EIZO Rugged Solutions

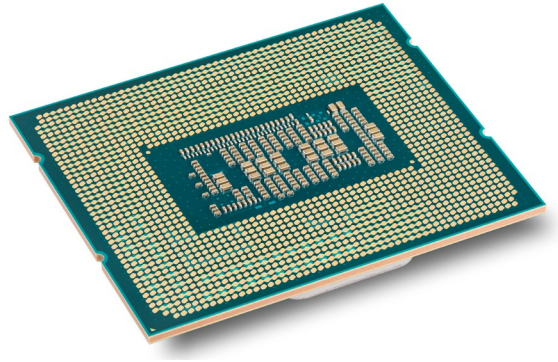
RUGGED VISUAL TECHNOLOGY FOR EVERY MISSION

EIZO Rugged Solutions

Using GPUs to Architect AI/ML Solutions that Align to MOSA's Objectives

Christopher Fadeley
Chief Technology Officer

GPUs Use – Rendering

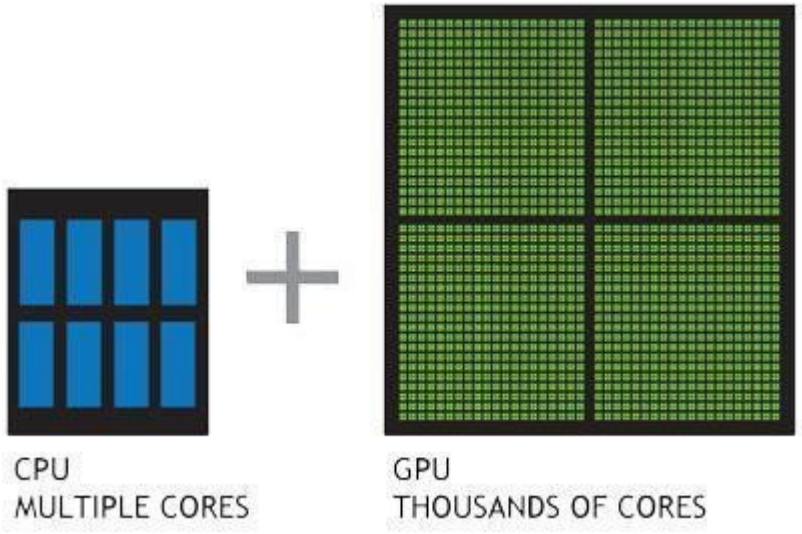


- Engine for graphics rendering
- Frees up CPU from the doing work

GPUs Use – Parallel Compute

~~Pixels~~

Anything



https://www.nvidia.com/en-us/glossary/data-science/tensorflow/

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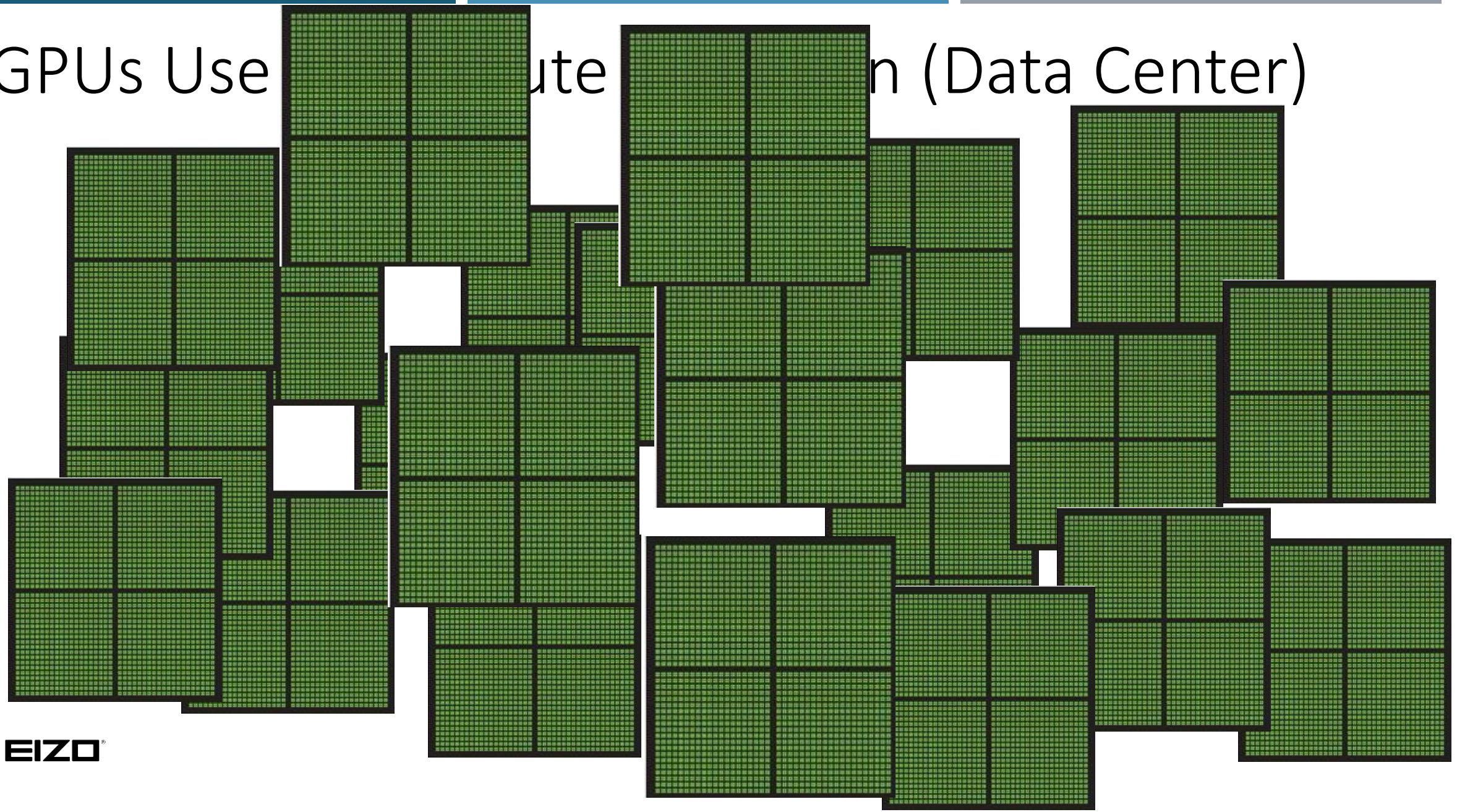
GPUs Use ute n (Data Center)



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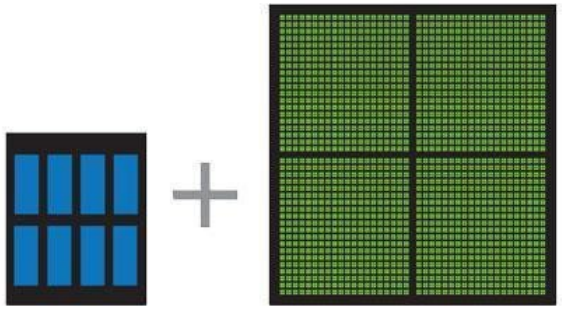
Why GPUs for Compute at **Embedded**?



What are we trying to Achieve with MOSA?

- Interoperability
- Reuse
- Future Proofing
- Reducing Cost
- Faster Tech Adoption/Refresh

"The beginning of wisdom is the definition of terms"

Ambiguous

What are we trying to Achieve with MOSA?

- Interoperability
- Reuse
- Future Proofing
- Reducing Cost
- Faster Tech Adoption/Refresh

- Short Term
- Long Term
- Upgrade
- Lifecycle
- Per unit
- Maintenance

What are we trying to Achieve with MOSA?

Solutions need to be designed with **Flexibility** to address the **Ambiguity**

Difficult to do in embedded space where SWaP is often top priority

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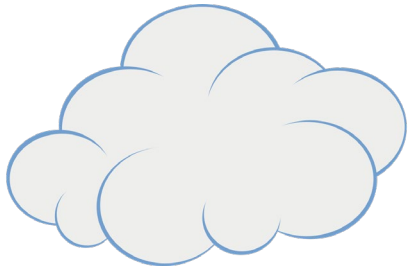
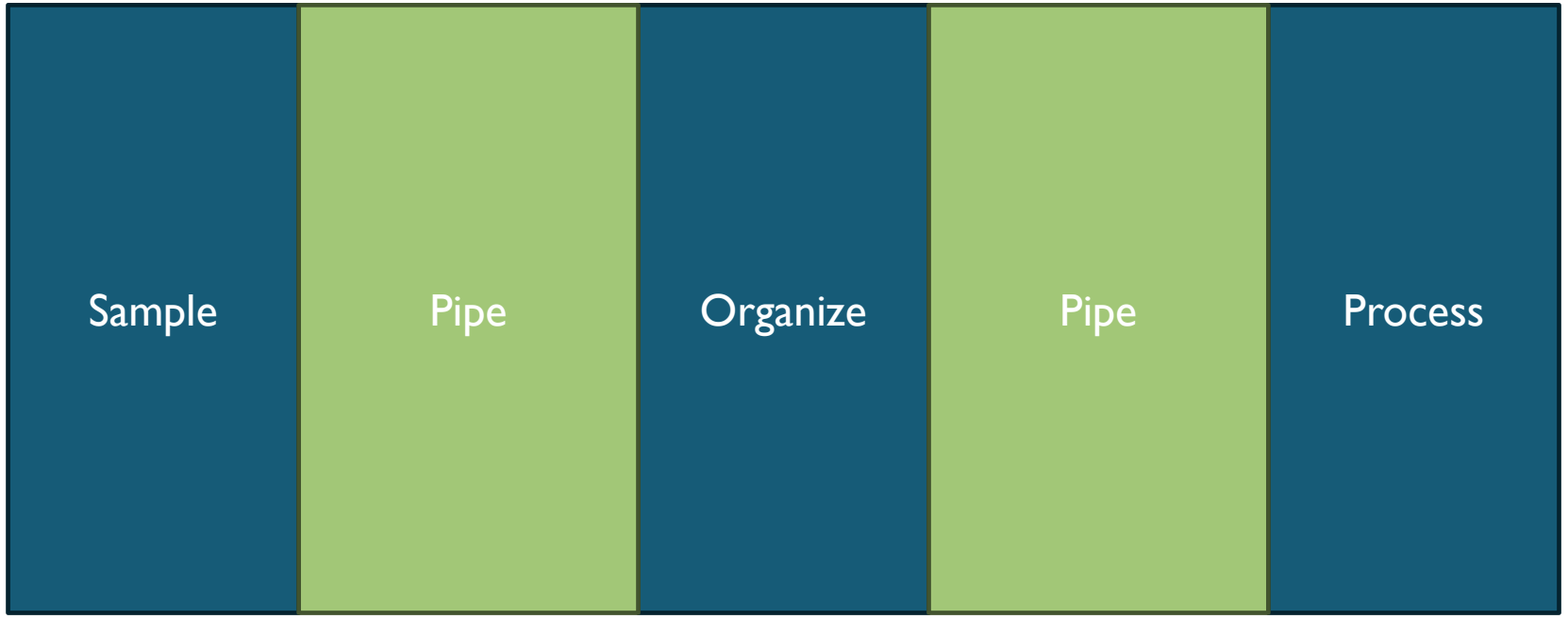
Partition of Workflow



