**THE MAN BEHIND
THE CURTAIN**
Jahangir Mohammed
didn't create the
internet of things—but
his company, Jasper,
runs the software
connecting much of it.

LORD OF THE THINGS

When the future finally arrives, Jahangir Mohammed will be sitting there, reeling it in

By **WILL BOURNE** Photograph by **RAMONA ROSALES**

MY SHIPMATE IS NOT HAPPY. It isn't the 100-degree heat, although his stubbled brown skull is visibly sweating. And it's not the fact that we have caught exactly one tiny fish this August morning (a five-inch kokanee salmon we discovered dead on the hook). It's not even the paramilitary vibe of the *Koke Addiction*, a well-seasoned, 20-foot Boulton aluminum fishing skiff—bristling with antennas and nets and rods and rod holders—that would have looked right at home hunting for Viet Cong, circa 1970.

No, the problem here on the *Addiction* is the machines.

They're everywhere: There's the TR-1 autopilot system, the Garmin fish finder, the side-scan sonar, the shortwave radio, four machine-gun-like black Cannon electric downriggers, and the 200-horsepower Yamaha outboard paired with an 8-horse Yamaha trolling motor (with a tethered remote control). And then all around us are the damn Jet Skis, the boats pulling inner tubers and water skiers, the houseboats, and the other fishing charters. If you like your nature as God intended it, in other words, Lake Berryessa—which looks from space

like a blissful blue parallelogram just north of Napa, California—is a special slice of hell. "This," says Jahangir Mohammed, glumly, "is not how fishing should be."

That's quite a statement, coming from the CEO of Jasper, a 400-plus-person firm built on a love of the mechanical, the automated, and the data-driven. Jasper likes to call itself "the 'on switch' for the internet of things," the increasingly vast body of devices that now speak to one another over the internet. And that's a pretty apt description. With the cost of computing power and internet connectivity diminishing rapidly, networked intelligence is turning up just about everywhere these days: the moisture sensor on an apple tree, an assembly line full of industrial robots, the watch on your wrist, or the Ford you drive home every night. And Jasper, valued at $1.4 billion and widely expected to go public soon, is the reptilian brain for much of that network, ensuring that the nodes are on and aware and functioning as they should be.

"The internet of things is not about things," says Mohammed, a burly Indian with meaty hands and a beaming gap-toothed smile. "It's about becoming connected." Once connected, each "thing" is "part of a bigger fabric," he says. "And you can make money off the fabric by making the thing a conduit through which services are delivered. So that means you need software to create, launch, manage, bill, and monetize the service. That was our original insight."

Jasper, based in Santa Clara, California, keeps that conduit functioning smoothly. "We don't make the device" that generates the data flowing through the IoT, Mohammed explains. "We don't make the application" that collects data for the customer. "And we don't make the network that transports the

"We built a patchwork quilt around the world" is how Jasper investor Bruce Dunlevie describes its cellular technology.

data. But we make the last part, the software. The function of the software is to pull the other three pieces together."

If Jasper is a rather gray, faceless entity (outside a tiny coterie of IoT dorks, few know the company even exists), it has nevertheless used the $204 million it has raised to date to stake out an ingenious position: the middle. And while the company is "too techy and in the weeds" to attract much notice outside of Silicon Valley, as Forrester Research VP Frank Gillett explains, there's a reason "investors there are gaga about them." That reason is the fact that the IoT is not some theoretical marvel lying just over the horizon—it's already here, it's enormous, and its growth is explosive, especially in the business-to-business sphere Jasper inhabits. McKinsey estimated in June that the larger IoT will have, "across the global economy, ... a total potential economic impact of $3.9 trillion to $11.1 trillion a year

by 2025." Cisco puts that number at $19 trillion. The general consensus seems to be that something on the order of 50 billion devices (including PCs, laptops, and cell phones) will be connected by that year.

