

Kapsch TrafficCom

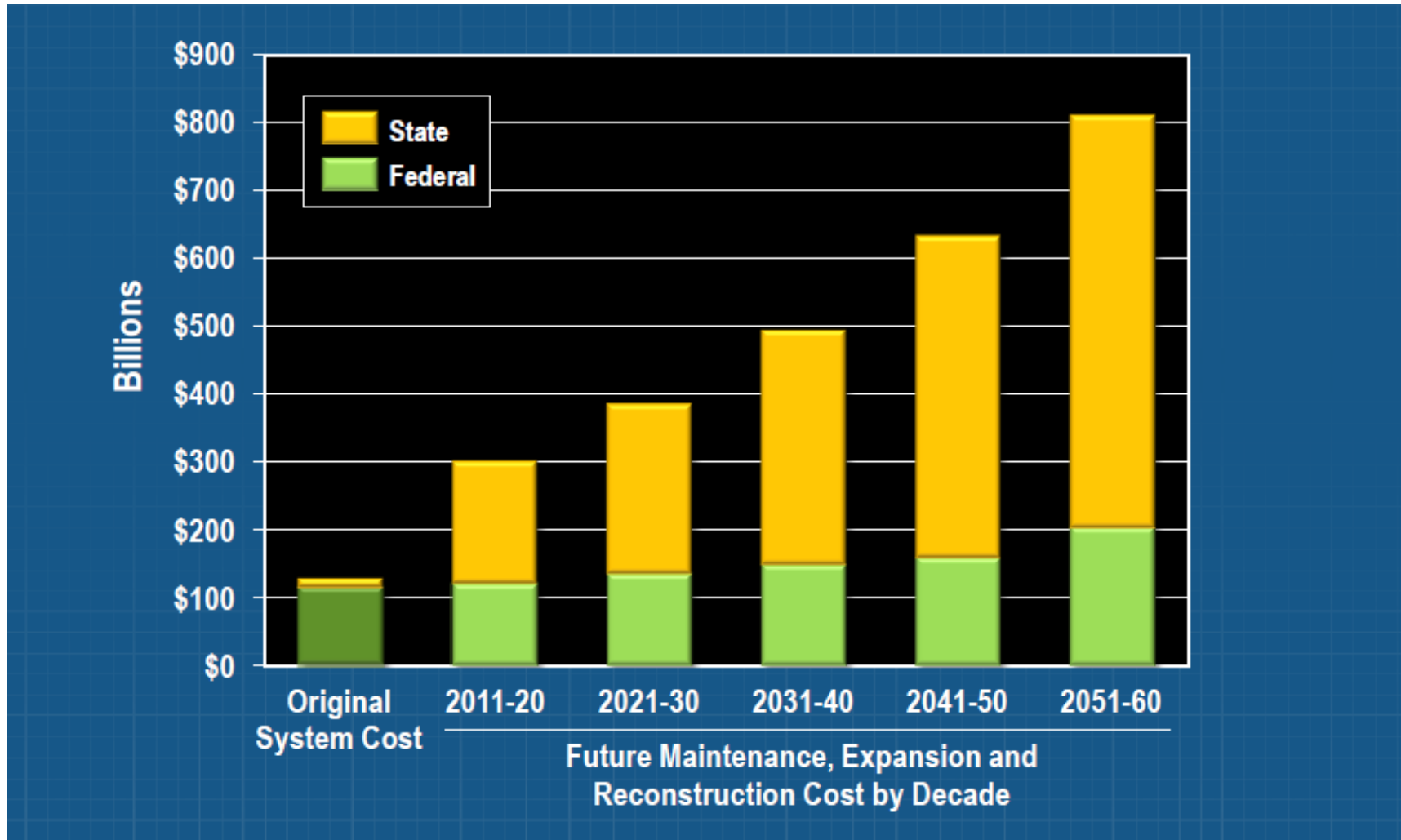
# *Tolling 101*



## Why Tolling?

- > Interstates are not paid for
  - > Will cost 50x what they originally cost to rebuild
- > Federal Funding is Decreasing
- > States Having to become more responsible for funding
- > States need flexibility – not one size fits all

