How Eurotech is Tackling Middleware Requirements in the Internet of Things Era

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Adapted from *Top 10 European IoT Predictions for 2015 — From Aspiration to Reality* by Lionel Lamy and others (IDC #IOT51X) and *Market Analysis Perspective: Innovation Accelerators in Europe — The Road to 2020* by Giorgio Nebuloni and others (IDC #VS51X)

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INTRODUCTION

Internet of Things (IoT) architectures are in strong demand – IDC estimates spending in the European market was at $78.9 billion in 2014 and forecasts it to grow at a compound annual growth rate of 29% over the next five years. Such numbers speak for themselves and attract a very diverse tech community. This paper provides a definition of IoT and describes where that paradigm sits in respect to digital transformation and IDC's "Innovation Accelerators" vision. In addition, it provides a view on how IoT applies pressure on the software back-end, requiring users to come up with new approaches to their middleware and cloud strategies.

Eurotech is a publicly listed solution provider in the machine-to-machine and IoT space with headquarters in Italy and global presence across Europe, North America, and Asia. Eurotech is a Red Hat ISV Advanced Partner. The second part of the paper looks at Eurotech's role as a supplier of IoT solutions, specifically with its Everyware offering. It provides a summary of Eurotech's differentiation and on the role its partnership with Red Hat plays in this context. Finally, it provides essential guidance to end-user organizations that are looking to deploy IoT architectures.

FROM MACHINE TO MACHINE TO THE INTERNET OF THINGS

IDC defines the Internet of Things as a network of networks of uniquely identifiable endpoints (or "things") that communicate without human interaction using IP connectivity. According to IDC, IoT finds its importance in the ability to capture and transport data, and ultimately enable analytics tools to analyze it. This has a clear impact on the business processes and decision making of organizations and consumers. Indeed, IoT is about bringing together people, processes, data, and things to make networked connections more relevant by turning information into actions.

IoT is becoming the de facto term to define this market concept, marking a qualitative leap beyond previous trends in this space, and particularly the idea of machine to machine (M2M). Machine to machine is a long-standing industry term that became popular to describe a network facilitating communications between devices (wired or wireless). Early applications were in telemetry and industrial automation.

IDC characterizes M2M as a precursor to, and now a subset of, the Internet of Things. In the new world, IoT architectures expand beyond the mere communication aspects summarized by M2M. IDC identifies as many as 12 components involved in IoT deployments, spanning from sensors to intelligent systems for network and device management, and from data analytics software and applications to installation and maintenance services. This also means that innovation in the IoT

space is being driven not only by pioneers of M2M, but also by software or solution players coming from the outside.

IDC believes that IoT implementations can bring both tangible and intangible advantages to organizations, with innovation the common denominator. Examples of the benefits coming from IoT deployments range from improvements in maintenance and field service to having a full picture of end customers across mobile devices and retail spaces (omni-channel marketing), from logistic costs savings arising from freight monitoring to enhanced customer experience (in the automotive space, for example).

IOT IN THE CONTEXT OF DIGITAL TRANSFORMATION

In 2015, digital transformation and the digital experience (DX) are key areas of focus for both the vendor and user communities. IDC defines digital transformation as the adoption of two or more 3rd Platform "pillars" (cloud, Big Data/analytics, social business, and mobility) to drive fundamental business or organizational change.

DX is in fact acting as a catalyst to IT innovation taking place on top of what IDC defines as the 3rd Platform. A number of technologies are seeing huge uptake, leveraging 3rd Platform pillars. IDC calls these technologies Innovation Accelerators (IAs) and these include disruptive elements such as cognitive computing, robotics, virtual and augmented reality, and, of course, IoT. Much like those other technologies, IoT is deeply interconnected with 3rd Platform elements. Social media interactions, for example, are one of its data sources, and it pulls data into repositories that often sit in the cloud. It also leverages cloud computing and storage capabilities to store and process information, and triggers Big Data analytics tools to make sense of such information and influence the actions of various stakeholders in the organization.

Unlike cloud or Big Data analytics, which are horizontal in nature, IoT has a very immediate vertical impact. IoT sees its relevance vary greatly from sector to sector. IDC has identified over 87 proven usage scenarios for IoT in Europe – adoption in commercial environments has been strongest in the manufacturing sector and healthcare will grow even faster (from a smaller base). Also, wearable-related IoT deployment in consumer-facing environments will continue to get the majority of the headlines, and will in some cases convert to strong business opportunities for consumer-oriented businesses.

