GETTING STARTED WITH THE EMP FRAMEWORK – PART 7

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- We have passed patterns through it in hardware

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- We have passed patterns through it in hardware
- But an FPGA by itself is not very helpful – we will typically want real data

WE NEED TO INSTANTIATE THE SERIAL LINKS

- Open `src/my-algo-repo/an-algo/firmware/hdl/emp_project_decl.vhd`
- Change the lines (or comment them out)

```
0   => (no_mgt, u_crc32, buf, no_fmt, buf, u_crc32, no_mgt),
1   => (no_mgt, u_crc32, buf, no_fmt, buf, u_crc32, no_mgt),
2   => (no_mgt, u_crc32, buf, no_fmt, buf, u_crc32, no_mgt),
3   => (no_mgt, u_crc32, buf, no_fmt, buf, u_crc32, no_mgt),
4   => (no_mgt, u_crc32, buf, no_fmt, buf, u_crc32, no_mgt),
5   => (no_mgt, u_crc32, buf, no_fmt, buf, u_crc32, no_mgt),
6   => (no_mgt, u_crc32, buf, no_fmt, buf, u_crc32, no_mgt),
7   => (no_mgt, u_crc32, buf, no_fmt, buf, u_crc32, no_mgt),
```

- To (or add)

```
0   => (gth16, u_crc32, buf, no_fmt, buf, u_crc32, gth16),
```

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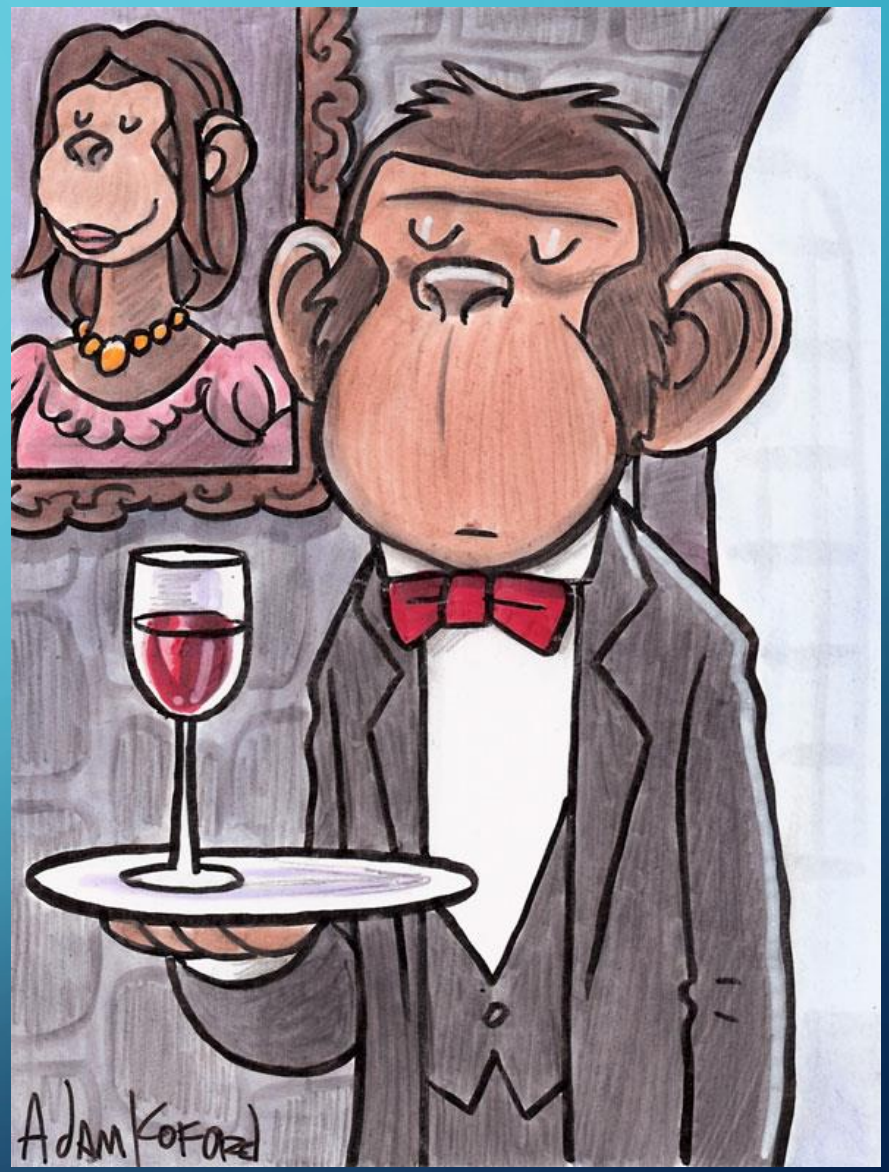
- And we are done

