

ONTARIO PROVINCIAL ENFORCEMENT REPORTING SYSTEM

Jay Jiang
Business Analyst, Enterprise Solutions Office
Road User Safety Solution Branch, I&IT Cluster
Ontario Ministry of Transportation
1201 Wilson Avenue, Toronto, ON, M3M 1J8, Canada

Tariq Hasan
Manager, Solutions Portfolio
Road User Safety Solution Branch, I&IT Cluster
Ontario Ministry of Transportation
1201 Wilson Avenue, Toronto, ON, M3M 1J8, Canada

Jeff Hudebine
Director, Regional Operations
Road User Safety Division
Ontario Ministry of Transportation
1201 Wilson Avenue, Toronto, ON, M3M 1J8, Canada

Paper prepared for presentation at the
Goods Movement – Reaching Destinations Safely and Efficiently Session
of the 2015 Conference of the
Transportation Association of Canada
Charlottetown, PEI

ABSTRACT

This document outlines Ontario Provincial Enforcement Reporting System (PERS) project in Ministry of Transportation (MTO) to provide the updated and improved intelligent reporting capability to MTO Regional Operations and Carrier Safety Enforcement Branch. The Business Intelligence (BI) dashboard is implemented for improved road user safety reporting. All of the vehicle inspections, impounds, and any applicable offense information can be found online using web based BI portal with the multi-dimensional data cubes. The approach and organizational changes of building intelligent information management system can be shared with other jurisdictions and benefit to other Provinces and Regions for accurate data mining with carrier safety.

1. INTRODUCTION

The Carrier Safety Enforcement Branch and Regional Operations Branch within MTO promote the safe operations of commercial vehicles in Ontario. They regulate commercial driver behaviour and vehicles performance. These two branches monitor and improve carriers' compliance levels for Ontario transportation. The enforcement officers use various applications within MTO and the primary one is Roadside Data Capture (RDC) system.

Business services are delivered by these branches across Ontario through a number of channels including Truck Inspection Stations on all major highways within the Province. The decision-making process was supported by a set of static reports which required elongated preparation steps and heavy resource engagement that was impacting efficient business management.

Currently, over 340 enforcement officers in Ontario working in 43 locations conduct over 150,000 safety inspections per year on commercial vehicles owned by 55,000 companies registered in Ontario besides trucks and buses registered in other provinces, territories and states. These inspections are routed from RDC into PERS through data Extraction, Transformation and Loading routines that embed business rules.

In the past, MTO used to rely upon various sets of manual pre-defined analytical reports to support the decision making processes for commercial carrier enforcement. These reports are historical in nature, based on data snapshots. The generation of reports involves manipulation of the complex source data, relies heavily on manual procedures which incurs repetitive preparation costs and presents increased opportunity for errors to creep in.

The business and IT worked together on Provincial Enforcement Reporting System (PERS) to develop a solution that could introduce analytical functionality to empower business in monitoring and responding to activities across the province in a timely manner through purpose-built dashboards and dynamic creation of new analytics.

The PERS project produces the dynamic drill-through web based dashboard system with analytical reports for MTO management with business intelligence capabilities.

