Springboard into Smart Cities

ITS Canada Annual Conference and General Meeting
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Images from U.S. DOT RITA¹, The Economist² and the City of Toronto³
Smart Cities

Intelligent Communities
A Smart City is a city that employs advanced Technologies to become more efficient and productive. What could be included?

- Smart Buildings
- Smart Power Grids
- Smart Environmental monitoring

Why we need Smart Cities:

• Increased urbanisation – cities continue to grow

• Continued growth in motorisation:
  - Congestion
  - Emissions – transport major contributor, move to low carbon

• Connectivity – people and vehicles

• Socio-demographic changes
  - Single living
  - Ageing population
Introduction

- A cornerstone of Smart Cities is promoting open sharing of information between agencies and between agencies and the community.

- Smart City applications must not only address the problems of the specific specialty area, they must also provide access to information to other applications using standards based approaches.

- Smart City applications must also leverage common telecommunications infrastructure (wired and wireless) to maximize funding.
• What is ITS?

  – **Intelligent Transportation Systems**
    
    “the application of advanced sensors, computers, electronics, communication technologies and management strategies – in an integrated manner – to improve the safety and efficiency of the surface transportation system”

  – **Integrated Transport Systems**
    
    “the application of advanced sensors, computer, electronics, and communication technologies and management strategies – in an *integrated* manner – to improve the safety, efficiency and sustainability of cities”
What have we noticed in some of the recent Smart City planning projects:

- the most common issues identified relate to the need for improved safety and efficiency of transportation of people and goods
- Sharing of information between departments and agencies
- Integration of operations

- THERE IS NO COMMON ARCHITECTURE TO DRAW FROM TO HELP THE COMMUNITIES PLAN
The *Intelligent Community Plan* builds a framework that allows for systems to be developed not only to provide improved level of services to citizens but to also allow for citizens to have access to more information in the community and provide input to shape the direction of the region in a more interactive way.

Specific Directives from the MDP that relate directly to the development of the Intelligent Community include:

- Sustainability and reducing the risk of environmental hazards;
- Taking action in climate change;
- Supporting urban mobility systems;
- Diversifying the regional economy;
- Developing local skills and knowledge;
- Enhancing the safety and security of citizens in the region;
- Promoting health and creating communities that support wellness;
- Promoting regional pride;
- Providing good governance;
- Enabling value added services; and
- Engaging Citizens.
Needs Based

- Existing RMWB operations
- Tracking and performance monitoring of fixed and mobile assets
- Safety and Enforcement
- Coordination during construction and emergency events
- Efficiency of the road network operations
- Urban Broadband telecommunications services
- Rural Broadband telecommunications services
- Sharing information system services

Use of technology by coordinating projects and sharing information in an intelligent way
Wood Buffalo Intelligent Community Plan

- Telecommunications Infrastructure Coordination
- Urban Broadband Connectivity
- Rural Broadband Connectivity
- Intelligent Community Architecture
- CAD /AVL
- GIS Data
- Intelligent Transportation Systems
- Customer Relationship Management
- RES & Bylaw Data Management
- 911 & Monitoring Dispatch Consolidation
- Capital Projects & Events Coordination
- Community Portal
- Emergency Operations Centre Data Accessibility
- RMWB E-Services
- Shared Services
- Video Services
- Voice Telecommunications
If all of these initiatives and projects are implemented without some kind of guiding architecture....

- Redundancies and duplicate work performed
- Incompatibilities
- Inefficient operations

- Inability to manage public input

- Unhappy customers
What do many of the initiatives have in common?

