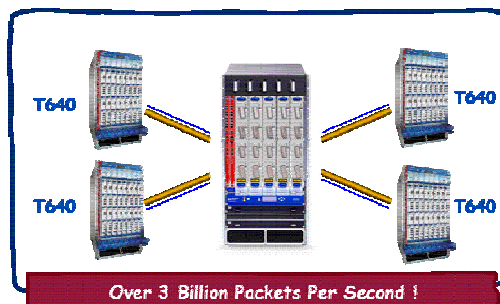


# TX Matrix Platform

Jean-Marc Uzé  
juze@juniper.net  
TF-NGN, Athens, Nov 3rd, 2005



## A Routing Matrix: Fundamentals



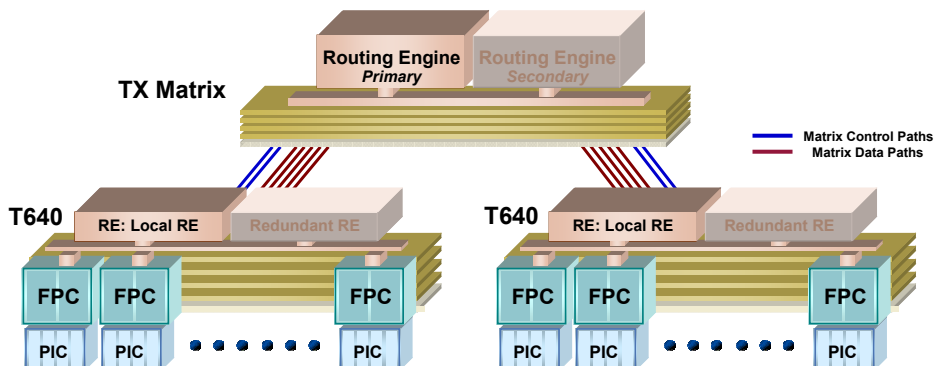
- Cluster of T640 Routing Nodes (up to 4 today)
- Distributed switch fabric
- Common JUNOS image
- Global master Route Engine
- Distributed control management
- Fully redundant

# TX Matrix - The Platform

- Fully Redundant – no single point of failure
- Passive midplane design
  - Oversized for future capacity upgrades
- Component Redundancy
  - (5) Non-blocking fabric planes (1:N)
  - (4) provide full line-rate bandwidth at 40B
  - Dual Routing Engines (RE's)
  - Dual Control Boards (CB's)
  - Dual Connector Interface Panels (CIPs)
  - Dual, load sharing Power Supplies (PEM's)
  - Dual Cooling systems, fan trays



# A Routing Matrix Architecture



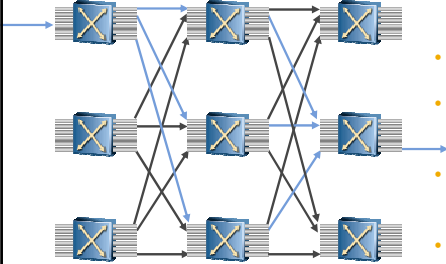
- TX Matrix (SCC):
  - Performs Routing
  - Stage 2 of CLOS Switch Fabric
  - Single Management Interface
- T640 Routing Nodes (LCC):
  - Stages 1 & 3 of CLOS Fabric
  - RE's: local chassis management
  - Distributed Packet Forwarding

# A Routing Matrix Control Architecture

- Distributed Control
  - Multiple REs share control of the system
  - Increased scalability
- Balanced, scalable division of labor
  - Single Processor for RPD
  - Reduce complexity
  - Central CLI
  - Increased operational simplicity
  - Distribute system/chassis control work

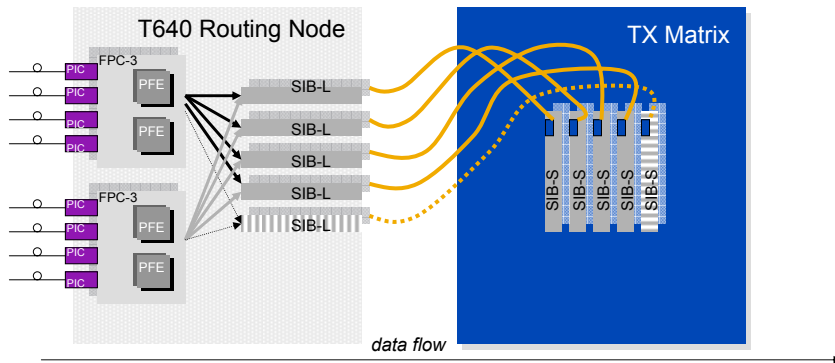
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## TX Matrix – Architecture



