

Clarus

Weather System Design

ICC Meeting

November 15-17, 2005

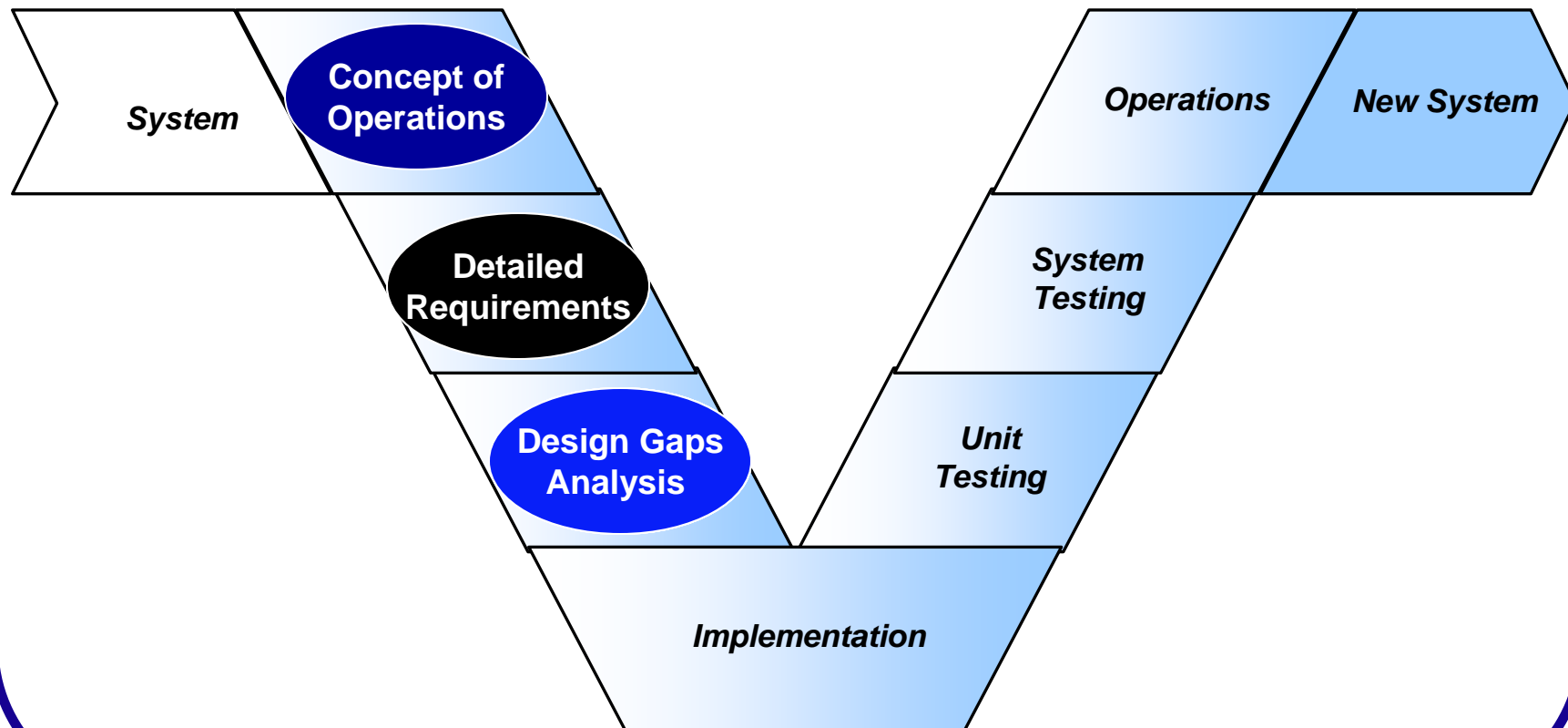
www.clarusinitiative.org

Target



"Bummer of a birthmark, Hal."