- Geographic base
- Need to share data with other departments/agencies
- Need to share data between initiatives
- Telecommunications Infrastructure needs
- Community outreach
- Central systems
- Distributed systems (fixed users)
- Mobile platforms
Intelligent Transport Systems – Transport of Water

• The Problem
  – Large Cities require large utilities (e.g. Water System)
  – Large Utilities use a lot of energy, are complex to operate
  – Energy market has variable cost rates

• The opportunity
  – How to use ‘Intelligent’ systems to efficiently operate complex utilities to reduce operating cost
  – Most Water Transmission/Distribution Systems have reservoirs and tanks providing storage capability (potential energy)
Intelligent Transport Systems – Transport of Water

- City of Toronto / York Region Intelligent/optimized Water Transmission Control System
  - Large complex integrated system
  - City/Region spend approximately $40M annually on electrical power/energy costs
  - Future electricity rates and structures expected to be very volatile
  - System consists approximately:
    - Treated water pumping at four filtration plants
    - Approx 500 km of large transmission mains
    - 30 Pumping Stations
    - 30 Reservoirs/Tanks
    - 150 Pumps (up to 1865 kW)
  - Large part of the system manually operated (remotely from a central location); each Pressure District has Storage/Reservoirs
SMART REAL-TIME WATER SYSTEM CONTROL

Real-Time On-Line system that will **automatically** determine control strategies (i.e. how to pump) to **minimize electrical energy costs** while ensuring required water delivery standards are met.
- SMART REAL-TIME WATER SYSTEM CONTROL

- Real-time Weather Data
- Hydro Rates
- SCADA Data
- Past Demand Data

SMART REAL-TIME WATER SYSTEM CONTROL

Output to SCADA (Control Strategy)
How Does this relate to the Architecture for ITS?

- Optimized Water Distribution System
- Electric Utility
- Weather Centre
- Etc.

Service Vehicles System Monitoring

Pumps/Sensors Weather Stations Monitoring Network

Customers
- Demand
- Billing

Centres
- Toll Management
- Commercial Vehicle Administration
- Maintenance & Construction Management

Vehicles

Travellers

Wide Area Wireless (Mobile) Communications

Fixed Point - Fixed Point Communications

IBI Group CSCE

October 2012
There is limited guidance provided by governing agencies on Smart City architecture:

Some groups exist that do good work but lack the backing of government to develop standards that can be used by all:

- Intelligent Community Forum (NY)
- Intelligent Community Canada
- Other specialty technology committees focused on their needs (ie SCADA, AMI)
- Vendor specific solutions and Services (Bell, IBM, Cisco etc.)
Opportunity:

– Canada and US have invested large amounts of time and money to develop an architecture that deals with a complex area that uses many different technologies and impacts many user groups

– The architecture for ITS could form the basis for a starting point to move towards a Smart City architecture

– ITS Canada and the ITS community as a whole could take a leadership role in assisting to move this forward
Why use ITS?

Reduced Driver frustration & travel time

Efficiency

• Demand management (Increase capacity without added lanes)
• Strategic traffic management
  ➢ Networks
  ➢ Corridors
• Route and mode choices
  ➢ Traveller information
• Management of unplanned (e.g. traffic incidents, etc) and planned events (e.g. maintenance road closures, etc)

Safety

• Event reductions – secondary & avoidance through connected vehicle
• Roadway condition warning (traffic, weather, animals, etc)

Environmental

• Emissions and consumption
• Reduce carbon foot print
• Sustainable transportation

So why not apply the same logic and lessons to other applications?
Application of the ITS Architecture

- Proven and recognized tool and terminology

- Useful from planning through to implementation

- ITS Practitioners have diverse skills to work in this area (civil, electrical, systems etc)

- Structure & Resources such as ITS Canada, the ACGM, some of the required technical committees are already in place to begin the conversation
Smart City Architecture

The Challenge:

- This is not a small or short term undertaking

- Communities are already moving forward with Smart City concepts and are not going to wait for an architecture, but....

- Starting with one or two willing industries could create momentum and proof of the benefits of such and approach.
What will the future bring?

SARTRE (Safe Road Trains for the Environment)
Thank you

We are ready!

“Imagination is more important than knowledge” – Albert Einstein

Imagination and Knowledge will achieve something very significant