What technology experts foresee for the not-so-distant, it-will-be-here-before-we-know-it future.
<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>05</td>
<td>Technology Becomes More Human</td>
<td>Brian David Johnson</td>
</tr>
<tr>
<td>09</td>
<td>The Last Corporate Data Center Shuts Its Doors</td>
<td>Dick Csaplar</td>
</tr>
<tr>
<td>11</td>
<td>A New Business World, Thanks to Cloud Computing</td>
<td>Kevin L. Jackson</td>
</tr>
<tr>
<td>13</td>
<td>Welcome to the App Store of 2020</td>
<td>CenturyLink</td>
</tr>
<tr>
<td>15</td>
<td>Understanding Consumers Now Will Prepare Us</td>
<td>Richard Sear</td>
</tr>
<tr>
<td>17</td>
<td>Smart Technology Will Transform Health Care</td>
<td>Stephen Ward</td>
</tr>
</tbody>
</table>
For CIOs, the Only Constant is Change

ATLANTIC-ACM

19
Smaller Data Centers, Thanks to Virtualization and Third-Party Providers
Robert Neill

21
Enterprise Cloud Adoption Enters a New Phase
Amy DeCarlo

23
Expect Big Changes to IT Organization and Infrastructure
Ken Male

25
Cloud Computing Barriers Will Fall, Adoption Will Rise
Sean Buckley

29
‘Grandpa, What is a Computer?’
Dick Csaplar

31
Smart Users and Smart Networks Will Help Each Other Grow
Juniper Networks
Technology is moving so quickly, predictions for next year already are losing relevance. A more distant view is now required to stay ahead of the curve. Short-term trends come and go, but the true impact of mobility, Big Data and the cloud still remains to be seen. That’s why we asked some experts to weigh in on their long-term predictions for business technology. So 2020, here we go. Or rather, here we come.
Technology Becomes More Human

As Intel’s Futurist, it’s my job to look 10 to 15 years out and understand how people will act and interact with technology.

I do this through a process called future casting, a mix of social science, technical research, economic forecasts, data analysis, hundreds of hours of global interviews — and even a bit of science fiction. Although this might sound a little like science fiction, it’s actually quite pragmatic. It takes about 10 years for us to design, develop and deploy the chips, platforms and computational intelligence that we manufacture as a company. It is of vital business importance today for Intel to understand what people will want to do in a decade.

One of the most exciting and important developments we’ve seen as we approach 2020 is that the size of meaningful computational power approaches zero. As we continue to make the chips smaller and faster, the size of meaning computation power approaches zero by volume. That’s so small that it’s nearly invisible. For decades in the technology industry we’ve been asking ourselves “can.” Can we make a workstation small enough to fit in a desktop? Can we make a desktop computer small enough to fit in your lap? Can we make a laptop small enough to fit in your pocket? Can we do it? That was the question.

As we continue to make the chips smaller and faster, the size of meaning computation power approaches zero by volume. That’s so small that it’s nearly invisible.
Imagine if your collection of business machines knew all the most important things about you so that you could be your most productive self. We know that our states change through the day. When we are at home, we are one person. When we are at work, we are another. When we are busy and rushed, we operate in one mode. When we are on the road, we work in a completely different fashion. Now imagine that your devices could sense this through multiple hardware, software and service solutions and tailor your working experience for optimal comfort and productivity.

Hyper-personalization down to the individual can go far beyond the trivial. Imagine a machine that can tailor its information design differently for introverts versus extroverts. This vision for the future of work gets really interesting when we apply it to the four generations of workers we will need in the workforce in 2020.

By asking ourselves what we want this increasing computational intelligence to do, we can make systems that are more humanly, that adapt to a wide variety of people and, ultimately, that make the workforce of 2020 not only more productive but able to live meaningfully better.

When the size of meaningful computational power approaches zero, something wonderful happens. We don’t have to ask ourselves “can” we do it anymore. We have to ask ourselves “what.” What do we want do? When you get intelligence that small, you can turn anything into a computer. You could turn a table into a computer. All of a sudden it’s possible to turn your shirt, your chair and even your body into a computer. That’s why we have to ask: What do we want to do with all that intelligence?

The business implications of this shift are both exciting and massive. How we think about the systems we build, the services we deploy and the people we hire and train will need to change. For example, all of this computational power will mean that we will be able to hyper-personalize the working environment for each employee. People will not only be able to work where and when they want, but they will be able to work how they want, thanks to machines that can tailor themselves. Our machines will become more human and know us better so that they can communicate with us with better efficiency.
As I look toward 2020, I see three trends that will transform businesses in the future.

