



PRESENTS

NETWORLD INTEROP



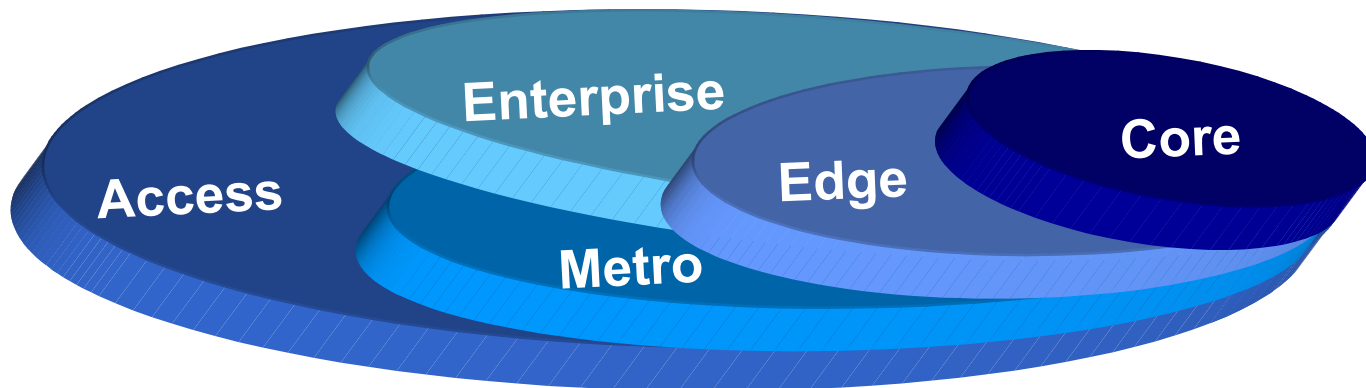
Programmable Traffic Management for the Core and Metro

Simon Stanley

ClearSpeed technology

10th September 2001

The Intelligent Internet



Enabling delivery of revenue generating services

- Increasing demand for quality of service
 - Best effort network Services
 - Differentiated network services
- Function & speed boundaries in state of flux
 - Metro and Edge bandwidths increasing
 - Core becoming more intelligent and faster
- Similar products deployed in multiple markets

New Router Market Opportunities

Enhanced routers with Intelligent line cards will support wider applications:

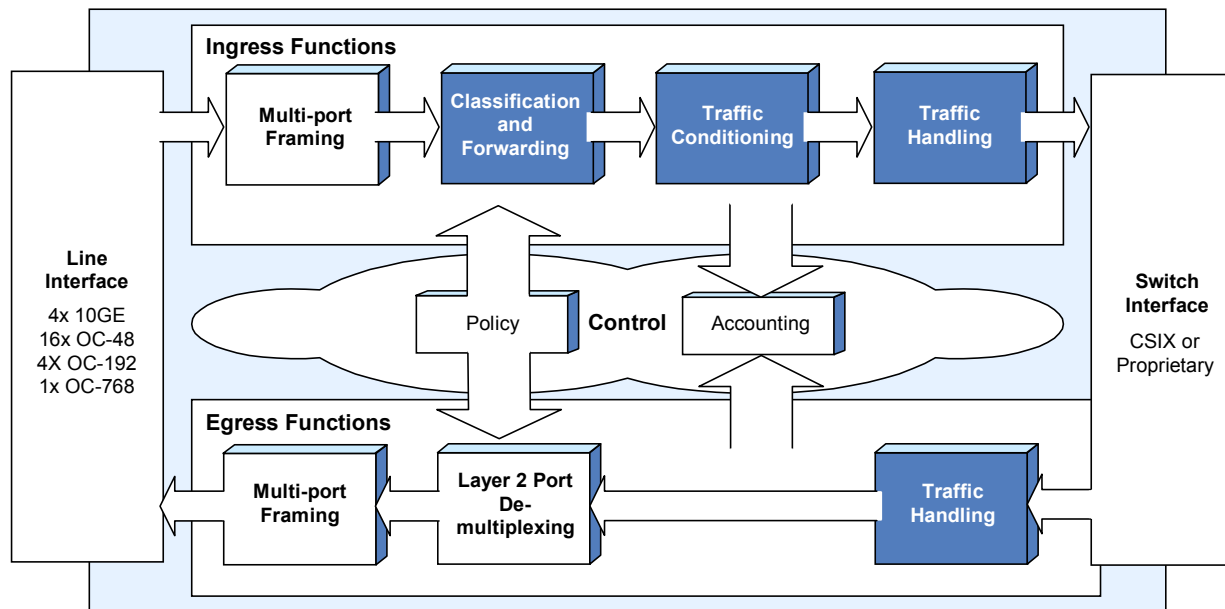
- Differentiated network services
 - Guaranteed internet service for key subscribers
 - High speed VPNs
 - Carrier VoIP and video over IP
- Storage area networking (SAN) over the public network
 - Moves Internet based SAN away from Best Effort limitations
- Web switching
- Data centers