Clarus Design Deliverables



High Level System Requirements Specification

- Capture the expression of general needs
 - Concept of Operations
 - Stakeholders
- Types of requirements
 - Design constraints
 - Functional requirements
 - Functional data requirements
 - Functional interface requirements
 - Performance requirements
 - Quality characteristics
 - External requirements

High Level System Requirements Specification

- Functionally, the *Clarus* system will:
 - gather observations from fixed and mobile environmental data “collectors” across North America
 - provide continuous quality checking (i.e., assessment) and flagging of the data through a variety of methods, logging the quality control process
 - disseminate data on request or by subscription, according to pre-established data sharing agreements
 - administer the process by managing access, issuing change notices, keeping logs, and retaining the environmental data according to the data sharing agreements

High Level System Requirements Specification

- *Clarus* data will:
 - be based on the NTCIP, TMDD, and CMML standards
 - include atmospheric weather, surface conditions, and hydrologic data
 - include sensor metadata
 - include location, time and date stamp, and source for all observations

High Level System Requirements Specification

- *Clarus* interfaces will:
 - be based on industry standards
 - disseminate data based on a variety of query techniques, subject to data sharing agreements
 - respond to dissemination requests on one-time and subscription bases
 - allow for system administration

High Level System Requirements Specification

- *Clarus* will be designed to:
 - minimize latency in data collection, quality assessment, and dissemination
 - scale to 470 million *current* observations
 - scale to 600 concurrent users
 - scale to 6000 registered users

High Level System Requirements Specification

- Forms the basis for the detailed requirements
- Document available at www.clarusinitiative.org

System Architectural Description

- Operational Concept
- System Architecture
 - Services Viewpoint
 - Network Viewpoint
 - Hardware Viewpoint
 - National ITS Architecture Viewpoint
- Standards
- Document available at www.clarusinitiative.org

ESS Survey

- Deployment patterns
- Data collected
- Communications, data flow, and processing systems
- Use of data
 - Data users
 - Information sharing and coordination
 - Quality control
 - Archiving practices and dissemination policies
 - Maintenance and performance
 - Standards and procedures

ESS Survey

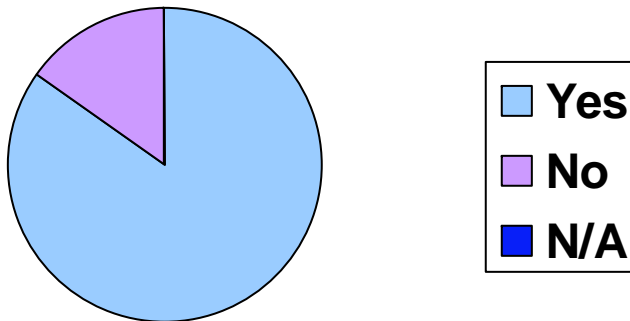
- Concerns for *Clarus*
 - Coverage areas
 - Maintenance levels
 - Quality of data
 - Reporting frequency
 - File availability
 - Communication methods
 - Proprietary or for agency use only
 - Funding for expansion and maintenance

Systems Engineering Analysis of *Clarus-Related Systems*

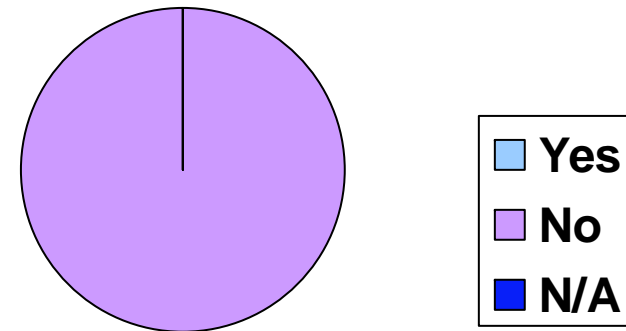
- Assessment of the relevance of existing software and hardware systems
- Assessed systems based on the high level requirements