**Mobility**

One of the most important technology trends we’re seeing is mobility. And mobility is not really a technology; it’s a state of mind. Mobility is one of those trends that businesses should take a step back and look at how they can take advantage of the capabilities and transform how they interact with users, employees and partners. Mobility will allow context and location data to be available to better serve customers. Advanced predictive analytics will allow any person’s location at any point in time to be forecast. It will allow enterprises to communicate and collaborate with employees, helping employees to be efficient by using profile, capability and location data. It already is reshaping the shopping experience, as any shopper can get any price information as well as competitive bids during the shopping experience and complete transactions with their mobile wallets.

**Machine-to-Machine Technology and Analytics**

This type of technology, in which instrumented assets communicate and transmit to data-gathering systems, will dramatically transform quite a few industries. The opportunities businesses have to monitor and mine for data are huge. Take health care, for example: We can now use smartphones to monitor our daily bodily functions, and the data can be transmitted along with health records directly to physicians. By 2020, it could be possible for a health care professional to make a diagnosis based on that data and obtain a recommended course of action.

Paul Bloom is responsible for applying the latest IBM technologies and research from its eight laboratories to emerging telecom solutions. He recently led the research strategy for Mobility and is driving IBM Watson applications for the IBM Telecom team. Bloom also is a member of the IBM telecom executive team, which is responsible for IBM’s solutions and sales in the telecom market.
Cognitive Computing

For more than half a century, computers have been little better than calculators with storage structures and programmable memory, a model that scientists have continually aimed to improve. Comparatively, the human brain — the world’s most sophisticated computer — can perform complex tasks rapidly and accurately using the same amount of energy as a 20 watt light bulb in a space equivalent to a 2 liter soda bottle. Today, data is being created at an unbelievable rate. Making sense of real-time input flowing in at a dizzying rate is a Herculean task for today’s computers, but it would be natural for a brain-inspired system. Using advanced algorithms and silicon circuitry, cognitive computers learn through experiences, find correlations, create hypotheses and learn from the outcomes.

For example, a cognitive computing system monitoring the world’s water supply could contain a network of sensors and actuators that constantly record and report metrics such as temperature, pressure, wave height, acoustics and ocean tide, and issue tsunami warnings based on its decision-making.

Researchers at IBM have been working on a cognitive computing project called Systems of Neuromorphic Adaptive Plastic Scalable Electronics (SyNAPSE). By reproducing the structure and architecture of the brain — the way its elements receive sensory input, connect to one another, adapt these connections, and transmit motor output — the SyNAPSE project models computing systems that emulate the brain’s computing efficiency, size and power usage without being programmed. IBM is combining principles from nanoscience, neuroscience and supercomputing as part of a multi-year cognitive computing initiative.

Another early example of cognitive computing is the IBM Watson solution, which has the ability, through natural language understanding, to comprehend questions asked and provide answers with supporting evidence. Watson constantly learns from changes in data and its experiences. This technology will be used in the health care industry to help physicians make the right diagnoses; in financial industries, so planners can optimize their clients’ portfolios; and for telcos to transform the customer contact experience.

For businesses to take advantage of these technologies, it’s important for them to understand what their IT departments are doing today and where they want their businesses to go. Whether you’re an auto manufacturer that wants to be a company creating travel experiences for customers in 2020, or a telco that wants to help transform other enterprises, you will need to understand what technology will best support your business in getting there.

“Using advanced algorithms and silicon circuitry, cognitive computers learn through experiences, find correlations, create hypotheses, and remember — and learn from — the outcomes.”
Dick Csaplar, who has more than 30 years of experience in the IT field, covers the growing concept of cloud computing, both private and public. He has worked, lived or traveled in more than 60 countries.

SHUTS ITS DOORS

The doors to the last corporate data center were closed today, and the remaining servers were sent to a recycling center for metal reclamation.

We all knew this day was coming. Data centers just don’t make sense anymore. It seems strange that a fixture of 20th century business would go the way of water wheels and canal barges.

I started my career in a data center. In the early 1980s, Digital Equipment Corporation announced the PDP line of mini-computers, making the concept of a data center popular. True, there had been some organizations with large mainframes in specially designed rooms before, but this was only for the largest and richest of government departments and companies. The mini-computer was cheap enough, and applications had become useful enough for small and midsize organizations to buy and invest in computers — and the required IT specialists — making data centers a fixture in every company by the 1990s.

