Clarus Initiative Coordinating Committee (ICC) Meeting # 2
March 2 – 3, 2005
Las Vegas, Nevada

Meeting Synthesis

DAY ONE

Introductions – Paul Pisano, FHWA Office of Transportation Operations

Welcome – Regina McElroy – Director, FHWA Office of Transportation Operations

The *Clarus* Initiative is under the auspices of the U.S. DOT ITS Joint Program Office, which is undertaking 9 high level initiatives, *Clarus* being one of them. Each initiative is being tracked and monitored by the U.S. DOT Management Council, which gauged stakeholder buy-in and decided on pursuing the initiatives. FHWA wants to avoid duplication of efforts while keeping an eye out for additional synergistic opportunities. The potential for the *Clarus* Initiative is limited only by our imagination.

Refresher Overview & Reminder – Paul Pisano

Great road weather information is out there, but it is not readily available to everyone who needs it, and often it is not in a format that is useful to end-users. *Clarus* will optimize the investments being made nationally by DOTs to benefit those who need it. There are two development components to the *Clarus* Initiative: the *Clarus* System which is the network for sharing surface weather observations and relevant transportation conditions; and the *Clarus* Initiative that is the end to end system from field sensors to end-user that demonstrates the value-added surface transportation weather information enabled by the *Clarus* System.

Review of ICC Meeting #1

Held in September 2004 with over 60 participants. Those present validated the management objectives and approach of the *Clarus* Initiative.

Progress since ICC Meeting #1

The www.clarusinitiative.org website was launched; the concept of operations (ConOps) was drafted along with operational scenarios and refined through two task forces. The Task Forces reviewed the user needs (led by Charlene Wilder, FTA) and the use case scenarios (led by Brenda Boyce, Mixon / Hill).

The *Clarus* System Design procurement was put out on the street, an award is anticipated by May 2005 with project completion within 20 months after notice to proceed. The *Clarus* Initiative Management Team (IMT) has also convened since the last meeting. The IMT represents the ICC's interests and works closely with FHWA.

Three upcoming research initiatives related to *Clarus* have been identified:

1. Closed-Circuit TV (CCTV) – MIT's Lincoln Laboratory is doing image-processing work to identify visibility and road conditions.
2. Vehicle Infrastructure Integration (VII) – Exploratory work to determine what weather and road condition data can be collected from vehicles as part of the VII Initiative.
3. Collaborative Adaptive Sensing of the Atmosphere (CASA) – Phased array radar that is low cost and low power which could look at surface and near surface conditions. The University of Massachusetts and the University of Oklahoma are doing this research.

Objectives for ICC Meeting #2

To refine the ConOps scenarios and to have an open discussion on activities that will affect the development of the *Clarus* Initiative, even if they are not ConOps relevant.

Discussion

- Were the findings of the 2 task forces published? The results of the efforts of the task forces are evident in the revised ConOps.

- It is important to note that data assimilation is key, and should be an important feature of the system design.

Executive Summary Review of ConOps – James Pol, U.S. DOT ITS Joint Program Office

The *Clarus* community is very broad, which makes it difficult to capture all the needs. To that end, the ConOps likely under represents issues that are important to certain groups, including the private sector. It is important to have the ICC contribute its thoughts on how to better define the ConOps so that the *Clarus* System's design meets the needs of all sectors. As the surface transportation weather information system is designed, who puts data in, who pulls data out, and what is done with the data is germane to the ConOps development. *Clarus*' ConOps was developed with 'principal users' in mind, those who will interact directly with the *Clarus* System.

Inherent time latencies are also a critical part of the system's design. Data dissemination latency must be identified and prioritized, taking the requirements into account. There are public and private sector benefits that should be considered as the *Clarus* System is defined.

Discussion

- How does the airport industry involve itself in the *Clarus* process? How does the marine industry do the same?

The scope of Clarus is transportation agency assets that collect environmental observations related to roads or routes. This includes vehicles traversing roads as well as trains and ferries traversing routes. The airport industry has been identified as an industry that will have to be linked to Clarus; though not a specific component of the initial system design in the way the boundaries were identified for the base Clarus System. Some DOTs are investing in airport or other industry sensors, (e.g., Michigan DOT's AWOS investments); however, AWOS data falls under the FAA and/or NOAA. Marine data is not homogenous, as the railroad industry also operates marine ports. It is conceivable that Clarus could collect certain aviation or marine reports but these and other environmental information fit better under existing NOAA collection mechanisms or through NOAA arrangements with other agencies. – No Change to ConOps

- It seems like everything involves service providers accessing data and making it available to users, but if *Clarus* is being funded by taxpayer dollars, we should consider making this data available to everyone.

