csg

TOGETHER, YOU WIN.

PROFITING FROM THE INTERNET OF THINGS:

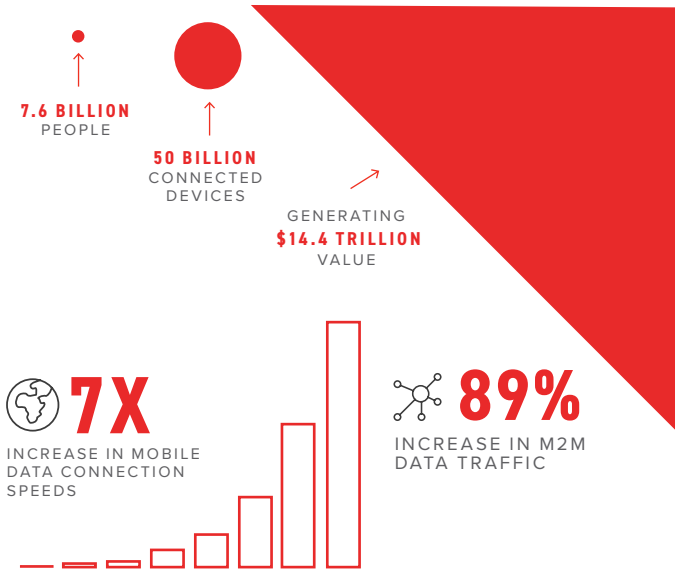
ABOVE AND BEYOND CONNECTIVITY

A WHITE PAPER

IT'S ALL CONNECTED

A utensil that can alert you to slow down between bites while you're eating; livestock that alerts the farmer when they begin birthing; a shirt that can record your heart rate and g-forces while you exercise: these are not examples from science fiction, but have already become reality in the burgeoning Internet of Things. Industry heavyweights like Cisco forecast that there will be far more connected things than people in the near future, predicting that 50 billion devices will be connected by 2017. And 50 billion is a staggering number when you consider that these forecasts are based upon counting only devices where the connectivity itself is central to the device's function.

When you add the reality of forks, livestock, shirts and other common, everyday items communicating without the need of human intervention, the actual number of things that are networked, generating data, being monitored and driving automated and manual responses could be orders of magnitude larger than 50 billion. After all, 50 billion equates to 7 connected devices for each human on the planet.



Source: Cicso NVI: Global Mobile Data Traffic Forecast Update 2012-2017

FIGURE 1 THE IMPACT OF M2M DEVICE CONNECTIONS SOURCE: CISCO VNI GLOBAL MOBILE DATA TRAFFIC 2012-2017

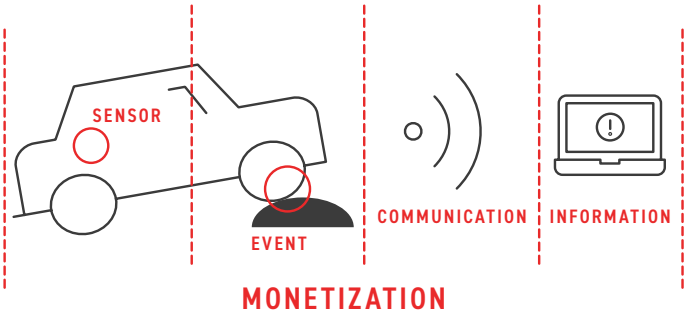
In developed markets today, it's not hard to imagine owning and using 7 or more connected devices; in fact, the typical household already has this number of connected things:

- My smart phone or tablet
- My internet-connected television
- My car with a monitoring and safety service
- My work computer or laptop
- My home's smart meter
- My personal activity or health monitor
- My e-reader

As connectivity becomes more regularly embedded in not only these personal devices but increasingly in everything from articles of clothing and home appliances, to health care monitors and even livestock, it seems possible that the 50 billion forecast may be off by orders of magnitude. The combination of machine-to-machine (M2M) connectivity for industrial use cases with the embedded connectedness of personal things results in an enormous amount of communications activity to be collected, monitored, managed and monetized. This creates a potent business opportunity – but for whom?

