



VISION PROGRAM

Vehicle Information System & Integrated Operations Network

January 21st, 2016





- CAD/AVL (Computer-Aided Dispatch and Automatic Vehicle Location)
 - Fleet Management System for TTC Surface Operations
- Original System from 1978
 - One of the first such systems in public transit
- Terrestrial Sign Post and Radio Based system
- Significant investments made over the years (\$36M)
 - Computing Upgrades
 - Introduction of GPS
 - Digital Cellular from Analogue
- Built and supported in-house



LIMITATIONS OF CURRENT SYSTEM



- Antiquated system architecture
 - Challenge to support and modify
 - Difficult to grow and add modern features
- Hardware provider no longer in business
- On-board system is not integrated
 - Organic Growth of Disparate Systems
 - Next Stop Announcements
 - Automatic Passenger Counters
 - Cameras
- Communications
 - UHF radio on legacy system
 - CDMA cellular End of Life (Early 2018)





- In 2012-2013 the TTC contracted IBI Consultants to review the current CIS and develop options for a way forward strategy which resulted in a recommendation for replacement
- New VISION System will deliver:
 - Improved Service Delivery to customers through enhanced route management and AVL for buses and streetcars
 - Modern life safety communications for operators
 - Better integration with TTC maintenance systems, Yard Management and Real-Time Information, Automatic Passenger Counting and Open Data Toronto
 - Automated Vehicle Health and Condition monitoring
 - Integration with existing and future Transit Signal Priority (TSP)

ESTIMATED COST EFFICIENCIES



	Extend CIS SOGR	VISION Program (updated with proposed 2016 contract values)	Cost Savings
Implementation Costs	\$62,900,000	\$99,100,000	(\$36,200,000)
20-Year Operating Costs	\$383,000,000	\$123,700,000	\$259,300,000
Total Cost of Ownership	\$445,900,000	\$222,800,000	\$223,100,000

Methodology used is consistent with the CIS Way Forward Study concluded in 2013.

The cost savings include:

- Reduction in personnel to operate and maintain system
- Reduction in end-user personnel for service delivery and management;
- Reduction in manual data processes
- Replacement instead of rebuild of communications architecture and TRUMP units
- Termination of CIS SOGR program





- VISION Operations Control System
 - Improved monitoring of service to identify delays
 - Headway adherence for streetcar and high-frequency bus routes
 - Schedule adherence for low-frequency bus routes
 - Real-time dashboards to track overall performance and drill down where needed
 - Expedite service adjustments in response to delays (e.g. change offs, short turns, add/remove service, shuttle service)
 - Effective detour management functions
 - Transfer connection protection for blue night services

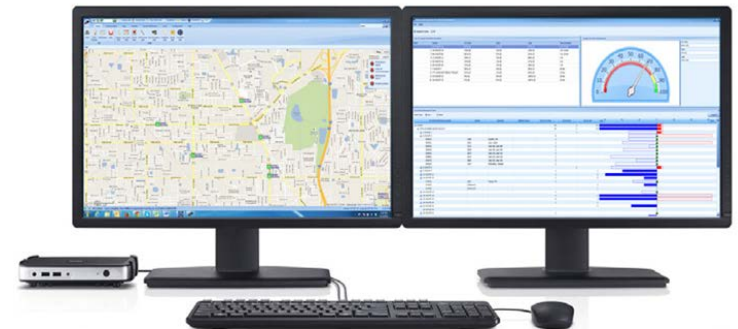
Improved on-time performance and reliability





- VISION Operations Control System
 - Emergency management functions
 - Integration to covert alarm
 - Security events trigger highest-priority response
 - Integration to on-board camera system
 - Coordinate response between Central Control, On-street Supervisor and first responders
 - Upgrade to TETRA and LTE communications

Improved safety and security



- Route Supervisor Solution

- Runs on standard field-ruggedized tablets integrated and synchronized with the VISION Operations Control System
- Monitor service remotely and receive automatic alerts/notifications
- Adjust service to respond to on-site issues
- Complete and submit incident forms while in field



*Improved coordination between
central and on-site supervisors*



- Smart Vehicle Equipment

- Modern color touch-screen (Mobile Data Terminal) to interface with operators
- Enhanced voice and text communications channels to provide support when required
- Vehicle On-board Computer that *knows* and responds to what's happening:
 - Informs operator if they are late or early to enable autonomy and improved performance
 - Updates customers of detours and broader service issues
 - Activates Transit Signal Priority if delayed
 - Informs central control if there are maintenance issues

