Performance Analysis of Cluster Networks

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Content

Introduction

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- The nodes of the cluster are loosely coupled and the interconnection of the nodes happen typically with the help of local networks
- The cluster can be used as one uniform computational resource

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- Power reduction techniques (e.g. DPM)

Investigated models

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  - Common Queue

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- Jobs are uninterrupted under service (non - preemptible property)
- Jobs are atomic, which can not be divided into smaller pieces
- Any server can execute them

Server type	C_s	$P_{ac,*}$ (W)	$C_s/P_{ac,*}$	$P_{id,*}$ (W)
Acer AW2000h-Aw170h F2 (Intel Xeon E5-2670)[1]	6419263	1700	3776	364
Acer AW2000h-Aw170h F2 (Intel Xeon E5-2660)[2]	5286503	1275	4146	331
PowerEdge R820 (Intel Xeon E5-4650L)[3]	2790966	457	6102	108

Table 1: Measured results

- C_s - Number of operations finished per second
- $P_{ac,*}$ (W) - measured average power consumption at 100% target load
- $C_s/P_{ac,*}$ - energy efficiency: larger number of ratio means more energy efficiency
- $P_{id,*}$ (W) - measured average power consumption at 0% target load

[1] https://www.spec.org/power_ssj2008/results/res2012q4/power_ssj2008-20120918-00546.html.

[2] https://www.spec.org/power_ssj2008/results/res2013q1/power_ssj2008-20121212-00590.html.

[3] https://www.spec.org/power_ssj2008/results/res2012q4/power_ssj2008-20121113-00586.html.

