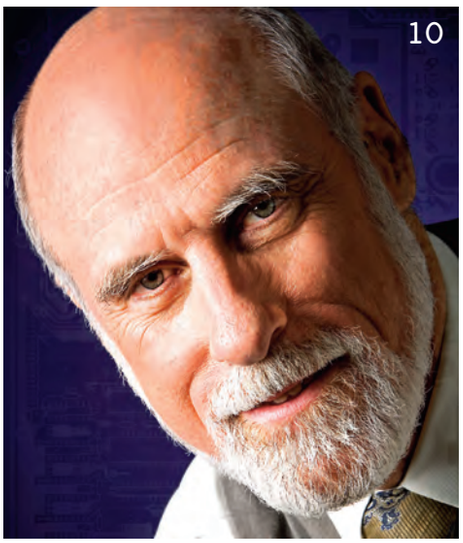


Panning for gold

What new media companies are the venture capitalists of Silicon Valley tipping as being the next billion-dollar exits, asks **Sean Hargrave**

Ask any financier in Silicon Valley what the next Google may be and they'll point to Joost, the online TV streaming service created by Skype founders Niklas Zennström and Janus Friis. Even if the company currently needs no further investment, it ticks two key boxes for VCs: online video without rights issues.

Joost, originally dubbed The Venice Project, is in live beta testing with users around the globe and currently tops the wishlist of investments that most financiers in the US would love to be asked to make, according to Howard Hartenbaum, partner at Draper Richards, one of Skype's original backers.

"I think it's the most interesting company in the world right now," he says. "People always want to know what the next billion-dollar company is going to be. Joost could be a multi-billion-dollar company within five years because it has the track record. It's interesting that on the day Viacom told YouTube to take down video content it hadn't given permission to show, it signed a deal with Joost, as did CBS."

Indeed, the mantra at nearby VC firm Beringea is that content is king. While technology platforms come and go, co-founder Charlie Rothstein remains convinced that they all hinge on content, so that's the place to be right now. "It's all about media," he says. "Look at the music industry: it has moved from vinyl to tape to CD to download and mobile – it's going from strength to strength.

"New technology and platforms are like comets: they shine brightly and make someone some money, but then fade as they're surpassed. Media is where it's at because you have old media companies buying new ones, like News Corp buying MySpace, but you also have new media companies buying even newer ones, like Google buying YouTube and Ebay buying Skype."

Hence Beringea has made an investment in **Shout Factory**, which combines video and audio content with a DVD and CD shop and a community in which people chat about music and TV shows. However, it believes there's also a huge opportunity for content owners provided by online advertising shifting from TV and print to the web, as partner Jeff Bocan points out.

"As more and more ad dollars come online, we feel there are two major opportunities, both coming from the traditional thing that attracts VCs: pain," he says. "The pain in ad dollars coming online is how companies go about spending their budget and how they get great creative. These are huge opportunities, and though we haven't made any significant investments we're actively looking for a company that would be able to provide video content and graphics to companies advertising online.

"We're also very interested in ad networks, particularly those building up video networks, because they take the pain out of launching an online campaign. That's what VCs will always find attractive."

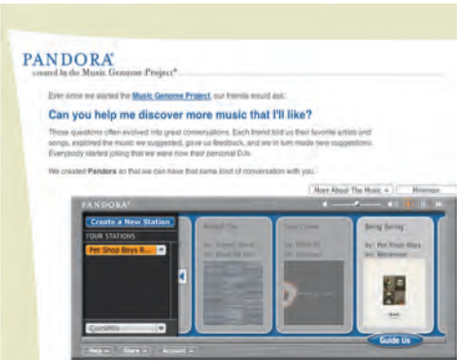
A company that has been touted as one to watch in the online video content area is **Thought Equity**, which has a mass of broadcast quality footage that advertisers can preview and buy for their campaigns.

In addition, Beringea's Rothstein believes the next couple of years are going to see a huge shift to making the social networks that defined Web 2.0 more relevant to their users.

"The problem with social networks is that they're just so huge that they become less relevant for the people who are using them," he says. "The area we're keen to look into is where people want to make networks more relevant to a particular cultural grouping, such as **aSmallWorld**. That site is great because it's invitation only, so you know people are going to be relevant and it's a way for high-fliers to talk to one another. It would be great to be able to build online country clubs."

