


计算机科学与工程学院

School of Computer Science and Engineering

dshen@seu.edu.cn

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- ChatGPT
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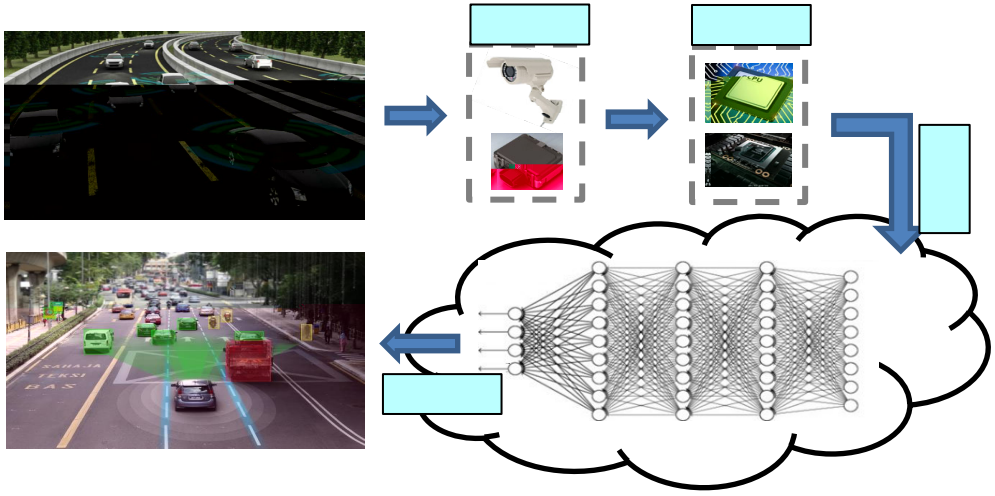
Training Type	Cluster Configuration	Training Time
Finetune	A100-80G*8	One week
Reward Model	A100-80G*24	One week
Training ChatGPT	A100-80G*160	One week



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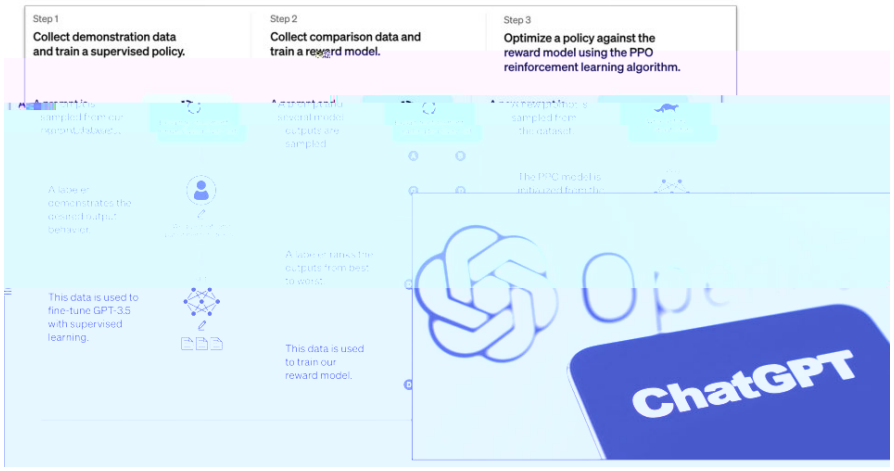
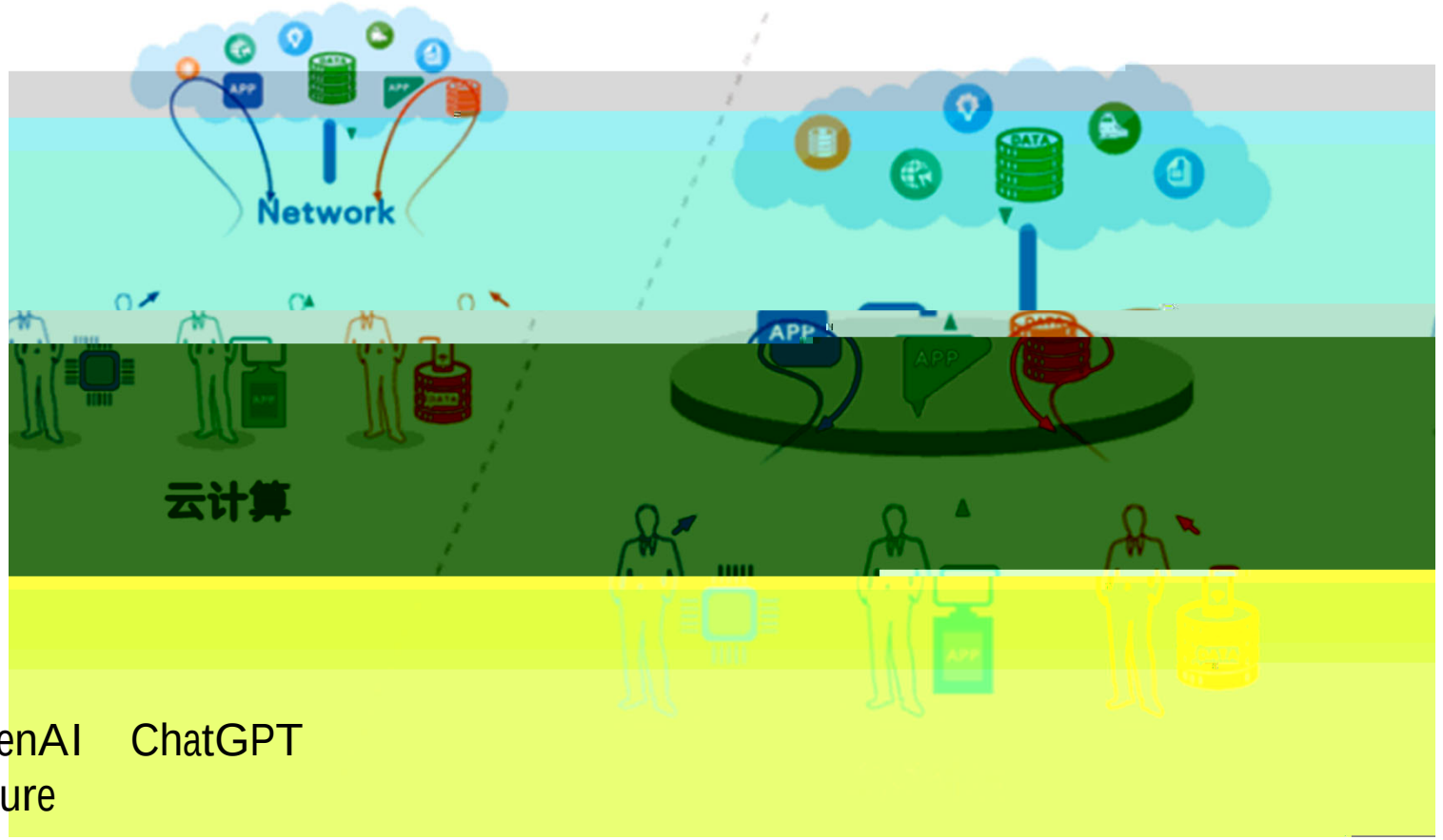


