

Shuttle Bus Fleet Management System

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Introduction

Sponsor

The Zhuhai branch of Orient Overseas Container Line (OOCL) provides shuttle bus service for its staff. This brings convenience to employees as shuttle bus carries them to and fro between their companies and other places. The probability of being late for the employees can also be decreased.

Objective

In order to handle bookings more easily and efficiently than before, this shuttle bus fleet management system has a user-friendly interface. It is connected to a database which keeps all the data related to the shuttle bus management. The database also receives data from Global Positioning System (GPS) devices installed in shuttle buses provided by OOCL. In general, our system provides users to manage bookings and profiles, generate reports, plan routes and schedules, and also track and trace bus.

Design

Functions of our system

1. Booking Management
2. Profile Management
3. Report Generation
4. Route Planning & Scheduling
5. Bus Tracking & Tracing

Required Hardware & Software

Web Server	Virtualized Server MS Windows Server 2008 running under MS Virtual Server
Memory	4GB RAM
Hard Disk	200GB (for storage)
Integrated Development Environment	Microsoft® Visual Studio 2008 with Microsoft® Visual Basic.NET 2008
Database Management System	Microsoft® SQL Server 2008
System Platform	.NET Framework 3.5
Web Application Framework	Microsoft® ASP.NET 3.5

Implementation

For the booking function, different users can use the system to create bookings, approve bookings and assign buses and drivers. Once there are any changes of booking and status, the system will send email notification to inform the users.

This system also provides users to plan new routes and schedules. Then the new created routes can be used for staff to make scheduled bookings. Different profiles are managed in the system so that users can retrieve personal information at anytime. Users can also use this system to create ad hoc and scheduled booking reports.