Waves



Convert
waves to Data

Make it
“processable” data

Do something
with the data

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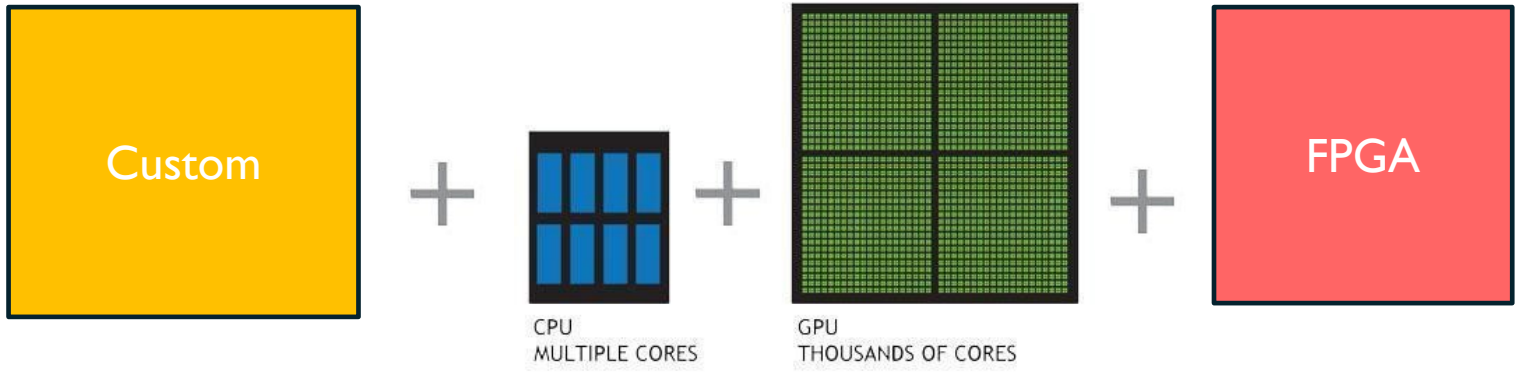
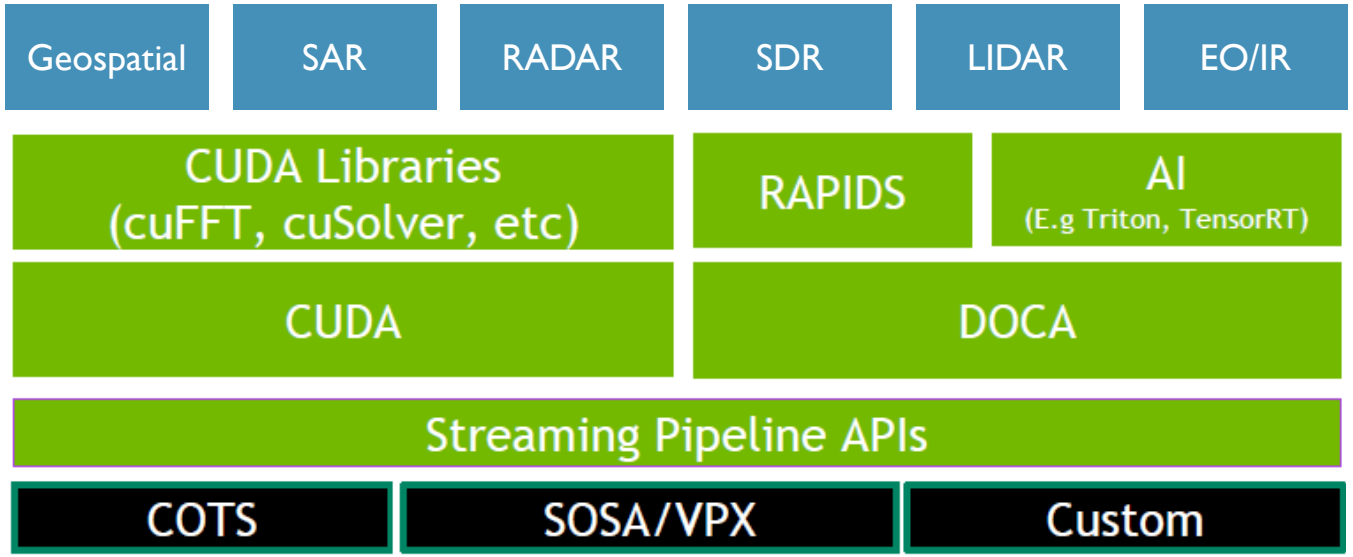
Why GPUs for Compute at **Embedded**?



- GPUs are the true **software defined** processing compute engine



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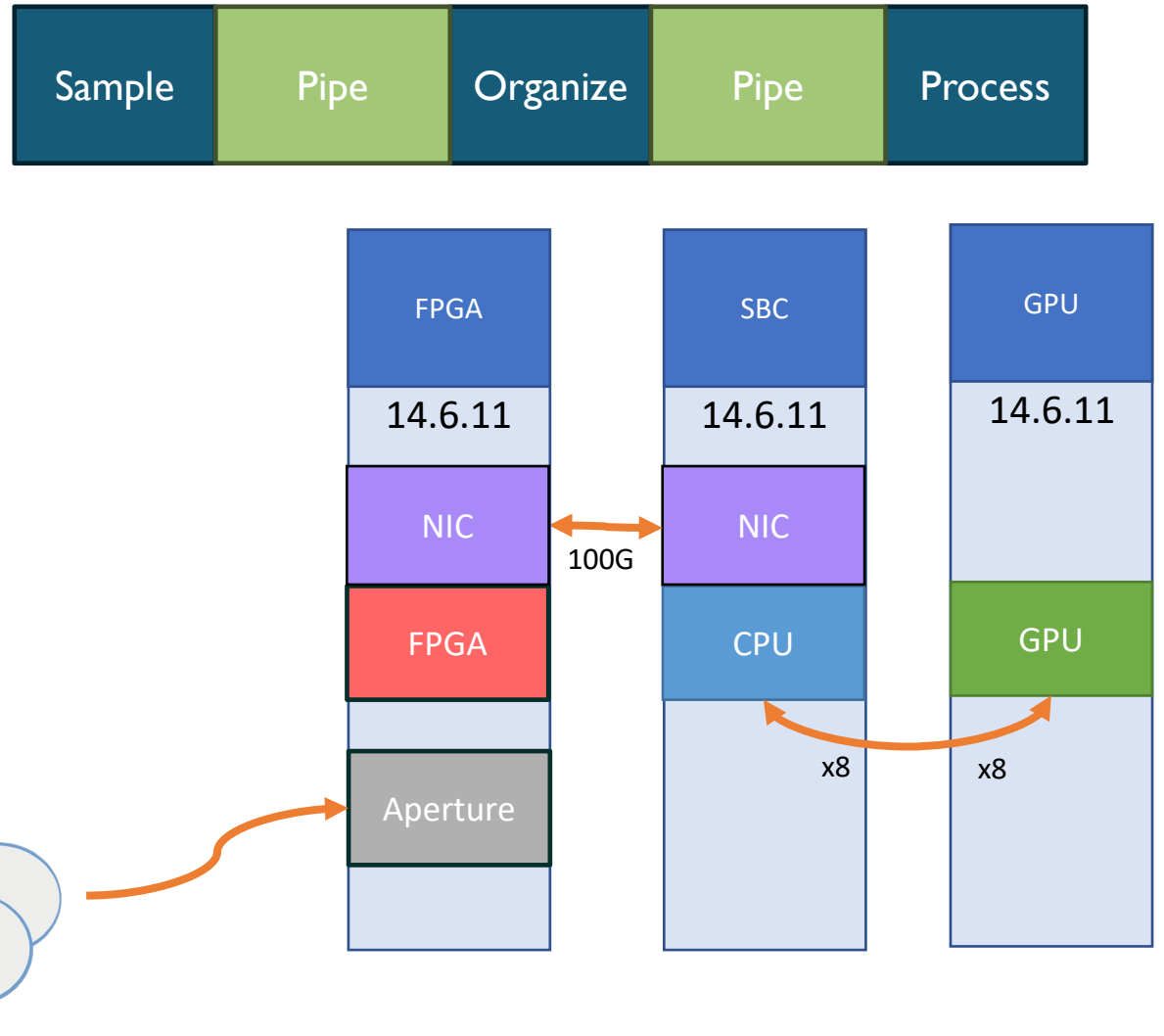
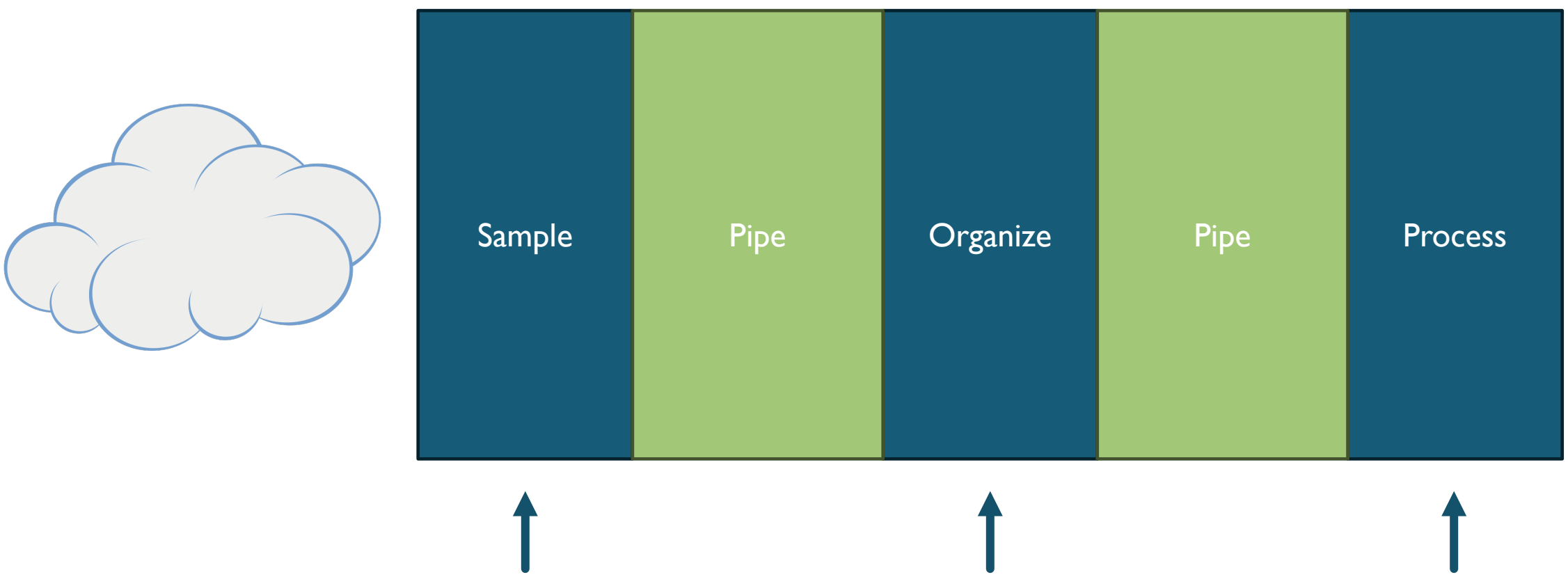
VPX Work Flow



