Priority Switching Scheduler

draft-finzi-priority-switching-scheduler-01

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Context and Motivation

- Sharing the capacity of a link is an important issue for mixing traffics
- Many existing solutions: Weighted Fair Queuing (WFQ), Deficit Round Robin (DRR), ...
- But all are complex to configure and provide only soft guarantees

Objective of this new Priority Switching Scheduler (PSS): achieve a service closer to PGPS and obtain more predictable available capacities.

Priority Switching Scheduler

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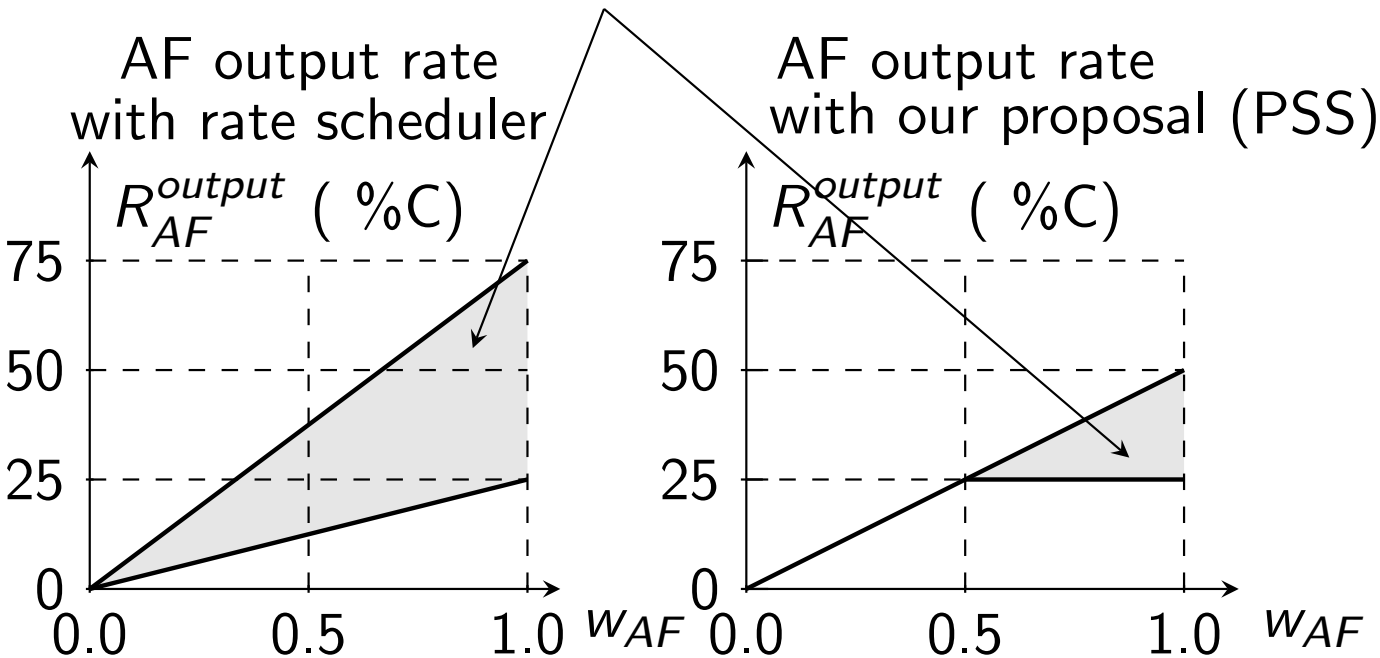
We propose the Priority Switching Scheduler (PSS), to **ensure more predictable output rates**.

Usecase example on 3-classes DiffServ core router (following RFC5865) within AF class, what we seek to obtain:

Range of AF output rate as a function of EF input rate and the rate scheduler weight



