

Driver Dispatch Information Application for Pocket PC

By

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Driver Dispatch Information Application for Pocket PC

1. Statement of the Problem

This project addresses the need for an on-road information communication application specifically targeted for use at United Parcel Service (UPS). UPS is the number one shipping company in the world, handling more than 13 million parcels per day. Due to this high volume, the company devised a new way to sort and load packages into the vehicles with the goal of making loading procedures and driver dispatching more efficient (7).

The proposed on-road information application will specifically target on-road supervisors, who are primarily responsible for dispatching drivers. They are responsible for determining vehicle pickup stops, delivery stops, and air stops for each individual driver. The application will retrieve information provided by the new sort/load system to a handheld device used by the supervisor.

This new sort/load system is based on “Smart Labels” which use barcode technology to track and store information (7). Each package is scanned before it is loaded into its truck. This information is stored in a database, and reports are generated for the on-road supervisors. Generally, the supervisor will look at these delivery reports to determine the dispatch of each truck. While the reports are currently in a multi-page paper format, they contain all of the information necessary for each of the center’s drivers. The on-road supervisor must manually search through each report to find the particular driver he/she is trying to dispatch. Currently, the only way the on-road supervisor can view the reports in the hub is to carry them in a binder.

A brief interview with one UPS on-road supervisor has led me to conclude that an on-road information application will provide him with the information required to

perform his job duties at the touch of a button (1). The application will give him quick access to the needed reports at any given location.

The on-road information application should provide the following functionality:

- Retrieve delivery information from the center database
- Get information for a specified driver
- Get current load information for a specified truck
- Update the current days pre-trip dispatch report.

The prospective functionality of the application was discussed in an interview with Colerain supervisor Rick Leppert (2). His feedback indicated a Pocket PC application that would provide him the ability to obtain specific information regarding the load conditions would be extremely helpful to him during dispatching tasks.

The primary goal of this project is to provide an electronic tool which will assist in making the job of an on-road supervisor easier. With UPS's fast-paced mentality and society's need for faster service, providing information electronically to the on-road supervisors will improve the overall capabilities of UPS's delivery operations.

2. Description of the Solution

My solution is to develop a mobile application titled the Driver Dispatch Information Application (DDIA). The DDIA will be able to run on Pocket PC 2000 or Pocket PC 2002, and would be best suited for a PDA, since most PDA's are compact and could easily fit in the pocket of a prospective user. The supervisors will use this application to quickly retrieve the information they need to dispatch the trucks every morning.

The DDIA will be able to retrieve information for each driver. The user will be able to specify which driver they need to dispatch. The DDIA will also be able to retrieve information for each truck. If the supervisor looks into a truck that looks “heavy” (it has too much work on it), he/she will be able to pull up the information on that truck quickly. Finally, the supervisor will be able to update the morning dispatch report from the belt. Currently, he/she writes down all the information for the dispatch report and updates it in the system after he/she gets back to the office.

This application will help the supervisor dispatch the UPS trucks more efficiently. They will no longer have to manually look through long paper reports to get the information that they need. In this fast-paced environment, the DDIA will prove to be a valuable asset.

2.1 User Profile

The primary user for the DDIA will be a UPS on-road supervisor. The supervisor is responsible for dispatching the UPS trucks every day. They need information quickly due to their time limitations. The supervisor needs to be able to effectively use a PDA. If they have not used a PDA before, a short training session might be required to get them used to this portable device. The user will not need a high level of IT expertise because the interface will be designed for all levels of users. The supervisors are already familiar with Windows 2000 Professional. Since the interface will be designed on a Windows form, the supervisors should be able to use the application with little extra training.

2.2 Design Protocols

The two main IT areas that will be focused on in this project are database and programming. I also will have a small focus in wireless networking.

- **Database** – The backend of my application will be a SQL 2000 database. This database will contain the information needed by the supervisors.
- **Programming** – I will use C# as my programming language. C# is the programming language that I am most familiar with. I will use C# with Microsoft Visual Studio .NET 2003 and its Smart Device Extensions. ADO.NET will be used to programmatically connect to the database backend.

2.2.1 Interface

The interface is going to be the most difficult part of my project. Putting information onto a window on a desktop computer is not hard, but trying to fit that information onto a Pocket PC screen proves to be challenging.

To overcome this challenge, I will be using various tools such as tabs and data grids. For example, Figure 1 (Page 8) shows the layout for my application. The tabs will be used to hold different sections of information for any given driver.

