Data Challenge Testing for USATLAS sites

Hironori Ito

Brookhaven National Laboratory

US ATLAS Computing Facilities Face-to-Face at SLAC 2022/12/01

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Data Transfer Rate Estimates for HL-LHC

Data Transfer Rate has been estimated in 2021

- CERN to all T1s at **4.8Tbps**
  - Includes x2 factor from burstiness and additional x2 from safety margin.
  - BNL is estimated at between **450 Gbps** to **900 Gbps**

[WLCG data challenges for HL-LHC - 2021 planning]

T1	%ATLAS	%CMS	% Alice	% LHCb	ATLAS+CMS Network Needs (Gbps) Minimal Scenario in 2027	Alice Network Needs (Gbps) Minimal Scenario in 2027	LHCb Network Needs (Gbps) Minimal Scenario in 2027	LHC Network Needs (Gbps) Minimal Scenario in 2027	LHC Network Needs (Gbps) Flexible Scenario in 2027
CA-TRIUMF	10	0	0	0	200	0	0	200	400
DE-KIT	12	10	21	17	450	80	70	600	1200
ES-PIC	4	5	0	4	180	0	20	200	400
FR-CCIN2P3	13	10	14	15	450	60	60	570	1140
IT-INFN-CNAF	9	15	26	24	480	110	100	690	1380
KR-KISTI-GSDC	0	0	12	0	0	50	0	50	100
NDGF	6	0	8	0	110	30	0	140	280
NL-T1	7	0	3	8	140	10	30	180	360
NRC-KI-T1	3	0	13	5	50	50	20	120	240
UK-T1-RAL	15	10	3	27	490	10	110	610	1220
RU-JINR-T1	0	10	0	0	200	0	0	200	400
US-T1-BNL	23	0	0	0	450	0	0	450	900
US-FNAL-CMS	0	40	0	0	800	0	0	800	1600
(atlantic link)					1250	0	0	1250	2500
Sum	100	100	100	100	4000	400	410	4810	9620

Data Challenge Schedule and 1st test

- 1st challenge conducted in Oct 2021

T1	LHC Network Needs (Gbps) Minimal Scenario in 2027	LHC Network Needs (Gbps) Flexible Scenario in 2027	Data Challenge target 2027 (Gbps)	Data Challenge target 2025 (Gbps)	Data Challenge target 2023 (Gbps)	Data Challenge target 2021 (Gbps)
CA-TRIUMF	200	400	100	60	30	10
DE-KIT	600	1200	300	180	90	30
ES-PIC	200	400	100	60	30	10
FR-CCIN2P3	570	1140	290	170	90	30
IT-INFN-CNAF	690	1380	350	210	100	30
KR-KISTI-GSDC	50	100	30	20	10	0
NDGF	140	280	70	40	20	10
NL-T1	180	360	90	50	30	10
NRC-KI-T1	120	240	60	40	20	10
UK-T1-RAL	610	1220	310	180	90	30
RU-JINR-T1	200	400	100	60	30	10
US-T1-BNL	450	900	230	140	70	20
US-FNAL-CMS	800	1600	400	240	120	40
(atlantic link)	1250	2500	630	380	190	60
Sum	4810	9620	2430	1450	730	240