Buffer schemes

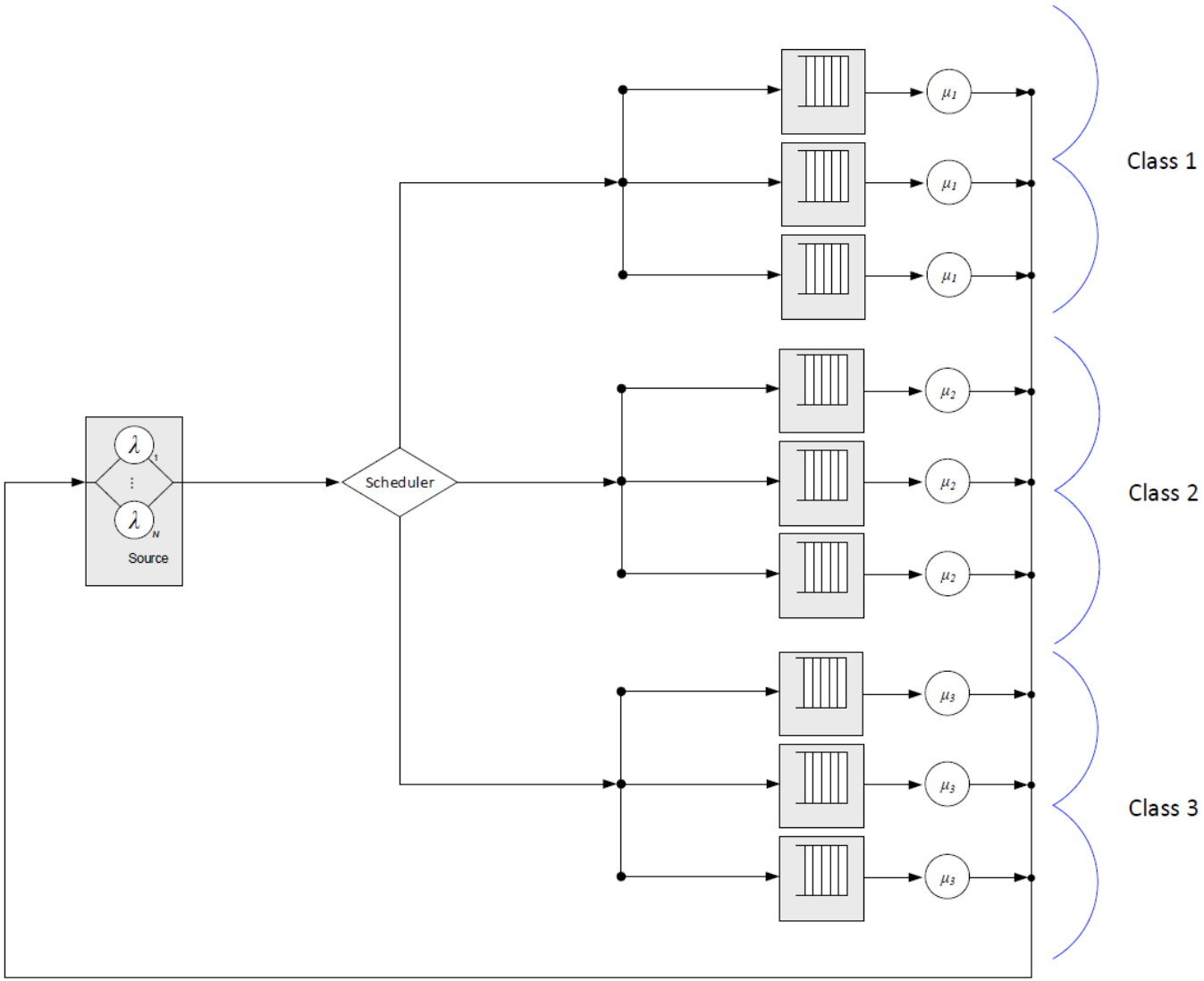

Figure 1: Separate Queue Scheme

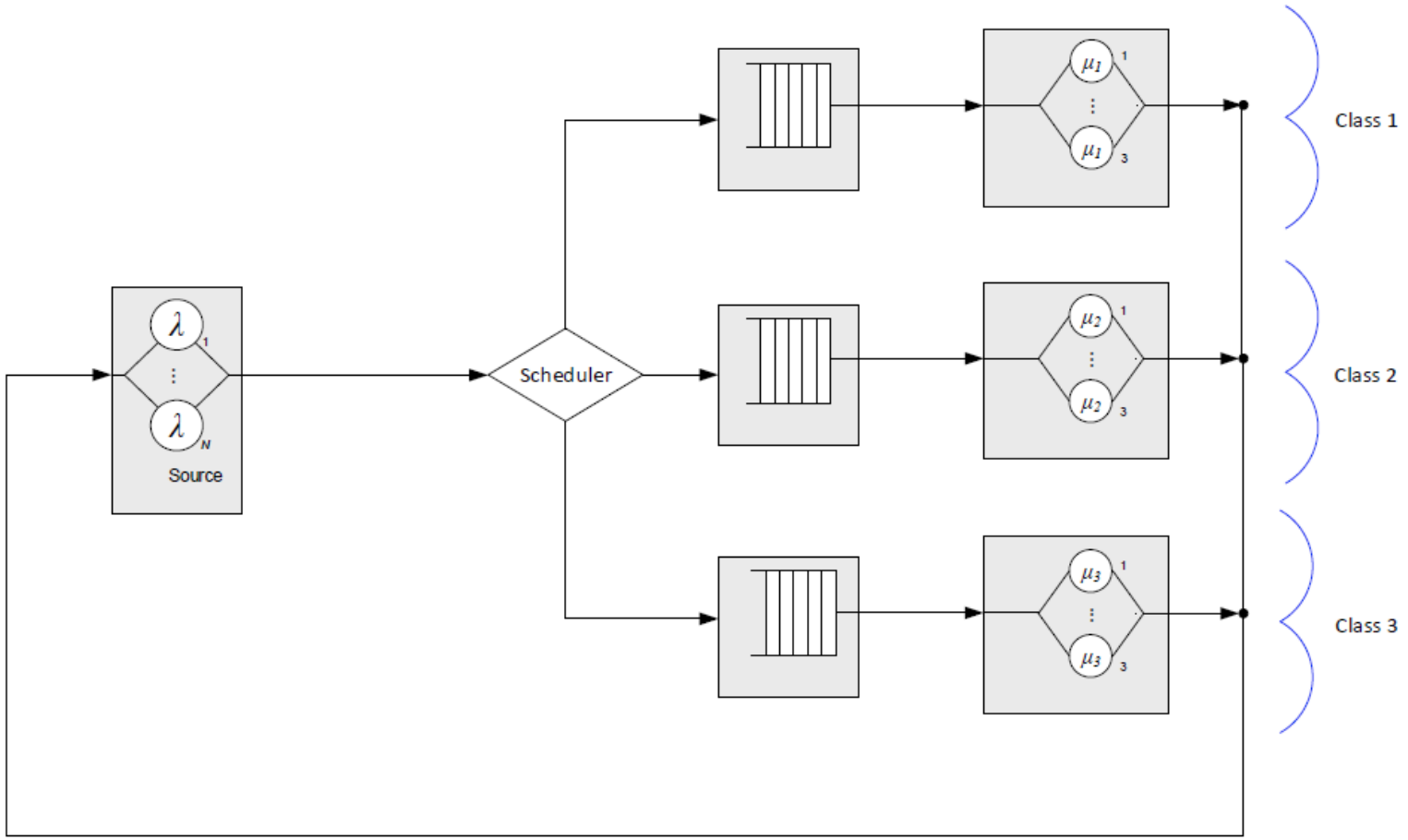

Figure 2: Class Queue Scheme

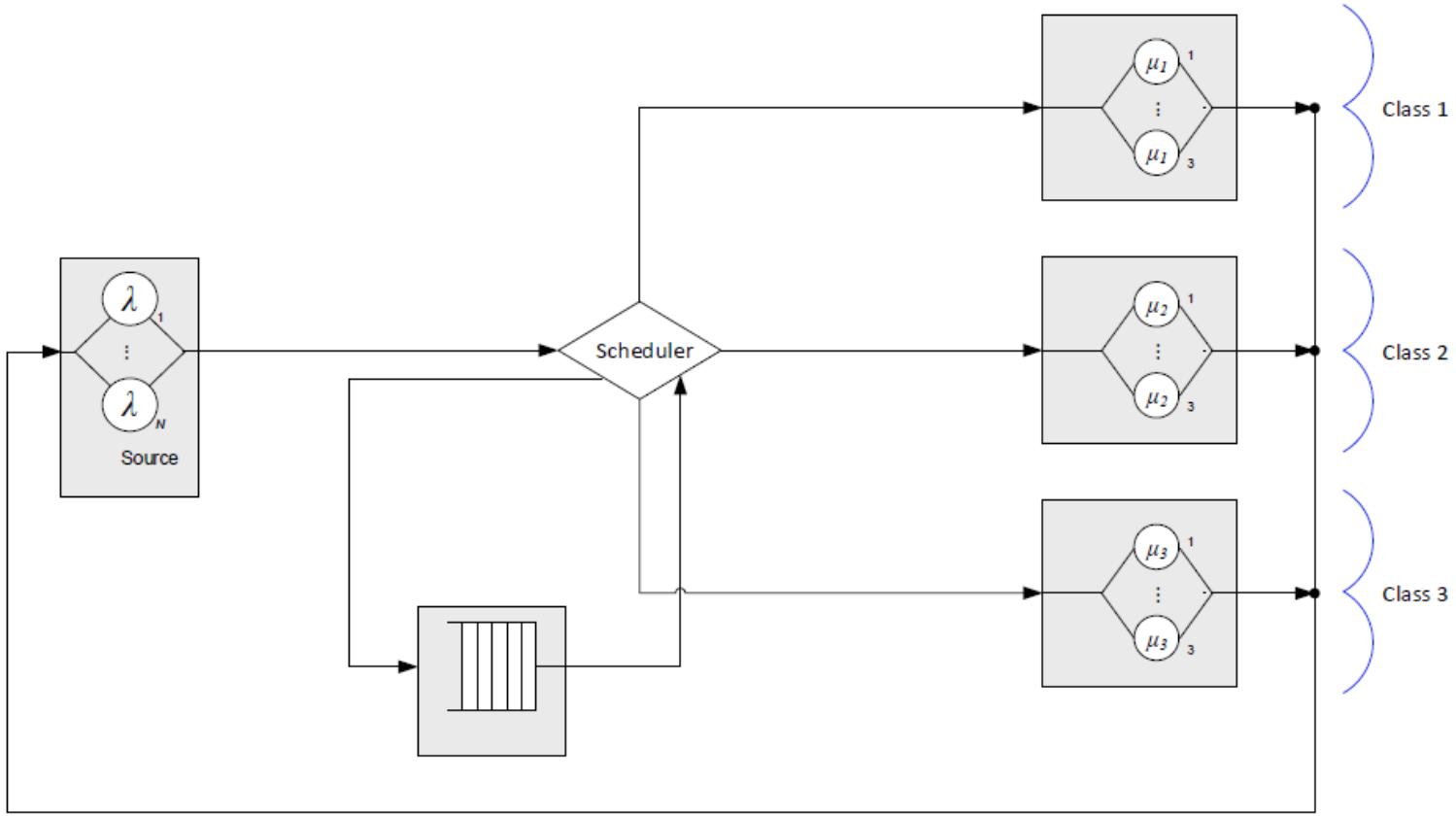

Figure 3: Common Queue Scheme

Results in connection with performance measures

