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AVI FROM THE GROUND UP…

FEBRUARY 9, 2018

BELOW GROUND TECHNOLOGY IS STILL
BETTER, AND IN MOST CASES
LESS EXPENSIVE THAN
ABOVE GROUND TECHNOLOGY

HISTORY OF AVI

DETECTOR SYSTEMS

- Developed between 1988 and 1989
- Simple Design (installation and maintenance)
- Design based on constraints and technology at the time(based on simple coding used in garage door openers)

HISTORY OF AVI

EARLY ADOPTERS

- Clark County, Nevada
- Needed access to ever popular gated communities
- City of Los Angeles Transit District
- Needed something for transit and priority access at intersections

HISTORY OF AVI

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- Detector Systems disappeared in acquisitions
- Early Adopters needed something to replace and extend existing equipment
- AVI-A was first released product to work with existing Detector Systems equipment
- Fully Retrofitted to existing equipment
- AVI-B was released to fix noise issues that were found in Detector Systems equipment

LARGEST DEPLOYMENT FOR EMERGENCY VEHICLES

CLARK COUNTY FIRE DEPARTMENT

Started with Emergency Vehicles only,

It now incorporates most County vehicles

LARGEST TRANSIT SYSTEM

LOS ANGELES TRANSIT DISTRICT

Most if not all of City of Los Angeles buses are equipped

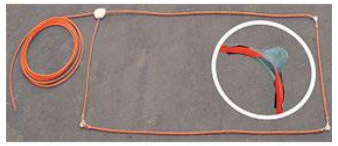
Over 1000 intersections use the detection

TRAFFIC SIGNAL CABINETS

INTEGRATES INTO ANY CABINET TYPE

AVI COMPONENTS

2 BASIC COMPONENTS



- Reno A&E
  - Cabinet Hardware
    - AVI-E detector card (Receiver)
  - Vehicle
    - Transmitter (Puck)
- Controller Software / Hardware
  - Software
    - Controller needs to have TSP programming capabilities
    - Cabinet needs to have loop detection racks or capable of shelf mounted detectors

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FUNCTIONALITY AND TECHNOLOGY

- AVI (PUCK AND CABINET)
  - Technology
    - Transformer coupling technology
    - Vehicle equipment is “transmitter” and is the primary coil
    - Loop in the ground is “receiver” and is the secondary coil
- CODING
  - Security (Puck)
    - Only Emergency vehicles can be outfitted with EV code
  - Codes (Puck)
    - 19682 codes can be generated
    - Uses 375 KHz frequency (above loops, below AM band
    - Fixed logic chip from Motorola
- CABINET COMPONENT
  - AVI-B, AVI-C, AVI-E, BT-AVI
    - Different detectors for different uses
    - Receives 375 KHz frequency and triggers output if right code is received.
    - AVI-E has a serial output for additional information
      - ID / Time Stamp / Location
- TOOLS
  - Code Reader
    - Used to verify codes in puck and if the puck is working

INSTALLATION

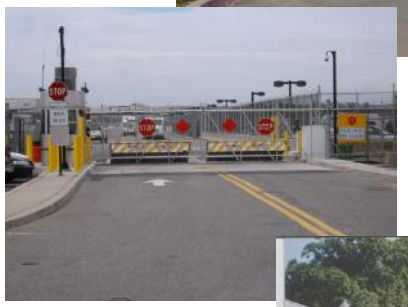
- LOOP
  - Technology
    - Loop can be any size, (LA Transit uses 6 X 90 loops across the roadway)
    - Can use existing loops
    - Maintenance and set up is much less cumbersome
- CODING (DUAL CODE)
  - Security
    - One code used universally for TSP at each intersection
  - Access
    - Second Code can be used for tracking or access
- PROGRAMMING
  - Programming is done at the factory
  - No EV codes are sold to private parties

ADVANTAGES

- COSTS
  - Less expensive than competing technologies
    - Cabinet hardware much less expensive than other technologies
    - Vehicle equipment much less expensive
- SECURITY
  - Hacking
    - Not able to hack this system with 3rd party devices
  - Tracking
    - Easily track vehicles using the system.
- MAINTENANCE
  - Virtually no maintenance
  - Once installed there is no need to go back.