*States will become more responsible for funding*



## *Types of Toll Roads*

- > Mixed Mode (Cash, CC, E-ZPass)
- > All Electronic Tolling – Gantry Only
  - > High Occupancy Toll Lanes – HOV Conversions
  - > Truck Only Tolling
- > Open Road Tolling
  - > A combination of All Electronic and Traditional Mixed Mode (Cash, E-ZPass)





Traditional Toll Plaza



Open Road Tolling



HOT Lanes



AET/ Truck  
Only Tolling

**Technical Operations**

**Systems Integration and Design/ Build**

**Transponders and Readers**

**Classification and Detection Solutions**

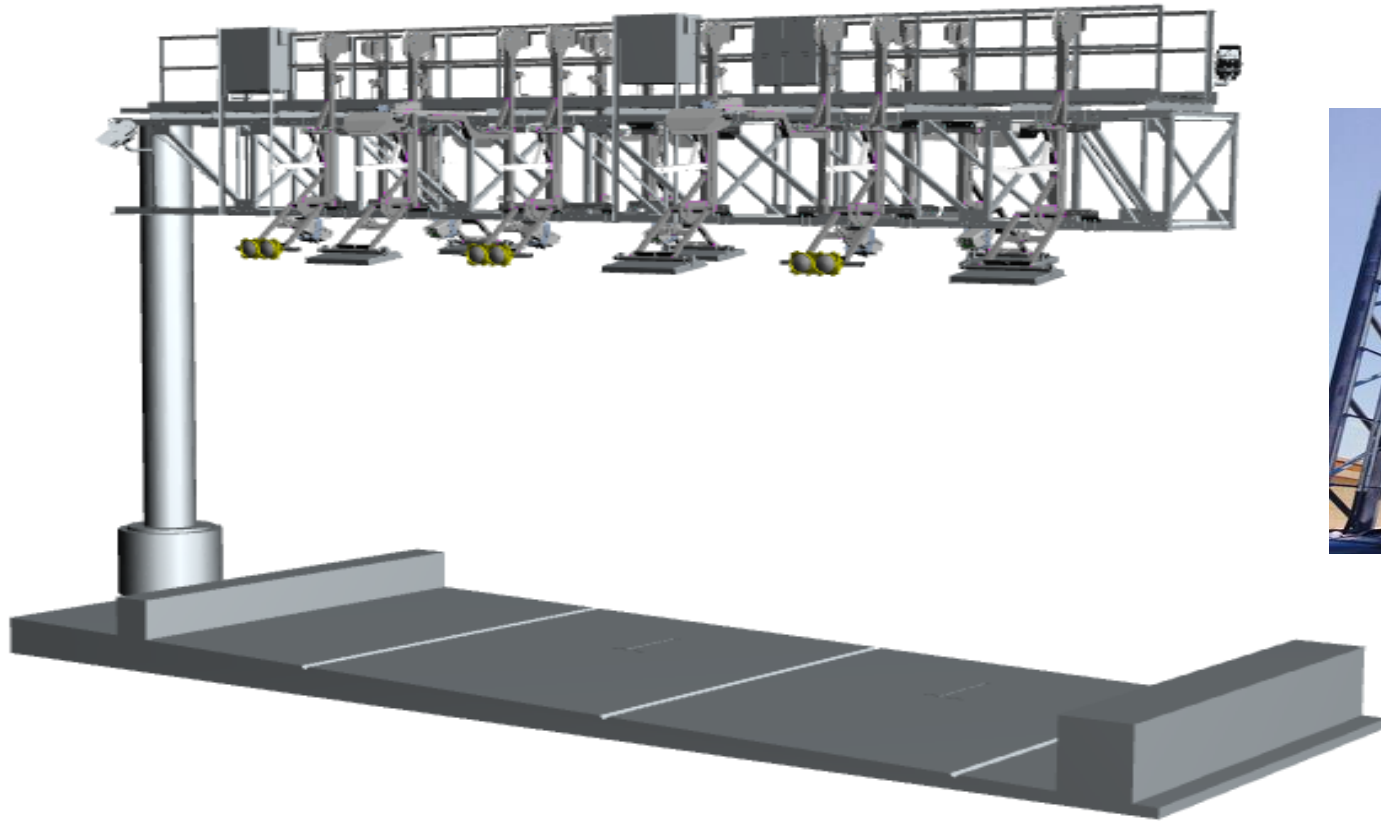
**Video Solutions**

**Operational Back Office Solutions**

**Remote Operations and Maintenance**

**Technical