THE EVOLUTION OF CONNECTIVITY

The essence of the M2M world is machines communicating with each other without the need for human intervention. M2M is about sensors with transmit/receive capabilities embedded in anything—from tractors to refrigerators to sheep!—being cost-effectively monitored and managed, providing volumes of valuable data that can be analyzed and



acted upon to enable both efficiencies in current processes and the creation of new services across a variety of industry segment. Industrial applications of M2M are rapidly expanding and evolving. Telematics and security solutions—today's leading use cases for M2M solutions—provide a glimpse into this evolution. Beginning in the business realm, vehicle monitoring and communications for fleet management along with security systems for office buildings and large public spaces became, over time, 'consumerized' for broad personal use. Early consumer-focused telematics solutions, such as GM's OnStar, packaged voice minutes along with a few event-based services such as accident/emergency services and vehicle tracking options. Most automobiles being sold today in developed markets are connected right off the assembly line. More than 10 million such cars shipped in 2013, and many manufacturers, including General Motors, Honda, Mercedes, Kia, Volvo and Hyundai, committed to enabling greater integration with Apple devices in a hands-free and eyes-free manner.

This is just the tip of the iceberg. M2M device forecasts further predict that other industries will rapidly surpass today's leading telematics and security use cases. Technology availability and declining costs will enable other sectors to reap the benefits of real-time data collection to optimize and enhance business performance and operations through the remote monitoring/control of assets, personnel and facilities.

By embedding SIM cards, Bluetooth, or WiFi transmit and receive capabilities in almost anything, the things that can and will become connected are limitless. The world already has, or will very soon, become familiar with connected livestock, oysters, forks, ice cubes, jet engines, clothing, beer taps and even bloodstreams.

In addition to device manufacturers who are embedding connectivity in more and more things, there are a host of other players building the ecosystem to create the emerging Internet of Things. Platform providers are establishing and expanding solutions for specific industries that target the activation, monitoring and management of specialized connected devices. Such use case-specific platforms will enable and drive the forecasted expansion for M2M, but ultimately will fall short in delivering convergent scenarios across use cases and into the broadest collection of Things.

Application developers, having proven themselves the fastest moving players in the evolving communications value chain, are leaping to the forefront, finding ways for individuals and industries to make sense of the flood of data available in their connected world. Finally, as more and more devices, applications, and platforms evolve and expand the use of M2M, there will be a growing opportunity for aggregators to bring together services, data, and insights to add value to the individual, the business and industries.

THE EVOLUTION OF CONNECTIVITY

- **Livestock:** Equipping livestock with monitors has advanced well beyond tracking their location and identity. Herds in Europe are being equipped with sensors that alert the farmer when waters break and births begin.
- **Oysters:** Is this fish fresh? Oyster beds in Tasmania monitor the invertebrates' heartbeats and the rainfall level to detect the onset of potentially dangerous environmental conditions and determine the ideal time to harvest.
- **Forks:** Sometimes it's hard to resist that second piece of pie. But utensils like the HapiFork can be embedded with sensors to determine when the user has consumed his caloric limit.
- **Ice Cubes:** Friends don't let friends drink and drive, and neither do these artificial ice cubes. They monitor alcohol consumption and can send a text message to a friend when the drinker has had one too many.
- **Jet engines:** Rolls-Royce has equipped every jet engine it sells with monitors that transmit data to a central location so they can optimize maintenance schedules.
- **Clothing:** High-performance sports clothing, like Under Armour's E39, senses heart rate and g-forces and provides feedback to athletes to optimize their training.
- **Beer Taps:** In an office building in New York, a beer tap has been equipped with a sensor that measures each pour, tweets each drink, and alerts when the keg needs to be replaced, ensuring continued high employee morale.
- **Bloodstreams:** Dr. Andrew Topol, an eminent US cardiologist, envisions sensors the size of a grain of sand that will be injected into the bloodstream. These will monitor various conditions including arterial linings and will send messages to your mobile warning of the onset of a heart attack.

