

2015 - Q3 Quarterly Tech Update

Infrastructure

Software Defined Networking (SDN)

The great debate when I was in my computer engineering program at university, was the back and forth between hardware and software people, who said anything that was on silicon could be emulated in software, and vice-a-versa by the hardware types. With everything moving to scalable, virtual environments, the software types have won for the moment, as hardware, on which all of this runs on, is relegated to commodity infrastructure that is bent and twisted into what software defined infrastructure wants it to be.

In many cases, companies that focus on cloud implementations usually only observe software defined networking as involving virtual switches and routers within a virtual space, but SDN also bridges software defined mobile networking, especially in the case of adaptable wireless networks. With mobile still being a current and present technology that is to a clear point of ubiquity, it is important to also focus on some of the lesser known or implemented software defined networking technologies. Use cases would include adapting networking infrastructure in WDRP to support oversubscription of available wireless network access points and shape and manage traffic usage to backend applications and outbound requests.

One of the added advantages of defining your network along with virtualizing all the other applications and hardware in your environment, is that, based on promises, it can be moved easily from a lab to a live environment regardless of where it lives, provide those containers are supported^a. This not only supports the workflow, but has the added benefit of wrapping up the challenges in scaling, failover, and provide independence that drives risk reduction and lower costs^b. However some costs will increase, as tools will need to be developed or acquired, then maintained (including the accompanying skills) to orchestrate the deployment and management of these environments that differ from the traditional engineering and administration skills.^c

Cloud / XaaS

Most of the recent activity within the cloud services space has been stories of consolidation and some of defeat. This is a realization of two distinct points within the space, that of maturity and opportunity. In a number of cases, early pioneers in

^a <http://www.gartner.com/document/3007921>

^b <http://www.gartner.com/document/2713317>

^c <http://www.gartner.com/document/2864517>

the cloud services space have decided to close up shop or were forced to by the current maturity level (and commercial demand) of certain offerings. Others, the ones that field a niche or were competing against more mature players, such as Google, IBM, Oracle, EMC, and Microsoft, were handily snatched up – then dissolved or integrated into those portfolios. This, in itself, should provide an adequate level of caution before putting all your organizations chips in on a provider, whether it be the “hot, new thing” or the “old, conservative standby”.

In one very publicized case, with game-maker Zynga, they went from cloud to private data center to cloud again due to the changing of their business^d. It was suspected that the reasons for this and other moves have been the inability to adapt to the ebbs and flows of the technology market, and the lock-in of a private data center for a new venture isn't prudent. Cloud companies are betting on this change of heart for those who abandon cloud computing after these companies seem to find their footing^e, and may, or may not have the skills to effectively scale their business – a niche that cloud services often are chosen to fill.

In other cases, the stars have not shown brightly for certain aspects of cloud, such as Nebula (Open Stack) shutting down and cloud-only companies Grooveshark and OnLive either folding or being acquired only to be shuttered, as well as some of the early stars of cloud services firing critiques against the mission and motive of some cloud projects^f. Other cases larger tech companies have acquired cloud capabilities rather than develop internally, such as Cisco's acquisition of Metacloud, HP and Euclayptus, and EMC purchasing Cloudscaling all within the last 12 months. This would begin to have some organizations begin to consider, if they hadn't already upon signing contracts with cloud providers, is having an exit strategy when the provider changes or the market significantly changes and they are left holding the bag and no way to access their data and services^g.

Mobile

Google, which at their I/O conference held during the last week in May, officially announced Android M albeit without it's candy or dessert moniker. In parallel to what Apple announced this past week at the WWDC, the focus for both of them centered on mobile payments, wearables, media, and automobiles^h. Other less high profile announcements, from Google's ATAP program, were from Project Ara, the

^d <http://blogs.wsj.com/digits/2015/05/08/for-zynga-a-journey-from-the-cloud-to-home-and-back-again/>

^e <http://readwrite.com/2015/05/12/zynga-data-center-amazon-aws-public-cloud>

^f <http://www.networkworld.com/article/2927460/cloud-computing/early-openstack-contributor-says-cloud-project-has-lost-its-heart.html>

^g <http://www.techrepublic.com/blog/the-enterprise-cloud/what-happens-when-your-cloud-provider-goes-out-of-business/>

^h <https://architecture.disney.com/mobile-round-up-google-io-and-apple-wwdc-edition/>

modular smartphone, Project Tango, the machine learning and augmented/virtual reality project to incorporate such imaging and processing into smartphones and tablets, to the more whimsical Project Jacquard, which aims at making the wearable actually wearable by embedding technology within the cloth itself.

This is one of the first major pushes to the 'Android Everywhere' strategy that analysts have seen out of Mountain View, the second is the push for both wearables and the "internet of things" (IoT). It seems natural that these would go hand-in-hand, as the best way to connect to an automated home or environment is through a mobile or wearable solution. For Google it is Android Wear (already at revision five [5]), but much more given the second and third generation devices that are coming to maturity once the marketplace has adjusted to better understand what consumers are actively looking for. However, even while released to hardware developers, many are still trying to overcome performance issues with the platform that have stalled or slowed updates and new releases. Besides the wearables focus, Google also announced Brilloⁱ, it's core for IoT development and automation, nestled to the side of Android Home (another nod to 'Android Everywhere'), and has a interoperability program called Weave, a new language/SDK, that is intended to make it easier for software and hardware providers to ensure compatibility between ecosystems – a smart move given the fractious environment currently in play.