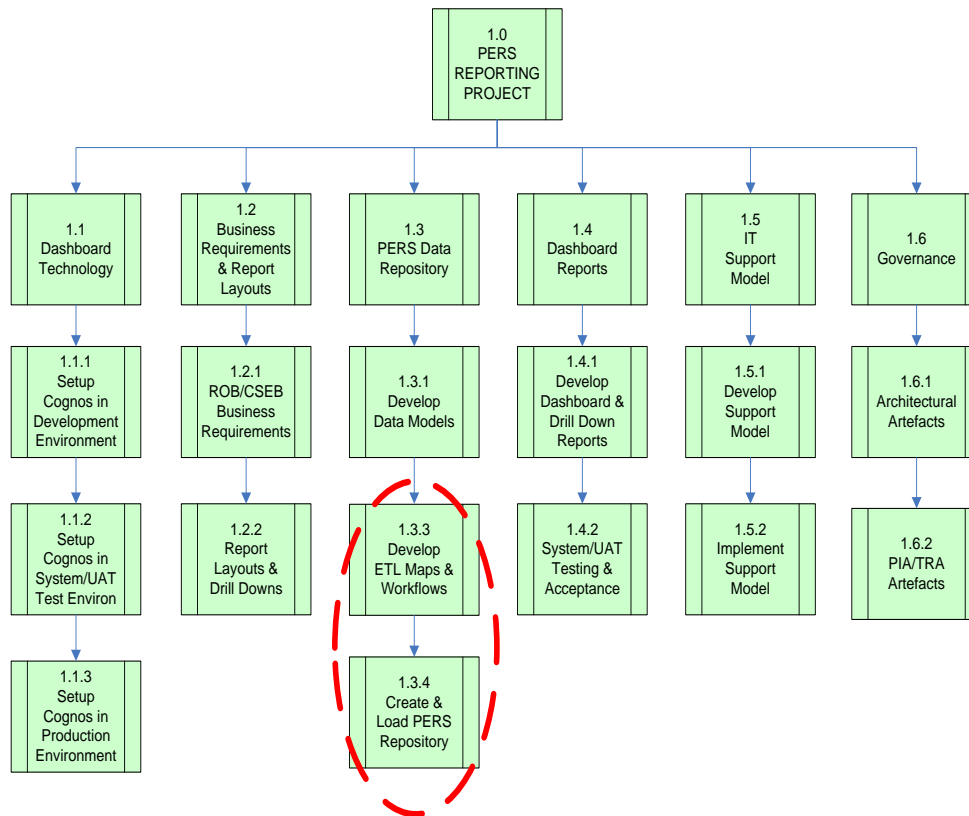
2. BUSINESS PROJECT PROCESS

IBM Cognos was acquired to support required analytical capabilities while extension of current Information Warehouse (IW) environment facilitated infrastructure provisioning. A collaborative model supported by iterative development methodology reduced “time-to-market” besides improving quality of end product. In addition to typical technology induction challenges, the compressed timeline and absence of technical skill-base in Cognos within IT were the key challenges. The project team responded to those challenges through parallelization of activities and supporting in-house team in learning new skills.

Enterprise wide collaboration is also enabled in bridging skills-gap. Active participation from the business at all stages of project life-cycle and a solid project team led to a successful implementation.

The work breakdown structure has been developed to provide further details on the project scope and project deliverables. ETL is highlighted under PERS data repository section.

PERS Work Breakdown Structure



3. BUSINESS VALUE OF PERS SYSTEM

With the introduction of the new PERS system, MTO Carrier Safety Enforcement Branch and Regional Operations Branch gained great business benefit on the following area:

- Performance improvement on the overall monitoring of commercial vehicles across Ontario;
- Ability to build quantitative analytics with actual data from the road side;

- Implement a selection of key analytical reports for Commercial Truck Inspections, Vehicle Impounds, and Provincial Offences Notices;
- Rapid response to various safety blitz events;

- Empower business to query and generate all analytic reports without IT intervention;
- Make use of the dashboard tool or drill-through capability to create new business reports and angular views of the data contained in the PERS data repository;
- Improving quality of conviction/violation tickets issued in a more effective way;
- Rationalization of types of inspections conducted;
- Ability to build ad-hoc report cards;
- Other jurisdictions can leverage this approach to drill down similar information within other jurisdictions/regions to make the data mining;
- This information management system can also be shared with other jurisdictions and benefit to other Provinces and regions.

The PERS project changed the current IT organizational structure to enable the business unit to initiate self-sustained data mining method for on-going business requirements.

4. DATA SOURCE REQUIREMENTS

The current Road-Side Data Capture system supports MTO core business processes, such as capturing Commercial Vehicle Inspection Reports (CVIR) at Truck Inspection Stations on the road and it also has the capability to issue electronic Provincial Offence Notices (ePON).

