

MCX Solution Overview



Open Standards Mission Critical
Communication Platform



Introduction to MCX ONE

MCX ONE is a 3GPP based open standard mission-critical platform for critical communication. MCX ONE supports Push to Voice, Data, and Video over broadband networks thereby allowing professional users to communicate with features suitable for mission and business-critical operations. MCX ONE solution also enables advanced features such as enhanced PTT services and multimedia group communications to provide users with capabilities relevant to growing requirements related to broadband data. The solution is built on architectures and technologies that consistently, reliably, and at scale deliver unparalleled operational efficiency and cost-effectiveness.

MCX ONE comprises an ecosystem of :

- MCX ONE Core
- MCX ONE Dispatch Center
- MCX ONE Mobile Application
- MCX ONE Interworking Gateway
- MCX ONE Application Integration Server
- MCX ONE Devices

The ecosystem is built in compliance with the defined MCX standard.

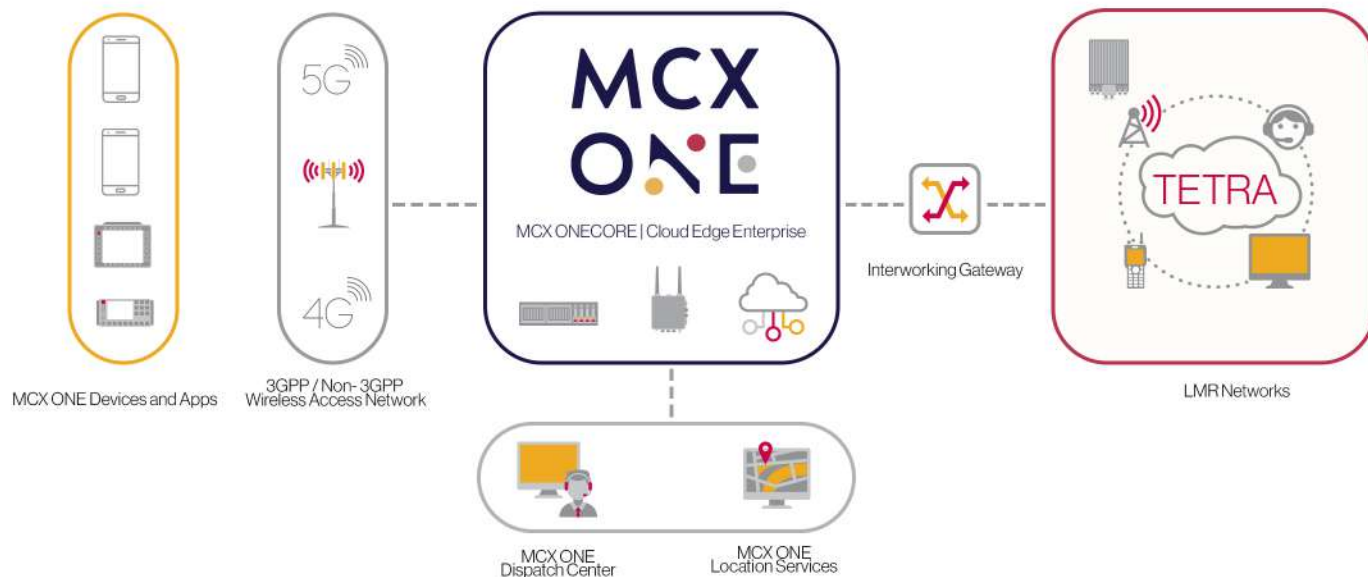
Open Standard Mission Critical Communication Platform



MCX ONE Core is an application service based on MCX standard and is available in Edge, Enterprise, or Cloud configurations based on customer requirements. MCX ONE solution can be deployed over a private or a public cellular network based on demand for a mission-critical or business-critical service. MCX ONE Interworking Gateway ensures integration to legacy LMR networks. MCX ONE

Apps are available on industry-standard platforms - Android, iOS, and Linux and can be used over commercially off-the-shelf (COTS) cellular devices as well as purpose-built MCX ONE devices. The MCX ONE Dispatch Centre deploys advanced dispatching solutions that let you track locations precisely, enable smart user management, remote monitoring access, and much more advanced features.

