

Closing the Book on *Clarus*

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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



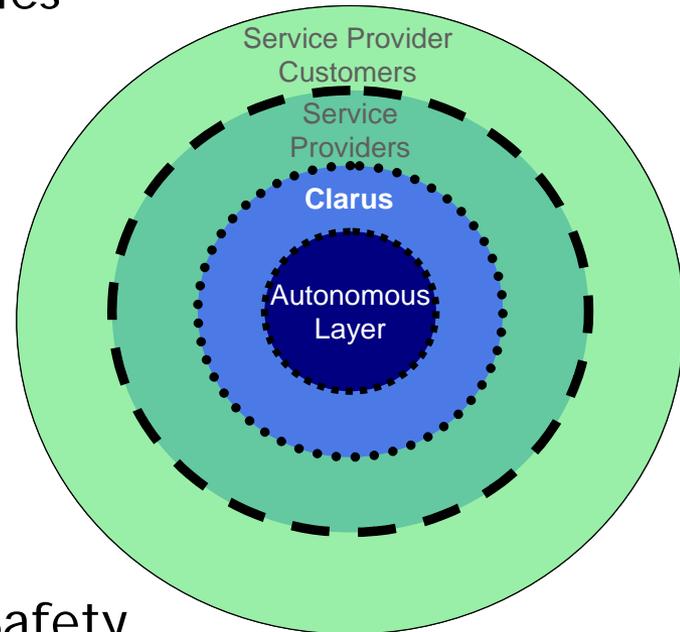
Chapter 2: Create a Concept of Operations (2005)

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:

Clarus Proof-of-Concept (2005-2006)

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:

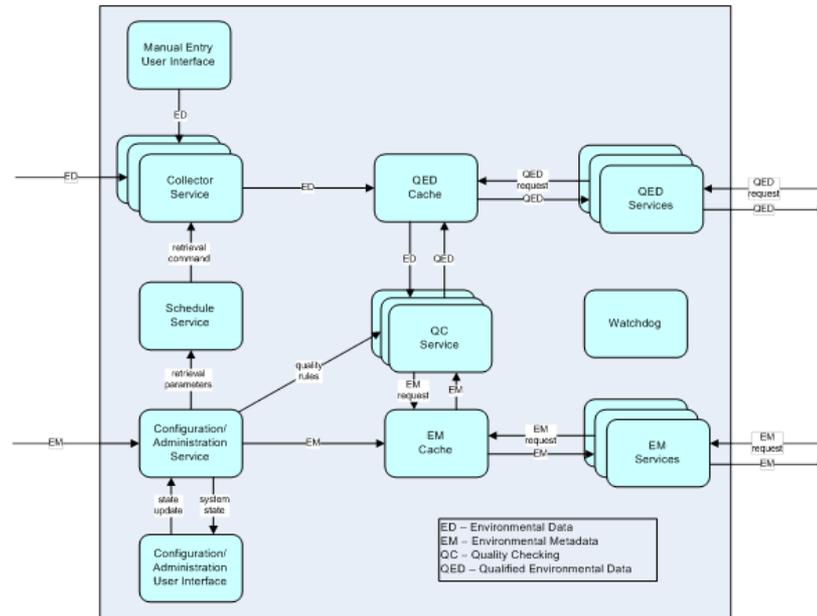
Clarus Proof-of-Concept (2005-2006)

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:

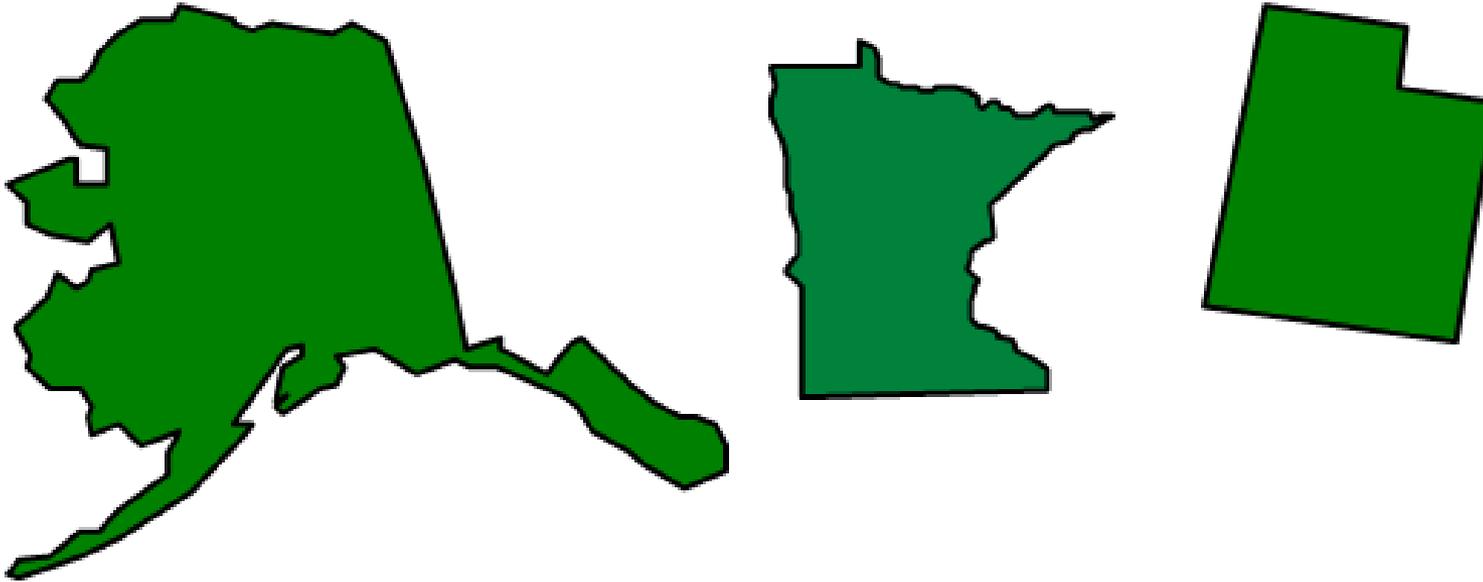
Initiative Coordinating Committee (ICC) Meetings

- 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



Chapter 6: Clarus Operations & Enhancements

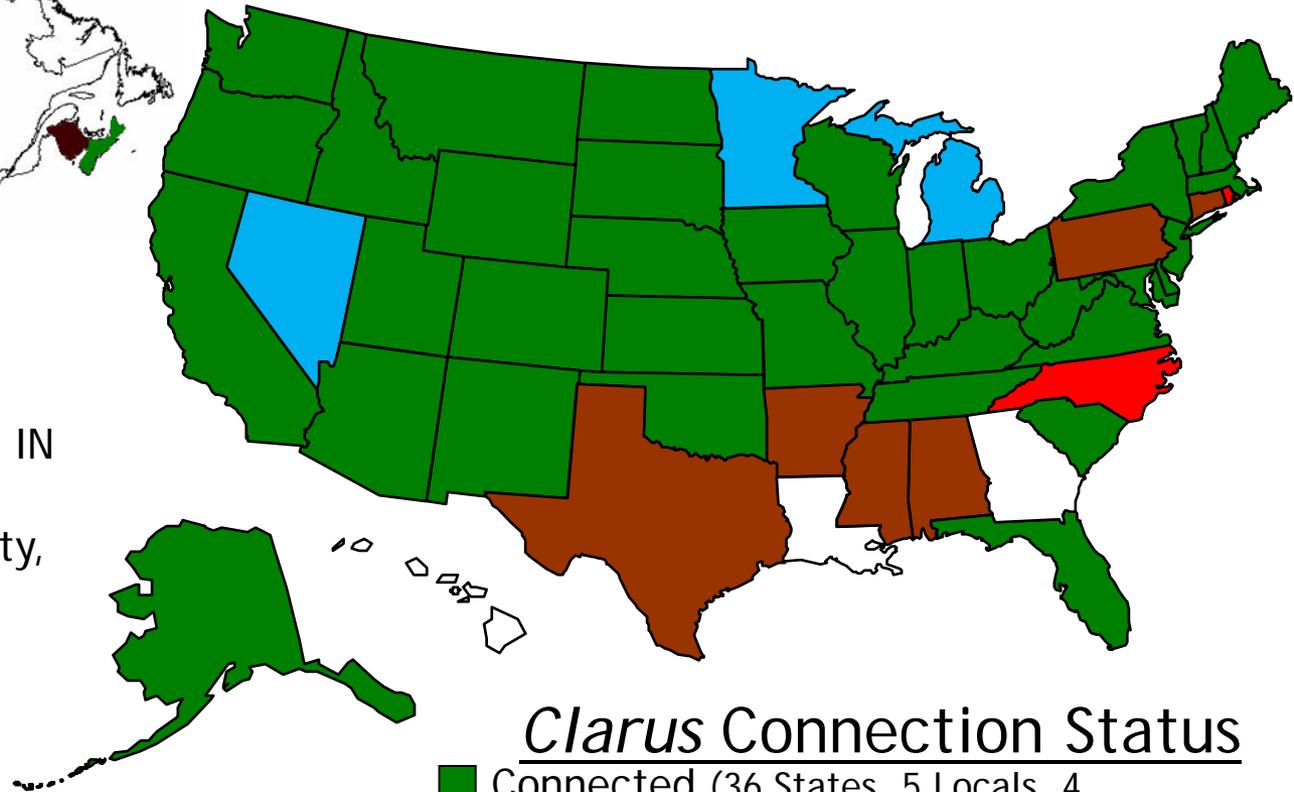
Mixon Hill operated *Clarus* from the proof-of-concept to the full system through June 15, 2013.



