

IPvSys: Intelligent Personal Vacation System

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I. Introduction

IPv6 (Internet Protocol version 6) has been demonstrated for many years. However there is still a lot of work to make IPv6 be in widespread use. The main reason could be the lack of killer IPv6 application. In fact, except for the large-scale IP addresses, IPv6 not only equips with the mobility support, but also has the auto-configuration advantage for users. Moreover, the “always on-line” property of IP networks makes communications between users more convenient. Taking the advantages of those mentioned above, we design a system named **Intelligent Personal Vacation System (IPvSys)**. In this proposal, we assume the Disney Park as our system environment. Through the cooperation of a handheld device (e.g. PDA) and the IPv6-based high-speed wireless LAN in the amusement park, users (or visitors) can get more convenient services in the park. IPvSys provides the visitors with reserving and creating their own personal vacation. We believe that IPvSys is a practical and feasible idea, and could be implemented not only in the amusement park but also places where a crowd of people exist, such as conference, stadium, exhibition center, and shopping mall.

II. System Overview

A. Infrastructure

The system infrastructure is composed by the following component:

1. **Basic IPv6 network:** The amusement park must have at least 100Mbps wire network deployed every spot. The switch or router must support IPv6 as default.
2. **Wireless LAN:** We deploy WLAN access points (AP) covering the amusement park to let users can access the network anywhere anytime. For channel capacity issue, two or more APs for one area may be required, especially the places where people gather. Currently, the IEEE 802.11g standard WLAN will be the best choice for both efficiency and compatibility issue.
3. **Transaction Center:** We need some high processing-power servers to build a transaction center (TC). TC will deal with all of the transactions between users and service provider (i.e. shops in the amusement park). Additionally, TC will provide the advertisement broadcast or multicast based on the transaction records of users. We will describe the detail later.
4. **Database:** The database (DB) maintains all information of the park, including the map, guiding, shops, movies and other real-time information, such as the number of users in the games, movies or restaurants; and the location information of each visitor.
5. **Handheld Device:** We choose the PDA with a WLAN module to get and view the real-time information. The PDA should also equip with microphone, camera, and earphone for multimedia services. Visitors can rent PDA from the information counter.
6. **IPv6/IPv4 Translator:** As we know, currently, IPv4 is the major layer 3 protocol running on the Internet. Before IPv6 could replace IPv4 to become the major protocol, IPvSys will provide IPv6/IPv4 translator for accessing the traditional IPv4 network even people in the IPv6-based amusement park. The NAT-PT IPv6/IPv4 translator is used here [RFC2766].
7. **VoIPv6 gateway:** Voice over IP is an epochal technology making people (even more than two) talk to each other over the IP network simultaneously. Via the VoIPv6 gateway, users in the park could make a phone (or a video-phone) call to share their vacation with others, even who are outside the park.

B. Software Requirement

The software on PDA must have the following ability:

1. IPv6 protocol enabled operating system.
2. Web browser.
3. Hyper-media processing, such as picture / voice / video with functions playing / receiving / transmitting.
4. Mobile IPv6 support.
5. IPSec protocol support.
6. VoIPv6 support.
7. IPv6 based ICQ or MSN.
8. Location information (LI) agent.

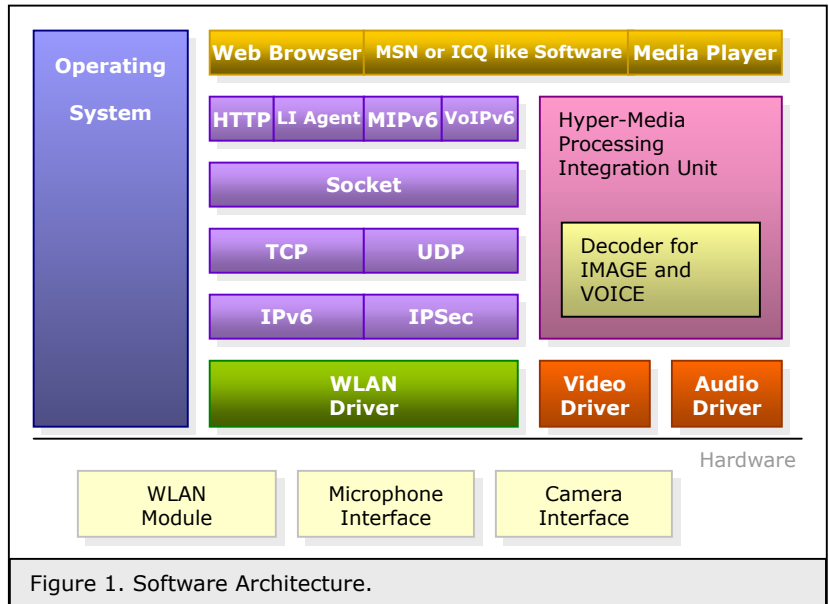


Figure 1. Software Architecture.

