

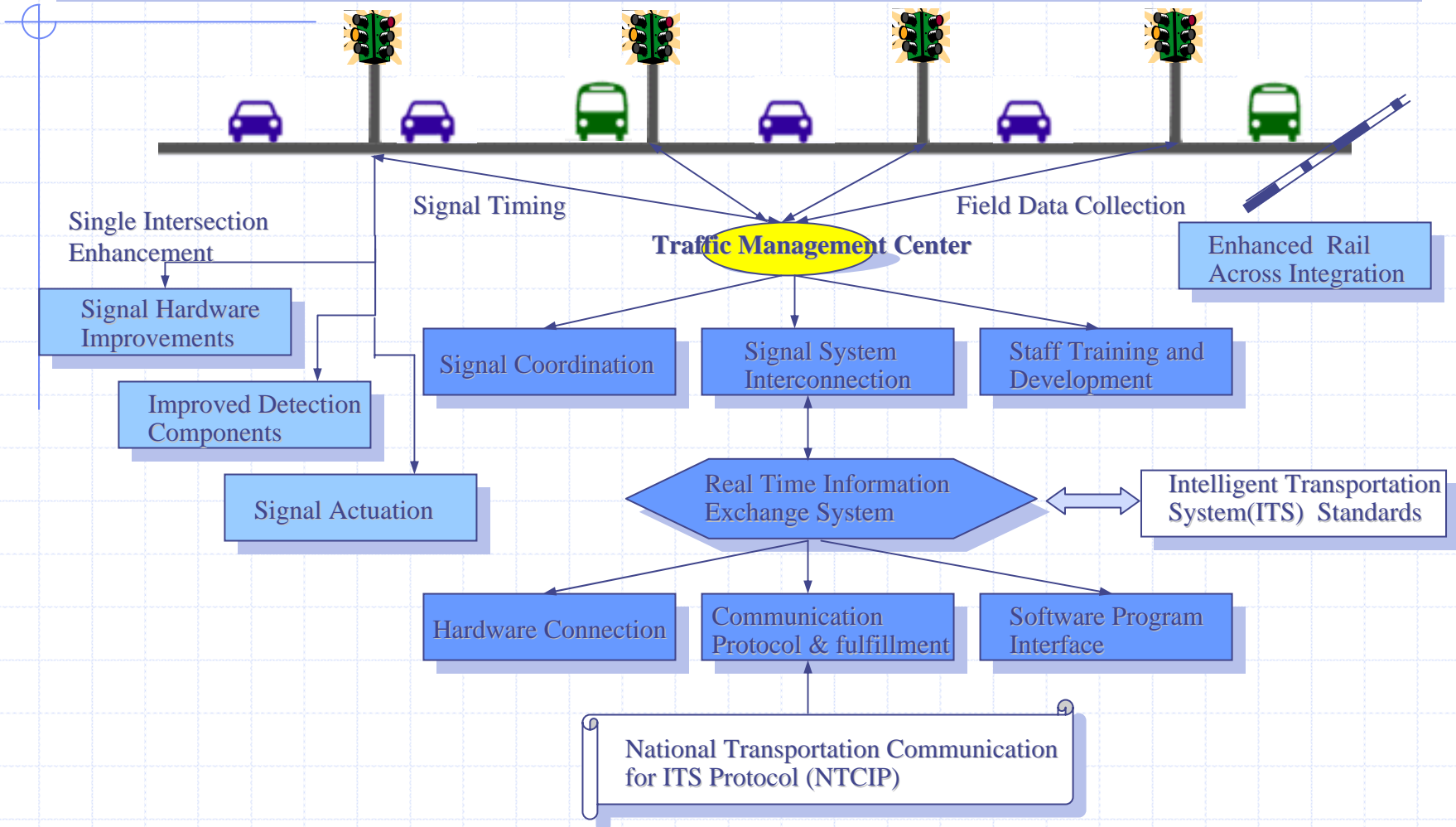
# CE474: Traffic Systems Design-Fall 2004

