# Harris County ITS Deployments

Presented by

***Wayne Gisler***
Manager – Harris County Traffic Management & Operations Section

***Ron Johnson***
Quality Control Coordinator
Harris County Traffic Management & Operations Section

## Our Goal
## "To Manage Arterials Regionally and Cost Effectively"

- **Systems must be designed with maintenance in mind**
- **Manageable with minimum staffing and training needs**
- **Scaleable to extend across jurisdictional boundaries**

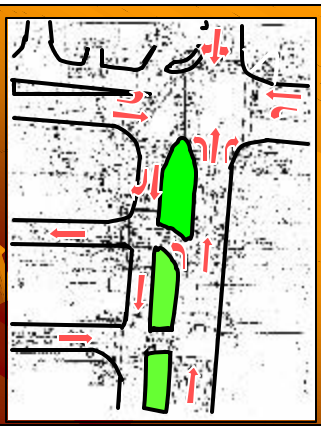
## Our Plan
## "Meet Big City Needs"

- Participate in National Standards Development
- Explore Opportunities for ITS Platform and use Staged Deployments
- Planned Future Initiatives

## Big City Needs

1. Dynamic High Volume Traffic Patterns (i.e., **Local Infusion of Superhighways**)
2. Increasing Maintenance Requirements and Needs.
   - Scalability
   - Survivability
   - Manageability
   - Training
3. Flexible Detection Capabilities
4. Inputs and Outputs may be logically "anded" or "ored", internally within the controller depending on the Software Application.
5. Efficient management from afar.
6. Accurate diagnostics from a remote location.

## ***Opportunities To Succeed***



## What's The Big Deal?

## National Standards Activities

1. Initial 'straw-man' concept cabinet developed and refined through prototyping process. Harris County deployed ITS Housing 3 Cabinets with "Parallel Wiring" and MMU Units in 2001
2. National ITS Expedited Standards Development Project Ongoing. User Comment Draft was available, January 2003. The development process resulted in revisions based on comments that produced second generation working units that were submitted to CALTRANS.
3. CALTRANS initial QPL approval of ITS Cabinets developed by two vendors in the fall of 2003.

## Staged Deployment

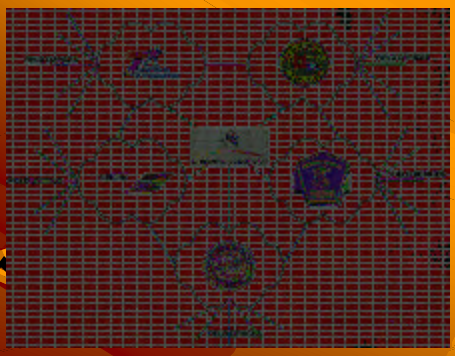
1. Harris County deployed Housing 3 Cabinets with "Parallel Wiring" and MMU Units in 2000 with further cabinet installations scheduled for 2005 using AMU CMU units.
2. Harris County is developing ATMS capability using the ITS Standards.
3. Harris County is currently developing Cabinet Interface Analysis tools operating independently from the Controller. This system does real time logging and reporting of events and processes within the cabinet, back to central.

## Ongoing Future Initiataves

- HOV Control
- Traffic Incident Management
- Remote Interrogation and Diagnosis Devices.
- Conversion from parallel to serial.

## *Components of Harris County's ATMS*

## *ITS Standards*



## Harris County ATMS System Architecture

- ITS Field Devices
  - 2070 Controllers
  - ITS Cabinets
- System Control Software
  - NextPhase Local Control Software
  - ICONs Central Control Software
- Fiber Optic Cable Plant
- ATM Communications Backbone

## Field Hardware

**2070 Controller**

- Open Architecture
- Scaleable Design
- Suitable for Freeway and Arterial Management

**ITS Cabinet**

- Scaleable "Plug and Play" Design
- Eliminates Point to Point Wiring
- Distributed Internal Architecture
- Improved Internal Communications
- Accommodates 2070 ATC and TS-2 Controllers

