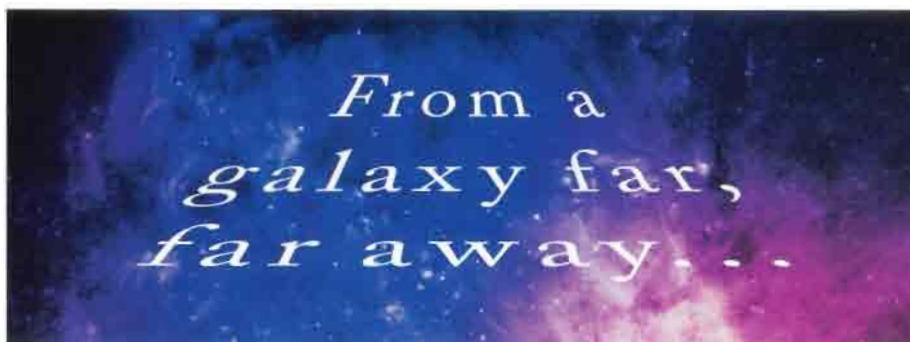


WHY BROADBAND NEEDS A BROADER VISION

BY ROUZBEH YASSINI, Ph.D.

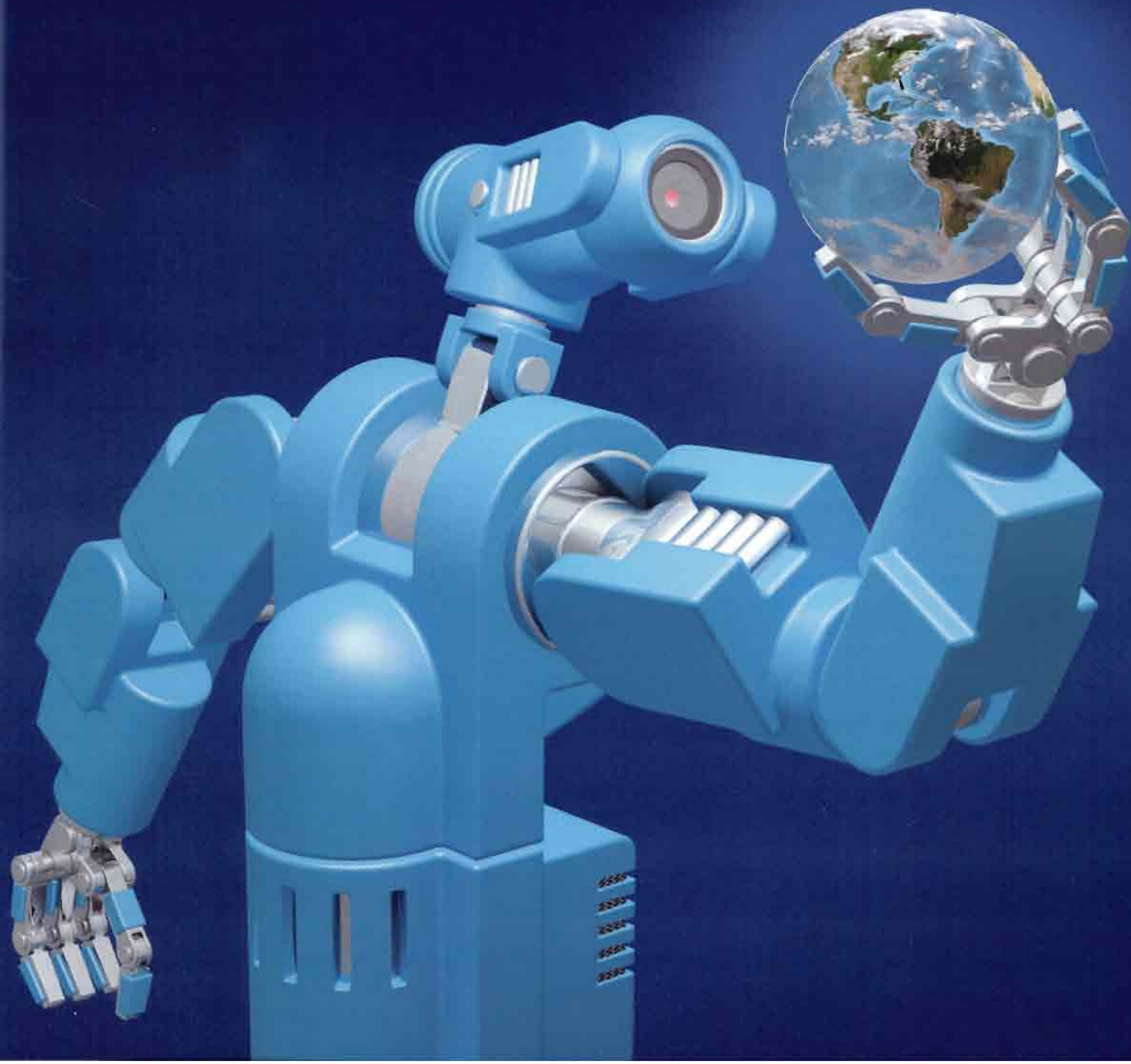


Imagine an intelligent being has been hurtled to Earth from a distant galaxy and is hovering somewhere over a metropolis near you. We'll call our being BOB, for Broadband Observational Bot.

