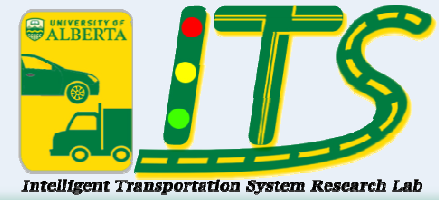




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Urban Traffic Data Integration: A Case Study for Edmonton

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7/4/2012

Agenda



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- Project Background
- Traffic Data Integration (TDI)
- Edmonton TDI Initiative
- Five Year Plan for Edmonton TDI
- Experiences and Lessons

Why we need TDI?



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- ❑ Data driven decision making procedure.
- ❑ Data are too valuable to only use once!
- ❑ Management of transportation system **CANNOT** be done without knowledge of its performance!

Traffic Data Sources



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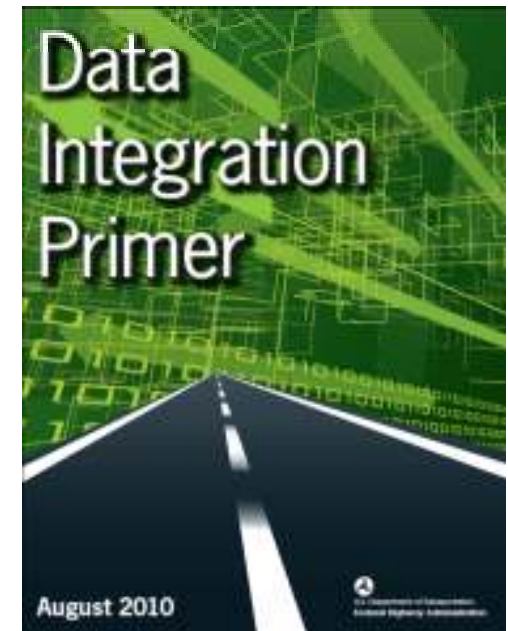
Data Sources	Primary Data Elements
Traffic Flow Data	Volume, Speed, Occupancy, Vehicle classification, Queue length, Vehicle trajectories, timestamp, location
Traffic Control Data	Begin time, End time, Location, Up/downstream offsets, time of pre-emptions, cycle length
Incident Management Data	Location, Begin, notification, dispatch, arrive, clear, depart times, vehicle type, response type, date, time, lanes/shoulders, blocked
Transit Data	Vehicle, boarding (by time and location), Station origin and destination (O/D), Para transit O/D, route number, time of advisory, route, segments taken
Collision Data	Location, Time, Vehicle type, Cause, etc.
Environmental Weather Data	Time, Location, Pollutant, Concentrations, Wind conditions, Precipitation, Temperature, Wind conditions
Other Data	Special case; pertains to all location references Vehicle ID, Segment, Location, Travel time VMS location, Time, Mug content Time/date, O/D, Route, Segments, Estimated travel time

Traffic Data Integration



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- ❑ A data management process aims at accessing and utilizing database by a combination of data from different sources.
- ❑ It require a transformation of data sets in a way that makes cross data set applications feasible.
 - ✓ Temporal data integration,
 - ✓ Spatial data integration
 - ✓ Semantic data integration
 - ✓ Topical data integration
 - ✓ Procedural data integration
 - ✓ Functional data integration



(Reference: Vladimir Livshits, TRB 91st Annual Meeting)

