

# PTP Management & Media Flow Monitoring For All-IP Infrastructures

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# INTRODUCTION

Our company: Skyline Communications

- established in 1985, independent
- headquartered in Izegem, Belgium
- global presence (19 international sites)
- 300+ employees
- acknowledged expert in e2e monitoring & orchestration

Our product: DataMiner

- multi-vendor off-the-shelf NMS & OSS platform
- monitor, control, orchestrate
- 6000+ systems deployed
- 5500+ drivers to interface with products from 600+ vendors



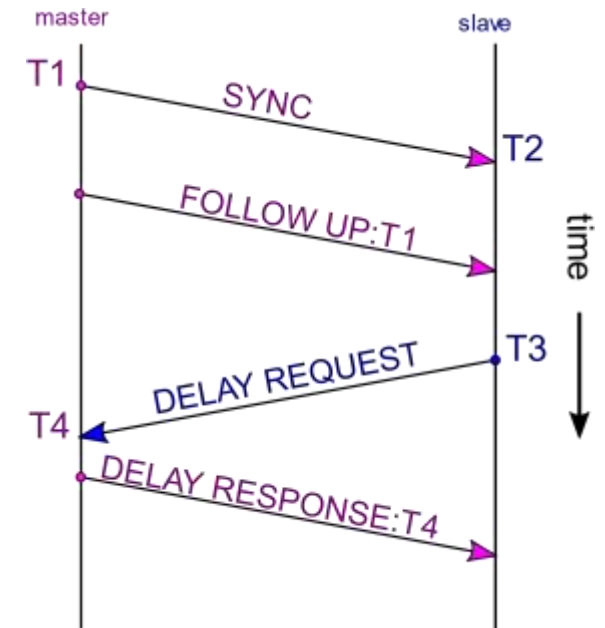
## PTP – a protocol, not a signal

PTP standard makes some assumptions

- no packet delay variation (PDV)
- no assymetry (internal assymetry, transmission assymetry)
- timestamps are perfect

mechanisms to alleviate these sources of errors

- create timestamps in hardware
- use QoS to prioritize PTP traffic
- chose between BC, TC, E2E, P2P, correct timing intervals, etc.. to optimize the precision of time at the endpoint



→ but nothing is perfect

## PTP – common sources of error



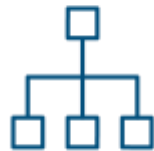
configuration issues (grandmaster, boundary clock, slave)

- BMCA settings
- messaging rate intervals
- communication mode (unicast, multicast, mixed)



device issues

- grandmaster, boundary clock failure
- loss of external reference
- badly implemented BMCA, PTP master election process



network issues

- missing event messages
- corrupted event messages
- increased packet delay variations (PDV)
- network assymetry
- multicast issues



automate PTP configuration



monitor & control PTP environment

## Automated PTP Provisioning

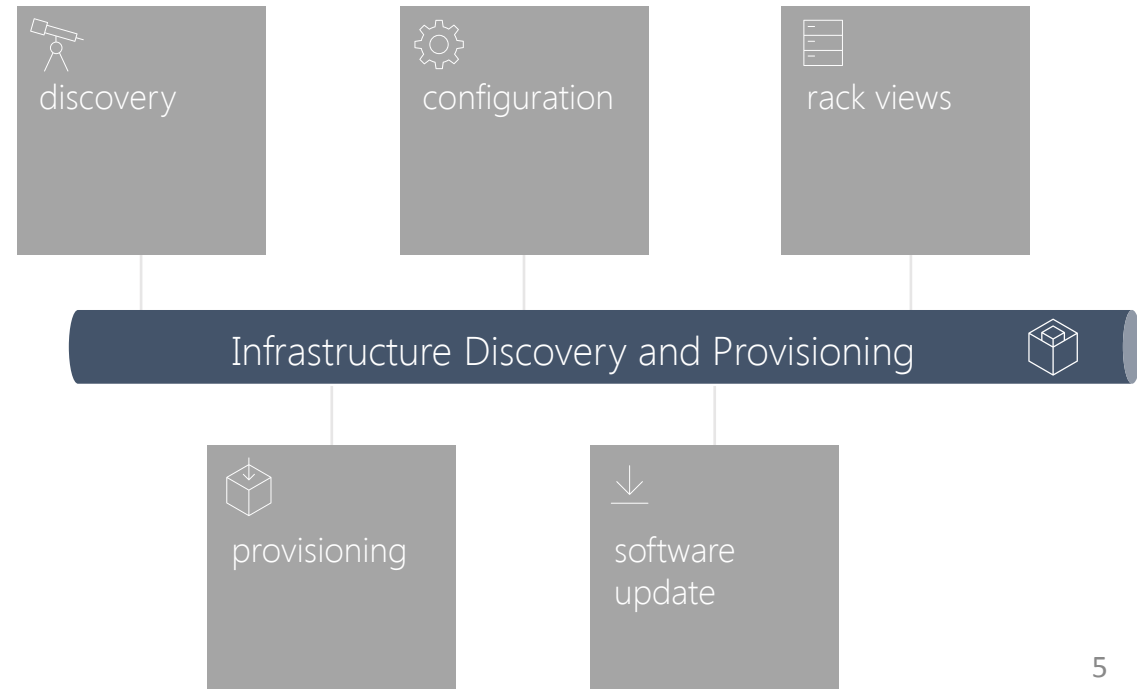


- automatically detect ANY new PTP aware devices (IS-04 / proprietary protocols) – FUTURE PROOF
- automatically extract e2e PTP topology (LLDP)
- apply standard PTP settings/profiles to ANY grandmaster, switch, slave device
- compare PTP configurations
- define and apply “golden” configurations