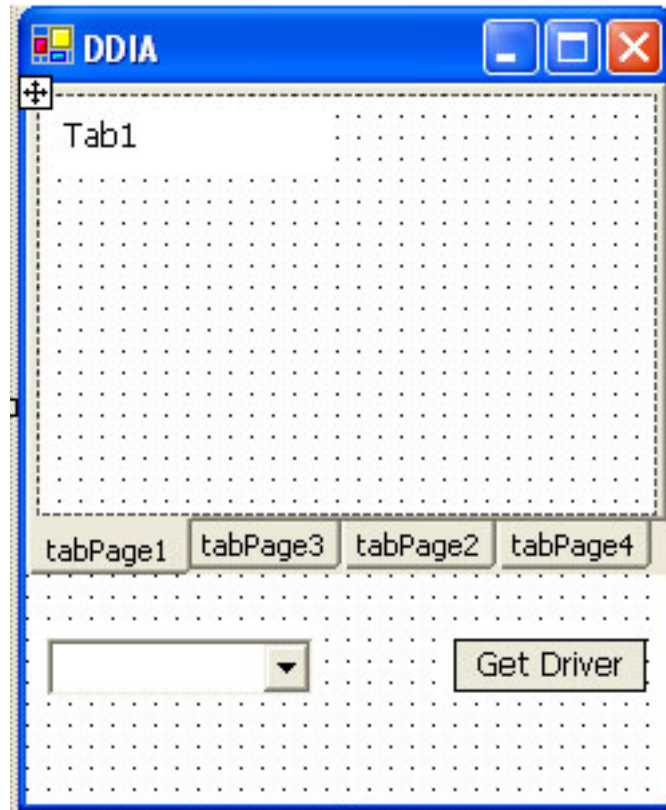


Figure 1. Tab Layout

The interface will be designed so the user can quickly retrieve information. The user should not have to enter in information. The DDIA will have drop down lists so the user can select criteria instead of entering it in.

2.2.2 Program Flow

The main page of the program will ask which center the supervisor needs information about. There are three centers, and each center has around 40 drivers (see Figure 2. Page 9).

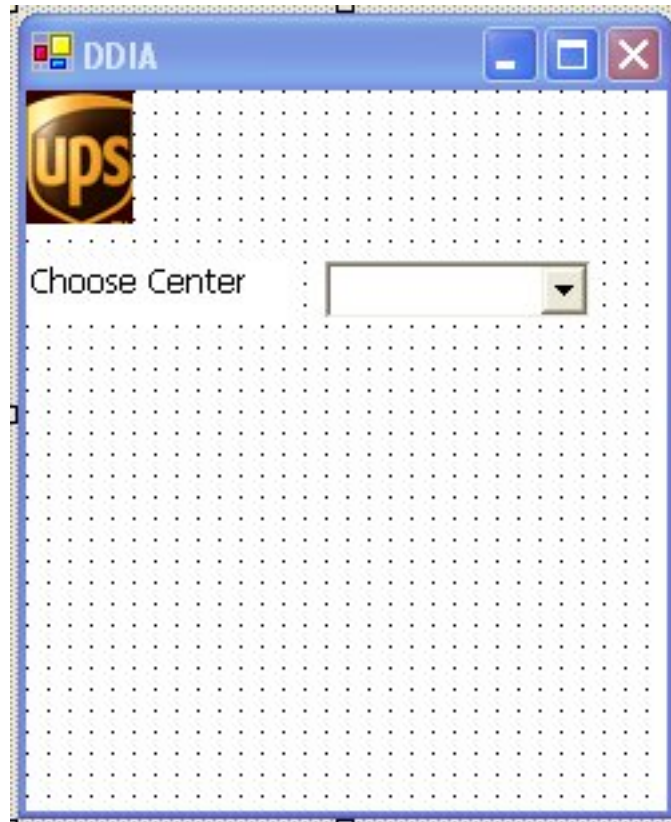


Figure 2. DDIA Chose Center Screen

After the supervisor enters the center he/she wishes to look at, the select driver/truck form comes up. This will allow the supervisor to select the driver from a database populated drop down list. The supervisor can also enter the truck number in to find truck specific information (see Figure 3, Page 10).



Figure 3. DDIA Choose Driver/Truck Screen

When the supervisor chooses the driver or truck, the information for that driver/truck will be populated into a set of tabs similar to the page shown in Figure 1.