They changed over time, of course. The first required raised floors to carry the wires and the cooling needed to keep them running. The number changed, too. Once there was only one per company, but then the cost of computers dropped and every department, remote location and project had to have its own. You really weren’t worth anything if you didn’t have your set of computers. But this got out of hand. Companies tried to re-centralize the operations as complexity and redundancy became common. But that really didn’t change the situation. Departments still had to pay an “IT tax” without understanding what they were getting.
The real change started early this century with the cloud. It’s a funny term, as that was the word IT people used to show parts of the IT infrastructure they didn’t understand nor care about when drawing up their schematics. There finally was an alternative to having to finance, buy, budget, depreciate, write off, install, staff, upgrade, network, manage, defrag, protect, fix, power, cool, retire, decommission and dispose of their own servers.

It appeared that company management finally came to realize that there was nothing to be gained from owning a private set of servers that couldn’t be accomplished at a lower cost by managed service providers in the public cloud. As cloud use increased, the IT function in the enterprise transformed from writing code, deploying hardware and performing data backups to being a business partner with company management. IT now translates the company’s business objectives into services performed by cloud providers. IT negotiates contracts and manages SLAs. When the monthly bill arrives that says how much computing and storage is used, it’s the job of IT to make sure it is accurate. Even the largest companies removed their data centers by turning them into clouds of their own. They even rent out their unused compute capacity to companies they trust.

For us older types, it seems kind of funny to talk of data centers as being part of history, but we all saw it coming. It hardly seems worth talking about, but in their day, they were really cool. Most people now seem happier, though. Business managers know what they are paying for, IT is no longer looked at as being the “progress prevention” department, and users get what they need when and only for as long as they need it.

It’s a strange world now, but it does make sense, even to someone like me.

“As cloud use increased, the IT function in the enterprise transformed from writing code, deploying hardware and performing data backups to being a business partner with company management.”
Kevin L. Jackson helps lead one of the largest information technology solutions providers for the U.S. Department of Defense. He has been involved in the effort between industry and the U.S. National Institute of Standards and Technology on the federal adoption of cloud computing technologies. He is the founder and author of “Cloud Musings” (kevinljackson.blogspot.com), a widely followed blog that focuses on the use of cloud computing by the federal government, and editor and founder of “Government Cloud Computing on Ulitzer” electronic magazine (govcloud.ulitzer.com).

A NEW BUSINESS WORLD, THANKS TO CLOUD COMPUTING

The world is accelerating into cloud computing. By 2020, cloud service will be the primary IT consumption source for 90 percent of individuals and enterprises.

Key drivers of this future include:

- Even lower IT costs driven by higher levels of automation and increased on-demand and self-service capabilities
- A revolution in the consumer supply chain logistics enabled by new manufacturing paradigms like digital product delivery and three-dimensional printing
- Broadening network access allowing a global customer base for nearly any product
- Cross-service provider resource pooling enabled by inter-cloud standards and the ubiquitous use of cloud service brokers

“Although technology is certainly the enabler, change in the business environment is being accelerated by our expanding digital culture.”
An often overlooked part of this story is that cloud computing is changing the very nature of business. Although technology is certainly the enabler, change in the business environment is being accelerated by our expanding digital culture. That, in turn, is also widening the use and acceptance of task-built virtual organizations. A 2020 leading edge corporation will resemble a pick-up basketball team:

- Quickly assembled
- Focused on accomplishing a short-lived mutual goal
- Dispersed quickly once the goal is obtained

IT infrastructure will be assembled in a similar fashion by going to a cloud brokerage website, swiping a credit card, picking from a menu of pre-assembled business process-as-a-service (BPaaS) offerings, renewing periodically and simply turning off the IT when finished. Software developers also will be an anachronism. The ability of business managers to simply assemble custom business applications from the menu provided by an advanced, infrastructure independent, platform-as-a-service offering will be an expected skill. Business owners and shareholders will be amply rewarded for these cloud enabled sense-and-respond capabilities with global market share and untold riches.

This future vision is virtually guaranteed. Would you go back to using a flip phone that can do nothing more than make a phone call? Cloud computing revolutionized the consumer marketplace, and it will certainly revolutionize the business marketplace as well.

Millennials compose

46% of the U.S. workforce.

SOURCE: MASHABLE
CenturyLink, the third largest telecommunications company in the United States, is recognized as a leader in the network services market by technology industry analyst firms. The company is a global leader in cloud infrastructure and hosted IT solutions for enterprise customers.

WELCOME TO THE
APP STORE
OF 2020

In 2020, we’ll be talking about cloud. You might be thinking, “Seven more years of this?” Our view of 2020 is that, yes, we will be talking cloud, but not in the same way we do today.

