Guilherme Spina (left), managing director at V2COM, talks with Leonardo De Moura Rocha Lima, chief technology officer, at the company's headquarters in São Paulo, Brazil.

Java 8 Is Here

FROM SMART GRIDS TO MICROBREWS

V2COM uses Java to connect millions of intelligent devices.
BY DAVID BAUM AND ED BAUM

PHOTOGRAPHY BY PAULO FRIDMAN

The science fiction films of yesteryear often depict a world of pervasive automation. Computers are everywhere, and people are constantly interacting with them. Other, perhaps more-prescient cinematic visions foresee chic living environments without a CPU in sight. The gadgets work autonomously, with circuits and controllers hidden from view.

Fast-forward to the present. The technologies that we use every day are fading into the background as the Internet of Things ushers in a new era of intelligent, seamlessly connected devices. With embedded microprocessors and a wireless communications fabric, today's "computers" require less intervention than ever before, even as they enable a higher degree of automation. At the forefront of this transformation is V2COM, a leading Latin American provider of smart grid technologies and advanced metering infrastructure.

"The Internet of Things is here, now," says Guilherme Spina, managing director at V2COM. "This is an interesting phase as IT moves from the data cen-

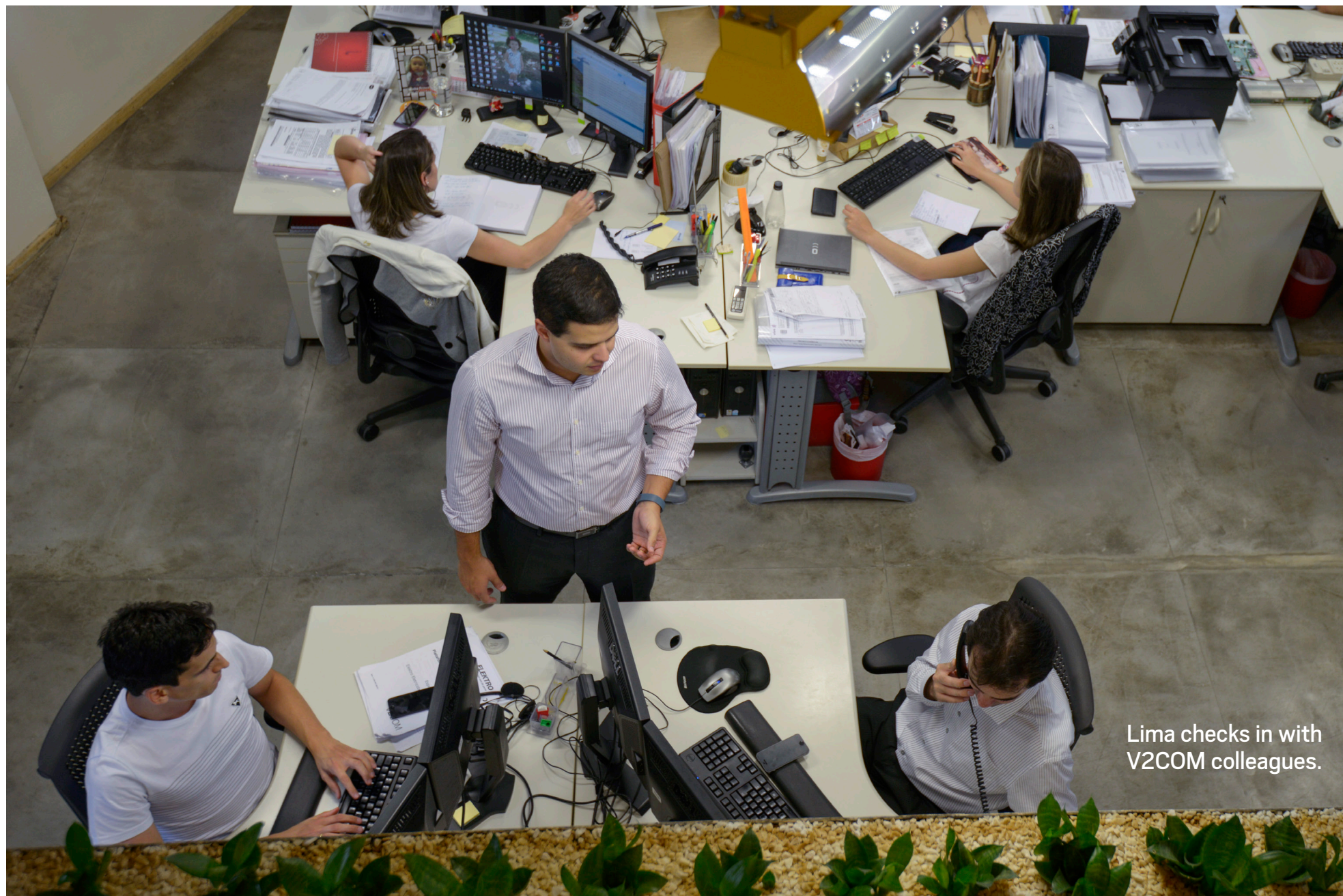Lima checks in with V2COM colleagues.

