JPS @立教大学

Quality of Service(品質保証機能)を用いた ネットワーク技術の アトラスイベントビルダへの適用

ATLAS TDAQ

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アトラスイベントビルダとQoS

Basic performance measurements

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What is QoS (Quality of Service)

Functionality of QoS

Admission control

decides whether input QoS request is acceptable or not.

Provisioning

sets up network configuration.

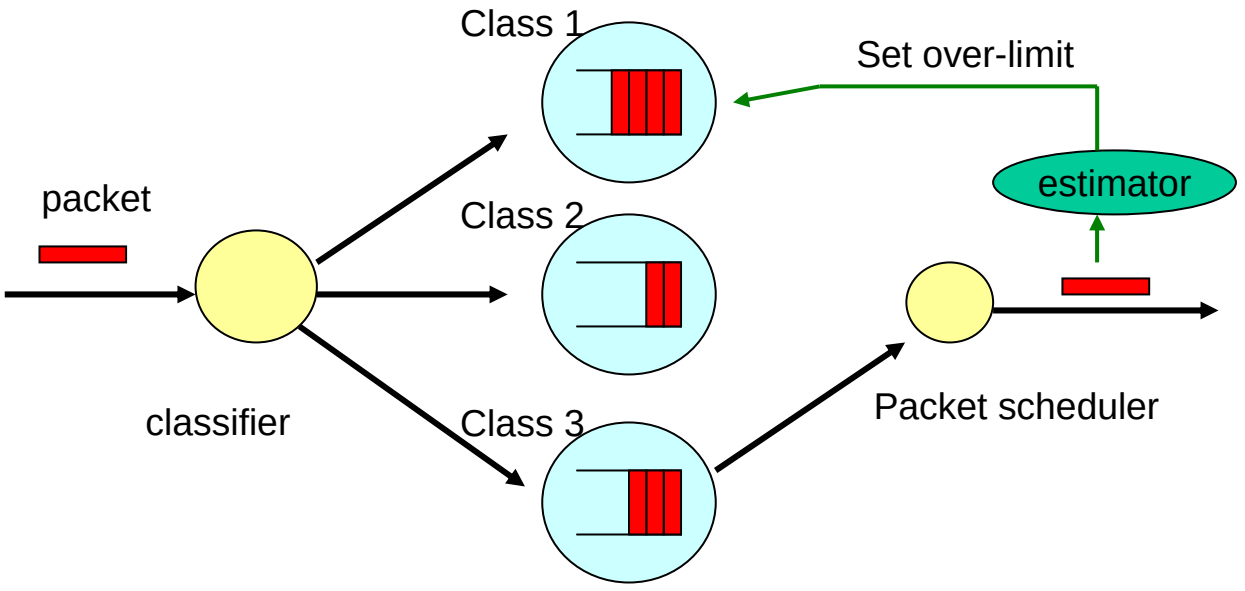
Classification

classifies input packets according to the QoS.

Queue management and Scheduling

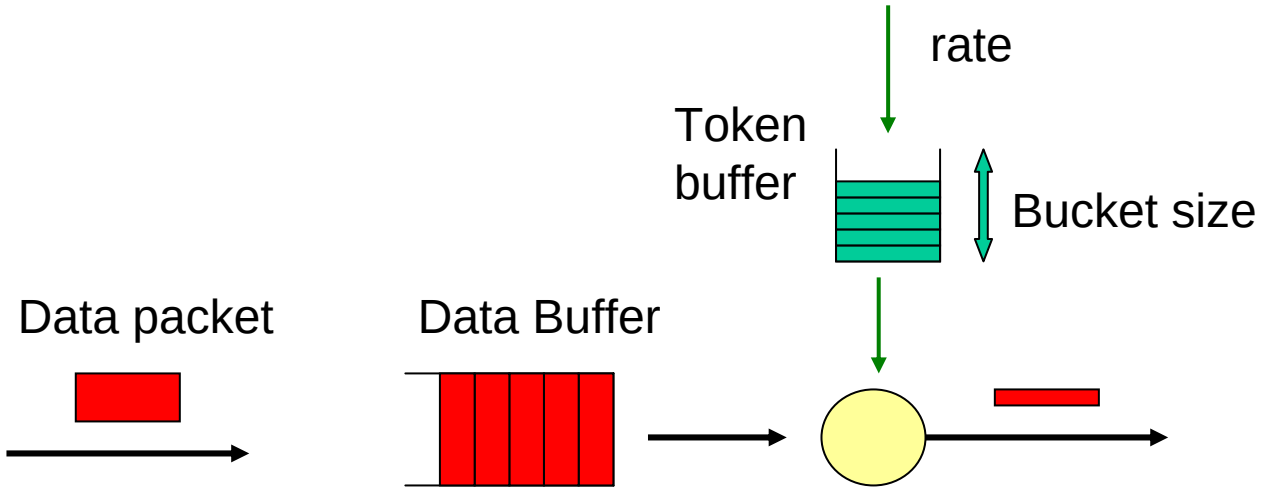
processes packets at output port.