Christian Lagerling at GP Bullhound agrees. After years of seeing huge numbers leading the way in social networking, he's convinced that having a more focused approach that can be taken onto mobile is the route to success. >

HOT START-UPS



From the founders of Skype, **Joost** promises to be even more successful; social networking sites like **Pandora** focus on specific interests; **Loopt** taps into the mobile generation

"There's a massively interesting area where mobile and the web converge," he says. "The social networks that are going to be successful in the future are those that build around an interest. I would point out something like **Pandora**, which is a rival to Last.fm. These sites that let you discover music build up a loyal, focused community that will give them great exit opportunities in the near future if they can find a way to make them go mobile."

This area, where web and mobile meet, is causing much excitement in Silicon Valley, where common wisdom is that to evolve and stay relevant to their user base, social networks will not only become more focused, they'll need to reach out to users who aren't in front of a PC.

With mobile phone use growing at a faster rate than web use around the world, it makes sense, according to Hartenbaum, to end the current disconnect between the web and mobile.

"Mobile is growing faster than the web and you have to accept that although you think email is great, the youth don't rely on it like you do, they live through their mobile phones," he says. "That's why we've invested in **Kyte**, which allows users to upload and share video and pictures taken on their mobile phone. It can be used by a dad to show the family their son at a soccer game the second the video has been shot, or it can be used more like social networking. One feature that's popular with young people is voting on whether a girl or a guy someone has photographed is 'hot or not'.

"We've backed it because it's in an interesting space, but crucially it gives the one thing you need for success: a great user experience. That's the one thing VCs are looking for because it's users who decide if great ideas become great companies."

Hartenbaum's excitement about the opportunities offered by mobile is shared by Kittu Kolluri, partner at VC firm NEA. He feels the main area of opportunity is location-based services, and the company he's tipping for the top is **Loopt**. It allows friends and contacts to find one another in a city and chat about where they are, what parties are taking place and so on. As such it has a similar business model to Dodgeball, which VCs have long pointed out as an exciting company, leading to it being acquired by Google last May to provide a mobile platform the web giant could expand onto.

"Location-based mobile search is a huge area of opportunity, so telling your friends about where you are and what's going on is a great service. We're very excited about Loopt," says Kolluri. "That's why we've also invested in **SnapTell**, which lets users send in a photo of a product name and the service searches for the best deal on it. You might take a picture of a book title, for example, and find that it's cheaper in another store or, at some stage we hope, buy it online through your mobile."

It's hard to talk to a new media VC in Silicon Valley without a mobile start-up featuring very close to the top of their ones-to-watch list. In fact, it's usually second only to the investment in Joost that most wish they'll one day be asked to make.

Warren Packard, MD at Draper Fisher Jurvetson (DFJ), points to the firm's investment in **Jaxtr** (pronounced Jackster), which allows users to add a button to an email, blog, website or social network profile that people can click to call the user's mobile without knowing the number. This gives them the flexibility of changing mobile at any time, as well as protecting a number from being seen by a wide audience which, of course, can be filtered to known and trusted friends.

"Voice-over-IP is a hugely disruptive technology so Jaxtr is very exciting and not very capital intensive," says Packard. "We invested in Skype when it had just 150 employees but something like 70m users. That's phenomenal and something traditional telcos would kill for. So we believe the next step is the mobile phone, allowing people to initiate a call online by clicking an icon. It's very private, it gives the user control and it's obviously a lot cheaper than traditional mobile-to-mobile calls, because you could be calling anywhere in the world and the majority of the call travels over the web."

Another area of interest is virtual worlds. Hartenbaum is predicting that **Doppelganger** will become a household name. The 3D avatar site is themed around parties and events, so is aimed at offering a fun experience to young people who want to mix and chat in real time, but not be seen as a nerd on a service used by older people, such as Second Life.

Another company he has backed and is tipping for success is **Attributor**, which can track down copyrighted material and report infringements to the rightful owner so they can take action.

Packard also believes there are huge exits waiting to happen in the infrastructure industry and in the equipment needed to deliver services. Hence DFJ has invested in **Akimbo**, which he describes as "an online TiVo" – a set-top box plugged into the TV that constantly scours the web for content as it gets to know what the user likes.

Nevertheless, put Packard on the spot and ask him which company will give him a billion-dollar exit, akin to Google, YouTube, MySpace or Skype, and he has a rather unusual answer.

"**Anagran** is the name I think you should look out for," he says. "It could come to nothing, but if it flies it'll be a billion-dollar company. It's a clever router that can tell which sort of traffic needs prioritising. So a TV show can be given priority over a music download or some P2P file-sharing traffic. It's a truly necessary piece of kit if networks are going to roll out IPTV networks that give a flawless TV experience.

