

ALGORITHMS AND THE RELATED SOFTWARE MODELS FOR NON-CONFLICT SCHEDULES IN COMMUTATION NODES OF INFORMATION NETS

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ABSTRACT *Software models for non-conflict schedule in commutation node are synthesized. An approach of the schedule modeling for different size of connection matrix is proposed. The software models are compared relating to the performance rate and needed memory for the same size of the connection matrix.*

Key words: *B.4.4 Performance Analysis and Design Aids, B.8.1 Reliability, Testing, and Fault-Tolerance, C.1.2 Multiple Data Stream Architectures (Multiprocessors), C.1.4 Parallel Architectures*

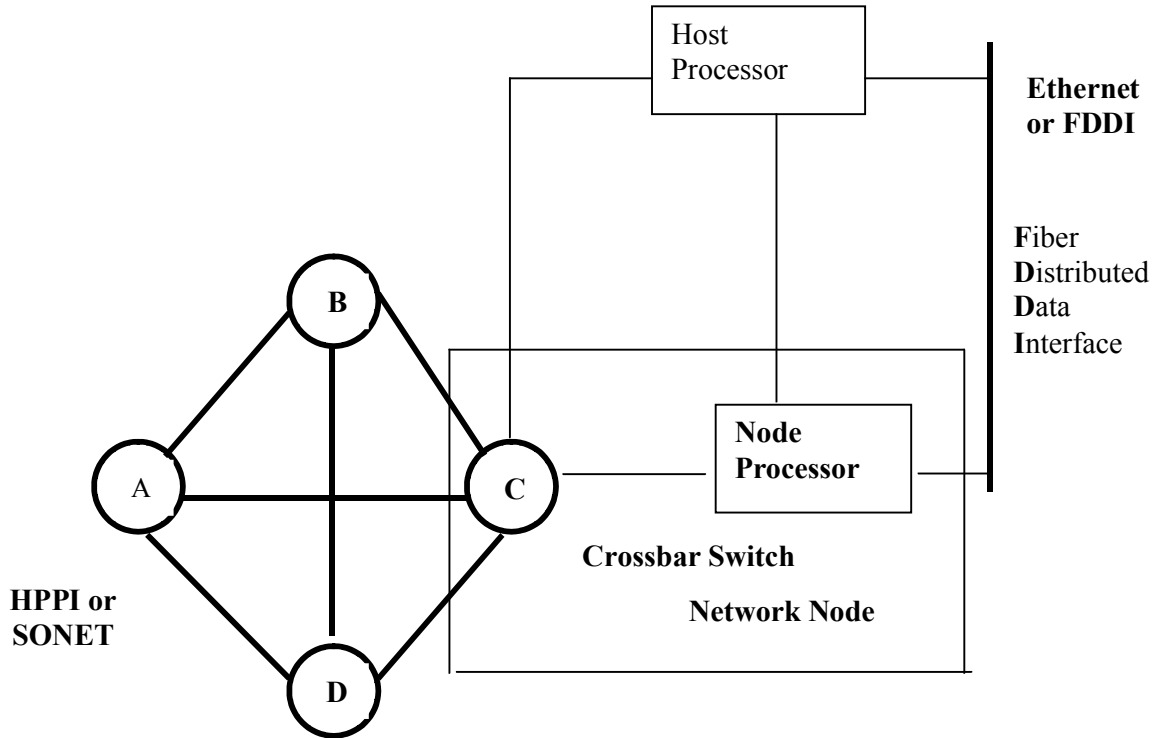
Introduction

The paper suggests the possible solutions for the problem of constructing non-conflict schedule in commutation nodes with possible conflicts in information networks.

Fig.1 shows a part of an information system with four commutation nodes A, B, C and D. Every commutation node consists of a Crossbar Switch and a Processor, controlling the operations of commutation network node (Node Processor).

The software models for non-conflict schedule eliminating conflicts are designed for a processor, controlling the operation commutation network node (Node Processor).

