# Evaluating

# Measurement-based

# Admission Control

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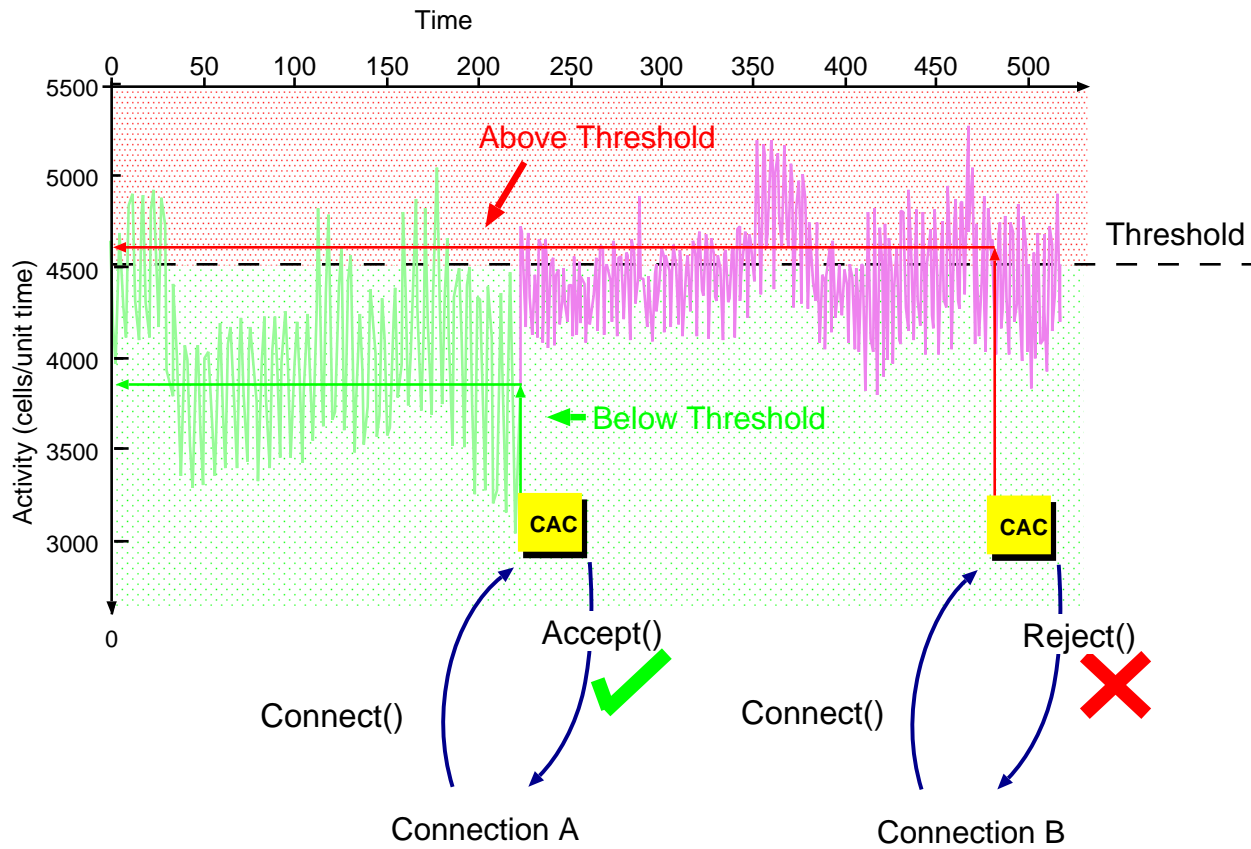*University of Cambridge Computer Laboratory*                    *Systems Research Group*

# Call Admission Control

- Model based

  - great for understood traffic sources
  - not great for different traffic sources

- Measurement based

  - works for any traffic sources
  - but which MBAC to use ??

