

EC Express - A Transportation Management System Using NFC Tags



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Objective

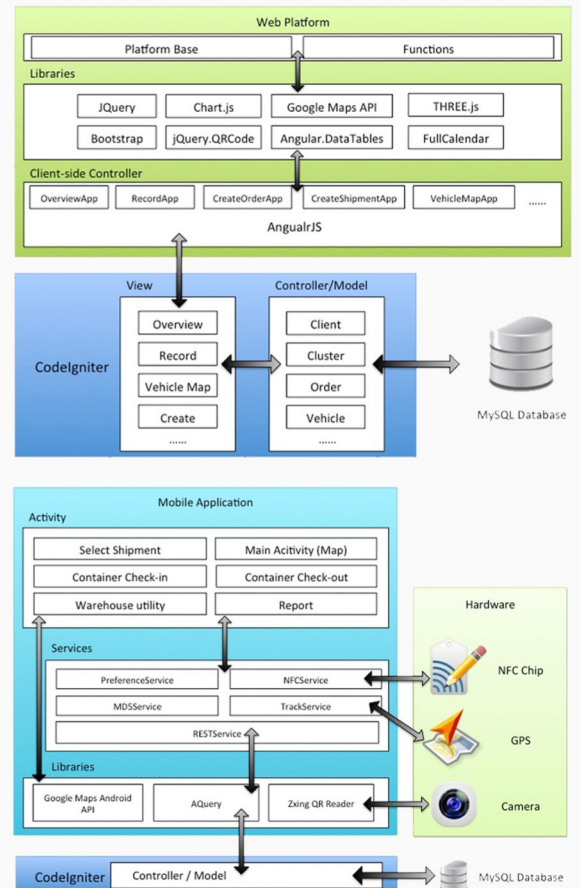
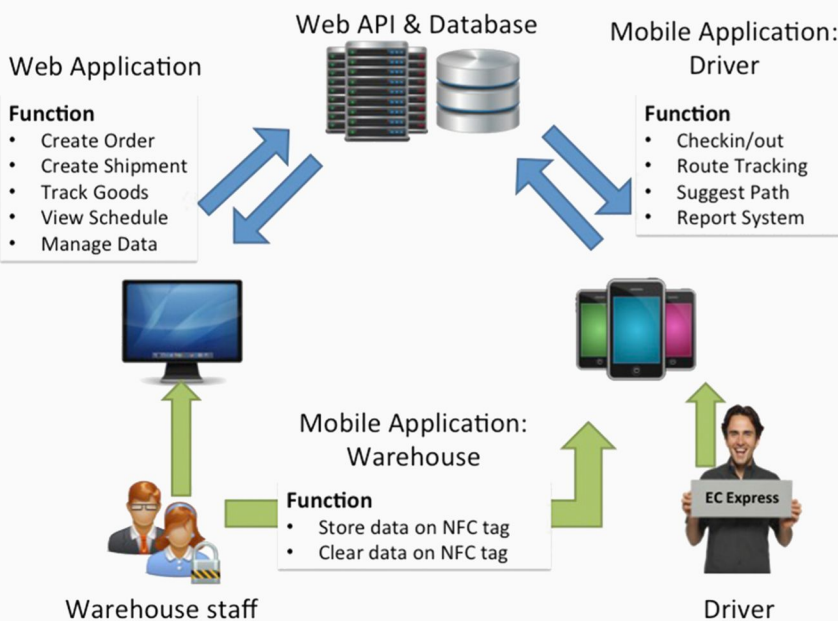
Near Field Communication (NFC) technology has become increasingly popular. It offers as an alternative to conventional wireless communication methods. Many applications regarding the use of NFC technology are discovered in our daily lives. For example, we can now use our smartphone as a medium of wireless payment, as well as retrieving information from interactive advertisement boards.



For our project, we developed a Transportation Management System with the use of NFC tags in an attempt to bring streamlined operation to the logistic industry. Additional functions are also included to bring benefits to different parties of the business. Three pillars: Backend server and database, web platform, and mobile application are the foundations of our system.



System Overview



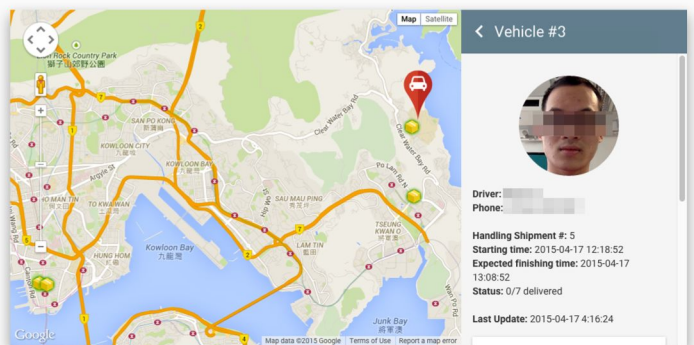
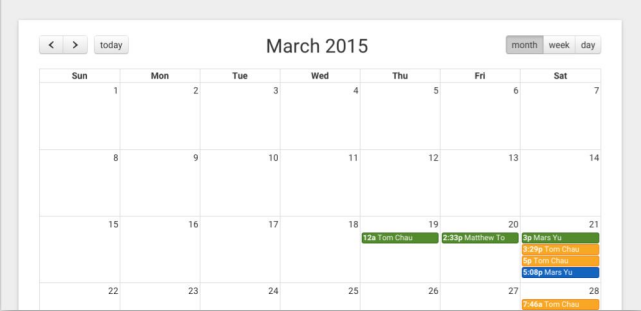
Highlighted Features