"Mobile is huge, everyone knows that, everyone in Silicon Valley is talking about it. But if you want my top tip, keep an eye on Anagran."

Although the companies being tipped may not be familiar to a UK readership, there are no huge surprises in the areas that are interesting Silicon Valley VCs. They tend to be concentrated on moving Web 2.0 onto the mobile phone, providing reach to a large audience when they're away from a computer.

While some VCs are saying they think the days of billion-dollar exits are over, most agree that with the originals being web-based, these new media companies now need to buy even newer media companies in order to make themselves relevant and provide eyeballs that can be sold to advertisers once Web 2.0 is mobilised. So further billion-dollar exits are still on the cards.

Making connections

The next evolution of the web will be applications that understand the context of content and link it together more productively. **Greg Brooks** examines the opportunities this offers for users and advertisers

Back in 1999, Tim Berners-Lee, father of the World Wide Web, unveiled his vision of the 'semantic web' – a universal medium for exchanging data, information and knowledge. Put simply, the semantic web is an evolution of the World Wide Web that labels all information in a way that computers can understand, so they become much better at finding and combining information.

There are many strands to the semantic web, but it will require a new set of programming languages, such as RDF (resource description framework) and OWL (web ontology language). These work with often ambiguous concepts and terms, and with content that's tagged in a new way.

The semantic web is a vast undertaking and it will be some time before users see the development of any consumer services to take advantage of work being done behind the scenes now. Nevertheless, developers and start-ups are gearing up for the impact it will have. And some companies have already been using semantic web applications. Since 2005, the bank JP Morgan has been using semantic web technologies to exchange information between previously unstandardised components of its business, such as bonds, equities, currency and interest rate derivatives (see *NMA* 16.05.05).

Stefano Mazzocchi, research scientist with the Digital Libraries Research Group at the Massachusetts Institute of Technology (MIT), sees the semantic web as being primarily about data integration. "One of the common fantasies is that software agents will be able to do most of the work for users," he says. "But we think of the semantic web as predominantly a data integration effort on a massive scale."

One of the projects that Mazzocchi has been working on at MIT is a semantic web browser. Piggy Bank is a Firefox extension that allows users to easily extract data from websites and combine it to create new services. It would allow you to get the data for, say, houses for sale from one site, add geographical co-ordinates using another web service, then put the results on a map, with a browsing interface to help drill down on your preferences.

Such services could be used by the next generation of web entrepreneurs to create applications based on the semantic web that go well beyond current notions of publishing from a single source.

One of the driving principles behind semantic web development is the notion of the 'deep web' – that is, the data stored on devices connected to the internet but which isn't currently visible. While existing search engines index around 10bn pages, it's estimated that the deep web could contain thousands of times more information.

"It's believed that most of the world's business and personal data is stored in spreadsheets," says Mazzocchi. "One of our aims is make it easy for people to get that data out of there and published on the web in a way that can be harvested and linked together. Exactly what the web did for text by providing hypertext, decentralised web sites and intranets, we want to do for datasets and the links between them, even small and personal ones."

One of the data standards for the semantic web is Resource Description Framework (RDF), a family of World Wide Web Consortium (W3C) specifications originally designed as a metadata model. Information modelled using RDF will drive a new era of semantic web services. Start-ups in the US are already working on services that use the semantic web and which will be launched by the end of the year.

Radar Networks is headed by Nova Spivack, co-founder of EarthWeb, and backed by investors including Microsoft co-founder Paul Allen's Vulcan Capital. It's guarded about what it's developing, only admitting to "a fundamental new technology for enriching content that will open up a new dimension of the web", and that it anticipates launching this online service sometime in 2007.

Spivack says that the semantic web offers a great opportunity in a number of areas, even if its beginnings won't be as sexy as services like Flickr >

Fake: "Yahoo! Pipes is rewiring the internet"

and YouTube. He says the semantic web is about computers being able to make sense of content.

"Web 1.0 was hyperlinks, and now we have tagging, but it's still not intelligent," he says. "Reasoning is one of the things that Tim Berners-Lee has been pushing the industry towards and the first step is the unification of data. The next generation of search is reasoning. Search is currently the intermediary between you and the information."

Both Radar Networks and semantic web start-up MetaWeb have their roots in development of systems for the military, which has been at the forefront of finding ways to make sense of vast amounts of information – the core challenge of the semantic web.