Objective: **evaluate Measurement based admission control algorithms.**

# Example MBAC

# Evaluating Admission Control

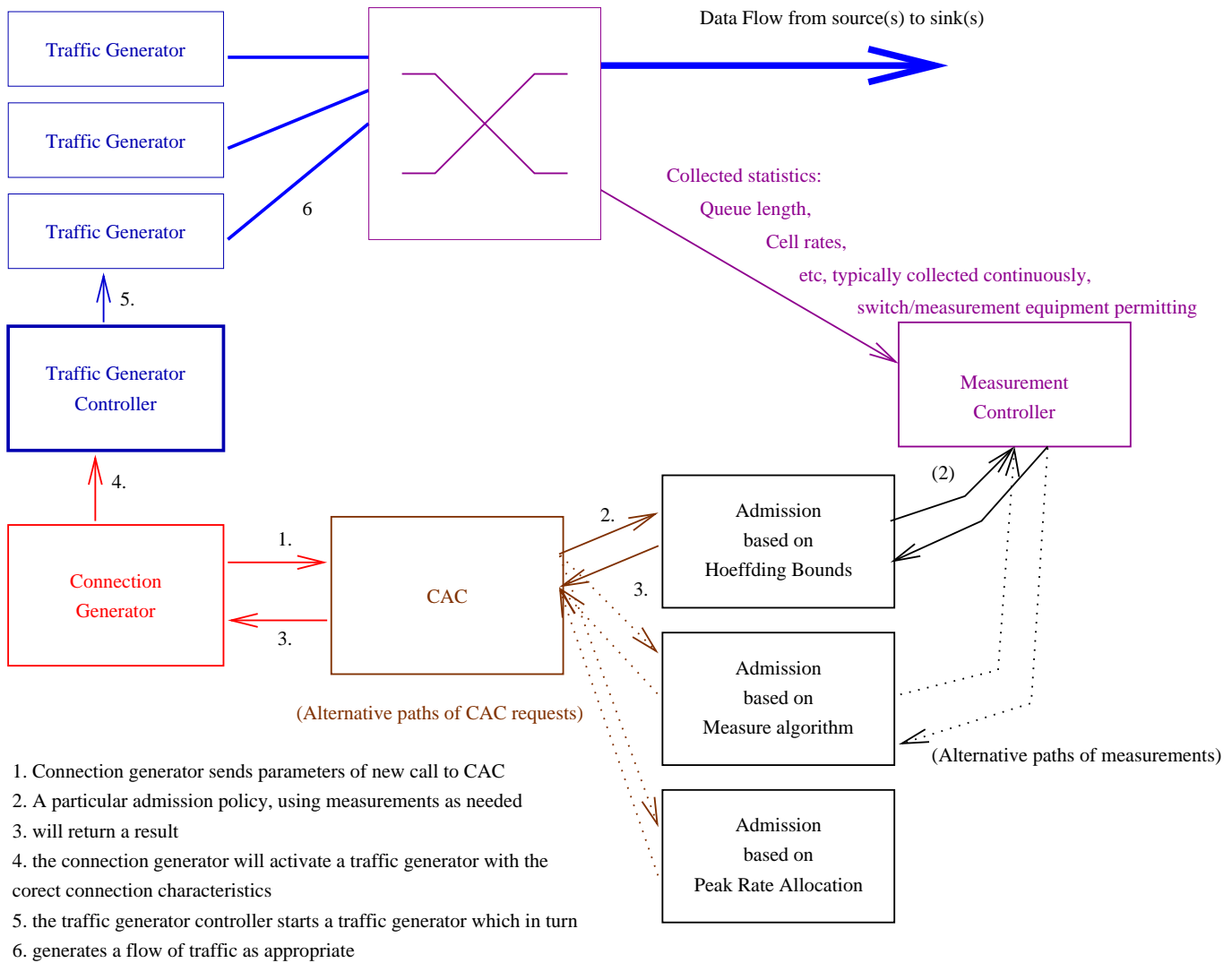Traffic types:

- Traffic Models

- Real traffic

Connection patterns:
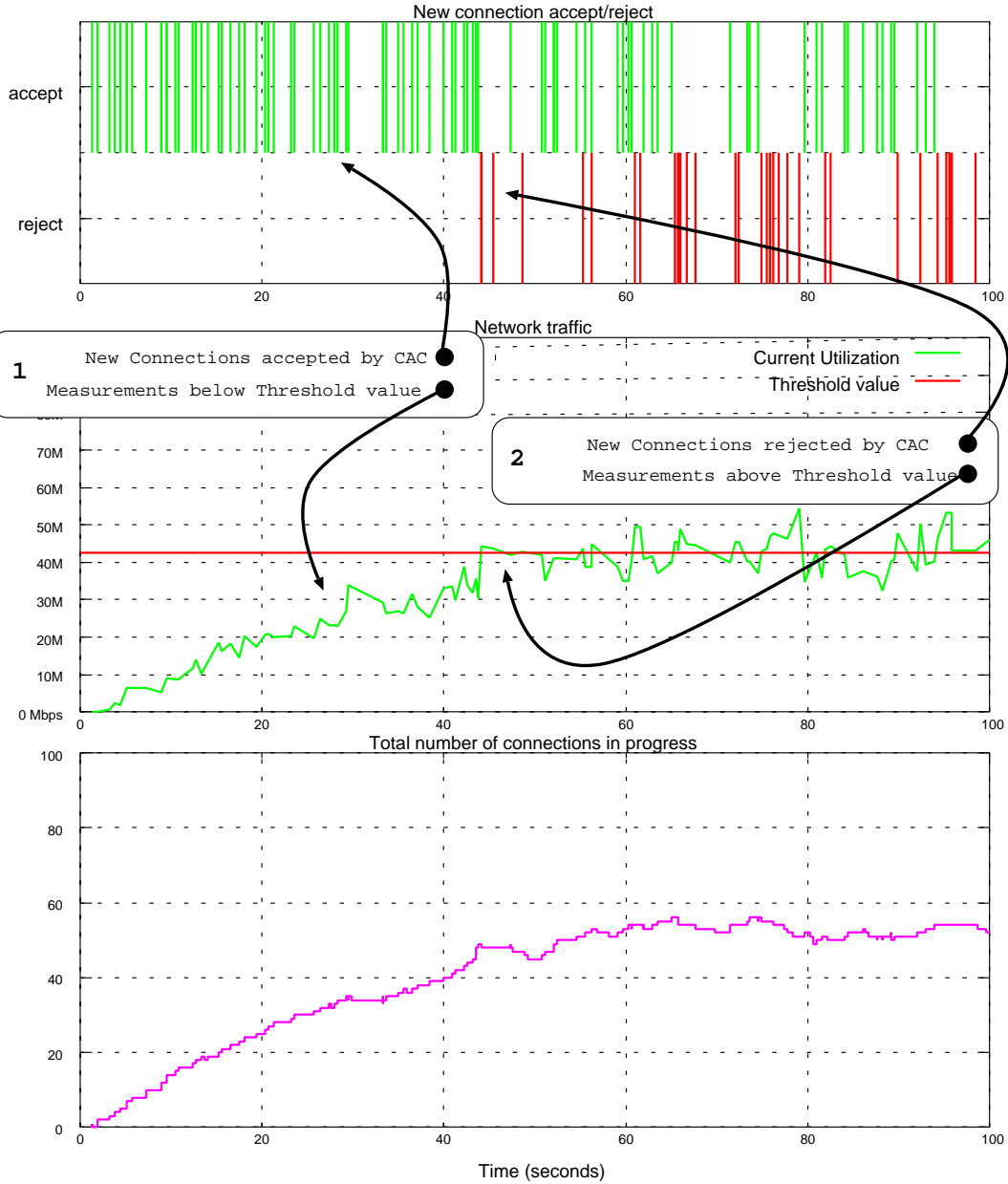
- Connection Models

- Real connection patterns

Measurements:

- Line Utilisation / Line loss

- Call use / Call loss

# Evaluation Environment

Traffic Generator

Traffic Generator

Traffic Generator

Data Flow from source(s) to sink(s)

6

5.