TDI Planning Steps



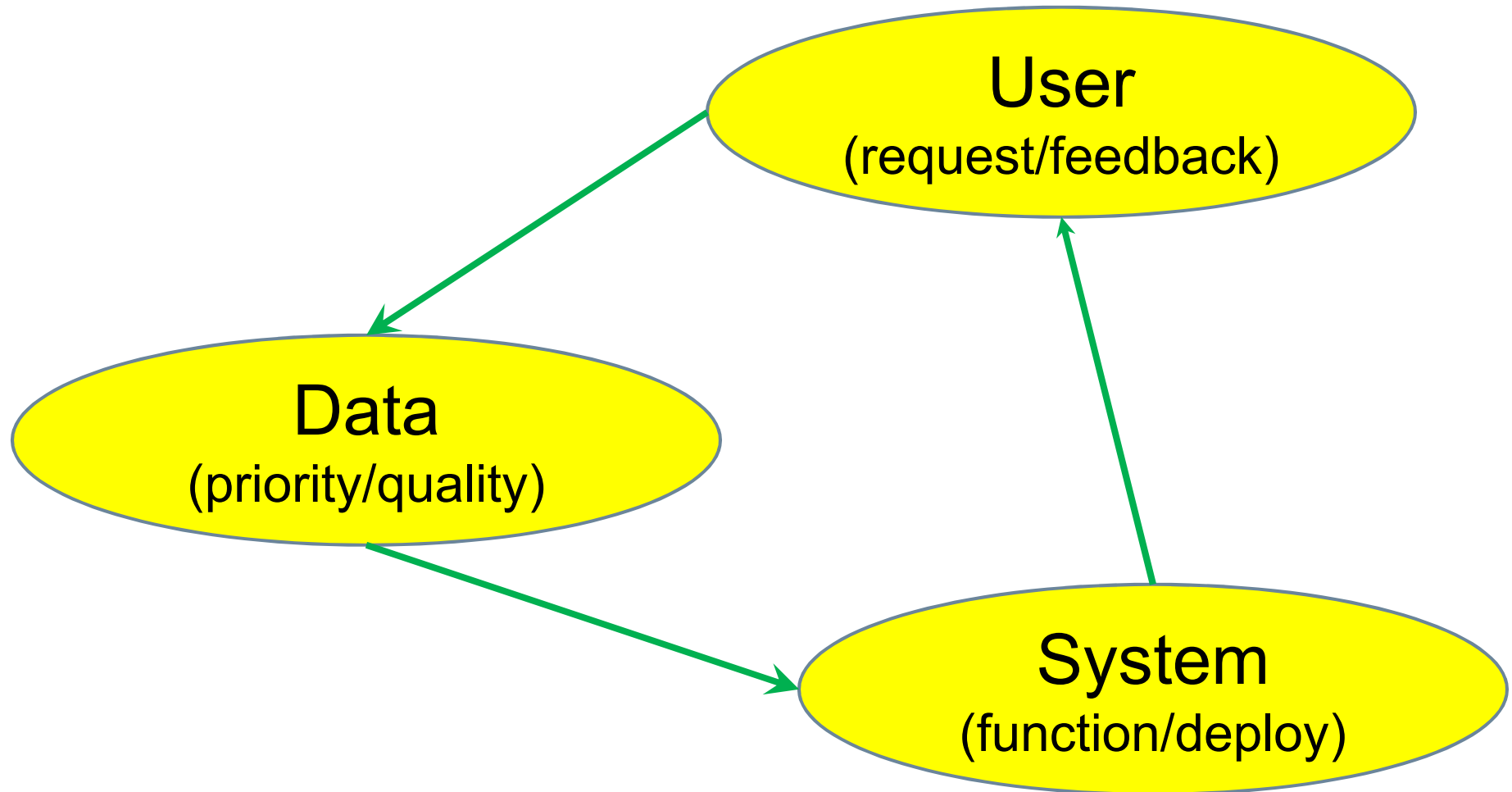
6

- ❑ Step I (user)– Gather request from users, scan for resources, establish context, and identify critical information;
- ❑ Step II (data) – Prioritize resources, analyze pertinent information and identify information gaps;
- ❑ Step III (system) – Synthesize best information and recommend next steps for implementation

TDI Planning Logic

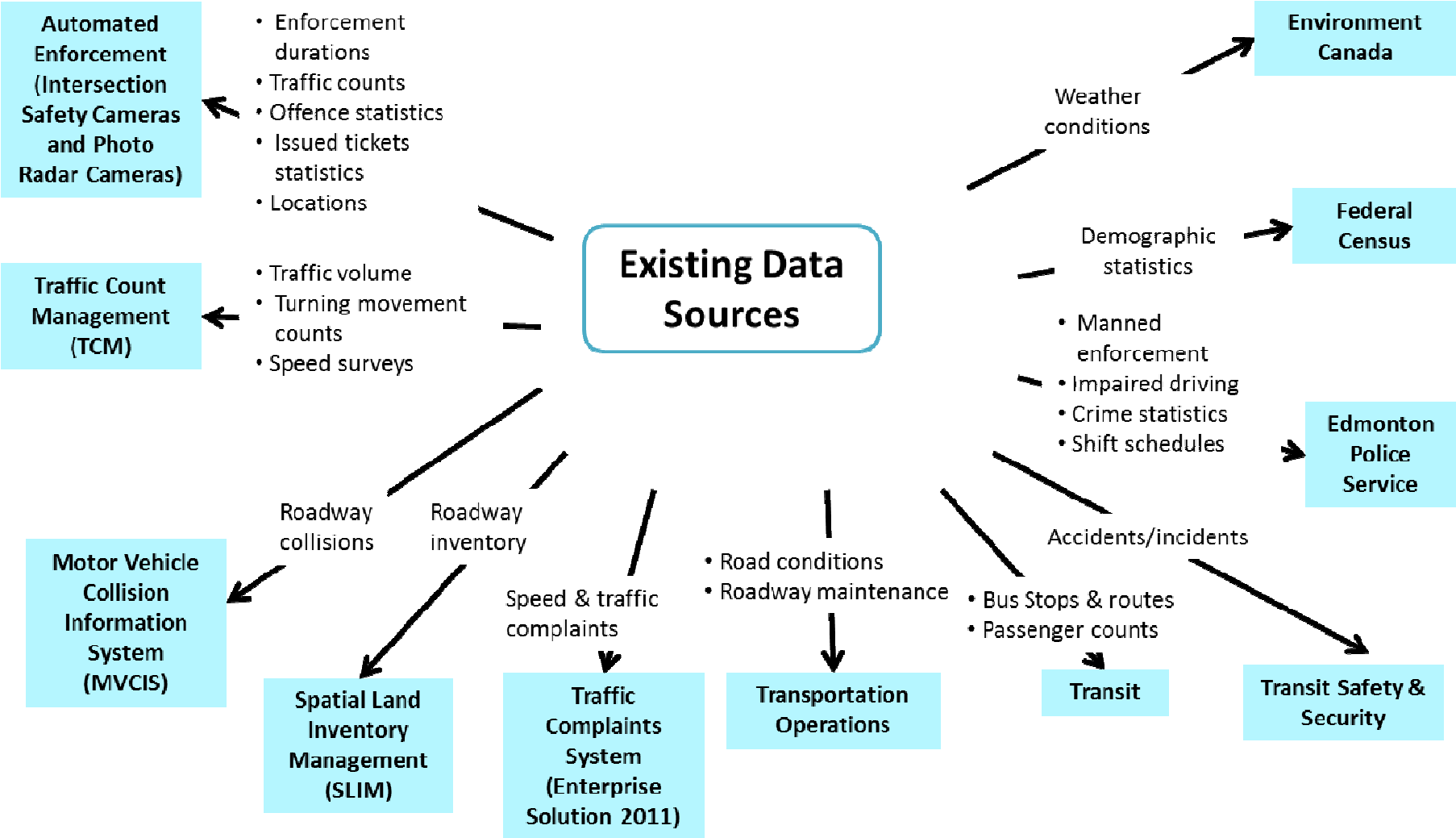


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Existing Situation in Edmonton