  The current scope of Clarus allows for data to be made available to service providers who provide the mechanism for data dissemination to others. – No Change to ConOps

- The ConOps focuses on data quality as a differentiator for *Clarus* from any other system, but there is not a quality assurance / quality control (QA / QC) process clearly identified as a key component of the design. Flagging data, but not removing it from the data stream during the QA / QC process is highly important.

  The specifics of the QA/QC process will be defined in the design. Clarus will flag the data and the ConOps does discuss this process at a couple of levels. – No Change to ConOps

Presentation:
http://clarusinitiative.org/documents/ICC2%20Presentations/ICC%20Clarus%20Update4.pdf

NOAA Surface Weather Program Update – Michael Campbell, NOAA and Jim O'Sullivan, NOAA

A Tiger Team working over a month and a half developed a Charter for the Surface Weather Program – developed recently to supplement NOAA's aviation and maritime programs. NOAA and FHWA have drafted a Memorandum of Understanding (MOU) with a ceremony planned for the spring of 2005 to formalize it. Current activities also include the *Clarus* Initiative, VII initiative, Office of the Federal Coordinator for Meteorology Weather Information for Surface Transportation Working Group and Meteorological Assimilation Data Ingest System's (MADIS) transition to operations. With the Global Earth Observing System of Systems (GEOSS), NOAA is looking at all of its observation systems. They are also looking at the National Digital Forecast

Database (NDFD), its interaction with forecast preparation systems and how these can best be used for surface transportation users. These initiatives strengthen ties between inter-federal agencies. While surface transportation is a focus, NOAA also plans to look at transit and rail and other areas of focus for weather support.

The Integrated Surface Observing System (ISOS) is developing an infrastructure to meet capacity for any foreseeable amount of data, be inclusive of all observations, be available, high quality, with stratified standards of observation and be accessible to everyone at, ideally, no to very minimal cost. This will include a metadata database and archived information.

Discussion

- Could you clarify the relationship between ISOS and *Clarus*?

  ConOps will be updated to better show the relationship between Clarus and ISOS. NOAA would like to see Clarus as a part of ISOS, but as federal agencies, we are looking to not have the two systems compete, but rather complement each other. We are determining how the systems will work cooperatively in the end. Clarus is on a more aggressive schedule than ISOS is and one vision is to develop Clarus and have it handed over to function under NOAA. Further discussion needs to occur to draw out the full relationship between Clarus and ISOS. – Incorporated into ConOps

Presentation:
http://clarusinitiative.org/documents/ICC2%20Presentations/NOAA%20Update.pdf

Canadian RWIN Program – Kent Johnson, Environment Canada

Transport Canada has provided seed funding to get the Road Weather Information Network (RWIN) going. This will help procure the equipment and get the program started. RWIS has been identified, in part, as a means of managing road salt – considered a toxin. RWIN focuses on the national roads for now.

The Data Management Framework Program integrates data from various weather sources into one database. Jurisdictions are required to share weather information for at least the first two years following acceptance of the Road Weather Information System (RWIS) Agreement. Ontario has over a thousand weather stations, but hardly any were available to the Meteorological Service of Canada until recently. As data becomes shared with the weather service, they are able to control how this data is further shared. Specific agencies providing the data may wish to keep this data from being shared like private sector forestry companies.

The Weather Service in Canada came about as a result of aviation, which set “hours” as an acceptable basis for weather information. With our current needs of weather information down to minutes and miles, Canada is faced with a system that is not capable of providing this information. Future needs also require probabilistic vs.

deterministic forecasts, so that a range of weather conditions are made available with a percent of probability for each.

The biggest change to meteorologists will come in the next few years, as the process becomes less human and more automated, shifting from deterministic to probabilistic forecasts, placing humans at either the front design end of the forecast or at the back interpretive end.

A prototype for RWIN is currently accepting test data from Ontario and will soon start to accept test data from Quebec. The RWIN orientation session is set for May 2005, with a revised and enhanced version available by June 2005. By 2006-2007, metadata files are to be populated and by 2007-2008, we will have a functional, tested system. RWIN started as a side project for weather information integration and it soon became a focus project.

