In MESSAGE, the eScience center has designed and implemented the information management framework for the wealth of data available from novel and intelligent transport systems. The measured data comes from networks of low cost, pervasive sensors referred to as motes or smart dust, as well as legacy monitoring stations for traffic and air pollution installed by city councils. The streaming data from the heterogeneous data sources is collected, processed, analyzed and disseminated so that it can be used to drive applications in real-time and store historic information in a data warehouse. The real time and historic data is integrated to create applications that monitor network status, congestion and pollution hotspots, validate traffic and pollution models and carry out assessment of impacts.

**eScience Objectives**

- To deliver data management capability for three different aspects of the data namely real-time monitoring, historic data analysis and integration of real-time events with historic analysis for decision support.

- To create a real-time UTMC compliant data capture platform for pervasive sensor arrays integrated with legacy systems for traffic, air quality and meteorological conditions.

- To handle the linearly increasing data volume by using a data warehouse with dimensional design.

- Implement real time capability to identify pollution hotspots and traffic hotspots.

**REAL TIME SYSTEM**

Different queuing systems are used for each data sources namely pervasive sensors, metrological stations and traffic loop detectors. The design behind these systems is to propagate and process the large amounts of data as fast as possible. Database oriented queuing systems meet the desired scalability and performance characteristics and deliver sophisticated business management capabilities. All data are streamed into the database using oracle sensor edge server that supports common operations for adding, configuring and removing data source devices as well as filtering faulty data and dispatching to the appropriate services. The real-time streaming data undergoes quality assurance. In addition, appropriate calibration of sensors (for example for pollutants carbon monoxide and nitrogen dioxide adjusting for temperature and humidity measured simultaneously at each location) is achieved by applying business rules to classify the data based on their origin.

**Data display platform**

The information derived from the traffic is displayed live along with the pervasive sensor data. In addition the pollution levels measured by pervasive sensors in the AURN cabin and the meteorological conditions data are integrated in and displayed on the same Google map platform. Real-time statistical processing provides for example the average of the most recent hour of minute data and when the highest level of pollution (red) is maintained for more than 50% of the recent hour a star appears to indicate a ‘hot spot’.

**eScience Framework**

**HISTORIC ANALYSIS**

Historic data marts are being created for calculating the daily pollution and traffic flow profiles. The data marts are referenced with different dimensions based on the time, location of measurement, type of the device and meteorological conditions.

**DECISION SUPPORT SYSTEM**

The decision support system is created by the integration of the historic and real time data sets. The historic data is mined and algorithms are developed. These are used to process the real-time data sets to deliver the network status which is displayed on a map. In a typical road network, the intersection of two roads is referred to as nodes and the road segments between these intersections are links. Algorithms based on occupancy and flow are used to derive the traffic states representing congested (red), busy (yellow), smoothed flow (blue) and free flow (green) as shown. These relationships support the decision making.

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