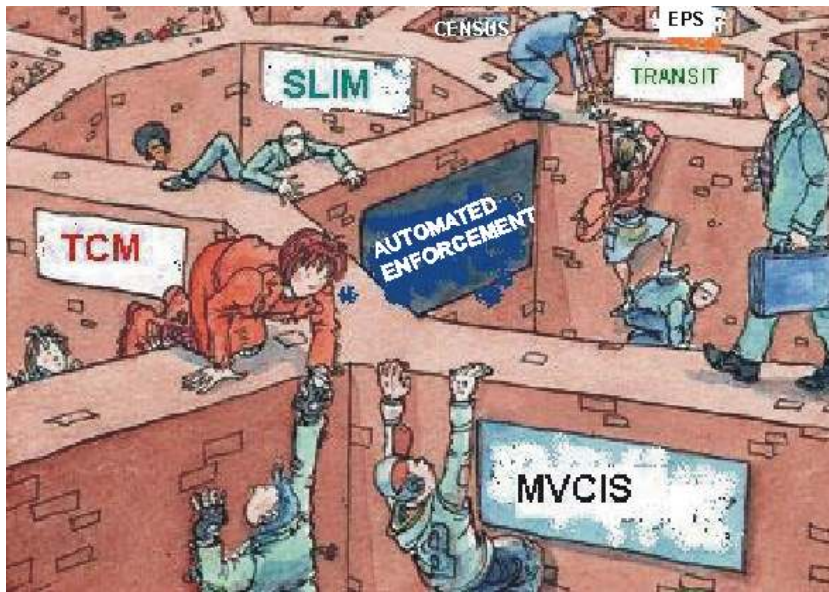


Existing Situation in Edmonton



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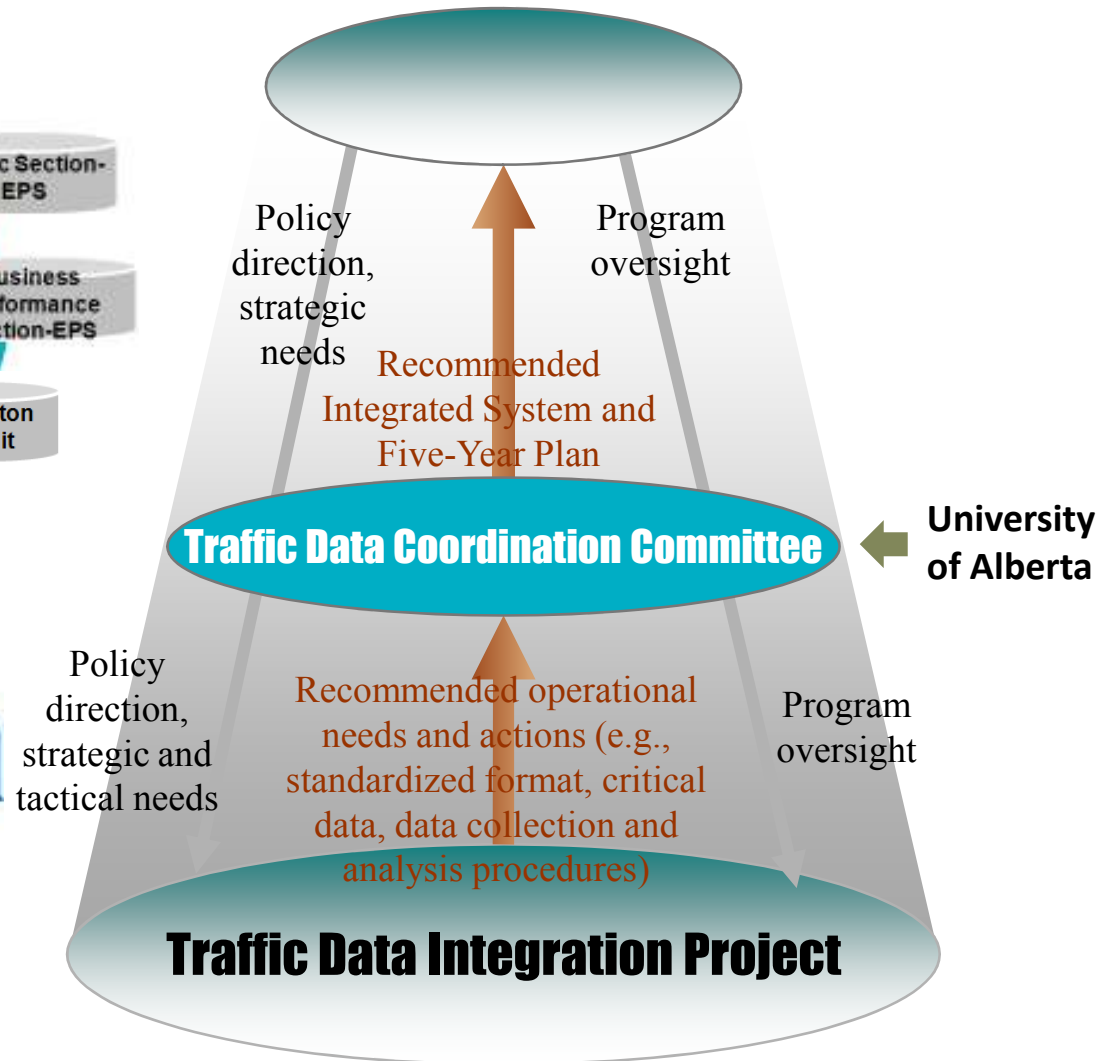
Data Silos



