ThinkEdge

Accelerating the path from data to intelligence

Edge computing in today's smarter enterprise

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Smarter technology for all

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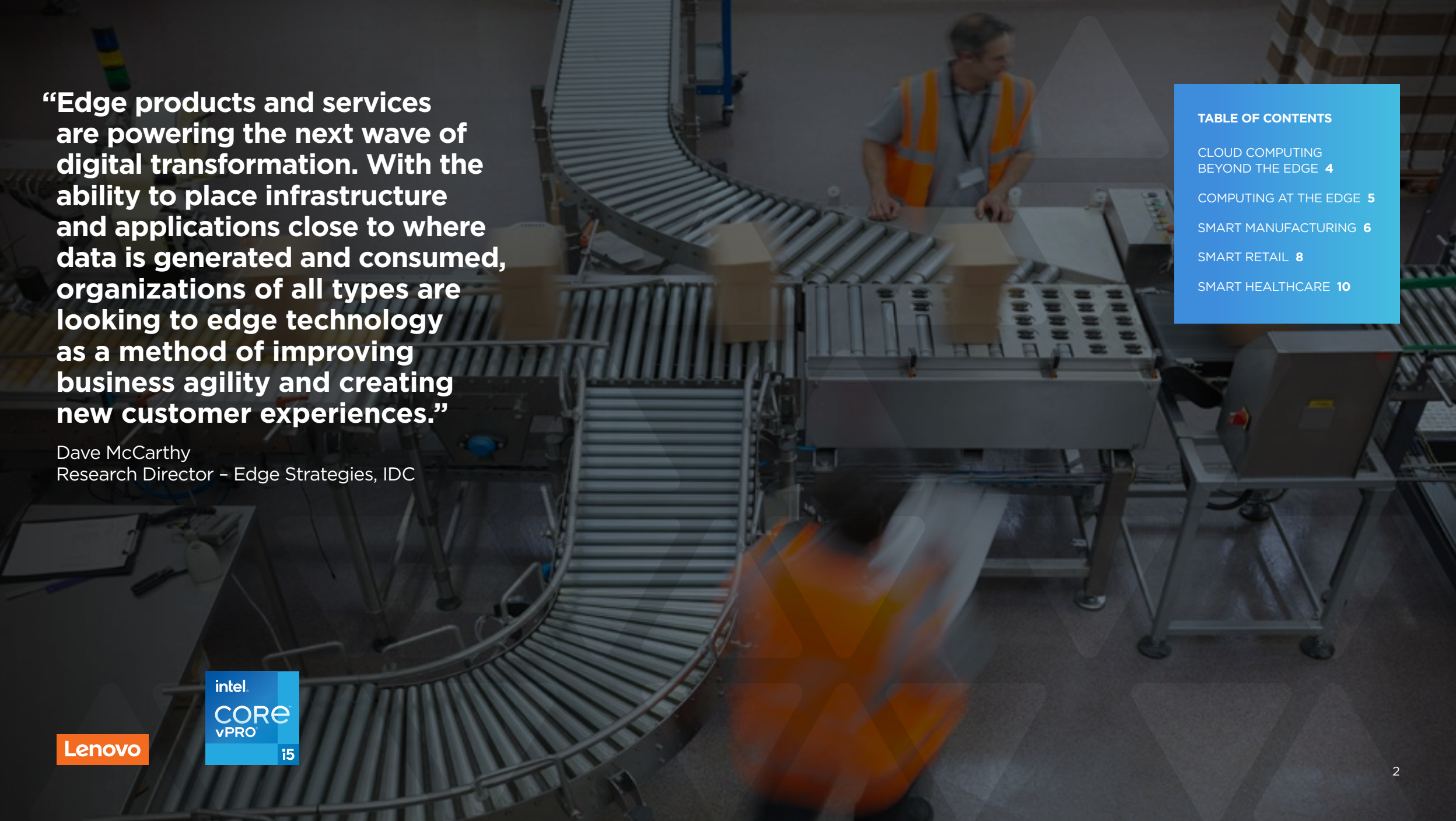

“Edge products and services are powering the next wave of digital transformation. With the ability to place infrastructure and applications close to where data is generated and consumed, organizations of all types are looking to edge technology as a method of improving business agility and creating new customer experiences.”