"In some ways, when you conduct a search you're asking the whole world for something, whereas ideally you would ask an expert," says Spivack. "These technologies are already being used by intelligence agencies, and that's a good indication that in 20 years we'll all be using them."

The advent of the semantic web and advanced services that include reasoning will, according to Spivack, spell an end to manual systems integration. "We spend too much time being librarians or systems integrators. All this technology was invented with the dream of freeing people from the drudgery of managing information, but it has had the opposite effect. The semantic web enables people to make technology smart. Within three years we'll see consumer applications based on it."

Other smart web applications that are being developed include the recently launched Yahoo! Pipes initiative. This is an early-stage prototype developed by the Technology Development group at Yahoo! and allows developers to combine web data using a drag-and-drop editor to connect multiple internet data sources.

For example, you could create a service that takes the New York Times home page, passes it through the Yahoo! Pipes Content Analysis tool and picks out keywords to find photos at Flickr.

Yahoo! Pipes is an enabling service, one of many seeking to make it easier for developers to extract and use the hordes of data that are online and most of which are currently locked away from public access. Freeing this data, or collating it in different ways, is the driving force behind most of the innovation online today.

Caterina Fake, co-founder of Flickr and now head of the Yahoo! Technology Group, says, "Pipes is rewiring the internet. The web right now is based on pages, but it's rapidly evolving to the point where the pages are really just transformations of databases. Pipes makes it possible to take this data and mix it, match it, customise it, filter it and amalgamate it in any way you want."

A driving force behind the current incarnation of the web is connecting people with like-minded interests. This model is being extended onto the semantic web too.

Friend of a Friend (FOAF) is an open community project lead by developers Libby Miller and Dan Brickley for machine-readable modelling of home-page-like profiles and social networks. It's based on the idea that data you enter on the home page of your blog can be modelled in such a way that a computer can read and understand the links between the information across any number of sites.

FOAF has been designed to make it easier to share information about people and their activities. It could lead to a new breed of social networking where many of the connections will be done in the background and linking people will be more intuitive.

It could also be used to combat spam, and this is one of the projects being pushed by the Semantic Web Education and Outreach (SWEO) group at the W3C. Another is Search Thresher, which has been developed by accessibility company Segala.

Like Piggy Bank, Search Thresher is a Firefox extension. It ranks the quality of a site based on independent verification using content tags. It adds another tag, held on its servers, to the system already operated by search engines to index sites.

Helping users navigate content is one benefit of the semantic web. But what might these changes mean for advertisers? Microsoft set up AdCenter Labs a year ago to investigate this question and has been developing some services that it will be trialling with users and advertisers this year. Microsoft has a tough job continually finding ways to involve the advertiser. However, with richer data being made available for machines to read, advertising has an opportunity to get smarter. In readiness, it launched AdCenter Labs to learn what consumers were doing online and how advertisers could become involved in a non-intrusive way.

"We now have a social video solution," says James Colborn, product manager at Microsoft. "If you're watching a video and have Windows Live Messenger open, you can hover over a product and ask a question. That shows up as a little star on the screen of friends who are watching and they can click to view your comments. Contextual ads can be served on the page accordingly.

"Search advertising as a medium made web advertising more relevant. We're learning more about the consumer and telling the advertiser so they can become more relevant," he adds.

The web as we know it won't be changing overnight. YouTube and MySpace will still catch the media headlines, and Web 2.0 will be around for some time. But the seeds of change have been sown.

MIT's Mazzocchi believes there will be many more hurdles to overcome before consumers see the benefit of the work currently being done. The brave new world may be a bit further off than many think, and will have problems attached, such as privacy, spamming or sheer computational complexity. But organisations like MIT will continue to lead the way.

"We have our own problems of data interoperability and integration to solve, and we hope that by solving them for ourselves, others can find it useful and join our effort," says Mazzocchi. "If we can get more structured data on the web and make people interact with it easily, then that will have a big impact on the products, services and expectations that web users will have. Making more data available has enabling and cascading effects".

THE SEMANTIC WEB IN PRACTICE

If you want to find a cheap weekend break in Paris with a hotel near Notre Dame, you typically go to a search engine, enter something like 'Notre Dame hotel Paris' and receive a plethora of results to scan through. You might then look for 'train Paris' and 'cheap flight Paris' to sort out other elements of your trip, or you could to go to a specific site, such as travel site Expedia, to put together the whole package.

