Applications of the Software Radio as a Seamless Interface Between the Atmosphere and the Fibersphere

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Applications of the Software Radio as a Seamless Interface Between the Atmosphere and the Fibersphere

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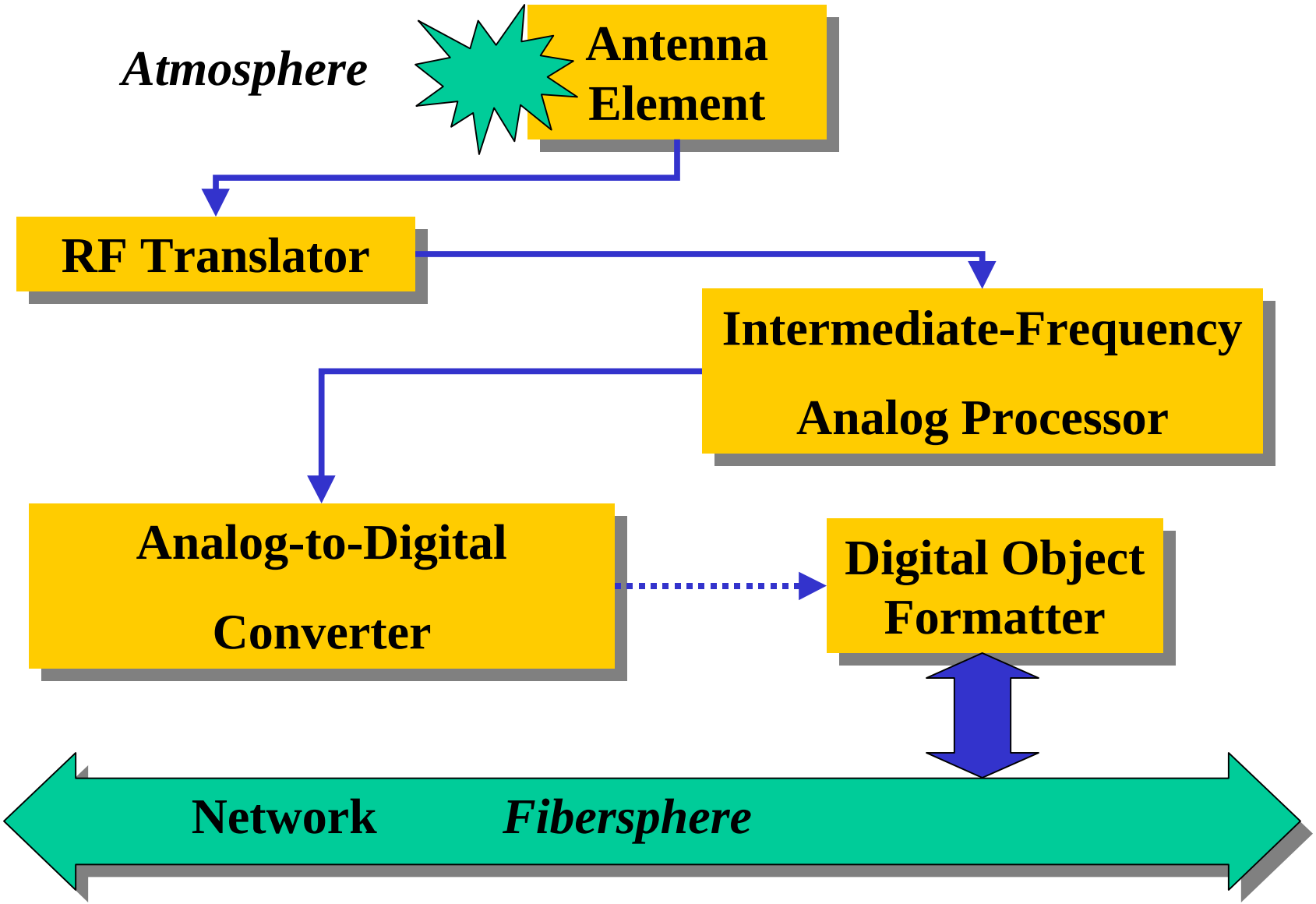
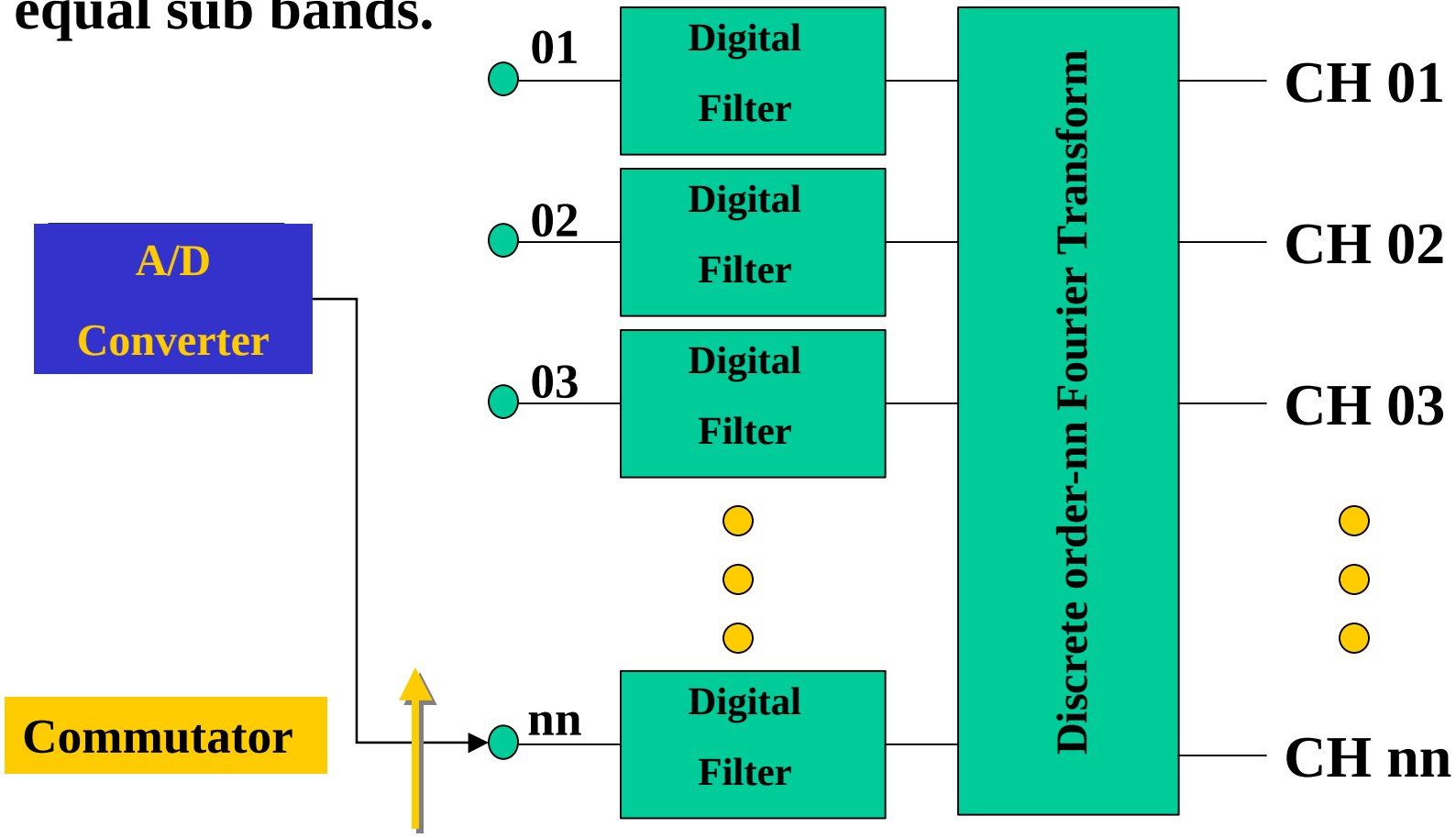
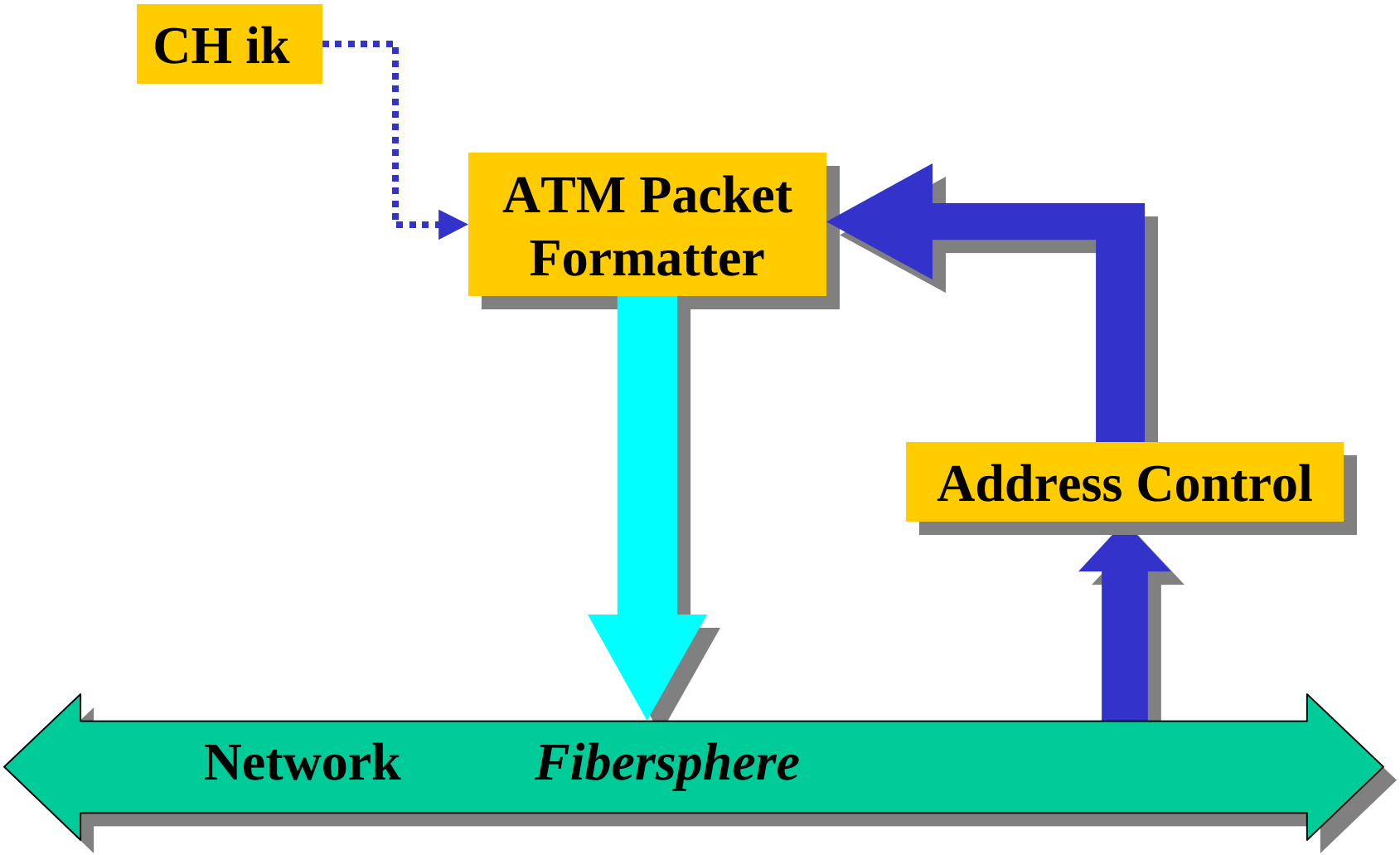
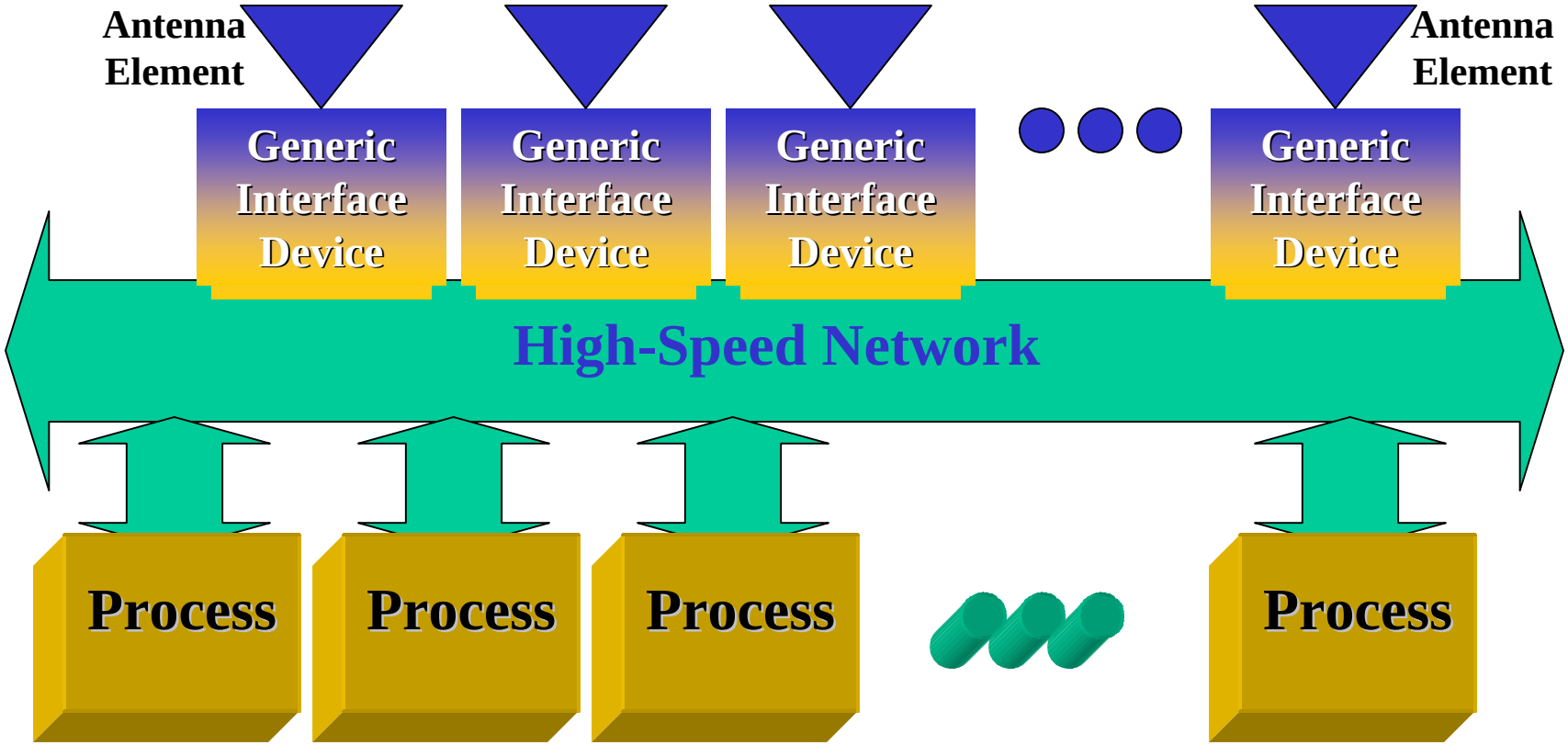


