Connected Vehicles and Weather – The Vehicle Data Translator (VDT) Version 3.0




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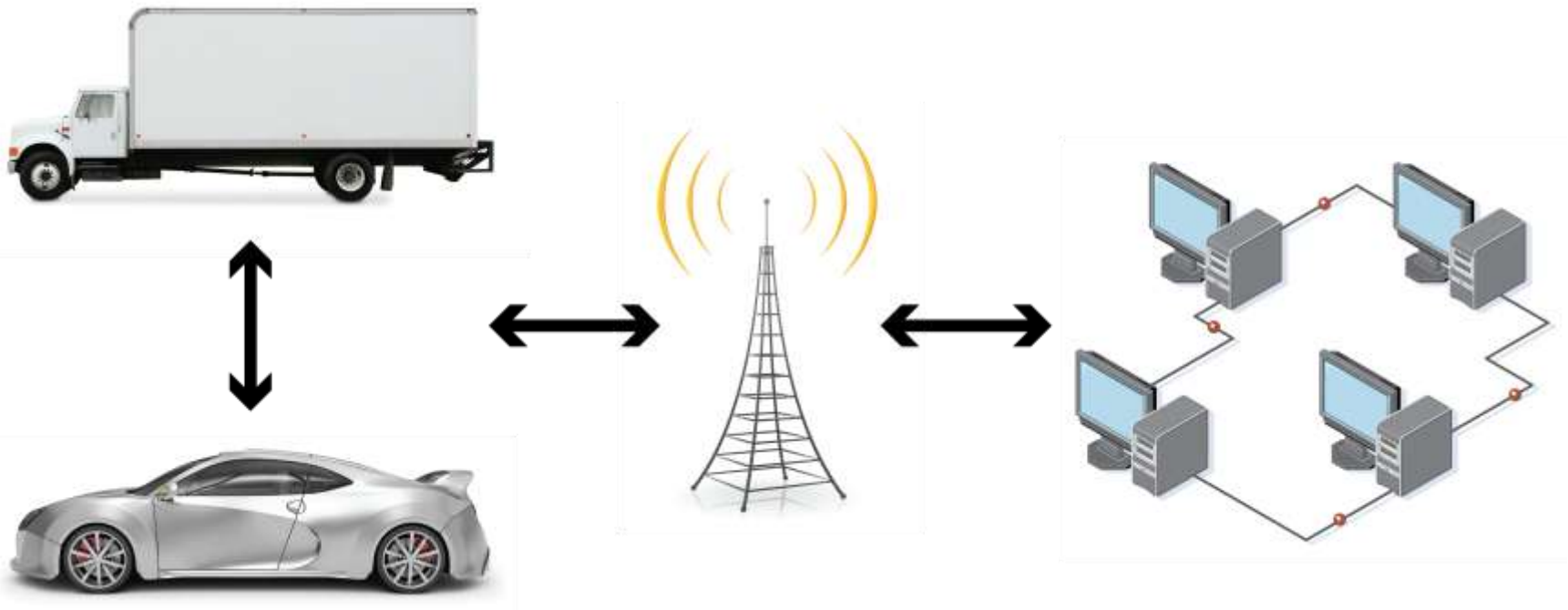
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

