CCE3310 Communication Systems LAB - Exercise II

Lecturer: Dr. A. Muscat

1 Introduction

In SingleSwitch all the customers are represented as one single group that is characterised by the mean call arrival rate and the mean call duration. It should be clear that this customer representation cannot be used to differentiate between various customer profiles.

In this exercise we will be modifying SingleSwitch to cater for three distinct customer profiles or groups, where each group or profile is characterised by a mean call arrival rate ($\lambda$) and a mean call duration ($s$). Additionally $\lambda$ and $s$ shall be a function of the tariff in operation, $\alpha$, specified in monetary units, e.g. Euros. See table.1, fig.1&2 below. Furthermore

<table>
<thead>
<tr>
<th>Profile</th>
<th>$\lambda$</th>
<th>$s$</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$\lambda_A(\alpha)$</td>
<td>$s_A(\alpha)$</td>
<td>...</td>
</tr>
<tr>
<td>B</td>
<td>$\lambda_B(\alpha)$</td>
<td>$s_B(\alpha)$</td>
<td>...</td>
</tr>
<tr>
<td>C</td>
<td>$\lambda_C(\alpha)$</td>
<td>$s_C(\alpha)$</td>
<td>...</td>
</tr>
</tbody>
</table>

Figure 1: Mean Arrival rate ($\lambda$) and mean call duration ($s$) as a function of tariff ($\alpha$). The three distinct customer profiles are defined by setting appropriate values for ($x_1, y_1$), ($x_2, y_2$), ($x_3, y_3$), ($x_4, y_4$)
**SingleSwitch** will output the profit made over a finite period of time units. The profit shall be calculated using the following formula,

\[
\text{Profit} = \left( \sum_{\text{profiles}} \text{Revenue} \right) - \text{Cost}
\]

where revenue accrued from each customer profile is calculated as,

\[
\text{Revenue} = (\text{Total duration of accepted calls}) \times (\text{Tariff})
\]

and cost is calculated with

\[
\text{Cost} = \text{Fixed Costs} + k \times \text{Number of Channels(N)}.
\]

where \( k \) is a constant.

## 2 Suggested Modifications

This section provides hints on how to modify **SingleSwitch**. You may ignore these hints and do it your way.

1. Define a *struct* or a *class* of **customer**. This class defines \( \lambda(\alpha) \), \( s(\alpha) \), and a running sum of revenue accrued. Declare three instances of type **customer**.

2. Modify the initialisation routine to define the tariff in operation and number of channels installed and to initialise the three instances of **customer**.

3. Calls to the three event routines should now include the passing over of customer attributes, mainly \( \lambda \), \( s \), and \( \sum \text{Revenue}_p \).

## 3 Testing and Verification

Execute your modified SingleSwitch and verify that it works as intended. It is recommended that you go through the following steps;

1. Define a verification procedure

2. Go through the verification procedure

3. Write a report on the verification results. In the report include the procedure adopted and the results.

Please submit the report by the date stipulated on the www page.