Pynqrypt

A FPGA-accelerated encryption library for PYNQ

Roberto Alessandro Bertolini

FPGA101 - Politecnico di Milano

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The Hardware

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Encryption Algorithms

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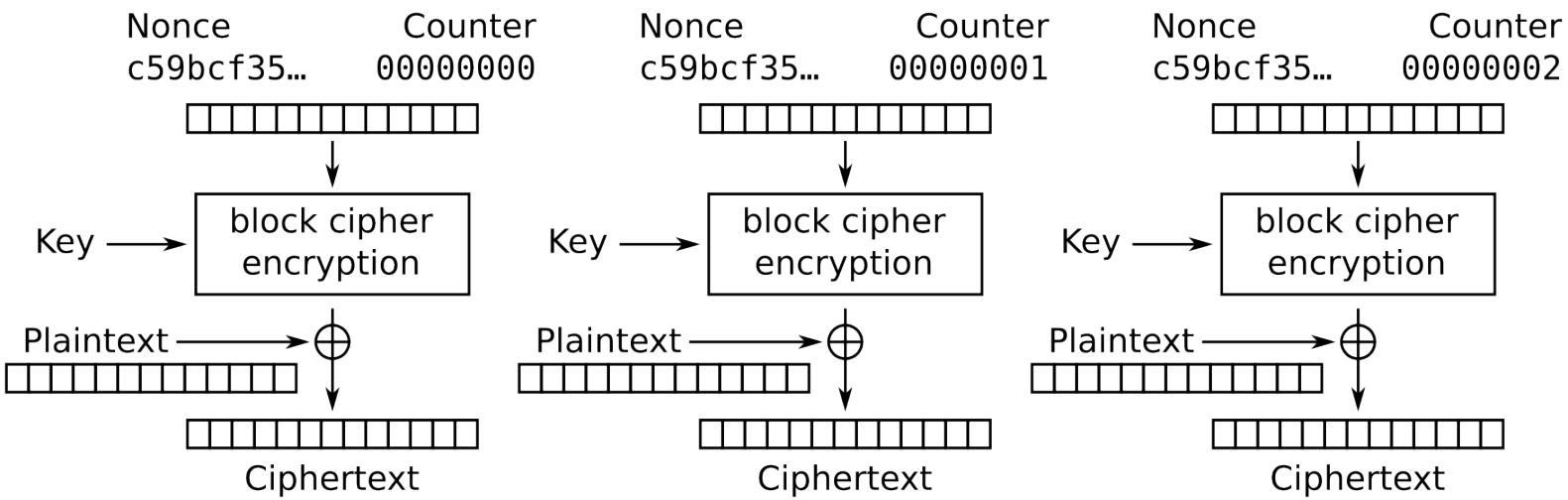
AES-CTR

AES-CTR is a mode of operation for the AES block cipher. It is a highly-parallelizable and efficient encryption algorithm, well suited for hardware acceleration.

AES-CTR



Counter (CTR) mode encryption

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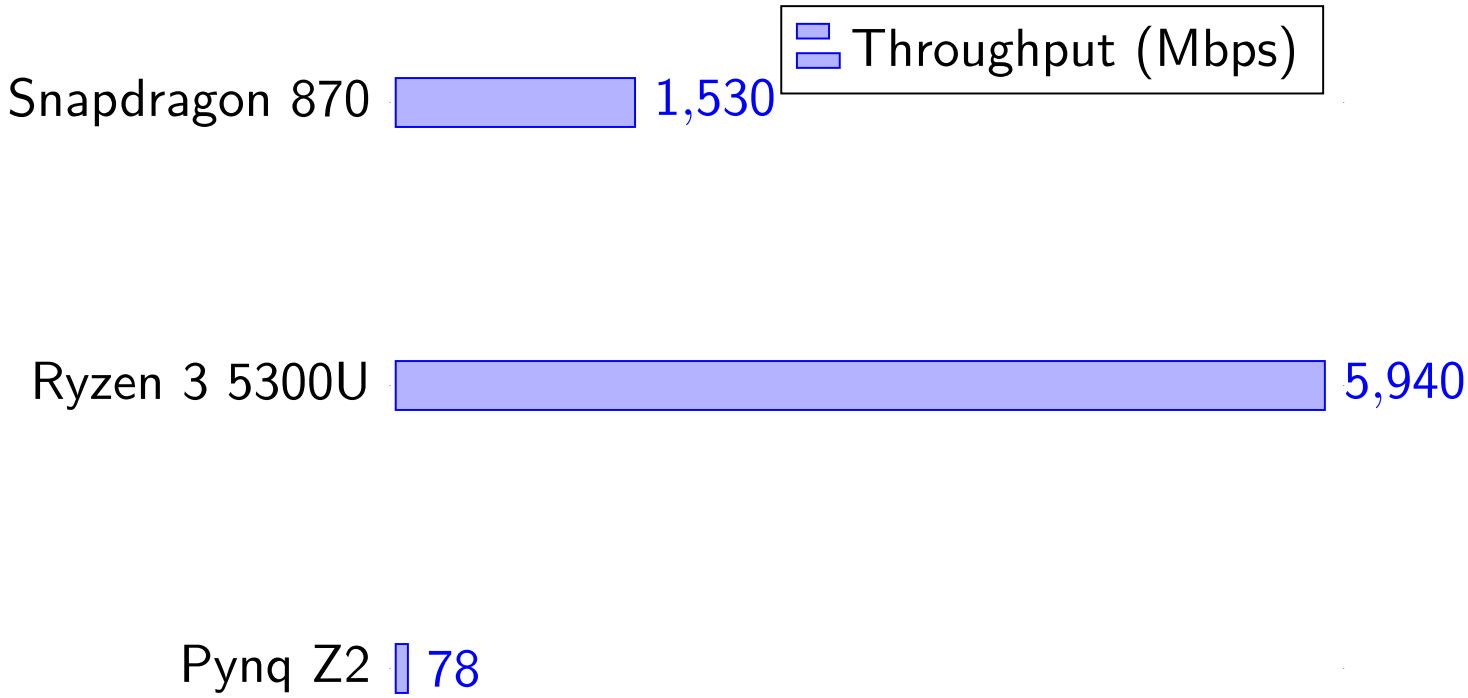