U.S. Department of Transportation
Federal Highway Administration

Weather Observations from Connected Vehicles



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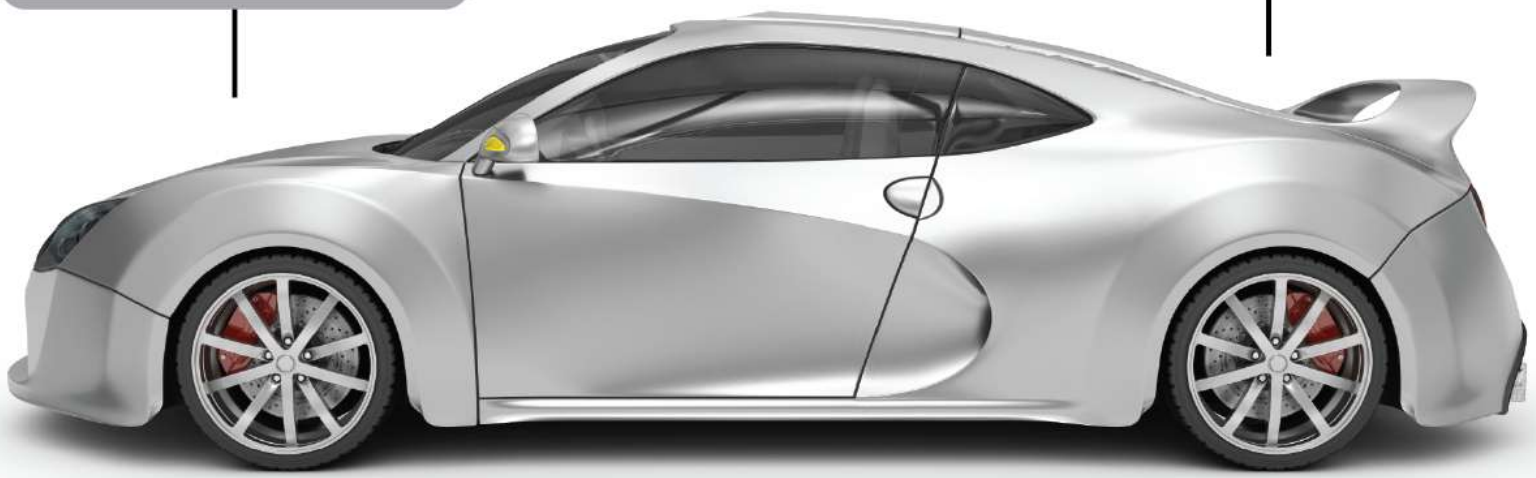

Barometric Pressure
Windshield Wiper Setting
Headlights Status
Ambient Air Temperature

Speed and Heading
Adaptive Cruise Control (ACC)
Location and Elevation
Hours of Operation

Anti-lock Braking System (ABS)
Brake Status
Stability Control
Traction Control

Yaw/Pitch/Roll
Accelerometer
Steering Angle
Differential Wheel Speed

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Vehicle Data Translator (VDT) – Version 3.0

Objectives

- Develop and improve the Connected Vehicles' role in "Anytime, Anywhere Road Weather Information"

- Better Characterization of current weather and road-weather conditions

- Accurate Quality Checking and/or Quality Control of vehicle data

- Development of inferred road segment specific weather and road-weather information for end-user applications

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Vehicle Data Translator (VDT) – Version 3.0

Ancillary: Radar, Satellite, RWIS, Etc.

VDT 3.0

Stage I

Mobile data ingesters

Output data handler

Stage II

Ancillary data ingesters

QCh Module

Statistics module

Output data handler

Stage III

Inference Module

Output data handler

Parsed mobile data

Qched data, Basic road segment data

Advanced road segment data

Apps

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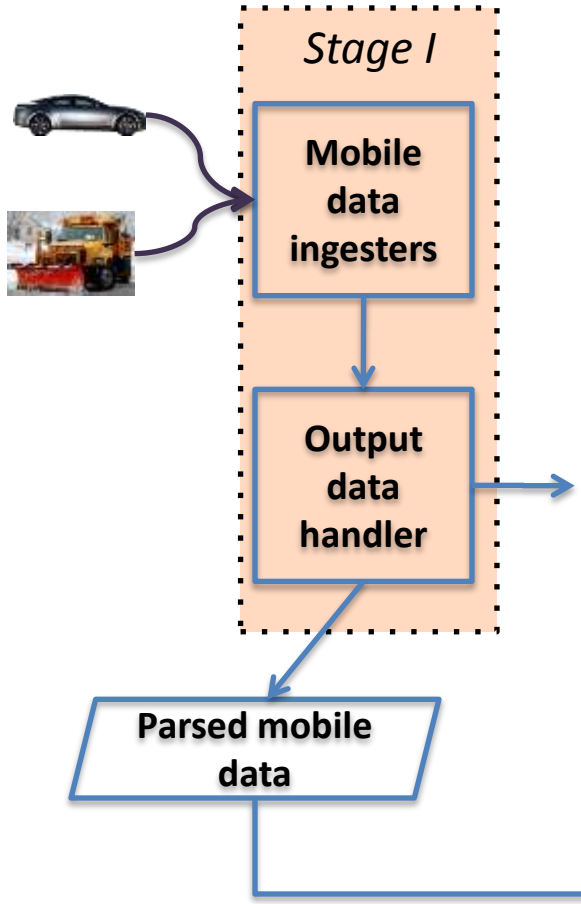

- Ingest vehicle data from CANBus & aftermarket sensors
- Data parsed, sorted/binned
- Light Quality Control
- Sorted by time, road segment and grid cell
  - Segments & grids user defined
- All processed data available for other applications