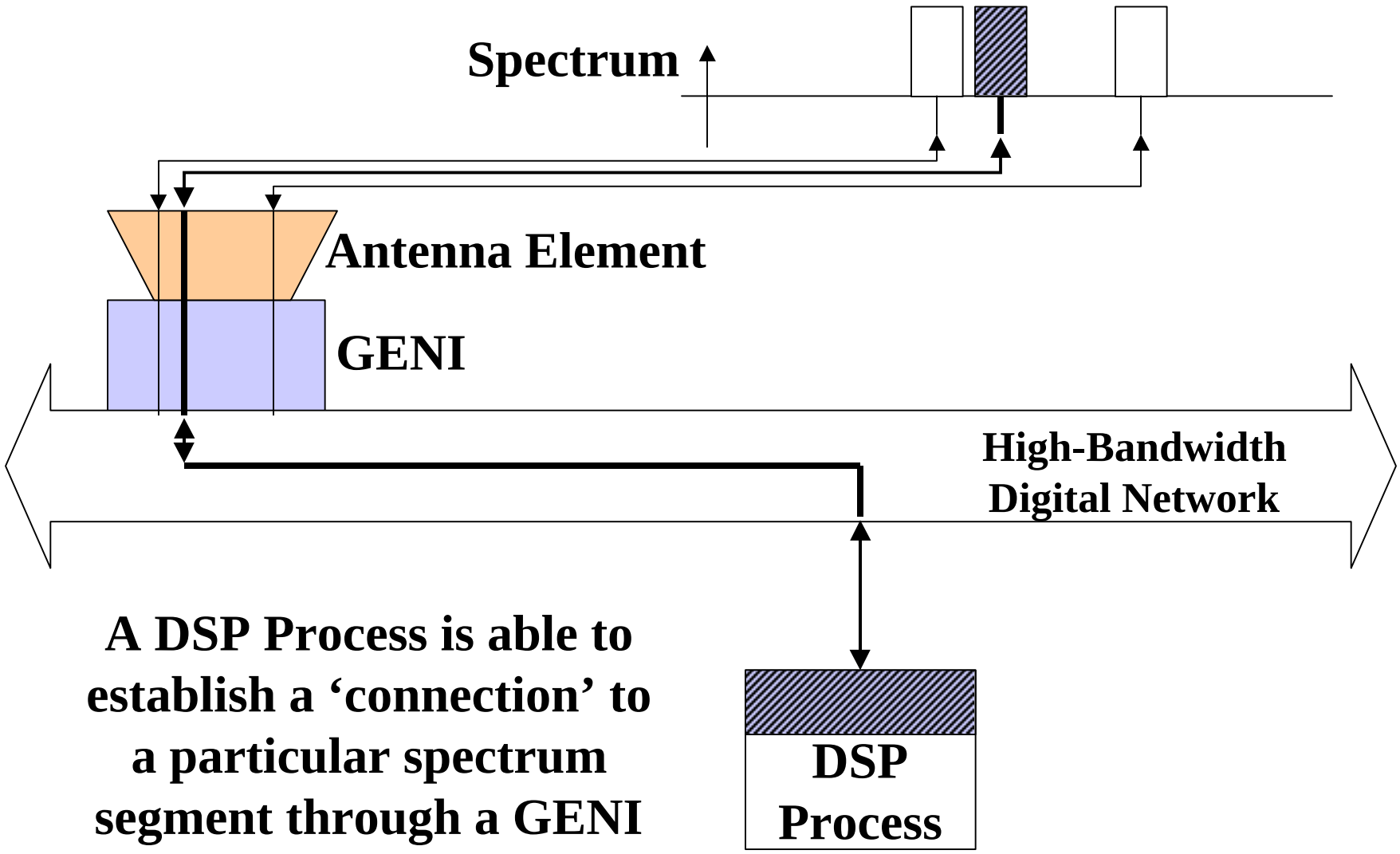
A digital partitioner separates the Nyquist band into nn equal sub bands.



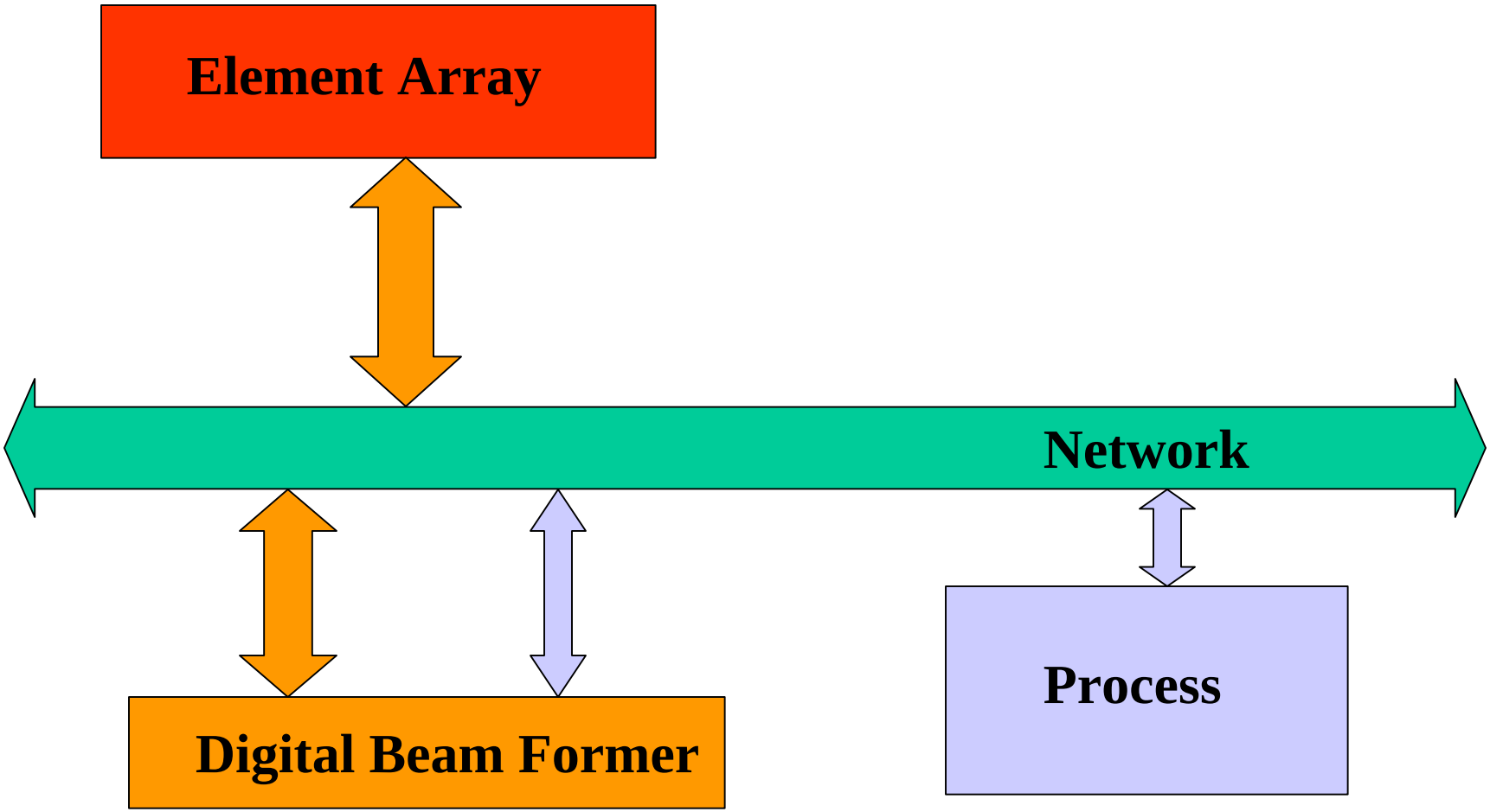


SNAP *Network-Centric Smart Antenna Structure*





A DSP Process is able to establish a ‘connection’ to a particular spectrum segment through a GENI and an antenna element



The Generic Infrastructure

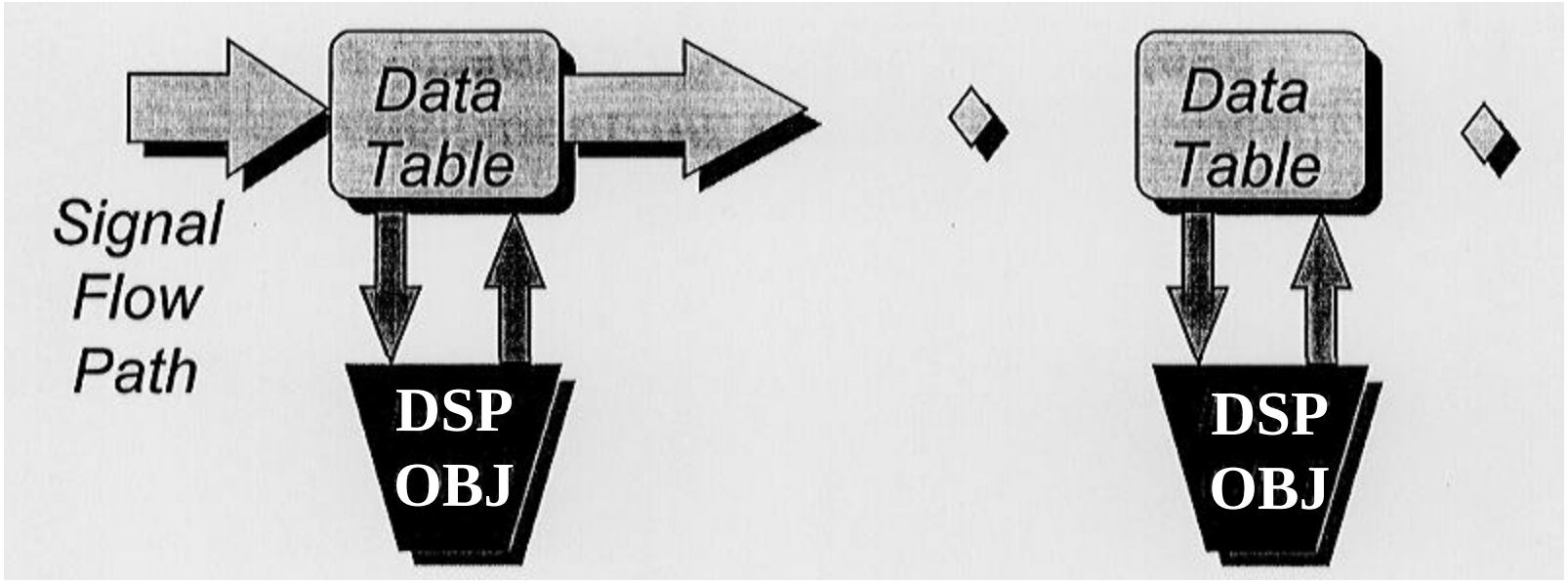
ABSTRACT:

"The SpectrumWare project is applying a software oriented approach to wireless communication and distributed signal processing....."

....David L. Tennenhouse

The Generic Infrastructure

Building a DSP Thread



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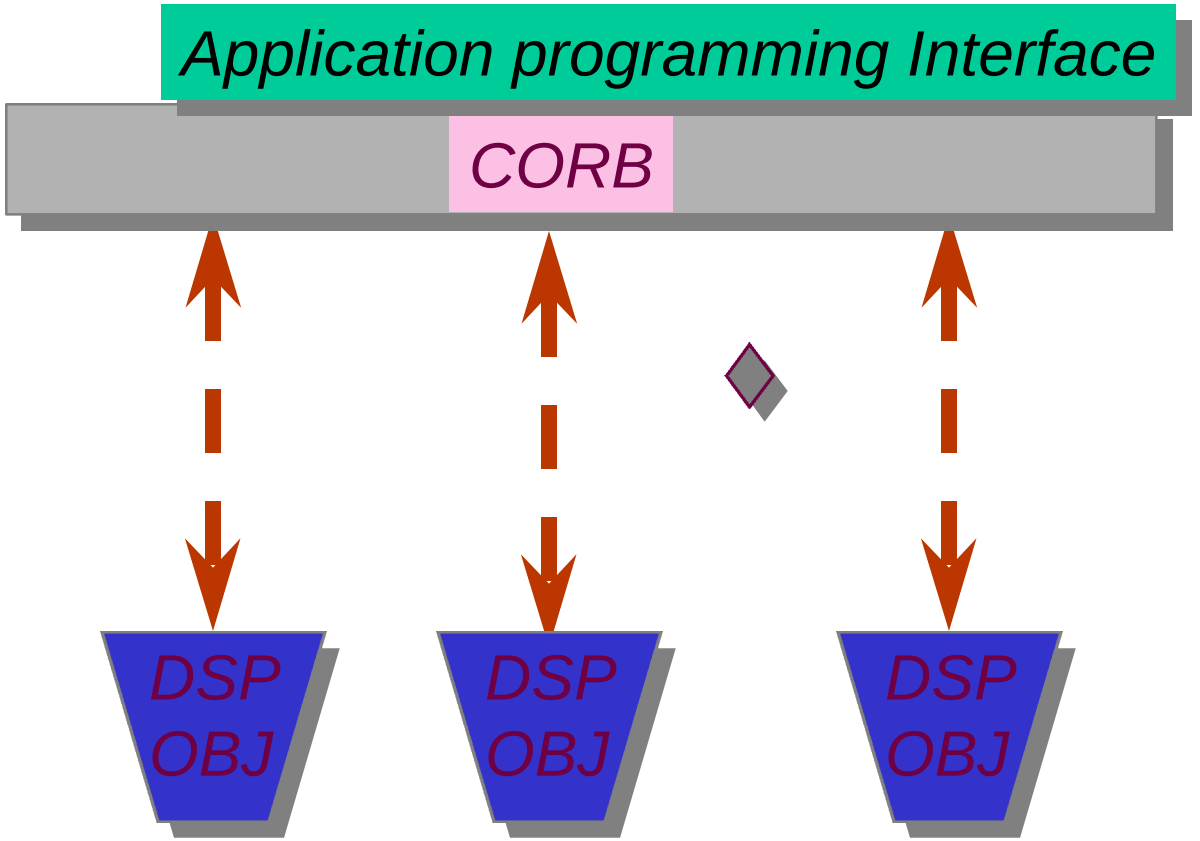

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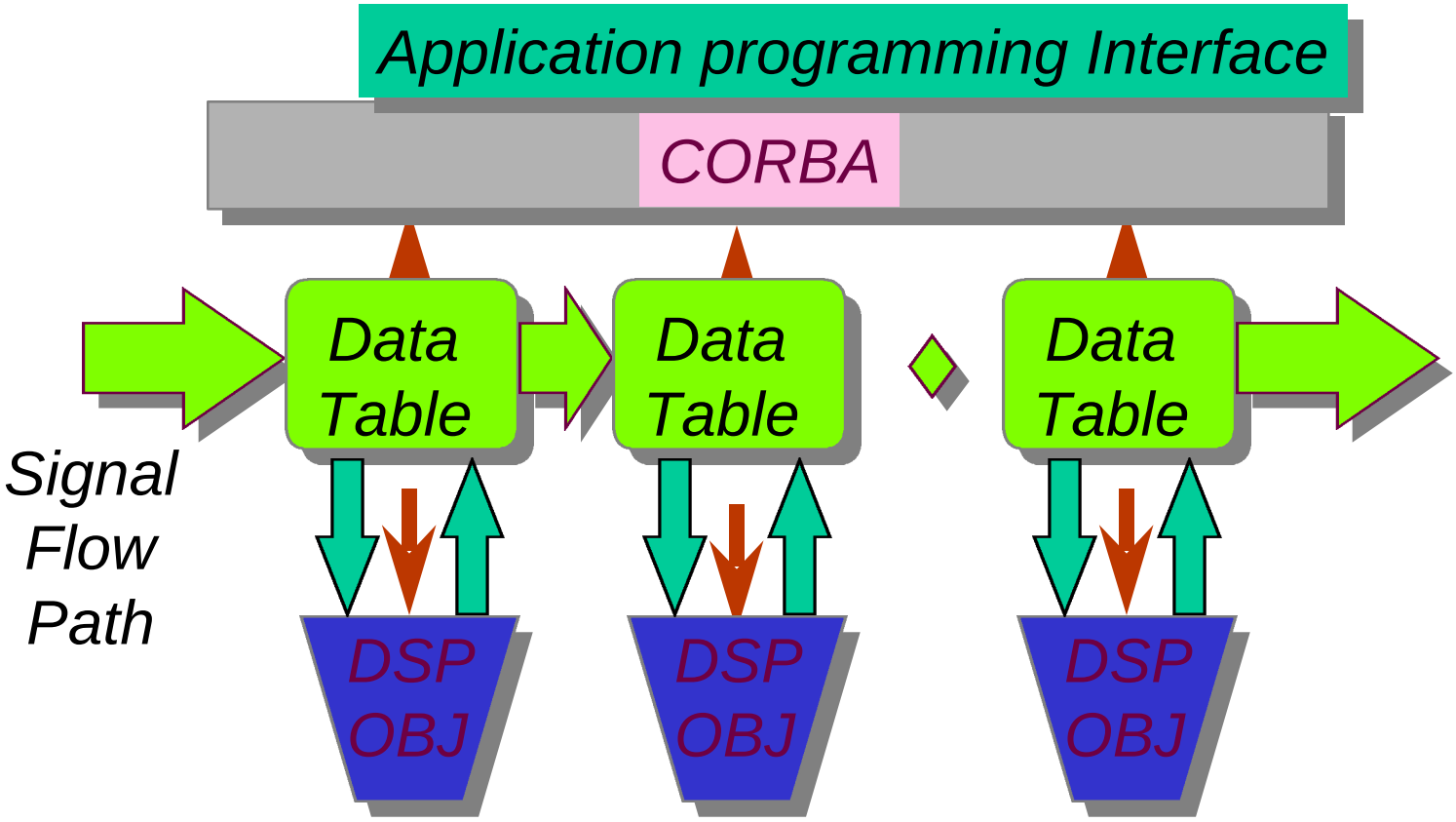

