

The Future of Technology is at the Edge

When the compute comes to the data

Anthony Sayers – ThinkEdge EMEA

Today's Agenda

Exploring together the following

- A review of what the Edge is
- Why Edge is important
- What we are seeing as Edge matures

As well as a broad ranging review of

- Solutions and Validated Designs
- ThinkEdge technologies
- ThinkEdge portfolio



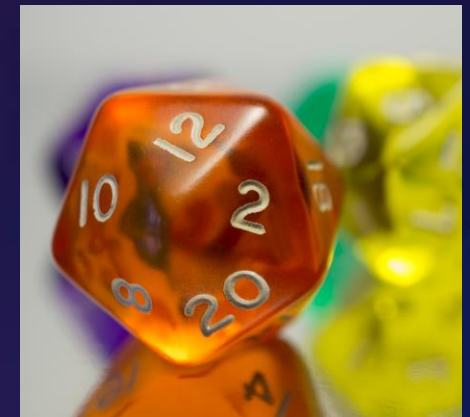
EDGE COMPUTING IN ACTION...



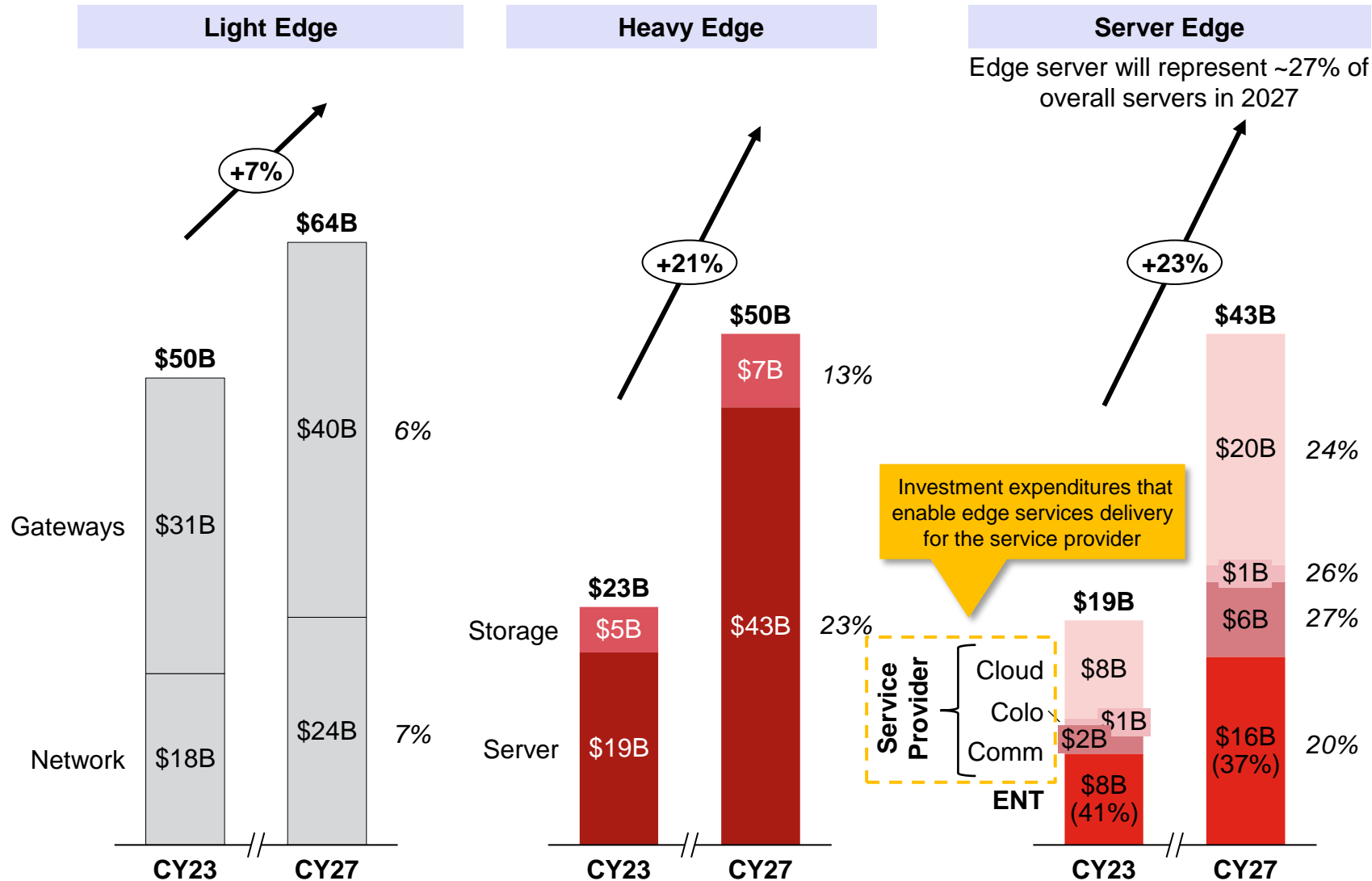
ThinkEdge

The ThinkEdge approach to operating at the Edge

- Everything we do in our design is about reducing the risks that clients face as they deploy into these new and varied locations
- ThinkEdge tackles the challenges with experience and innovation.
- We draw on knowledge from all areas of Lenovo and don't just rely on datacentre thinking
 - Thinkpad ruggedness
 - Motorola compactness
 - ThinkSystem scalability
- Could clients run datacentre systems at the Edge? Maybe, but...
 - Would it physically fit?
 - How long would it survive?
 - Would it be accepted by users?
 - Do you feel lucky?



