CITY OF HOUSTON
Administration & Regulatory Affairs Department

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January 12, 2015

Mr. Alan Clark
Director of Transportation Planning
Houston-Galveston Area Council (H-GAC)
3555 Timmons Lane
Houston, TX 77227-2777

RE: 2015 Transportation Improvement Program (TIP) Call for Projects

Dear Mr. Clark,

As the lead sponsor of the automated parking guidance system (APGS) implementation, I am pleased to submit this application in response to the H-GAC Call for projects. Attached to this letter of transmittal, please find the following:

1. Letter of support from COH TIP Committee
2. APGS Executive Summary
3. Houston PGS Concept Document
4. Benefits analysis consideration

My contact information is maria.irshad@houstontx.gov or I may be reached at 832.393.8643 if you have any questions. I look forward to working with H-GAC on this worthwhile project.

Kind Regards,

Maria Irshad, CAPP
Assistant Director

cc: Jeff Weatherford, Deputy Director, PWE
Mike Kramer, Assistant Director, PD

CITY OF HOUSTON

Planning and Development

Annise D. Parker

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January 8, 2015

Mr. Alan Clark
Director of Transportation Planning
Houston-Galveston Area Council (H-GAC)
3555 Timmons Lane
Houston, TX 77227-2777

Re: 2015 Transportation Improvement Program (TIP) Call for Projects – **Letter of Support for City of Houston Projects**

Dear Mr. Clark:

On behalf of the City of Houston, we would like to inform you that the City plans to submit twelve projects to H-GAC for consideration in the 2015 TIP Call for Projects. We respectfully request H-GAC's support and consideration for the projects listed below.

These are projects the City deems as high priority due to project readiness and the impact they will provide to the region's transportation network. The proposed projects will fill gaps to our bikeway system, improve pedestrian safety, improve pavement conditions, and will further the City's goal of having a multi-modal transportation network that encourages walking, biking and public transit. Based on the region's current and predicted growth, a highly functioning transportation network is crucial for regional connectivity and economic success. Furthermore, these transportation projects are consistent with the 2035 Regional Transportation Plan goals to maintain, enhance and expand the multi-modal, regional transportation system.

We note that three of these twelve projects are further supported by agencies that are acting as funding partners for the project: the International Management District, the Houston Parks Board and Uptown District. The projects for which these agencies are acting as partner are noted below.

1. Administration & Regulatory Affairs Department – Automated Parking Guidance System
2. Public Works & Engineering Department - Tanner Rd: Hempstead to BW 8 P&D
3. Public Works & Engineering Department – Westpark P&D: Wilcrest to Dairy Ashford
4. Public Works & Engineering Department – W. Airport: Hiram Clarke to FM 521
5. Public Works & Engineering Department – Gessner: Buffalo Bayou to Richmond
6. Public Works & Engineering Department – Fondren: Braeswood to W. Airport
7. Public Works & Engineering Department – Dairy Ashford: IH-10 to Buffalo Bayou
8. Public Works & Engineering Department – W. Fuqua: City Limit to Chimney Rock
9. Public Works & Engineering Department – Signal Detection Upgrades
10. Parks & Recreation Department/Houston Parks Board (funding partner) – Kingwood Pedestrian/Bicycle Connection

11. Parks & Recreation Department/Uptown District (funding partner) – Memorial to San Felipe Connections

Project Previously Approved for Transportation Enhancement (TE) Funding:
The following project had previously been selected for funding but was unable to advance to construction within the required 3-year timeframe. We respectfully request that H-GAC give additional consideration to this project, since it previously demonstrated worthiness of TE funding.

12. Parks & Recreation Department/International Management District (funding partner) – International Management District Bikeways

If you have any questions regarding these projects, please contact Michael Kramer at (713) 837-7781 or via email at michael.kramer@houstontx.gov. We thank you for your consideration.