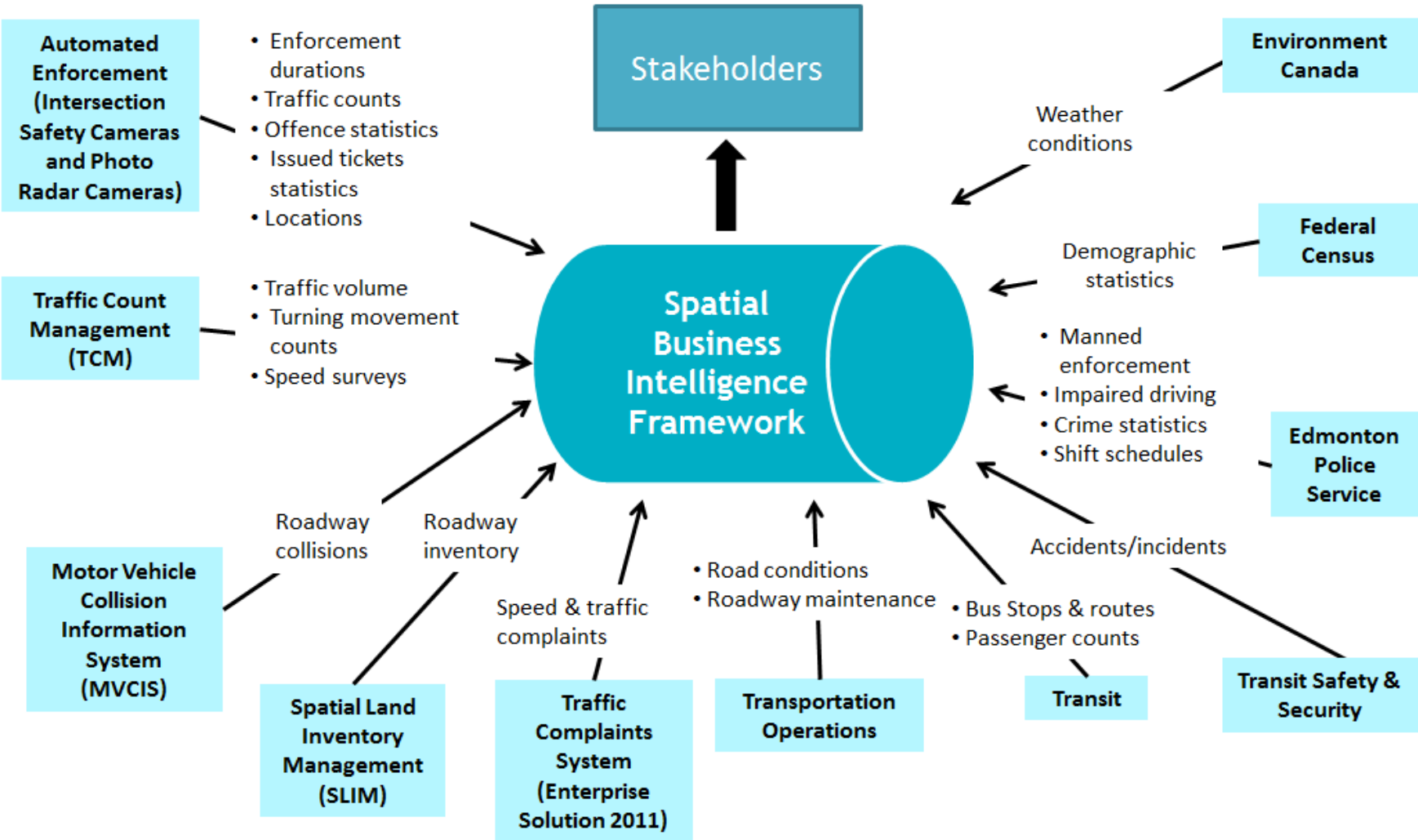
Modified from the original picture shown in http://blogs.sun.com/bblfish/entry/business_model_for_open_distributed

- ❑ Inadequate knowledge about the existence of various data and their availability,
- ❑ Lack of linkages with other databases resulting in duplicate data collection, processing and management,
- ❑ No standardized method for the specific identification of attributes across data sources,
- ❑ Lack of communication among stakeholders of important changes to the data, and
- ❑ Lack of access to other data systems

Traffic Data Coordination Committee (TDCC)