## 2070 Controller Specification Development

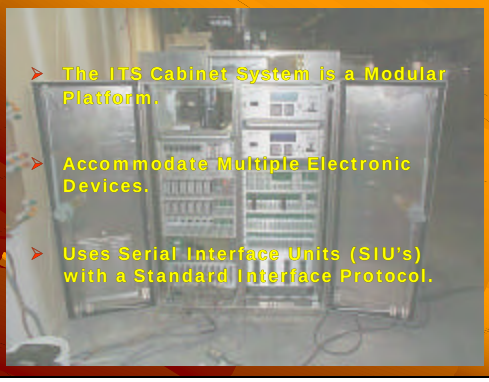
- Open Architecture Hardware Platform
- Multipurpose Computer
- Scaleable Relative to Cost Versus Functionality
- Provided Migration Path from NEMA to 2070 Environment
- Suitable for Arterial and/or Freeway Management

## Controller Integrated Cabinet

- Specialized Central Processing Units
- Integrated Cabinet Power Sources
- Modular Input & Output Assemblies
- Integrated Monitoring Systems
- Plug-In Filtering Devices

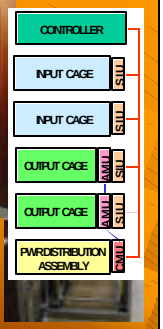
## ITS Cabinet Specification Development

- Scaleable, Modular "Plug and Play" Design
- Accommodates 2070 ATC and TS-2 Controllers
- Supports Controller & Serve as Communications HUB
- Eliminates Majority of Point-To-Point Wiring
- Allows for Distributed Intelligence within Cabinet
- Ease of Installation, Maintenance, and Testing of Components



- The ITS Cabinet System is a Modular Platform.
- Accommodate Multiple Electronic Devices.
- Uses Serial Interface Units (SIU's) with a Standard Interface Protocol.

## ITS Cabinet Architecture




## ITS Cabinet Functionality

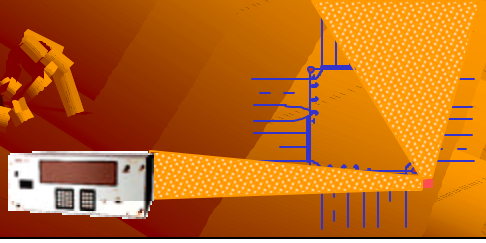
- ✓ **ITS Platform for Arterials or Freeways**
- ✓ **Accommodates 2070 ATC and TS-2 Controllers**
- ✓ **Serial Bus Communications**
  - Scaleable, Modular "Plug and Play" Design
  - Allows for Distributed Intelligence within Cabinet
  - Adaptable to Future ITS Applications

## ITS Cabinet Specification Development

- ✓ **Paid For By FHWA Through ITE**
- ✓ **Agency Driven Functionality**
- ✓ **Manufacturer Supported Design**
- ✓ **Multiple Skill Levels**
- ✓ **Ease of Installation, Maintenance, and Testing of Components**
- ✓ **Standardization of Components Minimize Future Development Costs**

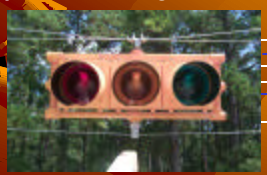
## Traffic Signal Improvements

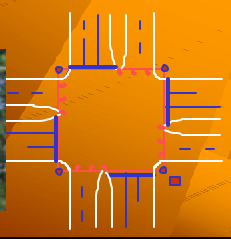
- **ITS Cabinets**
- **2070 Traffic Signal Controllers**



## Traffic Signal Improvements

- **ITS Cabinets**
- **2070 Traffic Signal Controllers**
- **Signal Head Hardware**
- **Span Wire Design**