If you think about it, every seemingly “new” IT trend is just another application of a previous trend. For example, virtual networking, which we know today as MPLS, started with X.25, and then reappeared as ATM, then Frame Relay, and finally, IP services. Virtualized compute services started as time-sharing in the 1980s, then moved on to mainframe-based Virtual Machines, and then the intensive server-based cloud we are familiar with today.

In this way, we predict that the next incarnation of cloud will be virtualization of the entire application delivery infrastructure. In the future, enterprises will be able to buy applications that can be quickly integrated into existing infrastructure through software-based extensions available through APIs. This is tantamount to an “app store” for enterprises, but that’s just the beginning. Companies will be able not only to buy, but also configure and specify performance characteristics of those applications to meet the needs of the business. Underlying infrastructure will be reconfigured on the fly by apps to ensure that they deliver the desired user experience. This control will start with the browser on user PCs, but extend to include data center-based services, private networking and compute and storage resources. For example, businesses will be able to set security and privacy policies, performance parameters, reporting and even see their bill through a virtualized software layer. What will this mean to the enterprise? When it buys an app, the enterprise will get the whole package: performance and reporting, automated suggestions on how to optimize its environment, and an automated bill that can be easily integrated into the flow of information.
What can companies do now to be positioned to take advantage of virtualized application delivery?

**Plan**

Businesses should consider organizing for success by creating teams to focus on innovation, growth and how technology adoption will affect their user base. Product organizations need time to respond to market demands and the possibilities of technology mash-ups, but a start-up like focus on these issues can reduce speed innovation and reduce time-to-market. The future is bright for companies that can really focus on their users, deliver what their users want, and continue to execute as the business grows.

**Protect and Secure the Crown Jewels**

With data centers and network becoming more global and interwoven, the opportunity to access higher-growth markets is well within reach. But that brings a host of challenges for businesses as they encounter different regulatory requirements, security standards and overall global security threats. As more businesses are finding out, working with a global technology provider that specializes in the latest and greatest security technology and certifications is more cost-effective than doing it themselves.

**Embrace Software**

Like it or not, most of the features that either delight or infuriate enterprise buyers are software-based. With that in mind, businesses will need to cultivate an awareness of the demands, benefits and pitfalls of software as it’s deployed in the enterprise. How your sales professionals deliver a quote, place an order for a customer, and provision your goods and services can all be automated with software.

With the right steps and a forward-thinking perspective, businesses can be poised to take advantage of technology in 2020 and beyond.

The next incarnation of cloud will be virtualization of the entire application delivery infrastructure.
Richard Sear leads Frost & Sullivan’s Visionary Innovative Research Group, a team of global consultants focused on understanding how future transformative developments will affect the various industries it monitors, tomorrow’s consumers and clients it serves. He believes that we can shape the future by taking practical data-driven steps that keep decision-making firmly grounded in future certainties. His 17 years at Frost & Sullivan have led him to work with various industries, including energy, health care, IT and chemicals, giving him a rounded perspective of the global business environment.

So many options, so little time, so much pressure to reduce costs. Do I really need to think about 2020? I am only now figuring out cloud, and now you want me to think beyond cloud?

And so goes the pressure of someone living in the IT and communications technology arena today. Frankly, yes, I expect all of those things of you, and more. Technology is moving forward at such a rapid pace of change, if you do not innovate today, you will not have the chance tomorrow. The days of being able to play catch-up are going away, if not already gone. So my outside-in view really consists of a few core observations based on my travel around the world, interacting with dozens of industries, people and entities. Here is my take on your key musts when thinking 2020:

Get “Consumer Smart”

We talk about “smart technologies” all the time because we techies love developing “stuff.” But we can’t continue to do this blindly, pretending we know the end user. Gen Y influence is growing at a frenetic pace, and let us be honest: How much do we really know about its members? That is to say 2.4 billion of them by 2020. Ignore them at your peril, since they will decide whether what you do will actually work or not, no matter how “cool” you think it is. Oh, and focus on China and India, because 37 percent of the 2.4 billion will come from there — and not just as potential consumers, but as your fiercest competitors!

Technology is moving forward at such a rapid pace of change, if you do not innovate today, you will not have the chance tomorrow.
Know That Humans Are Aggregating

Sixty percent of us will live in cities by 2020, and that percent will increase each year after. This means that short distance connectivity is critical, but it also means there will be significant pressure on infrastructure and city resources. This translates to opportunity for those with a thirst for tough problems to solve. The winners will come from those who understand these two key trends, but they also must have an effective business model to capitalize on that understanding. Therefore, traditional companies will face increasing pressures from new entities known and unknown with creative models to bring solutions to consumers and business. Much of that will rest on how transformational your Big Data strategy is.