Edge servers will make up ~38% of edge HW spend in 2027

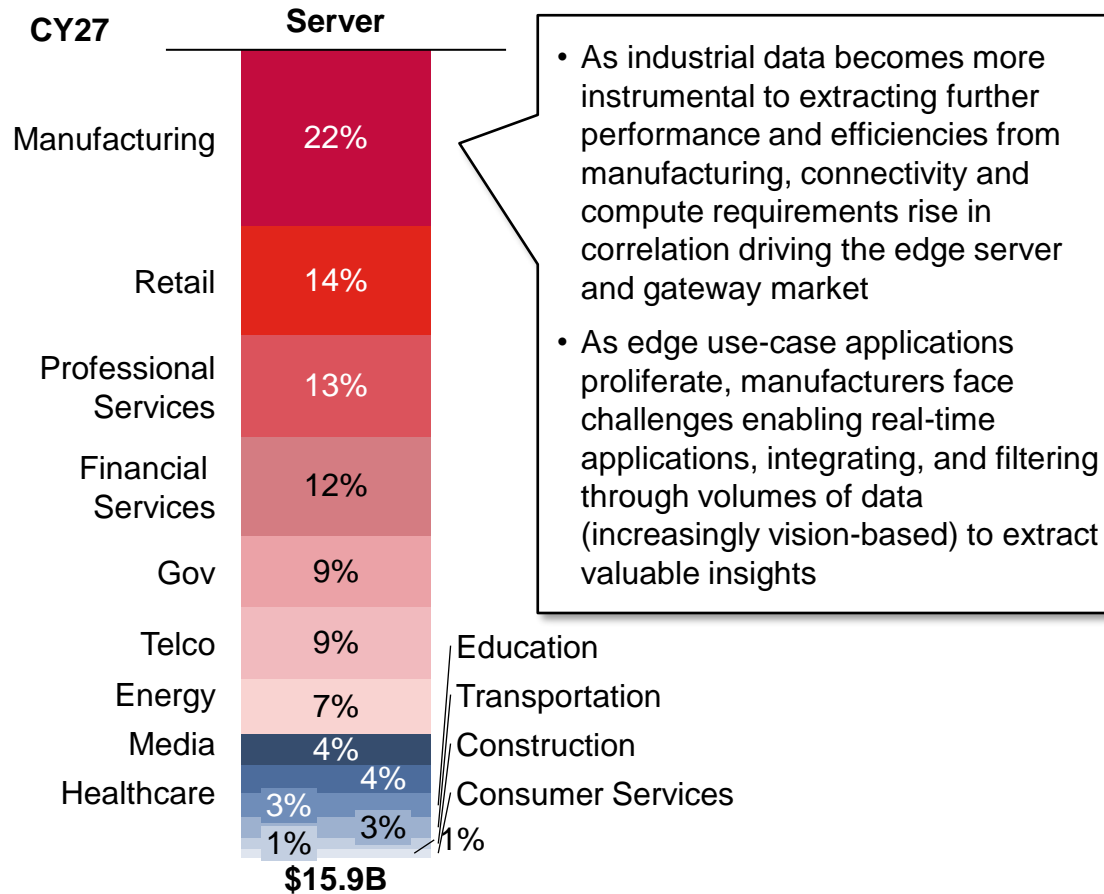


- Edge computing remains one of the most resilient areas of investments, growing globally at a double-digit rate over the next five years
- Enterprise edge server currently represents the largest segment (alongside cloud), though not growing as fast as the other segments within service provider
- Across enterprise edge user, discrete and process manufacturing will account for the largest portion of investments in edge servers this year, followed by the retail and professional services industries
- Edge infrastructure includes general purpose and edge-optimized products
- We believe edge-optimized products is a \$3B - \$7B opportunity
- *Note: Lenovo Telco 'OT' opportunity is represented by Comm SP (\$6B in CY27) and the Telco 'IT' as a portion of ENT (\$1.4B in CY27)*

Edge enterprise server deployments have highest concentration within manufacturing

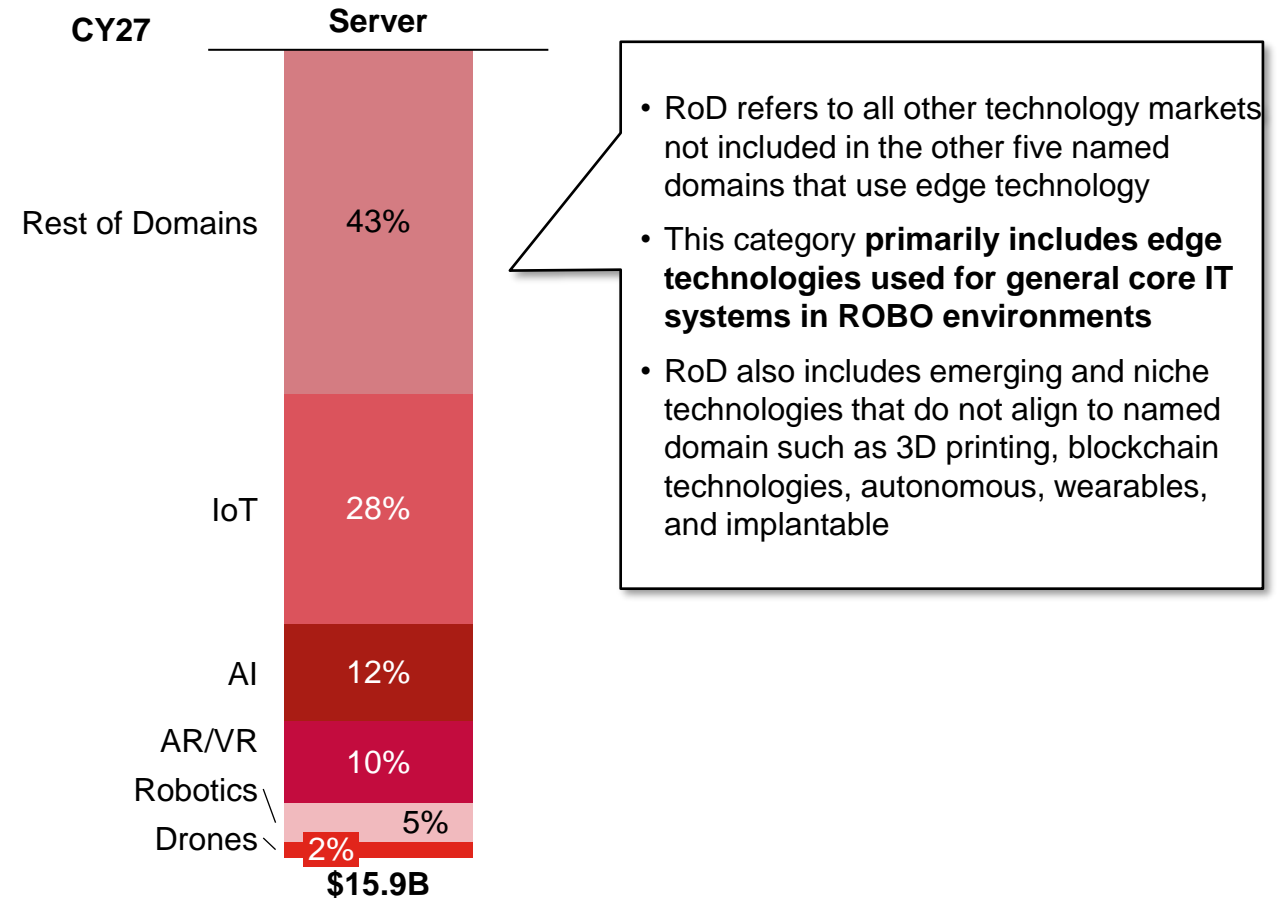
Enterprise edge server spend is being led by Manufacturing

