

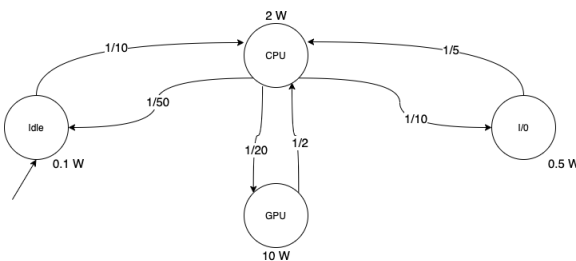
CTMC Performance Indices

To have this assignment evaluated for the in-class exam, please upload on WeBeep a ZIP file including:

- the source code used to solve this assignment
- this file, with the table below properly filled

Name (Family + given)	Makovec Matteo
Student ID (codice persona)	10782774
QR-code ID (8 digits of the QR that was given you)	24499815

CTMC drawing:



```
graph LR
    Idle((Idle  
0.1 W)) -- 1/10 --> CPU((CPU  
2 W))
    CPU -- 1/50 --> Idle
    CPU -- 1/20 --> GPU((GPU  
10 W))
    GPU -- 1/2 --> CPU
    CPU -- 1/10 --> IO((I/O  
0.5 W))
    IO -- 1/5 --> CPU
```

Infinitesimal generator matrix:

$$Q = \begin{bmatrix} -1/10, & 1/10, & 0, & 0; \\ 1/50, & -1/50-1/20-1/10, & 1/10, & 1/20; \\ 0, & 1/5, & -1/5, & 0; \\ 0, & 1/2, & 0, & -1/2; \end{bmatrix}$$

% Idle
% CPU
% I/O
% GPU

	1	2	3	4
1	-0.1000	0.1000	0	0
2	0.0200	-0.1700	0.1000	0.0500
3	0	0.2000	-0.2000	0
4	0	0.5000	0	-0.5000

State reward vectors, and transition reward matrices:

$\alpha = [0.1, 2, 0.5, 10];$ $\alpha_{\text{utilization}} = [0, 1, 1, 1];$

```
% System Throughput
e_X_s = [0, 0, 0, 0; % idle
         1, 0, 0, 0; % cpu
         0, 0, 0, 0; % i/o
         0, 0, 0, 0]; % gpu

% GPU Throughput
e_X_g = [0, 0, 0, 0; % idle
         0, 0, 0, 0; % cpu
         0, 0, 0, 0; % i/o
         0, 1, 0, 0]; % gpu

% I/O Throughput
e_X_io = [0, 0, 0, 0; % idle
          0, 0, 0, 0; % cpu
          0, 1, 0, 0; % i/o
          0, 0, 0, 0]; % gpu
```

Figure with the evolution of the state probabilities as function of time.

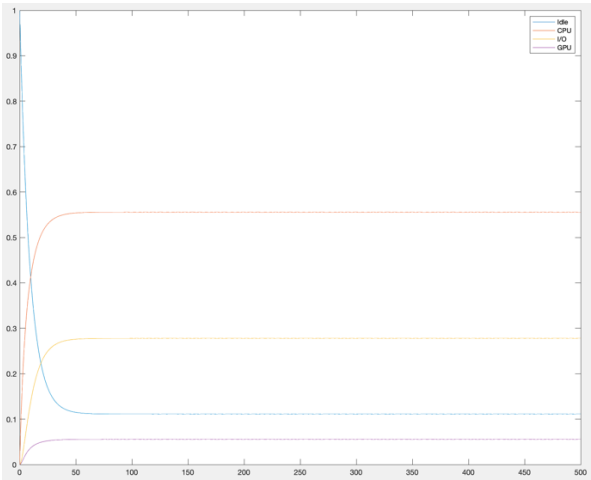
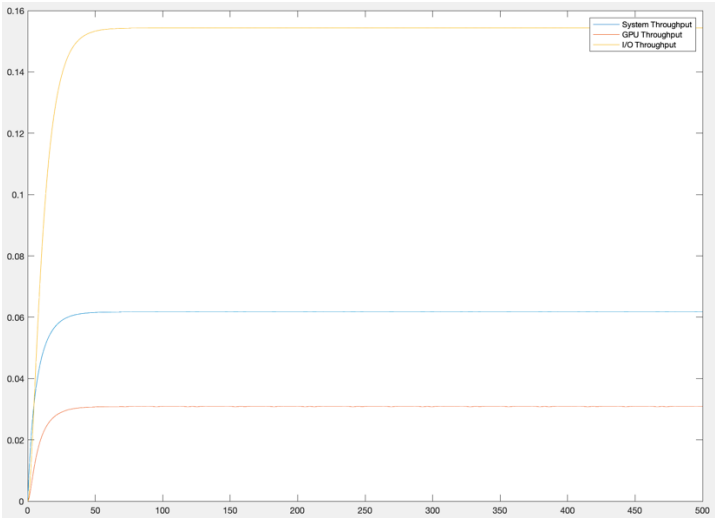
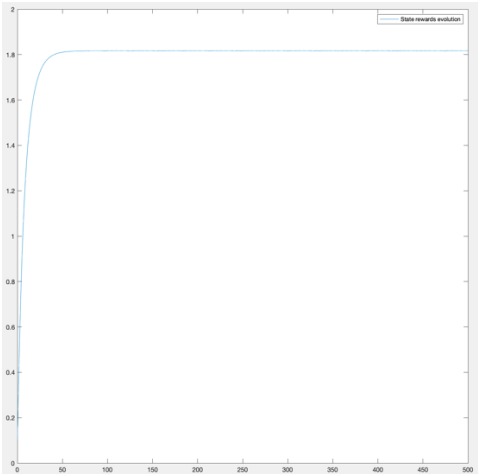



Figure with the evolution of the rewards as function of time




Steady state probabilities, and limit rewards.

 pi	[0.1111,0.5556,0.2778,0.0556]
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 U	0.8889
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 X_gpu	0.0278
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 X_io	0.0556
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 X_system	0.0111
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