CE474: Traffic Systems Design-Fall 2004

Class 20 – Advanced Traffic Signal Systems
November 1, 2004

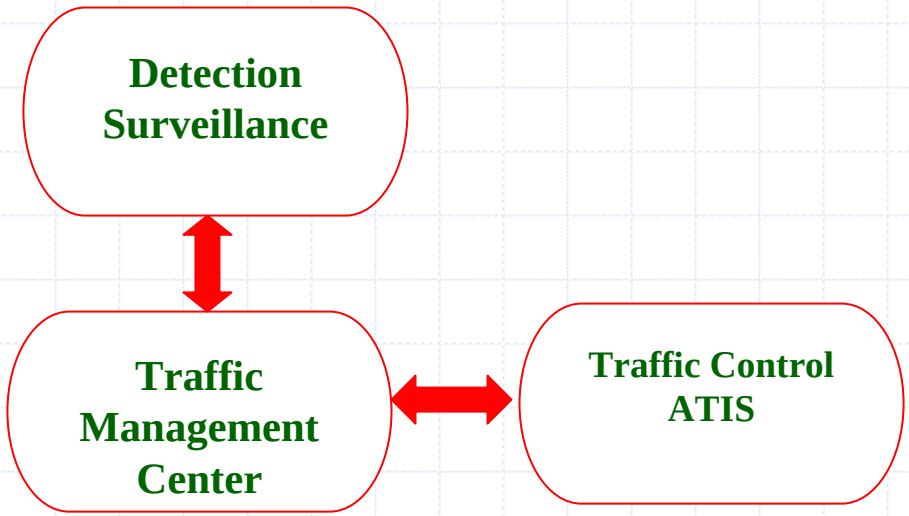
Ahmed Abdel-Rahim
Civil Engineering Department, University of Idaho

Schedule

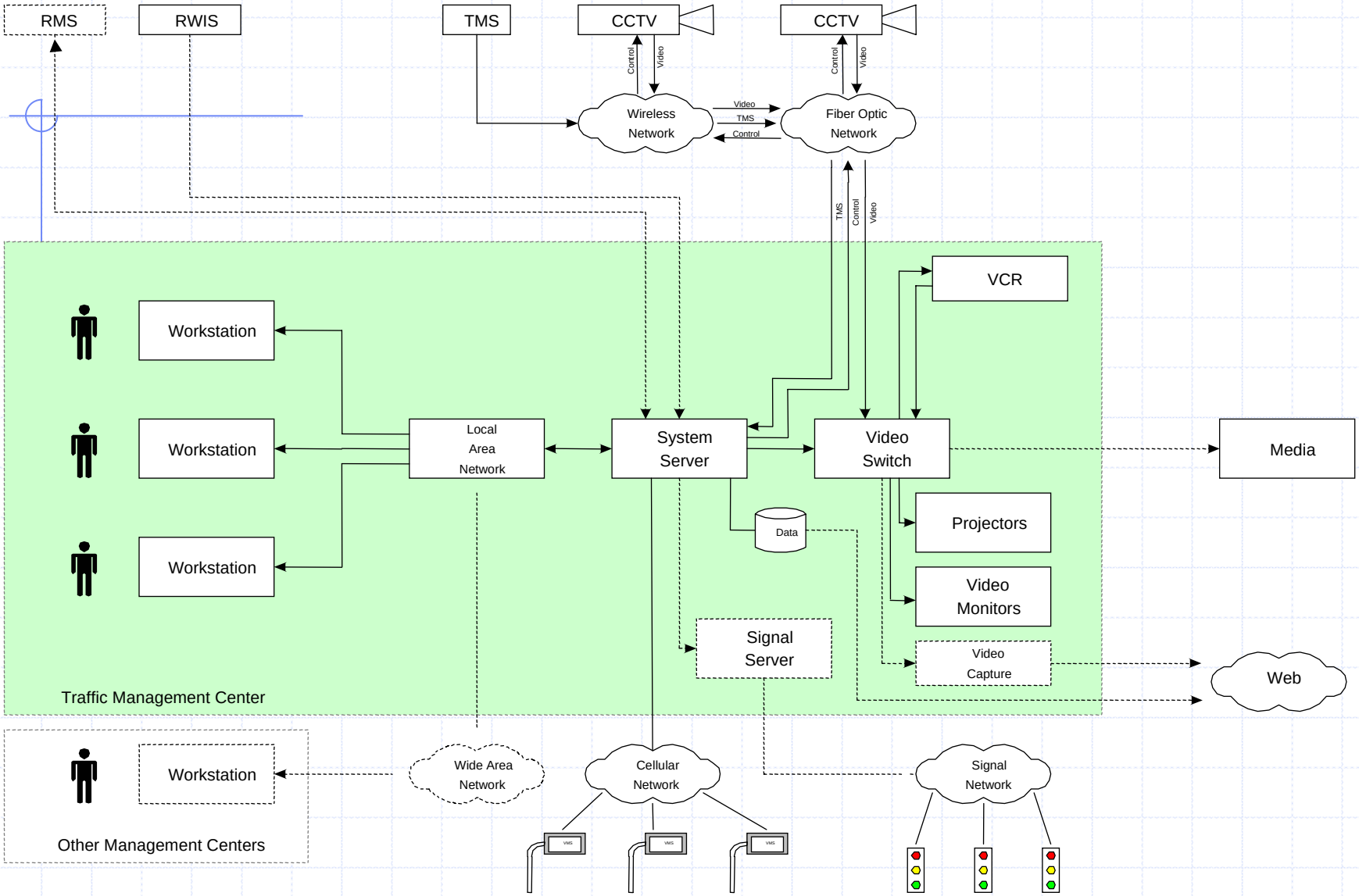
- Exam-2 [Wednesday November 17]
- Assignment 2 [Intersection Warrant Analysis] Due Monday November 15
- Assignment 3 [Diamond intersection] Due Wednesday December 1st]
- Design project 3 presentations? Wednesday December 8th.
- Design Project 3 report due Friday December 10