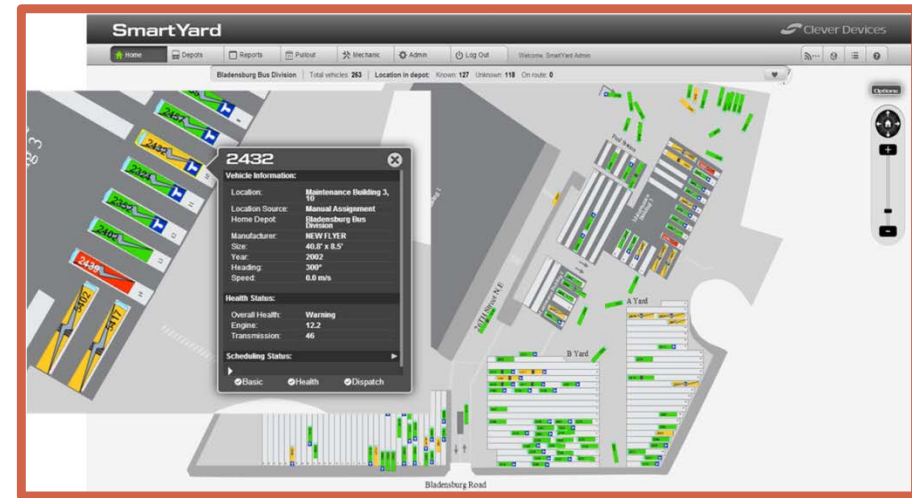


*Improved service performance and
operator satisfaction*



- Yard Management System

- Sensors at all divisions and car-houses that automate process for identifying where vehicles are parked
- Automate process for vehicle pull-in, assigning parking spots according to asset utilization and next-day service requirements



Improved asset utilization and efficiencies

- Vehicle Health Monitoring

- Monitor vehicle health information while in-service to minimize and control change-offs
- Collect and analyze significant detail about vehicle health to improve overall utilization
- Interface to TTC's IFS maintenance mgt. system to automatically generate work orders and schedule preventative maintenance



Reduction in change-offs and associated service delays

- Operator Workflow Automation
 - Sign-in kiosks at divisions to pick-up assignment and updates/notices
 - Yard management solution that identifies vehicle locations to the operator
 - Circle check completed electronically on vehicle to automate submission and tracking of issues
 - Parking direction via Mobile Data Terminal upon returning to yard



Improved process efficiency

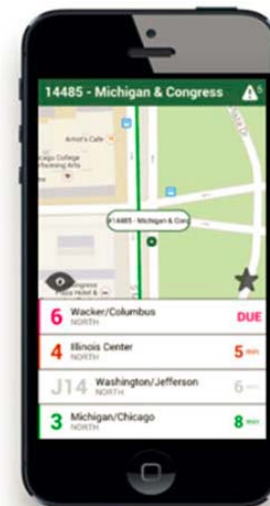


- Operator Performance Management and Support
 - Enhanced vehicle sensors to detect:
 - Hard acceleration/braking
 - Abrupt lane changes/turning
 - Speeding
 - Excessive revving and idling of engines
 - Direct operator feedback to promote safe and effective driving
 - Analytics reporting to identify persistent issues for training opportunities

*Improved driving safety and
reduction in fuel consumption*



- Customer Information
 - Initial integration to current provider for seamless transition to customers
 - New real-time information responsive website and modern mobile applications (iOS and Android)
 - E-mail and SMS next vehicle alerts at stops and for service bulletins
 - Open Data (GTFS-Realtime) to enable third-party development of customer applications



Improved customer information and satisfaction



- Historical reporting
 - Analyze data to identify patterns and trends
 - Generate standard and custom reports
 - Data is pushed out to TTC's Enterprise Data Warehouse for further utilization
 - Feedback to service schedules
- Incident playback
 - Replay and investigate incidents or issues resulting from internal and external requests
 - Export playback as video file for future reference or to respond to request



Improved planning and analytics





- System integration requirements:
 - Central via middleware:
 - Scheduling and Maintenance System
 - Customer and Operator Information
 - City of Toronto Traffic Signal Control System (for TSP)
 - City of Toronto Traffic Office
 - Enterprise Data Warehouse
 - PRESTO
 - On-board:
 - Vehicle sensors and diagnostics
 - Speakers and signs (for next stop calling)
 - Automatic Passenger Counter
 - On-board camera system and covert alarm