I could list many issues, and I likely have not done justice to them all, but some to think about are the importance of ubiquitous connectivity; the key that is IPv6; never losing a wallet or keys again because we won’t own any; and interacting with media, and how that will dramatically change with the notion of the TV evolving. But when the dust settles, I know as a long-term planner that this will still be a society of personal interaction. So focus on how you can make those personal interactions of higher quality and, if you like, “humanize” your technology.

**Most consumers fully adopt smart-device swiping for purchases, nearly eliminating cash and credit cards.**

*Source: Mashable*
Technology is not a barrier to health care. Rather, it is a “discovery tool” to help improve the quality of an individual with the overall intent to improve the quality of life.

In 2020, when patients go to the doctor for their annual exams, they will see incredible changes to the workflow of the clinic visit.

**No More Forms**

Patients will not have to fill out the same information they did the last time they visited the clinic, specialist, exercise training center, pain management clinic or any other health services center. Signing in with technology such as an iris scan will use object-oriented programming to intuitively know where the latest patient health information is located — and automatically populate and update to the most current data file on record.

In fact, signing in will tell patients how much co-pays are and total deductibles to date. It might even be able to pull money directly from an HSA to pay for the deductible.

**Shared Health Records**

The electronic health record will replace the paper medical record of today. Patient records will be stored in virtual repositories around the world that are easily accessible to other health care providers whom patients have given consent to read.

In fact, a doctor’s medical-grade secure and HIPAA-compliant network will be able to access radiology images at 1.3 terabytes per second, all before patients even get to the exam room. The power of this cumulative record is that a patient’s personal care team will be informed of all the healthy behaviors monitored by bluetooth technology since the last visit. A specialist will have knowledge of a primary care doctor’s interventions, and in turn, will see your progress with cardiac therapies or diabetes management.
The physician of the future will have completed a full gene scan and will be able to tailor individual health recommendations to the medications patients take and how medicines react to the foods patients eat (or don’t eat), and drug interactions will be alerted before medications are given.

**Smarter Health Records**

The electronic health record will have the ability to perform analytics on the information from patient lab tests or home monitoring devices. A patient’s vital sign readings will populate the electronic health record before the doctor has even entered the exam room, thanks to readings from a finger band given during sign in that records blood oxygen levels, blood sugar levels and pulse. As a patient walks in the exam room, weight will be taken, and height and body mass key indicators will be recorded.

“**A patient’s vital sign readings will populate the electronic health record before the doctor has even entered the exam room.**”

**Tablets and Dashboards**

Doctors will come in to exam rooms carrying smart tablets with patients’ electronic health records. They will show a dashboard view of a patient’s current health status, highlighting factors out of the normative range. The doctor will address and focus on these issues first; and, through a process of clinical care guidelines of best practices, will recommend the appropriate course of treatment. Any prescriptions patients need will be emailed immediately to the preferred pharmacies and be ready when they arrive.
Robert Neill is responsible for the management of enterprise technical services, including telecommunications infrastructure, electronic messaging, wireless communications, back-office applications such as financial reporting and human resources, data center operations, and local user support. In addition, he is responsible for the development of security and information technology policies and plays a key role in monitoring compliance with Sarbanes-Oxley and data privacy related regulatory requirements.

I was recently asked the question, “What will business technology look like in 2020?”

My first thought was, “That’s so far out into the future; there is no way to think that many years ahead.” Then I looked at the calendar and realized it was almost 2013, and that 2020 really wasn’t far down the road. I also realized my oldest daughter will be wrapping up college around 2020 and entering the workforce for the first time. So I decided to ask her what she thought it would look like.

My daughter’s first response was one of shock that in seven years she would be starting a career. She told me she thought people would just be using some kind of tablet for work, but a tablet a little bigger than what we use today. One that lets you do multiple things at once: be on a video call, edit a document, and look at a Web page. She also thought the cube mazes at many offices would go away because people would not need to be plugged into anything to do their work.