Traffic Generator
Controller

Collected statistics:
Queue length,
Cell rates,
etc, typically collected continuously,
switch/measurement equipment permitting

Measurement
Controller

4.

Connection
Generator

1.

CAC

3.

3.

2.

(2)

Admission
based on
Hoeffding Bounds

3.

Admission
based on
Measure algorithm

(Alternative paths of measurements)

(Alternative paths of CAC requests)

Admission
based on
Peak Rate Allocation

1. Connection generator sends parameters of new call to CAC

2. A particular admission policy, using measurements as needed

3. will return a result

4. the connection generator will activate a traffic generator with the
corect connection characteristics

5. the traffic generator controller starts a traffic generator which in turn

6. generates a flow of traffic as appropriate

# In operation

New connection accept/reject

accept

reject

0    20    40    60    80    100

Network traffic

| 1 | New Connections accepted by CAC |
| | Measurements below Threshold value |

Current Utilization
Threshold value

| 2 | New Connections rejected by CAC |
| | Measurements above Threshold value |

70M
60M
50M
40M
30M
20M
10M
0 Mbps

0    20    40    60    80    100

Total number of connections in progress

100

80

60

40

20

0

0    20    40    60    80    100
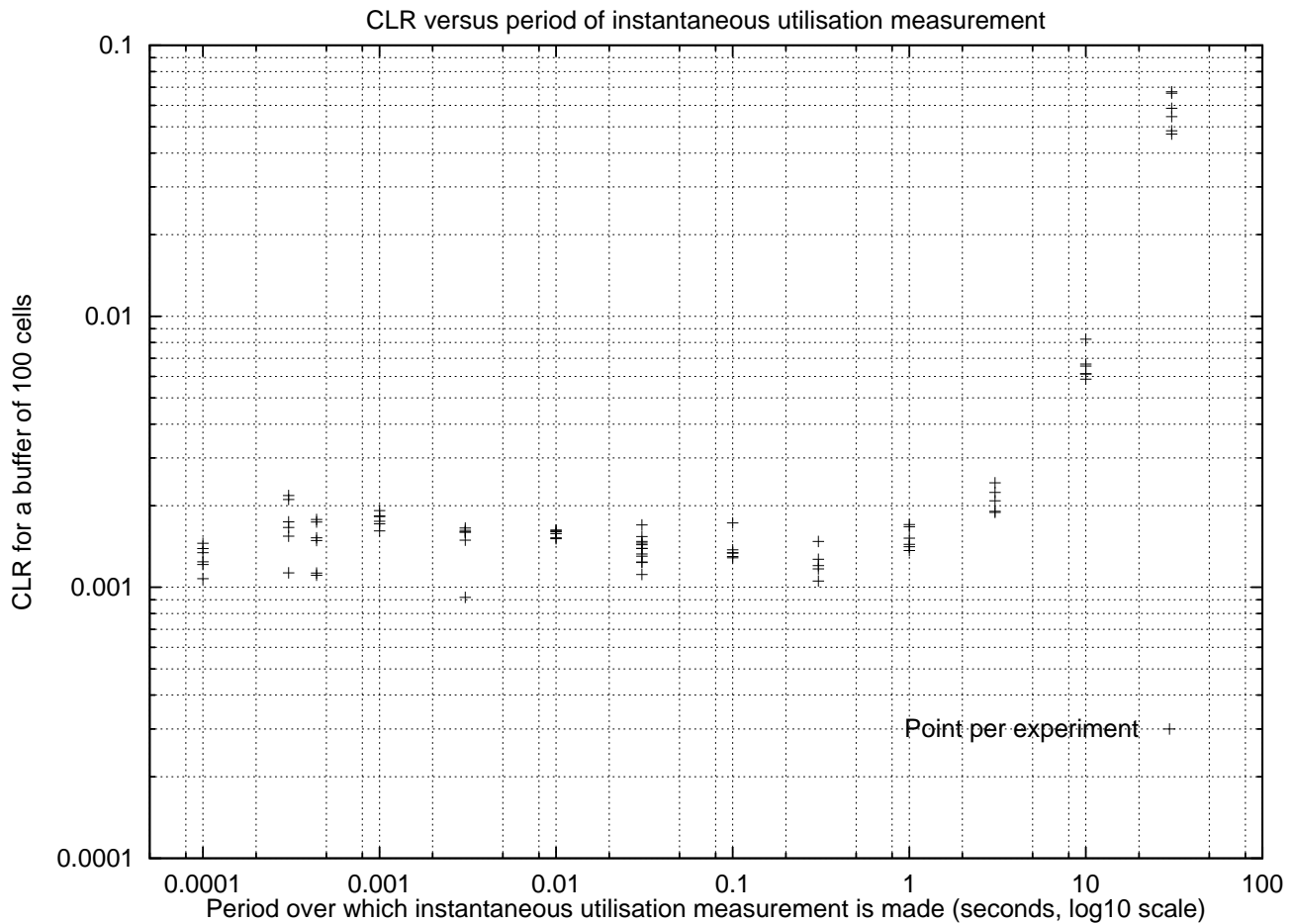
Time (seconds)

