

MPD & BMN Data Acquisition in 2017

Ilya Slepnev for the
MPD DAQ Collaboration

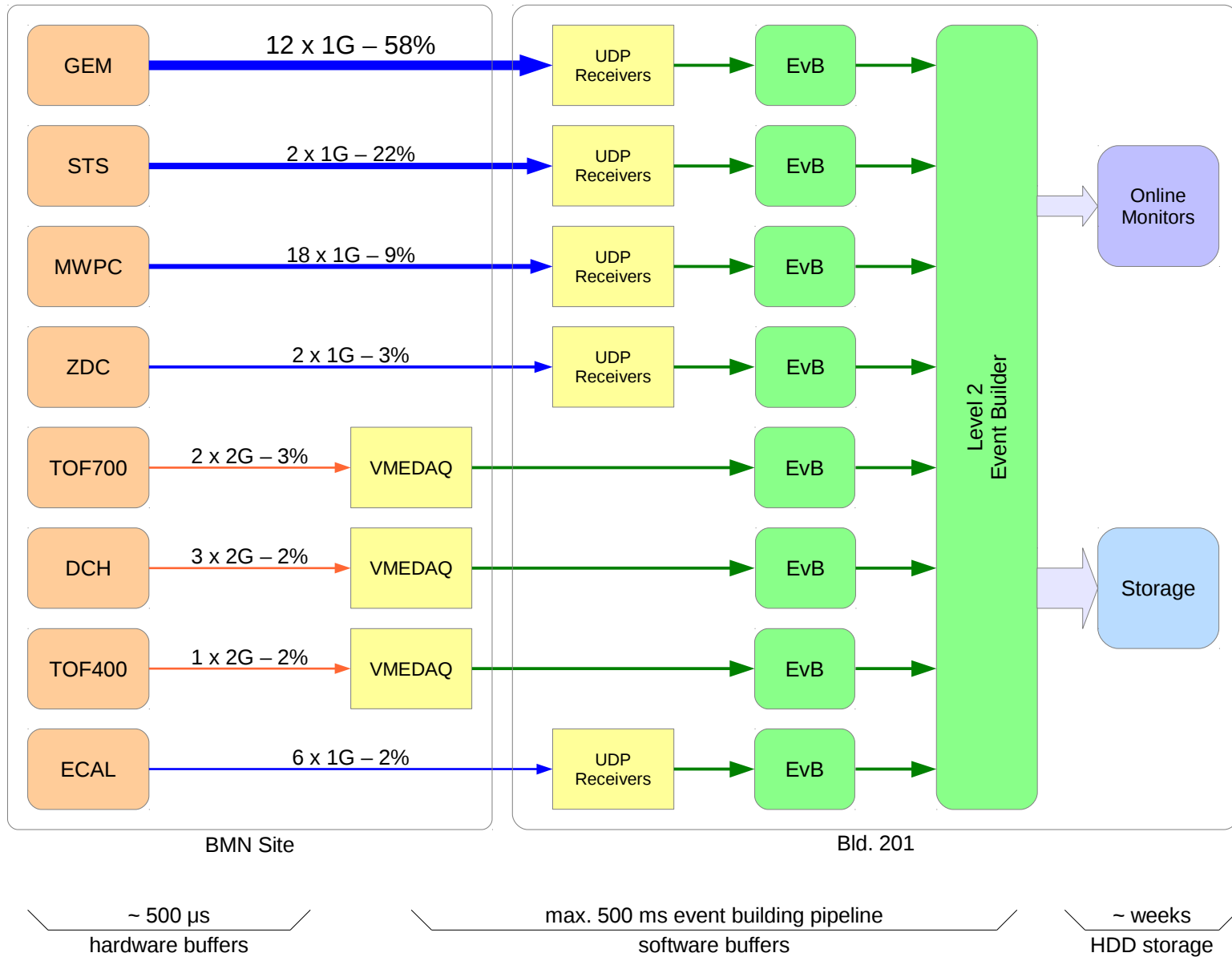
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Joint Institute for Nuclear Research, RU