MCX ONE Solution Architecture



MCX ONE ecosystem and its connectivity with LTE 4G / 5G and legacy narrowband systems

Benefits of Cloud-Native

The new 3GPP standard for broadband introduces a service-based architecture designed for cloud-native deployments. MCX ONE Solution is based on microservices architecture that ensures building and deploying applications that are optimized for agility and automation of cloud computing. The key principles of MCX ONE Solution architecture are:-

- Division of application into more manageable pieces, whether this is referred to as "microservices", "subroutines", "code modules" or "software components".
- Each piece has a well-bounded scope and can be individually deployed, scaled and upgraded using a containerized environment.
- Faster and more automated upgrades using CI/CD (Continuous Integration and Continuous Deployment).
- Applications are deployed over VM therefore independent of underlying hardware.

Faster time-to-market for new services

Scalability to grow services according to demand

Flexibility to update services and develop new ones quickly

Resilient as one instance of a service fails, another one can quickly take its place

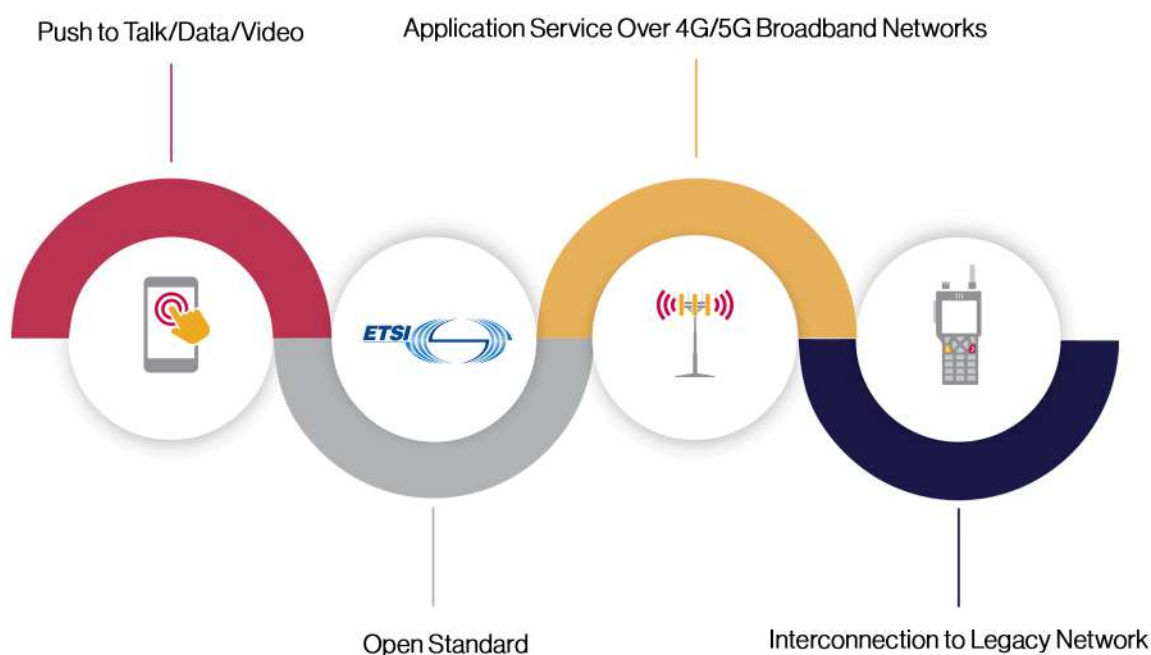
Reduced capital and operational expenditure for better cost efficiency



What is MCX?

A platform for mission-critical (MC) communications and MC services has been a key priority of 3GPP in recent years to fulfill requirements from different sectors of the global critical communications industry. Mission Critical X (MCX) is an open standard defined by ETSI and 3GPP, where X denotes several Mission Critical (MC) services such as Push to Talk (MCPTT), Push to Data (MCData) and Push to Video (MCVideo).

Various features for these MC Services are incorporated in the standard's roadmap and are developed with each 3GPP release. MCX is provisioned as an application service on current LTE 4G/5G and future broadband technologies. With regular updates, it will incorporate mission-critical services for industry-specific requirements such as railways, industries, marine, public safety, etc.



FRMCS for Rail Application

Future Railways Mobile Communication Systems (FRMCS) is all about the next generation communication needs of railway professionals for their mission critical applications. The gradual need for shifting from narrowband technologies GSM-R/TETRA to LTE 4G/5G is imminent and the foremost need for the new standards is to cater to the broadband data requirements of the transportation sector.