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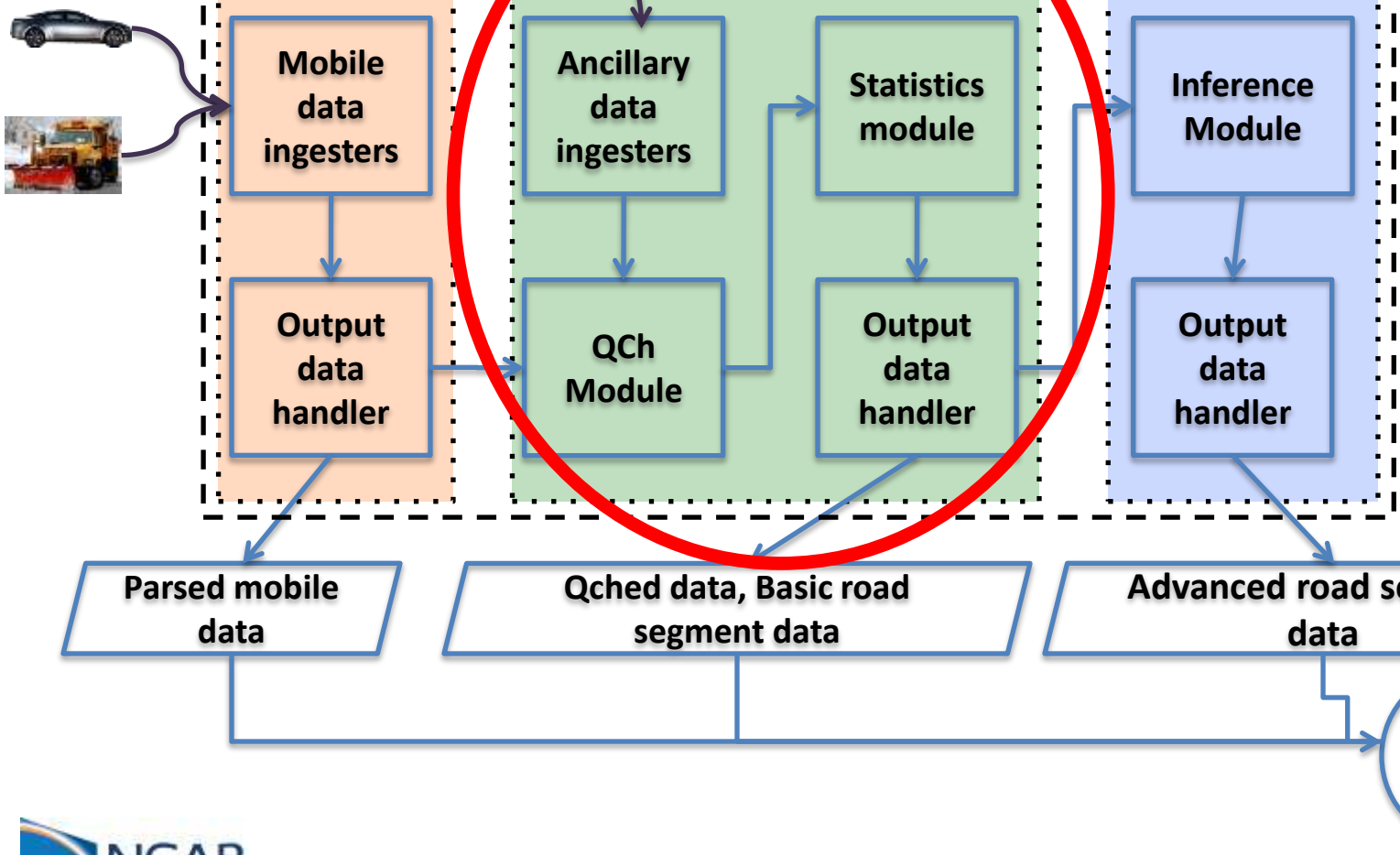