**dataminer**

infrastructure discovery and provisioning



# 360° PTP Monitoring & Control



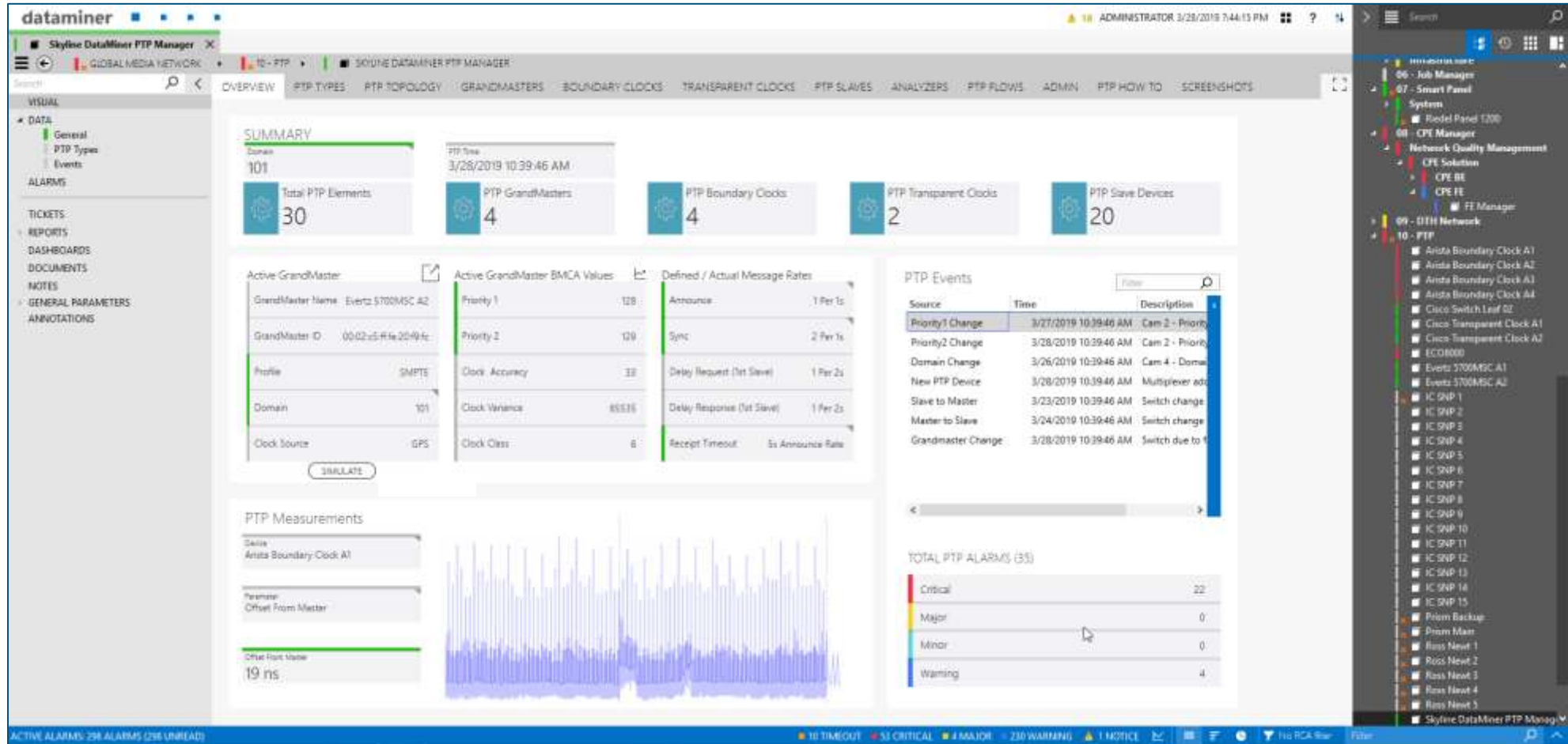
- monitor every single PTP metric on all PTP grandmasters, PTP masters, PTP slaves
- monitor PTP performance (e.g. PTP offset, PTP mean path delay)
- monitor PTP multicast-traffic (network packets as well as switch tables)
- apply PTP security workflows (e.g. block PTP slave devices to never become a master)
- integrate network analyzers



**dataminer**

monitoring & control

# PTP Overview



The screenshot displays the 'dataminer' interface for 'Skyline DataMiner PTP Manager'. The dashboard provides a comprehensive overview of the PTP network configuration and status.

**SUMMARY**

- Domains: 101
- PTP Type: 3/26/2019 10:39:46 AM
- Total PTP Elements: 30
- PTP GrandMasters: 4
- PTP Boundary Clocks: 4
- PTP Transparent Clocks: 2
- PTP Slave Devices: 20

**Active GrandMaster**

GrandMaster Name	Evertz 5700MSC A2
GrandMaster ID	00:02:25:ff:fe:20:9:fc
Profile	SNTPS
Domain	101
Clock Source	GPS

**Active GrandMaster BMCA Values**

Priority 1	128
Priority 2	129
Clock Accuracy	33
Clock Variance	85338
Clock Class	6

**Defined / Actual Message Rates**

Announce	1 Per 1s
Sync	2 Per 1s
Delay Request (1st Slave)	1 Per 2s
Delay Response (1st Slave)	1 Per 2s
Receipt Timeout	5s Announce Rate

**PTP Events**

Source	Time	Description
Priority1 Change	3/27/2019 10:39:46 AM	Cam 2 - Priority
Priority2 Change	3/28/2019 10:39:46 AM	Cam 2 - Priority
Domain Change	3/26/2019 10:39:46 AM	Cam 4 - Domain
New PTP Device	3/28/2019 10:39:46 AM	Multiplexer add
Slave to Master	3/23/2019 10:39:46 AM	Switch change
Master to Slave	3/24/2019 10:39:46 AM	Switch change
Grandmaster Change	3/28/2019 10:39:46 AM	Switch due to 1