Sincerely,

Patrick Walsh, P.E.
Planning & Development Department
Director

Dale A. Rudick, P.E.
Public Works & Engineering Department
Director

PW:MK/ams

cc: Joe Turner, Director, Parks & Recreation Department
Mark Loethen, Deputy Director, Public Works & Engineering Department
Jeff Weatherford, Deputy Director, Public Works & Engineering Department
Gwendolyn Tillotson, Deputy Director, Mayor's Office of Economic Development

CITY OF HOUSTON

Administration & Regulatory Affairs

Interoffice

Correspondence

To: TIP Committee

From: Maria Irshad, CAPP
Administration & Regulatory Affairs

Date: January 12, 2015

cc:

Subject: Parking Guidance System Executive Summary

Project Overview

The City of Houston Parking Management Division will implement a pilot project for an Automated Parking Guidance System in downtown parking structures and on-street parking spaces. APGS is an Intelligent Transportation System (ITS) that guides the traveling public to an available parking space quickly and efficiently. The project consists of a management software system, dynamic LED message signs and static wayfinding signs. The completed system will provide real-time off and on-street parking space availability and direction from main access roads through dynamic and fixed messages signs, website and/or mobile application.

The system will be able to detect, compute, store and transmit real-time space availability. The APGS utilizes a series of way finding directional LED signs showing a combination of locations and available space count to direct the motorist to the first available vacant space in a participating parking facility. The available space information will be displayed in real time on dynamic message signs located in Houston's downtown and at participating garage entrances. The system will be completely automated requiring no input or actions by any individual to gather and display the information. The system will gather available space information from individual garages' Parking Access and Revenue Control systems (PARC), and transmit information to a SQL database in order to transmit in real time the parking availability data for each garage.

The pilot program will be scalable to add additional facilities in any location in Houston deemed necessary.

The goals of the APGS include energy savings, reduction of traffic congestion and its resulting pollution from auto emissions. The City desires to focus on an improved parking customer experience when they arrive in the CBD, to reduce traffic congestion and emissions and improve mobility.

Background

The APGD Program is the City of Houston's proactive approach to address changes and growing demand for parking in the Central Business District (CBD) over the next several years. Marketing, wayfinding, and technology measures will improve access to parking by 2017 when Houston will host the Superbowl. These measures will keep the CBD moving as more jobs and people come to Houston.

The APGS system uses signs to provide motorists with real-time parking space availability and directs them from main Downtown access points to parking garages or on-street spaces. The new technology will make it easy for shoppers and visitors to find parking. It will also reduce traffic congestion and pollution by minimizing the need to circle the block for vacant on-street parking.

Since the city only owns a few parking garages in the CBD this project will rely on partnerships with private garage facilities The project will initially start with four participating private facilities with an option to expand to as many as twenty private garages. Each of the garages uses and maintains a proprietary PARC system that will need to be interfaced with in order to obtain information about the number of available short-term spaces. Each of these garages may also sell monthly parking which would need to be taken into account to determine actual number of short-term spaces available.
The project will be completed in two phases: initial phase and an optional second phase. Initial phase focuses on three destination areas of the CBD, Theater District, Market Square or Historic District, Retail District and Convention District. All participating facilities are located in one of the focus districts. Traffic routing will be coordinated with the Traffic Engineer.

Project Goals
The objectives of this solicitation include the following:
Provide real-time parking information for customers
Mitigate the perceived lack of parking
Reduce time spent searching for parking
Reduce cruising for parking
Contribute to a positive perception of Houston's Central Business District through enhanced parking information.

Parking Facilities included in pilot
300 on-street parking spaces (Market Square)
Theater District Garage, 511 Rusk, 7 entry/exits, 3369 spaces
Convention District Garage, 1002 Avenida De Las Americas, 1 entry/exit, 663 spaces
City Hall Annex Garage, 901 Bagby, 1 entry/exit, 450 spaces
Market square facility
Retail facility
Vicinity Map attached

Houston Parking Guidance System

CONCEPT REPORT

June 2014

Prepared By:

Kimley»Horn

Table of Contents

Tables

Figures

1.0 Introduction

The City of Houston is currently investigating deployment of a parking guidance system in the Downtown area to facilitate a collaborative parking experience. The purpose is to allow travelers to make informed decisions and most efficiently guide them to their desired destination.

This document is intended to provide a nontechnical, user-oriented analysis of the system's approaches and strategies. It focuses on the needs, goal, objectives, solutions, and stakeholder issues. This concept document is the first step towards development of functional requirements in the overall process of implementing a parking guidance system. It is essentially a guide developed to identify what parking guidance is, how it is supposed to work, and what needs to happen to accomplish that.

