



Programmability, Integration and Visibility for Media Networks

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IP SHOWCASE THEATRE AT IBC - SEPT. 14-18, 2018



The visibility challenge

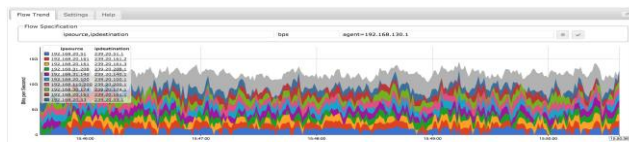
- physical
- coding
- baseband

- Single essence per BNC
- Single duplex
- Direct measurement
- Synchronous transport



7 layer OSI model --
More to keep an eye on! --

- Multiple essence per Fiber --
- Full duplex --
- Indirect measurement --
- Asynchronous transport --



```

#show ip interface brief
Line    Name             IP-Address      Status     Config
-----  ---             -
Et0/0/0  GigabitEthernet0/0/0  10.1.1.1/24     up         10000
Et0/0/1  GigabitEthernet0/0/1  10.1.1.2/24     up         10000
Et0/0/2  GigabitEthernet0/0/2  10.1.1.3/24     up         10000
Et0/0/3  GigabitEthernet0/0/3  10.1.1.4/24     up         10000
Et0/0/4  GigabitEthernet0/0/4  10.1.1.5/24     up         10000
Et0/0/5  GigabitEthernet0/0/5  10.1.1.6/24     up         10000
Et0/0/6  GigabitEthernet0/0/6  10.1.1.7/24     up         10000
Et0/0/7  GigabitEthernet0/0/7  10.1.1.8/24     up         10000
Et0/0/8  GigabitEthernet0/0/8  10.1.1.9/24     up         10000
Et0/0/9  GigabitEthernet0/0/9  10.1.1.10/24    up         10000
Et0/0/10 GigabitEthernet0/0/10 10.1.1.11/24   up         10000
Et0/0/11 GigabitEthernet0/0/11 10.1.1.12/24   up         10000
Et0/0/12 GigabitEthernet0/0/12 10.1.1.13/24   up         10000
Et0/0/13 GigabitEthernet0/0/13 10.1.1.14/24   up         10000
Et0/0/14 GigabitEthernet0/0/14 10.1.1.15/24   up         10000
Et0/0/15 GigabitEthernet0/0/15 10.1.1.16/24   up         10000
Et0/0/16 GigabitEthernet0/0/16 10.1.1.17/24   up         10000
Et0/0/17 GigabitEthernet0/0/17 10.1.1.18/24   up         10000
Et0/0/18 GigabitEthernet0/0/18 10.1.1.19/24   up         10000
Et0/0/19 GigabitEthernet0/0/19 10.1.1.20/24   up         10000
Et0/0/20 GigabitEthernet0/0/20 10.1.1.21/24   up         10000
Et0/0/21 GigabitEthernet0/0/21 10.1.1.22/24   up         10000
Et0/0/22 GigabitEthernet0/0/22 10.1.1.23/24   up         10000
Et0/0/23 GigabitEthernet0/0/23 10.1.1.24/24   up         10000
Et0/0/24 GigabitEthernet0/0/24 10.1.1.25/24   up         10000
Et0/0/25 GigabitEthernet0/0/25 10.1.1.26/24   up         10000
Et0/0/26 GigabitEthernet0/0/26 10.1.1.27/24   up         10000
Et0/0/27 GigabitEthernet0/0/27 10.1.1.28/24   up         10000
Et0/0/28 GigabitEthernet0/0/28 10.1.1.29/24   up         10000
Et0/0/29 GigabitEthernet0/0/29 10.1.1.30/24   up         10000
Et0/0/30 GigabitEthernet0/0/30 10.1.1.31/24   up         10000
Et0/0/31 GigabitEthernet0/0/31 10.1.1.32/24   up         10000
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Et0/0/35 GigabitEthernet0/0/35 10.1.1.36/24   up         10000
Et0/0/36 GigabitEthernet0/0/36 10.1.1.37/24   up         10000
Et0/0/37 GigabitEthernet0/0/37 10.1.1.38/24   up         10000
Et0/0/38 GigabitEthernet0/0/38 10.1.1.39/24   up         10000