## System Control Software

## NextPhase Local Control Software

- Combines Best Features from 170 & NEMA Worlds
- Fully NTCIP Compliant, Allowing Modular Expansion
- Enhanced Ring Structure and Barrier Controls
- Control of Cabinet Wiring through Software Mapping of Inputs and Outputs
- Allows Development of Templates for Intersection Geometry and Cabinet Wiring

## The Role of Web Access to an ATMS

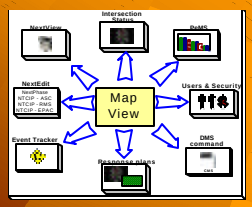
### Remote access to ATMS functions

- The ATMS System has information about
  - Intersection Status
    - Coordinated, Flash, Free, Transition, Priority
  - Link Status
    - Volume, Occupancy, Speed
  - CCTV Images
  - DMS Messages
- And supports remote operations
  - Controller Database Editing
  - Pattern Selection/Response Plans
  - Alarms/Notifications

3

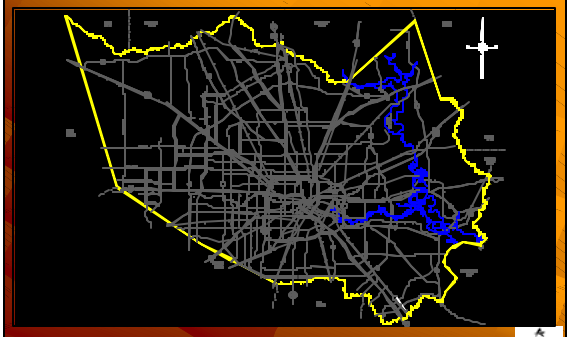
## Components of the Web-Based System

- All client applications are browser-based using Web-services technology
- Components can be phased in over time
- Common user & security management for all modules
- Components designed to assist normal workflow – e.g. management, maintenance, analysis,...




## Fiber Optic Cable Plant

## The Passive Communications Infrastructure



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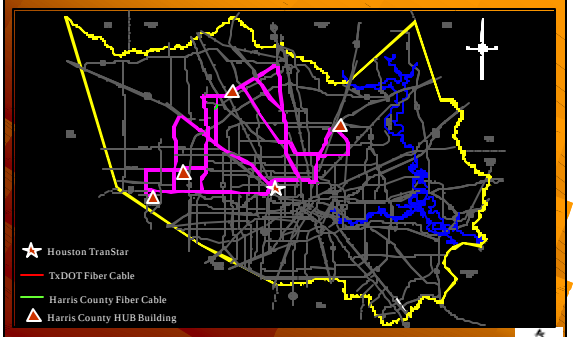
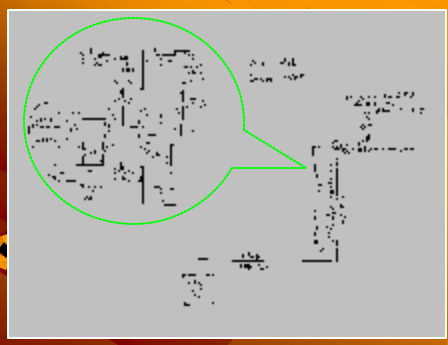
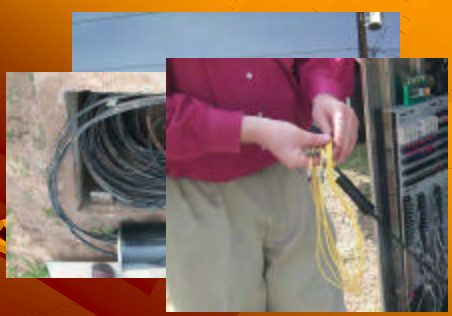