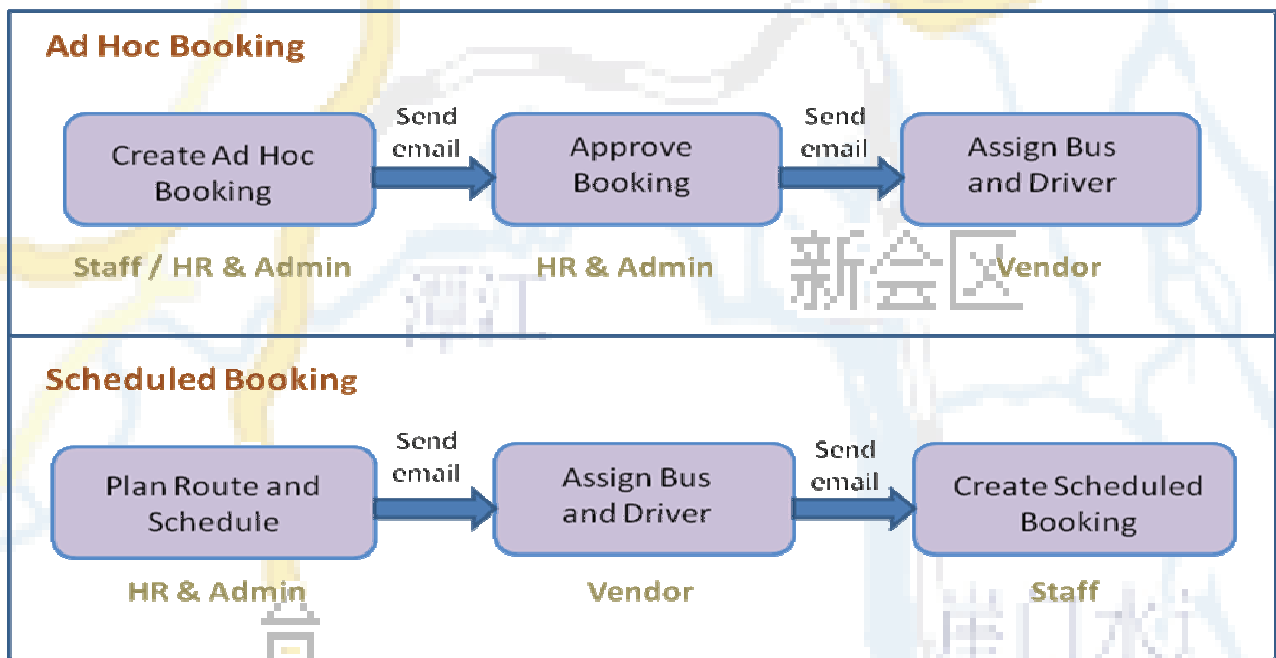


Figure 1: Flow Chart of Booking Management

The following is the GPRMC sentence and its format. This is the GPS data handled by the OOCL computing infrastructure which is used for bus tracking and tracing. It consists of different data which includes geographic information and other data such as an event number which indicates the type of GPS sentence (event), unique serial number of GPS device (IMEI) and the receive time of the GPRMC sentence (timestamp).

```
<GPS_Message><event>No#200</event><imei>358244015397559</imei><rmc_message>$GPRMC,1
32455.000,A,2219.0056,N,11410.6821,E,0.46,34.91,200208,,A*5C</rmc_message><timeStamp>03/05/2
009 06:55:49:937 GMT</timeStamp></GPS_Message>
```

Table 1-11 RMC Data Format

Name	Example	Units	Description
Message ID	\$GPRMC		RMC protocol header
UTC Time	161229.487		hhmmss.sss
Status ¹	A		A=data valid or V=data not valid
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Speed Over Ground	0.13	knots	
Course Over Ground	309.62	degrees	True
Date	120598		ddmmyy
Magnetic Variation ²		degrees	E=east or W=west
Mode	A		A=Autonomous, D=DGPS, E=DR
Checksum	*10		
<CR> <LF>			End of message termination

1. A valid status is derived from the SiRF Binary M.I.D 2 position mode 1. See the *SiRF Binary Protocol Reference Manual*.

2. SiRF Technology Inc. does not support magnetic declination. All "course over ground" data are geodetic WGS84 directions.

Figure2: RMC format

Testing & Evaluation

Our system testing was based on the acceptance test. Booking management, profile management, report generation and route planning & scheduling functions could achieve the results. However, the bus tracking & tracing function could not satisfy our expectation since there are some limitations of Google Map Service that affects our design.

The limitations are as follows:

1. Large Deviation of the exact route on Street Map



Figure 3: An exact route plotted on the Street Map

2. Without Street labels of Satellite Imaginary

3. Large Deviation of the planned route on Satellite Imaginary

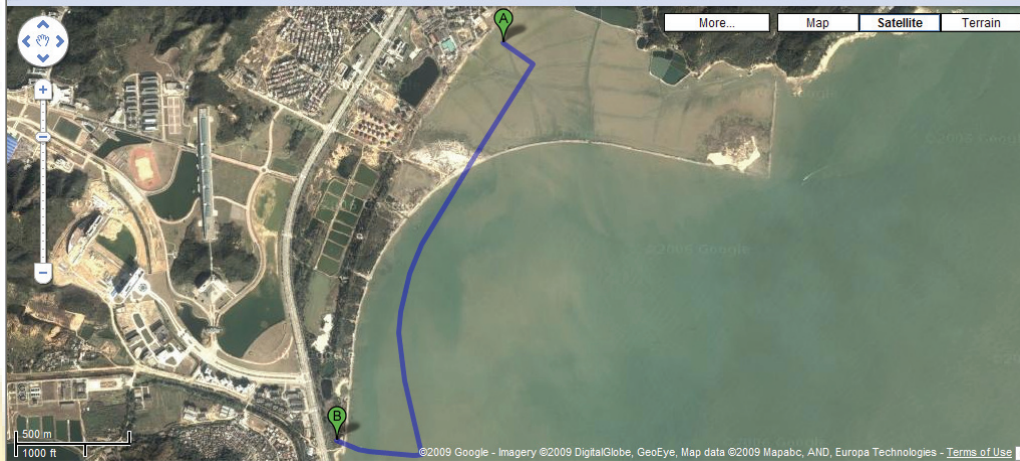


Figure 4: A route from 唐家市場, Zhuhai, Guangdong, China to 中山大學, Zhuhai, Guangdong, China is plotted on Satellite Imaginary

Conclusion

This system is used to replace the current manual booking and registration procedures of shuttle bus management. Hence, it is designed in a simple and user-friendly way to use. Data can be obtained from database at anytime so the booking management is more efficient than before. Users can also use this system to track the bus so that users can know the status of the bus such as direction, speed and distance from the map. They can see the route that the bus has just passed by on the map and check if the driver follows the designated route.