CURRENT USERS

- USERS
  - City of Los Angeles Transit District
    - Over 1000 intersections use this technology
    - Busses outfitted with 2 code hockey pucks
  - Clark County, NV
    - All Police, Fire, Emergency vehicles
    - All Parole officer vehicles
    - Planning on other County vehicles including meter readers.
    - Used for gate access to all gated properties by building code
  - Rental car agencies
    - Avis, Budget,
      - Used for bus access into lots
  - Salt Lake City LRT
    - Used to control traffic signals using TSP
  - Park and Ride
  - University of Virginia
    - Security vehicles
  - Orange County Airport – Security Access
  - New York / New Jersey Port Authority
  - Private Residences

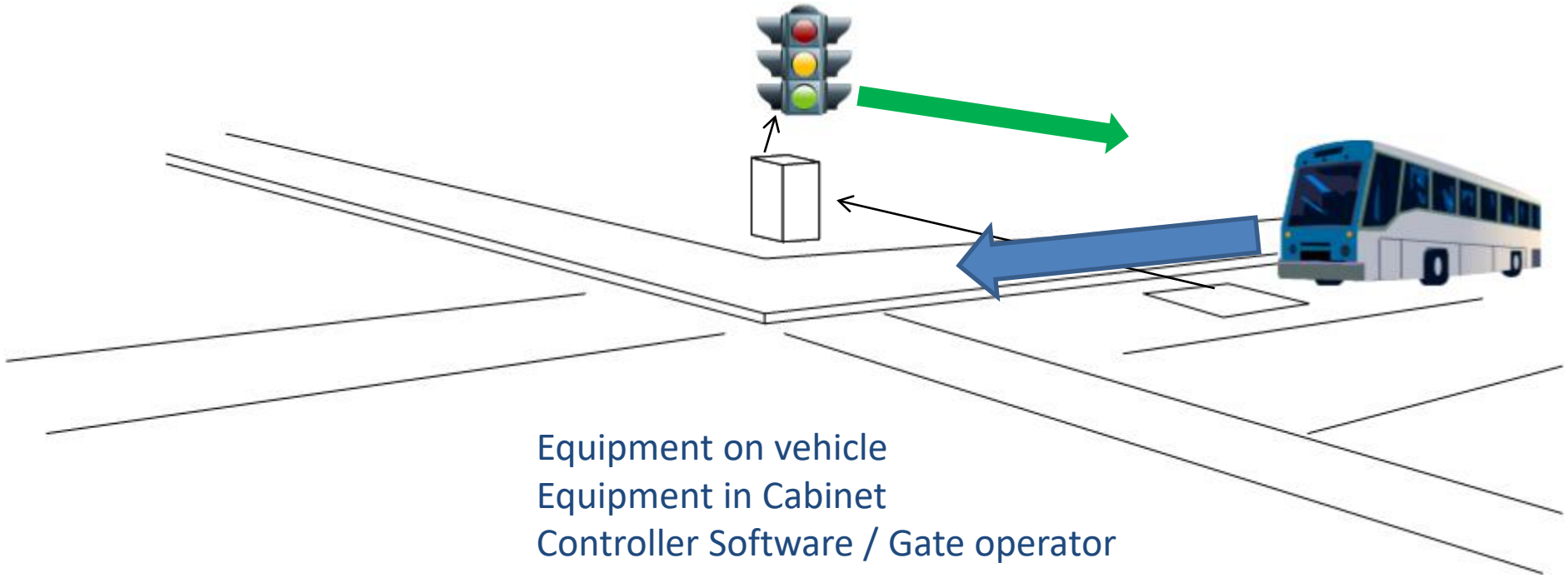


OPERATIONS

- TSP
  - Controller Software
    - Advanced Software functionality in different controllers
    - SEPAC 3.52 uses advanced detection and multiple levels of priority based on specific inputs
    - ASC3 software uses advanced detection and low or high priority for TSP
- LRT
  - Additional functionality or priority given to Light rail because of size and separation from traffic.
- PREEMPTION
  - Higher level than priority, used for emergency and train preemption
    - Can be used for TSP in certain conditions
    - Uses AVI or other types of detection
- ACCESS
  - Used for secure gate operations into yards
    - All city vehicles could be isolated or have one single code
    - Directional to determine entry or exit

