

# Video-Based Parking Space Count System

## INDUSTRY:

Airports, Seaports, Transit, Universities, Entertainment Venues

## CUSTOMER:

International Airport

## PRODUCT:

PureActiv Video Analytics

## CHALLENGE:

A rising incident of traveler's rage, mounting complaints, illegal parking, lost revenue and high emissions from cars looking for parking spaces had one international airport searching for a better way to route cars to available parking spaces.



International Airports can address parking challenges with the use of a video-based parking space count system. The resulting installation can help meet both performance and budget objectives.

The airport parking terminal is expansive, accommodating over 9,000 vehicles on eight levels. The airport sees an average of 75,000 passengers on a weekend day, and in excess of 105,000 passengers on the busiest holidays. The parking garage is frequently at near capacity. Travelers would drive into the airport's parking garage hoping to quickly locate an empty space. Without a system in place, drivers were forced to travel from level to level and up and down long rows of parked cars, hoping to find an open space or another car leaving a space. Sometimes, in frustration or due to time constraints, they would resort to parking illegally in no-parking zones or on the shoulder of traffic lanes. In addition to customer satisfaction issues, drivers cruising up and down isle after isle looking for a parking space were creating excess emissions.

The airport had to find a car park system that would quickly direct travelers to the empty parking spaces and be within their budget constraints. They evaluated several systems already installed at several other airports as a means of comparison.

- Ultrasonic Sensor Design - Where each parking space was equipped with an ultrasonic detector to monitor if the space is occupied. The installed cost was approximately \$1,100 per space ... outside the available budget.
- Buried Copper design – This system, which was also outside the targeted budget, relied on copper wires embedded in the floor to sense and count cars as they enter and leave. Cutting into pre-stressed concrete can be a very expensive and dangerous undertaking and would impact current operations.

## SOLUTION:

After extensive research to determine the optimal approach to the problem, they decided on the use of a vision based, video analytic vehicle counting system to count cars in their airport parking garage. The resulting system consists of four components: video cameras, PureActiv [vehicle counting video analytics](#), aggregating / signage server and the physical signs to display the lot information to the drivers.

The cameras themselves, are ordinary IP surveillance cameras. Each floor was divided into several zones. The cameras were mounted at the entrances and exits of each zone and each floor so they could monitor cars moving in and out of the regions. The parking structures contained sufficient lighting, so no additional illumination was required. The video signals are then sent to the PureActiv software.

The software analyzes the video image and then advanced background algorithms ignore any nuisance images, such as shadows or lighting changes. Once an object is detected, a filter is applied to avoid counting non-vehicle items, such as humans and luggage, or vehicles not moving in the desired counting direction. An accurate count is then provided by floor or zone to the signage server.

The signage server then aggregates the counts of incoming and outgoing vehicle for each floor and zone, formats that information and sends it to the physical displays for drivers to view when entering the structures. The system includes the ability to manually adjust the count to compensate for any count anomalies.

The development and installation of the video analytics-based space count system was up and running within 18 months. The cost was under the \$3.5 million budget or less than \$400 per space for 9,000 spaces (compared to \$1,100 per space for comparable counting systems).

### SYSTEM CHALLENGES:

The installation was not without its challenges. The system had to be configured to take into account many variables such as lighting, weather conditions, headlights, speed of cars passing, color of cars, cars driving in the wrong lanes, and high profile vehicles. The low ceiling height of 7.5 ft and close proximity of the cameras to the vehicles created additional challenges for the software engineers.

Now fully operational, the new system uses 108 cameras throughout the garage. PureActiv software [analyzes the video feeds](#), detects moving cars, and keeps track of how many cars are parked in each section. Signs at entrances of each level tell drivers which direction to proceed and how many spaces are available in each section.



Challenges to deploying the video based counting system included lighting, weather conditions, headlights, speed of cars passing, color of cars, cars driving in the wrong lanes, high profile vehicles and very low camera mounting heights