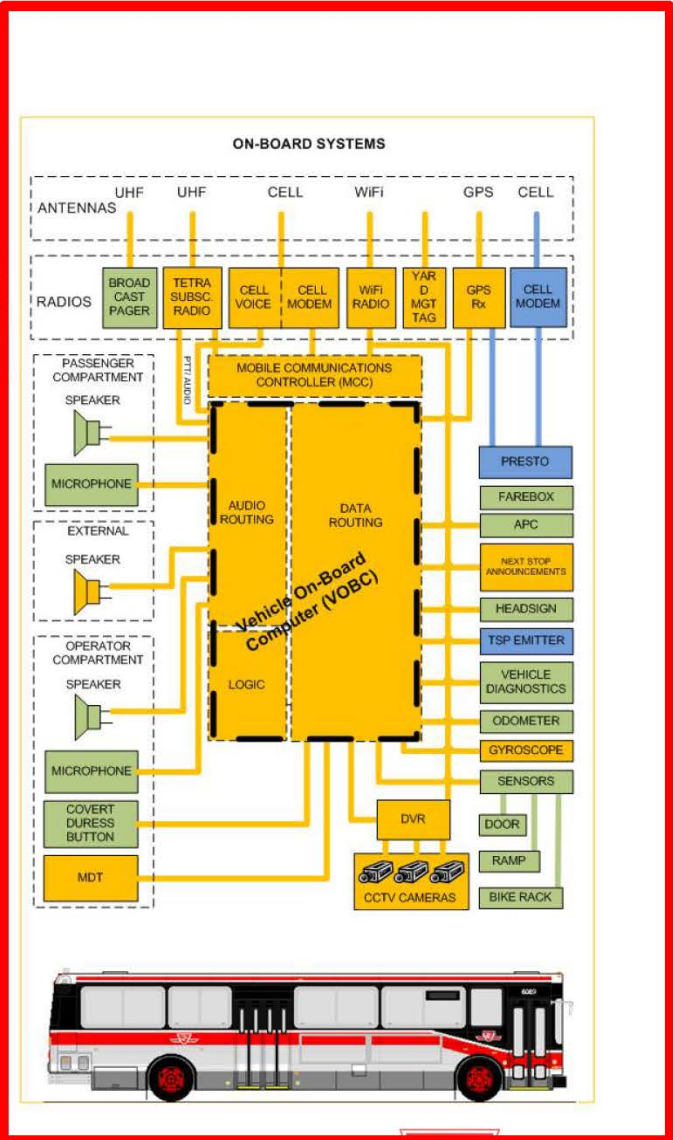
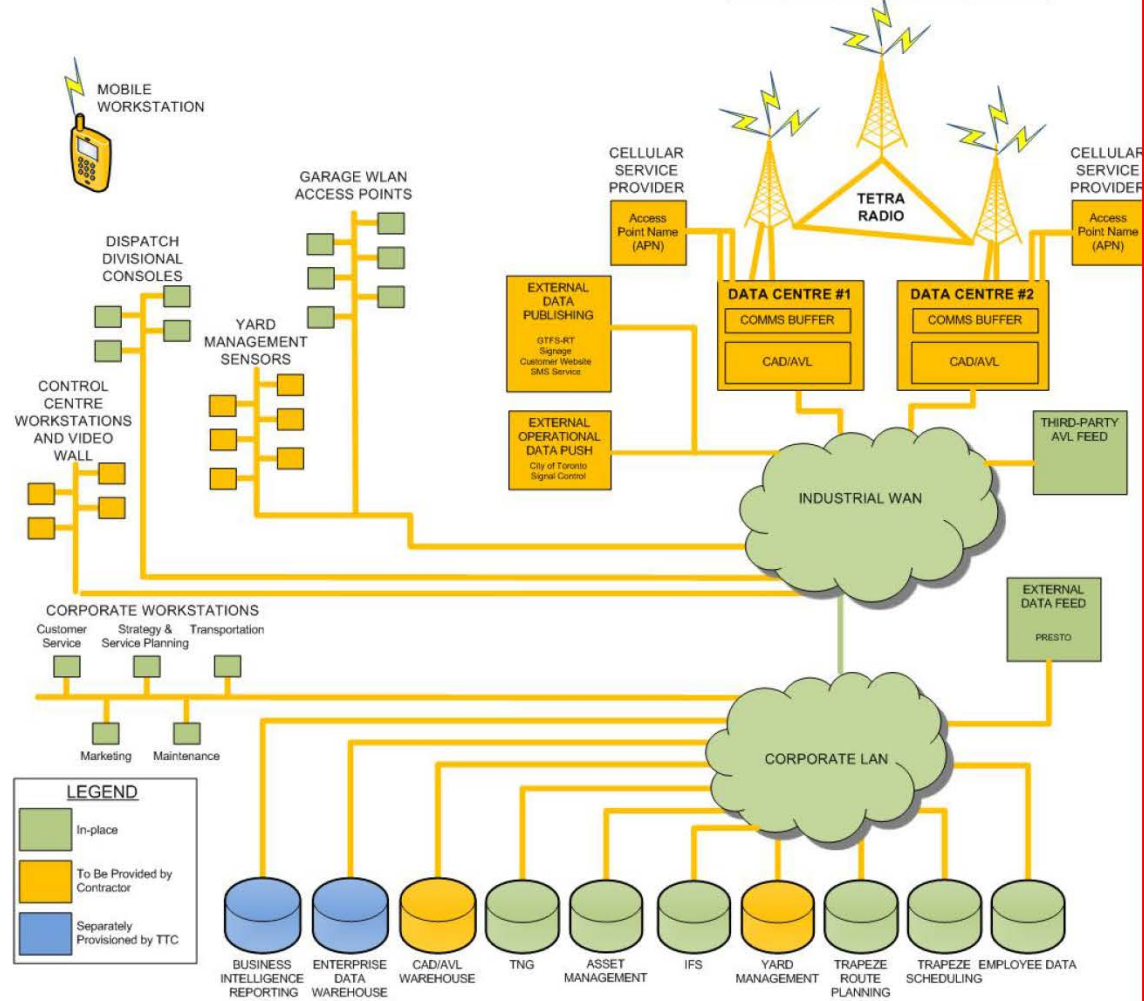