Bottlenecks and Efficiency



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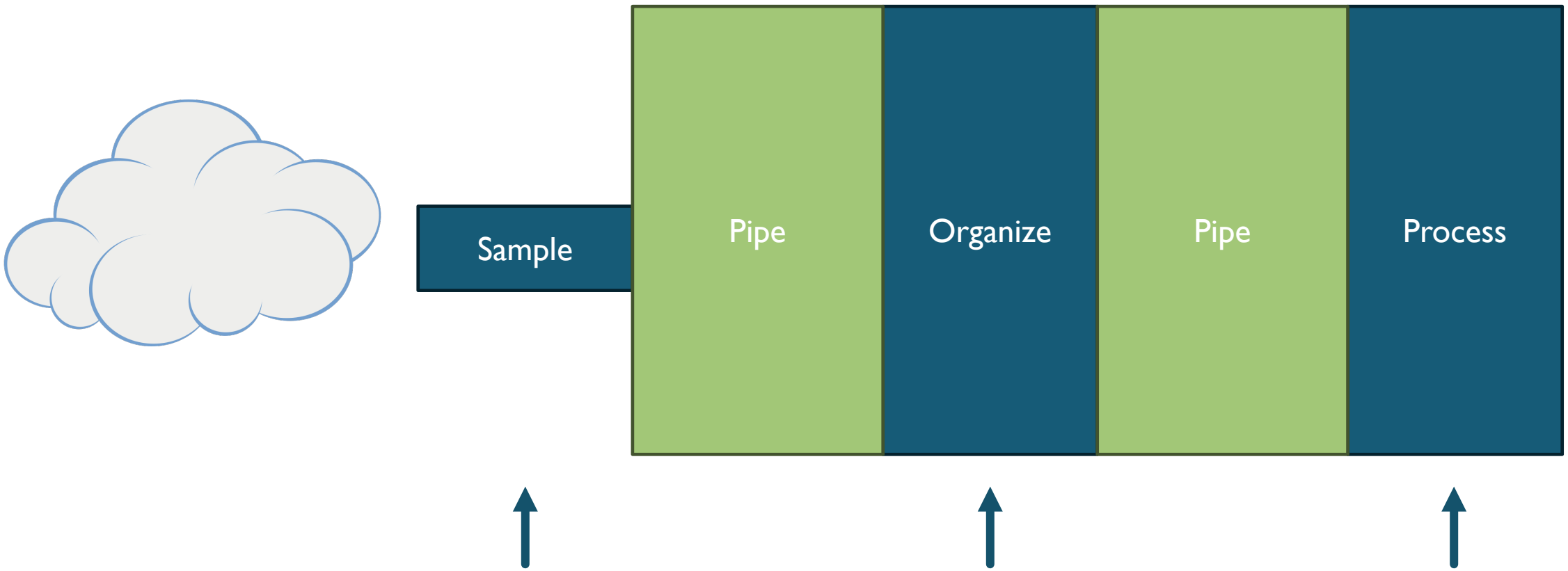

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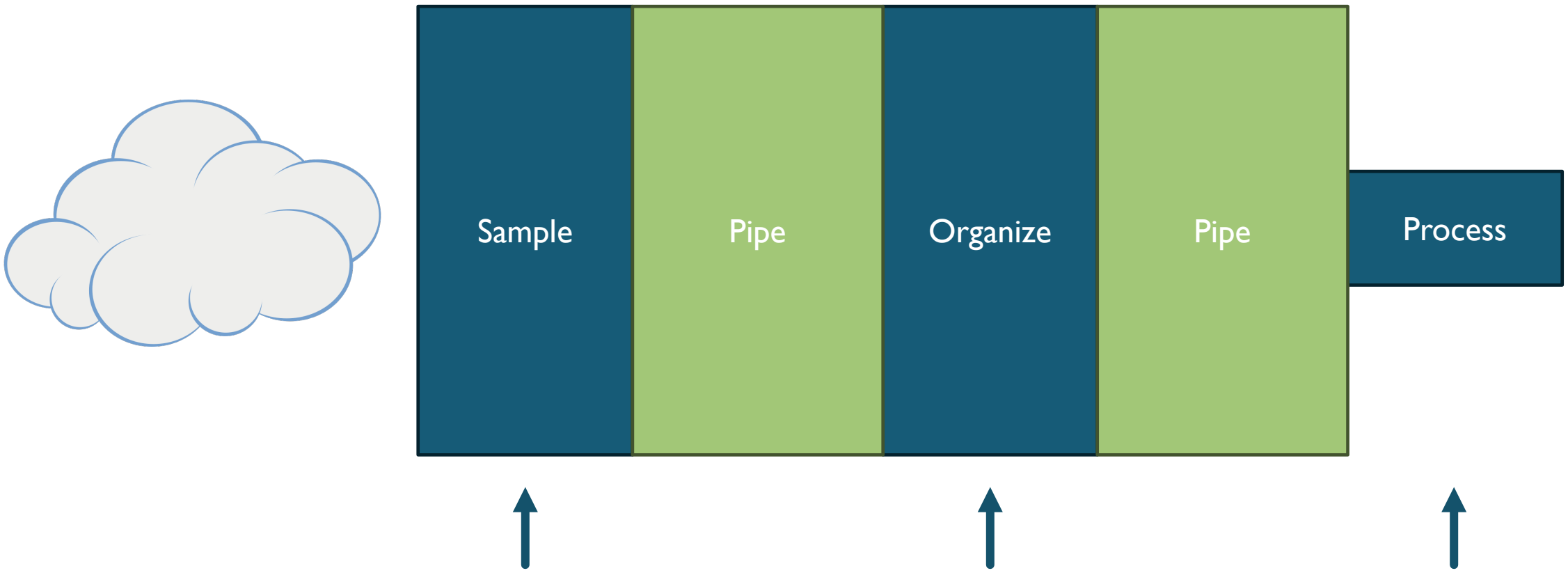
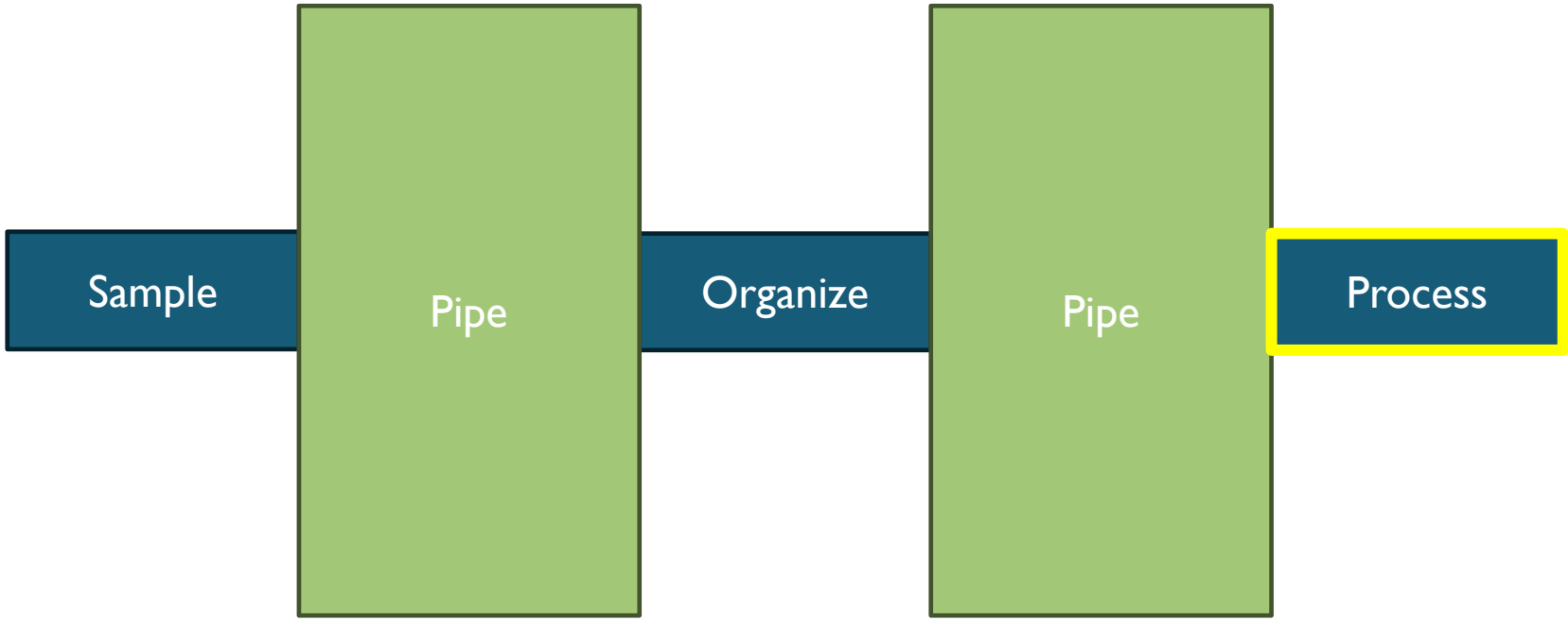


