A unifying framework for deciding synchronizability

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FIFO Systems

Client-Server-Logger example

From Lange and Yoshida, CAV'19
FIFO Systems

Client-Server-Logger example
From Lange and Yoshida, CAV'19

Testing if there is a bound on the size of a queue is undecidable!
Brand and Zafiropulo, JACM'83
Synchronizability

~ if every execution can be rescheduled so that it meets certain criteria

a channel bound
all accepting executions re-ordered to a k-bounded execution.

Lohrey and Muscholl, Inf. Comp. '04
DEFINITIONS

all accepting executions re-ordered to a k-bounded execution.

send projection equivalent to that of rendezvous.

Basu and Bultan, WWW'11
DEFINITIONS

all accepting executions re-ordered to a k-bounded execution.

send projection equivalent to that of rendezvous.

if every MSC admits a linearization that can be divided into "blocks"

Bouajjani et al., CAV'18
DEFINITIONS

Inclusion into these classes?

if every MSC admits a linearization that can be divided into "blocks"
The class of MSCs are MSO-definable.

The class of MSCs have bounded special tree-width.
The class of MSCs are MSO-definable. Condition 1

Decidable inclusion!

The framework
<table>
<thead>
<tr>
<th>Class of MSCs</th>
<th>Peer-to-Peer</th>
<th>Mailbox</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weakly synchronous</td>
<td>Undecidable</td>
<td>EXPTIME</td>
</tr>
<tr>
<td>Weakly $k$-synchronous</td>
<td>—</td>
<td>Decidable</td>
</tr>
<tr>
<td>Strongly $k$-synchronous</td>
<td>—</td>
<td>Decidable</td>
</tr>
<tr>
<td>Existentially $k$-p2p-bounded</td>
<td>Decidable</td>
<td></td>
</tr>
<tr>
<td>Existentially $k$-mailbox-bounded</td>
<td>—</td>
<td>Decidable</td>
</tr>
</tbody>
</table>