DELL Technologies

Dell Technologies Webinar Series: Edge & 5G

Dell Technologies

- Dell Technologies' Advantage
- 5G
  - What is 5G
  - How is 5G different
  - Use Cases
- The Edge
  - What is the Edge
  - Architecture of the Edge
  - Challenges of the Edge
  - Compute @ Edge Devices
  - PowerStore at the Edge
  - Use Cases
- Recent Win
- Data Protection

DELL Technologies
FEDERAL PARTNER PROGRAM

Dell Technologies

Accelerating IT from Ideas to Innovation

Strategic Partnerships highlighting technology leaders and innovators

DELL

DELL EMC

Hugging Face

Secureworks

RSA

boomi

THALES

DELL Technologies

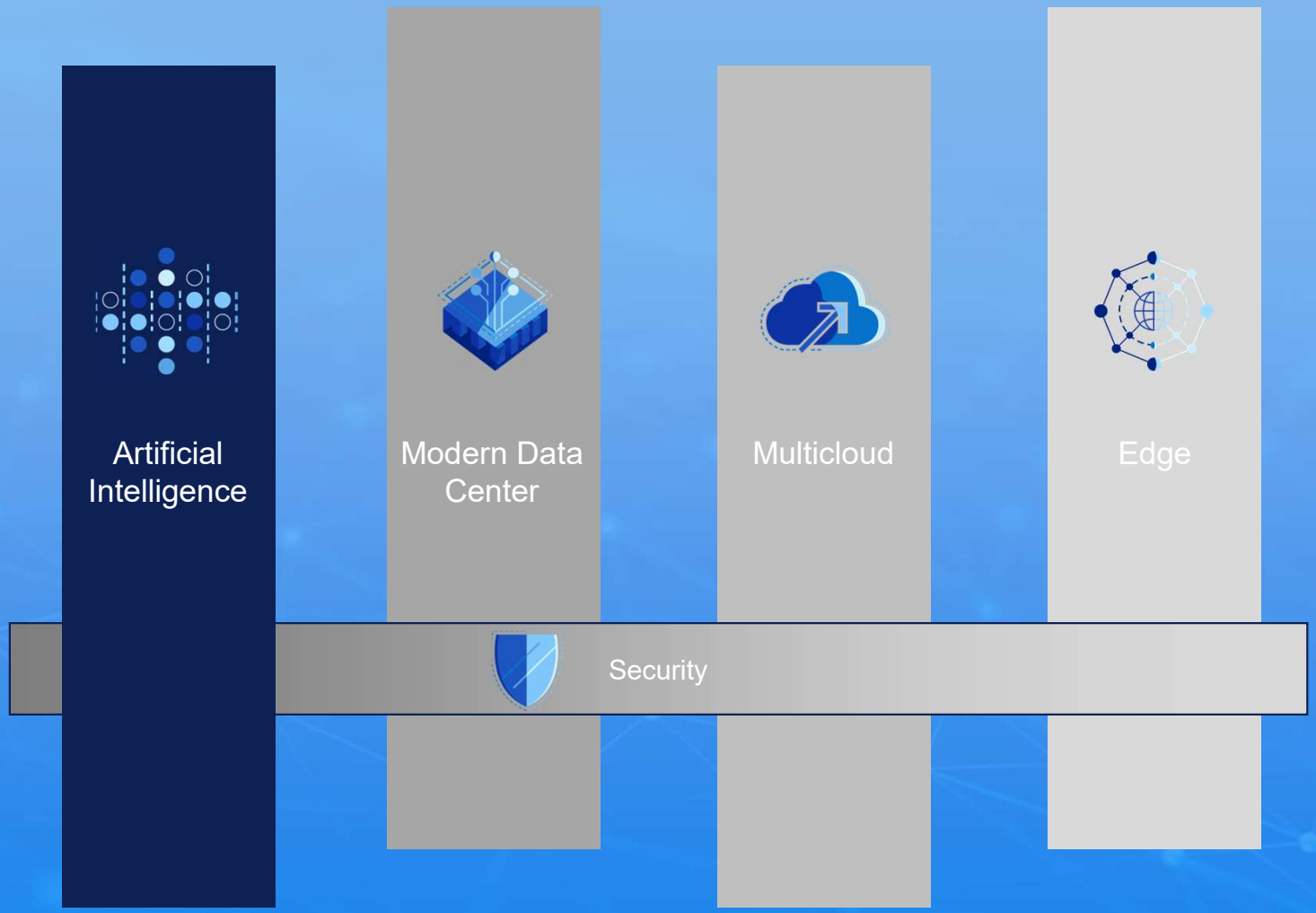
Dell Technologies

A new era for AI

AI is transforming how we work and innovate. Organizations need the right data, strategy, technology and tools to take proof of concept to proof of productivity.

- Simplicity
- Model Control
- Data Sovereignty

Dell Technologies makes this a reality by bringing AI to the data.



