ITU / BDT- COE workshop

Nairobi, Kenya,
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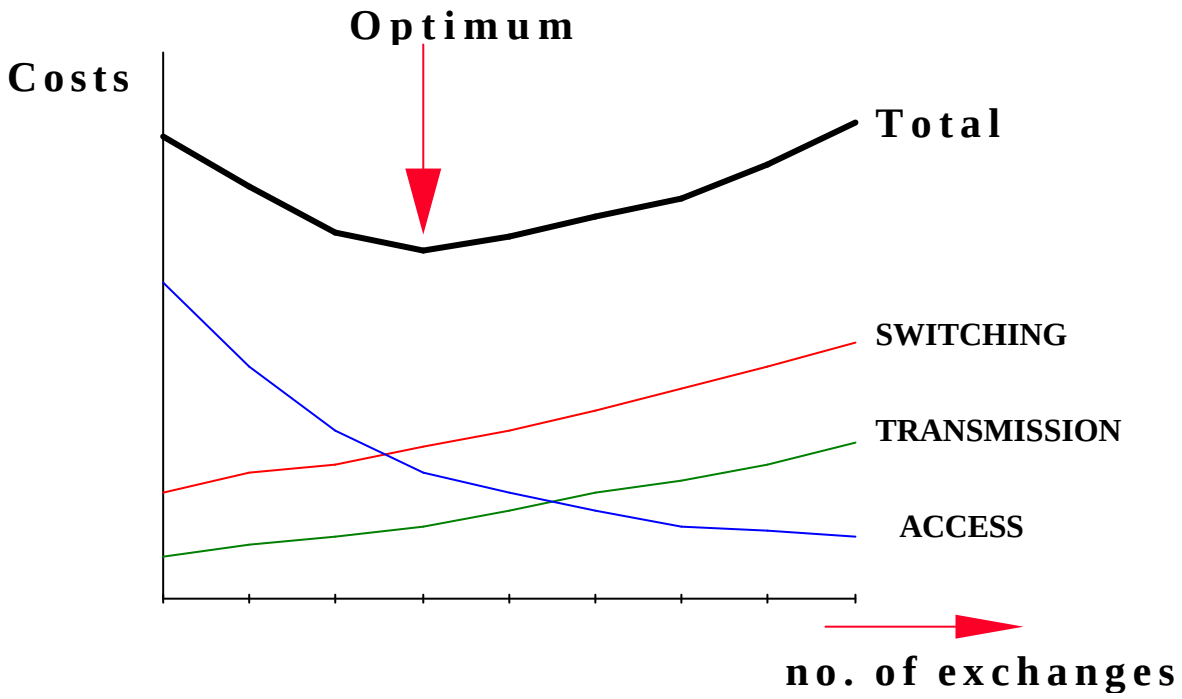
Network Planning

Lecture NP-3.4

Network optimization and costing

Network optimization:

Cost components of telecom network



Optimization task -

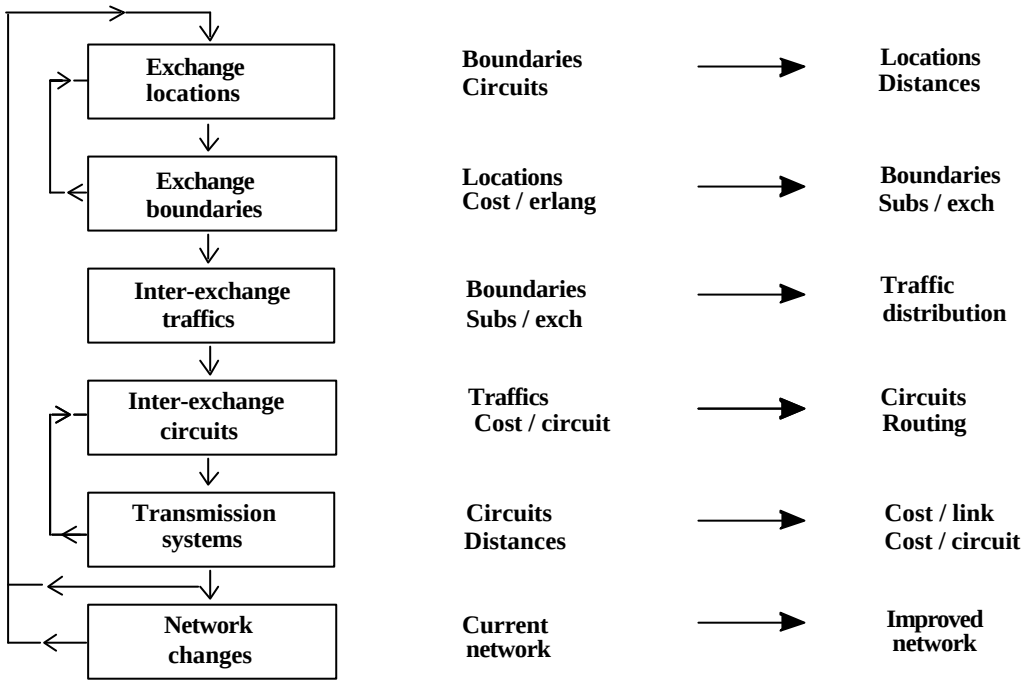
find minimum network cost solution for given (forecasted) demand for services and specified (requirements) quality of service.