ChatGPT [1]

[1] Alibaba Cloud. Towards AI-Oriented High Computing Power Data Center Network. APNet 2023.
[2] 2030 — “ ”



Tips OpenAI ChatGPT
Azure

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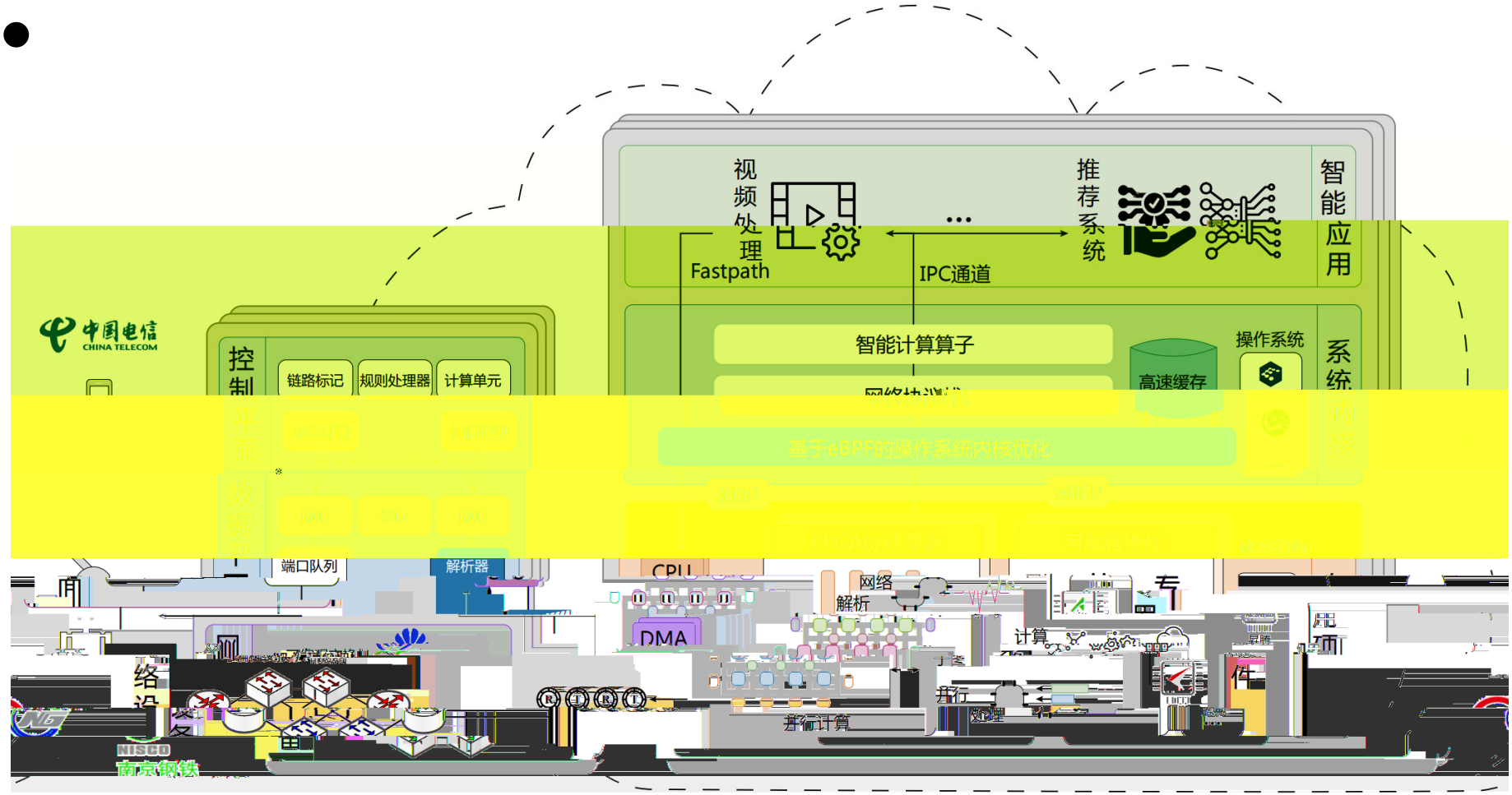
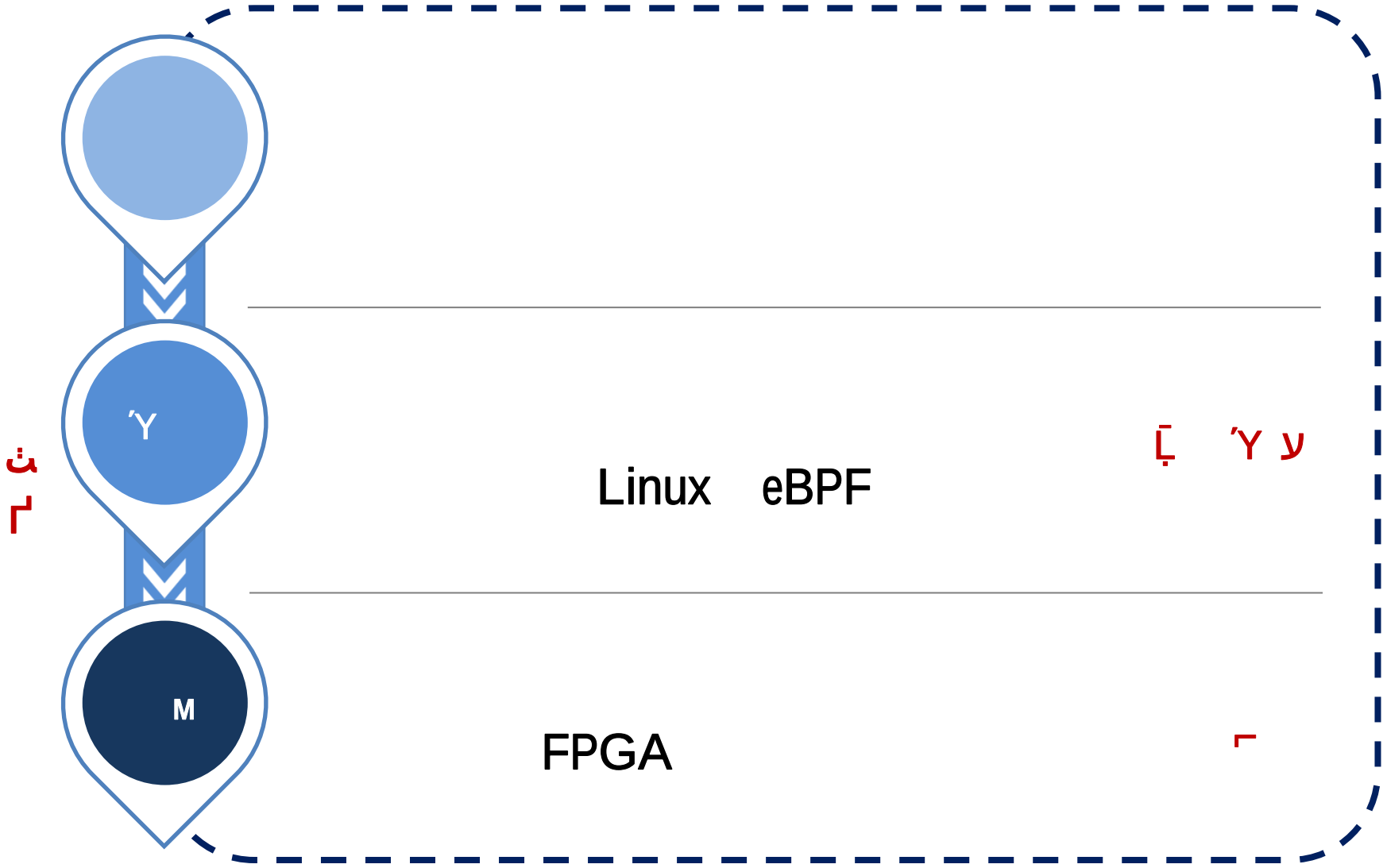