## Local Circuit Schematic

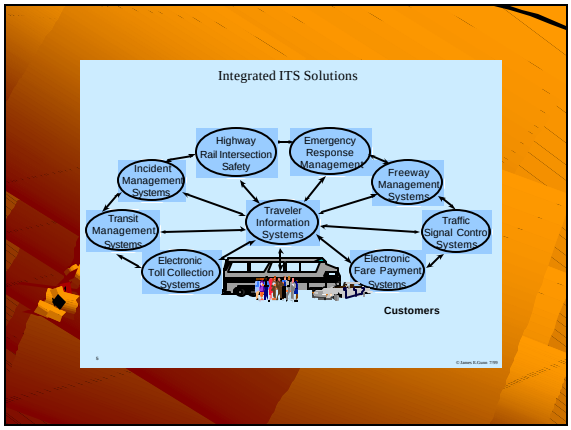


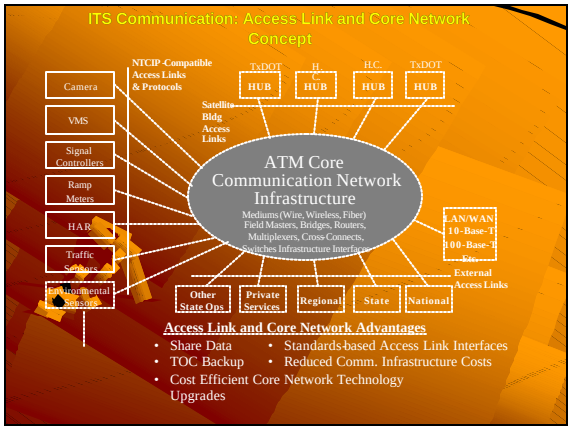
## Field Construction

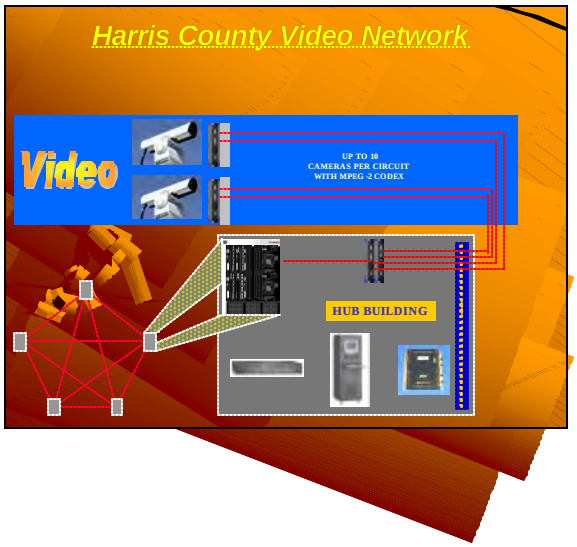


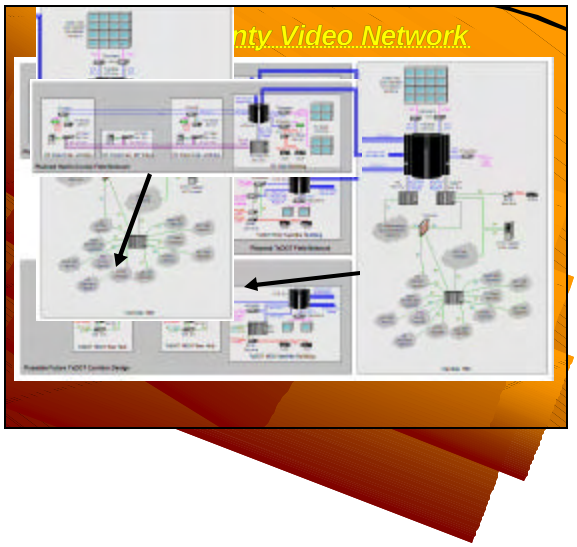
## ATM Communications Network Architecture