- Vendor Services will include:
 - System Engineering and Design (multiple stages)
 - Configuration of their standard solution to meet TTC's stated needs
 - System Quality Assurance and Testing (multiple stages)
 - Installation support
 - Documentation
 - Training
 - Project Management



ON-BOARD SYSTEMS

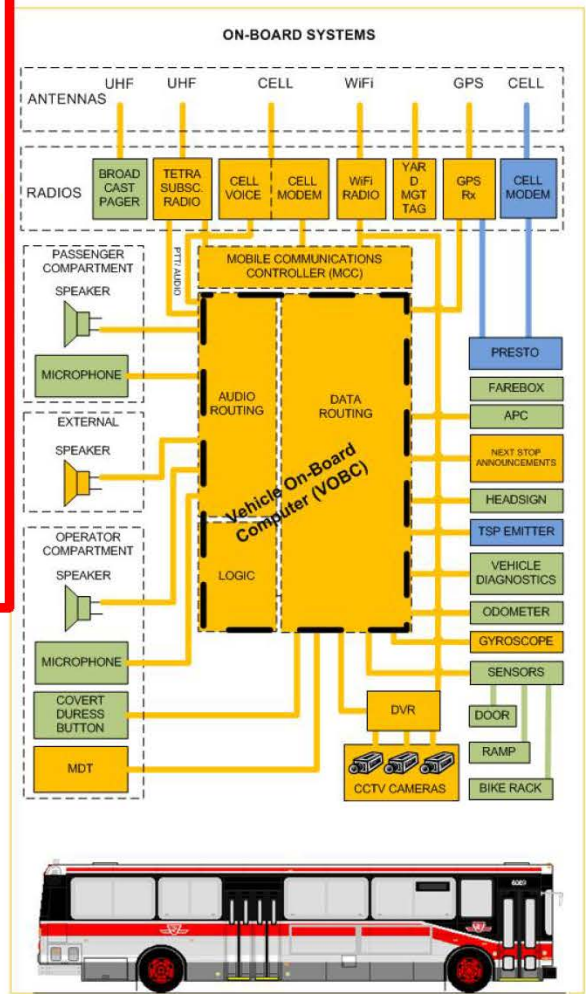
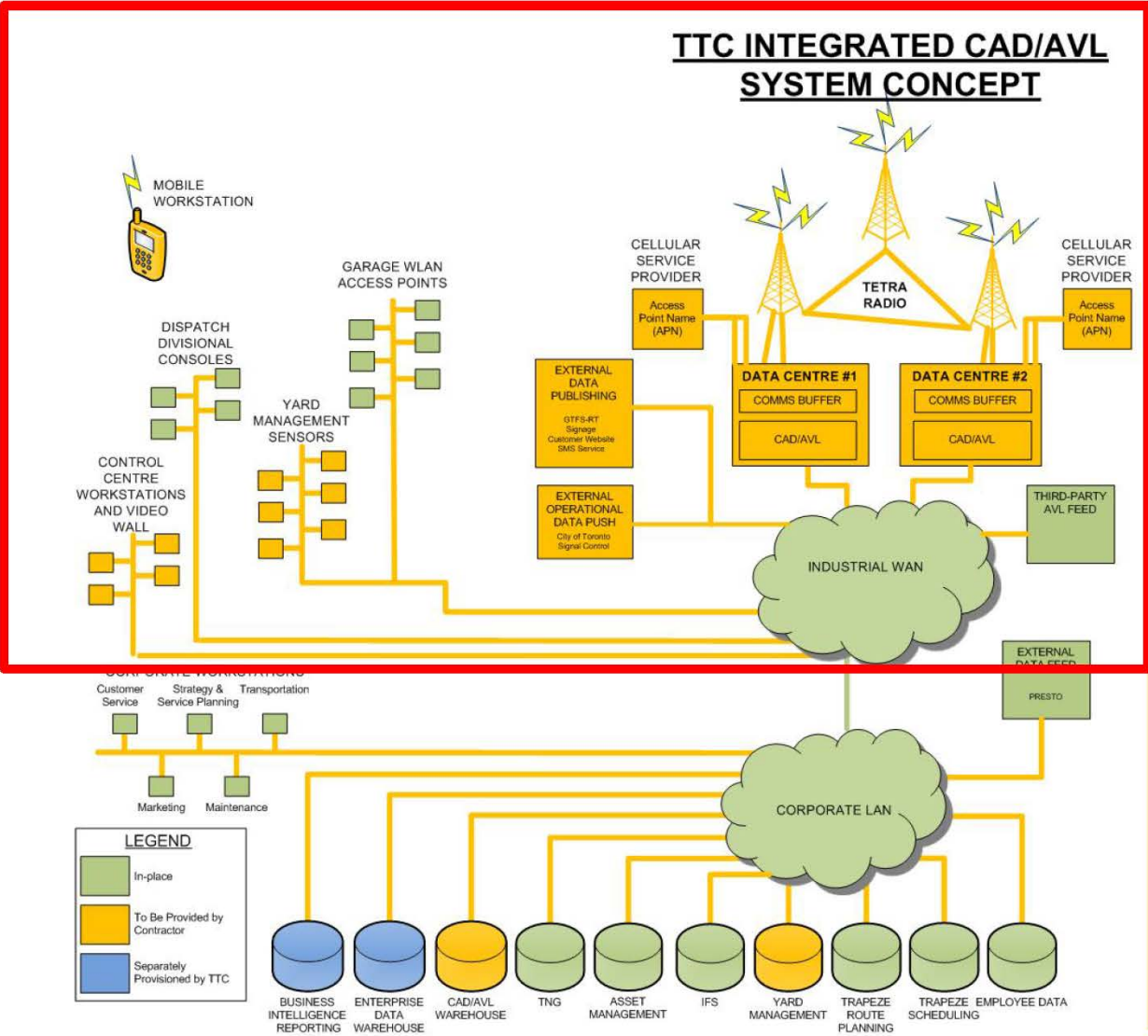
TTC INTEGRATED CAD/AVL SYSTEM CONCEPT