视频处理
推荐系统
智能应用
Fastpath
IPC通道
智能计算算子
操作系统
高速缓存
系统
控制
链路标记
规则处理器
计算单元
基于eBPF的操作系统内核优化
端口队列
解析器
CPU
网络解析
DMA
计算
NISCO
南京钢铁

边缘计算系统


Linux eBPF
FPGA

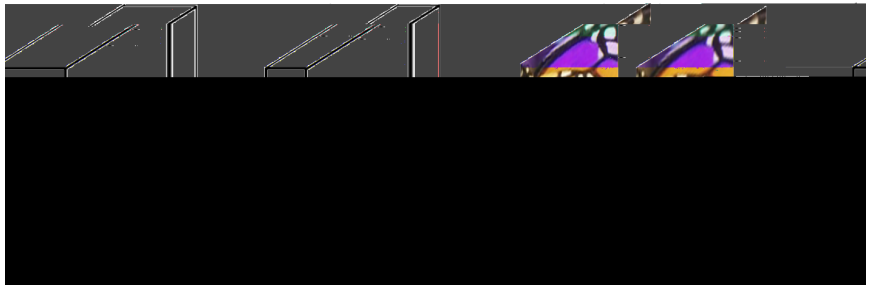
Multi-exit DNN Inference Acceleration based on Multi-Dimensional Optimization for Edge Intelligence. IEEE Transactions on Mobile Computing, 2022. CCF A

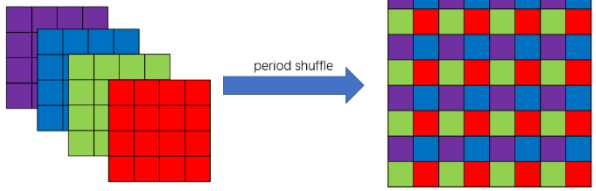
Exploiting the Computational Path Diversity with In-network Computing for MEC. IEEE SECON 2022. CCF B

WAEVSR: Enabling Collaborative Live Video Super-Resolution in Wide-Area MEC Environment. IWQoS 2023. (CCF B)