Weather stations are capable of tracking weather information at granular levels, so while they are spaced far apart, much analysis could be done given these data records and interpolation of data. Our goal is to overcome challenges in Canada and work with the U.S. through *Clarus* and other initiatives to better share weather information across boundaries.

Discussion

- Any sort of shared data between Canada and the U.S. at the moment?

  Sharing data is between Canada and the U.S. is a goal. Currently there are obstacles to sharing data, even within Canada itself. The Canadian Federal government does not own all stations and provincial governments that do are beginning to make them available. – No Change to ConOps

- Do insurance companies provide funding for weather information?

  A quasi-public insurance corporation, owned by the government, in British Columbia has provided funding for weather info. To enhance safety. In other provinces, private insurance companies have supported our efforts, but show very little interest. – No Change to ConOps

Presentation:
http://clarusinitiative.org/documents/ICC2%20Presentations/RWIN%20Update%20-%20Clarus%20ICC2.pdf

Update on Standards – Lynette Goodwin, Mitretek

Clarus is a nationwide system, collecting data from state and local agency data collection points. The use case diagrams (UCDs) illustrate where standards are needed.

Version 1 of NTCIP 1204 – the ESS Interface Standard – is deployed in Minnesota and Washington State. Based on lessons learned, Version 2 was developed and will soon be approved. It will be tested in the *Clarus* proof of concept demonstration.

There are various standards that must be evaluated for *Clarus* center to center communications. NTCIP 1301—the Weather Report Message Set for ESS—has a ConOps developed, but no further development is underway due to funding issues. The Traffic Management Data Dictionary (TMDD) and the Message Sets for External Traffic Management Center Communication (MS/ETMCC) have some weather elements. NTCIP 1602—the Generic Reference Model for Traffic Management—uses the Unified Modeling Language (UML) that *Clarus* will also use. NTCIP 2304—Application Profile for DATEX is also under consideration.

SAE J2354—Message Sets for ATIS—contains weather and road condition information and is harmonized with MS/ETMCC. This standard is also available in eXtensible Markup Language (XML).

Other available XML standards include NTCIP 2306—Application Profile for XML in ITS Center to Center Communications—which has its messages defined in other standards. Weather Information Dissemination Guidelines were funded by Aurora and Enterprise and cover an XML interface for weather information. NOAA's Digital Weather Markup Language (DWML) can be used to request data from the NDFD. The Canadian Meteorological Markup Language (CMML) is based on DWML and used in RWIN. The Japanese Road Web Markup Language (RWML) was released in 2003 and could be used to develop a road weather data object dictionary for the U.S.

An ICC task force may be proposed to identify the best suitable standards for *Clarus*.

Discussion

- Is DATEX being supported any longer?

  The comment at the ICC #2 meeting was that CORBA may not be supported, but DATEX is supported. It is more likely that the Clarus interfaces will involve XML. – No Change to ConOps

Presentation:
http://clarusinitiative.org/documents/ICC2%20Presentations/Standards%20Update.pdf

Update on VII Program – James Pol

VII can have a very strong transforming effect on how we do business and how we handle transportation in the future. VII creates an enabling communication infrastructure to support vehicle to vehicle and vehicle to infrastructure communications. It offers an opportunity to establish a report on the transportation system that refreshes

at very short intervals. On-board units in the vehicles manage vehicle data and transfer this to a roadside unit for further dissemination. Consider, that in a full build out, 600 gigabytes of data a minute (the equivalent to 145 DVDs or all channels broadcast by DirecTV in one hour) would be transmitted – a lot of data! *Clarus* will have the challenge of integrating weather-related information in this massive data set to make it useful to the end user!

Still, over 40,000 people die on U.S. highways each year, warranting the need for increased emphasis on crash avoidance and alerts. The VII Coalition will address the issues (privacy, funding, infrastructure, outreach, etc.) that surround such an effort and is composed of U.S. DOT, AASHTO and seven major auto manufacturers.

How does all of this VII information impact the *Clarus* effort? There are 3 fundamental deficiencies in weather information today:

- A lack of transportation system relevant weather observations
- A lack of understanding of how to apply weather information in decision making
- A lack of capabilities for predicting and / or assessing surface level weather phenomena.

VII could provide a wealth of information that could be used for weather forecasts and advisories at various levels. The initiative also has several challenges that it must overcome – urban vs. rural focus, volume of data, temporal decay of data, geographic distribution, quality assurance of data and anonymity of data.

