Smart Transportation Pricing (STP)

An Innovative *Connected and Sustainable Mobility* Pilot by the Cisco Internet Business Solutions Group (IBSG) and the Seoul Metropolitan Government

Background

In recognition of the profound trends of urbanization, climate change, and innovation at the beginning of the 21st century, Connected Urban Development (CUD) was born from Cisco's commitment to the Clinton Global Initiative to participate in helping reduce carbon emissions in cities. Launched at the end of 2006, CUD consists of building partnerships with cities worldwide to focus on applying information and communications technology (ICT) to promote innovative practices for reducing carbon emissions, while fostering economic growth and improving the quality of life. Innovation is transforming urban life, and is making it possible to design and manage cities in radically different ways. With the advance of broadband, wireless, and increasingly smart city infrastructures, collaboration and connectivity are becoming essential to urban sustainability.

CUD envisions that the same principles of openness that have made the Internet a thriving ecosystem over the past 20 years can be applied to make cities a smarter platform for people, products, and services. This global, open-standards approach will support all urban and natural environment-related applications, tools, and technologies. It will provide real-time, tangible information to enable citizens, communities, cities, countries, and business organizations to make smarter decisions and to develop policies that improve the sustainability of cities. Following are the program's urban technology principles:

- Wired communications provide infrastructure
- Wireless communications provide mobility
- Miniaturized, inexpensive electronic devices provide access points everywhere
- Digital memory and processing power provide intelligence everywhere
- Software and online content provide new functionality and services

Through its partnership with the City of Seoul, CUD has created a global best practice—Smart Transportation Pricing (STP)—that will be replicated across other CUD cities and scaled around the globe. The organizations are jointly applying an urban services platform approach toward which visionary cities and the ICT industry are moving.

Sustainable urban development pursues a balance among environmental soundness, economic efficiency, and social inclusion. It's a concept that is especially applicable to urban mobility, due to its impact on the environment and society.
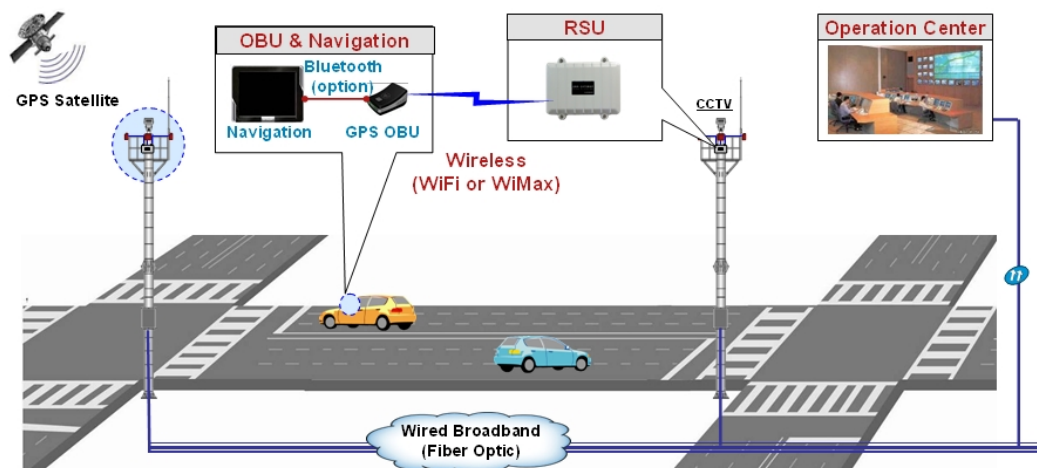
Connected and sustainable urban mobility solutions provide accessible and efficient services that help citizens achieve a healthy and desirable quality of life. They are affordable, offer choices in transportation modes, and support a vibrant economy. They limit emissions and waste, recycle components, and minimize land use.

As cities become wealthier, motor vehicle ownership tends to increase, as do energy consumption, carbon dioxide emissions, traffic accidents, and unproductive time spent on the road. Innovative solutions based on ICT can meet these challenges by helping make public mobility more attractive to citizens.

Overview

Smart Transportation Pricing will provide new functionality and services through next-generation road-use charging and integrated transportation pricing. The objective is to create an urban development infrastructure that makes traffic flow more efficient and ultimately lowers emissions from vehicles and other transportation systems.

Figure 1.   Conceptual Diagram of the Smart Transportation Pricing Communication Network

Source: eNaruTNT; Cisco IBSG Connected Urban Development, 2008

Today, personal car transportation is overused due to improper pricing signals being given to motorists. We pay for roads with a myriad of flat taxes. Once the flat taxes are paid, the variable cost of driving is small or somewhat hidden (as in maintenance). The objective of STP is to convert what were once fixed costs into variable costs. The cost of personal car transportation becomes more apparent when it is based on kilometers (or miles) driven.

STP encompasses a set of technology-based pricing reforms to encourage more efficient travel behavior. In recent years, transportation pricing reforms—especially congestion charging—have gained consideration as a means of conserving energy and reducing both emissions and traffic congestion. This is the first step toward higher variable costs.

STP's technology approach enables flexible, wide-area, time- and distance-based road-charging schemes, and features a universal mobility account as an integrated transportation payment system. STP incorporates global positioning system (GPS) transponders and onboard units (OBUs) installed in each vehicle to track when and where it is driven.

STP is an important element of CUD's Connected and Sustainable Mobility framework. Begun in summer 2007 with input from the Seoul Development Institute (SDI) and the Victoria Transport Policy Institute (VTPI), the proof of concept (PoC) and the pilot project are collaborative efforts involving Cisco IBSG—the global strategic consulting arm of Cisco—and the city of Seoul.