Operations**

## Toll Zone –Single Gantry



# *Gantry Design Considerations*



## **Performance:**

- Technology Needs, Accuracy, Speed, Lane Count, Traffic Type, Capture Zone

## **Space/Aesthetics:**

- Technology Needs, Accuracy, Speed, Lane Count, Traffic Type
- State specific design criteria

## **Devices:**

- On gantry, In Pavement, Overhead, Side Mount

## **Environmental:**

- Weather, Ambient

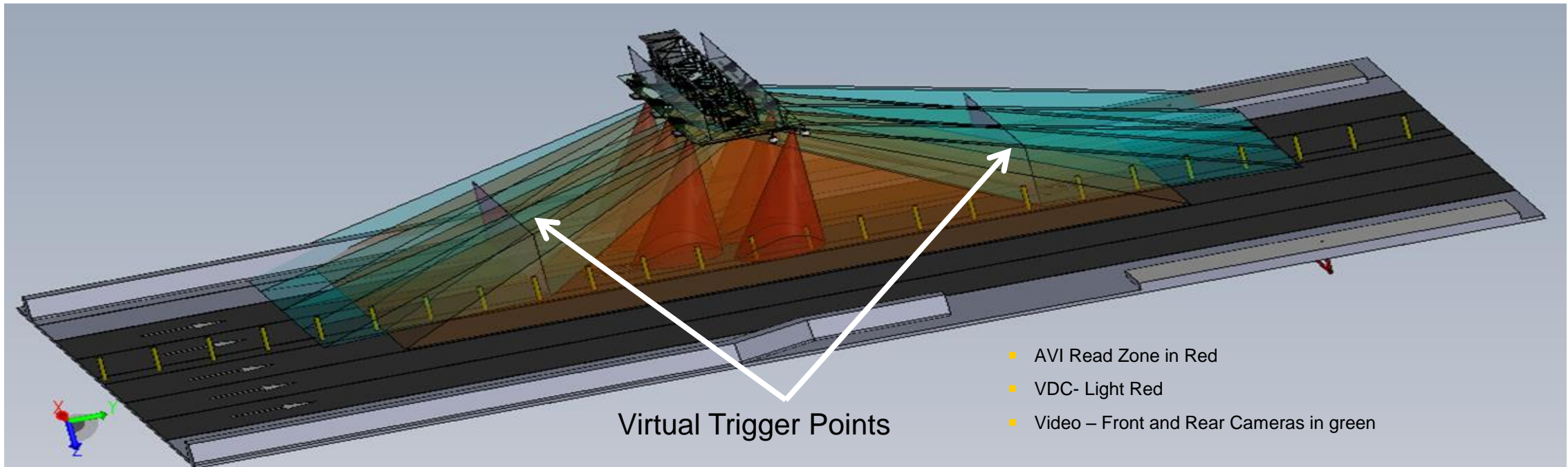
## **Maintenance and Access:**

- Maintenance Over Traffic Acceptable?
- MOT/Lane Closures, Traffic Volume, Revenue Loss



# Typical Toll Collection System

- Detection and Classification
- Automatic Vehicle Identification – RFID/ E-ZPass
- Video and Image Capture



