Introduction to Network Processors

Readout Unit Review
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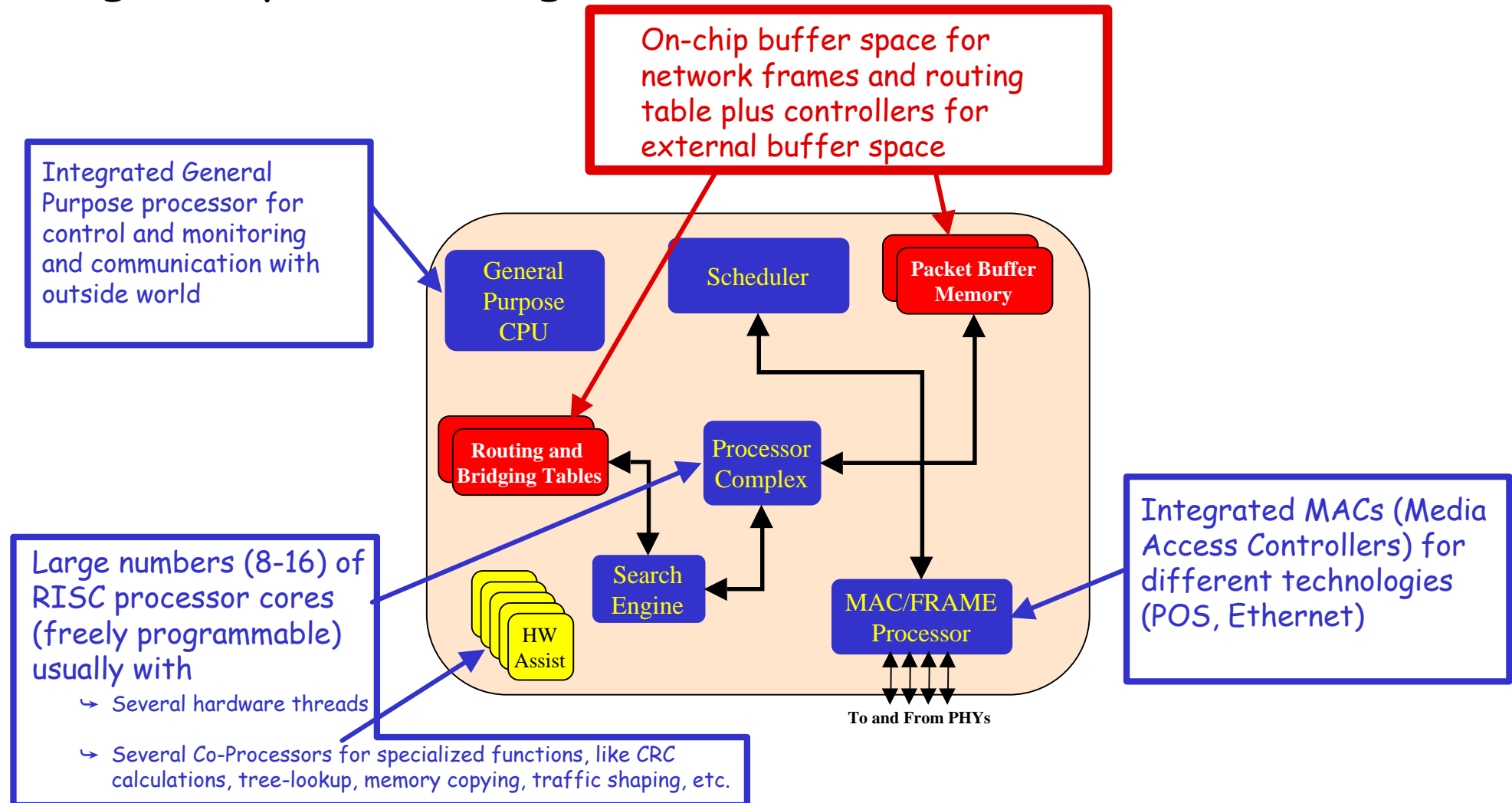
Little Bit of History

❑ September 1999 C-Port (Motorola) announced the first Network Processor (actual production only in 2001!). The aim was to provide a flexible means to handle frames/packets in a distributed manner at the input of high-performance switches and routers.

❑ During 2000 several big companies also started developing NPs (Intel, IBM, Lucent,…) driven by networking industry

❑ Today there are some 20 companies either offering NPs already or announced the development of NPs

❑ Nowadays the market is dominated by small companies, but the biggies are catching up…

❑ There are some 200 projects ("design wins") currently underway. IBM is applied by Alcatel, CISCO, NORTEL,…

Single Chips containing

On-chip buffer space for network frames and routing table plus controllers for external buffer space

Integrated General Purpose processor for control and monitoring and communication with outside world

| General Purpose CPU | Scheduler | Packet Buffer Memory |

| Routing and Bridging Tables | Processor Complex |

| HW Assist | Search Engine | MAC/FRAME Processor |

To and From PHYs

Integrated MACs (Media Access Controllers) for different technologies (POS, Ethernet)