COMMUNICATIONS AND OPERATIONS



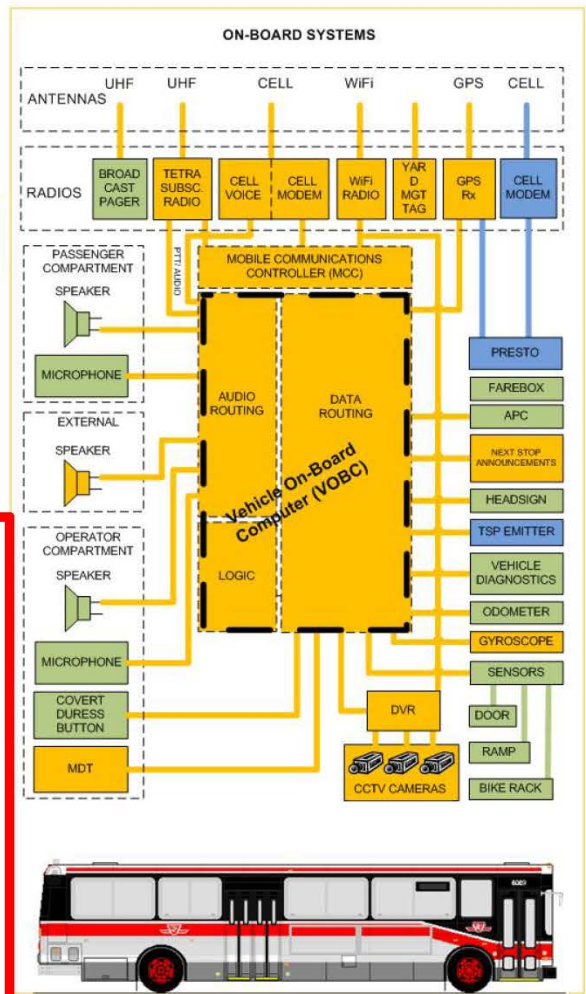
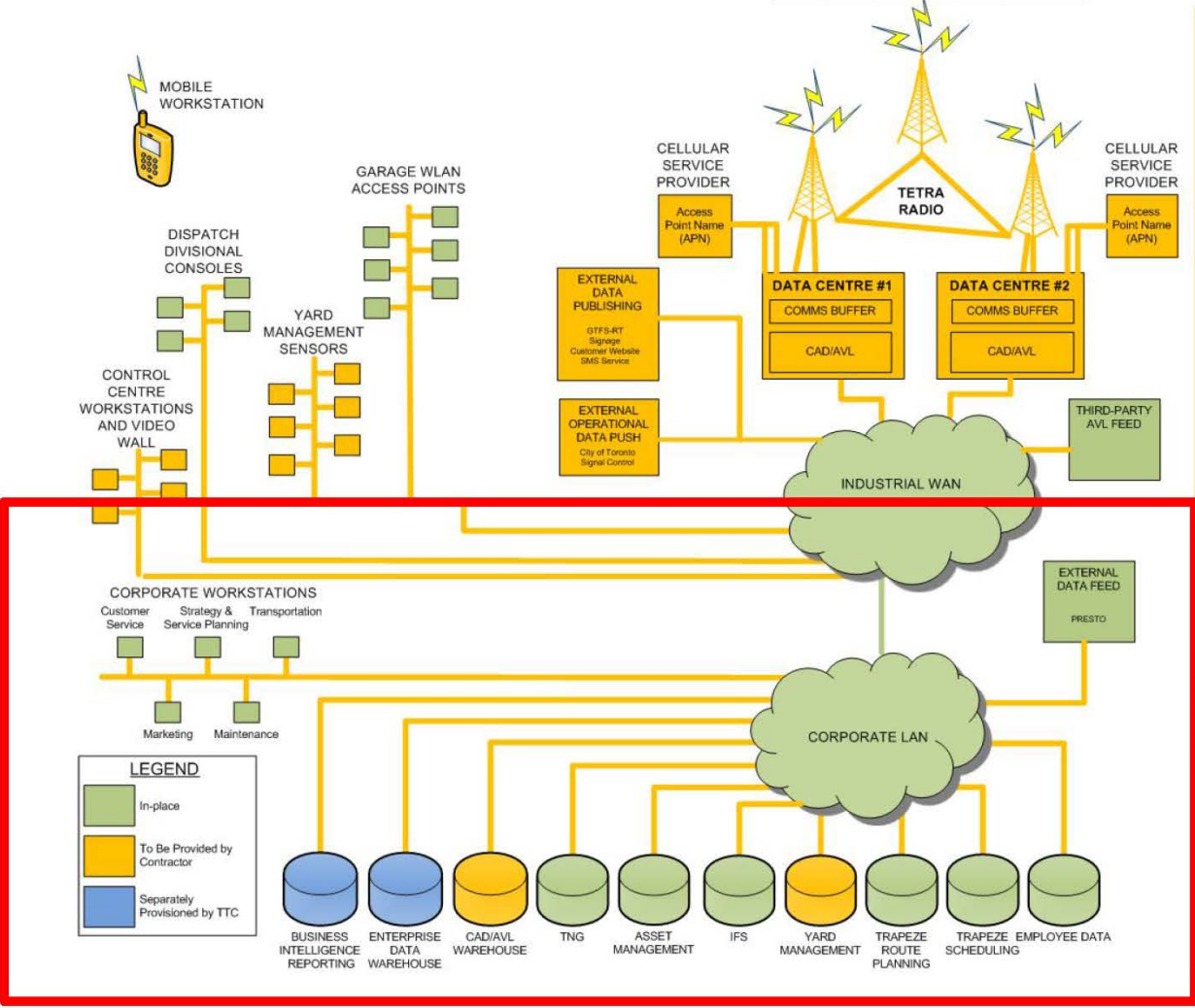
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