**PTP Measurements**

Device: Arista Boundary-Clock A1

Parameter: Offset From Master

Offset From Master: 19 ns

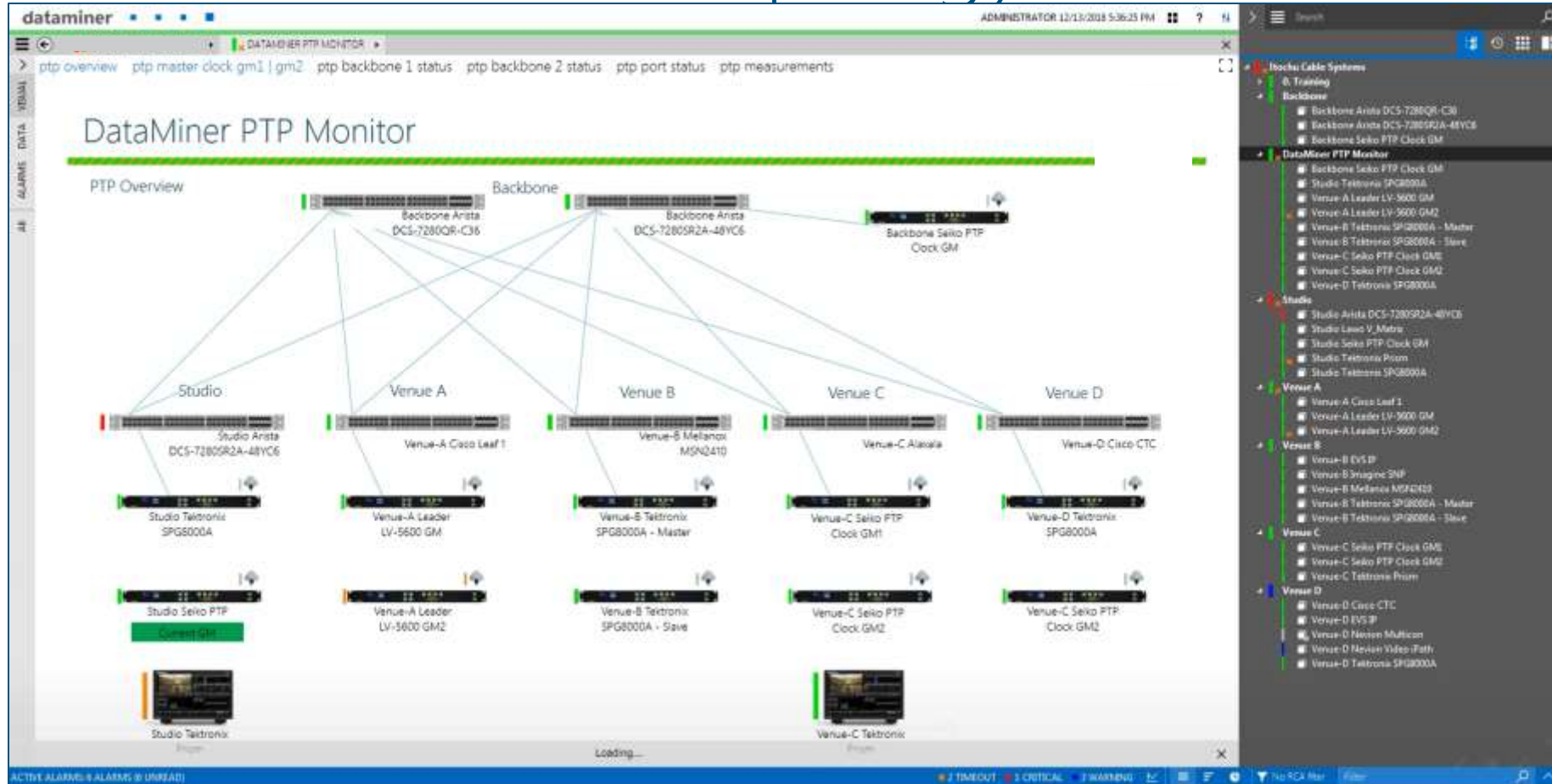
The interface also includes a 'PTP Measurements' section with a line graph showing the offset from the master over time. A 'TOTAL PTP ALARMS (53)' summary is provided, showing 22 Critical, 0 Major, 0 Minor, and 4 Warning alarms.

**TOTAL PTP ALARMS (53)**

Critical	22
Major	0
Minor	0
Warning	4

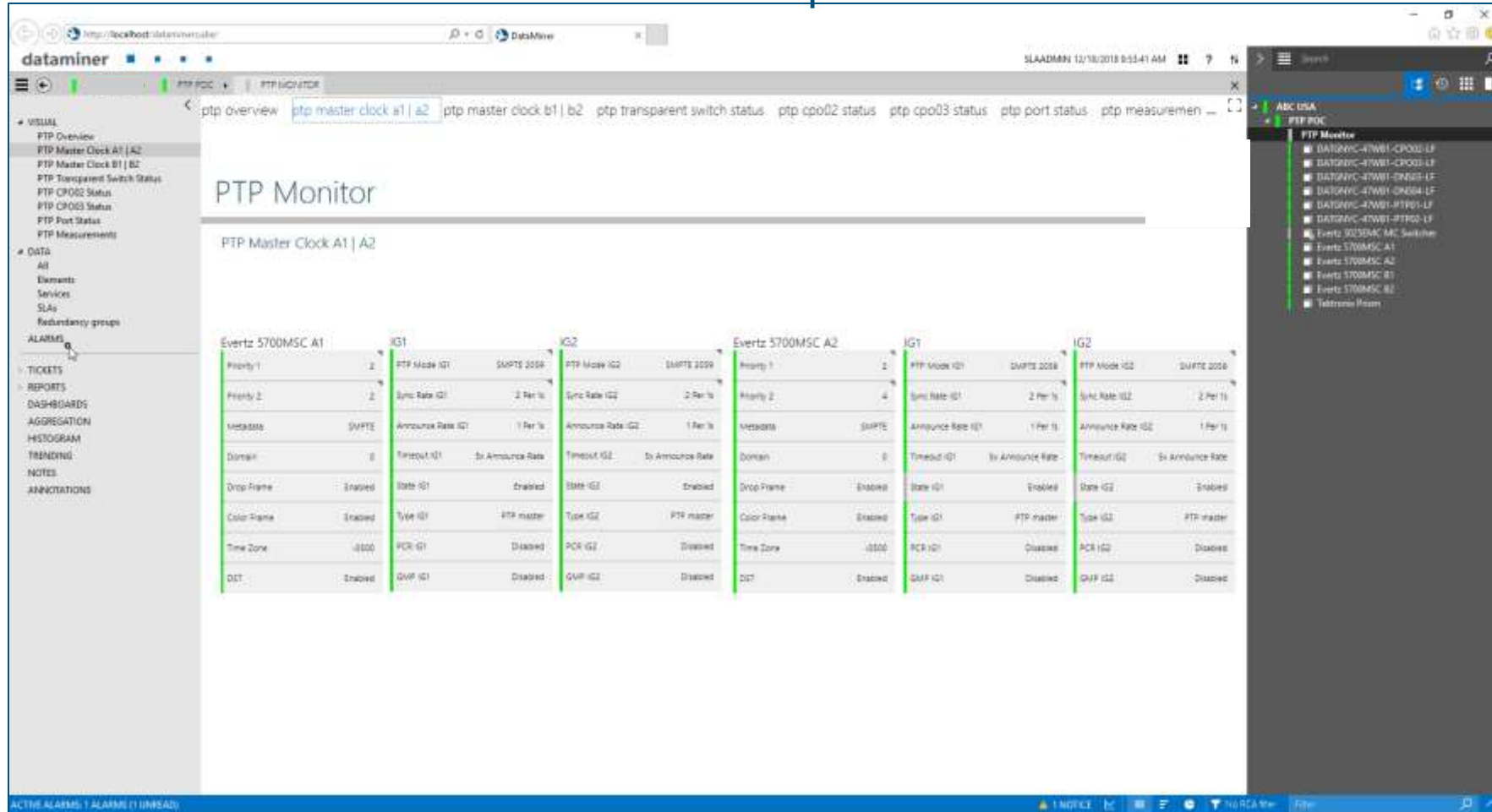
The interface includes a navigation menu on the left with sections like VISUAL, DATA, ALARMS, TICKETS, REPORTS, DASHBOARDS, DOCUMENTS, NOTES, GENERAL PARAMETERS, and ANNOTATIONS. A right-hand navigation pane shows a tree view of the network structure, including Job Manager, Smart Panel, CPE Manager, and various network devices like Arista Boundary Clocks and Cisco switches.