TSP – COMPONENTS

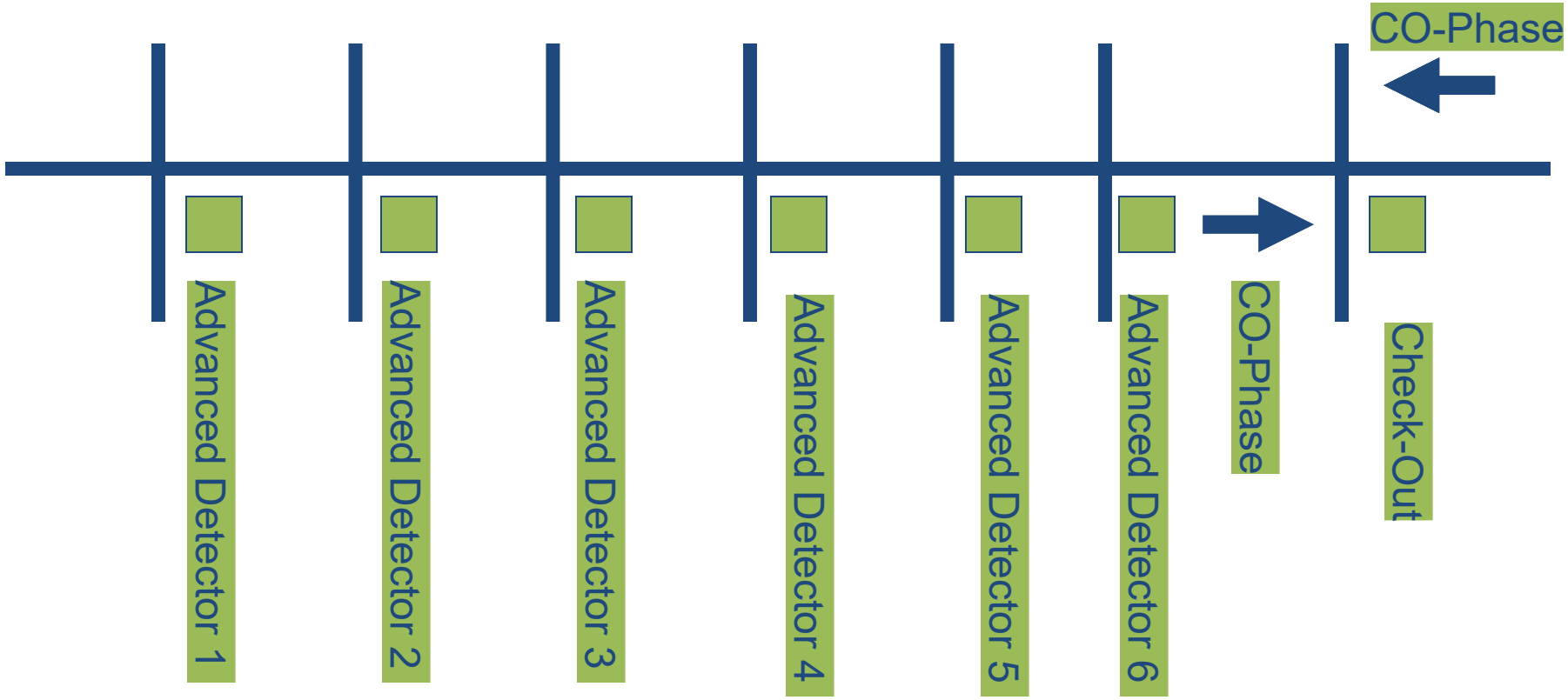
REDUCED COST ALTERNATIVE



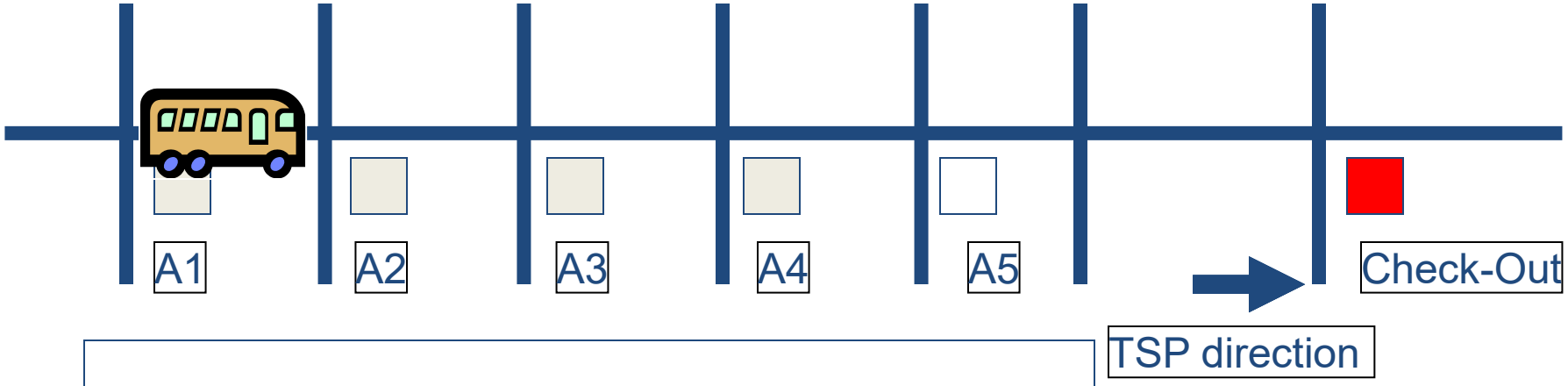
Equipment on vehicle
Equipment in Cabinet
Controller Software / Gate operator

TSP VEHICLE TRACKING WITH AVI

Use of advance detection using AVI over multiple intersections gives the Transit vehicle ultimate capability of getting a green light