V2COM
v2com.mobi

Industry:
High technology/
energy

Location:
São Paulo, Brazil

Employees:
50

Oracle technologies used:
Oracle Java ME
Embedded, Oracle
Java SE Embedded,
Oracle Utilities Meter
Data Management,
GlassFish Server Open
Source Edition, Oracle
Database, Oracle
WebLogic Server

ter and the desktop out to the streets to be embedded in all types of things. For example, in the energy industry, companies are replacing dumb meters with smart meters that not only enable people to conserve energy but also to play an active role in providing other services, such as internet connectivity and in-home automation solutions. Java is key to creating and delivering these solutions to our clients."

FROM STARTUP TO INDUSTRY LEADER WITH JAVA
When it was formed in 2002, V2COM was—in Spina's words—a "bootstrap startup." The fundamental ideas upon which the company is based were formulated during the mobile phone phenomenon that swept through Brazil in the 1990s. Spina and his colleagues realized they could leverage the same communications infrastructure that

connects people to automate remote devices.

One of the first orders of business for V2COM's founders was to choose a software platform to manage the interactions between these remote devices and legacy systems. "We chose Java from the beginning," Spina says. "We liked the speed of development and ability to reuse components by writing code once and deploying it many times,

supporting functionality on both the mobile side and the server side. Also, we found that the majority of the people we hired were proficient with Java."

Spina and his colleagues also favored Java for its high level of support for object-oriented programming and for its open source development environment, which makes it easier to add intelligence to a wide variety of end units such as meters, transformers, and circuit breakers. These components work together to manage energy flow at homes and businesses and report back to the energy distribution systems at a utility company's head office.

Lima (center) and Spina (right) get a project update from a V2COM team member.

"A complex set of rules governs these devices, so we need a software infrastructure that allows us to code in a way that is manageable, expandable, scalable, and not too complex," Spina says. "Our system embeds Java in all these different computing platforms, from the back-end applications to the edge devices and pole-top smart concentrators, creating an environment of distributed processing."

Today V2COM offers hardware, software, and services that can reduce losses and increase water and energy efficiency, connecting more than 1 million devices on its platform. Spina believes the electric power industry is ripe for disruption, as analog distribution systems, control mechanisms, and usage meters are replaced by computerized devices. Smart grids can support millions of remote intelligent devices that handle complex operations in the field, all connected to a data center through smart concentrators. These massive, intelligent networks allow electric companies to better manage the flow and consumption of energy, with less equipment and fewer IT and field resources. And for that, Spina explains, you need dynamic man-

agement of energy distribution—something for which Java is innately suited.

LAYING THE GROUNDWORK FOR SMART CITIES

In the energy sector, V2COM's innovative solutions use Gemalto M2M's Cinterion modules with Oracle Java ME Embedded to share energy usage data over cellular wireless networks. These modules communicate with V2COM's Intelligenceware Suite, which uses Oracle Java SE Embedded, Oracle Utilities Meter Data Management, and GlassFish Server Open Source Edition to transmit meter and sensor data to back-end utility systems.

One of V2COM's most successful projects was for Elektro, an energy distribution company in Brazil controlled by Iberdrola Group. Elektro, which serves 2.3 million clients and reaches 5.5 million people, enlisted V2COM to automate its commercial and industrial metering processes. Together the companies created a flexible solution that is modernizing electrical power delivery in Latin America. The project includes intelligent communication modules connected to legacy electronic meters through the public cellular network. In addition to improving energy efficiency and decreasing energy loss, the solution has helped Elektro improve its remote monitoring capabilities and respond to incidents faster. It also helps the company detect fraud and field installation problems that weren't visible before.

Smart meters line the walls of the lab at V2COM headquarters.

V2COM and Elektro consider the venture to be an important step toward a much more extensive set of distributed computing solutions. "The Elektro engagement is exciting because it lays the groundwork for smart-city projects," says Leonardo De Moura Rocha Lima, chief technology officer at V2COM. "Cities face huge challenges including congestion, pollution, blackouts, crime, debt, and rising costs, while competing with each other for investments, jobs, and talent. Technology is the best answer to manage these challenges."

