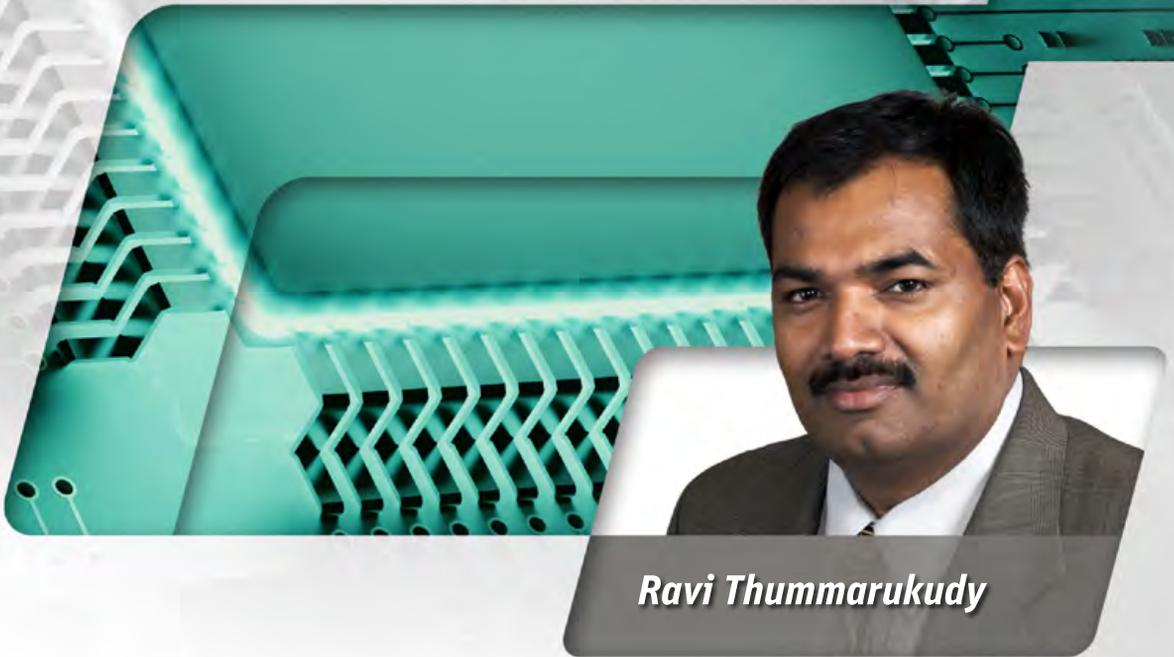
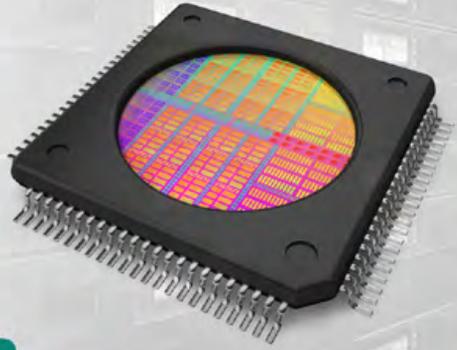


THE INDUSTRIAL IOT: CAPTURING THE POTENTIAL



Ravi Thummarukudy

The Internet of Things has revolutionized our personal lives, providing us with new levels of convenience, productivity and connectivity. However, the business world has been slower to adapt wireless devices and digital technologies. Here, Ravi Thummarukudy of Mobiveil – a technology leader in the data center, networking and IoT markets – discusses why companies have been slow to embrace the Industrial Internet of Things, along with the opportunities that await them once they do. He also describes some strategies for beginning to realize the benefits of emerging IoT technologies today.



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DIMENSIONS: Can you tell us what Mobeveil does and how the company plays a central role in the Internet of Things (IoT)?

