Evaluating Traffic Management Strategies in an Emergency Call Center Context

Case study at the Swedish emergency call service provider, SOS Alarm

Klas Gustavsson
PhD student
Department of Information and Communication Systems
Mid Sweden University
SOS Alarm – An Overview
Alerting & preparedness - Introduction

• The emergency number 112 - person or property in need
• Crisis preparedness
• About 650 employees
• 13 SOS-centers
Research problem

- Steady increase of emergency calls since 2010 (17%)
- Increasing number of non-Swedish speaking emergency calls
  - 250-400 calls/month
- Several other factors (such as service requirements)
- Increasing response time

Future challenges
- Climate change
- Instability in the world
Research objectives

• Reduce response time using traffic management strategies
• Especially reduce wait>30s
• Three sub-objectives
  1. Evaluate specified traffic management strategies
  2. Design strategies managing heavy-traffic scenarios/big events
  3. Optimize system adjustable parameters
Traffic management strategies

- Traffic management concepts:
  - Routing
  - Overflow

- Skills/reception:
  - Local
  - Regional
  - National
Theoretical framework

- Analytical Erlang-C
  - Probability functions
  - Commonly applied when staffing call center
  - Simplified
  - Single line queues

- Simulation models
  - Networks
  - Details
  - Upcoming in call centers
Approach

• Enabling details
  • All characteristics
  • Various phenomenon

• Arena Simulation Software
  • One of the leading commercial simulation softwares
  • Discrete-Event simulation
  • Module-based
  • Similarities to process modeling
Implementation

- Empirical data
  - Arriving call times and their origin (from call-logs)
  - Staff levels (calculated from operator logs in the system)
  - Distribution of call types
  - Average service time for each call type

<table>
<thead>
<tr>
<th></th>
<th>care</th>
<th>rescue</th>
<th>112</th>
</tr>
</thead>
<tbody>
<tr>
<td>fraction (%)</td>
<td>≈30</td>
<td>≈3</td>
<td>≈67</td>
</tr>
<tr>
<td>service time (s)</td>
<td>≈288</td>
<td>≈268</td>
<td>≈50</td>
</tr>
</tbody>
</table>

- Estimated data
  - Sociological parameters (about 40% utilization)

- Excluded parameters
  - Situational behaviour among traffic managers and operators
Visualization enables advantageously verification properties
Model validation

• Accessible data since 2010 enable model validation

• Performs equal at 95% significance level
  • Average response time
  • Service level
Results

• The more centralized, the better efficiency
• 2-4s difference between overflow strategies
• Prioritization algorithm
• Trade-off qualitative and quantitative criteria
Concluding remarks

- When the project started 2015: 3 regional receptions
- In December 2015: local receptions with 5s overflow to national
  - A project delivery
- Service level effect (Jan-Apr)
  - 2015 -> 90.7%
  - 2016 -> 94.6%
- Assisting operational staffing and other analytical issues at SOS
- Interesting journey accompanied with many research questions and issues
Future project challenges

- Discover and estimate contributory parameters
- Socio-technical system
  - Behaviour among operators and traffic managers
  - Operator time to answer the call, answering morality
- Changing environment
Questions?

Klas.gustavsson@miun.se