THE ROLE OF MIDDLEWARE AS THE BACKBONE FOR IOT DEPLOYMENTS

A typical IoT "chain" entails several elements. Moving from the edge to the core, the IoT chain includes sensors, aggregation points (e.g., gateways), connectivity, data ingestion middleware, device management and messaging software, data storage and analytics software, hardware, and applications. The very articulated nature of IoT brings with it some challenges. In Europe, some of the main obstacles to IoT adoption include:

- Difficulties for IT/digital departments in making a business case for IoT deployments
- Lack of skills and requirement for external service support in setting up IoT architectures
- Connectivity challenges
- Security and privacy concerns in some verticals and geographies
- Complexity in the back-end software platforms or middleware supporting the architecture

Let's focus on the latter point, which is often overlooked when talking about IoT. IDC defines integration and orchestration middleware as a set of software tools that integrate applications, exchange business transactions between enterprises, transfer files inside and outside

organizations, publish and process events, and monitor the business and process performance of these applications and automated processes (for a deeper analysis see *IDC's Software Taxonomy, 2015*, IDC #256767, June 2015). In other words, middleware is the backbone on which enterprise applications sit, and the glue that keeps them together and allow them to talk to each other and to external data sources.

IDC believes that middleware for IoT will play a key role in two main locations:

- At the aggregation points (gateways) close to the edge of the network. Here, the software's key role is to help communication between the remote applications and the sensors at the edge. This is often achieved by "masking" the sensors' complexity to the application.
- In the centralized back-end environment, either on-premises in enterprise datacenters or, often, in a public cloud datacenter. In this environment, the middleware software broadly overlaps with what IDC defines as platform as a service (PaaS). A strong PaaS solution becomes the real backbone for an IoT implementation and has to:
  - Ingest data
  - Enable communication between various elements of the IoT chain
  - Manage the elements of the IoT chain (connectivity, devices, etc.)
  - Store and analyze data
  - Allow developers to quickly build web or mobile interfaces to visualize and present the information generated by the IoT architecture

With so much at stake, building a solid middleware foundation for both those middleware aspects is the minimum requirement for enterprise IoT projects to be successful. The PaaS back-end in particular can bring the following benefits to IoT implementations:

- Faster time to market through use of prebuilt, pretested software
- Ability to quickly scale the software backbone if data volumes or the number of connected devices increase
- Operating expense savings linked to reduced staff time dedicated to maintenance and patching

EUROTECH AND ITS ORIGINS

Eurotech is a publicly listed solution provider in the M2M and IoT space with headquarters in Amaro, Italy, and global presence across Europe, North America, and Asia. In 2014, Eurotech reported full-year revenue of €63.9 million. In FY1Q15, Eurotech reported revenue of €14.8 million, up 3.8% year on year. In that quarter, around 15% of revenue was generated in Europe, 41% in the U.S., and 35% in Japan. The company employs 370 staff, a large number of whom are dedicated to engineering efforts.

The company was founded in 1992, with the goal of becoming a leading provider in the then-burgeoning "embedded" space. At the time, the client-server era (the "2nd Platform" in IDC's terminology) was in the early phases of its dominance. Eurotech's founders set out to "embed" industry-standard PC technology, primarily based on Windows ecosystems, into industrial, interconnected environments, such as manufacturing plants, logistics, defense, and utilities. Eurotech focused on long-term supported hardware embedding midrange to high-end client CPUs. Initial offerings included off-the-shelf hardware, often targeted at control systems or rugged systems, as well as customization of hardware, firmware, and software.

Starting from 2000, Linux inched its way into maturity. Beginning that year, Eurotech gradually expanded support for open source operating systems and firmware, exploiting their advantages in terms of customization and the fact that they enabled an even longer support cycle.

EUROTECH'S APPROACH TO IOT

Eurotech's leadership perceived a change in the market in 2007, as computing platforms began to quickly shrink in size, marking the beginning of the M2M and "pervasive computing" era. Technology and processes were not mature enough, but the ground was being prepared for the IoT explosion that IDC is now seeing. In 2010, Eurotech started its research and development efforts in the IoT space.

Now, in 2015, IoT solutions are one of the major pillars in Eurotech's overall offering, which is divided into three main areas:

- **Industrial embedded hardware.** This remains the major revenue contributor, and includes gateways, control systems, boards, and servers, both off-the-shelf and customized, all targeting vertical-specific environments.
- **High-performance computing (HPC) systems.** The vendor first forayed into this space in 2012 with the Aurora systems, and recently announced installations at the University of Regensburg and Jülich centers in Germany.
- **IoT offering.** The M2M and IoT portfolio is marketed under the Everyware Device Cloud (EDC) umbrella. Implementation services and hardware aside, the core added value of EDC resides in a proven middleware backbone, covering the two bases discussed above: a gateway layer to make edge sensors accessible and back-end PaaS to glue together applications and gateways but also to compute and store data originated from the edge.

