Measurement of Traffic Distribution Matrix

(Solution to Exercise)

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MEASUREMENT OF TRAFFIC DISTRIBUTION MATRIX:

Solution to the Example

The first step in the job is to establish a form (matrix) in which the different information can be stored. See fig 5.3. It is convenient to put both routing and traffic information in this form.

First position in first row can be filled in directly as it is a *D-case*. The measured value is *35 erl* and the minimum value is decided to be 95% i.e. *35 erl*. Note that traffic values are given as integers, normally this gives sufficient precision.

In first row there are no more *D-cases*, then we turn over to the *H-cases*. See section 2. From each 1 to 4 *102 erl* is measured on the *H-route*. The measurement shows 16.5% rejection from *H-route,* and from traffic route tester results the total congestion $B_h \cdot B_t$ is estimated to 5%. Thus eq. 2.2 gives

$$A_H = 102 \cdot \frac{1-0.05}{1-0.165} = 116 = 102 + 14$$

which is written in the form. The minimum value is estimated as

$$A_{Hm} = 102 + 0.3 \times 14 = 106$$

Measurements show that the originating traffic from each no 1 is *292 erl* of which *35 + 102 + 14 = 151 erl* now have been declared. The remaining traffic *292 - 151 = 141 erl* is distributed on the *T-cases* in accordance to calling rates found from number analysing equipment, which gives a distribution like

$$A_{T12} = 141 \cdot \frac{1386}{4801} = 41 \ \ erl$$

$$A_{T13} = 141 \cdot \frac{2299}{4801} = 68 \ \ erl$$

$$A_{T15} = 141 \cdot \frac{1116}{4801} = 33 \ \ erl$$

As a consequence of this unprecise method we assume maximum error of 40% i.e. minimum values

$$A_{Tm} = 0.6 \cdot A_T$$

In the next row the three *D-cases* are treated as already shown and as exchange no 2 has no number analysing equipment the remaining traffic *318 - 48 - 70 - 115 - = 85 erl* is distributed between exchanges 1 and 5 in accordance with their terminating traffics *221 erl* and *182 erl* respectively. i.e.

$$A_{T21} = 85 \cdot \frac{221}{221 + 182} = 47 \ \ erl$$

$$A_{T25} = 85 \cdot \frac{182}{221 + 182} = 38 \ \ erl$$

and minimum values 60% of this.

The following rows are calculated analogously, but the calculations and underlying measurements are omitted in this example.

From to →	1	2	3	4	5	A_0
1						292
routing	(D)	T	T	H	T	
estimated traffic	35	41	68	102 + 14	33	
minimum traffic	33	25	41	106	20	
2						318
routing	T	(D)	D	D	T	
estimated traffic	47	48	70	115	38	
minimum traffic	28	46	67	109	23	
3						421
routing	H	H	(D)	D	H	
estimated traffic	40 + 8	61 + 3	95	157	50 + 3	
minimum traffic	42	62	90	149	51	
4						496
routing	H	H	D	(D)	D	
estimated traffic	55 + 6	60 + 10	115	186	60	
minimum traffic	57	63	109	177	57	
5					——	229
routing	T	H	H	D		
estimated traffic	36	30 + 5	50 + 5	103		
minimum traffic	22	32	52	98		
Terminating A_I	221	265	398	690	182	1756

Figure 5.3

Now fig. 5.3 contains 25 traffic values of varying reliability or confidence.

As explained in section 4 the minimum matrix is removed from the tentative traffic matrix. Fig 5.4 shows the result of this.

E.g. the elements of the first row are

$$35-33,\ 41-25,\ 68-41,\ 102+14-106,\ 33-20$$

and the desired sum *67* is formed as

$$292 - (33+25+41+106+20) = 67$$

Now the Kruithof method is applied on the matrix fig 5.4, thus giving the matrix shown in fig 5.5 which then is added to the minimum values shown in fig 5.3. This gives the final result shown in fig 5.6. Due to rounding-off errors the sums are not exactly right but the differences are not more than *2 erl*.

j i	1	2	3	4	5	$A_0 - \Sigma A_m$
1	2	16	27	10	13	67
2	19	2	3	6	15	45
3	6	2	5	8	2	27
4	4	7	6	9	3	33
5	14	3	3	5	0	25
$A_I - \Sigma A_m$	39	37	39	51	31	197

Fig 5.4

j i	1	2	3	4	5	$A_0 - \Sigma A_m$
1	2	19	23	12	12	67
2	17	3	3	8	15	45
3	6	3	5	12	2	27
4	4	9	6	12	3	33
5	12	4	3	7	0	25
$A_I - \Sigma A_m$	39	37	39	51	31	197

Fig 5.5

j i	1	2	3	4	5	A_0
1	35	44	64	118	32	293
2	45	49	70	117	38	319
3	48	65	95	161	53	422
4	61	72	115	189	60	497
5	34	36	55	105	0	230
A_I	223	266	399	690	183	1761

Fig 5.6