



Trains crossing at Toronto's Old Mill Station © 2009 TTC

Train Control

AN ADVANCE COMMUNICATION BASED TRAIN CONTROL SYSTEM FOR TORONTO

RESIGNALING FOR HIGHER PERFORMANCE

The Yonge-University-Spadina Line (YUS) in Toronto had been constantly experiencing heavy traffic, and the Toronto Transit Commission (TTC) was seeking a higher level of operation performance to absorb the ridership increase.

TTC chose Alstom's Communication Based Train Control System (CBTC), awarding the company a contract to resignal the line instead of building an entire new system, adding another 15-20 years of life.

CBTC is the current generation of advanced train control technology using radio and modern network technology. Alstom's solution allows for more efficient operation and makes it possible to increase train frequency and transport capacity. The system is capable of providing headway of 90 seconds or better under normal operating conditions, allowing the TTC to run more trains, and therefore carry more passengers in less time.

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Alstom's CBTC solution is easy to install and can be applied to upgrade existing lines with minimum service disruption.

Alstom has developed a technique for migrating from a conventional signaling system to a radio-based automated train control system while existing metro lines are still in operation, without closing down any transit systems.

Note: The system will be put into service starting in 2012.

In This Section:

- Centralized Traffic Control
- Traffic Control Tools

> Centralized Traffic Control



Transit Control Center

Alstom's Centralized Traffic Control Systems are state of the art solutions to Train Control system requirements for both Transit and Mainline Rail Systems. The design is based upon a network distributed architecture and applies industry standard approaches in both hardware and software. This open architecture results in systems that are flexible, modular and cost-effective. The products apply Train Control application software design concepts that have been proven for over 40 years and feature Redundancy, Automatic Failover and High System Availability.

These systems evolved from Supervisory Control Systems beginning with single CPU minicomputers in the 1960's. They address the needs of both transit and mainline rail systems, with specialized modules for advance scheduling functions in transit and dark territory control in railroads.

Through the use of flexible building block approaches and open systems software and hardware technology, they cover a broad range of both system size and capabilities.

The building block approach and the distributed design also allow for easy system growth and functional expansion, as well as integration of MIS, AVI, and future communication based signaling information.

Alstom Systems provide advanced supervisory solutions for train control requirements, including specialized modules for advanced scheduling functions, dark territory control, conflict detection/resolution, Time-Distance Graph, simulation, playback, and asset planning.

The modularity of the system promotes distributed hardware control where any workstation may be used for supervisory control functions at any time. Operating over wide and local-area networks, customers can distribute control functionality to improve resource utilization.

Ease of use and maintainability tools allow users to efficiently operate and maintain their system. This includes the ability to add, remove or modify territory on their own, using a suite of user-friendly software tools.

BENEFITS

Operations

- > Centralized/Remote Train Control Management
- > Increased Dispatcher Productivity
- > Improved Efficiency via Automated Processing
- > Faster Scheduling, Routing and Event Response
- > Real-Time Alarm Notification
- > Remote Diagnostics
- > High System Availability

Open Systems

- > Industry Standard Hardware Platforms
- > Modular Scalable Software
- > Distributed Client/Server Architecture
- > Redundant Fail-Safe Processing Configuration
- > Portable/Expandable/Upgradeable Components
- > Transit or Mainline Railroad

Costs

- > Lower Initial Investment
- > Reduced Upgrade/Expansion Outlays

TRANSIT FEATURES

Train Control System

- > Color graphic displays for train occupancy/train location, wayside equipment status and alarms/warnings
- > Operation for mainline, local and interlocking control
- > Display and/or Printing of Train Graphs
- > Simulation and Playback
- > Alarm Management
- > High availability with Warm Standby auto - failure

Automatic Train Supervision

- > Signaling supervision
- > Route setting
- > Train tracking and identification
- > Timetable management
- > Traffic regulation
- > Driver information

Auxiliaries Management

- > Supervision and control of equipment for traffic station infrastructures such as escalators, fans, pumps, lights, ventilation, fire detection, gates, etc.

Traction and Energy Control Supervision and control of:

- > Power supply network
- > Traction sub-stations
- > Third rail/catenary sections
- > Energy equipment such as feeders, circuit breakers, switches, transformers, rectifiers, battery systems, etc.