IDC believes that Eurotech's approach to IoT has the following key differentiators:

- Cloud first. PaaS solutions are built primarily for public cloud deployment, with the option of private on-premises deployment.
- Tight focus on optimizing the infrastructure part, cooperating with third-party companies for application front-ends.
- Selection, fine-tuning, and integration of strategic third-party software modules into Eurotech's own intellectual property (Java middleware for gateways, orchestration scripts, etc.), especially in the back-end PaaS space.
- Long experience in the verticals that are most ready for IoT adoption, such as industrial manufacturing, transportation, and defense.
- Open source commitment in both front- and back-end software.

The strategy is starting to pay off and this is being seen in more customer wins. Examples include:

- Eurotech's IoT platform has enabled an Italian public sector customer running a very large exhibition to monitor and analyze visitor flow and to plan logistics accordingly.

"When each and every product sold will be connected to its manufacturer, IoT will be as crucial to enterprises as ERP and CRM are now. That's why we believe in building IoT architectures on open industry standards."

Roberto Siagri, CEO Eurotech

- A manufacturer of industrial chiller systems has built an IoT environment on Eurotech's front- and back-end Everyware solutions. As a result, it is now able to monitor the status of

the air conditioning gear it has deployed in real time, collecting information such as pressure, power efficiency, power usage, and temperature. Eurotech also developed custom, ruggedized gateway hardware for the customer to enable deployment in extreme environments.

▪ In July 2015, Eurotech announced that Ariston Thermo Group, a multinational offering products and services for commercial and consumer heating, used Eurotech Everyware Cloud to support its IoT platform. Eurotech's solutions enable Ariston to connect the heating systems on the customer's premises to a centralized analytics and monitoring platform running in the cloud. While the companies didn't disclose details of the cooperation, IDC believes the competitive advantages of an IoT solution for a company like Ariston can be significant – from dramatically improved customer experience (e.g., heat cost reduction) to savings linked to overhauled business processes (e.g., automated alerts to technicians when a device malfunctions).

RED HAT'S ROLE IN EUROTECH'S IOT BACKBONE

Eurotech first started looking into building the Everyware Device Cloud platform in 2009. The first efforts went into standardizing the middleware on the gateway/device side, which was achieved with a home-grown implementation of the open source Java OSGi (Open Service Gateway initiative). Providing only edge devices was not enough, however. In 2010, Eurotech started to look into the back-end middleware PaaS components required to build a platform. The supplier had already understood that if it was to be efficient and quick to market in the long term, it would have to foster an ecosystem of software partners in that space.

As discussed above, one of the key tasks that a PaaS solution needs to perform to support IoT environments is to automate the communication or "messaging" between different elements of the IoT chain. To do that, two things are needed: a protocol or standard to codify the communication and a "broker" software program.

Eurotech looked at the MQTT messaging protocol as it was familiar with it and it appreciated the fact that it was open source. After selecting MQTT, Eurotech needed a broker software program that was open source and supported MQTT, but also wouldn't need to be continuously updated and maintained by Eurotech. The company tested Red Hat JBoss A-MQ and was convinced by the level of support and the broad range of protocols supported by the software.

The original version of Red Hat JBoss A-MQ was initially developed for enterprise use, whereas Eurotech had a clear IoT deployment scenario in mind. The two companies worked together, with Eurotech providing feedback from the field and Red Hat engaging engineering resources, and this led to a new version of Red Hat JBoss A-MQ that became a

"Extending our messaging backbone with a supported and proven technology like JBoss A-MQ enables us to offer faster and deeper integration into our customers' IT infrastructures."

Roberto Siagri, CEO Eurotech

powerful extension to the messaging element of Eurotech's Everyware Cloud PaaS. The value ultimately resides in the fact that the combination of Red Hat messaging solutions and Eurotech's IoT Integration Platform enables gateways and edge devices to be managed and integrated with enterprise applications through different means, including simple application programming interfaces (APIs).

In conversations with IDC, Eurotech referred to this setup as an "IoT operating system," allowing developers to write applications with a high level of freedom, without having to know and implement low-level hardware code. Eurotech is currently looking at leveraging other elements of

Red Hat's middleware technology to further bolster its capabilities both in its back-end and on its gateway solutions.

The positive experience with Red Hat on the message queueing platform led to closer cooperation between the companies, and enabled Eurotech to discover other aspects of Red Hat's broader portfolio, from Linux and enterprise infrastructure solutions, to IaaS, PaaS, and other enablers of IoT.

