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INITIATING COVERAGE OF MERGERS AND ACQUISITIONS IN IoT

THE GOLD RUSH OF THE 21ST CENTURY

BACKGROUND

The IoT sector is beginning to feel like the frontier of the Wild West in the mid-nineteenth century. Yes, indeed, it was the Gold Rush where Americans, European hunters and trappers, and wealth seekers from around the world risked everything to chase their fortunes in California. Over approximately a five-year period, 250,000 miners found a total of $200 million in gold (worth tens of billions in today's dollars). However, the vast majority of miners arriving late to the party ended up exhausted and broke. As panning gave way to more sophisticated and expensive mining technologies, so did the individual miner to large gold companies. At that stage, success on the frontier was defined by the ability to create and defend a community, improve productivity and use of the land, development of new markets, and ultimately, the conquest of competitors. Like the Gold Rush of the 1800s, IoT has started small and gathered momentum, changing company strategy, technology and social norms along the way. The question in front of every IoT entrepreneur and investor now is: Where will you fit into the spectrum of success in this new era, the "Gold Rush of the 21st Century?"

Over the past couple of years, Mirus has become increasingly involved with the rapidly developing IoT sector from a variety of perspectives (see our most recent report on Mergers and Acquisitions in Manufacturing Automation and recent blog articles on the topic), including advising multiple companies across a variety of application domains on their growth and M&A strategy, as well as recently completing an important sell-side transaction in the space (see Eutecus press release).

Gartner estimates that by 2020, there will be over 25 billion endpoint units connected to the internet, and BI Intelligence estimates that the software to drive these endpoints and related analytics is close to a $200 billion market today, projected to grow to approximately $600 billion by 2019, a 44% annual growth rate (yes, we would say this qualifies as a new Gold Rush). As a result of this rapid market growth, the widespread interest on our thoughts surrounding IoT, and frequent requests for more information, we have decided to broaden our regular editorial coverage to focus specifically on IoT.

With a wealth of data available today, it is our goal to provide followers with enlightening qualitative and quantitative analyses that will help readers to track IoT M&A activity and develop their own strategic buy- or sell-side growth plans. It is our intention to update the quantitative information surrounding the industry roughly every six months and supplement that with regular blog posts on topical items within the various industry sub-segments as needed. This report will cover global M&A in general (to provide context and a baseline), M&A in IoT specifically, sector analysis highlighting the major players ("Movers and Shakers"), and the most impactful trends shaping the industry and its stakeholders. Transaction data used in this report was obtained from Capital IQ.

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WHAT IS IoT?

Wikipedia has defined IoT as the network of physical devices (vehicles, buildings, wearable devices and other items) embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. Mirus broadens this definition slightly to include software, hardware and supporting services that enable connectivity and communication of physical devices, and the analysis and application of the resulting data, applied to help users (companies or people) improve their operational efficiency. While there are many ways to define and segment the market, for the purpose of this report and understanding the impact on M&A in a digestible manner we have segmented the market as follows:
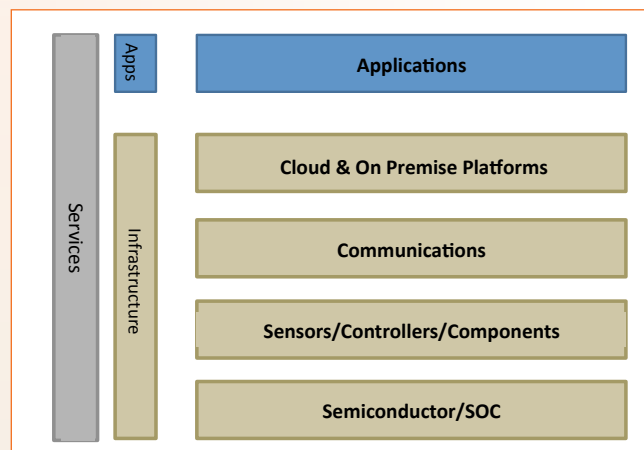

Exhibit I – IoT Market Segmentation

APPLICATION SOFTWARE AND SERVICES

1) **Applications:** End user applications providing a solution specific to a given domain.
   May include hardware, software, and/ or firmware, but is always tailored to solve a specific problem. End applications include Industrial/ Manufacturing/Smart Factory, Agriculture, Smart Grid, Smart City, Smart Home/Smart Metering, Smart Building, Smart Car/ADAS, Logistics/Fleet Management, Consumer Products/Wearable Devices, Retail, and MedTech/Healthcare domains.

2) **Services:** Development or system integration services specific to the IoT industry.

INFRASTRUCTURE PRODUCTS

1) **Cloud and On-Premise Platforms:** General purpose software capabilities used for device or API management, information management and/or analytics, or other related activities with features specific to IoT as opposed to general computing. These platforms are application agnostic and are most often used by others to develop domain-specific applications. Also includes non-application specific software development, security, and other complementary tools or components used to create or enhance the user experience.

2) **Communications:** Wireless, Wifi, RFID, Bluetooth and supporting hardware enabling IoT platforms and applications. This category does not include big cellular companies that may also be used for IoT, because it's not their primary intended use, nor do they do anything special to facilitate IoT.

3) **Sensors, Controllers and Components:** Typically, device-specific connectors that enable end products to be connected to the Internet. We specifically do not include routing hardware or general computing hardware that is used for general Internet or computing purposes, even if these also support IoT.

4) **Semiconductors/System on a Chip:** Companies with chip design and/or manufacturing capabilities specifically for IoT use. This does not include the giants like Intel (and others) that do a bit of everything, although these companies may be buyers of IoT focused brands.

DISCLAIMER: Before we go further, we should acknowledge that there has been some pollution of the IoT term by companies seeking to leverage this hot market trend by linking themselves to the term for marketing purposes, while not really impacting or focusing on the IoT business imperative. We have done our best to weed these out of the discussion in this report by reviewing what the companies really do. Despite our best efforts, some leakage is bound to occur. Nevertheless, we believe the statements contained herein are directionally correct based on the data reviewed, within some reasonable margin of error.

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INTRODUCTION TO M&A IN IoT

With this baseline in mind, Mirus is very excited about the opportunities for mergers and acquisitions in IoT. In fact, while M&A overall was on the decline in 2016, the number of transactions in IoT grew almost 20% (after a 25% gain from 2014 to 2015), with an order of magnitude increase in median valuations. Mirus believes these trends to be indicative of the maturation of the technology and increased competition for both product and domain expertise. IoT is no longer just a trendy buzz word, but a true technology trend unto itself, with plenty of room to grow.

At first glance, most sectors of IoT have grown or remained flat in transaction volume over the past 3 years, led by accelerated growth in the Applications and Platforms sectors. Recently there has been an emergence of single-source providers offering a range of products from sensors to analytics and associated services in an attempt to pull it all together and provide a comprehensive solution across a broad range of industries. Mirus believes that these "all-in-one" platform companies are filling a short-term gap in the market left bare by a shortfall in application delivery, as many applications are not quite market ready for mass implementation. At some point, Mirus believes these all-in-one shops will be replaced by commercial off-the-shelf solutions and there will be a steady state saturation of platforms in the industry, ultimately shifting IoT transaction volume to applications from platforms and other infrastructure. In support of this, we note that the application space has consistently been one of the most active of IoT M&A domains and 2016 was another great year with application transaction volume up 40% from 2015.