Therefore, 3GPP is working on the FRMCS standardization as an extension of MCX standards to develop a successor to the existing technologies to be deployed for railway networks critical communication. That closes the gap between MCX

and railway operation requirements in future 3GPP releases. FRMCS will be contained in the 3GPP Application Layer, just like MCX, and it will be agnostic of the transport layer that provides a radio bearer service.

FRMCS is said to become a global standard that will ensure improved safety, high operation and provisioning of applications for the mass transit customers. It will utilize current LTE 4G / 5G and future broadband technologies to deliver ultra reliable, low latency mission critical communication for the rail and mass transit organizations.

MCX ONE Core

MCX ONE Core is the functional backbone of the entire MCX ONE ecosystem. Designed and developed over 3GPP's MCX standards, it supports MCPTT, MCDData, and MCVideo, along with interworking functions that provide integration to legacy narrowband networks. MCX ONE Core can be deployed in controlling and participating mode of operations and provides all the standard based configurations and management functions such as:

- o Identity Management Server (IDMS)
- o Configuration Management Server (CMS)
- o Group Management Server (GMS)
- o Key Management Server (KMS)
- o Location Services (LMS)

MCX ONE Core features include Group call, Private call, Emergency, Broadcast calls along with Late Entry (LE), Call Merge, Call Forwarding, and Ambience Calls. MCX ONE Core also supports multimedia communication features such as Short Data Messaging, File Transfer (Audio, Video, Images, Text), Video Calls, and Video Streaming, MCX ONE Core provides enhanced Group/Re-group functionalities that are user, location, or system-defined and supports location services such as Geo-Fencing, Geo Tracking, etc.

MCX ONE Core is available in three deployment options - Edge, Enterprise and Cloud. They can be provisioned as a standalone or in high availability configuration.



MCX ONE Core - Edge

- o Upto 1,000 Subscribers
- o Industrial, Campus, Manufacturing, Mining
- o Integrated LTE for Remote Monitoring, Updates

MCX ONE Core - Enterprise

- o Upto 20,000 Subscribers
- o Rail, Airports, Public Safety, Smart Cities
- o COTS Server Hardware

MCX ONE Core - Cloud

- o Upto 100,000 Subscribers
- o Operator, Smart Cities
- o Cloud Services - AWS, Azure and Google Cloud
- o Flexible and easy provisioning

