

TRENDING SERIES

Information & communications technologies for 2013

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With the growth of smartphone ownership and mobile device usage, data networks must rapidly evolve to meet the growing information needs of a highly connected world. In this first installment of the series on communications and networking, five trends are discussed that will impact communications technology in 2013. This paper also examines potential for cellular networks to accommodate growth in demand, and how these trends overall might impact the job market for technology professionals.

MOBILE DEVICES WILL DOMINATE

By 2015, Gartner (2013) predicts that over 80 percent of mobile devices sold in mature markets, like the United States, will be smartphones, and that 50 percent of laptop shipments will be media tablets. In-house IT departments will no longer be able to standardize on a Windows platform with only a few models to support. Employees are connecting their email accounts on iPhone and Android smartphones, thus reducing the number of devices they must carry. Networks will be challenged

the ability to go online with their mobile device. As HTML5 continues to expand its capabilities, mobile sites will deliver richer functionality, thus creating a positive feedback loop that entices users to view more web content on mobile devices. The debate continues around whether to leverage media queries to render a single code base, or to build a separate code base that has been optimized for mobile networks. Optimization includes eliminating extraneous code, such as scripts, and reducing image sizes to reduce the overall file sizes being sent over cellular and Wi-Fi

By 2014, there will be more than 70 billion mobile app downloads from app stores every year. Also by 2014, most organizations will deliver mobile apps to workers via private application stores.

(Forbes, 2012)

to handle both the increased demands on email systems, and increased traffic overall as early adopters attempt to access other corporate systems via tablets.

In the consumer domain, ISPs will witness a rise in traffic as more smartphone users come online, and as brands begin to develop and promote their mobile web offerings. Apps still enjoy a more robust experience since they have access to unique device OS features such as those found on iOS. However, mobile web offers brands an opportunity to reach more consumers, especially those who do not frequent app stores, but do have

networks. Maintaining separate websites, however, introduces additional costs for organizations and more support needed not only for the code, but for additional data center space required to host separate web applications. For the time being, network administrators will need to plan for desktop file sizes being transmitted over limited bandwidth cellular networks until responsive design is more widely implemented.

CLOUD REPLACES THE PC

The cloud will replace desktops and laptops as the de facto place where consumers go

to access their content. Several products like Apple iCloud, Mozy and Box.com are making it easy for users to store individual files or backup entire devices to the cloud. This is transforming the content licensing process where previously some content that was only allowed on one device can now be synced with iTunes and iCloud for viewing on any Apple device.

The design and digital production domain offers a case study in how cloud computing is being integrated into business processes. Adobe, which is a mainstay in the creative industry, has launched the Digital Publishing

developer resources and data center space to manage development and hosting of mobile applications.

Design files can get quite large, especially as images and videos are embedded. Even though storage space will be reduced through cloud computing, maintaining a collaborative environment will increase traffic demands on the networks creative agencies must manage. Conversely, cloud use of Adobe Creative Suite will lessen the need for desktop support and file sharing servers, thus allowing firms to reap the benefits of collaboration and stay more

Location information is extremely sensitive information. GPS can pinpoint consumers down to 10 meters of accuracy. Companies aren't protecting the information the way they should. Half of apps give out location information to third parties without users' knowledge.

- Sen. Al Franken (D-Minn)

Suite. For a monthly fee, designers can access a license to the Adobe Creative Suite whereas in the past, users had to buy an expensive license up front (Adobe, 2013). Designers can now work locally and then share their files in the cloud with other designers and developers on the team, as well as clients. The Adobe Creative Cloud can host a full site, or simplify do the transformation that converts an InDesign document into a working iPad app for submission to the iTunes Store (Adobe, 2013). An enterprise license can potentially pay for itself by reducing a firm's need for

current with their software by reducing the up front expense.

Making data available anytime from any device via cloud computing raises issues for network bandwidth and prioritization, as well as data security. In 2012, Apple bought fingerprint sensor maker AuthenTec, which is inline with the consumer demand for increased security on mobile devices (Etherington, 2012; Basenese, 2013). Biometric authentication could soon be embedded into devices within the next two years as Apple looks for ways to incorporate AuthenTec technology into its

products (Etherington, 2012; Basenese, 2013). Similar to corporate IT departments, consumer providers will need to implement improved mobile device security to ensure devices are not broadcasting more personal information than is necessary to interact with apps and mobile web, especially where it concerns location-based services.