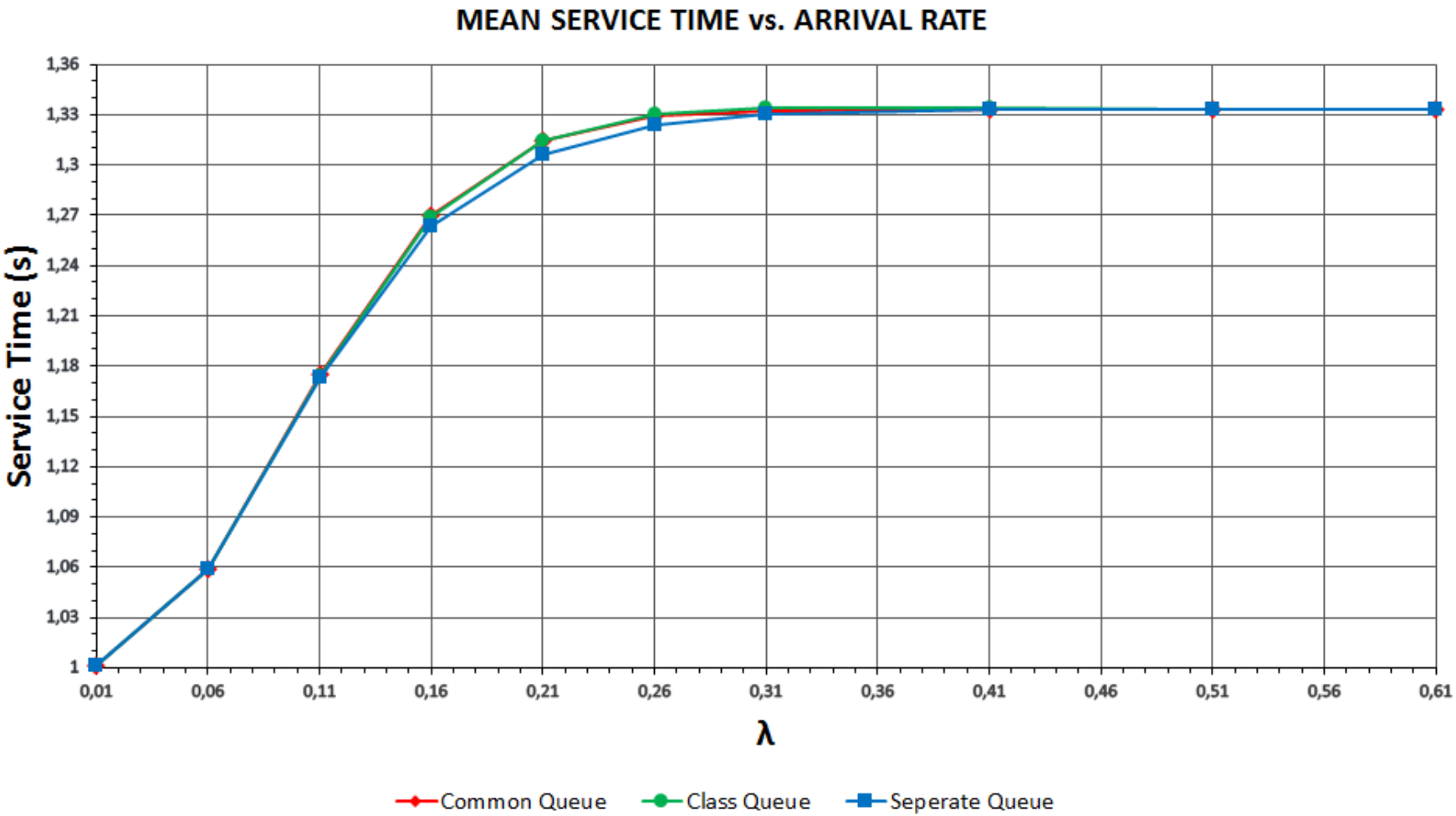

Figure 4: Mean service time in function of λ beside applying HP policy

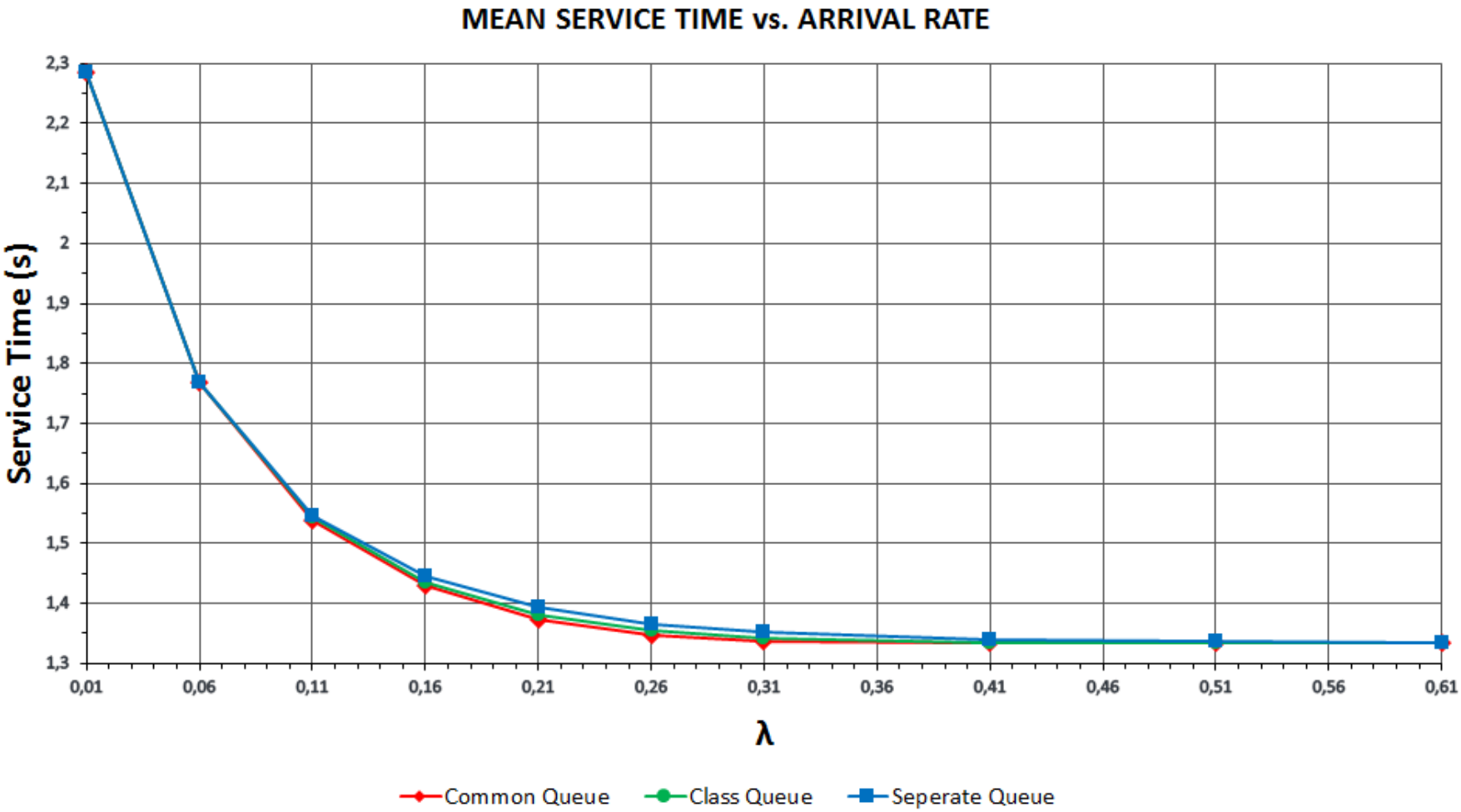

Figure 5: Mean service time in function of λ beside applying EE policy