Dave McCarthy
Research Director – Edge Strategies, IDC

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The worldwide edge computing market is projected to reach $250 billion in 2024.[2]

We've never had more data — and less intelligence. In 2021, almost 75 zettabytes of data will be created, captured, copied, and consumed around the globe. That's 75 trillion gigabytes, a stunning 25% jump from 2020.[1]

And things aren't slowing down: The amount of data created over the next three years will be more than the data created over the past 30 years.[1]

Traditional cloud computing architectures are powerful, but they're struggling to keep up with the pace of today's smart enterprises. These enterprises are seeking ever faster ways to turn data to insights and insights to intelligence. Speed is the "new currency of business," as Salesforce's CEO Marc Benioff likes to say.

Edge computing holds the promise of delivering the speed and agility smart enterprises are looking for. It deploys compute technology in close proximity to the "edge" — the location where things and people connect with the network — and bridges the physical and digital worlds.

Let's look at cloud and edge computing architectures and discuss real-world edge applications in the fast-moving manufacturing, retail, and healthcare sectors. Where speed and agility matter, we'll see that adding edge computing to your architecture will almost certainly deliver a competitive edge.

Cloud computing beyond the edge

Cloud computing is characterized by its centralized approach to data processing. The system's endpoints are constantly collecting data and transmitting it, sometimes hundreds or thousands of miles, to an at-scale data center for analysis. As needed, the system sends back new instructions, feedback, or other results.

This all-eggs-in-one-basket approach has merit in many applications, but it's far from perfect for everyone.

Consider its limitations:

Unreliable or slow connectivity
Bandwidth and latency can be challenging, especially in industrial, healthcare, and commercial settings where responsiveness is essential.

Bandwidth costs
There's a cost consideration as large amounts of unprocessed data are transmitted across public and private networks.

Data security risks
Sensitive data is potentially exposed anytime it travels across the web for processing.

Single point of failure
Network or cloud outages can have a serious impact on overly centralized systems.

Computing at the edge

Edge computing helps you optimize how and where data processing takes place. You may choose, for instance, to process raw data locally, only uploading extracts to the cloud for storage. Or you may choose to do the bulk of your processing locally and minimize use of the cloud altogether. This flexibility creates options and is valuable.

What else can make edge computing attractive?

Improved responsiveness
With little or no distance between data generation and processing, speed from data to decisions accelerates.

Reduced bandwidth costs
Less data transmission over public and private networks can lead to reduced network expenses.

Enhanced security
Sensitive data can be processed locally and needn't ever be exposed as it travels across the web.

Less risk of system failures
Localized, distributed processing reduces vulnerability to network and cloud disruptions.

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Around 10% of enterprise-generated data is created and processed outside a traditional centralized data center or cloud. By 2025, Gartner predicts this figure will reach 75%.[4]

