Table 1: Tempi esecuzione sperimentali (espessi in μs) ottenuti da vari test

$\lambda_{controller}(1)$	Total mean arrival rate into *controller* of class 1 tasks
$\lambda_{controller}(2)$	Total mean arrival rate into *controller* of class 2 tasks
$\mu_{cloudlet}(1)$	Mean service rate at *cloudlet* of class 1 tasks
$\mu_{cloudlet}(2)$	Mean service rate at *cloudlet* of class 2 tasks
$\mu_{cloud}(1)$	Mean service rate at *cloud* of class 1 tasks
$\mu_{cloud}(2)$	Mean service rate at *cloud* of class 2 tasks

$$(\lambda_1 + \lambda_2)\pi_{(0,0)} = \mu_1\pi_{(1,0)} + \mu_2\pi_{(0,1)} \tag{1}$$

$$(\lambda_1+\lambda_2+i\mu_1)\pi_{(i,0)} = \lambda_1\pi_{(i-1,0)}+\mu_1(i+1)\pi_{(i+1,0)}+\mu_2\pi_{(i,1)} \quad for \quad \forall i \in \mathbb{N} \mid 1 \leq i \leq N-1 \tag{2}$$

$$(\lambda_1+\lambda_2+i\mu_2)\pi_{(0,i)} = \lambda_2\pi_{(0,i-1)}+\mu_1\pi_{(1,i)}+\mu_2(i+1)\pi_{(0,i+1)} \quad for \quad \forall i \in \mathbb{N} \mid 1 \leq i \leq N-1 \tag{3}$$

$$\mu_1 N\pi_{(N,0)} = \lambda_1\pi_{(N-1,0)} \tag{4}$$

$$\mu_2 N\pi_{(0,N)} = \lambda_2\pi_{(0,N-1)} \tag{5}$$

$$(i\mu_1+j\mu_2)\pi_{(i,j)} = \lambda_1\pi_{(i-1,j)}+\lambda_2\pi_{(i,j-1)} \quad for \quad \forall i,j \in \mathbb{N} \mid \begin{matrix} 1 \leq i \leq N-1 \\ 1 \leq j \leq N-1 \end{matrix}, i+j = N \tag{6}$$

$$(\lambda_1+\lambda_2+i\mu_1+j\mu_2)\pi_{(i,j)} = \lambda_1\pi_{(i-1,j)}+\lambda_2\pi_{(i,j-1)}+\mu_1(i+1)\pi_{(i+1,j)}+\mu_2(j+1)\pi_{(i,j+1)} \tag{7}$$

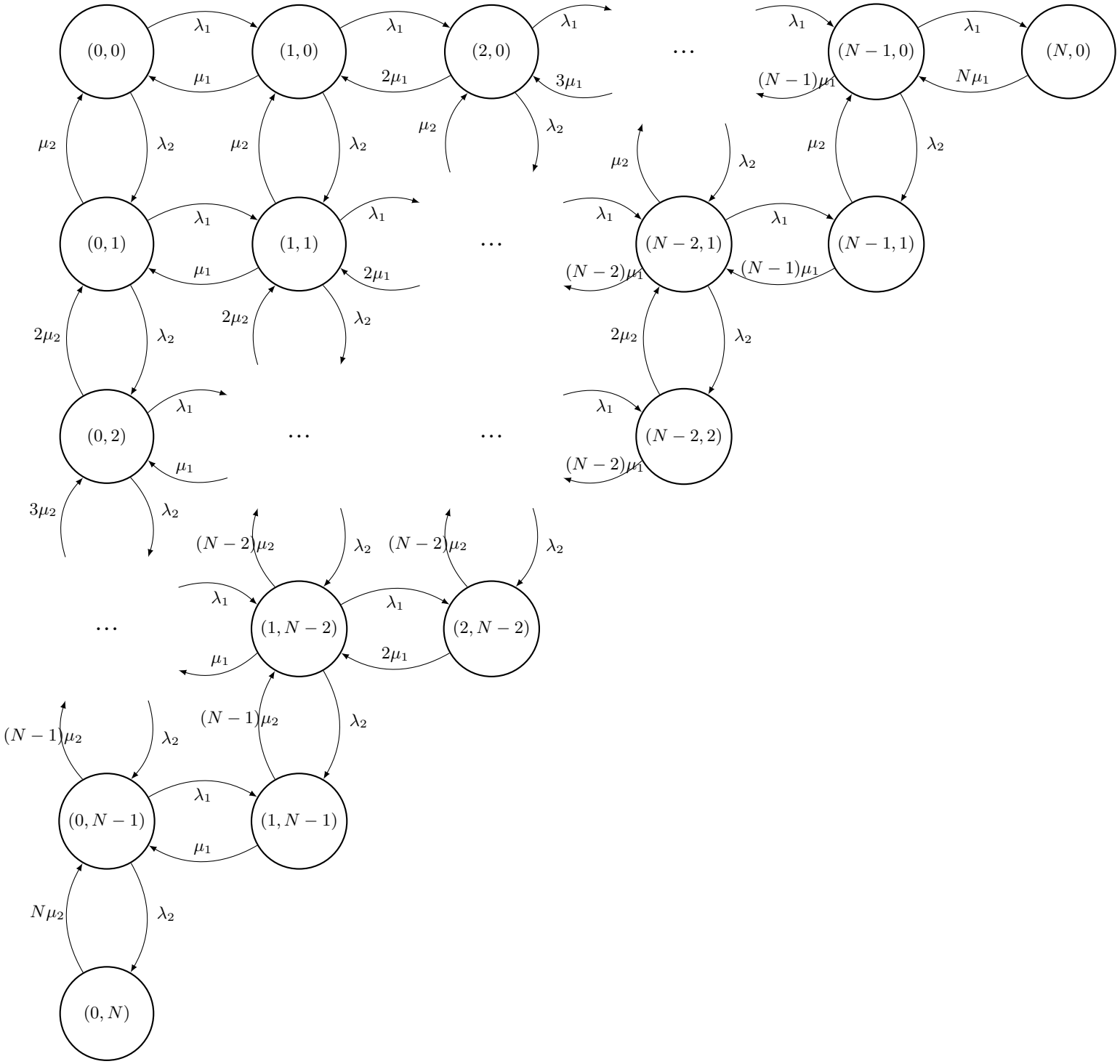
$$\forall i,j \in \mathbb{N} \mid \begin{matrix} 1 \leq i \leq N-1 \\ 1 \leq j \leq N-1 \end{matrix}, i+j < N \tag{8}$$