Source: IDC Edge Spending Guide

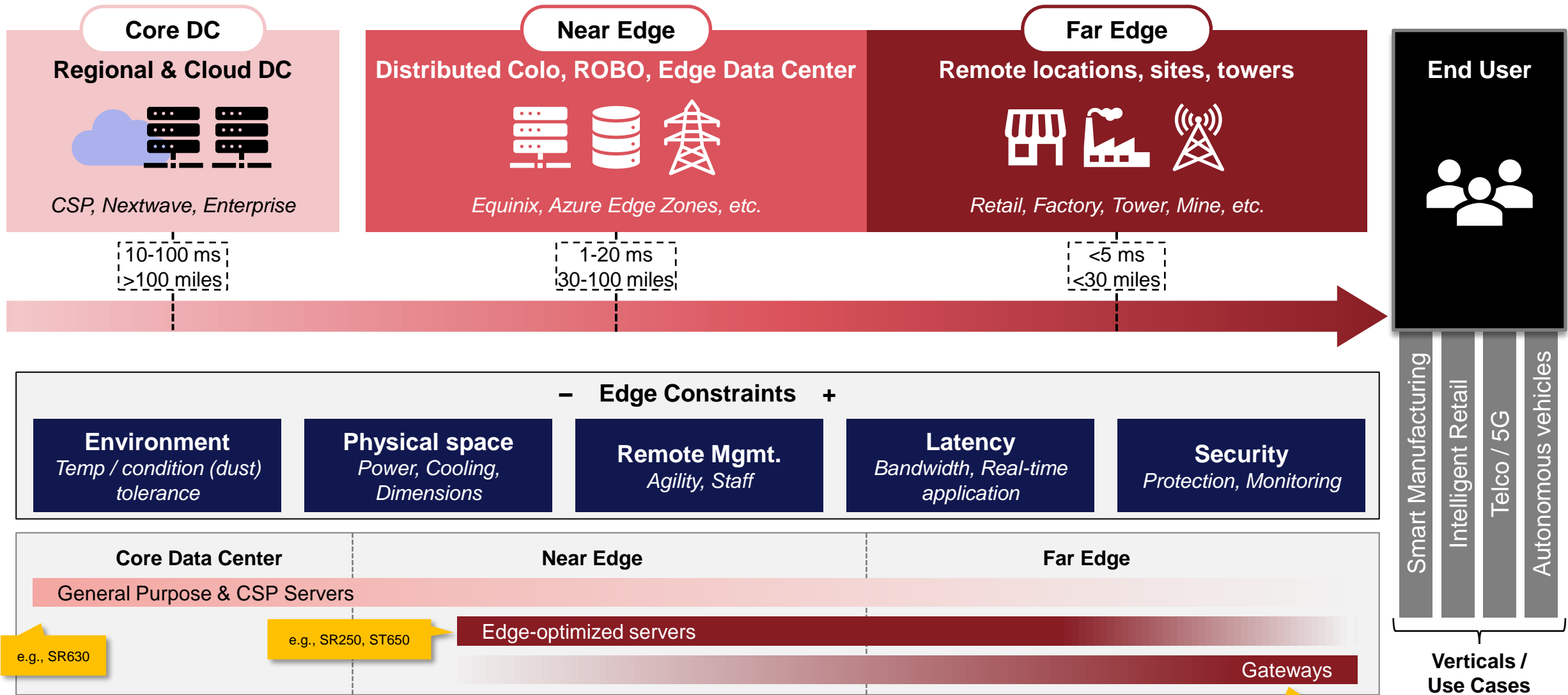


Enterprise edge server spend by domain

Source: IDC Edge Spending Guide



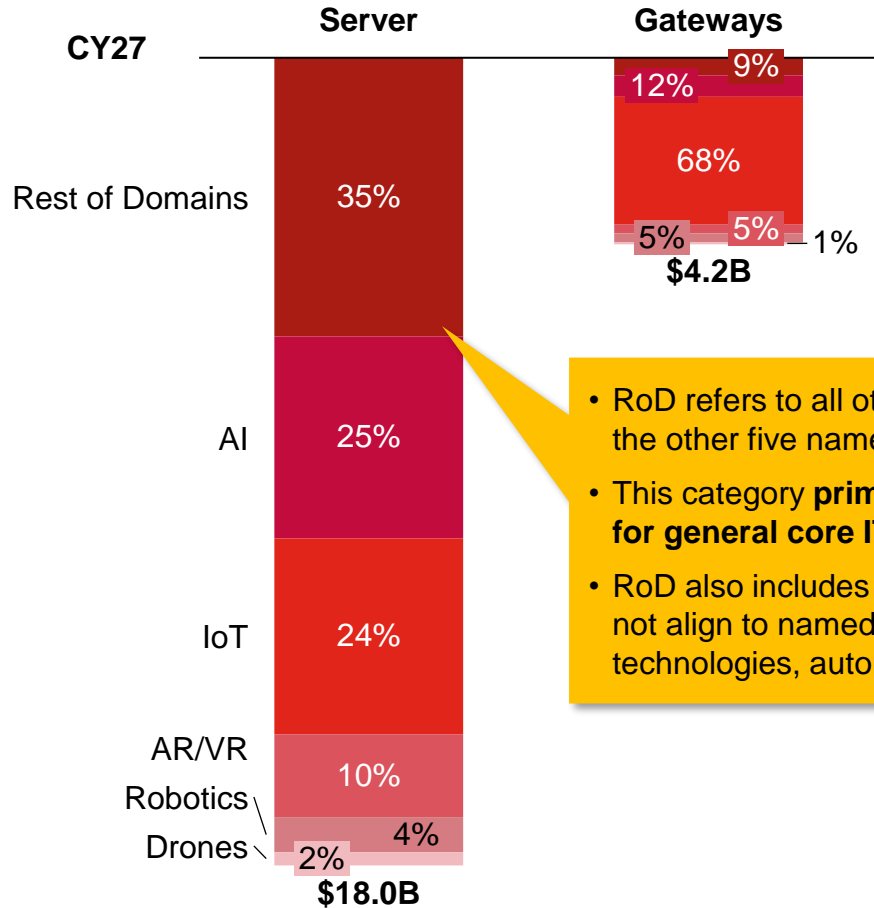
The infrastructure landscape is more than core datacenters



AI in server edge is forecasted to grow at a 22% 5YR CAGR

Domains being used at the enterprise edge

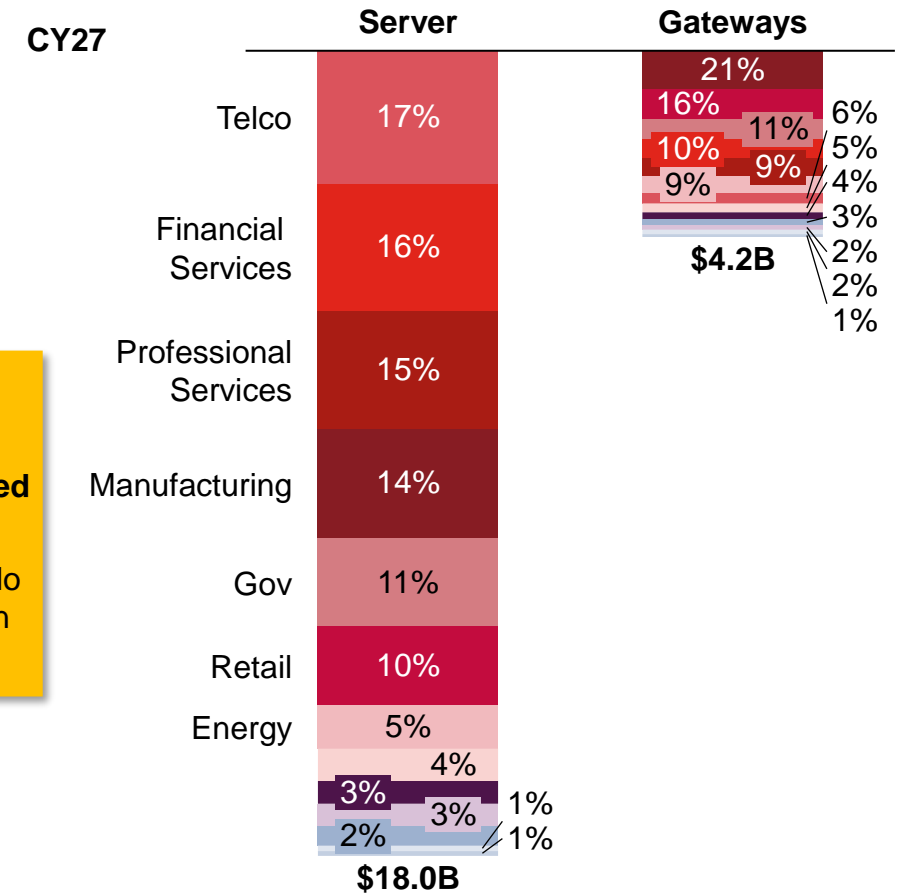
Source: IDC Edge Spending Guide



- RoD refers to all other technology markets not included in the other five named domains that use edge technology
- This category **primarily includes edge technologies used for general core IT systems in ROBO environments**
- RoD also includes emerging and niche technologies that do not align to named domain such as 3D printing, blockchain technologies, autonomous, wearables, and implantable