Mohammed, 46, is obsessively focused on being in the midst of as many of those connections as he can be. Since co-founding Jasper in 2004, he has been building out a global footprint that now comprises a partner network of more than 100 wireless carriers on the one hand, and more than 2,700 of their customers on the other: Amazon, GE, Starbucks, Coca-Cola, and nearly every automaker—they all rely on Jasper's software platform, which they access via a simple dashboard called Control Center. The dashboard allows each company to monitor its entire universe of devices remotely, whether that means all of Starbucks' refrigerators or the network of gunshot-detection monitors operated by Newark, California–based ShotSpotter. (In addition, it has major strategic partnerships with Microsoft, Salesforce, and, as of October, IBM.) Jasper gets paid by the carriers but works closely with their customers, managing not only the internet connections of their "things," wherever they may be, but also performing core services such as making sure the things are working properly, turning them on or off, updating software, and tracking data use. So when a GM car offers up a menu of music from Pandora, or an engine-service alert via OnStar, or a video streamed from Netflix, it is Jasper that makes sure each connection is working and secure, and tracks and bills for every megabit of data flowing through that connection.

That may sound unsexy in the extreme, but "Jasper is quickly becoming a global standard," says Gartner Research vice president Eric Goodness. "There are millions and millions of connections that are achievable, that can be torn up, torn down, built up quickly and effectively, because of Jasper." What's more, Jasper gets a cut "on every machine-to-machine connection [it maintains]," he says. "What they do is very, very important."

Mohammed's strategy has essentially been to scale Jasper quietly, one partnership at a time, to the point where no one can catch him. Along the way, he has put the company at the center of the next big technological phase change: In the same way Dell and Microsoft profited from the move from mainframes to desktops and laptops, and Apple from the rise of cell phones, Jasper stands to ride the next wave of miniaturization—the penetration of computing power and connectivity into the tiniest artifacts of daily life. "The architecture of computing is becoming one of plenty and atomization," says David Rose, CEO of Ditto Labs, an image-recognition software platform, and author of *Enchanted Objects,* a book about the future of the IoT. "Instead of the consolidation of functionality in the phone, you have this functionality that comes embeddable in jewelry and cars and nearly everything. I think it is the biggest macro trend of our time."

Mohammed recognized that trend earlier than just about anyone. He co-founded Jasper four years before IBM began its push to build a "Smarter Planet" and a full eight years before Cisco announced its "Internet of Everything" campaign. And

falling fast

TRT

Jasper also has

Do we need to keep about this? Did earlier

puts it

● JASPER-CONNECTED DEVICES

The company helps manage tens of millions of cars, trucks, appliances, and home sensors.

Businesses in more than

100 COUNTRIES

run their internet of things services through Jasper.

Jasper's platform processes more than

11 BILLION

"events," including text messages and data sessions, every month.

27

mobile operator groups are Jasper customers. They represent more than 100 operator networks, including AT&T, Telefonica, and China Unicom.

$150 MILLION

Amount Jasper reportedly wants to raise in its IPO, according to *The Wall Street Journal*

1 BILLION

Number of devices Jasper aims to connect to its platform by 2025

Jasper runs IoT services used by more than

2,700

companies, including Ford, GE, Coca-Cola, Sony, Starbucks, and Amazon.

now, he says, after more than a decade of very stealthy building, and with his company successfully enmeshed in the business operations of thousands of brands (and reportedly on the verge of an IPO), "we are about ready to come out."

O THE AVERAGE CIVILIAN, the internet of things is largely synonymous with what's often called the connected home, a tired meme used to describe the house of the future that sends reminders from the fridge to your smartphone to pick up more almond milk, or streams weather alerts to your umbrella stand. These ideas have been in the air for decades, since long before MIT's Kevin Ashton even came up with the term *internet of things* to describe the universe of interconnected doodads he felt would one day surround us. And plenty of them are actually here: Nest home thermostats adapt to our behavior; GlowCaps pill bottles remind patients to take their meds; ADT home-security systems can learn your body's schedule and adjust accordingly.

