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Network Systems Engineering: Intelligence in the Network
Network Systems

• Computing environments depend on communication networks and the performance of the network drives the performance of those systems

• Bandwidth is (relatively) easy, but latency is more difficult
  • Unless power is a concern and then bandwidth is difficult too!

• Teasing performance and efficiency out of a networked system involves techniques that span various architectural layers and components of the system

• We work on many aspects of networks from the data center to the edge
Intelligence in the Network

- Networks were traditionally designed to move bits, but a common theme in our work is programmable, adaptable networks.
- Software Defined Networks, Smart Network Interfaces, Network processing elements including Field Programmable Gate Arrays (FPGAs).
- All these platforms allow us to imbue the network with intelligent functions, leading to greater efficiency and performance.
- Realizing these techniques requires enhancements across layers and components.
FPGAs in the Data Center Network

- FPGAs are being increasingly utilized to accelerate network applications
  - Microsoft’s Bing search engine, key-value stores, etc.
- Significant engineering effort to implement and integrate, but tremendous gains are possible
- Our approach “offloads” collective communication in parallel, high-performance computing applications, resulting in significant speedup
InLocus Edge Computing

• InLocus is a lightweight Edge computing model that targets streaming data in the Internet of Things (IoT)

• This model is designed to enable simple streaming computation with limited resources

• Compatible with, but very different from Cloud streaming systems

• Initial results show over 1000x speedup over traditional implementations
THANK YOU

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