CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The main objective of this research work is to define a methodology to find a better routing plan which is less costly in near real time. The term 'near real time' need to be considered since it was really necessary to cater for sudden changes in the operator and future traffic specific parameters instantaneously. There were following main challenges in this research work,

a) Future traffic prediction
b) Finding the optimised routing plan
c) Producing the results in near real time.

5.1.1 Future Traffic Prediction

It was not necessarily required to use a complicated method to determine the future traffic pattern as the required information (parameters) for the proposed heuristic method is readily available within in any Telco. An expert system, using neural network or fuzzy logic could be heavy for this type of a system where it is required to produce the results in near real time.

In the proposed system, this was addressed using history data (past traffic pattern), current traffic trend and considering sudden changes heuristically. This exercise was very successful and the proposed system is able to produce very close traffic patterns in reality.

5.1.2 Cost-effective Routing Plan

It was decided initially to make use of an existing third party tool which is available in the market. But it was found that using an existing optimising tool is not feasible for this particular problem because of its dynamic nature of parameters.

Genetic Algorithm was used to obtain the cost-effective routing plan. The system produced optimised routing plan which has a cost reduction of 30% - 50% compared to the manual routing plan considering only the operator rate.

5.1.3 Results in Near Real Time

Even though, the initial setup (database and other parameter configuration) takes some time, the rest of the operations, which are part of generating the optimised routing plan takes only few minutes.

The system produces results in less than 40 minutes. This is sufficient for a near real time system.

As a summary of the conclusion it can be stated that the proposed system is capable of,

a) Predicting the future traffic which is close to the real traffic.
b) Producing the optimised routing plan for the next day (next 24 hours) which reduces the cost by 30% to 50% against the manual routing plan
c) Producing the solution in less than 40 minutes.

The proposed solution could be used in the Telco industry with a significant margin of profit for the international telecommunication business.

5.2 Recommendations

The effectiveness of the results is dependent on the accuracy of the input, consistency in setting up that information in the system and operation of the system. Following guide lines will help to gain the maximum benefit out of the proposed system in the context of international telecommunication traffic business.

- **Initial Data Gathering and Setup**

  It is very important to acquire the correct set of history data for the purpose of analysis. Usually, there are millions of traffic data, approximately 50 million call detail records. For simplicity of handing and processing of the

history data, it is recommended to summarise the past traffic information in to every hour and store in the proposed system database. This will give provisions to configure the system with required changes and generate the optimised routing plan even in the middle of the day. Since, very simple light weighted database is used, it is better to keep history information for a specific traffic period only at a given point in time.

- **Parameter Setup**

It is required to get up to date operator specific information (traffic commitments, rates, discounts if applicable and supported international locations) and configure them in the proposed system. It is also very important to determine the current growth rate of the traffic to each international location compared to the previous year.

- **Apply Changes**

Need to be in constantly alert for any changes in the system related parameters and update the system. This is one of the strongest features in the proposed system where the system could be updated with any changes in the parameters and the optimised routing plan which reflects the changes made generated. Since the proposed solution is capable of generating optimised routing plan in near real time, it is necessary to configure the system and process at least one hour in advance for the optimised plan to be in operation.

- **Update with Real Traffic Done**

It is required to update the system with up to date traffic done in the middle of the traffic period just before generating the optimised routing plan. This is important for the system to consider the rest of the traffic volume for the current traffic period in the process of generating the optimised routing plan for the next day.

- **Update the network element**

Finally, cost-effective routing plan (generated through the system) needs to be updated in the network element (Telco switch). The optimised routing plan will be available in the proposed system as a text file which can be used by an external interface which could read the text file and update the network element. The optimised plan is also available in the database.

5.3 Future Work

- **Interface to Network Element**

Defining of the "network element" update functionality was not part of the scope of this research work and need to be addressed separately as a future work (not a research work). The proposed system has the provisions for such functionality which can be incorporated easily.

- **Optimising the Fitness Calculation Process**

Initial fitness calculation process takes most (95%) of the time in the proposed system and it would be beneficial if the calculation time could be reduced.

- **User Interface**

Defining a suitable user interface which can be used to configure, monitor and operate the system effectively has to be done in the future.