Class 21 – Traffic Signal System and ITS Architecture  
November 3, 2004

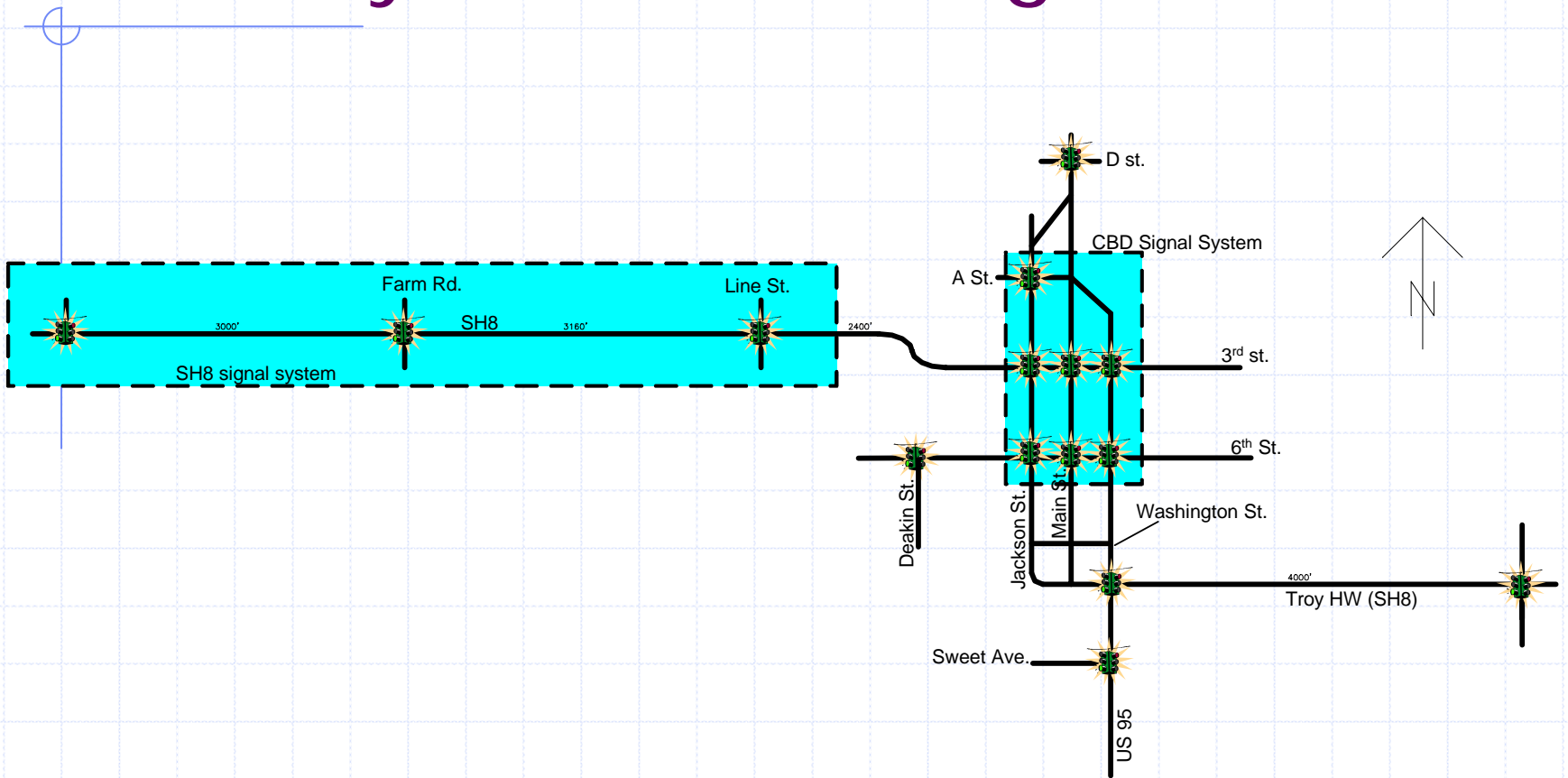
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# Advanced Traffic Management Systems in Idaho