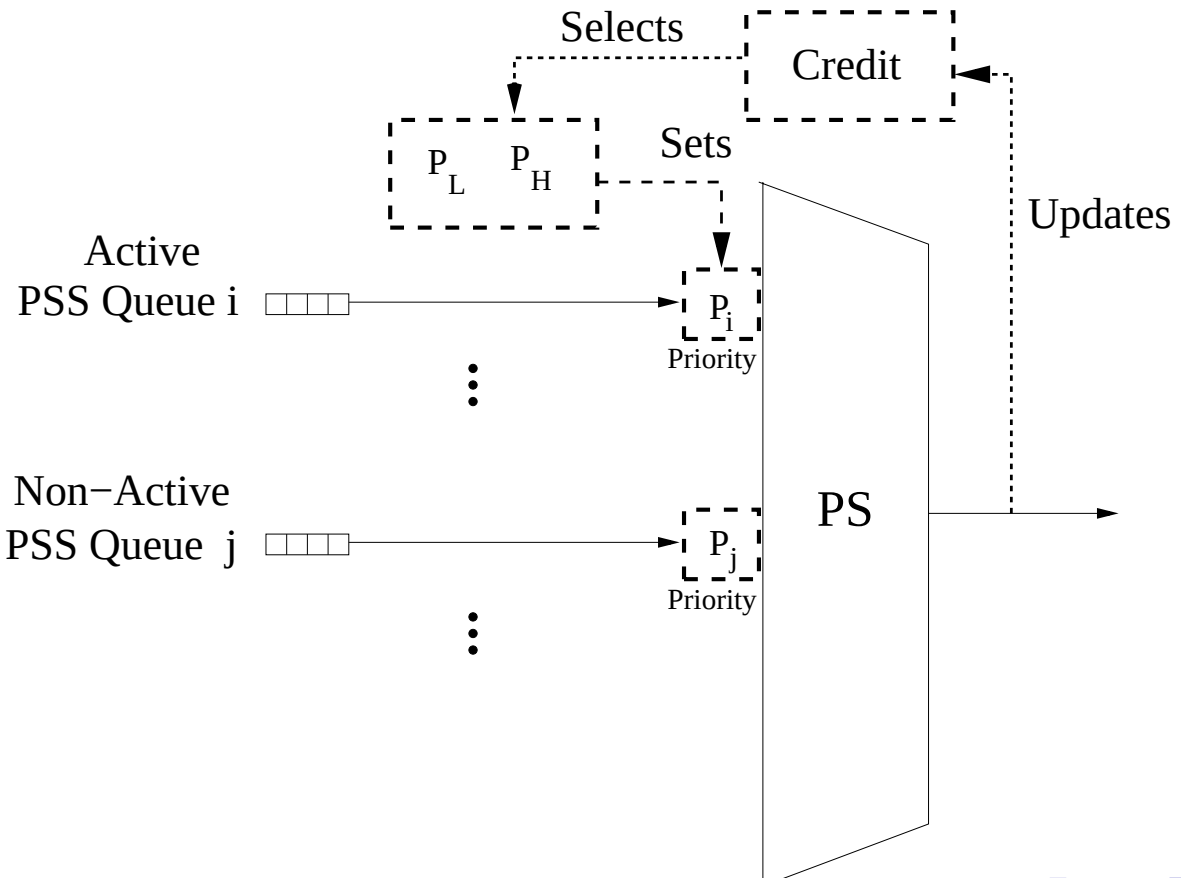
Draft Content

1. Introduction
   1. Context and Motivation
   2. Priority Switching Scheduler in a nutshell
2. Priority Switching Scheduler
   1. Specification
   2. Implementation
3. Usecase: benefit of using PSS in a Diffserv core network
   1. Motivation
   2. New Service offered
4. Security Considerations (TBC)

PSS in a nutshell

The PSS is a credit-based scheduler inspired by the Burst Limiting Shaper (BLS) proposed by the IEEE Time Sensitive Networking (TSN) task group.

Its **key idea: a credit-depending priority change**



PSS Parameters

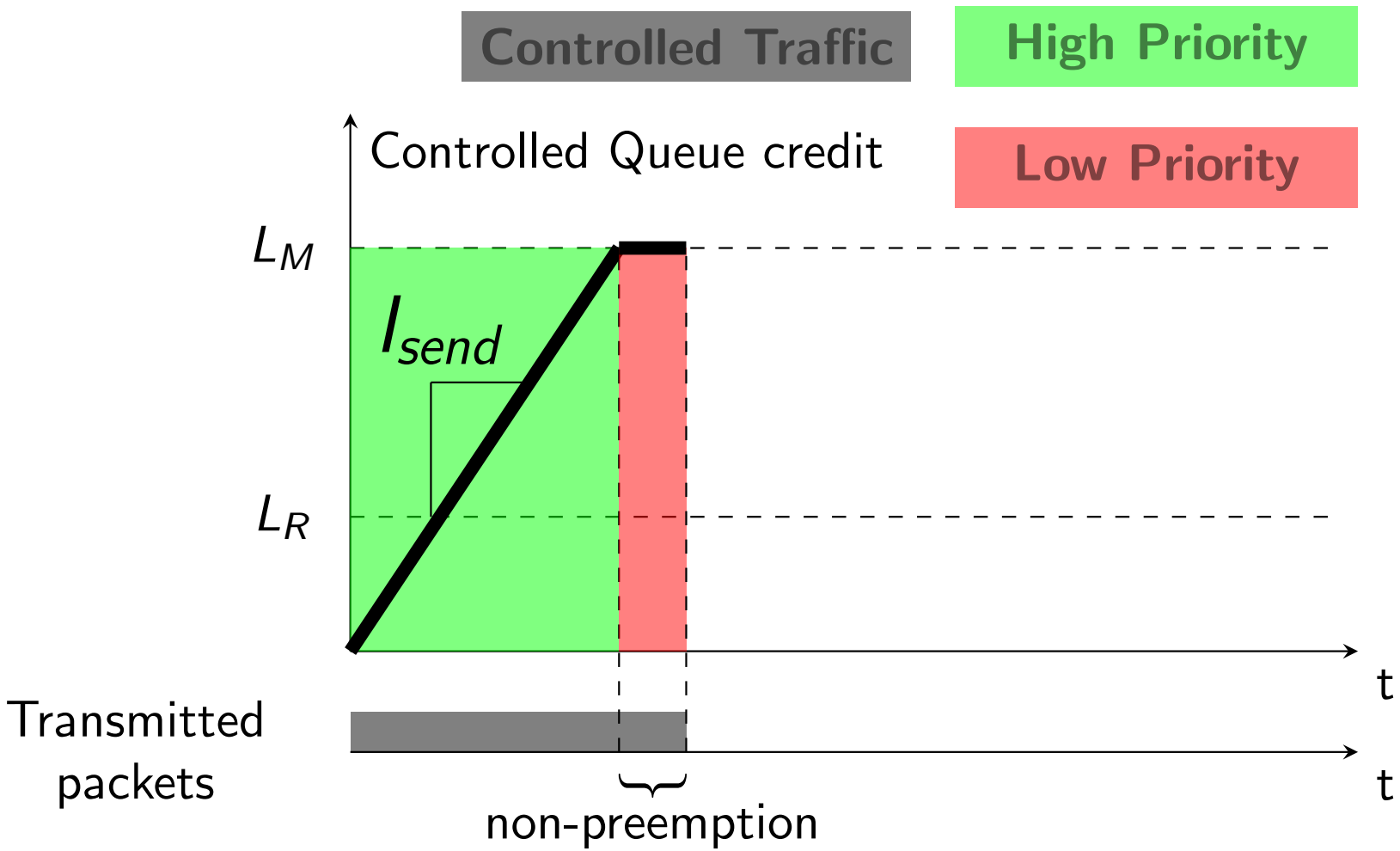
The PSS credit has 3 parameters per controlled queue:

- a Maximum Level (L_M)
- a Resume Level (L_R)
- a Reserved Bandwidth (BW)

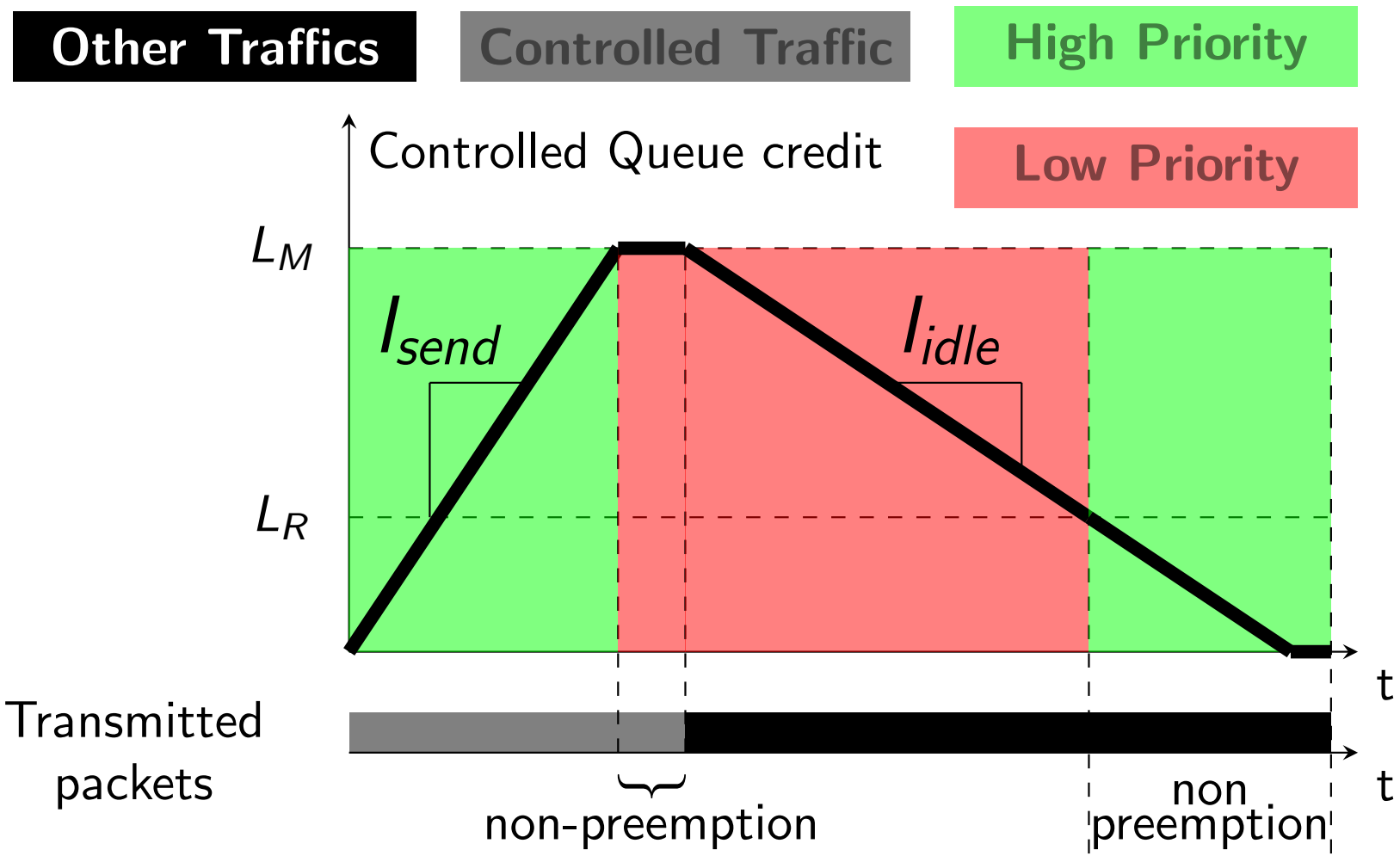
BW is used with the output link capacity C to compute the credit slopes as follows:

- the sending slope, $I_{send} = (1 - BW) \cdot C$
- the idle slope, $I_{idle} = BW \cdot C$