All of the information collected by this system can deliver a secure and efficient access to manage drivers, vehicles, and carriers in support of the core business of enforcement jurisdiction.

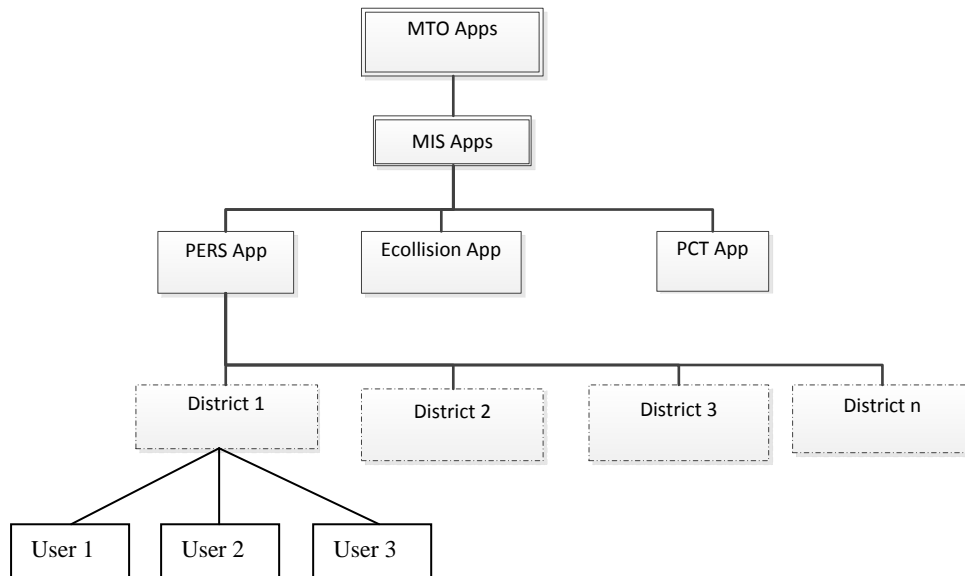
The final central data repository consists of the following database objects:

- Inspection data and Impound data elements
- Dimensional Inspection and Impound data
- Electronic Provincial Offence Notices (ePON) data
- Intermediate Staging Data Repository
- Traffic Violation data

5. SYSTEM SECURITY

The PERS system applies detailed user access security at the data elements level. The user can login to PERS to query data, view dashboard, and create ad-hoc business intelligence report for the specific focused area.

The system also enables the user role for power user as the high level administrator, who has full access to all provincial wide data regardless of region/district/location constraints.