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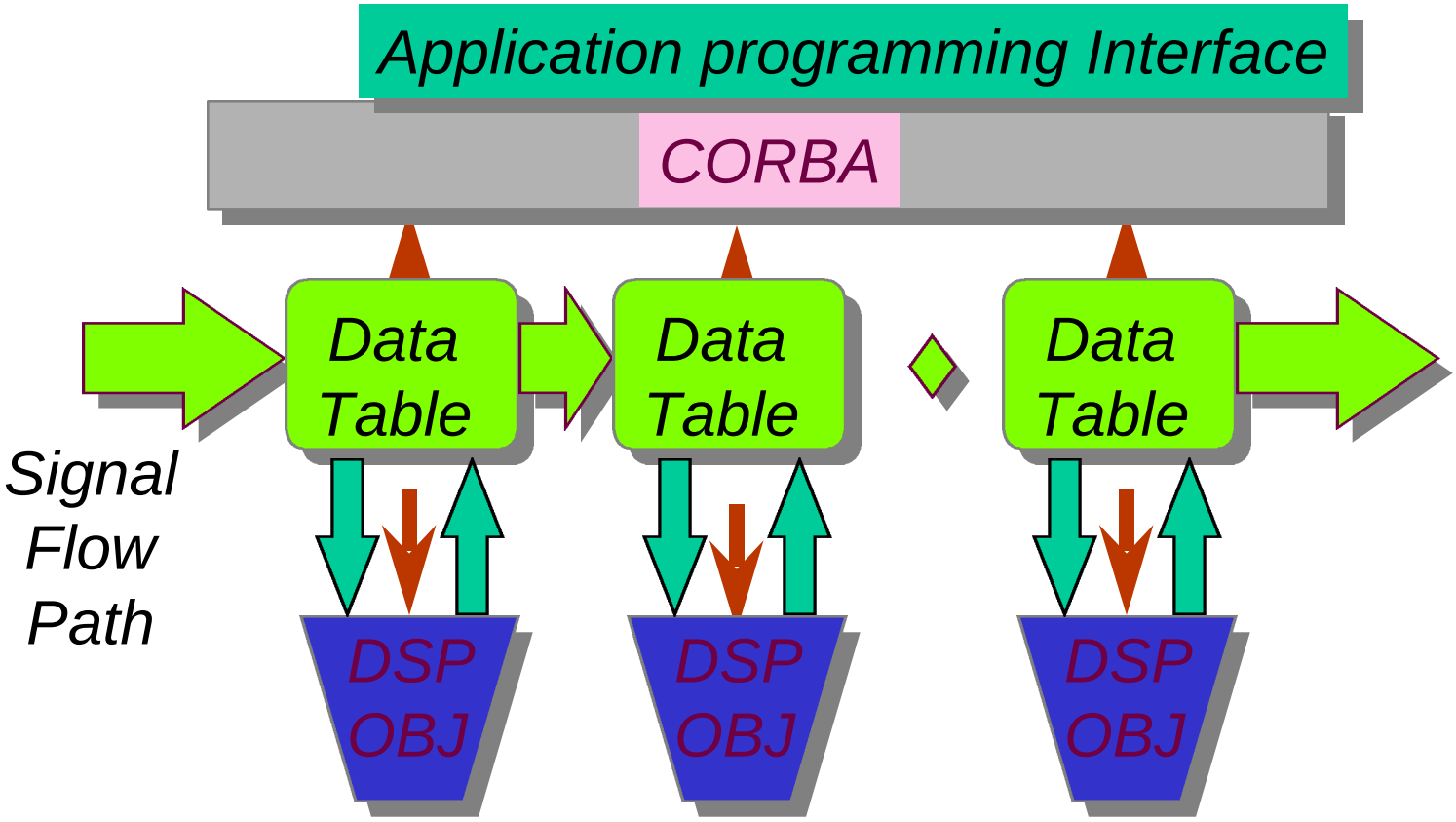

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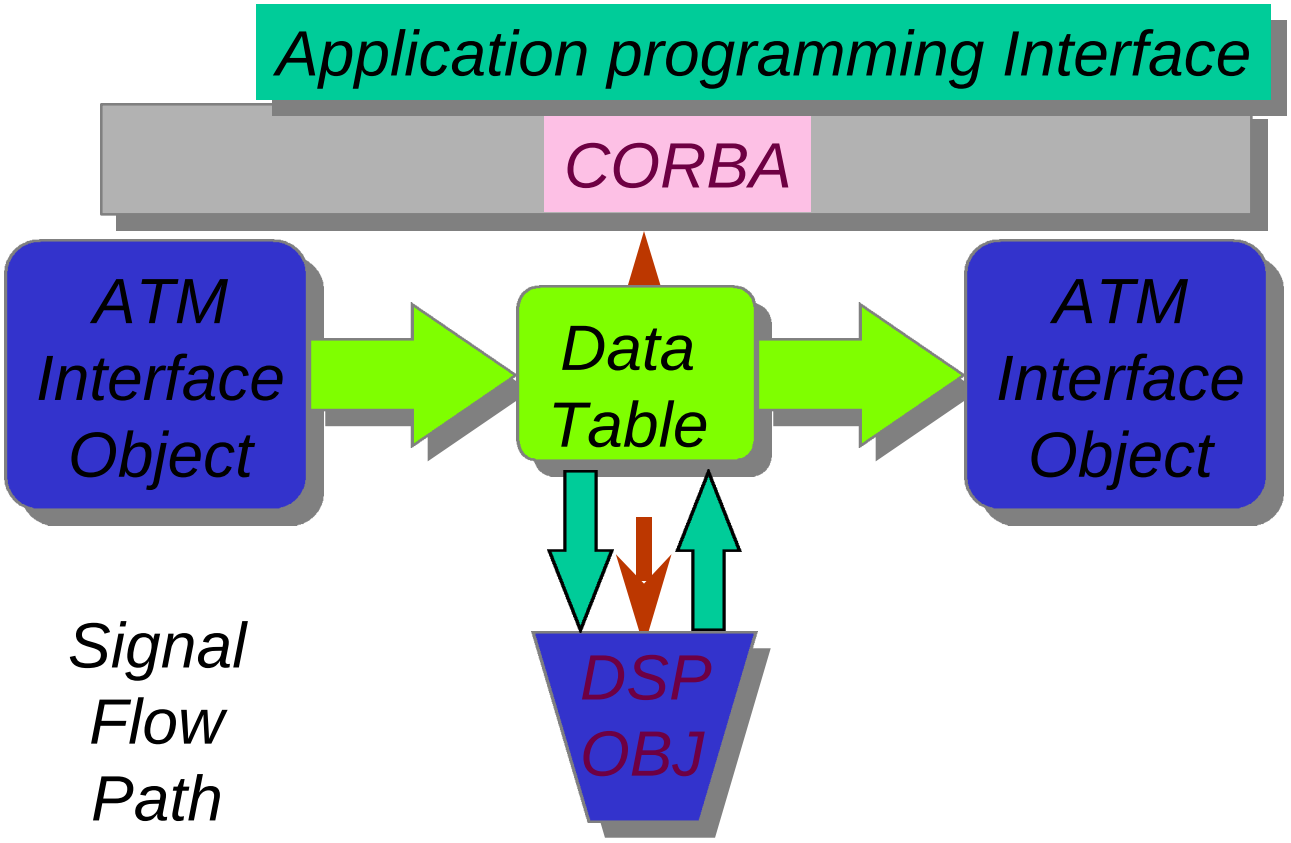

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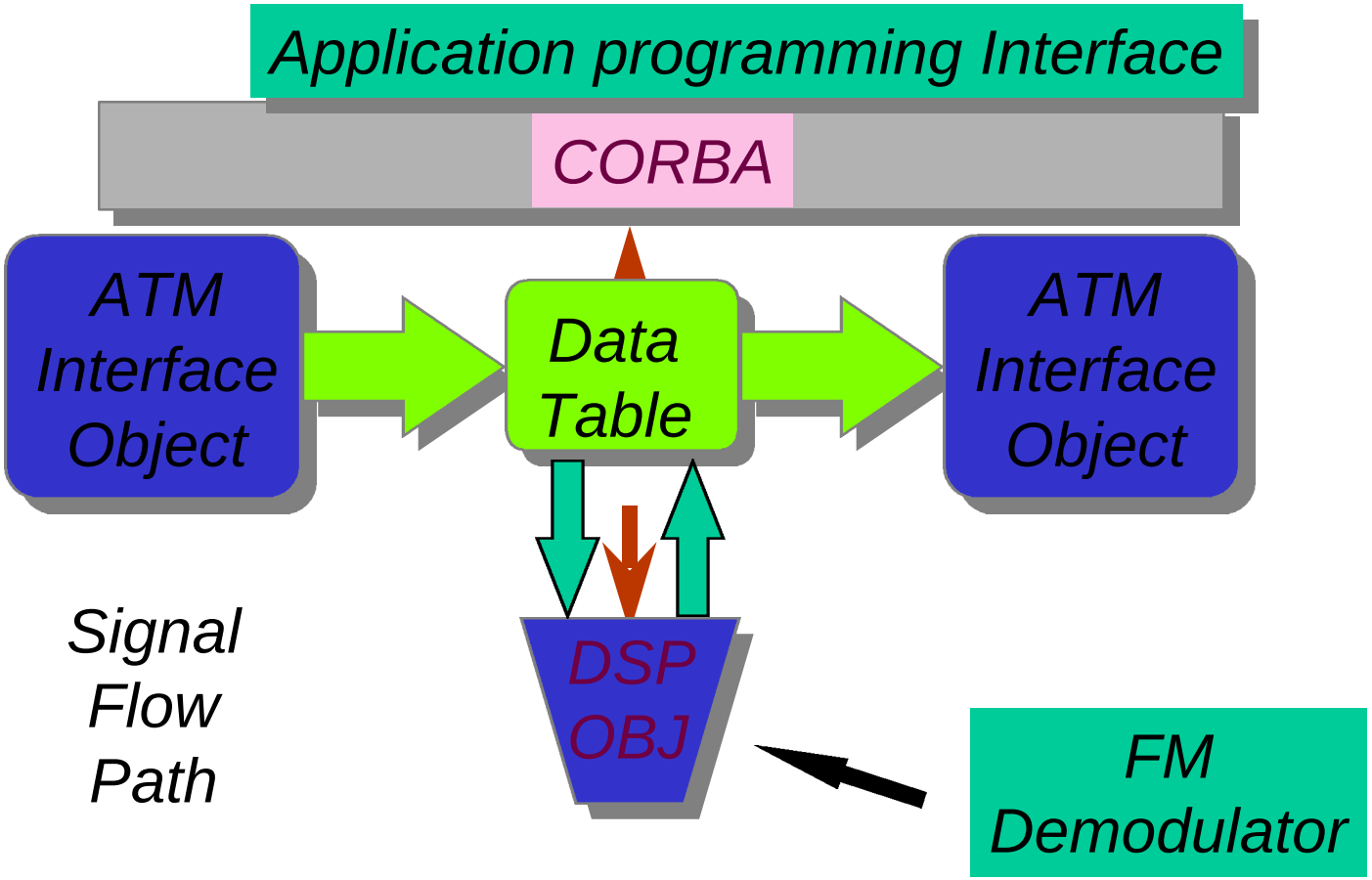

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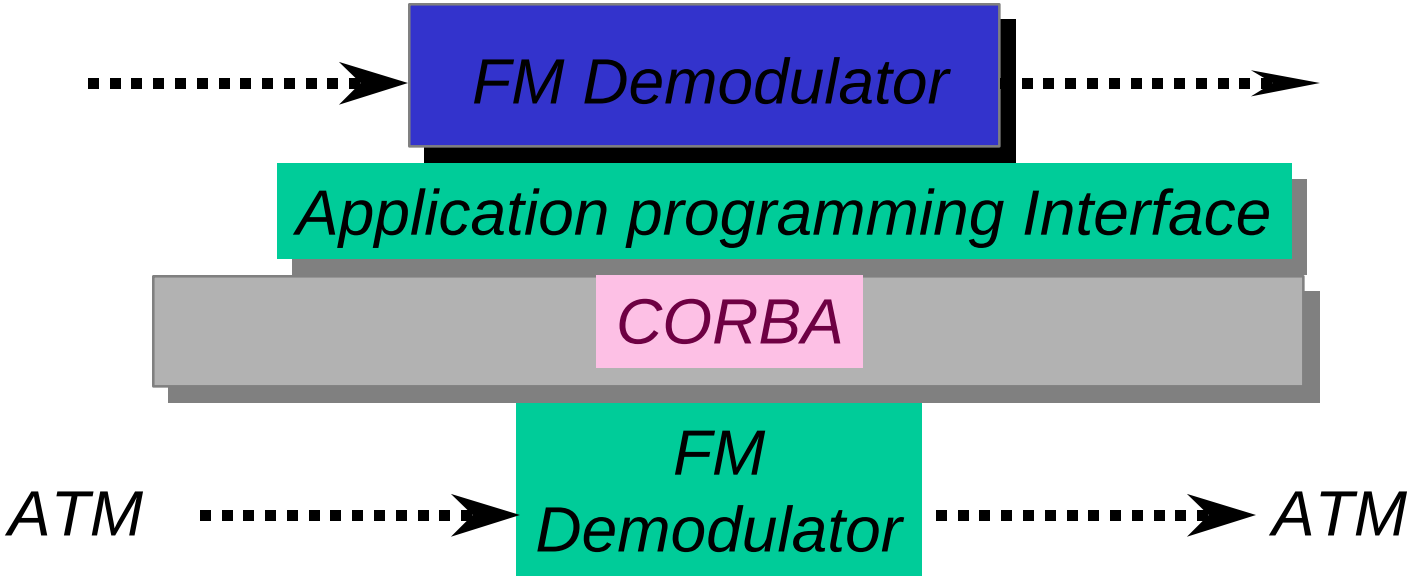

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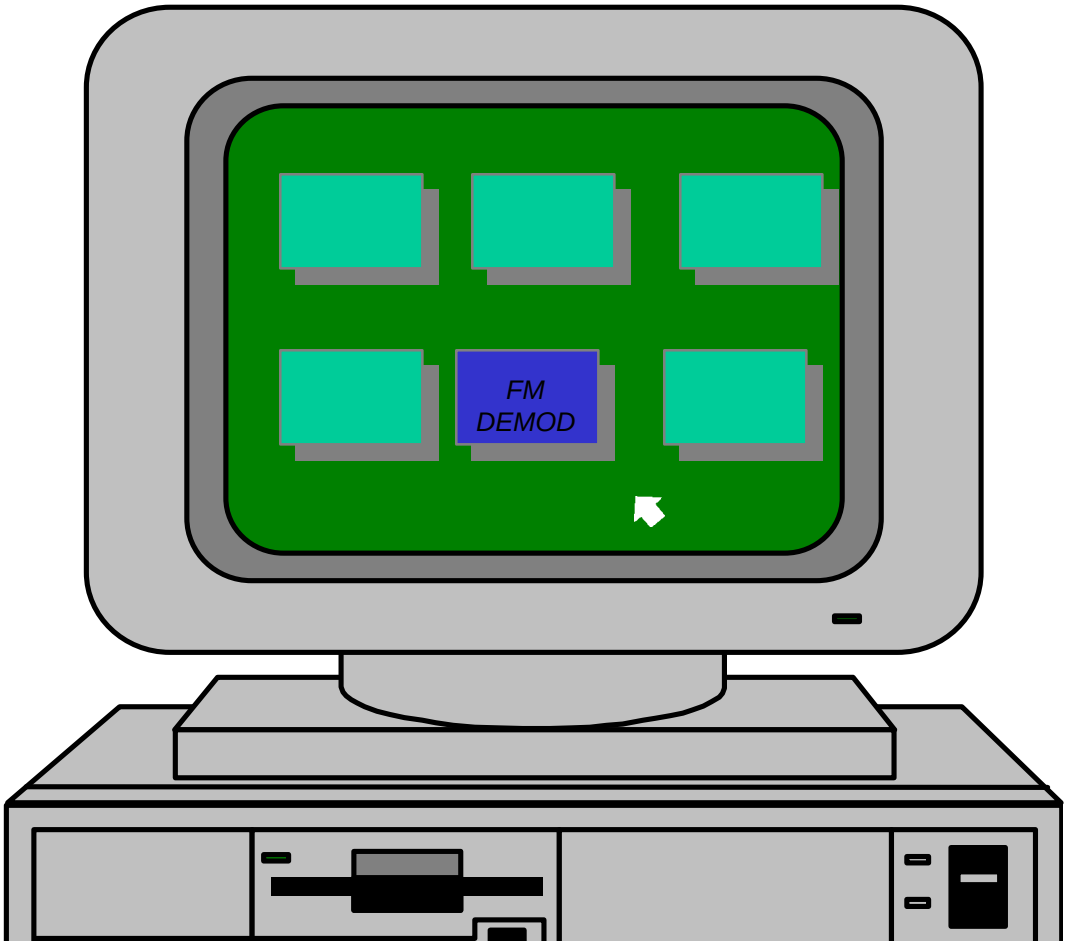