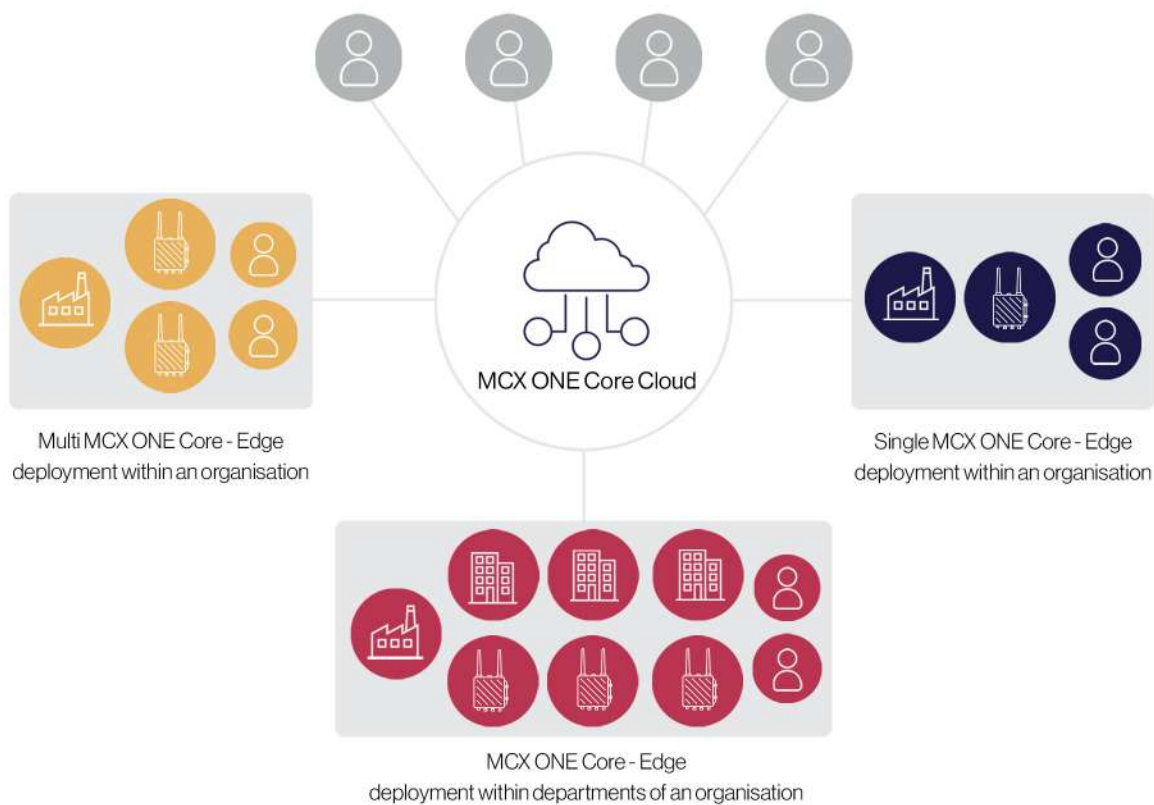
MCX ONE Core - Deployment Options

MCX ONE Core offers highly scalable architecture that helps the user meet its growing business needs easily. For organizations that require a private on-prem deployment, MCX ONE Core - Enterprise is an ideal solution that can be provisioned either as a standalone or multi-node solution. Typical users are public safety, and transportation (railways, metros, airports, ports, etc), among others,

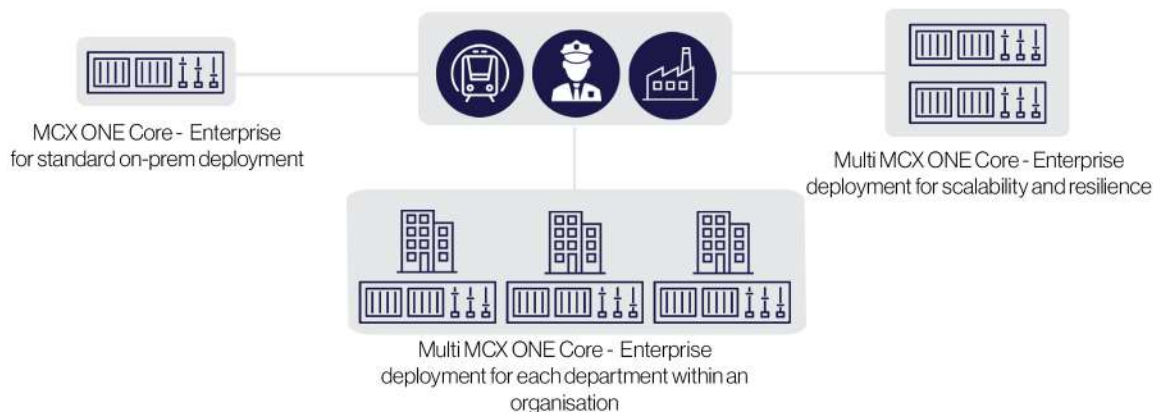
MCX ONE Core - Edge is typically deployed at customer premises which can be connected to MCX ONE Core- Cloud thereby providing scalability and resilience for small

to large organizations. Each organization can deploy single or multi Core EDGE within the premises or even within each department. MCX ONE Core - Edge provides exceptional efficiency and performance being close to the on-prem users while it connects to the MCX ONE Core Edge - Cloud to provide services to remote users. MCX ONE Core - Edge clustering and integration with the cloud also ensures seamless upgrades, backup, and monitoring. Typical users include small and large industries, municipalities, smart cities, logistics, hospitality, and health care.

