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EOS Precision Data Analyzer

Nick Ciarleglio
Nick@aristanetworks.com

Precision Instrumentation – The *Next* Pillar of SDCN

Integrated monitoring and analysis tools have not kept pace with network technology

Customers with high end environments must fly blind or deploy expensive overlay infrastructures

Tool deployments become artificially limited because aggregation networks are disproportionately expensive

The monitoring market is prime for disruption

EOS + Data Analysis Enables Scalable Precision Instrumentation

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Would You Drive Blindfold?

Precision Data Analyzer Core Capabilities

Visualization Tools →

Home Grown	Open	Enterprise

Core Components →

Advanced Filtering Mirroring and Flow Analysis	Precision Capture and Time Stamping	EOS Control Plane Event Management APIs

Advanced Hardware →

Hardware Precision Timing

Programmable Data Plane

Precision Data Analyzer Components

Troubleshooting / Application and Network Performance Management / Security

Advanced Filtering Mirroring and Flow Analysis

- TAP Aggregation
- Filtered Multiport Mirroring
- Packet Truncation Hardware Time stamping

Precision Capture and Timing

- LANZ+ Monitor and Capture
- Hardware Time Stamping
- PTP 1588 Precision Timing

EOS Control Plane

- EOS Software Defined Control Plane
- Advanced Event Management
- Open API Linux Extensibility

Hardware Precision Timing

- Arista first to integrate precision timing into a data center platform

- Enables advanced functionality from the heart of the network

- Supports high densities of 1/10/40G and beyond

- Dramatically lowers the entry costs for precision instrumentation
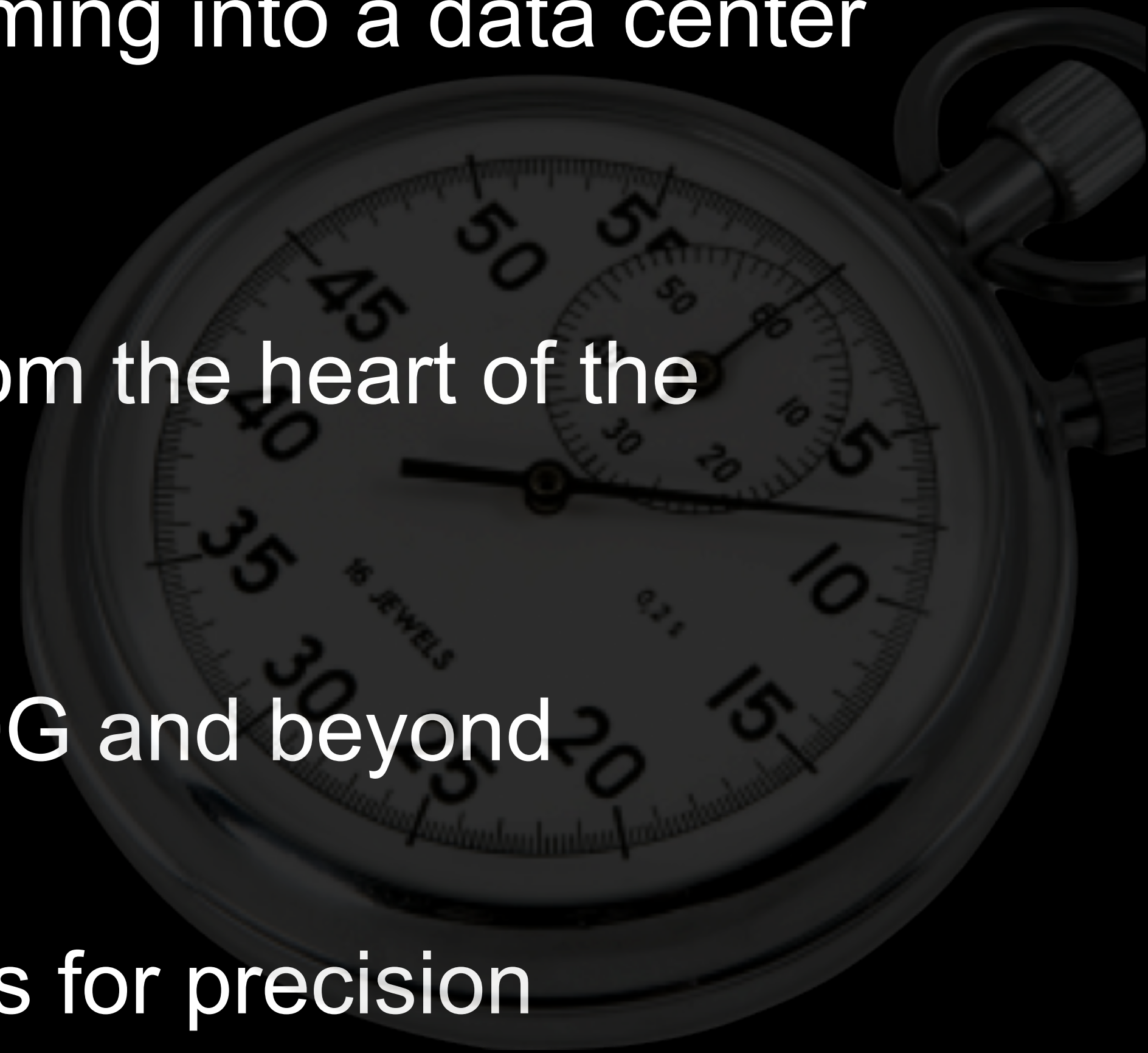
Advanced Mirroring