With IoT experiencing its own form of a Gold Rush, the market is crowded and fragmented and remains a challenge to decipher between marketing spin and solutions generating real value. However, the smaller entities (miners) are increasingly becoming overshadowed by the entrance of several large, global players (gold companies) bringing to bear their brands, customer bases and significant cash war chests. An increasing number of early entrants that have brought some organization and success to market have already been snatched up by these larger global players looking to leapfrog into technology leadership positions. Nevertheless, many of the larger players are saddled by the inertia that comes with Wall Street's quarterly expectations of their significant and long-standing franchises. Conversely, newer and more nimble pure play Internet companies are also pursuing the IoT space, unencumbered by legacy businesses, such as Uber in ADAS (advanced driver assistance systems). This dynamic will likely be played out over the next 3-5 years, but the land grab to capture big accounts (prime mining territory) is well underway. The rationale is simple; customer stickiness is enormous in IoT given the embedded nature of an IoT-enabled smart device, which is likely to coincide with a product's useful life in the field.

With this land grab increasing in velocity, coupled with a noisy, crowded and highly competitive vendor landscape, understanding the pace of industry maturation and the importance of selling into the steep part of the commercialization curve (borrowing from Gartner Group's Hype Cycle model) is paramount to realizing a successful investment. Generally speaking, as we've observed across numerous segments of technology, valuations decrease significantly if a company is sold on the downside of the curve heading into the trough. This was a lesson many individual miners learned the hard way. Showing up late to the "party" after larger players have consolidated their market position often means losing everything.

In order to survive the imminent industry shakeout, ALL industry participants will need to parlay increasing "time to market" pressures into value-added customer
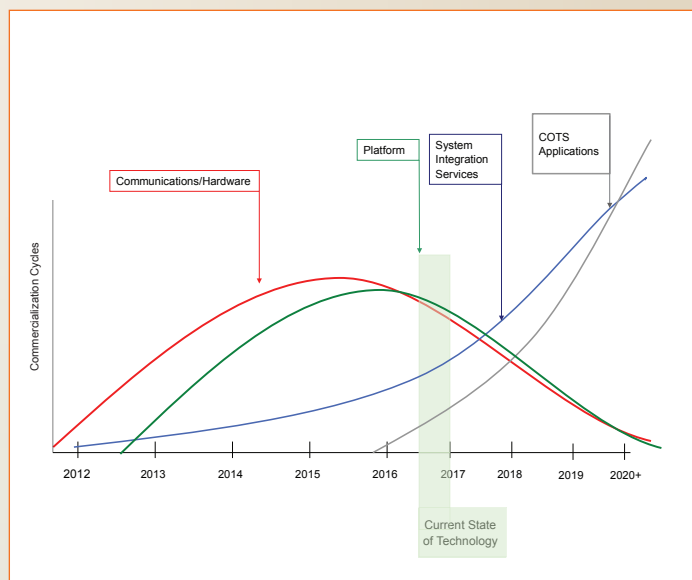

Exhibit II – IoT Industry Maturation by Segment

solutions either organically, or inorganically through partnership. To that end, the previous graphic charts where Mirus believes key industry segments are in their various maturation curves. We believe this series of curves to be directionally correct and should inform a stakeholder's strategic growth plans.

With the industry evolving rapidly, Mirus has had the pleasure of being involved with companies in a variety of IoT industries and technologies. This experience has given rise to a number of observations, predictions, and trends that we feel bear watching and may provide some insight into the market's direction, including:

- Ongoing industry maturation
- Increasingly strategic role for system integrators
- The race is on to develop the broadest and most compelling portfolio of use cases
- Low Power Wide Area Networks (LPWANs) and Narrow Band IoT will challenge traditional telecommunications companies for IoT business
- Security may be a short-term impediment to growth
- Advanced technologies that support security, mobility and simulation will provide needed differentiation
- Large global companies will buy their own connectivity
- Hopes of finding relevance in big data and improved operational outcomes are driving investment in artificial intelligence technologies

These trends and the details behind M&A in IoT will be discussed in detail later in this paper, but first, as a baseline for our analysis, let's take a look at the current state of M&A in general.

GLOBAL MERGERS AND ACQUISITIONS

For 2016, US technology sector transaction volume was a bit softer than in the last few years. At the same time, aggregate transaction size is up sharply from its 2009 low. In general, buyers are becoming harder to locate and, while we are seeing substantial valuations for the right company and technology (such as in the IoT sector), there are also fewer opportunities. Transaction value has also been driven by a few very large acquisitions as larger companies take this opportunity to consolidate and grab market share or enter new domains.
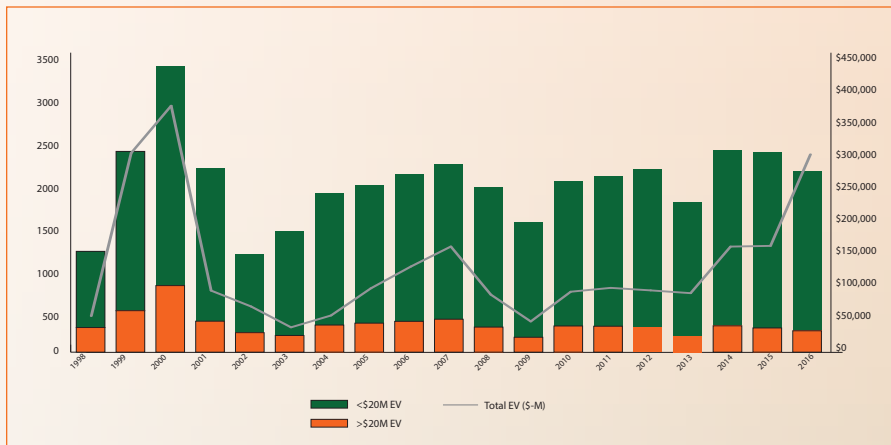
Despite sustained activity in technology, it is important to also recognize that overall global transaction volume has ebbed considerably back to early 2010 levels, without the usual significant spike in Q4 activity. Again, transaction value has remained near recent highs, but it does call into question the sustainability of activity.

Stock market volatility, the presidential election and Brexit have slowed acquisitions by creating uncertainty. While global transaction value has increased, this too is a sign of maturity as companies overpay for rare opportunities and gobble up companies just coming off the recent economic growth spurt. Anecdotally, raising capital is becoming more difficult as well. As we will see below, this further emphasizes the exceptional nature of the continued growth of the IoT M&A market.
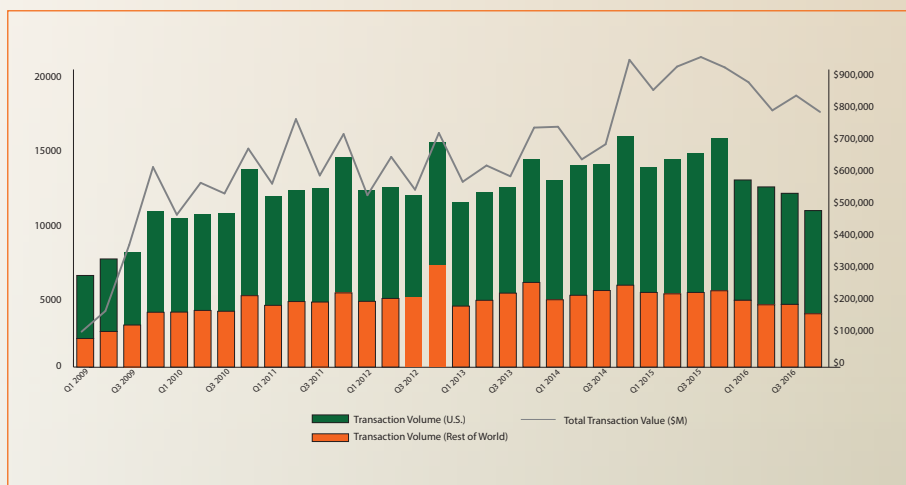

Exhibit III – North American Technology M&A Activity

Exhibit IV – Global M&A Transaction Activity

M&A IN IoT

Since 2013, Mirus has identified a total of 251 transactions involving companies that promote themselves as IoT. With 35 transactions in 2013, 57 in 2014, 71 in 2015, and 88 in 2016, the volume of IoT transactions has continued to accelerate its rapid pace of growth over the past three years, despite the overall decrease in market activity seen in other domains including technology as a whole. While deal volume has increased substantially in 2016, there was an even more drastic increase in median deal value from approximately $40M in 2015 to almost $140M in 2016.

