Latest Thinking on Forecasting Techniques

Jonty Pearce

Editor

Call Centre Helper

Erlang C

Invented by AK Erlang (Danish) in 1917 - Now 100 years old

Excellent piece of work working out number of advisors needed for number of calls and service

Assumes callers will wait indefinite time

- Does not factor in abandoned calls

THE
Post Office Electrical Engineers' Journal

SOLUTION OF SOME PROBLEMS IN THE THEORY OF PROBABILITIES OF SIGNIFICANCE IN AUTOMATIC TELEPHONE EXCHANGES.

By A. K. Erlang, M.A., A.M.I.E.E.,
Scientific Assistant at the Copenhagen Telephone Company.

Summary.—Sections 1–7. First main problem: Systems without waiting arrangements. (Two different presuppositions.) Accompanied by Tables 1, 2, 3, Sections 8–9. Second main problem: Systems with waiting arrangement. (Two different presuppositions.) Accompanied by Tables 4, 5, 6, 7, Sections 10–12. Approximative methods, references, conclusion. Accompanied by Table 8.

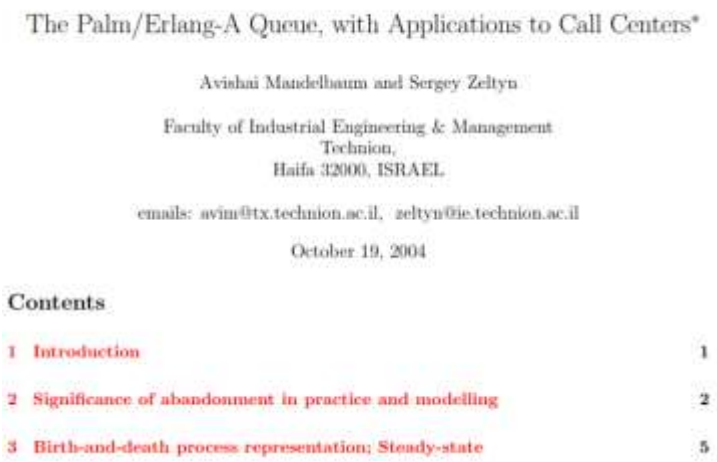
(1) *First Main Problem.*—Let us suppose that an automatic system is arranged in such a manner that, somewhere, there are provided x lines to take a certain conversation traffic, *i. e.* the outgoing

Erlang A

Invented Conny Palm (Swedish) in 1946

Erlang A (A stands for Abandon)

Works out the number of Abandons based on Average Patience (the average amount of time a caller will wait before caller hangs up)



The Palm/Erlang-A Queue, with Applications to Call Centers*

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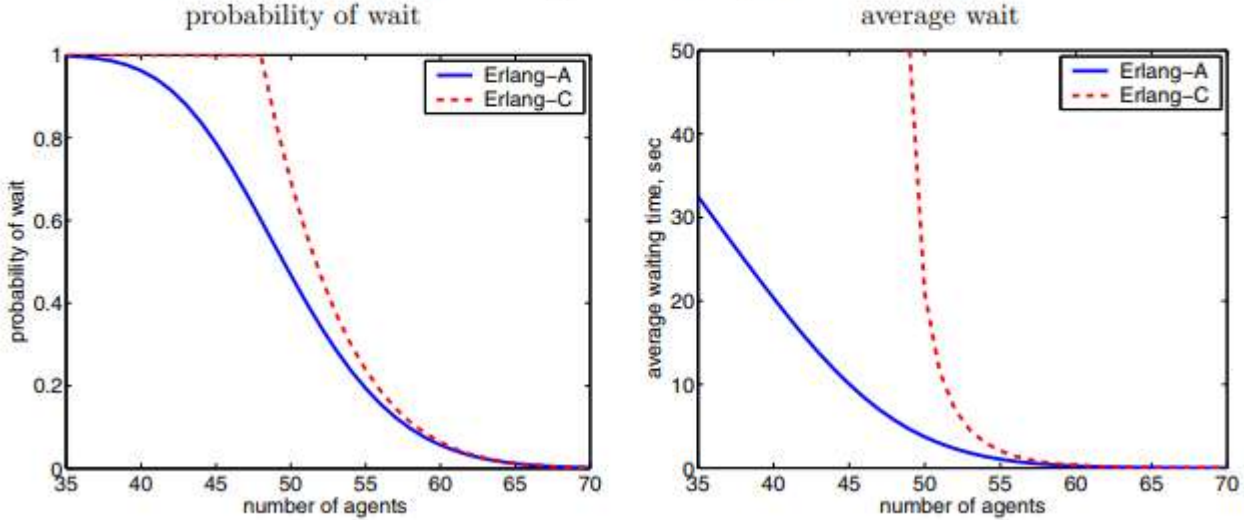
Erlang C vs Erlang A