What is QoS:Class-Based Queueing (CBQ)



CBQ can classify incoming packets into multiple classes
CBQ can share and limit the transfer rate

What is QoS :Token Bucket Filter (TBF)



Token buffer is fulfilled with tokens at start time.

Congestion control with QoS

Constant Bit Rate of ATM network could control the congestion on event builder by managing the bandwidth.
However, Ethernet does not have the functionality.

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Linux QoS can manage the bandwidth.

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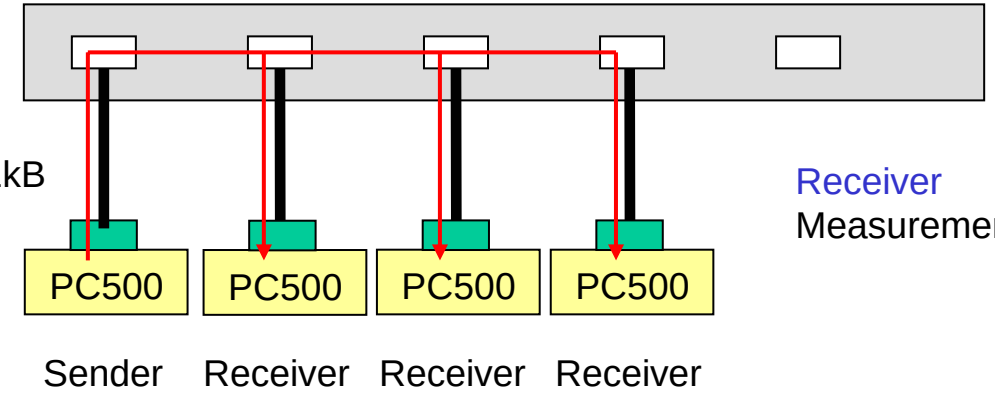
Can Linux QoS with Ethernet control the congestion?

