MOBATIME time systems for metros in India

For several years India has been investing large sums of money in the construction of metros in large cities. The master plan is that every city with a population in excess of one million is entitled to an evaluation and if need be – provided that financing is secured - the construction of a metro. The Swiss Moser-Baer Group, together with its subsidiaries BÜRK MOBATIME GmbH and MOBATIME India Pvt. Ltd, has been actively involved for years in the provision of clock systems and time systems for metros in India.

Precise timing is essential for the operation of metros and trains. Traditionally, the time on platforms, in waiting rooms, shopping areas and in offices has been displayed using analog and digital clocks. In addition, a precise time reference is increasingly used for the synchronization of subsystems such as access control, monitoring cameras, loudspeaker systems etc. In addition, analog clocks in particular are important bearers of the corporate identity of a metro or train, using logos, shapes and colors in the respective corporate design.

All of these requirements are also represented in one of the largest metro systems in the world, the Delhi Metro. This system, for which the Delhi Metro Rail Corporation (DMRC) is responsible, currently comprises a network over 180 kilometers long with 138 stations. MOBATIME has been involved for many years in the running of this impressive metro network as a supplier and service provider. In phase I, supplies were provided by BÜRK MOBATIME via a large German system integrator. Phase II was managed by a French group, which was supplied with MOBATIME products via the Swiss head office. In this configuration, additional work is currently being carried out under phase II and planning work is being expedited for the coming phase III. In parallel to the supplies of hardware, Mobatime India Pvt. Ltd, part of the Moser-Baer Group and whose head office is located in New Delhi, has been involved in all phases of the project, supplying services such as commissioning, training and after-sales support.





Turnkey solutions comprising technology and products as well as services characterize the strategy of the Moser-Baer Group. Time systems and clock systems have been developed, produced and sold all over the world for 75 years. Today, these activities are carried out by ten subsidiaries in six countries – Switzerland, Germany, the Czech Republic, Russia, India and China – as well as with more than 150 sales partners in a further 60 countries.

The systems used by DMRC illustrate perfectly the development and potential of time systems and clock systems. Fundamentally, the clock system of the Delhi Metro is constructed as follows: at two central locations – Shastri Park and Barakhamba Road – there are a total of three redundant master clocks (master time centers) which are synchronized via GPS receivers. The master clocks provide the entire communications network of the Delhi Metro with the exact time accurate to a hundredth of a second. At the individual metro stations the time signal is used as the input for the master clocks there. These are designed with switching devices to be redundant and thus guarantee a high level of availability. The outgoing time signal synchronizes the analog



and digital slave clocks on the platforms, in waiting rooms, in offices and in public areas.

The first development phase of the Delhi Metro involved the time distribution between the master clocks via serial connections using the best available technology at that time. The connections, specifically those for the clock system, required separate maintenance which was not always a simple matter. The precise distribution to the stations and the synchronization of the clocks respectively was carried out using MOBALine, a time protocol developed by MOBATIME and used in thousands of systems. It is transferred via a simple two-wire line up to 100 meters and supplies self-setting clocks with time and date information. The automatic time takeover enables the simplest of commissioning and daylight saving time / winter time switchovers. In addition, MOBALine also offers integrated switch functions for the operation of relay functions, for example in door closure systems and lighting.

The next development stage of the Delhi Metro saw the implementation of time distribution to the master clocks using Network Time Protocol (NTP). At the same time, a fourth master time center was installed at the central location of Barakhamba Road in order to increase availability. NTP is transferred using the Fiber Optics Transmission System (FOTS) along the metro lines to the substations. As the synchronization of the slave clocks at the substations was still to be implemented with MOBALine, corresponding network-compatible master clocks with MOBALine outputs to the slave clocks were required. Redundancy and the high level of availability were guaranteed with monitoring and switch devices in this situation as well.

Further developments have also been achieved in past years with analog and digital slave clocks. The analog slave clocks in use today are vandal-proof and thus guarantee a long service life with associated cost savings. In addition, LED installation sets are available which allow DMRC to convert those analog clocks which are currently still fitted with fluorescent tubes directly on the platform. In terms of digital clocks, there are models available today which can read several time signals simultaneously (e.g. MOBALine and DCF). This allows the flexible use and replacement of this clock over different technological generations, which also means costs savings.

Based on the two development stages, there are additions options open to the Delhi Metro for the next expansion of the time distribution. The main feature is the complete integration of the clock system and the integration of network-compatible NTP slave clocks. At the central locations, the four currently redundant master time centers can be completely integrated by adding a superordinate time source. This can be achieved with two redundant time servers based on NTP. Using a fiber optic connection between the time servers, a continuous master-slave relationship and hot standby for maximum availability can be guaranteed. At the substations the MOBALine technology can be replaced or expanded with NTP slave clocks. As the second-generation master clocks and the MOBALine outputs are also available via NTP servers, DMRC has the option of replacing existing MOBALine clocks with new NTP clocks. Irrespective of replacement or new installations, NTP clocks offer various advantages: they are self-setting, can be supplied with power, depending on the design, directly via PoE (Power over Ethernet) and can be configured and monitored by means of appropriate software. The latter is accomplished by MOBATIME with network management software – MOBA-NMS. MOBA-NMS incorporates all the IP/NTP-based equipment from the different development stages and thus guarantees central administration, configuration and monitoring of the entire widely ramified clock system. This means a massive reduction in the supervision and maintenance costs of the clock system.

The procurement, installation, operation and maintenance of clock systems and time systems for metros and trains in cities such as Delhi with dozens of stations and



a network ramified over hundreds of kilometers is subject to specific requirements.

Investments which have been made are to be retained with expansions and must not be replaced. This is achieved using an open system concept in order to be able to connect existing and future technology – serial, MOBALine, NTP.

A complete integration of the relevant time sources should mean that the identical time is displayed or provided over the entire network.

The clock system is to be operated, monitored and managed centrally – in the Operation Control Center OCC. In so doing, servicing and maintenance work can be organized efficiently and economically.

Replacement parts and replacement products are to be standardized to a high degree over technological generations. This enables costs savings to be made and the logistics are simplified.

In addition to the investment protection with technology and systems, a standardized product concept should also cover the expenses for establishing know-how and training, e.g. for the maintenance employees.

At DMRC, MOBATIME is meeting these requirements using modularity and compatibility. At the central locations, the master time centers ensure that different time signals - serial telegrams and NTP - can be fed into the network and in this way several technological generations can be operated compatibly and at the same time. This is achieved using a modular concept. The different time signals required are provided by specific, intelligent modules in the same master time centers. This also ensures that by adding additional modules there is sufficient capacity for master clocks and slave clocks at the substations. There is also compatibility with the master clocks at the substations. The master clocks from the second development stage are network-compatible, have MOBALine outputs and integrated NTP servers and thus, if DMRC in future opts for NTP slave clocks, can also be used for synchronizing these time displays.

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We are always happy to discuss any questions and suggestions you may have.



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