

Securing your Rail Infrastructure:

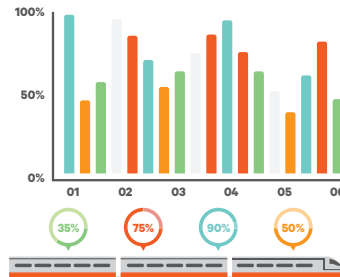
# Vertiv In Rail Transport

## THE EVOLUTION OF THE RAIL INDUSTRY



### Personalized Mobility

- There is growing focus on enhancing customer experience with the goal of enabling passengers to stay connected before, during, and after their commute.
- Passengers are now able to access real-time information on train routes and travel times and be alerted of any incidences to make their commute more convenient and comfortable.
- Integration of e-commerce features on some train stations, allowing passengers to do their shopping online and pick up their items at the nearest train stations.



### Sustainability for Growth

- As the rail system becomes digital, there is also a shift towards a more sustainable transport model.
- Operators continuously seek for innovative technologies that increase efficiency and resiliency while strengthening the overall rail infrastructure
- The goal is to be able to harness technologies while lowering operating cost and ensuring safety of availability of the entire rail network.



### Protecting the Digital Rail System

- With increased reliance on technology and customer experience, operators need to ensure that all personal data and information collected from passengers remain protected at all times.
- At the same time, operators must also ensure that their equipment are also optimized and protected against sudden breakdowns and outages.
- There is a need for a two-pronged approach to security: physical and digital.

## INFRASTRUCTURE CHALLENGES



### Managing Costs while Enhancing Infrastructure Performance

- Rail operators must be able to guarantee a more efficient and resilient system, while minimizing operating and maintenance costs
- The challenge is to integrate new technologies and systems to the existing network to enhance overall performance and introduce automation
- At the same time, existing equipment should also be designed to meet the environmental demands of rail networks



### Enabling a Smart Transport Network from Core to Edge

- With increased reliance on automation, rail operators must be able to manage multiple applications within the network, from the main data center to various train hubs across a particular region
- It is important to ensure seamless integration of all applications across the system for effective implementation of new technologies
- Different infrastructure requirements for both core and edge computing applications. Operators must be able to identify the right solutions for each IT deployment



### Maintaining Reliability and Safety

- Immediate access to data to address critical issues immediately
- Data security and reliable communication network is a major concern
- Protection against power disruption and disturbances across every location

## VERTIV CORE TO EDGE SOLUTIONS



### Liebert® NXC (10 to 60kVA)

- Double conversion efficiency up to 95.5%
- ECO mode efficiency up to 99%
- Input current total harmonic distortion correction (THDi)<5%
- Input/output and bypass circuit breakers
- Integrated manual bypass
- Integrated parallel load bus and synchronization port (LBS)
- Integrated Battery autonomy



### Netsure™ 531 A91

The NetSure™ 531 A91 series embedded high frequency switch mode power supply system was designed based on its years of experiences in development and running to meet the need of to deliver reliable and uninterruptible DC power supply for the LTE in-building solutions, FTTx broadband multi-solutions, macro station and outdoor cabinet.



### SmartAisle™

Liebert SmartAisle is a combination of the most advanced innovations in data center with the simplest self-assembled integrated design that is tailor-made to fit and perform in your white-spaces surpassing your expectations.

#### Features:

- Power Distribution System
- Modular Construction
- UPS System and Precision Cooling Units
- Support Utilities and Cable Management
- Remote Monitoring
- Advance Touch Screen Display Controller



### Liebert® HPS

The Liebert HPS is a high performance split air conditioner designed to provide proper environmental conditions inside technological environments, especially for mobile networks.

- Can be configured depending on the main application drivers (noise level, environmental conditions range etc.) and the desired options (freecooling, emergency freecooling, heating etc.).