Privacy issues are a focus of the VII Coalition – vehicle buyers would "opt in" and there would be no automated enforcement of traffic violations. Future steps for VII include: working with the auto manufacturers' consortium development; initiating engineering testing; and developing nationwide deployment scenarios that develop public / private partnership approaches.

Discussion

- Are we looking at interim projects that are currently ongoing to help solve some of the hurdles that VII faces? Have we looked at public / private fleets to deploy these vehicle sensors?

  This is a great topic for discussion as there are many projects that would contribute to VII advancement. We have had discussions with the Post Office and will consider these and other fleets in deployment. Clarus is working with the VII Initiative to make sure they are in concert with each other. – No Change to ConOps

Presentation:
http://clarusinitiative.org/documents/ICC2%20Presentations/VII%20Update.pdf

Review on Interpreting Use Cases and Operational Scenarios – James Pol

The UML is the method being used to express the Operational Scenarios in the *Clarus* ConOps. UCDs are used to describe the operations of a system, including the three main elements of a UCD: Actors, Use Cases and Associations. Associations bind the actors (companies, software components, people, etc.) with the Use Case (action that the actor wants a system to do). The Message Sequence Diagrams for Use Cases depict the actor on left providing a message / stimulus to the system on right. The timeline is depicted vertically, with time progressing as we go down the line. In these Sequence Diagrams, time advances as we move down. Actors stimulate other actors or the *Clarus* System to provide stimuli to the actors – this can all be a continuous loop.

Discussion

- Have we considered a three level hierarchy instead of a two level hierarchy system as part of a distributive system for information?

  It is unclear where the referenced hierarchy is in the Clarus ConOps. The diagrams define the logic of the system. While the ConOps will discuss possible alternatives for a regional vs. distributed Clarus System, this is a design issue. – No Change to ConOps

Charge for the Breakout Groups – James Pol

Consider the Operational Scenarios to better understand the decisions that will be needed in designing the system germane to your breakout group. Get involved in the dialog and provide feedback on the subject of your breakout group. Do not hold anything back and put everything on the table. This is a review of a DRAFT ConOps that needs redefining based on stakeholder input so that the final ConOps due in May is a document that addresses the concerns of all stakeholders. The ConOps can then be handed off to the system engineers to develop the system requirements.

All commentary on the draft ConOps should be sent by March 15, 2005 to James Pol.

Next Steps:

1. Synthesis of ICC Discussion by ITS America
2. Input to the ConOps by Iteris / Meridian
3. Review on ConOps Development by ITS America / PBS&J

Breakout!

Presentation:
http://clarusinitiative.org/documents/ICC2%20Presentations/ICC%20Use%20Cases2.pdf

Breakout Session Discussion Incorporated into ConOps

The following bullet points summarize the discussion that occurred during the breakout sessions. The italicized narrative indicates what was drawn from the breakout discussion and incorporated into the ConOps.

- Overall ConOps elements for Roadway Maintenance Treatment & Construction Operations Function:
    - Provide support for winter and non-winter maintenance decision making
    - Real-time verification of upstream conditions
    - Enhance construction operations scheduling
    - Quality-controlled data to *Clarus* users
    - Improved forecast of weather and pavement conditions

  ConOps will be updated with these bullets except the QC bullet where it should read "Data with quality control flags or metadata to Clarus users".

- Additional discussion ensued on what would gauge the extent of detail that goes into the UCD actors as these elements of data collection relate to each state's specific processes for data collection. Having an actor that is "too generic" loses the detail as to what entities are the actual components of data collectors for the *Clarus* System.

  The revised ConOps will have a diagram framework with generic actors (e.g., vehicles) and each scenario will discuss the specific detailed vehicle (e.g., transit vehicle) as it pertains to the scenario.

- What the actors should identify is entities / actors that provide data that will be used for different purposes. If they are used for the same purpose, then we can combine these into one actor. We should also identify actors where we will need to contract with them differently for data use agreements.

  Agree with comment and the ConOps will be improved to show a framework diagram with generic actors. Corresponding specific scenario will show the unique actors related to the generic ones at the higher level. Some actors are shown on different diagrams and if they have the same name they are the same actor.

- It is important to make a distinction between proprietary and non-proprietary data, as it will be handled differently. We are actually talking, then, about restricted data and non-restricted data. If actors and the actors being handed the data by the first set of actors can be combined in functionality, then we can combine them on the diagram. If they are not, or we are not sure, we should keep them separate and combine them later as the process gets clearer. We understand, also, that there is data that is being collected and processed that is happening outside of *Clarus* that does not need to get processed within *Clarus*.