Large numbers (8-16) of RISC processor cores (freely programmable) usually with

↳ Several hardware threads

↳ Several Co-Processors for specialized functions, like CRC calculations, tree-lookup, memory copying, traffic shaping, etc.
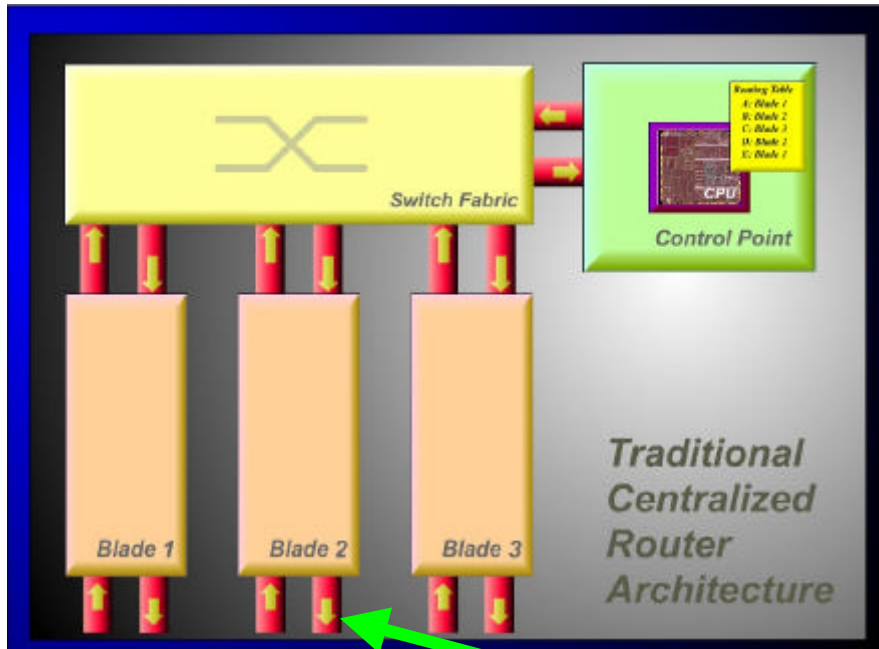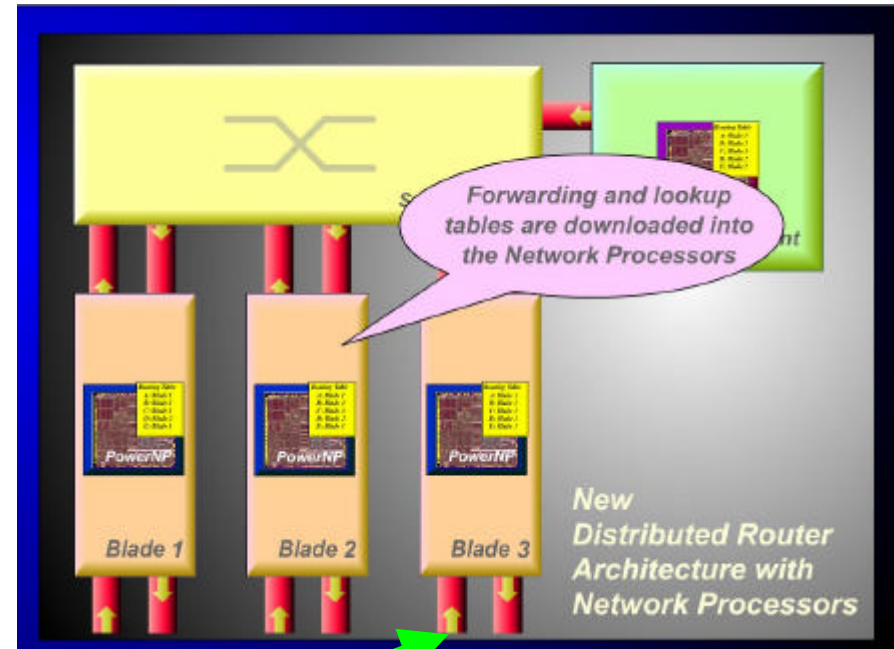
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3

Network Processors – What are they used for?

Primarily as front-end stage of high-speed network switches/routers

Conventional Switch

Next Generation (distributed) Switch

POS (packet Over SONET)/GbEthernet

Doesn't scale very well!!!!

Scales very well

Network Processors – What's their advantage?

The programmability of NPs

- ➢ Gives flexibility to cope with new requirements and network protocols
- ➢ Allows switch manufacturers to implement e.g. custom quality of service or flow-controls algorithms
- ➢ Keep Time-to-market much smaller than designing and manufacturing custom ASICs (~6 months compared to 18 months)

Summary and Prospects

❑ Summary

➢ NPs are a very interesting new technology for flexible network frame handling

➢ Every major chip manufacturer has them in their product catalog

➢ They can be used for data merging and other applications

❑ Outlook

➢ Next generation of NPs will be able to deal with 10Gb and 40Gb link speeds with corresponding upgrade in processing capabilities →lower prices for current devices

❑ Risks

➢ Economical failure

➢ Short life or discontinuity of a certain implementation (IBM claims NP4GS3 will be produced for 4-5 years)

➢ Cost

"The time-to-market benefits of NPUs are too great to ignore. Despite early disappointments, network processors are here to stay."
Bob Wheeler Senior Analyst Networking Silicon, The Linley Group Inc