e.g. BCHW=7 × 3 × 480 × 720 → e.g. BCHW=7 × 48 × 480 × 720 →

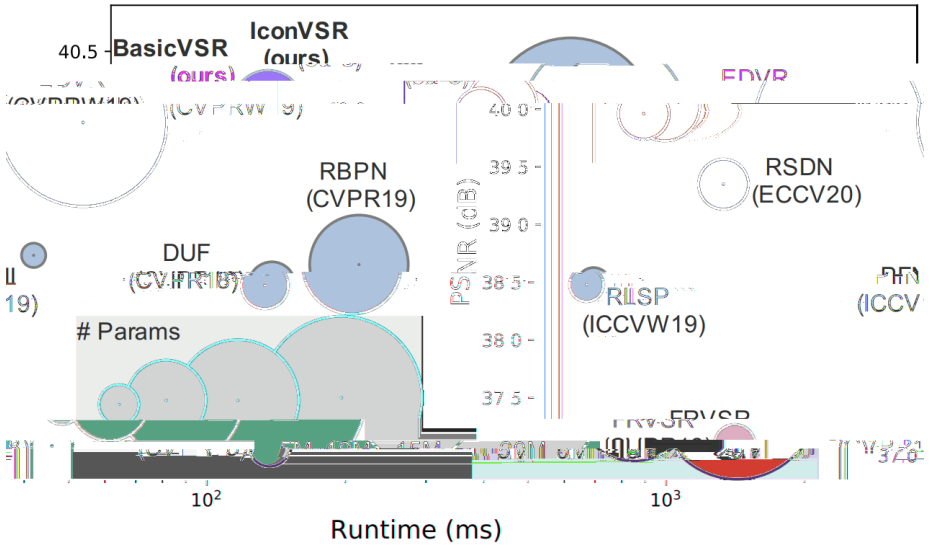
e.g. BCHW=7 × 3 × 1920 × 1080

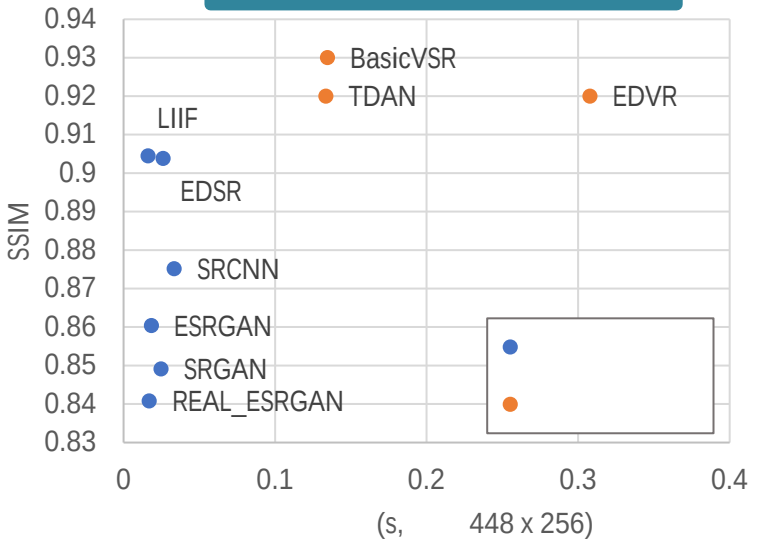


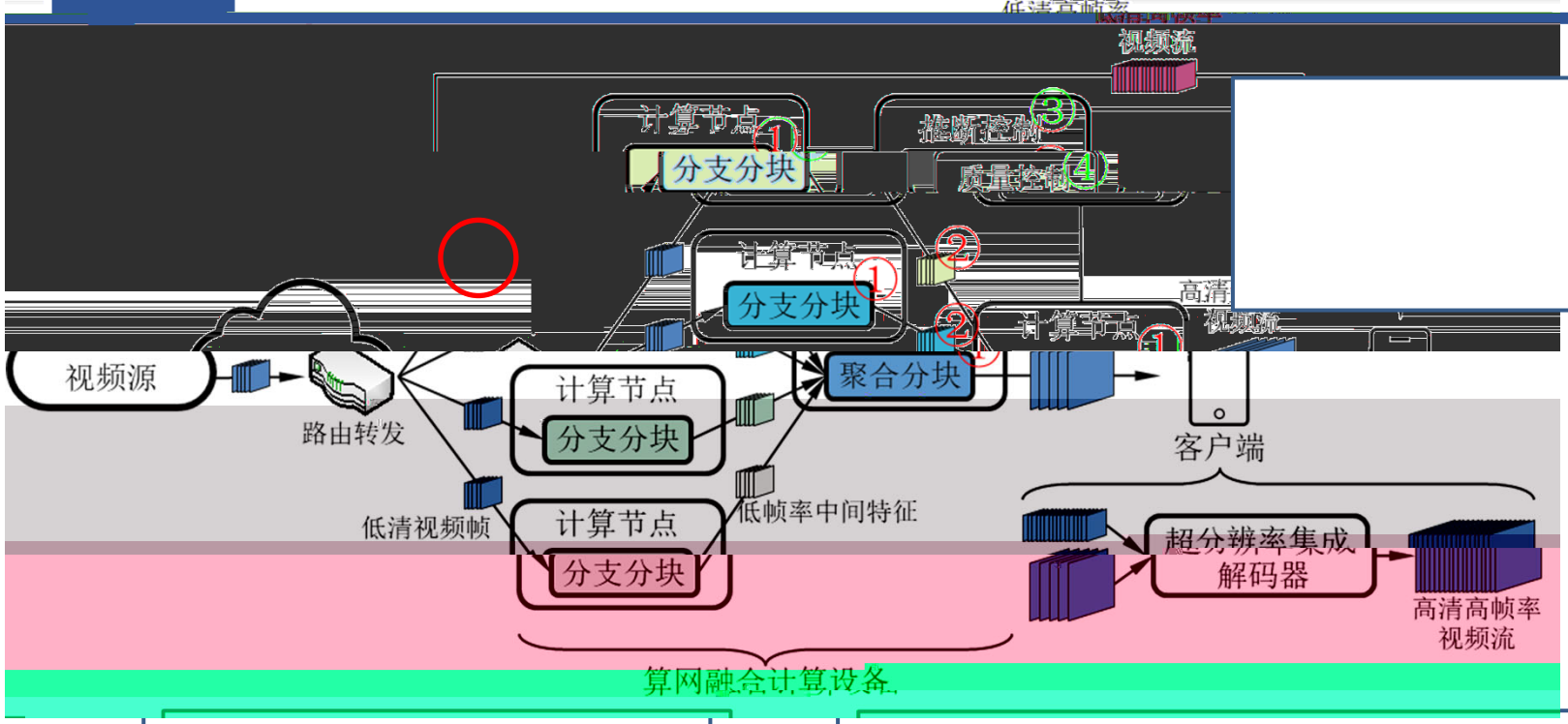


(SISR)