Advanced Traffic Management Systems Components and Operation

- Traffic Detection/Surveillance System
- Communication system
- Traffic Control/Traveler Information System
- Traffic Management Center



Advanced Traffic Management Systems: Components



Advanced Traffic Management Systems
Detection/Surveillance System

- **Traffic Monitoring System**
  - Closed Circuit T.V. Cameras (CCTV)
- **Traffic Detection System**
  - Loop Detectors
  - Microwave sensors
  - Video Detection

Advanced Traffic Management Systems Communication System

- Fiber Optics Networks
- Wireless communication Networks
- Usually a Combination of both
- The system must conform to the functionality defined by the National ITS Architecture.

Advanced Traffic Management Systems
Traffic Control/ATIS System

- **Traffic Control**
  - **Ramp Metering System (RMS)**
  - **Traffic Signal Network**
- **ATIS System**
  - **Changeable Message Signs (CMS)**
  - **Road Weather Information System(RWIS)**
  - **Network-Wide Travel information (ATIS)**
  - **Web, User Direct Access, Media**

Advanced Traffic Management Centers

- **Integrated Traffic Management Centers**
  - **Law Enforcement, Local Agencies, Universities, etc.**
  - **Issues: Communication, System Control, Security..**
- **Traffic Management Software**

Advanced Traffic Management Systems

Traffic Management Software Functions

- Traffic Monitoring (CCTV Real-Time Pictures/data Display on System Map)
- User Interface to Control Different Devices (CCTV, CMS, etc.)
- Analyze, Maintain, and Archive Traffic data
- Incident Detection, Response, and Management
- Ramp-metering and Traffic Signal Control

Advanced Traffic Management Systems
Traffic Management Software Subsystems

- Incident Tracking & Management Subsystem
- Incident Response Subsystem
- Ramp Metering Subsystem
- Traffic Signal Control Subsystem
- Traveler Information Subsystems (TIS)
- GPS and Computer Aided Dispatch (CAD) Integration Subsystem

Advanced Traffic Management Systems

The Challenge

Area-Wide Ramp Metering and Signal Control

- Integrated Control of Freeway Ramp Metering and Surface Streets/Interchange Traffic Signals for Optimal Network Wide Control

Challenges

- Estimate Operational Measures of Effectiveness from the Collected Data
- Optimal Control (Definition and Algorithm)
- Network-Wide Adaptive Signal Control

Advanced Traffic Management Systems

The Challenge

Advanced Traveler Information System (ATIS)

- Real-Time Traffic and Weather Data to Motorists

Challenges

- Reliability of the MOE's Estimated from the Collected Data
- Time Delay
- User Specific Data

Advanced Traffic Management Systems

The Challenge

GPS and Computer Aided Dispatch (CAD) Integration Subsystem

Integrating GPS Data

Provide Traffic and Route Assignment data through CAD systems

Challenges

- **CAD User Specific Data**
- **GPS Data Validation and Verification Mechanism**

Advanced Traffic Management Systems in Idaho

Treasure Valley Integrated Freeway and Arterials Management System, BOISE, ID.

