Closing the Book on Clarus

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July 16, 2013
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Chapter 1: Identify the Problem and Envision a Solution (2004)

The Problem:
- Many unmet weather-related needs across the community
- Significant yet non-optimized investments in RWIS/ESS by States

The *Clarus* Solution:
- Design and build a resource of road weather observations
- Enhance and extend existing weather data sources to support general purpose forecasting
- Enhance and extend road weather forecasting and decision support systems
- Develop partnerships between the transportation and weather communities
Chapter 2: Create a Concept of Operations (2005)

Authors:
- Meridian Environmental Technologies
- Iteris, Inc.

Scenarios:
- Roadway Maintenance and Operations
- Traffic Operations
- Traveler Information
- Transit Management
- Emergency Management & Public Safety
- Rail Operations Management
- Commercial Vehicle Operations
Chapter 3: 

**Consultant:**
- Mixon Hill, Inc.
- Mixon Hill Team: Oklahoma Climatological Survey, Cambridge Systematics, Stephenson Group

**Systems Engineering Documents:**
- High-level Requirements Specification
- System Architecture Description
- Detailed Requirements Specification
- Analysis of Architectural Alternatives
- Design Gap Analysis
- System Design Description
- Test Plan, Scripts, & Results
Chapter 3: Clarus Proof-of-Concept (2005-2006)

Proof-of-Concept States:
- Alaska ~ Jack Stickel
- Minnesota ~ Curt Pape
- Utah ~ Ralph Patterson

Clarus System:
- Collect
- Quality Check
- Disseminate
Chapter 4: Clarus Task Forces

Engage the community to ensure that what we built met their needs:

- User Needs
- Use Case Applications
- Metadata
- Detailed Requirements
- Quality Checking
- Design
Chapter 5:
Initiative Coordinating Committee (ICC) Meetings

1) 2004 ~ Norman, OK
2) 2005 ~ Las Vegas, NV
3) 2005 ~ Salt Lake City, UT
4) 2006 ~ Falls Church, VA
5) 2007 ~ Kansas City, MO
6) 2008 ~ Reno, NV
7) 2009 ~ Charlotte, NC
8) 2010 ~ Indianapolis, IN
2011 - Present ~ RWM Stakeholder Meeting
Mixon Hill operated *Clarus* from the proof-of-concept to the full system through June 15, 2013.
Participation Status for Clarus

**Local Participation**
- City of Indianapolis, IN
- McHenry County, IL
- City of Oklahoma City, OK
- Kansas Turnpike Authority
- Parks Canada

**Clarus Connection Status**

- **Connected** (36 States, 5 Locals, 4 Provinces)
- **Connected plus vehicles** (3 states)
- **Pending** (6 States, 3 Locals, 1 Province)
- **Considering** (2 States, 1 Local)

**Sensor & Station Count**
- 2,437 Sensor Stations (ESS)
- 54,251 Individual Sensors
- 388 Vehicles

RWM Stakeholder Meeting; July 16, 2013; Little Rock, AR
Chapter 6: *Clarus* Operations & Enhancements

Quality Checking Algorithm Enhancements:
- The National Center for Atmospheric Research (NCAR) researched the existing algorithms, made enhancements to some, and created two new algorithms.
- Mixon Hill implemented the changes and deployed the new algorithms, performed testing, and reviewed algorithm documentation.

*Clarus* System Enhancements:
- Over time, Mixon Hill upgraded the *Clarus* System to accommodate the increase in observations, implement mobile observations, and provide graphical user interfaces.
Chapter 6: Clarus Operations & Enhancements
Chapter 7: The Clarus Regional Demonstrations

Objectives:
• Ensure the Clarus System works as designed
• Foster proactive transportation system management in response to the weather
• Encourage improved private sector services for road weather information enabled with data from the Clarus System

Phases:
• Phase 1 - Concepts of Operations for Decision Support Systems
• Phase 2 - Expand participation
• Phase 3 - Develop, test and evaluate optimal concepts
Chapter 7: Phase 3 - Field Tests

1) Enhanced Road Weather Forecasting (Meridian & Mixon Hill)
2) Seasonal Load Restriction Tool (Meridian)
3) Non-Winter Maintenance Decision Support System (Mixon Hill)
4) Multi-State Control Strategy Tool (Mixon Hill)
5) Enhanced Road Weather Content for Traveler Advisories (Meridian)

**Meronian Team**
- Iteris
- Univ of North Dakota
- Idaho TD
- Minnesota DOT
- Montana DOT
- North Dakota DOT
- South Dakota DOT

**Mixon Hill Team**
- NCAR
- KMJ Consulting
- Avaya Government Solutions
- Athey Creek Consulting
- Iowa DOT
- Illinois DOT
- Indiana DOT
Chapter 8:
BAA - Additional Uses of *Clarus* Data

- Integrating *Clarus* Data with the New York 511 Traveler Information System (Telvent-NY)
- Passenger Bus Industry Weather Information Application
- Western States *Clarus* One-Stop Shop for Rural Traveler Information (Montana State)
- Integrating *Clarus* Data and State Crash Data into a Travel Decision Support Tool (Michigan Tech)
- Integrate *Clarus* Data into RITIS (Univ of Maryland)
- Fuse *Clarus* Data & MoPED Data for Alerting & DST (GST)
- Add Nova Scotia & New Brunswick to *Clarus* (AMEC)
Chapter 9: *Clarus* Users

- Government Agencies (Federal, State/Provincial, & Local)
- Academic Institutions
- Weather Service Providers
- Television Stations
- Private Sector Firms
- Unknown Sources
Chapter 10: *Clarus* Transition Track

- **Operational System**
  - **MADIS**
  - **Weather Data Environment (WxDE)**

- **Clarus**
  - **Research System**
The End
Credits

All *Clarus* Stakeholders

- James Pol
- Roemer Alfelor
- Ben McKeever
- Gabe Guevara
- Dale Thompson
- Ray Murphy
- Pat Kennedy
- Andy Stern
- Lynette Goodwin
- Lee Smithson
- Bill Mahoney
- Leon Osborne
- Lee Mixon
- Kyle Garrett
- Brenda Boyce
- Bryan Krueger
- Chris Hill