WE NEED TO INSTANTIATE THE SERIAL LINKS

- And we are done
- You have just modified your design to instantiate one quad (4 channels) of MGTs, running at 16Gb/s, with CRC-checking
- So, try building & reprogramming the FPGA!
  - And don't forget `pci_reconnect` afterwards

TESTING THE LINKS

- Back to the EMPbutler



TESTING THE LINKS

- Recall – reset the clocking

```
empbutler -c connections.xml do my-board reset internal
```

TESTING THE LINKS

- Configure outputs to play data through our link

```
empbutler -c connections.xml do my-board buffers tx PlayOnce -c 1-2
--inject generate://pattern
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TESTING THE LINKS

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```

We only instantiated "quad 1"

```
0  => (gth16, u_crc32, buf, no_fmt, buf, u_crc32, gth16),
```

Recall our framework declaration firmware

TESTING THE LINKS

- Configure outputs to play data through our link

```
empbutler -c connections.xml do my-board buffers tx PlayOnce -c 1-2
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```
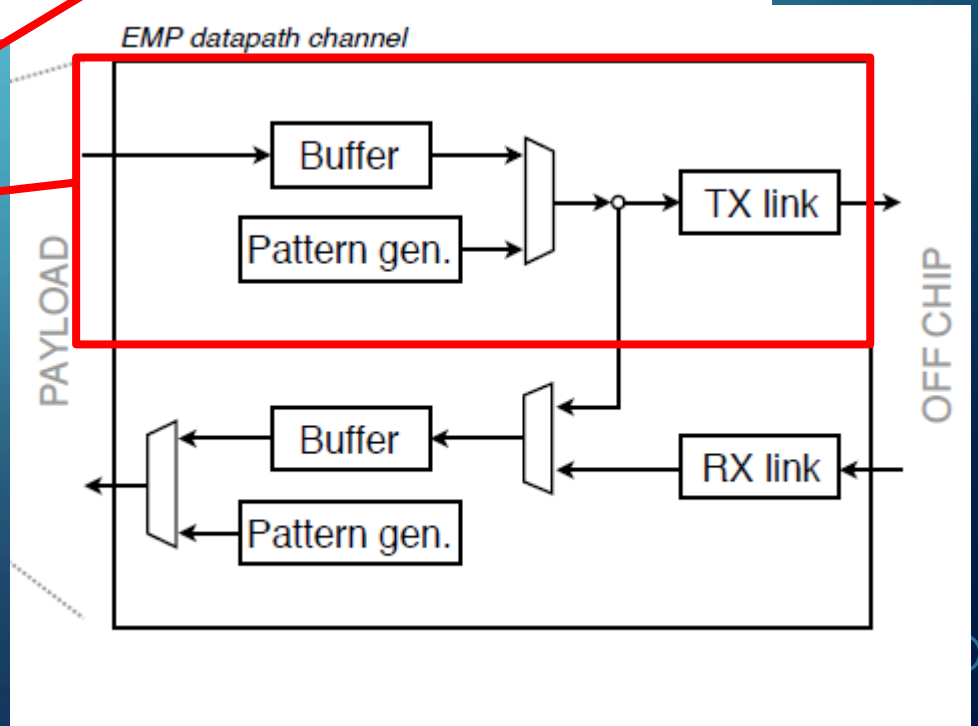

NOTE – THIS IS DIFFERENT TO LAST TIME!
Now pretending the data is coming from the payload



TESTING THE LINKS

- Configure the MGTs – didn't have to do this before

```
empbutler -c connections.xml do my-board mgts configure tx -c 1-2
          --loopback=nearPMA
empbutler -c connections.xml do my-board mgts configure rx -c 1-2
```