## PTP Topology





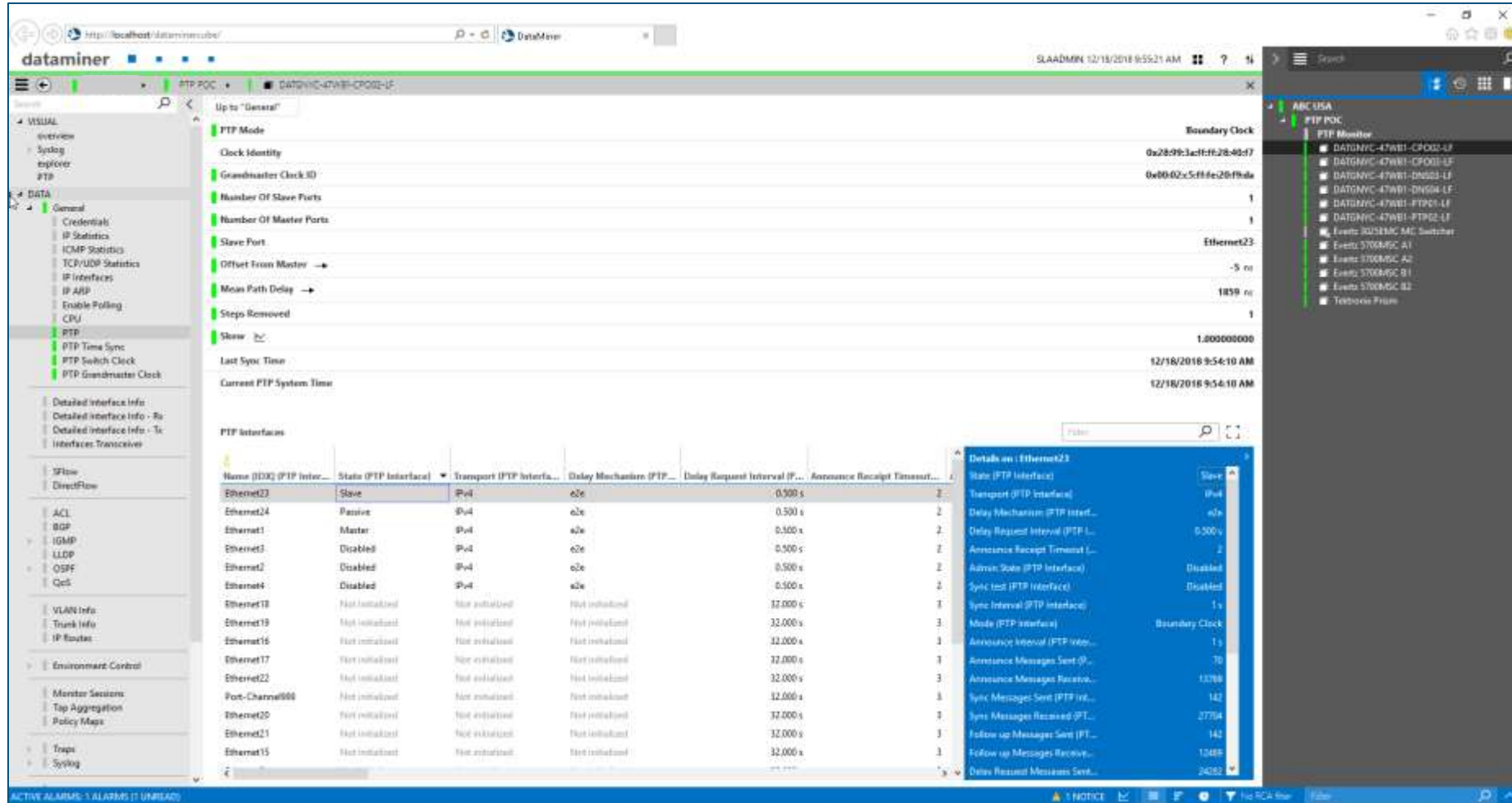
# PTP Comparison



The screenshot shows the Dataminer PTP Monitor interface. The main content area displays a comparison of two Evertz 5700MSC devices, A1 and A2, across various parameters. The interface includes a navigation menu on the left, a breadcrumb trail at the top, and a sidebar on the right showing a network tree.