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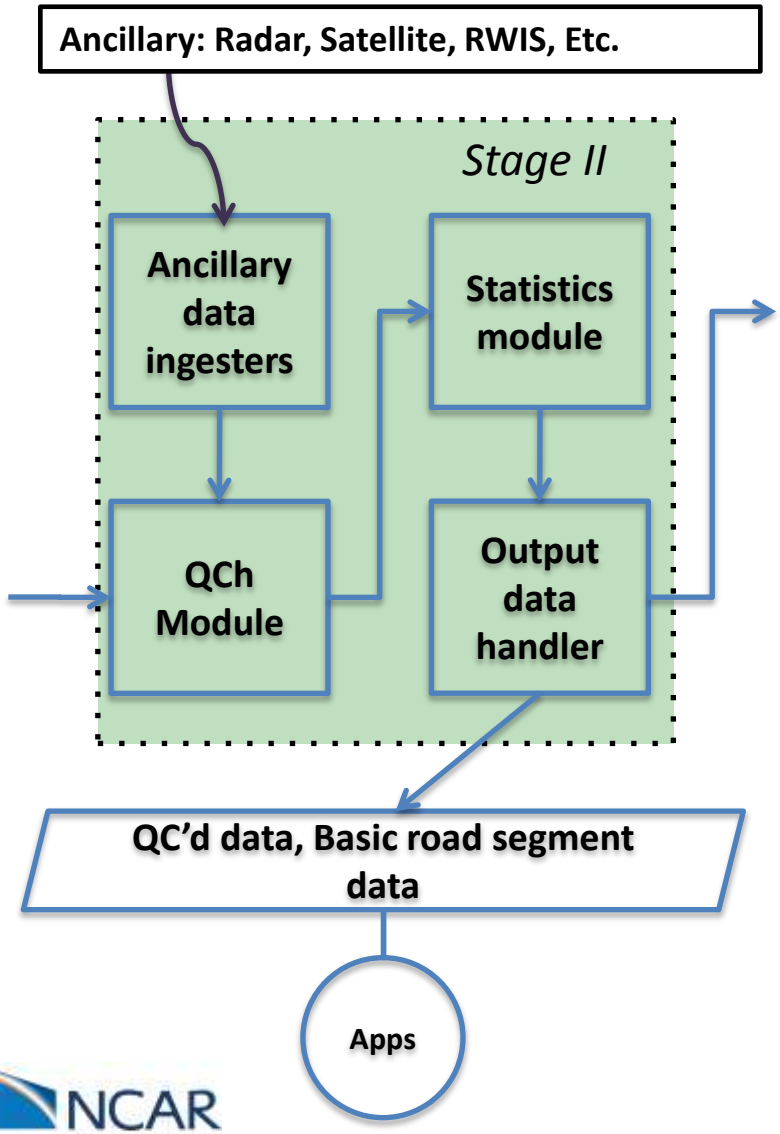

- Ingest ancillary data for QC and Stage III
- Quality Checks
  - From *Clarus*: Sensor Range, Spatial, Climate Range
  - New Mobile Data Tests: Data Filtering (tunnel, slow speeds), Model Analysis, Neighboring Vehicle, Combined Algorithm
- Combines point data into basic road segment products
  - Temp range, speed, etc