RAVI THUMMARUKUDY: Mobeveil specializes in developing silicon intellectual properties (SIP), platforms and solutions used in data centers, communication networks and many other Internet of Things applications. In essence, we are a fabless semiconductor company but we don't produce chips. We license our chip design and implementation technology to customers as an intellectual property. Our customers are leading semiconductor businesses working on complex chip and board designs, but they don't want to start from the ground up. We provide them with the building blocks they need to deliver speed, capacity, power and other performance features to their customers — who include the leading electronics companies producing technologies for the Internet of Things. Because we serve this market, we have a unique perspective on the future of the IoT.

DIMENSIONS: What special engineering challenges has the explosive growth of the IoT created?

RT: One of our key focuses at Mobeveil over the past several years has been designing and delivering the right communications and connectivity functions. It's no longer enough to see each board or chip as an independently functioning unit. In the IoT, everything is connected. The products of company A must effectively communicate with the products of companies B, C and D. In response, we've created many standard interfaces that ensure this integration. These interfaces are the "secret sauce" that our customers value, because they

know that communication and connectivity are being built in from the earliest design stages. We've relied on engineering simulation for years to test the performance of our chip and board designs before licensing them to customers. Our licensed knowledge helps to ensure that the Internet of Things is robustly engineered to maximize the performance and reliability of connections among all the different "things" that exist in today's heterogeneous technology environment.

DIMENSIONS: Given your unique perspective, what is the most exciting development you foresee for the IoT over the next several years?

RT: Much of the excitement and buzz about the Internet of Things today centers on the way it will impact our personal lives. We'll have connected homes and smart appliances that anticipate our needs for comfort and convenience. Drones will deliver our packages. We'll be wearing more and more electronics. This captures our imagination, and with good reason.

But I believe the bigger growth area will be leveraging the IoT in business applications — often referred to as the Industrial Internet of Things (IIoT). Just as smartphones and tablets have revolutionized our personal lives, technology has the power and potential to change our manufacturing facilities, our warehouses, our offices and our transportation networks. Unfortunately, the business world has been slower to discover and adopt these emerging technologies, even though the pay-off could be enormous. I think we will see this trend reverse itself over the next few years, and we will see companies

accelerating their adoption of IoT technologies. Eventually, strategically applying the IoT in an industrial setting will be recognized as delivering a competitive advantage. As market leaders adopt the Industrial Internet of Things, other companies will have to follow suit.

DIMENSIONS: Can you give us some examples of how the IIoT might benefit the typical company?

RT: Certainly there is a huge opportunity for plant automation. Manufacturers can gather data about customer demand, transportation capacity, materials availability and other real-time business conditions to run their production facilities much smarter and more cost-efficiently. Artificial intelligence can begin to drive many of the decisions about what to make, when and in what quantity — decisions that are largely made by humans today.

Remote equipment monitoring is another area in which the IoT can make a major contribution. Aircraft engines, undersea equipment and implantable medical devices are just a few examples of equipment that might be hard to monitor and control today. By installing sensors on these types of equipment, gathering data and analyzing it in real time, companies can predict and prevent many cases of mechanical failure — as well as schedule maintenance in a more cost-effective way, based on real-world conditions and not educated guesses. Future product development can obviously be significantly improved if we have a clearer understanding of how products are actually performing in the real world.

DIMENSIONS: Why has the business world been slower to embrace the Internet of Things than the consumer market?

RT: There are a number of reasons. Probably the most important is that companies have a lot more at stake. If a consumer buys a personal fitness monitor and it doesn't work as expected, that's a relatively minor problem. But if executives are trusting technology to manage their production facilities and meet customer commitments, the cost of failure is obviously much higher. Customers could be lost, and profit margins could disappear. For many enterprises, 24/7 operation is critical to their success, so it can be very risky to adopt any new technology model. While the IIoT offers a significant payback, sometimes it's easier for executives to just stick to "business as usual" and realize reliable results.

I discussed earlier how Mobiveil helps to ensure connectivity and communication. Openness and collaboration with business partners is highly valued in today's world. But anytime a company connects to a partner — or the cloud — there is an inherent security risk. No one wants to allow external parties to have the power to intercept data and gain control over a production facility, a plane in flight or an electric utility. That's a very real concern that must be addressed before most businesses will be willing to create real-time, device-based connections with third parties.

