Algorithms

LOOFA

LOOFA is an algorithm that allows to obtain *work-conservation* with speed-up $S = 2$. In this algorithm, there are 2 phases exactly because $S = 2$. They are:

1. every input that is still unmatched has to select a non empty VoQ directed to an unmatched output with lowest occupancy; after the choice, the input sends a request to that output;
2. each output still unmatched grants one request; the approach through which the grant is given could be anyone: round robin, random, etc..

MUCF

The algorithm allows to obtain *OQ emulation* requires 4 phases because $S = 4$; it is called MUCF (Most Urgent Cell First) and the phases are:

1. outputs request their most urgent cells to inputs;
2. inputs grant outputs with the most urgent cell if there are no contentions;
3. in case of contention, outputs request their next urgent cell because matchings must be *maximal*;
4. cells are transferred when the matching is maximal.

ISLIP (approximation of $\mathcal{MSM}$)

The algorithm is composed of 3 phases:

1. each unmatched input sends a request for every output for which it has a cell;
2. each output, if it is unmatched and receives a request, sends a grant to one of the inputs that had contacted it in precedence;
3. if an unmatched input receives grants it has to select one output: this is a new matching.

Contentions in phase 2 are usually solved thanks to a round robin mechanism. The 3 phases are also named shortly: Request-Grant-Accept. Table (1) shows how actors are involved in the communication during each phase.

ISLIP is *maximal*:

- always with N iterations;
- often with $\log N$ iterations.

Request	Grant	Accept
inputs $\rightarrow$ outputs	outputs $\rightarrow$ inputs	inputs $\rightarrow$ outputs

Table 1: which actor initiates the correspondent phase

ILQF (approximation of $\mathcal{MWM}$)

As ISLIP, also ILQF is composed of 3 phases, but it takes care of queue-lengths while ISLIP does not. Indeed, the phases are:

1. each unmatched input sends all its queue lengths at the corresponding outputs;
2. each output, if it is unmatched and receives any request, sends a grant to one the input corresponding to the *longest* queue;
3. if an unmatched input receives grants it selects the output with the *longest* queue: this is the new matching.

According to ISLIP, ILQF solves contention that can arise in phase 2 with a round robin mechanism and is *maximal*:

- always with N iterations;
- often with $\log N$ iterations.

Communications among actors in the different phases are the same as in ISLIP and they are reported in Table (1).