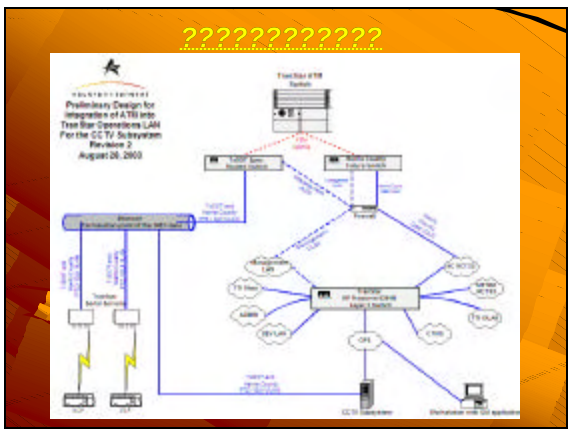
*(Where The Rubber Meets the Sky)*


Integrated ITS Solutions
Highway Rail Intersection Safety
Emergency Response Management
Incident Management Systems
Freeway Management Systems
Transit Management Systems
Traveler Information Systems
Traffic Signal Control Systems
Electronic Toll Collection Systems
Electronic Fare Payment Systems
Customers


ITS Communication: Access Link and Core Network Concept
NTCIP-Compatible Access Links & Protocols
TxDOT HUB
H HUB
H.C. HUB
TxDOT HUB
Camera
VMS
Signal Controllers
Ramp Meters
HAR
Traffic Sensors
Environmental Sensors
Satellite Bldg Access Links
ATM Core Communication Network Infrastructure
Mediums (Wire, Wireless, Fiber) Field Masters, Bridges, Routers, Multiplexers, Cross-Connects, Switches Infrastructure Interfaces
LAN/WAN 10-Base-T 100-Base-T Etc.
External Access Links
Other State Ops
Private Services
Regional
State
National
Access Link and Core Network Advantages
• Share Data
• TOC Backup
• Cost Efficient Core Network Technology Upgrades
• Standards-based Access Link Interfaces
• Reduced Comm. Infrastructure Costs


Harris County Video Network
Video
UP TO 10 CAMERAS PER CIRCUIT WITH MPEG -2 CODEX
HUB BUILDING


nty Video Network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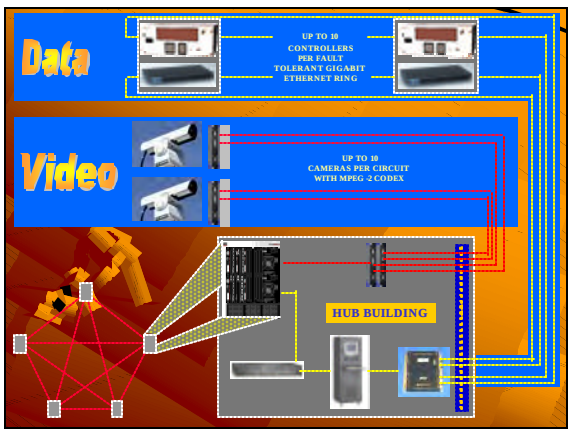
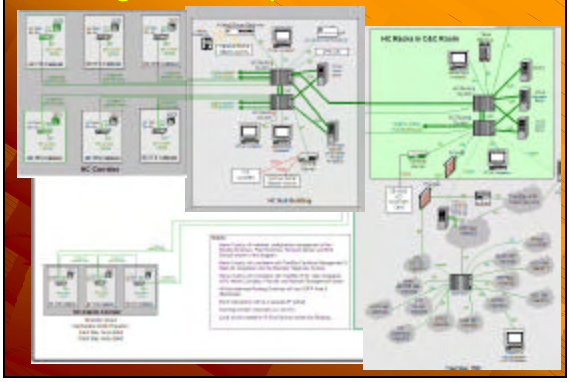
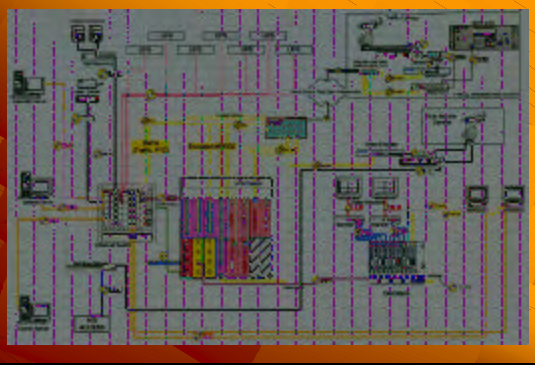
Preliminary Design for Integration of ATMS into Traffic Operations LAN For the CCTV Subsystem
Revision 2
August 26, 2003