- Enhancing standard mirroring features to support flexible monitoring without expensive overlay hardware

- Enable on-box capture to leverage EOS & SSD

- Leverage hardware timing to accurately track packets without the need for 3rd party apps

Advanced Mirroring Feature Overview

- Multi-destination mirroring

  - Replicate traffic to multiple capture/ tools

- Mirror direct to EOS

  - Troubleshoot dataplane activity using TCPdump

  - Capture locally to flash or SSD

  - Integrate with Event Manager for automated captures

- Advanced load sharing

  - Symmetric traffic distribution

  - Intelligent Load sharing

- Flow manipulation

  - Add hardware timestamps

  - Truncate packets
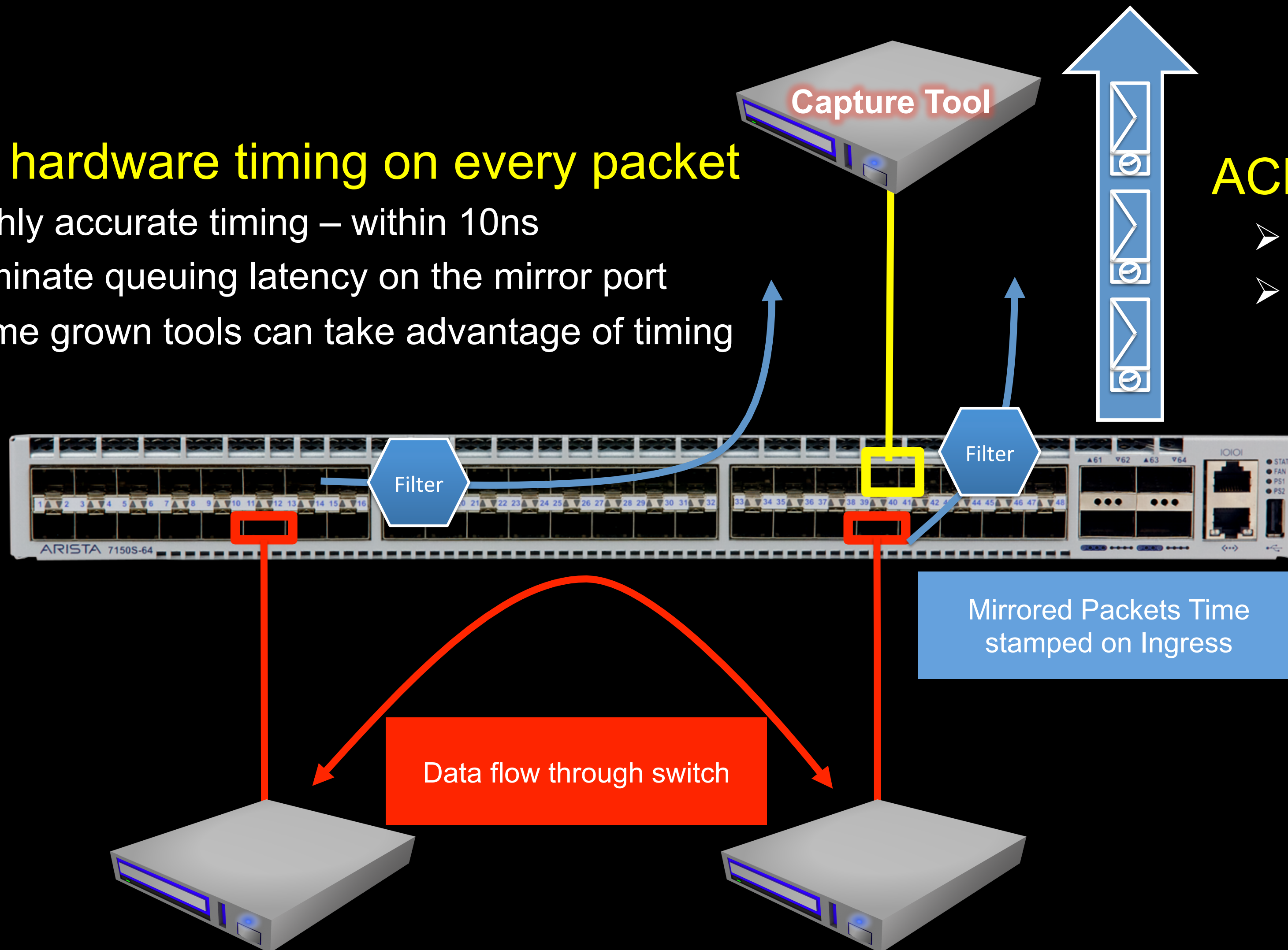
  - Filter traffic by ACL