Dell Technologies

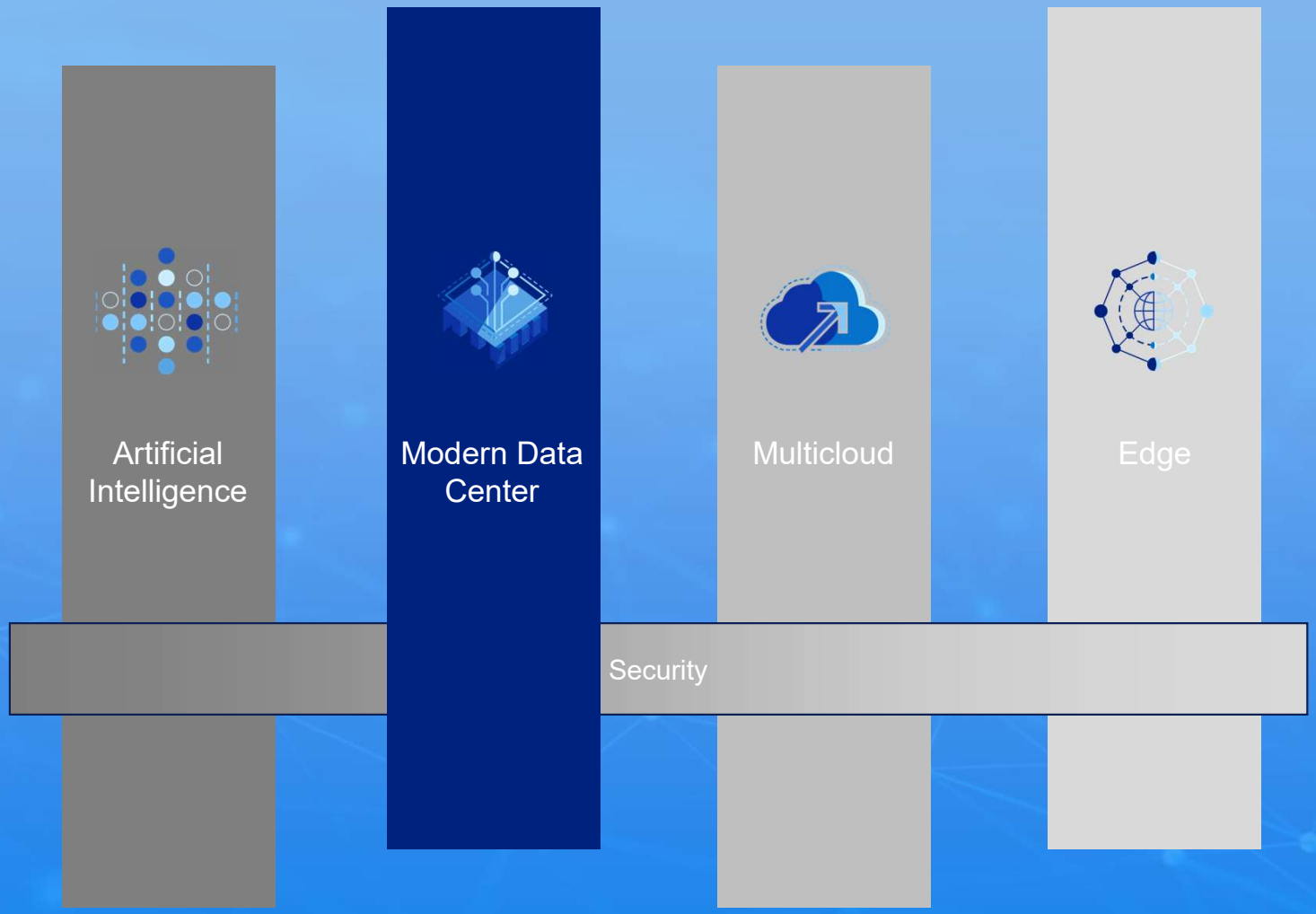
Modernize your Data Centers

Design a Modern Data Center that's smart, flexible & resilient to meet the needs of today, tomorrow & whatever comes next.

Flexible
- Power any workload across the edge, data center & public cloud.

Smart
- Accelerate innovation with intelligent & efficient systems

Resilient
- Deliver comprehensive data protection everywhere



DELL Technologies

Dell Technologies

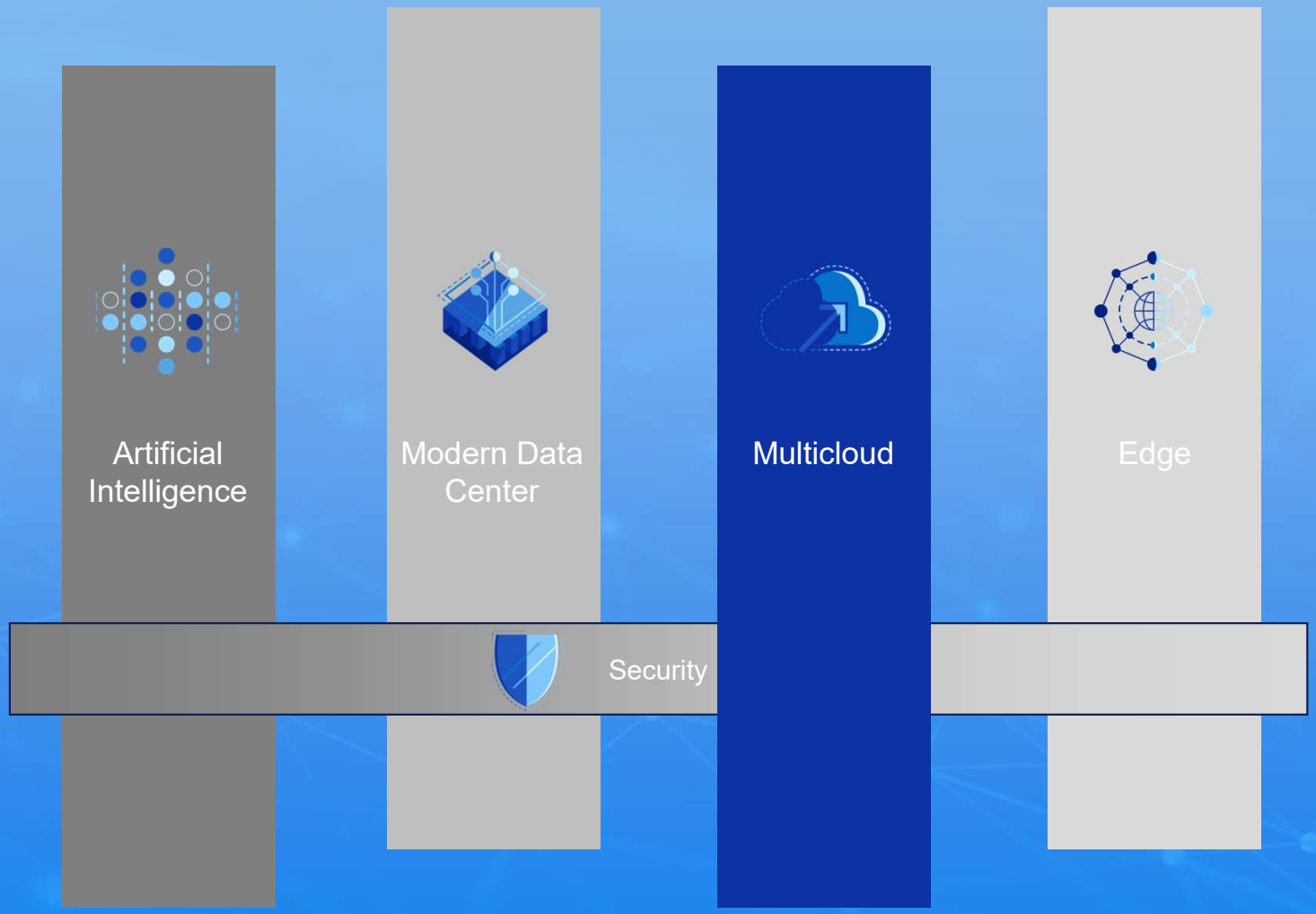
Unleash Multicloud by design

Dell Technologies brings disparate cloud experiences together with choice, consistency and control.

Ground to Cloud
- Best-of-breed Dell software innovations.

Cloud to Ground
- Modern cloud software and experiences.

Simple
- Cloud experience in the Multicloud with technology you trust.



