



# WRONG WAY, RIGHT SOLUTIONS

THE EVOLUTION OF WRONG-WAY DRIVER DETECTION

Presented by Sabrina Mosher

## IMPORTANCE OF WWD SYSTEM

- Wrong way driver incidents are among the most severe types of accidents, typically involving head-on collisions.
- The fatality rate of a WWD accident is significantly higher than other types of incidents.



1967 – Caltrans used a kodak Instamatic camera to capture wrong way drivers to identify hotspots

2008 – Harris County Toll Road Authority (HCTRA) launches wrong way driver detection system

WWD programs launched across the US, including programs in Florida, Texas, and Arizona

More advanced detection and notification technologies developed

In-depth research and comparison of detection technologies and countermeasures

Emergence of cloud integration, Artificial Intelligence, and Connected vehicles

## EVOLUTION OF DETECTION SYSTEMS

# WRONG WAY DRIVER DETECTION SYSTEMS

- Initial wrong way driver systems consisted solely of a detection element paired with an automated notification.
- Detection devices can be integrated with traffic management software to form a wrong way driver detection system.

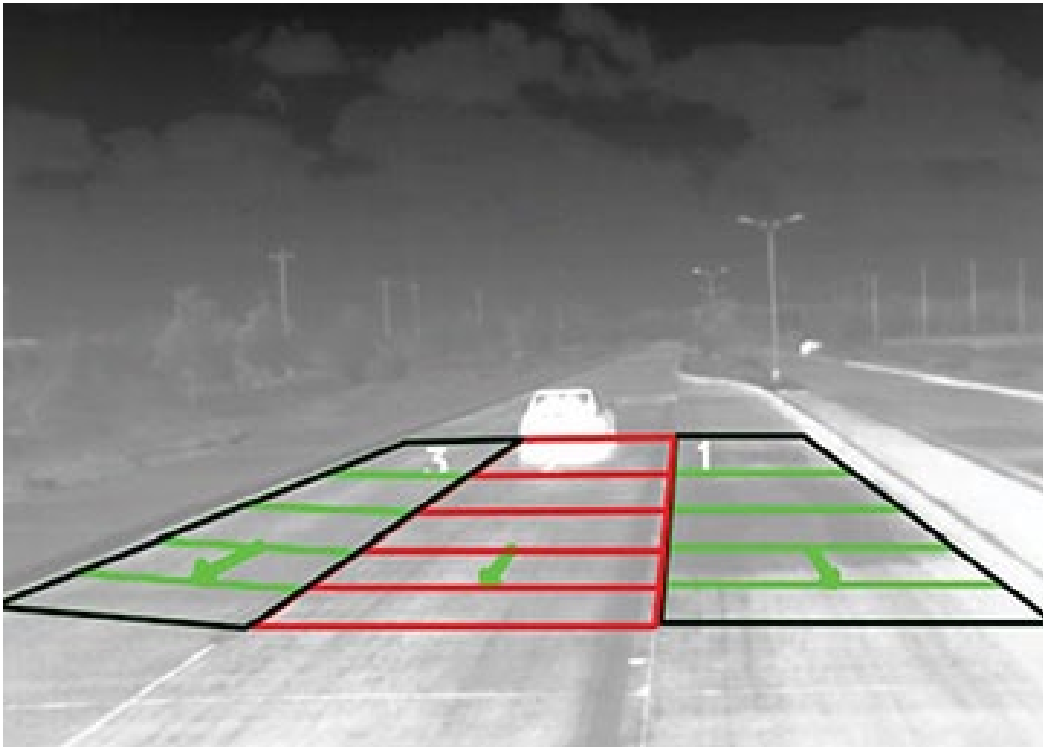
Detect

```
graph TD; A[Detect] --> B[Notify]; B --> C[Warn];
```