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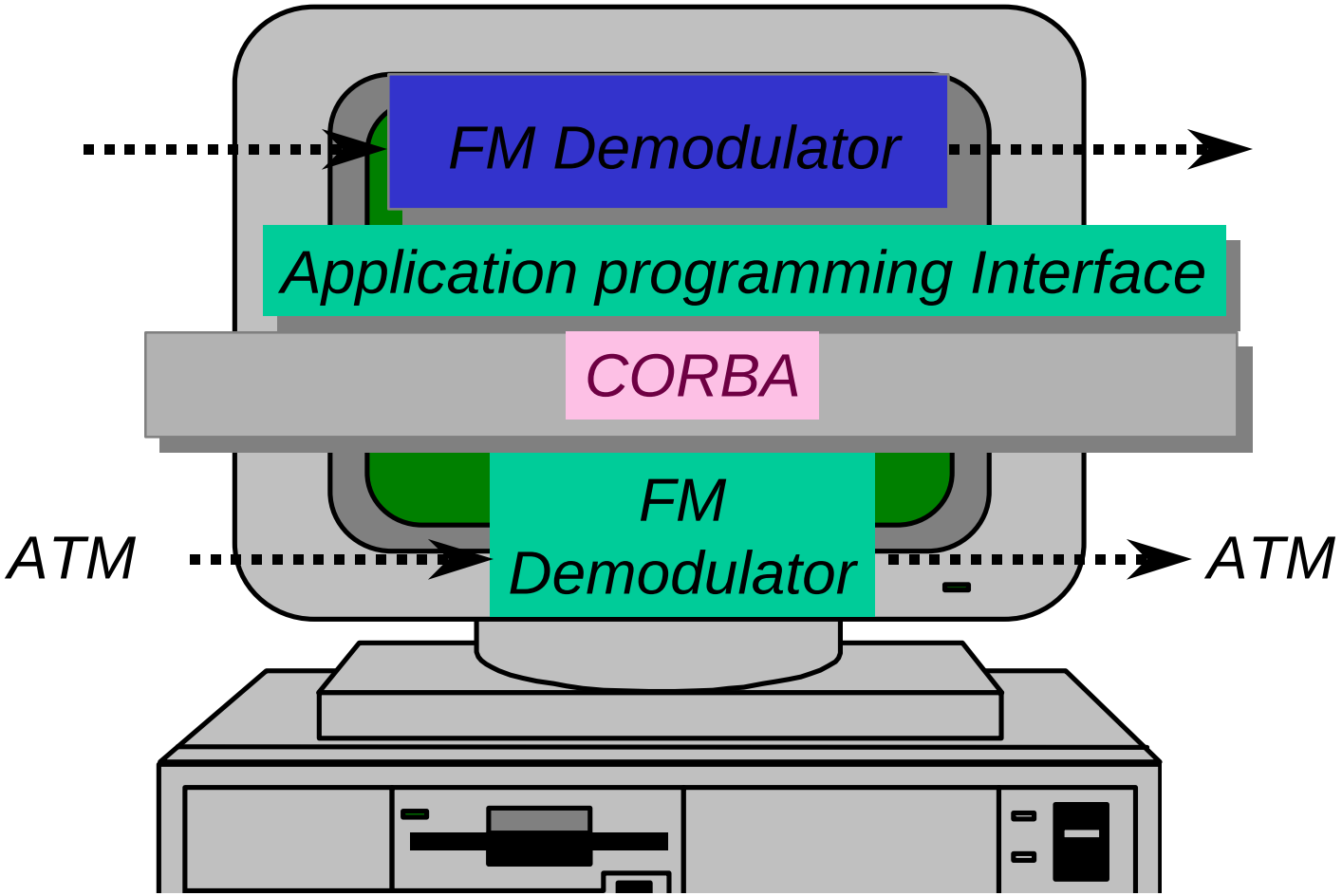

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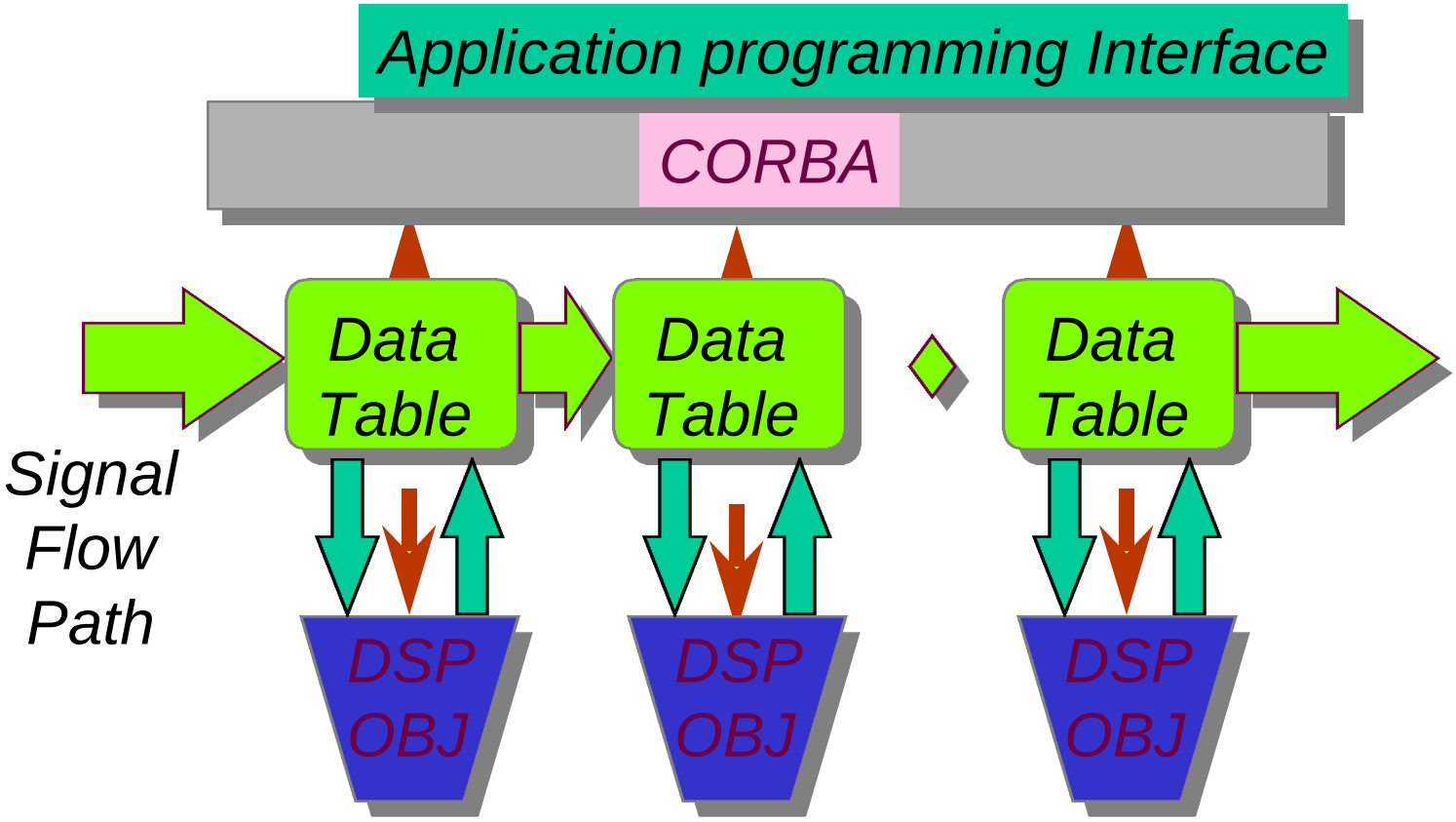
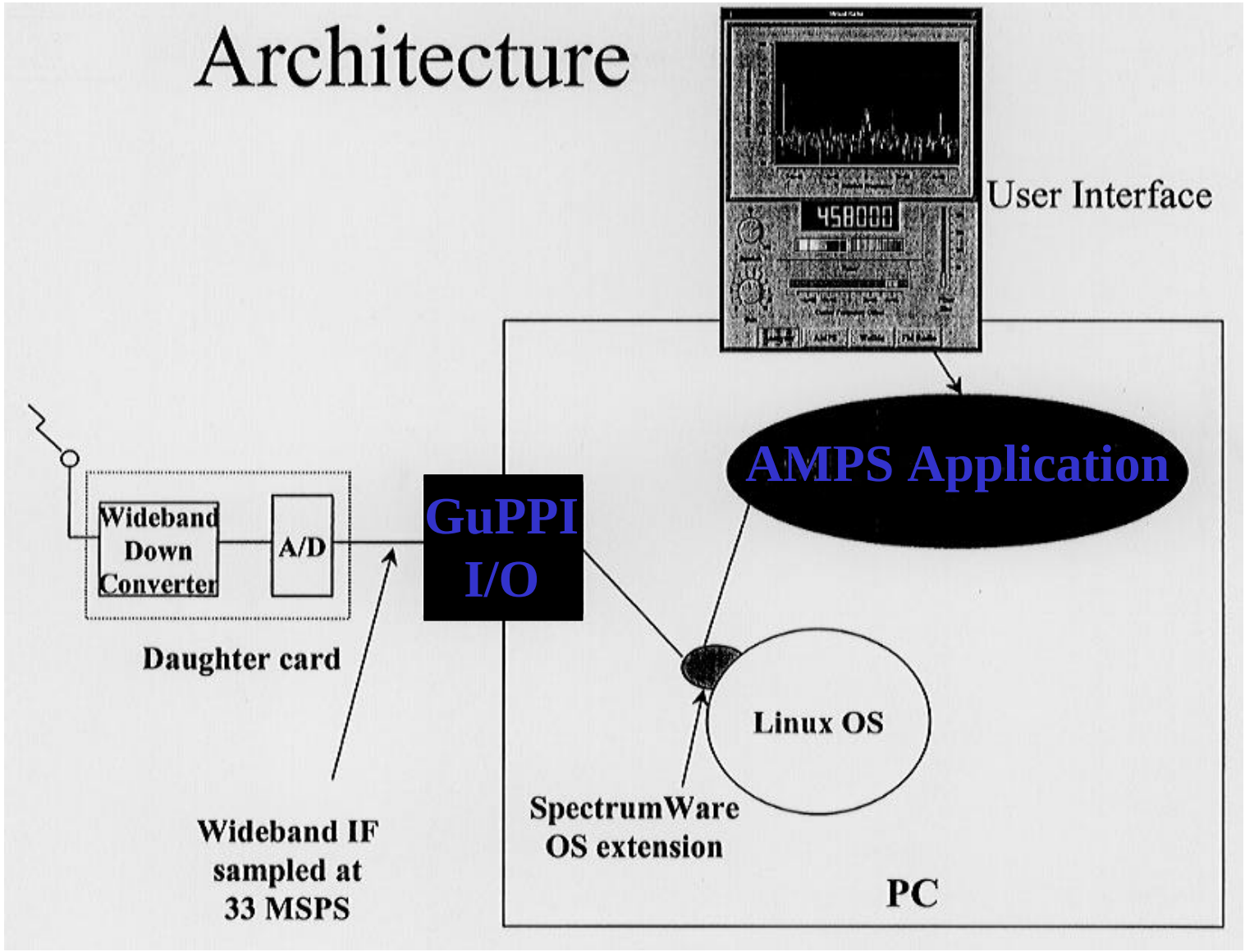


Virtual Radios

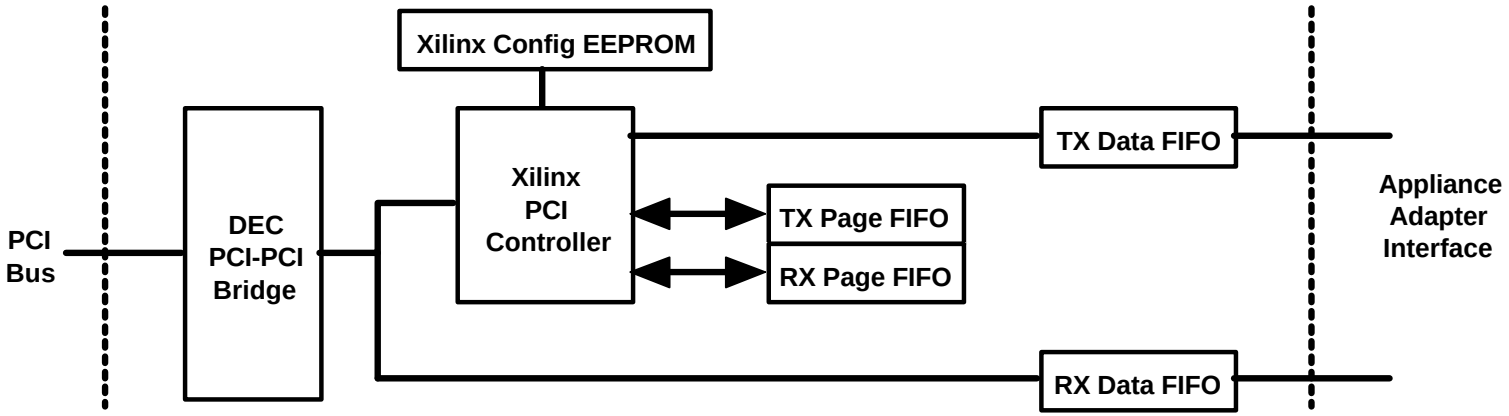
Vanu Bose

Software Devices & Systems Group

MIT Laboratory for Computer Science



I/O System Design

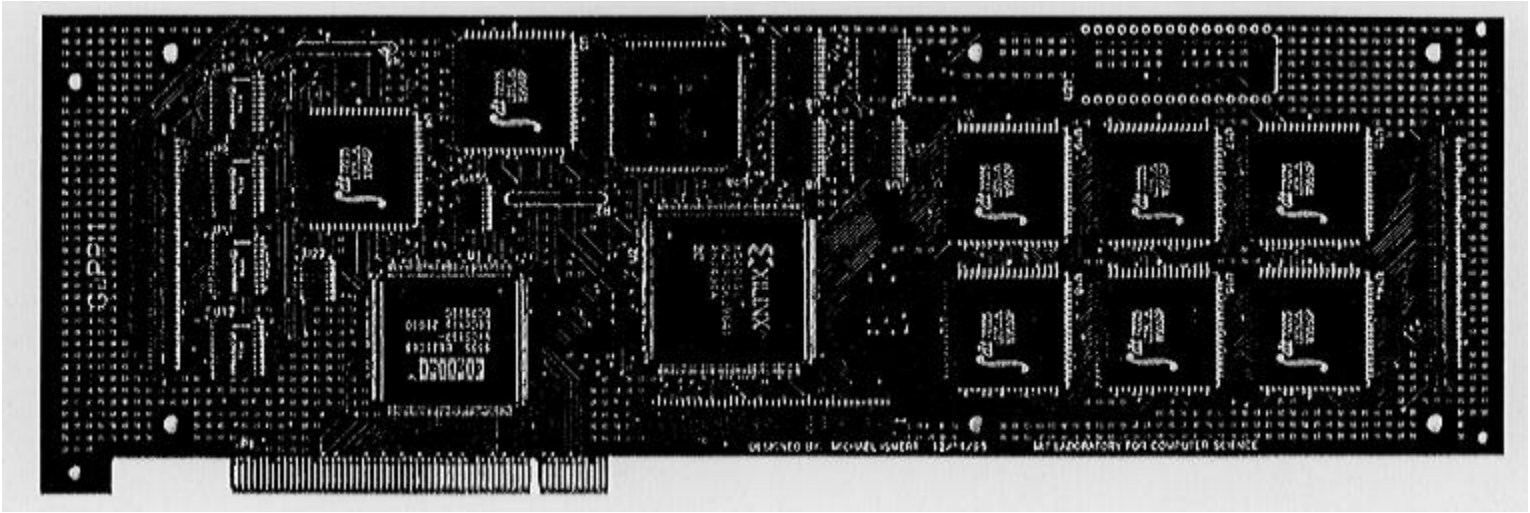


Hardware: General Purpose PCI I/O card (GuPPI)