DELL Technologies

Dell Technologies

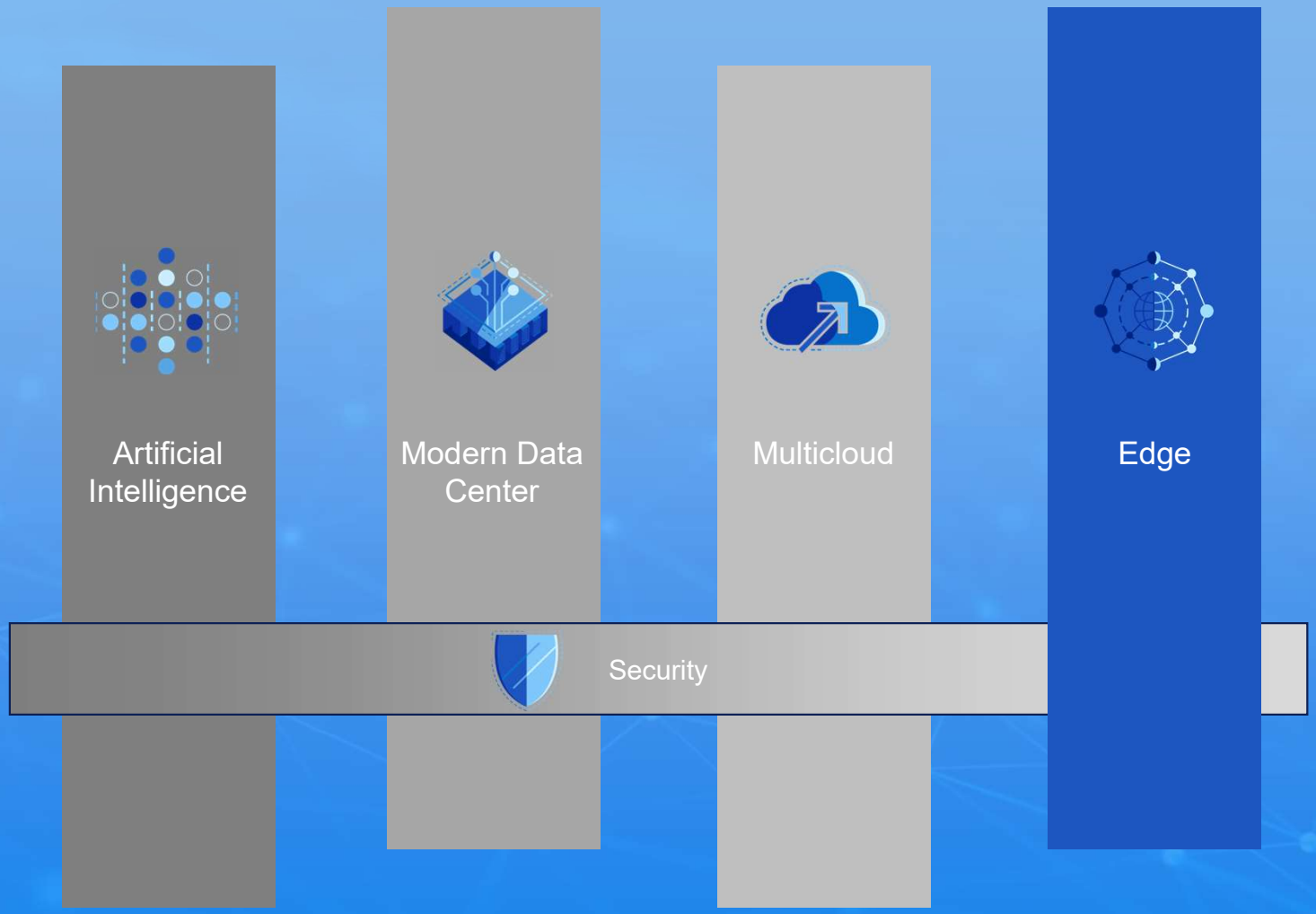
Tap into the Edge

Proximity to data at the edge drives innovation.

Leverage AI
- AI and analytics near data sources.

Simplify the Edge
- Modernizing your Edge AI architecture, workloads and operations.

Protect the Edge
- Embedded cybersecurity with Dell's Intrinsic Security.