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Et0/0/41 GigabitEthernet0/0/41 10.1.1.42/24   up         10000
Et0/0/42 GigabitEthernet0/0/42 10.1.1.43/24   up         10000
Et0/0/43 GigabitEthernet0/0/43 10.1.1.44/24   up         10000
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Et0/0/48 GigabitEthernet0/0/48 10.1.1.49/24   up         10000
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Et0/0/51 GigabitEthernet0/0/51 10.1.1.52/24   up         10000
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Et0/0/62 GigabitEthernet0/0/62 10.1.1.63/24   up         10000
Et0/0/63 GigabitEthernet0/0/63 10.1.1.64/24   up         10000
Et0/0/64 GigabitEthernet0/0/64 10.1.1.65/24   up         10000
Et0/0/65 GigabitEthernet0/0/65 10.1.1.66/24   up         10000
Et0/0/66 GigabitEthernet0/0/66 10.1.1.67/24   up         10000
Et0/0/67 GigabitEthernet0/0/67 10.1.1.68/24   up         10000
Et0/0/68 GigabitEthernet0/0/68 10.1.1.69/24   up         10000
Et0/0/69 GigabitEthernet0/0/69 10.1.1.70/24   up         10000
Et0/0/70 GigabitEthernet0/0/70 10.1.1.71/24   up         10000
Et0/0/71 GigabitEthernet0/0/71 10.1.1.72/24   up         10000
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Et0/0/73 GigabitEthernet0/0/73 10.1.1.74/24   up         10000
Et0/0/74 GigabitEthernet0/0/74 10.1.1.75/24   up         10000
Et0/0/75 GigabitEthernet0/0/75 10.1.1.76/24   up         10000
Et0/0/76 GigabitEthernet0/0/76 10.1.1.77/24   up         10000
Et0/0/77 GigabitEthernet0/0/77 10.1.1.78/24   up         10000
Et0/0/78 GigabitEthernet0/0/78 10.1.1.79/24   up         10000
Et0/0/79 GigabitEthernet0/0/79 10.1.1.80/24   up         10000
Et0/0/80 GigabitEthernet0/0/80 10.1.1.81/24   up         10000
Et0/0/81 GigabitEthernet0/0/81 10.1.1.82/24   up         10000
Et0/0/82 GigabitEthernet0/0/82 10.1.1.83/24   up         10000
Et0/0/83 GigabitEthernet0/0/83 10.1.1.84/24   up         10000
Et0/0/84 GigabitEthernet0/0/84 10.1.1.85/24   up         10000
Et0/0/85 GigabitEthernet0/0/85 10.1.1.86/24   up         10000
Et0/0/86 GigabitEthernet0/0/86 10.1.1.87/24   up         10000
Et0/0/87 GigabitEthernet0/0/87 10.1.1.88/24   up         10000
Et0/0/88 GigabitEthernet0/0/88 10.1.1.89/24   up         10000
Et0/0/89 GigabitEthernet0/0/89 10.1.1.90/24   up         10000
Et0/0/90 GigabitEthernet0/0/90 10.1.1.91/24   up         10000
Et0/0/91 GigabitEthernet0/0/91 10.1.1.92/24   up         10000
Et0/0/92 GigabitEthernet0/0/92 10.1.1.93/24   up         10000
Et0/0/93 GigabitEthernet0/0/93 10.1.1.94/24   up         10000
Et0/0/94 GigabitEthernet0/0/94 10.1.1.95/24   up         10000
Et0/0/95 GigabitEthernet0/0/95 10.1.1.96/24   up         10000
Et0/0/96 GigabitEthernet0/0/96 10.1.1.97/24   up         10000
Et0/0/97 GigabitEthernet0/0/97 10.1.1.98/24   up         10000
Et0/0/98 GigabitEthernet0/0/98 10.1.1.99/24   up         10000
Et0/0/99 GigabitEthernet0/0/99 10.1.1.100/24  up         10000

