The Future with Broadband (Part 1)

White Paper
Insight
Perspective

In the first installment of a two-part series, we look at how widely-available Broadband will change the way we use the web. In the second paper, we will explore how computing infrastructure will need to change to support widely-available Broadband.

From Humble Beginnings

2009 marked 40 years since the introduction of the Internet. In October of that year, researchers connected 4 computers across the US which formed the first internetwork. In that first tentative connection, the researchers managed to send the characters "L" and "O" (of the word LOGIN) before the connection was lost.

What started as a research project by the US military agencies to build a robust, fault-tolerant and distributed computer network (in response to the possibility of catastrophic nuclear war) has morphed into a global networks of networks. The business utility of the Internet took a major leap forward in 1991 when the WWW was unleashed. This was a significant event – because computers work with files/data, while humans understand alphabets/language, something was needed to bridge the gap. Linking pages between servers on the WWW provided this middle ground.

The world-wide-web masks the complexity of the Internet (by allowing human readable pages to be linked instead of merely exchanging files between computers) and provides the basis of online functionality which we take for granted today. Since then the WWW has evolved from a one-way communications channel to incorporate collaborative elements (e.g. Web 2.0 blogs, wikis, etc).

Everything is Possible

The web has transformed the way we do business. It is increasing the speed of innovation and dismantling traditional marketing and distribution barriers. Almost every day, we hear of new products being launched or novel ways of doing things. Testament that speed to market, interactively engaging users and mass personalisation are driving competitive advantage.

Just five years ago, would you have believed someone if they said you could get street level maps (of virtually every inhabited place on earth) complemented with a view from the street? And all this would be available free of charge? The point is it's difficult to imagine the future when we view the world through today's perspective.

The next step change will come from the wide availability of higher speed broadband which will accelerate these innovation drivers. Our concept of computing and the services it can provide is bound to change with access to more bandwidth and bigger pipes. In this article we cast a long-term view and seek to answer the question: How will widely-available high-speed broadband change the business landscape?

In the Web

Today, we "go to" our notebook/computer to get online; we have to "get to" an internet access point. This is an indication of scarcity. Since when things are scarce there is usually limited distribution or reach. More bandwidth from ubiquitous broadband will change this equation. As bandwidth becomes less scarce, more users participate, driving new applications and new ways of working online. This will evolve into a scenario where the web is truly ubiquitous to the point that it surrounds us; everywhere we turn … we will be immersed in the web.

The pervasiveness of the web will be fuelled in part by the ever improving display technology and proliferation of devices. This isn't that difficult to imagine when we combine more efficient screens that use less power, more flexible screens allowing them to be integrated onto different surfaces and wireless broadband connectivity.

The web is becoming an extension of human intelligence; it is becoming our default library. Every comment, every blog entry, every video and photo we upload is adding to a common shared memory. The cross-linking that the web is so adapt at are mimicking the natural processes of the human brain connecting synapses.

Our relationship and increasing dependence on the web was presaged by the futurist Kevin Kelly. "We think we are merely wasting time when we surf mindlessly or comment on something, each time we click we strengthen a node somewhere on the web thereby programming the machine by using it … the more we teach this megacomputer, the more it will assume responsibility for our knowing. It will become our memory. Then it will become our identity" [1]

The always accessible, always on web presence means immediacy and online availability are crucial differentiators of online performance. Ubiquitous web availability brings more touchpoints with customers, who expect to interact whenever they need to. Online infrastructure will need to match this expectation by being always on and highly available to deliver the experience demanded by customers

Distributed Sensor Networks

Devices are proliferating – not just the traditional devices we are used to, such as notebooks or smartphones but a new class of specialised devices such as the e-book readers, netbooks, consoles, etc. Yet another class of devices will become increasingly common – these are non-human accessible devices such as tags, measurement devices, proximity sensors (RFID), etc are also being increasingly deployed and embedded in many objects from toll gates to electricity meters to clothes we wear.

Connecting these sensor devices together using a unifying fabric such as Broadband allows each of these devices to be addressed individually. The real power comes from connecting different embedded devices together into sensor networks and having the ability to exchange data between them, creating an intelligent sensing web. So in the future we will be moving and interacting in a web of sensors and this will have profound implications on location tracking and delivery of customer information. All these embedded devices will "chatter" as they communicate with each other increasing the amount of data that needs to be processed, managed and stored over time. The aggregation, processing and storage will strain the capabilities of current standalone computing

architecture. This will see the evolution towards centralised computing models which are equipped to effectively handle the increased demands of data processing, ensuring minimum response times and easier management. As more and more computing power is centralised, Data Centres will become the nerve centres of the future.

Intelligent Adaptive Agents

We discussed the increasing proliferation of devices (both traditional and embedded) and how Broadband will provide the networking fabric for these devices. We've got all these devices which are connected together and are sensing different things and collecting a lot of data. Intelligent Agents are software programs which help us make sense and mine all this data in real-time. Rudimentary intelligent agents (using collaborative filtering) exist today in the form of applications which provide recommendations on online bookstores and email spam filters.

Intelligent agents can utilise data from different sensors to effectively coordinate and manage a situation on our behalf by combining data from different layers that weren't previously linked – in other words agents can take a range of inputs, coordinate between themselves and adapt to situations according to preferences set by the user. As centralised computing models play an increasingly important role in globalisation, the threats posed by virus and other contagions spreading between platforms also increases. In scenarios such as this, Intelligent Agents can be used to predict a system crash or prevent security threats. As an example, a network of intelligent agents can be used to coordinate and actively respond to a security threat (such as a Denial of Service attack) by autonomously monitoring and correlating data from different sensors and proactively re-route to serve traffic from another server to pre-empt the DoS attack. In doing so, the agent is acting on emerging patterns and adapting the infrastructure to defuse the situation before it becomes a crisis situation.

For agents to work more effectively, they require connectivity to as many endpoints as possible. This can be achieved more efficiently by connecting into some form of cloud infrastructure. Since by definition a cloud service is connected to a larger community of endpoints, and so, can quickly and more effectively establish any emerging threat patterns and trends.

Rich Media, Paradox of Computing and Content … and More

In the next installment, we continue exploring how broadband is changing not just the way we use the web, but also the underpinning computing infrastructure which is required to support these new applications.

References

1. Kelly, K., "We are the web", wired.com, 13.08.2005

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