The IIoT is also going to create new power demands as increased volumes of information are collected and stored. The multitude of sensors and devices deployed around the world will need to be supplied with power in a reliable, cost-efficient manner. In addition, companies will need to create or access data centers where they can process and analyze their new insights about customers, plants, equipment and other factors that affect their success. Not only will these data centers consume large amounts of power, but they will be accompanied by practical problems such as cooling needs and physical security requirements.

These are not minor concerns. When you consider all these new requirements and risks, it's really not surprising that businesses have been slow to invest in the Industrial Internet of Things.

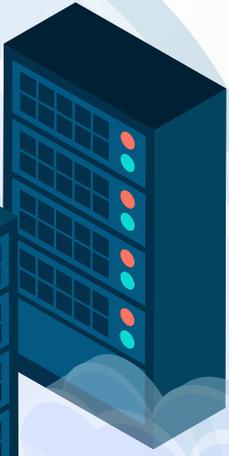
DIMENSIONS: What can businesses do to mitigate these factors and speed up their adoption of emerging technology?

RT: In the short term, the clear answer is to partner with established experts who have already figured out these issues. It is simply too costly and time-consuming today to build an independent IIoT capability — and the required knowledge and technology resources are readily available.



ANSYS recently teamed up with Tata Consulting Services as part of the GE Predix early adopter program to demonstrate how engineering simulation can be intimately integrated into the industrial internet ecosystem. One example demonstrated anomaly detection in a gas pipeline.





For example, there are many service providers around the world offering affordable cloud storage that can be accessed by anyone. This cost-efficient option enables any company to begin collecting new data via the IIoT and applying it to pressing challenges. One caveat is that most businesses store entirely too much information; executives need to separate the truly useful data from the unimportant, then only store the most essential insights that will actually be helpful. This will help minimize their outsourcing costs.

A number of trends are making cloud storage more affordable every day, putting it within easy reach of any enterprise. Many service providers have addressed the power and thermal issues associated with large data centers by constructing facilities in cooler climates such as Eastern Europe, and designing buildings with low cooling costs as a primary goal. This allows cloud providers to reduce their service fees. In addition, the transition from magnetic storage systems to emerging flash storage technology — which is a magnitude faster in terms of data retrieval time — is bringing down the time and costs involved in data processing. Large, data-intensive companies like Amazon and Google have already made this transition, and we can expect others to follow suit.

While data security is a huge challenge, there are certainly experts who can help address this issue as companies collect data from devices and sensors, as well as interact with trading partners and cloud providers. This is a well-founded concern that must be thoughtfully considered, but ultimately it should not be a deterrent to capitalizing on the IIoT.

Until internal capabilities for data analysis — which is one of today's fastest-growing career fields — are built, companies can access third-party expertise in this area too. Mining data and identifying key insights are specialized skills, but many firms today offer this expertise. With today's software-centric data-center architecture, many third-party analytics applications could be run on the collected data to provide for the best management insight and decision making.

Collecting the right amount of data, ensuring the right level of security, and applying the right amount of data processing at the right location are all key challenging questions that need to be answered for each enterprise. Eventually, I believe the cloud will become smarter and actually incorporate analytics along with compute and physical storage. That's when we'll really see an explosion of the Industrial Internet of Things. 



About Ravi Thummarukudy

Ravi Thummarukudy has over 28 years of experience in the semiconductor industry. Before joining Mobiveil as CEO, he was a co-founder of GDA Technologies, a privately held design firm offering end-to-end solutions for semiconductor product development. Prior to this, Thummarukudy held global business and technology management positions at Cadence Design Systems, Tata Consultancy Services and the Indian Space Research Organization. He has contributed articles to *Chip Design Magazine*, *Electronic Design*, *ISD Magazine* and *SiliconIndia*. He holds a B.S.E.E. from Mar Athanasius College of Engineering and an M.Tech. from IIT Madras, India.



Mobiveil at a Glance

Privately Held Employees: 125 Headquarters: Milipitas, USA