Systems Engineering Analysis of *Clarus-Related* Systems

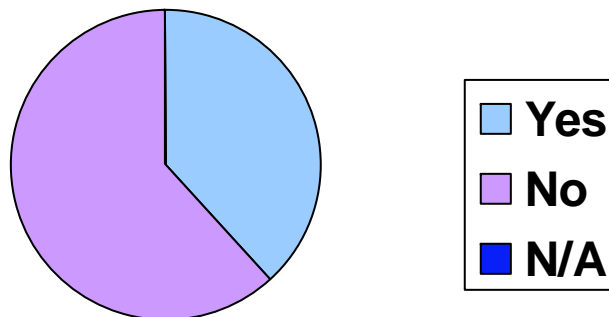
Collects Obs from Collectors



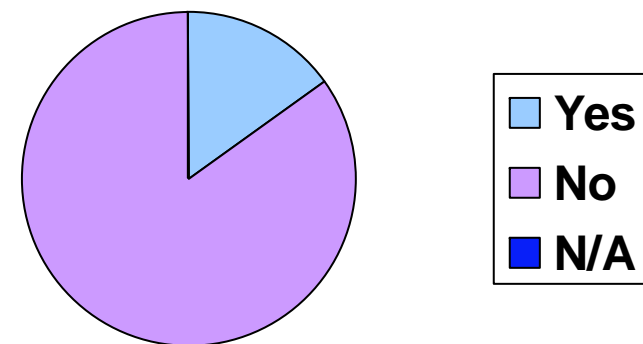
Collects Obs from Vehicles



Collects Obs from Weather Service Providers

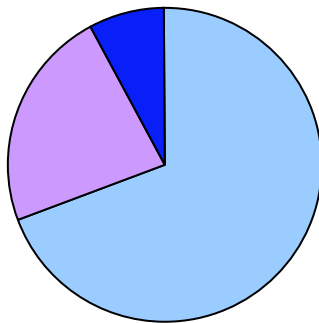


Collects Obs from Across North America

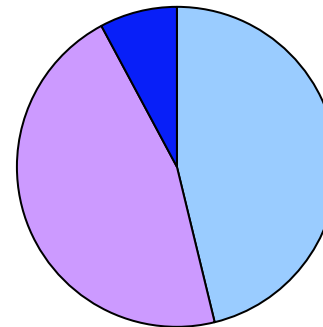


Systems Engineering Analysis of *Clarus-Related* Systems

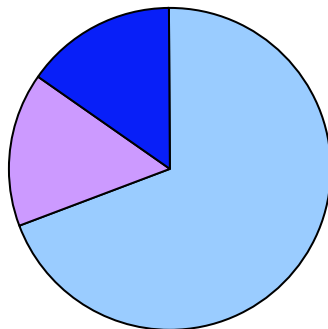
Calculates Derived Variables from Obs



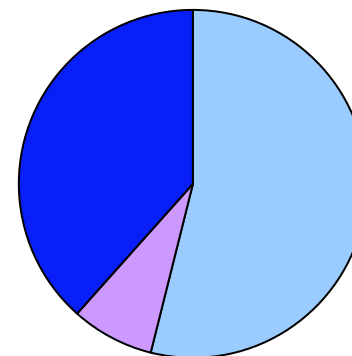
Provides Quality Checking Continuously



Provides Quality Checking using Multiple Methods

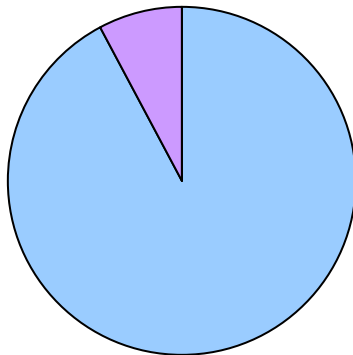


Logs the Quality Checking Process