```





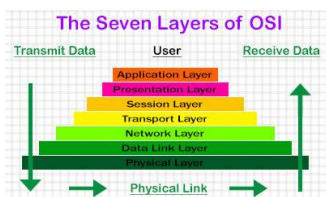
We need more visibility



Network monitoring is all about:

- Transforming data into actionable information
- Spotting trends
- Preventing service outage pro-actively
- Managing performance as the network:
 - Expands
 - Evolves
 - Gets upgraded
 - Supports new functionality

- Physical health – PSU/Fans/Temp
- CPU - load, memory, processes
- Connectivity - optics, optical strength, BER
- Logical links, topology, host presence
- Bandwidth use – host and link
- CRC errors, dropped packets, multicast paths, congestion
- PTP / SDN / IGMP / PIM / BGP / STP...
- sFlow, latency analysis, buffer usage...
- Status of High Availability components in the network
- Flow credentials (TTL, L2/L3 addressing)
- New device introduction
- Security...
- **NONE of this is about baseband video**

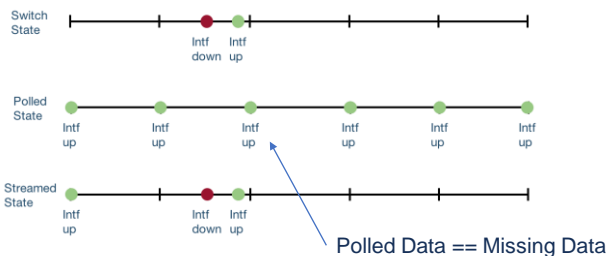


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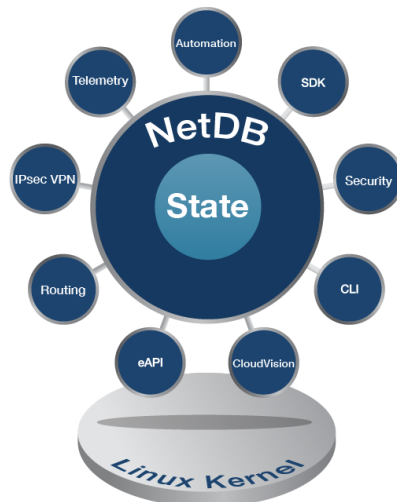


For more visibility we need a rich data set

- Rich data
- Timely
- Fine grained
- SNMP – is it timely or fine grained?



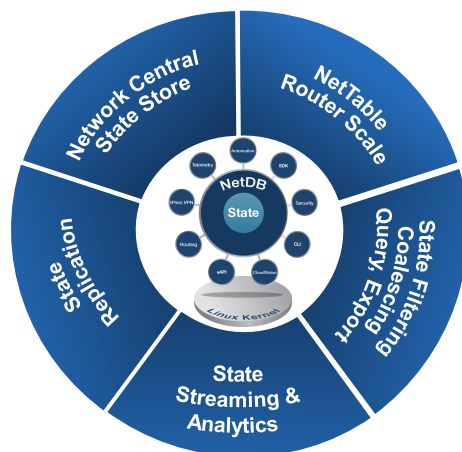
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Beyond SNMP

- Streaming telemetry is the future!
- Timely + fine grained : Events are streamed when they happen
- No more 30-60s SNMP sampling cycles
- Redundant data eradicated : lower processing load and network bandwidth