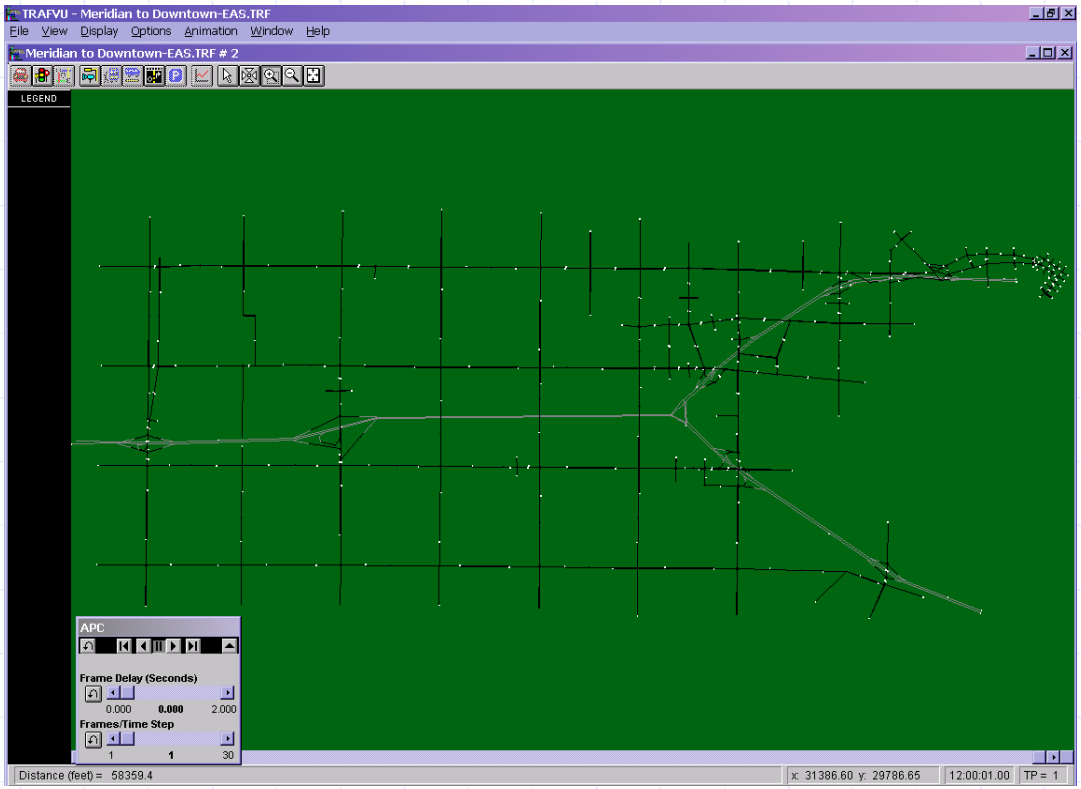
Evaluation Approach:

Integrated Simulation model for the freeway and arterial systems network, the model will be utilized for:

- Examine the effectiveness of freeway diversion routes during different incident situations
- Quantify the potential delay reduction benefits of the Integrated Management System
- Develop training materials and tools that will help train TMC operators manage incidents under different scenarios

Integrated Freeway and Arterial systems Management

Treasure Valley Integrated Freeway and Arterials Management System, BOISE, ID.



Freeway and Arterials systems integrated Simulation Model

Integrated Freeway and Arterial systems Management

Summary Results:

- In integrated management systems, diversion of freeway traffic can reduce incident-based delay by up to 35%
- Changing the signal timing plans on the arterial network can increase the delay-reduction benefits
- Diversion plans, and the percentage of freeway traffic to be diverted need to be developed and estimated accurately to achieve such benefits