Configuration of Testbed

Gigabit Ethernet Switch

UDP/Multicast



Sender
Pseudo Trigger
Message size : 1kB

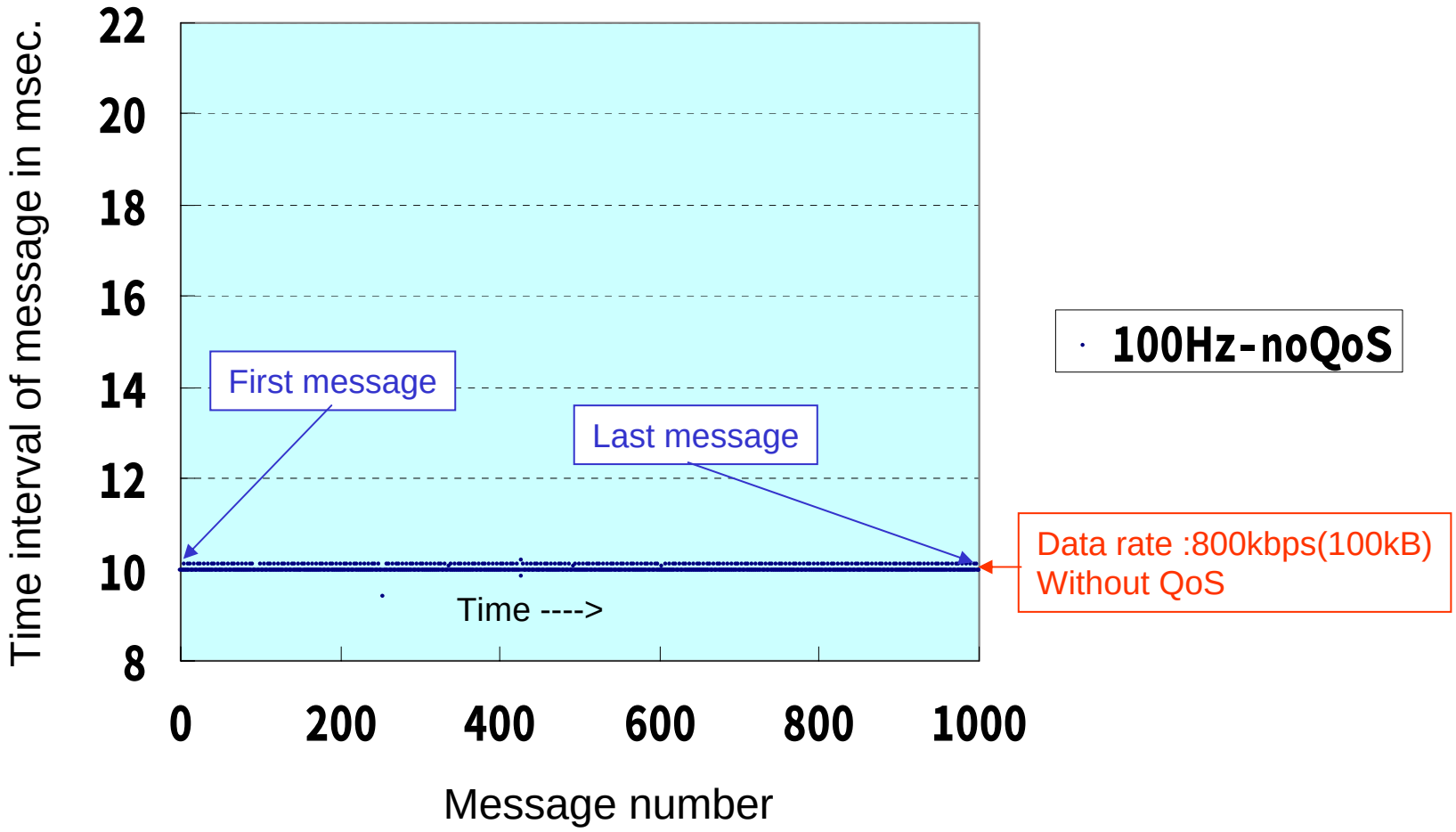
Receiver
Measurement by tcpdump utility

Configuration of PC500 system