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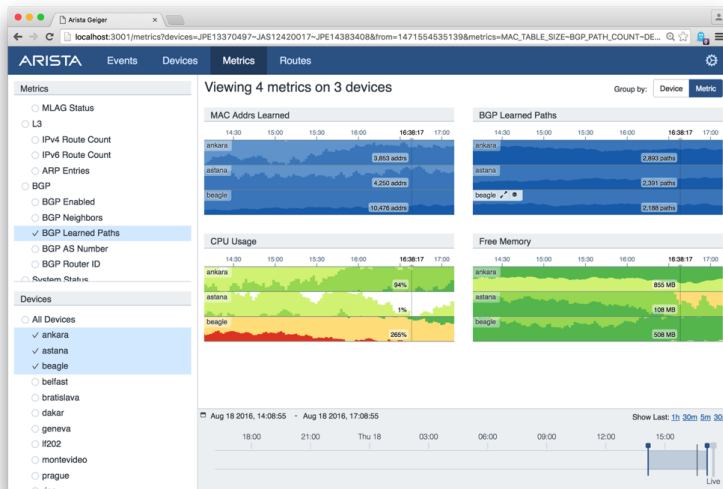
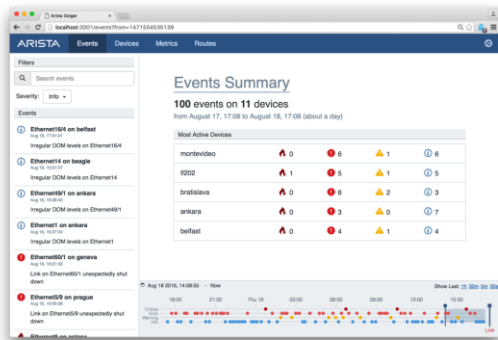
- User Driven
- Vendor-neutral
- Configuration & Streaming Telemetry
- Model-based
 - Common data model for management and operations
 - Multiple transports available





Empowered by streaming telemetry..

- Real-time network health insight provided across an entire networking estate
- Device - device & time - time comparisons uncover trends, outliers and anomalies



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Empowered by streaming telemetry..

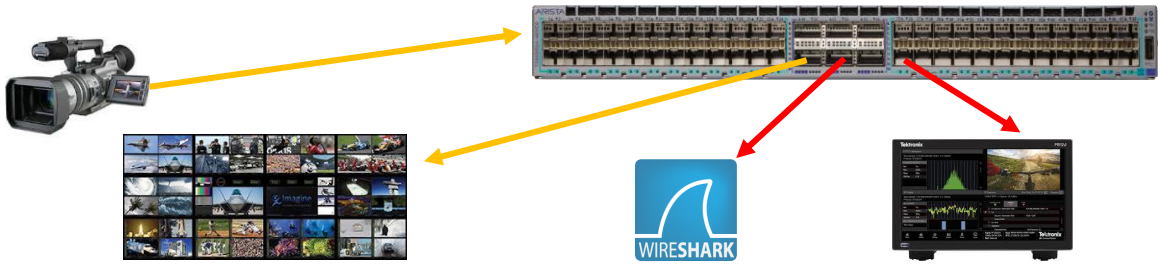
- Map multicast flows through a complex network
- Identify ingress, replication and egress points
- Network data converted to Broadcast Information

Source & Group	Name	Ingress	Egress	Monitored Interface Count	Action
10.123.1.11, 239.1.1.1	Studio 1 - UHD Camera 1	eosplus-7050q-1.rtp.aristanetworks.com Ethernet1/1: 0.08 Mbps	-	8	[Stop] [Start]
10.123.1.11, 239.1.1.2	Studio 1 - UHD Camera 2	eosplus-7050q-1.rtp.aristanetworks.com Ethernet1/1: 0.24 Mbps	-	8	[Stop] [Start]
10.123.1.11, 239.1.1.3		eosplus-7050q-1.rtp.aristanetworks.com Ethernet1/1: 29.827 pps	-	8	[Stop] [Start]
10.123.1.11, 239.1.1.4	Studio 1 - UHD Camera 7	eosplus-7050q-1.rtp.aristanetworks.com Ethernet1/1: 0.48 Mbps	-	8	[Stop] [Start]