Data
UP TO 10 CONTROLLERS PER FAULT TOLERANT GIGABIT ETHERNET RING
Video
UP TO 10 CAMERAS PER CIRCUIT WITH MPEG -2 CODEX
HUB BUILDING

## Management & Operations Network



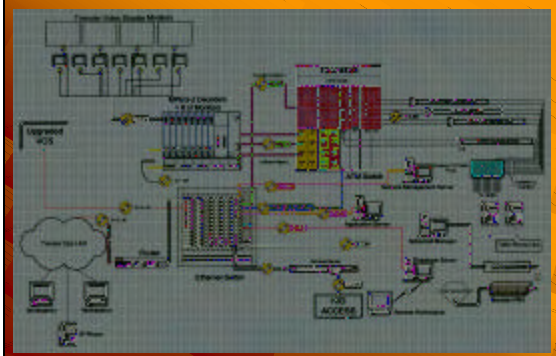
## ATM Video Network HUB



## Communications HUBs

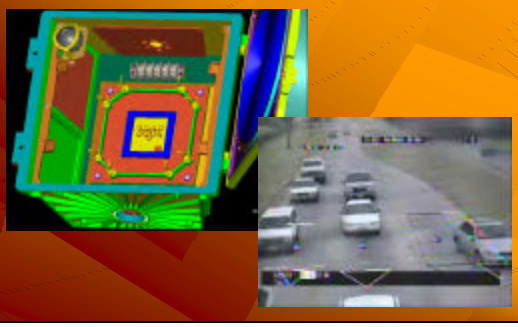
## Interagency Connections

## TranStar ATM Video Network

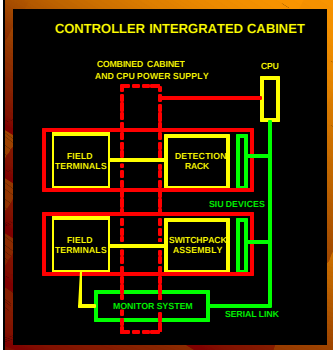


## The Future…

## Modular Design Provides Cost Effective Platform for Future Features and Up Grades

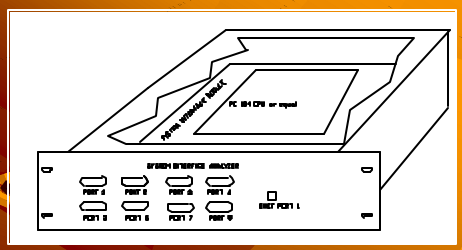


## ITS Cabinet Deployment and Maintenance Concepts

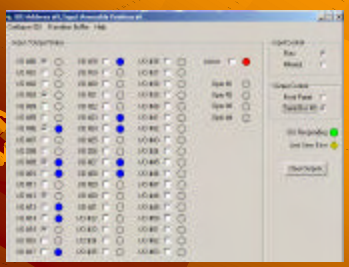



- Power Supply and CPU mounted in rack or on shelf.
- Each Input and Output Assembly contains a remote Serial Interface Unit for interface to the Field.
- An integrated Monitoring System provides feedback to CPU and Flash Transfer System.

## System interface analyzer



## INPUT ASSEMBLY REAL TIME DISPLAY PROVIDED VIA THE SYSTEM INTERFACE ANALYZER



## OUTPUT ASSEMBLY REAL TIME DISPLAY PROVIDED VIA THE SYSTEM INTERFACE ANALYZER

## CMU REAL TIME DISPLAY PROVIDED VIA THE SYSTEM INTERFACE ANALYZER