Though the musings of the future in the eyes of a 13-year-old are interesting, I have my own thoughts on what business technology will look like in seven years. If the past decade is any indication, we are in for a wild ride. I have often said that if my company’s revenue and operating income had grown over the past decade at the same rate as our data storage and bandwidth requirements, I would have retired early. My crystal ball shows that growth in data to still be going strong in 2020, which means a continued demand for more and faster storage, faster network speeds, and larger data circuits.
I have said before that I could see being the CIO of a company without a data center. I don’t think that we will be there by 2020, but it will certainly be closer to a reality. I envision a continued contraction in the size of corporate data centers and the continued expansion of computing capacity being delivered by third-party service providers. I recall five years ago worrying about whether the main data center we built would be large enough to handle our growth and physical consolidation of smaller satellite centers. As I walk through that data center now, I worry about what to do with all the space where racks full of servers once stood — servers that have now been virtualized and take up a small fraction of the physical space. The worry of having a too small data center has been replaced with the worry of having one that is too large. As we march toward 2020, server virtualization and X as a service — X being software, platform, infrastructure, or application — will continue to change the shape of data centers. There will be fewer servers, more network hardware, and less energy consumption.

When I look back at how much has changed with end user devices since I entered the workforce in the early 1990s, I can’t help but think that we will see that same pace and innovation over the next seven years. They will not have gone completely the way of the typewriter, but the install base of desktops and laptops will be reduced substantially by 2020. Tablets and smartphones will be the standard devices in the workplace, and I am sure there will be some not yet thought of device form factor that will be the hot new thing in 2020. Rest assured: There will still be people camping out in June 2020 to buy the iPhone 13. Much like my daughter, I also see the use of the traditional office phone, hard-wired data drops, and the conventional office cubicle slowly being phased out as we approach 2020. I might even dare say that for some businesses, the office as we know it today will cease to exist. The office will truly become wherever the employee happens to be, which will surely drive InfoSec professionals crazy.

Many businesses and public sector organizations have been using the cloud for just the most tactical applications. But recent research and anecdotal reports are pointing to more broad-based cloud deployments by 2020.

This is despite questions about delivery stability, security and compliance, and the potential negative impact on the IT organization’s control over resources.

Current Analysis’ 2012 survey of 550 U.S. and European enterprises about their cloud adoption plans found that 64 percent already are using cloud services, with the remaining organizations planning to tap on-demand services within the next 24 months. Though most organizations are still using cloud to support only a relatively small percentage of their IT needs, there is evidence that percentage will grow in the near term, particularly over the next seven years.

“Though most organizations are still using cloud to support only a relatively small percentage of their IT needs, there is evidence that percentage will grow in the near term.”
Of the 350 organizations Current Analysis surveyed that already are using cloud services, only 5 percent say they are consuming more than 20 percent of their IT resources through the cloud today. However, that percentage rises significantly in the near term with 28 percent planning to deploy cloud services to support at least one-fifth of their needs within the next two years. And expect those percentages — both the number of organizations and how much they plan to use cloud services — to grow even more by 2020.

This signifies an important move forward as organizations consider where the cloud is a good fit. However, making these changes will require providers to address a number of areas of concern, including security and compliance questions. This is an inherent challenge in a segment that doesn’t have industrywide standards for baseline security.

For providers that are able to establish out of the gate that they can exceed an organization’s existing capabilities both in terms of price, performance, security technologies, processes, and expertise, there is a prime opportunity to help advance the enterprise from investigating cloud today to moving forward with enterprisewide strategic deployments by 2020.

Source: Gartner Research

85% of customer interaction with a business won’t involve talking to a human.
EXPECT BIG CHANGES

TO IT ORGANIZATION AND INFRASTRUCTURE

As we look out to the end of the decade, our research depicts an information technology organization being transformed and an infrastructure undergoing major structural changes.

On the organization side, one trend is for IT to become more embedded in the business units as the enabler, and in some ways, a broker of services that will be delivered: on premise via company-owned IT and intellectual property, and the various “as a service” offerings that will be internal and external in delivery mode. Setting policy and governance and ensuring security will be the DNA of IT as this transition occurs.

On the infrastructure side, virtualization has been the catalyst for a generational change in how IT is delivered. We are at the advent of the “Industrialization of IT,” with the goal being to standardize and drive down the cost of servers, storage and networking gear. Delivering a “unit of compute” as cost-efficiently as possible in a standard, modular and portable manner is the charter. Some would call this commodization, and when we look at what businesses like Amazon are able to deliver, we agree. This transformation enables the use of Software Defined Networks and Software Defined Storage.