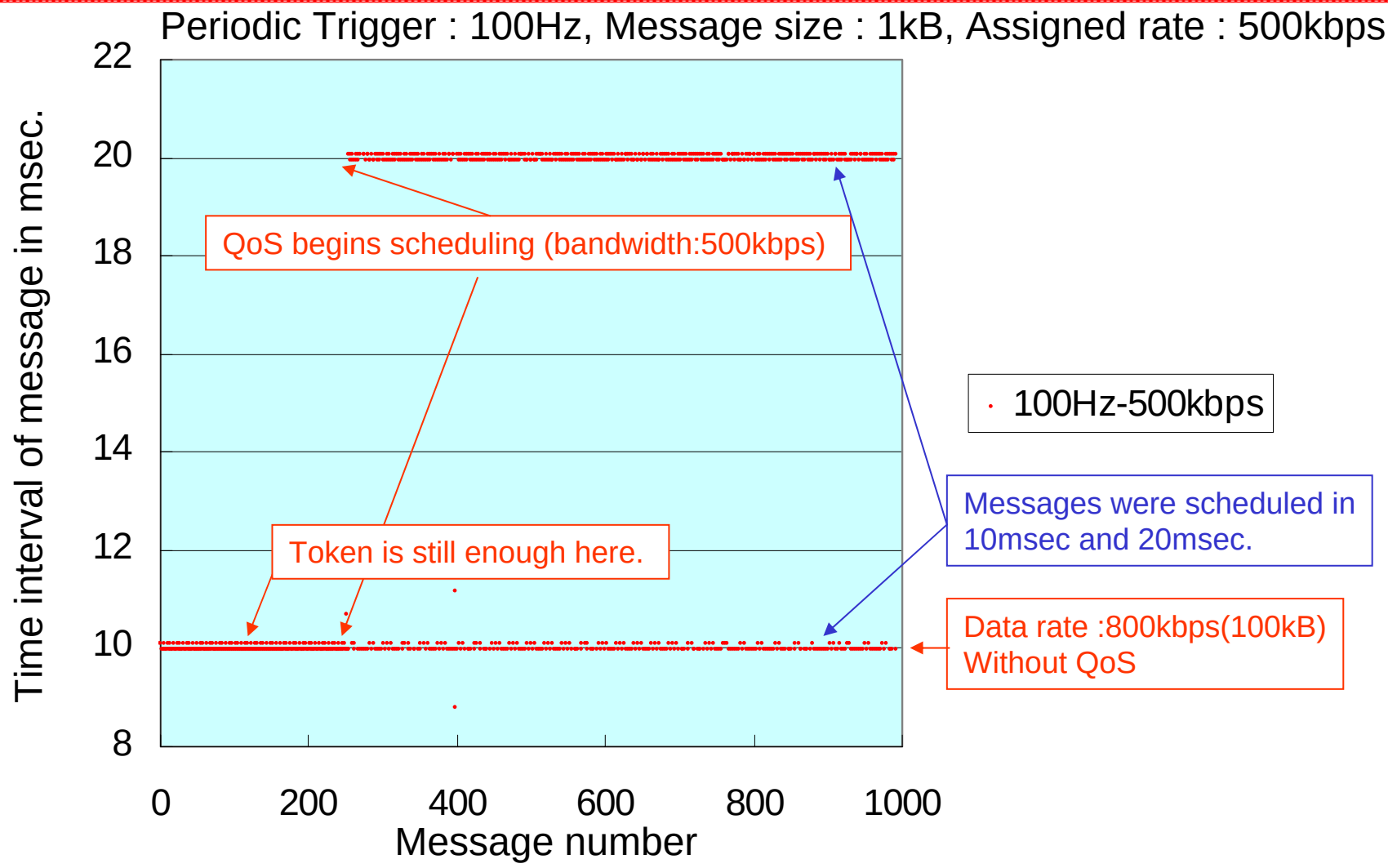
CPU:	PentiumIII/500MHz	Linux kernel version :	2.4.5
Chipset	440GX	gcc version:	egcs-2.91-66
Memory:	100MHz/SDRAM/256MB	acenic driver version :	0.8
PCIbus:	32-bit/33MHz		
NIC:	AceNIC(1MB)		