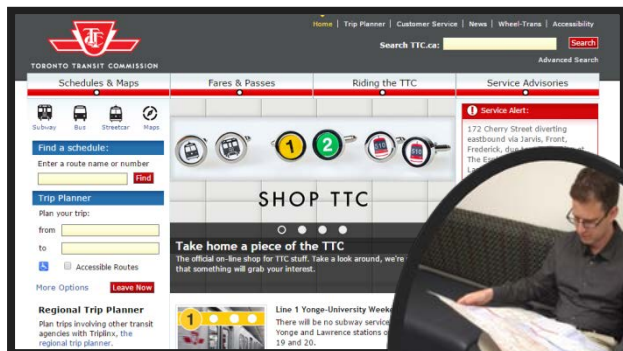
BACK OFFICE INTEGRATION



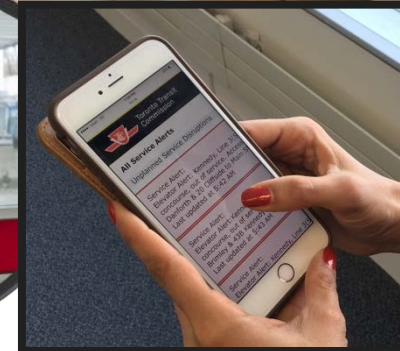
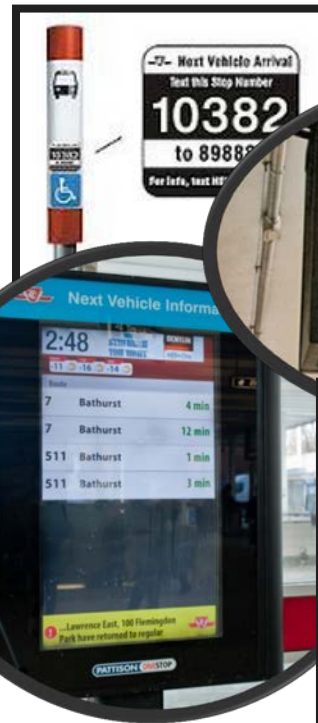
TTC INTEGRATED CAD/AVL SYSTEM CONCEPT