Conversely, Apple completed their World Wide Developers Conference (WWDC) in early June that many of the major announcements mirrored those of Google, with a slight nod to their desktop/laptop side of the business with a new version of OS X and it's merging similarity to its mobile OS, iOS, and it's upcoming point of singularity in which both may become indistinguishable. However, most of the excitement among the faithful revolved around that same mobile platform, of which got a version number bump, this time version 9, and the extension of "Kits" which include HealthKit and HomeKit, both bringing the mobile and wearable platforms into synchronicity and then giving developers a jumping off point to the "land of IoT". Unlike Google, Apple is essentially always wedding their releases to their own curated hardware ecosystem, from iPads and iPhones to the new Apple Watch (thankfully ditching the "i" moniker), which also received an OS version bump at this event.

The most notable announcement between Google and Apple announced at their respective events, was Apple's upgrade and reworking of Apple Pay to not only be more functional and flexible (presumably by also gobbling up Passbook and renaming it to Wallet), but enabling the NFC components in the i-Devices to use those stored payment and memberships to interact with the world. Most notably, in the UK, becoming an supplicant to the Oyster Card used for the London Underground. Apple is also now leveraging the TouchID sensor as a multi-factor biometric component as part of the payment process with Wallet as well as apps

ⁱ <https://developers.google.com/brillo/>

built to support the Apple Pay API. While using a form of tokenization similar to what Android pay uses, it does it dynamically via a different cryptologic hardware platform called Secure Element, which is designed in a similar fashion to Trusted Platform Modules (TPM) seen on many PC motherboards for similar keying operations. In both cases, this is to keep to customer's account number from being transmitted, and those reduces potential theft, replay, and other forms of fraud. However, as Apple has stated, they do not store the information, only act as a payment enabler, and unlike Google, do not keep you stored cards centrally – in short, they are a front-end to the relationship between the card issuer, marching and processing bank.

Google rebranded Google Pay to Android Pay, thus emphasizing that this is centered around mobile platforms and the experience. According to Google, switching to the new environment should be relatively seamless for merchants, but payment processors will see a change in order to enhance security. In this case, the step away from card emulation to now using tokenization removes the potentiality to perform fraud at the point of sale, and relies upon the matching of stored payment methods via the purchase tokens to that user. It is expected that this may also be enhanced with geo-location features to avoid blatant fraud (such as a POS purchase in Europe while the user's mobile device says they are using the POS system in California at a Starbucks).

Wearables

As noted in the discussion above regarding mobile, with Apple's entry into the wearable space with Apple Watch, it's actually a multi-horse race with the platforms. The third and fourth generation Android Wear solutions are reaching market or are in the announcement pipeline, and the Kickstarter darling, Pebble, has released their second version, Pebble Time, that starts to indicate some level of parity among major players in the wrist-bound wearables market.



Figure 1 - Pebble Time

It's important to separate these types of devices from, which were seen as the dominating presence at CES this year, the fitness bands which focused nearly exclusively to the "quantified-self" crowd. The Apple Watch, Android Wear and Pebble are the connections to any other components of the technologies already

discussed in this report. They are the control surfaces and notification platforms for the IoT, new seamless payment enablers, communication portals, and the next platform for media and possibly gaming.

The next area to watch will be the use of these devices within the enterprise, as the consumer capabilities can also be leveraged to enable several important enterprise technology and services. These can range from enabling multi-factor authentication, to geo-location, direct messaging, contextual information, and other assistive and communications technologies. We've also seen a step back from other types of wearables in the enterprise, particularly the head mounted displays, and the prevailing expectation of them becoming ubiquitous has been reevaluated^j.

However, each organization is different and has differing needs and thus varies applications of a number of these technologies. In this case, the idea of wearables, if not thought to be only usable while being mobile, can also include the large swath of VR/AR headsets and associated gear. Integrating the wrist-based wearables into the VR environment, can be used as position or object tracking for integration into those immersive virtual environments. However, much like the enabling APIs for the data captured with these tools, policies on how that data is used, as well as the creation of tools that manage the opt-in/opt-out nature of those enablers (just as geolocation, biometric data, etc.) will need to have a business process adjusted or developed to address their unique situations. Imagine having to opt-in/out of advertising to every business you walked into while leveraging such a wearable device.

Google and Apple are pushing for these platforms to also be mobile payment platforms – essentially trying to kill the idea of a wallet altogether. Both platforms, Apple Watch and Android Wear^k, have specifications and OS support for contactless (NFC) transfer, and with each announcing an aggressive focus on payment technologies, these extensions of their already pervasive mobile platforms are set to follow suit. However, with the low penetration of individuals actually using these technologies available to them, the still spotty point-of-sale support in certain areas, competition, as well as resistance (and even counter systems^l) by retailers, this is far from an area that has a winning solution^m. The pairing of two strong platforms and compelling technologies, may, in this case, start to loosen the logjam and inspire users to give it another try.

