The Internet of the Future: To control or be controlled

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Networked, intelligent environments will give us complete control over our world, our privacy, and our property. But we also will be more watched, and our actions more controlled.

The World Wide Web as we now know it is out of control. It’s hard to use it without a computer terminal at hand, and when we do use it, other people—businesses, governments, spammers—can invade our privacy and steal our intellectual property.

But that may soon change. In the near future, the convergence of technologies and the computerization of everyday objects will lead to networked environments that are totally within our control.

Instead of a Web that allows us to copy and create links to other people’s knowledge without restriction, imagine a scenario in which we...

Photo: Xybernaut Corporation’s new wearable computer, dubbed “poma.” Portable technologies will evolve into embedded communications and information systems that unleash us from the traditional desktop computer-based Internet.
will be able to attach conditions to that copying and rules to those links. And we will be able to automatically enforce those conditions and rules. The same anti-copying techniques in CD-ROMs and MP3 players, for example, might be used. Already, there are Net “borders” to restrict access; for example, UKbetting.com can prevent access by citizens of countries where gambling is illegal.

As a result, we may get something that can be called Control Web, a kind of second Internet that is built into our increasingly networked environments and makes it possible to control access to those environments. Control Web could lead to two major changes: First, citizens and customers would really gain control over information and communication with an improved version of the mobile telephone. And second, Control Web could lead to a safer society without leading us unwillingly into a police state.

Control Web is a scenario, a possible future in which we are “in total self-control,” that might come about in the next five to 10 years or more. This will be the Internet of our children—a safe Internet for our children. Whether this scenario will become reality depends not on technology but on what kind of society we want.

The scenario has two aspects since it is about being in control and about being controlled, for the sake of your own safety and that of others. These two aspects of Control Web may lead to a more efficient (and powerful) government, a more powerful position for the citizen, greater added value for business, and a better environment.

**Gaining Personal Control**

Let’s look first at how we will gain more personal control over the world we live in and protect and enforce our own privacy, our copyright, and the use of our earthly possessions.

You will live, work, and move about in Control Environments that both control you and permit you to control others and to safeguard your physical and virtual property. This will be possible with a Control Card that stores your preferences, personal traits, and identities. It also records your rights and duties as they pertain to your personal Control Environment. The Control Card only responds to your fingers, voice, or eye. If you insert the card into your mobile telephone, you can turn it into a Control Mobile that allows you to do a dizzying array of very normal, but absolutely essential, things: You can page your waiter and instantly pay your lunch bill; find the least-expensive soap in the supermarket; identify strangers lurking around the corner. (Of course, the same technology also allows others to find you—your lover, or a colleague you dislike.)

You can open doors and gain entry to houses, offices, train stations, airports, amusement parks, or Web sites. The Control Card serves as your admission ticket—no more waiting in line at the ticket office. You can check the truth of every claim: Is this person really old enough to enter the disco? Does this taxi have an approved meter? Is this woman really authorized to sign for that company, as she claims? You can also filter all communications from the outside world according to your preferences. No more spam or hate mail will get through.

Your Control Card will feature an intelligent Control Agent that can continuously negotiate with companies and government agencies about which of your copyrighted knowledge and products (and even your private, personal details) others may use, for how long, and under what conditions.

In short, with the Control Card you
BlueSpace work environment developed by IBM and Steelcase integrates advanced technologies into the walls and furniture. The movable threshold to the workspace has an embedded front-panel screen and controls for adjusting the temperature, airflow, and lighting.

have a very powerful instrument for making decisions. The Control Card is a combination of credit card and bank card with PIN, a password, a location finder, a search engine, a card to prevent spam and annoying messages, a remote control, a display control, a digital passport, a personal database manager, a privacy and copyright protector, and a lie detector. The Control Card will smooth your passage through everyday life, and very soon you will be unable to live without it. It is your line of defense against an overly transparent digital world.

Being Controlled

Now let’s look at the other aspect of the Control Web—being controlled in an increasingly digital world that is transparent. This may sound less appealing, but it is necessary if personal control is to be possible.