Evertz 5700MSC A1		IG1		IG2		Evertz 5700MSC A2		IG1		IG2	
Priority 1	2	PTP Mode IG1	SNRPTS 2008	PTP Mode IG2	SNRPTS 2008	Priority 1	2	PTP Mode IG1	SNRPTS 2008	PTP Mode IG2	SNRPTS 2008
Priority 2	2	Sync Rate IG1	2 Per %	Sync Rate IG2	2 Per %	Priority 2	4	Sync Rate IG1	2 Per %	Sync Rate IG2	2 Per %
Holdable	SNRPTS	Announce Rate IG1	1 Per %	Announce Rate IG2	1 Per %	Holdable	SNRPTS	Announce Rate IG1	1 Per %	Announce Rate IG2	1 Per %
Domain	0	Timeout IG1	By Announce Rate	Timeout IG2	By Announce Rate	Domain	0	Timeout IG1	By Announce Rate	Timeout IG2	By Announce Rate
Drop Frame	Enabled	State IG1	Enabled	State IG2	Enabled	Drop Frame	Enabled	State IG1	Enabled	State IG2	Enabled
Color Frame	Enabled	Type IG1	PTP master	Type IG2	PTP master	Color Frame	Enabled	Type IG1	PTP master	Type IG2	PTP master
Time Zone	US00	PCR IG1	Disabled	PCR IG2	Disabled	Time Zone	US00	PCR IG1	Disabled	PCR IG2	Disabled
DCT	Enabled	GMF IG1	Disabled	GMF IG2	Disabled	DCT	Enabled	GMF IG1	Disabled	GMF IG2	Disabled

# PTP Details



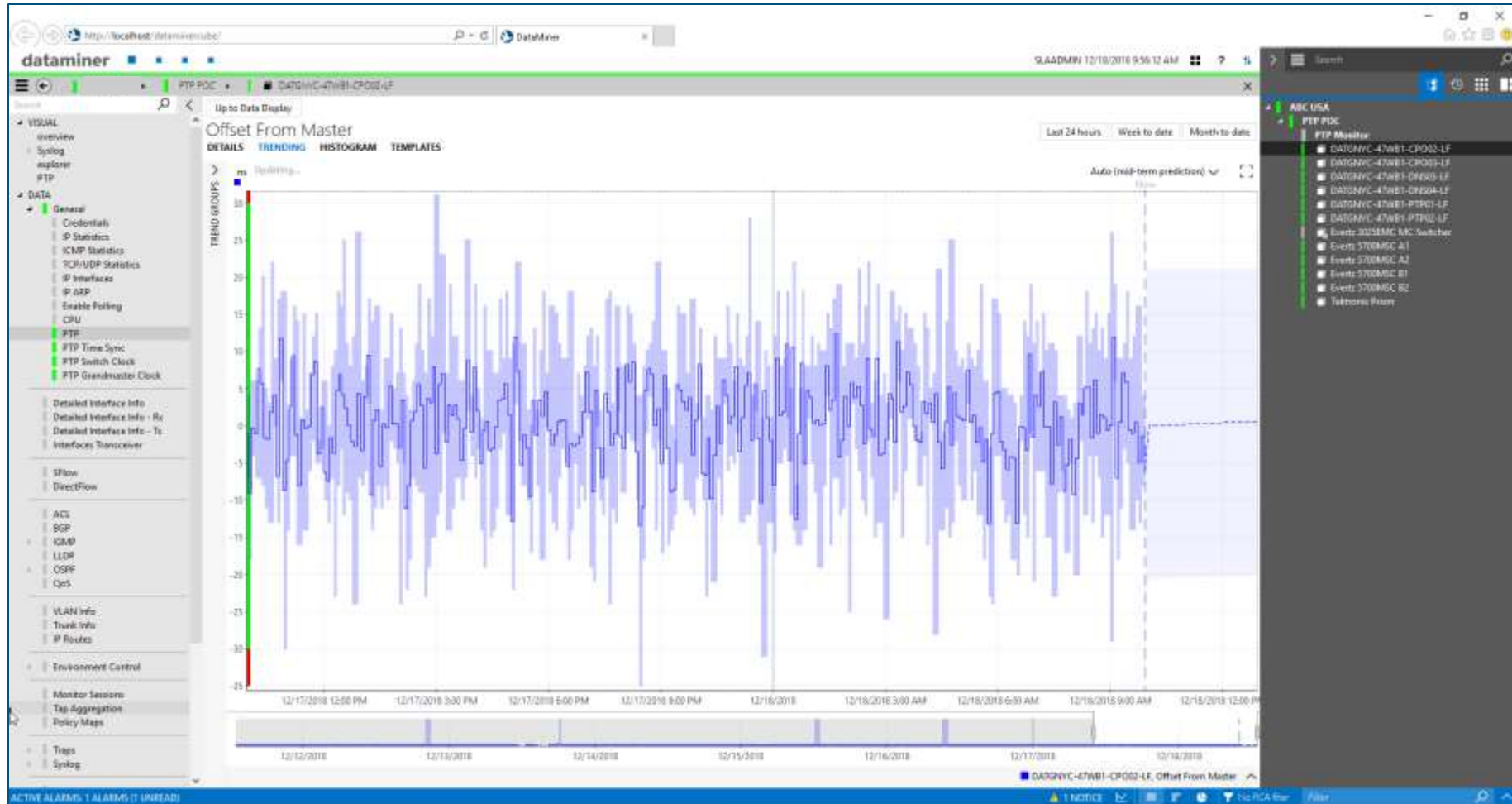
The screenshot displays the Dataminer interface for PTP configuration and monitoring. The main configuration area shows the following details:

- PTP Mode:** Slave
- Clock Identity:** 0x2879:3acff:6:28:80d7
- Grandmaster Clock ID:** 0x00:02:c5:ff:fe:20:ff:0a
- Number Of Slave Ports:** 1
- Number Of Master Ports:** 1
- Slave Port:** Ethernet23
- Offset From Master:** -5 ns
- Max Path Delay:** 1859 ns
- Steps Removed:** 1
- Skew:** 1.00000000
- Last Sync Time:** 12/18/2018 9:54:10 AM
- Current PTP System Time:** 12/18/2018 9:54:10 AM

A table lists the PTP interfaces with the following columns: Name (ID), PTP Inter., State (PTP Interface), Transport (PTP Interfa...), Delay Mechanism (PTP...), Delay Request Interval (P...), and Announce Receipt Timout... The table shows Ethernet23 as a Slave interface with a delay mechanism of e2e and a delay request interval of 0.500 s.