THE ROLE OF THE CSP: BEYOND CONNECTIVITY?

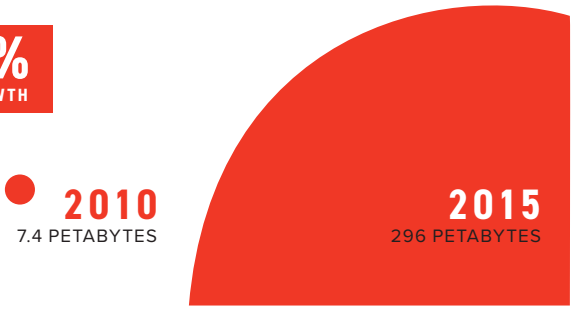
M2M and the Internet of Things are based upon a foundation of connectivity, so Communications Service Providers (CSPs) have played, and will continue to play, a key role in the evolution of M2M solutions across industries. CSPs are investing heavily in providing the most expansive, reliable and high-capacity connectivity for subscribers, machines and Things. This investment will ensure the continuation of the business model with which they are most familiar: adding connections, delivering the quality of connectivity required for a purpose, and monetizing the connection itself.

M2M opportunities frequently have spawned the creation of new CSP business units and specialty groups focusing primarily on those industries which have been at the forefront of M2M use case deployments: telematics, utilities, health care, and security to name a few. For the CSP, the return on investment and new revenue streams from expanding connectivity services use cases are a welcome respite from the reality of competitive pressures and declining revenue in their traditional consumer voice and data segment.

SURVEILLANCE VIDEO, HEALTHCARE AND TELEMATICS DRIVE TRAFFIC VOLUMES

40-FOLD OVERALL

100%
ANNUAL GROWTH



Source: Cicso NVI: Global Mobile Data Traffic Forecast Update 2012-2017

This is especially true as most CSPs are still smarting from the rise of the Over-the-Top (OTT) content and services players over the past few years; undoubtedly wondering if they've completely missed the opportunity to strike profitable partnerships with content owners, optimize their go-to-market processes, and become a leader in the delivery of the digital content and services that consumers demand. As M2M and the Internet of Things rapidly evolve, CSPs face the specter of yet another wave of application developers, aggregators, device manufacturers, and other competitors looking to cash in on another sizeable digital opportunity. The question will be whether they can take the lessons learned from their experience with OTT, entering the fray with a more open and savvy perspective-ready to capitalize on this opportunity to enable and monetize this world of Things.

Trying to learn from their OTT experiences, telco leaders have recognized the consumerization of M2M connectivity, and are focusing on the provision of these consumer Internet of Things use cases. Deutsche Telekom, AT&T and SingTel are but three examples of global CSPs focusing on the digital life of consumers. Increasingly, some leading CSPs have taken it a step further and begun investing in platforms that enable and manage the M2M ecosystem for businesses and industry to embed connectivity into their own services. Verizon's acquisition of nPhase and Hughes Telematics are examples of this approach.

85% THINK M2M IS PART OF THE NATURAL EVOLUTION OF THE CONSUMERIZATION OF IT.

SOURCE: HARRIS INTERACTIVE MULTINATIONAL IT DECISION MAKERS STUDY 2013

CSPS FACE AN EVOLUTIONARY IMPERATIVE: ADAPT YOUR OSS/BSS TO MEET THE NEW ENVIRONMENTAL REALITIES OF THE INTERNET OF THINGS AND JUMP TO THE TOP OF THE M2M FOOD CHAIN.