Hardware Timing & Packet Filtering

Capture Tool

Ingress hardware timing on every packet

➤ Highly accurate timing – within 10ns

➤ Eliminate queuing latency on the mirror port

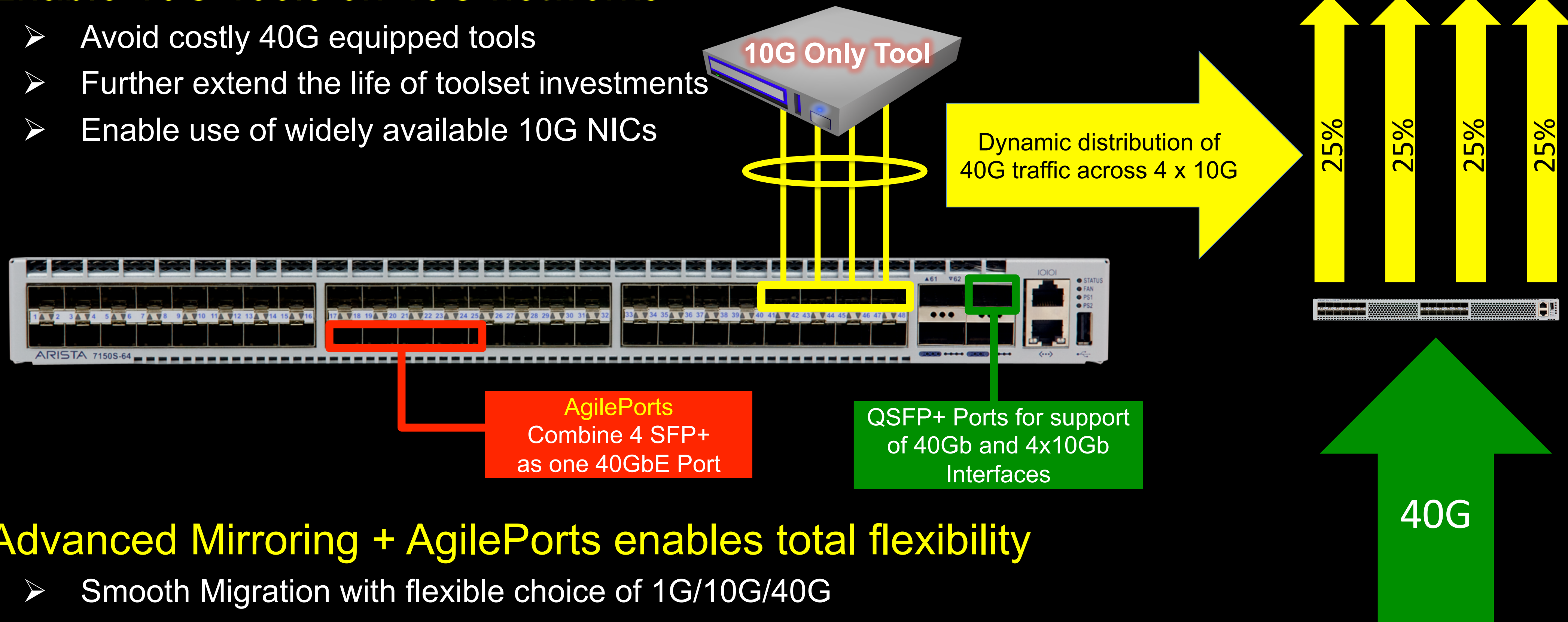➤ Home grown tools can take advantage of timing

ACL Based filtering

➤ Reduces load on tools

➤ Increasing longevity

Filter

Filter

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Mirrored Packets Time stamped on Ingress

Data flow through switch

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Intelligent Loadsharing

Enable 10G Tools on 40G networks

➢ Avoid costly 40G equipped tools

➢ Further extend the life of toolset investments

➢ Enable use of widely available 10G NICs

10G Only Tool

Dynamic distribution of 40G traffic across 4 x 10G

25% 25% 25% 25%

AgilePorts
Combine 4 SFP+
as one 40GbE Port

QSFP+ Ports for support of 40Gb and 4x10Gb Interfaces

40G

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Advanced Mirroring + AgilePorts enables total flexibility