VPX Data Flow

GPU Class	Power
A500	10W-45W
A2000	26W-60W
A4500	46W-115W



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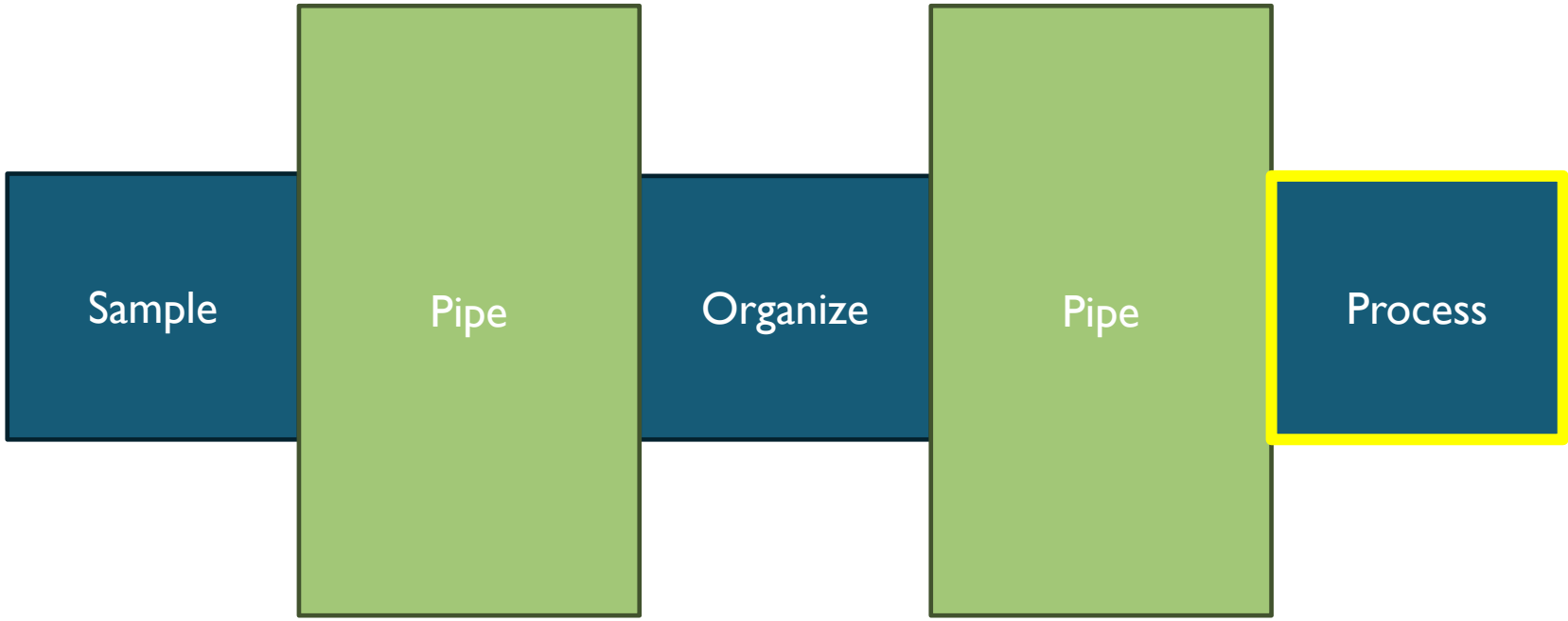

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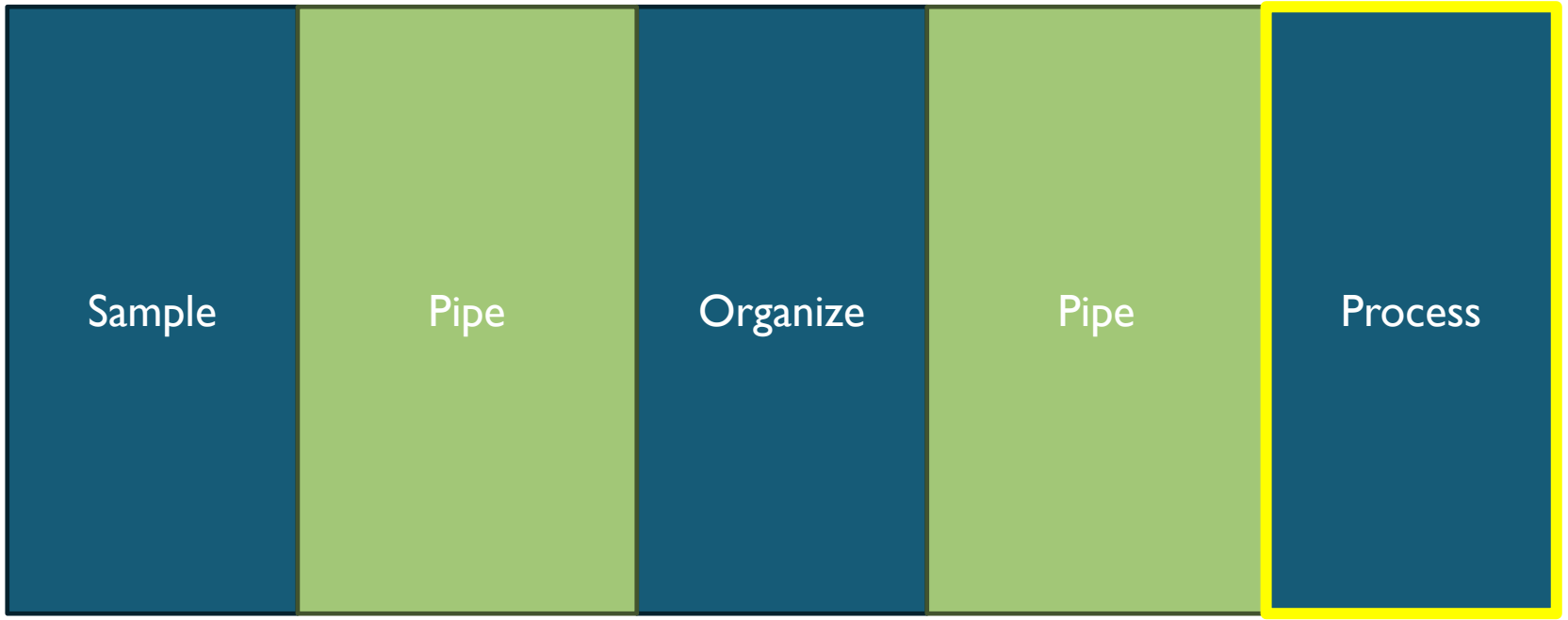