The semantic web will change this. By allowing content to be read and understood by other software, you could tell one application precisely what you were looking for. It would then go off across the web and find it for you, returning detailed itineraries for a weekend break in Paris with a hotel near Notre Dame, rather than making you sift through everything before finding what you want.

The key is that the agent understands what constitutes each element, such as 'near' and 'hotel', and doesn't simply match the word against metatags in its database to return results to you, which is how search engines currently operate.

Think green

With climate change the hot topic for all industries, how is the digital media sector attempting to reduce its carbon footprint? Emma Rubach looks towards a cleaner future

Google grabbed the headlines last year when it announced it was installing the largest-ever corporate implementation of solar power in the US at its Googleplex HQ. The 1.6-megawatt project is designed to provide enough electricity for 1,000 average Californian homes.

Apart from media, the hottest trends in Silicon Valley are clean technologies, as VCs smell the opportunities arising from growing concern about global warming. This building mega-trend is driving investor sentiment as well as political and consumer action. But how is the digital industry responding?

It may seem odd to single out digital media for its carbon footprint when the web can be used to raise environmental awareness and help consumers reduce their CO_2 emissions, whether by using comparison sites like uSwitch, car-pooling services like Liftshare.com (see *NMA* 03.08.06) or simply by online shopping, which can make for a more efficient way to deliver goods to people.

Environmentalist Mark Palmer, founder of hosting company Green ISP and a former Green Party candidate, says the web can bring lots of benefits to combating emissions. "It can create massive environmental benefits, in that you can buy a lot of stuff online," he says. "One van can transport 40 orders in one go, rather than 40 cars travelling around picking up from supermarkets."

But as we push ever-growing quantities of data around the internet – not least because of the explosion in video content – bigger data centres are required, usually drawing energy from conventional sources. According to consultancy Gartner, PCs and servers in their use phase alone account for in excess of 0.75% of global CO_2 emissions. This may seem small, but it's not insignificant when compared to the total emissions created by aviation – 2% – and that's without factoring in emissions from hardware production and distribution.

Might consumers one day have to consider the carbon emissions generated by sending an email, doing a web search or playing their favourite computer game? Palmer thinks so. Three years ago he founded Green ISP to provide "environmentally guided" internet access. Its clients include the Ecology Building Society, Green Building Store, Amnesty International and organic box schemes. But Palmer says that ordinary consumers are also responding to his company's proposition.

"We're seeing a definite shift. In the last 12 months we've trebled our customer base," he says. Admittedly Green ISP's user base is in the "small thousands", but Palmer says people are making the connection that their internet use has an impact. "There's interest in the whole idea," he says.

Perhaps this is why Palmer says that he knows of at least four ISPs that have claimed carbon-neutrality. These include EasyNet, which is now part of Sky, a company that CEO James Murdoch has pledged to make carbon neutral.

EasyNet has upgraded its systems to use disks that store more information without an increase in energy consumption, and offsets unavoidable emissions through a wind power project in New Zealand and a hydro-electric scheme in Bulgaria. For its part, Green ISP has solar-powered offices and offsets the carbon generated for its additional power needs through a tree-planting scheme in the UK.

As Web 2.0 takes over the world, companies must continually add rack upon rack of computers to their data centres in order to keep up. "In 2000, research showed that our customers were running out of space and power so they couldn't buy any more of our products," says Richard Barrington, head of public policy for Sun Microsystems UK & Ireland. "So we started looking into ways to reduce our physical footprint."

Sun Microsystems was forced to investigate ways to make processors cooler and smaller. It estimates the average energy bill of a UK data centre is £6m a year, of which half is spent on air conditioning, 25% on cooling and only 25% on powering the processor itself. Reducing the need for so many servers and so much cooling is a surefire way for Sun to gain an advantage over its competitors.

It's so confident in its abilities to produce newer and better heat-reducing technology that it's open-sourcing its current and past designs so that other people can take them and develop them further.

Sun is vocal on the subject of climate change. Together with mobile operator Vodafone, it's a member of the UK's Corporate Leaders Group on Climate Change, which has argued that a low-carbon future should be an objective for UK business as a whole.

This headstart has given Sun a green edge over its rivals. However, almost as if he's frightened of being seen as self-righteous, Barrington is at pains to point out that the main reason the company is spending millions on R&D in this area is down to cold cash. "We aren't doing this because it's green per se. We do it because it saves money or makes money for us," he says.