Notify

Warn

# DETECT



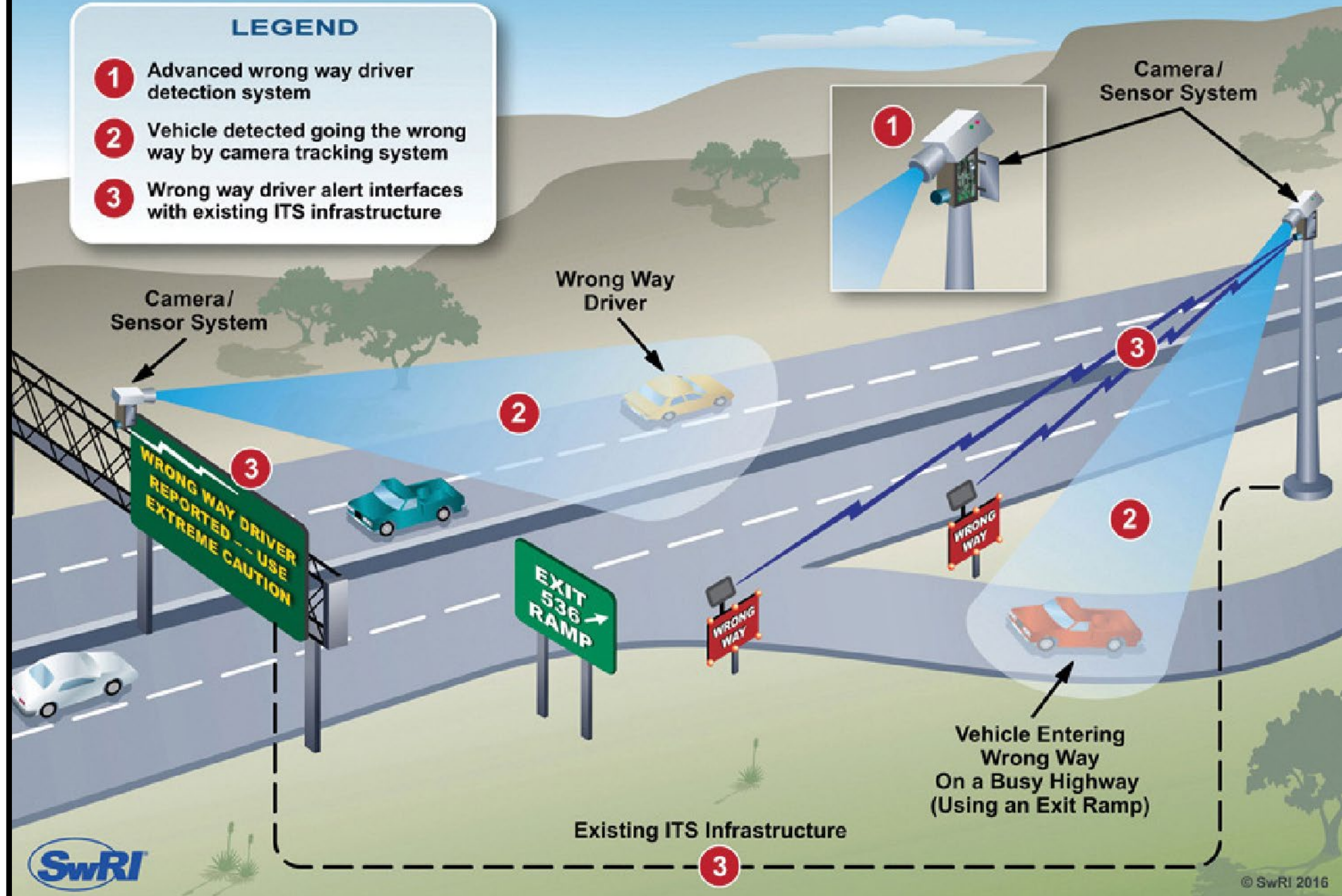
- Detect wrong way drivers as they enter the roadways and track them as they continue driving.
- Sensors:
  - Loop Sensor
  - Radar
  - Infrared Camera
- Emerging Technologies:
  - AI and Cameras
  - Connected Vehicles

# Camera / Sensor-Based System – Wrong Way Driver Alert

## Traditional Infrastructure

### LEGEND

- 1 Advanced wrong way driver detection system
- 2 Vehicle detected going the wrong way by camera tracking system
- 3 Wrong way driver alert interfaces with existing ITS infrastructure



# NOTIFY

## Receive the Detection

Operations personnel receive a real time traffic notification.