Passenger Information

- > Inform passengers with voice and visual message displays about train arrival, train destination, incidents, public address, etc.

Telecommunications and Security

- > Systems Supervision and control over communication systems such as radio closed circuit television (CCTV), etc.



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RAILROAD FEATURES

Train Control

- > Control of Territory with Train Descriptor, Train Tracking, and enhanced Signal Control Function
- > Automated Schedule Regulation, with Computer Aided Dispatching and Routing
- > Display and/or Printing of Train Graphs
- > Simulation and Playback
- > Dark Territory Control
- > Alarm Management
- > Track Management via Blocking and MOW Authorities (DTC & TWC: GCOR, CROR, NORAC)

System Integration

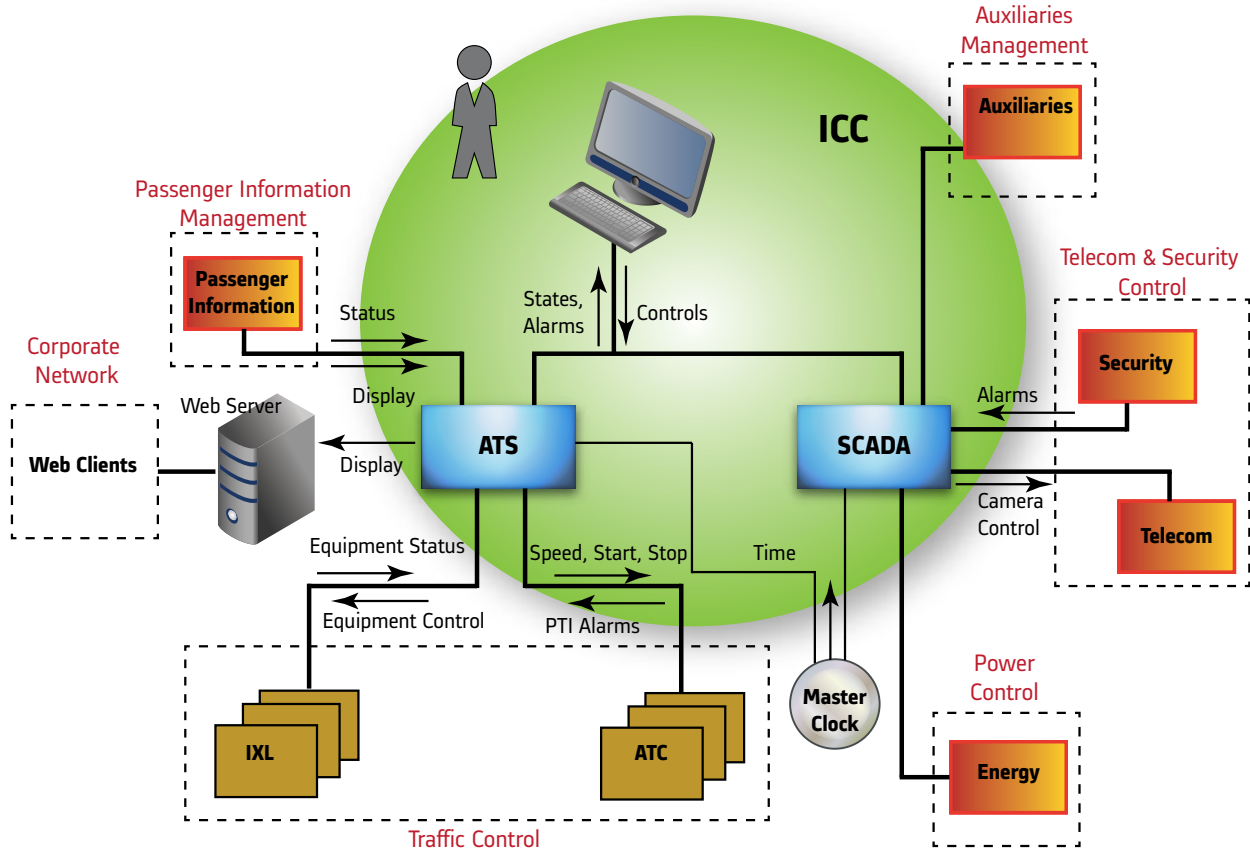
- > Communication Equipment
- > Video, Voice Integration
- > System Staging
- > Project Management