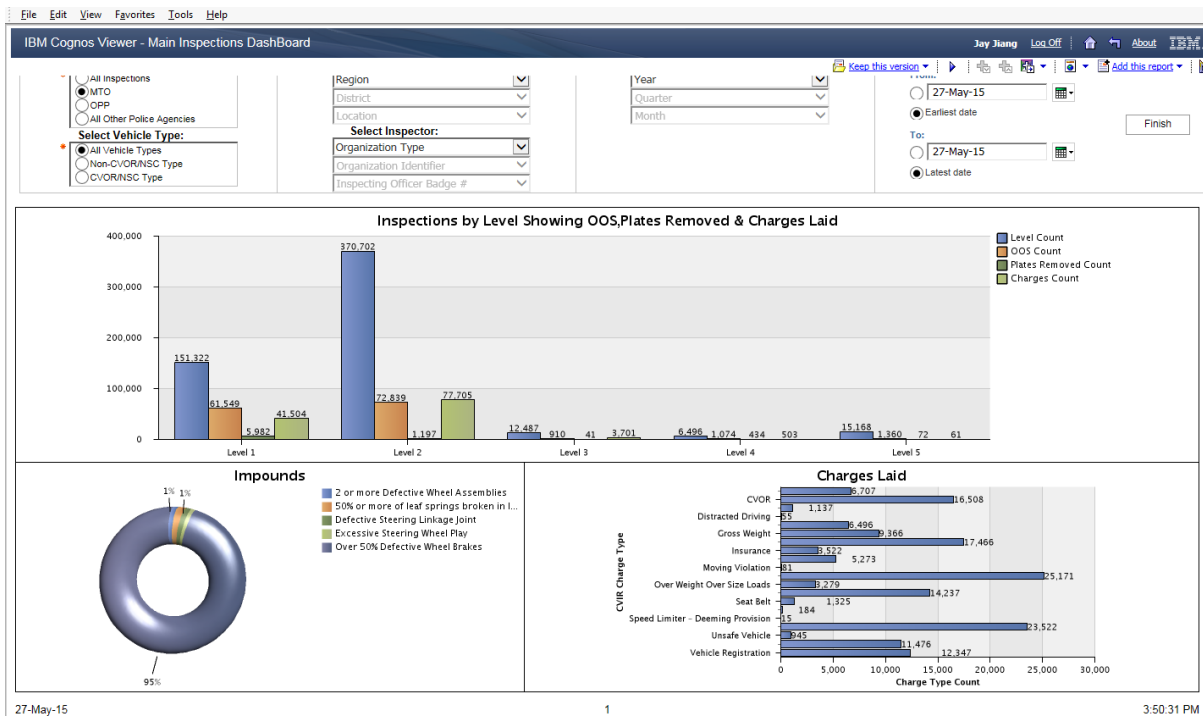
6. DEVELOPMENT OF BUSINESS INTELLIGENCE PORTAL

A multi-dimensional data mart is created to build star-schema data cubes to establish the initial data warehouse. The Extract, Transform, and Load (ETL) process was developed to fulfill the loading of operation data to the final data warehouse. Cognos Bi portal was deployed into the online web applications. The PERS project achieves the following goals:

- Implement a selection of key analytical reports for Commercial Truck Inspections, Vehicle Impounds, and Provincial Offences Notices;
- Utilize BI dashboard reporting tool to generate various business reports for graphic innovative, faster, and safer results;
- Empower policy/program users and enforcement office staff to make use of the dashboard tool or drill-through capability to create new business reports and
- Multi-dimensional views of the data contained in the PERS data repository;
- Improve ongoing Ministry IT support for the business reporting process.

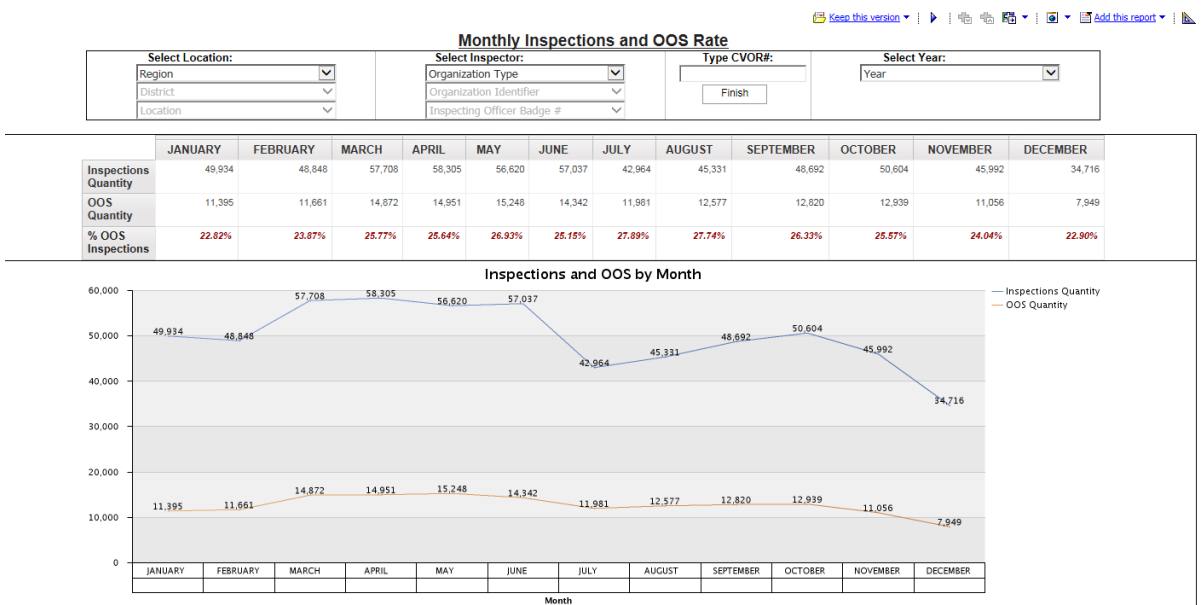
With the development of PERS, it is expected more and more jurisdictions will join us to take this approach to collect carrier safety data and enable business to make full use of the data efficiently across the nation.