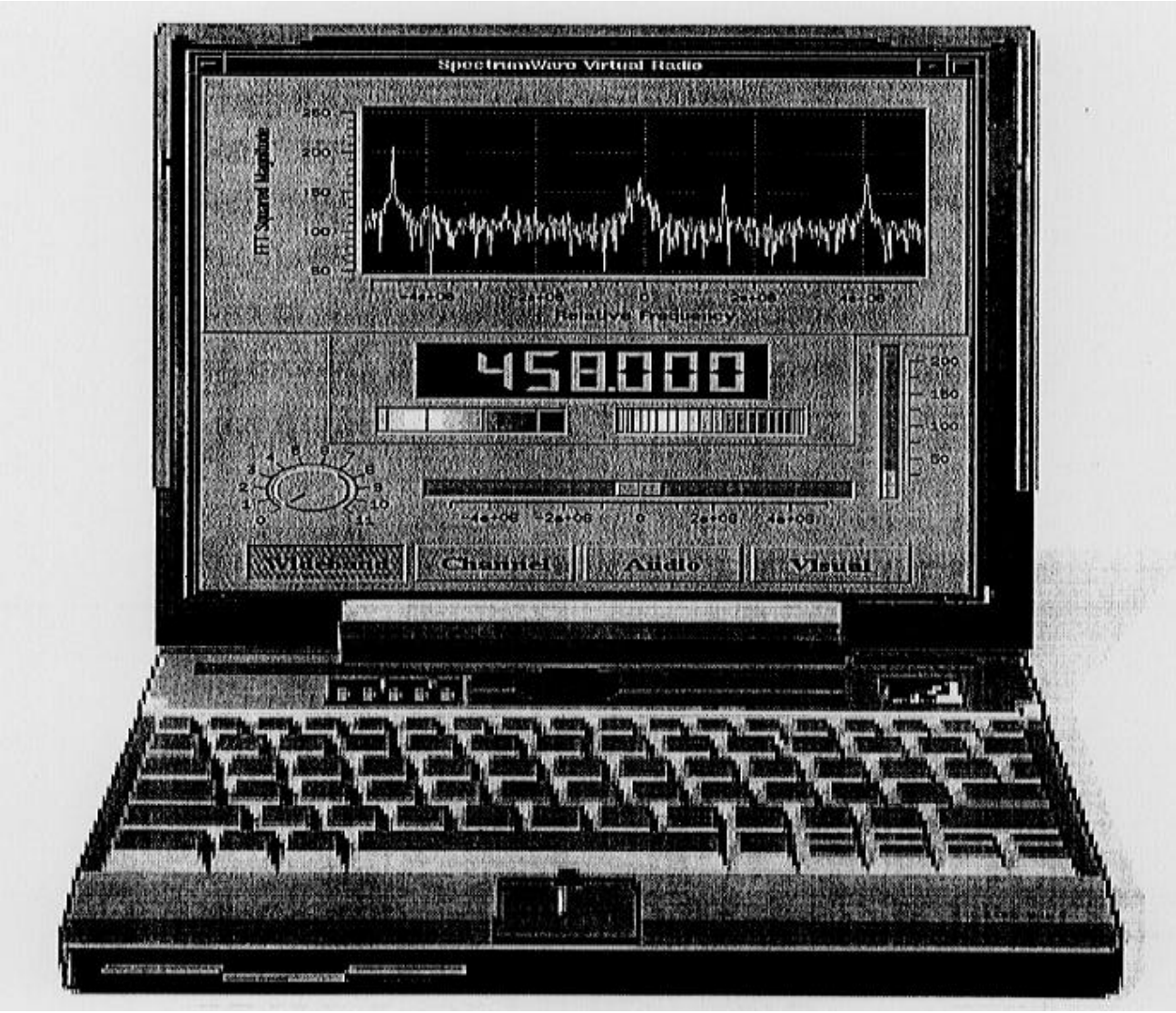
- Stream samples directly to/from memory
- Bus master capability takes advantage of high PCI throughput

- Raw performance
  - Transmit: 850 Mbits/sec
  - Receive: 930 Mbits/sec
- Design: Mike Ismert

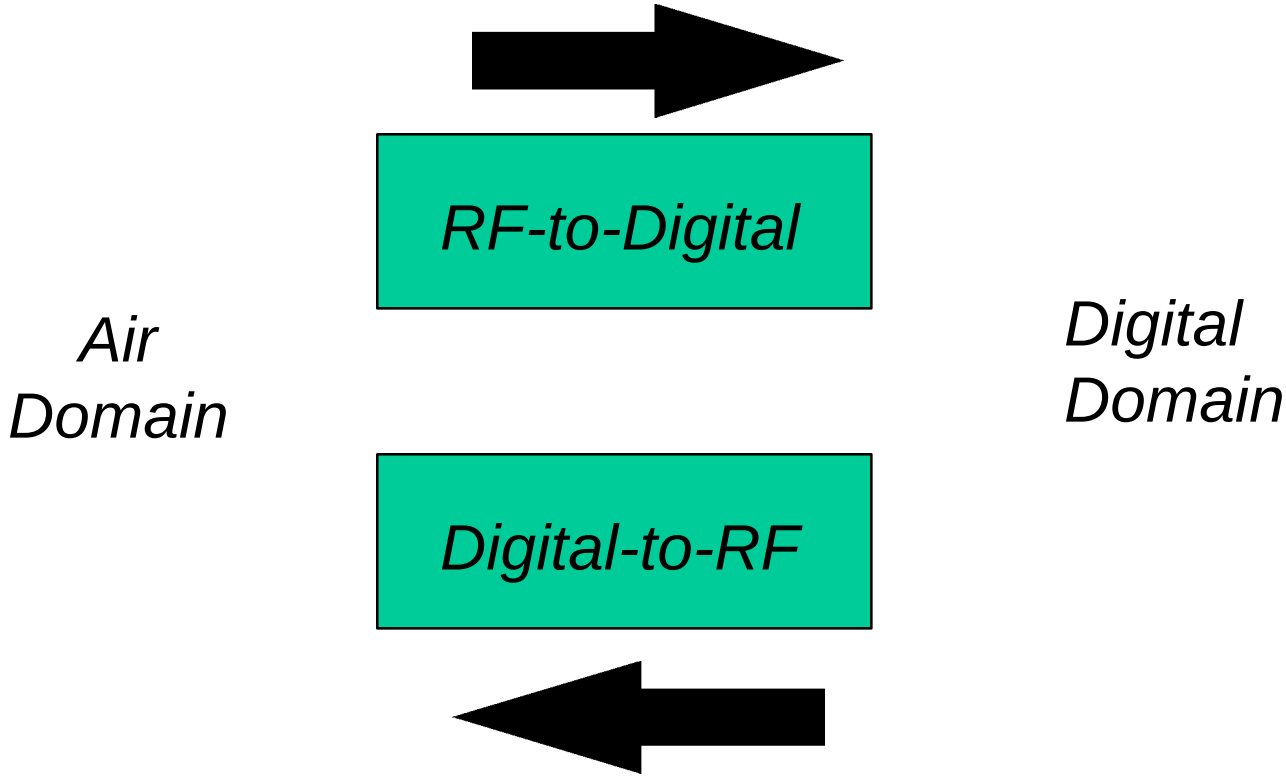
I/O System Performance



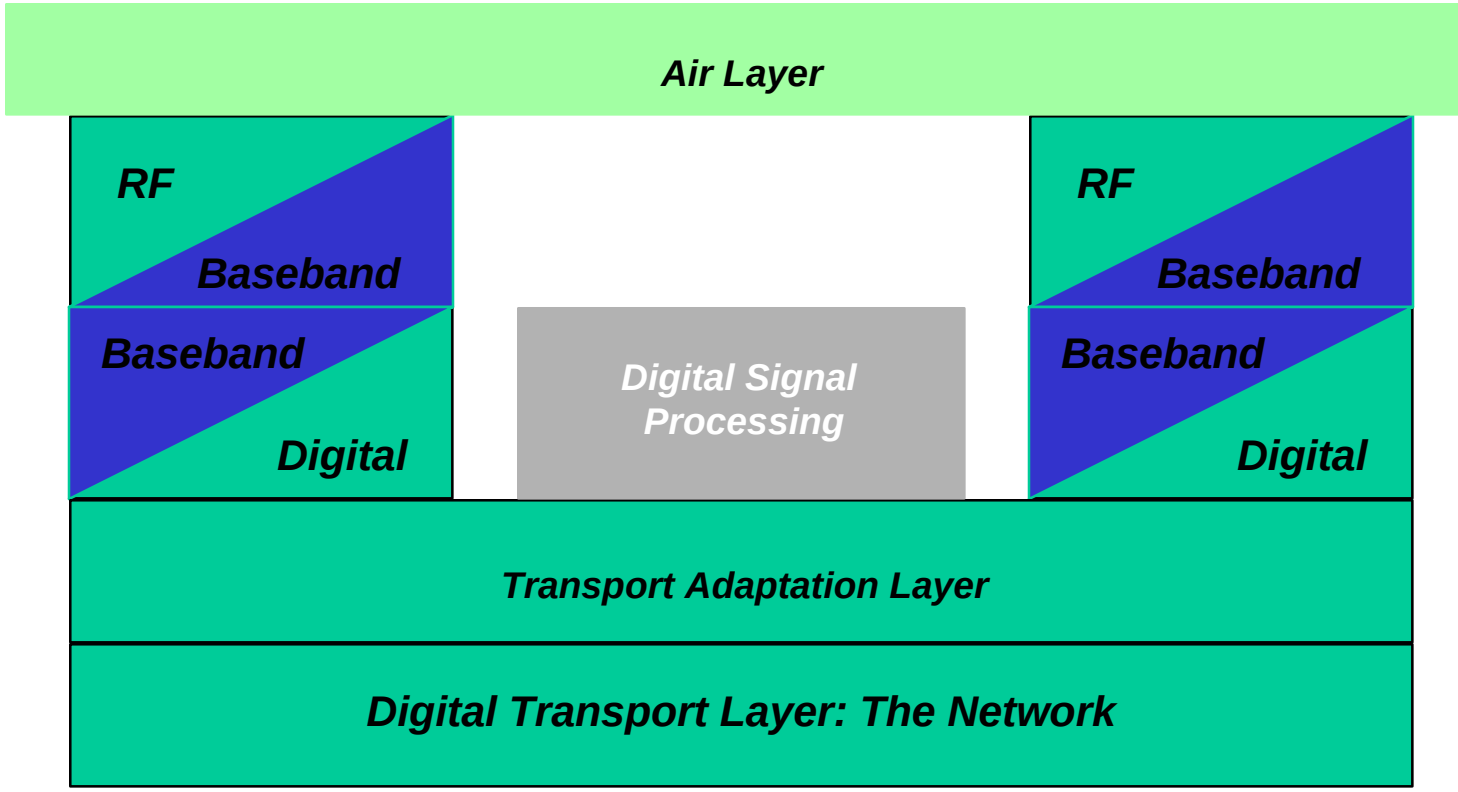
- **GuPPI device driver**
  - **Use virtual memory remapping to eliminate expensive data copies**
  - **Use memory to absorb process scheduling variance**
- **Current performance**
  - **<u>Sustained</u> transfer of 512 Mbits/sec (32 MSPS @ 16 bits) between application and RF front end**
  - **Low processing overhead: < 0.1 cycles/sample**



Air Interface....The Future



A Layer Model for Digital Radio



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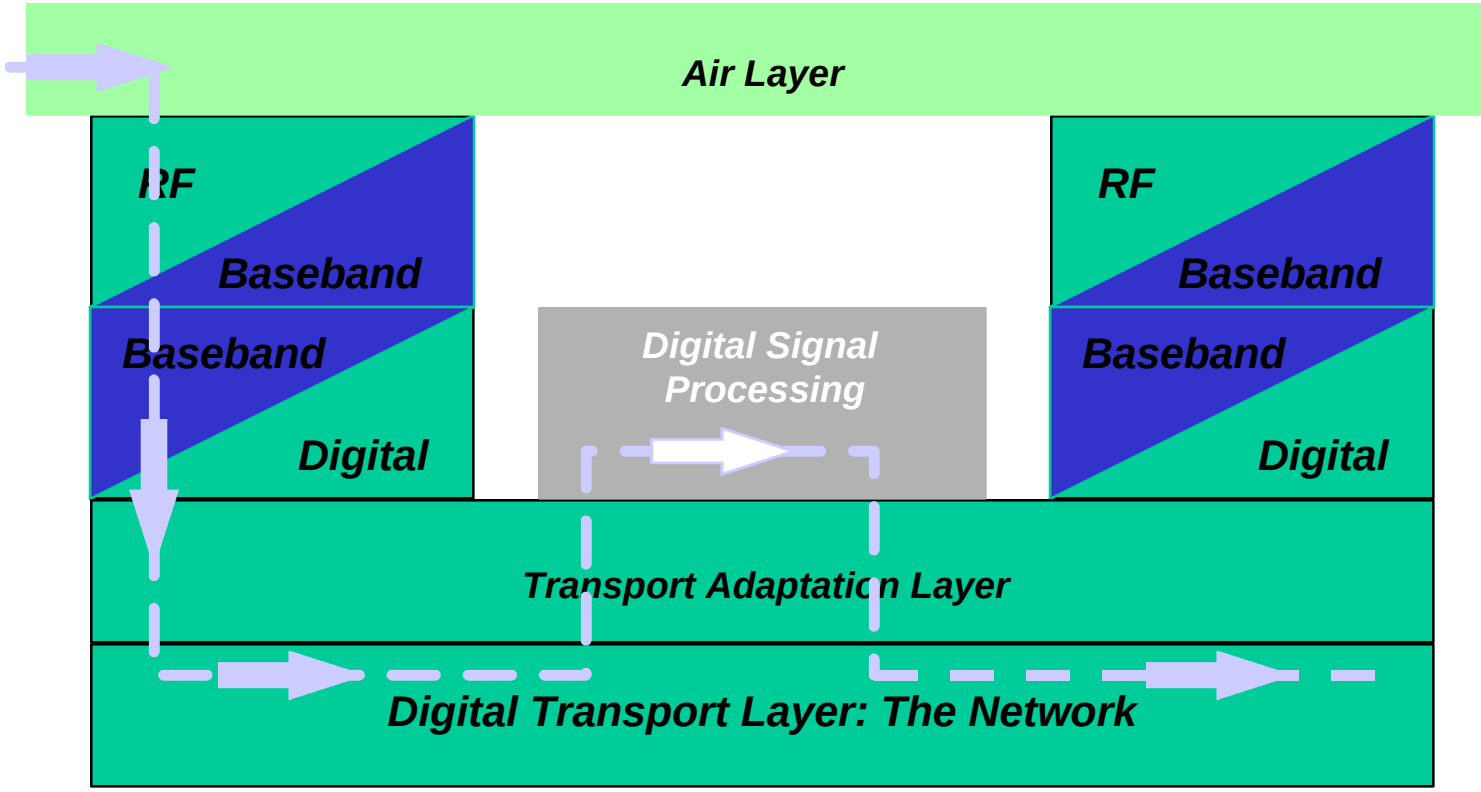