MPD Plenary Meeting

BMN DAQ setup in March 2017



BMN Data Size, March 2017

	Readout boards	DAQ channels	Channel size	Z/S ratio	Payload size	Header size	Readout size	%	DAQ, MB/s	Storage MB/s
GEM	12	768	64	1.00	49 152	18 816	67 968	56.5%	136	6.8
STS	2	80	256	1.00	20 480	1 973	22 453	18.7%	45	2.2
MWPC	18	1 728	7	1.00	12 384	432	12 816	10.6%	26	1.3
ZDC	2	128	60	0.40	3 072	1 293	4 365	3.6%	9	0.4
TOF700	20	1 280	8	0.19	1 946	1 600	3 546	2.9%	7	0.4
DCH	48	3 072	4	0.19	2 335	1 088	3 423	2.8%	7	0.3
TOF400	15	1 080	8	0.20	1 728	1 496	3 224	2.7%	6	0.3
ECAL	6	384	80	0.06	1 843	745	2 588	2.1%	5	0.3
Total					92 940	27 443	120 383		241	12.0

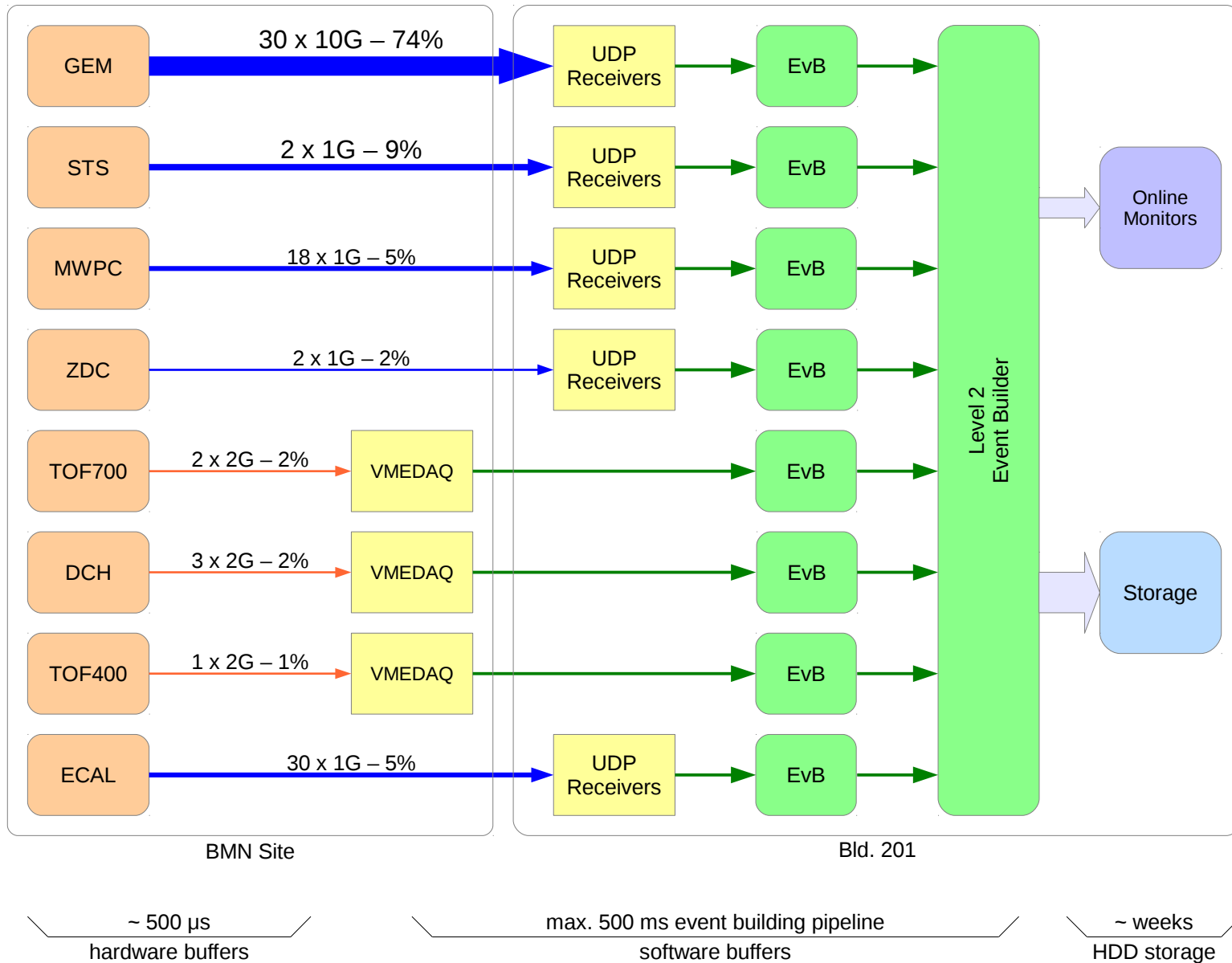
Event rate, Hz	100	Events / week	6.0E+7
Duty factor, %	5%	Data size, TB / week	7.3
Triggers / cycle	2 000	Event readout time	108 μ s