When faced with this exciting challenge, many questions arise immediately. In the following paragraphs, we will attempt to answer and address such questions.

2.0 Concept

The most obvious, basic question is "What is a Parking Guidance System?" A Parking Guidance system is a system that will assist motorists in locating available parking. Many of these types of systems have been deployed in large parking facilities with multiple levels (at airports, for example). In most cases there would be a sign at the facility entrance displaying available parking on each level. In a Central Business District, the parking is more likely to be spread over several blocks rather than located within one facility. Therefore the point at which information is conveyed would not necessarily be as simple as at the entrance. Users would need information in advance to make informed decisions on the direction of available parking. Providing this information to motorists, and allowing them to make educated decisions about their driving direction will have cascading benefits to the community and the environment, as well as giving the driver a pleasant experience. These types of parking guidance systems are very popular in European countries and have been gaining popularity in the US.

2.1 Goals and Objective

The stated goals and objectives of the new system are to:

- Mitigate the perceived lack of parking
- Reduce time spent searching for parking
- Reduce fuel consumed searching for parking
- Reduce queuing at parking facilities

2.2 Benefits

There are several benefits of a parking guidance system to the community:

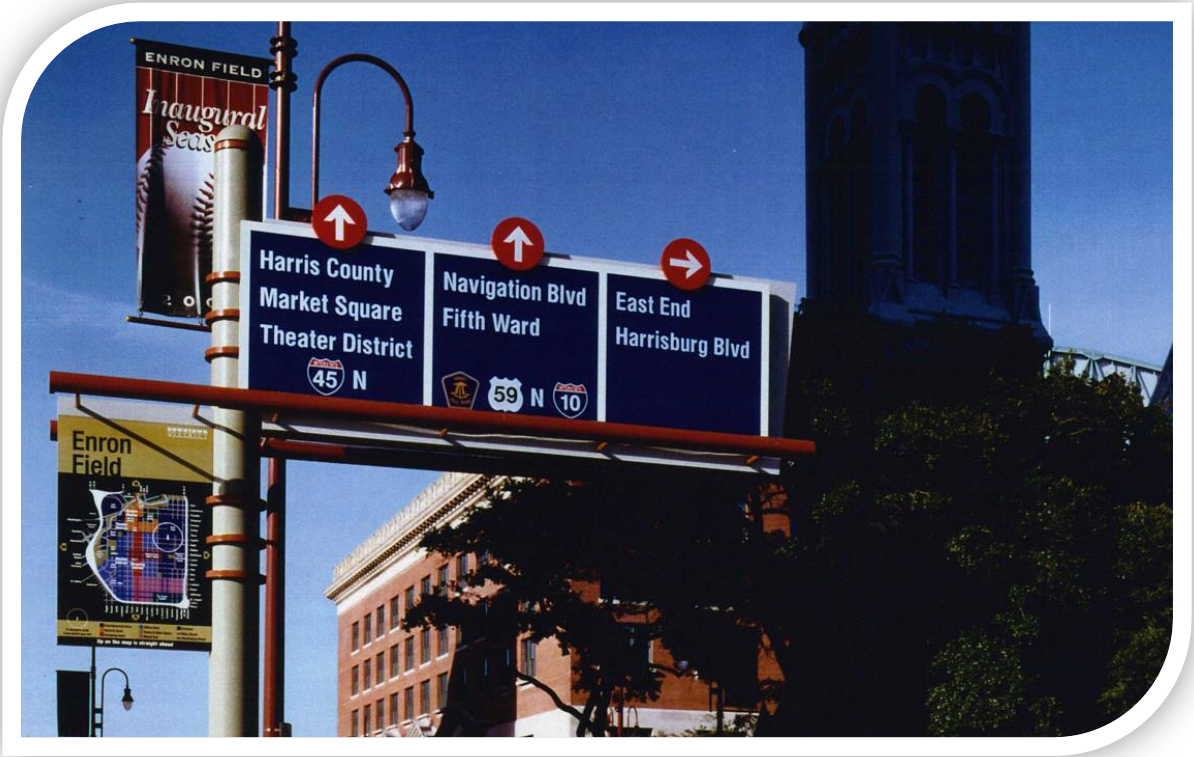
- Parking guidance systems can help a motorist feel more comfortable in knowing they will be able to find parking easily. It will reduce the time spent searching for parking.