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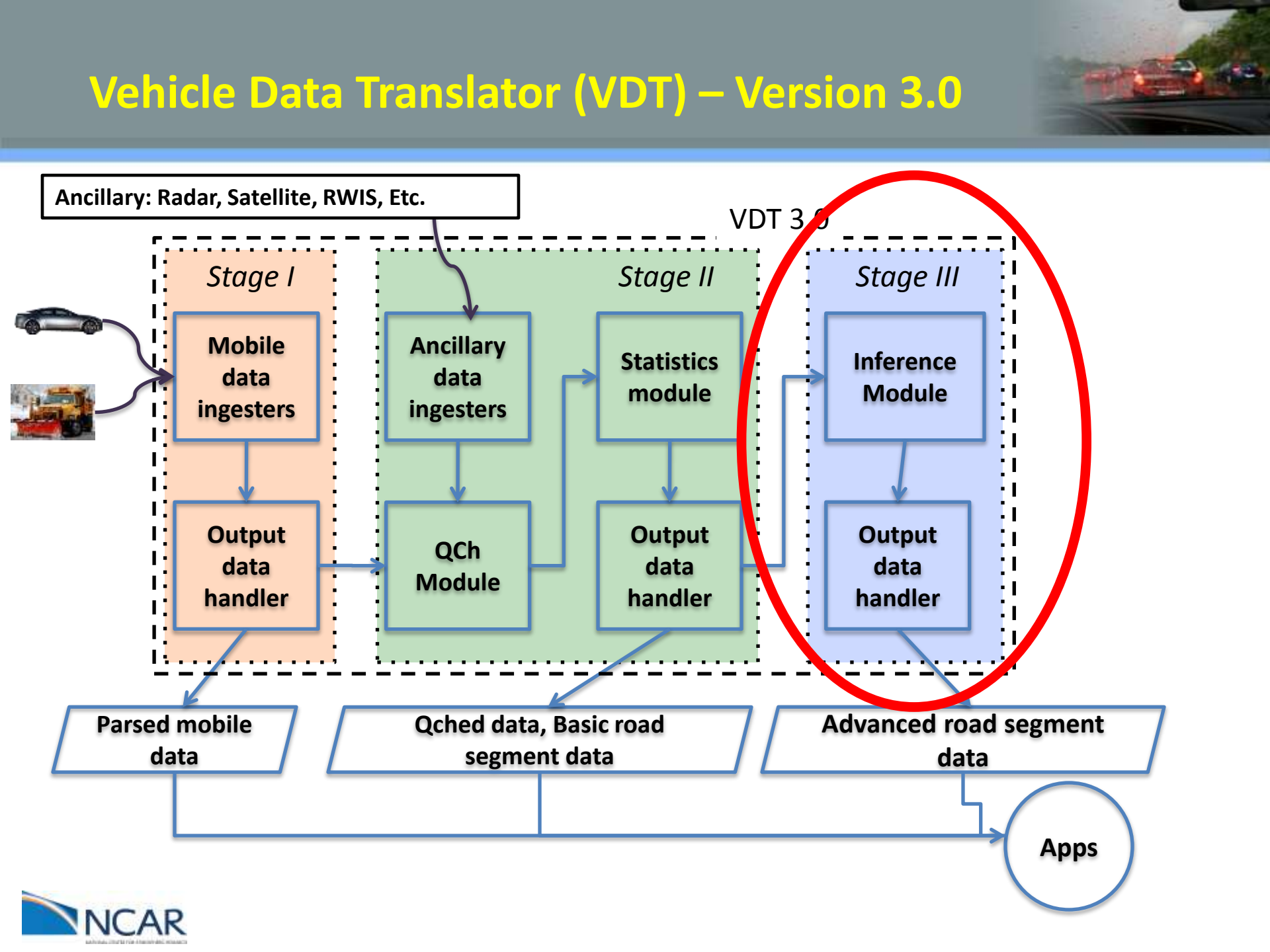