At the other end of the scale, Green ISP's Palmer explains that his company's non-profit structure means it doesn't encourage untrammelled use of the web, which can have such a cumulative effect. "We advise people not to take out an all–singing, all-dancing package unless they really need it," he says.

The ISP is investigating the technical feasibility of setting up a solar-powered data centre in southern Portugal. "If the backbone looks resilient we'll be restructuring the business to allow sufficient investment to put that project together," says Palmer. >

ENERGY SAVING

The question is, then, at what point does it become economically viable for the digital industry to bite the green bullet? Gartner VP of research Simon Mingay agrees that companies like Sun are doing an excellent job at the R&D level to bring down the carbon emissions of digital media. "It's working hard on improving the power consumption and management of its technology, and particularly in terms of data centre infrastructure there have been great improvements," he says.

But many of Sun's clients aren't ready for what it's producing. "There's a behaviour aspect to all this, says Mingay. "There's no point in power-consumption and management technology being produced if consumers immediately chose to disable it. Six out of ten PCs are left on overnight. To change behaviour requires input from all stakeholders: governments, NGOs, IT vendors, even organisations like the UN."

Other companies are managing their carbon worries less transparently. Google is happy to talk about Mountain View's solar panels and the special buses and organic food for workers, but it refuses to discuss the carbon footprint of its server farms or any ideas it might have about cutting the tonnes of carbon they may generate. This is despite the fact that Google founders Sergey Brin and Larry Page are also behind Tesla Motors, whose Roadster electric car is causing an investment buzz.

A spokeswoman for Google points out that it's talking about ways to make computing more efficient. For example, in 2006, Page called for a single power supply for computers, while at an Intel Developers' conference last year two Google engineers suggested ways to make power supplies more efficient.

So far, the digital industry – with the notable exception of Apple, currently on the receiving end of a Greenpeace campaign to get it to make its products more environmentally friendly – has managed to escape the ire of green campaigners.

Green ISP uses solar-powered hosting facilities and uses tree-planting group TreeSponsibility to offset its carbon emissions

Although companies like Google and Microsoft are household names, most in the industry have a consumer recognition rate that belies both the size of their empires and their importance to the climate change debate. This might benefit such companies for now, but there's the opportunity to take action now rather than face harsher legislation later.

One company that could clearly be in the firing line for an environmental clampdown is Nokia. The mobile phone maker's situation is a difficult one: its current business model relies on it selling around 400m new devices a year, which it says have an average life of two years. It points out that these go on to have a second or third life, before coming back for the company's responsible recycling programme on average nine years later. However, in the UK, Sun estimates that 18m mobile phones are discarded every year and only 5% are recycled.

Nokia's director of environmental affairs, Markus Terho, says the company is looking at changing its business model to lower its carbon footprint through every phase of a product's lifecycle. He denies, however, that it's because the company fears legislation. "We believe that being seen as an environmental leader supports our brand," he says.

While this may be true, Terho hints at massive changes in Nokia's operations – it's already starting to be a software as well as hardware provider, for example. In the short term, its plans to reduce emissions revolve mostly around putting the responsibility onto its consumers.

"The use phase of a phone's life is the highest carbon emitter, because consumers tend to leave their phone chargers plugged into the wall, 24 hours a day, seven days a week," Terho explains. "We're trying to educate people about this, but so far we haven't been very vocal." By next year, many Nokia phones will be able to indicate when they're fully charged and remind the user to unplug them.

As environmentalists hunt for solutions to the planet's future, businesses are looking to protect the bottom line. Digital media companies won't be exempt from the attempt to square this circle and will find that going green can, to an extent, make financial sense.

GREEN GADGETS

Small design companies are exploiting the gap in the market for green gadgets that let consumers enjoy the benefit of their favourite digital devices while saving power.

Although there may not yet be a mainstream market for wind-up laptops or solar-charged mobiles, this won't be the case for long and the UK is already home to the manufacturers of several power-saving gadgets. These include the Tango Group, which created the Freeplay wind-up radio and is working on a calculator, digital clock and alarm clock that run on water-based batteries. Meanwhile, Solar Technology International is launching the Freeloader portable solar-charger system for phones, iPods and other small electrical devices.

One of the main causes for concern about the use of ever more powerful digital equipment is the energy wasted by leaving gadgets on standby for long periods of time. The Bye Bye Standby range from Domia includes a remote-controlled plug that switches off all your appliances, while the power-aware cord from Static Energy gets brighter the more power flows through it, preventing people from forgetting to turn off their computers.