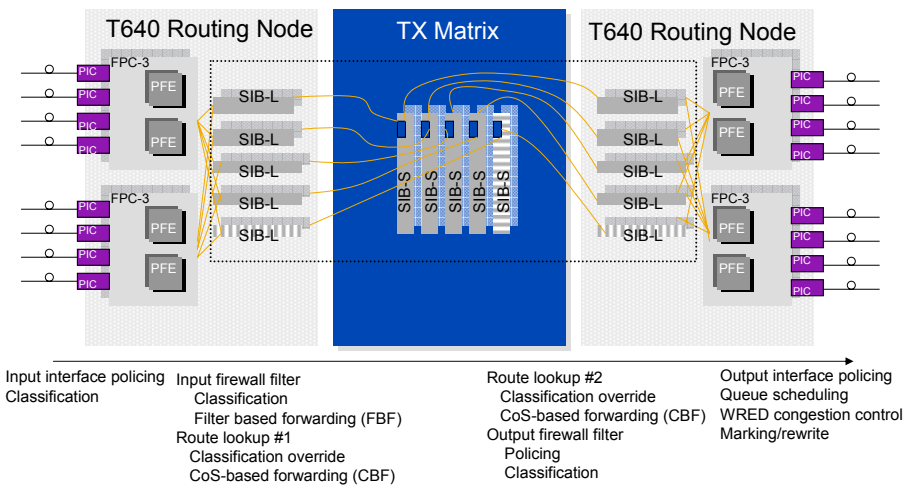
- Proven 3-stage Clos architecture ensures
  - Optimal architecture for multi-chassis multi-terabit
  - Distributed control for high-availability
  - Full redundancy and graceful degradation
  - Non-blocking architecture (any to any)
  - Fair bandwidth allocation
  - Low latency for high-priority traffic
  - Seamless, multi-terabit scale
  - In-service chassis insertion

# TX Matrix-T640 Routing Node Interconnect



- VCSEL fiber cable - Molex (Vertical Cavity Surface Emitting Laser)
- Distributed up to 100 meters

# Distributed Switch Fabric



# 10GE DWDM PIC

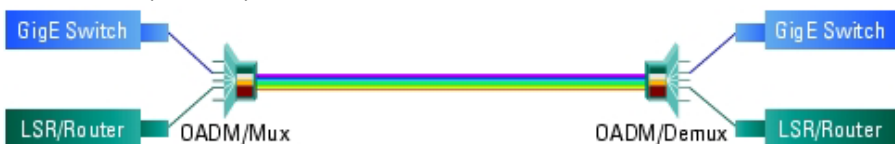
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- 1-port, Type 3 for M320/T-series
- Full C-band ITU-grid tunable wavelength support
- Program wavelength via the CLI
- 100 Ghz spacing for up to 45 individual wavelengths supported on a single PIC (1528.77 to 1563.86 nm)
- Common sparing for ease of use and operation
- 80 Km reach for extended metro deployments
- Supported since JUNOS 7.2

# Benefits of Tunable Solution

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- Integrated optical interfaces on the router
- Common sparing and CAPEX for entire ITU-grid (as opposed to pluggable solutions)
- Leverage port management capabilities on the router
- OADM example:
  - Mux/demux of up to 16 wavelengths for \$70,000 list (2 RUs)



## For more information

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- T640 Routing Node and TX Matrix Platform: Architecture
  - [http://www.juniper.net/solutions/literature/white\\_papers/200089.pdf](http://www.juniper.net/solutions/literature/white_papers/200089.pdf)
- 10 GE DWDM Specifications:
  - <http://www.juniper.net/techpubs/hardware/t320/t320-pic/ten-ge-dwdm.html>



Thank You!