- Because parking can be found quickly, there will be less fuel consumed while circulating in search of parking.
- Less circulating traffic will make a safer environment for pedestrians.
- It will provide a more pleasant experience to all; from pedestrian, to motorist, to retailer.

Knowing the positive impact of each of these on the environment, economy, and visitors experience answers the question of “why is a parking guidance system important”.

3.0 Approaches

While studying Downtown Houston and the availability of parking, it has become clear that two of the greatest strides in enhancing a visitors parking experience are to utilize the existing wayfinding signage in the Downtown area and to make the parking more easily identifiable. Once completed, the parking guidance system will be represented as a continued component of the City’s wayfinding program. Motorists will follow wayfinding signage from the freeway (in some cases) to their district and will then encounter dynamic parking information as an extension of the wayfinding system. This will provide visitors with guidance and reinforcement until they have quickly and safely reached their destination. The ingress routes into each district and proposed signage is further detailed by the PowerPoint presentation and map accompanying this document



3.1 Inputs

There are a number of operational and design considerations to take into account to ensure the implementation of the most effective guidance system. One of the most important questions is, “what facilities will participate in the program”? It is expected that facilities must have an acceptable number of public parking spaces available at least 5 days a week and be willing to provide electronic, real-time, parking capacity and availability numbers for dissemination to the traveling public.

When it comes to data collection and transfer, there are a number of technological approaches possible. How will the space availability data be collected? The inventory of available spaces needs to be accurately quantified. Installing inductive loops or other in-ground sensors at facility entrances and exits to monitor vehicles entering and exiting is one possible approach. Non-invasive ultrasonic sensors are similar to inductance loops but require that the ultrasonic sensor be hung overhead. These approaches generally require some channelization to be effective.

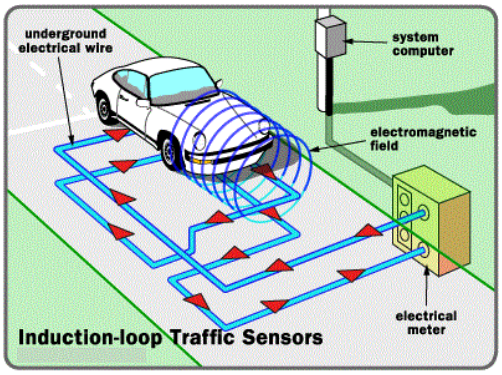


Figure 1: In-pavement Loops
Photo courtesy of: http://juturimedia.files.wordpress.com/2013/01/red-light-camera-loop.gif?w=529

Video detection is also a means of achieving the same goal, although the presence of pedestrians and extreme weather conditions may cause false reporting. Re-calibration of video detection equipment may require specialized expertise and the equipment is generally more expensive than in-pavement detection technology. However, installation of video detection technology is generally non-invasive to structures.

Figure 2: Video Detection
Photo courtesy of: http://www.visoway.com

Additionally, a revenue control system can also be used to report space occupancy. This generally requires software integration with the revenue control system vendor, but does not require installation of additional detection equipment. Installations in other cities have shown the revenue control system counts to be inaccurate unless calibrated daily by garage deck operators. The way each parking facility handles special events parking needs can also present challenges when using any of these technologies. However, some revenue control systems are advanced enough to make accommodations for such use.

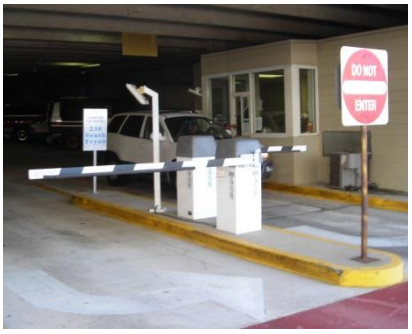


Figure 3: Revenue Control System

Each of these approaches has benefits and drawbacks.