➢ Smooth Migration with flexible choice of 1G/10G/40G

➢ Cost Effective migration with 10G transceivers reuse

➢ Support 10G tools on 40G networks with intelligent loadsharing

  ➢ Avoid issues with multi-port LAG hashing

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Symmetric Loadbalancing

Ensures all traffic in one flow is sent to the same Analyzer

➢ Enables distribution of aggregated over multiple lower speed tools
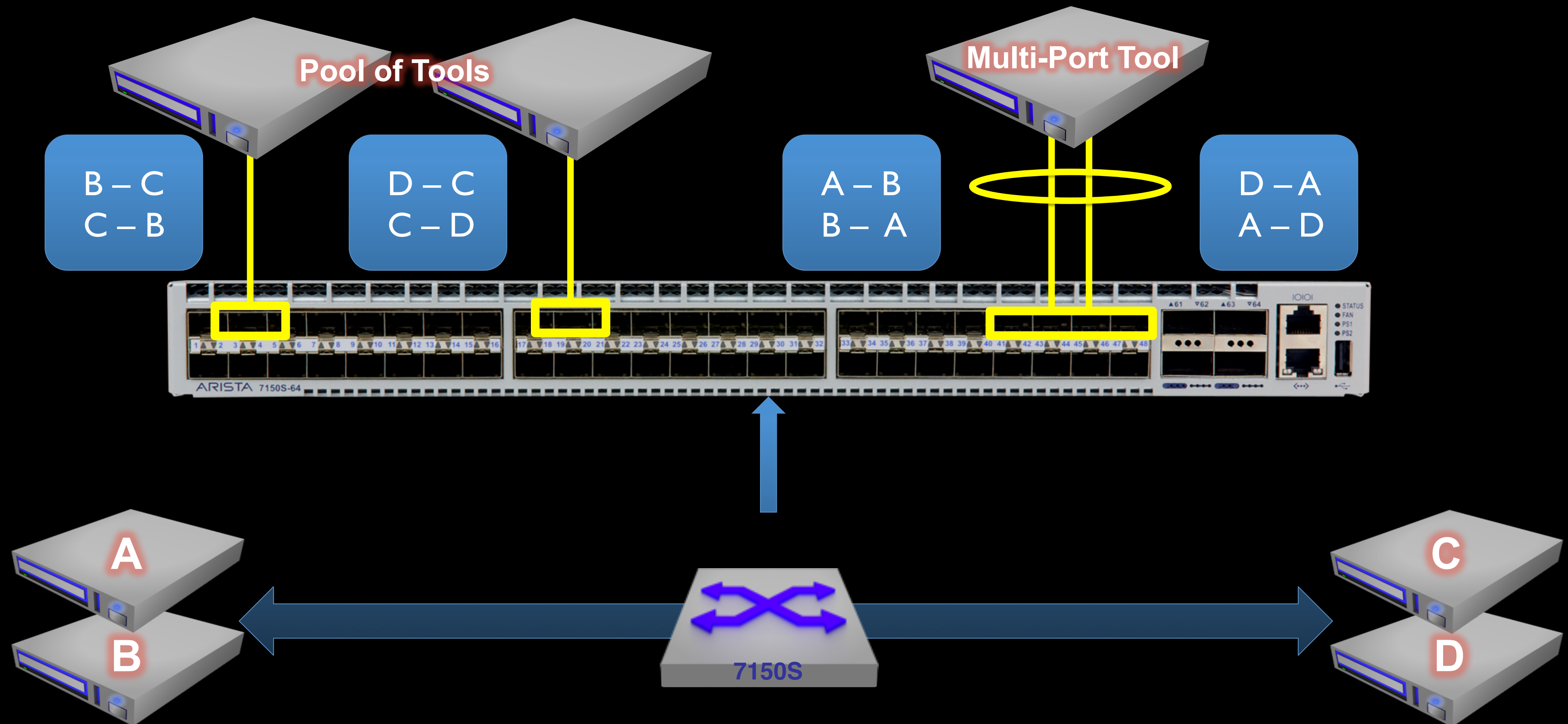
What Is TAP Aggregation?

- Customers who need deep network visibility deploy parallel instrumentation networks

- 3 major components:
  - Sources: TAPs (Optical, Electrical), SPAN ports
  - Aggregators: / Matrix Switches
  - Tools: Analysis tools / Packet Capture

- Analyzers are expensive, low density and limited in performance
  - Usually 1-2 x 10G max