# Results

**Comparison of one MBAC with different parameters - I.**

Target CLR is $1 \times 10^{-3}$ for a 100 cell buffer

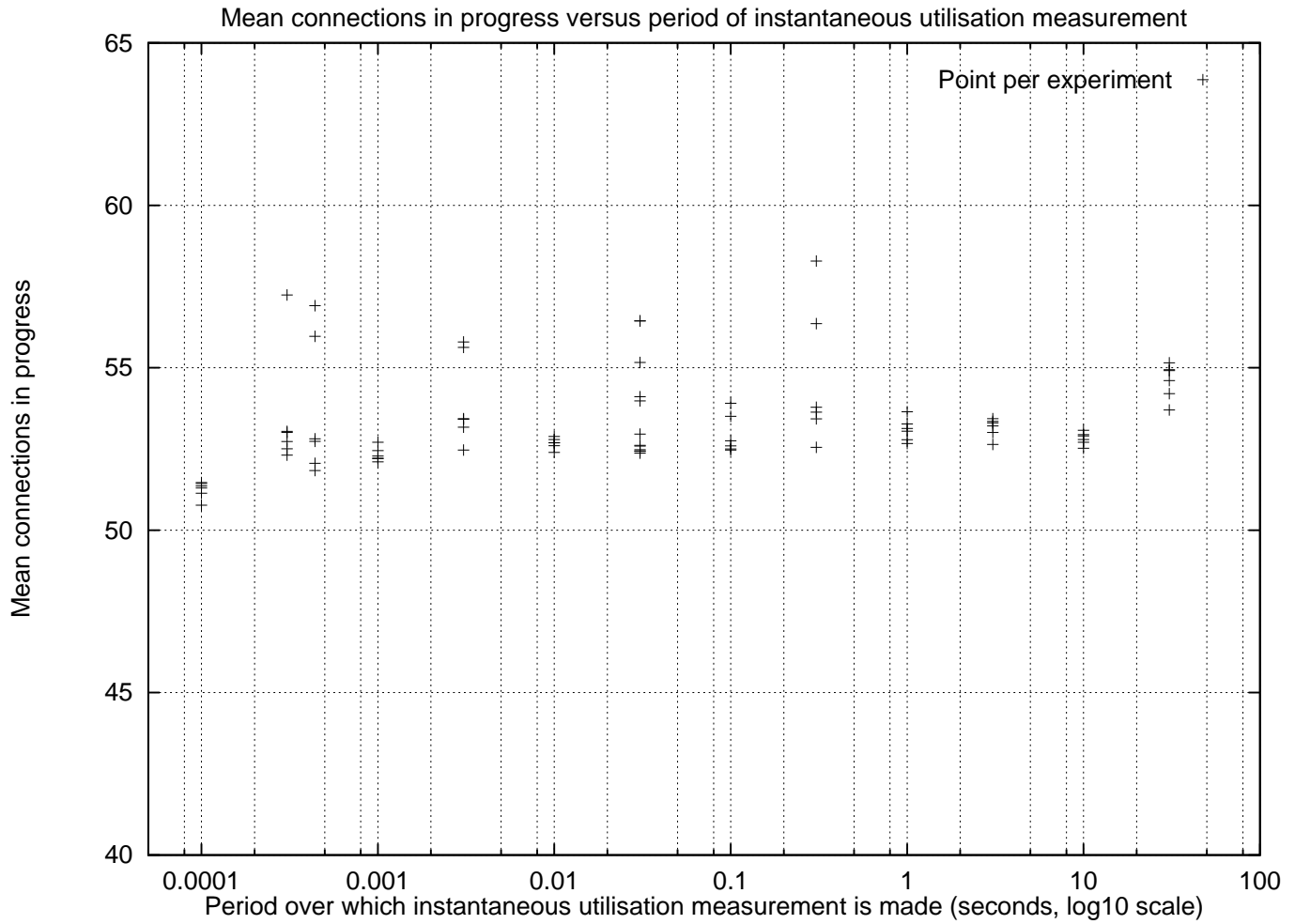Traffic