Smart manufacturing

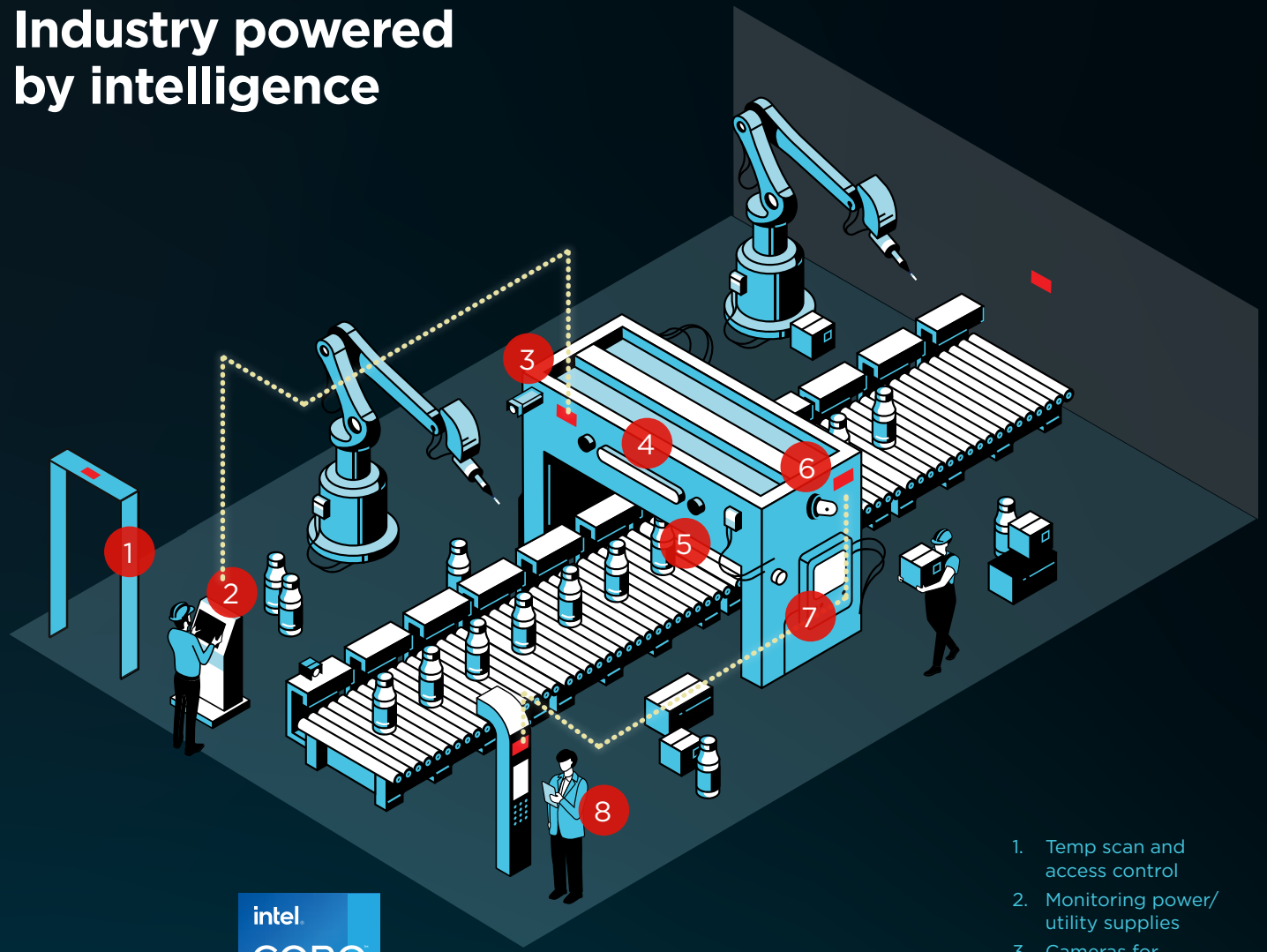
Edge computing is an especially compelling solution in manufacturing, energy, logistics, and other industrial settings.

Here, connected sensors, cameras, actuators, valves, thermostats, and other devices are already generating torrents of data every day. Local and remote operators rely on this data for intelligence related to process control, predictive maintenance, productivity optimization, and supply chain management.

This real-time information and mission-critical data needs to be received and acknowledged quickly. A two-second retransmit time can be the difference between simply stopping the line when the system goes down and having to rework 1,000 products because the information wasn't delivered fast enough.

Additionally, edge computing reduces your reliance on slow and unreliable networks — a common problem in remote locations like oil wells and wind farms. There'll likely be network-related cost savings and security benefits from a move to distributed local processing, too.