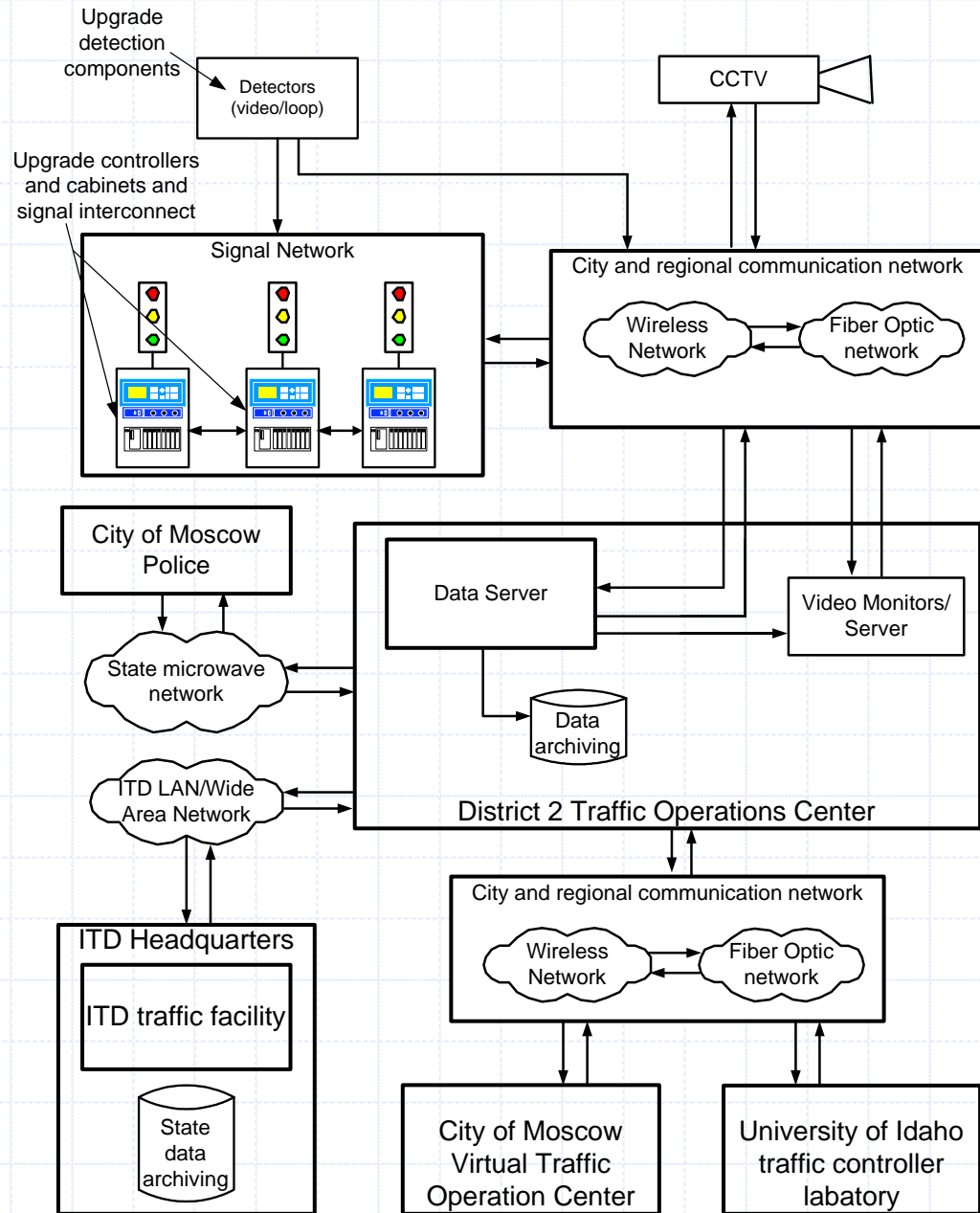
## Traffic Signals Systems Integration and Deployment-City of Moscow, Idaho