Proposed TDI Plan



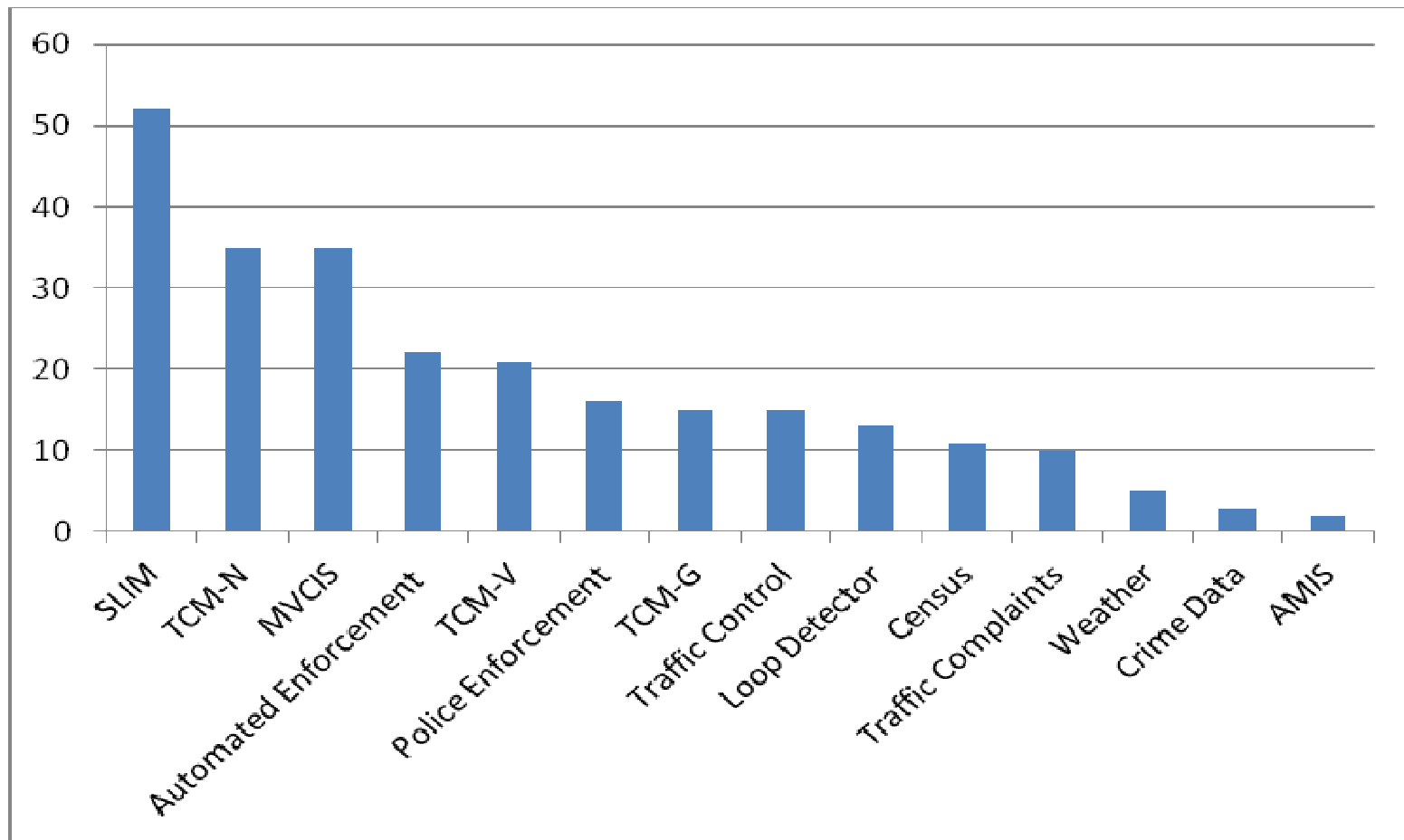
Hot Business Questions



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- ❑ What is the overall transportation status (collision, road class, traffic flow) by road segment, boundary (neighborhood, community)?
- ❑ What are the impacts of the community-based engineering initiatives?
- ❑ What is the turning movement and volume history by vehicle classification?
- ❑ Are the traffic signal timing plans optimal - do traffic turning patterns match signal timing plans?
- ❑ What is the actual flow of traffic (micro simulation in 10 minute time bins of traffic volume and speed)
- ❑ What is the collision rate per million vehicles entering the intersection, midblock?
- ❑ What are the top collision locations and collision rates involving a transit vehicle?
- ❑ What are the speeding hot spots by road classification/community and in ranked order?
- ❑ What is the correlation between speed and collisions by roadway classification and community?