Table 1. Vehicle Detection Options

Technology	Pros	Cons
Inductive Loops, Puck Sensors	Automatic, no manual input required	Invasive Installation
	Very accurate	Limits facility participation
	Generally less costly than other detection technologies	
Video Detection	Automatic, no manual input required	Not reliable in inclement weather
	Generally non-invasive	Presence of pedestrians could cause false reporting
	Capable of being calibrated from central location.	Limits facility participation
Revenue Control System	Automatic, no manual input required	Limits facility participation
	No detection hardware installation required.	Inaccurate unless accompanied by daily calibration.
		May require software integration with multiple revenue control system vendors.

3.2 Central or Hosted System

The City of Houston will have the choice of deploying either a central parking guidance software system at a City data center or purchasing hosted parking guidance software system services. There are two primary considerations for selecting a central or hosted system:

1. Does the City feel that it can maintain the software system more efficiently and cost effectively than the software vendor? In many cases, cities that maintain signal system, video management or other transportation-based software systems may have an appropriate environment for maintaining a PGS software system. However, many cities find that paying for a hosted system can remove maintenance headaches and provide them the ability to be more demanding with software system reliability and accessibility.
2. Does the City utilize owned network infrastructure? As discussed in the next section, if the City desires to utilize owned network infrastructure, then the City will already be maintaining one portion of the system and may be more open to a program for maintaining both the network infrastructure and the data center hardware.

The city will need to evaluate current vendor offerings with their IT team to determine the most appropriate central system.

3.3 Connections

How will data be sent from the parking facility to the central software system and from the central software system to the dynamic signs? Outside of video detection, parking guidance system hardware (such as Dynamic signs, loop detectors, ultrasonic detectors, and others) generally require very little bandwidth for communication. This broadens the spectrum of available communications technologies. If the City currently maintains fiber optic cable, copper twisted pair cable, or wireless communications in the Downtown area, it may be feasible to use some of these connections for the parking guidance system. Otherwise, cellular or leased telecommunication services (DSL or cable) may be most appropriate for the PGS.

It is recommended that the city take an in-depth look at both agency owned and service provider telecommunications available in the Downtown area to determine the most appropriate communications architecture.

3.4 Outputs

How will the information be conveyed to the users? There are several technological options for conveying parking availability and status. In keeping with the intent of the wayfinding program, dynamic message signs (DMS) along the roadway and on parking structures will be the primary means of conveying information to motorists. For the City of Houston, the use of dynamic parking directional signs is recommended along main entrance routes to each Downtown district. These signs will direct motorists toward individual parking facilities. Dynamic parking garage signs and parking lot signs are also recommended for each public parking facility (meeting the City of Houston's criteria for inclusion) within the district. These signs could include level-by-level parking information for large parking garages or could simply display the number of publicly available parking spaces in each garage.

Figure 4: Directional DMS (San Jose, CA)

Figure 5: Parking Garage DMS (Charlotte, NC)

In essence, DMS are only one option for system outputs. With the information infrastructure in place, pushing the parking information out to secondary sources such as GPS devices, Smartphones, and web pages is also a means of conveying information to users.

Figure 6: In-Vehicle Navigation System
Photo courtesy of: mustangs.about.com

Figure 7: Handheld Smartphone
Photo courtesy of: letsgomobile.org

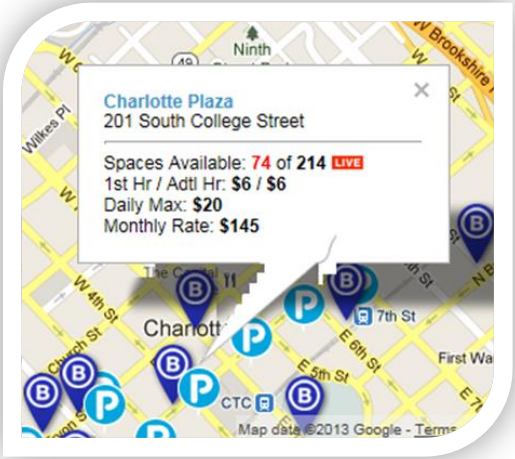


Figure 8: Real-time Parking Web Page
Photo courtesy of: http://www.charlottecentercity.org/transportation/parking/

4.0 Overall System Concept

The overall system concept has been depicted in **Figure 9** on the next page. As you can see, parking revenue control system and/or parking detection equipment will communicate with a central software system that is either hosted or located at a City of Houston data center. Software on the central system will disseminate the data to dynamic parking signs via a municipal enterprise network comprised of either agency owned or leased communications. The software will have its own web-based interface for maintenance, reporting, and control by City and/or parking garage staff. The software can also be integrated with parking mobile application providers and parking information web sites.