BMN Data Size, Oct. 2017

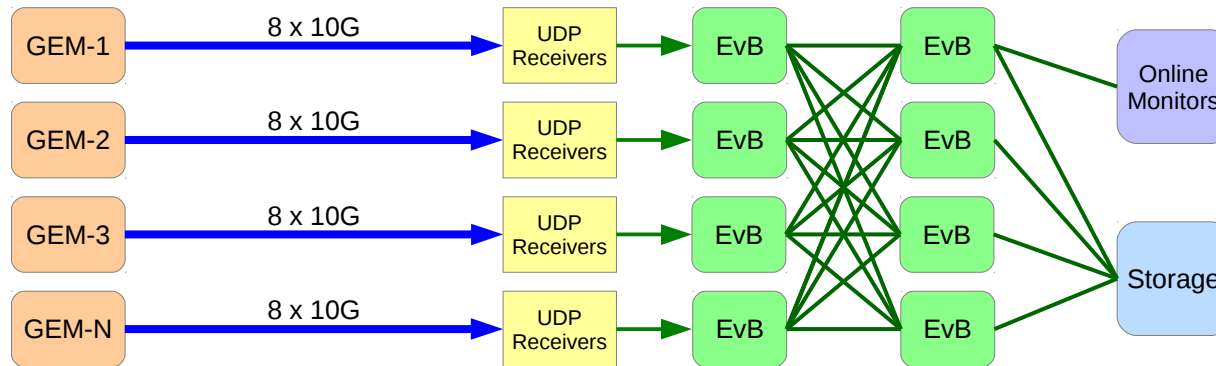
	Readout boards	DAQ channels	Channel size	Z/S ratio	Payload size	Header size	Readout size	%	DAQ, MB/s	Storage MB/s
GEM	32	2 048	64	1.00	131 072	50 176	181 248	72.4%	1 812	90.6
STS	2	80	256	1.00	20 480	1 973	22 453	9.0%	225	11.2
MWPC	18	1 728	7	1.00	12 384	432	12 816	5.1%	128	6.4
ZDC	2	128	60	0.40	3 072	1 293	4 365	1.7%	44	2.2
TOF700	48	3 072	8	0.19	4 178	3 392	7 570	3.0%	76	3.8
DCH	64	4 096	4	0.19	3 113	1 504	4 617	1.8%	46	2.3
TOF400	20	1 440	8	0.20	2 304	1 856	4 160	1.7%	42	2.1
ECAL	30	1 920	80	0.06	9 216	3 725	12 941	5.2%	129	6.5
Total					185 819	64 351	250 170		2 502	125.1

Event rate, Hz	500	Events / week	3.0E+8
Duty factor, %	5%	Data size, TB / week	76
Triggers / cycle	10 000	Event readout time	20 μ s