^j <https://www.forrester.com/The+Enterprise+Wearables+Journey/fulltext/-/E-RES103381>

^k <http://www.techradar.com/us/news/wearables/google-android-wear-what-you-need-to-know-1235025>

^l <http://www.macobserver.com/tmo/article/retailers-to-apple-pay-customers-shut-up-and-keep-your-money>

^m <http://www.tomsguide.com/us/mobile-wallet-guide,news-20666.html>

ⁿ <http://time.com/money/3311917/apple-pay-iphone-iwatch-passbook/>

Applications & Data

APIs

One of the great enablers of cloud services has been the strength of those provider's APIs, public or private that are leveraged with custom or third party tools, in order to make interaction with these systems easy and efficient. In contrast, API development tools for use by our own developers are also an area of consideration, as we are providers of data and services to internal customers, and as an example with several organizations, an exporter of APIs for use by the public at large. The market for these tools is increasing steadily as management and customers demand more dynamic and useful interactions with organizations and service providers^o. In the case of large organizations or consortiums that have an expected public facing role, the uses of clearinghouses where APIs are published, managed and documented, have been an effective tool to make sense of "an API for everything" environment^p. A similar model can prove to be useful within a company, especially ones with several business verticals or a level of operational autonomy that makes a sharing environment difficult or traditionally cumbersome.

As one of the particular issues with ensuring availability and awareness among developers also lends itself to one of the greatest concerns in centralizing and organizing these "crown jewels" of the enterprise in one place, and that is security. If used internally only, the risk of a poorly documented and tested API is relatively low, as a reduced number of people and services are expected to take advantage of it. However, if opened up to the world at large, ensuring that the API is sufficiently tested, vulnerabilities remediated, and those, if implemented as a gateway service, is adequately monitored (either through entitlements such as keys and licenses or via a rate limiting proxy), can help ensure that an API would be the key that opens up a system to complete compromise.

Walking the path of creating APIs for services can have the added benefit of addressing legacy issues, by typing data and addressing interface concerns with applications that haven't or traditionally aren't thought of as consumable service providers. While developing APIs for these systems, they become well documented and can be outlined with performance boundaries that assist in determining actual availability and resiliency constraints. This effort can help extend the life of older critical systems, create a way for them to be migrated to more modern platforms (such as virtualized or cloud), or assist in increasing security and reducing risk by clearly defining those touch points that the enterprise can leverage of those applications, especially if the original development was organic or patchwork in nature.

^o <http://www.developereconomics.com/api-management-tools-how-to-find-the-one-for-you/>

^p <https://451research.com/report-long?icid=3434>

Big Data (Management)

There are several challenges facing data-intensive organizations presently and in the upcoming months and years. With the new drive to be a data-driven decision making enterprise, organizations are instrumenting everything in their operational arsenal and collecting data from areas that they never did before, and this drives up concerns of infrastructure support ranging from connectivity and bandwidth to storage and computer and memory issues in order to effectively analyze all of it. For organizations with a large data footprint, but with a need to perform analytics on most or all of the collected data, hard decisions are being offered up whether to handle warehousing the data internally or externally (cloud) and also leverage grid/cloud computing to cut through and visualize these data sources^q. In other cases, adjustments will need to occur in the type of data stores, as traditional databases, typically relational (RDBMS), prove too expensive and slow by comparison to NoSQL and other storage and query methods. In each case, organizations will need to customize their storage and retrieval options to the expected data and access requirements by the recording method and expected end user consumption.

Add to the need, given recent large-scale data breaches, of effective data governance and desire for proper classification, a rise in demand on external vendors to support these features may weed out or exclude needed technologies that aren't compliant to management requirements. For organizations with archival requirements, sectioning off which data is transient and can "roll off" and be disposed of versus that which needs to follow a records retention policy complicates this selection of vendors and technologies even further^r. Utilizing that live and archive data is still a solution that needs to be developed, and as of yet, there are no clear leaders in that area. For many organizations, being able to do long term mining of such information, either within our business unit verticals, as well as across the enterprise, should be treasure trove of insights to our customers if the right tools and analytics are applied. However, bridging those gaps, identifying the right sources, and ensuring that actionable intelligence can be gathered is going to be a long term activity^s. Most organizations currently do not have a "Chief Data Officer", which becoming vogue in many organizations who realize the wealth of information lies around but needs to be strategically accessed and leveraged to make the investments actually pay off^t. Who will be the person making the call if the IoT network data at the companies is actually useful? It may be up to somebody in that

^q <http://www.informationweek.com/big-data/big-data-analytics/5-analytics-big-data-management-trends-for-2015/a/d-id/1318551>

^r <http://apps.ironmountain.com/dataarchive/>

^s <http://www.forbes.com/sites/homaycotte/2015/01/20/big-data-challenge-finding-haystacks/>

^t <https://hbr.org/2012/08/marketers-flunk-the-big-data-test>

role to develop a cross cutting strategy rather than expecting each unit to act on their own and miss out on opportunities that affect the enterprise as a whole.

Business Intelligence / Analytics

Along with the challenge of “big data” and its storage, access and manipulation requirements, deriving some insight into what all of it means, with business intelligence (BI) and analytics, is one of the, if not, the hottest and biggest technology segments in recent memory. Most recently, there has been an investment into services from Tableau, which offers data analysis and visualization tools that can ingest sources from multiple sources and in multiple formats. The flexibility of such software, since individuals gain insight from data visualizations differently, allow developers and end users to speak about the same data, but gaining context through differing presentations^u. Tools such as this allow organizations to get away from the older premise of “one dashboard to rule them all” and present the data that backs these visualizations as something that can be poked and prodded dynamically to see if there’s something useful in those data sets if they just looked at it from a different angle or method. This still supports the concepts of a data driven decision-making process, but removes the constraints of limited display options.