# The city of Moscow Signal network



# City Of Moscow Traffic Signal Integration Components as Identified by stakeholders needs



# Use of the National ITS Architecture Tools in Traffic Signal Control Projects

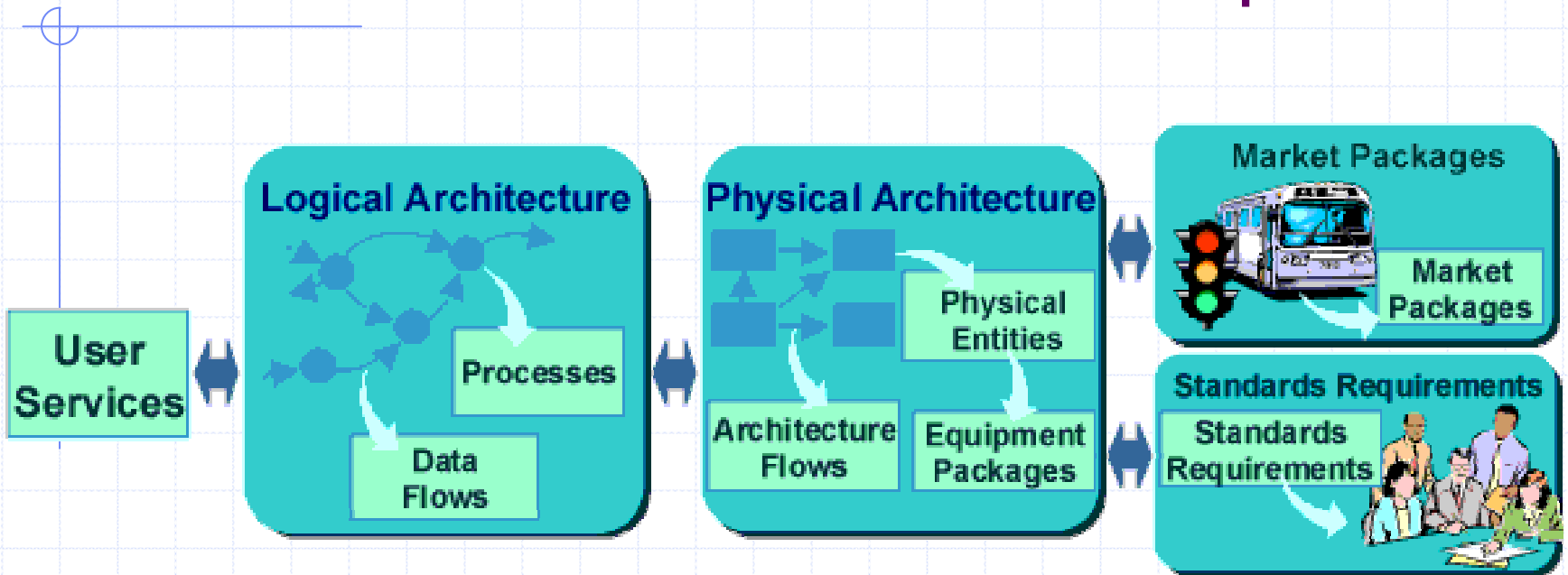
- ◆ The National ITS Architecture provides a common structure for the deployment of ITS
- ◆ It defines 19 interconnected physical subsystems, the transportation functions each subsystem performs, and the information subsystems exchange with each other to provide 30 user services.

# System Architecture Definition

- ◆ System architecture is the overall framework for accomplishing a system's objectives. It defines:
  - ◆ major system components
  - ◆ functions of the system components
  - ◆ interactions among components
  - ◆ interactions between components and the outside world
  - ◆ Communication requirements between different components