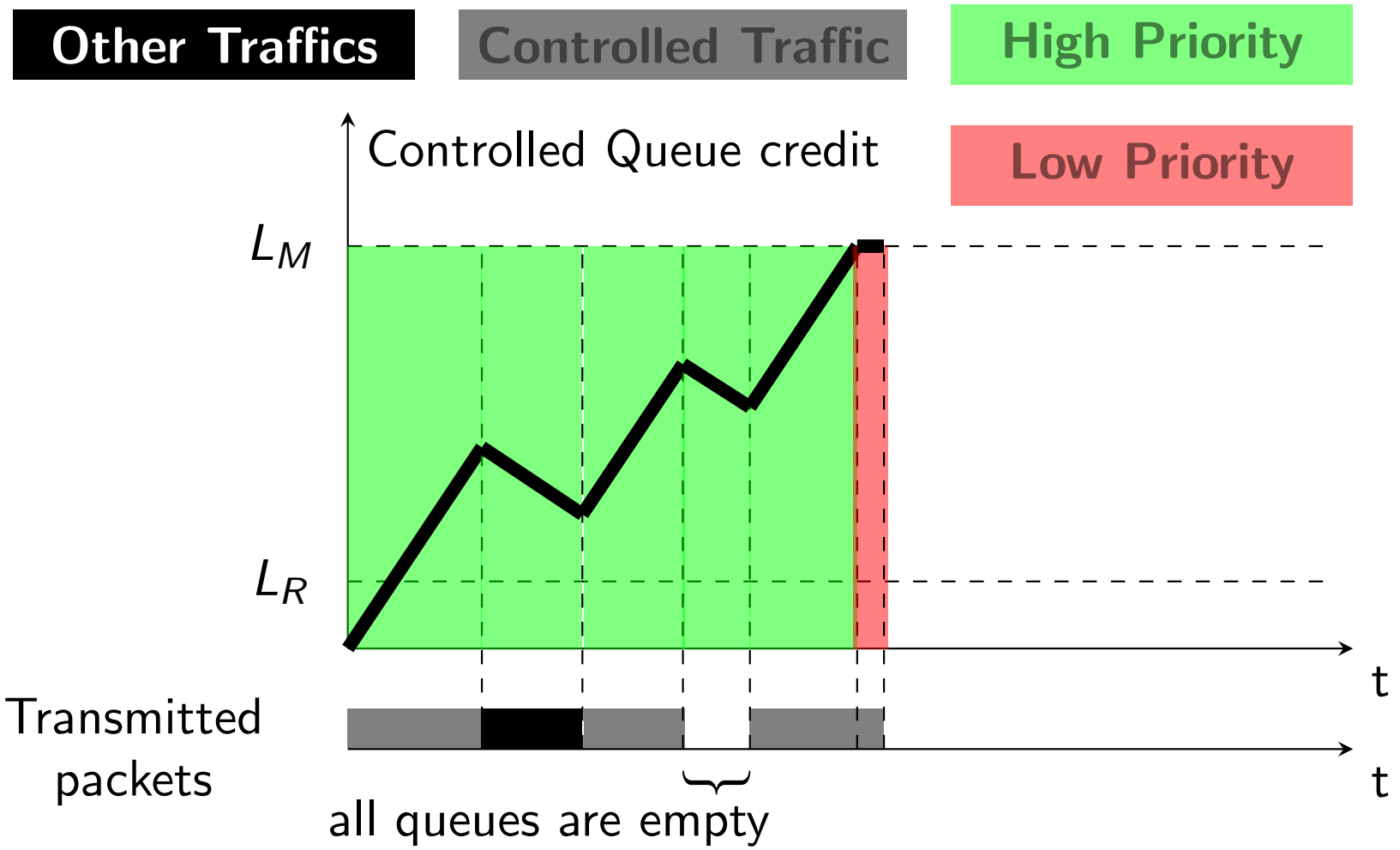
PSS credit evolution



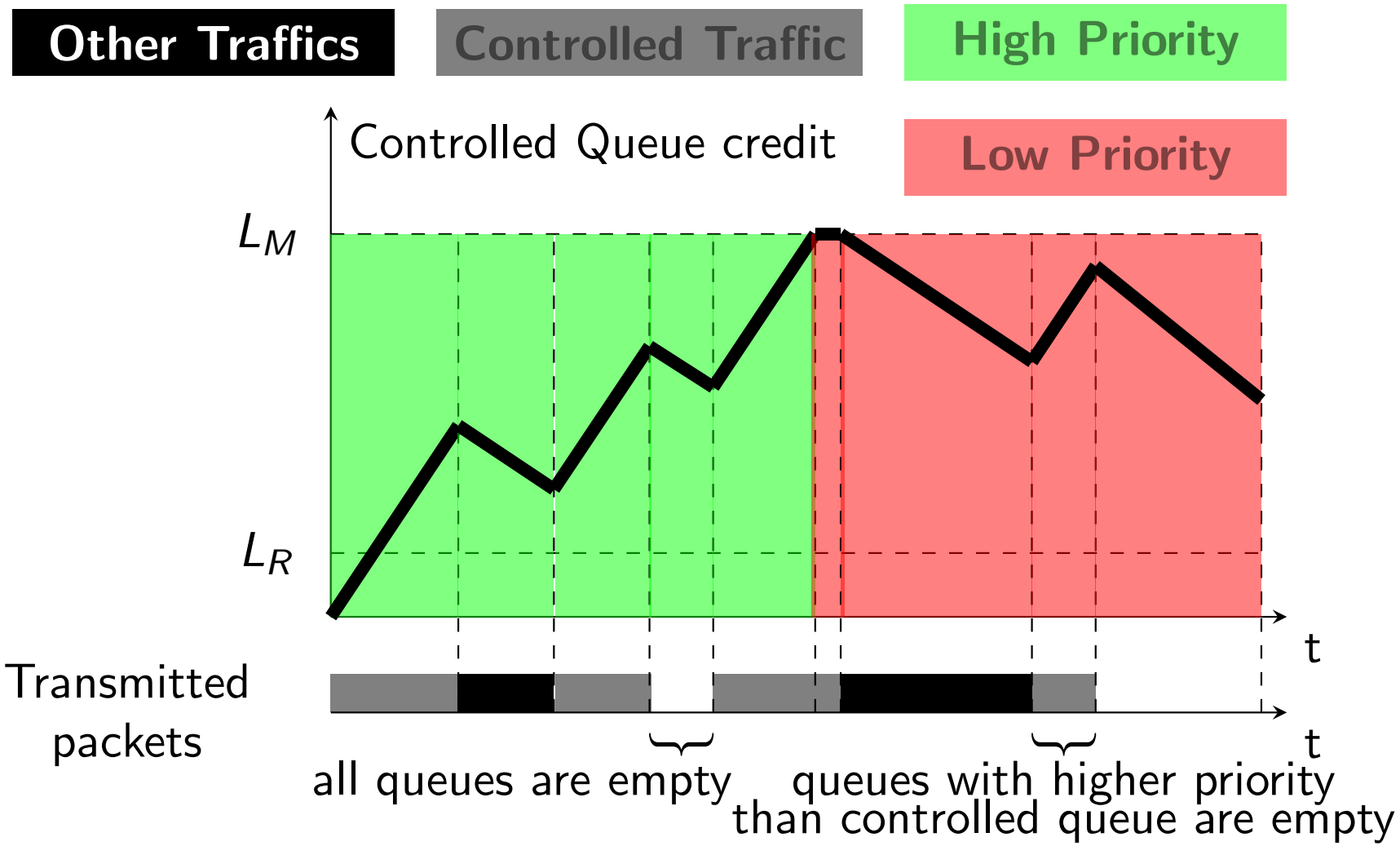
PSS credit evolution



PSS credit evolution



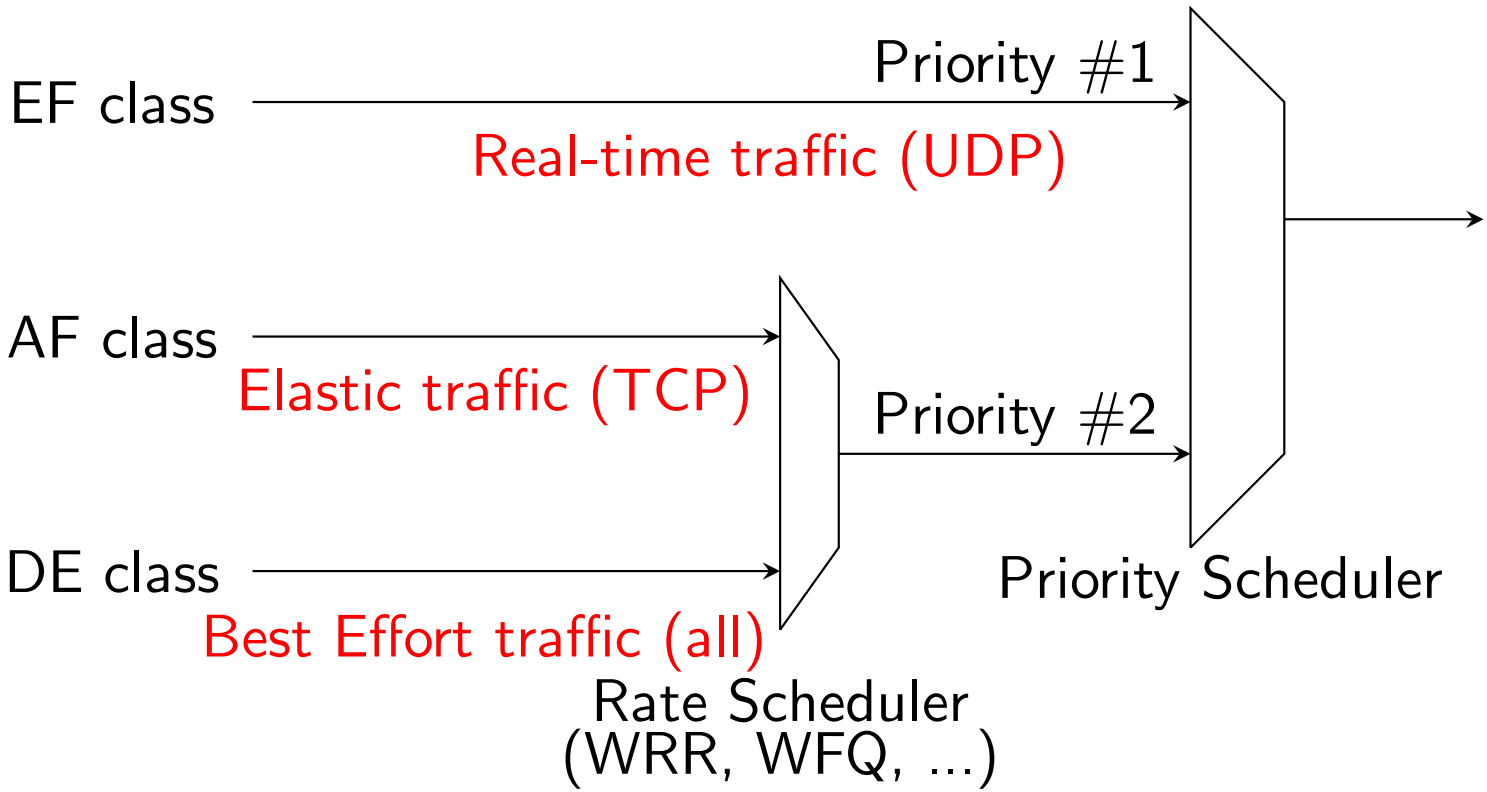