III. System Features

Based on the infrastructure and software architecture, IPvSys provides the following services.

A. Cyber-Village Services

After people enter the amusement park, either using their own PDA or a rent one, a PDA with WLAN module will automatically get an IPv6 address from the park's IPv6 network via the AP. The visitor treats the given IPv6 address as a unique ID. By this unique ID, visitor could make a registration to the **Transaction Center (TC)**. Besides, visitors will be directed to fill out their personal profile (personal data, interest...etc) via the system web interface. Based on the registrations and the visitor profiles, IPvSys will create a **cyber-village** and all the registrant visitors in the park are the village members. By the village member list, the visitors can identify to each other and thus they can communicate

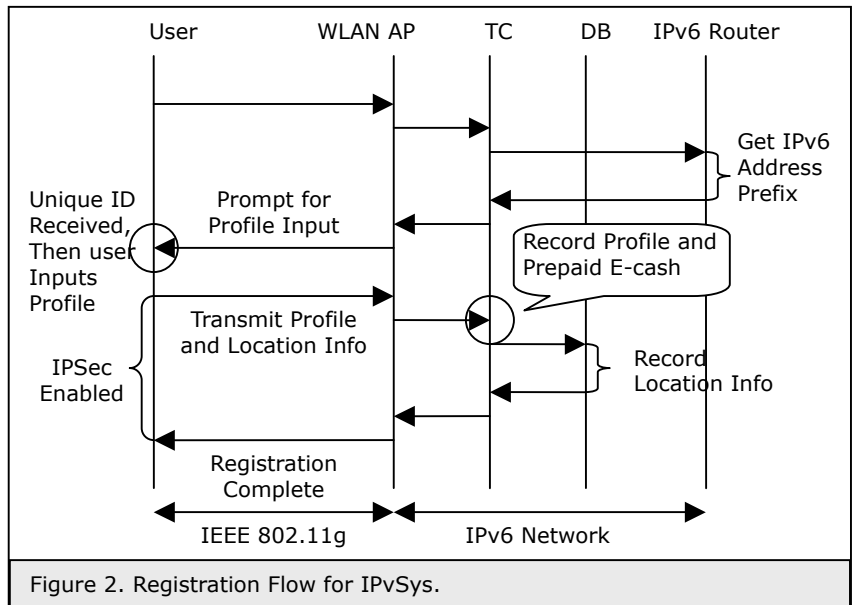


Figure 2. Registration Flow for IPvSys.

through the microphone or camera on PDA. The PDA supports IPv6 based voice and video communication applications (e.g. ICQ, Microsoft's MSN). Taking advantage of Mobile IPv6, visitors can make seamless communication with each other when they are moving in the park. In the profile setting, visitors can choose if they want their personal information known to the public. The TC could provide the "new friend matching" game based on these profiles. It will make the travel in the park more fun!

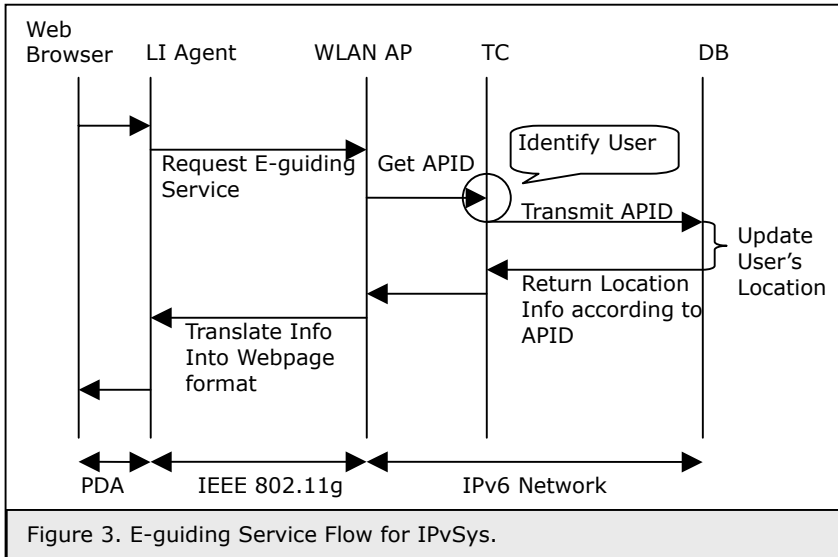
In this cyber-village, visitors could also buy some goods in the stores of the cyber-village (park). IPvSys provides a prepaid strategy. Visitors could buy one **E-cash** card in the E-cash counter of the park, and then they will get a serial number. Using this serial number, visitors can update their profile and save their E-cash in the cyber-village bank. TC will check the user's profile, user's unique ID and the serial number of the E-cash card; if these records are correct, the E-cash will be saved in the TC. After that, visitors can use the E-cash in the stores of the park and have some better services.