Operations Reporting System

- > Display Collected Operations Data
- > Generate User Defined Reports
- > Commercial Relational Database
- > System Interfaces For
- > Management Information Systems
- > Passenger Information Systems
- > AVI

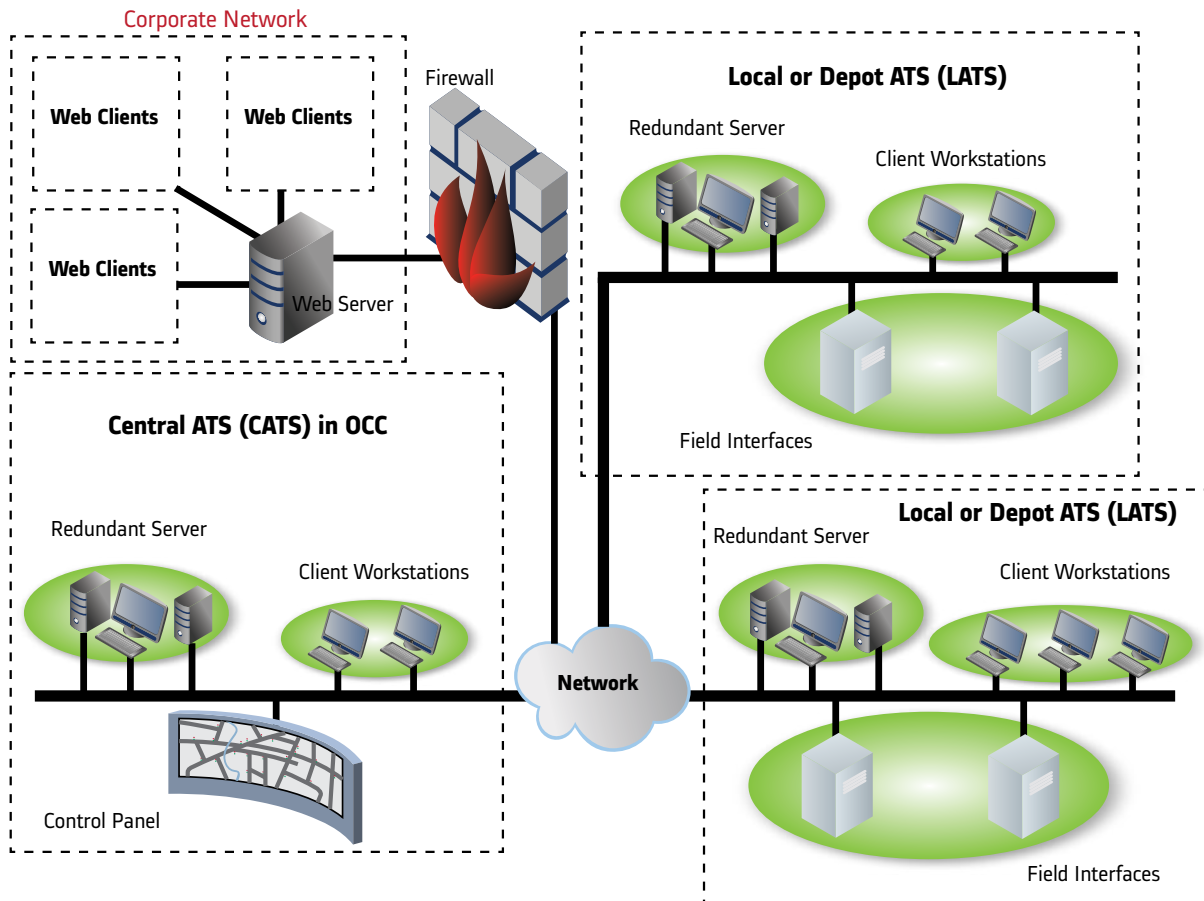


> Centralized Traffic Control



An open architecture utilizes standard hardware, software and communications. This PC-based solution enables the use of a large range of hardware and software modules for data acquisition. It allows implementation of a large range of scalable systems, from single standalone station, up to a full wide-spread client-server configuration involving hundreds of PC's.