As Argus Insights noted back in June, however, demand around the connected home—remote-controlled light bulbs, smart sprinklers, garage-door openers that anticipate your arrival—had fallen by 15 percent from a year earlier, despite investments in the sector by Google, which bought Nest, and Samsung. And that's not so surprising: Many of the consumer products thrown at us have proved to be dull, stupid, time

consuming, or technically frustrating for the typical human. There's a reason we have hands, after all.

Yet the commercial, B2B incarnation of the IoT is metastasizing. Enterprises around the world are recognizing and investing in the potential of cheap internet connectivity to reduce costs and generally make their businesses smarter and more efficient. Having a network of intelligent things—whether deployed across the globe or just a factory floor—allows companies to save money by anticipating technical or mechanical failures; remotely configuring, rebooting, or activating components; and managing complex logistics and supply chains. The data aggregated from those networks also can provide exceptional—and exceptionally valuable—insight into how reliable a production line is, say, or into consumer behavior and preferences. ("The potential money to be made from IoT awareness is apt to make today's advertising dollars look small," writes New School lecturer Sean Costigan.) And, as auto manufacturers have discovered, baking an internet connection into a piece of dumb metal can turn it into a data-rich services hub, opening up many new revenue streams.

All of those benefits are premised on a secure, resilient connection between the individual things and the larger network—precisely what Mohammed and his team have created. "Jasper is *so* integral," says Tavis Szeto, a senior director at ChargePoint, which depends on Jasper to manage and monitor connections to its 25,000-plus electric vehicle charging stations. "They're

not the consumer-facing piece of the IoT, but if they're not there in the back end, working with companies like us and all the telcos and the GMs of the world, it doesn't enable us to offer these really cool services that the end consumer really wants."

When I first reached out to Jasper, little enough had been written about Mohammed that I based my suggestion that we spend a day on the water together on scraps of online bio describing him as "a fisherman." Weeks later, when we finally climbed into his black BMW, packed with dirty coffee cups and car seats for his daughters, it was clear something had been lost in translation. "I grew up eating fish five days a week," he said. "Fishing was the staple—that's how most people earned their living. This was where you find your food."

Mohammed explained that he'd grown up in a town of about 10,000 people, Ammapattinam, near the Bay of Bengal, roughly 300 miles south of Chennai. His father was not a fisherman—he owned a grocery store—so Mohammed was "fortunately" spared a life at sea. But it was a humble start.

"We lived by the coast," Mohammed said as we sweltered in a line of Audis and Mercedes crawling north to Napa for the

As the internet of things expands, Garg predicts, Jasper will grow 50 or 60 percent a year "for a long, long, long, long time."

weekend. "In fact, sometimes when the seawater rose up, the waves hit our houses. I come from a village where the school only went to sixth grade; you sat on the floor until you got to third grade. I didn't know how to read a clock until I was 8 years old. Time didn't exist."

Stoutish, with a 5 o'clock shadow encircling most of his head and a still-pronounced accent, Mohammed radiates a tranquil, detached kindness. At the same time, he has an engineer's tendency to dial in on even the smallest physical details of his surroundings. At one point aboard the *Addiction* he took a moment to marvel at his Ocean Pacific flip-flops, which were apparently bought for our trip. "Normally, I go in for leather," he said. "But these *hold* your foot. They are incredible."

Mohammed became the first of his family to graduate high school by staying with nearby relatives, and then won a spot studying engineering at Coimbatore Institute of Technology, 100 miles away. ("It was a government school, so you don't have to pay too much," he says.) There, as he was finishing up his final year, a local business owner asked him to design and build a mechanical system for cutting decorative stone tiles. Just like that, the bug had him. "It didn't become commercial," Mohammed says, "but it gave me a taste. I loved the independence. So I said, 'Geez, I really don't want to work for anybody. I want to be my own company.'"