Mirus believes this trend to be indicative of the maturation of the technology and increased competition for both product and domain expertise. IoT is no longer just a trendy buzz word, but a true technology trend unto itself with plenty of room to grow and create substantial value.
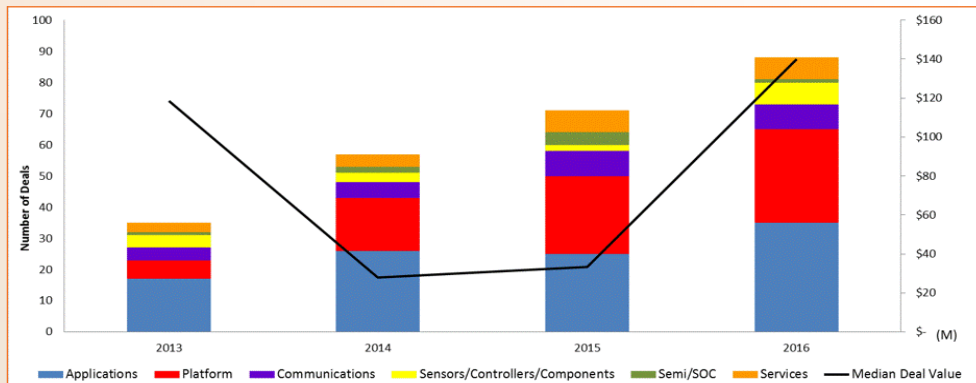
Exhibit V – Internet of Things M&A

SECTOR ANALYSIS

At first glance, most sectors of IoT have grown in transaction volume over the past 3 years. In general, those areas where hardware components predominate have remained steady, mostly because generics have been discounted in this analysis and bespoke sensors (and semiconductors) are almost always accompanied by application specific software (more on this below). But it is the further accelerated growth and volume of the applications and platforms sectors that truly stand out. In this section, we will explore what kinds of companies are being bought and who the most active buyers are within each sector.

Exhibit VI – Transaction Volume by Sector

PLATFORMS

Early on, from 2013 through 2016, there has been a clear preponderance of acquisitions being made to provide device access to the Internet from point of engagement. Large companies are scrambling 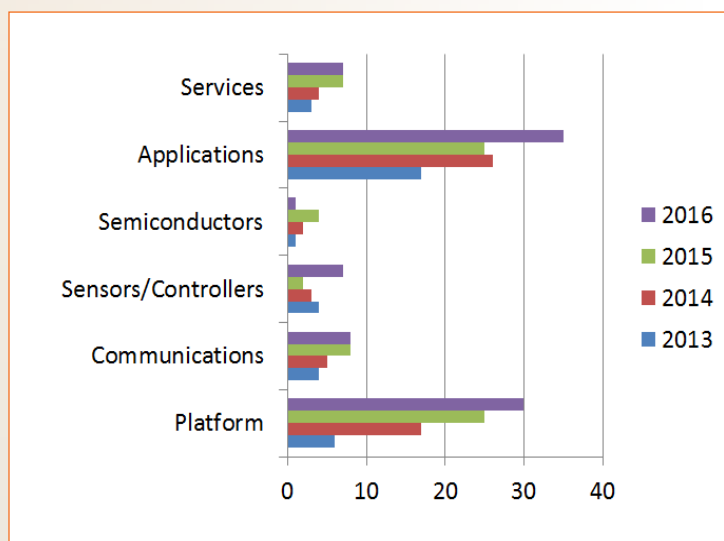to add cloud and device/API management capabilities to their portfolios in preparation for IoT applications becoming available. Acquirers ranged from traditional networking and communication companies (such as Cisco and Citrix) enhancing their existing positions to product companies in transition to a new paradigm for their offerings (including Amazon, PTC and Harmon). In 2015, big data analytics platforms (as represented in the chart to the right by information management and orchestration and pure play analytic acquisitions) became popular as companies sought to provide a way to manage and leverage the data being collected.
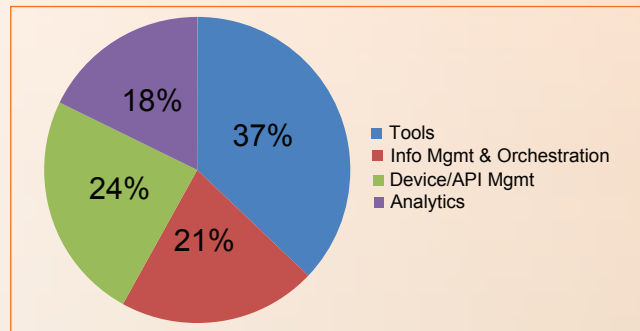

Exhibit VII – Platform Subsector Split by Transaction Volume

Recently (starting in 2015), there has been an emergence of single-source providers offering a range of products from sensors to analytics (and everything in between), plus the services to pull it all together to solve a problem across a broad range of industries. Mirus believes that these "all-in-one" companies are filling a short-term gap in the market left bare by a shortfall in application delivery, as many applications are not quite market ready for mass implementation. At some point, Mirus believes these all-in-one shops will be replaced by COTS solutions and there will be a steady state saturation of platforms in the industry, ultimately shifting IoT transaction volume to applications from platforms and other infrastructure. We are, however, probably some years away from both of these transitions. Nevertheless, a prudent investor may not want to be holding stock in a smaller IoT platform company once the industry has consolidated and the shakeout has occurred (see Exhibit II).

For the tools subsector, acquisitions have been heavily focused on security, with approximately 25% of tools companies sold for their IoT security solutions. New points of access also provide new points of potential penetration of a company or individual network and computing systems. Gartner has stated that it believes there will be a bottleneck in IoT adoption because of this security threat; they claim 25% of all hacks will be through IoT by 2020. While Mirus recognizes that there will always be new opportunities for security breaches, and anticipates the continuous evolution of security tools, we do not expect it to materially inhibit the rapid growth currently anticipated for IoT in general. This may prove to be a mistake, but IoT is off and running and won't be slowed. Security tools will simply have to keep up.

Other tools providing design, test and management functionality specific to the IoT environment are currently riding a wave of IoT growth, but Mirus believes that generalized development and management tools are often sufficient to do the job today, and where deficient, will soon evolve to plug their gaps as customer demand evolves. This is not an area in which we expect to see significant disruption.