Software models are created on the base of the classical algorithm and an algorithm for non-conflict schedule accounting the direction of message transaction. The classical algorithm use the knowledge about the fact that the serving request diagonally allocated in the framework of connection matrix are non-conflict. The question is in which manner the diagonal to be extracted. One way to do this is by using specially designed matrix - [1]. This approach is investigated by the software model [3].



High Performance Parallel Interface
Synchronous Optical Network

Fig.1

Software models description

Alternatively the classical algorithm is realized without matrix- masks, but with special operators. To distinguish the alternative approach it is named as classical without use of matrix – masks (**CWA**). The software model of non–conflict schedule based on **CWA** (**SMCWA**) is using special operators (program language of MATLAB 6.5) for selection diagonals of connection matrix.

The software model for non–conflict schedule accounting the direction of message transaction (**SMDAA**) is based on assumption that it is possible the messages to be transmitted by the directionally. The algorithm has a natural parallelism allowing at the same time the non-conflict schedules to be processed and created for messages of devices A_i to devices B_i and vice versa, where $i = 1 - N$, and $N \times N$ is the size of the connection matrix.

On Fig.2 high performance **SMCWA** and **SMDAA** are presented. On Fig.3 – the necessary memory is shown.

SMCWA is faster and needs less memory than **SMDAA**, when $N = \text{const}$.

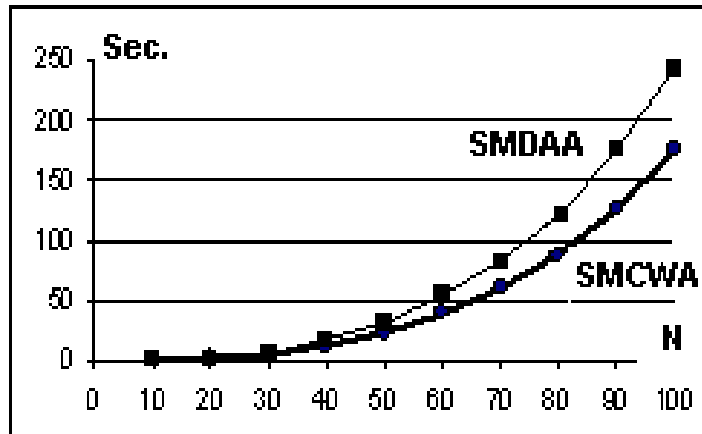


Fig.2

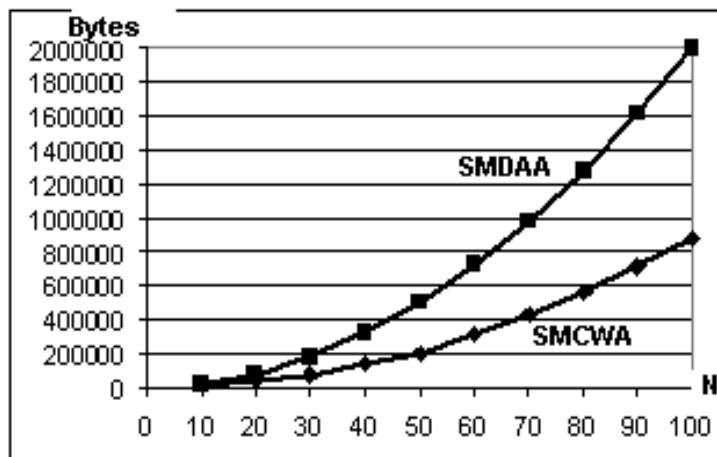


Fig.3

Compartment between software models

Four algorithms of software models for non – conflict schedule of commutation node are shown as follows:

1. Classical algorithm with matrix masks (**CMA**) [5].
2. Algorithm with joined matrix masks (**JMA**) [5].
3. Classical algorithm, without matrix masks (**CWA**).
4. Algorithm accounting direction of messages transaction. (**DAA**) [9].