A detailed view of Ethernet23 is shown in a pop-up window, listing various PTP parameters such as State (Slave), Transport (IPv4), Delay Mechanism (e2e), Delay Request Interval (0.500 s), Announce Receipt Timout (2), Admin State (Disabled), Sync Test (Disabled), Sync Interval (1 s), Mode (Boundary Clock), Announce Interval (1 s), Announce Messages Sent (70), Announce Messages Receiv... (15768), Sync Messages Sent (142), Sync Messages Received (PT... (27704), Follow up Messages Sent (PT... (142), Follow up Messages Receiv... (10489), and Delay Request Messages Sent... (24282).

## PTP Performance Data

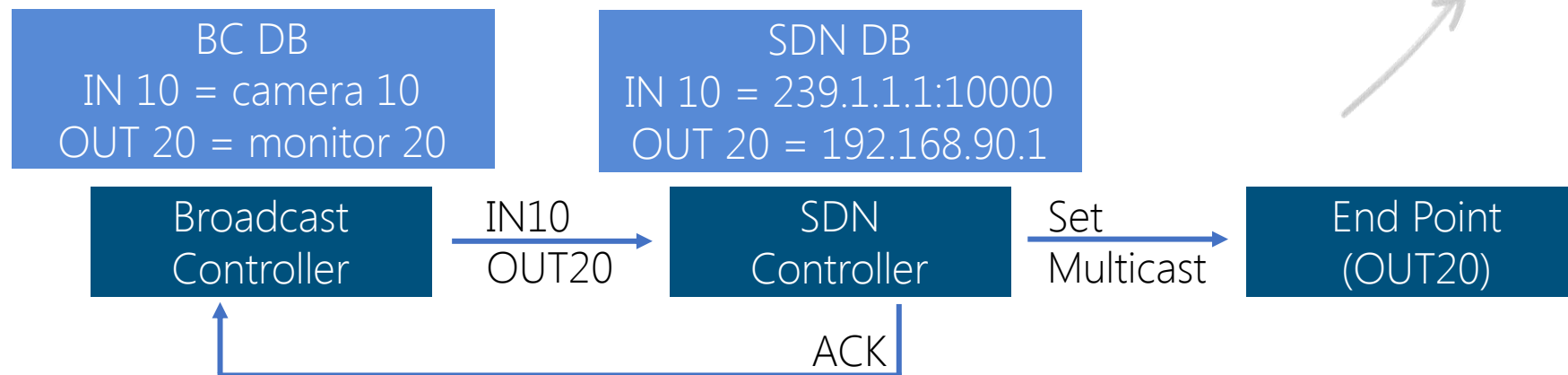


## Media Flow Tracking



- network is a shared & non-linear medium (vs single SDI cable)
- complex switch fabrics (vs single SDI router)
- multiple ST2110 essence streams (vs single SDI signal)
- SDN controllers talk to plenty of end points (vs single SDI router)
- broadcast and SDN controllers still use „classic“ SDI router protocols

what if the BC-controller panel shows a connection but the screen stays black?



## Media Flows - Sources Of Error



### Controller

- wrong DB entries (initial setup, device replacement, IS-04 querier issue)
- BC-controller and SDN controller DBs are out of sync



### Source

- source not active, not streaming
- wrong IP(s) or multicast transmit address(es)



### Network

- IGMP join / leave issues
- static multicast issues
- source specific multicast issues
- oversubscription (ghost streams)



### Destination

- IGMP join not sent
- wrong multicast receive address(es)