The Clarus ConOps will be updated to make the distinction between proprietary and non-proprietary data.

- For the Sequence Diagram, edits made to the UCD will be reflected on the Sequence Diagram as well. Listed actors on the left and right hand side of the Sequence Diagram should reflect the generic nature of actors as detailed as they are on the UCD. Arrows indicate to / from, start / stop of the data feed, correct?

  Correct, the diagram shows the flow of data between the actors and ultimately to the Clarus System and out to the end users.

- The diagram should show an arrow going back from *Clarus* to the data provider to indicate response where QC has found a flaw with the data.

  Correct, but we need to identify where a response is a requirement of the Clarus System and where it is not, to avoid redundancy from QC and notifications that NOAA is already providing. This notification will happen by Clarus anyway as a professional courtesy, data validation and partnership requirements between NOAA and FHWA on Clarus. Identifying this is "requirement creep" on Clarus, which will ultimately drive the cost and make the Clarus System a two-way communication system in reference to a data feed and that is more expensive than a one-way system. In terms of professional courtesy, possibly posting a static display of faulty data found may be the solution.

  It is within the scope of Clarus to provide Quality Control feedback to the originating observation sources if they so desire regardless of any other NOAA QC feedback. The Sequence Diagrams should be consistent with the Use Case Diagrams however, not all of the sequences are shown on the Draft ConOps diagrams due to the complexity of the diagrams. The revised ConOps will have these sequences depicted. With regard to "requirements creep" and communications cost, the Clarus ConOps is only defining potential operations based on stakeholder input. Requirements and Communications and Costs will be analyzed in the Design phase.

- What does Roadway Winter Maintenance Provider refer to? DOTs. We need, then, some consistency between what we call actors from one diagram to another to clearly define these actors or identify that there are more than one actor and reflect these on both diagrams.

  The intent of the appendix delineating the descriptions of each actor is to clearly define each actor. It is also important to understand that one agency can have multiple roles and in effect be multiple actors. The actors are designed to be logical in nature.

- In the UCD, all needs are not captured. There should be some flow of information on weather impacts to the general public, not just emergency managers. You may want to have people advised about evacuations. But will general public users be

able to interpret raw *Clarus* data? Are they sophisticated enough? If we are providing decision support to emergency management personnel, we need to provide it to the public also. They will be making travel decisions in evacuation situations. We do not have a complete set of users on right side if we are not providing information to the public.

Raw data sets will be provided for service providers to add value. Evacuation information and other weather impacts are provided to travelers in that scenario. It is expected that there will be some information service providers who will be taking the Clarus data and sending it to travelers. An information service provider actor will be added to the Clarus ConOps. Clarus users are those that directly interface with the system. To better understand how Clarus will perform, the primary users are the Service Providers. We are not dismissing the general public, but we are not designing the system for John Q. Public who will have to get that information from the system's primary users.

- You have to understand the trade offs to design the system; *Clarus* does not generate raw data but collects it from others. The provider will be able to restrict dissemination of data collected from their systems. Should dissemination control be included in the diagram? Who will manage this distribution? There needs to be access control. If everyone has access, DOTs might not provide data to *Clarus*. The data will be provided in ASN.1 or XML. We need a bubble for dissemination control within the box.

  Clarus will accept data access restrictions from data collectors and control who receives their information.

- We may have some processed data available, such as CCTV images and radar-derived data. *Clarus* will not generate raw data itself. Do we need a data fusion bubble or a bubble for internal processing?

  We will show the Roadway Condition Equipment actor covering CCTV images and radar-derived data as part of the overall Clarus framework and it also applies to the Public Safety function.

- Question about Non-*Clarus* Data. It was agreed that this is poor wording as it should be Non-ESS Data. These data are not quality controlled by *Clarus*, but will be in NOAA systems possibly. Automated Surface Observing System (ASOS) data is quality controlled. It will be used as a benchmark for quality control. Automated Weather Observing System (AWOS) may not be given the same weight as a Federal ASOS.

  The "Non-Clarus Data" designation is not just Non-ESS but any data coming from NOAA, or Private or Public Weather Data Providers. We will change this to the more generic External Environmental Data.