has 10Mbps PCR, 1Mbps SCR, 25 cell Mean burst length ON-OFF model
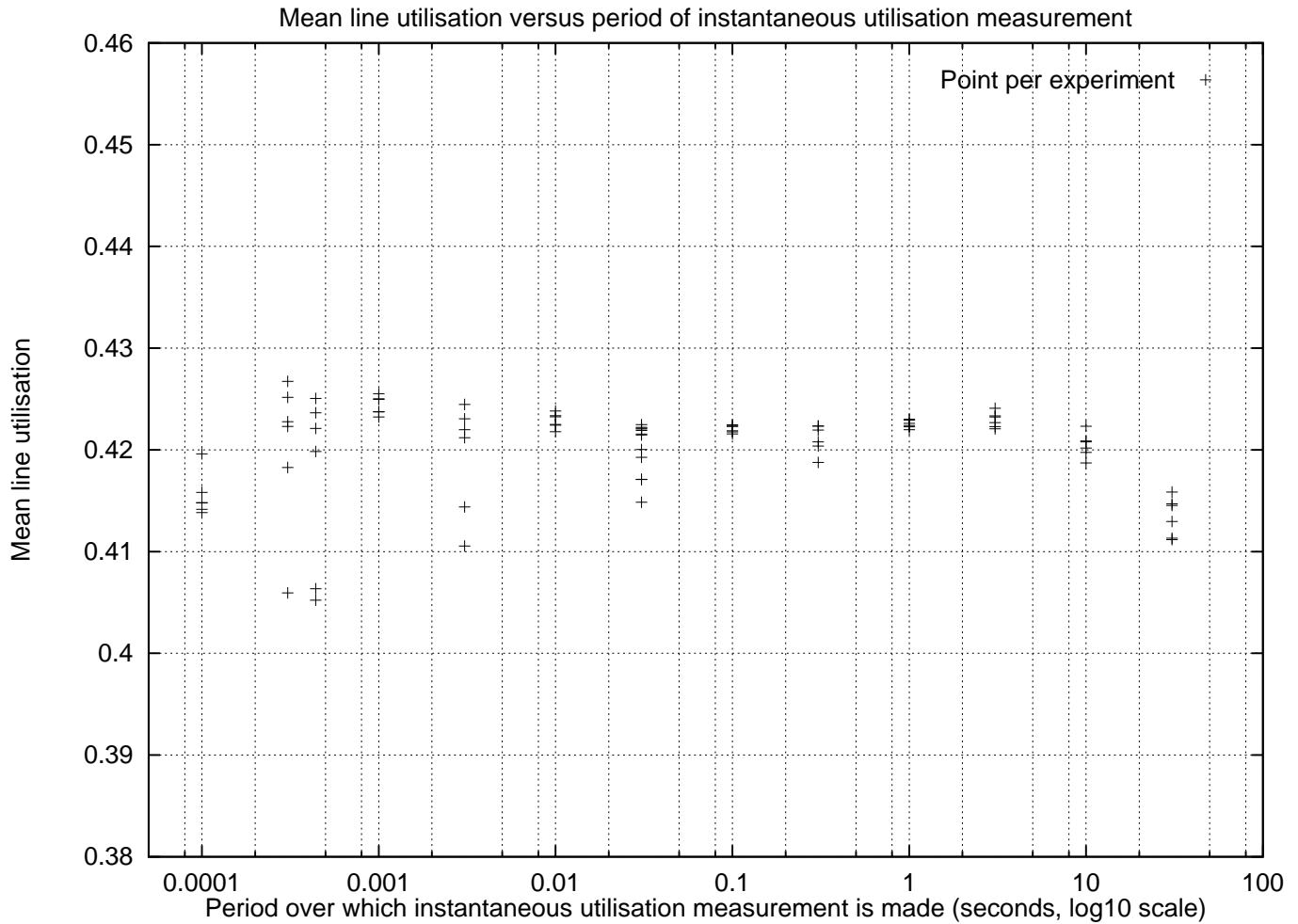
Link capacity is 100Mbps.