Asset Management

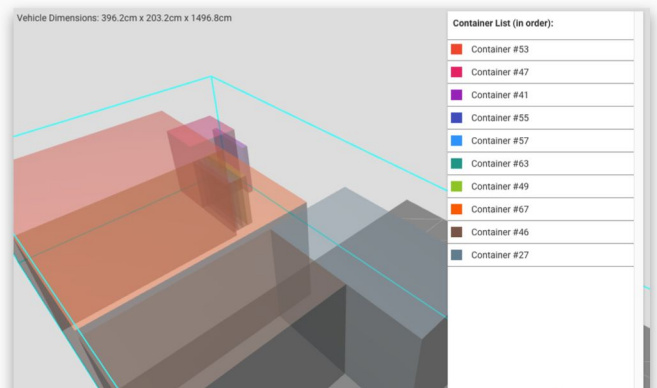
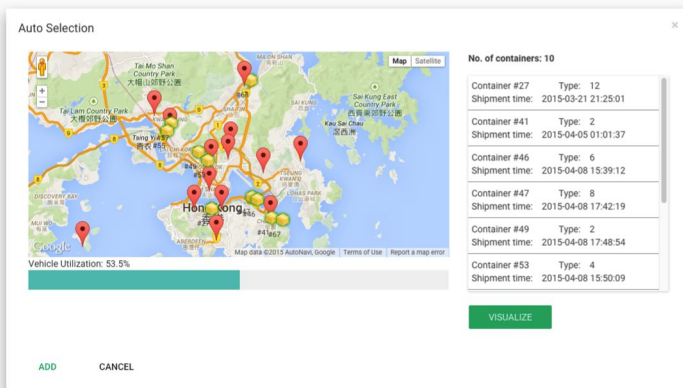
A web platform is presented for managing inbound/outbound goods of a warehouse for a point-to-point delivery service located in Hong Kong. Warehouse staff can create new orders and shipments, as well as provisioning for shipment schedules and vehicle whereabouts. This is achieved with modern web technologies such as AngularJS, jQuery and Google Maps API. Custom REST APIs are also defined in the backend server powered by LAMP and CodeIgniter. All these facilitates a flexible and responsive system for managing resources.

Vehicle Schedule



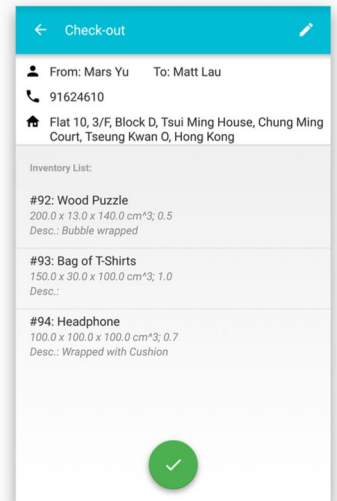
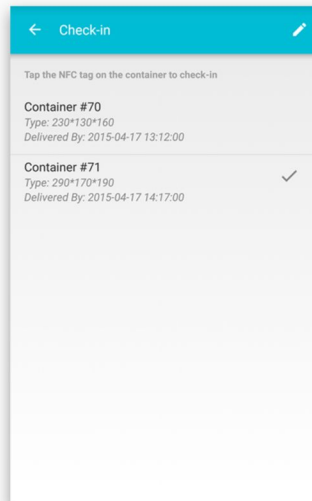
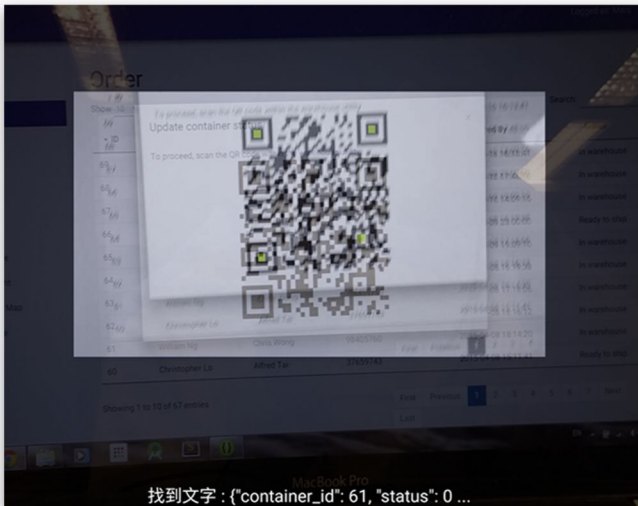
Shipment Automation

To facilitate shipment creation, an algorithm is developed to determine which and how the containers from the created orders are shipped. Factors such as geographical location (with clustering of recipient destination), expected time of delivery and container dimensions are considered. The selection result would be presented in a report with elements such as map fragment and utilization rate indication. Packing visualization is also available. Rendered with WebGL technology, warehouse staffs are given an intuitive look of how and in what order the containers are stored in the vehicle.



NFC Interactions

It is error-prone for both warehouse staff and driver to update container status manually. To automate the process, interactions with containers are handled using functions of the mobile application. Container information is first retrieved by scanning QR code from the web platform. When a container status needs to be updated, simply tap the device onto the NFC tags placed on the container. The container status will be automatically reflected to the web platform via the database.



Path Suggestion

For inexperienced drivers, it could be hard for them to determine the best route to traverse all shipping destinations. To tackle this problem, the mobile application is capable of suggesting an optimal path for travelling different places using Google Direction API. The suggestion takes current traffic condition and nearby shippings in account. With dynamic path suggestion, drivers are allowed to learn the best path they can traverse, with the vehicle moving in any directions. A navigation mode is also incorporated to give drivers a "heads-up" look of the map's path.

