ITU Seminar

Bangkok, Thailand , 11-15 November 2002

Session 3.2

Service and traffic forecasting

Service forecasting

Models for subscribers:

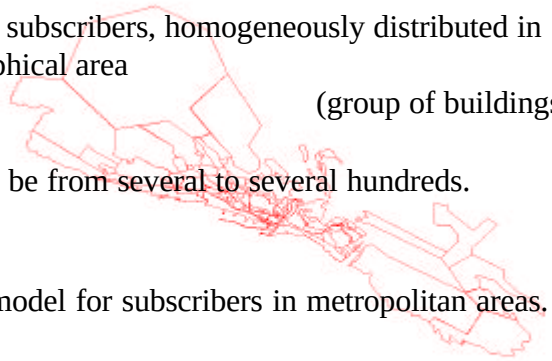
Subscriber zones / areas

Subscriber nodes / sites

Subscriber zones

Group of subscribers, homogeneously distributed in a geographical area

(group of buildings, houses, etc.)



They can be from several to several hundreds.

Typical model for subscribers in metropolitan areas.

In the suburbs are quite big areas (e.g. diameter of one km),

in the center they are much smaller (e.g. one administrative building).

Subscriber zones

- usually the city centre is surrounded by urban areas with high customer density, while the areas in the edge are suburban areas
- often the set of areas is similar to exchange areas

Customer densities are defined per square kilometre

Each area is described with a specified mix between different categories of customers

Subscriber categories

Subscribers with approximately similar habits of using the telecom network

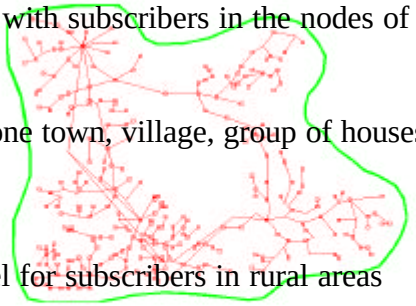
Generally used categories are:
Residential (RES) and Business (BUS).

Further, the BUS subscribers could be divided to:

- Direct business lines (B),
- PBX lines(PBX),
- Coin box telephones (CB), etc.

Subscriber nodes

Graph model with subscribers in the nodes of the graph



One node is one town, village, group of houses, business center, etc.

Typical model for subscribers in rural areas

Arcs of the graph represent geographical distances

Subscriber categories

Could be also Residential, Business, etc.

Could be based on the categorization of the populated places.

Usually the parameter for describing a category is the size of the populated place (in inhabitants):

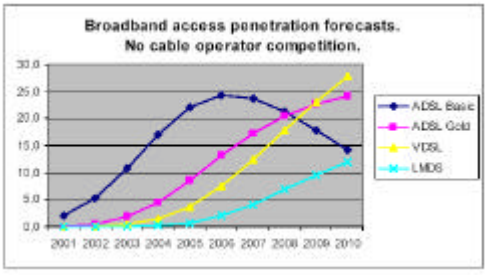
Category	Population
0	> 50 000
1	10000 - 50000
2	1000 - 10000
3	500 - 1000
4	100 - 500
5	0 - 100

Subscriber categories

Subscriber categories defined with Customer Classes

Services - services offered to the customers :

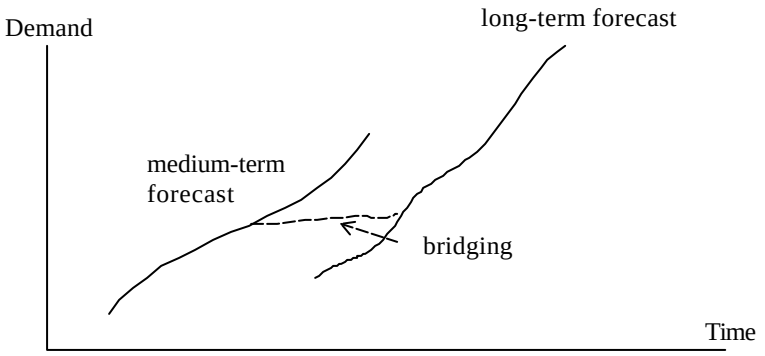
E.g. ADSL Basic, ADSL Gold, VDSL, SDSL-Medium Enterprises and SDSL-Small Enterprises.