- Aggregation layer
  - Aggregates many sources to fewer tool ports
  - Enables duplication or load balancing of traffic to multiple tools
  - Filters uninteresting traffic to unload analyzer
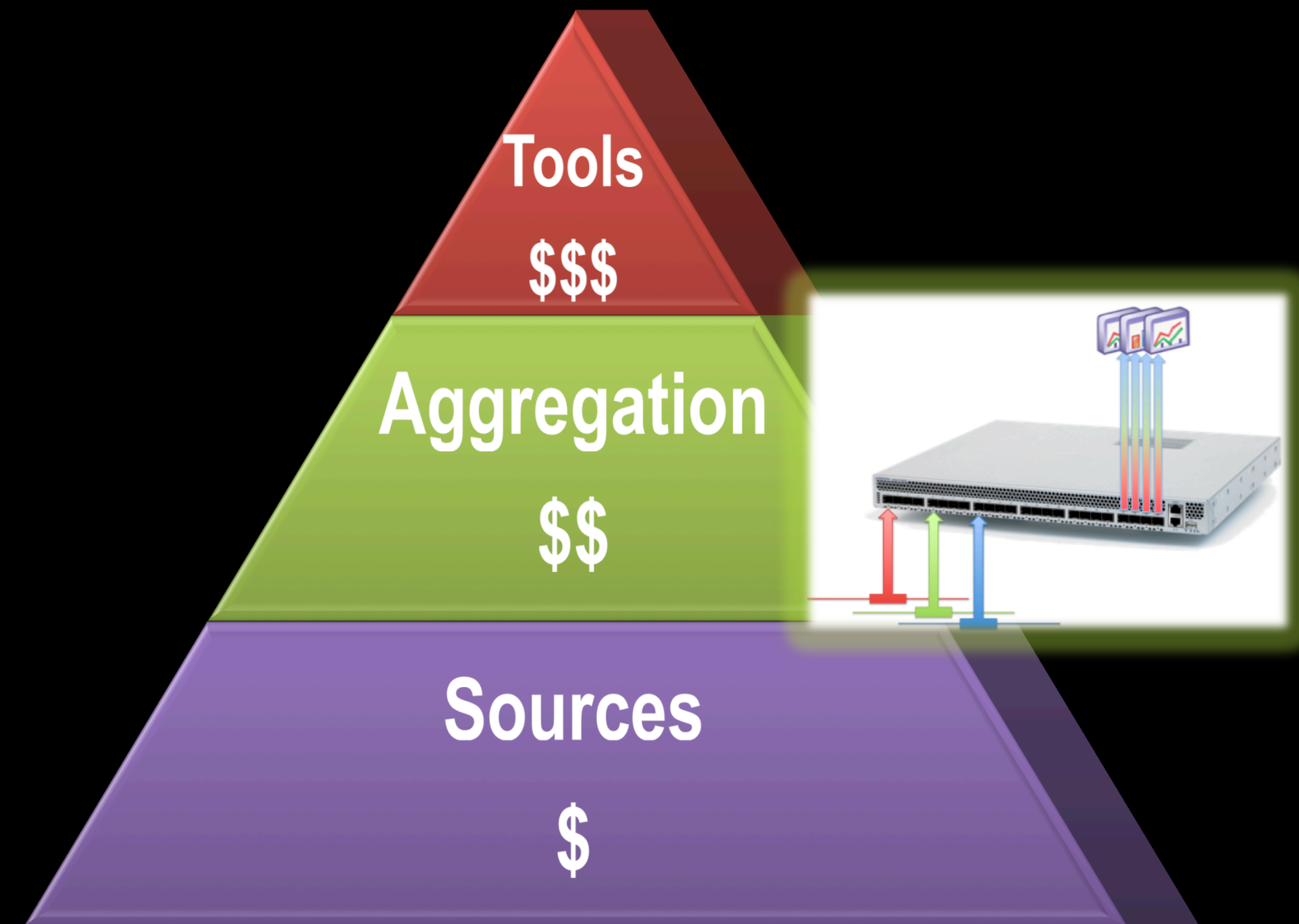
Who needs TAP Agg?

- Financial Services

  - Heavy users in trading and datacenter networks

  - For compliance, performance monitoring and troubleshooting

- High Performance Compute / Clustering

  - Fine grained monitoring of performance between nodes

- Cloud/Web Scale and Service Provider

  - DC wide monitoring infrastructure to allow rapid visibility into hotspots

  - Lawful intercept, capacity planning and customer sat. applications

- Government and Law Enforcement

  - lawful intercept applications requiring transparent traffic replication and filtering

Introducing Integrated SPAN/TAP Aggregation

Aggregation platform

Consolidates and filters multiple TAP/SPAN ports into fewer connections to the application