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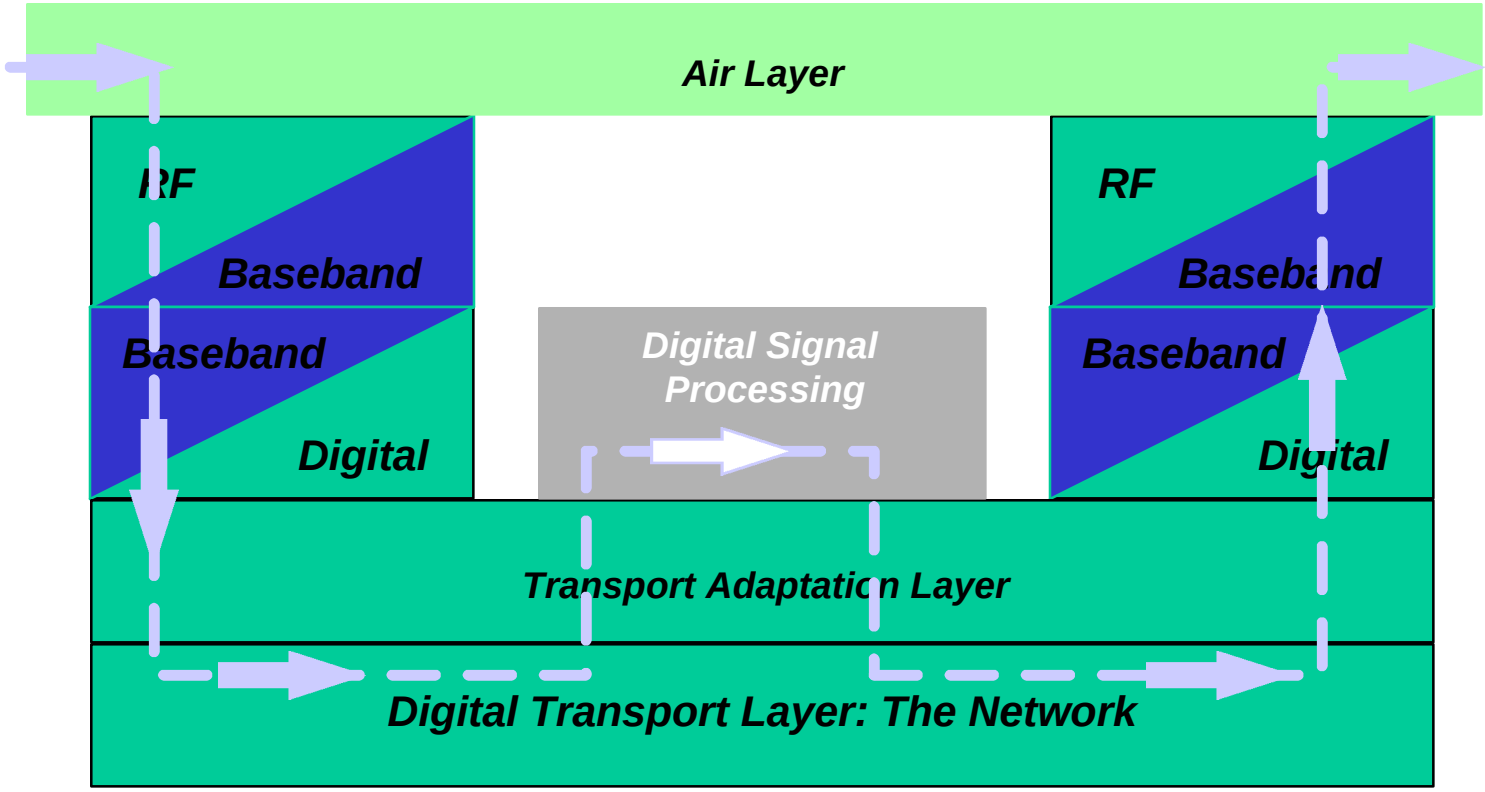

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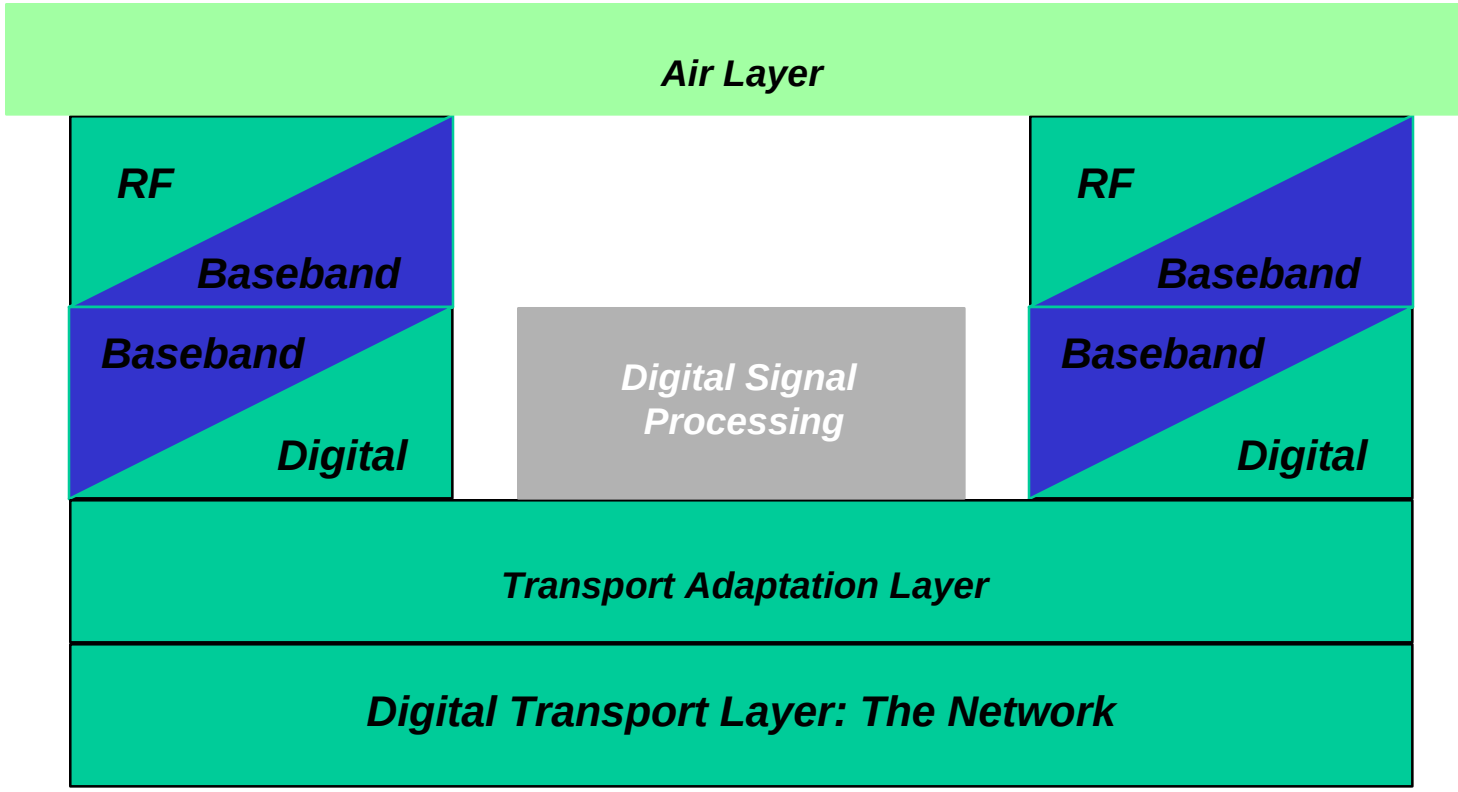
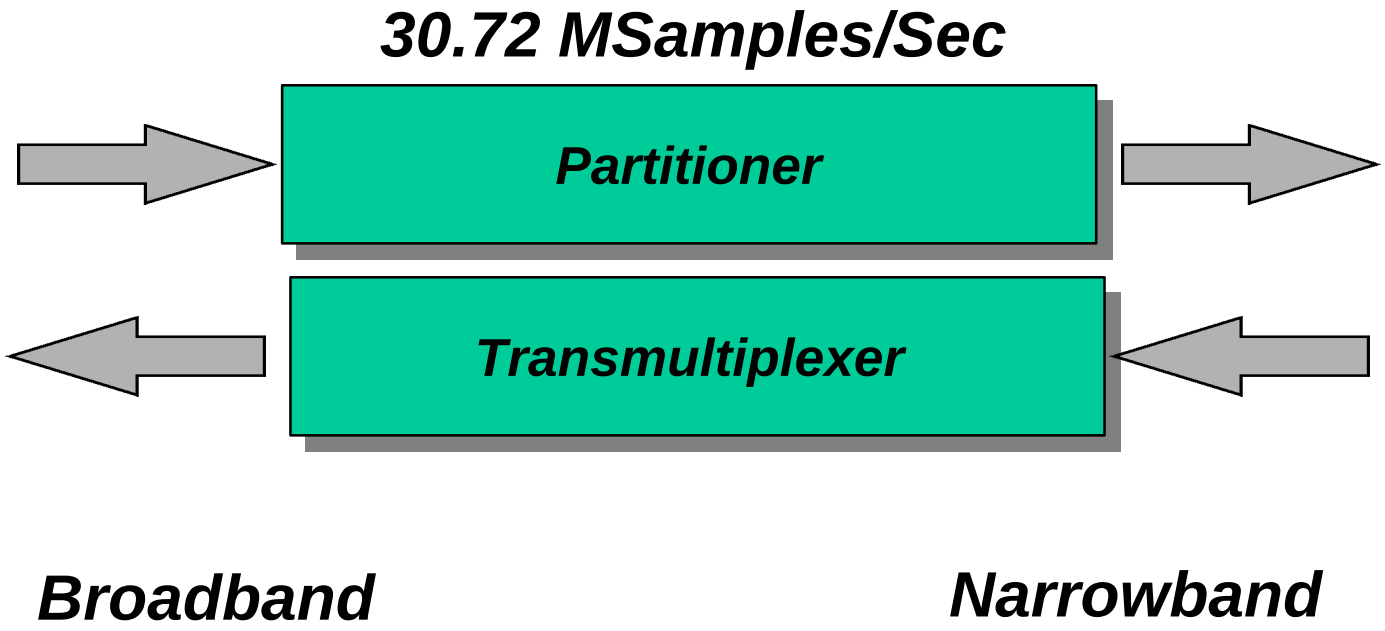


The Partitioner/Transmultiplexer Functions



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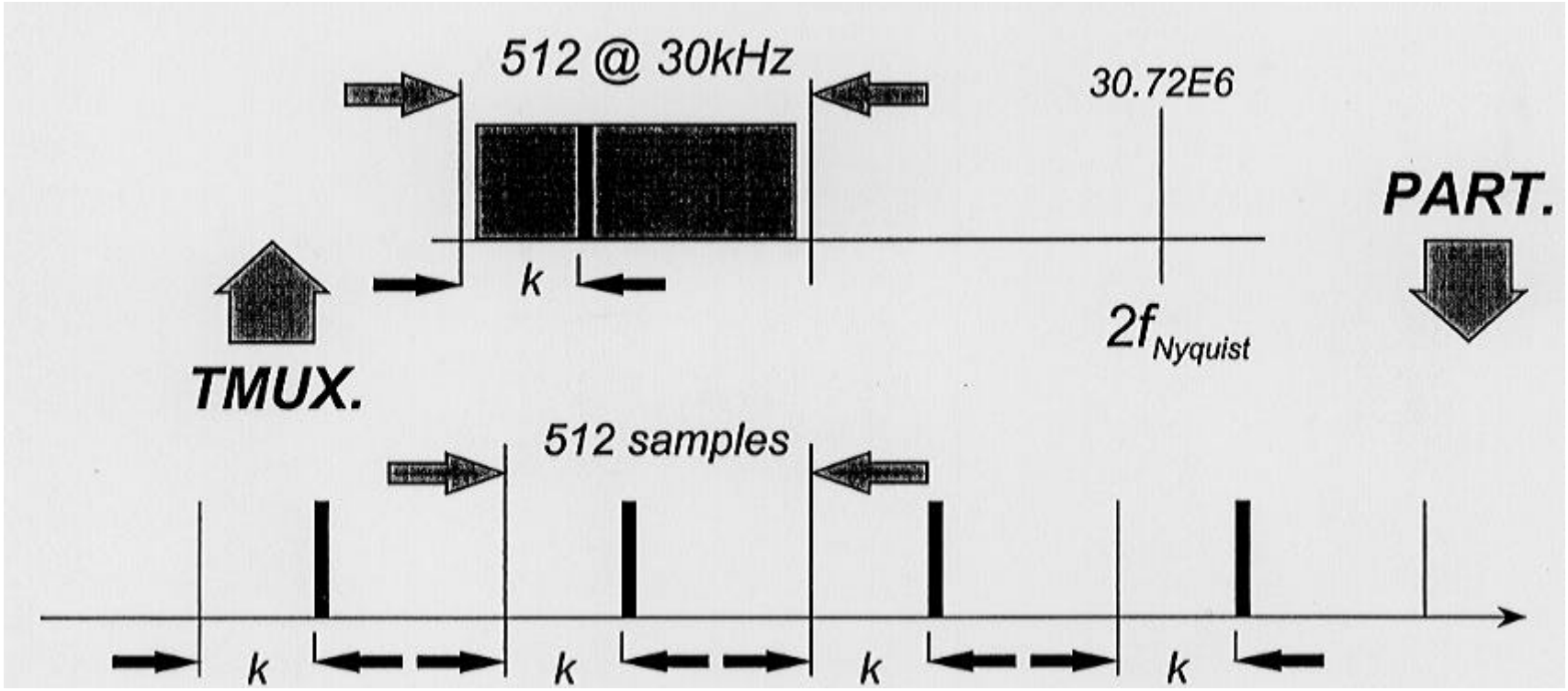
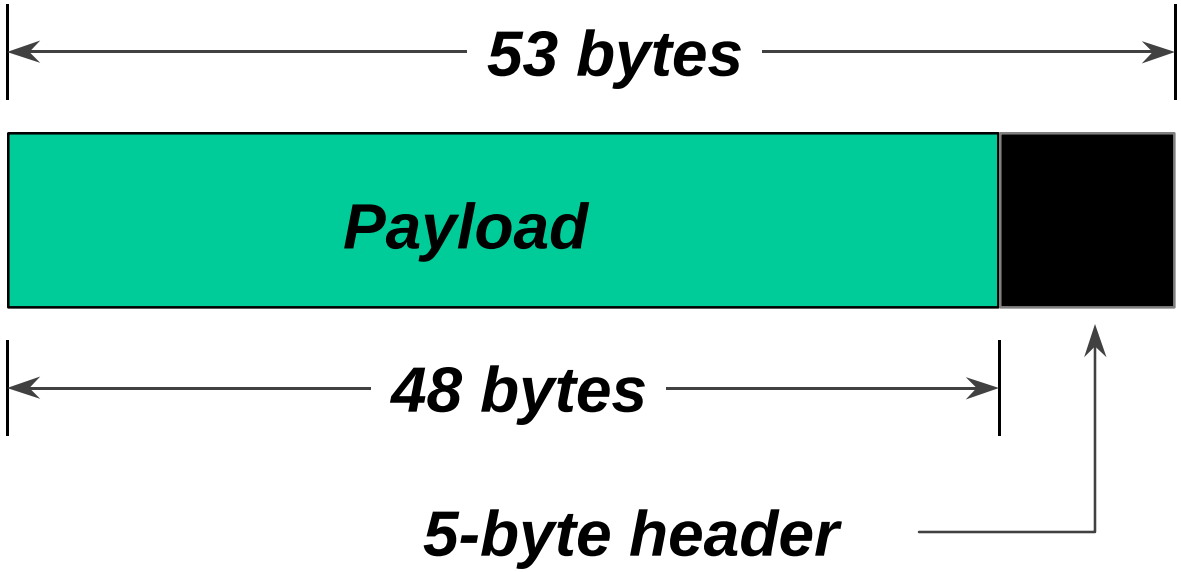
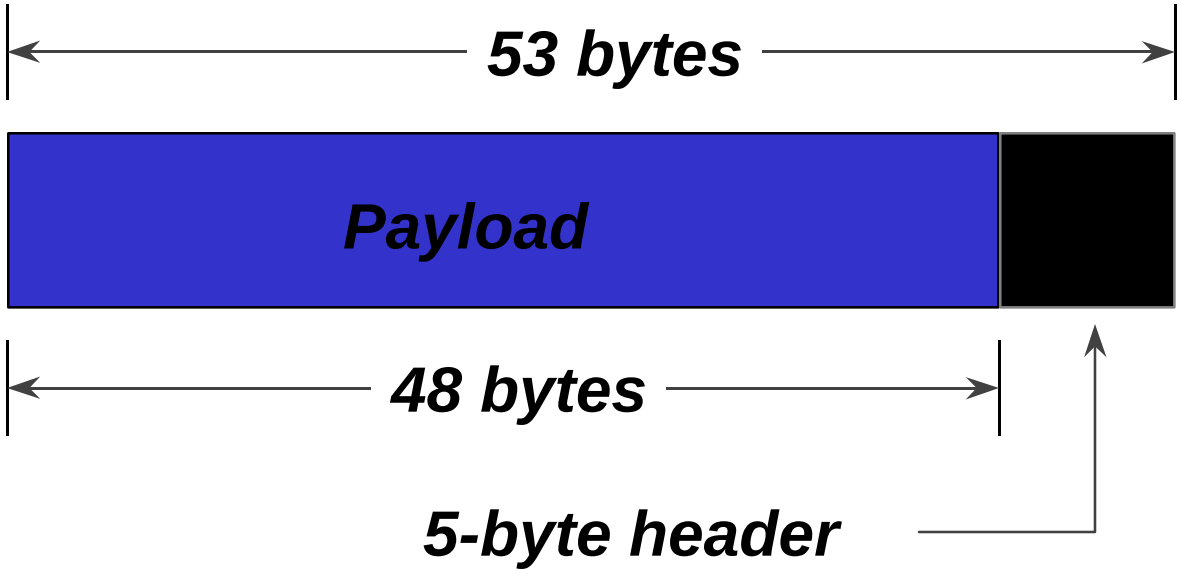


