METHOD FOR LOCAL NETWORK PLANNING

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In doing local network planning, we developed three main modules: forecast module; network optimization module and economic study module. We used AHP method for choosing the plan of transferring from analogue to digital network in decision making with multi-objective. Finally, we developed a computer program package CAPLIN for the planning of local telephone network.

1. THREE MAIN MODULES

The local network planning are divided into three parts, that is forecast; network optimization and economic study. see fig. 1

2. FORECAST MODULE

When planning local network, there are three kind of forecast have to be done.

2.1. Macro-forecast

It is to determine the subscribers of local area for the forecast period.
It is included the statistical analysis of original data and materials of past years. for instance: the number of subscribers; GDP, national income per-capital; telephone density and population etc. We used time series, correlative and regressive analysis mathematical model to forecast the growth of subscribers in the following years.

2.2 Micro-forecast

It is intended to forecast the subscriber density graph of local city, in order to divide the macro-forecast result into every element of the subscriber density graph.
For short term forecast, we classify the subscribers into 6 to 10 kinds, each kind has its growth growth rate. Let the different kinds of each element subscribers of the subscriber density graph times the growth rate would get the forecasted subscriber density graph.
For long term forecast we take the equal-density method. It depends on the element located in what kind of area of the local city planning, such as the long term macro-forecast result of the net growth industrial subscriber is K. We divide K by the total elements which located in the industrial area of local city long term planning, so we get the net growth subscriber of every element and then plus the result of short term forecast, the long term subscriber...
density is obtained. After that we may adjust some forecast results, in order to match practical condition.

Fig. 1
2.3 Traffic Matrix Forecast

Three methods are used for different conditions in order to get the traffic matrix.

2.3.1 Gravity Method

\[ Y_{ij} = \frac{C_i C_j / d_{ij}^n}{\sum C_i C_j / d_{ij}^n} Y_i' \]  

\( Y_{ij} \) incoming traffic
\( Y_i' \) outgoing traffic
\( C_i \) i office forecast
\( C_j \) j office forecast
\( d_{ij} \) distance between i and j offices

2.3.2 Community Interest Coefficient Method

\[ f_{ij} = \frac{Y_{ij}}{T} \]  

\( f_{ij} \) community interest coefficient of i and j
\( T \) total traffic flow of the network
\( Y_{ij} \) traffic flow between i and j

Total traffic forecasting value of the network times \( f_{ij} \) we may obtain the forecasting \( Y_{ij} \).

2.3.3 Double Factors Method

If we get the forecast incoming and outgoing traffic of every office and the traffic matrix of recent year. We may use the matrix balance method to obtain the forecast traffic matrix.

3. OPTIMIZATION MODULE

3.1. Planning of Exchange Locations and Boundaries in Multi-exchange Network Taking into Account RSU.

- Optimum number of exchanges
- Locations and boundaries of exchanges
- Critical distance for using RSU in the subscriber loop
- Optimum capacity of RSU

3.2. Optimization of Junction Network

- Determining the tandem exchanges and its areas
- Making decision of high usage junction circuits (T.H.L.)
- Choosing transmission mode (PCM or optical fiber etc.)

3.3 Choosing the Planning of Transferring from Analogue to Digital Network
An advanced method AHP in decision making with multi-objective is used. It is combined with qualitative and quantitative analysis. We may set up several projects for instance: overlap or integrate network etc., and then develop the determinative matrix by inquiring specialists. After that use AHP method to make the decision which project is better.

3.4. Set Up a Schedule of Capacity Augmentation by Stages

Dynamic programming method is used

4. ECONOMIC STUDY MODULE

4.1 Calculation of First Cost; Income and Expense

Cash flow tables and figures are established.

4.2. Financial Analysis

Calculation of economical parameters such as: PWAC; I.R.R. and payback period etc.

4.3 Sensitivity Study

Effects of parameter variations in the network are evaluated.

5. CONCLUSIONS

CAPLTN(computer aid planning for local telephone network) program package was developed with PASCAL language. It is intended to do planning for local network. The program has been used in network planning for cities of Hangzhou, Xian, Wenzhou, Jinhua etc. in China.

6. REFERENCES

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