What can we learn from Stockholm?

- Stockholm have made big improvements in the performance of their firmware.

- How have the done this?

- What can we learn from it?

Ian Brawn. 6.2.4.

VHDL vs HDLdesigner graphics...

- *Stockholm find it quicker & easier to enter VHDL directly; don't like graphics.*

- Possibly deterred by machine-generated graphics: definitely messy.
- Had the misfortune to be porting to a new version of HDLdesigner.
- Pure VHDL:
  – definitely more portable,
  – definitely less transparent for debugging, maintenance, education.
- Modifying large body of existing code not the same as building & organising it from scratch
- Conclusions:
  – For portability our firmware archive must store all generated VHDL.
  – Use & storage of front-end graphics is additional blessing/curse

High-Level vs. Low-Level Hardware Descriptions...

- *Stockholm improved implementation by moving from very low-level to very high-level description of hardware.*

- Original code written when synthesis engines weren't very good.
- Original code written without regard for Xilinx architecture; e.g. ignored fast carry.
- These days synthesis engines normally optimise code better than humans.
- We tend to work at higher level already, but...
- Knowledge of device architecture & appropriate targeting can improve results
- Generic code generally a good thing, but...
  – see comment above
  – don't waste time writing generic code for a component you'll never use again

- Conclusion: Stockholm have moved much closer to our way of working

80 MHz clock vs. 40 MHz clock...

- *Stockholm have recently moved from 80 MHz to 40 MHz clock for FPGA.*

- As long as clock is multiple of 40 MHz design is synchronous.
- FPGA has fixed minimum latency for each operation. Doubling clock frequency ~ halves number of operations performed per clock tick.
  - slightly worse than this as set-up & hold times are compounded.
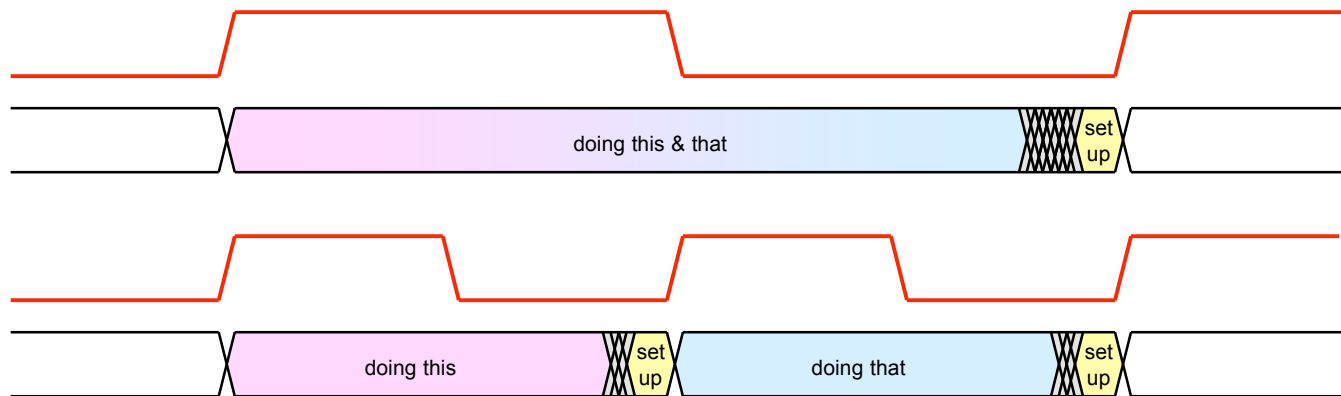
- Conclusion: we never saw the point of the 80 MHz clock.

Conclusions

- Stockholm have moved from a design that wasn't very well targeted to today's
- technology & tools to one that is.
- Clearly done some good work and achieved good results.
- Mostly they've moved much closer to our way of working, so on this occasion we've not much to learn.

- However, we mustn't get complacent. New ideas always arising & are always worth evaluating.