A Novel Approach to Design a Wireless Communication Based Railway Information System

Vijay Kumar
nitrkl.vijay@gmail.com

Sarat Kumar Patra
skpatra@nitrkl.ac.in

Sanjib Mishra
sanjib.mishra77@gmail.com

Departement of Electronics and Communication Engineering
National Institute of Technology, Rourkela 769008

Abstract-*Here we propose a Wireless Communication based Railway Information System will satisfy the requirements of next generation Railway Information System (RIS). Here we propose the overall implementation scheme for updating running train information in Railway Information System using wireless technology. The paper aims at enabling deployment of innovative, cost-effective and interoperable Wireless Communication based RIS for Indian scenario.*

Index Terms: Railway Information System (RIS), wireless communication, Nokia Mobile Browser (NMB), Nokia WAP gateway simulatior.

I. INTRODUCTION

Railway Information System (RIS), in general is built upon a computer based network to support railroad information collection, transmission, processing, and dissimilation in order to ensure safe and stable railway transportation and provide high quality operational service as well as passenger information services. Facing the rapidly increasing demand on "high-speed and high density" railway transportation to cope up with challenges from other transportation means, such as airlines and automobiles, the railway operator have to update their out-of-date RIS, which is classified as offline or narrowband underpinned.

This paper is intended to address a new generation of RIS network technology- Wireless Communication based RIS, which utilizes the emerging WAP (Wireless Application Protocol) and Web technologies to meet the requirements from next generation RIS. In recent time the mobile cellular commuincation has gained substanetial panetration rural areas. Urban areaa have mobile services available from multiple service providers, hence this paper introduces the feasibility of implementing the RIS based on the existing infrastructutre.Our tested Wireless Communication based RIS model consists of several components: Nokia Mobile Browser 4.0 (NMB4.0) SDK, Nokia WAP Gateway Simulator 4.0(NWGS 4.0), demo HTTP server i.e. Baby web Server, Microsoft Access database. Based on the design of Wireless Communication Based RIS will enable the innovative, cost-effective, and interoperable RIS system for transportations operation, production, and schedule, as well as passenger running information services. Due the resources constraints we have completed the simulation based test of the purposed model for running train timing information.

II NOKIA MOBILE BROWSER 4.0 SDK

In general NMB is a development tool intended for mobile Internet content developers who wish to preview how their content will look before it is ultimately deployed on a mobile phone handset. Using NMB, content developers can display any mobile Internet content developed using Nokia Mobile Internet Toolkit 4.0 (NMIT), as well as local file content and content resident on Internet servers and accessed through a WAP connection. WAP connections may be made through either a WAP gateway server or through Nokia's WAP Gateway Simulator (NWGS).NMB uses the Nokia Mobile Browser software, which has been developed by Nokia for deployment on actual phone handsets. However, NMB is not designed to reflect the functionality of any particular handset but rather an extensive range of current and evolving technologies of Interest to mobile Internet developers.

In our purposed model we have used the NMB to load the URL; which can be done by following the steps maintained below:

Choose the Load URL menu item (or popup menu) to load content from the Internet.

Fig. 1. Nokia Mobile Browser 4.0 SDK

For this type of content, NMB must be configured to use either an external WAP gateway or Nokia WAP Gateway Simulator (NWGS). If using NWGS, NWGS must be running before choosing Load URL.

After installing NMB, the configuration is done using the Settings dialogs accessible through the Tools>Settings menu item.

1. Configure NMB to use Nokia WAP Gateway Simulator (NWGS). Do this by choosing NMB's Tools>Settings menu item and then the Connections tab. By default, NMB is configured to use NWGS whose IP address is 127.0.0.1.
2. As we are using NWGS as the WAP Gateway, launch NWGS from the Windows Start menu as follows: Start>Programs>Nokia>WAP Gateway Simulator. NWGS must be running before you can browse mobile Internet content.