Dell Technologies

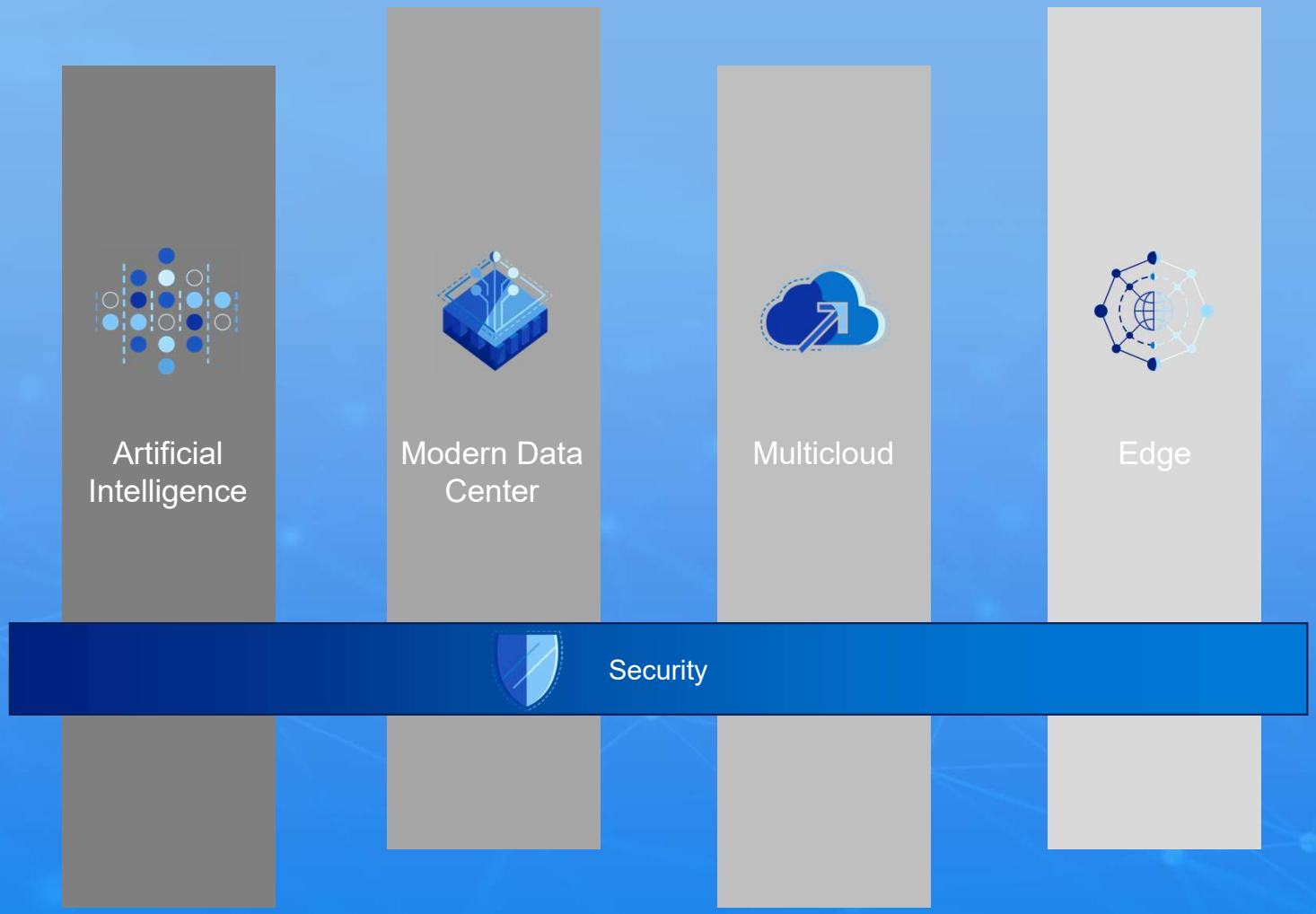
Advance Cybersecurity & Zero Trust

Don't let security risks stifle innovation.

Reduce the attack surface
- Minimize the vulnerabilities and entry points that can be exploited.

Detect and respond to cyber threats
- Actively identify and address potential security incidents and malicious activities.

Recover from a cyber attack
- Restore the organization to a previous, known secure and operational state.



5G = More Connections, Less Latency and More Services

The Landscape of 5G

5G will differentiate itself by delivering various improvements:

10x

Decrease in latency:
Delivering latency as low as 1 ms.

10x

Connection density:
Enabling more efficient signaling for IoT connectivity.

10x

Experienced throughput:
Bringing more uniform, multi-Gbps peak rates.

3x

Spectrum efficiency:
Achieving even more bits per Hz with advanced antenna techniques.

100x

Traffic capacity:
Driving network hyper-densification with more small cells everywhere.

100x

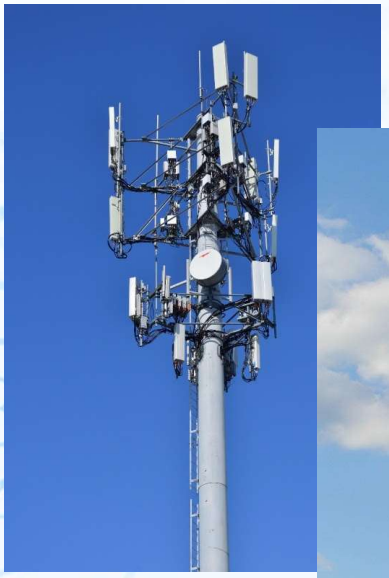
Network efficiency:
Optimizing network energy consumption with more efficient processing.

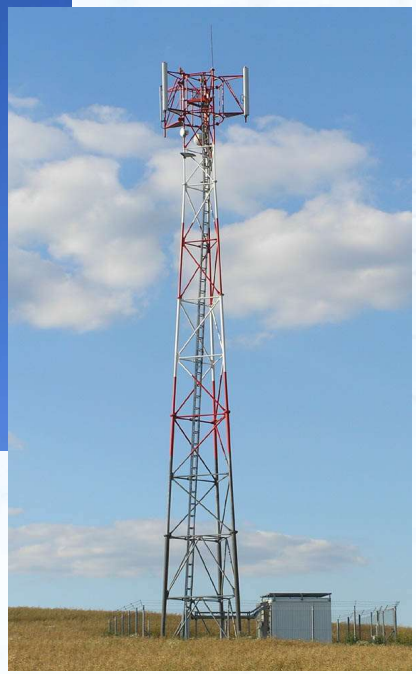
Migrating from 4G to 5G is revolutionary, but why?

- **Hardware defined, physical network infrastructure is giving way to software defined, virtualized networks.**
  - **Proprietary hardware is being replaced by “open-source” software.**
- **The “Edge” is moving closer to the end user.**
  - **Large centralized data centers are rapidly expanding to encompass smaller, forward deployed nodes.**
- **Network slicing of bandwidth allows better signal utilization.**
  - **Better utilization = Greater QOS / higher throughput.**
- **Expanding size of networks equals additional security concerns.**
  - **Zero Trust Architecture (ZTA); What is it?**

What this transformation will look like…

4G (LTE)





Traditional cellular, long range structure.

Transitioning Network Sizing

5G (NR)

Smaller scale, AI enabled mesh networks.

5G Communications Landscape

Application Ecosystem

- 5G Enabled (eMBB)
- Consumer Electronics
- IoT Gateways
- Indoor Access / Small Cells
- Access (uCPE, SD-WAN)

Radio Access

- 5G Spectrum
- 5G NR NSA/SA
- Small Cells/Densification
- Microwave/Fiber Backhaul
- **5G Private Networks**

Network Edge

- Open Fronthaul Networking
- C-RAN and vRAN
- MEC Platforms w/ VNFs
- Edge NFV-I / vEPC / NGC
- Mobile Data Center (MDC)

Network Core

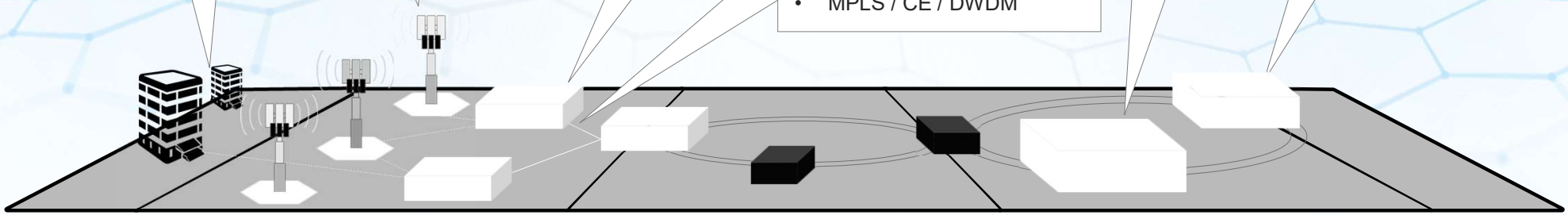
- NFV Infra. Core Systems
- vEPC / vIMS
- 5G Core (NGC)
- SDN Controllers
- Open Networking

Service Operations

- Orchestration
- Modern OSS/BSS
- Analytics & Data Lakes
- Infra Monitoring, AI, ML
- IT Infrastructure