Domia's Bye Bye Standby keeps electronics turned off

Tranquil PC's T2 range is powered by just 80W

Meanwhile, low-energy-use computers are slowly filtering into the market. The tiny, 1.15kg Cappuccino Mini PC uses a third of a standard PC's power, while Tranquil PC has produced a processor that uses only 15W of energy, as opposed to the 150-200W used by conventional PCs.

Farewell to the keyboard

The keyboard is becoming a clumsy way to interact with tomorrow's applications. **Matthew Wall** looks ahead to what might replace it

The way most of us interact with a computer hasn't fundamentally changed since the invention of the mouse. We still rely on a keyboard that a Victorian typist would recognise. But new technologies are changing that. The Nintendo Wii has seen a leap forward for computer games, with a new way of interacting for couch potatoes everywhere. While Apple's iPhone, with its graphical, multi-touchscreen, has caused gasps of admiration among technology enthusiasts and the gadget-loving public alike, the new generation of interface technologies are taking touchscreens even further.

Technology developed by Perceptive Pixel means it's already possible to manipulate large touchscreen computers using the fingers of both hands. Users can expand, zoom and rotate pictures and files just by moving their fingers apart on the screen. If you need to input text, just call up the virtual keyboard on-screen and change its size to one you feel most comfortable with. Unlike physical keyboards, virtual keyboards can be adapted and reprogrammed to keep up with developments in operating systems and application software.

The practical applications of this kind of technology in the classroom, lecture theatre, meeting room and public lobby are obvious. But as even Perceptive Pixel CEO Jeff Han admits, it has been around for several years and developed by several computer science institutions. What we haven't had is the computer processing power and the dynamic, high-resolution screens to make the most of it.

It will be this process of making existing technologies practically accessible and affordable to the mass market that will characterise the next few years, analysts believe, rather than some major breakthrough in user-interface technology itself.

The Wii gives us an indication of how interfaces could develop in the home, with motion-sensitive wireless remotes giving us much more freedom to move around and interact physically with applications.

Robert Mannings, a futurologist at BT, says, "Gesture and body movement can now be sensed. It won't be long before we can simply point at on-screen buttons and graphics."

This field of research, known as haptics, is already throwing up some fascinating results. Wearing a thimble-like device attached to a mechanical arm can trick you into thinking you're running your finger over a variety of surfaces just through the application of lateral forces on the fingertip. In the not-too-distant future we could be wearing 'input gloves' that translate a whole array of subtle finger movements into complex on-screen instructions.

Paul Crabtree is creative director of interactive marketing agency DNA, where he has responsibility for interface development. He sees a time in the not-too-distant future when we start to free ourselves from mice and keyboards altogether. "I see 2010 being about multi-point input devices," he says. "We'll adopt a new set of highly intuitive ways of manipulating on-screen data through hand movements and gestures. This comes at an ideal time, when the amount of data available is running away with us and we need these new ways of interacting to work with it usefully."

Bola Rotibi, principal analyst at IT and telecoms consultancy Ovum, agrees that the trend is towards graphical user interfaces and touchscreens, but says, "The biggest developments over the next few years will be in applications and how we use them. It'll be about making better use of existing technologies in a more integrated, unified way."

He cites Cisco's newly launched communications hub software that enables employees to communicate and collaborate with colleagues via the most appropriate medium at that time, be it mobile, email, instant messaging or voice-over-IP. The software integrates them onto one platform so that the technology doesn't get in the way of communication. Over the next few years these integrated platforms will become more widespread, believes Rotibi.

But the key point about user interfaces is that their suitability depends on context. Standing up before a touch-sensitive screen might be suitable for relatively quick tasks, but not for longer periods of text-inputting. Also, what works in one environment might not work in another. This is particularly relevant to mobile devices, where the form factor is much smaller and presents a number of interface problems, not least of which is text input. Predictive text has been one response to this.

DNA's Crabtree says that predictive text could form the basis of the next step-change in input devices. "I believe we'll finally begin to rid ourselves of mice and keyboards and form something that's a hundred times easier to learn, several magnitudes faster to type with and utilises the power of predictive systems like T9 with online content such as >

NEC's **PaPeRo** Personal Robot can respond to human voice and gestures and interacts wirelessly with other devices

Wikipedia to learn personal phraseologies and predict not only words but entire sentences and grammar," he says. "The input display will be a two-way extension of the system you're using. It will learn and it will feed back."