Business Question Survey

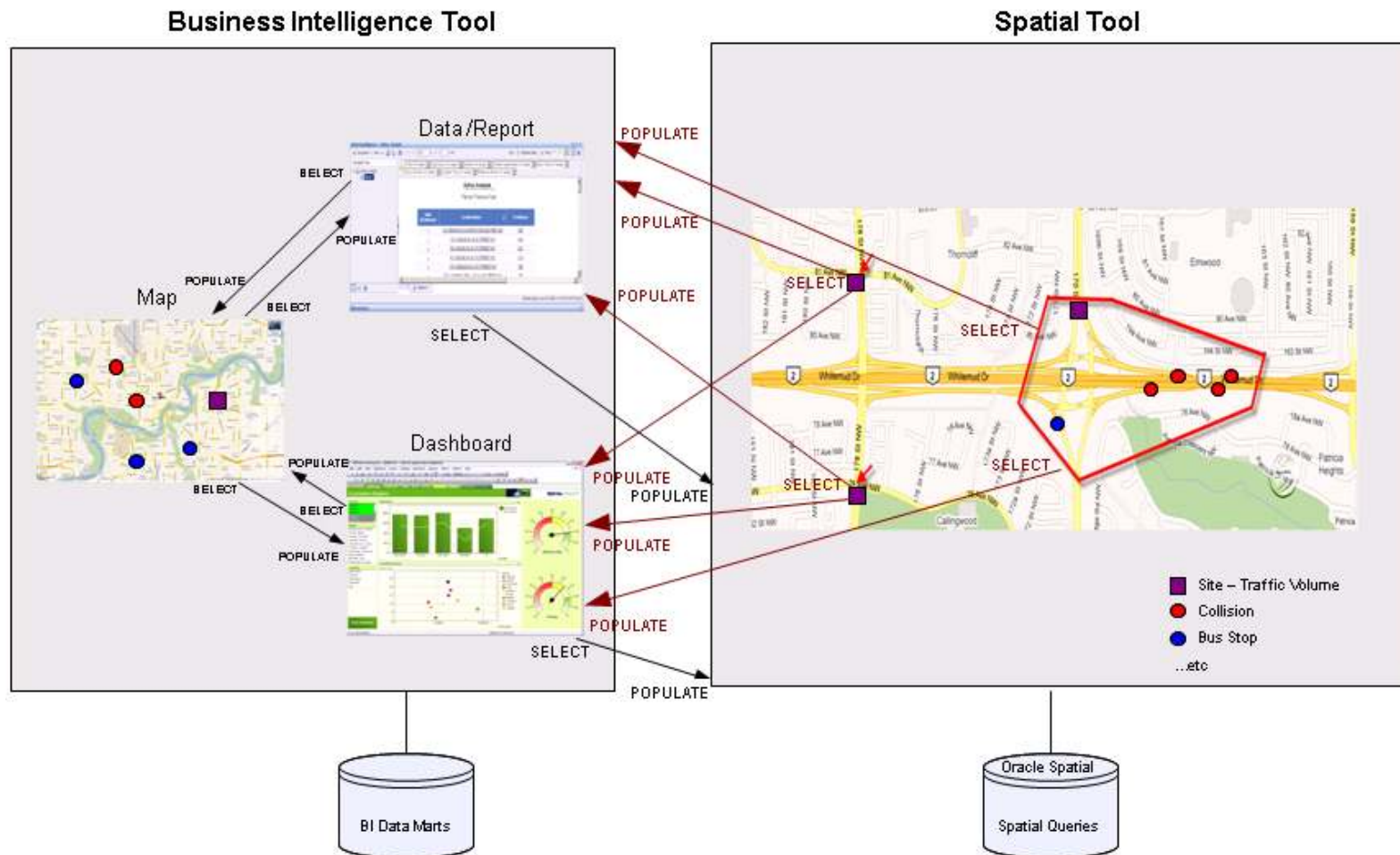


Number of Business Questions per Data Source

Functional Architecture



Integrating Business Intelligence and Geospatial



TDI Applications



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☐ Traffic Safety System Function

- ✓ Collision rate determination at intersections, midblock and access points
- ✓ Predominant collision cause study
- ✓ Speeding hotspots identification and predictions

☐ Traffic Operation System Function

- ✓ More accurate traffic flow studies
- ✓ Congestion location identification
- ✓ Arterial performance Measurement

TDI Applications

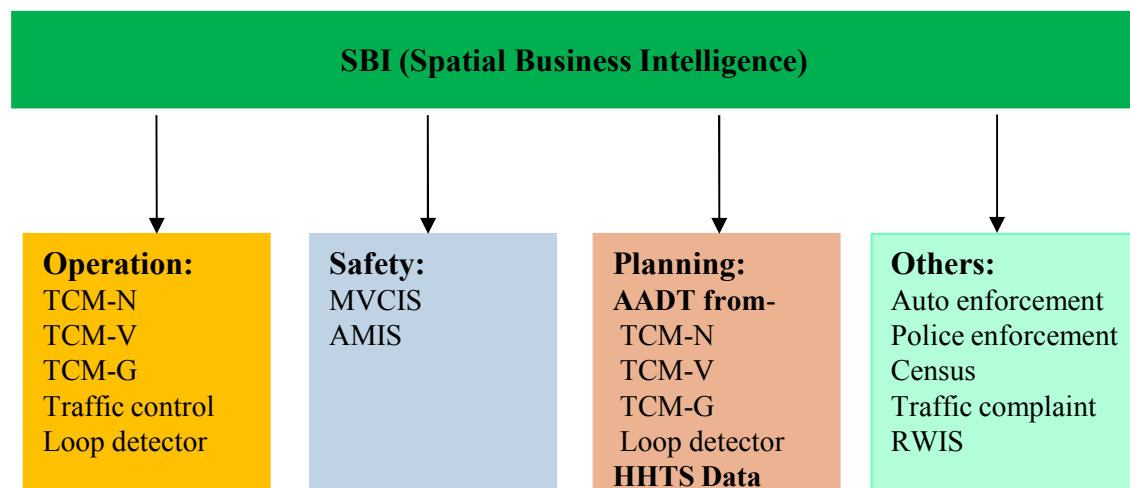


❑ Transit System Function

- ✓ Transit route planning
- ✓ Accidents study
- ✓ Passenger volume study

❑ Transportation Planning Function

- ✓ Sustainable transportation and land use planning



Priority of TDI Deployment



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Three criteria

- ❑ Requested function for general public
- ❑ Requested function for multiple stakeholders within City of Edmonton
- ❑ Requested function for one single stakeholder within City of Edmonton

Roadmap

Take Aim Before You Shoot:

Identify integrated data requirement and priority through business questions

Know your capacity:

- Reshaping, not reinventing, the wheel
- Available data integration platform
- Available resources (Business and IT)

Create plan and working pilot/prototype (start with small but meaningful set of data)

Feasible plan and Working results

Result

Identify 85 Business Questions from the stakeholders with their priority level: 48 High, 29 Medium, 3 Low, 5 N/A

- Business Intelligence (BI) platform: SAP Business Objects
- Spatial data warehouse, GIS platform: SLIM, Intergraph GeoMedia
- IT and Business leader and user support