Using their unique position in the market, CSPs undoubtedly can take an even more expansive approach. While network connectivity enables M2M, the network is hardly the CSP's sole asset in developing a strong M2M business strategy. CSPs have significant experience:

- Connecting disparate devices and networks
- Aggregating high volumes of transaction data
- Extracting valuable information
- Enabling interconnection of a wide variety of applications

And CSPs today own perhaps the most valuable asset of all: a broad subscriber base of individuals and corporations that trust them to manage their connections, personal data and transaction details. CSPs have an unprecedented opportunity to use their skills and systems to foster entire M2M ecosystems nourished by the information they can extract and broker from their advanced networks and subscribers.

OSS/BSS - A LEAP FORWARD

The good news for CSPs is that connectivity is the foundation of any M2M or Internet of Things business opportunity. The bad news is that 92% of CSP executives in an Accenture survey stated their billing systems were at least somewhat of a constraint to the launch of new products and services. Service providers have bred their OSS and BSS systems to collect network data, validate it, distribute it to other applications for billing, customer care, product and order management, and correlate it to determine operational metrics—just the beginnings of working with Big Data. However, the high volume and variety of data, the complexity and number of partner relationships, real-time requirements, and information security required by the Internet of Things will amplify the loads on legacy OSS/BSS systems. It seems an evolutionary imperative for CSPs: adapt your OSS/BSS to meet the new environmental realities of the Internet of Things and jump to the top of the M2M food chain.

65% OF BUSINESSES THINK THE BIGGEST CHALLENGE IN M2M IS MANAGING AND ANALYZING RESULTING REAL-TIME DATA.

SOURCE: HARRIS INTERACTIVE MULTINATIONAL IT DECISION MAKERS STUDY 2013

THE BSS IMPACTS OF M2M INCLUDE:

- The ability to collect enormous volumes of data from numerous sources and in diverse formats, aggregate it and analyze it in real-time
- The requirement to accommodate the individual's or the business's security and privacy requirements—especially in those aggregate scenarios where information about the performance, use or location of a device is shared with an interested third party or observer, in which case compliance with not only regulatory requirements but customers' expectations about how their information is handled is paramount.
- The fundamental need to monetize the services that transmit, process, react and report on the data from devices and Things. Multiple players will participate in the value chain including the end user, device manufacturers, application providers, aggregators, platform providers and the CSP. The value for which each might pay will depend upon levels of service delivered, timeliness of use, and degree of insight derived from the monitoring and data collection.
- With the number of sensors and devices, and the discrete nature of each data record collected, charging will take place at the aggregate level or above. Assessing each data record collected to determine what is chargeable requires advanced data mediation capabilities.
- In an ecosystem with numerous third parties, some of whom are merely industry observers, the CSP needs partner management solutions with advanced revenue share and settlement capabilities.
- Each of the business processes above must be embedded with advanced analytics capabilities to deliver insight, not only into the performance and use of the devices and Things that are connected, but into the business processes themselves. Monitoring the business enables the CSP to optimize efficiencies in high-volume Big Data environments, develop a comprehensive understanding of the markets served, and accelerate the development and launch of new services based upon that data and those connected devices.

The OSS/BSS layer exists to poll devices, collect data, correlate it, and distribute it to a multitude of users and applications—CSPS can capitalize on it to add value and create a richer experience for customers as well as partners throughout the value chain. Beyond corporate strategy and investment in networks, partnerships and resources, the CSP's business processes must be tailored to address the high-volume, data-centric convergent nature of Internet of Things services.

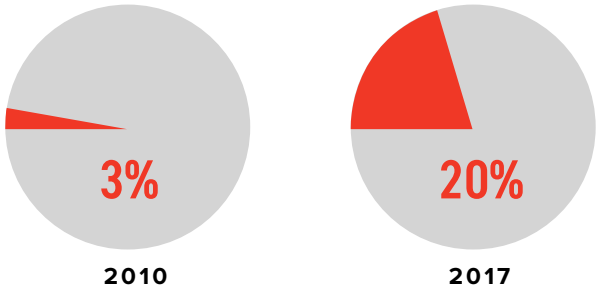
BEYOND CONNECTIVITY IN B2B

To maximize the efficiencies of M2M data in B2B scenarios, data ideally must be aggregated across multiple devices in multiple industry use cases. It is one thing to gather data directly from an electric car about its status and recent performance; but by aggregating information from the car—from the charging station and meter at the owner's home, and at various other transit points and stations where the driver travels and charges—the car owner's experience can be greatly enhanced via recommendations for driving behavior and optimization of energy costs and consumption.