The most active buyers consolidating the platform sector include GE Digital, Cisco, PTC, and SAP. Collectively, these platform leaders have invested many billions of dollars on acquisitions to accelerate and enhance their IoT technology leadership positions. Generally speaking, these leaders have been primarily focused on either adding horizontal elements (asset tracking, field services, analytics, security data aggregation, connectivity) to build out their technology stacks or specialization in the form of vertical applications.

• GE Digital has led the way, acquiring Meridium (asset performance management), Wurldtech (security), Bit Stew Systems (data integration services aimed at utilities, energy and manufacturing), Service Max (cloud field service management; a 2017 deal) and Wise IO (machine learning and intelligent AI systems for customer support). GE Digital has made several other investments in various application areas, which will be discussed below.

- PTC has kept pace with GE Digital, acquiring five IoT-related businesses, the majority of which strengthen and/or add scale to their platform offerings with a particular focus on industrial automation (Thingworx, Axeda, and Kepware). PTC also added predictive analytics with their acquisition of Coldlight and virtual reality technology through their acquisition of Vuforia.

- Similarly, Cisco added key horizontal elements with their acquisitions of Jasper (IoT platform), Parstream and Platfora (analytics), and Cloudlock and LanLope (security).

- SAP has made numerous acquisitions to bolster its HANA IoT platform, notably its PLAT.ONE acquisition, which along with MeLLmo and Altiscale, brings scale, analytics and vertical specialization. SAP has also added simulation capabilities through its acquisition of Fedem Technology to aid in its development of its next generation IoT-based predictive maintenance system.

- Other strong contenders include Microsoft, Fujitsu, Google, Bosch Software, Ayla Networks, Amazon Web Services, Oracle, Logmein and IBM Watson. However, with the exceptions of Logmein's acquisition of Xively, Amazon's acquisition of 2lemetry, Google's acquisition of Apigee, IBM's acquisition of Strongloop and Microsoft's acquisition of Solair, these contenders have yet to follow the leaders' more aggressive acquisition approach to bolstering their IoT credentials and accelerating the build of their IoT stacks.

COMMUNICATIONS

Acquisitions in the communications sector have been dominated by wireless and Wi-Fi (almost 75% of all communication transaction volume) for uses specific to IoT device connectivity, telemetry and remote monitoring. These acquisitions have been made by gateway, application and platform providers to create an alternative to pure play telecomm cellular wireless providers (not included in our numbers) that may also service IoT, but come with high connection costs. Examples include Oracle's acquisition of Acme Packet and Honeywell's acquisition of Intermec. Low power Bluetooth and RFID technologies have also been popular, especially for retail, medtech, home, and other localized applications, but lack the range to service more geographically dispersed applications. Recently, however, new low power wide area networks (LPWANs) and NarrowBand IoT (NB-IoT) networks have begun making inroads in the IoT market with the promise of longer range connectivity at a substantially lower cost than cellular networks. We anticipate there will be a scramble to add this capability to the stack by larger network providers as the technology matures over the next 5 years (see LoRa Alliance).

The list of active communications sector buyers is long and diverse, ranging from wireless connectivity and gateway providers to industrial automation and telemetry companies.

- Sierra Wireless, which is primarily a gateway provider, has been the most active, completing 7 transactions over the last three years. Those acquisitions have fallen into several categories including M2M mobile operators, cloud platform for connectivity, data management and mobile resource management (MRM) and telemetry.

- Some of Sierra's peers such as CalAmp and InSeego completed similar acquisitions in the telemetry and MRM arenas.

- Acquisitions into the remote asset monitoring and management space were numerous and completed by Digi International, Lindsay Corp., ublox holdings AG, Numerex, and Orbcomm across numerous end market segments such as food service, agriculture, government and public safety, automotive, transportation, energy, utilities and healthcare.

- Honeywell made several acquisitions in the satellite communications arena while Qualcomm and Skyworks Solutions acquisitions were more focused on personal mobility and consumer applications.

- Relayr acquired Proximetry, Inc. to strengthen its IoT device management and connectivity cloud platform.

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- Finally, several wireless providers focused on IoT remained active by building scale. More specifically, Sigfox raised an additional $160M to its total $300M war chest of capital to build out its global networks. Abry-backed Kore Wireless has pursued additional scale through the acquisitions of Wyless and Raco Wireless.

SENSORS/CONTROLLERS/COMPONENTS

While in many cases generic sensors (not included in our analysis) with many uses may well serve a given purpose, most IoT sensor company acquisitions have been for companies with very specific targeted IoT use to round out a more complete application offering. These bespoke sensors are designed for a specific purpose and often are accompanied by controllers, including chip sets (typically embedded or SOC) that manage the sensing process and delineate information to be uploaded. As these systems evolve, the sensor and controller companies are often quickly acquired by application or platform companies that deem their sensor partners as mission-critical. For example, Avigilon acquired VideoIQ for ADAS and related video analytics, and Sensata Technologies made a $50M private placement in Quanergy.

The most active acquirer by a wide margin in this segment is Apple. The company acquired several 3D machine vision, motion, sentiment and sensing technology targets, including PrimeSense, Faceshift AG, FlybyMedia and Emotient to name a few. These acquisitions when coupled with related acquisitions in the augmented reality, big data machine learning and artificial intelligence sectors reinforce and extend Apple's leadership in the consumer and wearable device market (more on that market below).

In the industrial world, InvenSense, Silicon Labs and Cognex added 3D sensors, motion sensors and/or microcontrollers, GPS positioning software and wireless/blue tooth connectivity used across a variety of industrial application areas such as smart factory, energy metering, retail, climate monitoring, home building and security. Audience acquired Sensor Platform and then was acquired by Knowles, the leader in mobile audio processing components. Finally, Rockwell Automation acquired vMonitor, which provides sensors and controllers to automate the monitoring of energy production; and FLIR (formerly Point Grey) acquired the people counting and tracking sensor assets of Nomi for retail.

SEMICONDUCTORS/SOC

As described with sensors above, IoT semiconductors and Systems on a Chip (SOC) are bespoke chips (as opposed to generic chips, which are not included in this analysis) that perform a specific IoT function as a part of a greater system. Acquisitions mostly occur in two cases: 1) When volume reaches critical mass for large chip makers to realize profit, which has been most common with communications chips so far; or 2) When an application or platform company needs to control its own destiny due to the critical nature of the technology (security or payment processing, for example).

The most active consolidators in this segment include Intel, Qualcomm and Softbank/ARM. Intel has focused its acquisition spree on chips and SOCs that support virtual or augmented reality (such as Movidius, VOKE) for the wearable and consumer markets, vision systems (Itseez and Yogitech) that enable ADAS and various other acquisitions that either provide horizontal elements in the areas of machine learning and advanced processing or target specific end market such as their acquisitions of MAVinci Gmbh, which supports UAS with a focus on agriculture and Lantiq, which focuses on connected homes. Their rival, ARM, which arguably has amassed the deepest IoT patent portfolio, was recently acquired by Japanese conglomerate Softbank for $31.5 billion. Once this domino fell, Qualcomm wasted little time announcing an even larger acquisition of one of the IoT semiconductor leaders with their almost $50 billion acquisition of NXP semiconductors. Sony added Altair, a fabless semiconductor company in the low power mobile WiMAX silicon solutions for handsets and handheld devices used in mobile hotspots, routers, and M2M.