AI split by vertical

Source: IDC Edge Spending Guide



The Edge

What is it? **LOCATION**

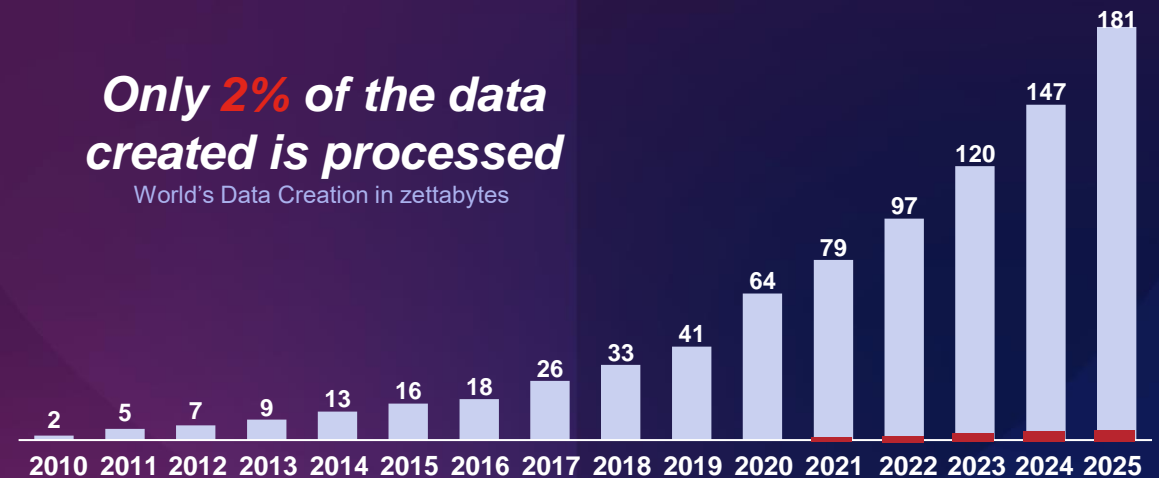
- ❖ Computing capacity **outside** of the **Datacenter**
- ❖ Closer to where data is **generated** and **acted** upon
- ❖ Unlocks new **business value** by enabling **innovative** new use-cases

What drives it?

- ❖ Too much data to move to the cloud
- ❖ Huge Cloud cost for intake & process
- ❖ Latency, Privacy, and Security

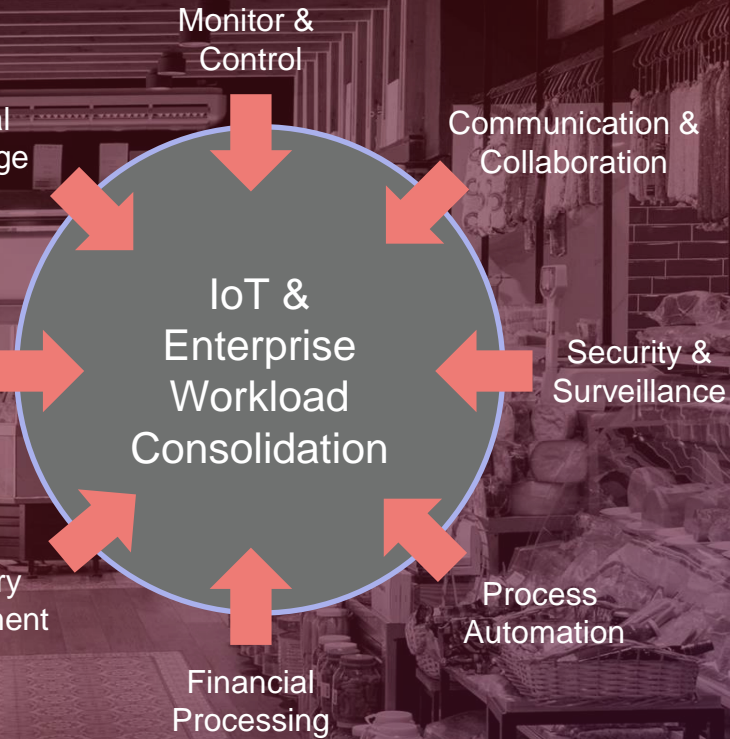
Only 2% of the data created is processed

World's Data Creation in zettabytes



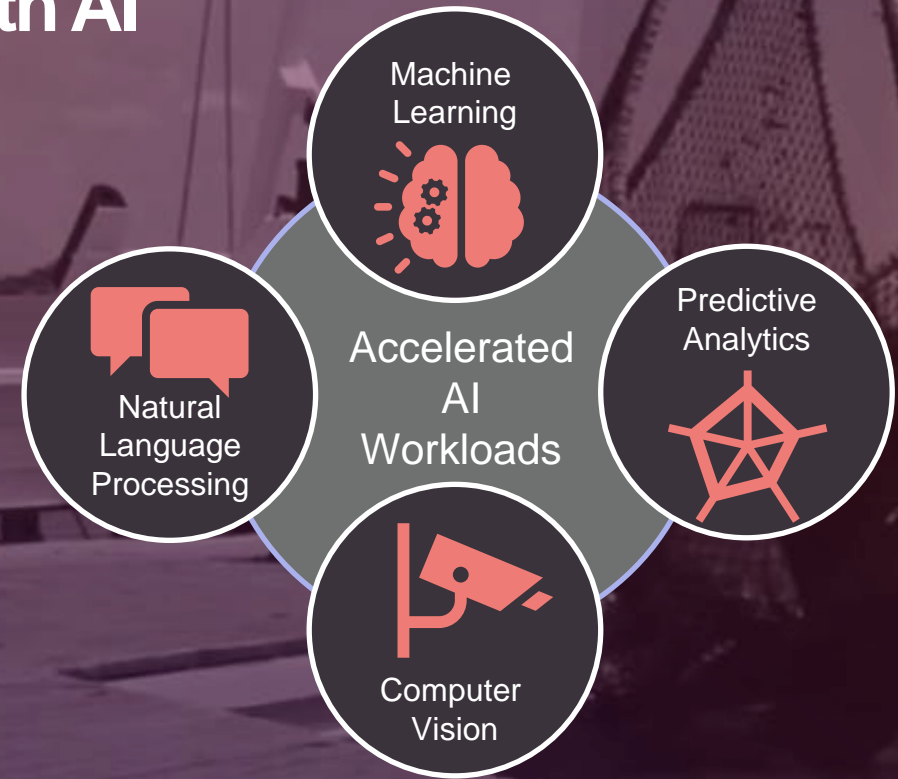
Trends @

The Edge



Consolidation
multiple devices, extending Cloud at the edge

Acceleration augmenting performance with AI



The Edge has unique requirements



Environmental

- ✓ Wide temperature
- ✓ Shock & vibe
- ✓ Dust filtering & fan-less
- ✓ Low acoustic