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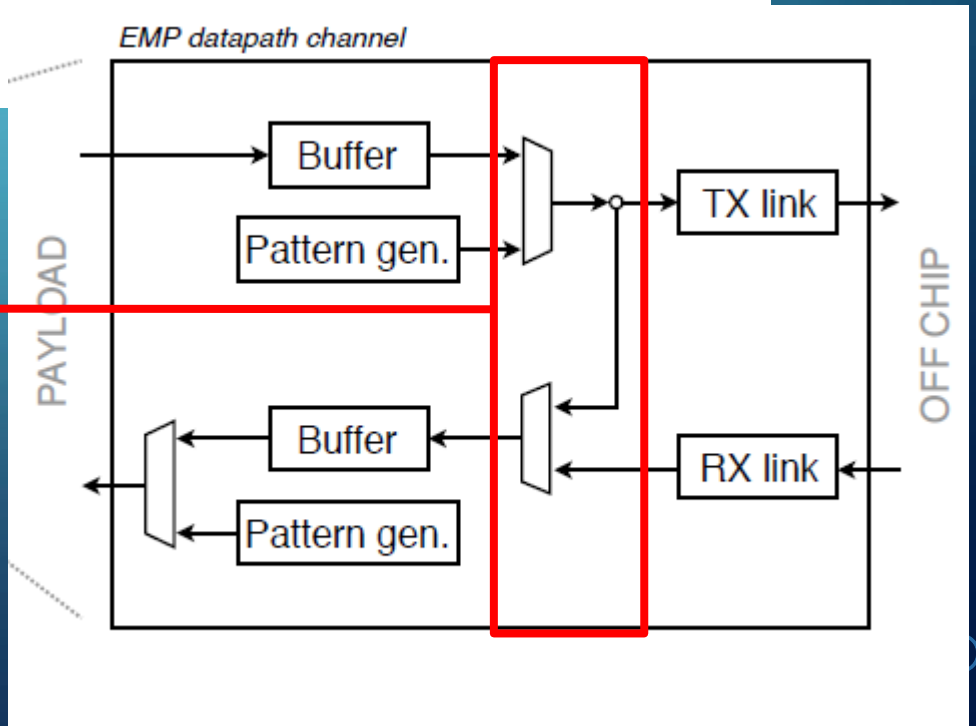
```
empbutler -c connections.xml do my-board mgts configure tx -c 1-2
          --loopback=nearPMA
empbutler -c connections.xml do my-board mgts
```

Send data into the TX and internally back onto the RX



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Currently giving CRC errors on the KCU105
Working fine on all the other boards

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PROOF THAT USING THIS STUFF IS HARD
WHICH IS WHY YOU **REALLY DON'T WANT TO BE REINVENTING IT EACH TIME**

TESTING THE LINKS

- Configure the MGTs – didn't have to do this before

```
empbutler -c connections.xml do my-board mgts align -c 1-2
```

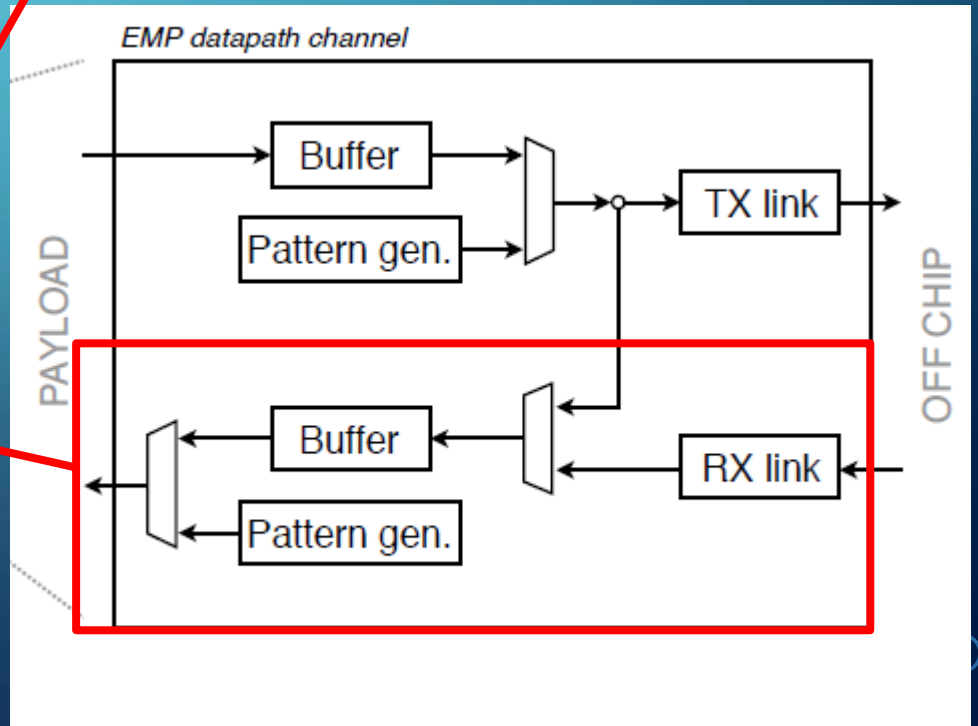
Train the links so that all channels are aligned

TESTING THE LINKS

- Configure inputs to capture data from the link

```
empbutler -c connections.xml do my-board buffers rx Capture -c 1-2
```

NOTE – THIS IS DIFFERENT TO LAST TIME!
Now pretending the data is coming from the link



AND PLAY DATA THROUGH OUR ALGO!

- And then do the capture

```
empbutler -c connections.xml do my-board capture --rx 1-2 --tx 1-2
```

- Same as before, since we are capturing both inputs and outputs