Maintenance of the PGS will depend on the software system and communications model preferred by the City of Houston. The level of maintenance could range from only administration of the PGS hosted system contract and communications contracts to a half-time employee responsible for maintaining the PGS central and field components.

5.0 Next Steps

As part of the Systems Engineering process, this Concept of Operations is the first step in the planning, design, construction, and maintenance of the parking guidance system. Using the information provided in this initial concept report, the next step will be to hold a workshop with City of Houston stakeholders to help define the details for a Concept of Operations document and to begin developing high level functional requirements for the PGS. These functional requirements will later be refined into detailed requirements as the City prepares to procure the PGS.

It is recommended that the City perform a small pilot, perhaps on a single garage or on a specific district before planning, designing and deploying a complete downtown system. This will provide valuable experience for Houston-specific issues related to a PGS deployment.

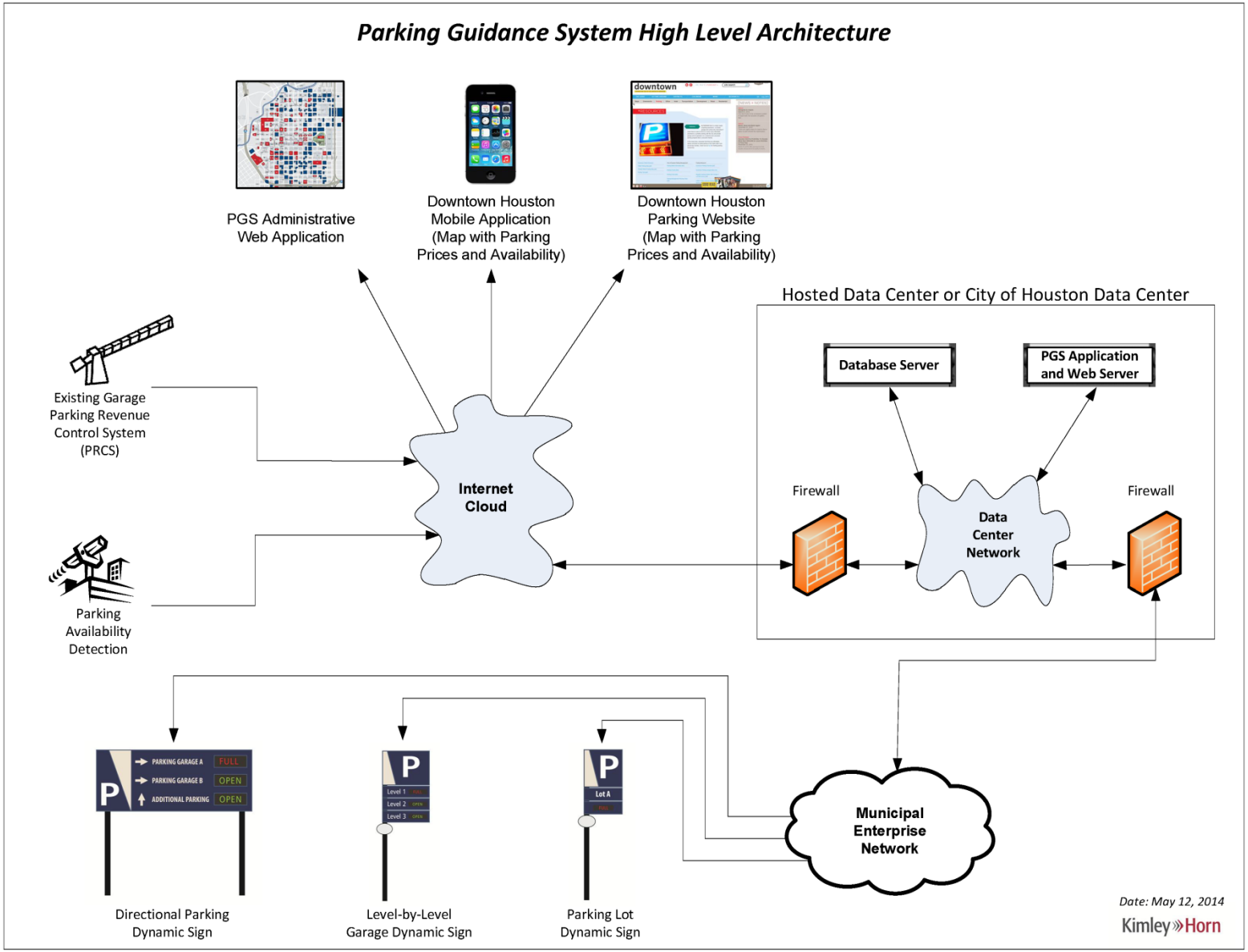


Figure 9: Parking Guidance System High Level Architecture

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Benefits Analysis

The Automated Parking Guidance System will provide benefits to the City of Houston including:

1. Reduced congestion
2. Positive impact to air quality due to reduced congestion/cruising

In order to measure the benefits, the City seeks the assistance of HGAC in developing a model for this type of Intelligent Transportation System.

In our research, we have found several programs that are similar in nature and the methods used to determine benefits for these projects are outlined below.

St. Paul, Minnesota, January 2007

In downtown St. Paul, Minnesota, 10 parking facilities were connected to an advanced parking management system that provided information on parking space availability via 56 on-street signs (10 with dynamic displays). A study of downtown traffic found that travel times were reduced by nine percent, and the stopped time delay decreased by four percent.

http://www.itsbenefits.its.dot.gov/ITS/benecost.nsf/ID/D53BD48A2E13BDF4852573D90050BC20?OpenDocument&Query=Home

ITS Review in Europe, August 1999

Several European cities operate real-time parking information systems primarily in downtown areas. These consist of a set of detectors to count the number of vehicles entering or exiting garages or lots. Display of available parking is transferred to variable message signs informing drivers of availability of parking. Benefits have shown a reduction of up to 25 percent in downtown traffic volumes related to searching for parking spaces. These timely messages have also shown enhanced use of transit and improved use of park-and-ride lots serving transit when drivers are informed that parking is full.