PSS credit evolution



UseCase: the DiffServ Architecture

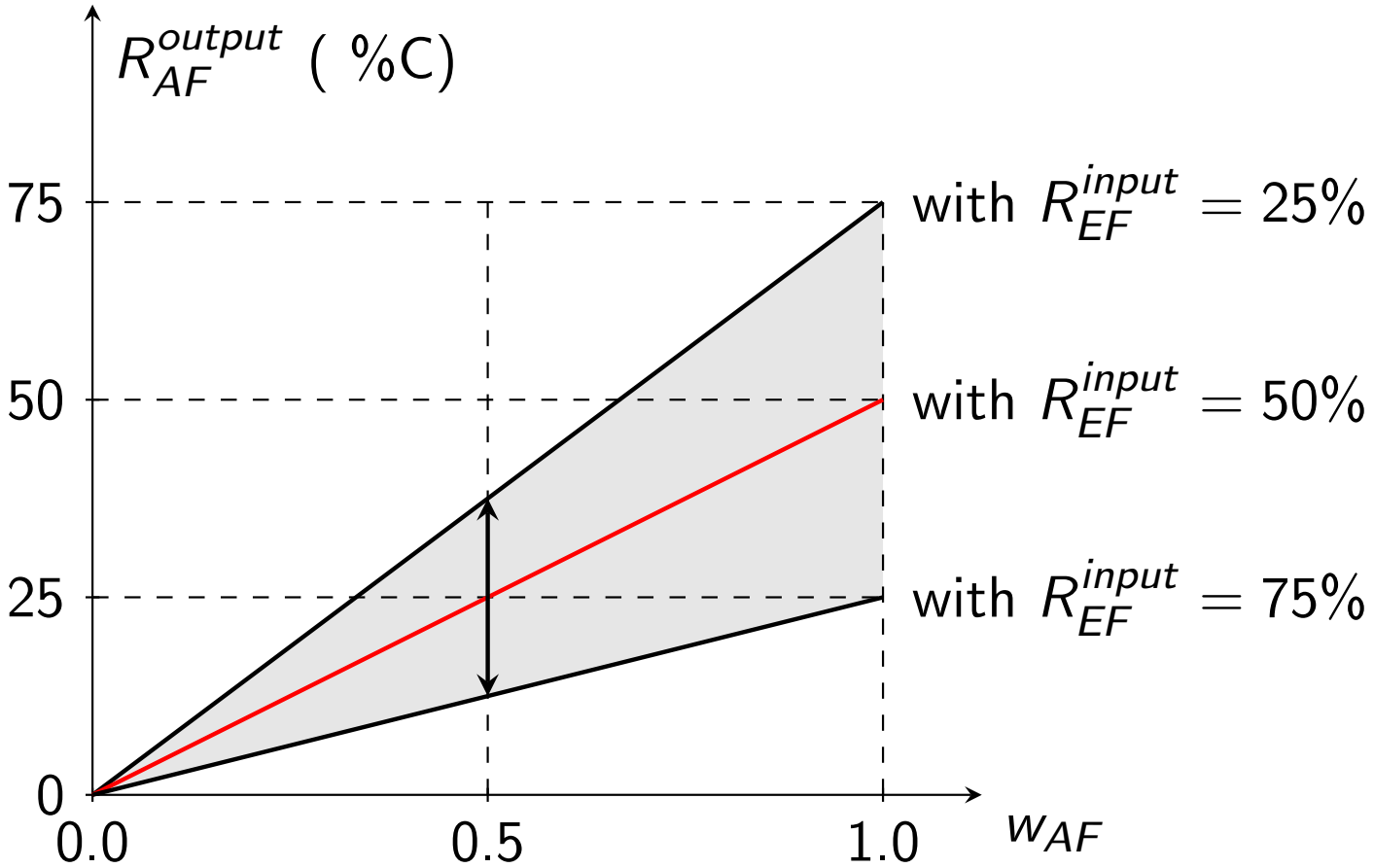
A Differentiated Services Code Point (DSCP) for Capacity-Admitted Traffic

Current core router architecture in RFC5865:



Rate Scheduler key feature: limits the capacity available to AF to prevent BE starvation and provide minimum service to both classes