**Technical Operations**

**Systems Integration and Design/ Build**

**Transponders and Readers**

**Classification and Detection Solutions**

**Video Solutions**

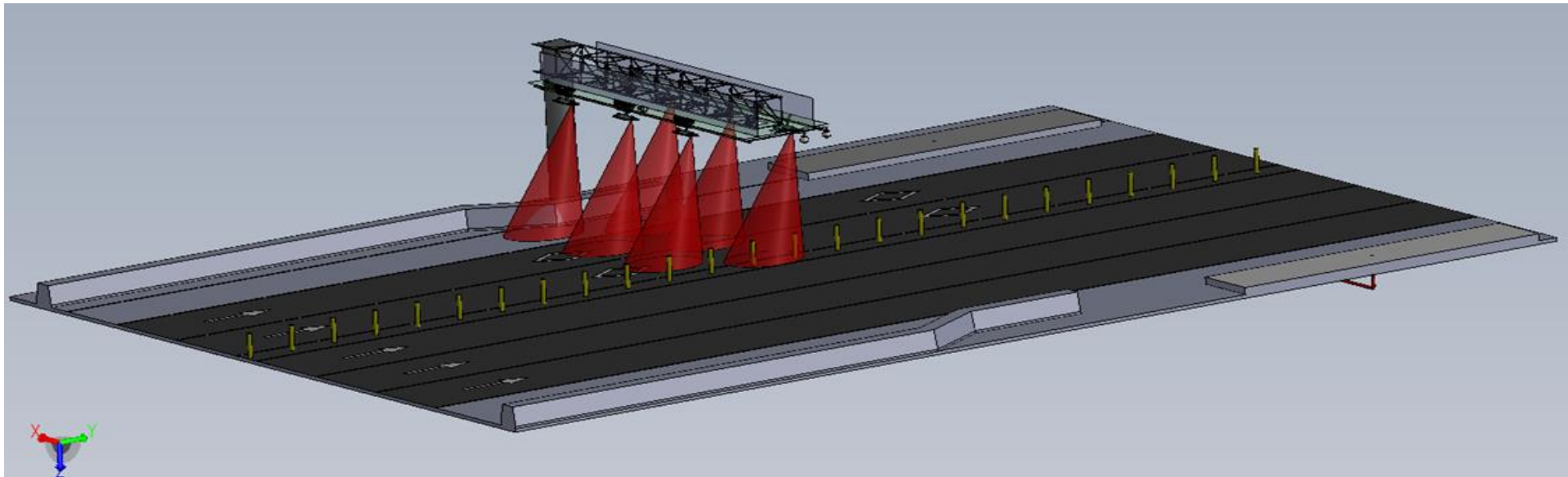
**Operational Back Office Solutions**

**Remote Operations and Maintenance**

**Technical Operations**

# AVI Subsystem

- Exemplary performance with AVI technology is based upon completing numerous RFID exchanges with each vehicle as it transits the toll zone – 6-12 times!.
- Works in conjunction with classifications systems to correlate transactions
- Possible Staggered Antenna Pattern for future interoperable protocols



## Transponders and Tags

- > Depends on Roadway Type
- > Full line up of E-ZPass and ISO 6C transponders
  - > Interior, HOT Switchable, Feedback
  - > ISO 6C: Stickertags Windshield, Headlamp, Switchable