IPv6 provides some advantages for this system. IPv6 can support large-scale users to access the resources in the park simultaneously while IPv4 cannot do this (or need a lot of overhead in routing between small IPv4 subnet for communication

purpose). Users need not to setup the network configuration since the auto-configuration property makes accessing network very easy! Furthermore, IPSec provides a secure environment for maintaining the user profiles and transactions.

B. E-guiding Services

E-guiding services provide users instant information about the amusement park through the wireless IPv6 network. IPv6Sys provides a **location information (LI) agent** on the PDA. The small LI-agent can get the ID of the attached AP (APID or called the BSSID in the IEEE 802.11), which means the PDA locates in the coverage of this AP. Using this APID, the LI-agent can update its location in the DB and fetch the location-aware information directly via the web-browser. The advantages of E-guiding services are as follows:



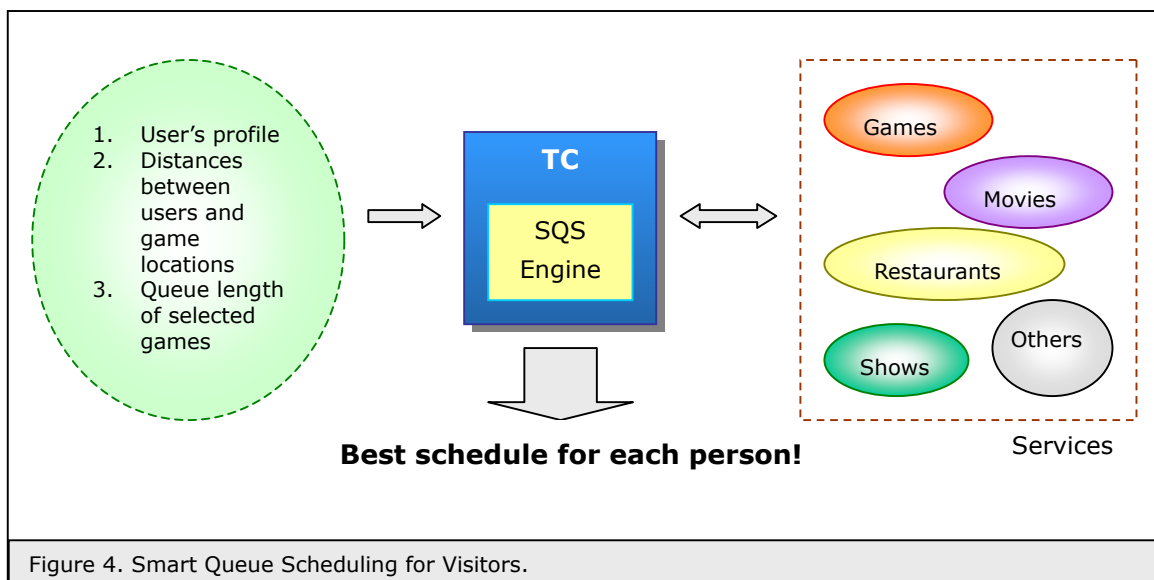
follows:

1. Users can get the **E-map** of the park anywhere anytime, and also they will know current location they are.
2. E-guiding services will provide the brief introduction to the equipment, popular index, attention information, current status and the number of user at the nearest games. If certain games were broken or unavailable, users will be notified in advance.
3. E-guiding services will provide the history, overview, today's special activities, exhibition, and total amusement equipment information

about the park. Then the visitors can choose their interests easily.

C. Smart Queue Scheduling (SQS) for Visitors

In the large amusement park, the most terrible thing could be the long queue length in front of the games. Most people have no choice but to waste their time queuing for the games they want to play. IPv6Sys makes queue disappear but visitors can still play what they want! Through the E-guiding services, users can view the real-time status of each game on the browser of PDA anywhere, i.e. how many people are playing or queuing at that game. Users can reserve one game directly or just check all games they want to play, and send the message to TC via the PDA to let the TC make the best schedule for them. TC will arrange the schedule based on the



following attributes:

1. Current queue length of the selected game.
2. Distance between the users and the game location.
3. The profiles provided by users.