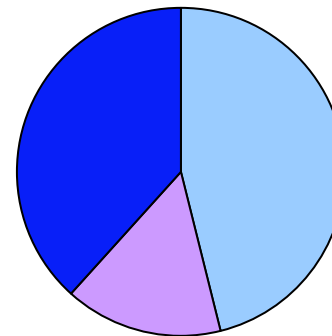


Systems Engineering Analysis of *Clarus-Related Systems*

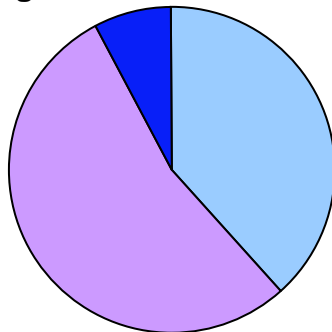
Disseminates Data on Request



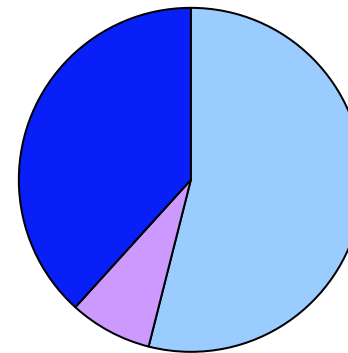
Disseminates Data by Subscription



Disseminates Data based on Agreements

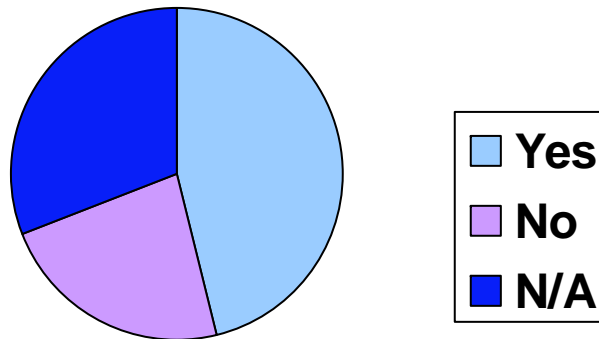


Maintains Data Sharing Agreements

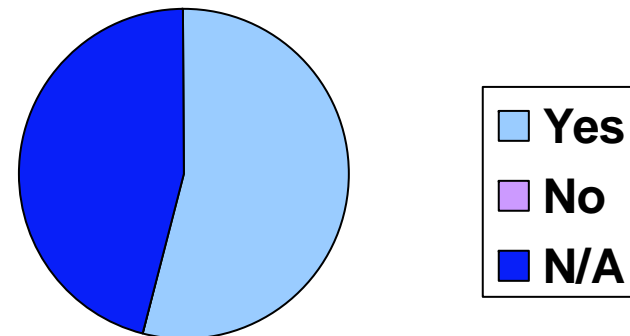


Systems Engineering Analysis of *Clarus-Related Systems*

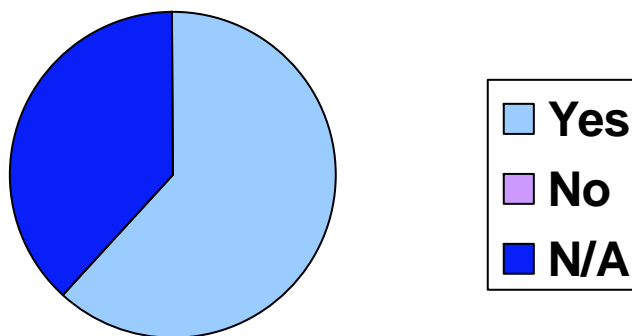
Manages Security Groups



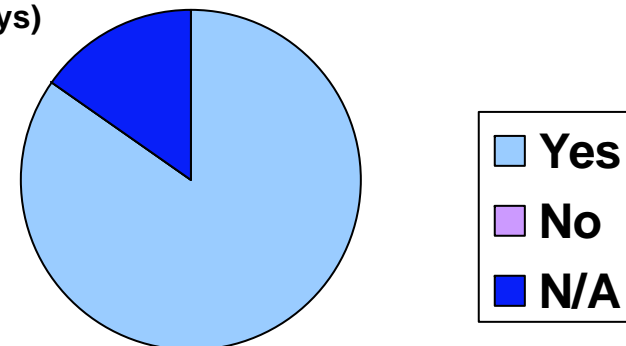
Issues System Modification Notices



Keeps Operations Logs and Statistics

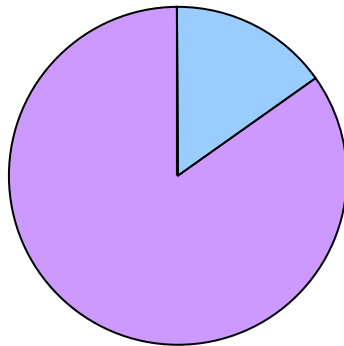


Manages Data Retention (nominal 7 days)