Transport Network

- 100G/400G Mid/Backhaul
- IP Everywhere
- Carrier SDN
- MPLS / CE / DWDM



Thousands of Sites | Hundreds of Sites | Tens of Sites | Few Sites

5G Headend

Headend Hardware Components

- Grand Master Clock / Remote Access Device
- Management and Access Switch
- Multi-Access Edge Compute
- Backhaul/Midhaul Switch
- Radio Access Network Servers
- Fronthaul Switch
- Fiber Distribution
- Radio Power Distribution
- Uninterrupted Power Supply and Conditioning

Software Services

- Security and Firewall
- Packet Core Server
- User Plane Functions
- 5G Virtual Radio Access Network
- ... to 5G FR1/FR2 Radio Access Network

Radio Hardware

CellHub
Midband
FR1 Radio

IOTA
mmWave
FR2 Radio

5G Use Cases

- **Virtual Reality** requires substantially more computing power than traditional IP video. VR requires a high frame rate in order for motion within a virtual space to feel natural. In addition, VR visual latency has substantially more downside. Today, VR gaming requires expensive hardware which is cost prohibitive for many consumers. Gaming VR equipment requires a customer headset and CPU with a state-of-the-art graphics processor. 5G may offer a solution, as faster speeds could allow for cloud-based (or off-site) processing.

- **Augmented Reality (AR)** seeks to superimpose a computer generated image on a user's view of the real world. 5G implementation could enable a new generation of AR games. Developers could incorporate multiple players' locations, geographic data from a service like Google Maps and overlay game objects.

- **Enhanced Mobile Broadband (eMBB)** focuses on hugely increased data rates, high user density and very high traffic capacity for hotspot scenarios

- **Ultra-reliable and Low Latency Communications (URLLC)** seeks to enhance safety-critical and mission critical applications that focus on latency and reliability

The Architectural Pendulum…

CENTRALIZED DATA CENTERS

"Civilized"
Centralized and
Unconstrained

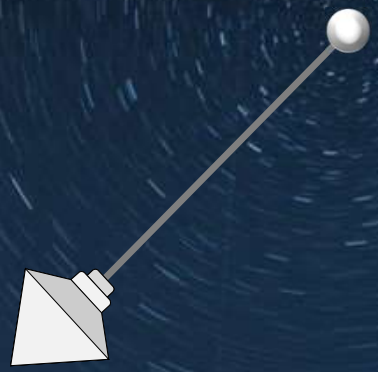
Modern data centers host computing in a well-ordered, controlled and relatively unconstrained environment

THE EDGE

"The Wilds"
Distributed and
Constrained

The Architectural Pendulum…

is again swinging to distribution



CENTRALIZED DATA CENTER

"Civilized" Centralized and Unconstrained

Increasingly, the desire to deliver real-time digital business processes and experiences to the world at large is pushing the need to compute in the chaotic and constrained "Wilds"

THE EDGE

"The Wilds" Distributed and Constrained

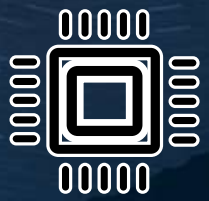
Why is the Edge happening

3 key factors

1

Physics: the speed of light versus time and application

2

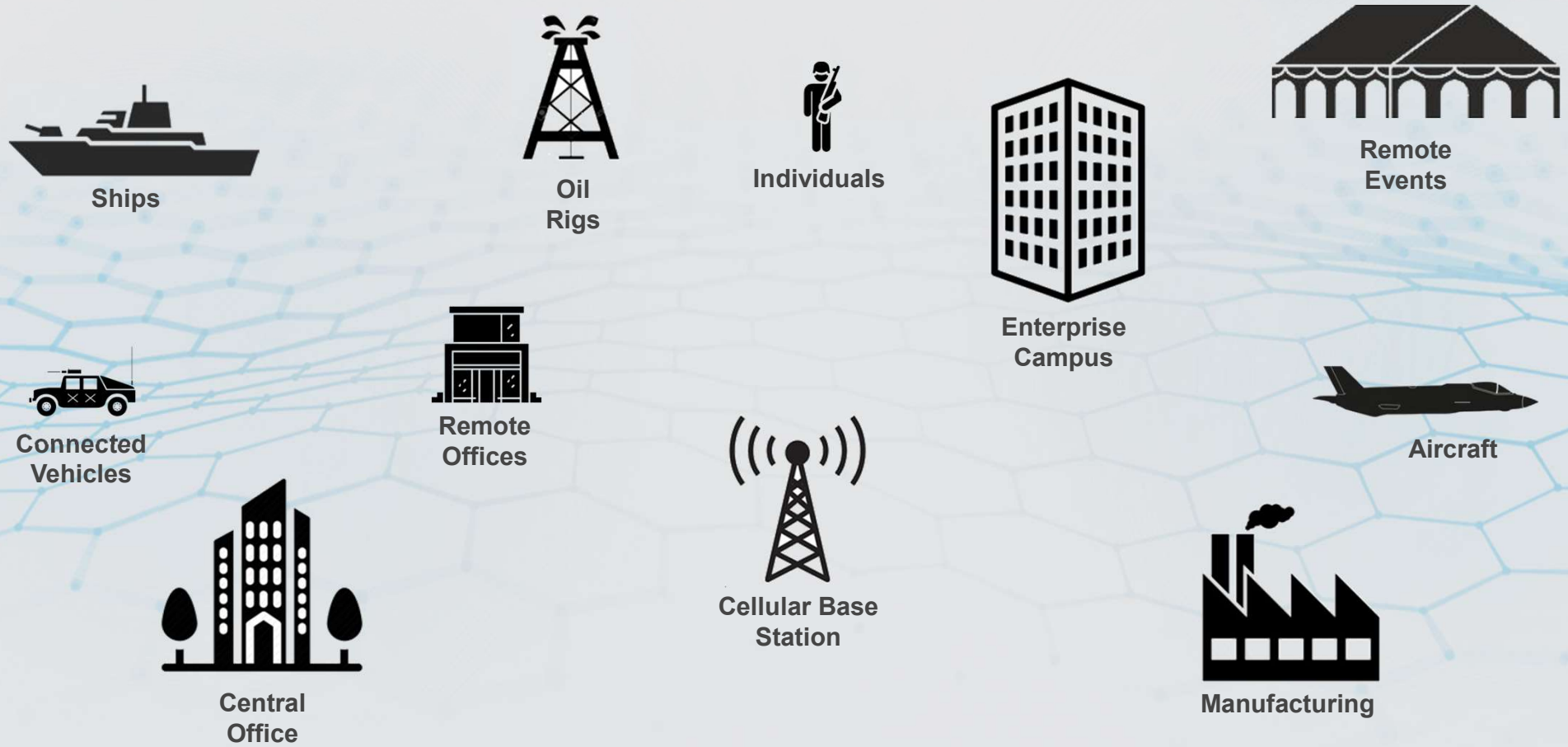


The smart movement: instrumented and measured

3

Cost: moving data is complex and impractical

Edge computing locations can be anywhere



ARCHITECTURE

Dell Validated Designs for the Edge

ptc	LITMUS	Telit Cinterion	XMPRO	DELL	COGNEX	CLAROTY
Thingworx Digital Performance Management	Litmus Edge Litmus Edge Manager	deviceWISE® Edge	App Designer Data Stream Designer Subscription Manager	Streaming Data Platform	Vision Pro ProDesigner VDi Deep Learning	xDome SRA CTD