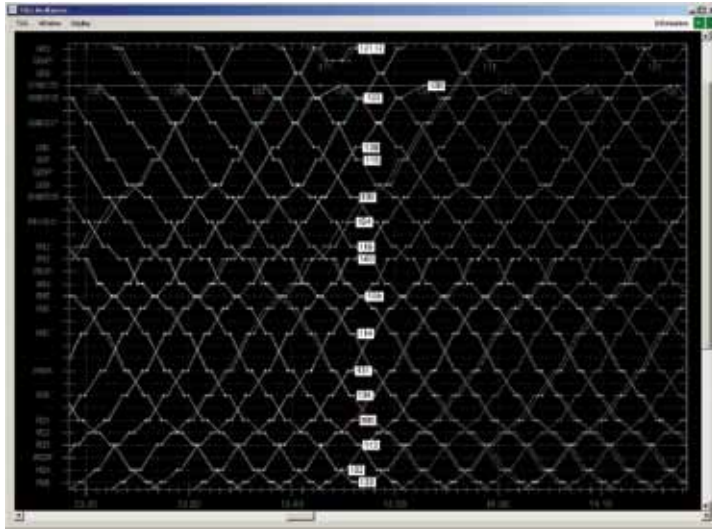
> Centralized Traffic Control



WEB ACCESS

- > Allows corporate network users to view real time and historical data from any computer
- > No special software to install and maintain, works with standard web browsers including Microsoft Internet Explorer and Mozilla Firefox
- > Uses the same graphical displays as the central office
- > Flexible access control system integrated with Microsoft Active Directory
- > SSL encryption protects network traffic
- > Provides Maintainers and Engineers the tools needed to troubleshoot signaling problems of all kinds

> Traffic Control Tools - Time Distance Graph and OGT



Time Distance Graph

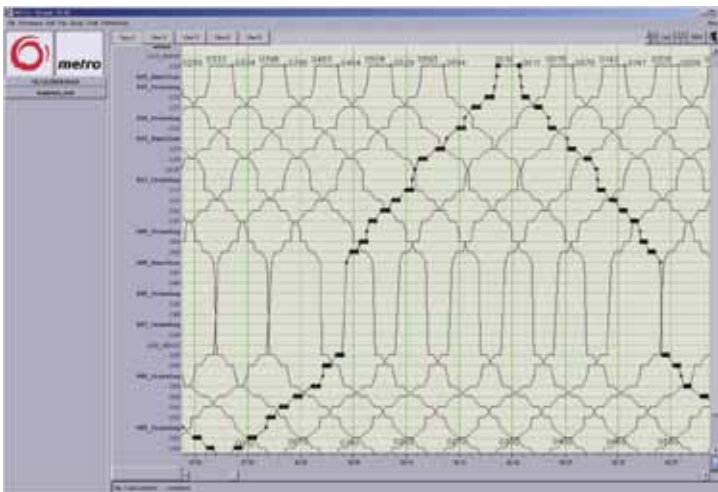
TDG can be used either in online mode or in historical mode to monitor or review train traffic taking into account infrastructure and temporary modifications to the timetable.

TDG is easy to use and highly configurable. It allows the operator to see in advance traffic problems in a clear and intuitive way and then to act quickly and to efficiently resolve the problem.

FEATURES

- > Real-time train representation in a space-time graph
- > Abnormalities representation

Time Distance Graph (TDG) helps users monitor and regulate train traffic. TDG gives a clear graphical view of the train circulation, infrastructure state and abnormalities.