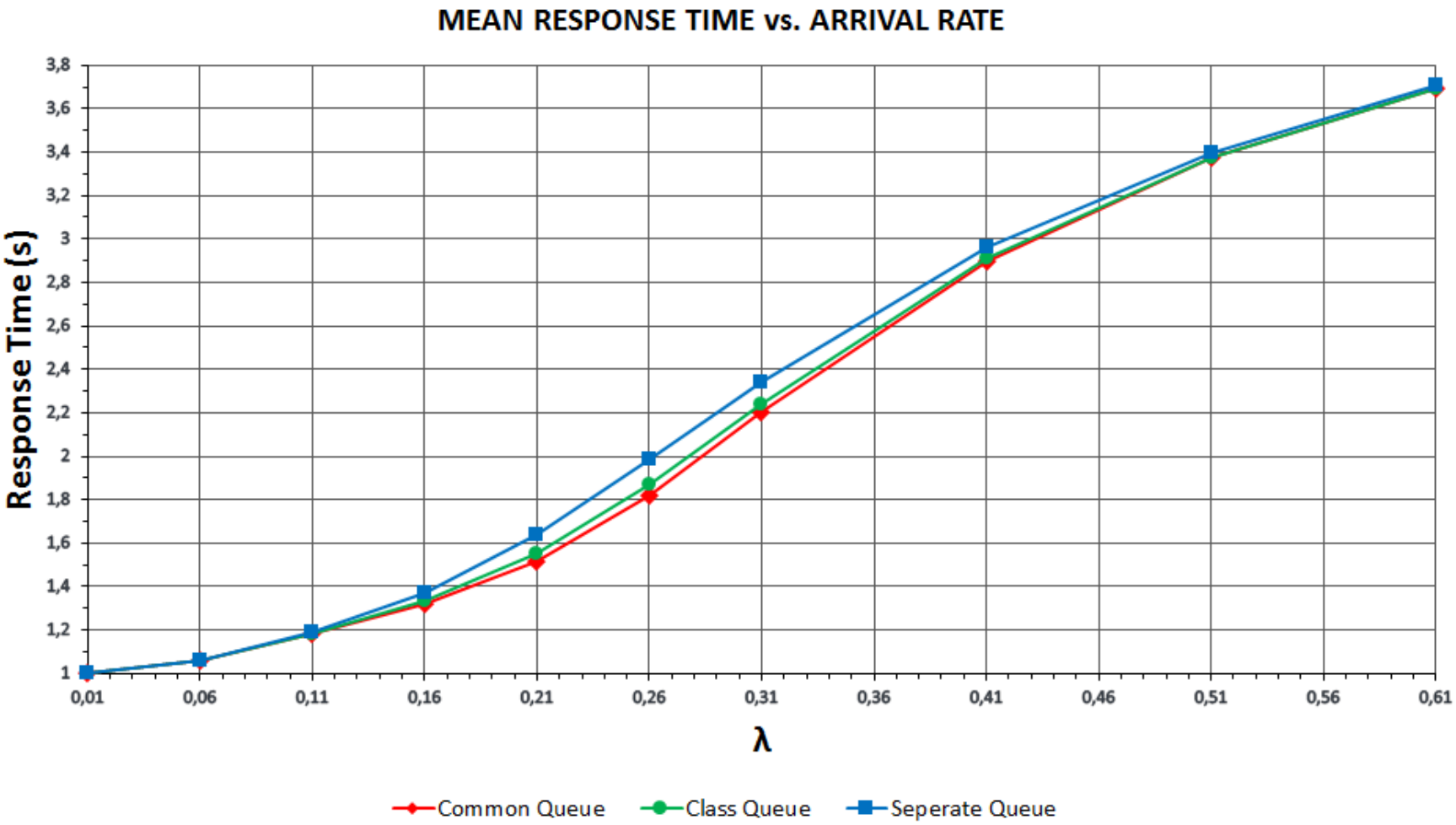

Figure 6: Mean response time in function of λ beside applying HP policy

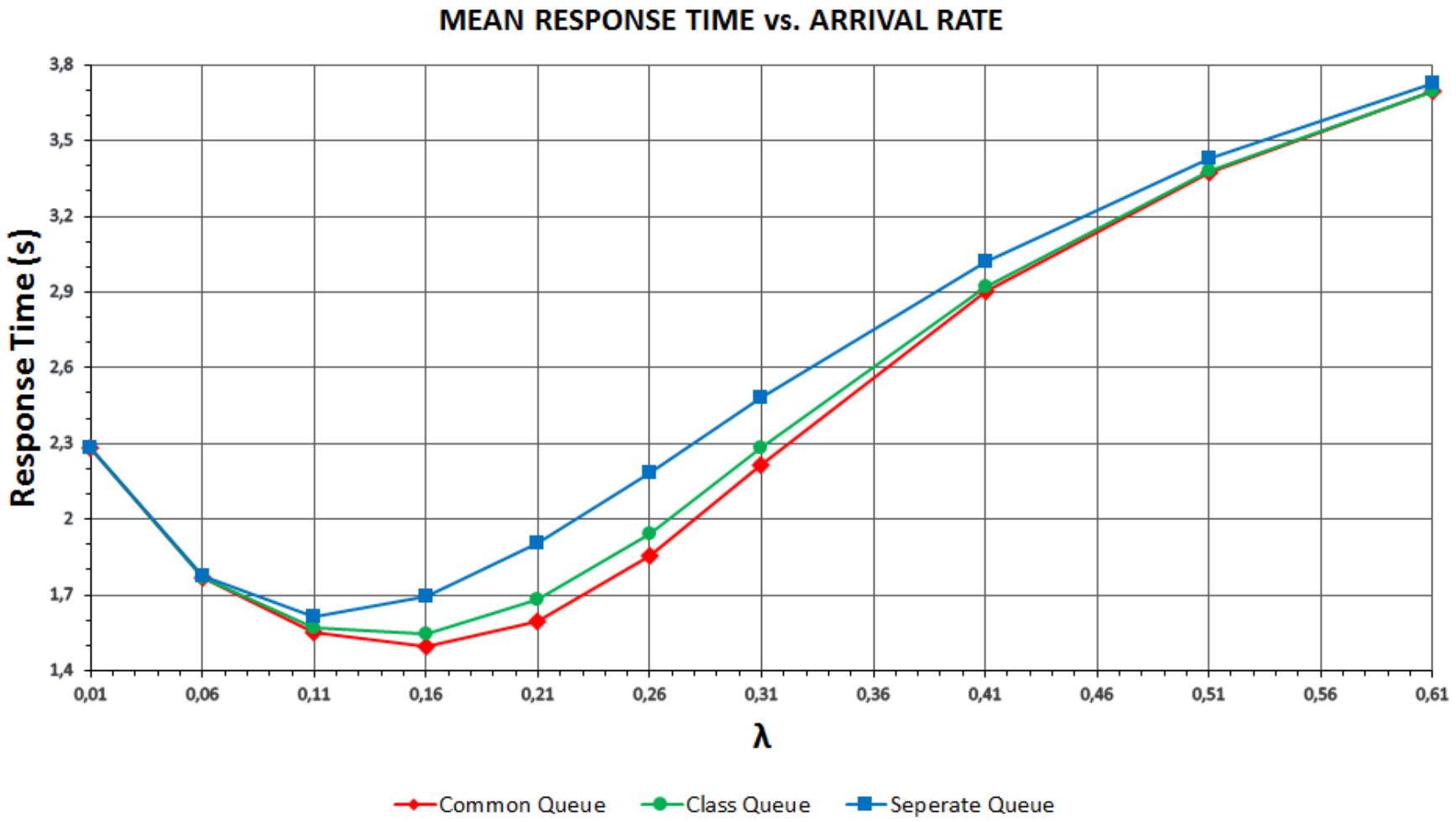

Figure 7: Mean response time in function of λ beside applying EE policy

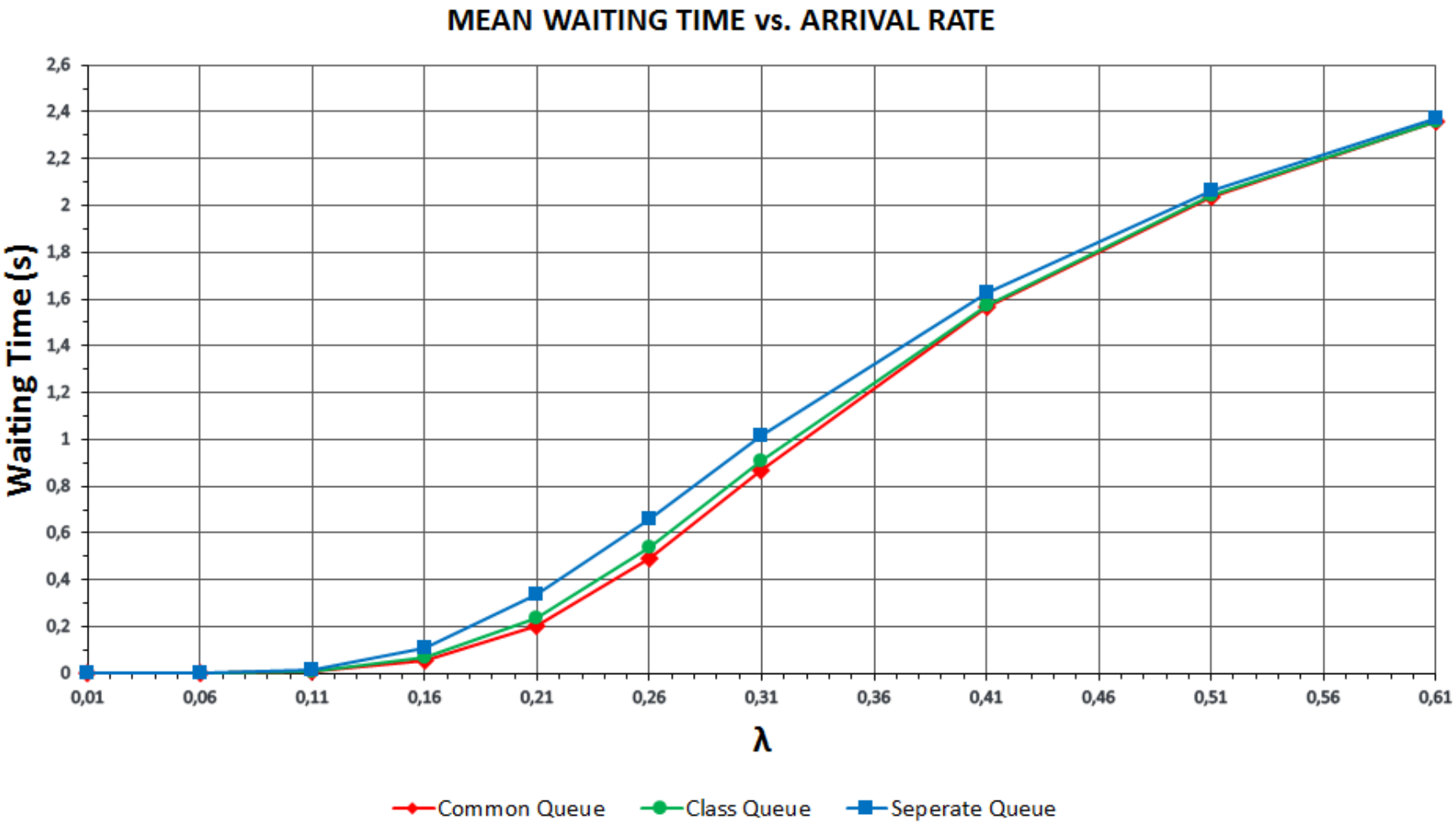