V2COM's smart grid solutions are the first vector for smart cities that will have smart street lighting, smart traffic control, smart video monitoring, and other remote intelligent devices sharing the same architecture and working in an orchestrated fashion. Elektro is using V2COM's solution as a test bed for these highly automated cities.

V2COM and the Java Community Process

All Java technology is developed through the Java Community Process (JCP), an open, industry-led organization chartered with evolving the Java platform. V2COM is on the JCP Executive Committee, through which it has influenced the Java ME 8 specification.

V2COM owes its involvement with the JCP to a fortuitous seating arrangement that placed V2COM's chief technology officer, Leonardo De Moura Rocha Lima, next to Terrence Barr, principal product manager for Java ME, at an Oracle Technology Network community event for Java developers in Brazil a few years ago.

"As we chatted about V2COM's product strategy, technical requirements, and use cases, it became clear to me that the company's general concept and approach to the solution was something that Oracle should support in its architecture," Barr recalls.

Barr and Lima kept in touch. When the JCP program office later contacted Barr looking for candidates for the Executive Committee, he suggested V2COM as a likely member. "They have a lot of experience with embedded Java," Barr says. "We like their vision for the Internet of Things, and we are confident the community will benefit from their contributions to the standardization process."

For example, V2COM's work with modularization makes it easier to partition an application across a wide range of remote devices and reuse the code in different projects. It also simplifies software updates because developers only have to update a single module, rather than multiple modules tailored to each type of field device.

"V2COM's input has been extremely valuable," Barr says. "They are helping adapt the Java ME platform to support a variety of Internet of Things use cases."

"The backbone of tomorrow's smart cities is the distribution network of the electrical utility," Lima explains. "Java is the connecting fabric."

Spina predicts that Brazil will deploy as many as 60 million smart meters over the next 10 years. "Java is a good fit for this massive project because it is available both on the embedded devices and on the server side," Lima adds. "It's the same technology, the same language, and the same feature set."

JAVA 8 IN THE WORLD OF CONNECTED DEVICES

V2COM has come a long way since 2002. Today, with more than 1 million devices connected to its platform, the company is a significant contributor to the Internet of Things, which Gartner predicts will include 26 billion connected devices by 2020.

Beyond the modernization of Brazil's energy infrastructure, says Spina, Java will play a key role in connecting and enabling the Internet of Things on a global scale. In the meantime, as V2COM's distributed computing model transforms the energy sector, embedded Java technology is establishing new patterns and precedents for many industries.

For example, just as Java took complexity out of processes and operating systems, it will eventually simplify networks and network protocols. "Lots of devices utilize proprietary networks. But with Java, we can standardize," says Spina. "The almost 10 million Java developers can easily start programming for the Internet of Things without having to learn a lot of complex network protocols. Today programming mobile apps is cool. Tomorrow it will be Internet of Things solutions."

New features in Java ME 8 are particularly important to this development. "Java 8 permits a distinct separation of services," Spina continues, "along with modularization so we can run different services on the same virtual machines, with a clearer boundary between them."

It's no coincidence that these features that are so valuable in delivering smart grid technology are now part of Java ME 8. V2COM shares its expertise as a member of the Executive Committee of Oracle's Java Community Process (JCP).

Through the JCP, V2COM contributed key concepts to the Java ME 8 specification. (See the "V2COM and the Java Community Process" sidebar.)

V2COM's work with Java took a refreshing turn when company directors realized they could use the same distributed infrastructure to accurately monitor and control refrigerator temperatures—a crucial variable in brewing beer.

"Our home-brew project is just one example of how flexible this technology can be," Lima says. "In addition to monitoring beer temperature, it could be used in medical laboratories to control the temperature of vaccines or in other sensitive environments."

Whether V2COM is monitoring electrical usage, the temperature of beer, or movements in a video field, it uses the same basic Java infrastructure to communicate between the end devices and the central controllers.

"It's the same set of Java services up to the application layer on the embedded device," Lima summarizes. "In the fast-growing Internet of Things, Java can be the common connecting technology for all these possible use cases." **</article>**

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Based in Santa Barbara, California, **David Baum** and **Ed Baum** write about innovative businesses, emerging technologies, and compelling lifestyles.

Left to right: Guilherme Vallerini, Lima, and Spina taste the beer they make at V2COM's headquarters.