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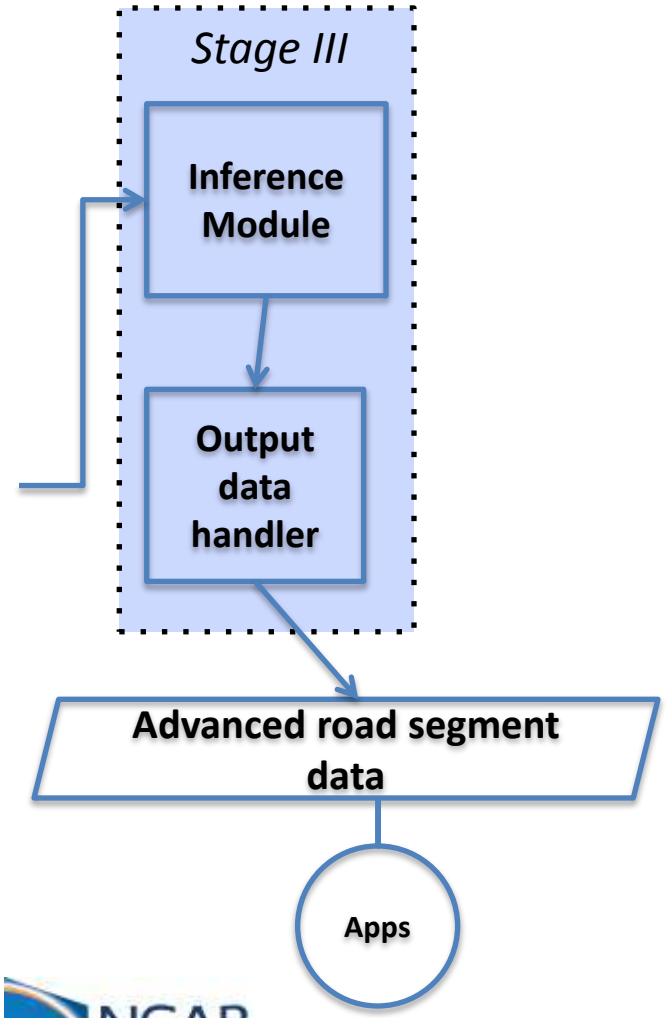
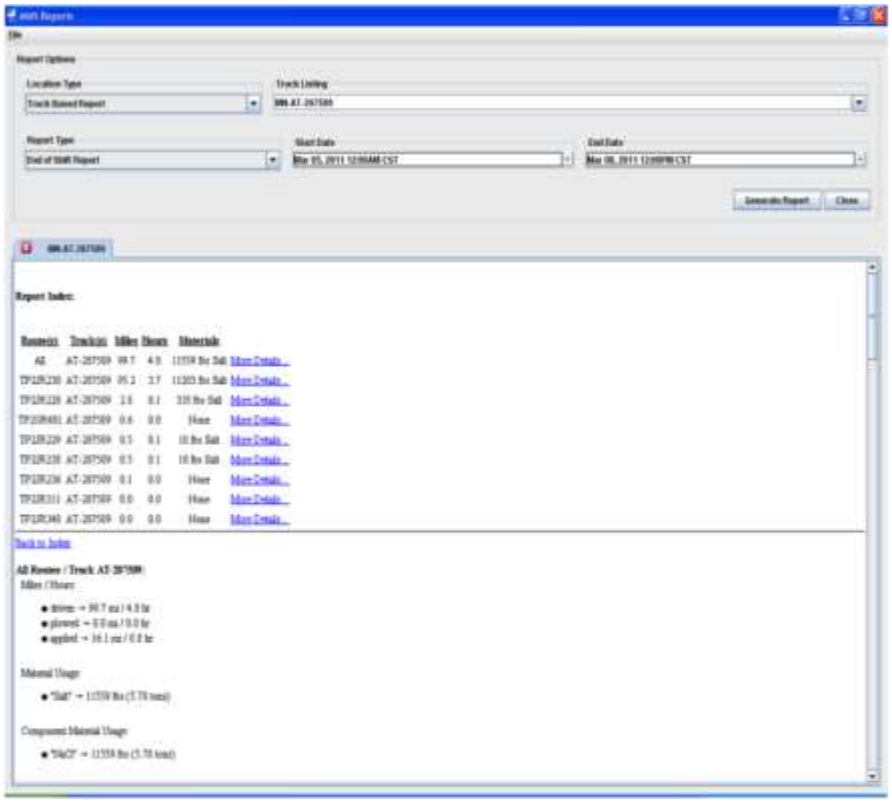


- More sophisticated road impact information
- Precipitation Type and Intensity: combines basic vehicle (e.g. wiper, temp), weather radar and satellite data
- Visibility: combines basic vehicle (e.g. headlight, wiper, temp), satellite and fixed weather station data
- Pavement Condition: combines more vehicle (e.g. ABS, traction, etc) , weather radar and satellite

APPLICATIONS – IMO Project



End of Shift Reports – MnDOT

- Material Management
- Efficiency

Observation assimilation

- Accurate pavement temperature modeling
- Fill in the gaps between fixed stations

MDSS

- Where do the roads need treatment?
- Real-time pavement temperatures

VDT 3.0 Development

- Algorithm tuning and development
- Quality Checking refinement

APPLICATIONS

VDT-based weather alerts

- ❖ Impending weather hazards
- ❖ Alerts from other vehicles
- ❖ Re-routing
- ❖ Decision support

Not just for the everyday driver!

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APPLICATIONS

Road Maintenance – Where are we losing the road to ice?
When should we paint or repair?

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Route Specific Impact Warnings for…

APPLICATIONS

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Route Specific Impact Warnings for…

School Buses

APPLICATIONS

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Route Specific Impact Warnings for…

School Buses

Truckers

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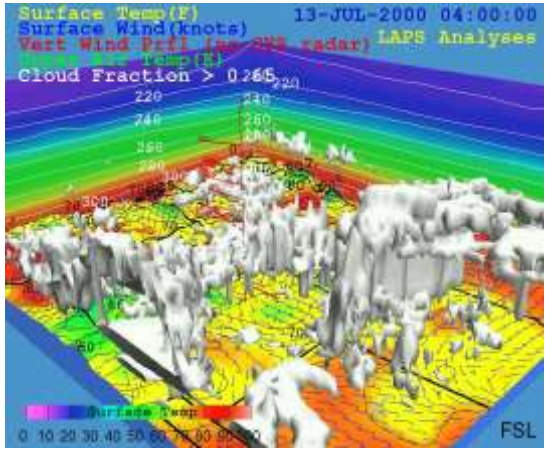
EMS