A DAY IN THE LIFE – CUSTOMERS



Trip planning



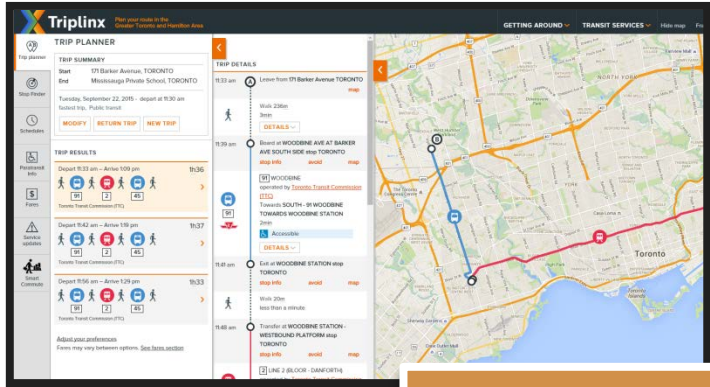
Information at stops and stations



Information on-board



LIFE TOMORROW – CUSTOMERS



Information
integrated across
channels

Trip planning

Information at stops
and stations



Information on-board





In-service



Automate manual processes

Supervision and control



Check-in and Pull-out



LIFE TOMORROW – OPERATIONS



In-service

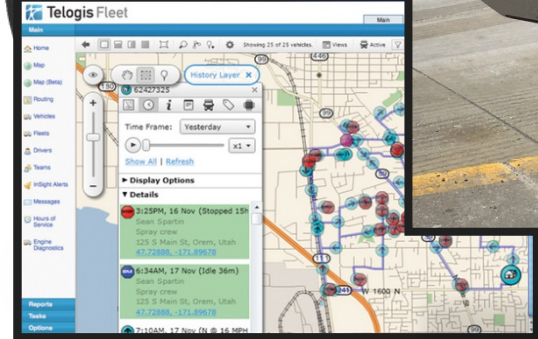
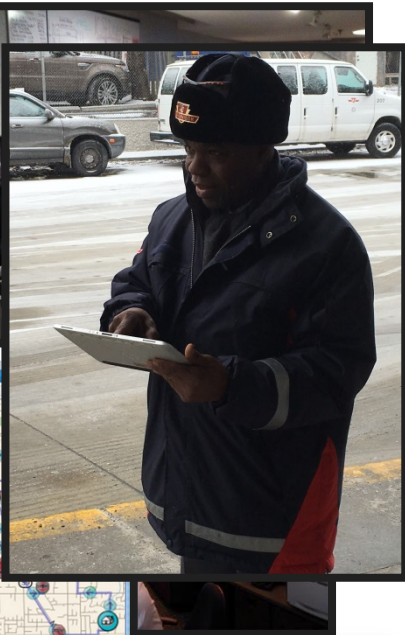
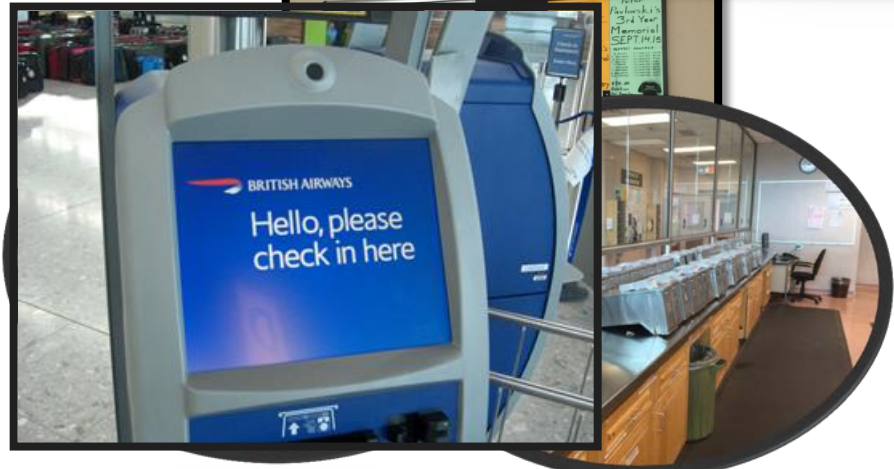