With GPUs, the **software** just works regardless of scale

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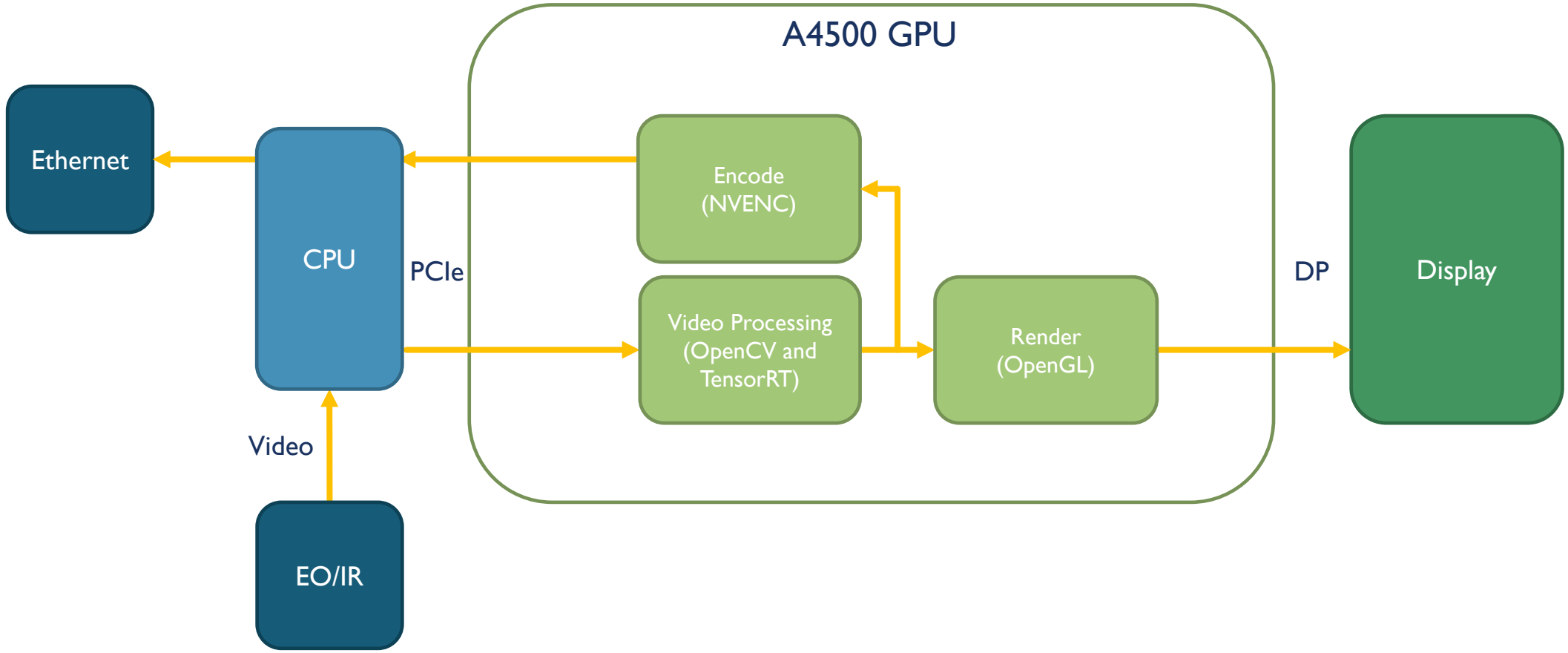
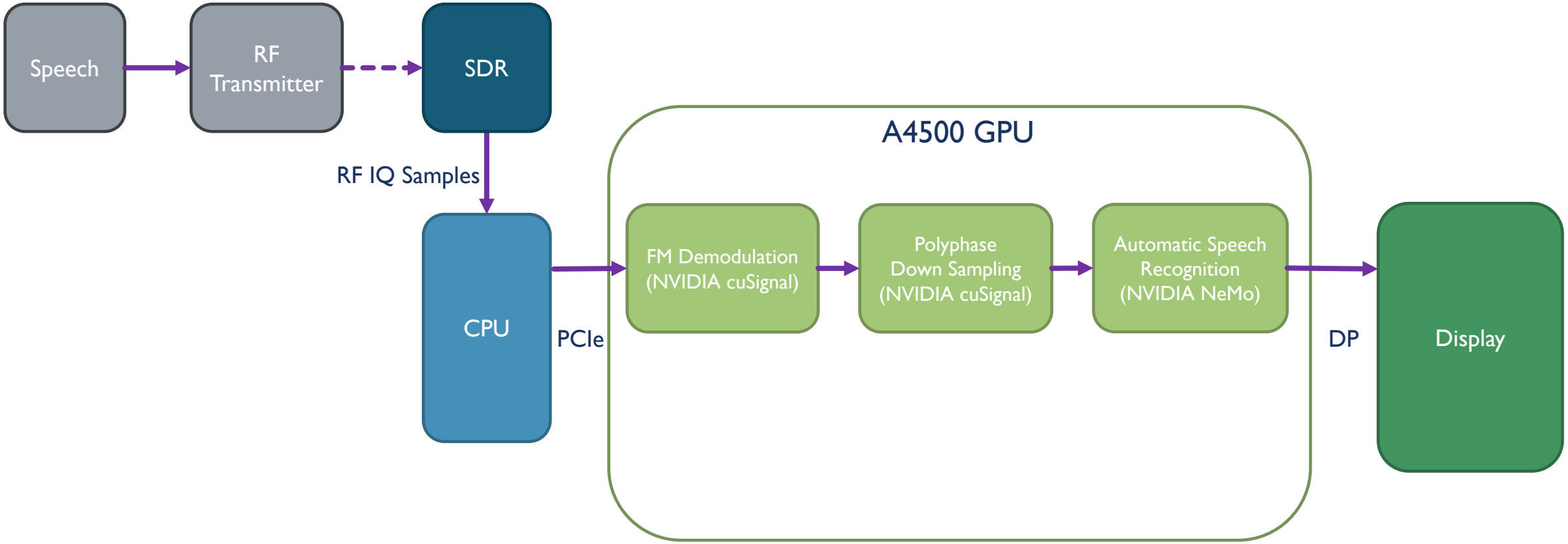
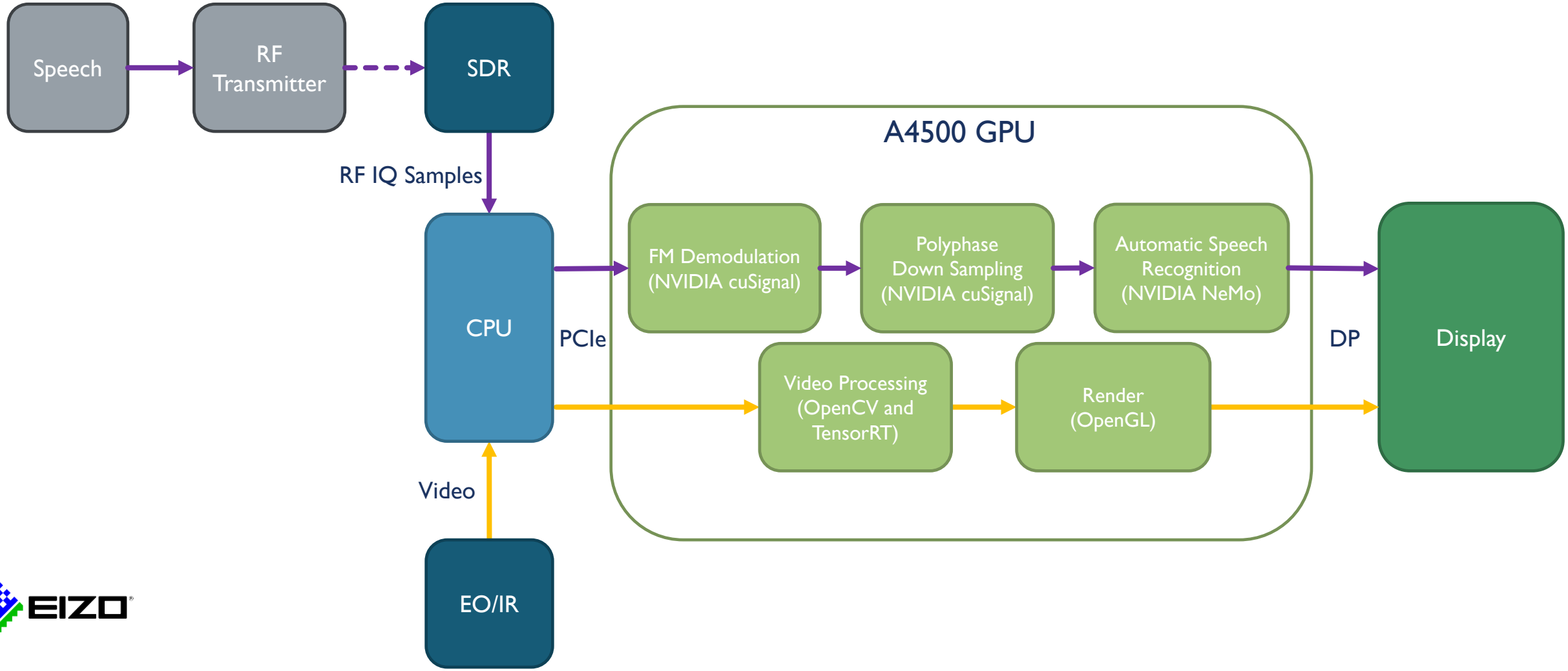
Multi Modality Flexibility