Figure 8: Mean waiting time in function of λ beside applying HP policy

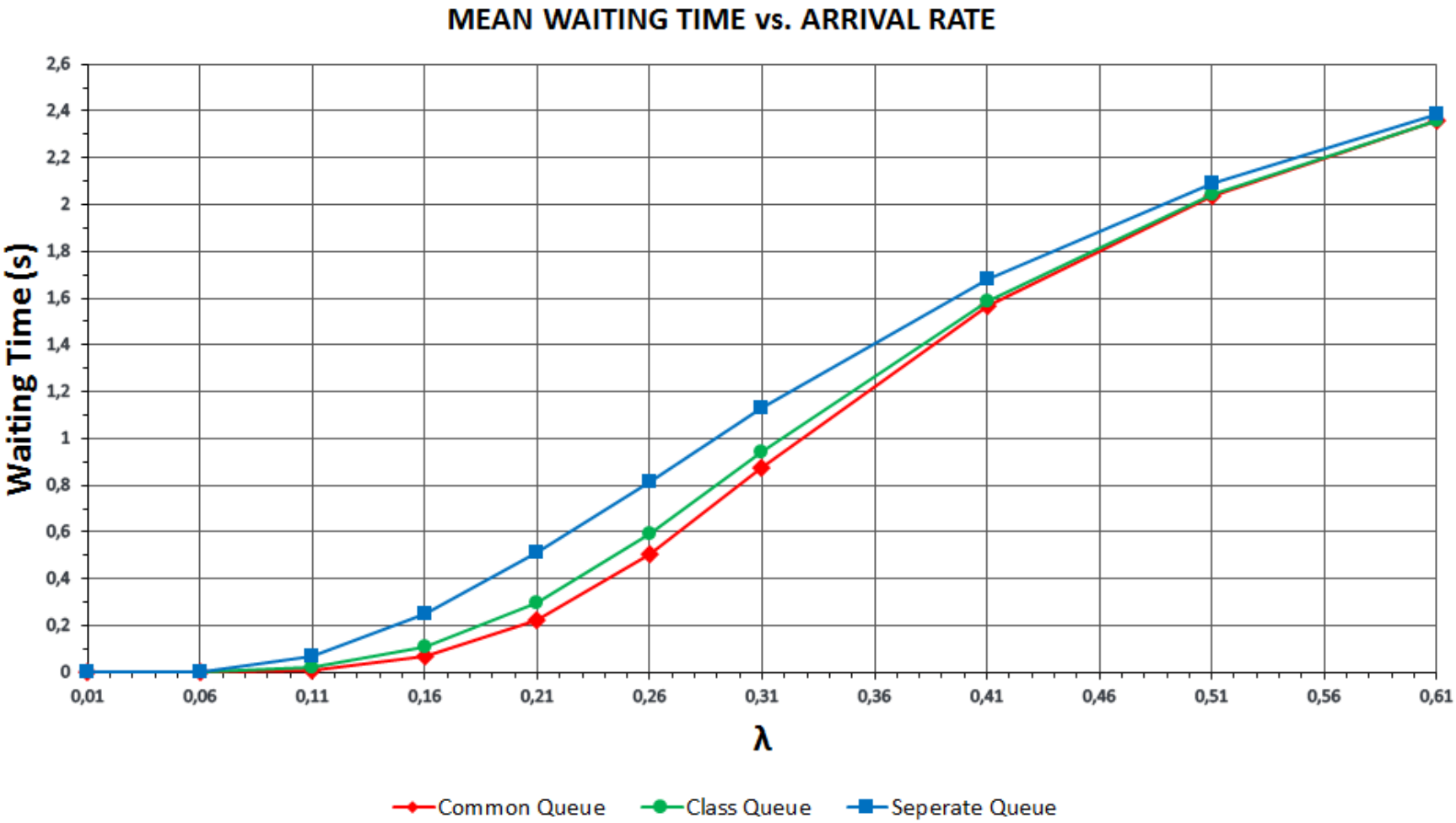

Figure 9: Mean waiting time in function of λ beside applying EE policy

Results in connection with energy consumption

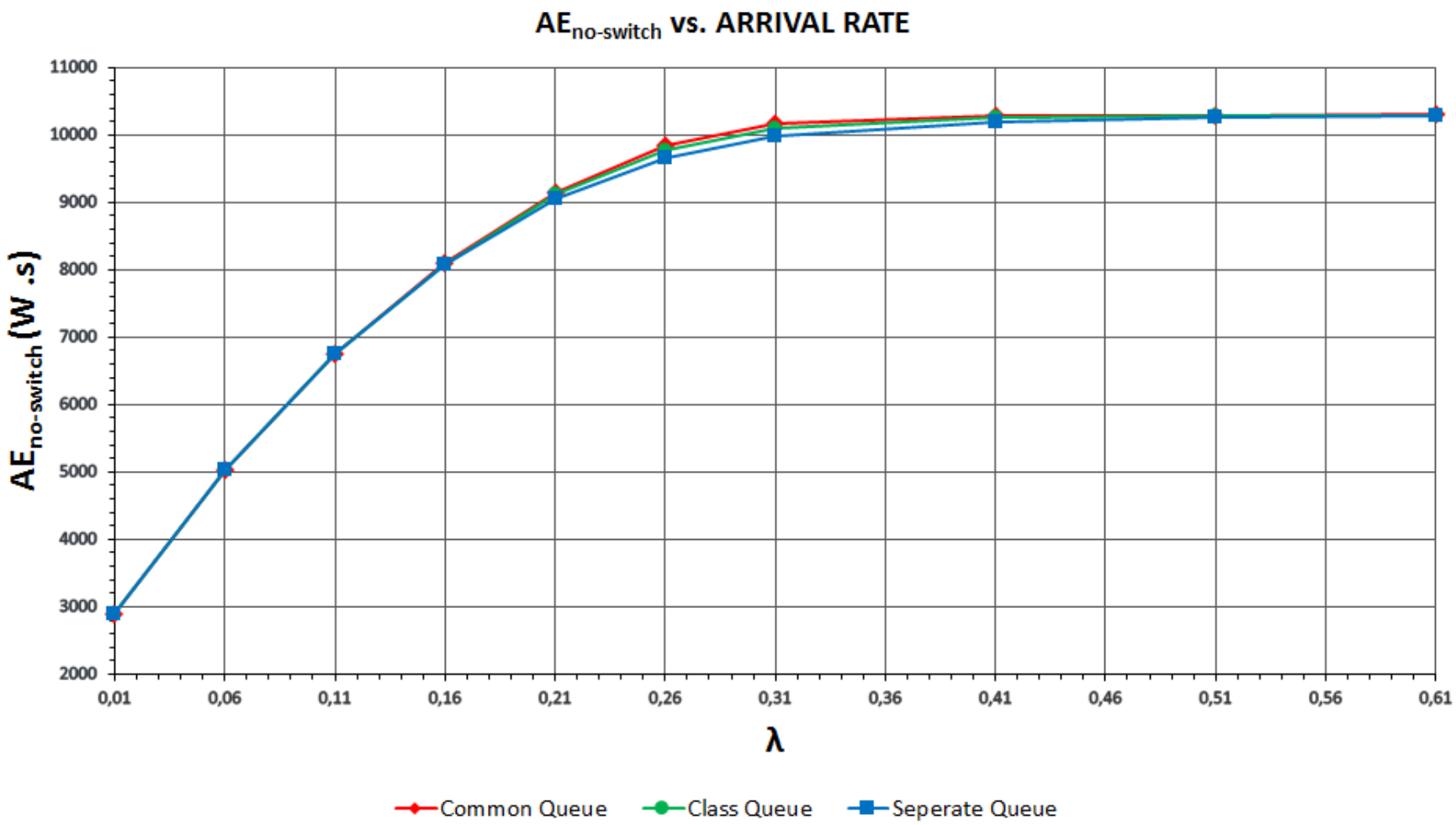