Security

- ✓ Encrypted data
- ✓ On-site authentication
- ✓ Movement & tamper detection
- ✓ Physical Security



Flexibility

- ✓ Mounting options (VES, Rackmount, Standalone)
- ✓ Networking options
- ✓ Diverse workloads
- ✓ Multiple protocols



Management

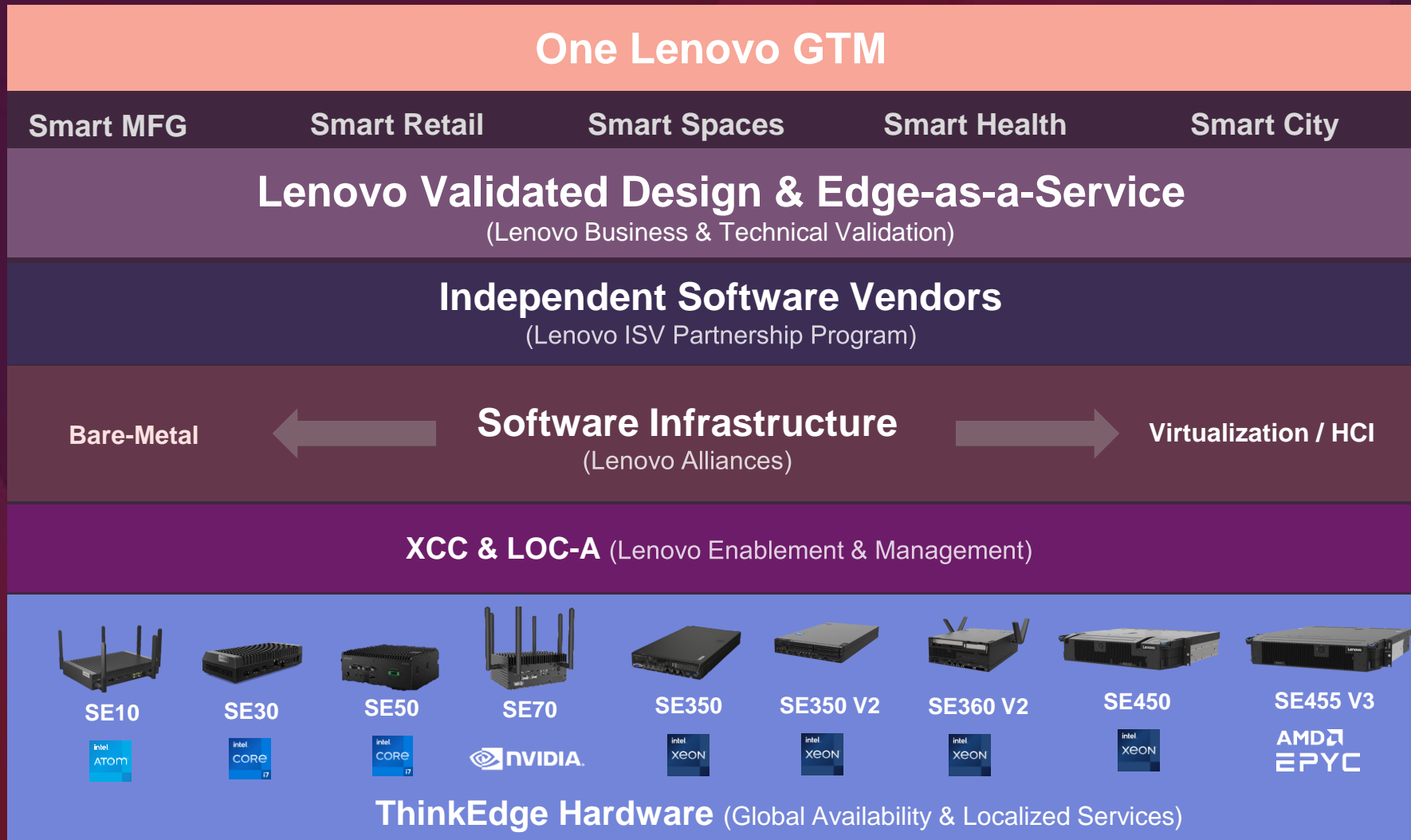
- ✓ Single tool for DC & edge
- ✓ Automate deployment
- ✓ Lifecycle Management



Sustainability

- ✓ Power savings (telemetry / cooling)
- ✓ Recycled composite material
- ✓ Packaging and refurbish

Full Stack: Strategy



Vertical Go-to-Market:

- ✓ Verticalized Approach
- ✓ Global Edge Specialist
- ✓ Direct & Indirect Programs

Accelerate Time to Value:

- ✓ Broadest ISV Eco-System
- ✓ Reference Architecture
- ✓ Outcome Validation

Manage & Deploy:

- ✓ Near Zero Touch
- ✓ Software Defined
- ✓ E2E Lifecycle Management
- ✓ ThinkAgile Offerings

Broadest HW Portfolio:

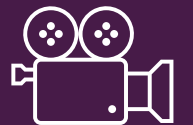
- ✓ Most Secure
- ✓ Highly Reliable
- ✓ Best Performance

Meet Grupo Pinsa

“We had a vision for making fleet and fishing production more effective, and Lenovo proved to be the perfect partner to bring it to life. Lenovo ThinkEdge SE350 servers have been a great enabler for our business.”



Sergio Alcaraz Pérez
IT Infrastructure
Manager
Pesca Azteca



Welcome to Barcelona!