BIG DATA DRIVES BUSINESS ANALYTICS

Since consumers are more likely to engage on mobile versus desktop, traffic

opposed to building large and complex “single enterprise data warehouse” stores. Analytics systems will be required to make connections between disparate data sets quickly enough to produce real-time or near real-time metrics for business leaders. These connections will facilitate increased personalization, customer service and efficiency for firms (EMC, 2013).

Network administrators will need to architect an automated infrastructure that leverages agile analytics and storage that can scale within minutes (EMC, 2013). Storage and data network vendors offer

Businesses that exploit Big Data to improve their strategy and execution can distance themselves from competitors by using new insights from data that was formerly discarded or could not be processed due to technology limitations.

(EMC, 2013)

inside data centers, especially those that support e-commerce, will need robust infrastructures that can provide simplified, fast and secure payment processing to capture on-the-go mobile purchases. All of this increased traffic and engagement generates substantial amounts of data.

Collecting, storing and analyzing the data will be crucial as firms measure how well their online activities are leading to engagement and revenue generation. Gartner (2013) reports that the business trend is to make connections between systems where the data resides as

solutions that can combine data center resources in various locations to create a large yet seamless scale-out data storage cloud that is managed as a single resource (EMC, 2013). Fiber optic data centers offer a solution to the level of internal compute power needed to process transaction and web metrics. Fiber can scale from 10 to 100Gb Ethernet making fiber ideal for a scale-out storage area network (Corning, 2013). Optical cable and hardware, including switches and servers, require not only less space, but also less power compared to copper wire, and this further

lowers the cost of implementing and managing dynamically scalable network infrastructure (Corning, 2013).

SECOND SCREEN & MOBILE CONVERGE

Marketers are realizing that banner ad engagement is on a downward trend, while mobile web ad engagements are rising. With more than 80% of smartphone owners using their phone while watching TV, broadcast and market leaders want to capitalize on this second screen engagement (Ulanoff, 2012).

Several firms like Zeebox and GetGlue are driving “big screen consumption with small-screen activities” (Ulanoff, 2012). In-show banner ads can drive engagement by prompting consumers to call a number, text to vote or visit a website. The evolution of content delivery and engagement for second screen will mean more data for cable and satellite broadcast providers, as well as home ISP and 3G/4G cellular service companies.

Satellite TV providers are also getting into the second screen space. Dish Network, a spin-off of EchoStar, has nine owned and leased satellites in its fleet, with customers typically linking to the 129°W or 61.5°W orbital locations (Wikipedia). They recently launched a tablet application, Explorer, that now serves as a remote and can offer customers with viewing recommendations (Fingas, 2013). This is in addition to their Sling-integrated Remote Access iPad app that offers DVR management and video

viewing anytime, anywhere (Lawler, 2012).

‘THINGS’ WILL BE CONNECTED

In an article from Forbes (2012), they note that over 15 billion things are connected on the Web, and these generate more than 50 billion intermittent connections. By 2020, over 30 billion connected things, with over 200 billion with intermittent connections (Forbes, 2012). This heralds a shift away from a client-server model to a model where devices, like sensors and RFIDs, behave autonomously and are becoming “a world of intercommunicating devices serving as the new web” (Hoffman, 2012). The existence of a direct user endpoint is no longer required, or necessarily a given (Hoffman, 2012).

Hoffman (2012) notes that for high priority devices like those used in medical delivery, network uptime and device reliability must be high. The billions of devices online will also contribute to the big data trend discussed above. Combining sales information from POS systems with RFID in warehouses and sensors measuring traffic in-store can provide retailers and suppliers with real-time information of customer behavior that drives strategic decisions about product offerings and customizations with high revenue potential.

THE CELLULAR NETWORK

The Advanced Mobile Phone System (AMPS) was the first cellular mobile system in the United States (Tech-FAQ), and

leverages frequency division multiplexing by assigning each user a frequency band in the spectrum. This assigned band uses 30kHz wide discrete channels of bandwidth for transmission across the 824 MHz to 849 MHz frequency band for transmission by mobile station, and the 869 MHz to 894 MHz frequency band for transmission by base station (Tech-FAQ; The Network Encyclopedia).