Sadly, most often BI tools are also constrained by the misconception that they are only valuable as a reporting mechanism, but their ability as a data exploration tool still remains on the fringe for traditional users. As noted above, the flexibility of tools such as Tableau, allow for insights to be gained by matching up various data sources and seeing how their modeling affects perceived outcomes. For instance, knowing that running a certain process 24x7 consistently costs a certain amount, but if combined with data sets on actual use, and maybe information regarding climate/weather or even certain economic data, an actual data-backed decision can be developed to support altering that process in order to conserve power or reduce costs of operations, whereas the previous one was developed based on intuition or “that’s just how it is” thinking.

There are also plenty of offerings by vendors that are trying to address BI and analytics from a specific business vertical, such as IBM’s recent announcement for their analytics branch which takes the knowledge gained from thousands of cross-industry engagements into the product offering^v. This differs from other tools, from which the solution can be modified and reworked to present custom views and leverage data from non-traditional sources within an organization. Each

^u

<https://www.forrester.com/TechRadar+Business+Intelligence+Q1+2015/fulltext/-/E-RES117714>

^v <http://www.computerworld.com/article/2927850/data-analytics/ibm-pitches-analysis-software-for-select-industry-verticals.html>

methodology has merit and will be up to the organization to determine which works best in their situation.

Security

Data Breaches

Over the past 12 to 18 months, there's been an uptick in publically disclosed large data breaches among companies^w, organizations and governments. Most of this has centered on PII and account information garnered from web-based application vulnerabilities or long-term network infiltrations that resulted in large caches of data being "dumped". While many have moved from retail (commercial) focus to healthcare (Anthem, CareFirst, Community Health Services, Primera) in the last few months, the questions exist as to the motivation of these breaches and the relative usefulness of the data by criminals who've obtained the data^x. Protecting this data may not revolve around strictly technical failures, those of which technology is the lone issue, but also involves proper classification and handling such data within the systems that this data is contained within. Addressing policy and culture issues within organizations, and how they and their employees treat data that they are entrusted with handling, is the next forefront in the battle to keep such breaches from becoming more commonplace.

Software Vulnerabilities

If one culprit can be identified as a major contributor to the afore mentioned data breaches, along with poor configuration management, lax data protection, and weak access controls, it would be the overall issues with software flaws and their role in lapses in organization information security. However, software vulnerability management is a complex issue that requires a top-down and bottom-up examination of development practices, tool selection and overall application implementation schemes. Most organizations are realizing that governance is a small step into developing and managing best practices for the selection, use and development of software applications to be used internally and other serving customers directly.

Many organizations are moving rapidly to shore up support for this area of information security by having a team of specialists that consult of secure coding practices and do security checks of major applications. This is also bolstered by software governance working groups and practices for COTS, open source (OSS), and internally developed applications, ensuring, going forward, that best practices are used before an application is placed live. This moves the organization and the

^w <http://www.informationisbeautiful.net/visualizations/worlds-biggest-data-breaches-hacks/>

^x <http://www.eweek.com/security/cost-of-a-data-breach-continues-to-rise.html>

practice towards a greater level of program maturity, and eventually helps reduce costs and other resource expenditures, but the efforts need to be universal and consistent. Some of the challenges in this space still exist for large applications such as Oracle and SAP that are too complex to be effectively addressed with one tool or process^y. Add cloud-based applications and services into the mix, and this becomes even more complex and potentially difficult, as remediation of issues now has to be coordinated with a third party, and with shared services and a common flaw, coordinated with other customers to which most organizations have no direct relationship with.

IoT

The United Nations' International Telephony Union (ITU) has entered the fray of IoT standardization efforts through the new study group recently formed^z. It's expected that even the ITU will have issues with this challenge given that the IoT space is defined by the lack of standards and inter-compatibility. Both Google and Apple have placed their flags in the sand with Brillo and HomeKit respectively, but it will be up to, not only the developers, but also third party device makers, to decide to leverage these SDK and APIs. Without these frameworks, much of what makes IoT a palpable future remains unsettled, and risk that such an enabling technology relegated to novelty status before it even starts.

The driving mantra behind IoT is "the connected world" and to ensure that it's more than a set of buzzword or sloganeering, if an IoT deployment or use case is developed, there needs to be an end application that should be able to make use of it. For example, if you are going to use IoT-enabled device around a home or business, they should be placed there with a thought of what data they are gathering or items they are controlling, and will it enhance and enrich the user's interaction and experience^{aa}. Some organizations are very well versed in answering these questions, but our partners and other organizations are not, and trying to ensure the work they may undertake may need some remedial interactions to ensure that the end-to-end use of this technology is seamless and complete.