On leaving CIT in 1991, an $8,000 scholarship in hand, Mohammed emigrated to Montreal to pursue his master's in engineering at Concordia University. He stuck around for a couple of years after graduating to work on "the first digital cellular systems" at Nortel Networks, and then set sail for Bell Labs in New Jersey. By the time he had moved west a few years later to become a systems engineer at Philips, Mohammed was not only an expert in cellular telephony, but also an entrepreneur at heart, looking for an opening.

At Bell, the prevailing sentiment had been that "most people in the world were going to be connected through mobile phones," Mohammed says, adding that the idea was ahead of its time, given that only some 40 million people in the U.S. had them back then. "But the guys around me believed in it," and it took hold of him, too. "Then, one day I was coming back from a fishing trip to Lake Tahoe and I saw this mother strolling with her son on a leash. A 4-year-old boy. He's on a *leash*." Although he laughs now, Mohammed says the moment made its mark: "It was a brutal scene. Obviously, the mom was paranoid about the kid. I said, 'Why not put a little device on his shoe so the mother knows where the kid is in case he gets lost?' So that was the idea."

The child tracker didn't fly (he tried and failed to sell the idea to Nike, which was still a decade away from announcing the Nike+ sensor), but it wasn't long before Mohammed left Philips to start his first company, Kineto, which allowed people to transfer calls back and forth between cell phones and Wi-Fi. "I had no money," he says, but Sutter Hill Ventures and Venrock funded the company. "I remember telling my wife, 'Wow! They wrote a $3.5 million check. Now, if I took this and went to Ammapattinam, nobody would ever know.' Then she said, 'Do you have the check?' and I said, 'No, I don't have it, but it's in the bank.' Then it crossed my mind: Maybe it is not that easy. So I went to withdraw one dollar. And I could withdraw one dollar. I still have it framed at home."

YOU COULD TRAVEL A LONG TIME through the beige precincts of Silicon Valley without finding an entrepreneur who calls his VC "my soulmate." But that's how Mohammed describes Gaurav Garg. He was a partner at Sequoia Capital at the time Mohammed was raising a second round of financing for Kineto; he eyeballed the company and offered to invest, but "at a very low valuation," says Mohammed, who declined. Yet the two men "kind of clicked," and when a year later the Kineto board pushed Mohammed out in favor of a more experienced CEO, they began plotting their next move. ("Now that I've got another 10 years under my belt," Mohammed says, "I think the board did exactly the right thing." Kineto was acquired in 2014.)

I met Garg in his just-minted offices in Menlo Park. Slight, large-eyed, and precise, he wore a crisp blue dress shirt, tightly belted black slacks, and ergonomically sensible Mephisto dress

shoes. *After growing up in Ahmedabad, India,* Garg ~~grew up more comfortably than Mohammed and~~ came to the States to study electrical engineering and computer science at Washington University in St. Louis. At Sequoia, he worked on investments including Aruba Networks, FireEye, and Jawbone; in 2012, he left to start his own firm, Wing Ventures, which is a bit like walking away from a no-lose $1 billion bet to throw dice in an alley.

Mohammed's ouster from Kineto had done nothing to contain his fascination with the internet of things. In fact, everything around him tended to reinforce the idea that an interwoven world was inevitable: "I'm seeing the traffic lights, the Coke machines, the cash registers, the kid [on the leash], and just wondering, why aren't all these things connected?" he recalls. He and Garg began laying the foundation for what would become Jasper. "We spent eight months iterating before going to go raise money," says Garg, who hasn't invested in Jasper at Wing but remains a board member and a close confidant of Mohammed's. He brought in Sequoia; "two other investors, both very well known," came as well. One of them was Bruce Dunlevie, who helped found Benchmark Capital and sits on the Stanford University board of trustees.