And beyond the individual owner, the electric car industry can derive insights to plan for and evolve the expanding electric car network and the required supporting infrastructure for the betterment of our planet and our society.

Data aggregation—in this example, data from the connected electric car, from the home's meter and charging station, and from various points in the transit and charging network—requires convergent platforms and data collection and aggregation solutions that are not specific to a particular M2M use case. Data must be assembled that includes the vehicle's performance telematics data, the smart meter's consumption data from the home, and potentially the transit network's data of individual and collective and traffic patterns. The Internet of Things' platform must be able to handle and make sense of data from across the spectrum of use cases.

TELCO OPERATORS COUNTING ON GROWTH IN VALUE-ADDED REVENUE



THE CONSUMER'S CONNECTIVITY

For the consumer's Internet of Things, the individual user ultimately desires an aggregated view of his world: across his residence, his utilities, his health care, his car and other transportation modes, and his entertainment patterns and preferences. Insight into his usage, his spending, and his interactions with his network of friends and colleagues, as well as with society as a whole, can be used to guide his next actions. But like the B2B scenario before, this aggregated view requires the convergence of data streams from multiple connectivity use cases. And in both the B2B and consumer connectivity scenarios, the convergence of data adds value not only to the business but to the industry as whole.

THE INTERNET OF THINGS' PLATFORM MUST BE ABLE TO HANDLE AND MAKE SENSE OF DATA FROM ACROSS THE SPECTRUM OF USE CASES.

RECOMMENDATIONS

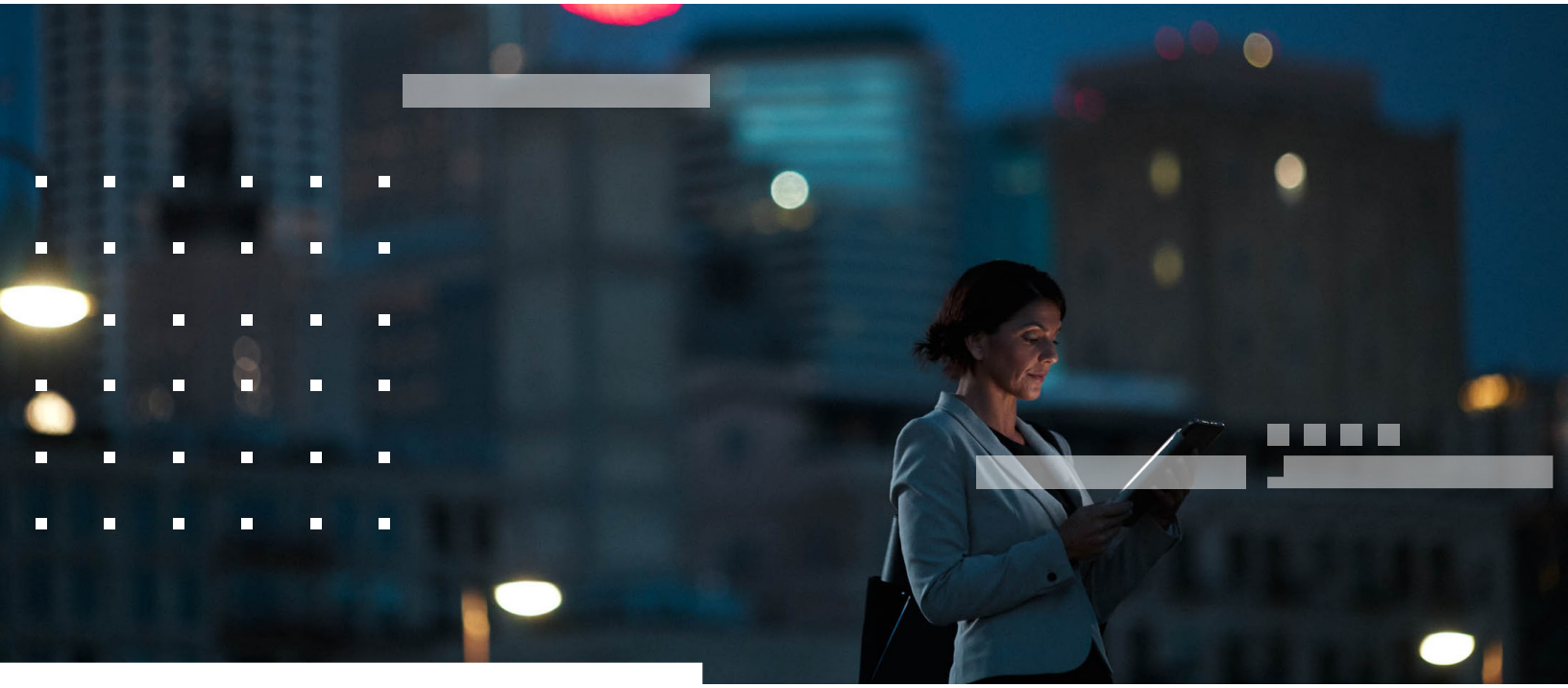
A global network of connected people and connected things has the potential to dramatically change society: it will change how business is conducted, how businesses interact with their customers, and how people interact with each other and with all of the Things in their environment and in the world. Data is just the content of the messages that a device or a Thing transmits and receives that reflect its status, its location and its performance. Information is the aggregation of that data to reflect the collection patterns of Things and their users. Knowledge is the understanding of that information, and predicting what will improve the quality, utility and value that the user, whether for personal or business purposes, derives from those Things.