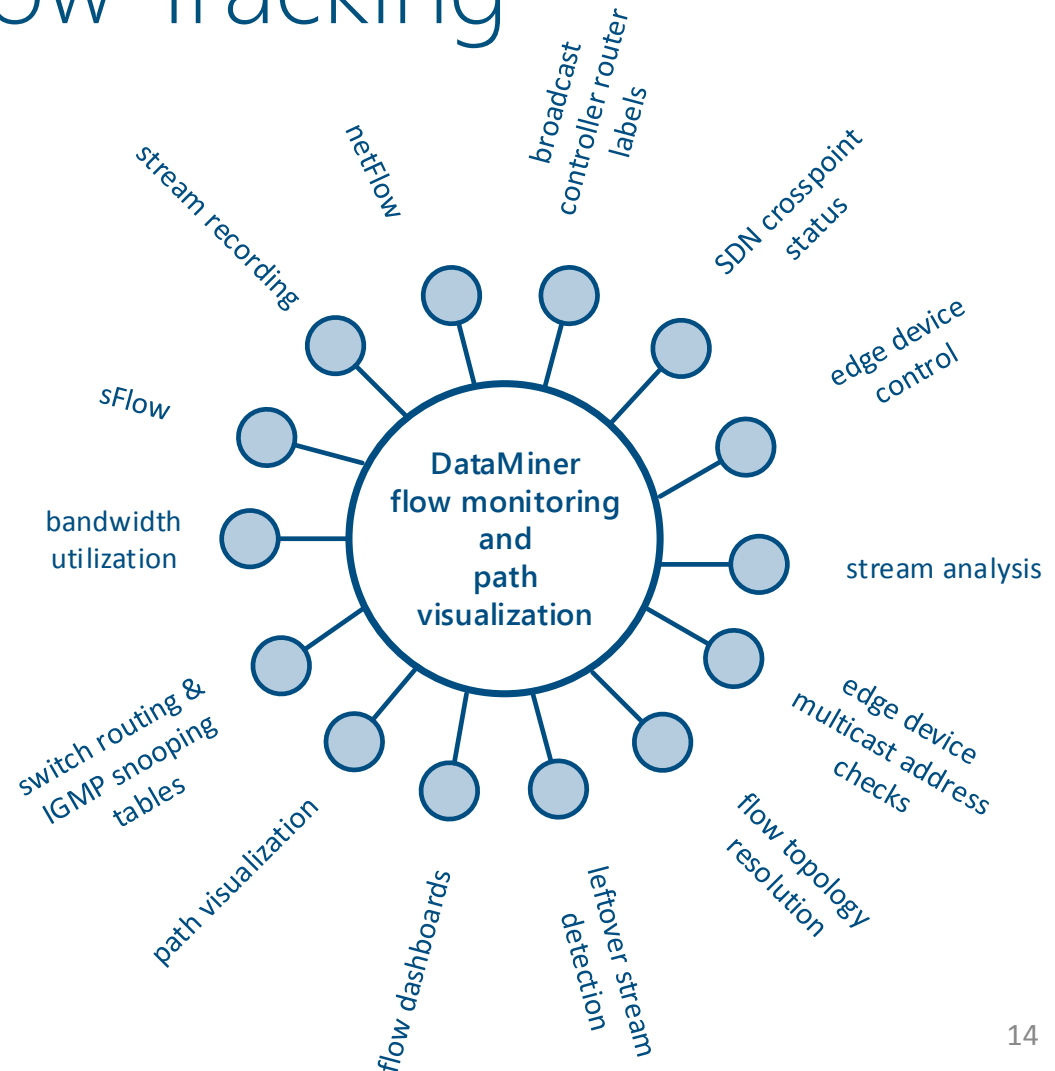
track your media flows in real-time

## DataMiner Media Flow Tracking

- read crosspoint status from SDN controller  
“where are all my flows supposed to be?”
- check this status versus the real-time situation  
“where are my flows in reality?”
- detect the flows which are there but should not be there



gather real-time information from source to destination  
„crawl“ through the network



## Start With The Source

The screenshot displays the dataminer network monitoring interface. The main window is titled "dataminer" and shows a "Track Application" window. The interface is divided into several sections:

- Source:** A sidebar on the left with a "Family" dropdown set to "CCU" and a "Group" dropdown. A list of CCU units (CCU 01 to CCU 24, CCU Me) is shown. "CCU 02" is selected at the bottom.
- Incoming Flow:** A central panel with a "Filter" input field and a list of incoming flows. The selected flow is "Mgn UHO CCU 02".
- Outgoing Flow:** A central panel with a "Filter" input field and a list of outgoing flows. The selected flow is "Mgn UHO CCU 02".
- Receivers:** A panel on the right with a "Filter" input field and a list of receivers. The selected receiver is "Mgn UHO CCU 02".
- Flow Groups:** A sidebar on the far right showing a tree view of flow groups, including "CCU", "CORV", "EVS", "Ext In", "Ext IP In", "Ext IP Out", "Ext Out", "GFX", "MEDAG", and "MON". The "MON" group is expanded, showing a list of monitors from MON00 to MON28.

The interface also includes a "Fetch Receivers" button at the bottom of the "Outgoing Flow" section and a status bar at the bottom indicating "ACTIVE ALARMS: 0 ALARMS (0 UNREAD)".

## Resolve Topology

The screenshot displays the 'dataminer' network management interface. The main window shows a network topology with several components:

- Source:** A list of CCU units (CCU 01 to CCU 24) and a 'CCU Ma' entry. A 'New' button is visible.
- Incoming Flows:** A section with a 'Filter' input field.
- Outgoing Flows:** A section with a 'Filter' input field.
- Network Elements:** Three Arista switches are shown in a central area:
  - Arista Switch 7504N Main (1.1):** IP Address: 10.119.1.221, IDN: 48m 21s.
  - Arista Switch 75073 Main (2.1):** IP Address: 10.119.1.222, IDN: 50m 51s.
  - Arista Switch 7504N Backup (2.1):** IP Address: 10.119.1.223, IDN: 48m 21s.
  - Arista Switch 75073 Backup (2.2):** IP Address: 10.119.1.224, IDN: 50m 51s.
- Receivers:** A section with a 'Filter' input field and a 'New' button.
- Right Panel:** A vertical list of network elements, including various SNIPs (SNIP01 to SNIP48) and SDN0.
- Bottom Bar:** A status bar with 'ACTIVE ALARMS 0 ALARMS 0 UNREAD' and system icons.



## Check Destinations

The screenshot displays the dataminer network management interface. The main view shows a network topology diagram with several devices connected. The devices are categorized into Source, Receivers, and a central network core.

**Source:** A list of devices is shown on the left, including MCR053 through MCR059, MVW01 through MVW09, SNP01 through SNP18, and EVS 1. A filter is applied to 'EVS 1'.

**Incoming Flows:** A list of flows is shown, including EVS 1-01 through EVS 1-07, and EVS 1-01 through EVS 1-07. A filter is applied to 'EVS 1-01'.

**Outgoing Flows:** A list of flows is shown, including EVS 1-01 through EVS 1-07, and EVS 1-01 through EVS 1-07. A filter is applied to 'EVS 1-01'.

**Receivers:** A list of devices is shown on the right, including MV Regie 3-1-1, MV Regie 3-4-1, MV Regie 4-4-1, VMU 1-2, and VMU 2-2. A filter is applied to 'MV Regie 3-1-1'.