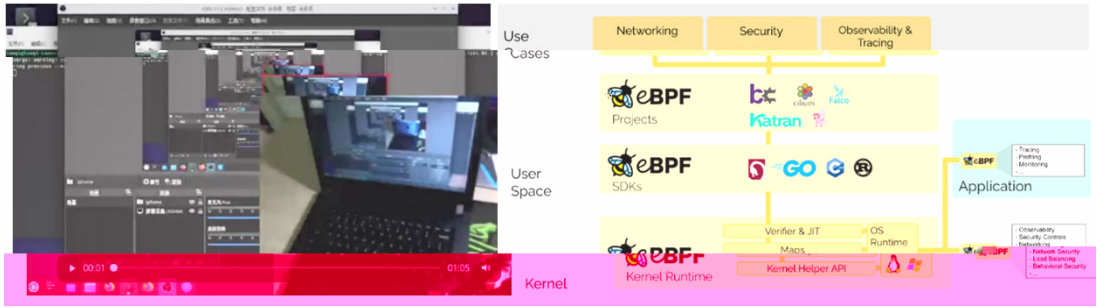
(VSR)






视频流
计算节点
分支分块
推断控制
质量控制
计算节点
分支分块
高清
视频流
计算节点
视频源
路由转发
计算节点
分支分块
聚合分块
客户端
低清视频帧
计算节点
分支分块
低帧率中间特征
超分辨率集成
解码器
高清高帧率
视频流
算网融合计算设备

Linux eBPF



eBPF

Distributed and Optimal RDMA Resource Scheduling in Shared Data Center Networks, Infocom 2020. CCF A
Facilitating Application-aware Bandwidth Allocation in the Cloud with One-step-ahead Traffic Information. CCF A
Last-mile Matters: Mitigating the Tail Latency of Virtualized Networks with Multipath Data Plane. IEEE CLUSTER 2022. CCF B

- eBPF:

  extended Berkeley ~~Packet Filter~~

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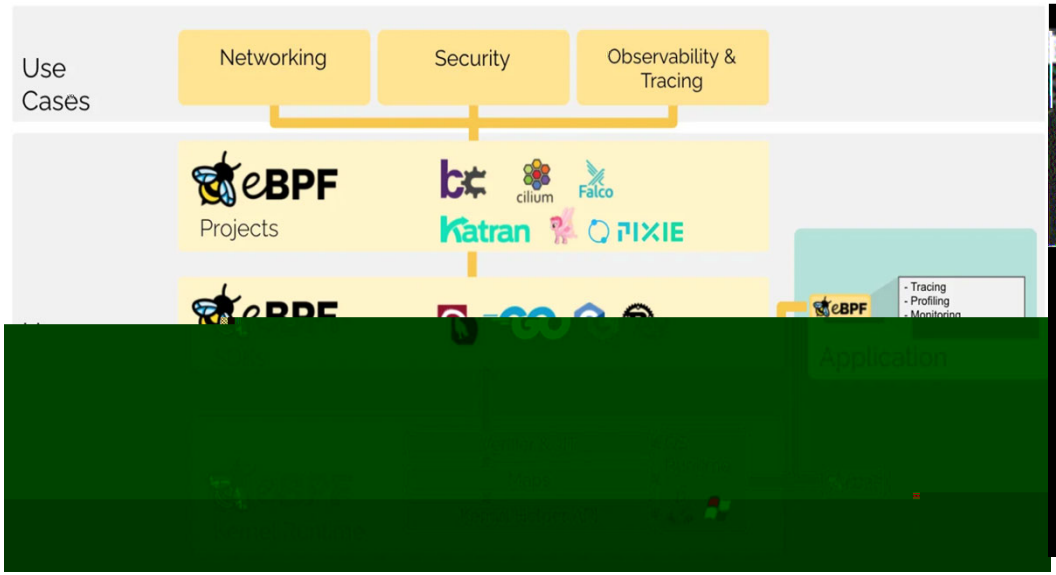

❑ eBPF

eBPF

eBPF

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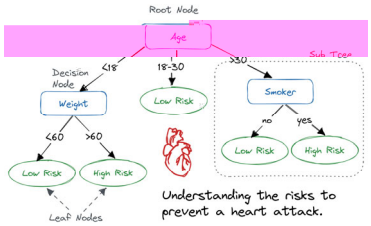

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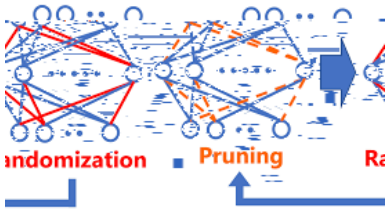
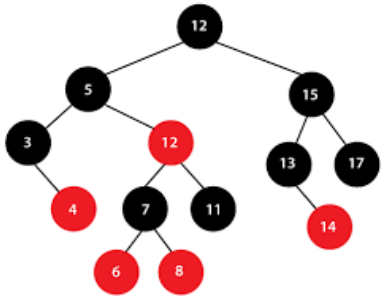


