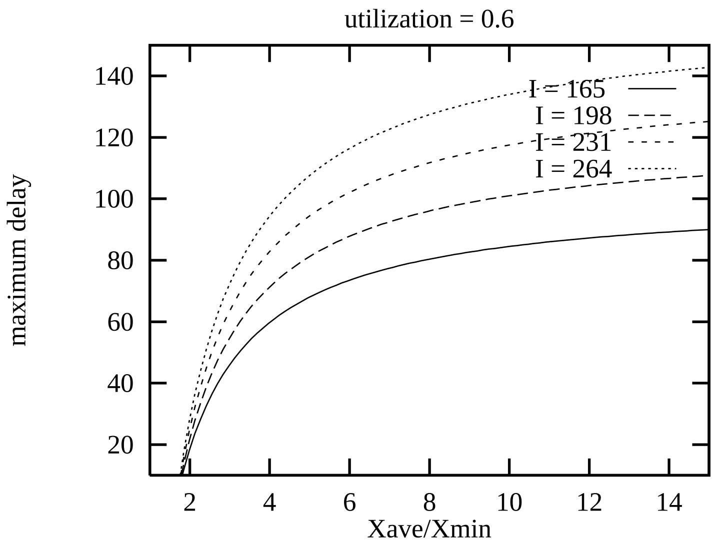
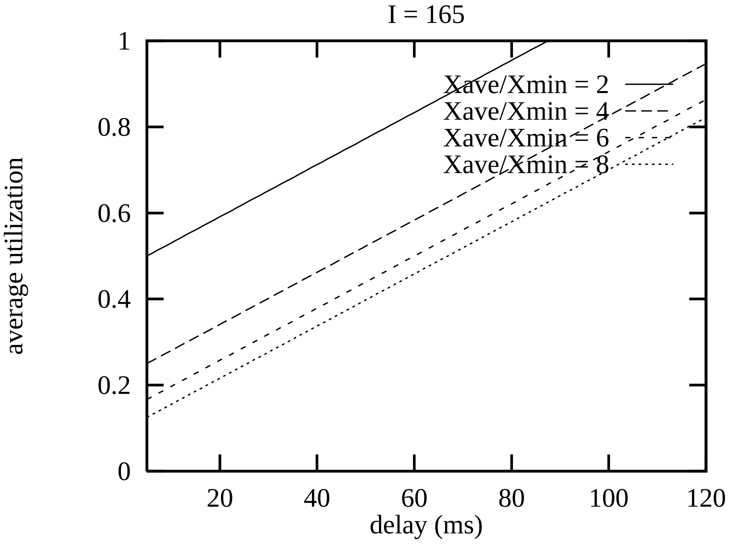
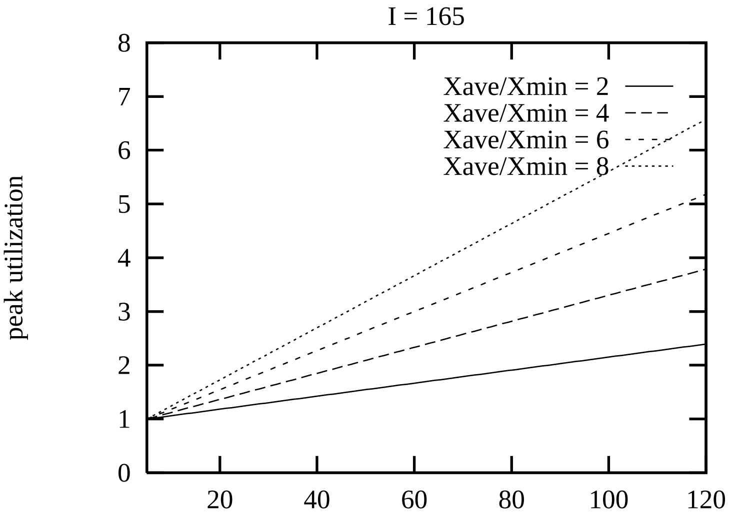