To hear Dunlevie tell it, the whole idea of connected devices, known then as M2M, or machine to machine, was distinctly unpromising at the time. "There were maybe a dozen venture-backed things for vending machines and that kind of thing, calling for more cans of Coke," he says. "They hadn't worked. It wasn't a very vibrant seam in the mine." The potential might have been massive, but to tap it—to colonize the most strategic piece of turf, namely the center—he, Garg, and Mohammed had to do the seemingly impossible: "We had to become a phone company, a member of the priesthood."

In other words, because Jasper's mission is to deliver effortless, fail-proof connections for things—even when those things move from one country or hemisphere to another—the company's first and defining challenge was to create a global, redundant system ensuring those connections. And while there are a number of "transport technologies" that will connect a thing to the internet, including Wi-Fi, satellite, and LPWA, the most obvious starting point for Mohammed was cellular—specifically GSM, the current global standard. In the end, the team developed what Dunlevie calls a "global SIM," a carrier-agnostic SIM card technology that allows companies using Jasper to pull down a signal almost anywhere on earth, moving ~~seamlessly~~ from one carrier to another on the basis of reliability, coverage, and price. (Because Jasper's platform is "transport technology agnostic," Mohammed says, it can easily be extended to other cellular technologies or to satellite, Wi-Fi, etc., if

MOHAMMED'S ADVICE

COURT THE SENIOR VC PARTNER
"You want to work with someone who doesn't have to beg all his associates for support in future rounds."

DON'T SWEAT THE EARLY RETURNS
"There is no point obsessing early on about what is going to generate revenue or what is going to be profitable. Ninety percent of all of that will be grossly wrong. You still need to do it, but the real purpose is to iterate and get better."

FEAR NICE CUSTOMERS
"You go talk to them, and they have so much empathy for this entrepreneur who has left his job and is busting his tail to make something work—they tell you what you want to hear instead of what you need to know. It's just not helpful at all."

SECURE THE RIGHT THINGS
"People go, 'Somebody is going to look at your refrigerator and know what's in there, what you're eating, and so on.' Come on. I realize people are hacking into cars—safety is important, most certainly. But I have way more important things in my laptop than in my refrigerator."
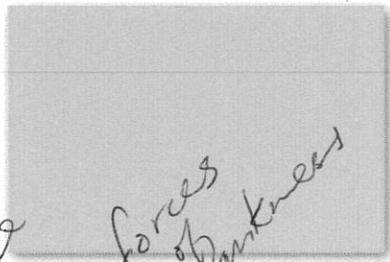
and when the demand arises.)

Of course, building something is not the same as getting anyone to care that it exists. By early 2005, with only a few mobile operators, including T-Mobile, signed on as distribution partners, Jasper had yet to persuade a business to use its technology. The paradox was a classic one—getting someone to be the first to say yes. Mohammed finally broke through during a visit from the CEO of Telogis, a small shipping company. "We show that it's a fantastic system," he recalls. "'Here is a device, you turn it on, it shows up on the platform, it automatically activates service and starts a billing cycle. It's beautiful!' And he looks at us and says, 'Ah, very good, very good. This is useful.' Then he goes, 'So tell me your largest customers and how many devices you have on the platform.' I pause for a moment and say, 'You are the first customer—but I have many that are just waiting!' He obviously is shaken, so I take him to an Indian restaurant and make him feel a little bit more guilty. Both of us are entrepreneurs leading young companies, so he appreciates my candor. He says, 'Yes, we'll try.' Nearly a decade later, they are still customers."

Today, Jasper works with 27 mobile groups representing more than 100 carriers—and that set of relationships represents its most powerful intellectual property. "We built a patchwork quilt around the world," explains Dunlevie. "We've gone from being unable to get a four-by-four-foot booth at the Mobile World Congress in Barcelona to being a keynote speaker." And along the way, Jasper has locked in a competitive advantage that seems all but insurmountable. The company may currently have only "high-single-digits market share," according to Garg, but that's only because the market is so unformed. Compared with anyone else's, that's "massive market share," he says, noting gleefully that there is "an enormous competitive moat," and that the barriers to entry for would-be competitors are "brutal."