The loaded URL provides the information regarding the timing information of running train. We clicked Submit icon to indicate the arrival of train on the railway station

III. NOKIA WAP GATEWAY SIMULATOR 4.0

Wireless Application Protocol (WAP) is an open international standard for the applications that uses wireless communication. Its main purpose is to access the Internet from a mobile phone or PDA. A WAP browser provides all the basic service of a computer based web browser but simplified to operate within the restriction of mobile phone, such as its smaller view screen. WAP sites are websites written in, or dynamically converted to, WML (Wireless Markup Language) and accessed via WAP browser.

A WAP gateway located between mobile devices using the WAP protocol and the World Wide Web, it passes pages from one to the other much like a proxy. This translates pages into a form suitable for the mobiles, for instance using the Wireless Markup Language (WML). This process is hidden from the phone, so it may access the page in the same way as a browser accesses HTML, using a URL, provided the mobile phone operator has not specifically prevented this.

Nokia WAP Gateway Simulator is a single-user WAP Gateway based on the multi-user Nokia Activ Server. When installed on a computer, NWGS enables the user of that computer to access the mobile Internet through programs that communicate using the WAP protocol such as Nokia Mobile Browser Simulator 4.0 SDK. NWGS includes a decoder for decoding incoming requests from WAP client user agents, such as mobile phone emulators (SDKs), so that these can be forwarded over the HTTP protocol to Internet servers. It also includes an encoder that is used to encode server (HTTP) responses before sending these back to requesting clients.

A. Launching the NWGS 4.0

We can launch NWGS from the Start menu by the following way:

Choose Start>Programs>Nokia>WAP Gateway Simulator Admin View. NWGS starts and displays the following two windows as shown in Fig.2.

The top window is the Administration window that you use to configure and manage the server. The bottom window is the running server display.

NWGS is intended for use by a single user running application development programs and SDKs such as Nokia phone emulators on a single, local computer. For this reason, NWGS supports only the UDP bearer adapter and has a limited set of monitoring and logging functions. (Specifically, error logs) The typical user will simply need to launch NWGS in order to start servicing WAP requests made by other programs unless the user's computer accesses the Internet via a proxy server in which case proxy server configuration is required. So long as NWGS is running, a phone SDK or other application development program may use it to connect to the mobile Internet. Nokia phone SDKs are configured by default to use a WAP Gateway at IP address 127.0.0.1. In our tested model we used the default settings of NWGS 4.0.

IV. Microsoft Access Database

The database used for data storage for the system is a Microsoft Access database. In real time environment where a large amount of data is to be handled Oracle or any high end database server may be used instead.

V. Steps in Testing The Working Model

The system model is persented at Fig. 3.

The Nokia Mobile browser 4.0 is a virtual mobile handset. Through it, accessing the Web Serve is accessed to store train arrival and departure timings. It sends its data through Wireless Application Protocol. In real environment a transmitter dual of this can be used to send the train number when it enters into a minimum distance zone of a station. The train departure can be recorded once the train leaves the station. Apart from this, information of the train can also we recorded at the intermediate stations through which the trains passes, it will provide more accurate information and will be particularly useful for the trains having very limited stopage.

The Baby Web Server is an HTTP service provider, so it can't directly accept requests on WAP. That's why we have used a WAP to HTTP converter i.e. Nokia WAP Gateway Simulator 4.0. This simulator converts the WAP request / response into a HTTP request / response. When the train enters into a minimum definite distance zone of the station, the wireless receiver receives the particular train number as signal, converts that into HTTP packet and sends the same to the web server. This is needed at each station where the synchronization has to be made.

Baby web server is demo purpose 5 concurrent user license free servers. In real environment because of huge data traffic, high end server needs to be used. After receiving the train number as the input from Nokia WAP Gateway Simulator 4.0, it updates the time of arrival with respect to the train number in the database.

VI. Conclusions

The whole system demonsrtate the concept rather than a product by itself. Usage of third party mobile network can greatly reduce the capital expenditure required to set up such a facility. But for sake of reliability, a dedicated limited zone wireless network can be adapted. The design of a wireless transmitter to detect a railway station and sending the train number has to be investigated more thoroughly because except this, all other software / hardware are readily commercially available. Deployment of such type of RIS at small stations in the country like India makes it easy to update the train information sytem. Persently these stations do not provide any update information. The system integration of the servers and their locations are to be further investigated to facilitate economical usage of the infrastructure.