TSP VEHICLE TRACKING USING AVI

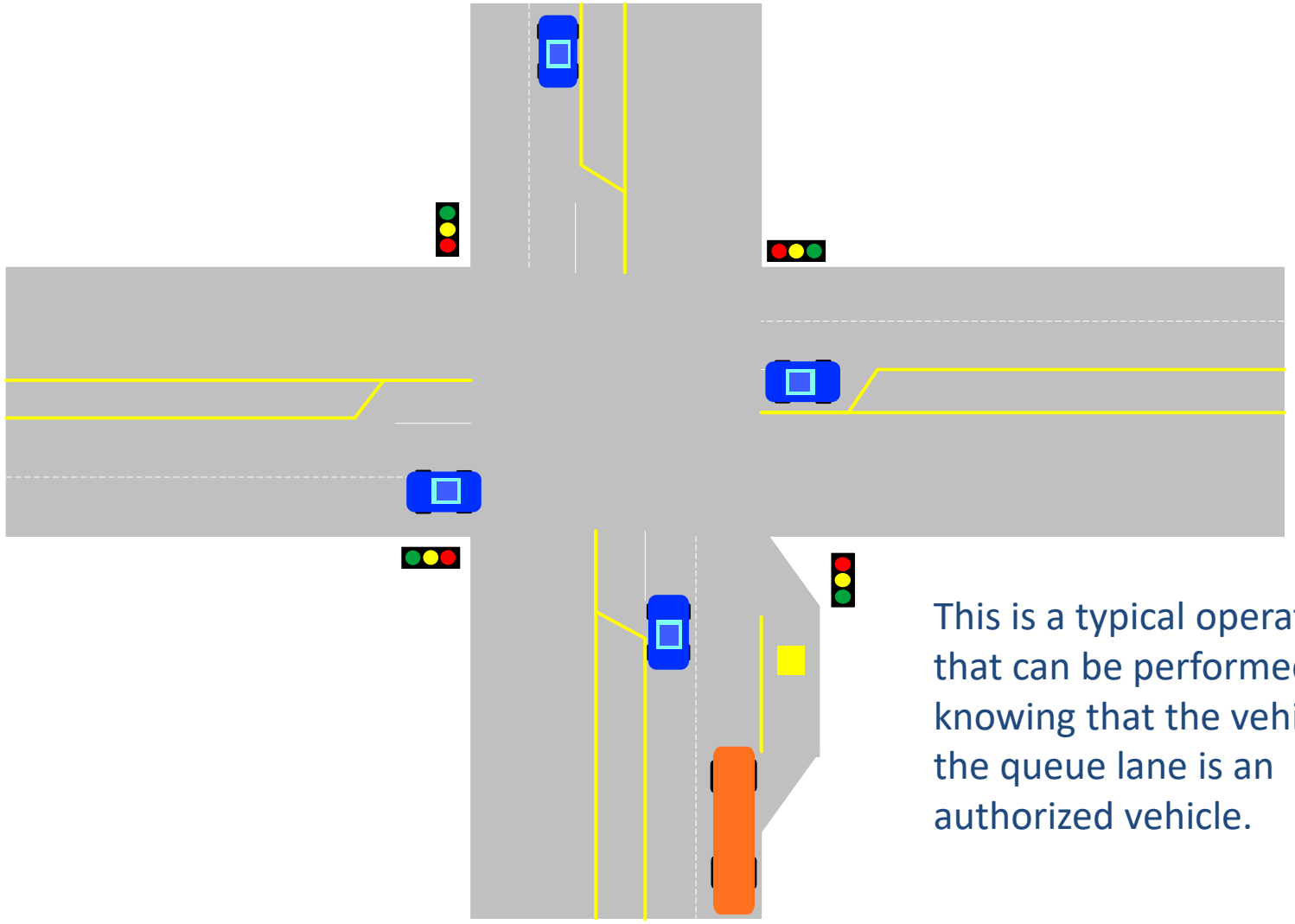


The Check-out detector releases the controller back to normal operation vs. waiting for a time-out to occur.

Can be performed using controllers with Peer-to-peer communications allowing advanced TSP operations.

QUEUE JUMPING PRIORITY SERVICE WITH AVI

QUEUE JUMPING



This is a typical operation that can be performed knowing that the vehicle in the queue lane is an authorized vehicle.

CONCLUSION

- AVI is a well developed product and has been in use for at least 20 years.
- Easily installed and maintained
- Can be used for transit and EVP as well as access security
  - Easily installed and maintained
  - Less expensive than other technologies.
- Tied to the vehicle
- Other possible functions
  - Fuel depot identification of vehicle
  - LRT
  - Station monitoring
    - Where a vehicle is on a property
  - Dock operations