Jasper won't talk about whether it intends to go public, although its decision to speak at length for this story is possibly not unrelated. *The Wall Street Journal* reported in late 2014 that an IPO could happen in 2015, and that Jasper would look to raise $150 million on a "multibillion" valuation of the company. The *Journal* may have been wrong on the timing, but Jasper hasn't publicly denied the general thrust of its reporting.

That said, there are potential threats to Jasper's world domination. Not least among them is a growing uneasiness about the security of the IoT itself. This past summer, *Wired* pulled a stunt involving two hackers who managed to take control of a Jeep Cherokee remotely, in an effort to demonstrate that the IoT is an accident waiting to happen, that any device with an IP address is vulnerable

[handwritten marginalia: "Why change? forces of darkness" "hate mischief!" "talks about its invisibility"]

to mischief, Mohammed points out that Jasper uses "GSM mobile phone security, which is a very, very mature protocol." But other "layers" in the system are more vulnerable, says Macario Namie, Jasper's VP of strategy, who has been at the company since 2007. "Security is a deep concern for the industry. It's not good for us to have Jeeps get hacked—that scares people. The car is probably the scariest example, so we spend a lot of time with the car manufacturers. Most haven't built connected products before, so a lot of them are just now learning what they really have to do." In the meantime, there's no denying that the field is young, the holes and bugs are many, and the potential disasters are legion.

Jasper has its own specific challenges as well. It doesn't sell directly to businesses, leaving its growth hostage to the cellular carriers that are its actual customers. Its brand is weak-to-nonexistent as far as consumers are concerned, which could doom its chances of becoming a hot stock. Goodness, the Gartner analyst, says Jasper wants to "put a hitman on me" every time he compares it with better-known software providers. And competing platforms developed internally at huge companies like Vodafone and Verizon have so far denied Jasper access to their millions of customers. But while Goodness "would be surprised to see it go IPO," he is a Jasper believer. Even if it remains a quiet, grayish brand, the numbers suggest that "Jasper has a great future ahead of it," he says. "There really are no other serious competitors in the market. I think they're getting to a size where a much larger player in the market is going to have to make a buy decision soon—they may become too expensive if they did go public."

For his part, Garg sees "the geometry of the logarithmic effect" pointing to a very bright future. "Just in the core connectivity [business]," he says, his voice dropping to a near-whisper, "we have the opportunity to grow at 50 percent, 60 percent a year, organically, for a long, long, long, long time."

BACK ON THE *ADDICTION,* Mohammed is mesmerized. The heat is oppressive, the fishing pointless, but he has become transfixed by the micro-piston that moves the trolling motor from side to side. It is a simple, elegant bit of engineering, and he clearly appreciates it.

The ability to extract some measure of contentment from the simple, even the mundane, is very much a part of Mohammed's charm: Small things matter. Just being alive is sometimes enough. The night before, I'd told him that I didn't think money would change him, that he wouldn't even know how to spend the fortune likely headed his way. "I think you have me there," he'd replied. In the car the next afternoon, after we jump ship, he returns to the theme: "One of the things I'm really blessed with is, I've seen such a spectrum. Now, when I come across somebody that's born really rich, I go, 'It's not a fortunate thing, because you miss out on life's spectrum. You want to see the colors. You want to see the variety. You want to see the extremes.'"

There have been plenty of extremes getting here from the Bay of Bengal, a journey not without its frustrations. Staring out at I-80, Mohammed talks about the conundrums of starting a business: getting funding when you don't have a product, winning that first customer when you have no others to point to. "This whole bloody thing of building a company is nothing but a whole sequence of chicken-and-egg problems," he says. "That's all it is." Chuckling, he adds: "My greatest advice for entrepreneurs is, 'Your success simply relies on your tenacity—and your resolve to break that egg and get the first chicken out.'"

It looks like his chicken is going to be just fine. ○

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