MCX ONE Core - Edge Cloud



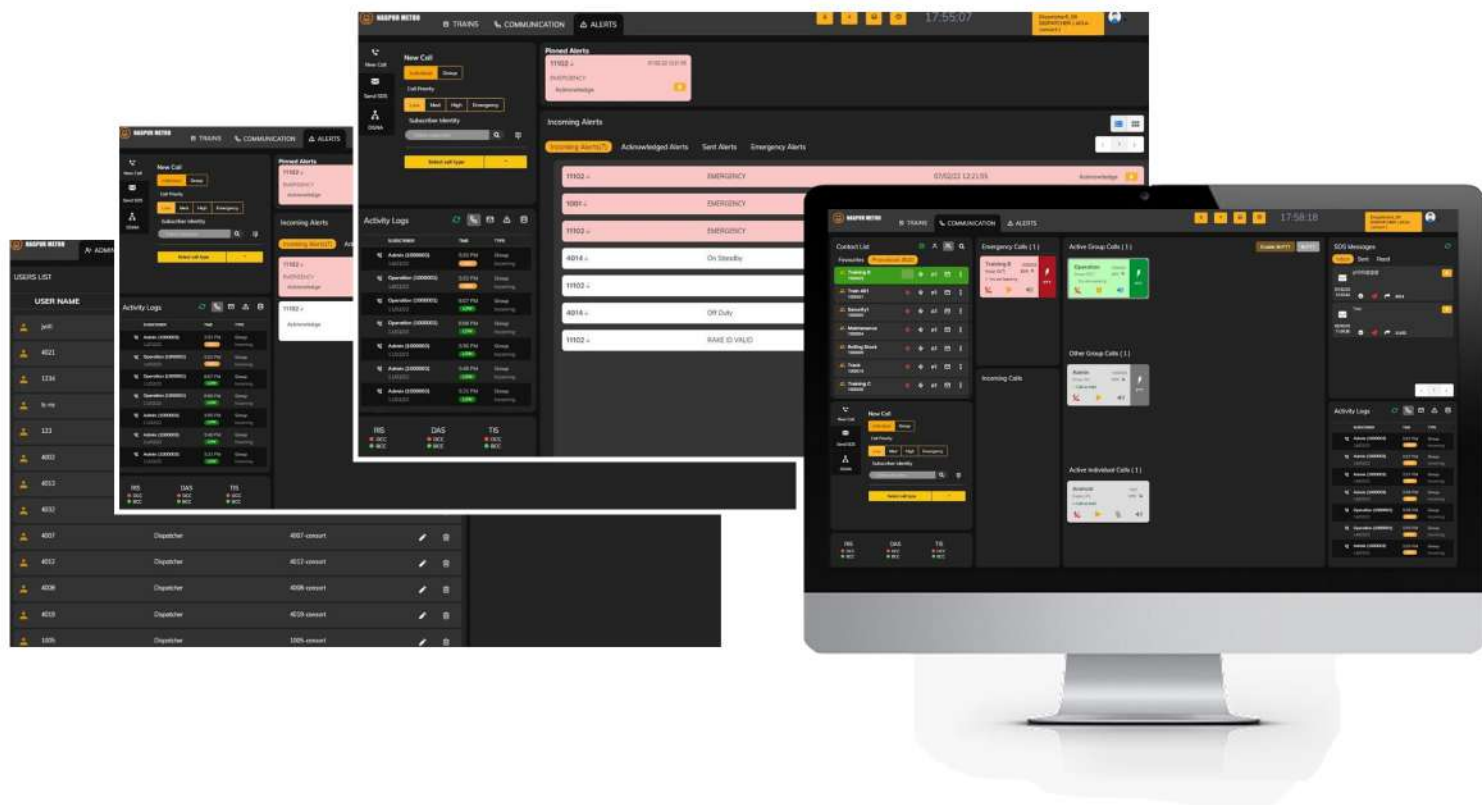
MCX ONE Core - Enterprise



MCX ONE Dispatch Center

MCX ONE Dispatch Center is a modern intuitive dispatch system that provides efficient management through its advanced functionality for control room users. The solution integrates seamlessly to broadband networks (LTE 4G/5G) using MCX Application service. It is based on a client server architecture and is scalable from a single control room to large multi control rooms scenario. MCX ONE Dispatch Center solution comprises the MCX Dispatch Client that provides a comprehensive human-machine interface for

ease of communication between the users. MCX ONE Dispatch Client is web based and provides a seamless transition between different available views - Communication, Alerts, Location and Industry specific custom views. The MCX ONE Dispatch Client connects to the MCX ONE Core and delivers advanced communication features such as MCPTT, MCData and MCVideo to MCX ONE Mobile Application. Dispatch Center also works with narrowband solutions using the inter-working gateway.



Modern and intuitive UI/UX design

Intuitive User Interface based on modern design templates using latest web technologies.

Custom Views for industry verticals

Custom views based on industry requirements such as Patrolling Management View [Public Safety].