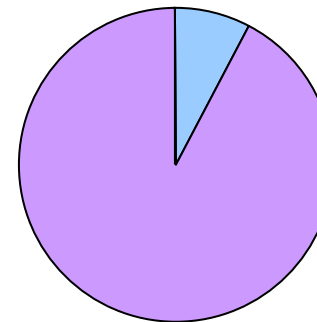


Systems Engineering Analysis of *Clarus-Related Systems*

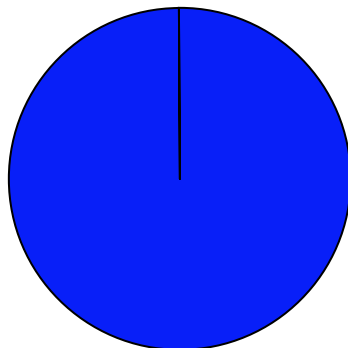
Based on NTCIP 1204



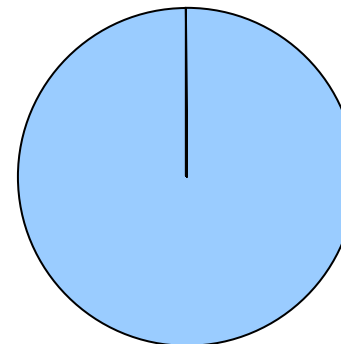
Supplemented by CMML



Supplemented by TMDD

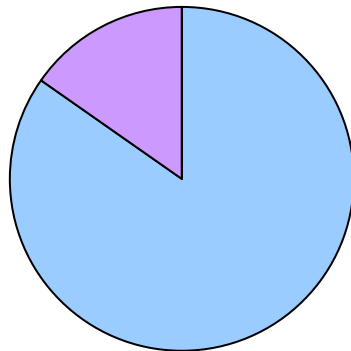


Atmospheric Observations

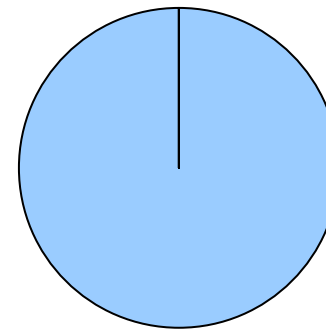


Systems Engineering Analysis of *Clarus*-Related Systems

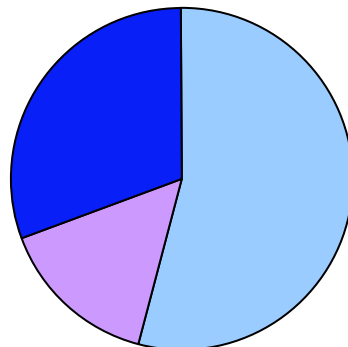
Surface or Subsurface Observations



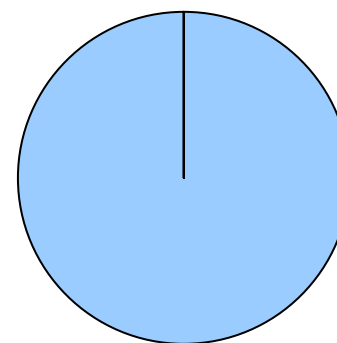
Hydrologic Observations



Sensor Metadata

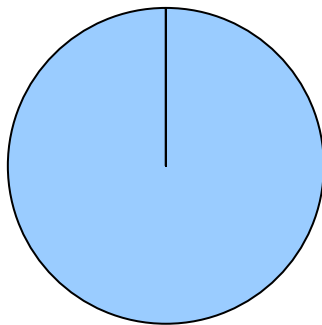


Geographic Metadata

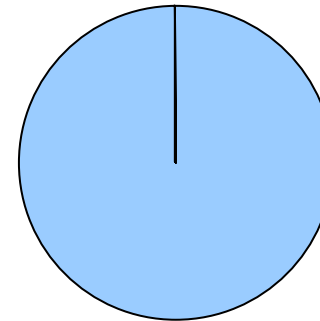


Systems Engineering Analysis of *Clarus-Related Systems*