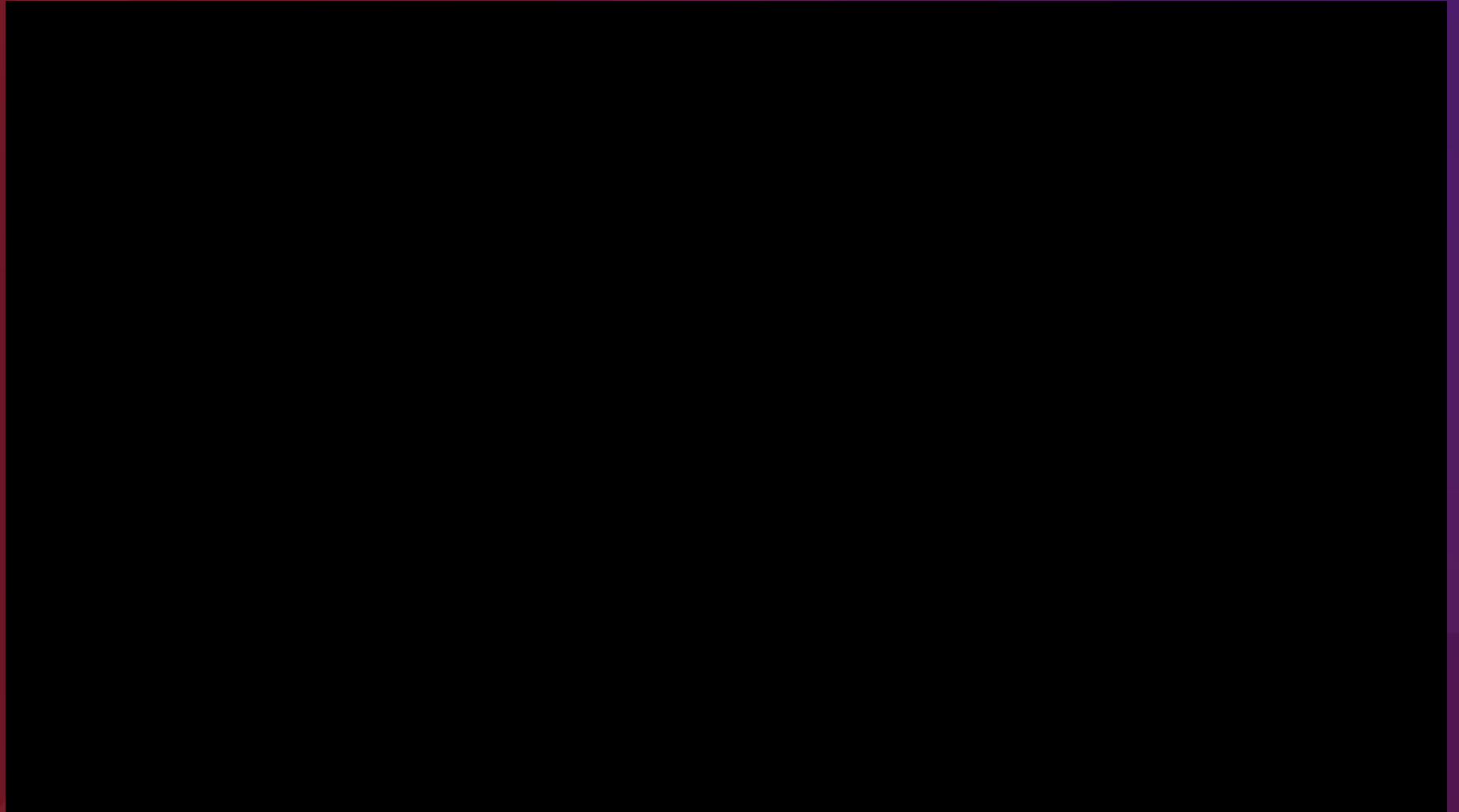
A population of over **5.7M**... Annual tourism of **6.4M** visitors per year...



- Lenovo working with the city of Barcelona to modernize infrastructure and deploy digital infrastructure.
- 3000+ ThinkEdge systems deployed through-out the city – leveraging Lenovo Open Cloud Automation



EDGE COMPUTING HAS UNIQUE REQUIREMENTS...



ThinkEdge

Lenovo

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Edge Computing - Full Picture

AI Innovation Labs
delivering value to
our customers



Services delivery in all
markets with TruScale

Scalable software,
securely
automating edge
deployments



Innovative edge computing portfolio
for on-premise deployments

Lenovo AI

Delivering cognitive solutions - core to edge, cloud to enterprise.

Lenovo AI Infrastructure

8

Platform Categories

60+

AI-Ready Platforms

High performance storage & compute DC & edge portfolio that scales with your demand

Lenovo AI Discover

Center of Excellence

4

Global COEs

180+

Countries served

Find faster time to value by leveraging the Lenovo AI Center of Excellence.

Lenovo AI Innovators

Partner Ecosystem

40+

AI Solution Partners

150+

Enterprise AI Solutions

Leverage certified solution partners to confidently address customer requirements.

Delivering infrastructure to full stack solutions

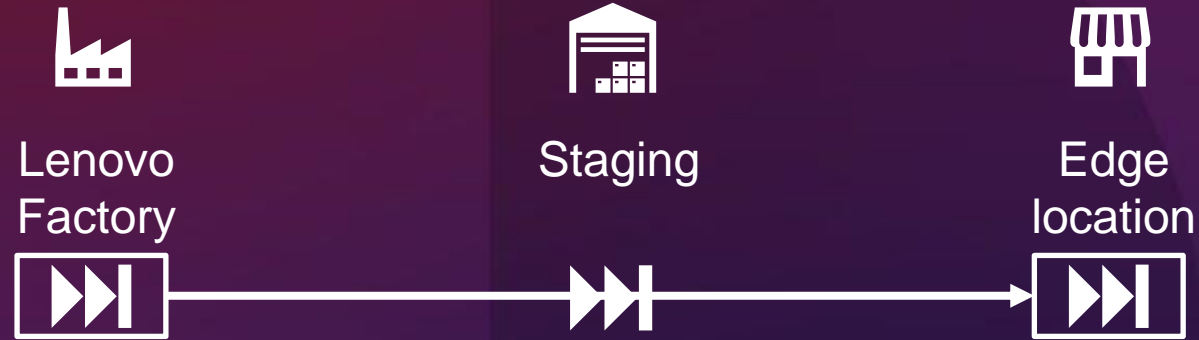
Accelerating time to value while reducing complexity with our validated solution designs.

Management of remote systems is critical



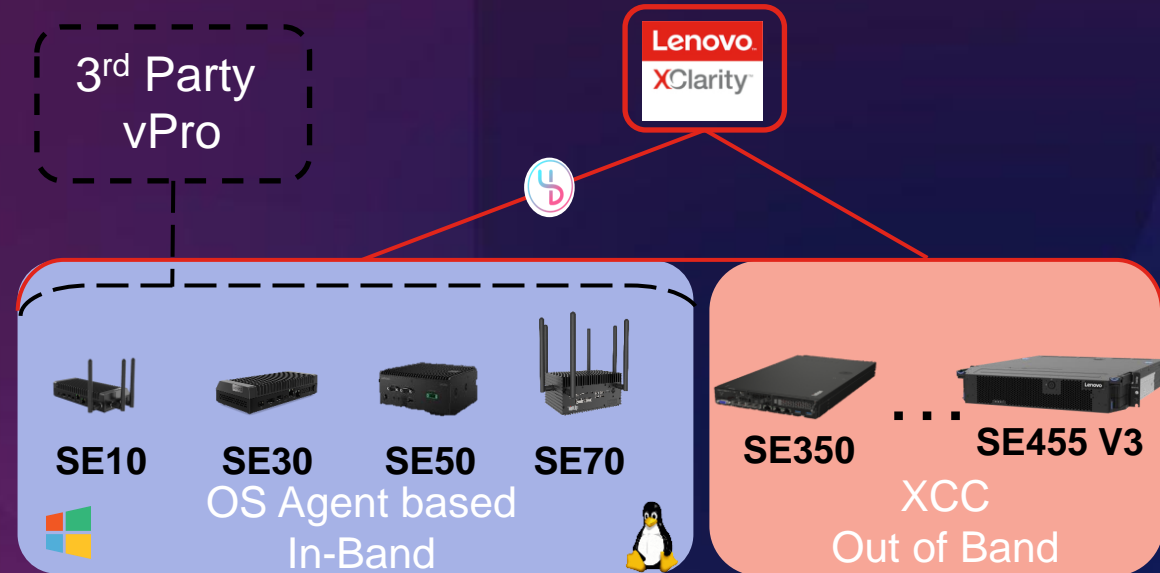
Deployment can turn into a logistical nightmare
- Lenovo can help!

Join this call series on 23rd May to hear more!