Enterprise Edge

VxRail D560F, E560F, E660F | PowerEdge R650, R750 | PowerEdge XR11, XR12 | PowerEdge XR4000 | PowerScale F200, F600

Network / SDN / 5G

Industrial Edge

ptc LITMUS Telit Cinterion XMPRO DELL COGNEX CLAROTY

EGW3200 | EGW5200 | OptiPlex | PowerEdge XR11 | PowerEdge XR12 | PowerEdge XR4000r | PowerEdge XR4000z

Protocols

Functional Edge

DELL Technologies

Integrate Tomorrow's Remarkable Technology Today

ptc LITMUS Telit Cinterion COGNEX XMPRO

Legacy & IT/OT Convergence

- Industrial Edge
- Data translation
- Re-host existing applications
- Workload consolidation
- VDI
- Industrial Cybersecurity

CLAROTY

Data & AI/ML

- Connect: IIoT, Industrial edge
- Collect: SDP
- Process: Edge computing, Dashboards, Computer vision, GPUs
- Store: NAS, VSAN, DR, CR
- Share: Multicloud

NVIDIA

DELL Technologies

Streaming Data Platform (SDP)

Private Mobility / 5G

- Data Connectivity
- Connected Worker
- AGVs & Mobile Robots
- AR/VR

DELL Technologies

Private Wireless

Sustainability & Efficiency

- Paperless factory
- Energy efficiency
- Reduce waste
- Equipment life extension
- Reduced emissions: SPC Models
- Future Proofing

DELL Technologies

Connected Worker

Digital Twins

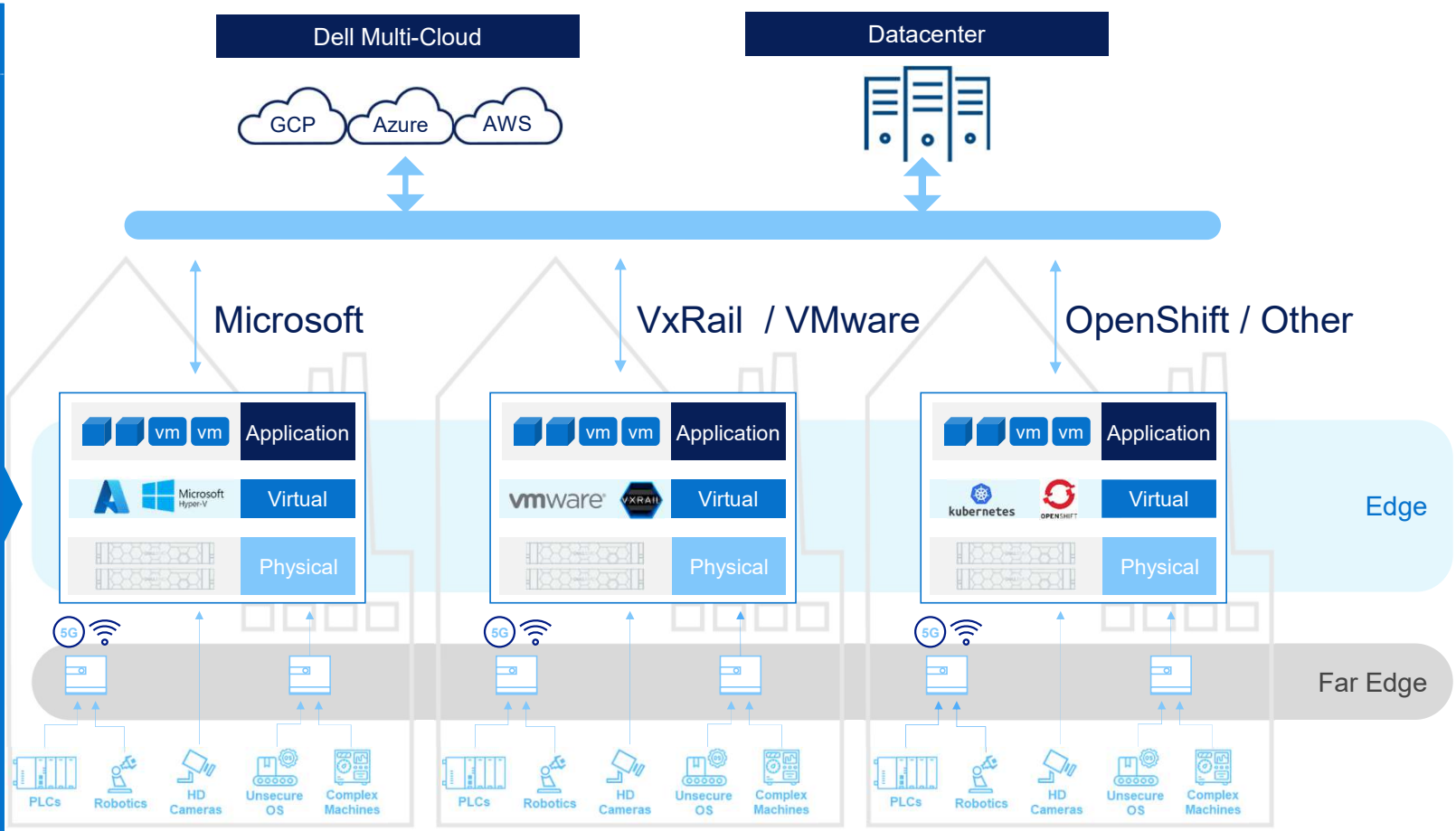
- Manufacturing superpowers
- Supply chain efficiencies
- Production optimization
- Every Smart Manufacturing use case