AF output rate R_{AF}^{output} with rate scheduler



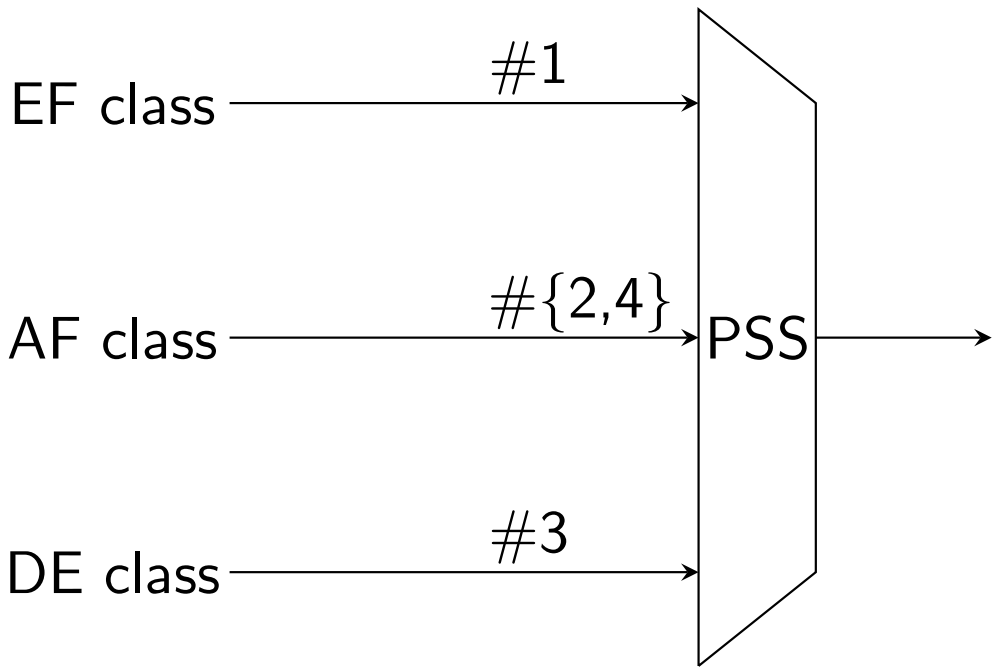
AF output rate with rate scheduler

AF output rate R_{AF}^{output} with rate scheduler

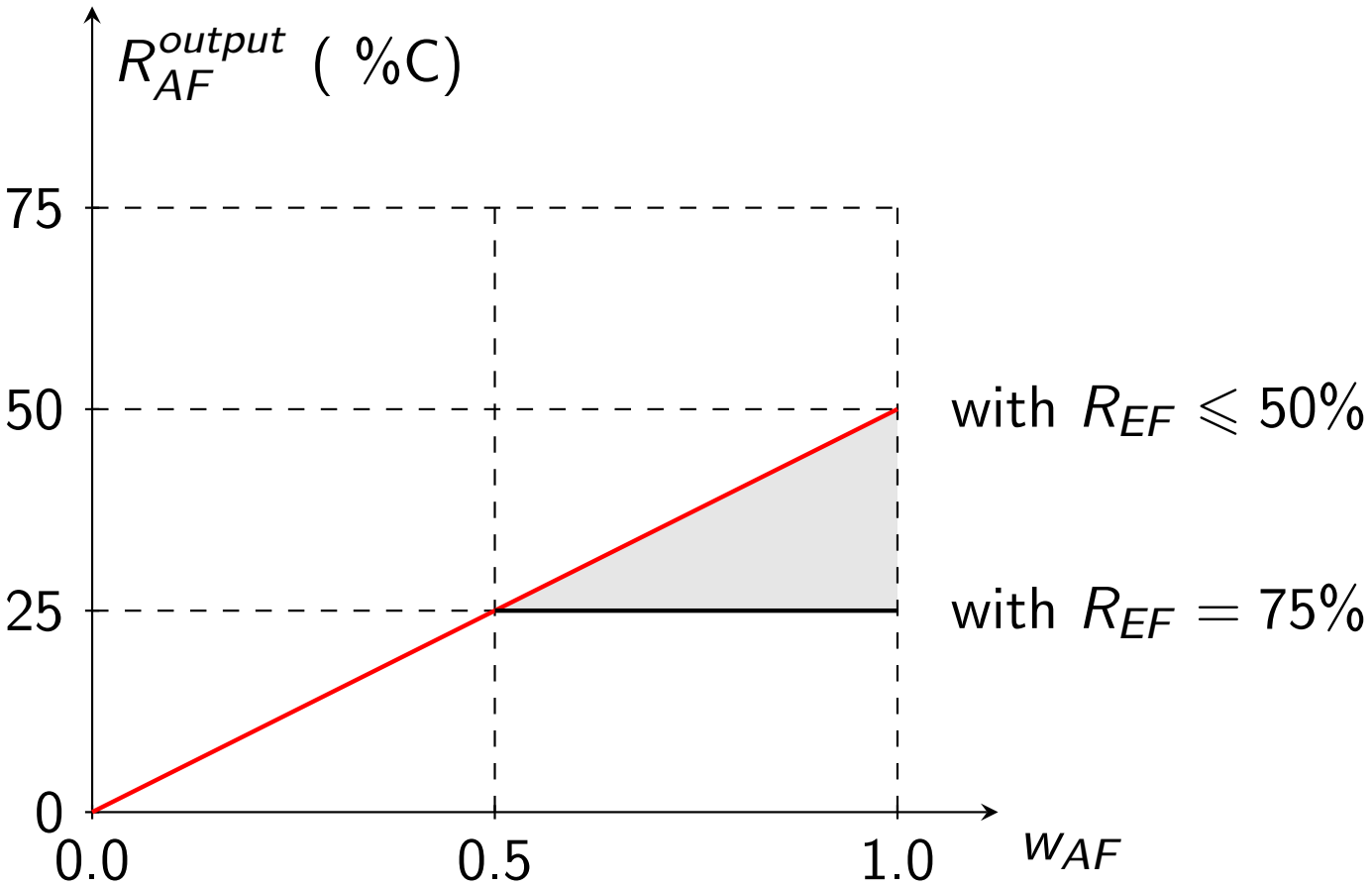
R_{AF}^{output} uncertain when R_{EF}^{input} is unknown