Offline Graphical Timetable Generator

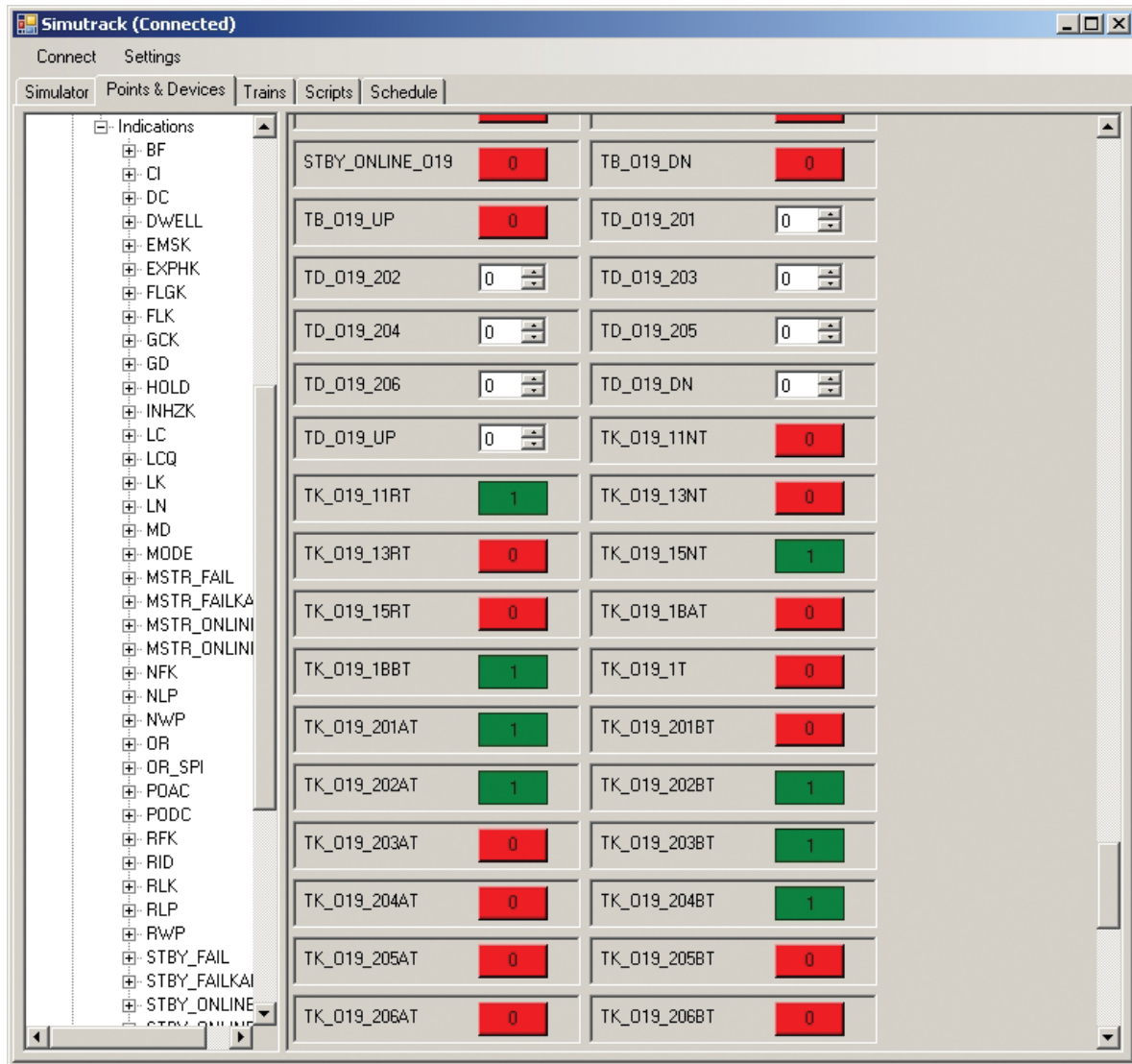
Offline Graphical Timetable Generator (OGT) helps users plan train traffic. OGT gives a clear graphical view of the train circulation, infrastructure state, abnormalities and detected conflicts.

OGT is used in a standalone offline mode to plan in advance train traffic taking into account infrastructure.

OGT is easy to use and highly configurable. It allows the operator to see in advance traffic problems in a clear and intuitive way and to efficiently resolve the problem.