APPLICATIONS

The application space has consistently been one of the most active of IoT M&A domains and 2016 was another great year with 35 transactions (up a full 40% from 2015) and a substantial rise in deal value. Largely due to rapid maturation of the market for IoT, applications are now generating significant revenue and becoming profitable, leading to higher valuation. In addition, the substantial acquisition volume over the past years has led to some scarcity value for proven applications as larger strategic buyers enter the market, often late, and are forced to pay premium prices. In addition, investors (including venture capital, private equity and even strategic venture investors) have begun to speculate in this space as the next hot growth sector, essentially buying call options into potentially disruptive new application areas. For instance, GE, PTC, Siemens, Schneider Electric, ABB, Mitsui,

Exhibit VIII – M&A by Applications

and Cisco, among others, have all done private placements into promising IoT companies and in some cases, have made several investments. While Mirus expects that valuations may not remain at all-time highs in terms of multiples, we do anticipate that overall dollar value will continue to increase over time with industry revenue.
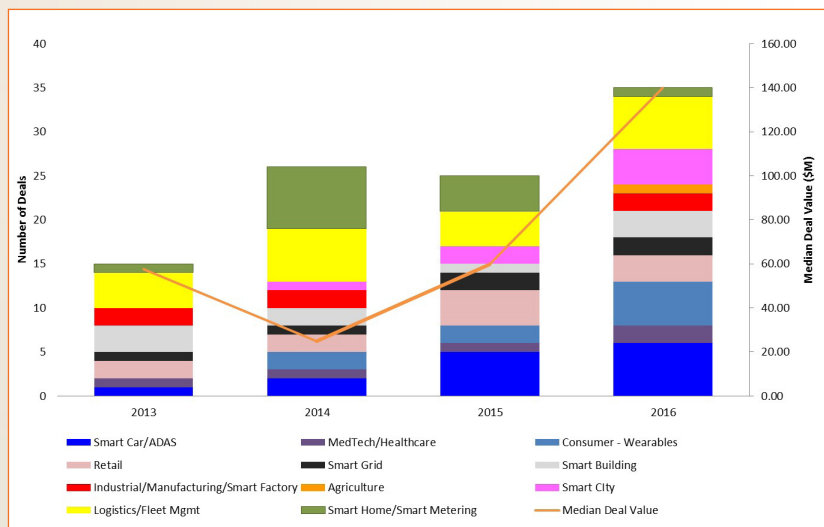
Interestingly, application concentration has remained diverse. While there was an early foray into Smart Home/Smart Metering, Logistics and Fleet Management, and ADAS, all application sectors had substantial 2016 activity; Logistics and Fleet Management was one of the earliest industries to show tangible customer benefit, owing mostly to the movement of asset management to the cloud. This in turn kicked off a spate of acquisitions by large strategic players needing to acquire technology in order to stay current and compete. A few comments on other application segments follow.

- **Smart Car/ADAS:** The connected car is real. ADAS, not so much, at least until the social implications sort themselves out. This is not as much of a technology issue as a social, political and legal one. Until that time, though, there are plenty of safety, parking, navigation, entertainment, and other "convenience" applications to add value to your premium automobile. The battle to lead the ADAS world is one primarily between legacy incumbents (Big Auto OEMs & Tier 1 suppliers) and internet–based newcomers to the automotive sector (such as Google, Uber, and Apple). The newest generation of Internet companies has leveraged speed, agility and technology to create new business models and markets, often at the expense of incumbents. In the ADAS market the race is on to index the physical world (not unlike Google did in the online world) as the foundation for next generation telematics services, including, but not limited to, automated driving. Some of the most notable transactions and consolidators include:
    - German auto consortium (BMW, Daimler, and Audi) acquisition of Nokia mapping technology;
    - Google's acquisition of WAZe;
    - Ford's acquisitions of Civil Maps, CharIoT, SAIPS Ltd. and its $150M investment in 3D auto sensor technology company Velodyne Lidan;
    - Ambarella's acquisition of Vislab sri;
    - WindRiver/Intel's acquisition of Arynga;
    - Harmon's acquisitions of Symphony Teleca and Redbend Software;
    - Uber Technologies' acquisitions of DeCarta, Geometric Intelligence and Otto;
    - Telit Communications' acquisition of the ATOP business of NXP BV; and,
    - Samsung Electronics' pending acquisition of Harmon International Industries.
- **MedTech and Healthcare:** This market represents a huge opportunity, behind only Smart Homes and Smart Cars, but getting government approvals always slows things down. This sector will continue to benefit from the aging baby boomers and Medicare reimbursement shifting from fee-for-service to a pay-for-performance model. Some of the most notable acquisitions and consolidators include:
    - Google's acquisition of Lynx Design;
    - Nokia's acquisition of Withings SAS;
    - BioTelemetry's acquisition of TELCARE;
    - Medtronic's acquisition of Cardio.com; and,
    - Intel's acquisition of Composyt Light Labs.
- **Consumer and Wearables:** Trendy? Yes. Staying power? We will see. This category is dominated by the pure play providers such as Fitbit accompanied by the large consumer electronics players, PC OEMs and GPS players such as Garmin. Some of the most notable acquisitions and consolidators include:
    - Intel's acquisitions of smart glass provider Recon Instruments and sports wearable app provider Basic Science;
    - Fitbit's acquisition of Coin Inc., Pebble Technology and Vector Watch (2017 close); and
    - Apple's aforementioned deal activity.

- **Retail:** With large retailers desperate to defend their shrinking market share to e-commerce pure plays, they are in the process of evolving to support the omni channel shopping experience. However, retail analytics are still at the data gathering stage and just beginning to make relevant business impact and recommendations. Some of the most notable acquisitions and consolidators include:

  - Retailnext's acquisition of Nearby;
  - Tyco Retail's acquisitions of Footfall ltd, Shoppertrak, and CreativeSystems combined with investments in Retailnext and Kovio;
  - Apple's acquisition of WifiSlam;
  - InfoSys' acquisition of Kallidus;
  - Accenture's acquisition of Vlocity and Kurt Salmon;
  - Axper's acquisition of Nomi's retail analytics software assets; and
  - Envision's acquisition of Lighthauslogic.

- **Smart Grid:** Big projects, low volume, and slow to implement, but huge implications for grid operators, power distribution and, more broadly, the energy sector. Some of the most notable acquisitions and consolidators include:

  - ABB's acquisition of Spirit IT;
  - Ericsson's acquisition of Ambient Corp.;
  - Emerson Electric's acquisition of Intellisaw;
  - Rockwell Automation's acquisition of SmartCloud; and,
  - SilverSpring Networks' acquisition of Detectent, Inc.

- **Smart Building:** Popular for monitoring early, but without corresponding proven cost saving actions to take advantage of the data collected, these applications have thus far lacked results. The industry is now managing new construction projects effectively, but infrastructure price tags make for slow progress. One of the key acquisition themes across this sector is building performance management and analytics. Some of the most notable acquisitions and consolidators include:

  - GE's acquisition of Daintree Networks;
  - Honeywell's acquisition of Elster Group;
  - Tridium's acquisition of DataEye Energy Analytics Application of Controlco;
  - Cisco's acquisition of JouleX;
  - 21st Century Utilities' acquisition of GridPoint;
  - Direct Energy's acquisition of Panoramic;
  - Telia Company's acquisition of Yoga AS; and
  - Schneider Electric's acquisitions of KGS Buildings, LLC and InStep Software, LLC.