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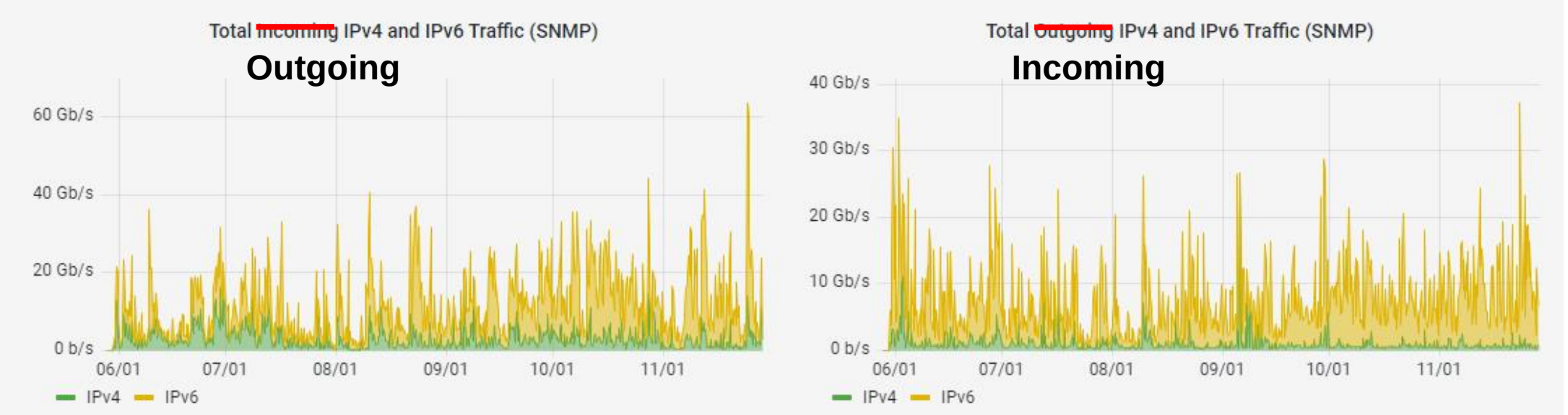
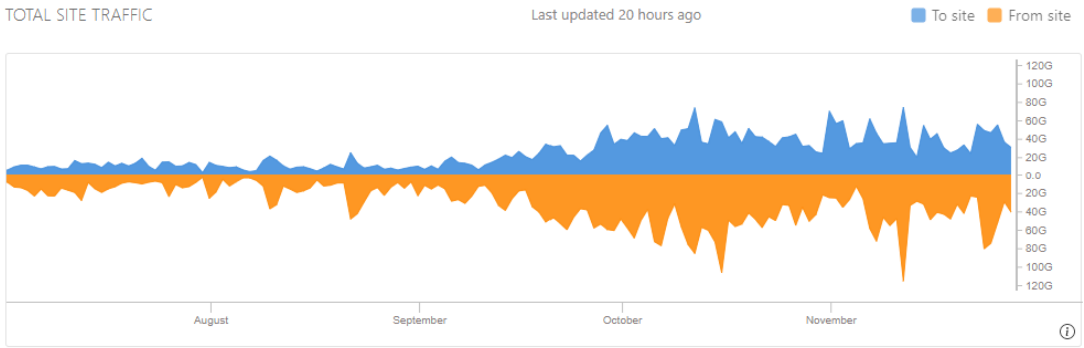
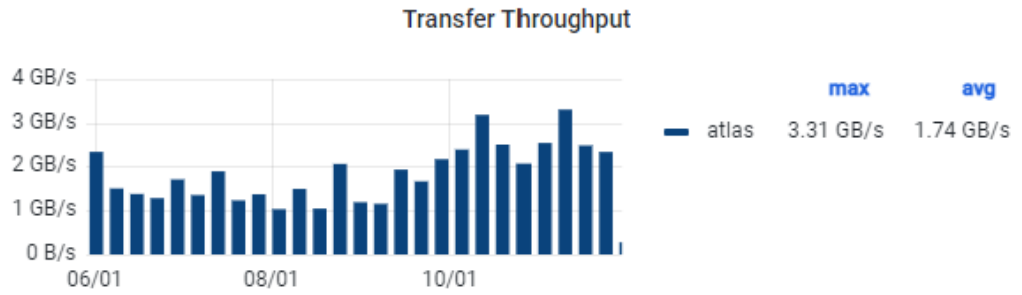
Result of the first Data Challenge

T1	Flexible Scenario 2027	Minimal Scenario 2027	10% Minimal Scenario 2021 Targets ingress/egress	Average ingress/egress (hourly)	Maximum ingress/egress (hourly)	Reference
CA-TRIUMF	400	200	10/10	17/26	49/71	CA-TRIUMF
DE-KIT	1200	600	30/30	26/42	77/143	DE-KIT
ES-PIC	400	200	10/10	9/11	18/17	ES-PIC
FR-CCIN2P3	1140	570	30/30	34/41	70/80	FR-CCIN2P3
IT-INFN-CNAF	1380	690	30/30	20/31	57/87	IT-INFN-CNAF
KR-KISTI-GSDC	100	50	0	0	0	KR-KISTI-GSDC
NDGF	280	140	10/10	26/26	49/81	NDGF
NL-T1 (NIKHEF)	-	-	10/10	10/12	38/53	NL-T1 (NIKHEF)
NL-T1 (SARA)	360	180	10/10			
RU-JINR-T1	400	200	10/10			
RU-NRC-KI-T1	240	120	10/10			
TW-ASGC	-	-	10/10			
UK-T1-RAL	1220	610	30/30	15/24	41/43	UK-T1-RAL
US-FNAL-CMS	1600	800	40/40	19/16	49/64	US-FNAL-CMS
US-T1-BNL	900	450	20/20	29/38	75/117	US-T1-BNL
Atlantic link	2500	1250	60/60			
Sum	9620	4810	240/240	242/309		