2.2.3 Database Design

The database used for the DDIA will be a SQL 2000 Relational Database. There are 4 tables in the database: Drivers, Deliveries, Pickups, and Routes. Below is the database diagram. (Figure 4, Page 11)

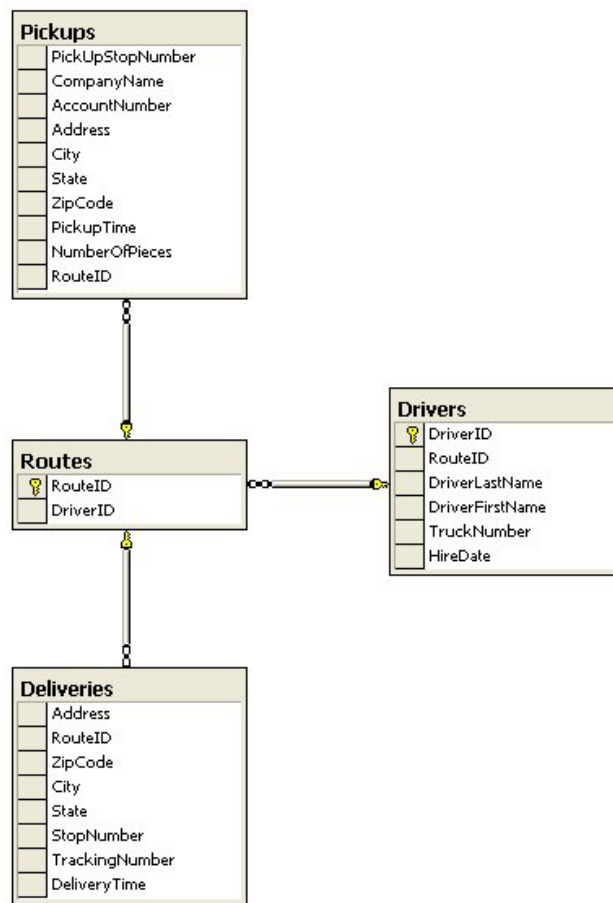


Figure 4. Database Diagram

3. Objectives of the Project (“Deliverables”)

- A mobile application to be used by UPS supervisors.
- The DDIA will be used in a wireless environment.
- The DDIA will be written in C# and will use ADO.NET to connect to the SQL database.
- It will be written for Pocket PC.
- Users will be able to retrieve information from the SQL database.
- The interface will involve little or no typing to relieve the user from trying to type on the Pocket PC.

- The DDIA will be able to retrieve driver specific information quickly.
- The DDIA will be able to retrieve truck specific information quickly.

4. Design and Development

4.1 Timeline

- Senior Design I – Spring 2003
 - Researched problem at UPS
 - Came up with solution: A mobile application for reporting
 - Researched mobile development
 - Obtained Visual Studio .NET 2003
 - Wrote proposal
 - Presented proposal
- Senior Design II – Summer 2003
 - Started designing relational database
 - Obtained a Pocket PC and wireless network card
 - Setup wireless network
 - Started designing interface for DDIA
 - Write Design Freeze
 - Finish Prototype
 - Present Prototype
- Senior Design III – Winter 2003
 - Tested interface
 - Had a Human Factors Engineer evaluate interface for usability
 - Redesigned interface per Human Factors Engineer's observationsd
 - Complete programming

- Wrote final report
- Present final product

4.2 Budget

Prior to the development of the DDIA, research was conducted to determine the prices of all of the necessary hardware and software. Figure 5 displays each item with its price.

Quantity	Product	Manufacturer	Price
1	Gateway Essential -- Desktop PC	Gateway	\$1000.00 ³
2	Dell Axim X5 – PDA	Dell	\$249.99 ⁴
2	BEFW11S4 2.4GHz --Wireless Router	Linksys	\$99.99 ⁵
2	Dell TrueMobile 1180 Wireless Network Card	Dell	\$69.00 ⁴
1	Microsoft Visual Studio .NET 2003 – Professional	Microsoft	\$1079.00 ⁶
1	SQL Server 2000 – Standard	Microsoft	\$4,999.00 ⁶
Total			\$7,496.98

Figure 5. Product Pricing

4.3 Resources

Several hardware and software resources were used during the development of DDIA. The major hardware resources were:

- Desktop PC
- PDA (Running Pocket PC 2002)

- Wireless Router
- Wireless Network Card

The DDIA was developed for Pocket PC rather than Palm OS because of its similarity to Microsoft Windows. This will keep training costs down. The Pocket PC was also programmed using Visual C# and ADO.NET which are two very powerful programming languages. ADO.NET is used to retrieve and update information from the database. Visual C# allowed me to program the Pocket PC using the libraries that I have used before in my Windows programming experience. The wireless router and network card is used to connect the PDA to a wireless network. The PDA is able to access the remote database through this wireless network.

The development of DDIA was done with Microsoft Visual Studio .NET 2003. Visual Studio .NET 2003 was used because of its new Smart Device Extensions (SDE). The SDE's are used specifically to develop Pocket PC applications. It allows me to use the .NET programming languages, which are familiar to me, to develop applications for Pocket PC. The database was designed in SQL Server 2000. The database will hold all of the information the supervisor will need to dispatch the drivers

5. Proof of Design

This section details the completed project deliverables.