1 Notation and Modeling for Classed Jackson Networks

2 Soluzione analitica

In quest'ultima sezione elaboreremo una soluzione analitica per validare i risultati ottenuti precedentemente attraverso le nostre simulazioni.

2.1 Algoritmo di routing 1



$r_i(c)$	Outside arrival rate into server i of class c packets
$P_{ij}^{(c)}$	Probability that when a packet of class c finishes at server i, it next moves to server j
$\lambda_i(c)$	Total arrival rate into server i of class c packet

$$\lambda_{\text{cloudlet}}(1) = \lambda_{\text{controller}}(1) \cdot P^{(1)}_{\text{controller,cloudlet}} \tag{9}$$

$$\lambda_{\text{cloudlet}}(2) = \lambda_{\text{controller}}(2) \cdot P^{(2)}_{\text{controller,cloudlet}} \tag{10}$$

$$\lambda_{\text{cloud}}(1) = \lambda_{\text{controller}}(1) \cdot P^{(1)}_{\text{controller,cloud}} \tag{11}$$

$$\lambda_{\text{cloud}}(2) = \lambda_{\text{controller}}(2) \cdot P^{(2)}_{\text{controller,cloud}} \tag{12}$$

$$\Pi = P^{(1)}_{\text{controller,cloud}} = P^{(2)}_{\text{controller,cloud}} = \sum_{\substack{n1+n2=N \\ n_1,n_2 \in \mathbb{N}_0}} \pi(n_1, n_2) \tag{13}$$

$$P^{(1)}_{\text{controller,cloudlet}} = P^{(2)}_{\text{controller,cloudlet}} = 1 - \Pi \tag{14}$$

For cloudlet:

$$\lambda_{\text{cloudlet}} = \lambda_{\text{cloudlet}}(1) + \lambda_{\text{cloudlet}}(2) \tag{15}$$

$$\lambda_{\text{cloud}} = \lambda_{\text{cloud}}(1) + \lambda_{\text{cloud}}(2) \tag{16}$$

contribution to the load due to jobs of priority 1:

$$\rho_{\text{cloudlet}}(1) = \frac{\lambda_{\text{cloudlet}}(1)}{\mu_{\text{cloudlet}}(1)} \tag{17}$$

$$\rho_{\text{cloudlet}}(2) = \frac{\lambda_{\text{cloudlet}}(2)}{\mu_{\text{cloudlet}}(2)} \tag{18}$$

$$\rho_{\text{cloud}}(1) = \frac{\lambda_{\text{cloud}}(1)}{\mu_{\text{cloud}}(1)} \tag{19}$$

$$\rho_{\text{cloud}}(2) = \frac{\lambda_{\text{cloud}}(2)}{\mu_{\text{cloud}}(2)} \tag{20}$$

.....

$$E[N_{\text{cloudlet}}(1)] = \frac{\rho_{\text{cloudlet}}(1)}{1 - \rho_{\text{cloudlet}}(1)} \tag{21}$$