Analogy the super highway system in the 1950's

# National ITS Architecture Components



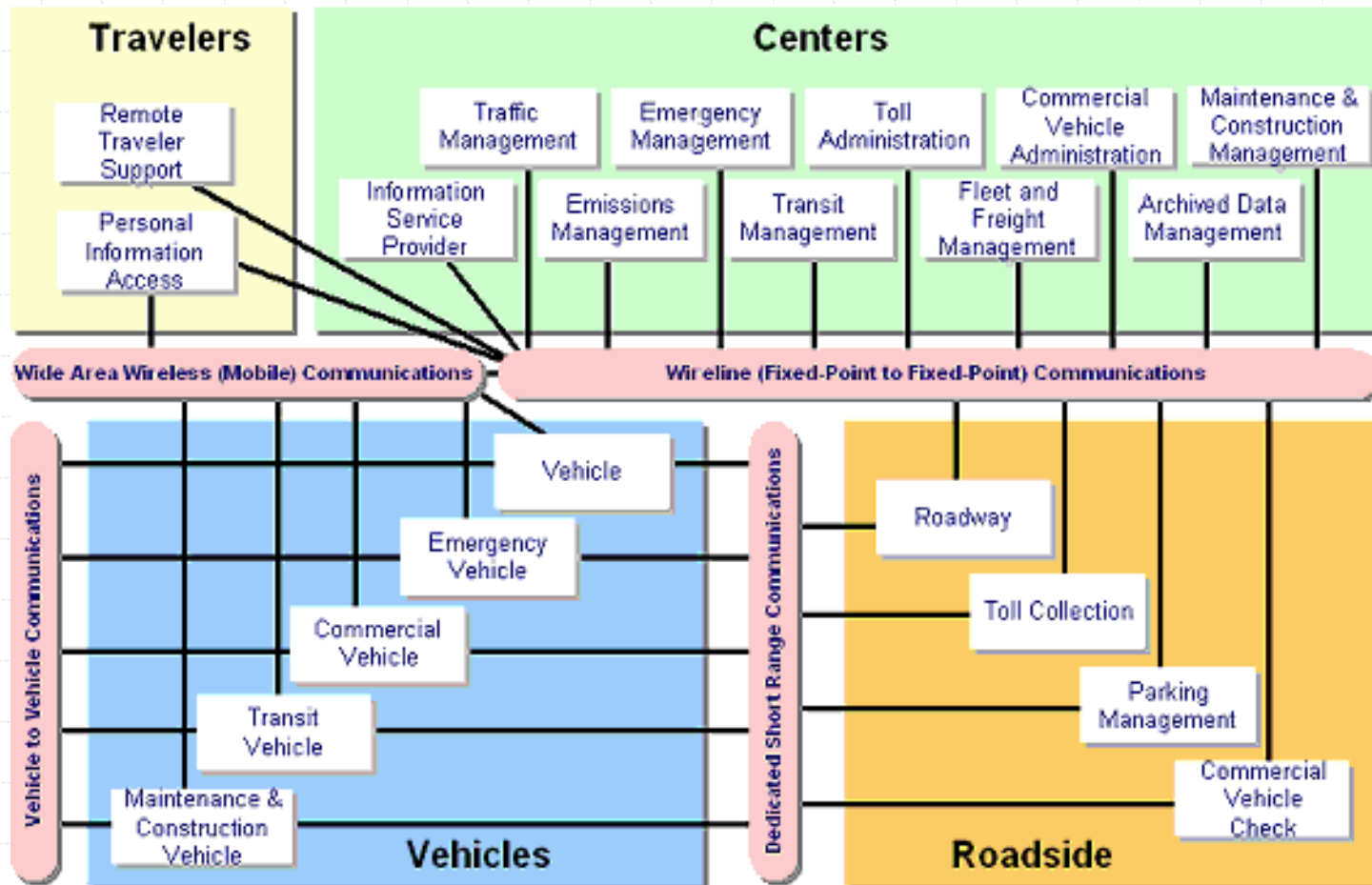
# Logical Architecture

- ◆ Defines Functions of User Services
- ◆ Defines Information or Data Flows between Functions

# Physical Architecture

- ◆ Defines physical entities where functions reside and their connections
  - Systems
    - ◆ Traveler
    - ◆ Center
    - ◆ Roadside
    - ◆ Vehicle
  - Subsystems
  - Communications

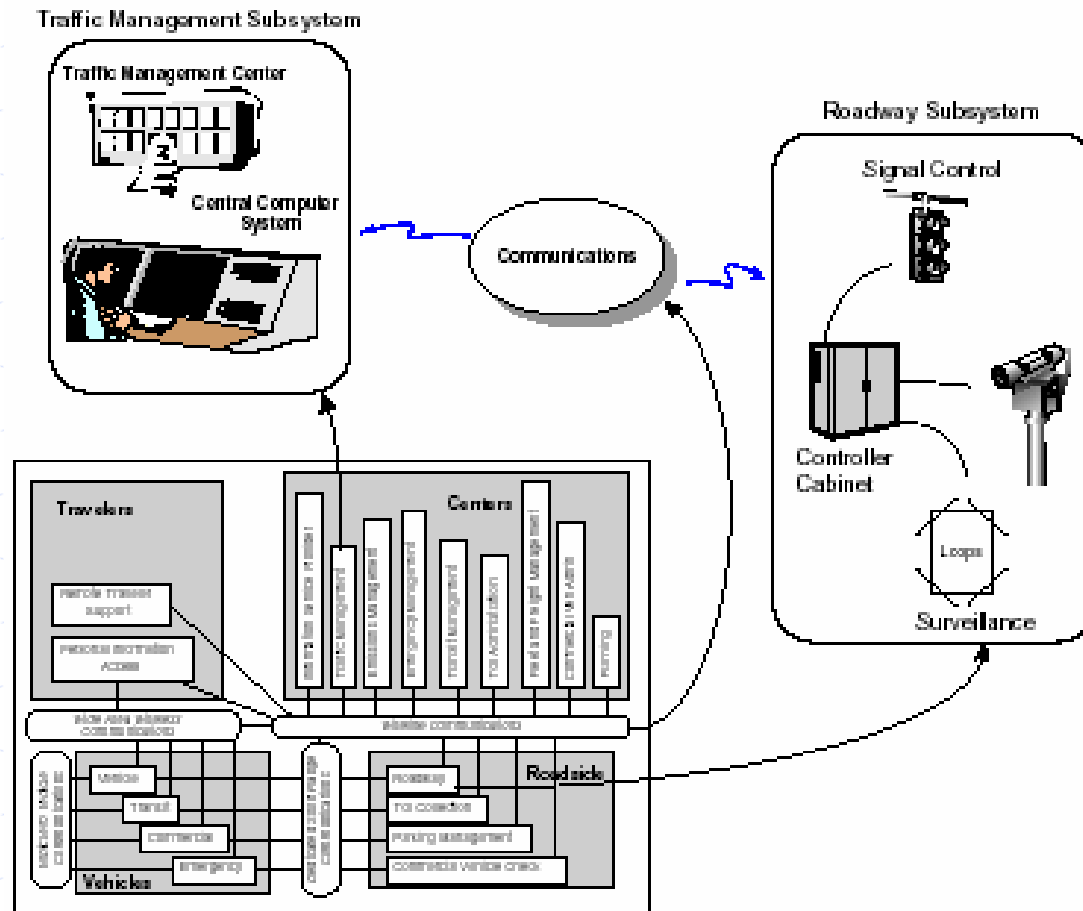
# System Interconnect Diagram- Physical Architecture



