Guide to Matlab Programs for MM1K
Steve Gaborik and M. Veeraraghavan, April 9, 2004
Updated by Xiuduan Fang and Eric Humenay Nov 26, 2006

1. **mm1k_ploss.m**
The function \([\text{Ploss, EN, ET, Throughput, Util}] = \text{mm1k\_ploss}(\lambda, \mu, \text{buffer})\) calculates the packet loss probability, mean number of packets in the system, mean response time, server utilization, and Throughput.

**Inputs**
1. \(\lambda\) – the packet arrival rate (in packets/seconds)
2. \(\mu\) – the service rate (in packets/seconds)
3. buffer – the number of queuing slots in the buffer + 1. For a more thorough explanation see *.

**Outputs**
1. Ploss – The probability of a packet loss
2. EN – Average number of packets in the queuing station
3. ET – Average response time (in seconds)
4. Throughput – Measures system throughput when packet loss is considered (\(\lambda_{\text{Effective}}\))
5. Util – The probability that the server is busy processing requests

2. **mm1k_buffer.m**
The function buffer\(_\text{size} = \text{mm1k\_buffer}(\text{ploss, lambda, mu})\) calculates the size of the buffer needed to stay within the given packet loss probability.

**Inputs**
1. \(\lambda\) – the packet arrival rate (in packets/seconds)
2. \(\mu\) – the service rate (in packets/seconds)
3. Ploss – The probability of a packet loss

**Outputs**
1. buffer\(_\text{size} – the number of buffers in the queuing station required to guarantee the desired packet loss probability.

3. **mm1k_plot.m**
The function function \(\text{mm1k\_plot}(\lambda_{\text{lower}}, \lambda_{\text{upper}}, \lambda_{\text{step}}, \mu, \text{buffer, testno})\) produces a plot that compares rho (\(\lambda/\mu\)) vs. ET, EN, Ploss, and \(\lambda_{\text{Effective}}\) for a given buffer size. An example output plot is shown in Figure 1.

**Inputs:**
1. \(\lambda_{\text{lower}}\) - the lower limit of \(\lambda\)
2. \(\lambda_{\text{upper}}\) - the upper limit of \(\lambda\)
3. \(\lambda_{\text{step}}\) - the amount \(\lambda\) is incremented
4. \(\mu\) - the service rate (in packets/seconds)
5. buffer - the number of queuing slots in the buffer + 1. For a more thorough explanation see *.
6. testno – used to name the output plot. Plot will be called mm1k\_plot\_testno\_fig

**Output**
1. mm1k\_plot\_fig – plots showing rho vs. ET, EN, Ploss, and \(\lambda_{\text{Effective}}\)
2. mm1k\_plot.txt – mm1k\_plot\_fig’s data file
4. demo.m

demo.m is an example of how to call mm1k_plot.m.

* Buffer Clarification

The buffer variable represents the number of buffer slots in the queue plus the number of jobs being served. A single server system is being modeled so therefore 1 is added.

Figure 1: Example output plot of mm1k_plot.m