Asynchronous Transfer Mode



Standard ATM Packet Design

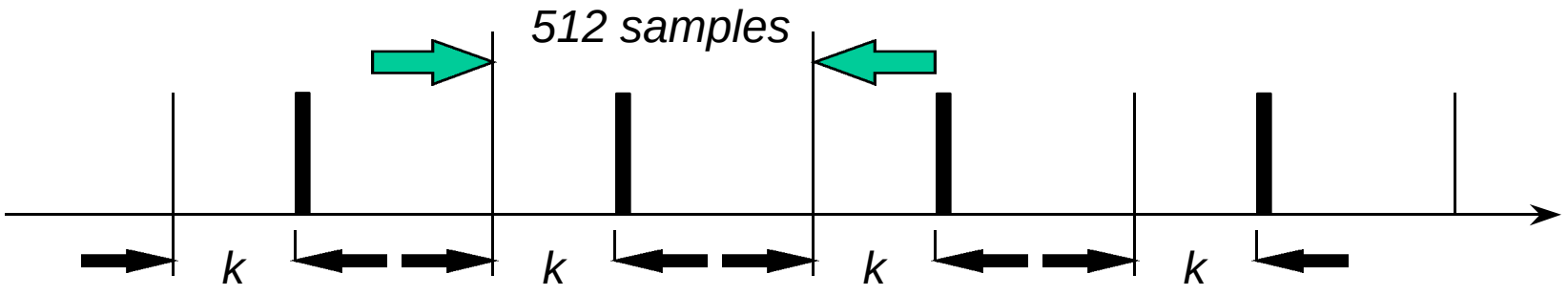
Asynchronous Transfer Mode



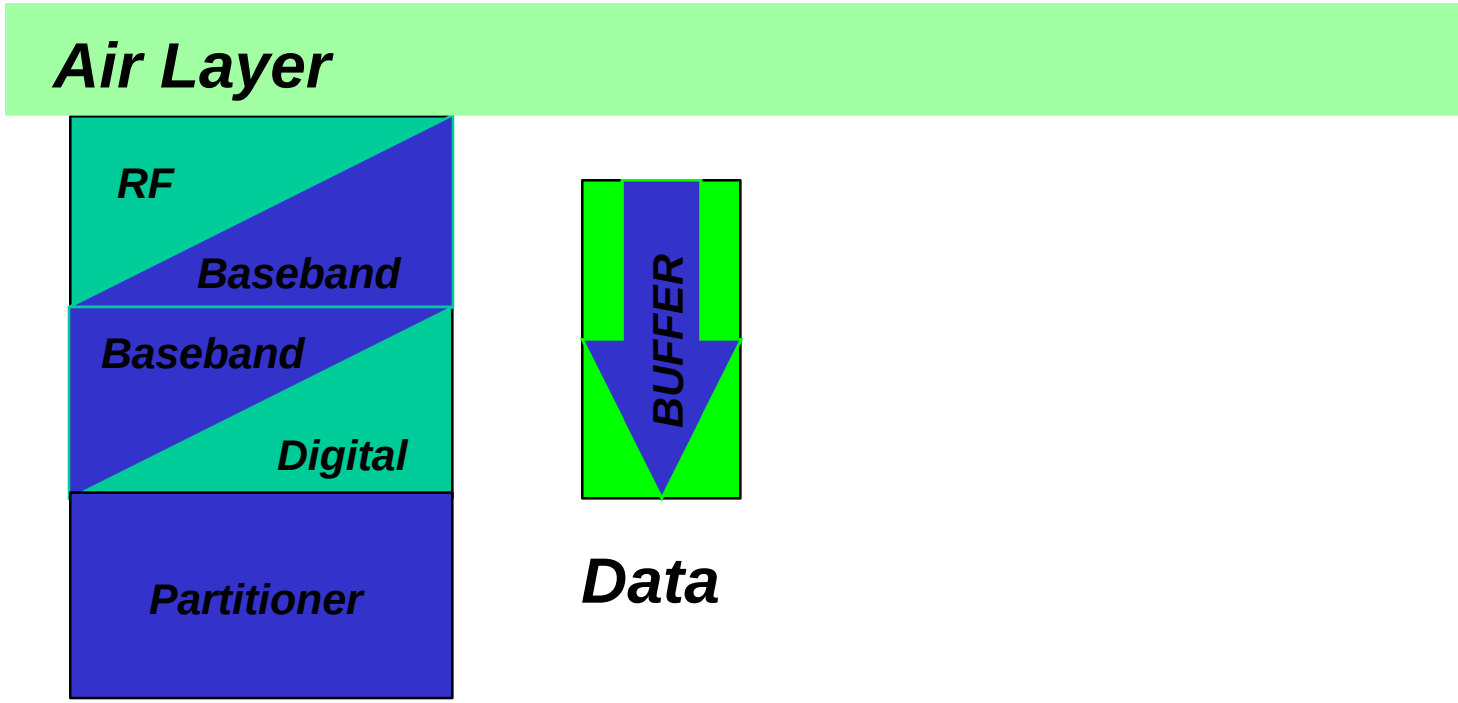
Standard ATM Packet Design

ATM Packetized RF Samples

- **Sample Rate for 30-kHz Channel = 60 kSamples/Sec.(12-bit samples)**
- **90 kbytes/Sec = 2000 ATM Packets/Sec**
- **OC-3c data payload transport rate = 135 Mbps**
- **OC-3c can support about 188 30-kHz channels**



Adaptation for Digital Transport



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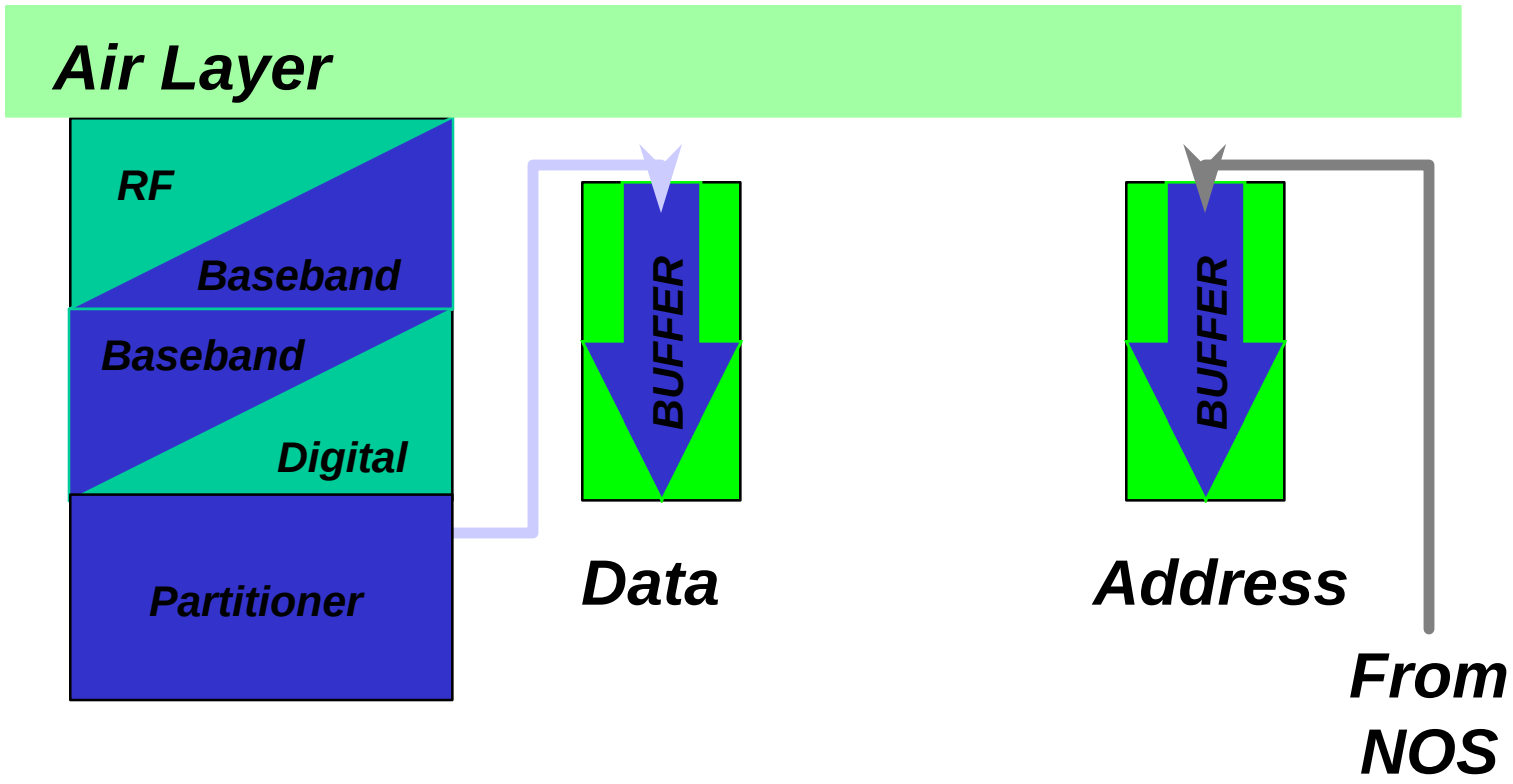

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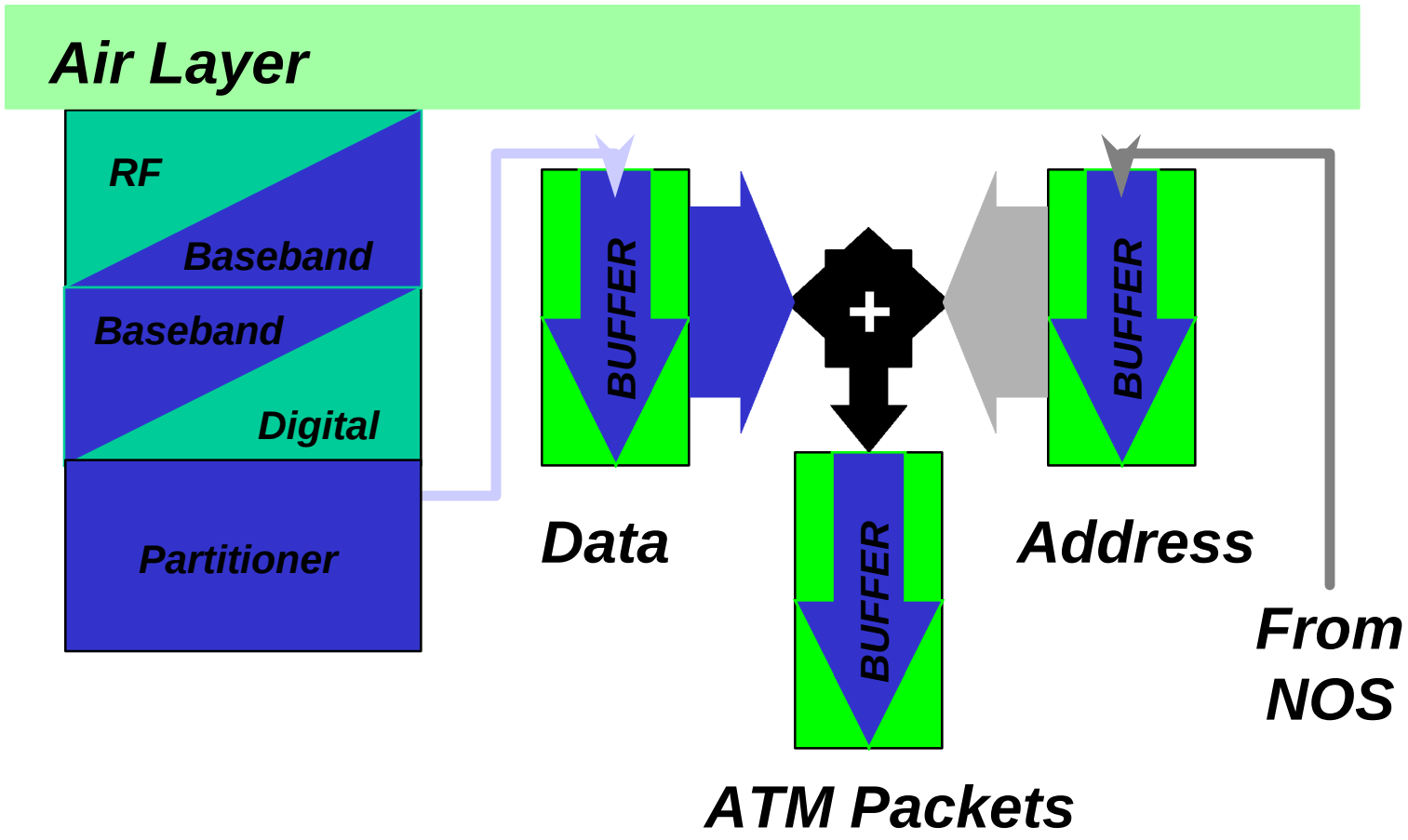