But Hari Tuutti, director of communications for Nokia's multimedia division, believes the keyboard is unlikely to disappear overnight. "Qwerty input is still extremely popular with business users, as the popularity of the Blackberry shows," he says. "Although screens are getting bigger, making touchscreens easier and more mass-market, people clearly prefer small handsets. So we will continue to see keyboards but they'll be more cleverly hidden underneath graphical displays. And we'll continue to develop a mixture of hardware and virtual shorthand keys that are more intuitive to use."

Tuutti believes that a combination of numeric, touchscreen and 'qwerty' input options will complement phones that have high-resolution screens up to four inches in size and much more powerful digital cameras. Soon GPS and high-speed wireless internet will be standard, making it easy for users to share photos and experiences on community sites or between themselves wherever they are.

BT's Robert Mannings also sees the mobile phone just getting smarter and smarter. "We already have virtual keyboards that can be projected onto any surface, so these could be packaged into phones along with a solid state projector, enabling users to input text and give presentations wherever they happen to be," he says. "Our phones will become like our own personal black boxes, recording all our movements and transactions, and establishing identity. Wherever we go we'll take our 'electronic bubble' with us."

Ironically, the one user-interface technology most beloved of sci-fi enthusiasts and yet the most difficult to perfect is voice recognition. Most analysts agree that its adoption into the mainstream is still a long way off – the nuances of human accent and language are just so incredibly complex, and interference from background noise is still a problem.

Again, there's the issue of context. Do we really want to be talking loudly to our gadgets while travelling on the bus or train? This isn't as much of a problem in a private, controlled environment, which is why the most successful applications of voice recognition are likely to be in the car, the home office and on the phone.

In February, IBM, a pioneer of speech-recognition software over the last two decades, announced a number of collaborations with technological innovators. For example, it has introduced its Embedded ViaVoice technology into Alpine Electronics' in-car satellite navigation system to facilitate completely hands-free operation. The software can recognise around 300 voice commands, including some basic audio functions and media sources.

But speech recognition has perhaps been most beneficial for people with physical disabilities, and innovations in this area could feed through to the mainstream in time. Bill Fine, principal consultant for AbilityNet, a charity giving advice on assistive technologies, says, "With the latest version of Dragon Naturally Speaking software, you don't need hands to operate it at all. The system improves its accuracy rate by using syntactical and predictive analysis. It can guess four-word groupings now. I don't think there'll be much change in the technology itself over the next few years, but it will be standard on all operating systems and people will be more aware of it and more knowledgeable about how to use it."

One of the problems with advances in technology is that as the computers and gadgets become more sophisticated, so do the user interfaces. One look at the proliferation of remote controls around the home proves the point. Yet the technology to simplify all this is here already – programmable über-remotes have been around for several years now. What consumers have lacked is the knowledge of how to use it.

So one of the key developments in the coming years will be intuitive interfaces. If we need a manual to operate it, forget it. "An ageing population means that there's a growing need for simplicity," says BT's Mannings. "If the interface is too fiddly, older people won't use it. So the move away from buttons to graphical interfaces has to be the way forward."

NEC's approach it to develop a friendly mobile robot that can wirelessly interact with other digital gadgets in the home. Its cute-looking PaPeRo and R100 robots can recognise faces and voices, nod their heads and talk. They can change channel for you, switch lights on and off, and if an intruder comes into the house when you're out, they'll record what they see and email you the video.

Centralising user interfaces this way would seem to make a lot of sense, but these robots are still very much at the prototype stage. And given that your little wheelie robot would have to follow you round the house to hear your commands, it makes you wonder if the solution to a problem can seem more complex than the problem itself. User interfaces are only going to develop if there's a clear improvement and advantage for the user. Technology for technology's sake is unlikely to break through to the mass market.

TOUCH CONTROL

Tactiva, based in Palo Alto, California, has developed the TactaPad, a touch-sensitive input screen that sends live video of your hand movements to your computer. Your hands appear as translucent shapes on the screen. As you press on the TactaPad, it also gives you dynamic force feedback, letting you know if the button you're clicking has been disabled, say, or that the value is increasing or decreasing.

At the moment the TactaPad is just a prototype and hasn't gone into full production. Whether this iteration of touch-sensitive input technology will become widespread over the next few years remains to be seen. But being able to use two hands in a much more dynamic, multi-functional environment offers obvious advantages for computer users in the home and the office. Could this signal the end of the mouse and keyboard?