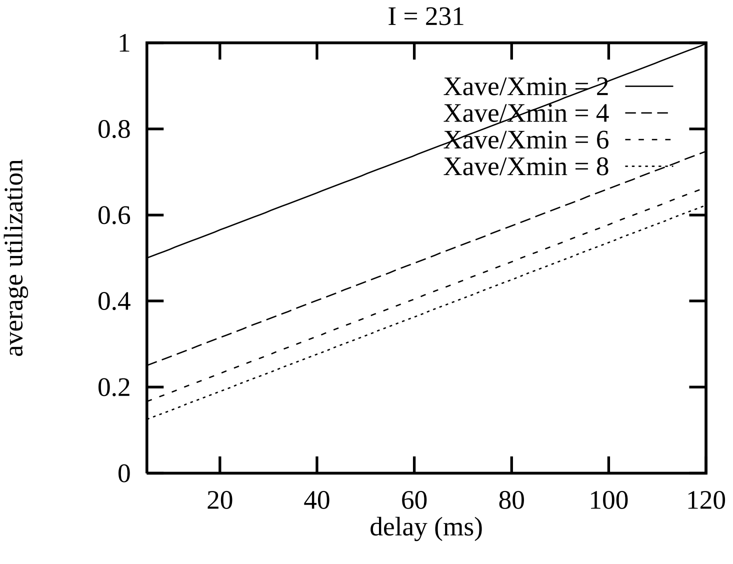
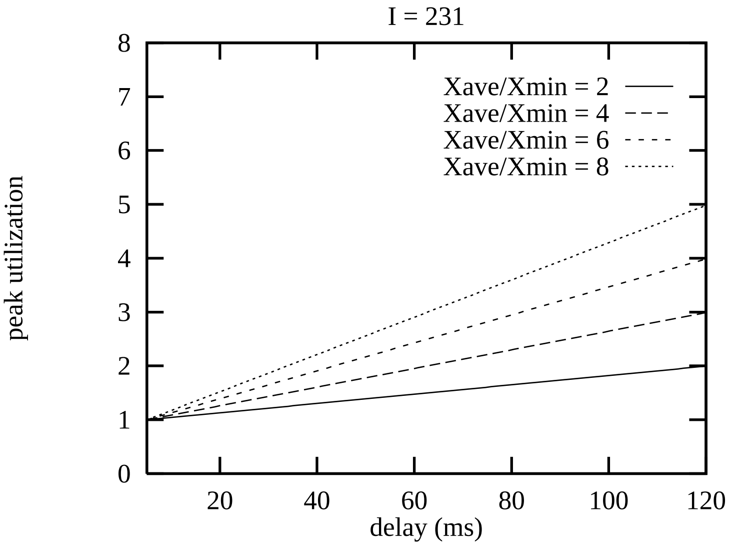
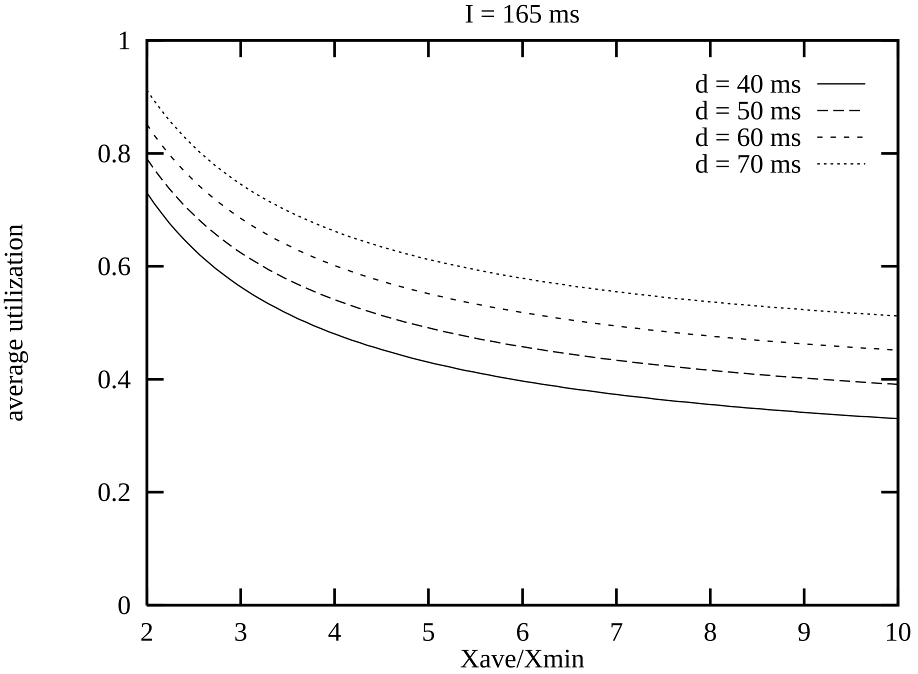