# Traffic Signal Control System Functions within the National ITS Architecture

- ◆ The functions associated with basic traffic signal control systems reside in 2 subsystems of the National ITS Architecture: the **Traffic Management Subsystem** and the **Roadway Subsystem**.

# Basic Traffic Signal Control System Components in ITS Physical Architecture





# Market Packages

- ◆ Market packages are set of deployment-oriented ITS service building blocks, defined from the original user services.
- ◆ They are designed to address specific transportation problems and needs and can be related back to the 30 user services
- ◆ Market packages are defined by sets of equipment packages required to work together (typically across different subsystems) to deliver a given transportation service

# Market Packages that Relate to Traffic Signal Control Systems

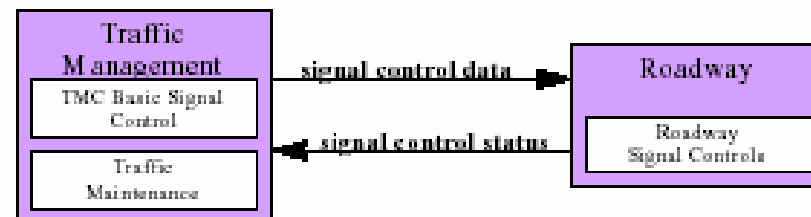
## Network Surveillance (ATMS1)

This basic market package provides the fixed roadside surveillance elements utilizing wireline communication to transmit the surveillance data. It can be loop detection connected with traffic signal control or it can be CCTVs sending back data to the traffic management centers. This enables traffic managers to monitor road conditions, identify and verify incidents, analyze and reduce the collected data, and make it available to users and private information providers.



## Surface Street Control (ATMS3)

This market package provides the communication links and the signal control equipment for local surface street control and/or arterial traffic management control. An example would be arterial signalization control. This market package is considered an intra-jurisdictional package since coordination between adjacent cities is required to coordinate signal control along arterials. This package is consistent with typical urban traffic signal control systems.



# What are ITS Standards?

## ◆ SET OF RULES CONCERNING

- Definitions of terms or procedures
- Specification of materials or performance
- Classification of system components
- Measurement of quality or quantity of materials, systems, or practices

## ◆ Well, What Are Protocols Then?

- SET OF RULES CONCERNING
  - ◆ Data exchange between two entities that desire connection

# Types Of ITS Standards

- ◆ Hardware/software standards,
- ◆ Human factors standards, and
- ◆ Communication standards.