IoT Economy & Market

Within the past few months, there has been some major announcements in the core support of IoT development, with Samsung announcing its Artik platform for IoT

^y <http://www.networkworld.com/article/2922730/security0/top-security-tools-in-the-fight-against-cybercrime.html>

^z

http://www.theregister.co.uk/2015/06/17/united_nations_enters_internet_of_things_standard_wars/

^{aa}

<https://www.forrester.com/Inquiry+Spotlight+Five+Ways+To+Energize+Your+Business+With+The+Internet+Of+Things/fulltext/-/E-RES113863>

hardware and development, and Google charging ahead along with Apple by releasing Brillo at Google I/O in May^{bb} and Apple announcing HomeKit^{cc} last year, but gaining a debut foothold upon the release of the Apple Watch and run up to the WWDC in June. Much in the same way that accessory makers flocked to each of these mobile/smartphone platforms with accessories and “works with” support, having these core technology leaders formally give shape to their own plans in the IoT field provides the impetus for these ancillary partners to officially develop and support these efforts^{dd}. This will push beyond the arrested “works with NEST” moniker and will be egging developers to support these platforms in earnest if they have hopes of wider consumer adoption beyond the consideration of a novelty. Both IBM and Intel are also investing significant resources into this space, but gained a little less fanfare upon their product announcements.

The market for IoT has started to push towards lower cost solutions to consumers and unifying management platforms^{ee}. The novelty still exists within the market, with mainly consumers who have the means (and patience) willing to become involved in being the earlier adopters. Some notable high-profile failures have also married the perception of the maturity of the technology (NEST), however major technology players are or have invested heavily into the space in order to acquire mindshare among developers and eventually control the market (Apple’s HomeKit and Google’s Brillo).

One of the first steps from adjusting from novelty to practical use, in a similar fashion of moving from incandescent light bulbs to fluorescents and then into LEDs, were the backing of companies that have a considerable reach to consumers. Home Depot and WalMart became the largest distributors of inexpensive CF bulbs in the country and then the world, and now IKEA^{ff} and Lowes^{gg} have moved significantly into the IoT/Smart Home space potentially acquiring those banners in this space.

IoT Security & Privacy

Much like the wearable space, and the expected connectivity between these two technologies, the greatest challenge, also indicated above is management. This will, again, like the case for wearables, hinge on a management framework, policy and strategy if the intent is to deploy them in an enterprise environment. The market is still in a nascent phase such that there are no clear leaders developing management

^{bb} <https://developers.google.com/brillo/>

^{cc} <https://developer.apple.com/homekit/>

^{dd} <https://www.cbinsights.com/blog/internet-of-things-periodic-table/>

^{ee} <http://www.zdnet.com/article/internet-of-things-why-your-home-is-a-connected-device-tower-of-babel/>

^{ff} <http://www.digitaltrends.com/home/ikea-wants-your-light-bulbs-to-help-you-control-your-smart-home/>

^{gg} <http://www.zdnet.com/article/ces-2015-lowes-smart-connected-home-improvement/>

platforms that work across a large variety of devices as well as functions – and in most cases are split distinctly through home/consumer use (home automation) and industrial and enterprise use (SCADA/ICS)^{hh}. Beyond those initial challenges, much as it was during the initial stages of the mobile revolution, developing, acquiring and maintaining skills within an organization that understands and knows how to use IoT effectively will be another challenge.

With the eventuality of everything being “connected”, leaves some concern for the security of these devices and the systems that are meant to not only harvest information from them, but also control them. As we’ve seen in the rush for the “great new thing” and the pressures of time to market for investors and leadership, often the same thing that often gets laid by the roadside with even more mature technologies, is kicked to the curb even faster in these situations, that of which, is security. One of those selling points of IoT, the simplicity and lack of complexity, since much of the technology is sold as purpose-built, single function action, is often suffering from the belief that nobody has an interest in harvesting the “smart light switch” but possibly not realizing that take control of a number of these control surfaces, you can wreak havoc in the operational environment. This will require security minded-thinking from the hardware-level on up to the software and management components.