Message rate (100Hz) without QoS

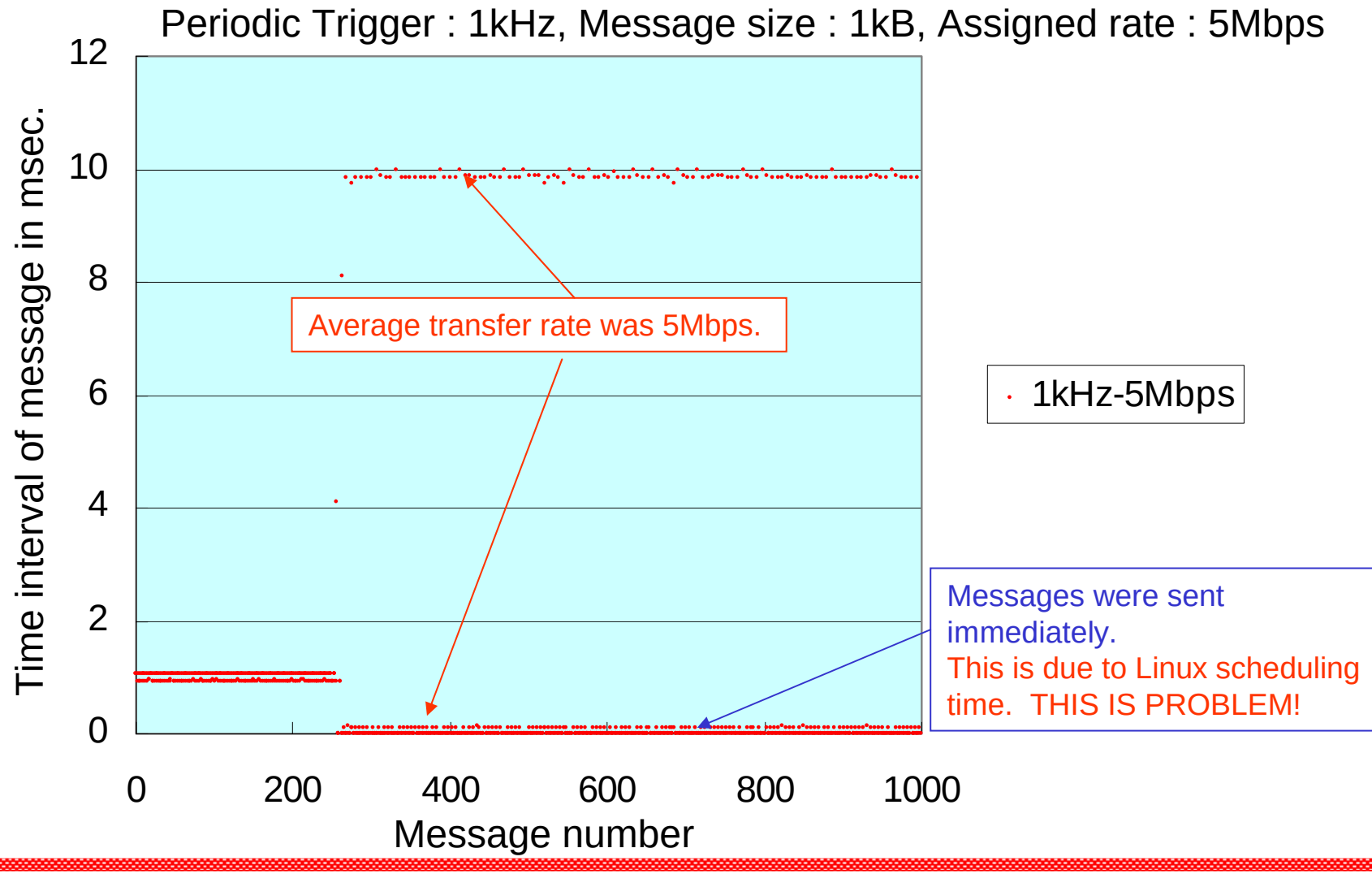
Periodic Trigger : 100Hz, Message size : 1kB, without QoS