Figure 10: Mean energy consumption of the system beside applying HP policy

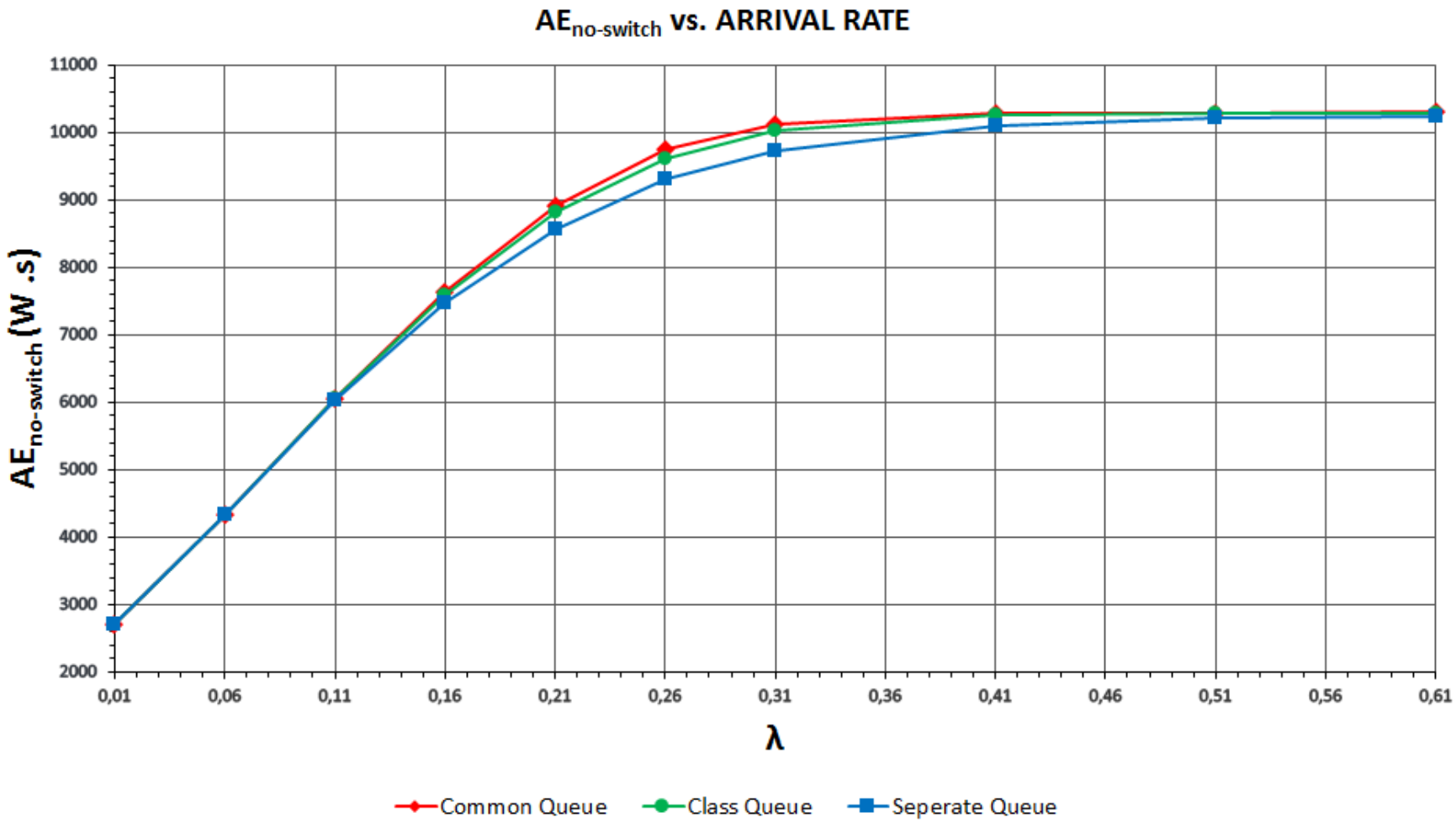

Figure 11: Mean energy consumption of the system beside applying EE policy

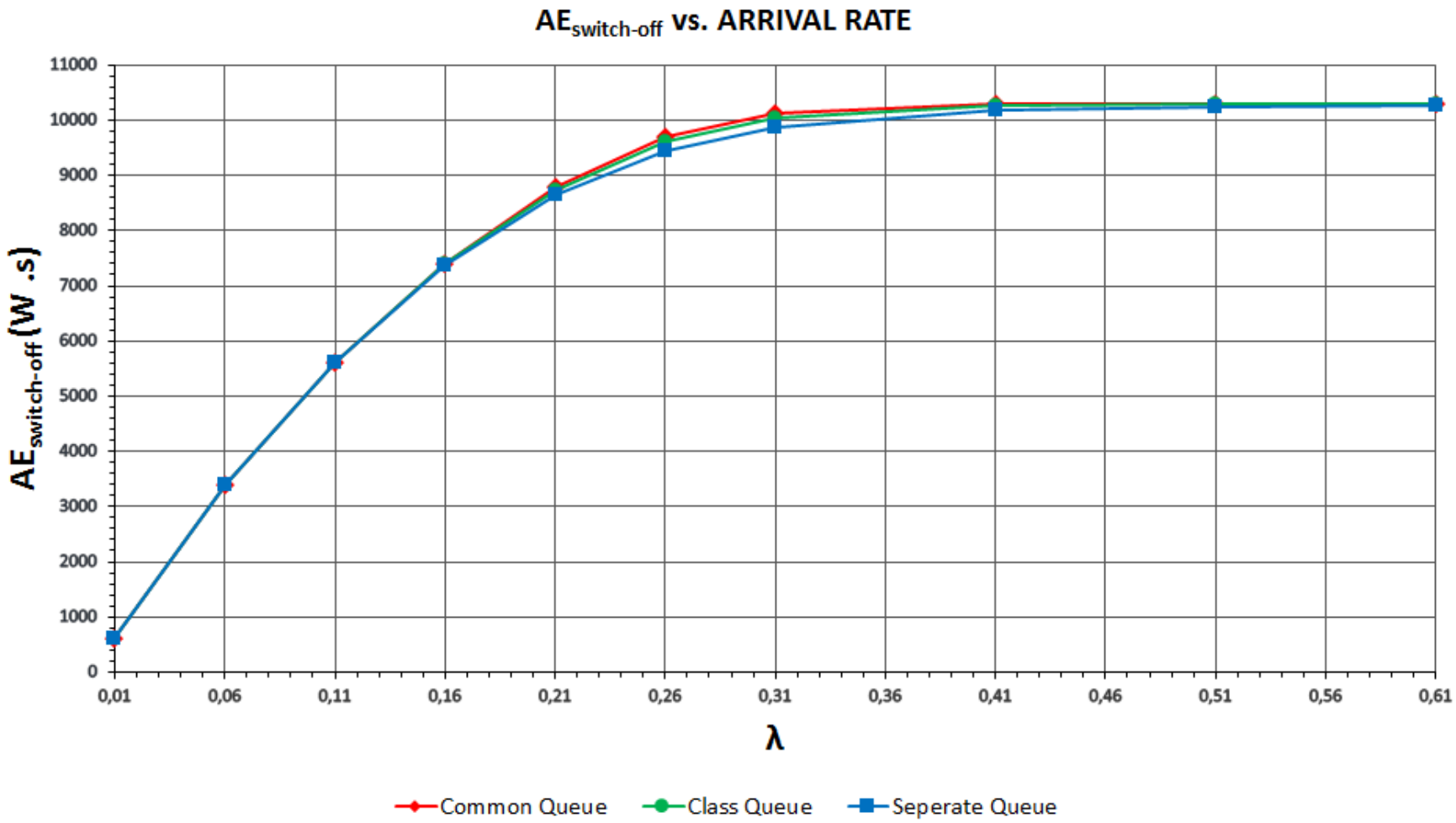