In most cases, the “being controlled” side of the Control Web story is about making the environment safe—for your sake and that of others. Appliances, machines, buildings, and animals are fitted with a chip; as they become digital, they acquire a certain “intelligence.” They can send signals, report, control, and decide, and sometimes they can coerce. Through Control Web, you’ll have complete knowledge of your environment; knowledge will be like oxygen, and we will access it through our mobile telephone, countless e-papers, and built-in displays.

Gradually, various intelligent environments, or “Control Environments,” will be created. Throughout the day you will find yourself in these Control Environments simply because you live, work, shop, and play somewhere. You live in your Control House. You drive in your Control Car or Control Truck. You exercise in your Control Gym. You work in a Control Office. You use a Control Walkman and a Control Video and a Control TV. And you carry your personal mobile telephone, your Control Mobile, with you everywhere.

Control Web is a transparent world, a praying world. What we do becomes known—not necessarily to everyone, but to anyone who needs to know, and in real time. The control in Control Web is conditional, much like Mission Control monitoring a space shuttle’s performance or a dispatcher tracking a cargo-laden truck.

Each of these different Control Environments is aware of your presence and knows what rights you have, and it reacts accordingly. The Control Restaurant environment knows whether you have paid for your lunch; the Control Highway knows how fast you may drive at a particular time on a particular stretch of road. Other Control Environments know how well you are performing in comparison with others, whether you are permitted to make a copy of something, whether your company has a permit, whether you are authorized to sign a contract, whether you are stealing something, whether you may access a particular Web site or change or send this information, whether you have paid your taxes, and whether you have respected someone’s copyright or privacy.

In these Control Environments, network checks are continuously taking place to see whether you are entitled to be where you are and to do what you are doing. A novel feature of Control Web is that, if the system discovers that you may not do something, you could be physically barred from doing it. All these different Control Environments will give

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The Basis of Control Web: Four Trends

Control Web is the result of four trends and dozens of related emerging technologies and organizational models. The four trends are:

- Intelligent appliances are connecting to our environments.
- Knowledge is becoming as essential—and ubiquitous—as oxygen.
- The body (biometrics) is increasingly the key to both access and security.
- Knowledge is becoming the new money.

The first three trends give the Internet a totally new appearance. The physical appearance of the Internet will change in the direction of mobile, wireless, and sensory communication. The old Internet will continue to exist in the very broad sense of linking digital sources of knowledge; it will just look totally different from what we are used to. The Control Web of the future will no longer consist of a desktop PC with cables and CD-ROMs and Web sites, but will be made up of mobile telephones, intelligent appliances, wireless connections, and huge numbers of displays built in everywhere, wherever you are. A PC is a chip with a bloated body; in Control Web, that body disappears.

Trend 1: Intelligent Appliances And Machines

Control Web will be a Web for devices; it will have nothing to do with those clumsy things we call "computers," which have made our lives a misery for so long. In a Control Web scenario, appliances and machines are no longer a nuisance but a source of ease and enjoyment. These intelligent appliances will have built-in chips that transmit their knowledge and recognize their environment and their owner. To a certain extent, they will also be able to make decisions. Intelligent appliances will work for you, doing nasty jobs and routine tasks for you. They exercise control and, if necessary, coercion in a Control Environment. If appliances are intelligent, they will belong to the network, and that makes them subject to control and management.

Trend 2: Knowledge as Essential and Ubiquitous as Oxygen

The growth of intelligent appliances is mainly about things (e.g., refrigerators with bar-code scanners and bridges with load-stress sensors) and the knowledge they transmit. The "knowledge as oxygen" trend is mainly concerned with people and the channels and media by which they acquire knowledge and services (e.g., buying groceries or avoiding the bridge based on what the refrigerator and bridge tell you). If knowledge behaves like oxygen, you have access to knowledge at any time, in any place, and from any appliance, and you have the services that are based on knowledge. In this scenario, your mobile telephone will be more important in daily life than the PC ever was. The mobile phone will function as a means of payment, a remote control, an "Open Sesame," and a lie detector all in one. It will be an essential instrument for making decisions, allowing you to seek, find, check, and control information.

Trend 3: The Human Body As a Key

Our bodies will be the keys that give us access to all this knowledge and services. With your finger or your eye, plus a biometric smart card, you will have access to appliances, buildings, and Web sites, anywhere and anytime.