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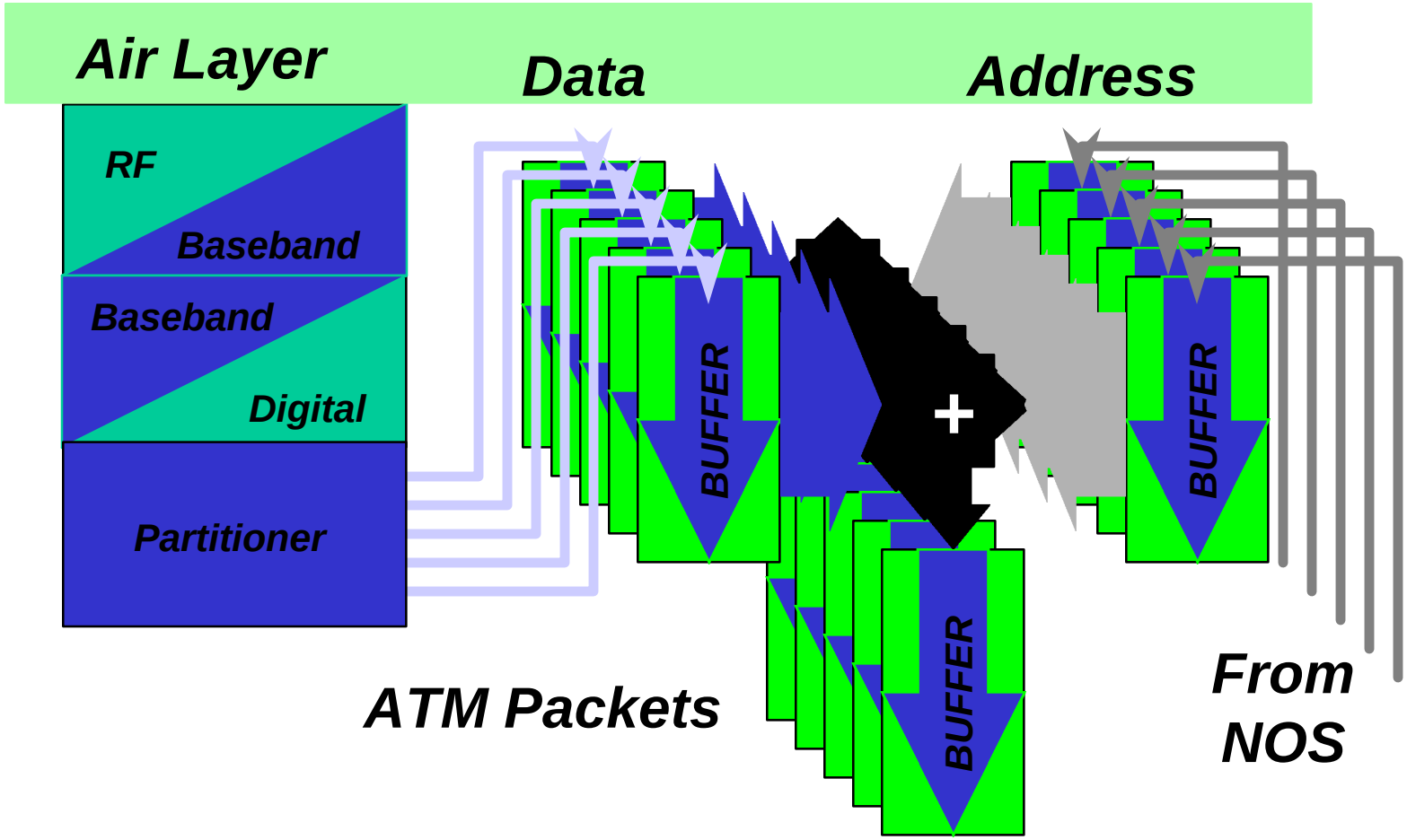
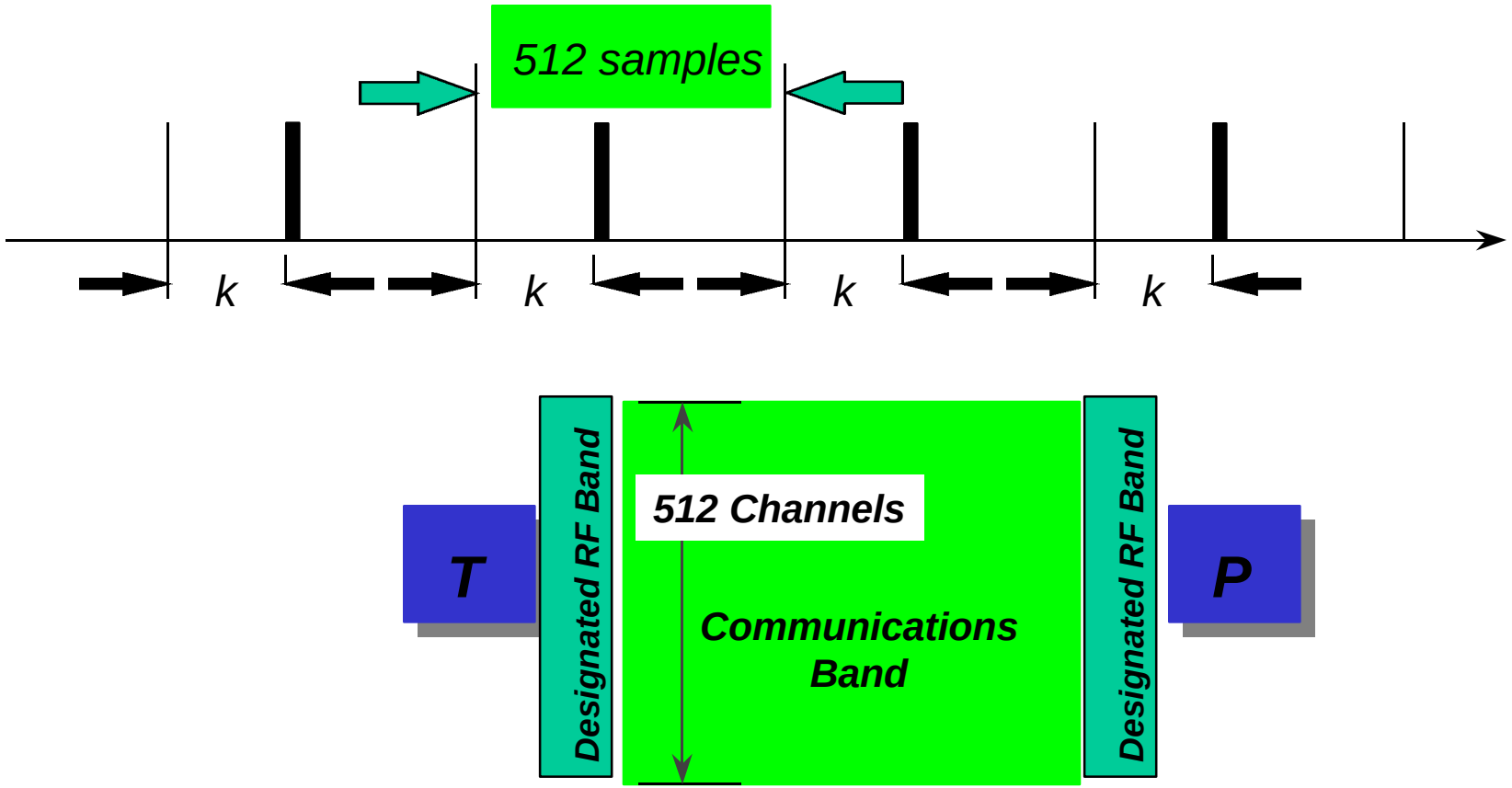


Addressing Spectrum Channels



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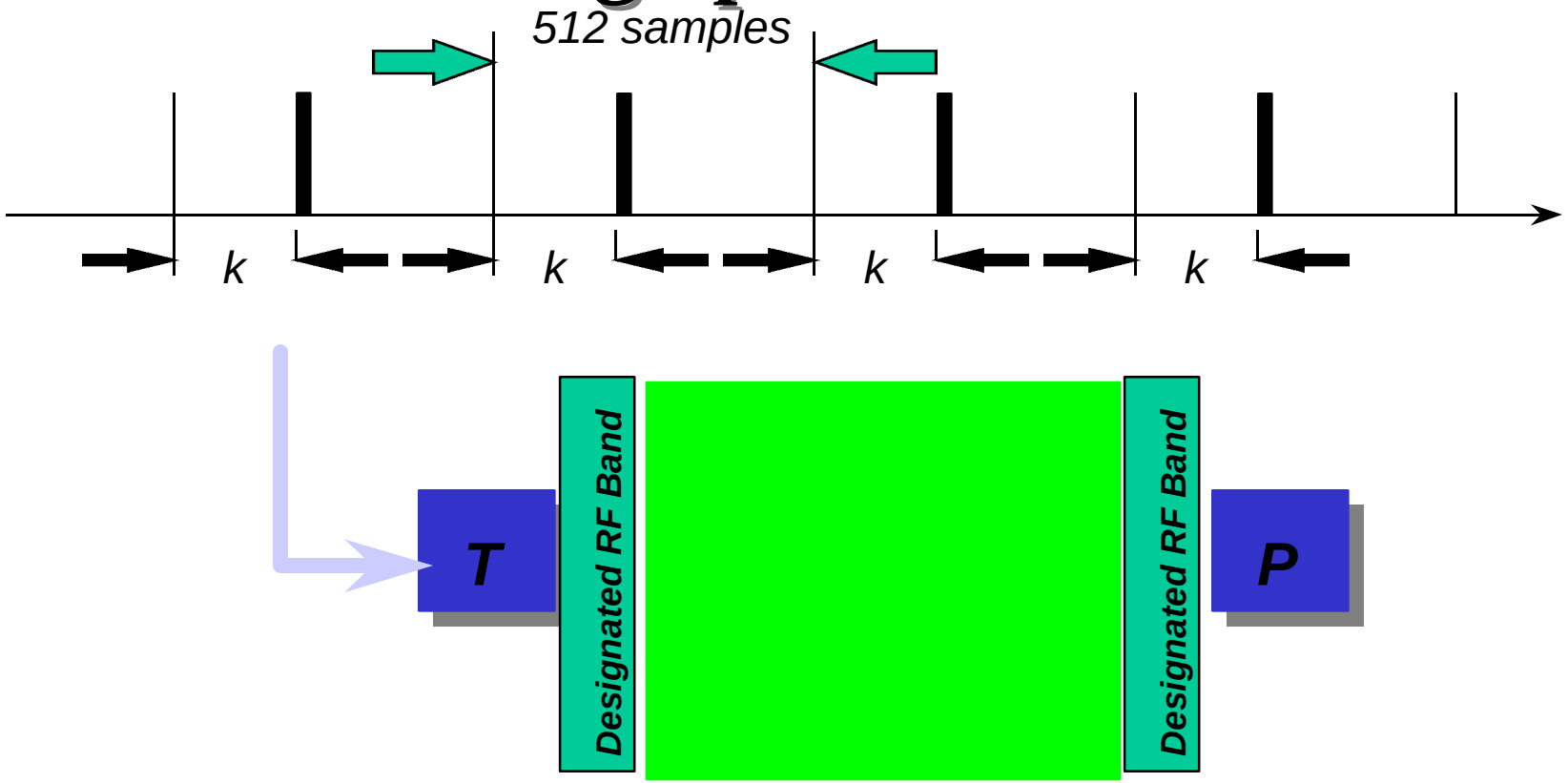

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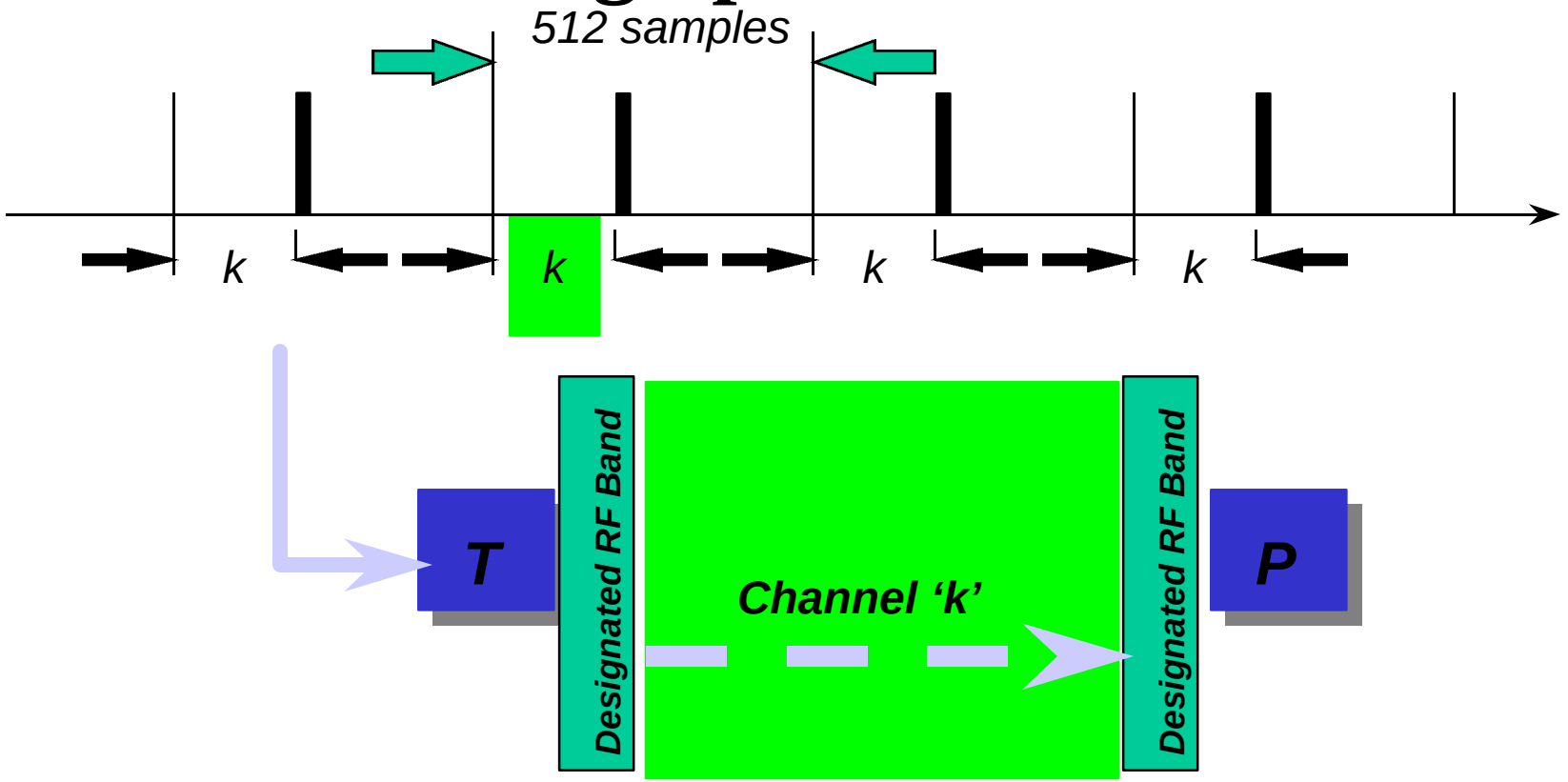

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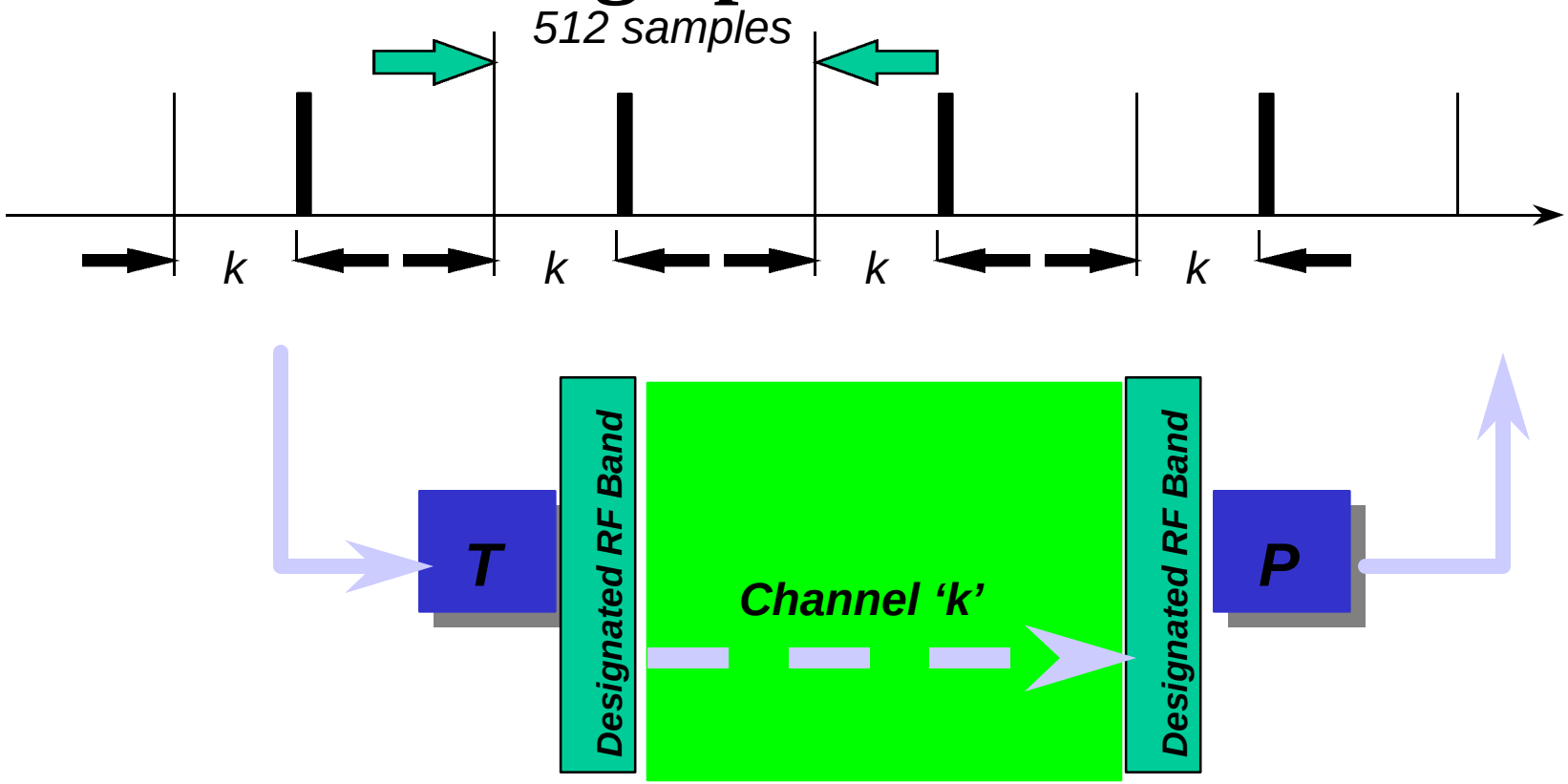

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