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- **Industrial/Manufacturing/Smart Factory:** By and large, this sector is at the concept level. Many companies manage assets on the shop floor; few have automated the interaction with tools themselves. The exception is the oil and gas industry where high cost of failure has driven the use of connected sensors everywhere practical. The leaders in this category tend to fall into either industrial automation or enterprise software sectors. Generally speaking, companies in this category are stuck inside the asset performance management and tracking box. They will need to expand into the business of delivering improved manufacturing process outcomes (i.e. improved production efficiency) if they are going to parlay their strong franchises into IoT success. Said another way, while most have IoT platform offerings, they need to add an analytic layer on top of asset performance to ultimately succeed. Many players have chosen to extend their asset performance offerings with predictive maintenance and asset and yield optimization solutions with the intention of improving production and field deployments. This is definitely a step in the right direction but still a long way to go. Some of the most notable acquisitions and consolidators include:

  • GE Digital's acquisition of PingThings, Inc. and $12M investment in Foghorn Systems;

  • Intel's acquisition of Saffron Technology;

  • SAP's acquisitions as previously discussed in the platform section;

  • PTC's acquisitions as previously discussed in the platform section;

  • Space Time Insight's acquisition of GO FACTORY;

  • Dassault Systemes' acquisition of Ortems; and

  • Autodesk's acquisition of SeeControl.

- **Agriculture:** IoT applications are just getting started for this labor-intensive industry. Decision support tools informed by satellite and weather related data has been an active area, and LPWANs offer future potential for effecient management of larger land masses. Look for technologies that track and trace assets first, as distributors attempt to trace the food all the way from store to source, before the government mandates it. Some of the most notable acquisitions and consolidators include:

  • HydoPoint Data Systems' acquisition of Baseline;

  • Digi International's acquisitions of Smart Temps (2017 close), Fresh Temps and Bluenica;

  • Monsanto's acquisition of Climate Corp; and,

  • Land O'Lakes' acquisition of Geosys.

- **Smart City:** This category is very real with numerous major players spending large quantities of money here. Industry analysts expect tens of trillions of dollars to be spent over the next twenty years, with some claims going as high as $50 trillion. The changeover of lighting to LED products is facilitating implementation, but again, large projects in large cities move slowly. A second tier of the market is emerging to encompass small cities and independent facilities that look like cities. Some of the names dominating this category through acquisitions include:

  • Verizon's acquisitions of Sensity Systems and LQD NiFi;

  • Hitachi Data Systems' acquisition of Pantascene;

  • Acuity's acquisition of DGlogik; and,

  • Silverspring's acquisition of Streetlight Vision SARL.

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- **Logistics & Fleet Management:** With the tracking, monitoring and management of assets, people devices that are foundational to IoT, this category has been busy consolidating with a handful of namesdominating the sector. Some of the active buyers in this category include:

  - Orbcomm is by far the leading consolidator in this sector having completed 4 deals including the acquisition of Wamtech, Euroscan, GlobalTrak, and MobileNet;
  - Verizon's acquisitions of Fleetmatics and Telogis;
  - CalAmp's acquisition of LoJack;
  - Danaher's acquisition of Teletrac;
  - Numerex's acquisition of Omnilink Systems; and
  - Invensence's acquisition of Trusted Positioning.

- **Smart Home/Smart Metering:** The digital home continues to be more automated ranging from control of utilities and security to entertainment and even appliances. The enormous opportunity to digitize and control the home has attracted a broad field of stakeholders including legacy industrial players, home security companies, Internet powerhouses and even contract manufacturers. Some of the names dominating this category in part through acquisitions include:

  - Google's acquisitions of NEST, Dropcam and Revolv;
  - Alarm.com's acquisition of iControl Networks Canada;
  - Honeywell's acquisition of Ester;
  - Samsung's acquisition of Physical Graph Corp;
  - Flextronics' acquisition of Wink; and
  - Control4Corp's acquisition of Blacksumac.

SERVICES

IoT services fall predominantly in two areas: product design and development, and system integration. We think of iPaaS and hosting service companies as platforms for the purposes of this paper, but will discuss them and their relationship to services more here in a moment.

Product development companies offer design services to shift a product line to the Internet of Things. They have specific expertise in unique IoT requirements and can augment staff to help with the transition faster than you can acquire talent and get them up to speed. These companies are often bought by other design houses or by their customers who deem the employees as mission-critical (such as in J. Walter Thompson's acquisition of iStrategy Labs).

On a larger scale are the system integrators ("SIs"). No one supplier today has a complete solution, so system integrators are requested to pull together multiple technologies to form a complete solution for end customers that just can't wait for COTS solutions to evolve in their industry.
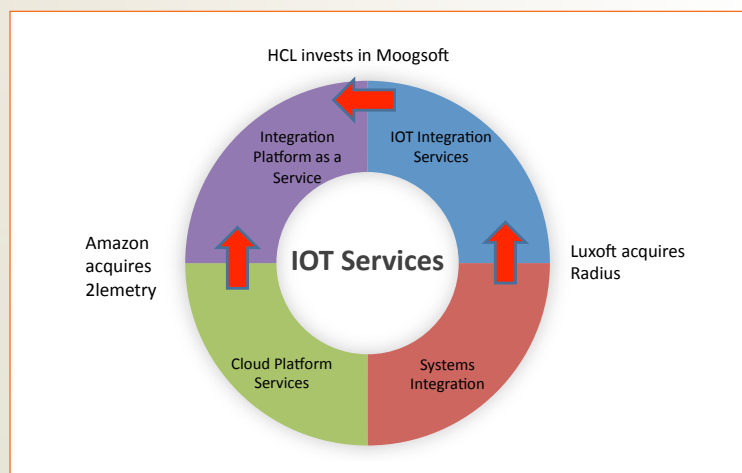

Exhibit IX – IaaS attracting Services & Software Vendors

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Smaller SIs which develop domain expertise, especially in connectivity, are attractive targets for the large SIs that aspire to offer IoT integration services (see, for example, Luxoft's acquisition of Radius). Mirus sees IoT system integration services as a growth opportunity at least until each IoT application area creates more COTS turnkey solutions. Some additional transactions in this category include:

- Rockwell Automation's acquisition of MAVERICK Technologies LLC;
- Incedo's acquisition of Syslogic Technical Services;
- Rivetry's acquisition of Rigado;
- Globalogic's acquisition of Research & Engineering Center; and
- Hitachi Data Systems' acquisitions of oXya and Pentaho.

Having said this, we believe that adding IoT domain expertise is often just the first step for SIs that are serious about IoT. Mirus is beginning to see system integrators add integration platform capabilities like cloud services or analytics to provide added value beyond billable man hours (not unlike we are seeing in PLM and other industries), essentially becoming iPaaS providers (such as HCL, which invested in Moogsoft). Further, we are seeing cloud platform service providers adding integration service capabilities and/or other IoT related platform capabilities to extend their offering and become iPaaS providers as well (see, for example, AMS' acquisition of 2lemetry).

Where will services end up? Probably with a few very large iPaaS providers that offer a complete range of integration platforms, including cloud and analytics and the services to customize and implement them, at least, until COTS applications are available in all domains at some point in the future.