VII. References

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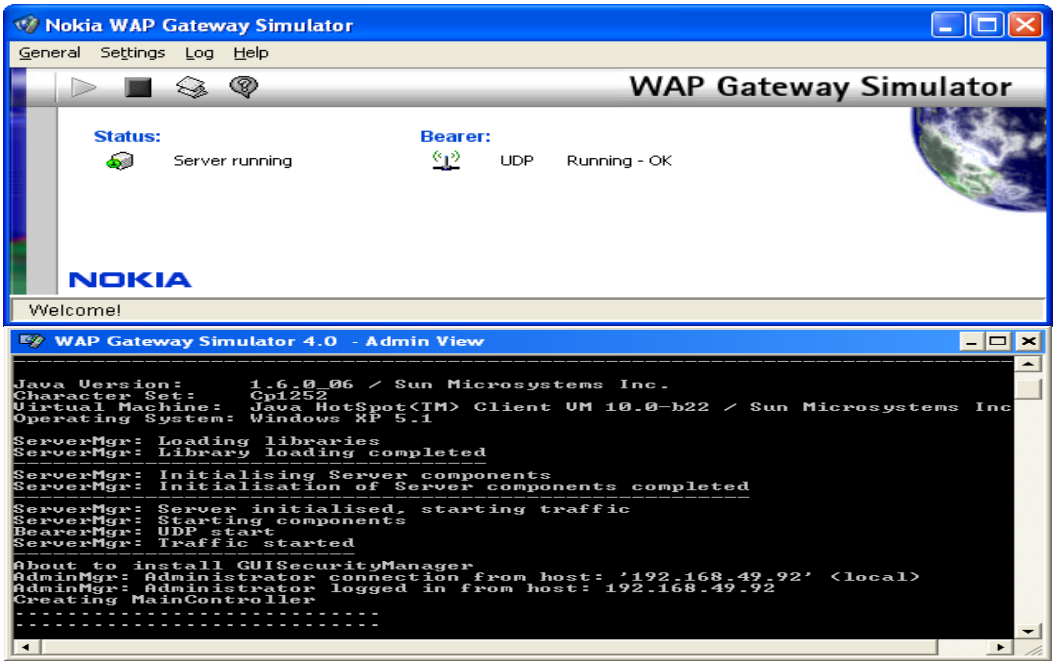

Fig. 2. Nokia WAP Gateway Simulator 4.0 GUI

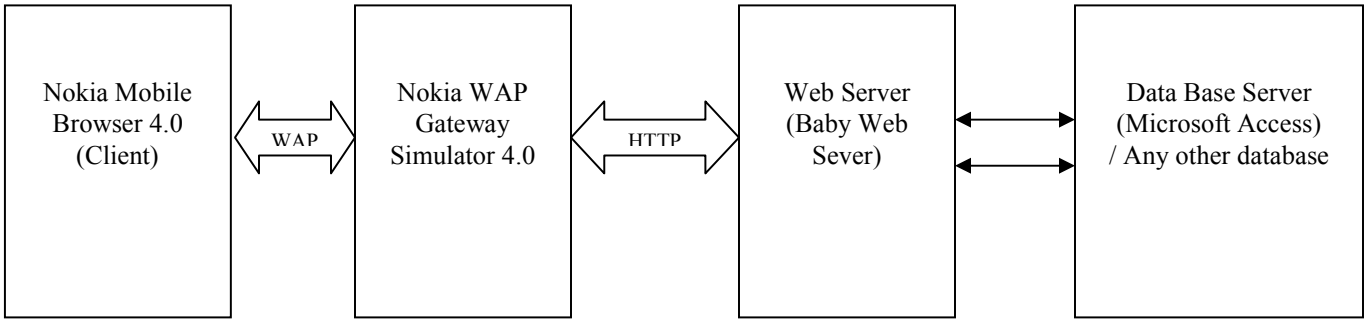

Fig. 3. Proposed Wireless Communication based Railway Information System