Linux eBPF

eBPF

- eBPF
- dynamic memory
- unbounded-loop



Red Black Tree

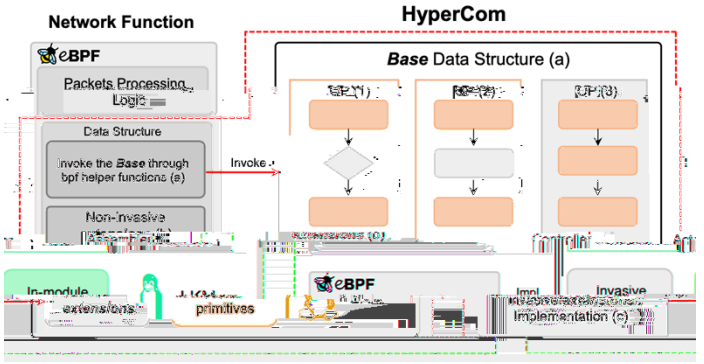
Algorithm 1: Insertion operation in Heap

Data: *B*: input array; *N*: starting index; *newValue*: new node
Result: Heap tree with the new node
Procedure Insertion(*B, N, newValue*)
  $N = N+1$;
  $B[N] = newValue$;
  $k = N$;
  while $k > 1$ **do**
    $PNode = k/2$;
    if $B[PNode] < B[k]$ **then**
      $swap(B[PNode], B[k])$;
      $k = PNode$;
    else
      return;
    end
  end
end

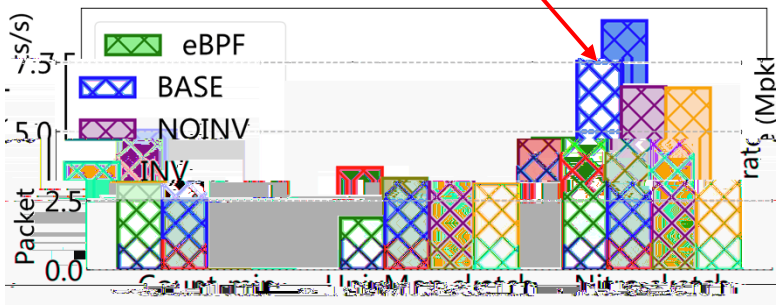
❑ eBPF

HyperCom: Enabling High Performance Complex Data Structure Designs with eBPF for Intelligent Applications

- LKM base part eBPF extension part (Comprehensiveness)
- (eg: SIMD) (Performance)
- (Flexibility)



62.3%, 96.8% 89.2%



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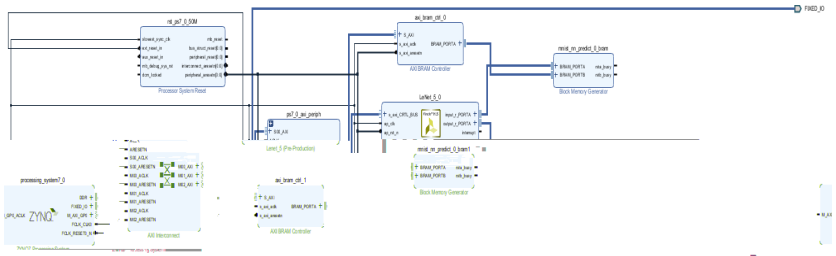
FPGA



CPU

FPGA

- FPGA: Field Programmable Gate Array

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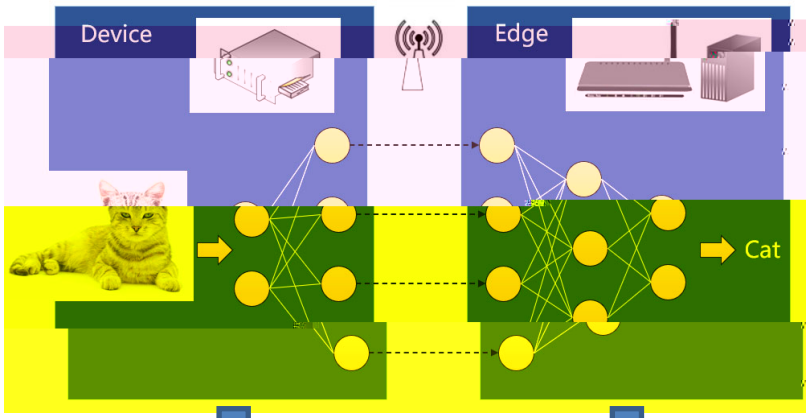