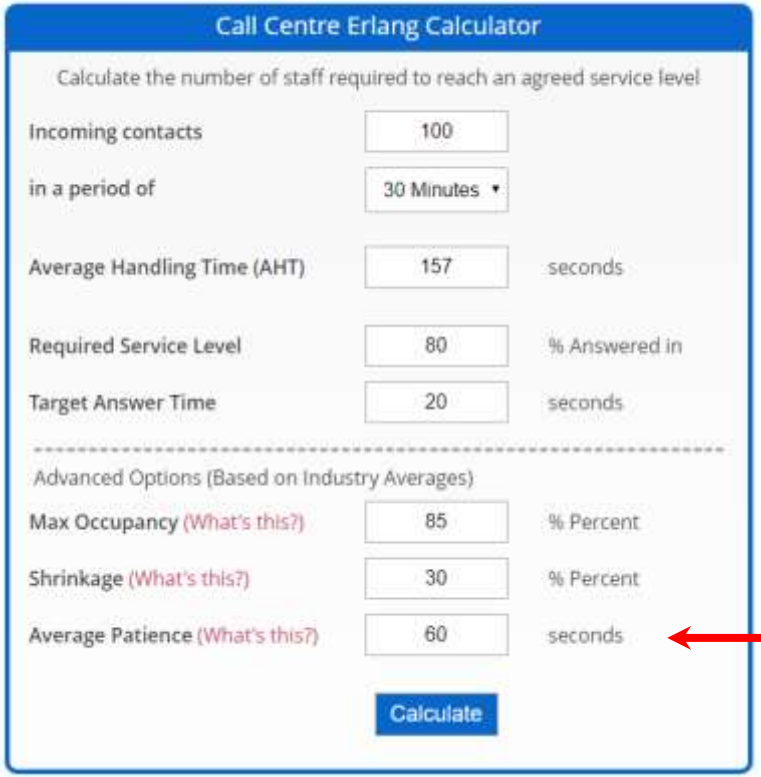
Figure 2: **Comparison between Erlang-A and Erlang-C**
48 calls per min., 1 min. average service time, 2 min. average patience



Erlang C is most used as it tends to be more conservative on staff numbers

- i.e. If you staff to Erlang C you can better handle call peaks

Hybrid Erlang Calculator



Agents	Agents Before Shrinkage	Service Level	Occupancy	ASA (s)	% Answered Immediately	Abandon Rate
13	9	[illegible]	[illegible]	506	10.4%	14.87%
14.5	10	[illegible]	[illegible]	72.4	41.1%	10.09%
15.5	11	[illegible]	[illegible]	25.7	62.8%	6.51%
17	12	[illegible]	[illegible]	10.8	77.5%	3.97%
18.5	13	[illegible]	[illegible]	4.8	86.9%	2.3%
20	14	[illegible]	[illegible]	2.1	92.8%	1.25%
21.5	15	[illegible]	[illegible]	1	96.2%	0.65%