Port Mirroring

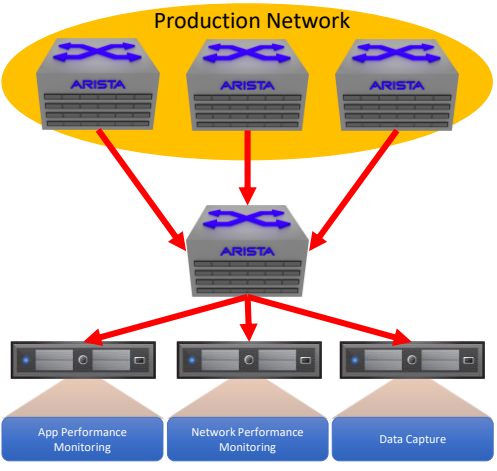


- **Port mirroring:** The switch sends a **copy** of all network packets seen on one or more **ports** to another **port**, where the packets can be analyzed
- **For Broadcast:** Non invasive tool access, no need for SDN or IGMP
- **Focused visibility:** Filter, truncate, and timestamp flows for more insight into the network






Virtualizing your Toolkit



- **Tap(Span) Aggregation:** Aggregate out of band monitoring into a single scalable fabric creating a tool ecosystem
- **Virtualised:** Tap any point in your network, virtualize your toolset
- **Visibility Focused:** Manipulate, steer, slice, and timestamp flows for maximum insight across the network
- **Automation:** Build powerful automated monitoring workflows maximizing visibility and minimizing OPEX / TCO





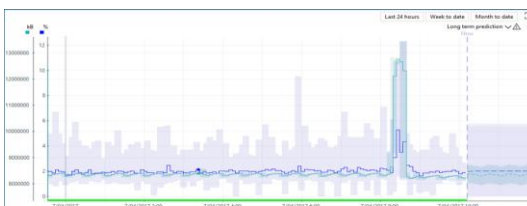
Programmability

- Network visibility tools can give us a detailed and timely view into the network
- Now we need the tools to act on that information
- OpenConfig, programmatic CLI access, SSH etc provides secure switch access
- 3rd Party applications can bring Broadcast knowledge and business logic to the analysis of this network status
- COTS switches are typically Linux servers attached to the forwarding silicon
 - Leverage this Linux infrastructure
 - Python, bash, yum
 - Close coupling to both the information source and the point of influence (the switch!)



3rd Party programmability example

- Highly integrated; sFlow, interface counters, multicast flow information, automated mirroring and Tap Aggregation
- Network info is reconciled against the Broadcast Controllers view of requested flows



dataminer

IP - SYSTEM OVERVIEW

SPINE TIER: Arista Switch Spine

LEAF TIER: Arista Switch Leaf 1, Arista Switch Leaf 2

SITE A NODES: SWP-A-1001, SWP-A-1002, SWP-A-1003, SWP-A-1004, SWP-A-1005, SWP-A-1006, SWP-A-1007, SWP-A-1008, SWP-A-1009, SWP-A-1010

SITE B NODES: SWP-B-1001, SWP-B-1002, SWP-B-1003, SWP-B-1004, SWP-B-1005, SWP-B-1006, SWP-B-1007, SWP-B-1008, SWP-B-1009, SWP-B-1010

Description [LDP Neighbors]	Local Interface...	Last Change Time L...	Interface Id [L...
Management1 -> Ethernet1 (lcanitademo)	Management1	08/05/2018 09:48:41	Ethernet1
Management1 -> gi1/24	Management1	27/02/2018 07:38:59	gi1/24
Management1 -> Management1 (lcanitademo)	Management1	27/02/2018 09:07:29	Management1





3rd Party programmability example

- A rich view of the network traffic status
- ... is transformed through a Broadcast lens
- Network knowledge is fed back into media IP routing
- Cloud scale routing techniques applied to ST2110!



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Visibility leads to flexibility, enabling choice

- IP installations for Live Production and Playout are getting more complex
- Rich, timely and fine grained data leads to information, which leads to insight
- Tight integration with the network fabric enables innovative SDN applications – in the broadest sense!
- SDN (in the broadest sense) drives improved performance and reduced OPEX
- With the right tools, the network becomes the solution, not the problem



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Thank You

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