PERS project has designed and developed a series of pre-loaded dashboard gadgets for inspection, impound, traffic violation, and ePON statistics. The main purpose is to provide business analytical insights on all carrier transactional data. Listed below are some of the sample gadgets for elaboration purpose:



This can be drill-through to find all details about the vehicle inspections in each TIS station with defective cases and charges including vehicle impounds.

The time series data for Out-Of-Service is developed as business driven user defined web portal that can be viewed with any time angle and base line to the total inspections for all Ontario carriers.



The Active Report provides an interactive analytics experience in a self-contained business intelligence application for browsing and exploring data both online and offline. Report authors can build reports targeted to users needs, keeping the user experience simple and

engaging. Mobile workers can take their data with them to discover opportunities and analyze trends even when they are nowhere near a network.

File Edit View Favorites Tools Help

ETR Inspection Stats for 2015 - APRIL

2010	2011	2012	2013	2014	2015	2016						
JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	

Inspections by Level Showing OOS, Plates Removed & Charges Laid

	Inspection Qty	Charge Laid Qty	Out Of Service Qty	Licence Plate Removed Qty
Level 1	28	13	13	0
Level 2	186	86	31	0
Level 3	8	3	0	0
Total	222	102	44	0

Charges Laid

	Charges Laid
Axle Weight	1
CVOR	7
Drivers Licence	4
Gross Weight	5
Hours Of Work	1
Insurance	1
Load Security	1
Other	77
PMCVI	10
Trip Inspection	7
Vehicle Maintenance	1
Vehicle Registration	9
Total	124

Reports includes data up to:2-May-15

Strong partnership between business and IT at all stages of project life-cycle created an environment for the project to be successful. The IT team exposed themselves to business operations, travelled across the province to work with the staff in responding to real-life challenges and enabled business users to help themselves.

7. CONCLUSION:

MTO has developed BI reporting tool for Carrier Enforcement and Regional Operation to provide better, faster, and efficient data analysis for decision making process. The automated extraction processes was introduced to improve data integrity. The Cognos dashboard was implemented to provide vivid BI drill-through reports. And the active report was deployed for off-line usage.

Implementation of PERS has improved business acuity through timely availability of information and empowered clients to independently access data based on their role. Availability of historical data for analytical purposes has created an environment where business insights could be developed through simple to use and intuitive business vocabulary. The efforts to assemble information through repetitive processes has been replaced with automated routines that has improved data integrity. The solution not only provides basis for consistency in analytical reporting but also provides opportunities to users to capitalize on the work done in other parts of the branch and customize it to their needs thereby improving effectiveness.

REFERENCES:

1. Dustin Adkison, 2013, IBM Cognos Business Intelligence Progressing;
2. Dan Volitich, Gerard Ruppert, 2012, IBM Cognos Business Intelligence 10: The Official Guide;
3. Percy Yu, Jay Jiang, 2014, PERS Data Models in PowerDesigner, MTO
4. Commercial motor vehicles, IHSA.ca Magazine Vol. 13 Issue 1
5. Ontario Road Safety Annual Report 2014, ISSN #0832-8269 (Printed Version)