Normal data to BNL

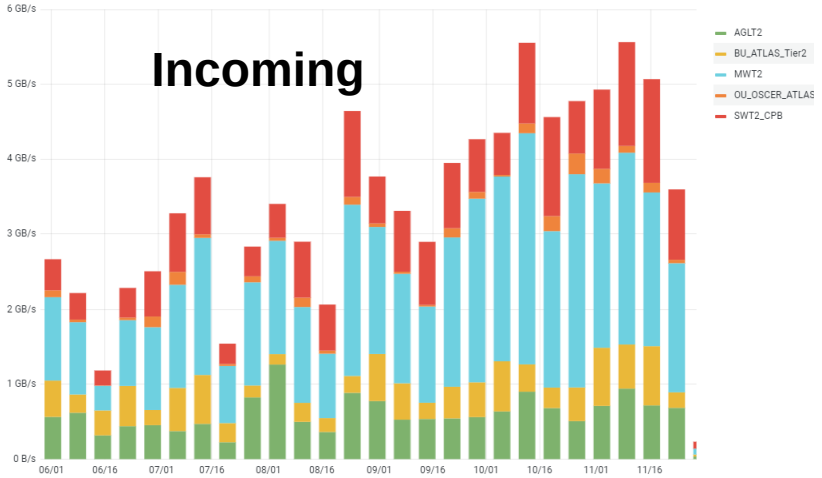




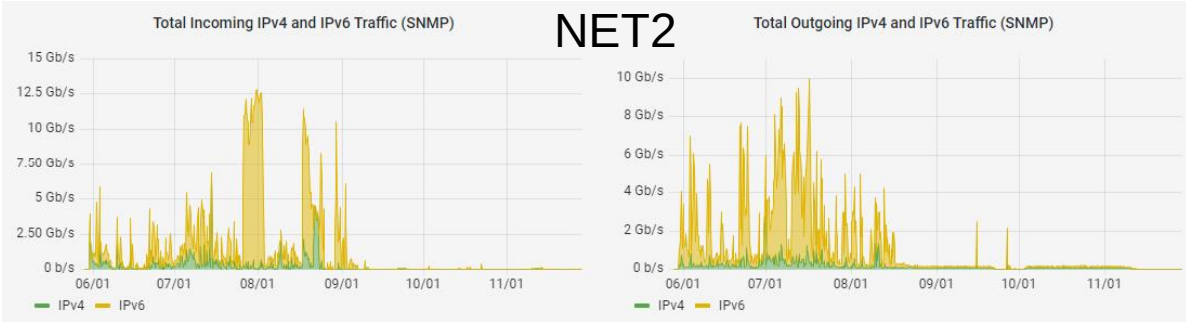


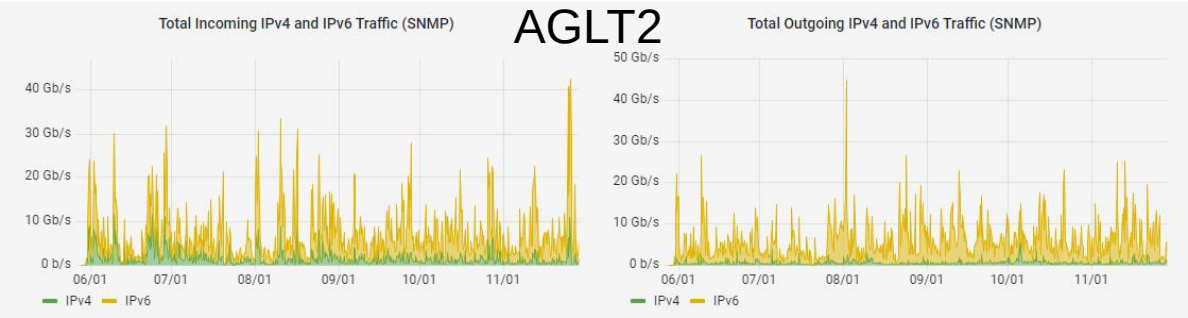
Does it look the same?
Make sure the monitor shows the accurate values.