Trend 4: Knowledge as Money

On the traditional Internet, we can copy and create links without being discovered or sanctioned. Often, there is nothing wrong with that. In fact, it is the greatest gift that the Internet has given the world. But sometimes you want or need control over your knowledge, and at the moment this is only possible for a few large, powerful entities such as national security agencies and entertainment conglomerates that want to protect their billion-dollar investments in music and film. Control Web abolishes this free and uncontrollable reproducibility of knowledge and gives the new powers of control to the individual citizen.

Our ability to control our knowledge will give it the properties of money. Controlled knowledge has conditions and options attached to it so it can't simply be copied. Control Web means that the different owners of knowledge can copy, share, and publish it conditionally, not only in the virtual world but, far more importantly, in the physical world. Control Web controls not only the initial use of copies, as is now the case, but every use.

The most important aspect is that citizens will actually be given new possibilities for greater personal control, "total self-control." The Control Card is the tool for this. It gives you as individual, as citizen, a degree of control and protection that was previously inconceivable and impossible. Unlike the classic Big Brother scenario, where we lose our privacy totally, Control Web gives us more privacy than ever before, physical as well as visual and digital. Big
FaceIt recognition system by Visionics Corporation zeroes in on a subject’s features. In the future, the Web will feature more such security systems enabling more control over access to secure places and information.

Brother is watching you, true, but only if you want him to.

In the Orwellian sense of Big Brother, control was one-way, with powerless citizens being spied on by an almighty government. In Control Web, there is two-way traffic between an interactive government and a citizen who is now better equipped.

Remember also, control is not always negative. Controlled systems often relate to safety, for yourself and for your environment. A Control Environment may even become like a personal mentor, coach, team member, or butler. This mentor or coach knows an awful lot about you, but you have no problem with that since it is to your advantage. In Control Web, “Big Brother” is actually more like thousands of Little Brothers at work, and most of them are more like Little Butlers.

Only in a limited number of situations are there really conflicting interests, when a Control Environment will give you a sharp rap on the knuckles and prevent you from breaking a rule. In some cases, your personal desires must defer to public interest, such as the need to fight crime, ensure road safety, or protect the environment. In the Control Car, for instance, road safety and environmental interests will weigh more heavily than your personal desire to race like a Formula 1 driver.
Control Web in Everyday Life

In the Control Web scenario, spam and stalking will be far less of a problem. The Control Card will make it extremely difficult for a stalker or spammer to reach you virtually. You will decide who can communicate with you and under what conditions, so you will be able to prevent telephone harassment and nuisance from instant messaging.

The European farm crisis from the foot-and-mouth disease would have been stamped out at the outset if the pigs and cattle, traceable with a chip in their bodies, had transmitted their own movements through the transportation system so that officials knew at every moment where infected animals were brought to.

Train strikes would be less of a problem, since there would be far fewer drivers and conductors to run things. A Control Train never goes through a red light, since signals will no longer be needed. And no one need run down fare-dodgers, since barriers at the station or the train doors would not have admitted a passenger without a ticket.

In Control Web, you'll own your privacy as a marketable consumer good that can be bought and sold. You will become a system manager of your personal data, subscribing or unsubscribing to databases, mailing lists, and Web sites, which will no longer be able to access your information without your knowledge or permission.

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One result of private ownership of privacy will be the end of international disputes over privacy protection. It will no longer matter what 150 different countries feel about your privacy and copyright since you protect them yourself. The European ban on linking databases, for instance, will be unnecessary in Control Web. You can create links to your heart’s content, because, as owner of the knowledge, you decide whether you will allow the links, by whom, and under what conditions.

If you change your telephone number or move to a new house, you'll no longer have to inform your friends and all the organizations you do business with, including the government. As soon as you change the information in one database, it will change in every database, in every appliance, in every computer, in every mobile telephone in which it is stored.

That also means you will never have to fill out common forms, since this basic information is already available and is reliable; validity is guaranteed by the government or the company that issued the information.

Unfortunately, you will still have to pay taxes. But you won’t have to spend nearly so much time completing the tax return. Most of the information will be collected from the source—for instance, your employer’s payroll office—and presented to you, ready to use. Businesses collecting value-added tax or sales taxes when you purchase an article or service will instantly transfer the funds to the tax authority’s bank account.