Figure 12: Mean energy consumption of the system in case of switching off the idle servers beside applying HP policy

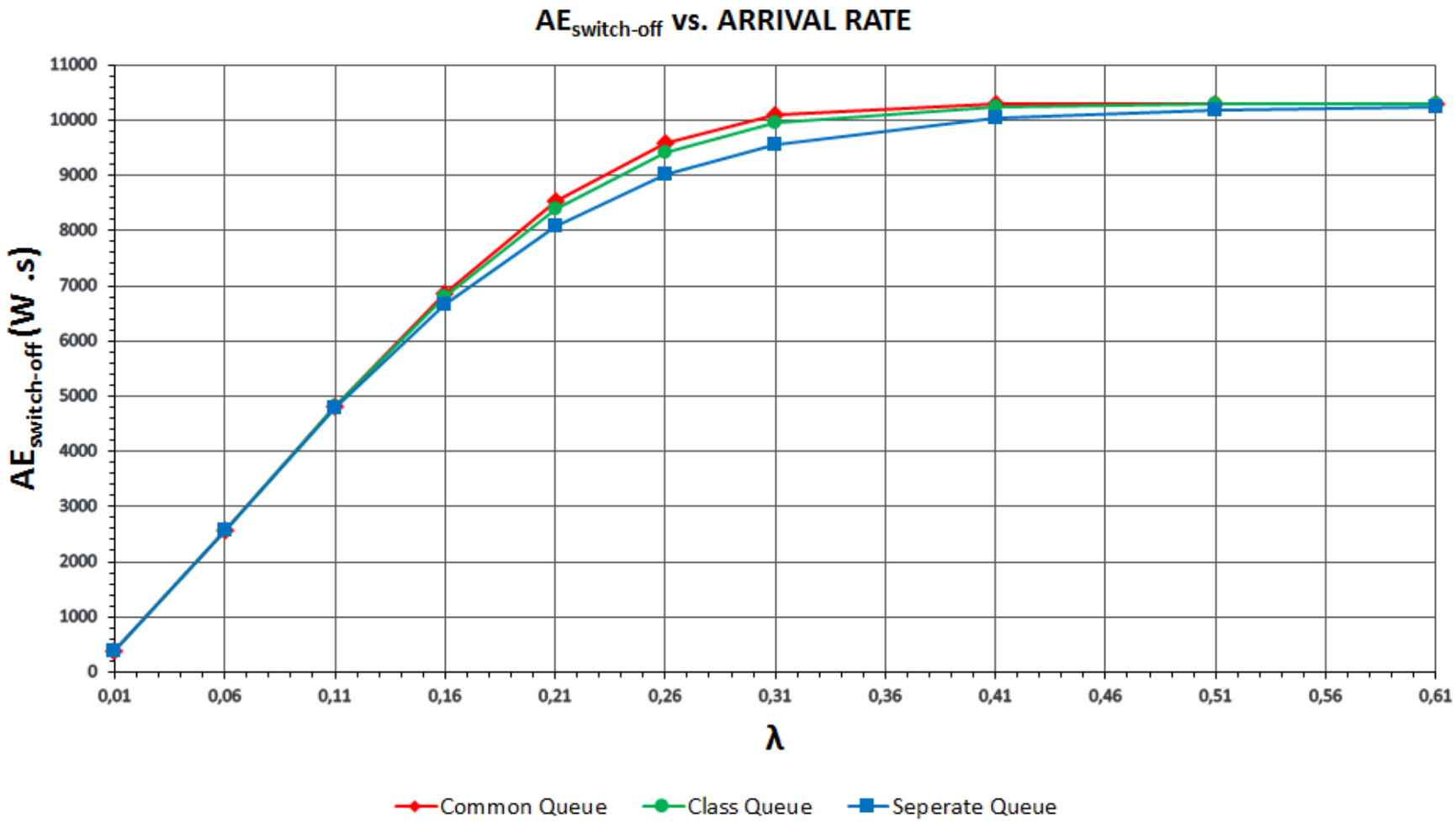

Figure 13: Mean energy consumption of the system in case of switching off the idle servers beside applying EE policy