In November 2014, the company joined the Red Hat Partner Program, becoming a Red Hat ISV (Independent Software Vendor) Advanced Partner. In June 2015, Eurotech – together with web application partner WebRatio – presented a demo solution for IoT at the global Red Hat Summit in Boston. The setup used Eurotech's platform to demonstrate a people counter and temperature counter application pulling and analyzing data from connected smartphones. It also highlights some of the key benefits of walking the open source ecosystem path for Eurotech, such as:

> *"Working with Red Hat gives us the opportunity to connect with potential software partners relying on the same open source platform and sharing a similar philosophy."*
>
> *Roberto Siagri, CEO Eurotech*

- The opportunity to connect with other ISVs, such as WebRatio, which rely on the same platform and share a similar philosophy.
- The speed of deployment through a prebuilt PaaS component, which is patched and maintained by an infrastructure specialist like Red Hat.
- The extra time for developer resources to be dedicated to differentiate Eurotech's platform, rather than reinventing the wheel.

CHALLENGES FOR EUROTECH

IDC believes that a clear view on the target markets, the exposure to a number of large global markets, and the long experience in the "industrial" world are strong foundations for Eurotech's ambitions in the IoT arena.

Eurotech and Red Hat do face challenges in this space too, however. Some of those challenges are related to the broader risks linked to IoT per se. One of these risks is that improvements to connectivity standards, the expansion of network coverage, and growth in computing power (Moore's Law) will slow down in coming years, creating a bottleneck that would ultimately thwart the promise of IoT.

Another risk is that full-stack providers that deliver mass-scale IaaS clouds – and in some cases also cloud applications – will move much faster on proprietary PaaS technology than the open source ecosystem, attracting critical mass and restricting innovation on top of the cloud.

An additional, more general challenge is in marketing and customer expectations. IDC believes there is a risk that customer adoption could lose steam if Eurotech, Red Hat, and all the other technology providers involved in making IoT real don't clearly highlight the successful business outcomes and the changes in business processes linked to IoT. In this sense, IDC believes that Eurotech could accelerate its momentum in the space by entering strategic partnerships with high-touch, business-oriented consulting companies. This would ensure that the disruptive technology enhancements brought about by IoT are matched by parallel adjustments in customers' processes and business attitudes.

ESSENTIAL GUIDANCE

With tens and soon hundreds of billions of dollars spent every year on IoT environments in EMEA, IDC believes that the opportunity is booming. IoT implementations can bring both tangible and intangible advantages to organizations, and they are already a powerful competitive weapon for suppliers in a number of sectors such as automotive and healthcare.

To be successful, IoT architectures need to link into lots of innovative application and data analytics code, implemented in a fast, iterative process. The best way to create this connection is through a strong middleware and PaaS backbone.

Conversely, IoT is crucial to the future of PaaS and will drive most of its growth in the coming years, opening up new implementation fields for PaaS beyond traditional enterprise environments and the slowly saturating area of consumer-focused mobile apps. This is why IDC expects an explosion in PaaS spending (see *2015 European Cloud Summit: Cloud Enabling the As-a-Service World*, IDC #CL56X). IDC predicts that by 2020 in Western Europe:

- More than half of the tactical users of PaaS will make it a strategic tool
- More than $5 billion a year will be spent on PaaS

IDC believes that Eurotech and Red Hat IoT offerings are in pace with market trends, especially in addressing the growing issue of edge and back-end middleware. Providing that Eurotech can address the challenges described in this paper and deliver the business innovation organizations need, the company has a good opportunity to use IoT to accelerate its top- and bottom-line growth.

Finally, IDC has the following recommendations for end users looking to implement IoT solutions:

- **Assess IoT implementations as holistic projects.** IoT investments will range from infrastructure to connectivity, from application to implementation services. These need to be captured and benchmarked for return on investment (ROI) as a whole, IDC believes, and the full value should be measured in business terms with strong alignment between the IT implementers and the business unit leaders.

- **Look at middleware as a critical component.** The PaaS and middleware components of an IoT project are often where success and failure of the whole implementation will be decided. We recommend that organizations spend a substantial part of their IoT planning time and resources on selecting and setting up a solid software backbone.

- **Consider the advantages of using open standards.** In many cases, IoT projects will encapsulate core investments that can give a business a real competitive advantage. IDC believes that the data hosted in those IT modules will become as valuable as the data currently residing in enterprise resource planning (ERP) systems. On top of that, the intellectual property and know-how linked to IoT architectures will arguably be even more valuable than the data, as it will represent a key differentiator and competitive advantage for companies relying on such architectures. Organizations should think long term and prioritize open source, industry standard approaches when selecting PaaS and cloud ecosystems to support their IoT implementations.

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