- Visual and audio notification
- Email

Review alert details.

## Verify

Visual verification of the incident is done through camera footage.

Dismiss false alarms.

## React

Respond to the wrong way driver to mitigate impact.

Automate responses and alerts.

Contact the authorities.


# EXAMPLE WRONG WAY DRIVER NOTIFICATION

WWD ALERT - 7:52:44 PM - Sable - administrator

WWD Detection

Sample Road - s  
South in North Lanes

TAPCO Images



Below the main image is a sequence of five smaller images showing the car's movement over time, with the current frame highlighted in blue.

Near Cameras

Imaginary camera

Dismiss Confirm View On Map Dynamic Switching



# WARN

- Alert the wrong way driver as they enter the highway and as they continue to drive.
- Warn Right-Way drivers of the potential thread threats.
- Alert Mechanisms:
  - Dynamic Message Signs
  - Roadside Lights
  - In-Vehicle Alerts



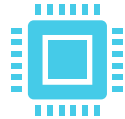
# CONSIDERATIONS



## **Accuracy:**

False positives would impact automated systems.

Missed detections risk lives.



## **Speed:**

TMCs should be notified of detections as soon as possible to facilitate rapid responses.



## **Reliability:**

An effective system must be operating 24/7 or missed detections are at risk.



## **Cost**

Systems may incur installation and maintenance costs.



## **Integration**

WWD systems should seamlessly integrate with existing systems.

# DIRECT-TO-DETECTOR INTEGRATIONS

## Pros

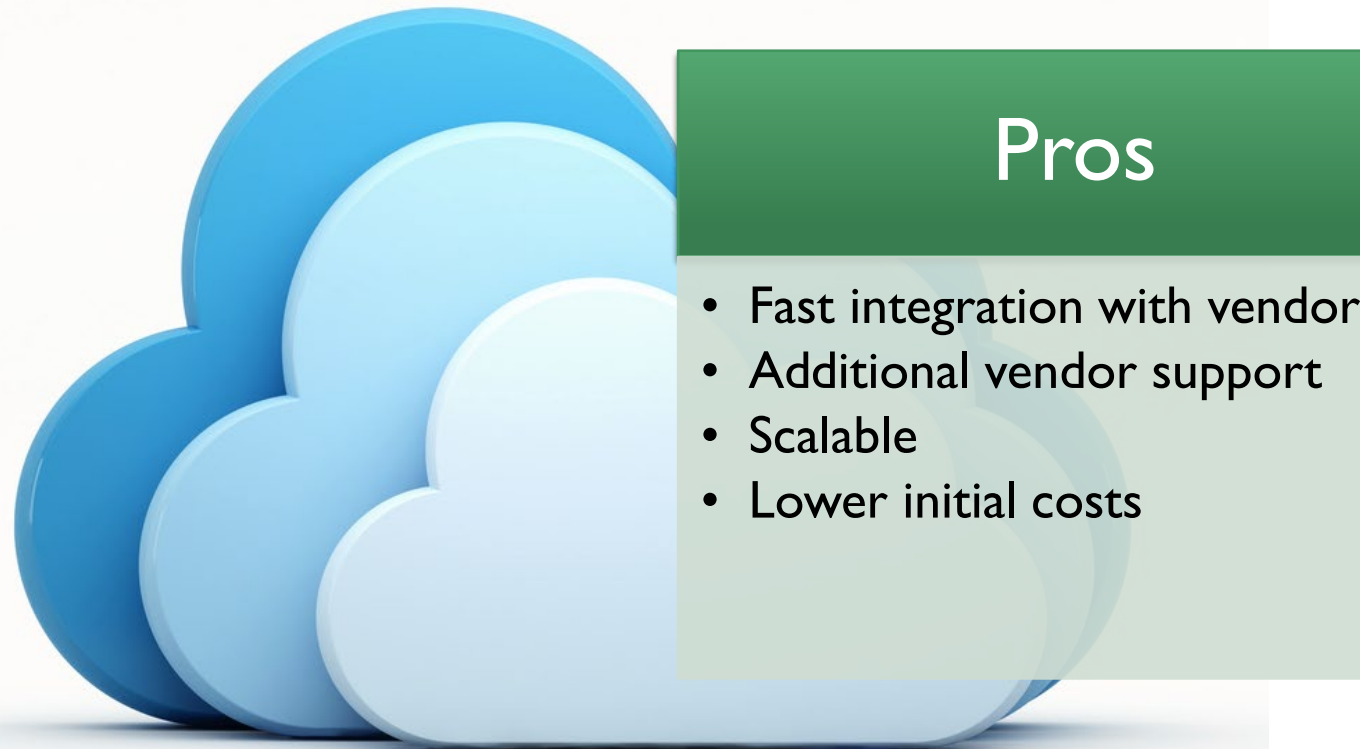
- Near real-time communication
- Closed network systems
- Fewer points of failure for outages
- Long-term cost is for maintenance