VALUATION

No M&A paper would be complete without a discussion of valuation, but let's be clear: the IoT market is too new, too hot, and has too few reported valuation data points to give you an accurate picture of the value of your business without considering the many intangibles that go into company valuation. The graphic to the right describes the various elements that go into valuation beyond simple financial ratios. Company maturity, fundamentals and trajectory essentially establish the financial valuation baseline, but it is timing, scarcity value, industry dynamics and buyer health and activity that drive the exceptional multiples that you hear about and are looking for.
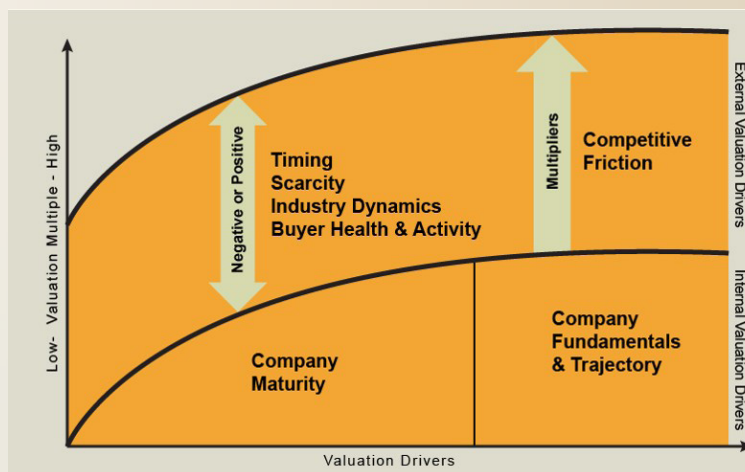

Exhibit X – Creating Exceptional Outcomes

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- **Timing:** As discussed above, we've observed industry maturation in IoT and, with that, increased consolidation activity. Despite growing uncertainty within the economy, it's clear that several well-capitalized buyers are deciding to buy vs. build, and in some cases, placing highly strategic premiums on the "time to market" advantages that come through acquisition. For instance, time to market was the primary driver behind Samsung's announced acquisition of Harman, where Samsung is expected to pay 10.4x EBITDA. Also, as discussed earlier, note where your industry segment lies on its commercialization curve. Ideally, business owners are able to combine these external considerations (i.e. a seller's market and industry maturation) with company maturity, fundamentals and trajectory to maximize value.

- **Scarcity:** At a macro-level, IoT has attracted billions of dollars of investment, and thus created a noisy and crowded field of players, arguably with limited differentiation. However, scarcity value can manifest in numerous ways such as scale, key partnerships, IP, anchor customers, etc. For instance, Cisco paid $1.3 billion for Jasper not for their relatively low revenue but for the scale of their customer and partner ecosystems, which reportedly numbered 3,500 and counting. Understanding your scarcity value in the context of how it helps a particular buyer is fundamental to establishing the right strategic positioning.

- **Industry Dynamics:** IoT is an extremely diffuse new market that is still in the formation process. As a result (as with the first Gold Rush), the scramble is on for market share, more complete vertically integrated solutions, differentiation, and ultimately, defensible market positions. With a plethora of well-capitalized and motivated buyers, rapidly evolving technology, and the hyper competitiveness amongst rivals present in this new Gold Rush, Mirus sees favorable industry dynamics that can be leveraged to generate strategic premiums. For instance, PTC is in the process of a major pivot away from its historical CAD/PLM business and to IoT in part due to slowing growth in its core markets. As discussed above, PTC has completed 6-7 transactions, paying significant premiums to become an IoT leader.

- **Buyer Health & Activity:** Now that IoT has proven itself as a disruptive, game-changing set of technologies impacting many application domains across multiple industries, we are seeing the early stages of an active M&A market we expect will continue to grow in transaction volume and value. This reality has created a broad and attractive pool of potential buyers ranging from the largest global publicly traded conglomerates to smaller, VC-backed vertical start-ups, and everything in between. As mentioned earlier, we are also seeing increasing amounts of private equity enter this market, adding yet another set of buyers to an already attractive buyer pool.

In our experience, it is the intersection of a large and healthy buyer pool coupled with favorable industry dynamics, timing and scarcity value that generates the kind of exceptional results a business owner's hard work and accomplishments deserve. Said another way, this is where your investment banker earns his or her money: 1) keeping you focused on your business, key value drivers and industry dynamics and 2) helping you to maximize your valuation at exit. Critical to success here is understanding the dynamics of your market and the intangibles that you bring to the table, which we recently exemplified in the sale of Eutecus to Sensity Systems, now a part of Verizon.

TRENDS IN IoT AND KEY TAKEAWAYS

Per the above discussion, Mirus has had the pleasure of being involved in a variety of IoT sectors, technologies and transactions. This experience has given rise to a number of observations, trends, predictions, and key takeaways we feel bear watching and may provide some insight into the market's direction.

- **Industry Maturation:** We believe certain sectors of the IoT stack have matured to the point of reaching the height of inflated expectations (again using Gartner's Hype Cycle lingo). We believe platform and communication penetration will mature first and become saturated, as there are currently over 350 IoT platform companies. While new platform and communication technology will create some level of turnover (see LPWANs), we believe the real action will be in the applications. Today many applications are still relatively immature, capturing data, but not really knowing what to do with it. Soon that data will be put to use, with application companies not just capturing, but dictating, actions to be taken in an automated fashion based on certain conditions. We will move from man using data to make decisions, to machines instructing man on the best course of action (and then asking why it isn't done yet!). For instance, think about physical product inspections being replaced by digital inspections based on real-time sensor data. As COTS solutions become more prevalent, this ultimately means a reduced need for generic platforms. While a few will remain, most will be forced to verticalize and focus on specific industries where they have the greatest installed base. The good news is that many of these companies will be well positioned for the transition, having developed significant domain expertise, both in technology and in the industry. The challenge will be the willingness to make the transition to verticalization and timing that transition to take advantage of current market conditions, while preparing for the next step, profitably. For instance, Silver Spring evolved from a generic communication player into an AMI (Advanced Metering Infrastructure) specialist primarily by making multiple acquisitions. Often this type of transformation requires management transition as well, something that can be hard to accomplish with a seasoned staff that has made a lot of money in phase one. To sum it up: change is hard, but it can be profitable.

  TAKEAWAY: We believe that the application and verticalized platform companies with the most insightful knowledge and impactful analytics that go beyond data capture to drive improved decision making are likely to garner the highest valuations.

- **Increasingly strategic role for SIs in IoT:** IoT represents a massive systems integration challenge and thus an IT services growth opportunity. Until each application area creates more COTS turnkey solutions, early adopters will be faced with the need to pull together multiple technologies to form a complete solution. Moreover, adoption and usage of industry specific solutions will be driven in part by SIs with deep industry domain expertise and strong process consulting capabilities. This puts system integrators in a key strategic position and presents an opportunity for growth beyond "body shops," to actually add value during the design, implementation and maintenance processes. After COTS solutions are created, turnkey implementation opportunities will continue to exist for what will remain a relatively complex solution stack crossing multiple departments within a given company, and often multiple companies and partners; all things system integrators relish and are good at.

  TAKEAWAY: SIs that fit this description and have strong customer relationships with operating executives, not just IT staff augmentation, will be in high demand both for partnership and acquisition opportunities.

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- **The race is on to develop the broadest and most compelling portfolio of use cases:** The underlying reason why the land grab is accelerating is the realization that IoT-enabled devices offer vendors enormous customer stickiness due to their embedded nature. Once the device is out in the field, the vendor is assured an ongoing customer relationship for the product's lifecycle. Our industry research suggests that many current IoT use cases today are really siloed asset tracking and performance management. We believe the race is on between multiple key stakeholders to build the broadest and most compelling portfolio of use cases that go beyond asset management to drive improved decision making and business outcomes. We envision these use cases starting horizontally, such as field service implementations of general platforms, but rapidly moving to purpose built vertical applications that can "lock in" customers for the long haul.