Owing to the complexity and size of the typical telecom network, it is not possible to treat all aspects of the network simultaneously.

Iterative procedure for optimizing a telecom network

Network optimization problem to be solved has to be divided into a number of suitable **sub-problems**, these to be treated **iteratively** in a certain order.

Such sub-problems are eg:



For the solution of any of these sub-problems, we assume that the rest of the network has been correctly optimized and/or dimensioned.

Initially, of course, this will not be the case, and the necessary data will then have to be estimated.

Subsequently, the results of the calculations performed in previous steps within an iteration, or in previous iterations, can be used.

Network costing:

COST STRUCTURE

Cost subscriber – exchange:

$$D_E \cdot C_s(D_E) + C_f$$

per subscriber, service

Cost exchange – exchange:

$$D_{EF} \cdot C_c(D_E) + C_d$$

per circuit, channel

Cost of exchange equipment (including the switch)

Cost of building, container, etc.

Total network cost function, C, could be expressed, e.g. in the model with subscriber zones (grid), as

$$C = \sum_{E=1}^{NEX} \sum_{(i,j)\in E} sub(i,j) \cdot \left[C_s(D_E) \cdot D_E + C_f \right] + \sum_{E=1}^{NEX} \left[C_a(E) + C_b(E) \right] +$$

$$+ \sum_{E=1}^{NEX} \sum_{F=1}^{NEX} N_{EF} \cdot \left[C_c(D_{EF}) \cdot D_{EF} + C_d \right]$$

Economy Study Techniques

The basic economic study methods are:

- The present worth method
- The annuity method
- The rate of return method

The choice of method to be employed for a certain study is rather arbitrary and the ease of calculation and the simplicity of presentation are factors which should always be considered when making the decision.

In network planning optimization problems, the most convenient method is the **present worth technique**.

Present Worth (PW) method

This method refers to all the events in an economy, both incomes and expenditures , as one figure at one point in time.

When comparing different alternatives for a given revenue or cost saving, the alternative with the least present worth of all expenditures or annual charges should be selected.

There are two methods of present worth:

- the present worth of expenditures (PWE), and
- the present worth of annual charges (PWAC).

Present Worth of Expenditures (PWE)

The present worth of expenditures (PWE) method measures how attractive an alternative is based on the comparative cost to an administration of undertaking each alternative.

By finding the PWE of each alternative, we are in a position to select that alternative with the lowest PWE for a given service to the subscribers.

The PWE does not require any estimate of revenues; however, if a difference in revenues is anticipated, revenues must be taken into consideration in order to maintain comparable conditions.

Present worth of annual cost (PWAC)

The present worth of annual costs (PWAC) method is essentially the same as the PWE method, except that capital costs are converted to equivalent annual costs (AC) before their worth is found.

The annuity method

With this method, initial capital costs are converted to equivalent annual costs.

Constant annual receipts and/or operating costs are then substracted and/or added to the annual capital costs.

The rate of return method