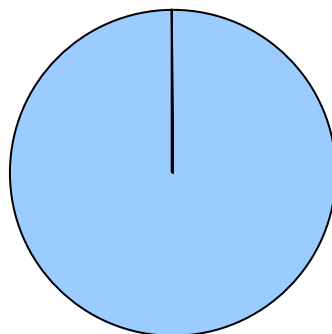
Time and Date Stamp for Observations



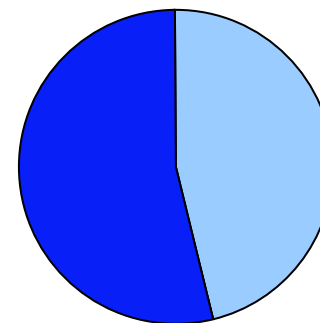
Source of Observations



Data Dissemination Interfaces

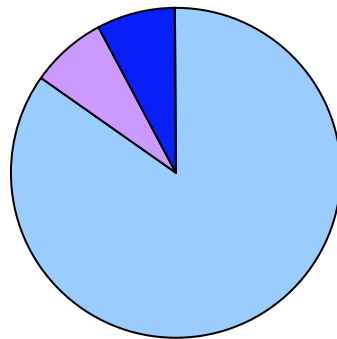


Administration Interface

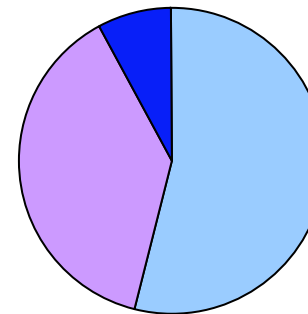


Systems Engineering Analysis of *Clarus-Related Systems*

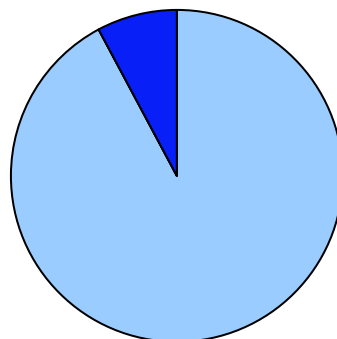
Select Datasets of Interest



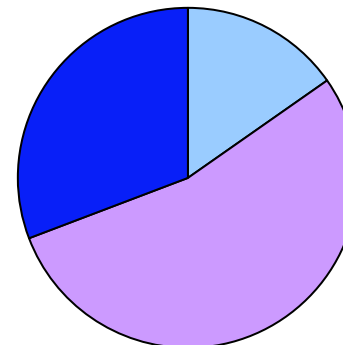
Query by Timestamp



Query by Location

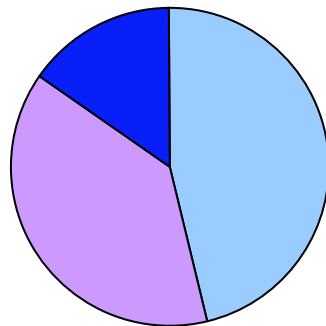


Query by Quality Flag

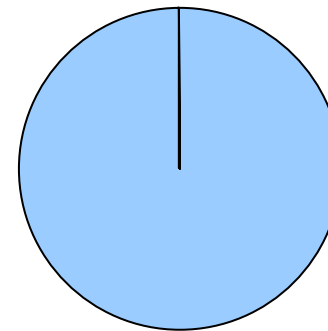


Systems Engineering Analysis of *Clarus-Related* Systems

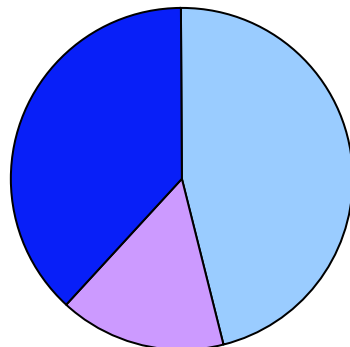
Constrain by Privilege based on Agreements