You'll be able to check a building’s safety before you enter. Standing in front of a café, you can see on your mobile phone whether it has a fire-safety permit and passed its recent health inspection before you decide to go in.

Enforcing environmental, traffic, and tax laws will be more efficient and effective in Control Web, and can be achieved with a minimum of manpower. In a Control Car, you cannot exceed the speed limit, no matter how hard you step on the accelerator. And enforcement doesn’t require a thousand extra police officers.

In a network of intelligent objects, every action in the network causes a conditional reaction somewhere else: a signal or instant message to the owner, a door that opens or closes, a database that is updated. In Control Web, actions are constantly linked to various forms of communication. You receive continuous feedback from your Control Environment. Built-in intelligence means interaction, action, and immediate reaction: Hold an empty medicine bottle in front of any display—on the Control Fridge, on the wall, or on your Control Mobile—and the doctor’s pre-
scription with all the information about side effects appears on the display. While you’re eating breakfast, the rubbish bin will tell you if it’s full and remind you that today is collection day.

Biochemical sensors in products at the supermarket will make the sell-by date dynamic—perhaps continually lowering the price as the expiration date on perishables approaches. You’ll get a signal on your Control Mobile Phone: “Intelligent lettuce, half price. Buy now!”

Your driver’s license will be embedded in both your Control Card and your intelligent car, the Control Car. In order to drive the car, you will have to pass the network checks, such as whether the car has passed inspection, whether you’ve paid the insurance on time, and whether you have been drinking alcohol (the car checks your breath by sensor). If you fail any of these checks, the car won’t start—and the government temporarily withdraws your license.

If you do pass the network checks and start driving, a road tax is paid for each mile you travel. You will pay extra tax whenever you drive on busy, expensive roads in the morning rush hour, but you’ll get money back if you drive very little or do most of your driving on the weekend or on quiet back roads. Another positive aspect is that there will be fewer accidents involving uninsured motorists, since an uninsured car cannot be driven.

Control Terror: Safety Without a Police State

Terrorists and fugitives will find it harder to move around the world, thanks to biometric passports that only “work” for their rightful owners. Intelligent video control, where people can be recognized and matched to a list of “wanted persons” in real time, will alert the police to movements of possible terrorists.

Control Web could have great significance in the war against terrorism. We already use mobile telephones to alert others of attacks while they are occurring. On the other hand, one of the unpleasant aspects of the mobile phone is that it can be used to detonate bombs and to disrupt air traffic. It might therefore be useful to build in gates that conditionally disable the mobile phone. In Israel, GSM network mobile-phone traffic can be disrupted when it creates a risk of bombing.

Barriers to Control Web

There will of course be problems with such a massively complex system. First, Control Web could fail miserably if there is a shortage of electricity. Second, the system could collapse under its enormous complexity and mutual dependency, or

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The biometric Control Card produces far tighter identity control. A terrorist can no longer use a stolen passport to move invisibly through the enemy’s country, since the passport is useless without the biometric features of the owner.

The Control Airport environment can scan and link all incoming and outgoing passengers and luggage. The system can continuously check that passengers and their luggage remain linked so that no unaccompanied baggage ever enters the aircraft. Intelligent video systems can recognize human faces and link them to a database of wanted persons—in real time and for all passengers. At the same time, the privacy of the vast majority of passengers is respected by only “revealing” the video images if something illegal has been done. In that case, the image of the wanted terrorist could be shown to the police, while the image of the innocent civilian beside him is concealed.

The aircraft as Control Environment could only be flown biometrically—that is, the plane would respond only to an authorized pilot. Another solution is for the aircraft to control the flight itself. Control Aircraft would not permit certain unusual movements or deviations from the programmed route.

because of a basic lack of technical reliability. Finally, the potentially destructive aspect of Control Web—that is, people being excessively tracked, controlled, and compelled—could outweigh the positive aspects of safety and personal control.

These are realistic barriers, but we can overcome them. Control Web is a scenario for the Internet of the next generation. There is still plenty of time to reflect on all these approaching ethical dilemmas and still plenty of opportunities to adjust, to try different directions, to really take advantage of the technological possibilities for strengthening the position of the citizen.

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