Message rate (100Hz) with QoS



Message rate (1kHz) with QoS



Important Linux Scheduling time

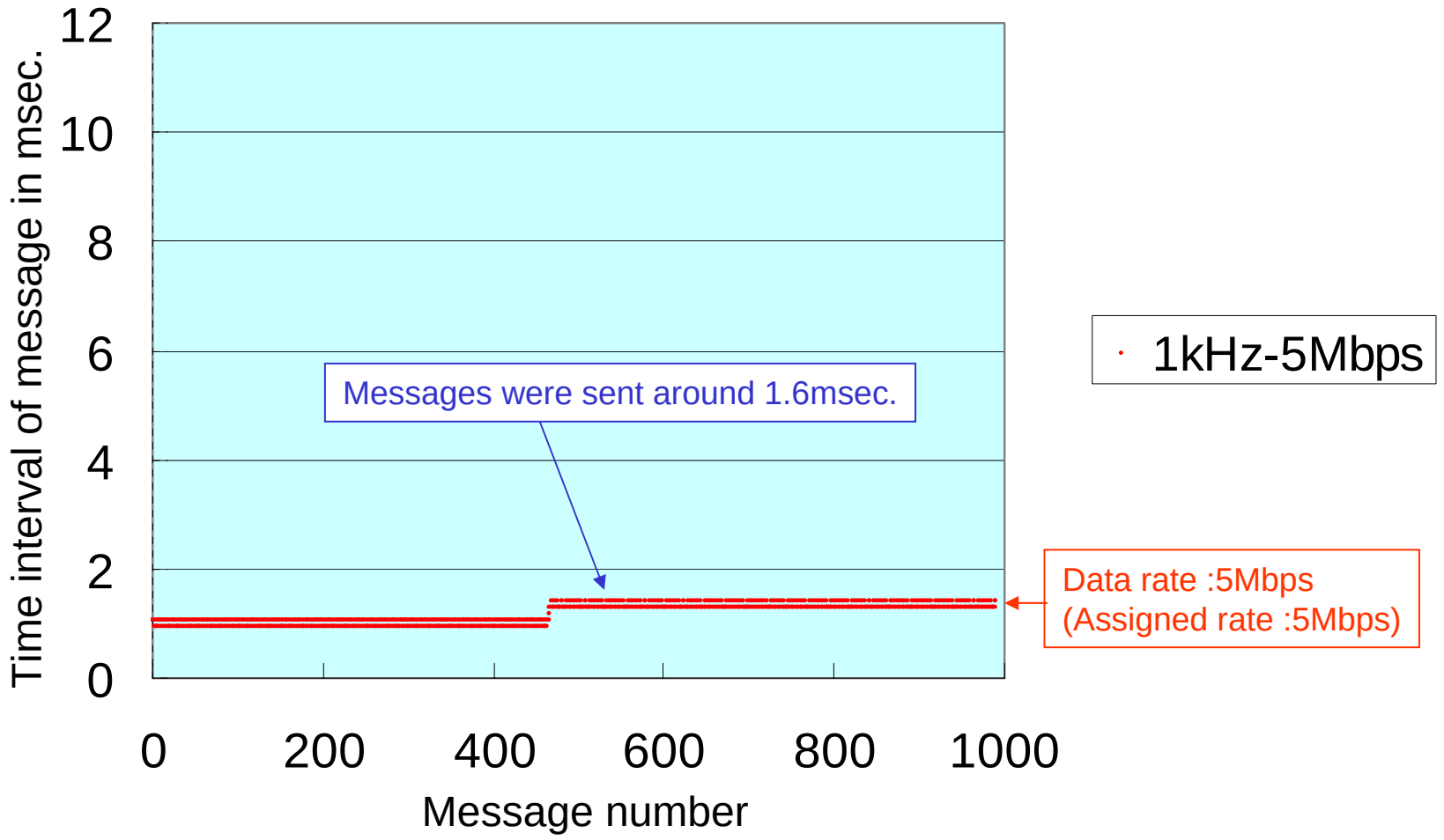
Linux scheduling time is usually 10msec.
It is defined by a parameter HZ in the kernel.
Namely, HZ is 100.
毎秒１００回のタイマー割り込みによる
プロセススケジューリング

This value is not convenient for the traffic shaping because the average trigger rate of Event Builder input is over 1kHz.

Let’s make the value 1500(667usec).