**Technical Operations**

**Systems Integration and Design/ Build**

**Transponders and Readers**

**Classification and Detection Solutions**

**Video Solutions**

**Operational Back Office Solutions**

**Remote Operations and Maintenance**

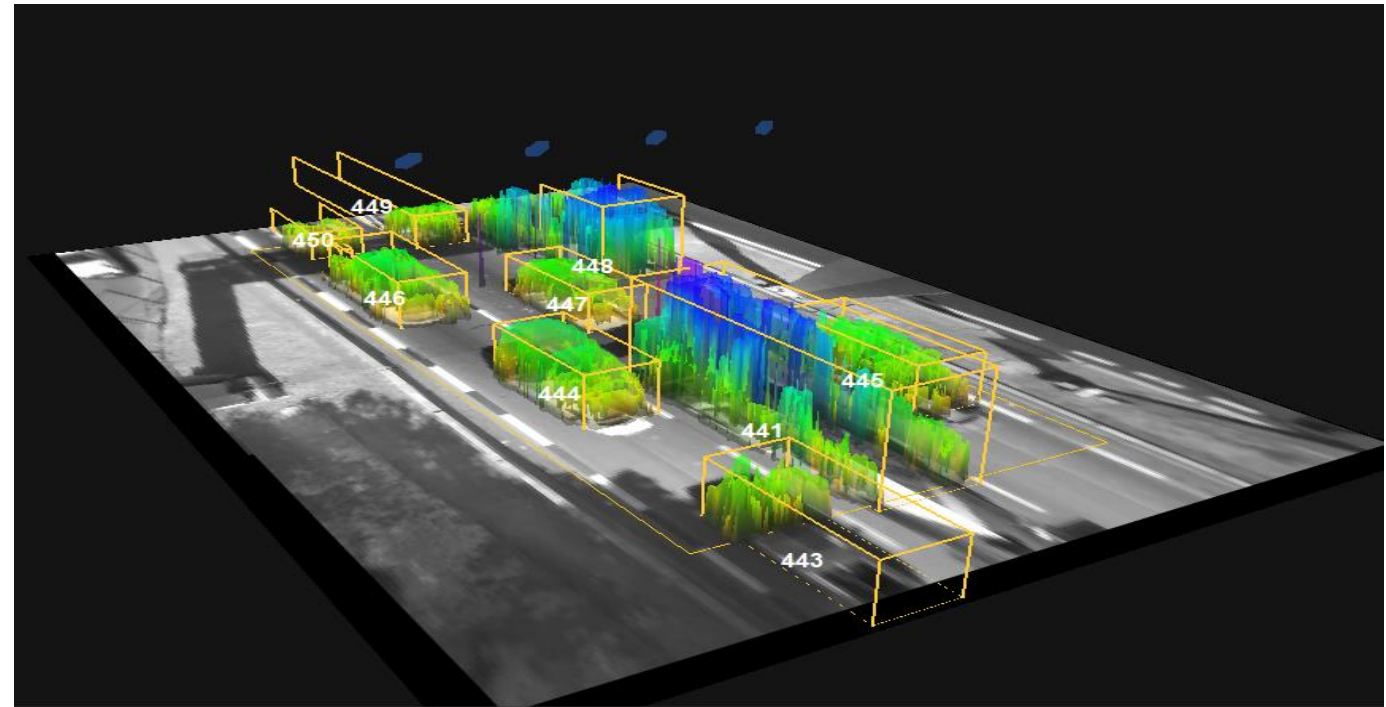
**Technical Operations**

# ***Detection and Classification Considerations***

- Proposed Solutions are based on customer requirements and KPIs
  - Axle Counting vs. shape based
  - In-ground vs overhead
- Extensive experience with:
  - Loops
  - Fiber Treadles
  - Lasers
  - Stereo-scopic video

# nVDC Overview

- Based on Missile Targeting Application
- Performance not affected by weather and traffic conditions, or vehicle types
- Axle counting without in-pavement sensors
- Correlation with transponders
- Correlation between front and rear image of vehicles
- Bi-directional traffic
- Can also be used for exact measurement of speed and lane usage
- Video can be found here:
  - <https://www.youtube.com/watch?v=twDgZ2S7934>