Filtered Traffic

Monitoring Applications

Corvil
TS-Associates
Precision Instrumentation

✓ Fewer Devices
✓ Less Ports
✓ Increase TAP Visibility

TAP Port   TAP Port   TAP Port

SPAN Port   SPAN Port   SPAN Port

Market Data Feed

Exchange Edge Switch

Feed Handlers

Co-located Low-Latency Switch

App. Servers

Co-located Low-Latency Switch

Historical & Audit DB's

Risk Engines

Dashboard Displays

Exchange Gateways

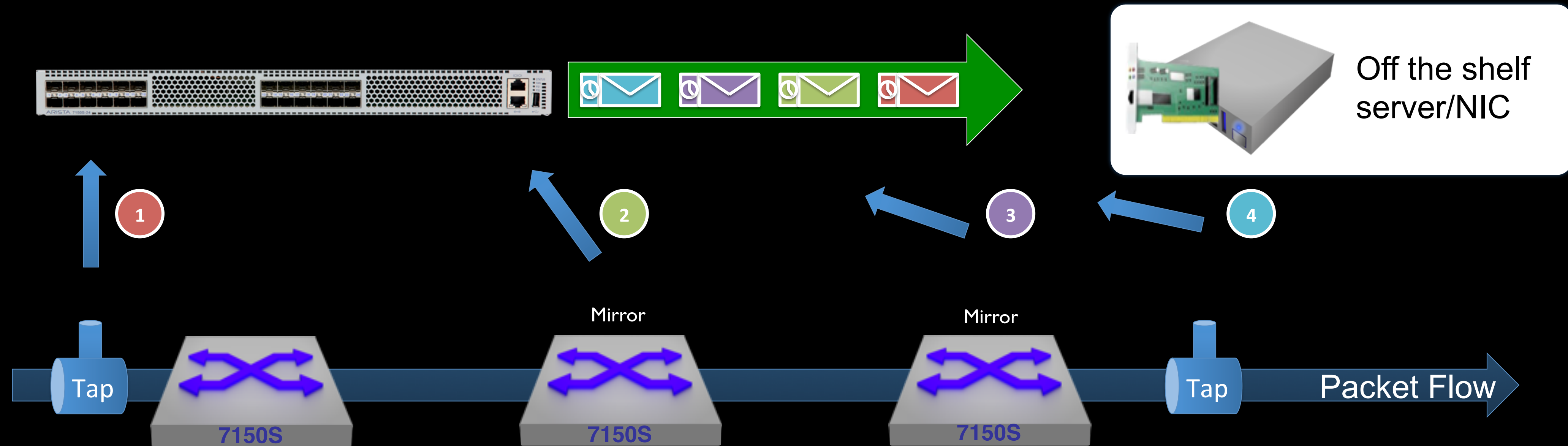Exchange Edge Switch

Exchange Matching Engine

- Integrated SPAN/TAP aggregation functionality

- Advanced features: N:M Replication, Filtering, HW Time-stamping and more

- Substantial Capex and Opex saving vs. proprietary SPAN/TAP aggregators

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Unique Feature Set

✓ Simple CLI Interface

✓ Any:Any Replication

✓ Symmetric Loadbalancing

✓ HW Time-stamping

✓ Intelligent Loadsharing

✓ PTP 1588

✓ Enhanced L2/3/4 Filtering

✓ Source Port Identification

✓ Packet Truncation

✓ AgilePorts + 40G

✓ Buffer Tuning

✓ sFlow and LANZ+

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Example – Unidirectional Flow Latency Measurement