The CSP who develops an Internet of Things ecosystem to manage the data and deliver convergent insights and services above the connectivity to devices will be at the forefront of delivering enhanced value and in progressing knowledge in tomorrow's connected society.

CONCLUSION

Bill Gates once spoke about having a unique IP address for each button on his shirt. And while not unimaginable in today's world, the world of connected shirt buttons (and more) is beyond M2M and the Internet of Things—it makes the leap to the Internet of Everything. The Internet of Everything is when every item is embedded with connectivity and, more importantly, the utility of connectivity, allowing individuals and businesses to connect to everything, and track what they own and operate for a benefit. And when the world reaches the state where not only everyone but everything can be connected and interacted with on-demand, the world will be equipped for another dimension of social change. When penetration rates for mobile telephones reached 100%, the world was ready for, and embraced, social networks and making content transportable. When penetration rates for connecting everything approaches 100%, why wouldn't we expect a similar social revolution? Now is the time to lay the groundwork for the future of Everything.

THE CSP WHO DEVELOPS AN INTERNET OF THINGS ECOSYSTEM TO MANAGE THE DATA AND DELIVER CONVERGENT INSIGHTS AND SERVICES BEYOND DEVICE CONNECTIVITY WILL BE AT THE FOREFRONT.



ABOUT CSG

CSG simplifies the complexity of business transformation in the digital age for the most respected communications, media and entertainment service providers worldwide. With over 35 years of experience, CSG delivers revenue management, customer experience and digital monetization solutions for every stage of the customer lifecycle. The company is the trusted partner driving digital transformation for leading global brands, including Arrow, AT&T, Bharti Airtel, Charter Communications, Comcast, DISH, Eastlink, iFlix, MTN, TalkTalk, Telefonica, Telstra and Verizon.

At CSG, we have one vision: flexible, seamless, limitless communications, information and content services for everyone. For more information, visit our website at csgi.com and follow us on LinkedIn, Twitter and Facebook.