## *nVDC - Components*



nVDC Sensor Unit



nVDC Illuminator Unit



*What most of our competitors still use*



\* = Courtesy Thousand Island Bridge Authority

**Technical Operations**

**Systems Integration and Design/ Build**

**Transponders and Readers**

**Classification and Detection Solutions**

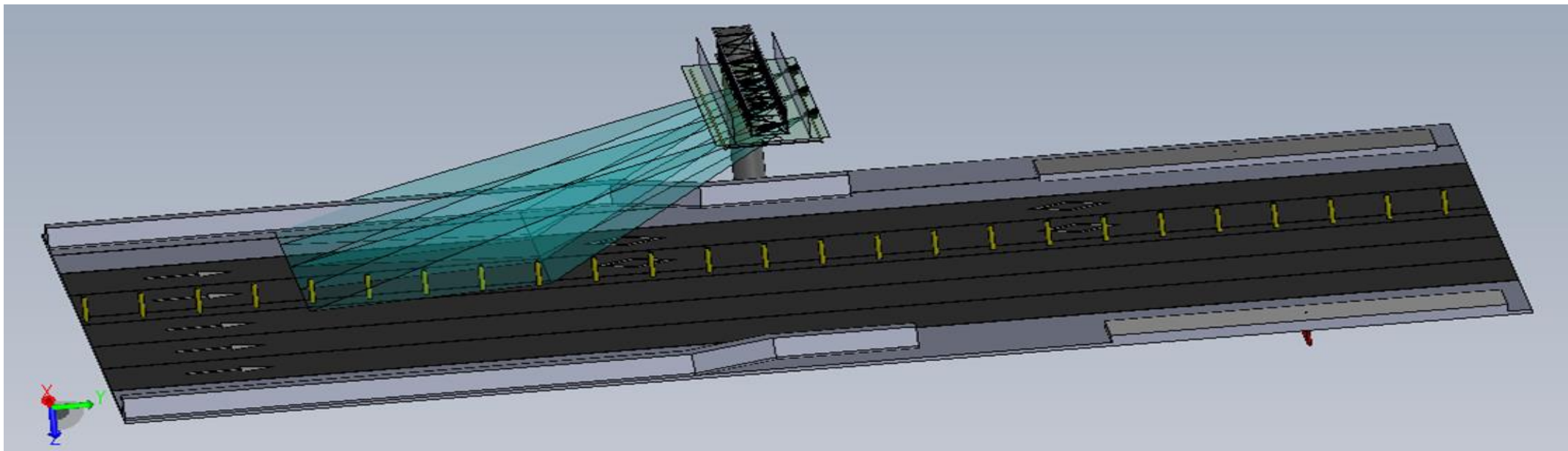
**Video Solutions**

**Operational Back Office Solutions**

**Remote Operations and Maintenance**

**Technical Operations**

## *Video – Front/ Rear License Plate Capture*



# Video and License Plate Capture/ Optical Character Recognition **kapsch** >>> challenging limits

## Overview – How it works

1. The Camera is triggered and license plate is detected
2. License plate is located in the image(s)
3. Overview image is associated with license plate candidate
4. License plate characters are extracted from the background
5. Alphanumeric characters are identified (and confidence level computed) via OCR
6. If above threshold, no manual review.

## Considerations

- Color vs. B&W Images
- Illumination



HD camera



Optional additional illumination unit



*Once Transaction is formed its has to be*

- Vehicle Classified
- Verified - valid Tag
- License Plate Images Reviewed, if needed
- Fully Formed Transaction sent to the Backoffice for processing
- Depends on Demarcation between Roadside System Provider and Backoffice provider



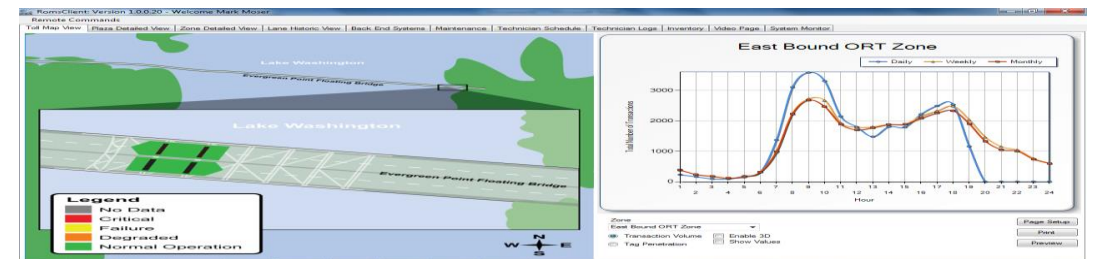
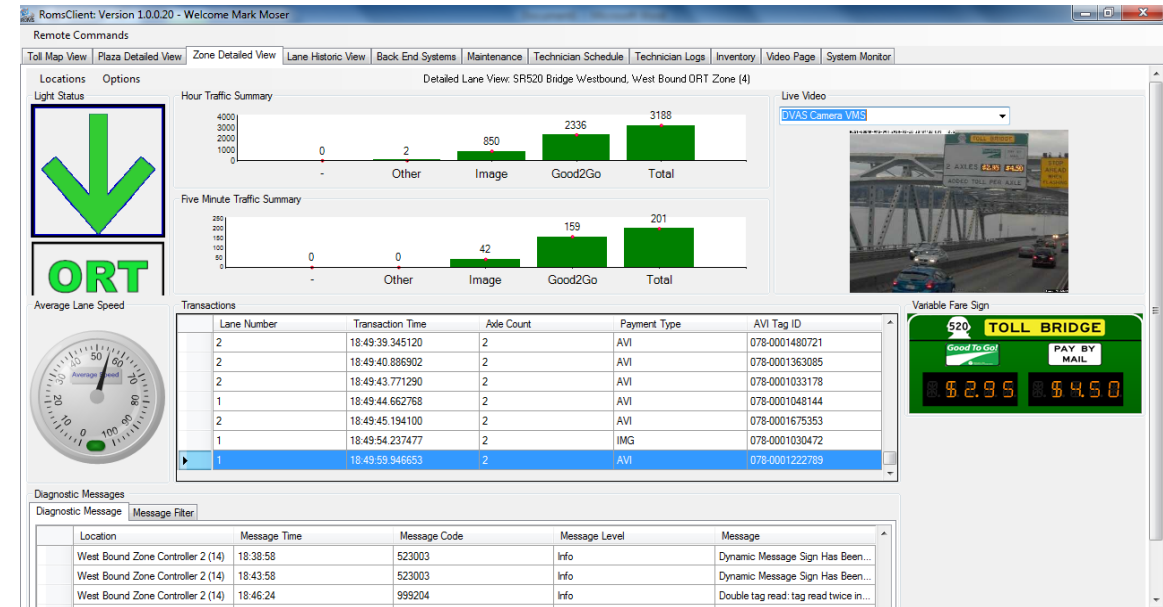
# Remote Operations and Management System