Automate manual processes

Supervision and control

Check-in and Pull-out

MUST



A DAY IN THE LIFE – MAINTENANCE



In-service



Automation and service reliability



Vehicle repairs



Pull-in and ready for service



LIFE TOMORROW – MAINTENANCE



In-service



Automation and service reliability



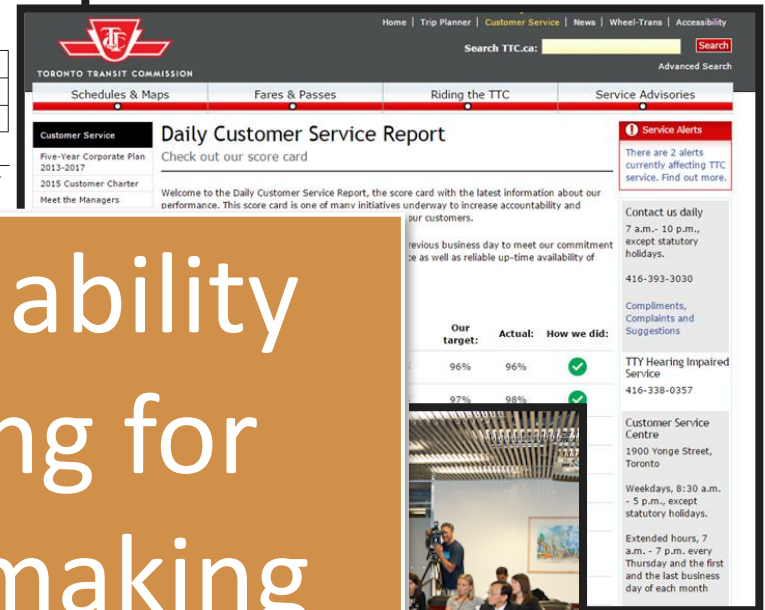
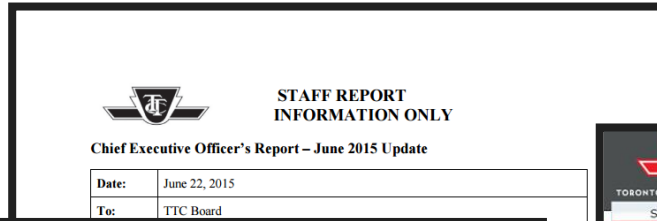
Pull-in and ready for service



Vehicle repairs



A DAY IN THE LIFE – MANAGEMENT



Data availability and timing for decision-making



Source: Toronto Star




Service oversight, monitoring and reporting



LIFE TOMORROW – MANAGEMENT




**STAFF REPORT
INFORMATION ONLY**
Chief Executive Officer's Report – June 2015 Update

Bus and Streetcar Dashboards

TIME
Year: 2015
Quarter: (All) Q1 Q2 Q3 Q4
Period: P1
Week: 1

Arrivals **Departures** **Missed Trips**

BUS

STREETCAR

Daily Customer Service Report
Check out our score card
There are 2 alerts currently affecting TTC service. Find out more.
Contact us daily 7 a.m.- 10 p.m., except statutory holidays.

Toronto Transit Commission
From: 3/24/2014 To: 3/24/2014 Division: MALVERN Route: 53 EAST Time Period: AFTERNOON Peak

Observed / Scheduled **Average Passenger Delay**

Average Section Travel Time Comparison

Individual Section Time Comparison

annual benefit at 11:45 p.m. tomorrow - 3 p.m. \$5 for a child. The

Source: Toronto Star

Service oversight, monitoring and reporting





Procurement Process for the VISION project

- RFI conducted to gauge capabilities and order of magnitude costs of current CAD/AVL product offering – 7 responses received
- Legal firm with system procurement expertise engaged to draft contract schedules and agreements published as part of RFP
- External Fairness Monitor engaged to oversee RFP process
- RFP issued – 49 vendors downloaded the RFP
- 7 proponents submitted responses





Multi-stage RFP vendor evaluation followed for system acquisition

- Commercial Compliance evaluation – all 7 proponents met the requirements
- Short listed proponents based on scoring of written technical and legal responses – 6 proponents were short listed
- Score short listed proponents based on product demonstrations
- Score proponents based on submitted pricing
- Negotiate contract with highest scoring proponent based on the above



PROJECT TIMELINE



Milestone	Date
Contract Award	Q1 - 2016
Showcase Event	Q3 - 2016
System Design complete	Q4 - 2016
Factory Acceptance Test complete	Q1 - 2017
Deployment begins	Q2 - 2017
Mini Fleet complete	Q3 - 2017
Roll-out to remaining vehicles begins	Q3 - 2017
Deployment to Buses complete	Q4 - 2018
Deployment to ALRVs complete	Q4 - 2018
*Deployment to LFLRVs complete	Q1- 2020

***Based on LFLRV Delivery Schedule**

