Exercise 8: SystemC and Virtual Prototyping

Exercise on TLM Payload Extensions

Lukas Steiner
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The source code to start this execise is available here:
`https://github.com/TUK-SCVP/SCVP.Exercise8`

Task 1

Setup of TLM AT Model

Setup a TLM AT simulation model of the system shown in Figure 1. The CPU and the memory models should use *Simple Sockets*. The target has an input buffer of size 8 and should implement backpressure. The bus should use *Multipassthrough Sockets* and should use *Payload Extensions* for routing.

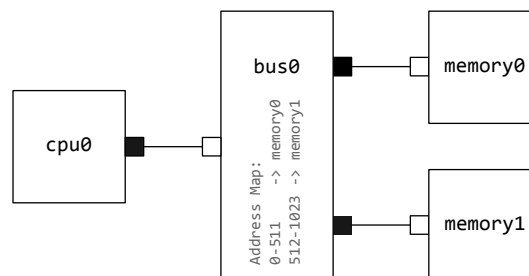To make things easier you can use the code that is provided on GitHub.

Fig. 1: Initiators Interconnect and Target

The initiators model the usual behavior of the application that we execute on them. If you execute the model you can observe how the buffers of the targets are behaving on the simulation output. By running the simulation with the following command, we can estimate the maximum number of transactions in the target buffer.

```
$ ./exercise8 | grep Buffer | awk '{print $9}' | sort | tail -n 1
```

Try to understand this bash scripting.

Task 2

Design Space Exploration of the Buffer Size

It seems that the *target buffer size* is overbuilt. The target buffer size can be reduced to 6 without any problems. Like this:

```
Target *memory1 = new Target("M1", 6);
Target *memory2 = new Target("M2", 6);
```

Please verify that the simulation time has not changed. However, the greedy management of our company forces us to save even more resources. So we have to find a trade-off between execution speed and buffer size.
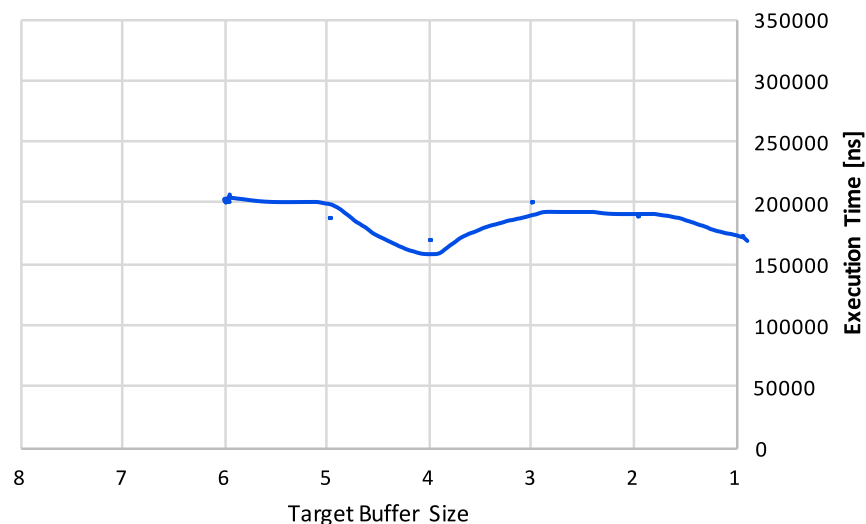
Fig. 2: Trade-off Estimation

Vary the buffer size from 8 to 1 and document the simulation time, i.e., the execution time of the CPU in Figure 2.

Which buffer size is reasonable to fulfill the request of the management?

Task 3

Wall-Clock Time and cout

Our simulation has a lot of `cout` statements. Measure the simulation time by running:

```
$ time ./exercise8
```

Now, comment out all cout statements in the simulation models and measure the wall-clock time again.

How much difference do you see?