- Please explain the Compare ESS Data with External Data bubble. This comparison to NOAA data is for quality control. Suspect data would be flagged. There is a need for a general use case scenario with highlighting of items of special significance for other scenarios. This is because the ConOps slices the system into different scenarios. Data are flagged in all operational scenarios based upon NOAA data and the assumption that their QA procedures are acceptable.

  The next version of the ConOps will have a general use case scenario with each scenario describing its unique items. We disagree with the statement "Data are flagged in all operational scenarios based upon NOAA data and the assumption that their QA procedures are acceptable." Weather data is always suspect. The assumption one must make is that the majority of the data accurately represents the variable measured and through a process of statistical comparisons, it is possible to flag potential outliers. The statistical process may begin to break down if the data points used as input for the QC process have already been modified by previous QC processes.

- There is still a lack of a path for human readings being input into the system. Bridge winds are an example. There were a number of things that could only be measured by humans. Human observations could also be used to indicate that hazardous conditions are clear and it is okay to start reentry.

  The next version of the ConOps will include an actor representing manual entry of road/route environmental information into Clarus.

- Would there be a situation where different data providers have different permission schemes that affect whether or not it is really a one-stop shop? There will be agreements for distribution categories and about sensitivity of data. Vendors, for example, will have to agree not to resell data. They can process the data and do forecasts, but not share the raw data or we would have the same situation that we have today.

  Clarus will accept data access restrictions from data collectors and control who receives their information. Vendors have always had the right to organize data from NOAA and charge for this service.

- This is a global comment for all use cases. The UCD does not reference a stakeholder for ESS Equipment actor. There is a focus on state DOT owned equipment, but there are some privately owned sensors that are operated for public agencies. It was suggested that both public and private actors be included. The top path has defined NTCIP 1204 linkages. The bottom path gives latitude for non-DOT equipment. Another person interpreted ESS Equipment to be all ESS. We may need an additional link for private ESS equipment operated for DOTs. The narrative on page 67 describes only publicly-owned equipment.

  It is the intent that the ESS Equipment actor applies to both public and private agencies. We will correct the narrative on page 67.

- There needs to be fault detection and correction that goes back to agencies. Data will be checked, flagged and sent back to provider agency (quality controlled). Then it is up to them to make necessary corrections. The FHWA cannot mandate sensor maintenance.

  It is within the scope of Clarus to provide Quality Control feedback to the originating observation sources if they so desire.

- In Florida, the University of North Florida is collecting and storing ESS data for the DOT. It is also being sent to other places. There are a variety of protocols being used for center to field transmission and center to center transmission. The narrative text in the ConOps may need to be revised.

  It is the intent that the ESS Equipment actor applies to both public and private agencies. We will correct the narrative text.

- Do we need human input from an on-scene commander? How does information about a plume get into the system? We need a plume flag and then we can collect data to model. We are missing a spotter network, like Skywarn (http://www.skywarn.org). There are other inputs from humans in the field which could be other weather observation equipment (lower left of UCD). The service providers could use that data with weather data to provide decision support.

  The next version of the ConOps will include an actor representing manual entry of road/route environmental information into Clarus.

DAY TWO

Recap of Day 1 – James Pol

James discussed the synergies between the various efforts discussed and what the *Clarus* team "heard" during Day 1:

- Need to better understand Primary Users vs. End Users: A Primary User is the user that has a direct interface with the *Clarus* System.
- Actors – We have a need to add actors for manual data entry, as well as defining explicitly who / what the existing actors are. Within the various use case scenarios, actors should be able to be identified easily.
- Flagging Data – We will need to determine what to do with data that is corrupt, and whether or not *Clarus* will be required to provide feedback to the source of the bad data.
- Uniformity Is Key – There is a need for a translator that accepts data from various data sources and various languages and converts them to a common language that will be input into and output from the *Clarus* System.
- Feedback on the *Clarus* System:
    - *Clarus* to enable better forecasts / analysis
    - There could be potential liabilities
    - System funding and ownership issues (FHWA / NOAA)
    - Proprietary data and how it is treated
    - Need to provide a general use case and then note what is additional / different in each use case scenario, describing the nuances specific to each scenario

Discussion

- Is it possible to have layered diagrams to overlap scenarios and an electronic version as an example of these?

  At this time we are investigating if we can put diagrams on a website. – No Change to ConOps

- Access Control To Data – should there be a separate actor for access control?