Flexible deployment options

Web technologies and IP based solution provides multiple deployment options such as hosted and cloud.

Web based solution

Web based dispatch solution that runs seamlessly on google chrome browser.

MCX ONE Mobile App

MCX ONE Mobile Application provides ease and reliability of professional radio PTT along with the ability to share voice, data, and video; The application is developed to facilitate Push-To-Talk, Push-To-Data, and Push-To-Video from Android/iOS devices with a modern user interface that provides excellent operational capabilities. It enables users to send and receive real-time multimedia attachments to fulfill the need of clear and evidentiary information. It also provides location services such as sharing current location, location based temporary groups and geo-fencing alerts.

MCX ONE Mobile Application can be installed on a COTS mobile handset or on specialized user devices with support for physical PTT buttons as well as external accessories to maximize ease of communication. The application also allows you to multitask with other background applications running parallelly on the device.

MCX ONE Mobile App is designed and developed to work well with the legacy systems such as TETRA and DMR, which makes it an easy upgrade for the existing TETRA / DMR users.



MCX ONE Devices



Android/iOS Handset



Rugged Handset



Vehicular Radio



Train Control Panel



Radio Control Panel

MCX ONE solution comprises of specialized devices suitable for critical operations. Based on the roles and functions of the users these devices provide features and functionalities that help deliver MC Services to the end users. Some of the special features that are required by professional users include:

- Dedicated push to talk button and emergency button
- Water and environmental protection
- Ruggedness
- Long battery life / Battery life to the last operational shift of the user.
- Intuitive user interface
- Programmable buttons
- Customisable key operations/ Single key operation
- Simplicity and comfort of the buttons
- Outstanding Audio Quality and Noise cancellation for noisy environments.
- Safety and Protection

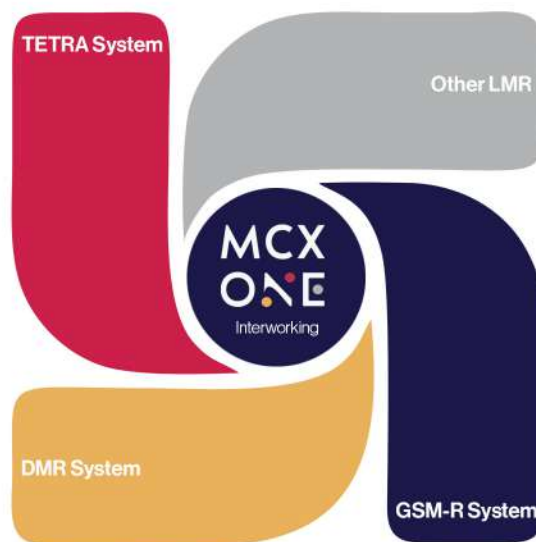


MCX ONE Interworking Gateway

MCX ONE Interworking Gateway provides integration of voice and data services between MCX and narrowband land mobile radio (LMR) systems.

In MCX systems, the identity of an LMR user is provided as an MCPTT ID, and the identity of an LMR group is provided as an MCPTT group ID, which can be used by the interworking gateway to derive the corresponding identities used in an LMR system.

Similarly, in MC Data systems, the identity of an LMR user is provided as an MC Data ID, and the identity of an LMR group is provided as an MCData group ID, which can be used by the IWF to derive the corresponding identities used in an LMR system.



Benefits

- Easy up-gradation of narrowband networks to broadband
- Service continuity to existing users
- Cost effective
- An easy path to future-proof current deployments
- Custom integration with upgradability to global standards (when available)
- Prioritization between the systems is managed
- Pre-emption

Interworking Gateway Features

- Group affiliation
- Group call
- Individual call
- Emergency call
- Broadcast call
- Short data messages/MC Data
- DGNA
- Call merge
- Ambience call
- Late entry
- Location services

MCX ONE Application Integration Server



MCX ONE Application Integration Server allows provisioning innovative applications relevant to particular industries. It enables a wide range of applications and solutions for Industry 4.0 and others that are key for future-proofing critical communication for various users.

For the mass transit industry, MCX ONE Rail Integration Server (RIS) allows integration to signalling systems deployed for train control & management operations. RIS provides signalling data from the signalling system to be used by MCX ONE Dispatch Center as well as MCX ONE Devices (Railway Solutions).

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All specifications are subject to change without notice.
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