utilization = 0.6
maximum delay
Xave/Xmin
20
40
60
80
100
120
140
2
4
6
8
10
12
14
I = 165
I = 198
I = 231
I = 264

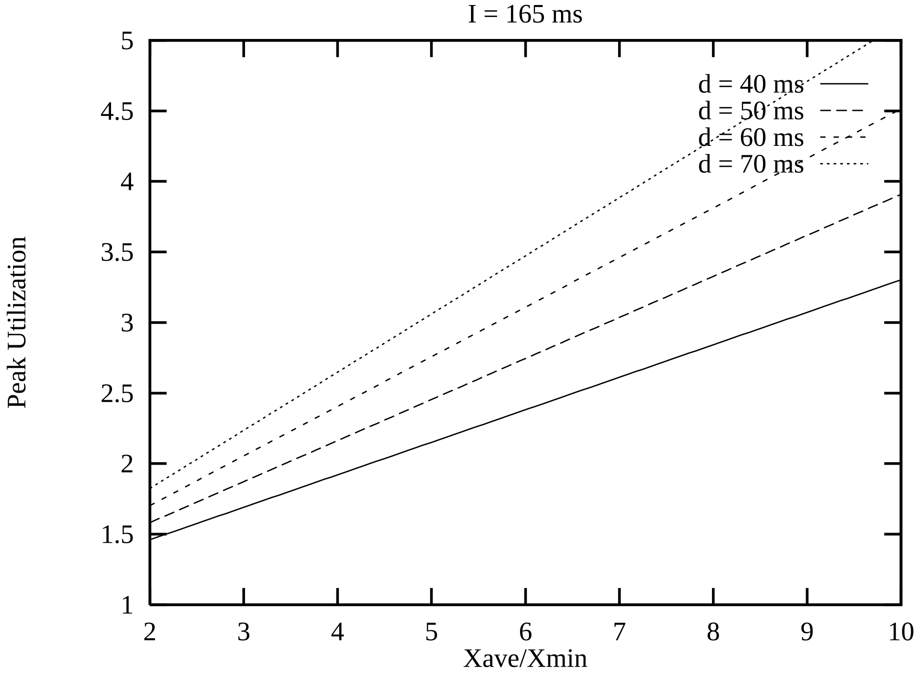

I = 165
average utilization
delay (ms)
Xave/Xmin = 2
Xave/Xmin = 4
Xave/Xmin = 6
Xave/Xmin = 8
0
0.2
0.4
0.6
0.8
1
20
40
60
80
100
120