Dispatched for a fact-finding mission about the state of high-speed networks, our bot immediately is puzzled by a few things it sees. On the ground below, for example, are separate but nearly identical delivery mechanisms whose fibers and wires and invisible waves connect homes and businesses and individuals, one by one, to the Internet, in different ways. What causes BOB to scratch his alien head is the apparent duplication of networks and resources going on.

PAGE 38 ►

“BOB”
BROADBAND
OBSERVATIONAL
BOT





What we need ... is a universal cloud-based platform that allows users to access, own, transfer and use any content they want, on any device, over any network carrier, anytime.

Each of these networks, BOB realizes, is attached to buildings where thousands of blinking lights and row after row of racks indicate the presence of some serious technology muscle requiring some serious power and energy. BOB thinks he'd hate to pay that energy bill even once. Paying for it several times over for duplicative services seems even sillier — especially on a planet where resources are limited and concerns over environmental degradation are rising.

But there are other puzzles to ponder. BOB notices when humans leave their homes and offices, they disconnect their devices from these networks and climb into automobiles that are poorly connected, if connected at all. Strange, thinks BOB, that given the average amount of time U.S. workers spend commuting (nearly an hour a day, according to U.S. Census Bureau), they seem willing to untether from the networks that seem so life-sustaining elsewhere.

Stranger still, thinks BOB, is that instead of relying on connected sensors and an intelligent network to guide vehicles safely, this civilization seems willing to tolerate a tremendous risk by requiring that humans make all the driving decisions. BOB knows from research that automobile accidents kill more than one million people globally every year (1.24 million in 2010, per the World Health Organization), and hopes for the sake of his research subjects that the era of the connected car comes about quickly.

BOB's befuddlement also extends to the economics of broadband. He quickly deduces that these harried humans appear to be relying on, and paying for, connectivity across three different domains (home, automobile and mobile), with different providers sending different bills. BOB, a relatively frugal bot, can't help but notice people are paying for the

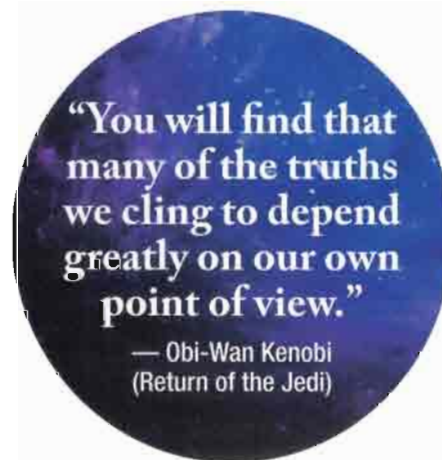
same thing 3x each month. It doesn't appear they're getting the biggest bang for their buck, either. Zeroing in for a closer look, BOB notices one poor chap who seems frazzled because he can't seem to connect his portable device to a video teleconference that performed just fine moments ago on his office computer. Nearby, another user worries about whether to access an online bank account from a public Wi-Fi network or wait until she gets home. BOB wonders why the burden here falls on the end-user: All that button-pushing and reloading of software and puzzling over security seems to BOB to be a stupendous waste of time. BOB thinks the network, not the user, should be managing the tasks here. When BOB files his report back home, his theme will be one of missed opportunity on the third rock from the sun.

broadband to reach its grand potential — the creation of a truly connected world that brings about improved life conditions — this historical approach to silo-bred innovation must be transformed into a much richer business vision: toward a high-performance, low latency, energy efficient, affordable and ubiquitous broadband infrastructure that connects and empowers everyone, everywhere.

An impossible dream? Hardly. It just seems that way in a world where we've been trained to focus on small advancements instead of huge leaps. For instance, we're told that moving to gigabit networks will be a game-changing migration, when really it's merely an incremental iteration of the existing order. We're supposed to get terribly excited when content delivery network providers add more edge servers to achieve modest reductions in latency. We wax poetic about 4K video and we organize conferences around dynamic spectrum management. These are welcome improvements. But they're hardly revolutionary.

What Is Revolutionary?