The move to 40Gbit/s line cards will enable higher density

- 4 x OC-192, 16x OC-48

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The 40Gbit/s Intelligent Line Card



- **Classification and Forwarding**

- Identifies and tags the packet
- Identifies the required class of service

- **Conditioning**

- Checks packet stream conformance to Service Level Agreements
- Requires metering, policing and marking

- **Handling**

- Per class packet queuing per class
- Schedulers apportion link bandwidth appropriately
- Packet buffering on ingress or egress

Application Comparison

	<u>Metro</u> (MPLS device)	<u>Carrier VoIP</u> (Core IntServ Device)
Customer	Cable MSO or ISP	ISP, ILEC or IXP
Port density	High	Low
Layer 2 technology	Ethernet	Ethernet or POS
IPv4/IPv6 supported	Yes	Yes
MPLS LSR/LER	Yes	No
Forwarding rules	100,000s	1Million
Differentiated services	Yes	Yes
NAT	Yes	No
Independent QoS rules	64	100,000s

Next generation network processing solutions must deliver on both

Key Challenges

Line Card Design

- Max packet rate
- Mixed protocols

Performance

Network Processor Solution

- Deterministic under all load conditions

- Unique features
- Future upgrade

Differentiation

- Design re-use
- Risk reduction

Time to market

- Power
- Size/cost

Constraints

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- Scalable architecture
- Programmable in C

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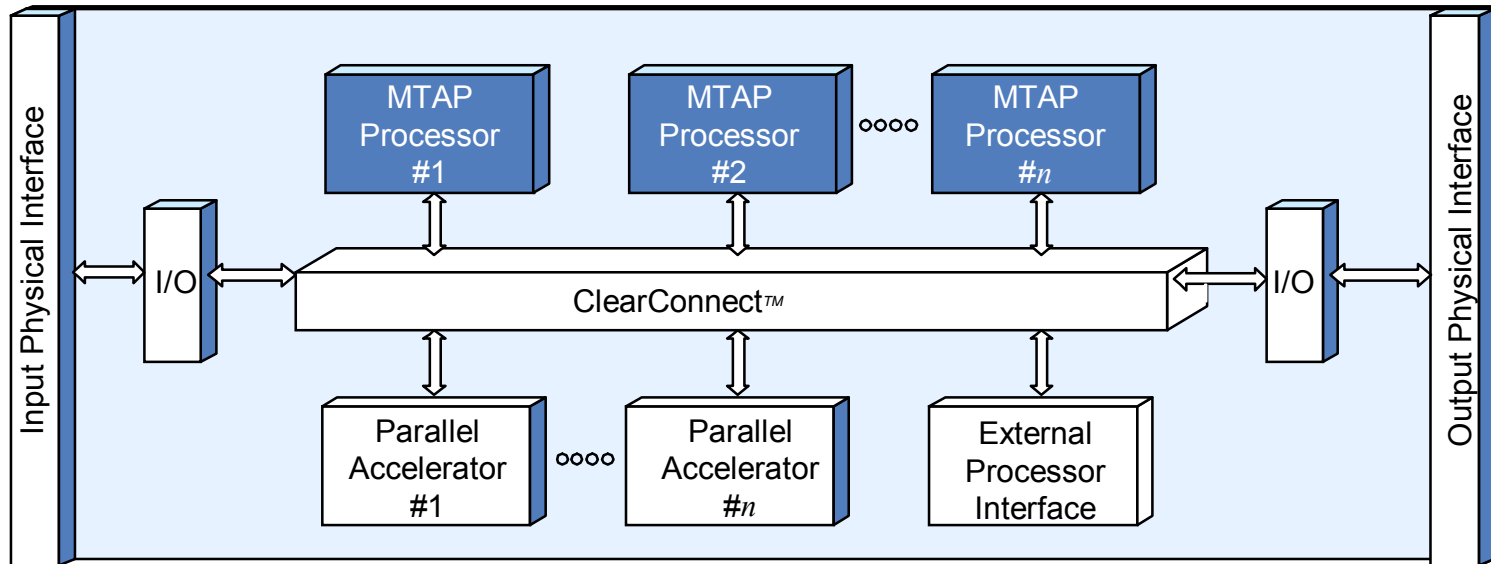
- Scalable architecture
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- 40Gbit/s chipset
- < 50W including TM