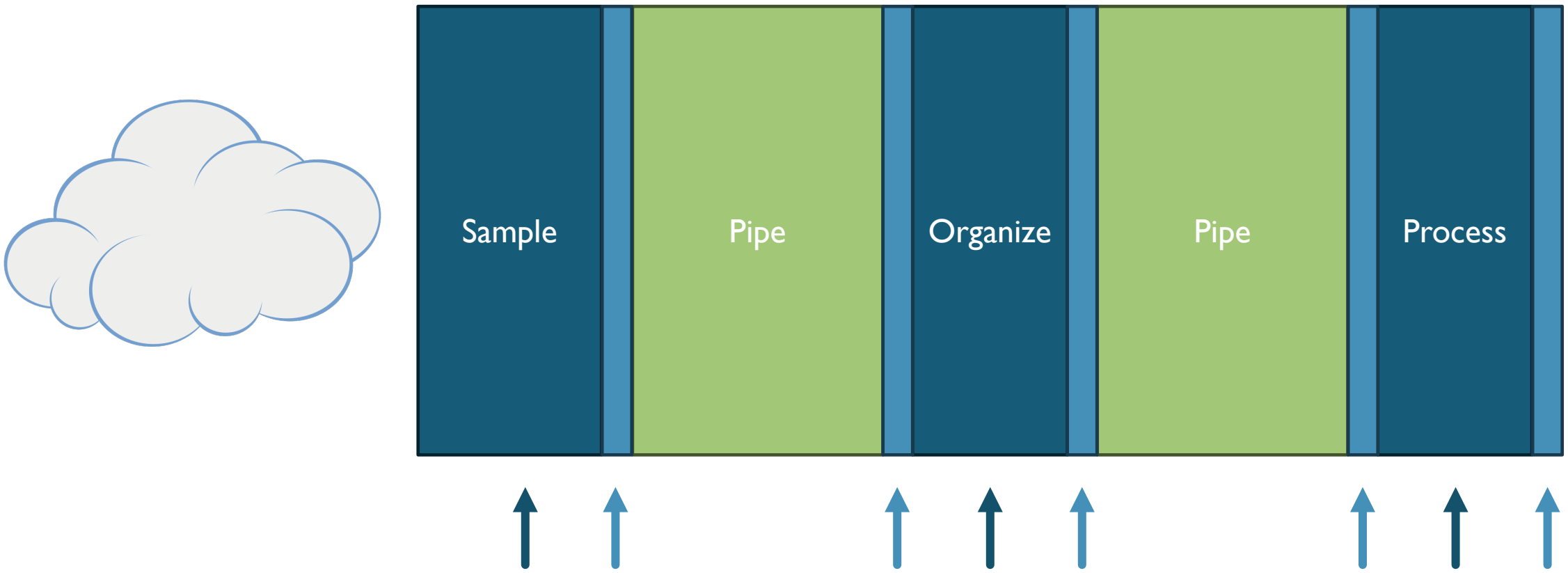
Multi Modality Flexibility



Multi Modality Flexibility

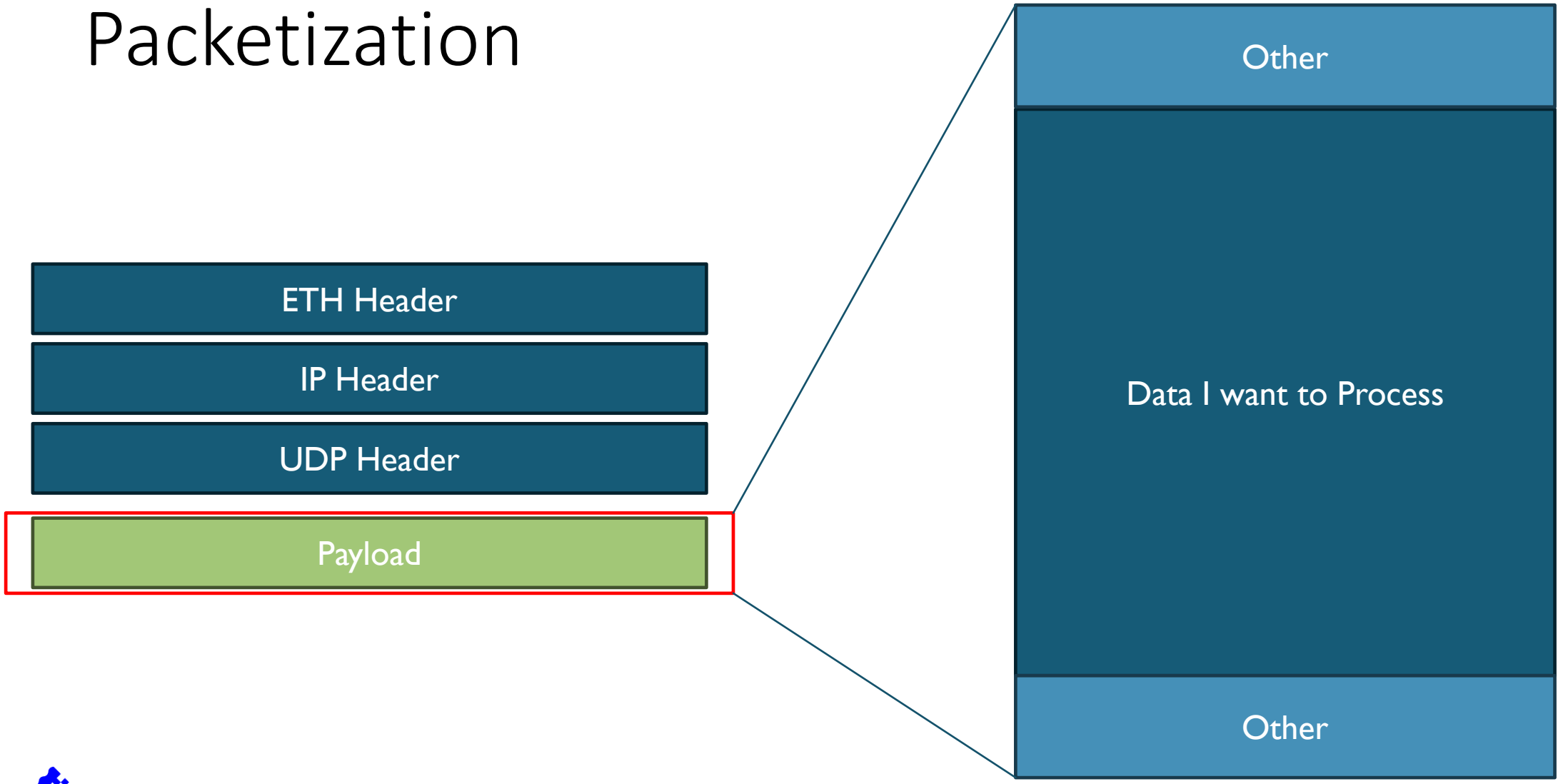


Hardware vs Software

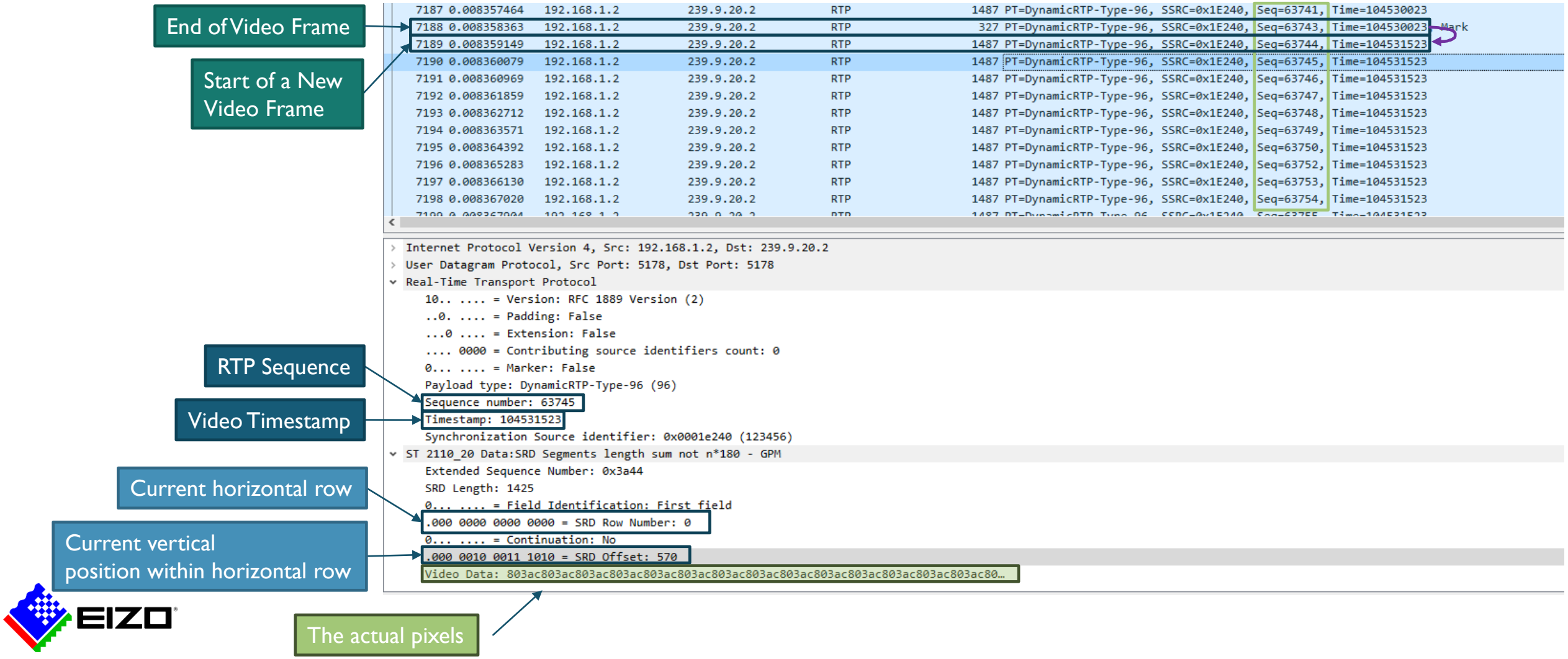


Software: Packetization and Delivery

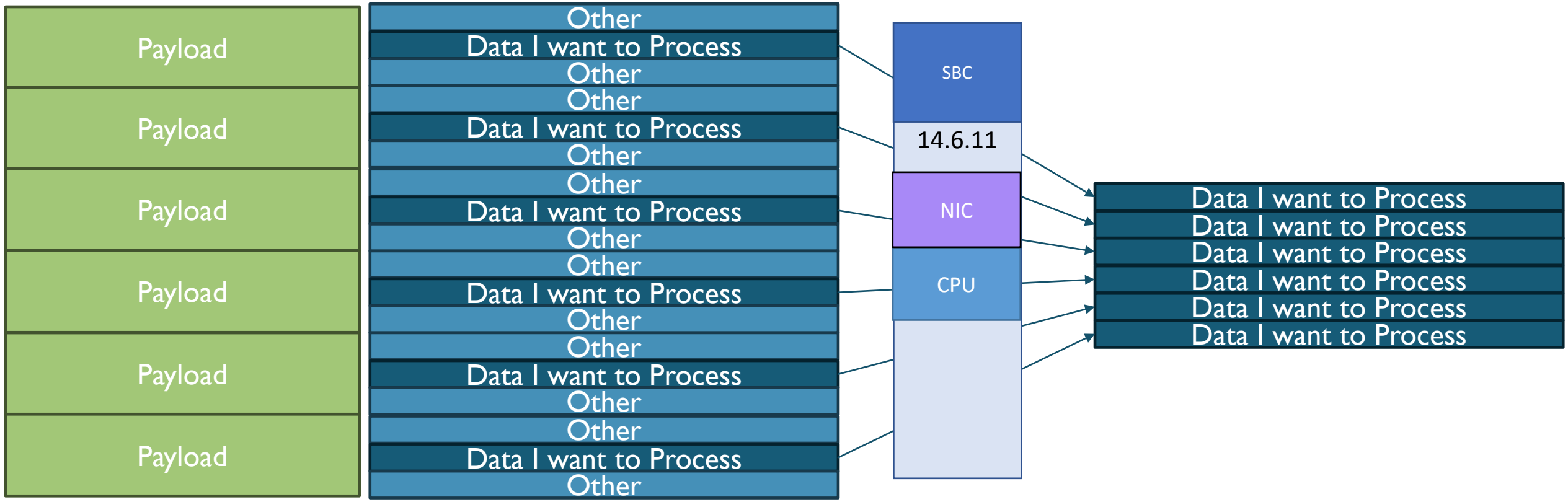
Packetization