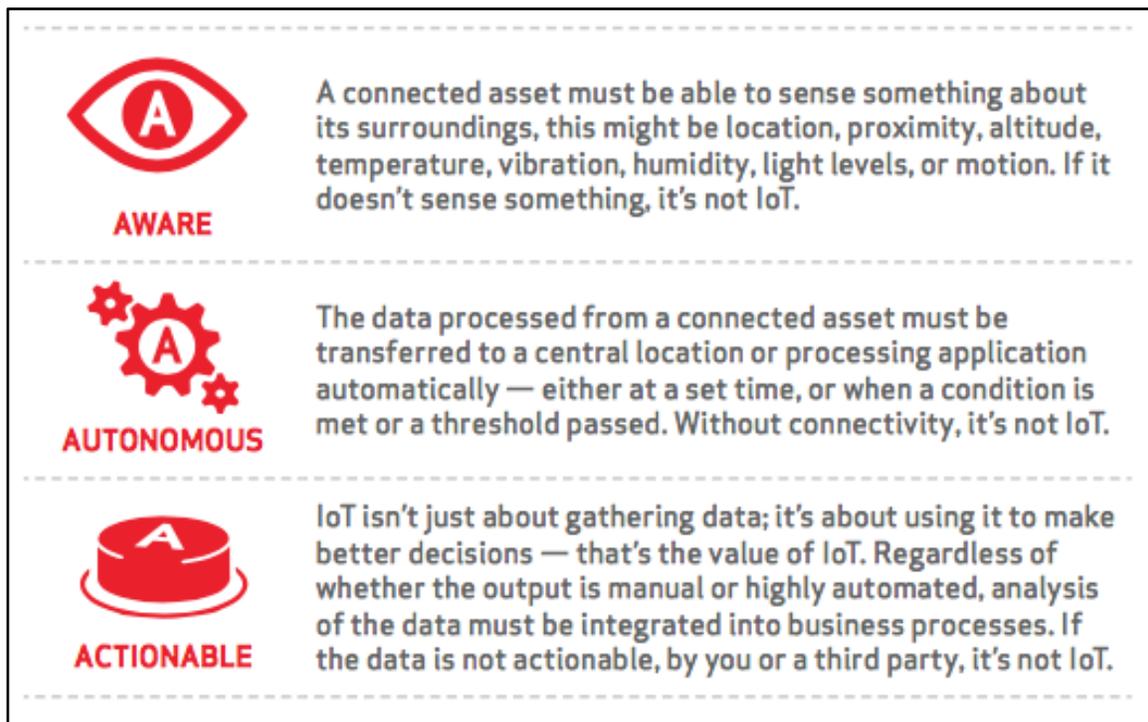


Figure 2 - Verizon's "Three As" for Defining IoT

^{hh} <http://bits.blogs.nytimes.com/2015/05/26/security-researchers-start-effort-to-protect-smart-cities/>

Add into the mix that many of these will not be managed via an on-premises solution, but rather a cloud-enabled service, and the security concerns increase, since another platform is now part of the machine-to-machine (M2M) architectureⁱⁱ. Verizon suggests that security needs to be built in from the start, the device, cloud service and transport and other associated services and methods. This requires coordination during the development process, but also an understanding by those implementing as a consumer solution, that privacy of the data and securing those control and communication channels will be a major concern of the operator. Most of these sensors will operate in a “home” which many intend to be a personal refuge and free of unwanted intrusions and threats, including leveraging passive data, even in aggregate, for potential marketing or other purposes, instead of say social networking, wearables and other consumed on-line services.

Entertainment

Gaming

At this year’s E3 Expo in Los Angeles, much like a good portion of CES earlier this year, the air was buzzing with virtual reality gaming and entertainment. In between CES and E3, the darling of the VR space, Oculus, finally announced their release date of the Rift VR headset. One could see that at CES, the VR headset space was becoming cluttered with competitors and upstarts, and finally releasing the long awaited device was necessary^{jj}. It is one thing to release a device, the next challenge has been ensuring that compelling content exist for the platform and technology at large. However, having current games support a non-commercial device with fungible release dates is disingenuous for consumers, as lifecycles of individual games drop off from playtime very quickly, unless supported by a franchise that integrates development and technologies from previous versions^{kk}. As seen with numerous research analysis and general sales figures, hardware platforms in themselves suffer from similar drop-off in installed base and use^{ll} if not supported by a good game pipeline^{mm}. This will be a challenge for individual VR units, as none of them, short of Microsoft’s VR/AR HoloLens project, is supported directly by a

ⁱⁱ http://www.verizonenterprise.com/resources/reports/rp_state-of-market-the-market-the-internet-of-things-2015_en_xg.pdf

^{jj} <http://venturebeat.com/2015/05/27/our-virtual-and-augmented-future-a-deep-look-at-the-next-generation-of-interactivity/>

^{kk} <http://www.tsanalysis.com/2011/05/the-video-game-hype-cycle/>

^{ll} <http://www.digitaltrends.com/gaming/is-the-console-war-already-won-playstation-4-to-outsell-the-xbox-one-by-40-by-2019/>

^{mm}

http://www.gamasutra.com/view/news/231661/When_big_games_launch_badly_Breaking_the_vicious_cycle.php

console manufacturerⁿⁿ. Plus with the development of tools such as Google Cardboard, in which everyday smartphones can be turned into reasonable VR devices, pushing for the über-headset unit may only appeal to a limited amount of consumers and risk losing others who have other imperfect options^{oo}.

With some entertainment companies that are developing immersive gaming environments as a publisher, it will be vitally important to consider the risks of wedding investments to a new technology that is far from solid, at the potential loss of being in the initial hype wave once it is in the market. The slight advantage for a company such as Disney, Sony, and others, is that other business units that have media expertise can and should be leveraged from “lessons learned” to support decisions regarding potential adoption and development investment. In these cases, as it was seen for home video, creating “3D-only” releases versus bundling them with a regular version as a package (similar to DVD and BluRay release sets) had less returns as 3D came to consumer sentiment as a gimmick which involved investment in relatively expensive new technology and few compelling applications to justify a purchase. In some cases, it was just bad timing, since the arrival of 3D technology^{pp}, much like the slipping timeline of VR hardware, is arriving shortly after a compelling technology advancement that consumers already upgraded to, in this case a 4K and possibly now, 8K TV.

