ROUTING SPACE SIZE ESTIMATION FOR RECONFIGURABLE OPTICAL NETWORKS

Alessio Ferrari, Mattia Cantono, Vittorio Curri

DET, Politecnico di Torino, Torino, Italy

alessio.ferrari@studenti.polito.it

ABSTRACT

We propose a heuristic method. The aim is to find a reasonable estimation of K_{MAX}. This parameter represents the number of lightpath per node pairs to be used in the routing algorithm.

MOTIVATIONS

In the routing and wavelength allocation (RWA) process, usually, a **k shortest path algorithm** is used. The **choice of the maximum value of k** (K_{MAX}) is crucial for the RWA algorithm performances. A too small value enhances the frequency of blocking events. A too large value slow down the RWA process.

METHODOLOGY

INPUT:

- Network **topology**
- The connectivity matrix $\boldsymbol{CM}$
- The percentile of allocated LP: $\boldsymbol{\alpha}$

ALGORITHM:

1. **Compute the routing space** using the k shortest path algorithm: $LP^k_{s,d}$
2. **Sort** the $LP^k_{s,d}$ based on a **priority** principle
3. **Allocate the CM** following the order
4. **Evaluate the CDF**: $F_K(k)$ of allocated $LP^k_{s,d}$
5. **Compute**: $\widehat{K}_{MAX} = F_K^{-1}(\alpha)$

PRIORITY TO:

I. Higher **Number** of **hops**: $m_I = \sum_{l \in LP} 1$

II. LP with link with **higher occurrence**

III. Higher **total occurrence**: $m_{III} = \sum_{l \in LP} O(l)$

TEST:

The **SNAP**[1],[2] is run with several K_{MAX} and the blocking ratio B_R is computed.

$$B_R = \frac{number\ of\ blocking\ events}{number\ of\ requests}$$

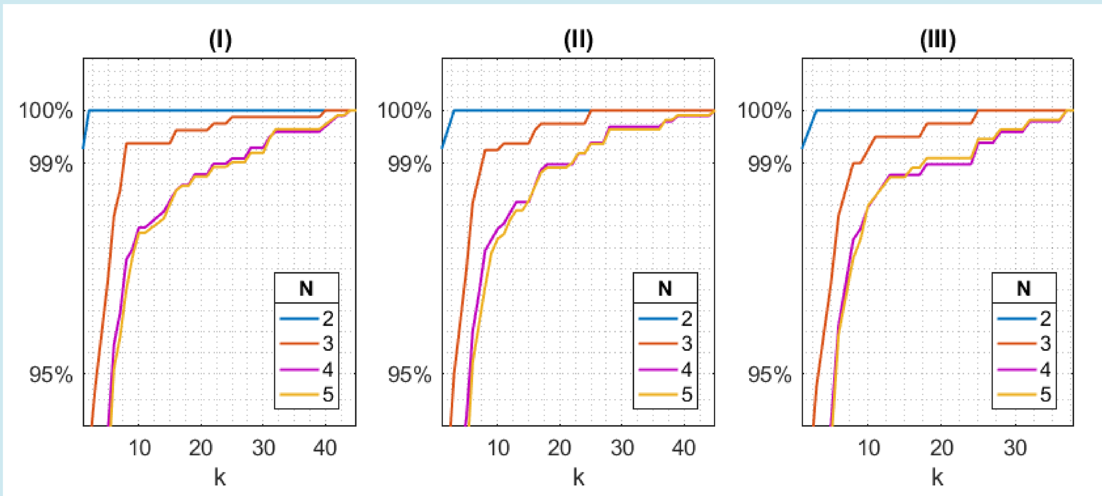
With the growth of K_{MAX}, the $\boldsymbol{B_R}$ **saturates**. Thus, **if $\widehat{K}_{MAX}$ is in the saturation region**, the results don't henance the frequency of the blocking events and **results are good**.