Example Specification

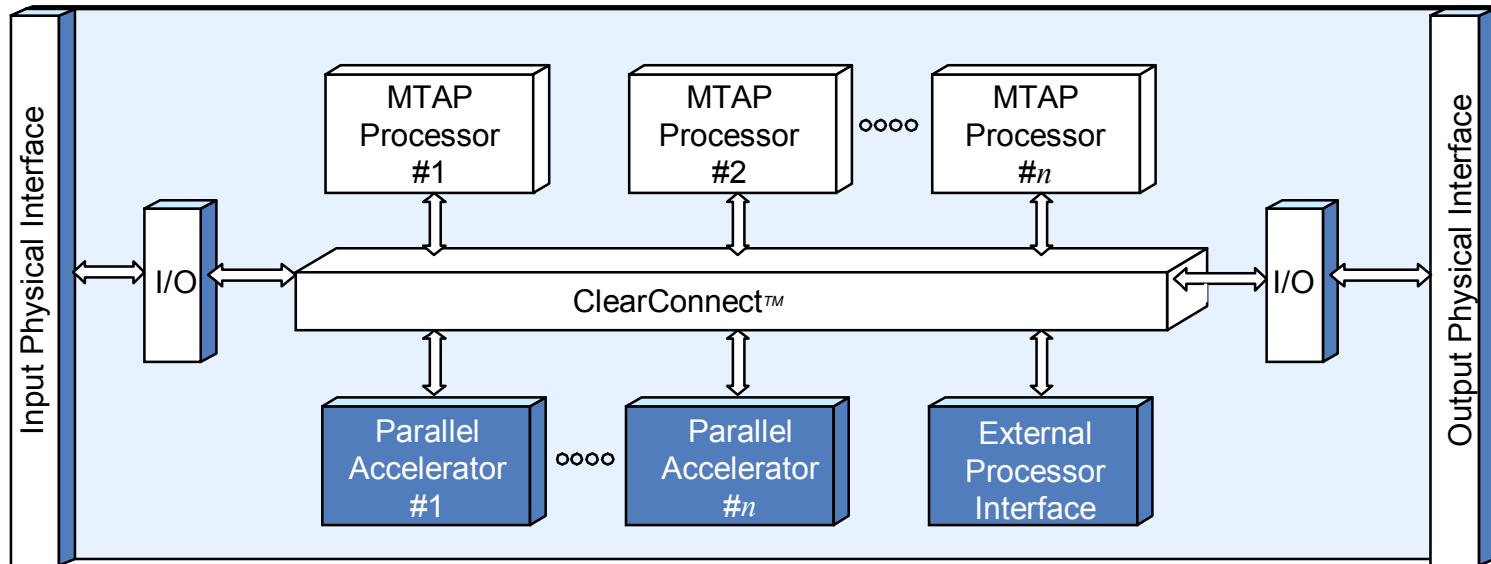
- 40Gbit/s guaranteed
 - >100 Mpps
 - Low jitter (<1us)
- Classification and Forwarding
 - MPLS-LSR, MPLS-LER, IPv4 & IPv6 simultaneously
 - 10's thousands to > 1 million forwarding rules
 - Variable key size (> 128bits in future)
 - Tunnelling & Multicast
- Traffic Conditioning
 - Policing, marking, dropping
 - 64 or >100K flows
- Traffic Handling
 - Scheduling of Differentiated and Best Effort services
 - Packet buffering (500ms)
 - Fair allocation of link bandwidth (SCFQ, WFQ, DRR, etc)
 - Programmable for new algorithms