5.1 DDIA in a Wireless Environment

The application needed to be wireless because the supervisors dispatch their drivers from out in the hub. The DDIA has the ability to connect wirelessly to a remote database. The connection is made with an 802.11b wireless Compact Flash network interface card.

5.2 DDIA Programming Specifications

The DDIA was programmed using C# in Visual Studio .NET 2003. I used ADO.NET to connect to a remote SQL Server 2000 database. The .NET Compact Framework libraries were useful in developing a mobile application.

5.3 DDIA for Pocket PC

The DDIA was written for Pocket PC 2002. The Pocket PC OS was used because of its familiar user interface. The training costs are cut down because the supervisors are already familiar with windows forms.

5.4 Retrieving information

The main objective of this application is to get information from a database wirelessly. This is accomplished by using ADO.NET to connect to SQL Server. The data is put into a *DataAdapter* and displayed using *DataGrids* and *ListBoxes*. (See Figure 6, Page 15)

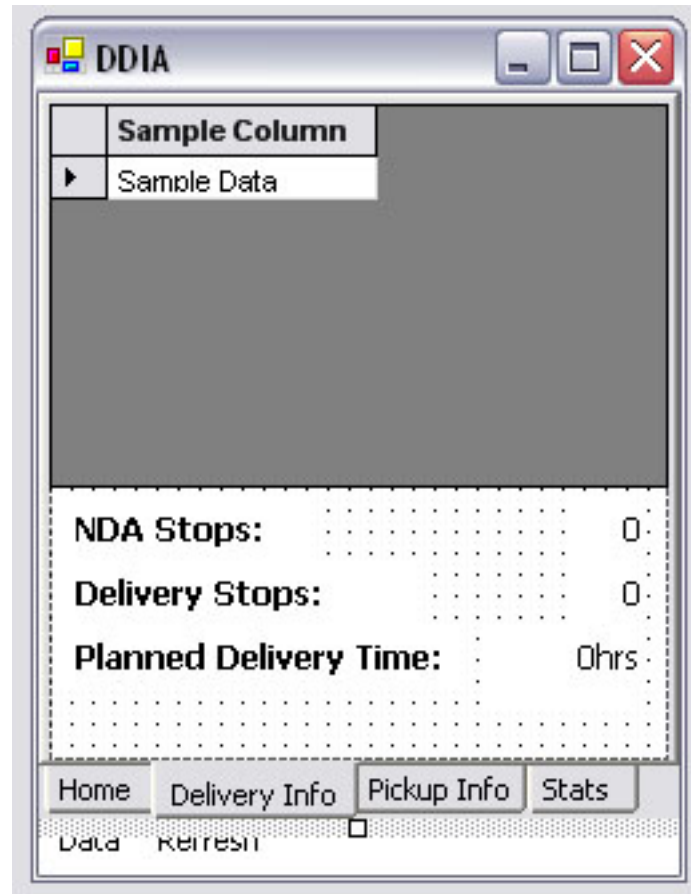


Figure 6: DataGrid Delivery Info

5.5 No Typing Required

A drawback to designing a Pocket PC application is the absence of a keyboard to enter information. I solved this problem by using drop down lists and clickable list boxes. This lets the user navigate easily through the program without having to use the stylus to enter information. This not only saves time, it also eliminates errors due to typing such as misspelling driver names.

5.6 View information by Driver or Truck

The user has the option of viewing information by driver or truck. A supervisor might be behind a truck that looks like it has too much work on it, so he/she would decide to view information specific to that truck. To search by truck the user would simply click the “Truck” radio button. On the other hand, to search information by driver the supervisor would simply click the “Driver” radio button.



Figure 7: Driver/Truck Screen

6. Conclusions and Recommendations

6.1 Conclusions

This project addressed a problem with the driver dispatch operation at UPS. The application will make dispatching much more efficient for the on road supervisors. The application was created for Pocket PC 2002. The application allows the supervisor to view up to the minute delivery information from the database. The DDIA also allows the driver to update certain fields in the database. I used C#, ADO.NET, .NET Compact Framework, and SQL Server to complete this project. The project would have cost around \$7,500 to complete. I have fulfilled all the deliverables set in the Design Freeze.

6.2 Recommendations

The design of the user interface was the major problem in the project. Trying to fit all the information that you want the user to view on one small Pocket PC for is difficult. The tab page layout was the easiest way to deal with this lack of space. Another problem was the first connection to the database took around 3 minutes. I used multithreading to free up the user interface for this lengthy connection. I recommend that anyone trying a Pocket PC project get familiar with the .NET Compact Framework libraries. When updating information into SQL Server I recommend writing and invoking your own stored procedures.

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