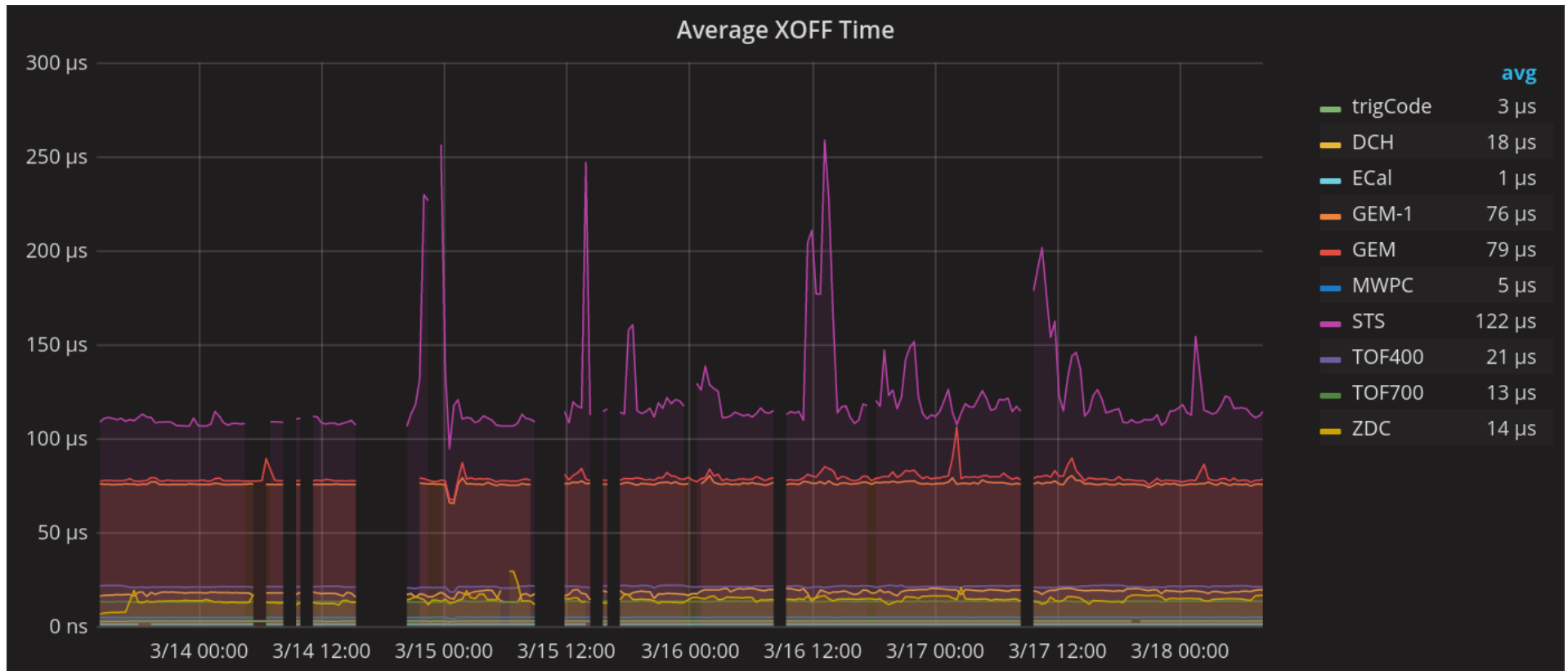
BMN DAQ setup in Oct. 2017



Load Balanced Event Building

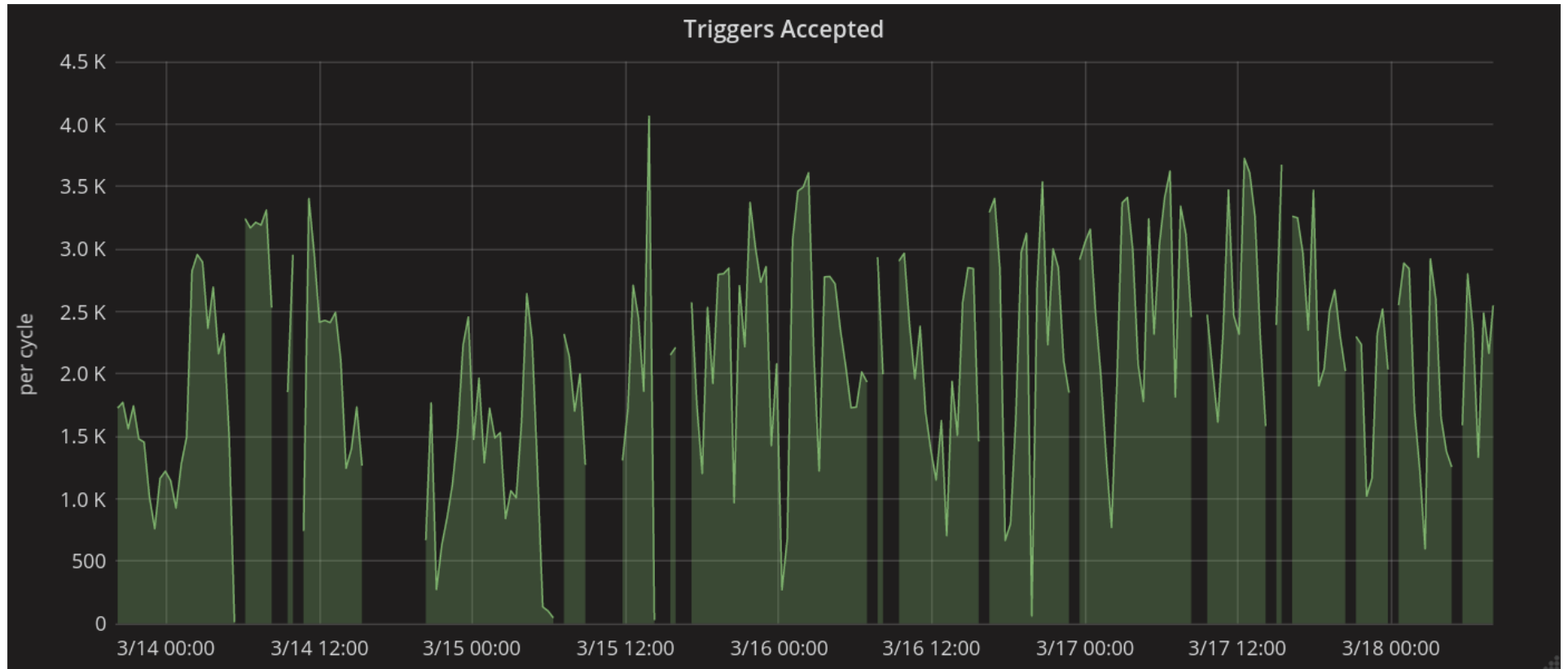


Event Readout (XOFF) Time

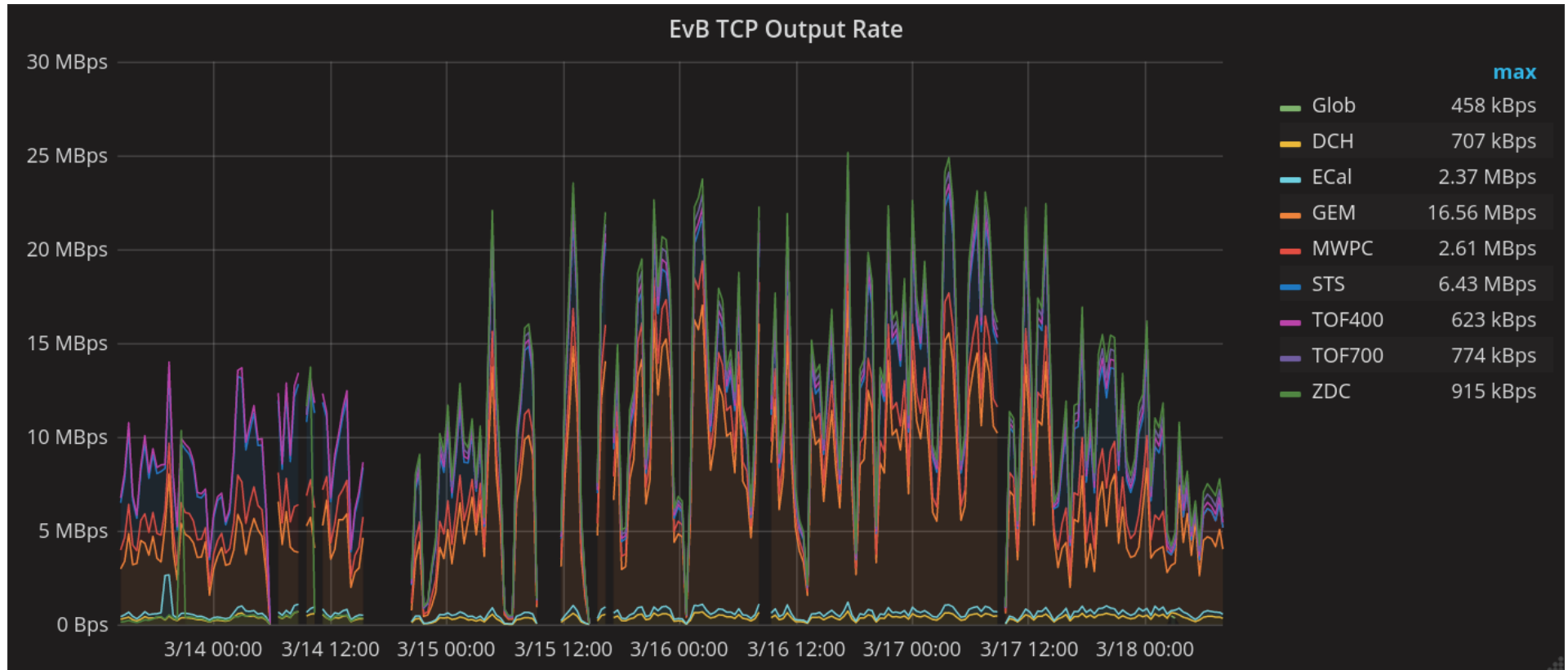


- Notes: It is possible to reach 20 μs readout time for all but STS:
- GEM sparse readout firmware near completion
 - VME-based TDC: disable debug headers/trailers
 - GEM, ECAL digitizers: 10 Gb/s interface near completion
 - MWPC: zero suppression (not important now)