Virtualization enables abstraction and high utilization of this industrialized IT plant, acting as a gateway to the internal cloud. Managing the environment; providing functionality like chargebacks based on utilization; prioritizing performance based on SLAs that IT provides to the business unit or app owner; and implementing cloud orchestration stacks will be key aspects of IT in 2020. The concept of intelligent workload management is what IT will need to be delivering, where location of the workload can be anywhere.
We are starting to see companies implement private instances of a public cloud, in which the cloud service provider installs its gear at a client site and manages it remotely. The client pays a unit cost for the service provided and is assured an SLA. Over time, as regulatory compliance and security can be ensured, these private instances have the ability to move outside a company-owned data center. The end of the decade is a logical target.

"The concept of intelligent workload management is what IT will need to be delivering, where location of the workload can be anywhere."

The old issue from the 1980s, the problem with “Silos of IT” rendering isolation and lack of interoperability, is a key to be prepared for. As we look at private cloud, SaaS, IaaS, PaaS, the role of the CIO will be to ensure integration, accessibility, and security of the mission-critical applications and data.
When I think about technology trends leading up to 2020, a recent Fierce Telecom article on cloud services in the European Union comes to mind.

This article reported that the EU plans to remove the following barriers to cloud adoption:

- Uncertainty about legal jurisdiction and location of data in the cloud
- Concern about the level of cloud security and assessing the trustworthiness of suppliers
- Uncertainty about the business case of adopting the cloud model
- Fear of lock-in with proprietary systems
- Insufficient local support

With these obstacles gone, cloud computing spending could double by 2020, and the EU could not only recognize billions in economic gains, but the cloud will be considered a game changer for the economy. If this is a game changer for the EU, the opportunity and impact on cloud services in the United States will be just as huge.
Another Fierce Telecom article is telling about what the research says about technology and where we’re going in the future. We recently reported the following:

- Colo vacancies are on the rise: London, Los Angeles and Hong Kong have all reported that their vacancy rates for colocation are on the rise. The demand for colocation services, the increase in colocation space, and the rate at which colocation sites are growing are all on the rise, and they are rising at a faster rate than last year. We all can expect this to continue in the next seven years.

- Optimal components market is in flux: There are definitely mixed reviews when it comes to the optical equipment market and whether it will be revived. However, thanks to upcoming rollouts of 100G networks beginning in 2014, there will be hope for growth between 2011 and 2016.

- Robot apocalypse is imminent: Recent news reports of accidental early releases of finance data that send stocks tumbling is just further evidence that we’re only as good as the humans setting up and programming the machines to run. We learned that there’s still a lot of work to be done when it comes to the robot revolution.

“We’re only as good as the humans setting up and programming the machines to run.”

The global cloud computing market grows to $Billion

Source: MASHABLE
No one said the CIO position would be easy. And with the rise in virtualization, the challenges are multiplied.

Pressure to do more with less — and the exploding data requirements — will continue to keep CIOs sharp.

As CIOs look toward 2020, they should consider ATLANTIC-ACM’s five tips for the next seven years:

**Drive to Virtual**
Continued decentralization of the workforce, including managers and the managed, will increasingly push company data and processes virtual, or even into the cloud. This will drive newer, faster connectivity demands.

“CIOs must understand what clients, executives, and sales forces are comfortable storing and accessing virtually.”

**Get Secure**
As decentralization materializes, information and process security becomes paramount. Confidential client information and patented company processes become potentially exposed in cloud and virtual environments. This means CIOs need to ensure that security and redundant connections are up to snuff. In ATLANTIC-ACM’s 2012 Business Connectivity Report Card, Network Security was listed as the second most important criterion in driving purchase decisions, close behind network quality.
Strike a Balance
CIOs need to manage the balance between off-site data storage and applications and what the company is comfortable putting in the cyber world. One challenge is confidence in the ability to reliably migrate to new systems. CIOs must understand what clients, executives and sales forces are comfortable storing and accessing virtually.

Keep it Personal
In an increasingly virtualized world, keeping customer-facing operations personal will remain critical. Technology should be embraced as a means of improving “behind the scenes” work and processes. Companies seeking differentiation would do well to keep personal interactions just that — personal.

Beware Buyers
Buying options are becoming difficult to compare, particularly with the addition of vertical specific software and complex bundles. For small and medium businesses, service provider offerings increasingly consist of converged voice, data and security options, and bundling makes for difficult apples-to-apples pricing comparisons.

The number of connected devices doubles to 50 billion globally

SOURCE: COMPUTER WEEKLY
By 2020, the concept of a computer will disappear for all but the cloud providers.

Computing, the processing of data into information will, however, be part of almost every device in the home and office. Everything we own will be intelligent: our phones, our entertainment, our cars, our homes, our business tools, and even our toys. How these devices get their data will be transparent to the user and be provided as a service to the device itself. There will be a plug in the wall or a wireless connection to some network, and data providers will manage the required data without the active involvement of the user. There no longer will be a need for a “computer” to access and create information, as that function is now done closer to where end users consume the information.