Message rate (1kHz) with QoS

Periodic Trigger : 1kHz, Message size : 1kB, Assigned rate : 5Mbps



QoS measurement with random trigger

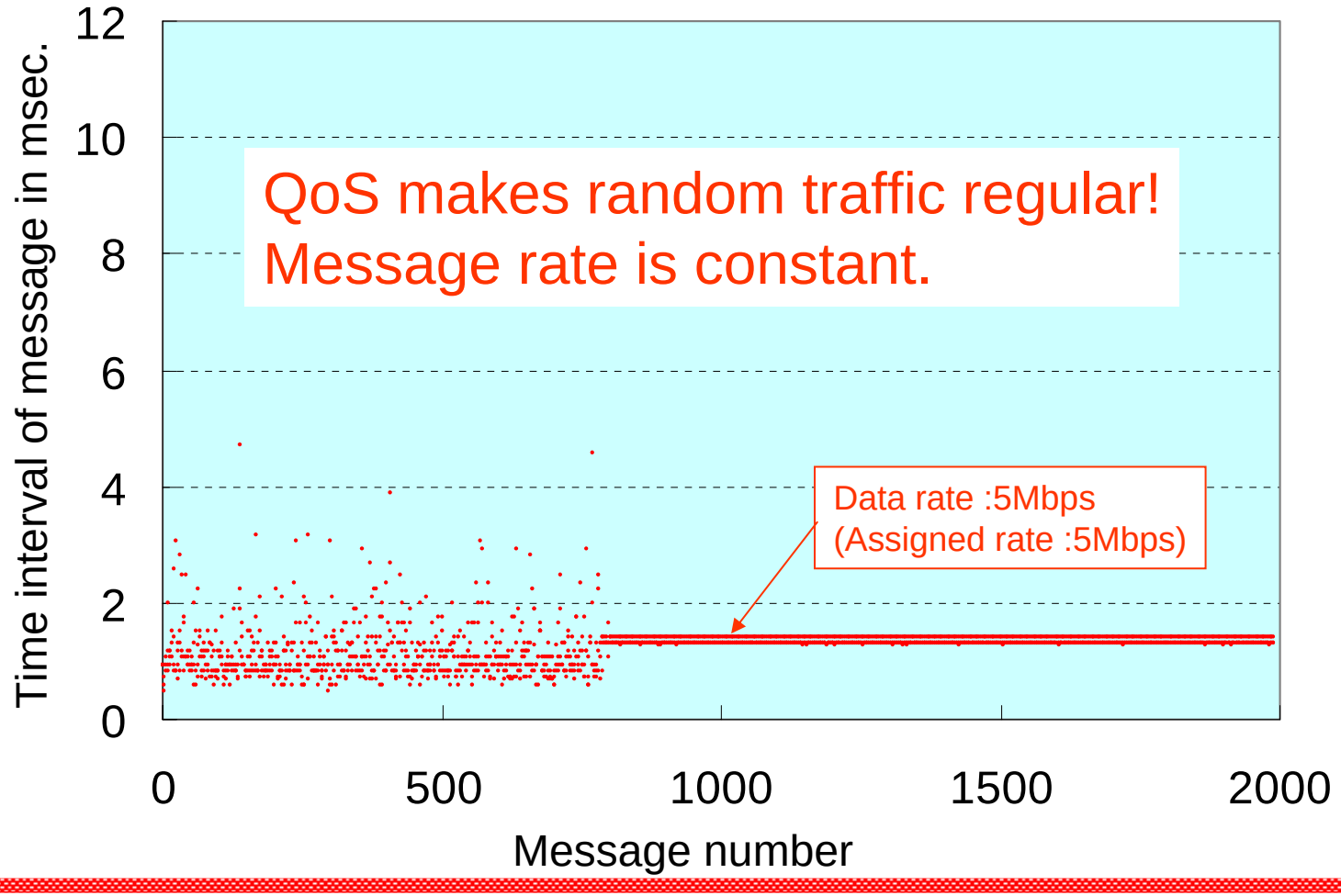
Periodic trigger → OK
However, actual trigger is random.

Can QoS make random traffic regular?
Namely, does it simulate Constant Bit Rate as ATM?

Let's make random trigger.

Message rate (1kHz) with QoS

Gaussian Trigger : 1kHz, Message size : 1kB, Assigned rate : 5Mbps



Linux kernel overhead

- **使ったベンチマークプログラムについて**
  memory copy**性能を指標とした。**
- **ノーマルなスケジューリングの場合と毎回１５００回のそれを比較しての場合が約1%程度の性能劣化があった。つまり、タイマー割り込みによるオーバーヘッドは約1%程度だった。**

Size of copy	HZ=100	HZ=1500	Overhead(%)
4MB	179.32MB/s	177.8MB/s	0.847647
8MB	179.34MB/s	177.08MB/s	1.260176
16MB	179.34MB/s	177.68MB/s	0.925616
32MB	179.3MB/s	177.67MB/s	0.909091

Conclusion and Plan

Conclusion

- Linux QoS with Ethernet can make 1kHz random traffic regular. This feature makes the feasibility of congestion control on Atlas Event Builder data path.

Plan

- We are now applying QoS to real Atlas event builder software framework on test-beds at Japanese sites and CERN for the Technical Design Report in next year.