Customer Classes – groups of customer using the same services (one or more) :

E.g. Residential ADSL Basic, Residential ADSL Gold, Small Enterprises (SDSL), Medium Enterprises (SDSL), Residential VDSL

Service/demand forecasting



Methods for forecasting of subscribers

time trend forecasting methods –
it is assumed that development will follow a curve which has been fitted to existing historical data

explicit relationships between demand and various determining factors –
these will remain the same in the future

Methods for forecasting of subscribers

Comparing various steps of telecommunication development –
it is assumed that the less-developed country (or area) will develop to the level of the more developed one

Personal (subjective) **judgment** in the forecast –
the future will resemble the person's previous knowledge and experience of past developments

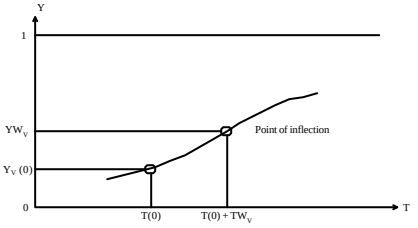
Methods for forecasting of subscribers

Logistic model

The development is supposed to follow a curve which first accelerates, then passes a point of inflection, and finally the development slows down and approaches an asymptote, the "saturation level", or "the maximum density"

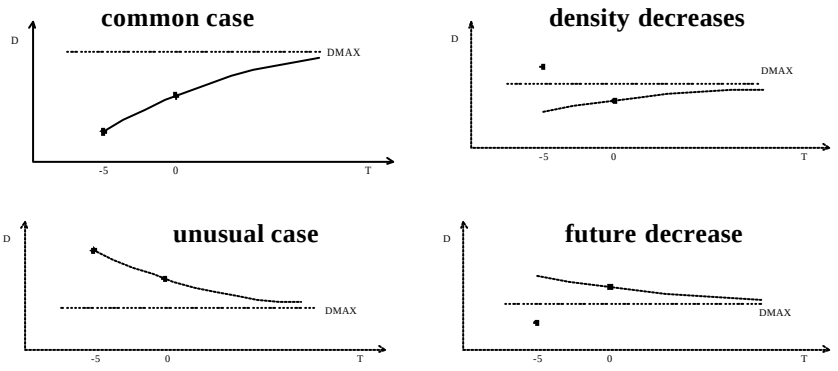
$$D_V = Y_V \cdot DMAX_V$$

$$Y_V = \frac{1}{\left(1+e^{-C_V(T-T_0)}\right)^{1/M_V}}$$



Methods for forecasting of subscribers

Logistic model

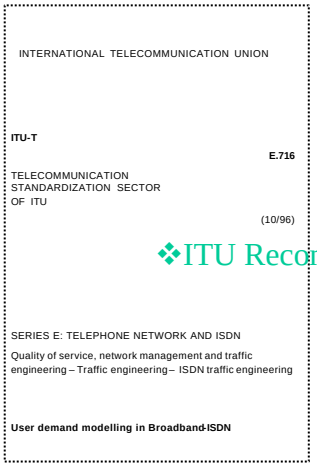


Traffic forecasting

Models for traffic

scope of teletraffic engineering

❖ITU Recommendations


INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

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TELECOMMUNICATION STANDARDIZATION SECTOR OF ITU

(10/96)

SERIES E: TELEPHONE NETWORK AND ISDN

Quality of service, network management and traffic engineering – Traffic engineering – ISDN traffic engineering

User demand modelling in Broadband-ISDN


TELETRAFFIC ENGINEERING HANDBOOK

❖ TTE Handbook

Traffic forecasting

Traffic zones –

groups of subscribers with similar habits,

homogeneously distributed in a geographical area

(e.g. the center of the city, the industrial zone, the residential area.)

Traffic forecasting

Calling rates –
traffic per subscriber (in Erlang)
per subscriber category, from certain traffic zone

HTTP service (web-browsing) –
traffic modeled with mean rate, peakedness, packet loss ratio, buffer size, and Hurst parameter

Voice over IP (VoIP) –
constant bit stream application, where the mean rate equals the peak rate

Traffic forecasting

Traffic interest –
of subscriber,
between traffic zones

Forecasting –
based on subscribers forecasting
and calling rates

Traffic matrix –
to specify the traffic needs in a region with *n* traffic zones (exchanges) - n^2 traffic values are required

Traffic forecasting

Traffic matrix

Set of traffic matrices – one for each services

Based on total originating and terminating traffic – distribution of the total traffics