More APPLICATIONS



Numerical Weather Modeling

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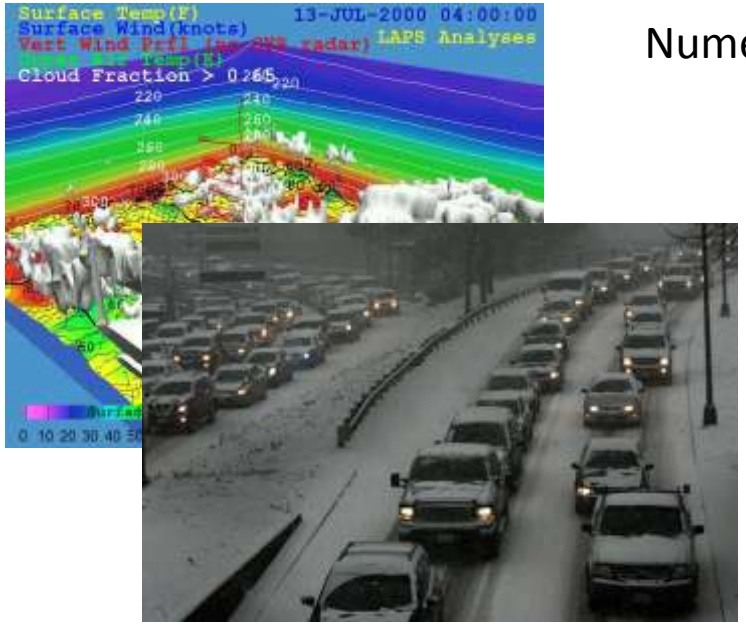
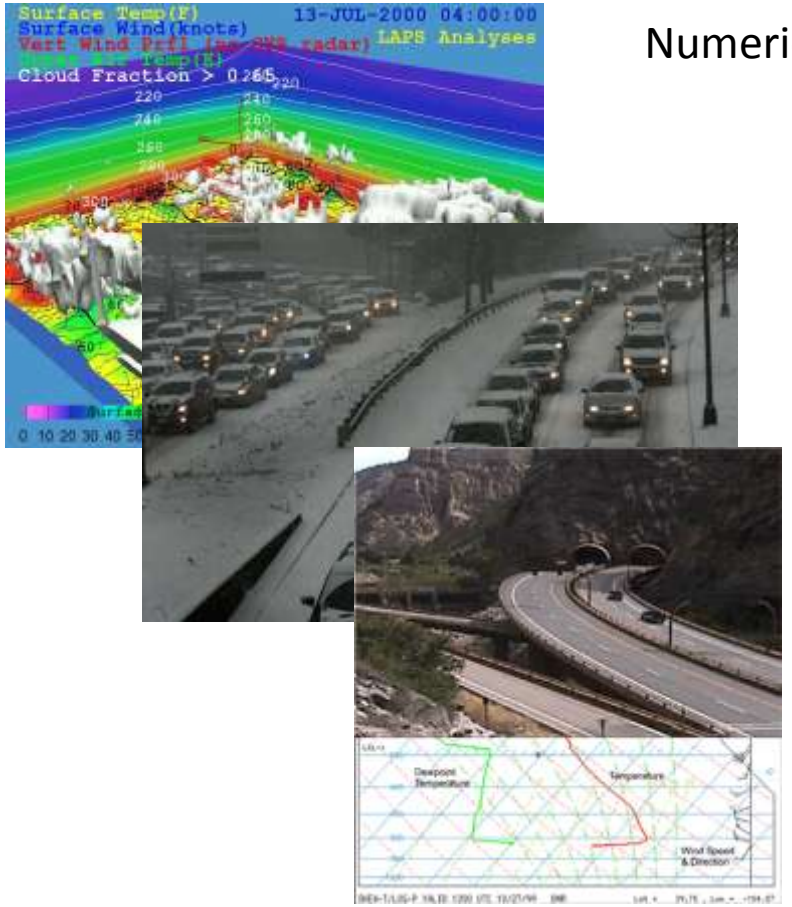
More APPLICATIONS