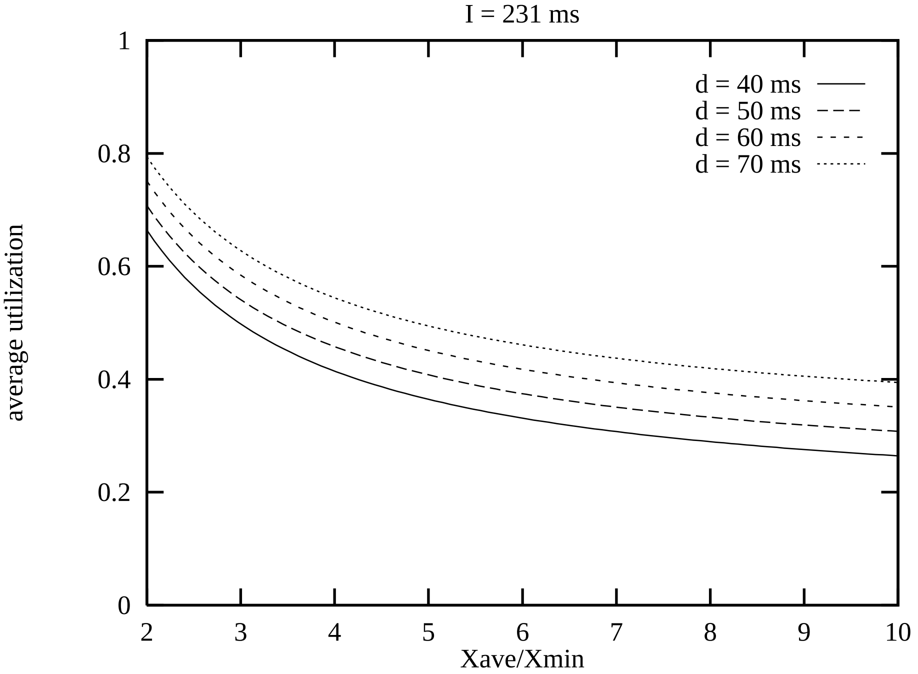

I = 165
peak utilization
delay (ms)
Xave/Xmin = 2
Xave/Xmin = 4
Xave/Xmin = 6
Xave/Xmin = 8
0
1
2
3
4
5
6
7
8
20
40
60
80
100
120

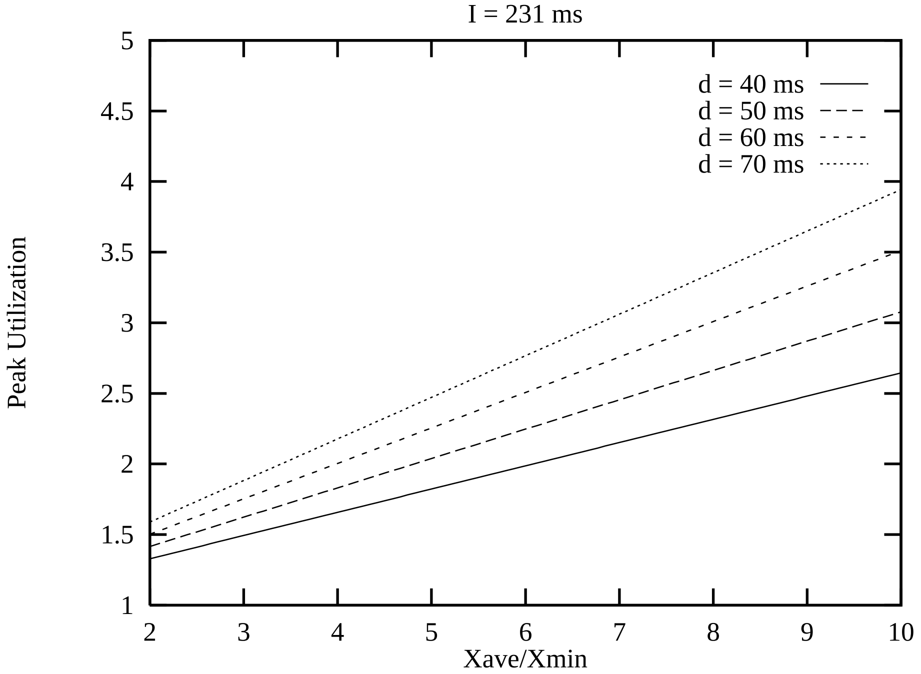

I = 231
average utilization
1
0.8
0.6
0.4
0.2
0
20
40
60
80
100
120
delay (ms)
Xave/Xmin = 2
Xave/Xmin = 4
Xave/Xmin = 6
Xave/Xmin = 8