The advantages for SQS are as follows:

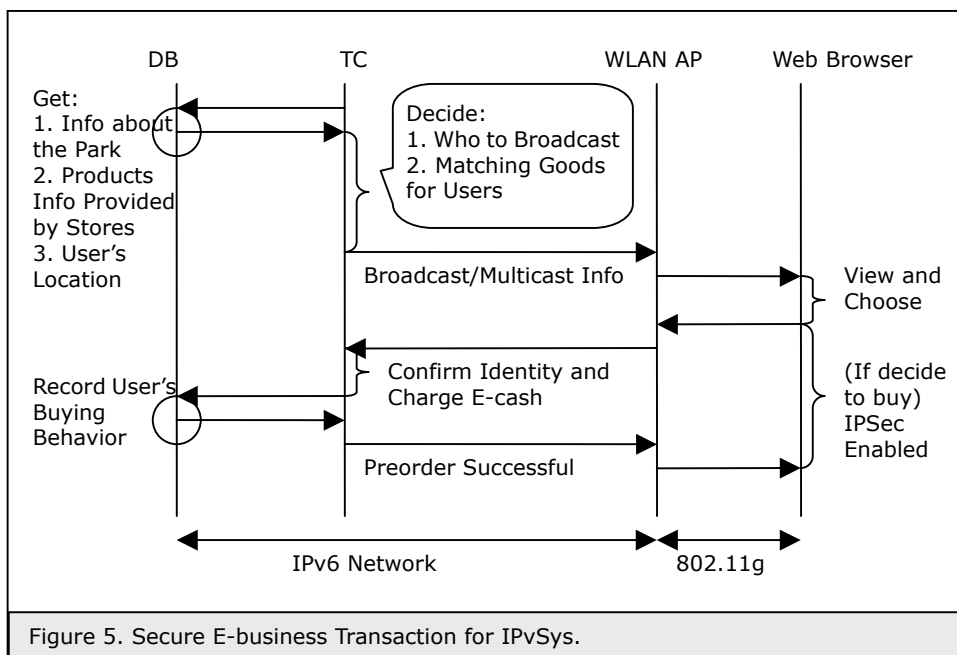
1. Users do not have to stand in a queue anymore! IPvSys can estimate the residual waiting time for the game, and visitors can just take a break in a coffee shop or go shopping during the waiting time!
2. TC could distribute the stream of people and improve the overall resources (i.e. games or scene spots) utilization.

Not only the games, visitors can reserve all kinds of services in the park through IPvSys, such as the movies, shows, and the restaurant, to arrange a leisurely vacation.

D. Secure E-business Transaction Services

In IPvSys, we adopt IPSec protocol to ensure the end-to-end security during the transactions. As we mentioned in subsection III-A, visitors can prepay some cash and this will be recorded in the TC; after that, visitors have the E-cash and can do the following transactions by using PDA directly:

1. Users can reserve some services via the PDA, and let TC to make the best schedule for users (subsection III-C). Users must pay a deposit for the reservation to prevent from wasting the resource.
2. The stores in the amusement park could advertise their products or mementos to consumers. Consumers could view pictures or demonstrations of the products via the web-browser on PDA, and make orders for their interested products on-line. The transactions will be recorded in the TC. Consumers could just take the ordered goods before they leave the park.
3. The TC would broadcast or multicast related products to users based on their past buying behavior or the type of games they have already played by using the **data mining** technologies.
4. The amusement park could cooperate with the other companies (for example, toy company, movie tape company) to make advertisement to users. Consumers may get a special discount from some stores and this may stimulate the volume of trade.



E. Babysitter (looking for someone in the park)

In very large park, there are many children lost from their parents. IPvSys could provide parents the **location tracking** of their children. Through the identity registered as mentioned in subsection III-A and the Mobile IPv6 supported WLAN infrastructure, we

can track the specific people and the system will display their location directly on the PDA. Of course, users must agree to be tracked by someone after the registration and this could be defined in the profile.

If the children have already lost, parents can still talk to children and see each other through the microphone, camera and the monitor on PDA by an always-on-line application. This could comfort the lost children and make their parents find them in a short time. This service is helpful in searching someone even for common people other than children.