Participation Status for *Clarus*



Canadian Participation



Local Participation

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

Sensor & Station Count

2,437 Sensor Stations (ESS)
 54,251 Individual Sensors
 388 Vehicles

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)



Chapter 6:

Clarus Operations & Enhancements

Quality Checking Algorithm Enhancements:

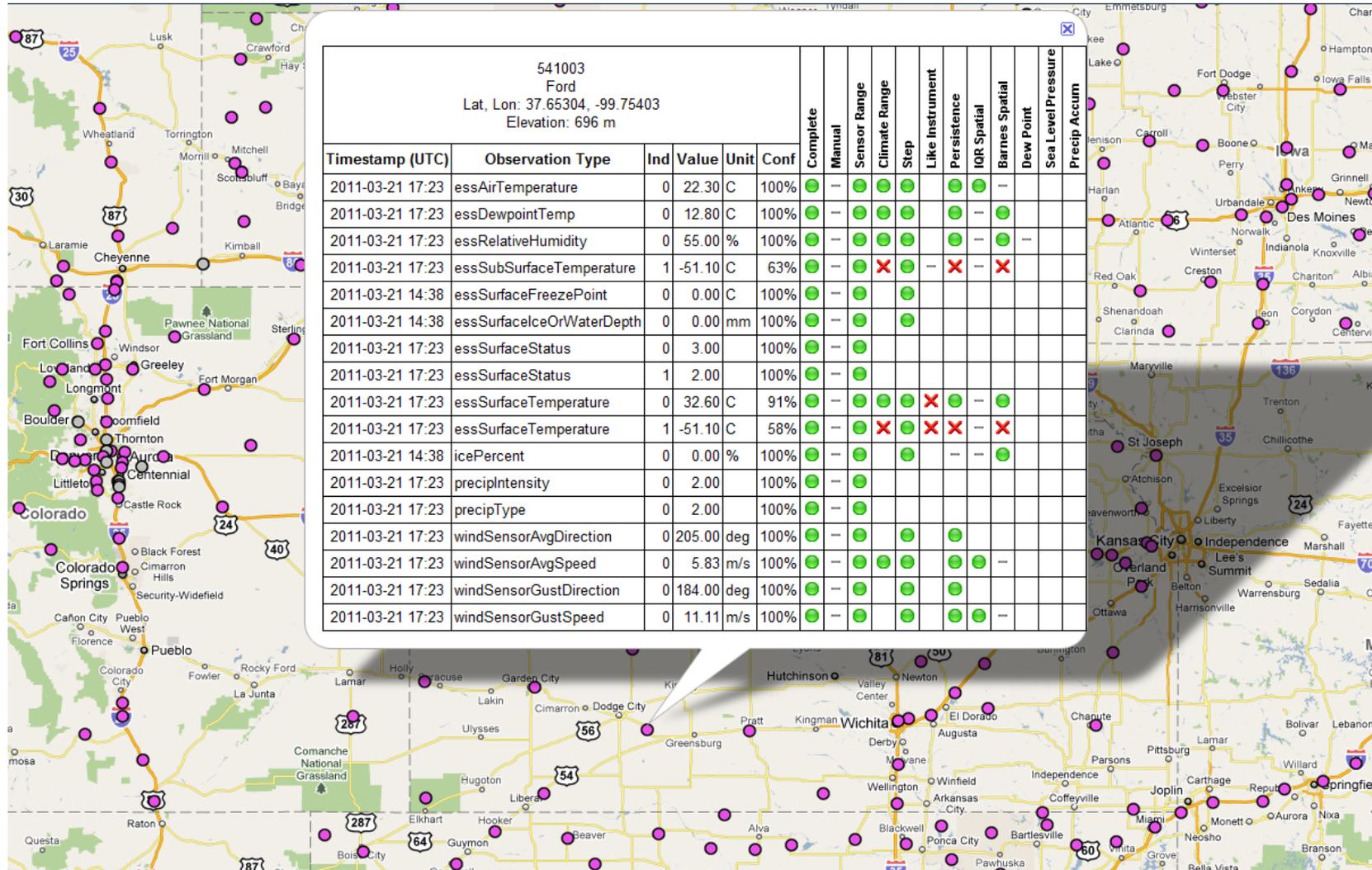
- The National Center for Atmospheric Research (NCAR) researched the existing algorithms, made enhancements to some, and created two new algorithms.
- Mixon Hill implemented the changes and deployed the new algorithms, performed testing, and reviewed algorithm documentation.