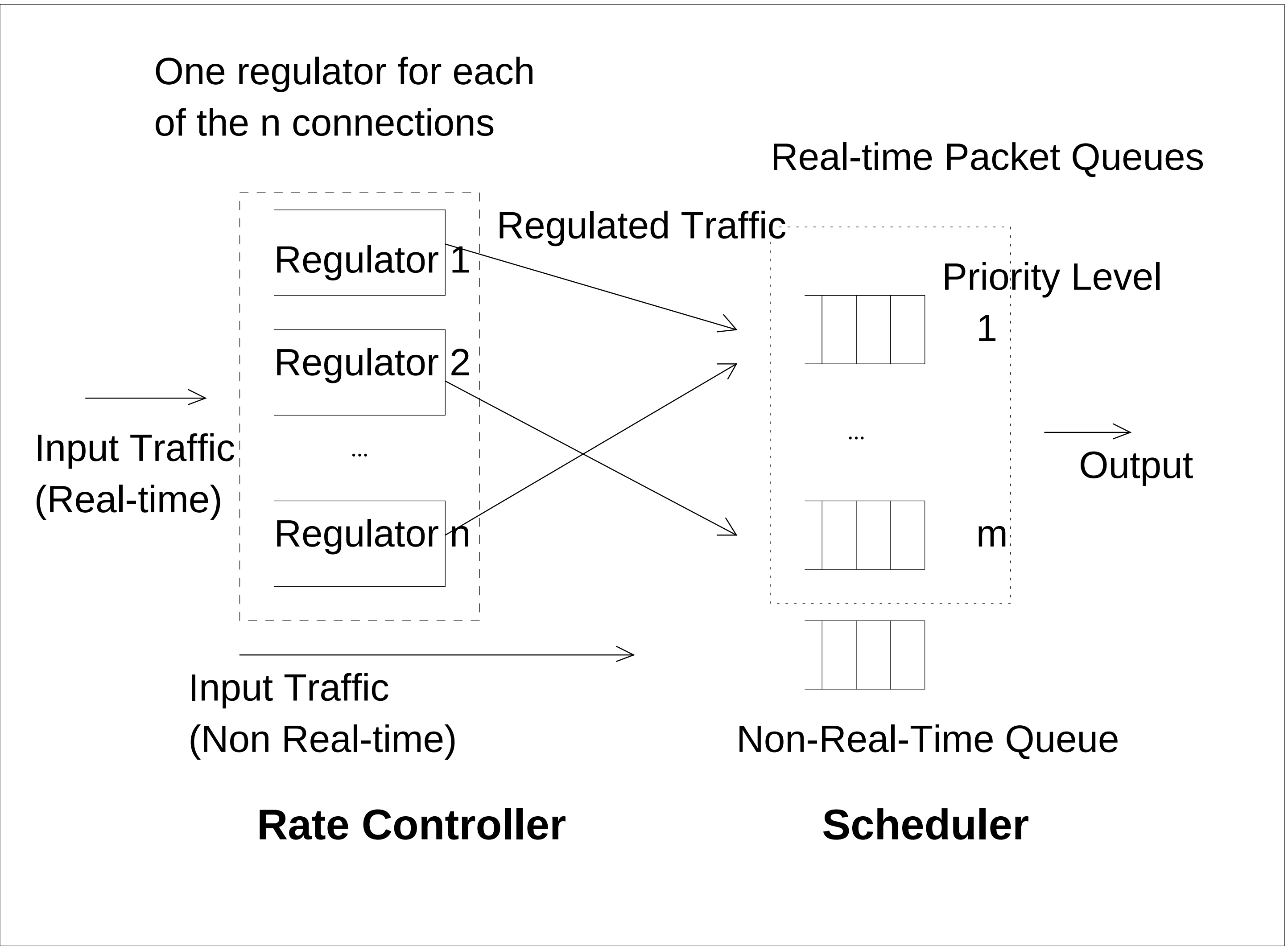

I = 231
peak utilization
delay (ms)
Xave/Xmin = 2
Xave/Xmin = 4
Xave/Xmin = 6
Xave/Xmin = 8
0
1
2
3
4
5
6
7
8
20
40
60
80
100
120

