Abstract - This paper explores the applications of FOIS and its architecture as a case study to show how it changed the mindset of working in a closed system. FOIS enables freight customers to have instant access to information regarding the current status of their consignments in transit, for just in time inventory. It is a system for management and control of freight movement that also assists managers to optimize asset utilization. The architecture is centralized. The paper also explores the possibility of future integration of latest Technologies with FOIS application.

Keywords - FOIS, Freight, Consignment, Integration, Management

I. INTRODUCTION TO RAILWAYS

Indian Railways is one of the world’s largest rail networks under a single management. The Route Length is around 63,332 Km with more than 8000 stations. There are around 250,000 wagons and 9045 Locos. The Gross Traffic Receipts is Rs. 90,000 Crores. The freight is transported about 2 million tonnes/day & around 5700 million Originating PASSENGERS. There has been a longstanding demand of the industry for transparency in sharing of information to give the customers an up to date businesslike environment.

II. FOIS PROJECT HISTORY

Project for track and trace of Freight Trains and Goods was conceived by Indian Railways about 15 years back. CANAC was procured by IR and customized to IR requirements. The project went on trials for 10 years and finally CRIS(Centre for Railway Information System) It wing of Railways and CMC Ltd took up the challenge to provide an indigenous tailor made solution for the problem. System study conducted and user requirements received. An iterative approach was followed for design/ development and release.

First version released to a single division (DLI) with two tier architecture. Complete roll out done in phased manner and expanded division by division. In 2002 Tuxedo TMS was put as a middle tier and FOIS was enhanced to 3 tier architecture. Since then it has been geographically expanded to cover the whole of Indian Railways.

III. FOIS –DRIVER PARAMETERS FOR FOIS

The FOIS is a centralized 3 tier client server architecture. Application servers are centrally located at Delhi. The Database is ORACLE parallel server in a cluster. The Middle Tier is Tuxedo & Visual Basic at front end.
Operating system- HP Ux 11i on HP Integrity Server. There are more than 3000 intelligent terminals at more than 800 field locations. The Data is captured from activity centers like control offices, yards, loco sheds, C&W depots, goods sheds. Terminals connected to application servers for transaction processing by reliable communication links through WAN, v-sat, microwave, ISDN.

A. Front End:

All the transactional MMI have been developed using VB 6.0 EE which is a object oriented event driven programming SDK. More than 200 reusable functions developed and modular approach followed to speed up the development and all industry standards followed. Once compiled an executable is created and distributed to all reporting locations through intranet and CD(s). There are more than 100 transactional MMI developed in Visual Basic for accepting inputs from various categories of end-users. There are more than 500 dynamic operational / statistical / Managerial reports generated. The same are accessed through intranet and also through WWW. There are another 2500+ Static reports generated for DSS and pushed to mail boxes of Railway Officers on daily basis. These generate more than 1GB of new Data on the storage on daily basis and modify more than 2GB of existing data. The yearly growth of about 10% in data volumes is taken into consideration.

B. Middleware – TUXEDO: TUXEDO an Oracle Middleware is the heart of all business logic. It acts as a Transaction Monitoring Server and provides for Two Phase commit across databases and applications. Complete business logic in form of Pro*C codes is developed by engineering team. There are more than 4000 such files residing on application server. A version management for the same is implemented to take care of changes and releases done in the system.

C. Database – Oracle 10g: Oracle 10g is being used in RAC mode to handle the database. Current size of live data is more than 300Gb. Current size of historical data is 2.5 Tb. Data inflow on daily basis 1Gb No of client requests being handled by the system is approximately 5,50,000 per day. Annual data growth of 40% is accommodated.

V. FOIS FUTURE INTEGRATION OF VARIOUS APPLICATIONS

A. E-Payment For electronic payment of freight for any commodity like Coal booked at a terminal like Power House like BTPS from collieries on ECR. Originating point intimates electronically the freight charges due to the bank eg SBI. After receipt of “Successful Transaction” message - electronic confirmation from the bank of this transaction confirming the debit from BTPS account, RR is printed at the originating point. It is a synchronous transaction and reply should be received within 2 minutes.

B. RFID based wagon tracking system. Using RFID technology for automatic identification of Railways Wagons. RFID is a system of a small electronic tag (Comprising a tiny chip plus antenna) that transmits a radio signal, radio signal readers, and by a radio signal related hardware and software infrastructure. With RFID Wagon number and the wagon location can be identified. This will solve the duplicate wagon and detention problem in the FOIS database.

C. Integration with Divisional applications of Railways

Integrated Revenue Accountal system, Train Charting and Control Systems at Divisions, National Train Enquiry System

D. Data Warehousing and DR For Data Analysis over historical data and trend analysis a Data Warehousing Solution is being worked out to store data for at least last
5 years and allow users to query the same on demand and on individual need basis.

E. DISASTER Recovery To avoid single point of failure with respect to site, a Disaster Recovery Site is being planned to provide services in case of any disaster at primary site.

VI. CONCLUSION
This Paper explained applications of Freight Operations Information System (FOIS) which met the long standing demand of the industry for transparency in sharing of information to give the customers an up to date businesslike environment. This online real time information about the Rake movement Examples were given to show how artificial intelligence & neural networks are used in applications like Pattern recognition, Autonomous Walker & Swimming Eel, Facial Animation, Artificial Creativity, Computer vision, Virtual reality and Image processing, and Strategic planning etc.

ACKNOWLEDGEMENT
No work can be accomplished without taking the guidance of the experts. It is only the critiques from Ingenious and intellectuals that helped in transforming a product into a quality product. We would like to gratefully acknowledge and express our deep gratitude to JIMS, our concerned institute and its management as well as Railways Department who always helped us in completing this paper.

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