DELL Technologies

Dell Technologies: Open, Scalable, Managed, Global

Dell Enterprise Edge

- Validated Manufacturing and Edge Solutions:
  - IIoT Platforms
  - Computer Vision
  - Industrial Security
  - Digital Twins
  - More
- Enterprise Grade Security and Manageability
- Global Repeatability
- Extreme Scalability
- End-to-end Portfolio
- Ruggedized
  - Servers
  - PCs
  - Notebooks
  - Tablets
- Cloud Choice: On-Prem, Public, Multicloud, Hybrid
- Zero-Touch Deployment
- Secure Onboarding
- OT Data Integration



DELL Technologies

Challenges deriving value at the ***Edge***

Constraints drive a range of design requirements for Edge infrastructure

Examples of server designs

Datacenter → Far Edge

	Datacenter			Far Edge
Constraints	Network Constraints	Network Constraints Environment Constraints	Network Constraints Environment Constraints Dimensional Constraints	Network Constraints Environment Constraints Dimensional Constraints Power Constraints
Example of a Solution Component	VxRail - "P" Series PowerEdge R9640 / 760 VxRail - "E" Series PowerEdge R660 VxRail - "G" Series C6620	VxRail – "G" Series PowerEdge XR Series VxRail - "D" Series "Ruggedized" PowerEdge	VxRail - "D" Series "Ruggedized" PowerEdge	Ruggedized Gateway "VEP"
Design Requirements	Standard Compute Environmentally Rugged Small Depth Low Power / Cooling	Standard Compute Environmentally Rugged Small Depth Low Power / Cooling	Standard Compute Environmentally Rugged Small Depth Low Power / Cooling	Standard Compute Environmentally Rugged Small Depth Low Power / Cooling

DELL Technologies

Dell PowerEdge XR7620

HIGH-PERFORMANCE & RUGGED EDGE SERVER

Purpose-built to reduce latency, provide scalability and deliver analytics at the edge

Targeted Workloads & Verticals

- **Verticals:** Defense, Telco, Manufacturing
- **Workloads:** Automation, video analytics, point of sale analytics, AI inferencing, edge asset data aggregation and analytics

Key Capabilities

- **High-performance, high-capacity** server for the most demanding workloads
- Manage with **reversible I/O & power** for easy serviceability
- Optional filtered bezel
- iDRAC and Dell Technologies manageability portfolio
- **Integrated Security** with Cyber Resilient Architecture

HIGHLIGHTS

- Short-depth **2U 2-socket server**
- Up to **2 DW Accelerators** and **8x NVMe drives**
- **4xPCIe** (2 Gen 5 + 2 Gen 4) + 1xLP + 1xOCP3.0
- Industry Certifications (MIL-STD, NEBS)
- Certified to operate in rugged, dusty environments ranging from **-5C to 55C** (23F to 131F)
- **Front and rear port access options**
- GPU and CPU Optimized variants

TARGET WORKLOADS

Digital Micro Data Center

Ideal for machine aggregation, VDI, AI inferencing, OT/IT translation, industrial automation, ROBO, and more

Defense

Hardened for dusty, hot/cold, and high-altitude operations

MIL 810G rated (limited configurations)

DELL Technologies

Dell PowerEdge **XR4000**

Versatile, Scalable, and Optimized for Edge.
PowerEdge XR4000 enables next-gen transformation through flexible, right-sized compute that grows with your business.

Targeted Workloads & Verticals

- **Verticals:** Manufacturing, Retail, Public, Banking, & Transportation
- **Workloads:** vSAN, VDI, IoT, point of sale, digital signage, video surveillance, video analytics for inferencing/ manufacturing, data aggregation/compression

Key Capabilities

- 1S **Intel** Ice Lake **Xeon-D**; **Integrated Security** & Cyber Resilient Architecture
- **Flexible** 1U & 2U compute sled & optional vSAN witness node
- Manage with **reversible I/O** & power for easy serviceability
- 2U rackable or flexible-mount chassis; Optional intelligent filtered bezel
- **iDRAC** and Dell Technologies manageability Portfolio

HIGHLIGHTS

- **355mm** deep chassis with **wall mount** option
- **Rugged** operating range from **-5C to 55C (27 to 131F)**
- **Accelerator** support up to **2x16 FHFL 250W**
- **4xM.2 storage** capacity up to **15TB** (+8x via PCIe)
- **vSAN ReadyNode Certified**
- Optional **vSAN witness node**
- Industry **Certifications** (NEBS, MIL-STD)

TARGET WORKLOADS

Civ

Perfect for flexible deployment, Micro data center of the Future, IoT, AI Inferencing, and many others

Military

Highly portable and light enough for single-person carry. Hardened for dusty, hot/cold operations

MIL 810H, 461G, 901E, 1474E rated (limited configurations)

Manufacturing

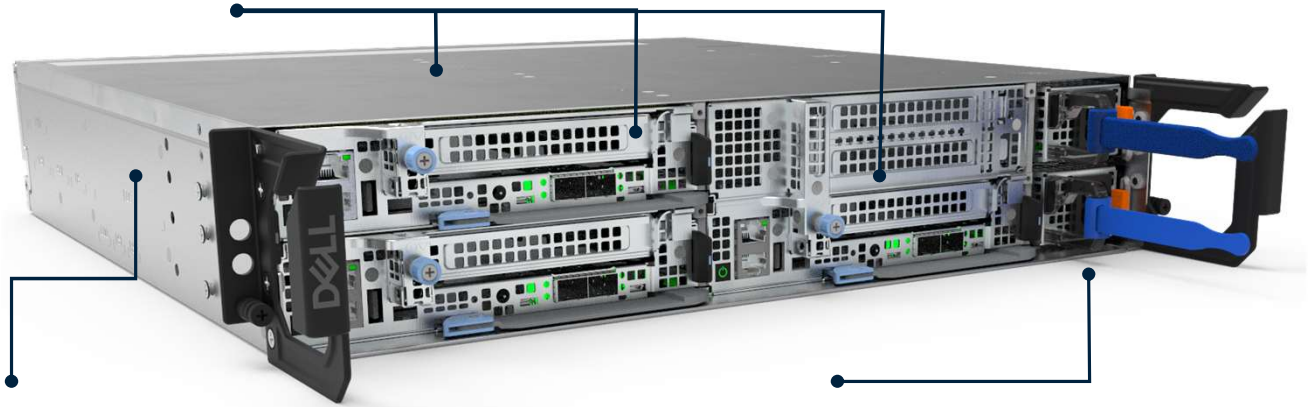
Ideal for machine aggregation, VDI, AI inferencing, OT/IT translation, industrial automation and more

DELL Technologies

Dell PowerEdge **XR8000**

Broad range of configurability supporting up to 4 nodes with flexible I/O sled options

- 2U modular front-accessible chassis with dual power supply to support up to 4 nodes
- 2U half-width sled configurations for Edge / Far Edge, storage* optimized work loads
- 1U half-width sled* configuration for dense compute and network edge optimized work loads