Off the shelf server/NIC

① ② ③ ④

Mirror

Mirror

Tap

7150S

7150S

7150S

Tap

Packet Flow

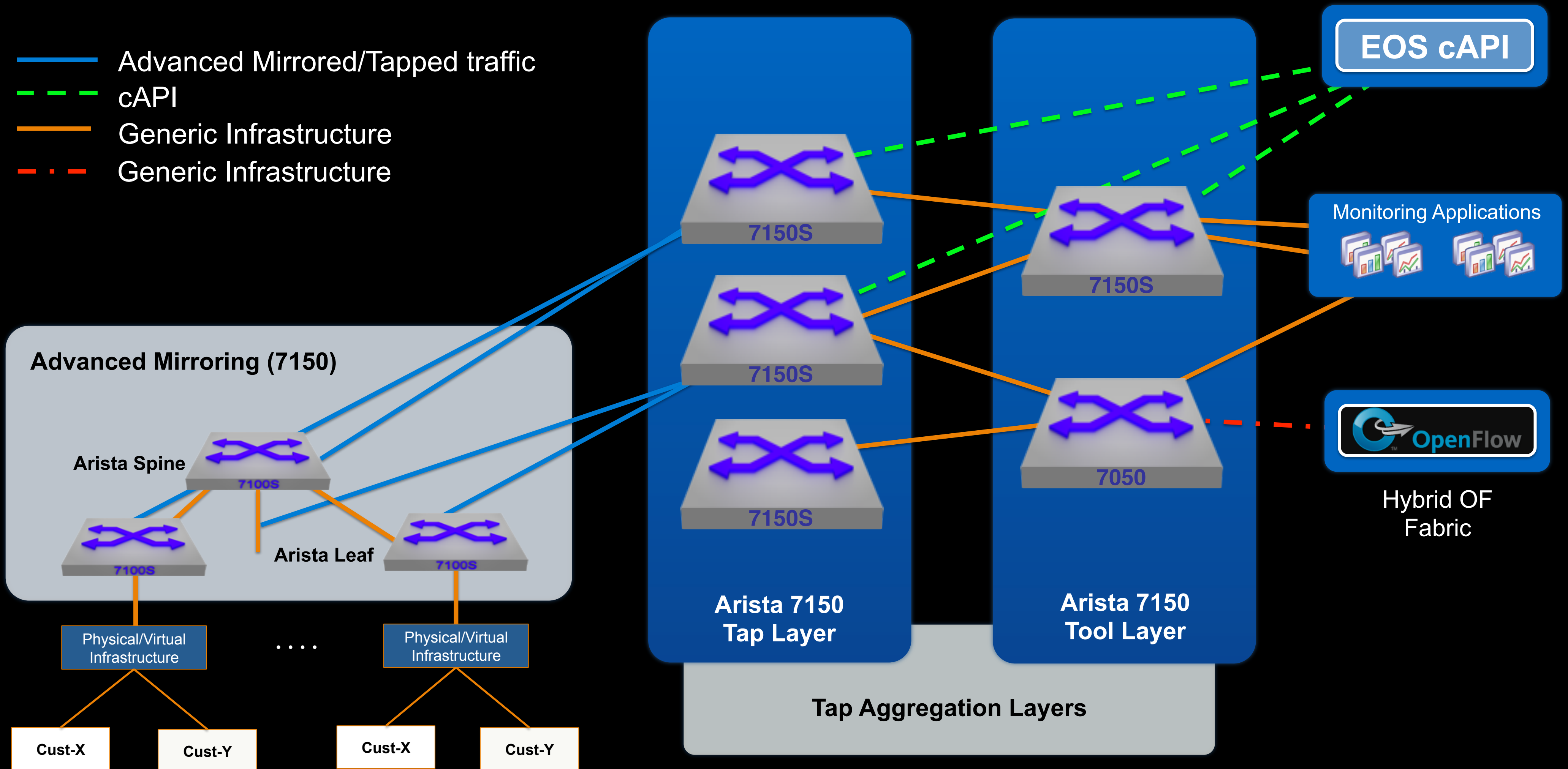- Packets marked with a per-hop ID

- 10ns precision timing with off the shelf hardware

- Relative timing can be recovered with simple scripts

- 95% reduction in cost vs traditional capture tools

```
~ capture$./Decoder.py timestamp.pcap

HW Timestamp(ns)          Delta(ns)
895645872.61
895671057.07              25184
895711657.89              40600
895736919.49              25261
```

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Example - High Capacity TAP Fabric Design

EOS cAPI

— Advanced Mirrored/Tapped traffic
--- cAPI
— Generic Infrastructure
-·- Generic Infrastructure

Monitoring Applications

Advanced Mirroring (7150)

Arista Spine
7100S

Arista Leaf

7100S   7100S

Physical/Virtual Infrastructure   . . . .   Physical/Virtual Infrastructure

Cust-X   Cust-Y   Cust-X   Cust-Y

7150S

7150S

7150S

7150S

7050

Arista 7150 Tap Layer

Arista 7150 Tool Layer

Tap Aggregation Layers

OpenFlow

Hybrid OF Fabric

Arista Confidential - NDA

What has LANZ+ got to do with TAP Aggregation?

TAP Aggregation is oversubscribed

- Filter aggressively to avoid traffic loss
- Or live with data loss

LANZ+ Provides the answer

- Real-time feedback to tools
- Detailed CLI outputs
- Allow implementation of rich filters
- Ultra close monitoring of utilization

Capture Tool

Capture Flow

LANZ+ Congestion Feedback

Incoming SPAN / TAP Feeds
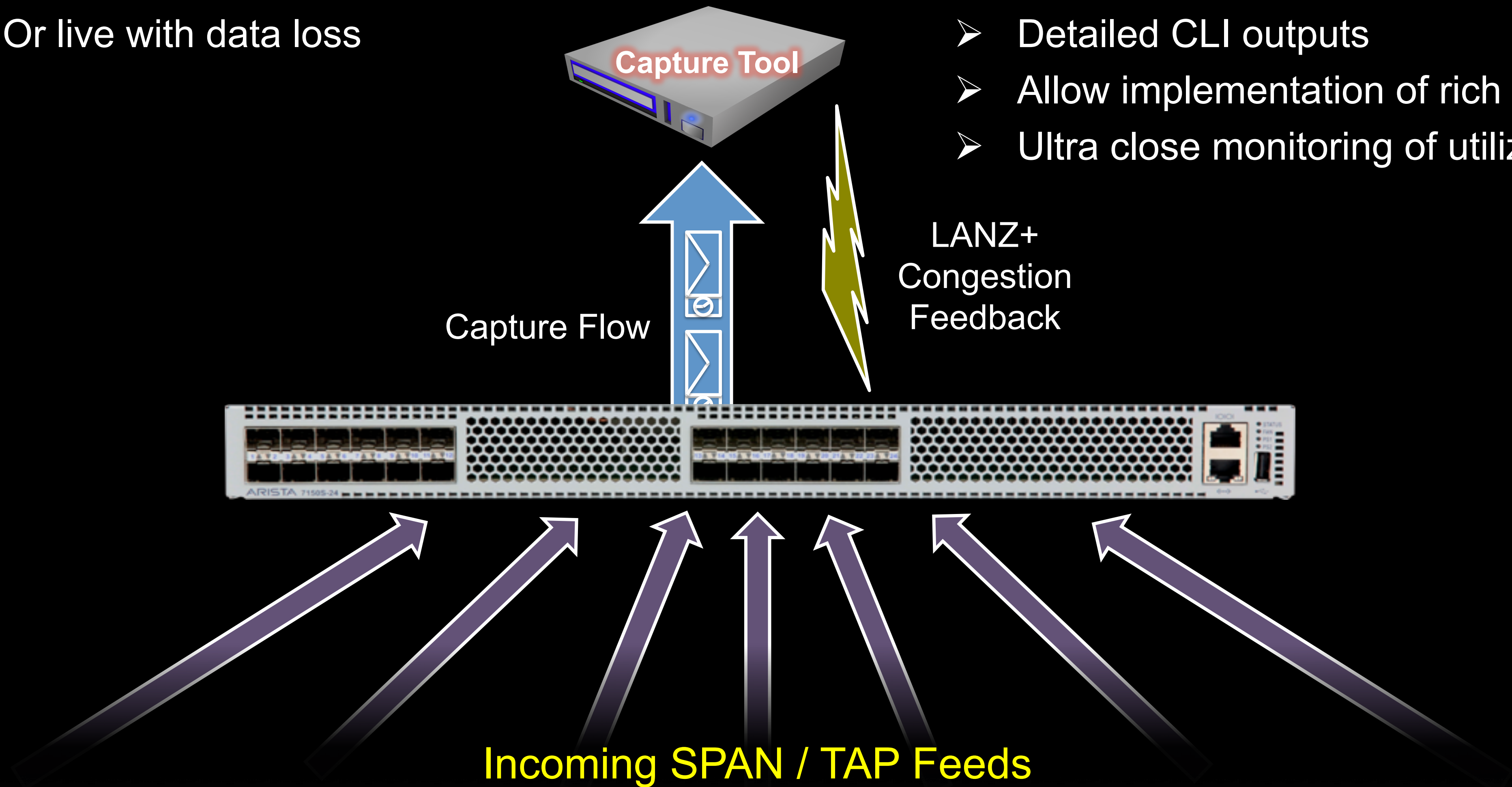
LANZ+ Enhanced Streaming