The software models complete responding to algorithms of non- conflict schedule:

1. Software model of classical algorithm with classical matrix-masks (**SMCMA**) is investigated and explained [4].
2. Software model of algorithm joined matrix-masks (**SMJMA**) is synthesized and investigated [4].

3. In this work software model of classical algorithm without matrix-masks (**SMCWA**) is synthesized and investigated.

4. Software model of algorithm account direction of message transaction (**SMDAA**) is synthesized and investigated.

The models are synthesized and written in MATLAB 6.5 by the author. All the models ensure complete non-conflict schedule in commutation node.

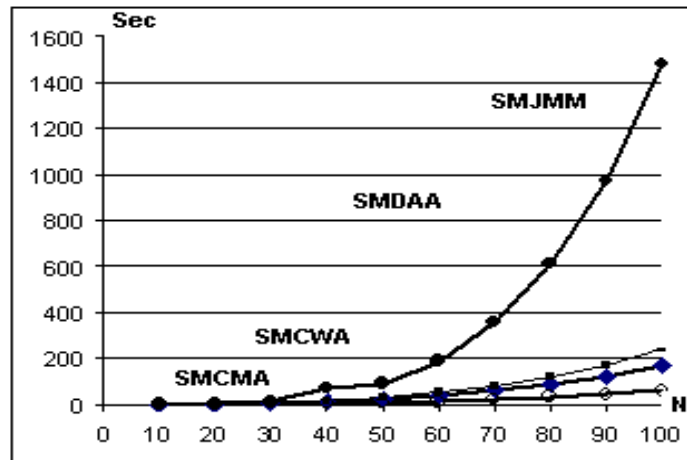


Fig.4

On Fig.4 the performance of the models are presented. On Fig.4a the data of Fig.4 for $N = 10$ to $N = 50$ in increased size is presented. For matrix size equal to $N = 30$ the performance of SMCMA, SMCWA and SMDAA is approximately equal.