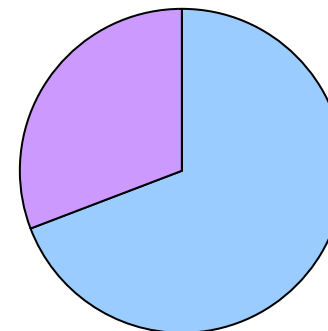
One-Time Request



Subscription Request

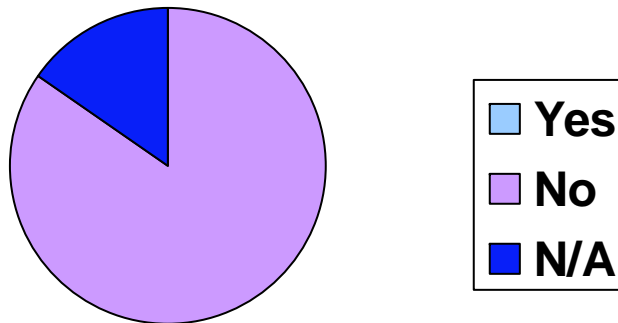


Minimizes Latency in Collection, QC, & Dissemination

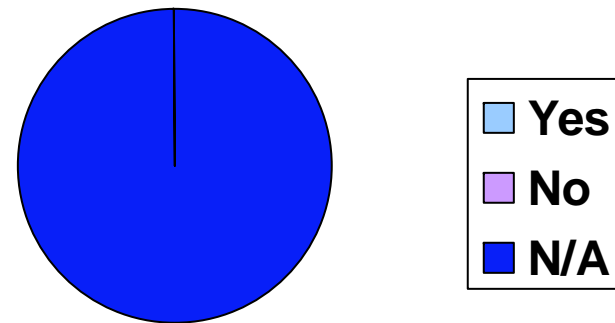


Systems Engineering Analysis of *Clarus-Related Systems*

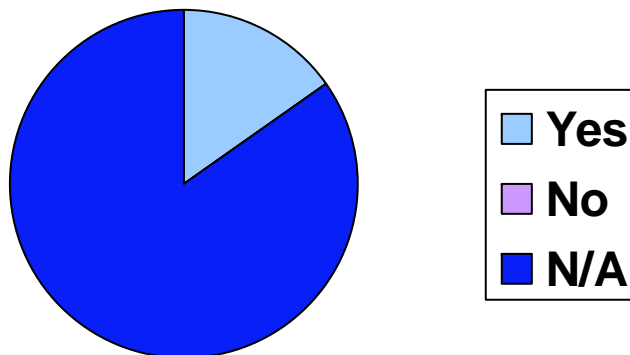
Operates with 470 Million Current Observations



Operations with 600 Concurrents Users



Operates with 6000 Registered Users



Architectural Alternatives Analysis

- Service topology
 - Centralized service
 - Distributed service
- Data interchange methods
 - Polling process
 - Publish/subscribe process
 - Notify/retrieve process
 - Hybrid push/pull process

Architectural Alternatives Analysis

- Contributor assignment
- Geo-referencing methods
- Station identification
- Data cache and repository
- Message formats
- Quality checking methods

Design Gaps Analysis

- Data sharing agreements
 - *Clarus*
 - MADIS
 - RWIN

Design Gaps Analysis

- Access to “real-time” data
- Data collection system standards
- Metadata reliability
- Standards for data quality checking
- Data dissemination standards

Project Information

- Project Contact Information
 - J.Kyle.Garrett@mixonhill.com
 - Brenda.Boyce@mixonhill.com
- U.S. DOT Contact Information
 - James.Pol@fhwa.dot.gov
 - Paul.Pisano@fhwa.dot.gov
- *Clarus* website address
 - www.clarusinitiative.org