  As part of the Clarus design an access control mechanism can be provided that allows each actor to control information receipt and dissemination. – No Change to ConOps

- There are inconsistencies in actors and actions on diagrams. In an electronic version we should be able to provide exact, consistent references between all diagrams and scenarios actors. On paper, the size limits this consistency somewhat.

At this time we are investigating if we can put diagrams on a website. – No Change to ConOps

- Air Quality / Environmental Scenario?

  There can be a myriad of scenarios for Clarus. An Air Quality / Environmental scenario would need to have something unique or that could not be extrapolated for the other scenarios in order to justify a new scenario. – No Change to ConOps

- Data Archive – the archive may be an actor
  - Important for planning / performance measures, being able to look back at data and make it useful for future analysis
  - Data Mining opportunity with this data – could find dangerous road segments with this data and it could be an "early warning system."

  Clarus has a short-term archiving capability "Store and Index Quality Controlled Data"; other actors are responsible for archiving their own data and data mining. – No Change to ConOps

- Is *Clarus* going to be a 24 / 7 type of system? If so, are there going to be redundancy requirements, safety issues, etc.

  ConOps will be updated to reflect that Clarus would be a 24 / 7 operation. The other issues are Design considerations. – Incorporated into ConOps

- Metadata should be considered within the concept of the use case scenarios, not necessarily at the high level ConOps

  Supporting Metadata is explained in each scenario description. – No Change to ConOps

Breakout!

Presentation:
(See file 'Recap of Day One.ppt')

Breakout Session Discussion Incorporated into ConOps

The following bullet points summarize the discussion that occurred during the breakout sessions. The italicized narrative indicates what was drawn from the breakout discussion and incorporated into the ConOps.

- Apply QA / QC to all data coming into *Clarus* because current quality control procedures on various data inputs are questionable. There needs to be feedback paths on incoming data, especially for flagged questionable input data.

  The current Clarus ConOps does not remove "bad" data from the Clarus output. Clarus does not change the collected data. It runs quality controls and compares the data at various levels and flags the data based on its related information. It is acknowledged that communicating "bad" data does take bandwidth and processing time. It is possible to have the option to manually mark a sensor as "bad" within Clarus and not propagate its data. It is within the scope of Clarus to provide Quality Control feedback to the originating observation sources if they so desire.

- Need human reported input (i.e. cell phone call-ins) to be analyzed for quality with other observational data coming in.

  The next version of the ConOps will include an actor representing manual entry of road/route environmental information into Clarus.

- Currently, public weather data collectors (non-NOAA) and private weather data collectors do not have QC feedback or controls prior to incorporating their data into the *Clarus* database. QA needs to be done ASAP – otherwise latency is a major issue.

  This was an omission from the sequence diagram in order to keep it readable. Feedback will be added as flows in the next version of the ConOps.

- The difference in this UCD is ESS equipment interfacing directly with *Clarus*. Conceptually, this is different from the other scenarios. Would *Clarus* request data from ESS? What would trigger direct communications? Establish a schedule possibly, but those issues are unknown.

  A direct interface is needed to support Time Critical Weather Operations. We need to add an ESS data collector to show that States still collect data. There are significant institutional issues involving this capability.

- What about International weather data?

  Add international to the description of the Non-Surface Observations and Surface Observation Networks actors within the NOAA box. It is acknowledged that International weather data could be useful to Clarus. The Canadians are

participating in the Clarus ICC meetings. Also, with their RWIN system, Canada is hoping to leverage advances made by Clarus. At this time, it is expected that International weather data will come to Clarus through NOAA.

- In *Clarus* is there critical condition identification as events unfold? The diagram needs input into *Clarus* from right side.

  Although it currently is not within the scope of Clarus to do critical condition identification, we will add a use case for receiving input from a service provider in order for Clarus to possibly concentrate on and/or prioritize critical road/route environmental information. However, the potential exists for multiple WSP customers to set their data requirements to the highest priority continually. Algorithms to manage priorities could get very complicated and subsequently decreasing the total throughput due to message queuing. These issues will be explored in the Design phase.

- There are other Federal agencies as potential data sources for adaptive information, such as U.S. Geological Survey stream gauges. These could be transportation related and they are not incorporated in the UCD.

  Although stream gauge information from hydrologic agencies are already available through NOAA and Law Enforcement backbones via the WFO, there are stream gauges owned by transportation agencies which will be processed by Clarus.

- Union Pacific appears to have about 500 wayside measurement stations, but not all wayside units are fully equipped and many lack anemometers.