Remote Lifecycle Management

- Not every ThinkEdge has XClarity Controller
- but Lenovo XClarity Management Hub can help!
- 3rd party vPro based solutions also possible



Portfolio Overview - From Far Edge to Core Data Center

Edge Client



0C to +50C Intel ATOM Up to 32 GB RAM	-20C to +60C Intel ATOM Up to 32 GB RAM	-20°C to +60°C Core™ i3, i5 Up to 16GB RAM	0°C to +50°C Core™ i3, i5, i7 Up to 32GB RAM	-20°C to 60°C NVIDIA Jetson Up to 16GB RAM
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Edge Server



0°C to 55°C Xeon® D-2100 Up to 256GB RAM	0°C to 55°C Xeon® D-2700 Up to 256GB RAM	-20°C to 65°C Xeon® D-2700 Up to 256GB RAM	-5°C to 55°C Xeon® SP 3 rd Gen Up to 1TB RAM	-5°C to 55°C AMD 8004 Up to 576GB RAM
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Datacenter



0°C to 35°C

Client

Diverse Portfolio

From ultra compact clients to data center grade products.

Base Station / DC Closet

Highest Performance

CPU & GPU rich systems for ultimate performance.

Data Center

Flexible Deployment

In harsh environments with ruggedized devices & unique cooling capabilities.

Positioning ThinkEdge Client

SE10



Ultra compact (0.8l) Intel Atom based system for 0°C to 50°C operation. Flexible mounting including VESA, DIN, Tiny sandwich and desktop.

SE10-I



1.4l variant of SE10 increases connectivity with optional DI/DO, CAN, PoE. Wider temp range configuration support -20°C to 60°C

SE30



Ultra compact (0.8l) Intel Core i3/i5, with standard and wide temp support. Expandable (1.2l) with optional IO Box for more Serial, Ethernet and DI/DO

SE50



Compact offering with Intel Core i5/i7 that focuses on a wide range of connectivity options

SE70



NVIDIA Xavier NX based system focused on Computer Vision solutions

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Positioning ThinkEdge Server

SE350



The original Lenovo Edge Server! Half width 1U with 1x PCIe slot for GPU. Still popular, but sales now moving to the SE350 V2 and SE360 V2.

SE350 V2



Same size as SE350. Focused on Infrastructure with 4x Hot Swap 7mm SSDs. Now with single internal PSU or dual external PSU (or direct 12-48V DC)

SE360 V2



SE350 V2 internals repackaged into a shorter depth 2U allows 2x GPU support. Wireless ready and wide temperature range (-20°C to 65°C) configs available.

SE450



Ultra short depth (300/360mm) Intel based 2U. Delivers 4x GPUs with flexible deployment with wall, tower and rack kits.

SE455 V3



Short depth (440mm) AMD based 2U. Flexible design allows AI focus (6x GPU), Storage focus (8x 2.5" SSD) or processor focus (64 cores).



Security at the Edge is a major requirement

- The Edge is a diverse place and ensuring it is secure is challenging
 - Physical security of the asset to prevent theft and resulting loss of service.
 - Security of the data, which is typically even more valuable to the client!



Devices are more vulnerable to physical attacks



It's often viable to steal the whole unit to sell or compromise later

- Lenovo ThinkEdge has tackled these challenges to ensure our clients can deploy their solution with the confidence that their assets, both physical and data are protected

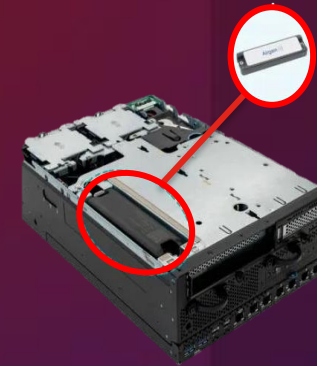
ThinkEdge has a multi-layer defence

Physical*

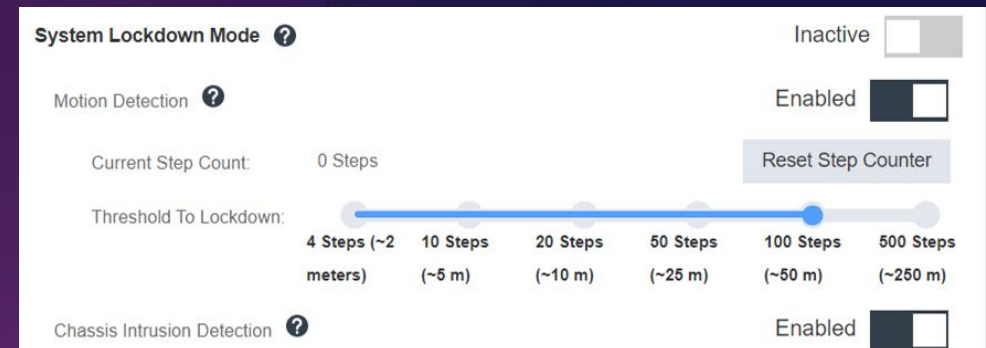
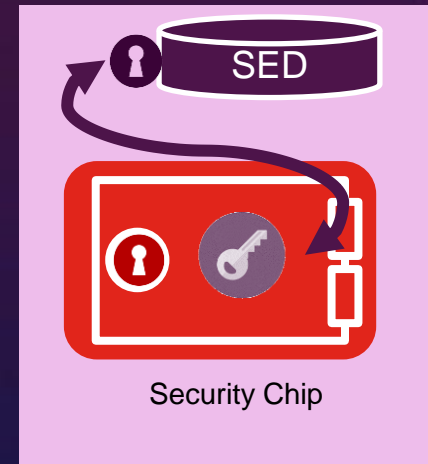
- Lockable Front Bezels and Covers
- Security EIA Bracket, Kensington Lock
- Airgain Geo-tracking module
- Intrusion Switch and motion detection sensor

Digital*

- Tamper Detection with System Lockdown
- Local SED Authentication Key management and storage
- Cloud or XCC managed lockdown and SED control
- NIST SP800-193 compliance using hardware Root of Trust and Platform Firmware Resilience
- XClarity Controller (XCC) with TPM 2.0
- Intel Software Guard Extensions (SGX)
- AMD Infinity Guard
- Lenovo System Guard
- Disable unused ports