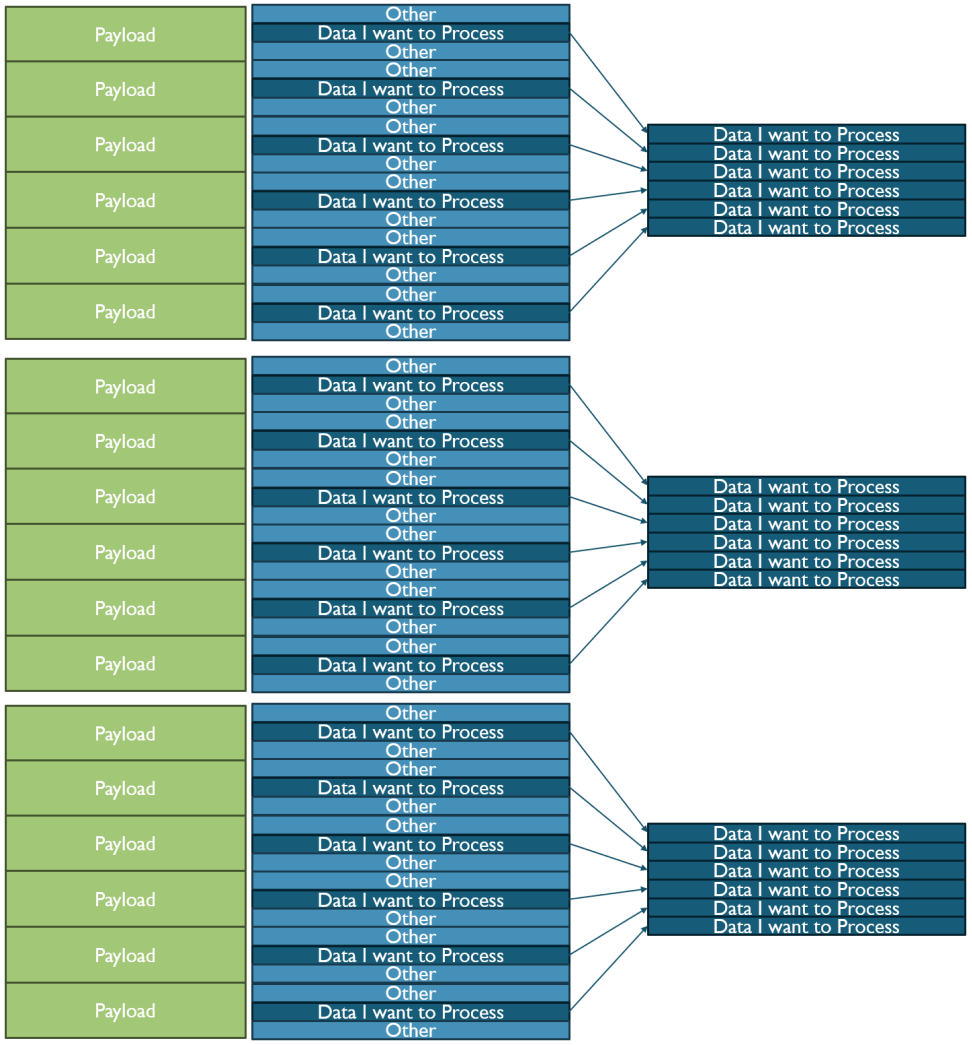
Packetization: ST2110 EO/IR



Packetization



Ethernet Scaling



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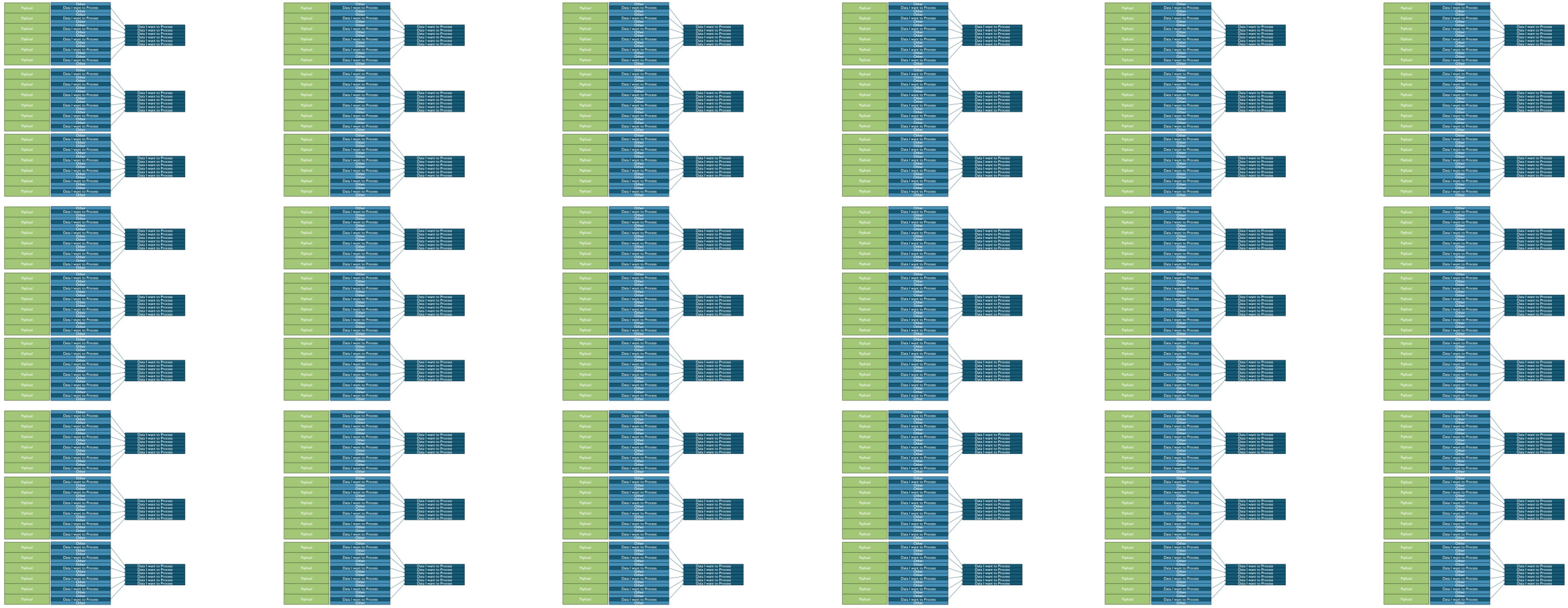
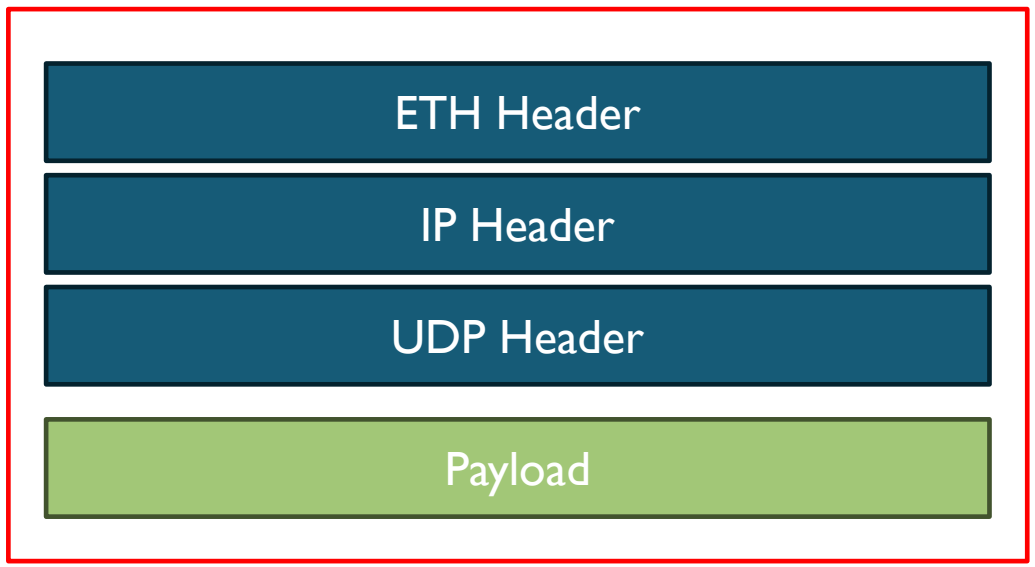
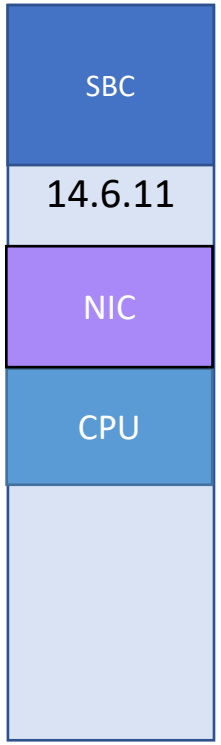


