

P4 Programmable Data Plane Switches

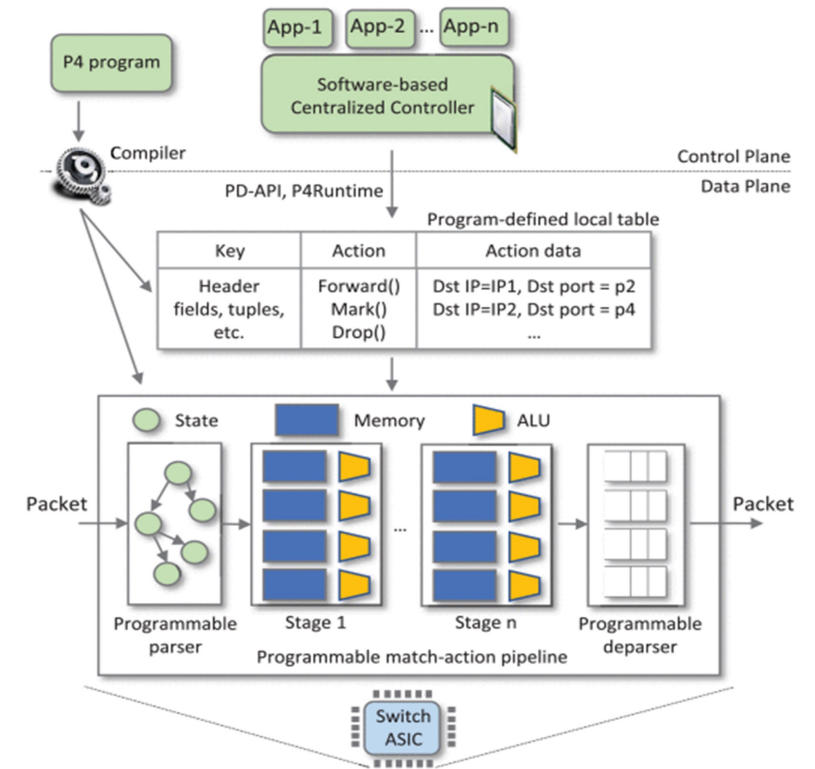
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Traditional Switching

- Hubs
 - Layer 1 (Physical)
 - Forwards everything everywhere
 - Relies on packet dropping
 - Slow
 - Can cause DOS on large networks
- Unmanaged switches
 - (Layer 2 Data-Link)
 - Forwards based on MAC
 - Popular to just add more ports
- Managed Switches
 - Layer 2 with Layer 3 (Network) functionality
 - Operates very similarly to unmanaged
 - Has added configurability & security
 - Can do some routing (VLANs)
 - Modify control plane but not data plane
 - Best for buildings and datacenters

Control & Data Plane

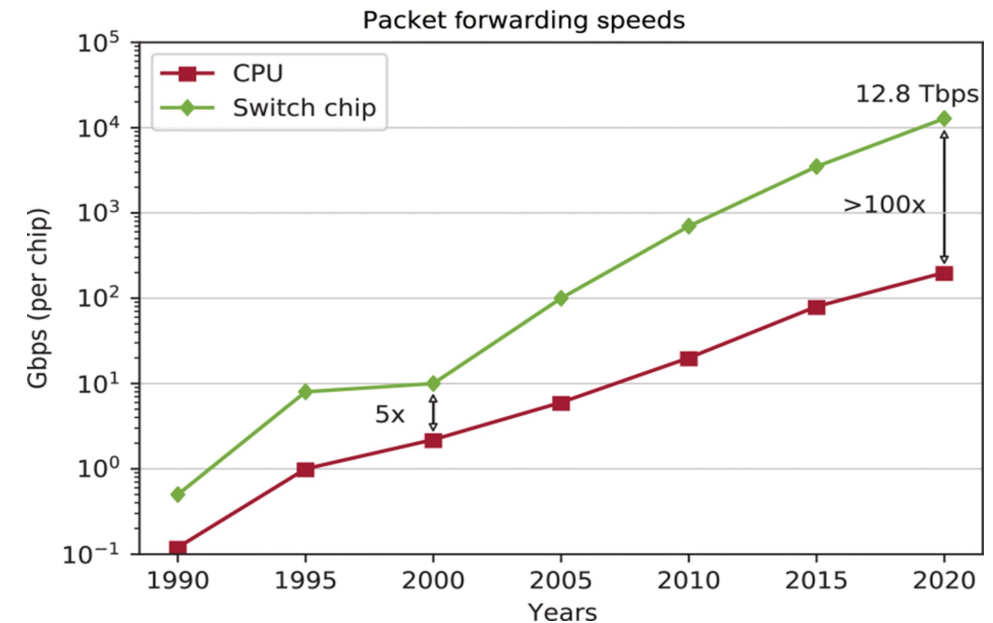
- Control Plane
 - Defines logic to determine how packets are switched by the data plane
 - Independent of Data Plane
 - Contains routing table
 - Applications like QoS
 - Protocols like BGP, OSPF, IS-IS
- Data Plane
 - Functions & Processes for packet switching
 - Parser & De-parser



P4



- (Programming Protocol-Independent Packet Processors)
- Programming language developed in 2014
 - Target-Independent (CPU & ASICs)
 - ASICs are significantly faster
- No native protocol support
 - Everything defined by programmer
- Allows researchers to develop protocols faster
 - Feature rollout from vendors takes years



Applications

- In-Band Network Telemetry
 - Add metadata in transit
 - Adjust sending rates to reduce congestion
- Load Balancing
 - Do forwarding on the switch and manage table on a server
 - Instead of forwarding from the server
- Machine Learning
 - Aggregate data on switch instead of on workers (Aggregation is cheap)