http://www.itsbenefits.its.dot.gov/ITS/benecost.nsf/ID/908E1267499C4322852569610051E27E?OpenDocument&Query=Home

Oakland, CA, June 2008

From 2004 to 2006, researchers implemented a smart parking field test at the Rockridge, Oakland BART station to complement the monthly reserved program by providing daily flexibility during the morning commute to those who do not use transit every day.

The project included in-ground sensors in the BART parking lot to determine available parking spaces, two changeable message signs (CMSs) located on the highway that display dynamically updated parking availability information for motorists, and a computer reservation system accessible via the Internet and a telephone Interactive Voice Response (IVR) system. Researchers conducted the analysis with expert interviews, internet surveys, focus groups, and parking reservation data to evaluate:

- The effectiveness of an advanced smart parking system in managing a parking resource,
- The impacts of smart parking management on transit ridership,
- The behavioral response to parking information and reservations, and
- Lessons learned from the smart parking field test.

The results from a before and after Internet-based user survey showed that:

- Reduced overall vehicle miles traveled on average by 9.7 fewer miles per participant per month and decreased average commute time by 2.6 minutes.
- More than 30 percent of respondents indicated that smart parking encouraged them to use BART instead of driving alone to their typical place of work or on-site work location, and 55.9 percent stated the same for commutes to an off-site work location.
- 49 percent of respondents did not use BART to commute to work before smart parking and were encouraged to use BART more because they could drive to the station.
- Smart parking users increased BART use by 5.5 trips per month for on-site work commutes and by 4 trips per month for offsite commute.

http://www.itsbenefits.its.dot.gov/ITS/benecost.nsf/ID/F7A062737B15DC3D852575A7006B769B?OpenDocument&Query=Home

Maryland, 2003

In Maryland, a parking guidance system was implemented at the Baltimore/Washington International (BWI) airport that directed travelers to individual available parking spaces. In October 2003, a customer satisfaction survey indicated that 81 percent of the BWI travelers surveyed thought that parking was easier at BWI compared to other airports they frequent and 68 percent agreed that parking was faster.

http://www.itsbenefits.its.dot.gov/ITS/benecost.nsf/ID/DA8401DB8BA38BA3852573DA004930FF?OpenDocument&Query=BApp