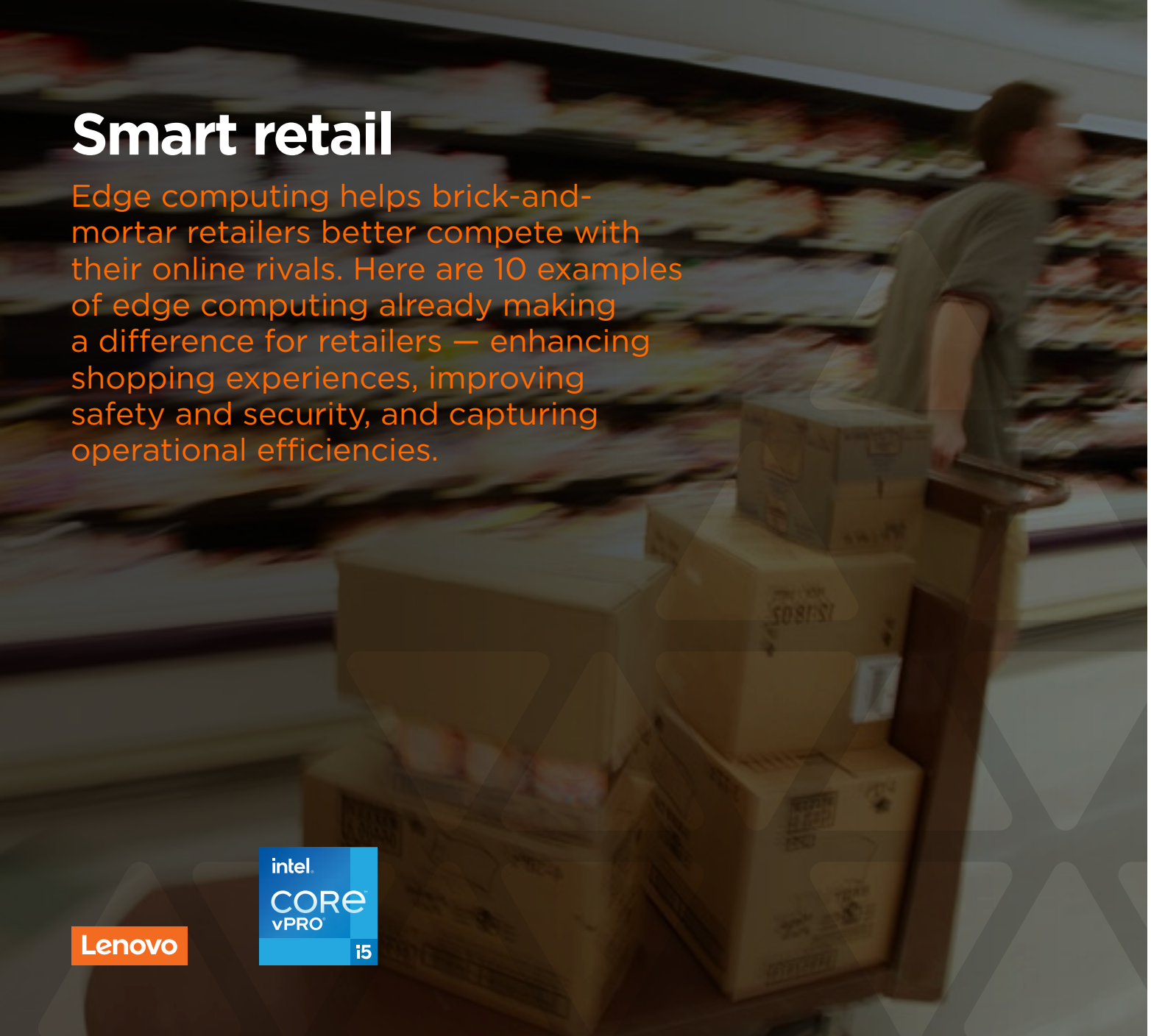
Industry powered by intelligence



“Edge computing will complement existing cloud infrastructure by enabling real-time data processing where the work takes place: motors, pumps, generators, or other sensors. By integrating edge functionalities with existing cloud infrastructure, organizations will worry less about logistical IT considerations and, instead, focus on rethinking what’s possible in a smart machine.”