- Data repository for:
  - Raw events
  - Diagnostic messages
  - Asset management
  - Maintenance management
- Maintenance engine:
  - Scans all events
  - Can utilize time-in-service or event tracking to predict failures and schedule proactive maintenance
  - Completely automated
  - Designed for remote maintenance

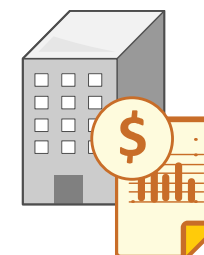
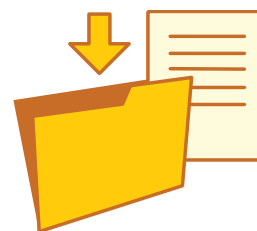
Demo

<https://www.youtube.com/watch?v=fhyl1CMS-xY&feature=youtu.be>



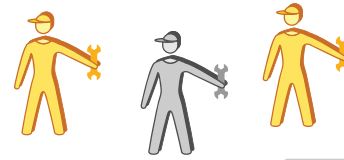
## It's your data.

ROMS and Host provide full access to your data, reporting and roadside data. All of this information is at the discretion of the agency.



## Maintenance Considerations

- Communication, Communication, Communication.
- Maintenance Manager with daily contact to agency
  - Geographically located, dedicated maintenance staff
- Recurring PMs. Frequency adjusted throughout life of project as roadway conditions are learned.
- Tiered staff structure for easy escalation and faster resolution.
- Predictive failure monitoring



Level/ Tier	Description
Level 1 Maintenance	24/7/365 monitoring of system components and performance by Kapsch Service Center in Austin.
Level 2 Maintenance	In-field maintenance of roadside and host systems.
Level 3 Maintenance	Remote SW support as required by system Admin, etc.
Level 4 Maintenance	Escalated SW support for bug fixes, SW changes.



# **The Environment The Tool The Interface to Your Customer**

# The Tool: Six Pillars of Back Office Platform

## Back Office Platform



### Security

- OpenID Connect
- PCI support using tokenization



### Scalability

- Service Oriented Architecture
- Actor Model
- H+V Scalability



### Reliability

- Redundant Servers
- Fault tolerant design



### Efficiency

- Front End design driven by UX guidelines



### Transparency

- You see what we see
- Ad Hoc reporting
- Data Analytics



### Flexibility

- Modular Design
- High level of configurability



## *The Team.*

- > Commitment to employee empowerment
  - Inspired Determination
- > Transparency is a core value
  - Always – at all levels
- > History of exceeding client and customer expectations
- > Flat organization – responsive and nimble



## *The Environment.*

- > Employee engagement
  - Career pathing
  - CSR certification process and advancement
- > Inspiring Facilities
- > Engaged Corporate culture
- > Employee Recognition
- > Strong Safety and Security programs
  - Ergonomic focus
- > Culture of continuous improvement