Single socket Intel Xeon per node

- 4th Generation Intel® Xeon® Scalable processors with optional vRAN boost up 32 cores

Dual 60 mm PSUs

- -48VDC options: 800W, 1100W, 1400W*
- 100 to 240VAC options: 1400W, 1800W

Product Family

- Optimized to operate in Class 1 (-5C to 55C) environments
  - Extended range (-20C to 65C) for select configurations*
- Short-depth: 430 mm from front I/O wall to rear wall
- Front-accessible and simplified field serviceability

TARGET WORKLOADS

Centralized RAN

Optimized for centralized hub-sites / LDC deployments of aggregated Distributed Unit (DU) and Centralized Unit (CU) to support the transition to vRAN / Open RAN

Distributed RAN

Extensible to cell site deployments of DU and DU/CU in certain building cabinets and cell site shelters

Network Edge

MEC and UPF use cases to support network optimization, cloud services at edge, time sensitive verticals, applications for mobile users

Civilian Edge

Micro data center: video monitoring and analytics, IoT device aggregation, AI inferencing, OT/IT translation

Military & Defense

Field ready, provides remote support for field operations and reconnaissance.

*pRTS feature

DELL Technologies

Dell Technologies Networking Platforms

MAXIMIZE CONNECTIVITY FROM **EDGE** TO ANYWHERE

Dell EMC SD-WAN Solution powered by VMware

Simple and powerful turnkey modernization
Optimized appliances for the Edge

Factory-integrated with VMware

Dell EMC Virtual Edge Platform (VEP)

Advanced uCPE hardware with VMware
Open platform enables flexibility

Multiple virtualized networking functions

Full lifecycle support, services, and global supply chain capabilities all delivered by a single trusted vendor – Dell Technologies

DELL Technologies

Dell Technologies Streaming Data Platform

INGEST AND ANALYZE DATA AT THE **EDGE** IN REAL-TIME

ANOMALY DETECTION	HEALTHCARE DELIVERY NETWORK ANALYTICS	ADVANCED DRIVER ASSISTANCE SYSTEMS
STREAMING VIDEO ANALYTICS	EVENT SITE MONITORING	

DELL Technologies

Industry Leading Ecosystem from Dell Technologies

A SAMPLE OF PARTNER ECOSYSTEM TO COMPLEMENT OUR **EDGE** OFFERINGS

Telcos
Connectivity

AT&T, vodafone, verizon, NTT

App ISVs
Apps and Analytics

ptc, Genetec, sas, noodle.ai, Telit, software, MALONG, sparkcognition, Greenbird

Dev tool ISVs (Tanzu)
App and Analytics Enablement

MuleSoft, hazelcast, mongoDB, GitLab, bluemedora

GSIs
Solution Deployment

Atos, accenture, Deloitte., wipro, World Wide Technology

vmware

Industry-specific OEMs
Use Case Customization

Honeywell, EMERSON, SIEMENS, Rockwell Automation

Network Equipment
Telecom Network Integration

NOKIA, NEC, ERICSSON

Public Clouds
App and Data Services

IBM Cloud, aws, Microsoft Azure, Google Cloud

Silicon Providers
Use Case-enabling Components

intel, NVIDIA

DELL Technologies

Common EDGE Use Cases

- **Facial Recognition** requires computing power to scan video Surveillance sources and match facial mages to a known database. Additional requirements are to allow un-known facial images to be transmitted back to the data center to be added to the database and to continually retrain the image system.

- **Virtualized radio networks (5G)** providing the cost benefits of providing low latency and complex processing capabilities.

- **Augmented Reality (AR)** by providing the processing capabilities in 'local', the AR hardware can be lighter and more flexible.

- **Smart devices / telemetry data analysis** by proving processing to analyze data directly with low latency, results and decisions can be provided in a timely period.

- **Digital Twins** utilizing real time sensor data, virtual models can simulate the real world and provide insights into processes, actions and results.

Recent Win

DOD – remote location support

Customer: DOD / USAF

Scenario: Customer desired an initial test environment to evaluate a ‘non-physical’ relay of operational telemetry data to core analysis ‘data center’

Proposed solution: Working with the End User team, the customer’s engineering support, the initial design of the solution was a 5G (high speed / low latency / low power) mesh solution. As part of this solution the Radio Access systems were built with Dell’s XR4000 Ruggedized Platform.

Current Project Status: Initial design is in early testing phase (lab environment).

Dell Technologies Data Protection Solutions

Comprehensive portfolio built to protect modern workloads

Data Center Backup

Backup Targets

Integrated Appliances

Direct Cloud Backup

In Cloud Protection

In-Cloud
Protect Cloud Born Workloads

SaaS Apps
O365, G-Suite, Salesforce, Slack

Protect any cloud-born workload

Disaster-Recovery

Cloud DR
Replicate VMs to the Cloud

On-Prem
Replicate to DR Site

DRaaS
On-Prem/Cloud DRaaS Offering

Ability to recover from disasters

Cloud Archive

ECS Tier
Long-Term Retention

Cloud Tier
Long-Term Retention

Tier rarely accessed data to free space

Cyber-Recovery

Air-Gap
Recover From Cyber-Attacks

Ability to recover from cyber-attacks

CLOUDS: VMC, aws, Microsoft Azure, Google Cloud

PLATFORMS: vSphere 7, kubernetes, Tanzu, VCF, OpenShift, Rancher, AKS, GKE, EKS

APPS: RDS, cassandra, mongoDB, MySQL, SQL Server, PostgreSQL, ORACLE

DELL Technologies

Next Steps and Q & A

Architect your Edge solutions to achieve
And assist your mission

- Devices
- Applications
- Multi-Clouds
- Infrastructure

Next Steps

- Schedule a Test Drive
- Contact Carahsoft & Your Technology Partner
- Contact your Dell team

DELL Technologies

DELL Technologies

Thank you for viewing this Dell Technologies presentation! Carahsoft is the distributor for Dell Technologies public sector solutions available via GSA, ITES-SW, MHEC, and other contract vehicles.

To learn how to take the next step toward acquiring Dell Technologies' solutions, please check out the following resources and information:

For additional resources:

carah.io/DellResources

For additional Dell Technologies solutions:

carah.io/DellSolutions

To purchase, check out the contract vehicles available for procurement:

carah.io/DellContracts

For upcoming events:

carah.io/DellEvents

For additional public sector solutions:

carah.io/DellSolutions

To set up a meeting:

Dellgroup@carahsoft.com or 866-Dell-2-Go

carahsoft

For more information, contact Carahsoft or our reseller partners:

Dellgroup@carahsoft.com | 866-Dell-2-Go