## Cons

- Integration may take longer
- Higher initial installation and integration cost
- Limited vendor support



# CLOUD BASED INTEGRATIONS



## Pros

- Fast integration with vendor
- Additional vendor support
- Scalable
- Lower initial costs

## Cons

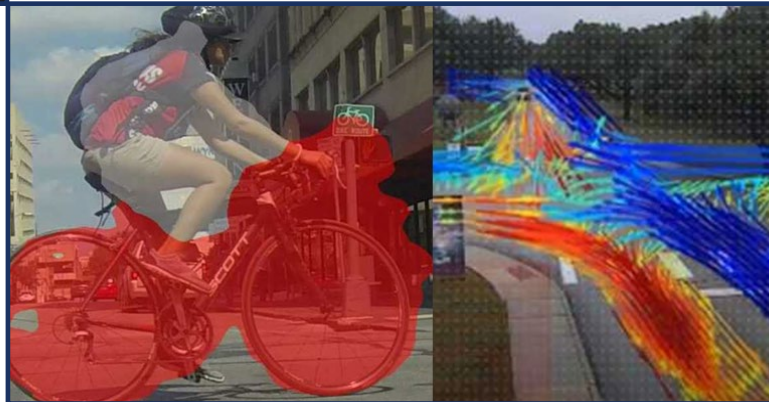
- Network latency
- Risk of outages based on vendor
- Subscription cost
- May not integrate with existing software

# FUTURE OF WWD



Connected and  
Autonomous  
Vehicles

Artificial  
Intelligence



Advancements  
in Hardware  
and Analytics

QUESTIONS?

Sabrina Mosher

[Sabrina.Mosher@SwRI.org](mailto:Sabrina.Mosher@SwRI.org)

(210) 522-6709

## ADDITIONAL RESOURCES

- [https://aiaa.transportation.org/Documents/wrong\\_way\\_driving\\_adot\\_pilot\\_report.pdf](https://aiaa.transportation.org/Documents/wrong_way_driving_adot_pilot_report.pdf)
- <https://static.tti.tamu.edu/tti.tamu.edu/documents/0-7119-R1.pdf>
- <https://www.swri.org/technology-today/righting-wrong-way-driving-problem>
- <https://aaafoundation.org/wp-content/uploads/2021/03/20-1347-AAAFTS-Wrong-Way-Driving-Brief-FNL-CX.pdf>