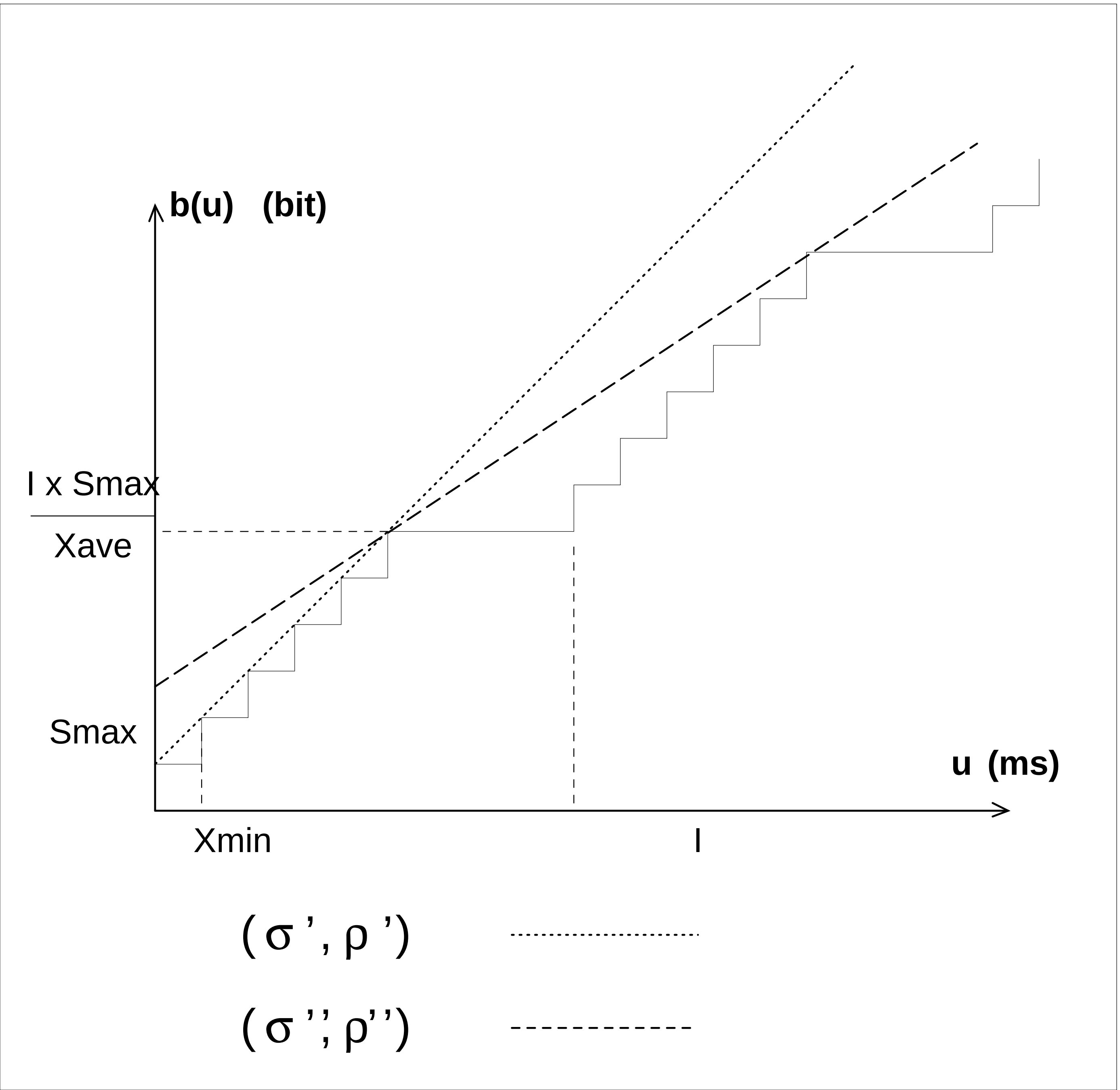

I = 165 ms
d = 40 ms
d = 50 ms
d = 60 ms
d = 70 ms
average utilization
Xave/Xmin
0
0.2
0.4
0.6
0.8
1
2
3
4
5
6
7
8
9
10


I = 165 ms
Peak Utilization
Xave/Xmin
1
1.5
2
2.5
3
3.5
4
4.5
5
2
3
4
5
6
7
8
9
10
d = 40 ms
d = 50 ms
d = 60 ms
d = 70 ms


I = 231 ms
average utilization
Xave/Xmin
0
0.2
0.4
0.6
0.8
1
2
3
4
5
6
7
8
9
10
d = 40 ms
d = 50 ms
d = 60 ms
d = 70 ms


I = 231 ms
Peak Utilization
Xave/Xmin
d = 40 ms
d = 50 ms
d = 60 ms
d = 70 ms
1
1.5
2
2.5
3
3.5
4
4.5
5
2
3
4
5
6
7
8
9
10


One regulator for each
of the n connections
Real-time Packet Queues
Regulated Traffic
Regulator 1
Regulator 2
...
Regulator n
Priority Level
1
...
m
Input Traffic
(Real-time)
Output
Input Traffic
(Non Real-time)
Non-Real-Time Queue
Rate Controller
Scheduler


b(u) (bit)
I x Smax
Xave
Smax
u (ms)
Xmin
I
(σ ', ρ ')
(σ ''; ρ'')