$\Rightarrow$ our aim: make R_{AF}^{output} more predictable

Proposed core router architecture with 3 queues

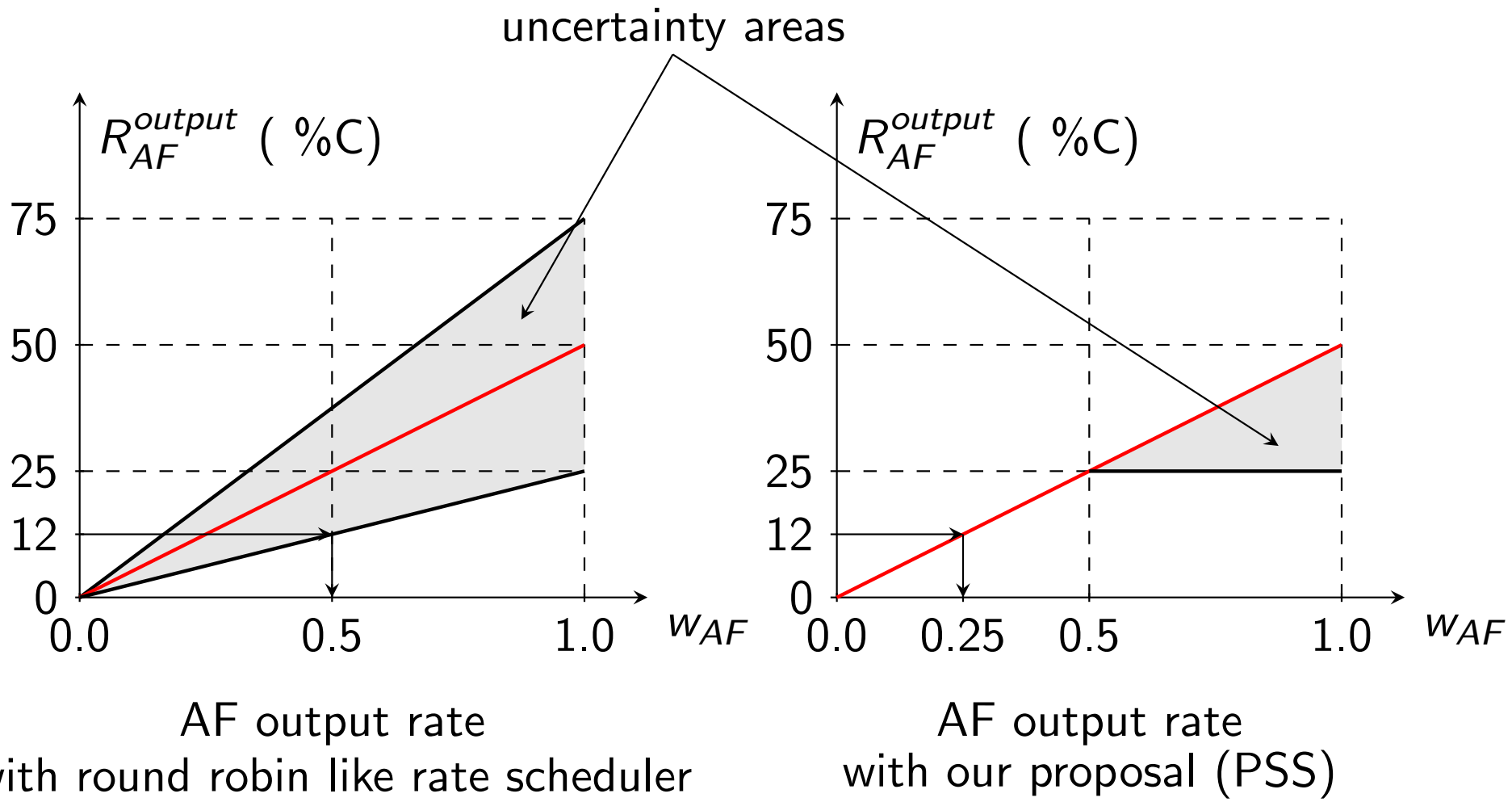


AF output rate R_{AF}^{output} with PSS



AF output rate with our proposal (PSS)

Better quantify AF output rate R_{AF}^{output}



AF output rate
with round robin like rate scheduler

AF output rate
with our proposal (PSS)

Usecase: conclusion

- EF class not impacted by the proposed change
- When **EF input rate is known**: PSS and WRR have **same AF output rate**
- When **EF input rate varies**: the **range** of possible **AF output rates** is much **narrower with PSS than with WRR**
- These results have been corroborated by NS2 simulations (available here)

[1] A.Finzi, A.Mifdaoui, F.Frances, E.Lochin. Improving RFC5865 Core Network Scheduling with a Burst Limiting Shaper. IEEE Globecom, 2017

Conclusion

To sum up:

- PSS improves the predictability of controlled queues available capacities
- hardware implementable
- can replace any kind pf round robin like scheduler

On-going real implementation
Interest from satellite company to test proposal