FEATURES

- > Train representation in a space-time graph
- > Infrastructure provision representation
- > Abnormalities representation
- > Conflict representation
- > Modifications - all displayed objects can be modified



Simulator

FEATURES

- > **Simulates the Signaling System Devices**
- > **Simulates the Train Movement**
- > **Simulates the Trackside ATC**

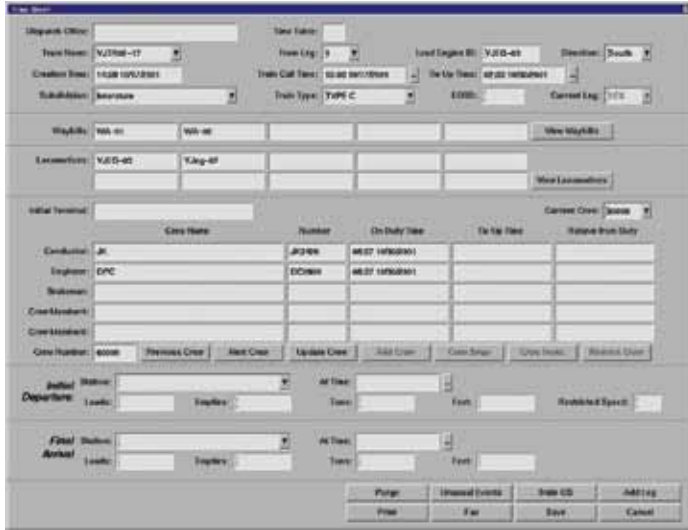
The Simulator is ideal for operator training and also supports testing of schedules before they are used in service.

Alstom's **Simulator** is a complete simulation system devoted to Mass Transit, Suburban Railways and Railroad applications. It is able to simulate the whole set of Signaling System Devices and the Train Control System (ATC).

The Simulator performs three distinct functions:

- > Simulates the operation of field devices in response to control requests
- > Simulated trains accelerate, decelerate and stop just like real trains
- > Manual point-to-point test of field indications and controls

> Traffic Control Tools - Database and Reports



Railroad Timesheet

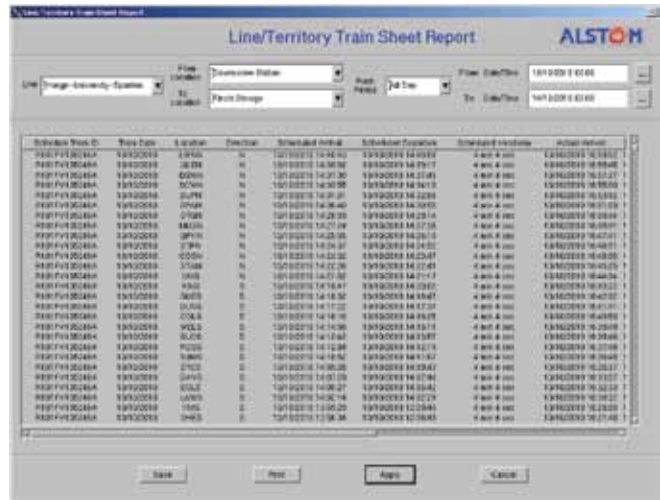
DATABASE FEATURES

- > Industry standard relational databases (Oracle, SQL-server, etc.)
- > Easy access to all data via SQL
- > Data is remotely accessible to external system (subject to security constraints)
- > Data is backed up using replication

Alstom's Centralized Traffic Control Systems utilize industry-standard databases, providing standard and efficient management of operational data. Users can easily access desired data and create their own ad-hoc reports.

REPORTS FEATURES

- > Standard set of reports
 - Train Sheet
 - Train Performance
 - Blocking Summaries, etc
- > Ad-hoc reports can be easily generated by the user
- > Individual reports can be added or customized using an easy to use report writer
- > Reports may be viewed, printed, archived



Transit Summary

FEATURES

- > Ability to graphically view all previous events
- > User can control the playback speed via an intuitive control panel
 - Fast Forward
 - Normal Speed
 - Slower than Normal Speed
 - Single-step to next event /time
 - Rewind
- > User can select any location(s) to display and can change them at will as playback continues. This allows the user to see what is happening anywhere on the rail system



Railroad Playback



Transit Playback

FEATURES

- > Displayed data are the same as the running system, no new graphics to learn
- > Available at any workstation
- > No special equipment required

Playback allows users to review operational situations to determine what happened in past incidents. Much more than a simple video playback, the user can examine any location on the system under full playback control, allowing an easy yet comprehensive analysis of the sequence of events.