# Hardware/software standards

- ◆ Define the standards for physical devices, such as controller and cabinets. They also define the standards for the software that control those physical devices (Applications, Application Program Interface, Operation System, etc.) Examples are:
  - NEMA TS2-1998 traffic controller assembly with NTCIP requirements
  - Standard practice for installation of fiber optic cables
  - ITS cabinet subsystem definitions
  - Advanced Transportation Controller (ATC)

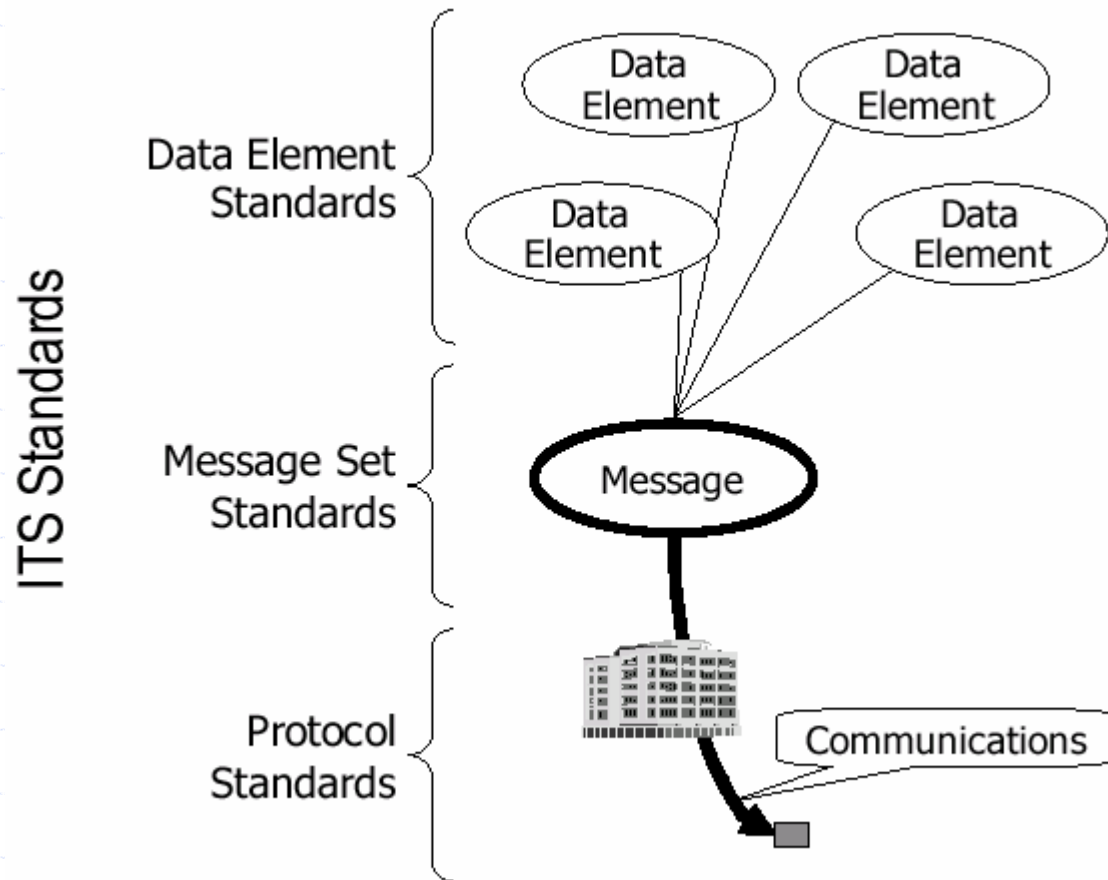
# Human factors standards

- ◆ Define how to design ITS systems safely for humans and provide consistent operating characteristics and control/interface design. Examples are:
  - Navigation and route guidance systems
  - Adaptive cruise control system
  - Commercial Vehicle Credentials TS286
  - Commercial Vehicle Safety and Credentials Information Exchange TS285
  - Commercial Vehicle Safety Reports TS284