Erlang C used to calculate Agents Needed

Erlang A used to calculate abandon rate

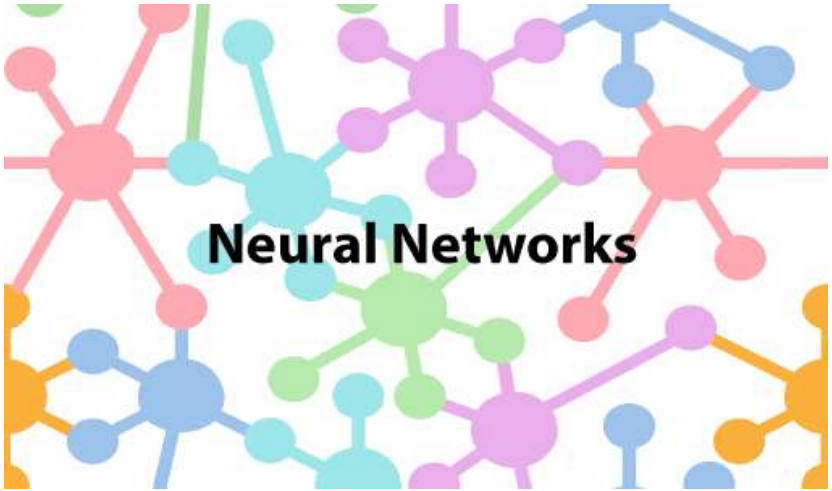
https://www.callcentrehelper.com/tools/erlang-calculator/

Latest Techniques for Call Centre Forecasting

- **Triple Exponential Smoothing**
- **ARIMA**
- **Neural Networks**
- **Multiple Temporal Aggregation**

https://www.callcentrehelper.com/webinar-the-secrets-of-wfm-100167.htm

Neural Networks



Neural Networks seem a way off being able to generate a forecast

Bad at identifying trends

Very good at spotting outliers

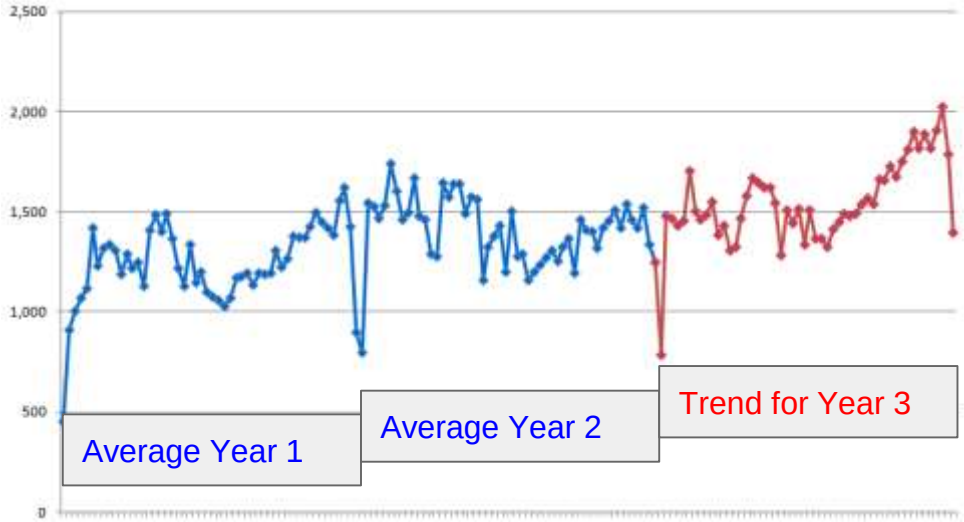
Could be used to good effect on cleaning up data in the pre-forecast phase

https://www.callcentrehelper.com/the-latest-techniques-for-call-centre-forecasting-117394.htm

Multiple Temporal Aggregation MTA

Combines different time periods yearly, quarterly, monthly, weekly, hourly to generate the forecast

MTA Multiple Temporal Aggregration



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