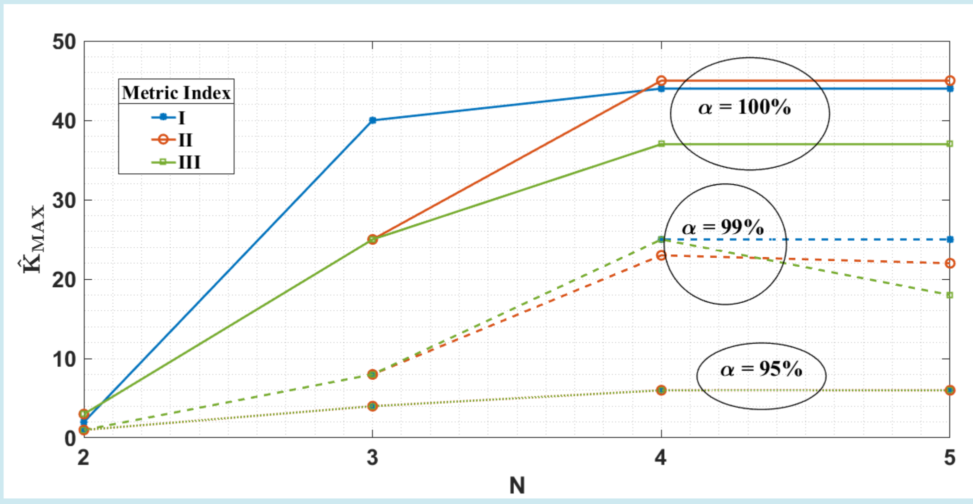
RESULTS

- We used the 17-nodes and 26-link **German** backbone **network**
- $CM = \boldsymbol{N}(\boldsymbol{1} - \boldsymbol{I_{17}})$, N=**2, 3, 4, 5**
- α = **95%**, **99%** and **100%**

K-MAX ESTIMATION

The **CDFs** and $\widehat{K}_{MAX}$ are computed.





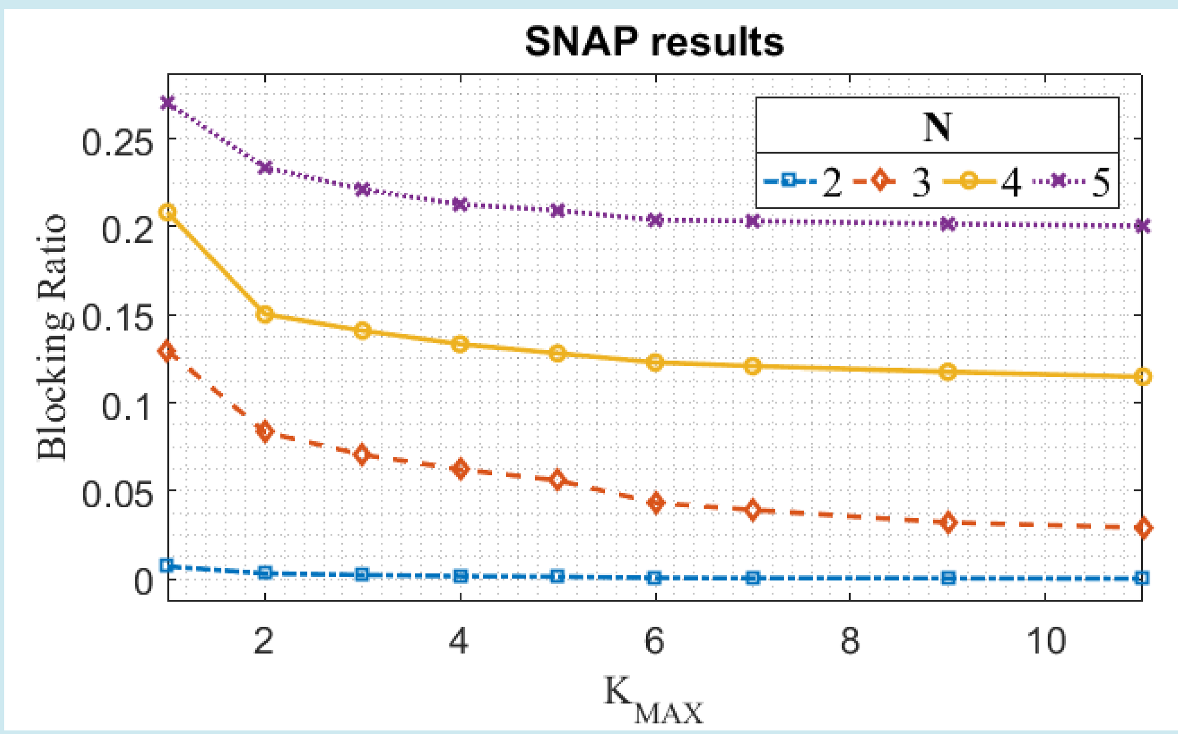
$\widehat{K}_{MAX}$ results to be: **1** (95%), **2**(99%), **3**(100%) for **N=2**
4 (95%), **8**(99%), **25-40**(100%) for **N=3**
6 (95%), **18-25**(99%), **37-45**(100%) for **N=4,5**

TEST OF RESULTS

The **SNAP** is used to validate the results. It is run with the ***CM*** matrices and several values of $\boldsymbol{K_{MAX}}$.

It can be observed that for:

- **N=2,3**: 99% and 100% are more confident
- **N=4,5**: all the percentiles provides reliable results



CONCLUSION

- A finer analysis based on randomly generated networks to **refine $\boldsymbol{\alpha}$** and **find** the **better priority principle**
- Using the algorithm to **study** the **variation of $\boldsymbol{K_{MAX}}$** in function of the network parameters

BIBLIOGRAPHY

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