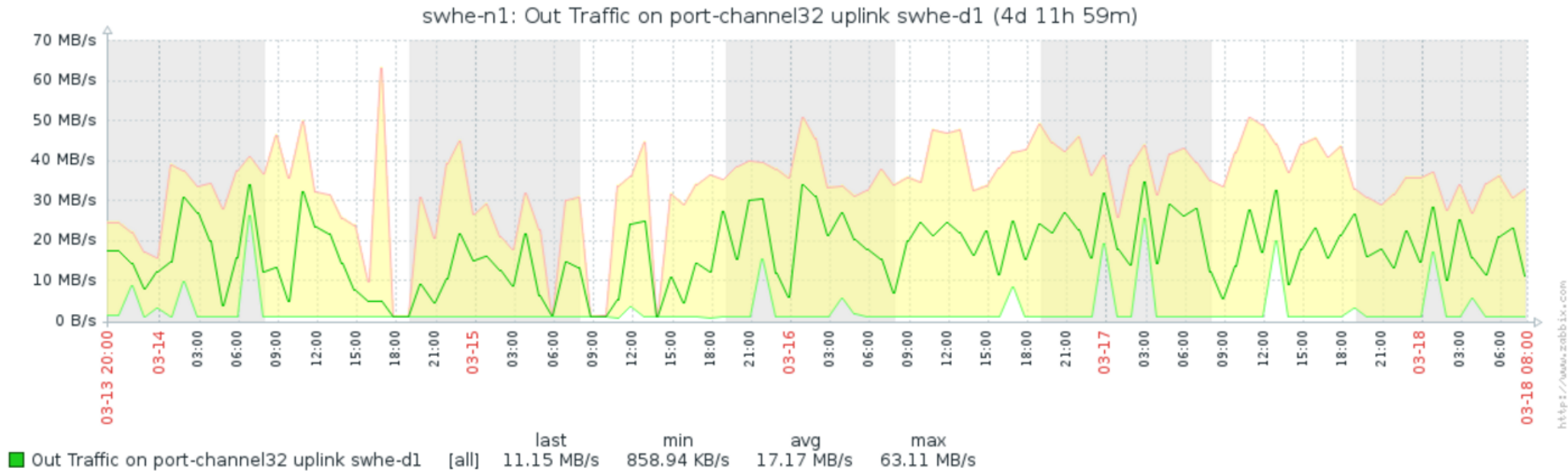
Readout Events per cycle



Data Rate by Subdetectors



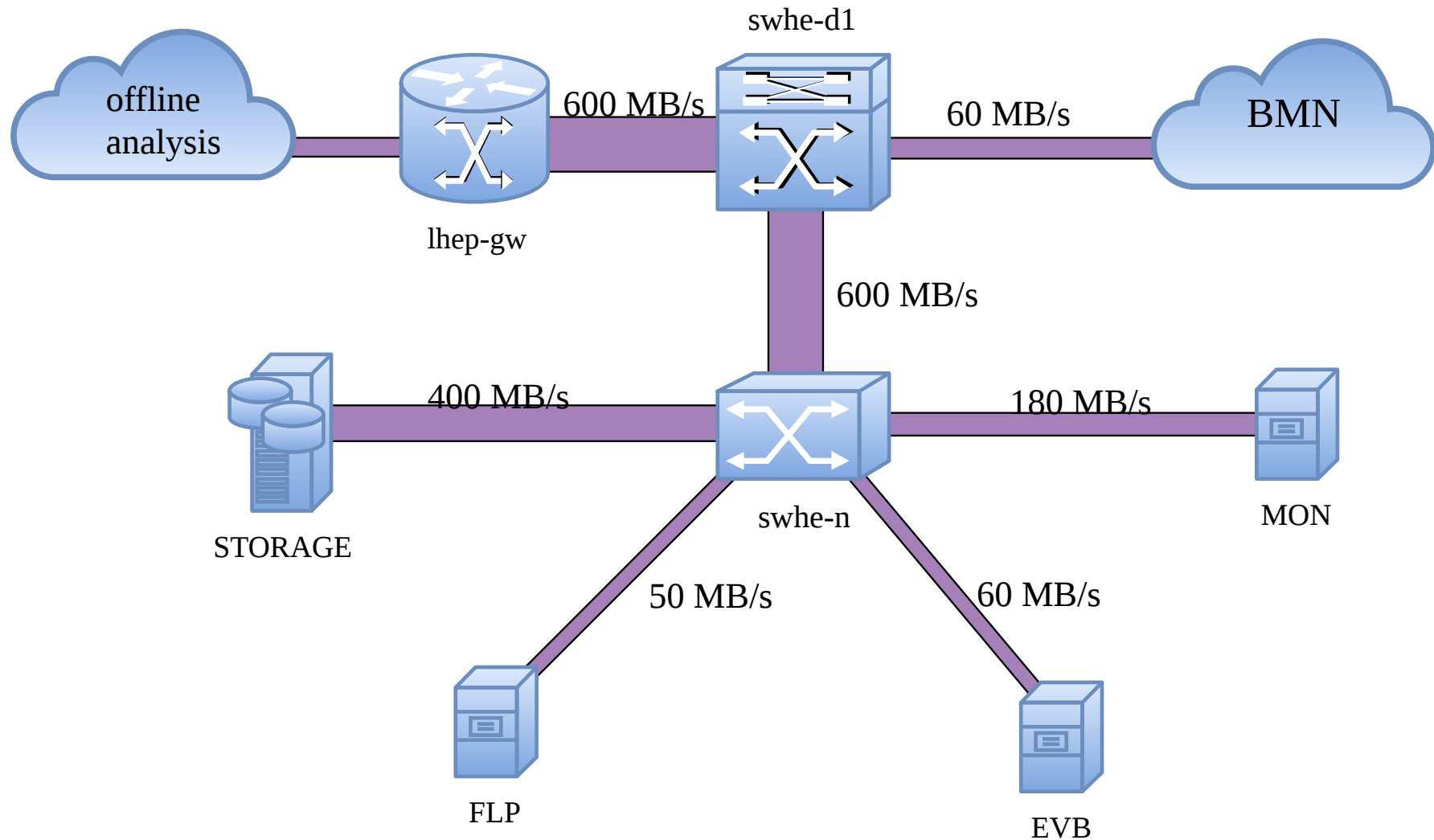
Traffic from BMN site



	March 2017	Oct. 2017 estimate
Average rate	17 MB/s	180 MB/s
1-second peak rate ⁽¹⁾	240 MB/s	2 500 MB/s
Connection	2 x 10 Gb/s	2 x 100 Gb/s
Link bandwidth	2 500 MB/s	25 000 MB/s