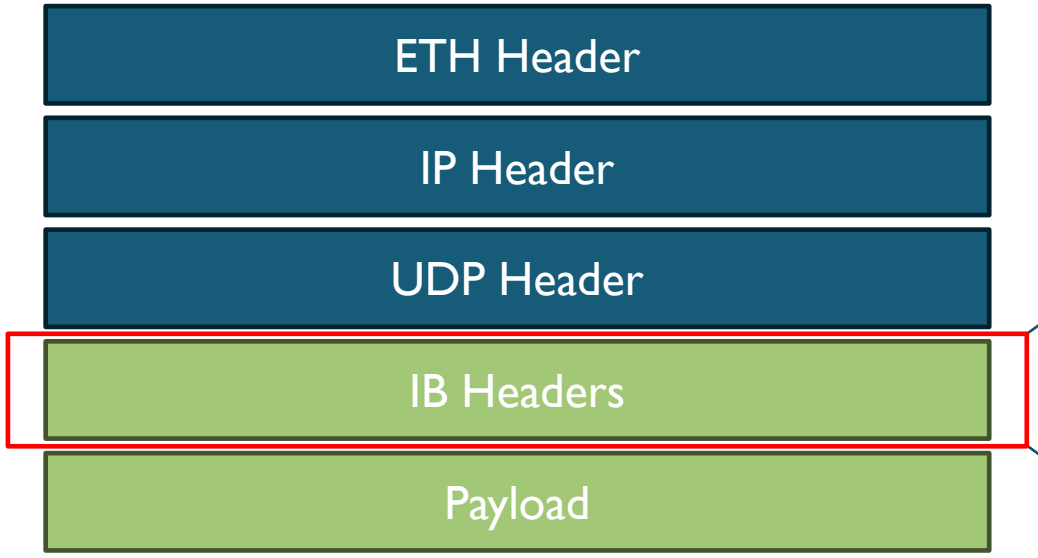
Can’t Keep Up

Delivery





RoCE (RDMA over Converged Ethernet)




```
Frame 12: 138 bytes on wire (1104 bits), 138 bytes captured (1104 bits)
Ethernet II, Src: Mellanox_30:10:3a (b8:ce:f6:30:10:3a), Dst: Mellanox_30:10:3a (b8:ce:f6:30:10:3a)
Internet Protocol Version 4, Src: 192.168.1.2, Dst: 192.168.1.2
User Datagram Protocol, Src Port: 50148, Dst Port: 4791
    Source Port: 50148
    Destination Port: 4791
    Length: 104
    Checksum: 0x0000 [zero-value ignored]
    [Stream index: 0]
    [Timestamps]
    UDP payload (96 bytes)
InfiniBand
    Base Transport Header
        Opcode: Reliable Connection (RC) - RDMA WRITE Only (10)
        0... .... = Solicited Event: False
        .1.. .... = MigReq: True
        ..00 .... = Pad Count: 0
        .... 0000 = Header Version: 0
        Partition Key: 65535
        Reserved: 00
        Destination Queue Pair: 0x000112
        1... .... = Acknowledge Request: True
        .000 0000 = Reserved (7 bits): 0
        Packet Sequence Number: 11089513
    RETH - RDMA Extended Transport Header
        Virtual Address: 0x000055ab433e3570
        Remote Key: 0x002008b7
        DMA Length: 64 (0x00000040)
    Invariant CRC: 0x49d05774
Data (64 bytes)
    Data: 72646d612d70696e672d303a204142434445464748494a4b4c4d4e4f5051525354555657…
    [Length: 64]
```

RoCE Write

RoCE Setup

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.1.2	192.168.1.2	RRoCE	322	CM: ConnectRequest
3	0.004333	192.168.1.2	192.168.1.2	RRoCE	322	CM: ConnectReply
5	0.005201	192.168.1.2	192.168.1.2	RRoCE	322	CM: ReadyToUse
7	0.005202	192.168.1.2	192.168.1.2	RRoCE	74	RC Send Only QP=0x000113
9	0.005203	192.168.1.2	192.168.1.2	RRoCE	62	RC Acknowledge QP=0x000112
11	0.005349	192.168.1.2	192.168.1.2	RRoCE	74	RC RDMA Read Request QP=0x000112
13	0.005350	192.168.1.2	192.168.1.2	RRoCE	126	RC RDMA Read Response Only QP=0x000113
15	0.005438	192.168.1.2	192.168.1.2	RRoCE	74	RC Send Only QP=0x000112
17	0.005439	192.168.1.2	192.168.1.2	RRoCE	62	RC Acknowledge QP=0x000113
19	0.005546	192.168.1.2	192.168.1.2	RRoCE	74	RC Send Only QP=0x000113
21	0.005547	192.168.1.2	192.168.1.2	RRoCE	62	RC Acknowledge QP=0x000112
23	0.005661	192.168.1.2	192.168.1.2	RRoCE	138	RC RDMA Write Only QP=0x000112
25	0.005661	192.168.1.2	192.168.1.2	RRoCE	62	RC Acknowledge QP=0x000113
27	0.005739	192.168.1.2	192.168.1.2	RRoCE	74	RC Send Only QP=0x000112
29	0.005836	192.168.1.2	192.168.1.2	RRoCE	62	RC Acknowledge QP=0x000113

Establish connection with RDMA Connection Manager

Client sends 1st buffer location

Server reads buffer contents with RDMA

Client sends 2nd buffer location

Server writes to buffer with RDMA

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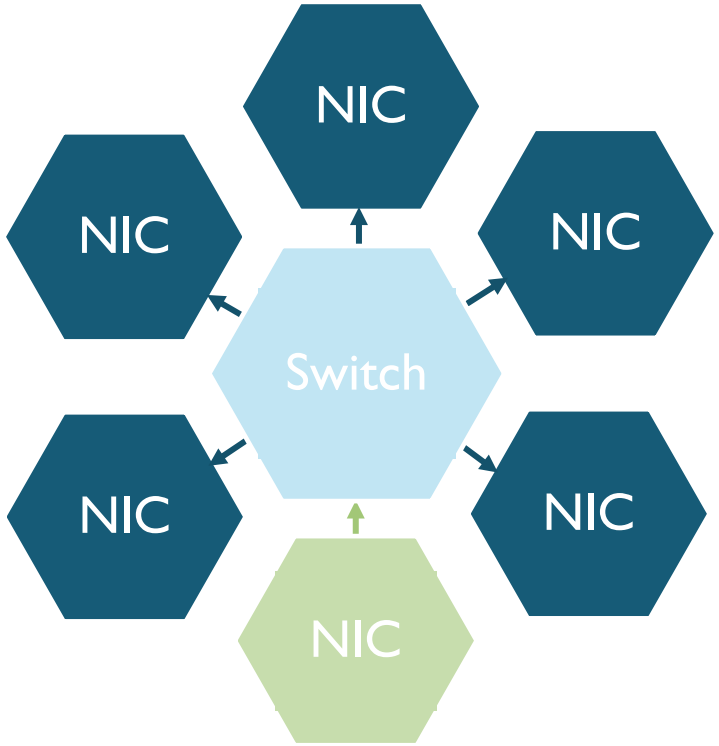
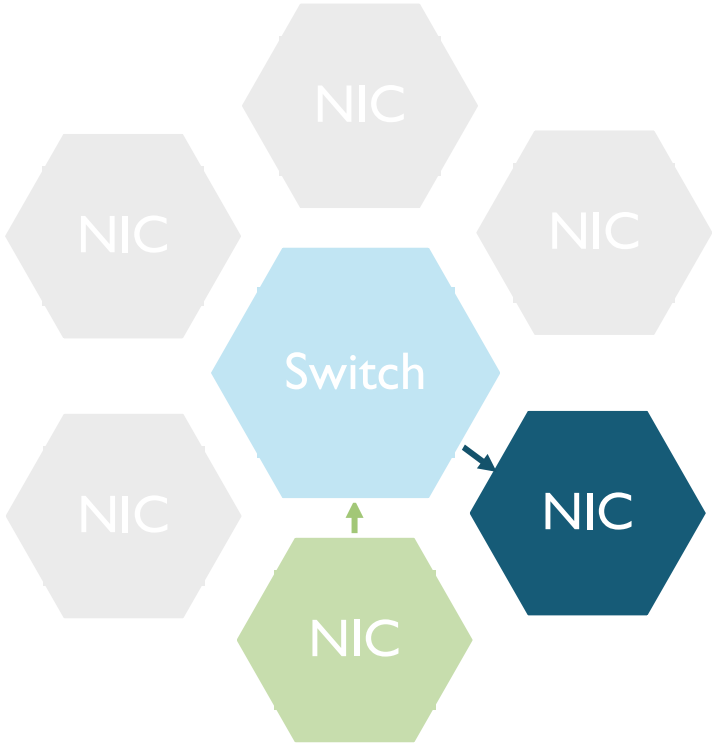
Standard Ethernet



Multicast and Connectionless

RoCE



Point to Point

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What do we do?

Cross Functional Approach to Open Solutions

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