### Liebert® APM 150 (30 to 150kVA)

- Ultra high efficiency up to 96 in double conversion mode, flat efficiency curve
- Each 30kVA module deliver 30kW, unity PF
- Maximum power density in its range allow it to accommodate 150kVA in <0.66m<sup>2</sup> space
- Distributed controller: Each module has its own DSP
- Input PF >.99, THDi <3%
- Standard built in LBS function and smart parallel
- Capable to handle 0.9 leading loads
- Flexible battery combination adopts 12Vx30/32/34/36/38/40 cell design



### Chloride® CP70Z

AC Uninterruptible Power Systems designed for heavy-duty industries offer full flexibility with a wide variety of configurations and options. These systems combine conservative design topology (SCR/IGBT) with proven digital control technology to provide high reliability and best performance in any electrical and environmental conditions.



### SmartRow™ 2

Vertiv™ SmartRow™ 2 brings an innovative approach to efficiently integrate and manage distinct systems namely, Power and Distribution system, Thermal Management, System Security, Comprehensive Interface, Cable management, and other pertinent aspects.

#### Features:

- Efficient Cooling Architecture
- Demand-Driven Deployment
- Intelligent Monitoring and Management System
- Accessibility, Management & Secure



### Liebert® HPF

- Compact & Easy to Install Solution with R410A Refrigerant Included
- Provides enhanced energy savings with direct freecooling through the use of outside cold air as a main source of cooling.
- Fast and easy installation. All components easily accessible from the front for simplified maintenance and service. Service delivered by factory trained technicians guaranteeing 24/7 technical support.



### NetXtend M-Series

Multi-purpose enclosures for outdoor applications. The outdoor cabinets and enclosures protect an array of electronic equipment at remote sites



### Avocent® HMX

The Avocent HMX Digital High Performance KVM system is designed for organizations that need to provide workers the ability to seamlessly access and share one or more computing resource(s) which are physically separated from their work environment.



### Chloride® CP70R

DC Uninterruptible Power Systems designed for heavy-duty industries offer full flexibility with a wide variety of configurations and options. These systems combine reliability from naturally cooled thyristor-based rectifier with proven digital control technology to offer the best performances in any electrical and environmental condition.



### Liebert® RDU A-G2

The Liebert® RDU-A G2 is an infrastructure management solution from Vertiv that allows data center administrators to manage environmental conditions i.e. temperature and humidity, leak, smoke, vibrations and digital inputs and outputs.