Security screw

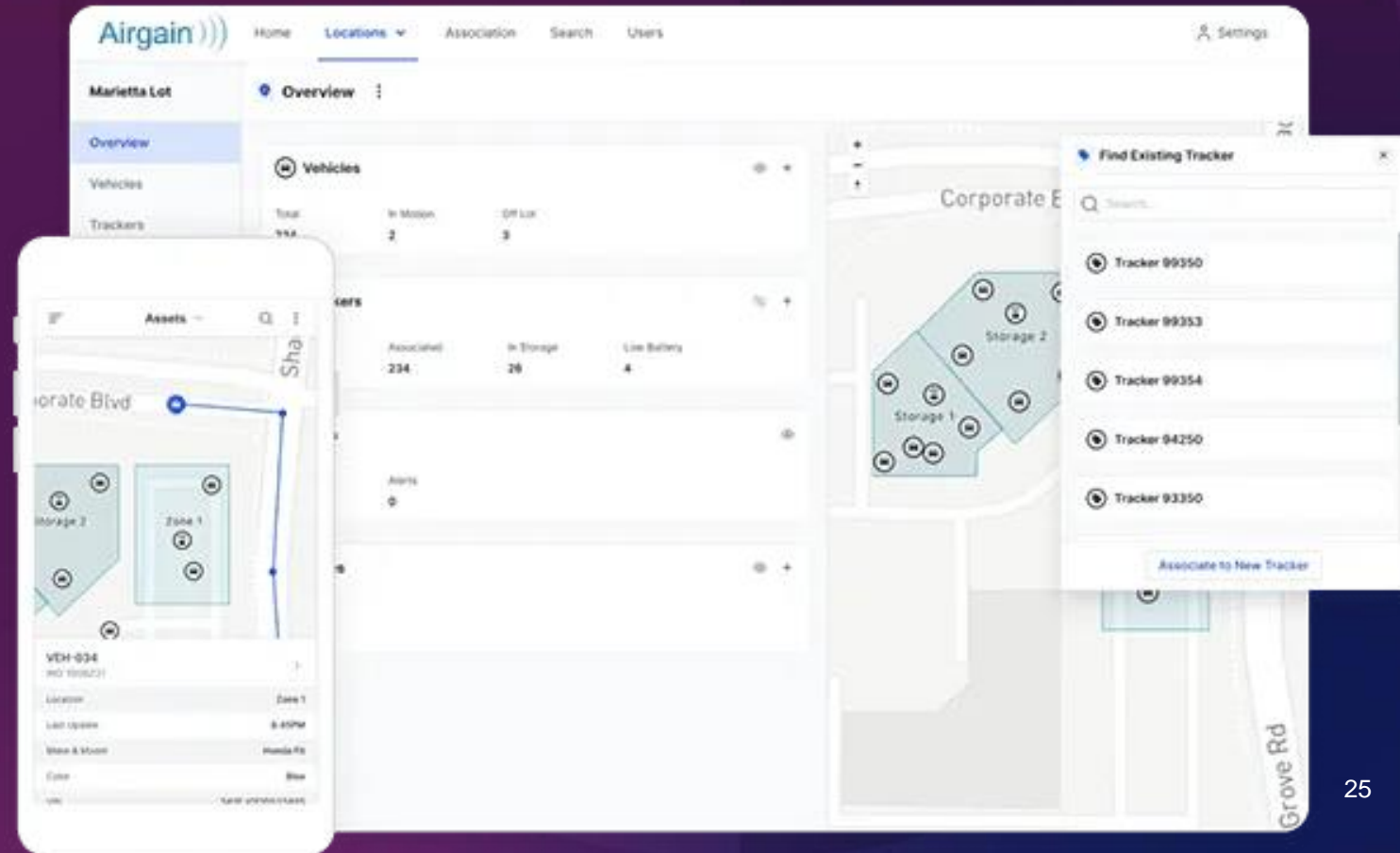


*Features vary by system

Support for 3rd Party geo tracking on SE360 V2 with Airgain



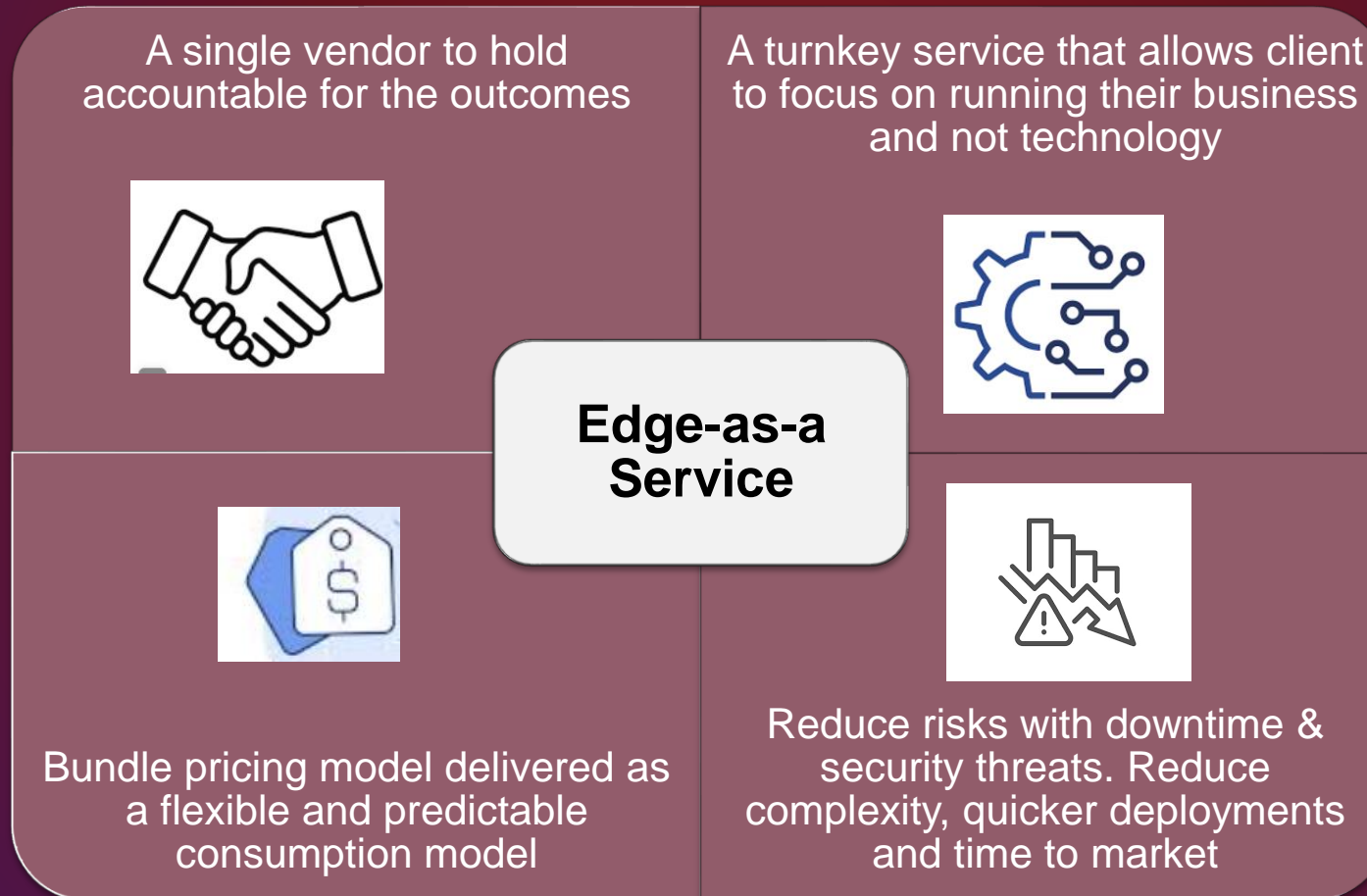
- Provides an independent viewpoint with no dependency on Lenovo tools, connectivity, power etc.
- Track using GPS, Wi-Fi and Cellular sources
- Sensors for acceleration, light (tamper detection) and temperature



The Edge Market Needs...

Scalability, Manageability, and Cost Efficiency

As the need for Edge computing advances, customers are facing new challenges around scaling, implementation, management, and leveraging data to produce the target outcomes.



Smarter
technology
for all

Lenovo

thanks.