FPGA -

FPGA

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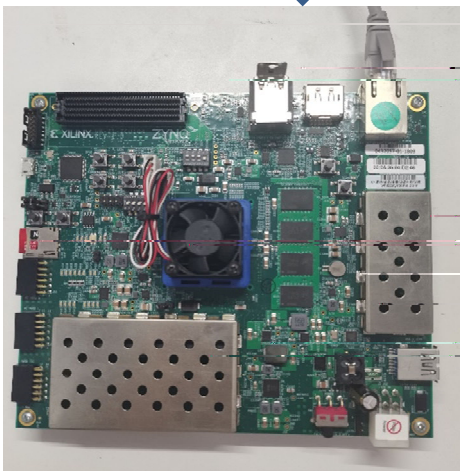
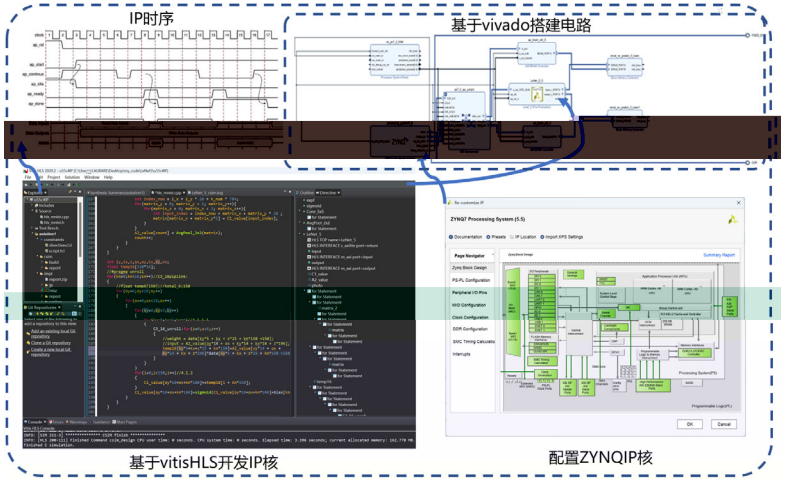
HLS





- Dian Shen, Junzhou Luo, Fang Dong*, Xiaolin Guo, Ciyuan Chen, Kai Wang, John C.S Lui. Enabling Distributed and Optimal RDMA Resource Sharing in Large-scale Data Center Networks: Modeling, Analysis, and Implementation. IEEE/ACM Transactions on Networking, 2023. Accept. CCF A
- Bin Yang, Dian Shen, Junxue Zhang, Fang Dong, Junzhou Luo, John C.S. Lui. Towards the Full Extensibility of Multipath TCP with eMPTCP. 2022 IEEE International Conference on Network Protocols (ICNP). (TH-CPL A)
- Fang Dong, Huitian Wang, Dian Shen, et al. Multi-exit DNN Inference Acceleration based on Multi-Dimensional Optimization for Edge Intelligence. IEEE Transactions on Mobile Computing, 2022, 10.1109/TMC.2022.3172402. CCF A
- Dian Shen, Junzhou Luo, et al. Distributed and Optimal RDMA Resource Scheduling in Shared Data Center Networks, Infocom 2020 : 606-615. (CCF A)
- Shen Dian, Luo Junzhou, et al. Facilitating Application-aware Bandwidth Allocation in the Cloud with One-step-ahead Traffic Information [J]. IEEE Transactions on Services Computing, 2020, 13(2):381-394. (CCF A)

CCF A/B

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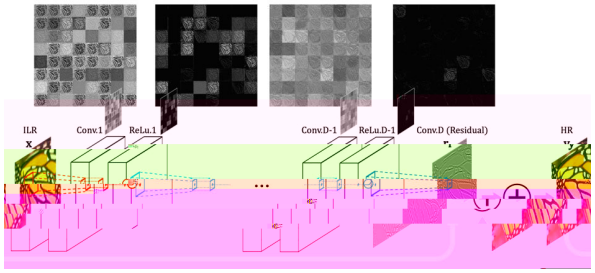
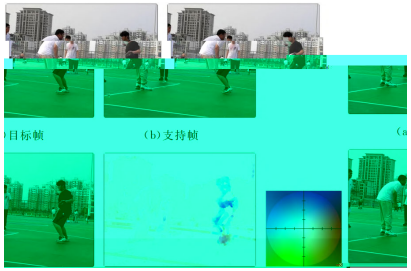
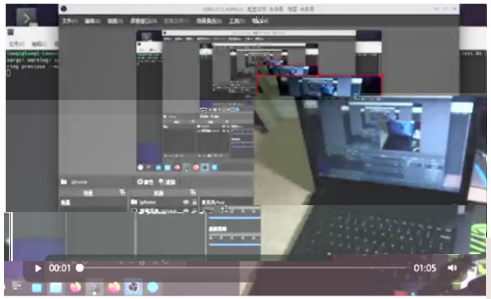
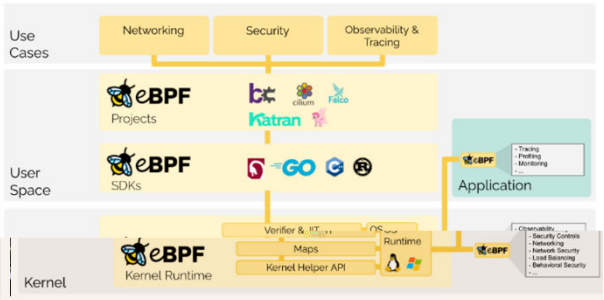




Linux eBPF





FPGA