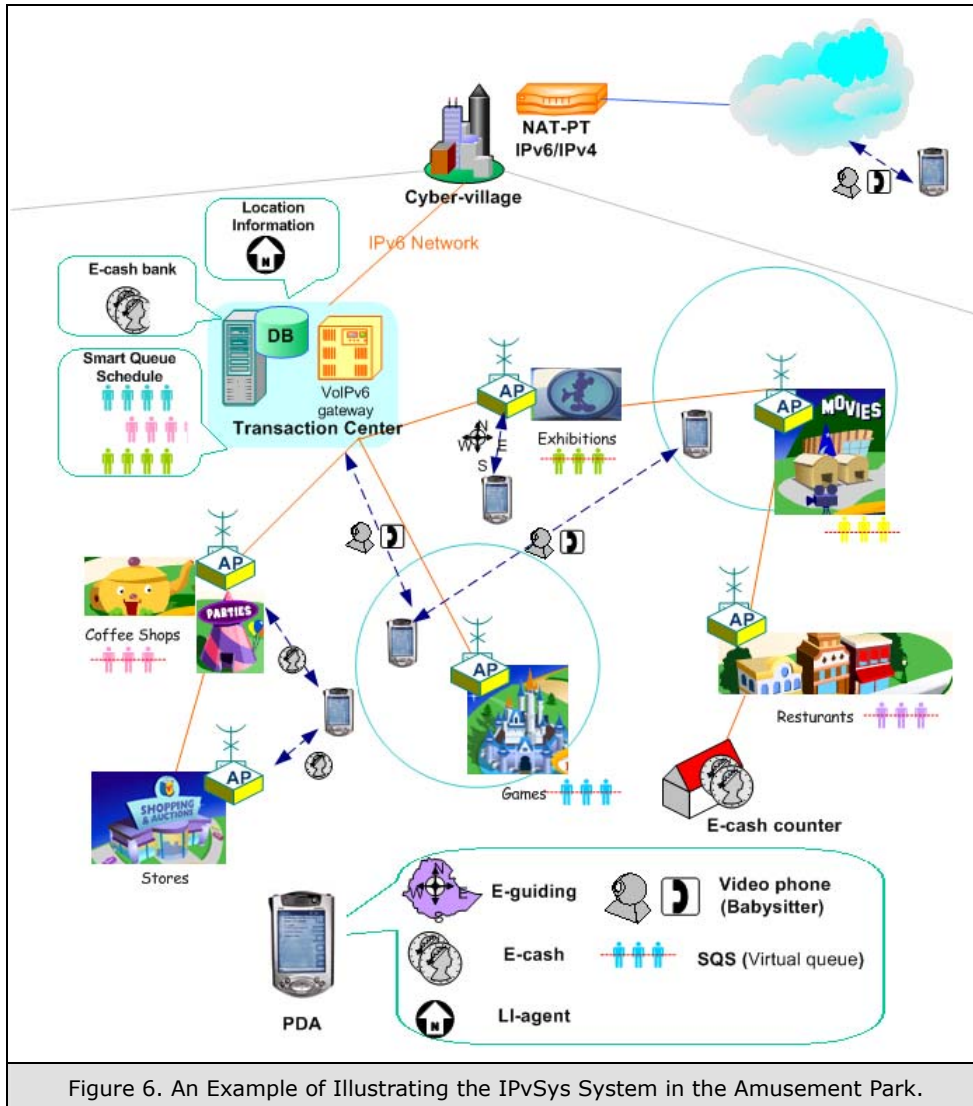


Figure 6. An Example of Illustrating the IPvSys System in the Amusement Park.

IV. Why IPvSys needs IPv6

1. IPv6 provides very large-scale IP addresses, and thus users can access intra and inter network simultaneously.
2. IPv6 is easy to configure for common people. (Basically no network configuration is required).
3. The unique ID composed of IPv6 prefix and MAC address makes transactions in the park secure and easily. Furthermore, IPSec supports a secure business environment.
4. Since IP network is always on-line, users can make a voice or video communication via a unique ID with each other anytime anywhere.
5. Mobile IPv6 is more efficient than traditional Mobile IPv4. Mobile IPv6 does not need a Foreign Agent and is easier to establish.

V. Conclusions

We believe IPvSys is very practical and feasible especially for serving a large number of people. IPvSys makes a good utilization on IPv6 hot technologies, and therefore there is no difficult to implement IPvSys. Besides, it could create lots of business chances over IPv6 services. IPvSys also helps visitors to arrange their vacations without tying to the queue anymore and create their personal vacations.