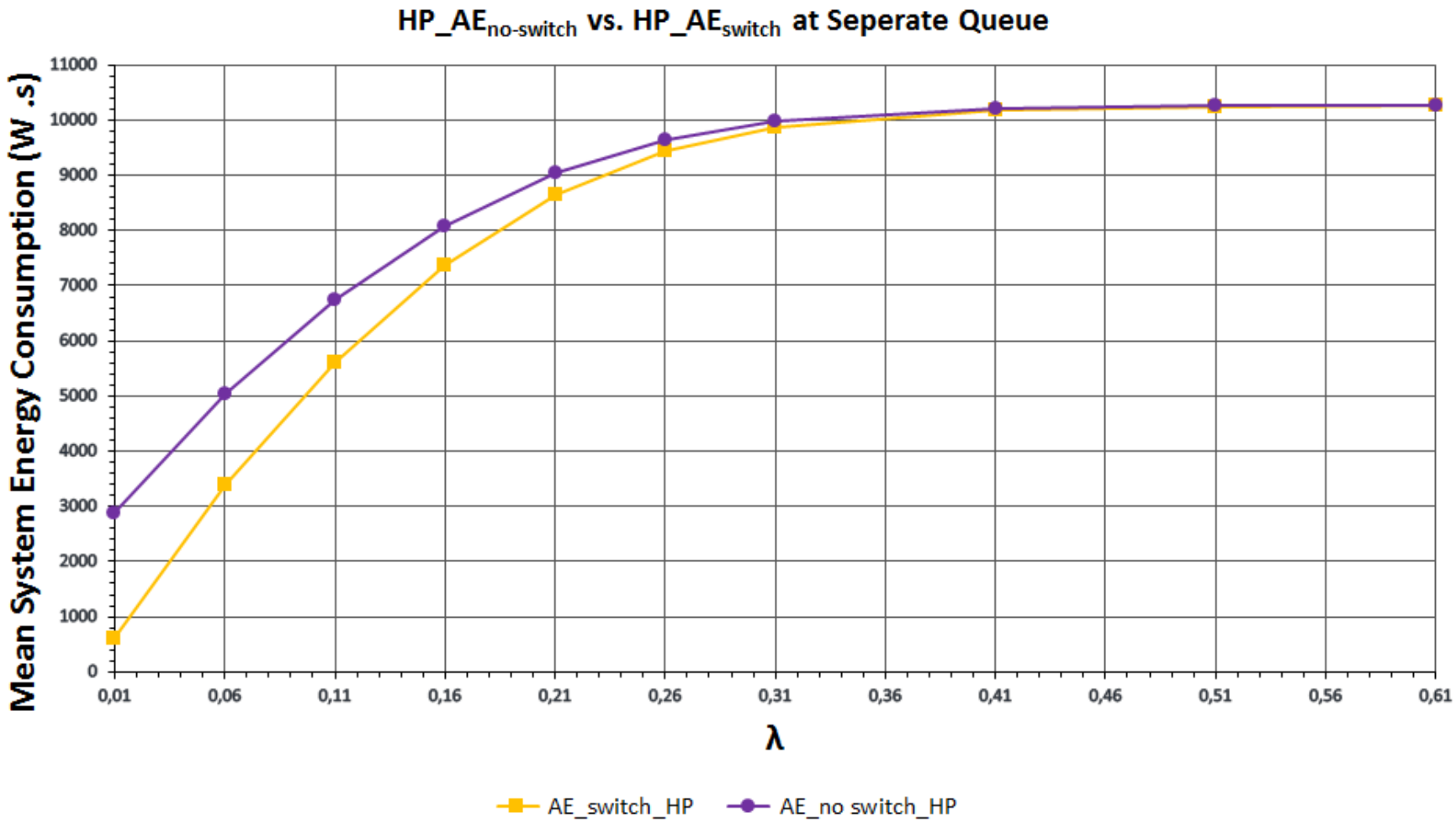

Figure 14: The effect of switching off the servers beside applying HP policy

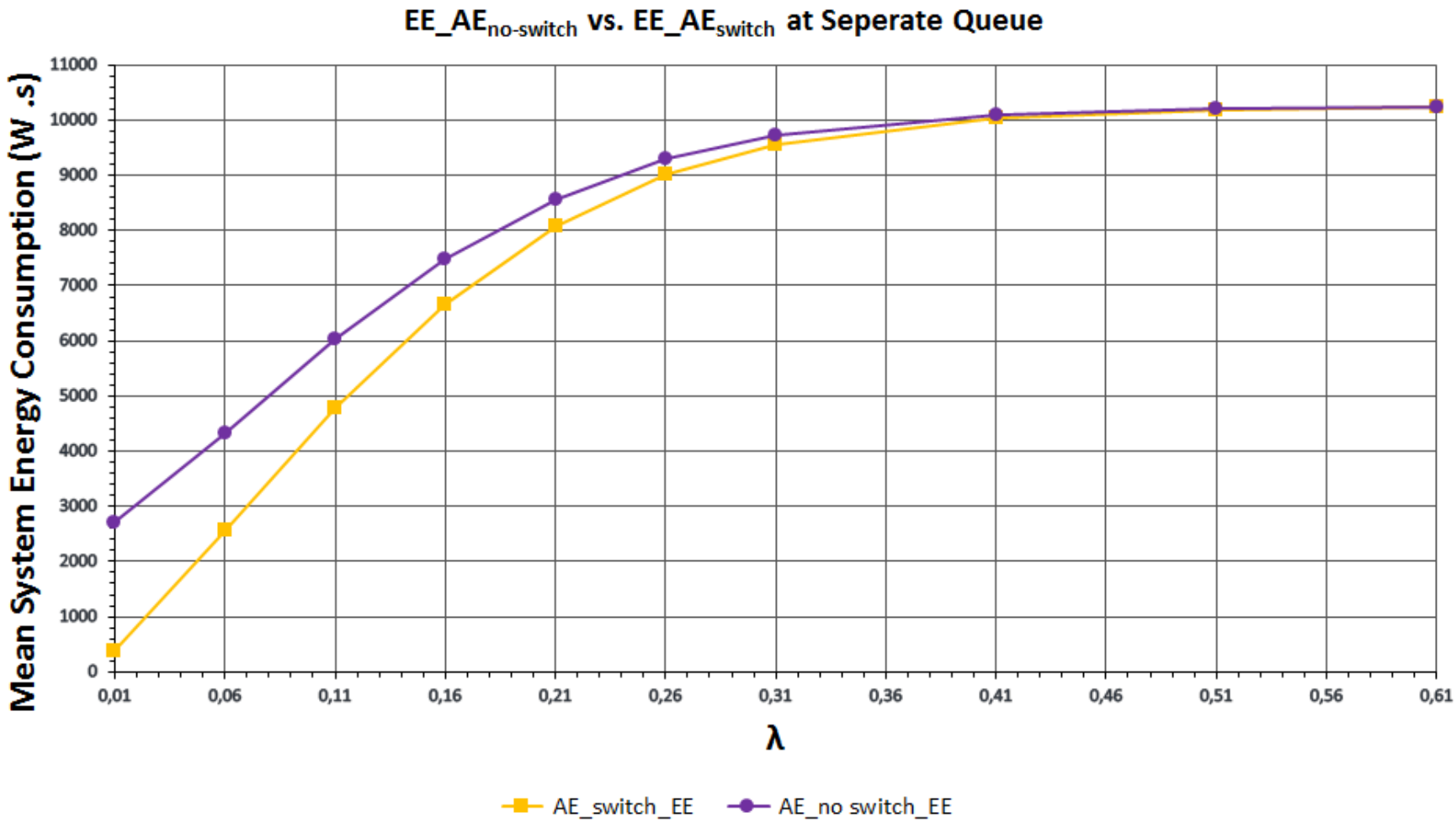

Figure 15: The effect of switching off the servers beside applying EE policy

Future plans

Further possible ideas, improvements

- Examination of further algorithms

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- Observance of further parameters like server failure

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- Using more classes
- Effects of other different distributions

Thanks for your attention!