  Need to add Wayside Measurement Station (Rail ESS?) actor similar to ESS Equipment.

- Manual information / confirmation is needed as an additional actor and it could be transmitted from the rail operation centers.

  The next version of the ConOps will include an actor representing manual entry of road/route environmental information into Clarus.

- Sequence Diagram: Traffic Management should have a line going straight from *Clarus*, so that it receives weather data directly. Who would then provide data directly, as the TMC is in effect the information service provider (ISP), as was discussed for the UCD? There was a concern with the definitions of actors in case use diagram when DOTs take on the role of ISPs, if the definition implies that DOTs are adding value to data received and forwarding on to the NWS for forecasts or forecasting weather from the beginning. The definitions are vague, and it is important that we define our requirements as well. For example: what is the definition of weather? Does that include seismic events? Does it include forest fires? Before the document is finalized, we need to provide descriptions for each of

the actors and events. According to the use case, if you're not taking the data and adding value to it, you are outside of the *Clarus* System.

DOTs have every right to add value to their data and make it available to their constituents or any other party who wants to view it in a value added format. If a DOT chooses to make the data available to the TMC for presentation, then they are merely expanding their delivery mode to their constituents. The decision regarding who becomes an ISP is partially the decision of the autonomous entity. ISP's to provide free access to data is desirable as long as there is an agreed mechanism to cover the cost of data acquisition, maintenance of sensing equipment, archival costs, etc. DOTs acting as ISPs are a predecessor condition to Clarus and one of the very reasons Clarus was proposed. The cost to acquire data from all of the separate sites argues the need for the consolidation process. Value is also gained from composite views of combining weather data with transportation data without regard for political boundaries. Service Providers are outside of the Clarus System as well. They merely interface to it.

- UCD Discussion:
  - Flagged data should go back to the provider:
    - Why added to the cost of the system?
    - What level of QC does the DOT want?
    - WSDOT does not compare for out of range data or viable, it is flagged and transmitted.
    - WSDOT data is sent to the University of Washington for QC.
    - Data should be date and time stamped for visual check by the TMC to make real-time decisions or posting of data.
    - Standard level of QC for all data.

It is within the scope of Clarus to provide Quality Control feedback to the originating observation sources if they so desire.

- UCD Discussion:
  - Provide manual data input to the system.

The next version of the ConOps will include an actor representing manual entry of road/route environmental information into Clarus.

- Do the Actors / Use Cases interfacing in the *Clarus* System adequately capture *Clarus* operations in support of your needs? Fixed route systems operate differently than deviating routes (passenger trains vs. buses). Do we need another scenario for light rail (other than freight rail)?

  We will include light rail in the Transit scenario.

- What potential changes do you anticipate in services rendered by Weather Service Providers, as *Clarus* becomes an active quality-controlled data clearinghouse

resource? Service Provider service changes – decisions to add more cars or change speeds, better scheduling and routing. Add Transit Parking to the decision support narrative. Possibly add a new actor for School Administrator or cover information application in the decision support narrative. The level of route planning / management data needed for each region is encouraged by *Clarus*. We have a weather plan (certain operations for designated routes under specific conditions) that goes back to *Clarus* for performance measurement.

We will add transit parking to the decision support narrative. We will investigate adding a School Administrator actor – right now that role falls under the Transit Management Personnel actor.

- Need to include information called in from cities and counties or from their ESS.

  The next version of the ConOps will include an actor representing manual entry of road/route environmental information into Clarus.

- In narrative, change "graphical" to "geographical" or "spatial"

  Agree

- Global change "road condition" to "road / route condition" because some transit vehicles do not travel on roads, such as trains and ferries.

  Agree, within Transit section.

Next Steps – Paul Pisano

The ConOps will be completed in May 2005. The Task Forces, which have a bearing on the ConOps, will ramp up quickly. We will also kick off the system design around that timeframe.

The next ICC meeting will be sometime in the fall of 2005 possibly in Stennis, MS where we will be looking at requirements. Between now and the next meeting, there will be much discussion between NOAA and FHWA.

Discussion

- Dr. Bruce Hicks, Director of the NOAA Air Resources Laboratory, has an urban weather network concept that is driving dispersion models for homeland security. Is that a possible link to *Clarus*?

  The Emergency Transportation Operations Initiative is also involved and we are discussing applications and the potential for work with Lawrence Livermore Labs is in the early stages. We need data, not a model and there might be sensors to gather data. – Incorporated into ConOps