CLR versus period of instantaneous utilisation measurement

Point per experiment +

CLR for a buffer of 100 cells

Period over which instantaneous utilisation measurement is made (seconds, log10 scale)

# Results

## Comparison of one MBAC with different parameters - II.



Mean connections in progress versus period of instantaneous utilisation measurement

Point per experiment

Mean connections in progress

Period over which instantaneous utilisation measurement is made (seconds, log10 scale)

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# Results

## Comparison of one MBAC with different parameters - III.



Mean line utilisation versus period of instantaneous utilisation measurement

- x-axis: Period over which instantaneous utilisation measurement is made (seconds, log10 scale)
- y-axis: Mean line utilisation
- Legend: Point per experiment +

# Results

**Comparison of different MBACs under similar conditions**

Target CLR is $1 \times 10^{-3}$ for a 100 cell buffer

Traffic has 10Mbps PCR, 1Mbps SCR, 25 cell Mean burst length ON-OFF model

Link capacity is 100Mbps.

| Algorithm name | % calls with CLR> $1 \times 10^{-3}$ | Connection accept ratio | Mean connections in progress | Mean line utilisation |
|---|---|---|---|---|
| Peak Rate Allocation | 0% | 0.100 | 9.9 | 0.09 |
| Simple Threshold | 72% | 0.526 | 52.0 | 0.409 |
| Measure | 58% | 0.554 | 53.8 | 0.532 |
| Hoeffding bounds | 60% | 0.637 | 63.0 | 0.630 |
| Theoretical model estimations | | | | |
| Guérin | – | – | 36.92 | – |
| Elwalid | – | – | 42.98 | – |
| Buffett & Dufield | – | – | 45.20 | – |

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# Conclusion

Evaluation Environment for Measurement Based Admission Control

Flexibility in

- Traffic sources

- Call types

- Admission Algorithm

- Measurement techniques

Leading to a rig for evaluation of measurement based admission control algorithms in **REAL** use, not just a simulation.

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# So what?

Well the world is largely IP so what is the relevance...

- MPLS

- MultiService-Forum

And perhaps...

Measurement Based Admission Control give an insight into calculating the amount of resource to manage as much as a method of management.