✓ Real-time streaming of congestion events

  ✓ Full Precision timestamps correlate to external events

✓ Direct to applications via open protocols

✓ Analyze network performance in real-time

✓ Hotspot early warning system for

  ✓ Hadoop, Cloud, Cluster, Financial
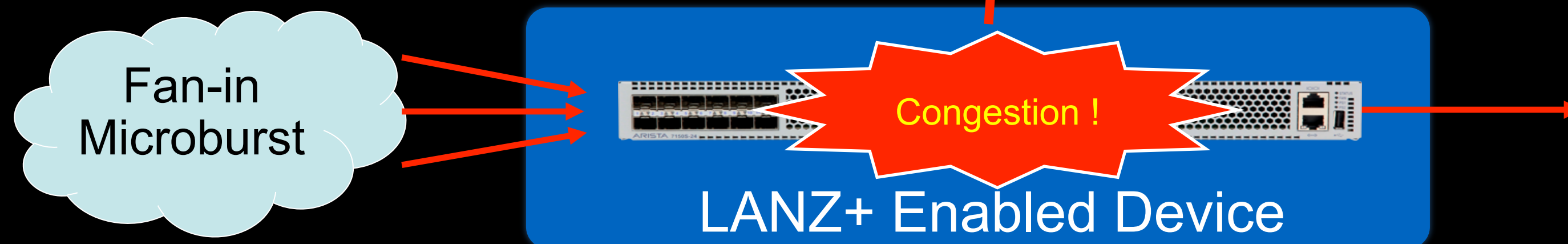
```
CongestionRecord:
    timestamp: Fri Feb 10 19:02:00.37462 2012
    intfName: Ethernet3
    switchId: 0
    portId: 5
    queueSize: 3
CongestionRecord:
    timestamp: Fri Feb 10 19:02:00.37474 2012
    intfName: Ethernet3
    switchId: 0
    portId: 5
    queueSize: 3
```

Corvil   TS-Associates
         Precision Instrumentation

Streamed Congestion Records

Fan-in Microburst

Congestion !

LANZ+ Enabled Device

Correlate Performance with Congestion Events and En-queued Data

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Unique - LANZ+ Congestion Capture

✓ Congestion threshold triggers data capture

✓ Capture packets actually experiencing congestion

✓ Reveal which applications were involved/affected

Congestion

Congested Packets

```
Report generated at 2012-12-06 09:15:22
Time                      Intf( TC )    Tx-Latency (usec)
---------------------------------------------------------
0:22:41.62959 ago         Et17(1)           0.904
0:22:42.38197 ago         Et17(1)           0.625
0:22:47.38219 ago         Et17(1)           9.605
0:22:52.38242 ago         Et17(1)          29.811
0:22:57.38265 ago         Et17(1)          29.440
0:23:02.38288 ago         Et17(1)          35.625
0:23:02.38296 ago         Et17(1)          32.440
0:23:02.38304 ago         Et17(1)           0.718
0:23:02.38313 ago         Et17(1)           6.834
0:23:02.38321 ago         Et17(1)           6.400
```

Dynamic calculation of Transmit Latency

Correlate performance with traffic captured at the time of congestion

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