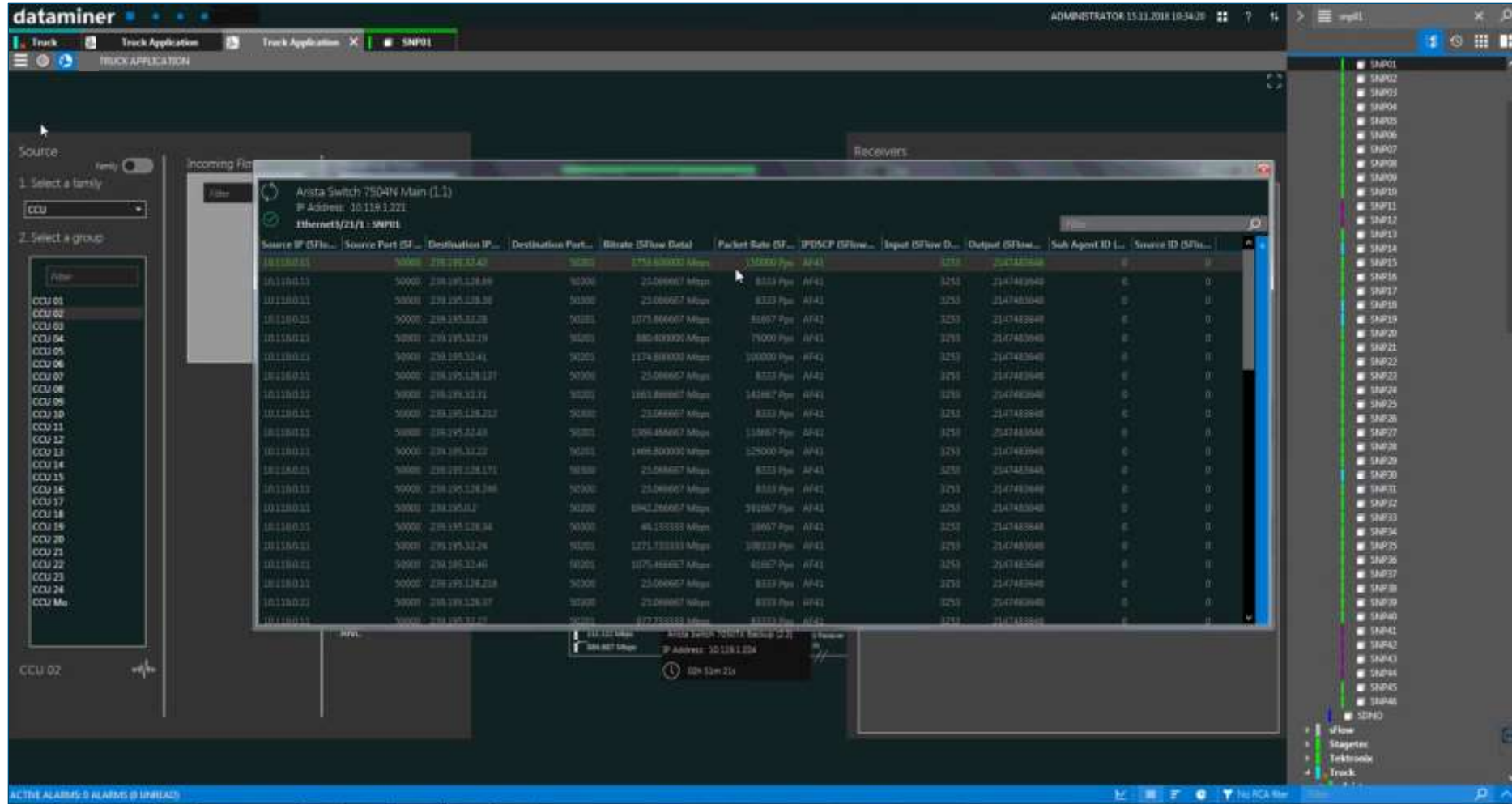
**Network Core:** The central part of the interface shows a network topology diagram with several devices connected. The devices are categorized into Source, Receivers, and a central network core. The devices are:

- Arista Switch 7504N Main (1.1)
- Arista Switch 7007X Main (1.1)
- Arista Switch 7504N Backup (2.1)
- Arista Switch 7007X Backup (1.1)

The interface also shows a status bar at the bottom with the following information:

- ACTIVE ALARMS: 20 ALARMS (20 UNREAD)
- 3 TIMEOUT
- 2 MAJOR
- 13 MINOR
- 3 WARNING
- 1 NOTICE

# Drill Down To Details



The screenshot shows the Dataminer interface with a modal window open for 'Arista Switch 7504N Main (L1)'. The modal displays a table of traffic data with the following columns:

Source IP (SFlow...)	Source Port (SFlow...)	Destination IP...	Destination Port...	Bitrate (SFlow Data)	Packet Rate (SFlow...)	IPDSCP (SFlow...)	Input CSFlow D...	Output CSFlow...	Sub Agent ID (...)	Source ID (SFlow...)
10.118.0.11	50000	238.195.128.42	50000	2754.800000 Mbps	150000 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.88	50000	25.086667 Mbps	8333 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.56	50000	25.086667 Mbps	8333 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.28	50000	1075.800000 Mbps	61667 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.18	50000	580.400000 Mbps	7000 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.41	50000	1174.800000 Mbps	100000 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.137	50000	25.086667 Mbps	8333 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.21	50000	1801.800000 Mbps	14887 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.213	50000	25.086667 Mbps	8333 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.43	50000	5796.800000 Mbps	13887 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.22	50000	1486.800000 Mbps	125000 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.171	50000	25.086667 Mbps	8333 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.248	50000	25.086667 Mbps	8333 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.17	50000	8942.800000 Mbps	391667 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.34	50000	46.133333 Mbps	18667 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.24	50000	1275.133333 Mbps	108222 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.46	50000	1075.800000 Mbps	61667 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.218	50000	25.086667 Mbps	8333 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.37	50000	25.086667 Mbps	8333 Pps	AH41	3253	2147483648	0	0
10.118.0.11	50000	238.195.128.45	50000	877.733333 Mbps	8333 Pps	AH41	3253	2147483648	0	0

## Stream Issue Example

The screenshot displays the Dataminer network management interface. On the left, the 'Source' section is set to 'CCU' and 'CCU 05' is selected. The 'Incoming Flows' and 'Outgoing Flows' sections are empty. The main area shows a network diagram with three Arista Switches (7504N Main (1,1), 7507N Main (2,2), and 7504N Backup (2,1)) and a grid of 18 Receivers (MV Audio and MV Range). The 'Receivers' section shows a grid of 18 receivers, with several showing a 'Stream Issue' (red 'X' icon) and 'SLOW' status. The status bar at the bottom indicates 'ACTIVE ALARMS: 27 ALARMS (27 UNREAD)' and a legend for alarm severity: 8 TIMEOUT, 6 CRITICAL, 1 MAJOR, 21 MINOR, 2 WARNING, 1 NOTICE.

## SUMMARY

MONITOR AND MANAGE  
YOUR PTP INFRASTRUCTURE  
WITH CARE



TRACK YOUR  
UNCOMPRESSED MEDIA  
FLOWS IN REAL-TIME



GO FOR TRUE E2E  
SDN ORCHESTRATION  
RATHER THAN  
SDN CONTROL



monitor  
control  
orchestrate

Thank You!

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