Eric Gibbons
ITS Product/Project Manager

Specialized/Site Specific RWIS vs. full RWIS Implementation

August 26, 2009
Presentation Outline

Specialized Site Specific RWIS vs. full RWIS Implementation

- RWIS = Problem Solving
- Regional vs. Local RWIS
- Implementation examples
- Integration with other ITS Equipment
- Advanced applications

August 26, 2009
RWIS = Problem Solving

- RWIS exists to provide information to solve problems
  - Identifying Regional impacts on transportation
  - Allocating resources for road closure, lowered speed limits, plowing and deicing
  - Improving traffic safety
    - Local impacts
RWIS = Problem Solving

- Full RWIS provides information that helps with regional decision making
- Sometimes results in positioning an RWIS in a less than optimum location.

August 26, 2009
RWIS Problem Solving

- Full Regional RWIS
  - NTCIP 1204 ESS compliant
  - Full RPU & suite of sensors
    - Road Surface Condition
    - Precipitation Type & Rate
    - Present Weather
    - Snow Depth
    - Air Temp
    - Relative Humidity
    - Barometric Pressure
    - Visibility
    - Traffic Sensor
- Dedicated tower on concrete pad
- Relatively large investment
- Construction costs can approach equipment cost

August 26, 2009
RWIS = Problem Solving

- Municipalities need to know conditions locally as well as regionally.
- Many weather related traffic hazards are unique to a localized area.
  - Bridge icing
  - High winds through a pass
  - Localized flooding at low water crossing
  - Low visibility at foggy stretch
  - Icy area at an intersection
Innovating Outside the RWIS Box

- Many locations already have some ITS infrastructure in place that can house and connect a small RWIS system to monitor those local conditions.
- Targeting specific local traffic hazards can improve traffic safety while contributing data to regional RWIS networks.
City & County of Denver

Several RWIS are around the area, but conditions within the City were not monitored. Determining pavement conditions around this large city was a guessing game. The problem was solved with Traffic Cabinet mounted Road Sensor Stations

- NTCIP Road Sensor Station
  - NTCIP 1204 ESS Compliant
  - Passive sensor
    - Pavement Surface Temperature
    - Deep Road Temperature
    - Surface Status derived by Remote Processing Unit (RPU)
      - dry, wet & ice
- Open Architecture NTCIP 1204 ESS
- Low Cost, not expandable
- Enables Public Works to determine conditions remotely.

August 26, 2009
Overland Park, KS

The City has a large existing weather and flood warning system. Adding pavement sensors has improved PW response and traffic safety.

- Model 5721 Road Sensor
  - Integrates with existing open architecture ALERT weather data collection systems
  - Passive sensor
    - Pavement Surface Temperature
    - Deep Road Temperature
    - Surface Status derived by Central Software
      - Dry, wet & ice
- Very low cost, simple sensor.
- Provides opportunity to collect pavement data by tying into existing weather networks.

August 26, 2009
Harris County, TX

Westpark Tollway Connector at Beltway 8. Sunken road segment in each direction is monitored for flooding.

- Water level/flood data is sent to ATC2070 cabinet via SS radio.
- MiniRWIS RPU connects to available Ethernet port.
- Data is collected at the Harris County EOC along with other regional weather data and shared with Toll Roads and TxDOT.
- Local ATC2070 tie-in is planned

August 26, 2009
Site-Specific Need Targeted RWIS

- Much lower costs can be realized with RWIS designed for need-specific sensors.
  - Utilize existing infrastructure rather than new installation.
  - Utilizing Traffic Cabinets and overhead signal or sign structures eliminates the need for a new tower structure and foundation, power and communications.
  - A small footprint and low power requirements simplify deployment.
  - Capitalize on existing Ethernet presence for connectivity.
  - Non-Intrusive Road Sensors minimize installation and ongoing maintenance.
MiniRWIS - Overland Park, KS

Compact 1U Mini RWIS system resides in ATC cabinet.

Targeted RWIS implementation

- RWIS technology integrated into ATC, DMS or other available cabinet
- Utilizes existing cabinet, power source, communications & poles
- Allows local sign, beacon or DMS activation
- Allows Weather Responsive Traffic Signal Control preemption (i.e., increased amber and all red times)
- Affordable, expandable technology conserves budget
MiniRWIS Architecture

ATC 2070 1U Rack Mount Chassis

- Enables deployment in existing cabinets, rather than requiring new construction.
- Occupies just 1.75” of cabinet rack space
- Connects to available Ethernet port in cabinet
- Isolated digital outputs
- Built in surge protected sensor inputs and sensor power distribution
- Flexible power options
  - Power via +24VDC from 2070 power supply module
  - Power via 12VDC or 115VAC supply
- Can also be provided in a ATC2070 4X card cage for deployment within a 2070 Lite chassis.