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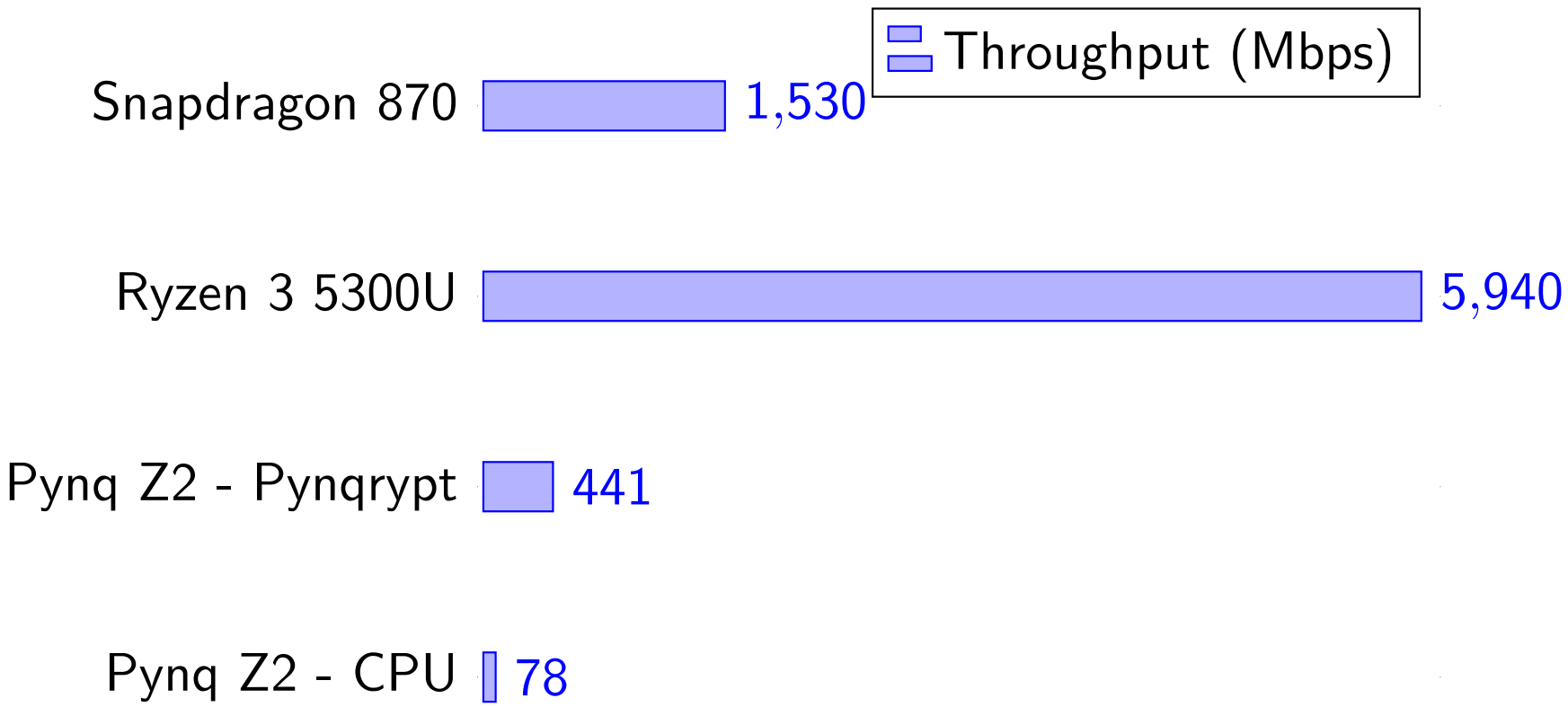

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```
data = np.frombuffer(..., np.uint8)

pynqrypt.set_key(...)
pynqrypt.set_nonce(...)
pynqrypt.set_length(len(data))
```

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```
input_buffer = pynqrypt.get_input_array()
output_buffer = pynqrypt.get_output_array()

input_buffer[:] = data[:]

pynqrypt.prepare()
pynqrypt.run_blocking()
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```
output_buffer.invalidate()

... = bytes(output_buffer)

pynqrypt.cleanup()
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USBCrypt: let's see it in action!

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  Maybe rewatch the lesson?

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Drawbacks

- Not every task is suitable for an FPGA, and some platform-specific optimization is required for best results
- Hardware accelerated libraries might not always be a drop-in replacement, some code refactoring might be required

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- Vitis HLS is magical, and makes it easy to write software for FPGAs...
  ... but it is also broken, badly documented and finicky to use.
- Pynq is a great platform for development and prototyping, but it is not intuitive to use and the documentation is lacking.
- Sometimes I felt like I was just throwing things at the wall and hoping they would stick.

The End

Thanks for your attention!