Keith Higgins, Vice President
of Digital Transformation, Rockwell Automation

1. Temp scan and access control
2. Monitoring power/ utility supplies
3. Cameras for security/safety/ quality inspection
4. Sensors for line speed
5. Managing condition-based operator alerts
6. Safety/shutdown alerts
7. AI/ML for productivity and predictive maintenance alerts
8. Monitoring inventories/ automated replenishment



Smart retail

Edge computing helps brick-and-mortar retailers better compete with their online rivals. Here are 10 examples of edge computing already making a difference for retailers — enhancing shopping experiences, improving safety and security, and capturing operational efficiencies.

Retail edge computing: 10 winning ideas

Camera applications

- **Self-checkout.** Cut shrinkage and errors with cameras that detect unscanned items.
- **Inventory.** Reduce costly overstocks and stockouts with real-time inventory tracking.
- **Health and safety.** Improve safety with smart cameras that monitor in-store conditions.
- **Merchandising.** Enhance store layouts with data-driven traffic flow analysis.

Device applications

- **Point of sale.** Speed checkouts and improve service with smart terminals.
- **Maintenance.** Monitor refrigerators and other equipment for signs of failure.
- **Automation.** Deploy autonomous warehousing robots to reduce labor costs.

Informed customer applications

- **Personalization.** Deliver personalized promotions and information to smartphones.
- **Customer service.** Improve service with store floor kiosks and tablets.
- **Digital signage.** Inform and excite shoppers with immersive multimedia signage.

Bringing intelligence to retail

“It [edge computing] will enable retailers to take advantage of advancements in AI, computer vision, machine learning, augmented reality, IoT, and robotics. The benefits include becoming more responsive, agile, and customer-focused.”

Joe Jensen, General Manager of Retail Solutions, Intel®

1. Loss prevention
2. Self-checkout
3. Social distancing
4. Wayfinding and promotions
5. Smart shelves
6. Demand-aware warehouse
7. In-store layout optimization
8. Digital display and video analytics
9. Remote refrigeration monitoring
10. Energy management
11. Food temperature compliance
12. Temp scan and access control
13. Real-time traffic monitoring

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Smart healthcare

Edge computing accelerates the processing of data from monitoring tools, imaging platforms, research systems, and other sources, ensuring the data is accessible and useful to clinicians in real time.

Dr. David Klonoff, a diabetes researcher from Mills-Peninsula Medical Center, is a proponent. He notes, “Edge computing is most useful for devices whose data must be acted upon immediately because there isn’t time for it to be uploaded to the cloud. An example would be intensive care unit sensors that require instantaneous analysis of data and execution of commands, such as closed-loop systems that maintain physiologic homeostasis.

As sensors become more sophisticated, we’ll see similar closed-loop control of devices that monitor insulin levels, respiration, neurological activity, cardiac rhythms, and GI functions.”[5]

At the same time, edge computing aligns with healthcare’s high standards for security. Patient and other sensitive data never has to leave your secured network and cloud. The distributed nature of edge architectures can also reduce your vulnerability to outages.

Accelerating clinical decision-making

> **"The key benefit of edge computing is the ability of devices to compute, process, and analyze data with the same level of quality as data analyzed in the cloud, but without latency."**

Dr. Shafiq Rab, Senior Vice President and CIO, Rush University Medical Center

1. Wayfinding and promotions
2. Cameras for security/safety/ quality inspection
3. Temp scan and access control
4. Staff resource utilization/scheduling
5. Lobby check-in/ visitor management
6. Medical equipment integration and remote monitoring
7. Asset tracking/ utilization
8. Patient monitoring/ telemetry
9. Remote patient monitoring

Get from data to intelligence faster with Lenovo

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- Contact your Lenovo Account Representative or local Business Partner
- Visit www.lenovo.com/ThinkEdge
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SOURCES

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