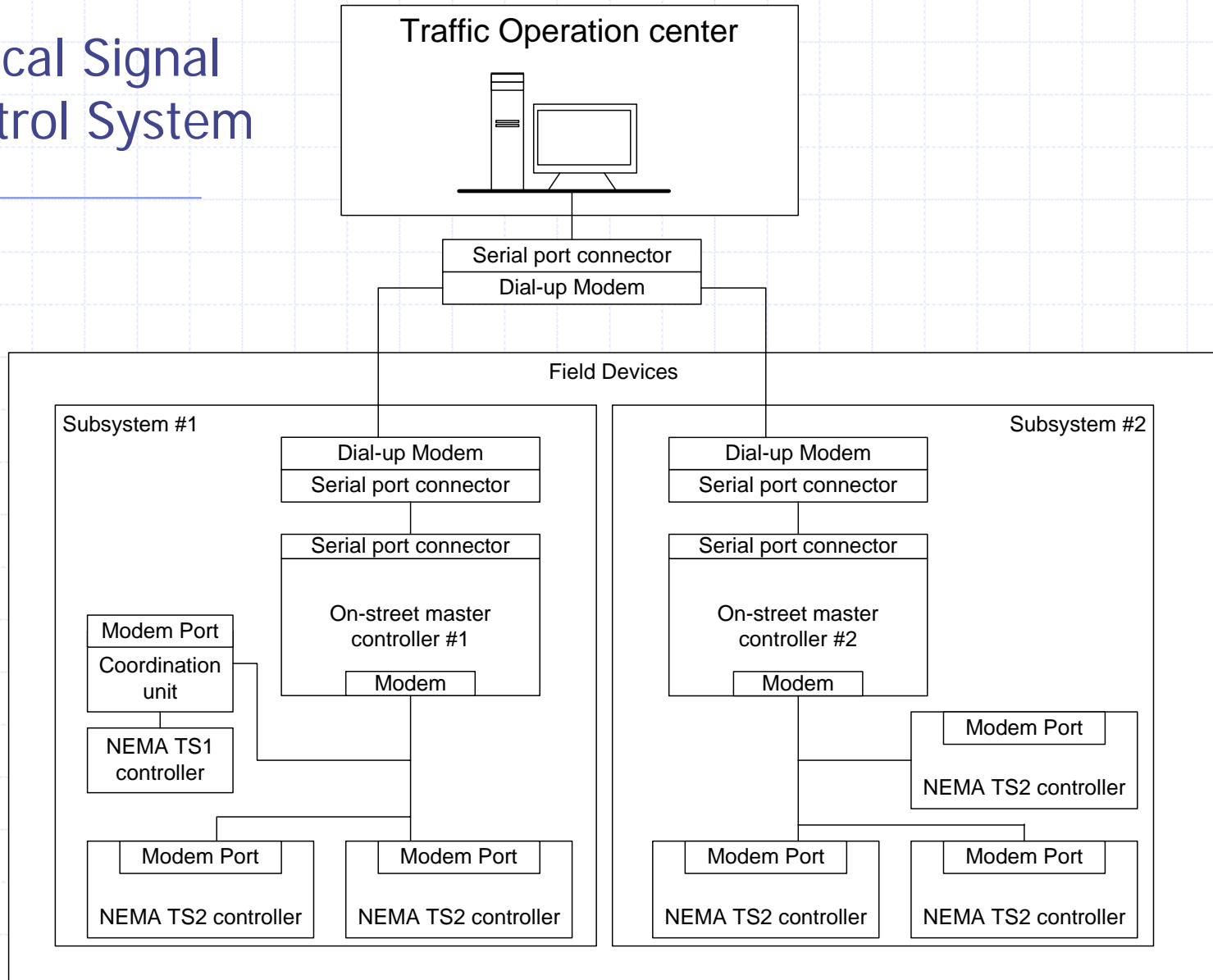
# Communication Standards

- ◆ Communication standards allow different systems to speak with each other in a common language, using common data elements, well-defined data structures or "messages", and well-understood protocols or rules for data exchange and sharing.
  - ◆ Data elements (words)
  - ◆ Messages (sentences)
  - ◆ Protocols (rules to move information)

# ITS Communication Standards



# Typical Signal Control System



# Traffic Signal Control Systems

## Functions

### ◆ Top Level Functions

- Control and Coordination of Traffic Signals
- Surveillance and Monitoring of Traffic
- Monitor Faults And Malfunctions

### ◆ Other Functions

- Transit Vehicle Priority
- Highway-Rail Intersection Coordination
- Emergency Vehicle Preemption

# Using the National ITS Architecture to Develop Traffic Signal Control Projects

- ◆ **Identification of Needs or Problems**
- ◆ **Identification of Solutions**
  - **User Services**
  - **Market Packages**
- ◆ **Planning and Design**
  - **Determine Functional Requirements – Concept of Operation Report**
  - **Identify Information Exchange Requirements**
  - **Identify Relevant Standards**
- ◆ **Funding, Procurement, and Implementation**

# Identifying the needs/solutions

- ◆ Are we getting the most of the current system ---is it optimal?
- ◆ What's optimal?
- ◆ To actuate or not to actuate..
- ◆ To coordinate or not to coordinate...
- ◆ CCTV.. Do we really have to have them?