How about transforming an automobile into a massive data storage and delivery device that is the fulcrum of a family's broadband connection? Or turning a single LED lightbulb into an intelligent Ethernet node, and a single overhead light panel into a massive data-collection system. Or creating a workplace that accommodates more workers and more work, but requires fewer desks and less energy. Or improving the food output of an Iowa farm by 4x while slashing fuel consumption in half. Or reducing signal latency to the actual speed of light. All of this can be done by creating a broadband infrastructure that is not so much physical, as in something you connect to, as it is ambient, as in something you're surrounded by.

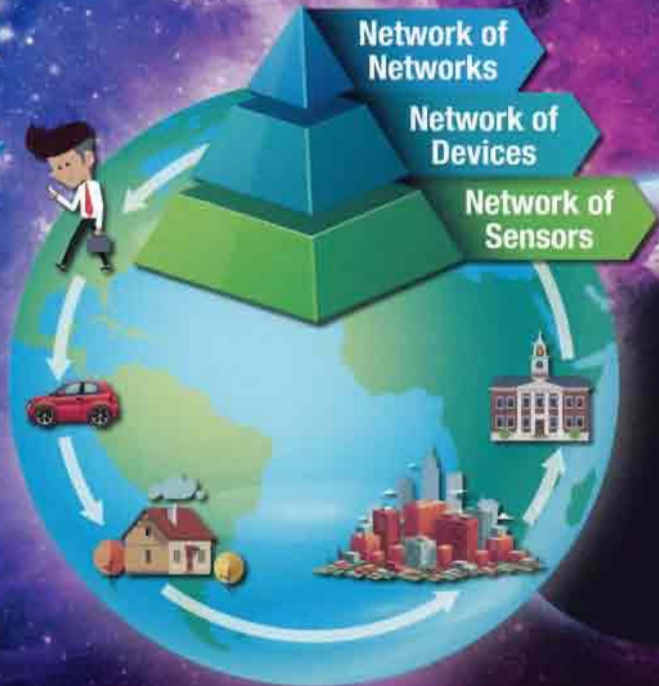
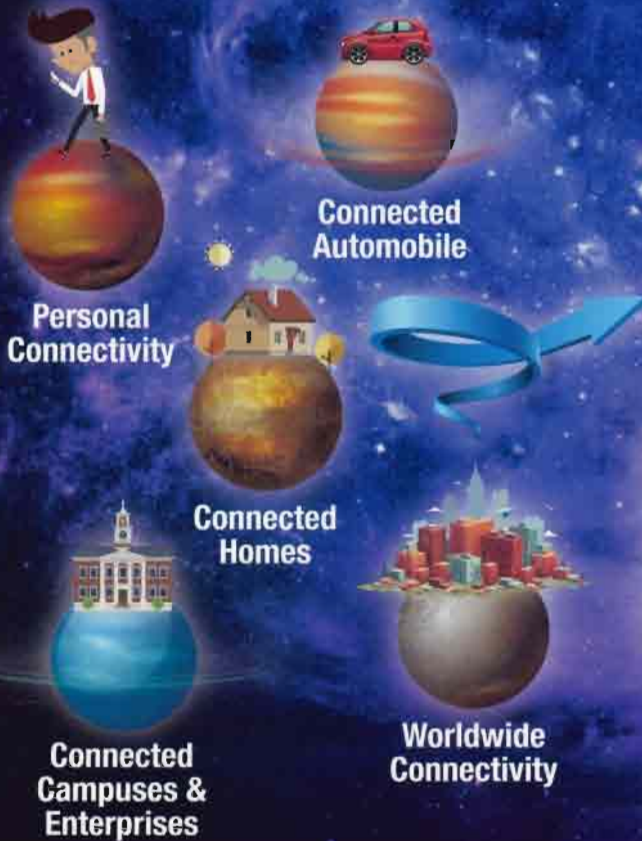


What We Need

To be fair, the conditions our alien friend BOB has observed are the product of an imperfect but still-impressive technology march over the past several years. It has happened in fits and in bursts, with lots of participants, varying agendas and a regulatory environment where the rules seem to constantly change. But for

TRUE BROADBAND

Achieving true broadband requires that we transform today's islands of connectivity into a constellation of sensors, devices and a holistic network of networks.



Fundamental Changes to Create a New Vision for Global Broadband:

- **Destroying the barriers between islands of connectivity.** As the diagram shows, we suffer from separation among essential broadband distribution and connection points. Each island, starting with personalized connectivity and ultimately reaching global distribution, has its own massive set of devices, technologies, service providers, security mechanisms, and costs to the user. We can't attack any one of these isolated areas and expect to achieve a truly connected world. We have to think bigger: going forward, how can we produce technologies and intelligence that play across the entire domain?