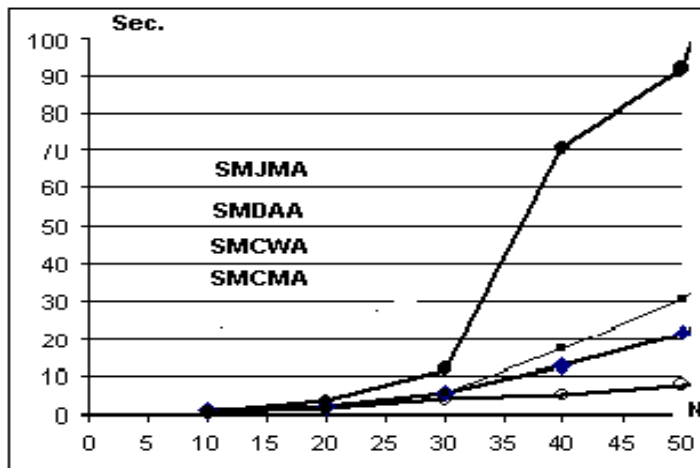


Fig.4a

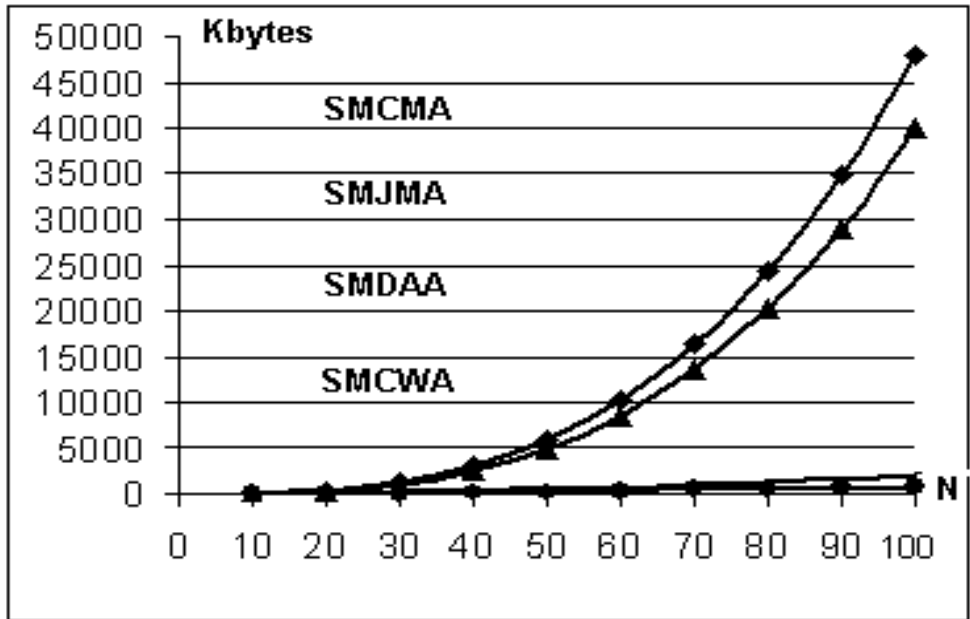


Fig.5

SMCMA and **SMCWA** are software models with the best performance. Increasing the size of commutations matrix, we see, that **SMCWA** is better **SMCMA** (Fig.6).

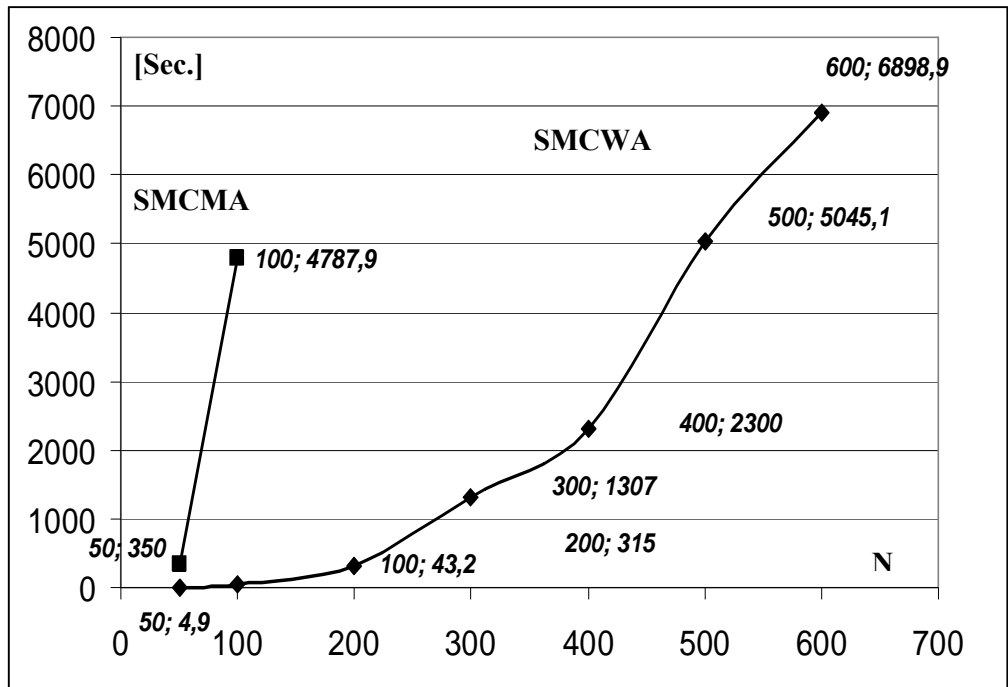


Fig.6

Conclusion

Increasing the size of commutation matrix decreases performance for all models, increasing the needed memory (Fig.5). The fastest one is SMCMA, but more memory is required, followed by SMCWA, SMDAA and SMJMM. SMCWA is better than SMCMA for large size of commutation matrix.

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РЕЗЮМЕ: Синтезирани са програмни модели за получаване на безконфликтно разписание в комутационен възел. Моделите са изследвани при различен размер на матрицата на връзките. Програмните модели са сравнени по отношение на бърздействие и необходима памет.