### SmartCabinet™

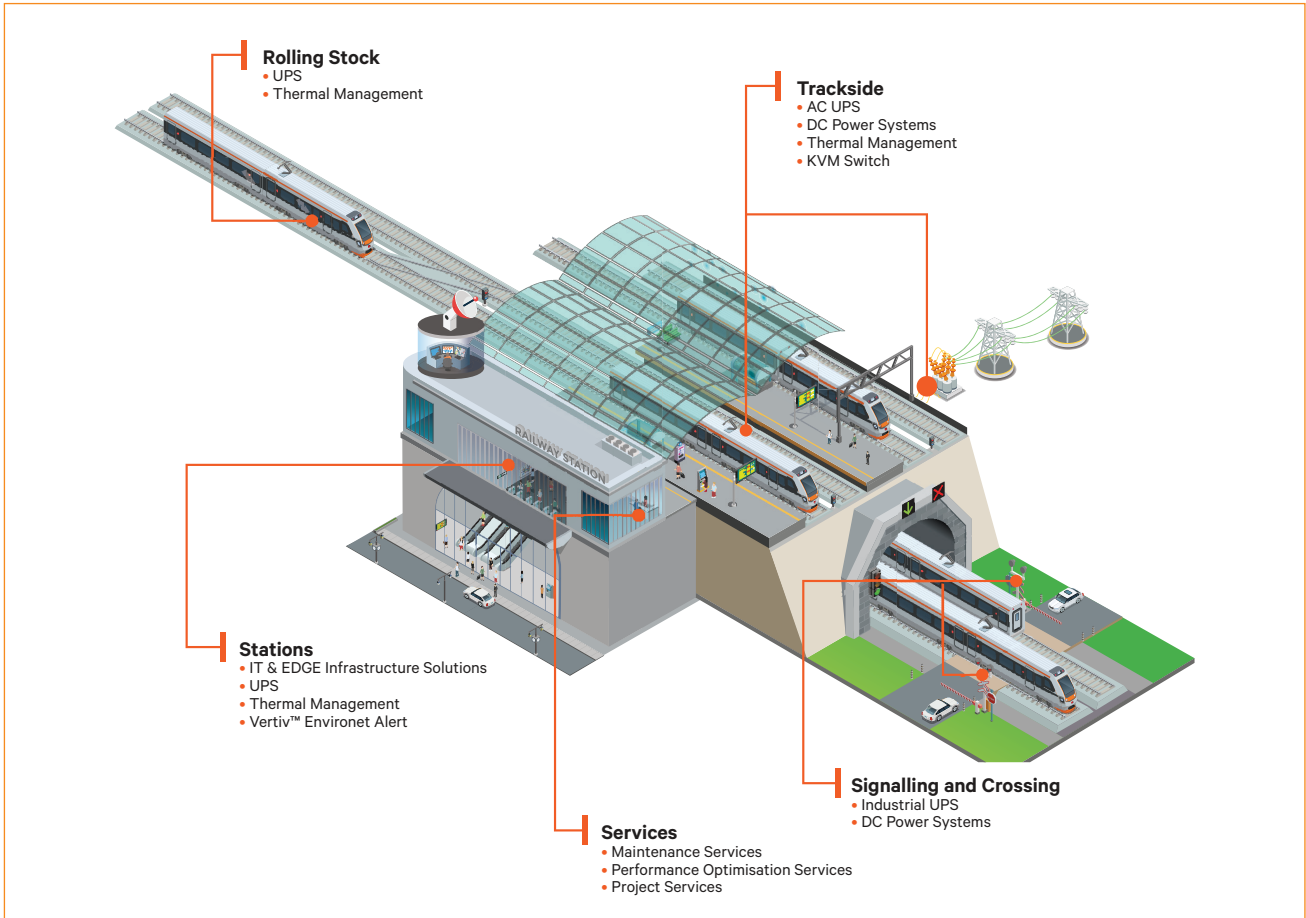
Self-contained, pre-configured, pre-engineered and factory tested infrastructure solutions for data centers and telecom networks.

#### Features:

- Fully integrated
- Dust protection and noise insulation
- Highly Efficient
- Fast deployment
- Central Management

# Vertiv in Rail Transport | Case Studies

## VERTIV END-TO-END CRITICAL INFRASTRUCTURE



### TRAIN NETWORK IN ASIA



#### Overview

Minimized downtime in its data center through installation of next-gen power and cooling technologies to support intensive operations and long working hours.

#### Vertiv Solution

- Liebert® NXA
- Liebert® PEX
- Liebert® APM
- Liebert® CRV
- Avocent® KVM
- Chloride® FP60
- SmartCabinet™

### TRANSPORTATION NETWORK IN NEW ZEALAND



#### Overview

The customer needed a centralized solution that would help it monitor all Rail Stations, Ferry Terminals, Car Parks and Bus Depots across Auckland City. The solution should be highly efficient, easily scalable, and can withstand harsh environment conditions as is the condition in the transport hubs across the region.

#### Vertiv Solution

- Avocent® DSView 4
- Avocent® ACS6000 Series
- PM3000 Managed PDU
- Liebert® RDU
- NetSure™ DC UPS

### RAILWAY SYSTEM IN SOUTHEAST ASIA



#### Overview

The customer needed a solution that would protect its critical infrastructure, as well as provide back-up power to minimize downtime and ensure smooth running of all support infrastructure, particularly the data center.

#### Vertiv Solution

- Liebert® NXA
- Liebert® PEX

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