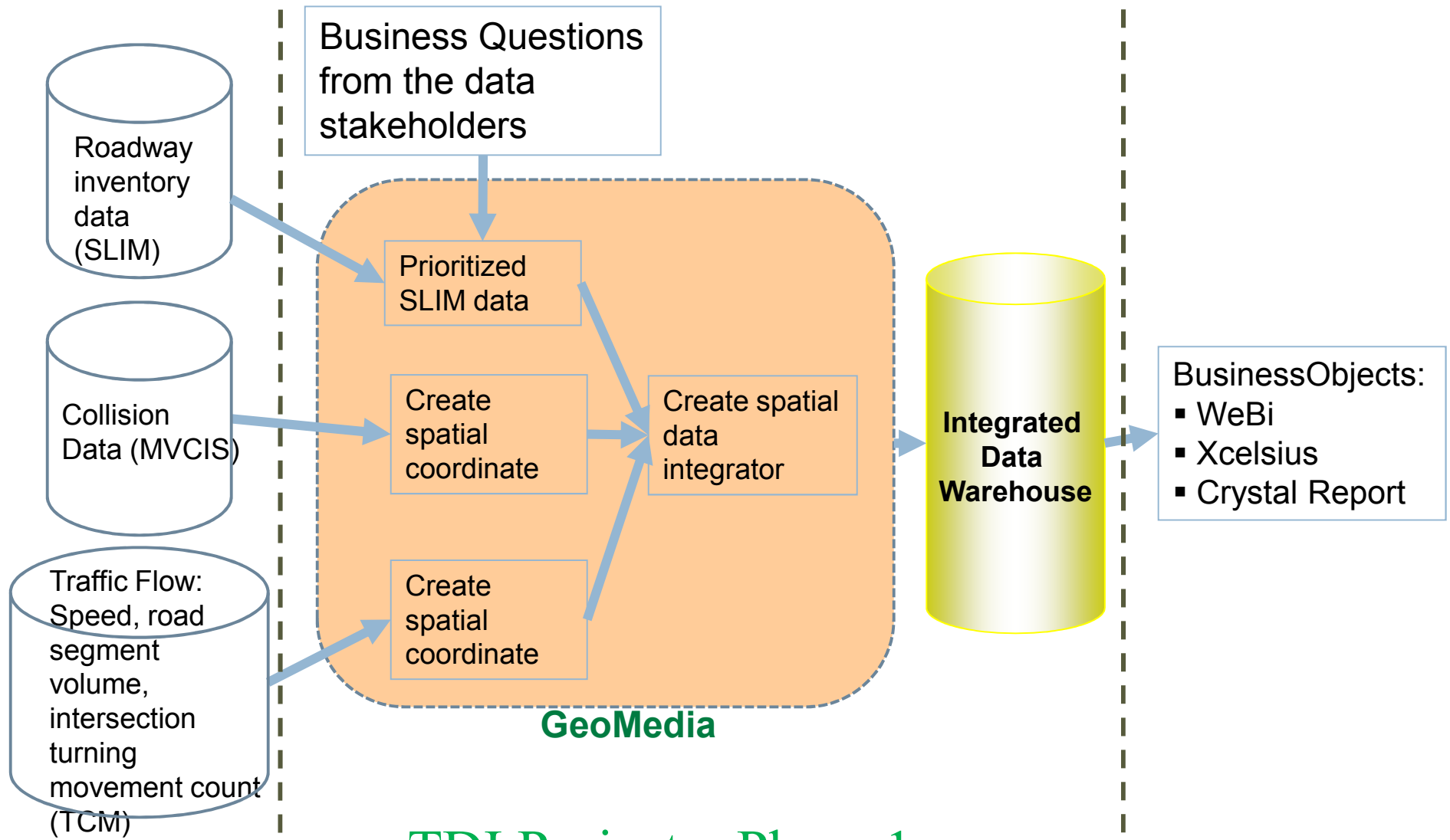
Pilot data: Collision, Traffic flow, and roadway attributes

- Five year plan for data integration
- Integrated BI for above three data sets:
 - ✓ Answer 28% (24/85) business questions with 42% (20/48) high priority questions
 - ✓ enable business users to create cross-section report and perform data analysis
 - ✓ Text and chart report in BI; map interface in SLIM
- User training for integrated BI system
- Total project cost:

Data Sources

Staging Area

End User Applications

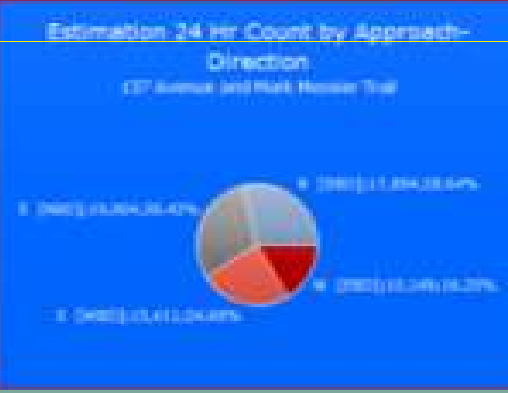
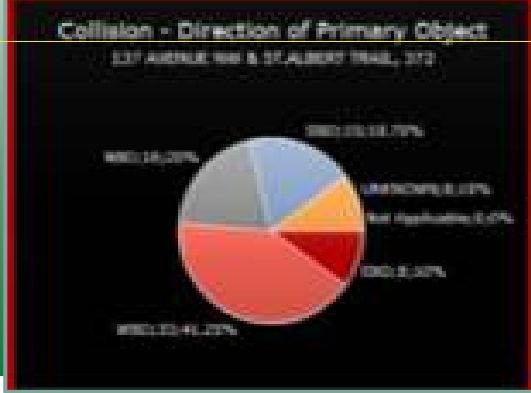
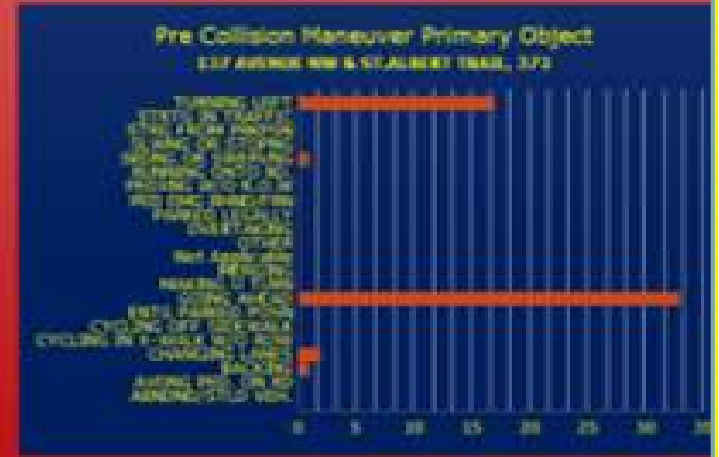