The next compelling entry into entertainment is streaming games. While not an entirely new concept, and already seen in how Netflix decimated DVD rental through streaming video, consumption of TV shows and movies differs from the interactivity needed to make games “go”. Sony has been using the PlayStation Now streaming service for just over a year and has had some moderate success as competitors have died off, and also began licensing the technology to TV manufacturers, as demonstrated at CES this year, to bring gaming to consumers without the investment in a console system. Sony’s competitor in the space, the game rental (disc) company GameFly, struck a deal with Amazon to deliver their library of games through the FireTV set top box. GameFly has a wider variety of titles^{qq} to Sony’s current lineup of mainly PS3 titles, and that provides one leg up, and due to the “any HDTV” nature of the Amazon Fire TV box, much more in the way of compatible hardware and display options. This will definitely be an area to watch as companies attempt to monetize their libraries for longer periods of time and attempt to sustain consistent revenue via a subscription model. This is not unlike the subscription model currently used by console manufacturers to access on-line services for those devices, just now extended to renting, versus owning, video games. This potentially has a benefit for publishers, as patches and bug fixes, as well as added content tends to be a difficult undertaking at times, and sometimes

ⁿⁿ <http://www.rockpapershotgun.com/2015/06/17/editorial-why-vr-is-going-to-be-an-enormous-flop/>

^{oo} https://en.wikipedia.org/wiki/Nirvana_fallacy

^{pp} <http://betanews.com/2014/04/07/why-3d-tv-is-failing-in-the-home/>

^{qq} <https://www.gamefly.com/#!/support/search/streaming>

backfires, resulting in poor PR and customer dissatisfaction. Centralizing this via a streaming model could make this a lot easier and result in fewer mishaps, and potentially reduce costs in the long run.

Transportation

Senior Apple executive, Jeff Williams, recently teased that automobiles are the next (and ultimate) mobile platform, signaling that there may be a significant push to get iOS and other Apple technologies as integral parts of vehicles in the near future. While Apple has CarPlay and Google has Android Auto available for entertainment and telematics systems for vehicles now, none of them are tightly integrated into the automobile's data system. Each have been plagued by slow adoption and roll out to production automobiles, while many automobile companies still rely on legacy or in-house developed solutions^{rr}, like Ford's adoption of QNX for the next generation of My Ford Touch (SYNC v3) and Subaru's disastrous entry^{ss} for their 2015 and beyond model lineup. However, manufacturers such as Tesla, while going alone, consider the car as one big computer, from which patches and updates^{tt} are downloaded and applied to constantly tweak and enhance the vehicle (albeit, while not in motion).



Figure 3 - GfK's 'What Innovations Should Car Manufacturers Be Focusing On?'^{uu}

^{rr} <http://www.theverge.com/2014/11/19/7243621/android-auto-is-great-automakers-are-holding-it-back>

^{ss} <http://www.theverge.com/2015/2/5/7982525/in-car-navigation-systems-are-terrible>

^{tt} <http://www.teslamotors.com/support/software-updates>

^{uu} <http://blog.gfk.com/2015/06/what-innovations-should-car-manufacturers-be-focusing-on/>

Along with telematics and entertainment, the concepts of autonomous driving vehicles are still on the lips of most individual with an interest in this space. As explained by presenters at CES this past January, the companies where much of this automated driving technology originates from (in either actual integration or development) exit in countries with long histories with driving (Germany and the UK), but those drivers rapidly reject it^{vv}. It's seen that the United States is more forgiving and accepting of these technologies to potentially increase safety and decrease traffic, but also potentially the monotony of travelling long distances, which while not wholly unique to the US, still is a major part of our driving^{ww}. Google recently released their safety reports^{xx} from their autonomous driving testing^{yy} as well as finally unleashing the full-on autonomous vehicle on open roads^{zz}. Even Daimler Trucks, a division of Mercedes-Benz, launched their own autonomous "big rig" in Las Vegas this spring, essentially putting bookends on the vehicle types that can benefit from this technology^{aaa}.

The consistent consumer market push for most manufacturers has been the manufacture and sale of hybrid and fully electric vehicles (EV), with a number of manufacturers offering variations of their model lineup in flexible options (gas, hybrid, electric). While hybrid electric cars have existed in the US since 1999, the uptick in sales began in 2005 and even further increases in 2012 as more automakers began offering more models and options within their fleets^{bbb}. Plug-in electric vehicles only reached mass-market penetration in 2011/12 model years, but still lag in overall market sales due to the high expense of ownership, even with rebates and subsidies^{cccddd}. Some foreign automakers, such as Volkswagen, BMW and others have tended to put their most advanced technology into those vehicles, such as self-park, collision avoidance, and other safety and convenience options as a potential value-add beyond a zero-emission footprint of ownership. As denoted in the chart above from GFK, this plays well into consumer's desires for automobiles, regardless of their powertrain, and potentially such a marketing tactic will increase the penetration of these powertrain options higher into overall sales percentages.

^{vv} <http://blog.gfk.com/2015/06/british-drivers-give-muted-response-to-the-connected-car/>

^{ww} <http://blog.gfk.com/2015/01/safety-first-the-road-to-self-drive/>

^{xx} <http://googleblog.blogspot.com/2015/05/self-driving-vehicle-prototypes-on-road.html>

^{yy} <http://qz.com/402732/googles-driverless-cars-have-been-involved-in-three-car-accidents/>

^{zz} <http://www.google.com/selfdrivingcar/>

^{aaa} <http://www.wired.com/2015/05/worlds-first-self-driving-semi-truck-hits-road/>

^{bbb} https://en.wikipedia.org/wiki/Hybrid_electric_vehicles_in_the_United_States

^{ccc} https://en.wikipedia.org/wiki/Plug-in_electric_vehicles_in_the_United_States

^{ddd} <http://www.plugincars.com/cars>

Communications

Much has been said regarding the media and communications mergers and acquisitions in recent years. However, with the public's new awareness of "net neutrality", the ones most present in their minds are the activities of many of the communication transport companies. Whether it be the Direct TV and AT&T merger or the Time Warner Cable saga with Comcast and now Charter, the landscape is becoming more condensed, and the options for consumers becoming less^{eee}. This, in itself, brings about many potential wins and losses for the consumer, many of which rest on the opportunity of choice and cost. While the recent NBCUniversal and Comcast merger was less about a delivery mechanism for NBCUniversal, but all about Comcast acquiring a media/content creator for its distribution network, potentially creating a value add for consumers in which Comcast has some actual competition from the top tier of AT&T, Cox, Verizon and other regional providers.