The ClearSpeed™ Platform



- MTAP parallel processors:
 - Array of hundreds to thousands of 8-bit Processing Elements (PEs)
 - Programmable in C

The ClearSpeed™ Platform



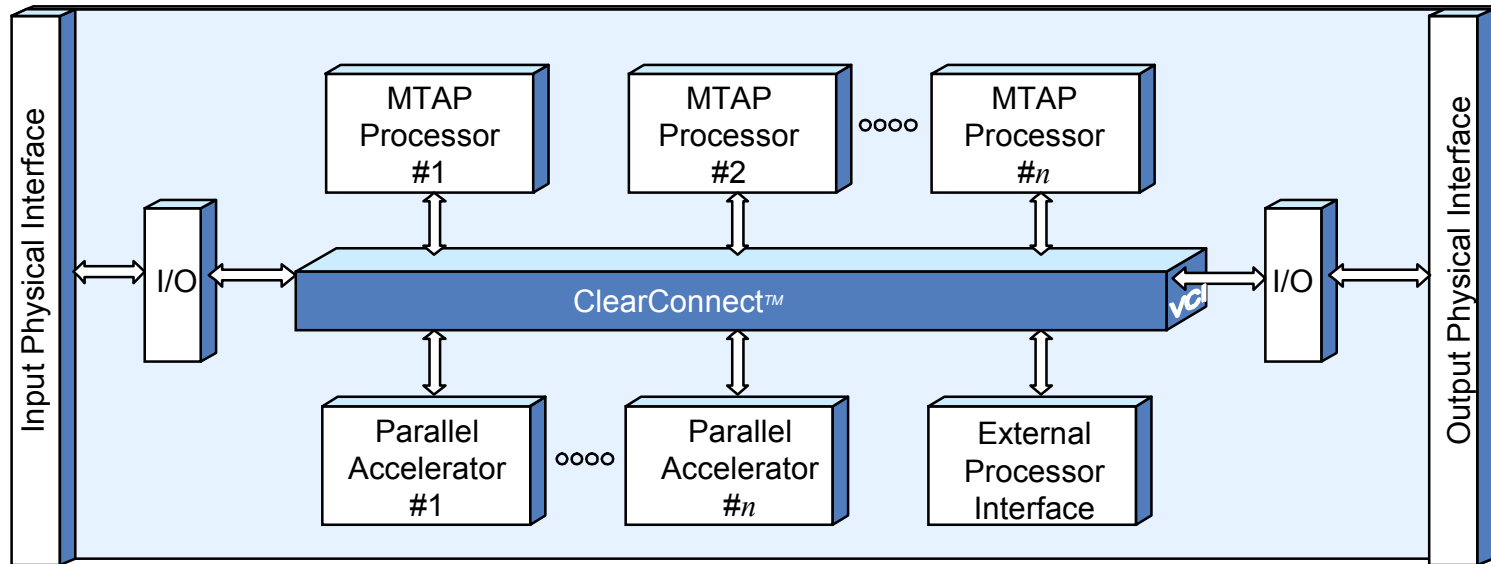
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- **Parallel accelerators:**

- Application specific
- Configurable functionality
- eg. Table Lookup Engine (TLE)

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- ClearConnect on-chip network

- Bus scalable up to 400Gbps
- Distributed arbitration & clocking
- All interfaces VCI compliant

User Benefits of Programmable Solution

- In-service upgrade
 - Include new features and services
 - Enhanced performance
- Flexibility
 - Deploy similar products in Metro, Edge and Core
 - Re-deploy equipment from Core to Edge
- Fast time to market
 - Scalable solution
 - All algorithms in software
 - Classification and Forwarding
 - Traffic Management
- Line rate performance
 - Performance must not be compromised for programmability

Fully programmable network processing solutions will meet these requirements even at 40Gbit/s



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www.clearspeed.com