For the mobile base station band, this would allow for 1,000 channel connections over the AMPS. With nearly 6 billion mobile

the spectrum by time and channel (Tse et. al., 2005), thus accommodating more mobile users. The full coverage area over a licensed spectrum is divided into cells through a process known as sectorization, and then each cell is managed by a fixed base station where mobile users connect to the closest base station (Tse et. al., 2005). CDMA uses a direct-sequence spread-spectrum with information bits from users coded at a low rate and modulated with pseudonoise to reduce interference within a cell (Tse et. al., 2005). Messages can travel within a cell, or with the use of

The BLS notes that the industries offering the highest median earnings that year included computer and peripheral equipment manufacturing companies, insurance and employee benefit funds, and the U.S. Postal Service.

(Hosler, 2012)

subscribers globally, and 969 million of those subscribers in the Americas (MobiThinking, 2013), cellular networks must find ways to efficiently allocate channels across the spectrum band. One solution was to enhance AMPS so that a reduced channel size could be used for voice data. The Narrowband Advanced Mobile Phone Service (NAMPS) reduces this channel size to 10kHz, thus tripling cellular capacity (Tech-FAQ).

The narrowband principle when applied to a cellular model enables the code division multiple access (CDMA) system to be implemented, which can then further divide

switching technology can move between cells; while channels can be reused by cells, they must be cells a few concentric circles apart to reduce interference (Tse et. al., 2005).

Public Wi-Fi can also help to alleviate the strain on cellular 3G and 4G networks; however, ISPs will have to contend with the challenge of incrementally monetizing Wi-Fi usage. Companies like Amazon, with the Whispernet service for Kindle, and Starbucks have set the standard for free Internet access, which will challenge other entities, like airports and hotels, to incentivize their paid Wi-Fi offerings

(Amazon; Starbucks). Additionally, Vonage and Skype offer IP telephony for free or low cost to customers with a cable, DSL or other Internet connection. This will increase demands on networks to offer more efficient multiplexing and low delay for transmitting voice data.

Satellite offers additional opportunities to expand mobile network bandwidth. Typical satellite downlinks are transmitted in the C-band (4–8 GHz) and/or Ku-band (12–18 GHz), with most satellites having up to 32 transponders for Ku-band and up to 24 for a C-band only satellite, and even more for hybrid satellites (Wikipedia). Currently, Dish Network is the only American satellite TV service to use the non-DBS portion of the FSS band for transmission (Wikipedia). Dish Network recently obtained FCC approval to open up excess capacity in the previously restricted AWS-4 spectrum in the 2 GHz band, and use it for 4G data transmission, which it plans to lease out to cellular service providers (Lawson, 2012; FCC). The 2 GHz band at 2000 – 2020 MHz and 2180 – 2200 MHz is currently assigned to Mobile Satellite Service (MSS), that is used to provide “services in areas where the wireline and wireless networks may not extend or provide coverage” (FCC). This deregulation opens up new applications that could support Dish Network’s second screen initiative specifically, and create more mobile bandwidth in general.

CAREER OUTLOOK

Not only will IT departments need to staff

up capability to support an increasingly diverse ecosystem, but they must also ensure that networks can handle increasing traffic as employees and consumers alike access more content over mobile web. This translates into increased demand for innovative and highly analytical networking professionals who can anticipate future network capacity needs, and implement complex and sometimes cutting edge solutions to accommodate emerging trends.

The Bureau of Labor and Statistics (BLS) reports a 28 percent projected growth for network and computer systems administrators between 2010 and 2020, along with an above average median salary of \$70,970 as of 2011 with the top 10 percent earning up to \$112,210 (Hosler, 2012). Hosler (2012) reports that interested professions would do well to have a bachelors degree, but opportunities are also available for those with associates degrees and training from network administration schools and online colleges.

Virginia offers a strong career outlook for network professionals with the highest mean salary at \$85,370, and second highest projected growth (27 percent) after Utah (31 percent) (Hosler, 2012).

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