Toward the end of the 20th century, the concept of research and development for consumer products changed. Early in the century, inventors looked for new technology first, and then found ways to make it into a product. Today, that process is often upside down. Companies first try to find untapped markets and then invent devices to fill them. The Walkman — a small cassette player — wasn’t really a new technology as much as it was a tool to meet the needs of an untapped market, even if people didn’t realize they wanted it.

Today, we can add intelligence to anything we make. For example, you could make an intelligent shower head: Program it to start hot and gradually cool off, set a max temperature so young children are not burned, increase the pressure late to do a final rinse or limit the time so your kids don’t use all the hot water. This wouldn’t be an outstanding technology achievement: All that’s needed is a chip, a user interface (put in Bluetooth and create an iPad app), and a power source. The missing ingredient is a forecast that proves you could make money off the idea. (I want a share of the action if this idea does find a market!)
By 2020, computing chips and memory will be small and cheap enough to embed into any device worth owning. No need to go to a special $800 computer to read email, get a recipe, see pictures or manage your budget. There will be more appliances in our life dedicated to helping us to manage our time, money and communications. And they will be linked. Your car will be able to access all your devices so it is the user interface to the world while you drive. Our homes will take on that role when we arrive there.

Though adults today will understand that there once was a computer to which you went for all interactive written communication, processing and storing of data, by 2020 that will be diffused. The kids will react to seeing a PC like we do to seeing an old-fashioned typewriter: “Wow, I can’t believe I used to use one of those. Does that come with correcting fluid, carbon paper and extra ribbons?” And we will be forced to make old person comments like, “You think you kids have it hard? In my day, we used to have to type H,T,T, p,:,/,W,W,W, dot, before we could go anywhere. Why? Don’t know, but that was just the way it was!”

There will be more appliances in our life dedicated to helping us to manage our time, money and communications.
We see two important paradigms dominating the hyper-connected world in 2020.

First, everything will be smarter, and second, users will rule. Smartphones and tablets have only scratched the surface of how and where services will be accessed and what they will be capable of. Smart cars, smart houses and pervasive, networked intelligence will let users connect with one another and what they want — wherever and whenever they want. To thrive in the hyper-connected intelligent world, operators and businesses will have to broaden how they think and shift toward enabling the experiences users will expect.

How will this happen?

First, operators and businesses will want and need to open up their systems and environments to become collaborative development environments. Software-defined networks are only the beginning. Co-creation platforms will be the rule. A key aspect of these environments will be enabling collaborators — “subscribers” and “application partners” — to “write” on the new network like a grand, distributed tablet. Of course, they will be leveraging well-established standards and using security and protection mechanisms that will let them negotiate reliably. But the possibilities of combining and mixing resources into more flexible consumer and business outcomes, such as purchases, reservations and online artworks, will be realized. The user will imagine it, and the intelligent network will respond.

“To thrive in the hyper-connected intelligent world, operators and businesses will have to broaden how they think and shift toward enabling the experiences users will expect.”
Second, operators and businesses will want to reach out to understand and embrace their customers’ intentions across a wide array of interests, and allow them to blend and interwork for more enriching experiences than have been conceivable in the past. Video delivery will blend with online shopping. Uploads and anycasts will be as frequent as downloads and unicasts were during the Web’s emergence. Enabling users to express what they’re interested in and mining those interests to facilitate a more dynamic subscriber experience will be the leader’s prescription. This will be true across:

- Communication and collaboration
- Entertainment and content
- Business and professional platforms
- Shopping and commercial transactions
- Real-time financial services

In 2020, it won’t be about reachability and simple connections anymore. It’ll be about application-aware, device-aware, location-aware, ID-aware and personalized experience networking and technologies that will enable the always-on world.
The experts have spoken … for now. In a nutshell: Technology will become more human, data centers as we know them will be gone or entirely reinvented, our workforce will approach complete mobility, and, yes, we will see more cloud. But with 2020 still seven years out — a lifetime in technology years — the conversation is far from over.

Continue the conversation on Twitter.

Have your own take on business technology in 2020? Want to find out what others have to say? Follow @CenturyLinkEnt and use the hashtag #biztech2020 to stay in the loop.

Continue to expand your business technology knowledge by visiting us at:

- youtube.com/centurylinkbusiness
- linkedin.com/company/centurylink-business
- slideshare.net/centurylinkbusiness