"You can't stop change any more than you can stop the suns from setting."

— Shmi Skywalker
(The Phantom Menace)

- **Eliminating dependence on closed environments.** We walk a dangerous path when we attempt to cordon off the Internet into discrete fiefdoms that limit maneuverability and reduce personal freedoms. I understand the natural tendency for carriers and application developers to want to profit

from transactions and activity that involves their infrastructure or their content. But this is a short-sighted approach, akin to requiring that owners of Toyota automobiles purchase fast-food meals only from prescribed restaurants. We're killing the bigger opportunity. What we need — and what ultimately will create more economic opportunity for every participant — is a universal cloud-based platform that allows users to access, own, transfer and use any content they want, on any device, over any network carrier, anytime. From medical records to home videos. Everything.

- **Getting energy efficient.** We spend far too much money and demand far too many resources to make broadband available. We pay the price in environmental carnage and in retail prices that make broadband

unaffordable for billions of people. The vision that must prevail going forward is for simpler, high-connectivity networks and devices with intelligence to manage their own energy requirements so that a 10x reduction in energy consumption results. In the cable industry, we've started to see how dramatic these improvements can be as we adopt architectural revamps like CCAP. This is just one indicator of where broadband needs to go.

- **Making broadband affordable.** This has been an ongoing mantra of policymakers and providers alike for years. There are good intentions everywhere. But with more than half of all global citizens lacking a broadband connection, it's apparent we're missing the mark badly because we continue to demand that end users bear the major obligation for producing investment returns and profits that are shared among ecosystem participants. We should be looking instead to ways that broadband can be supported from the trillions of dollars spent globally today on everything from repairing streets to managing food distribution to operating utilities to delivering healthcare to teaching students. The retail marketplace should be only one among many revenue sources for broadband. Participants can thrive by creating value across all five islands of connectivity listed in our graphic, and not focusing purely on capturing subscription fees. When we focus purely on user fees as a revenue source, we end up shortchanging the medium. And pricing out billions of customers.

The Good News

Some of the enabling elements of this broadband vision — intelligent sensors, devices, networks and end users that are interconnected in harmony — are beginning to come to life. Among the key ingredients are:

5G. This revolutionary approach to broadband networking turns existing models for density, latency and scalability upside down, inside out and sideways, resulting in a completely re-imagined model for an ambient, always-on, zero-latency network capable of connecting people, devices and intelligent sensors in ways we've only dreamed of until now.

Dynamic frequency usage. We can't create more spectrum — the laws of physics say so. What we can do is use what we have much more efficiently. We all know about dynamic spectrum management, which enables us to tease out unused RF bands and modulate broadband signals over them. These are welcome, helpful additions that help to extend broadband's availability. But a bigger, bolder revolution is promised by the introduction of "gray space" technologies that simultaneously use the same spectrum, effectively pumping more oxygen into the broadband environment.

Better security. Way better. An essential ingredient that will unleash the global broadband economy is an age-old enabler: trust. We don't have it now. And we need it yesterday. Military-grade identity security and digital rights management schemes are vital contributors to a new broadband vision.

"Remember: Your focus determines your reality."

— Qui-Gon Jinn
(The Phantom Menace)

Take on the Challenges

The 21st century challenges for humankind at large are many. From the supply of food to the availability of health care to environmental degradation, war, inequality, education, safety... the list is long. Solving these challenges demands we empower more people with more resources. Quickly.

Broadband connectivity, available to all, is the key enabler of universal human empowerment. But true broadband doesn't magically sprout from nowhere. It demands tremendous amounts of capital, and capital requires a discernable path to return on investment. The prevailing metrics about broadband tell us we're not going to get there fast enough based on current models and disconnected islands.

We need a bigger field of play, touching on all aspects of life, from individuals to automobiles. From automobiles to homes. From homes to workplaces and schools. And ultimately to a global community. As our friend BOB would observe, our current vision for broadband is narrow. We need to open it up. We need true broadband that provides ubiquitous connectivity touching all aspects of life. We need to transform five islands into a constellation of sensors, devices and a holistic network of networks. And maybe we'll save this planet yet.



About the Author

Dr. Rouzbeh Yassini, Ph.D. is Founder and CEO of YAS Capital Partners (rouzbeh@yas.com) and is acting Executive Director of the University Of New Hampshire Broadband Center Of Excellence (@unhbcoe), an interdisciplinary initiative devoted to the advancement of broadband Internet technology. Yassini is widely known as the "father of the cable modem," reflecting his pioneering work in cable broadband technology. He was a prominent contributor to the CableLabs DOCSIS® specification, a pillar of today's worldwide, multi-billion dollar broadband industry.