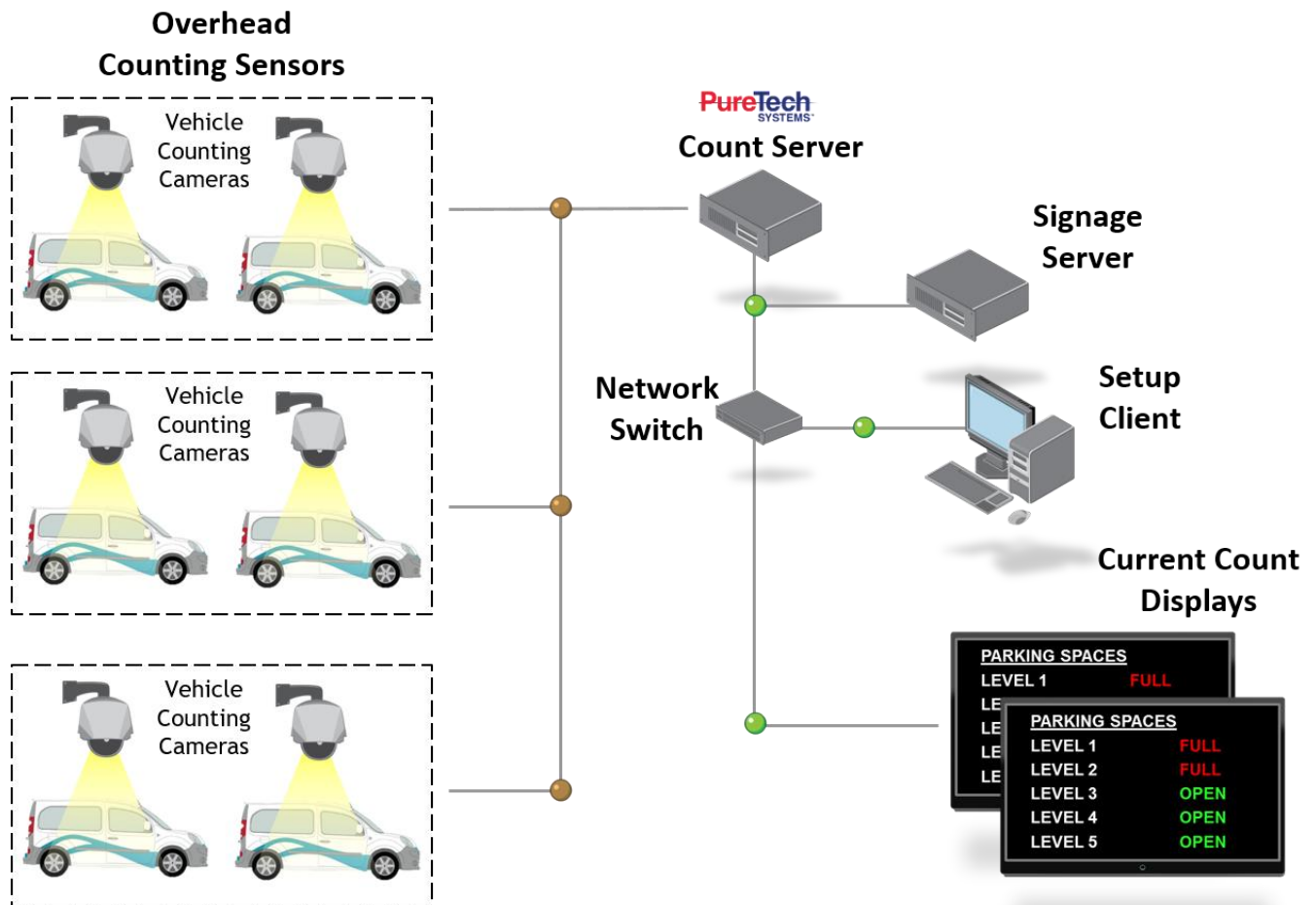
### RESULTS

**Accuracy** - Reported count accuracy at greater than 98.7% on a daily basis.

**Customer Satisfaction** - Travelers are now finding their way to available parking spaces with ease. The number of daily customer complaints has been reduced from 20 to 50 to nearly zero.

**Budget** - The final cost was under the \$3.5 million budget (Less than \$400 per space)

**Reduced Emissions** – Vehicle Emissions have been substantially reduced.



Example Architecture – Cameras as counting sensors, provide count data to the signage system for display to drivers

### Additional Information / Links

Car Counting	<a href="#">Video</a>
Stages of Video Analytics	<a href="#">Video</a>
Solution – Car Counting	<a href="#">Web Site</a>
Video Analytics – Car Counting	<a href="#">Brochure</a>
Car Counting & Service Duration	<a href="#">Brochure</a>
Video Based Car Counting	<a href="#">White Paper</a>



## About PureTech Systems

PureTech Systems Inc. is a manufacturer of wide-area perimeter surveillance software solutions including internally developed outdoor video analytics, PTZ Auto Follow, multi-sensor integration and a map-based (real object size) command and control. It is offered to fortune 1000 firms, petro-chemical, water and electric utilities, seaports, airports and federal, state and local governments. With headquarters in Phoenix Arizona, PureTech Systems serves national and international markets. To find out more about PureTech Systems Inc. visit our website at [www.puretechsystems.com](http://www.puretechsystems.com) , follow us on [Twitter](#) or sign up for our [email list](#).