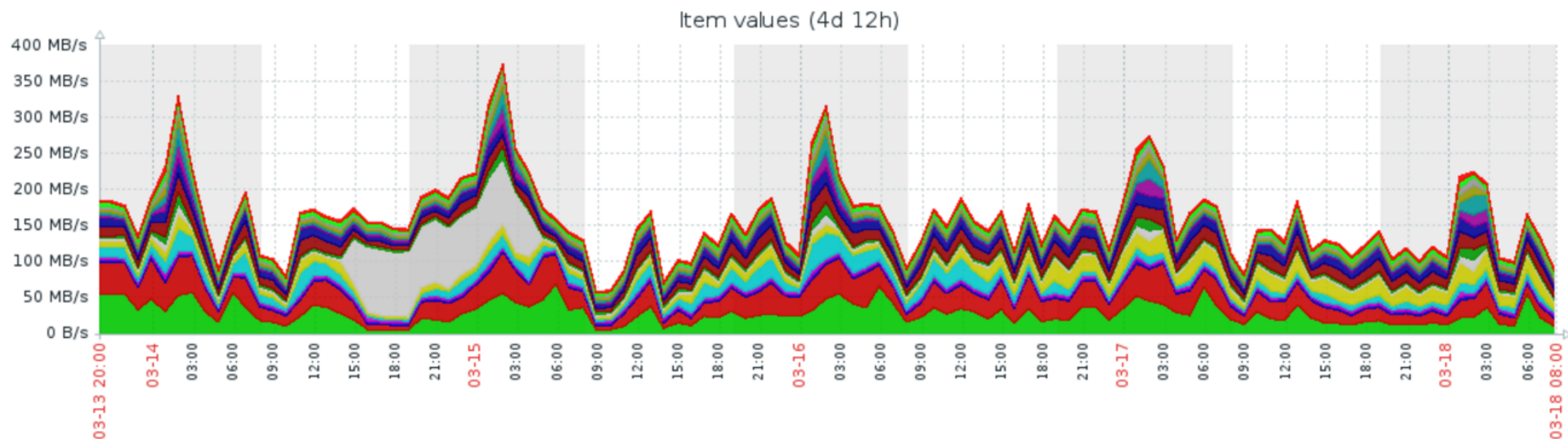
1. peak rate defined as 99th percentile of 1-second average rate from live counters while data taking

BMN Data flows, March 2017



Note:
120-second peak values

Compute nodes aggregate traffic



		last	min	avg	max
■ swhe-n4: Out Traffic on port-channel8 c3n08	[avg]	2.46 MB/s	1.96 MB/s	2.79 MB/s	21.37 MB/s
■ swhe-n3: Out Traffic on port-channel8 c3n08	[avg]	4.15 MB/s	2.75 MB/s	4.9 MB/s	19.86 MB/s
■ swhe-n4: Out Traffic on port-channel7 c3n07	[avg]	3.14 MB/s	2.23 MB/s	4.23 MB/s	30.42 MB/s
■ swhe-n3: Out Traffic on port-channel7 c3n07	[avg]	4.26 MB/s	3.02 MB/s	5.4 MB/s	33.49 MB/s
■ swhe-n4: Out Traffic on port-channel6 c3n06	[avg]	3.55 MB/s	2.93 MB/s	5.67 MB/s	52.02 MB/s
■ swhe-n3: Out Traffic on port-channel6 c3n06	[avg]	2.82 MB/s	2.24 MB/s	4.66 MB/s	54.06 MB/s
■ swhe-n4: Out Traffic on port-channel5 c3n05	[avg]	8.45 MB/s	4.34 MB/s	11.32 MB/s	41.68 MB/s
■ swhe-n3: Out Traffic on port-channel5 c3n05	[avg]	10.22 MB/s	4.16 MB/s	14.02 MB/s	53.92 MB/s
■ swhe-n4: Out Traffic on port-channel4 c3n04	[avg]	3.07 MB/s	2.44 MB/s	4.13 MB/s	42.03 MB/s
■ swhe-n3: Out Traffic on port-channel4 c3n04	[avg]	3.32 MB/s	2.68 MB/s	14.5 MB/s	120.05 MB/s
■ swhe-n4: Out Traffic on port-channel3 c3n03	[avg]	11.15 MB/s	2.64 MB/s	13.07 MB/s	81.07 MB/s
■ swhe-n3: Out Traffic on port-channel3 c3n03	[avg]	4.44 MB/s	2.43 MB/s	12.67 MB/s	89.81 MB/s
■ swhe-n4: Out Traffic on port-channel2 c3n02	[avg]	3.41 MB/s	2.41 MB/s	3.85 MB/s	24.48 MB/s
■ swhe-n3: Out Traffic on port-channel2 c3n02	[avg]	3.46 MB/s	2.77 MB/s	3.76 MB/s	17.62 MB/s
■ swhe-n4: Out Traffic on port-channel1 c3n01	[avg]	11.18 MB/s	4.9 MB/s	27.7 MB/s	175.06 MB/s
■ swhe-n3: Out Traffic on port-channel1 c3n01	[avg]	8.56 MB/s	2.66 MB/s	26.51 MB/s	203.59 MB/s

Data from trends. Generated in 0.56 sec.

Note: 120-second average values are shown. 1-second peak values are 10-20 times higher.

Thank You!

Extra slides

MPD Data Processing Pipeline