August 26, 2009
Sensor Placement - Overland Park, KS

- Traffic Signal Arm Mount
  - Remote Surface Sensor and Microwave Traffic Monitor mount on common bracket on signal arm.
  - Pelco Astro-Brac signal mounting hardware.
  - All wiring internal to bracket and signal arm.
  - RPU resides in ATC 2070 cabinet.
  - The City gets road condition and traffic data for all lanes from single site, with no road work.
MiniRWIS

- MiniRWIS controller
  - NTCIP 1204 ESS compliant.
- Sensor Suite
  - 2 Flood Water Level
  - Remote Road Surface Condition (2)
  - HSE Passive Road Sensor
  - Lufft Intelligent Road Sensor
  - Visibility
  - Wind
  - Precipitation
- Weather event based digital outputs for local public warning device activation & controller preemption
- Supports Ethernet and RS-232 connectivity

August 26, 2009
Flooded Roadway Traffic Hazard

- Flood Sensor (PT)
  - 2 Sensor Inputs
  - 2 Thresholds for each sensor
    - Deep Water (Yellow beacon)
    - Very Deep Water (Red beacon)

- Actions
  - 2 digital outputs for each sensor
  - Central Software notifies first responders of flood conditions
Wet or Icy Road Surface Traffic Hazard

- **Remote Surface Sensor**
  - Non-Intrusive, no pavement cuts
  - Optically determines:
    - Road status
    - Surface temperature
    - Friction coefficient
    - Air Temperature
  - Pole Mount
    - IceSight 2020, 50’ range
      - Washer/Wiper System
    - IceSight 2020-E 50’ range
      - Lower Cost

- **Actions**
  - Wet Road digital output
  - Snow/Icy Road digital output
  - Central Software notifies first responders of wet or icy conditions

August 26, 2009
High Wind Traffic Hazard

- Wind Sensor
  - Wind Speed
  - Wind Direction

- Actions
  - Active when spot wind speed exceeds value
  - Deactivated when 10 minute wind gust below value
  - Central Software notifies first responders of high wind conditions

August 26, 2009
Low Visibility Traffic Hazard

- **Visibility Sensor**
  - Fog, smoke, dust, blowing sand
  - Forward Scatter Visibility Sensor
  - 10m to 16Km range
  - AC Power (DC optional)
  - Optional hood heater

- **Actions**
  - Low Visibility digital output
  - Central Software notifies first responders of poor visibility conditions

August 26, 2009
Precipitation

- Rain Sensor
  - 8” Rain Gauge (small size) with pole mount
  - 12” Rain Gauge

- Actions
  - Cumulative rainfall reports via Central Software augment existing National Weather Service or Agency data
Central Software

NTCIP 1204 ESS compliant architecture can be polled by NTCIP compliant Central Software:

- DEC Data Systems DataWise Supervisory Alarm and Control Software
  - Monitor digital output status
  - Notifications sent to First Responders via text message, email or pager
    - Combinations of alarms can be set to alert selected personnel
  - Hydrological Forecasting and analysis tools
  - Import existing USGS Stream Gauge data automatically
  - Easily interfaces with other databases, such as GIS, MDSS, Oracle, etc.
  - No hidden/proprietary data or databases.
  - Serves WebPages (Apache, IIS)
  - Extensive quality checking
  - Archives data

- Intelligent Devices’ Intelligent Control software
  - Integrates management of NTCIP field devices, including DMS/VMS signs, cameras, traffic sensors, weather stations, ramp meters, parking systems & incident management. All data is accessible.
Site-Specific RWIS Benefits

- Cost effective RWIS implementation allows taking advantage of existing site and communications infrastructure.
- Small size. Takes advantage of existing Traffic Cabinet installations.
- Easily deployed
- Mount weather sensors on existing traffic poles
- Ethernet or RS-232 communications
- NTCIP 1204 ESS compliant
- Actionable Sensors with adjustable digital outputs for local public warning device activation and controller preemption.
- With careful planning, an effective traffic safety improvement can be attained.

August 26, 2009
Weather Responsive Traffic Signal Control

  - City of Charlotte, NC - heavy rain, snow, or icy conditions are observed operators access the signal computer and manually implement weather-related timing plans, which increase the cycle length, while offsets and splits remain the same.
Weather Responsive Traffic Signal Control

  - City of Clearwater, FL - When the rain gauge senses a predetermined rainfall amount in a given period, the signal system computer issues a preemption command to 14 downtown traffic signals along the Route 60 corridor. These signal controllers execute new timing plans with longer green times for inbound approaches.
Additional Signal Timing Information

- Mountain-Plains Consortium, Inclement Weather Signal Timings (MPC01-120) provided detailed recommendations to UDOT for implementing Weather Responsive Traffic Signal Control for rain, slush, snow and ice events.
Eric Gibbons
ITS Product/Project Manager
800-275-2080
eric@highsierraelectronics.com

Specialized/Site Specific RWIS vs. full RWIS Implementation

www.highsierraelectronics.com

August 26, 2009