This consolidation has benefits for the consumer and content providers, however, in such a way that the combined resources will provide a less confusing path for acquiring and distributing content, even if the prices may not remain as low as they are now. One of the biggest challenges for content developers has been distribution, whether it ranges from the last mile (cable, fiber, wireless, OTA, etc.) to getting those products into the curated distribution chains through on-demand services such as Hulu, Netflix, iTunes and others, reducing the amount of complex contractual and regional restrictions naturally will occur^{fff}. Conversely, for consumers, in which there had been distribution restrictions due to regional contracts, such as live broadcast of sports teams, those may disappear due to consolidation. In cases where content providers find that the benefit of bundling their packages for satellite or cable TV providers in the form of packages, going direct to the consumer, such as the recent launch of Sling, potentially negates the power that these consolidated providers would have by restricting distribution deals. It is yet too soon to determine whether this new model for live TV is effective in attracting consumers and lowering prices or even decoupling services from bundles on cable systems.

There are still cases where there are poor to no distribution channels for digital media, both here domestically and abroad, up to 4 billion out of 7.4 billion on Earth^{ggg}. Some effort has been placed into addressing these shortcomings, some by individual organizations, others by municipalizes and governments, and in some cases, those network companies themselves, each with their own reasoning and goals to get to every potential person or household. One of the more "blue sky"

^{eee} <https://www.ncta.com/industry-data>

^{fff} <http://www.sfgate.com/business/technology/article/As-TV-goes-online-Suddenlink-latest-to-hook-up-6289452.php>

^{ggg} <http://www.computerworld.com/article/2926716/networking-hardware/more-than-4b-people-still-have-no-internet-access.html>

projects originates out of Google, called Project Loon^{hhh}, which uses a series of autonomous balloons to form a meshed communications network over areas that can't or aren't typically served by network providers. In other techniques, leveraging a more flexible mobile/cellular network for high-speed communications has seen successful in areas that have reasonable backbones, but lack sustainable "last mile" infrastructure to support the populationⁱⁱⁱ, especially those that do not have geographic formations that degrade signal dispersal^{jjj}. In many cases, even the cellular communications are out of reach for consumers, not necessarily due to infrastructure constraints, but costs associated just to maintain a subscription, in some cases 20% of a person's salary in Africa. Not being on-line and connected rapidly relegates areas of the globe to higher rates of illiteracy, social and economic equality, and general ability to actively participate in their society^{kkklll}. The lack of these relatively basic tools for the 21st century create a wider gap between societal advancement than at any time previous to this due to the rapid pace of technology and it's uptake in more developed areas. Ensuring a supportable distribution and communication network not only can benefit content developers like Sony, Disney, Warner Brothers and others, but also create better and smarter consumers and lift communities and individuals up by providing access to education, the basic building block of any society, which leads to expanded career opportunities and maturity of culture^{mmm}.

The other societal impacts of getting a sustainable communications infrastructure in place include supporting basic life and safety activities, including but not wholly subsuming that category is health care and services. As demonstrated with the Ebola crisis, one of the greatest challenges was communication networks and training, along with other issues such as transportation and coordination of supplies and medical expertiseⁿⁿⁿ. While most network providers and operators see establishing these capabilities as a way to develop a revenue stream, ensuring that these channels are there and sustainable helps ensure that that customer is alive to keep paying for that service after such events as the Ebola outbreak. Potential cobranding or sponsoring development efforts is one way to bring these universal communication needs to the population that needs them, and when not in crisis, can still be leveraged to deliver content by those partners^{ooo}. Essentially, maintenance

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iii <http://www.networkworld.com/article/2921580/wireless/internet-over-voice-a-solution-for-developing-countries.html>

jjj <http://opensignal.com>

kkk <http://www.nyu.edu/classes/keefer/waoe/amins.pdf>

lll

http://www.mckinsey.com/~media/McKinsey/dotcom/client_service/High%20Tech/PDFs/Offline_and_falling_behind_Barriers_to_Internet_adoption.pdf

mmm <https://books.google.com/books?id=jMyeBQAAQBAJ&pg=PA137&lpg=PA137>

nnn <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6350a5.htm>

ooo <http://www.technologyreview.com/news/523736/around-the-world-net-neutrality-is-not-a-reality/>

and upkeep of these networks can be sponsored by ads or interstitials by such branding, and essentially subsidize operations and access while balancing brand awareness and access to content, something Facebook is leveraging through its Internet.org program^{PPP}.

^{PPP} <http://techcrunch.com/2015/06/01/how-to-make-the-internet-truly-free-in-developing-countries/>