Numerical Weather Modeling

Traffic Modeling and Alerting

More APPLICATIONS



Numerical Weather Modeling

Traffic Modeling and Alerting

Weather Modeling – complex terrain

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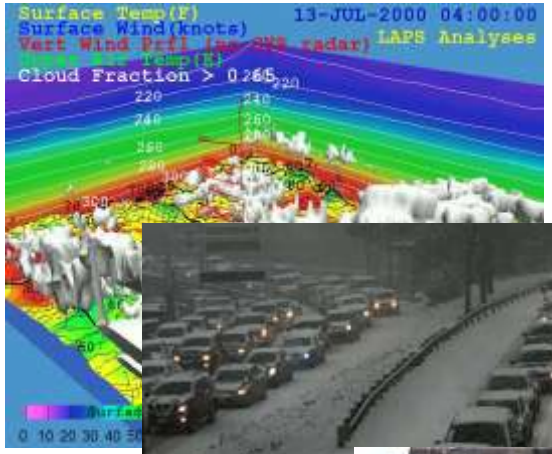
More APPLICATIONS



Numerical Weather Modeling

Traffic Modeling and Alerting

Weather Modeling – complex terrain

Other surface transportation users

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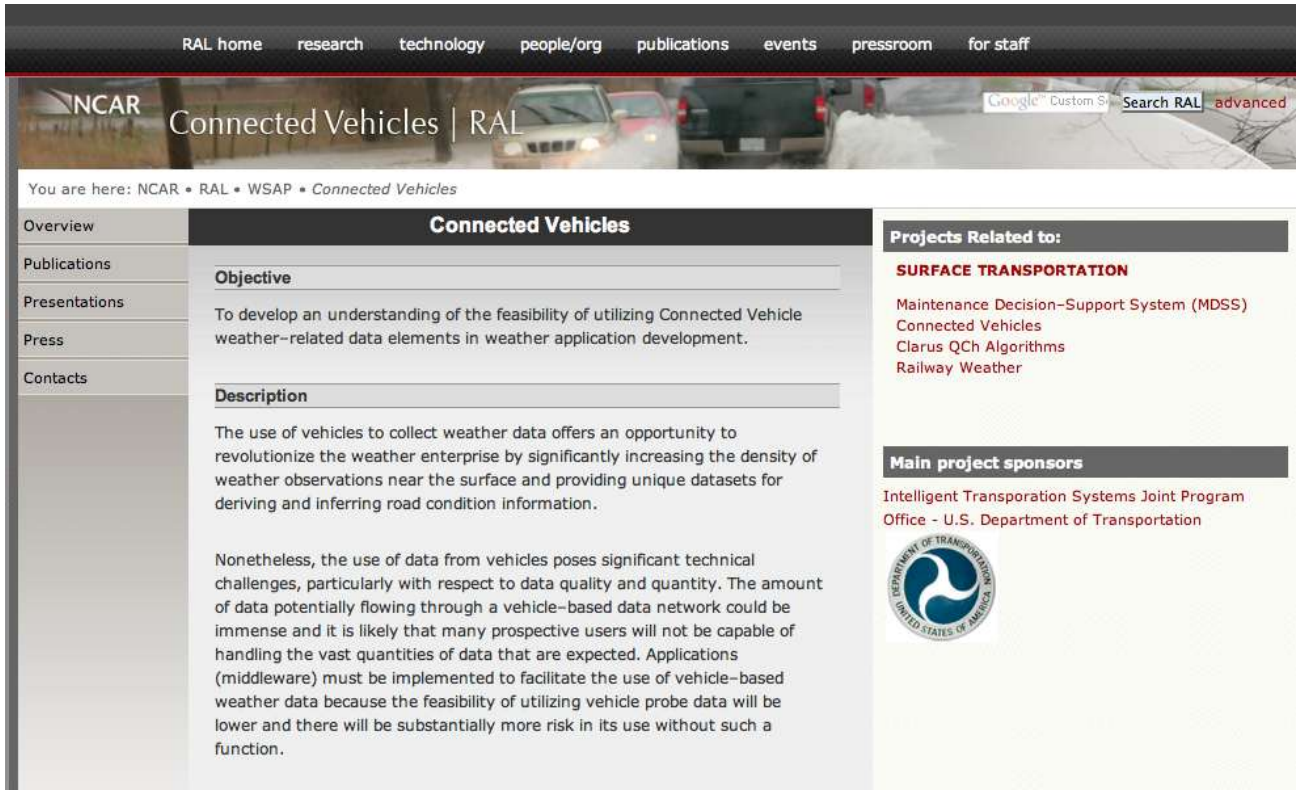
Thanks!



http://www.rap.ucar.edu/projects/connected_vehicles/

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