Trainguard Sirius CBTC
For efficient mass transit operation
Proven success
Siemens has been developing and delivering automatic train protection (ATP), automatic train operation (ATO) and automatic train supervision (ATS) systems, for mass transit railways for many decades.

Over a few thousand km of track as well as thousands of trains are currently in revenue service with automatic train control (ATC) systems designed, manufactured, installed and commissioned by Siemens Rail Automation.

ATC systems, use common safety principles and shared technological platforms and have been installed in many mass transit and suburban railways around the world, including major network operators in London, Madrid, Barcelona, Valencia, Beijing, Singapore, Bucharest and Manila.

Maximum transport capacity
Trainguard Sirius CBTC has been specifically designed for high density lines. By optimising headway the operator is able to reach maximum transport capacity and optimise rolling stock usage.

Trainguard Sirius CBTC

Trainguard Sirius communication based train control (CBTC) is Siemens Rail Automation’s solution for all types of mass transit and suburban railways – conventional, driverless or fully automatic/unmanned. Trainguard Sirius CBTC is based on moving block principles, and uses the latest state-of-the-art digital radio transmission techniques.
Operating principles

Trainguard Sirius CBTC is an automatic train control system designed on a virtual moving block principle using communication-based train control (CBTC) technology. Trainguard Sirius CBTC uses a digital radio system to provide a continuous, high capacity, bi-directional train-to-trackside data communication link.

The basic operating principle of Trainguard Sirius CBTC is that each train is granted its own limit of movement authority (LMA). From the information contained in the LMA, the on-board equipment continuously supervises train speed, to safely ensure that the LMA cannot be exceeded.

In order to do this, each train continuously reports its position over the digital radio to the trackside block processor (BP). The BP uses the position information from the trains and track status information from the interlocking to recalculate the LMA for each train.

The LMA is sent, together with track profile data, via the trackside communications controller (TCC), based on moving block principles.

Passive absolute position reference (APR) beacons, located along the track, are activated by the train as it passes over them. They provide information which allow the trains to determine their position to the optimum level of precision as they move along the line. The train's movement is fully automatically controlled by the automatic train operation (ATO) equipment.
For lines that are not entirely driverless, a train attendant – not necessarily in the driver’s cab – will control the train doors and train start functions through a touch-screen device acting as driver machine interface (DMI).

Trainguard Sirius CBTC can also interface with platform screen doors (PSDs) by means of a bidirectional data exchange between the trains and trackside equipment. This allows open/close commands to be coordinated between the PSDs and train doors in a safe way and to provide accurate train stopping.

To operate such a system a wide set of automatic command and control functionalities must be available. To this end Trainguard Sirius CBTC includes an automatic train supervision (ATS) system, specifically developed by Siemens Rail Automation for its CBTC solution.

The ATS integrates a set of programs and tools to implement a wide range of functionality, including traffic control, depot management, train wake/sleep, automatic regulation, integrated maintenance, incident report/replay and operation simulators.

The ATS is also constructed using an open architecture allowing it to provide simple integration with other railway control systems such as traction power control, passenger information systems, building management, environmental control or any kind of telecommunication system.
Digital radio communications
Trainguard Sirius CBTC uses a powerful bi-directional data transmission system for vital information. This uses digital radio based on spread spectrum technology and internet protocol (IP) communication.

Architecture
The system architecture is open and distributed, allowing for easy application of Trainguard Sirius CBTC and its interfaces with other systems.

Flexibility
Trainguard Sirius CBTC can operate with other systems from Siemens Rail Automation on lines equipped with other Siemens Rail Automation systems – speed signalled, or distance to go.

Modularity
All of the subsystems of Sirius perform specific functionality. This enhances reliability and makes maintenance easier, but it also allows each sub-system to be upgraded without affecting the overall system.

Connectivity
Trainguard Sirius CBTC uses profibus and TNC standards for train carried equipment and IP based communication for trackside equipment and track to train communication.

Safety and reliability
Trainguard Sirius CBTC has been designed in accordance with European standards CENELEC 50126, 50128 and 50129. Vital functions are performed in both train-borne and trackside processors. Train location is determined to high resolution through the use of passive beacons.

Availability
Trainguard Sirius CBTC uses a 2 out of 3 architecture. This configuration, combined with the high level reliability of the individual components, results in availability figures in excess of 99.99%.

Maintainability
Trainguard Sirius CBTC includes a centralised maintenance aid system (MAS) to facilitate diagnostic work, both train-borne and trackside. All fault and incident information is stored within the relevant equipment and transmitted to the central maintenance system through a non-vital radio link.

Main characteristics
Trainguard Sirius CBTC embraces all the features expected in a modern effective, automated train control system
The information in this document contains general descriptions of the technical options available, which do not always have to be present in individual cases. The required features should therefore be specified in each individual case at the time of closing the contract.