SmartPark Technology Demonstration Project, Phase II: Final Report

BACKGROUND

In 2000, the National Transportation Safety Board recommended that the Federal Motor Carrier Safety Administration (FMCSA) create a guide to inform truck drivers about locations and availability of parking. In 2002, the Federal Highway Administration completed a congressionally mandated study on the adequacy of truck parking facilities. The study urged the development of Intelligent Transportation Systems (ITS) deployments to provide commercial drivers with real-time information on the location and availability of parking spaces.

In response, FMCSA initiated a two-phased Smart Roadside Initiative project called "SmartPark," the purpose of which was to demonstrate a technology to provide real-time parking availability information to truckers on the road.

PHASE I

Phase I of the SmartPark project demonstrated that Doppler radar-laser scanning technology can be used to count truck parking space usage and determine availability at a truck-stop rest area.

PHASE II

Phase II was designed to demonstrate, via a 6-month field operational test (FOT):

- How truck parking availability information can be disseminated.
- How two adjacent truck parking areas can be networked to divert trucks from a filled parking area to an unfilled area.
- Whether a truck parking space reservation system would be feasible.
- Whether forecasting future truck parking availability is feasible.

SUMMARY OF SMARTPARK CONCEPT

The basic concept of the SmartPark system is to determine (using Phase I-identified technology) the number and type of vehicles entering and exiting a parking area to determine parking lot occupancy. Each site sends its information to a central server.

In the FOT, the parking availability information was disseminated through multiple methods: a Web site, a mobile application, an interactive voice response (IVR) system, and dynamic messaging signs.

The facilities were fitted with closed-circuit television (CCTV) cameras to verify parking lot availability and adjust lot count to facilitate calibration as needed.

The tested system allowed users to reserve designated parking spots via the Web site, mobile application, and IVR; users could create and manage a reservation, which eventually expired. There was no enforcement of the reservation system.

The system gave predictions on parking availability for given dates and times based on corresponding historic data.

Figure 1 shows an overview of the SmartPark system architecture.

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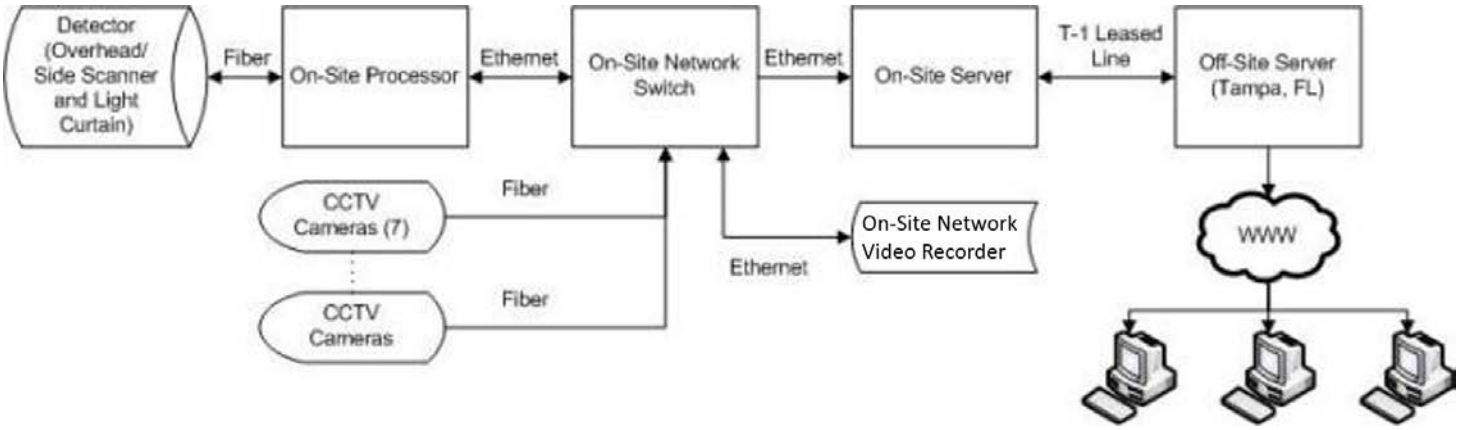

Figure 1. Diagram. SmartPark local area network architecture summary.

FINDINGS/RECOMMENDATIONS

A summary of the performance of the SmartPark system and its two sites is provided in Table 1. The research team learned the following lessons from the 6-month SmartPark FOT:

- **Management:** The check-in/check-out style system requires regular maintenance and calibration.
- **Usage:** Truckers have adopted the system and use it to determine where to park. Usage at both lots has increased significantly.
- **Future Deployments:** An alternate style of vehicle detection that does not result in compounding error would be superior.
- **Communication:** Robust communications are highly recommended to any traveler information system. When communication goes down, the accuracy of the information broadcasted to the public is affected.
- **Mobile Applications:** Truckers are accustomed to using mobile applications, but a standalone application (unincorporated with other applications) limits the number of users.
- **Dynamic Messaging Signs:** Truckers tend to rely on dynamic messaging signs much more than mobile applications for truck parking availability information.
- **Reservations:** The field test demonstrated that reservation system would only work if enforced.
- **Infrastructure:** Future deployments will ideally use pan/tilt/zoom (PTZ) cameras, which will reduce the number of cameras needed. Full visual coverage of a site is necessary for calibration of the ingress and egress sensors and identifying issues, such as vehicles parked illegally or blocking the roadway.

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Table 1. Summary of performance results.

Requirement	Description	Performance Target	Actual Performance
Component Performance Requirement (CPR) 1	The sensors shall determine the length of vehicles and classify all vehicles with no more than 1% false or missed detections.	99%	99.23%
CPR2	The sensors shall collect parking availability information 99% of the time.	99%	73.5%
CPR3	The sensors shall determine the length of vehicles and classify all vehicles with no more than a 5% rate of erroneous classification.	95%	18–100%
System Performance Requirement (SPR) 1	The system shall provide truck parking availability information 99% of the time.	99%	100%
SPR2	The system shall provide truck parking availability information with 95% accuracy.	95%	100%
SPR3	The system shall have fewer than 5% false detection alarms.	95%	92–93%
SPR4	The system shall provide truck reservation capability 99% of the time.	99%	100%