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)

Meridian 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)
- Integrating *Clarus* Data in Traffic Signal System Operation: A Survivable Real-Time Weather-Responsive System (Univ of Idaho)
- 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)



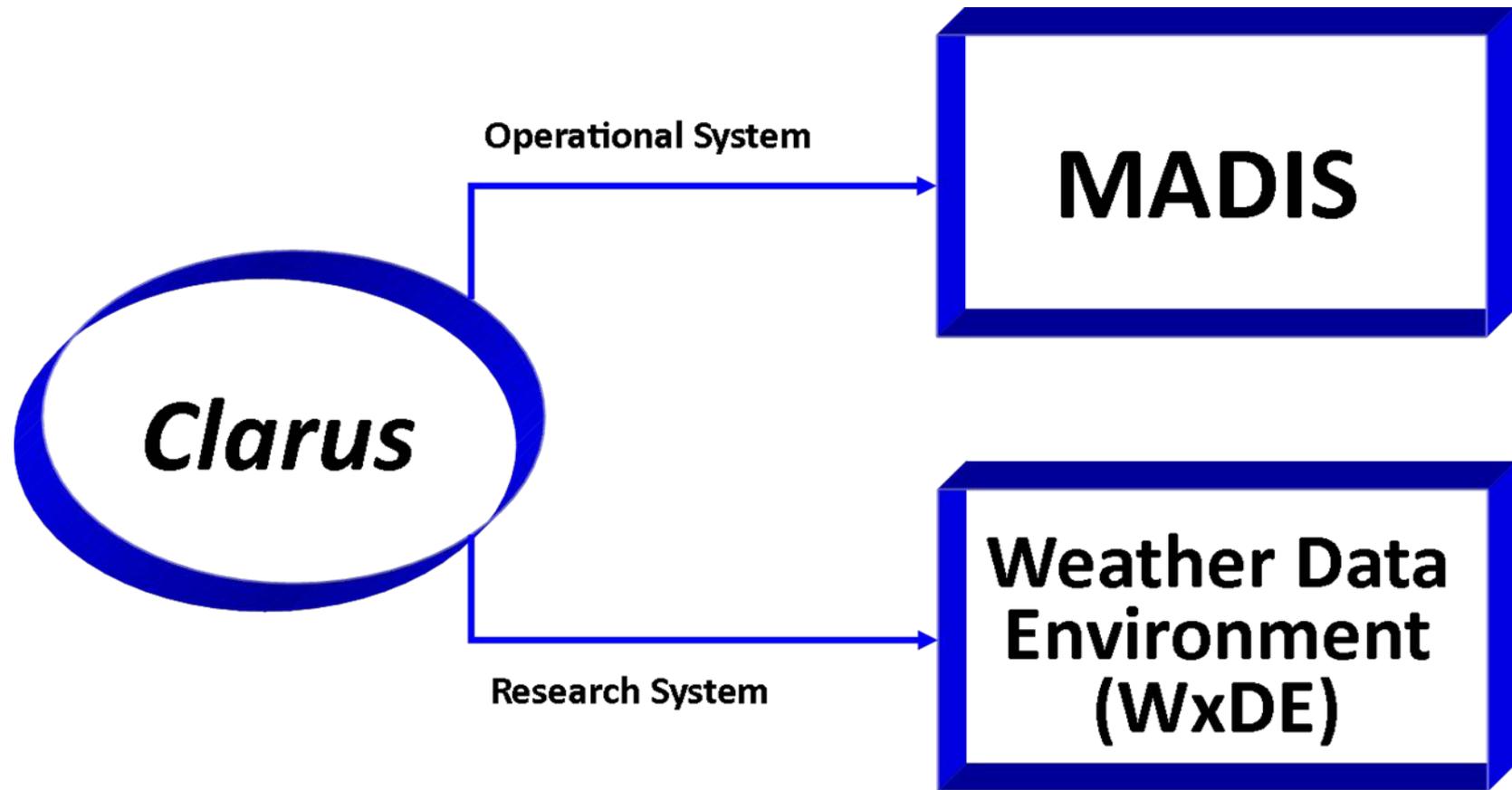
Chapter 9:

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



The End



Credits

All *Clarus* Stakeholders

- James Pol
- Roemer Alfelor
- Ben McKeeever
- 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