TDI Project – Phase 1



Introduction | **Midblock**

Top 20 High Collision Intersection 2010	Total	Injury	POD	Total Collision	Estimated 24 Hr Traffic Count	Collision Rate
107 AVENUE NW & 27 STREET NW	19	02	00	903	71,943	2.8
118 AVENUE NW & 28A STREET NW	9	00	00	87	66	66
WELLSBORO TRAIL NW & 127 STREET NW	10	01	00	98,572	98,572	2.3
107 AVENUE NW & 142 STREET NW	10	00	00	66	66	66
WELLSBORO TRAIL NW & 149 STREET NW	10	00	00	77,226	77,226	2.8
118 AVENUE NW & 28A STREET NW	19	00	00	91,499	91,499	2.8
27 AVENUE NW & 119 STREET NW	10	02	00	69,262	69,262	2.8
107 AVENUE NW & 97 STREET NW	11	02	00	63,949	63,949	2.7
64 AVENUE NW & 119 STREET NW	9	02	00	67,226	67,226	2.8
107 AVENUE NW & 98 STREET NW	9	00	00	64,029	64,029	2.8
107 AVENUE NW & 97 STREET NW	9	00	00	65,478	65,478	2.8
108 AVENUE NW & 108 STREET NW	10	00	00	65,997	65,997	2.8
107 AVENUE NW & 113A STREET NW	9	00	00	65,874	65,874	2.8
22 AVENUE NW & 27 STREET NW	9	00	00	61,119	61,119	2.3
24 AVENUE NW & 24 STREET NW	11	00	00	61,296	61,296	2.8
27 AVENUE NW & 119 STREET NW	9	02	00	65,847	65,847	2.8
64 AVENUE NW & 25 STREET NW	9	02	00	66	66	66
11 AVENUE NW & 92 STREET NW	10	00	00	63,879	63,879	2.8
11 AVENUE NW & 75 STREET NW	9	01	00	64,893	64,893	2.7
118 AVENUE NW & 97 STREET NW	10	00	00	64,240	64,240	2.8



Data set and integration methods	Spatial Business Intelligence Application	Research & Exploration
<ul style="list-style-type: none"> ▪ Improve the integration method ▪ Improve data update from MVCIS to SLIM ▪ Include SLIM street intersection attributes ▪ Include EPS subdivision definition in SLIM Data Warehouse 	<p>Expand the use of BI Toolset (visualization, dashboarding, and scheduling):</p> <ul style="list-style-type: none"> ✓ Xelsius Dashboard with Dynamic Data Source connection; Static Map Interface ✓ WeBi Reports with Static Map Interface ✓ Crystal Reports with Static Map Interface 	<ul style="list-style-type: none"> ▪ Explore Predictive Analytics tool ▪ Improved use of multiple Universes with BOE Upgrade ▪ Implementation of LRS to Traffic flow and collision data
<ul style="list-style-type: none"> ▪ Add one new data set; options: <ul style="list-style-type: none"> ✓ automated enforcement ✓ transit ✓ traffic flow data from VDS ✓ census 	<ul style="list-style-type: none"> ✓ InfoView as Report Portal – establish a Folder structure within InfoView to allow access to all TDCC reports via a common portal ✓ Report Scheduling – ability to schedule reports to run 	<ul style="list-style-type: none"> ▪ Traffic and Crime map (collaboration with EPS) ▪ Refine Year 3 to 5 plan
<ul style="list-style-type: none"> ▪ User training for the integrated SBI system. 		

Proposed TDI Project – Year 2

Year and time frame	Data set and integration methods	Spatial Business Intelligence Application	Research & Exploration
Year 3: July 1, 2013 – June 30, 2014	<ul style="list-style-type: none"> ▪ Optimize data integration using LRS ▪ Add one new data set; options: <ul style="list-style-type: none"> ✓ Unselected data in Year 2 ✓ RWIS ✓ roadway maintenance 	<ul style="list-style-type: none"> ▪ 3rd Party tool for bidirectional integration BI with Spatial ▪ Predictive Analytics ▪ Traffic and Crime map (collaboration with EPS) 	<ul style="list-style-type: none"> ▪ Explore “Real Time” data options ▪ SLIM Map Interface Interactive – Spatial Tool Analysis ▪ Feasibility study for the creation of Business Intelligence Competency Centre (BICC)
	<ul style="list-style-type: none"> ▪ User training for the integrated SBI system 		
Year 4: July 1, 2014 – June 30, 2015	<ul style="list-style-type: none"> ▪ Add one new data set; options: <ul style="list-style-type: none"> ✓ Unselected data in Year 3 ✓ Public complaints ✓ Police data (enforcement) 	<ul style="list-style-type: none"> ▪ Real Time data 	<ul style="list-style-type: none"> ▪ Add spatial capabilities into Predictive Analysis/Modeling functionality
	<ul style="list-style-type: none"> ▪ Use the Office of Traffic Safety for Piloting Business Intelligence Competency Centre (BICC) ▪ User training for the integrated SBI system 		
Year 5: July 1, 2015 – June 30, 2016	<ul style="list-style-type: none"> ▪ Add one new data set; options: <ul style="list-style-type: none"> ✓ Unselected data in Year 4 ✓ Transit security 	<ul style="list-style-type: none"> ▪ Predictive analytics with interactive mapping 	<ul style="list-style-type: none"> ▪ Explore Predictive Analytics with real-time data
	<ul style="list-style-type: none"> ▪ Establishment of BICC ▪ User training for the integrated SBI system 		

Proposed TDI Plan – Year 3 to 5

Experiences and Lessons

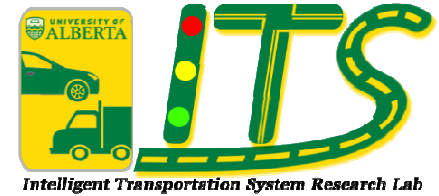


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- Begin with few data sources, and then more,
- Provide data through the GIS tool – visualization
- Standardization – term, location reference,
- Save raw data, with high resolution
- Implement data quality control and quality assurance
- Create adequate documentation of system and metadata
- Collaboration
- Work flowchart
-



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Question?

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