



IP over ATM: Why it doesn't matter anymore

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Topics

- IP
- ATM
- IP Switching
- Tag Switching/MPLS
- QoS

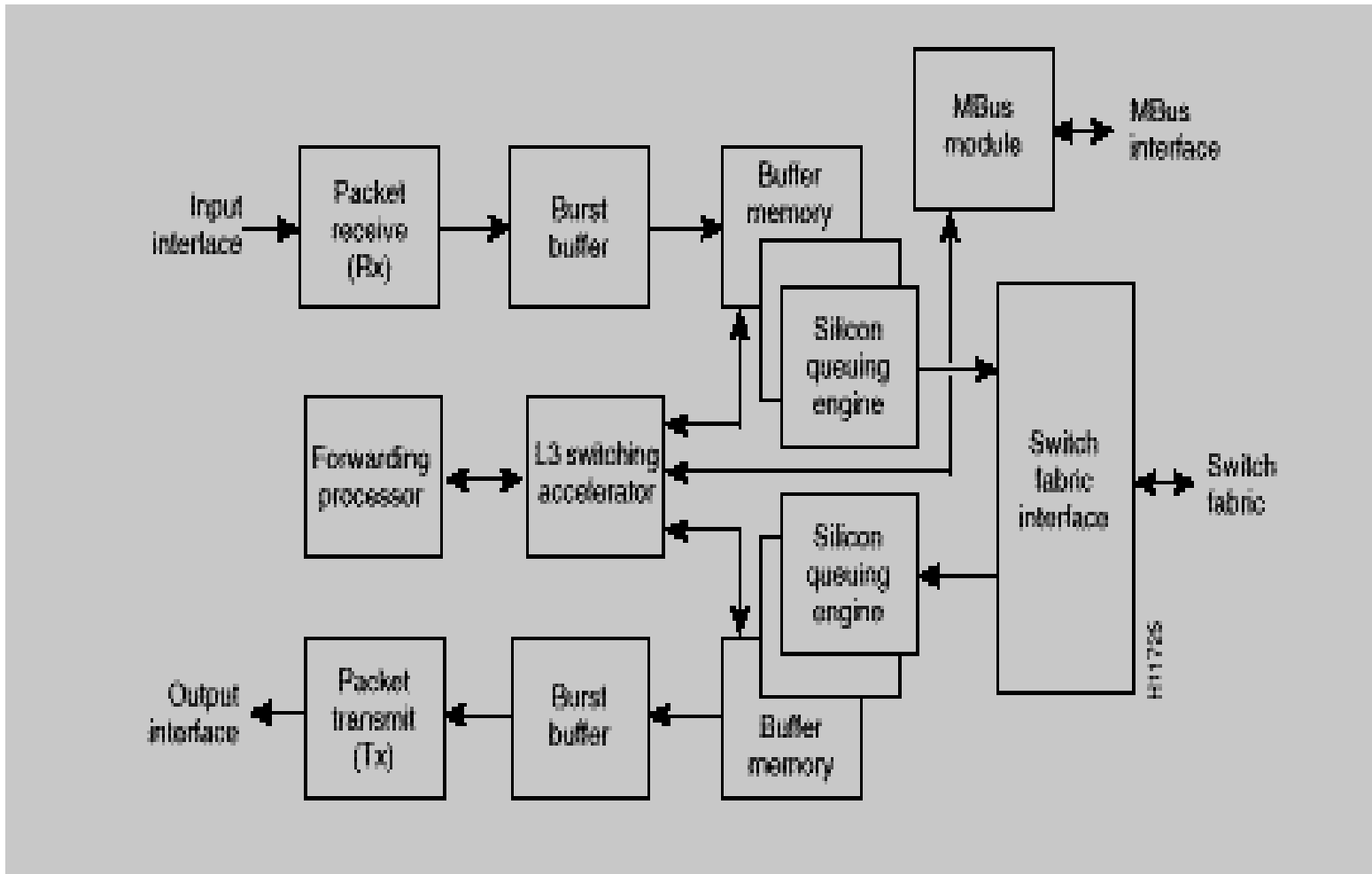
IP Forwarding: PPS

	40B	200B
ETH-100Mb	148,810	52,521
ATM-oc3	176,604	70,642
POS-oc3	398,298	90,435
ATM-oc12	706,415	282,566
POS-oc12	1,593,191	361,739
ETH-1Gb	1,488,095	525,210
ATM-oc48	2,825,660	1,130,264
POS-oc48	6,372,764	1,446,956

IP Software Forwarding

- Nokia IPSO R3.0
- Pure PC HW
- Pentium-133: 60Kpps
- P/PRO-200: 125Kpps
- Pentium II-300: 150Kpps
- Limitation is IO/PCI architecture, not SW

SW+HW Forwarding Cisco GSR OC-12c



Pure HW Forwarding

- Full Route Lookups require non-trivial amounts of memory: DRAM
- Optimize/pipeline around DRAM access cycles ~140ns
- Throughput = $1/140\text{ns} = 7,000,000$ PPS
- Buffer & IO mgmt still harder than lookups

ATM: A Brief History

- Early 80s: need for fast packet switching recognized
- 1989: CCITT adopts 48 byte payload
- 1992: AAL5 encourages data usage
- 1993-?: ATM Forum builds alternate universe around the ATM cell
- 1998: Still(!) the network of the future
- ATM today used as backbone for frame relay and some voice networks, I.e., next gen TDM

A Total Monopoly?

- ATM's monopoly on fast switching is gone
- Every other aspect of ATM is a negative to IP users
- The broadband market has not taken off because of the lack of competition in Telcos, esp local access
- ATM: killed by the Telcos?

IP Switching

- Switch IP flows in ATM hardware
- Take advantage of ATM hardware
- Partner with ATM vendors
- Flows for allowing control of Qos, no dependence on routing architecture

Just Kidding

- ATM hasn't happened like we thought
- Qos hasn't happened like we thought
- Telco's love ATM (because they have cheap bandwidth), hate IP
- ISPs love IP, hate ATM (because they pay for bandwidth)
- Corporations can do it all with Ethernet switches

Tag/MPLS

- MPLS allows fast switching in core after label is applied
- Dependent on core/edge routing architecture
- Tends to pollute other protocols, eg, RSVP & BGP
- MPLS over ATM has all ATM's problems & too few labels
- MPLS over SONET: who makes it?
 - Why isn't this frame relay?

MPLS for Traffic Engineering

- Lots of consideration for MPLS for L2 style traffic engineering techniques
- Just another L2 network?
- Speed aspects of MPLS not needed by BFRs
- Functional aspects could be done just with IP tunneling - a tried & true technique

QoS

- **Quality of Service or Quantity of Shouting?**
- While IP & ATM promise the world, Frame Relay sells
- Frame Relay model of static QoS between 2 points can be applied to IP networks
- Especially good fit for VPNs over IP
- Mostly fits with diffserv activities
- Diffserv, IFMP, MPLS, etc., make the job in the core easier at the expense of the edge
- But the edge's job is already the hardest - policy, shaping, etc.

Conclusions

- IP can go as fast as you need, with QoS when you need it
- ATM is just a next generation TDM replacement - just circuits, not a network
- Flow/Tag/Label protocols aren't needed
- You can learn a lot in startups (Ouch!)