A video preview of the STP prototype was presented at the second CUD Global Conference, September 23-24, 2008 in Amsterdam. Through the work of Cisco IBSG and its partners, eNaruTNT and Skymeter, the STP pilot will be introduced in conjunction with the Personal Travel Assistant (PTA) at the third CUD Global Conference, May 21-22, 2009 in Seoul.

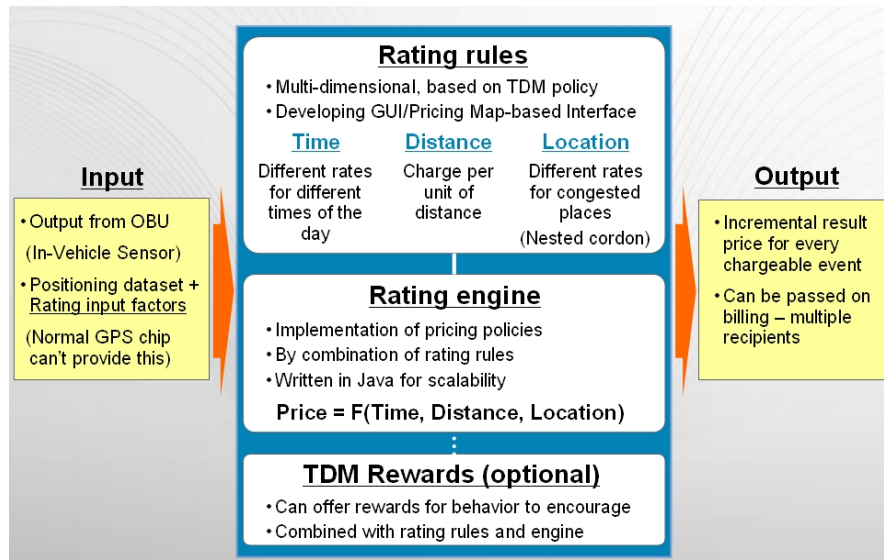## An Urban Services Platform Approach

CUD ultimately envisions STP as part of a global urban services platform approach for—and among—cities. Services will include, but are not limited to, citizen engagement, collaboration, community-building, professional geo-referential data, real-time environmental and energy metering and monitoring, simulations for real estate development, transportation planning, location marketing, and city scenario planning. Combining STP into this platform will enable cities to optimize citizen services over time, and encourage alternatives to road travel, whether public transportation or IP-based "smart work" options.

Key Features

- **GPS[1] and Wireless Technology:** To levy road-use charges, cities must prove that a vehicle was in a given charging area at a particular time. "Pay as you drive" pricing is designed to charge vehicles depending on their *real* traffic congestion or environmental impacts, which are directly related to the distances over which they operate.

- **Flexibility in Pricing Design and Deployment:** GPS-based STP systems grant two key benefits to city governments:
  - Allow cities to develop a demand-management strategy with true intelligence regarding vehicle traffic patterns, based on location, time, vehicle type, and demography.
  - Provide great flexibility in terms of designing and deploying pricing tactics. Pricing schemes can be designed and deployed by the pricing design software integrated with the electronic city map. Based on the policy direction or the situation, the city government can change variables such as unit charge per distance, charging time and area, weights by type of vehicle, and so forth. Other variables can be added as needed.

- **Integrated Pricing and Payment System:** Pricing integration involves much more than a simple summation of various service charges. Instead, it represents a pricing strategy that allows city governments to convince citizens to travel in more environmentally responsible ways. By doing so, city governments can more effectively manage the demand for roads, parking lots, and public transit services.
  - A payment system is another key element in realizing pricing integration. By incorporating a universal account—a virtual payment account associated with the OBU ID—integration with a variety of payment methods (credit cards, debit cards, Giro, and bank accounts) can present a seamless payment system. In addition, it provides service users with visibility into their historical service usage, encouraging them to rethink and improve their transportation patterns.

[1] For this reason, GPS is widely considered a solution to this challenge in many cities, such as Seoul, Amsterdam, Singapore, Dubai, London, and Stockholm. The biggest advantage of GPS for road-use charging is that it doesn't require any infrastructure except for an OBU containing a GPS chipset.

Figure 2.   Smart Transportation Pricing Engine

Source: Skymeter; Cisco IBSG Connected Urban Development, 2008

- **Urban Mobile Communication Infrastructure:** Mobile network infrastructure for communication between vehicles and the operation center is an essential part of STP. Unlike current congestion charging schemes that communicate through a wired network on an event basis, STP absolutely requires mobile network infrastructure.

- **Multiple-Use Metering:** To convert fixed costs into variable costs, it is important that meters be used for other applications, such as insurance, financing, and maintenance, based on per-kilometer (per-mile) pricing. In addition, other uses such as parking, navigation, and location-based services help reduce the cost of the overall system.

Benefits

- **Reduces the carbon impact of personal car transportation** on congested roadways
- **Decreases traffic** using wide-area, time and/or distance-based flexible road pricing
- **Increases public acceptance of road charging** by improving travel options and providing positive incentives for using more efficient modes of transportation
- **Encourages a modal shift from personal to public transportation** by using smart incentives linked with reward/loyalty programs
- Improves economic returns for cities by **increasing transportation system efficiency** and by avoiding the need to add capacity

Partners

- Cisco
- City of Seoul
- Seoul Development Institute
- Victoria Transport Policy Institute
- Skymeter
- eNaruTNT