  TAKEAWAY: A broad cross section of large, multi-billion dollar stakeholders including vendors from industrial automation, enterprise software, pure play Internet, system integration, OEMs, telecommunications and various infrastructure product companies are all building out their technology stacks by partnering with and/or acquiring vendors they believe will help them accelerate IoT application adoption and usage. As an IoT vendor, building a strong partner ecosystem and set of relationships can be the difference between an adequate exit and an exceptional return. For instance, GE Digital and their Predix platform, which GE hopes will become the de facto operating system for industrial IoT, is aggressively building out its Predix partner ecosystem.

- **Low Power Wide Area Networks (LPWANs) will challenge telcos for IoT transaction volumes:** While still in their early stages, Mirus' view is that some combination of Narrow band LTE (sometime called NarrowBand IoT or NB-IoT) and LPWANs will be major enablers of IoT, replacing the need for cellular access for many applications. These lower cost solutions are essentially "Bluetooth on steroids," promising connectivity matching that of cellular range for Bluetooth prices (popular in retail IoT). NB-IoT is designed for low speed, but long reach for small amounts of information (such as voice or counting) from sensors and industrial equipment that are often set up to operate for years in isolation with no service visits. LPWANs provide for more continuous operation with larger bandwidth to handle video or other data intense applications and can be used in concert with NB-IoT. The combination of the two technologies will service a broad spectrum of applications such as agriculture, factory, and recreation. While still in the early stages (Sigfox just raised$160M at a $600M valuation to accelerate their global aspirations) Mirus believes this technology is on the cusp of global rollout. Machina research forecasts that nearly 1.5 million devices will be connected to these so-called LPWA (low-power wide-area) networks by 2020.

  TAKEAWAY: Our view is that major cellular providers today who have let startups take the hit on the learning curve will soon buy into the technology as it gains popularity and becomes profitable. Intel, Ericsson and Nokia all just recently announced plans to commercialize the technology. Look for acquisitions here soon.

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- **Security may be a short-term impediment to growth:** Gartner says that by 2020, 25% of all recorded "hacks" will be on IoT systems. While we acknowledge this trend, we do not agree that it will substantively inhibit growth. There is simply too much momentum and too much opportunity (not to mention money at stake). Will there be issues? Yes, but the gold rush is on and once started, it can't be stopped.

  TAKEAWAY: The best advice we can provide to investors is to be aware of the risks. To entrepreneurs: build security in at the initial design and create a plan for constant updating. Security is not "someone else's job."

- **Advanced technologies that support security, mobility and simulation will provide needed differentiation:** New cutting edge technologies add novelty in the consumer space, security to sensitive data implementations, and flexibility to a mobile workforce adding a level of differentiation to an already crowded field. One example is augmented reality (where the physical and virtual meet). On the surface, this is entertainment, but if broadly applied to such areas as on-site maintenance, you have a productive teaching tool for the video game generation. For instance, PTC recently acquired Vuforia to add strong augmented reality capabilities to its IoT technology stack. Similarly, SAP recently acquired Fedem, a simulation technology to support digital twin initiatives and inspections.

  TAKEAWAY: As the industry matures and the battle over winning key accounts becomes a strategic imperative, large platform providers will look to add key differentiation through technology to sway customers in their direction.

- **Hopes of finding relevance in big data and improved operational outcomes drive artificial intelligence investment:** As we discussed repeatedly, the holy grail is generating meaningful and impactful insights that help operators make better decisions from the enormous volumes of data that are now being aggregated and processed. It's expected that these new insights will parlay new measurements and metrics into the ultimate prize of improved business outcomes. This continues to be easier said than done in part because these insights require combining business and IT, which is never easy. However, the biggest and most powerful companies in the world (Apple, Intel, Cisco, GE, SAP, etc.) are investing heavily in "deep learning" AI technologies to accelerate this time-consuming and complex process.

  TAKEAWAY: Those companies that help their clients unearth key insights into how to parlay IoT data into better business outcomes will be richly rewarded.

- **Large global companies will buy their own connectivity:** Already in process, Mirus is seeing a substantial number of device and API management, information management and orchestration, and analytics platform companies being bought by large traditional application companies now trying to make their way into IoT. PTC is a prime example as it remakes itself from a design management company into an IoT company that is engaged throughout the operations of its customers. These companies are placing huge (often $100M+) bets on technology and people to catch the first wave of this new Gold Rush.

  TAKEAWAY: If you are considering a sale, think more expansively about your prospective buyer pool based on your installed base, or even better, build out a robust partnership ecosystem in hopes of creating a "stalking horse" partner who might decide to preempt a process and buy you as opposed to being sold.

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CONCLUSION

At one point, many thought that IoT was just the latest marketing buzz word. Mirus saw it differently, as the natural evolution of technology, starting when mechanical devices were wired to make them electro-mechanical, had electronics and software added to become mechatronic, and now are connected to form the Internet of Things in a logical progressive application of available technologies. IoT has since proven itself as a disruptive, game-changing technology that is expected to continue to explode for years to come, and sector M&A will continue to grow in both transaction volume and valuation. Already proven resilient relative to the overall M&A climate, IoT is changing the way we interact with the Internet so fast that companies are struggling to keep up. To dominate in this diverse and changing industry will mean that partnering, and ultimately merging, will be a requirement, not a luxury. As such, we anticipate continued transaction growth for the foreseeable future. Valuations will likely continue to be dominated by scarcity value and time to market, but as companies mature and generate increasing IoT revenue, valuations will follow upward as well.

With the plethora of new companies, rapidly evolving technology and the spirit of entrepreneurship present in this new Gold Rush, Mirus does not see an end to these transactions any time soon. In fact we expect a "shake out" (not dissimilar to Gold Rush) over the next couple years as the "land grab" for the best "real estate" continues and the industry matures. Some vendors will strike gold, while others will come up empty handed due to poor timing, lack of execution, and/or enormous competition. Our best advice to IoT vendors looking to position themselves for successful growth and exit include:

- Understand your industry segment maturation curve and ideally sell into the initial growth part of the curve.
- Pursue a strong ecosystem of partners to gain credibility and ultimately plant seeds for future exit discussions.
- Stay focused and ideally, specialized, where you have legitimate scarcity value.
- Make meaningful analytics that inform better customer business decisions as a part of your solution stack.
- Build strong and repeatable use cases and customer references.
- Be prepared for the unsolicited inquiry (such as by completing an audit, FTO analysis, etc.) because it may come when you least expect it.

Owners should be considering this time as ripe for exit given the current seller's market. If you see yourself in this position, it may be worth a discussion on how you can take advantage of the current trends in IoT M&A. For more information on the specifics of liquidity planning, or on the details behind the material described in this paper, please feel free to contact us at boes@merger.com or alternative@merger.com.

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ABOUT THE AUTHORS

Together, **Peter Alternative** and **Bruce Boes** bring over 50 years of operating and M&A experience to bear on the market. Mr. Boes has spent over 30 years working in operational roles within manufacturing (shop floor and manufacturing engineering) and manufacturing software (marketing, sales, business development, and customer service). Mr. Alternative is the consummate deal making professional with dozens of transactions over his career. It is the combination of these two complementary talents and perspectives that allows this dynamic team to understand your business to a level of depth unobtainable by traditional investment banks and enables them to provide insights that help to maximize the total value of your business.

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