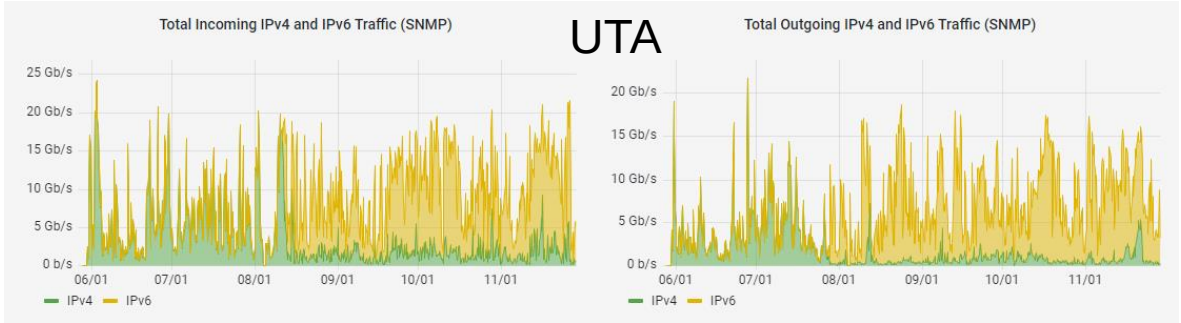
Normal Data Rate at US Tier2s

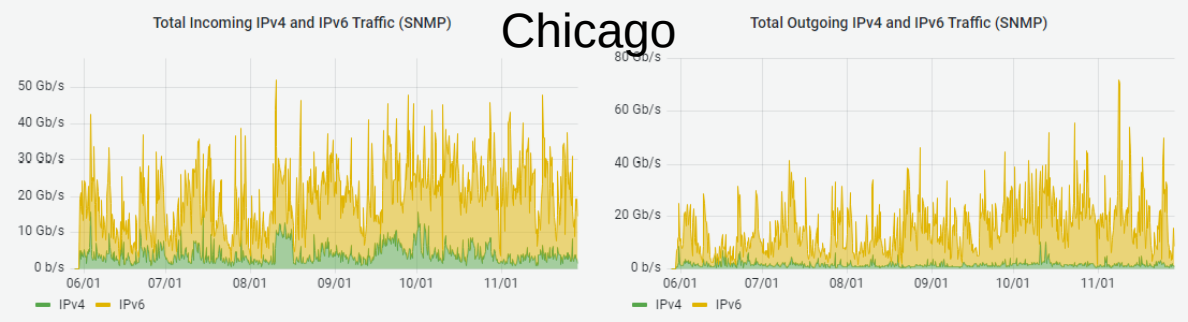


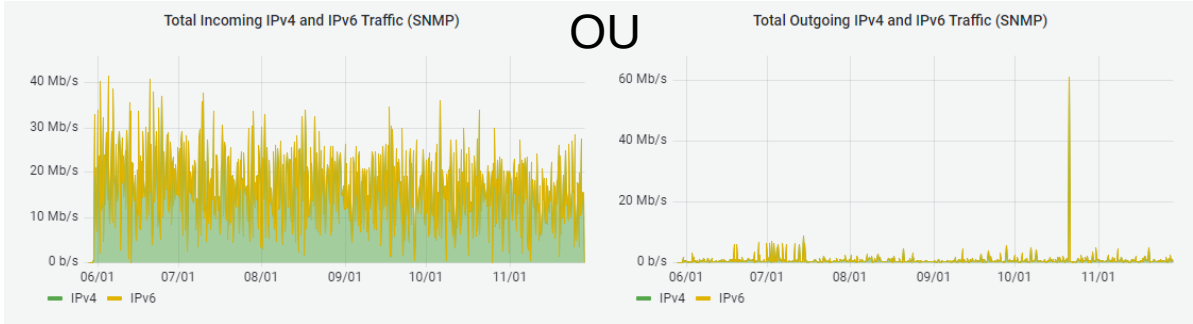
Need to make sure these are accurate.





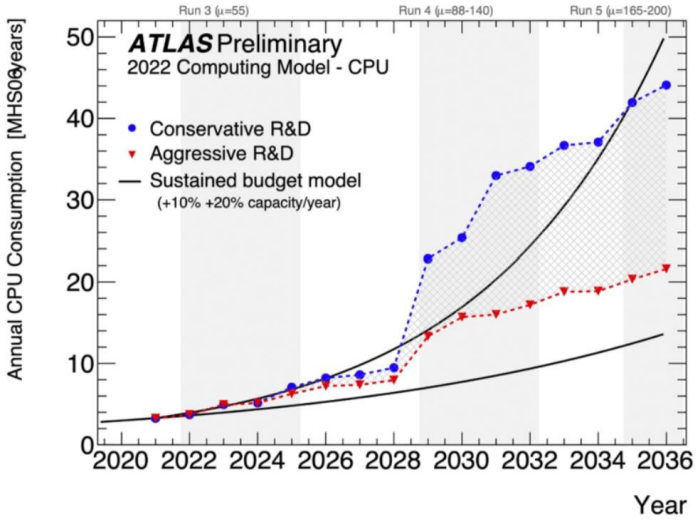


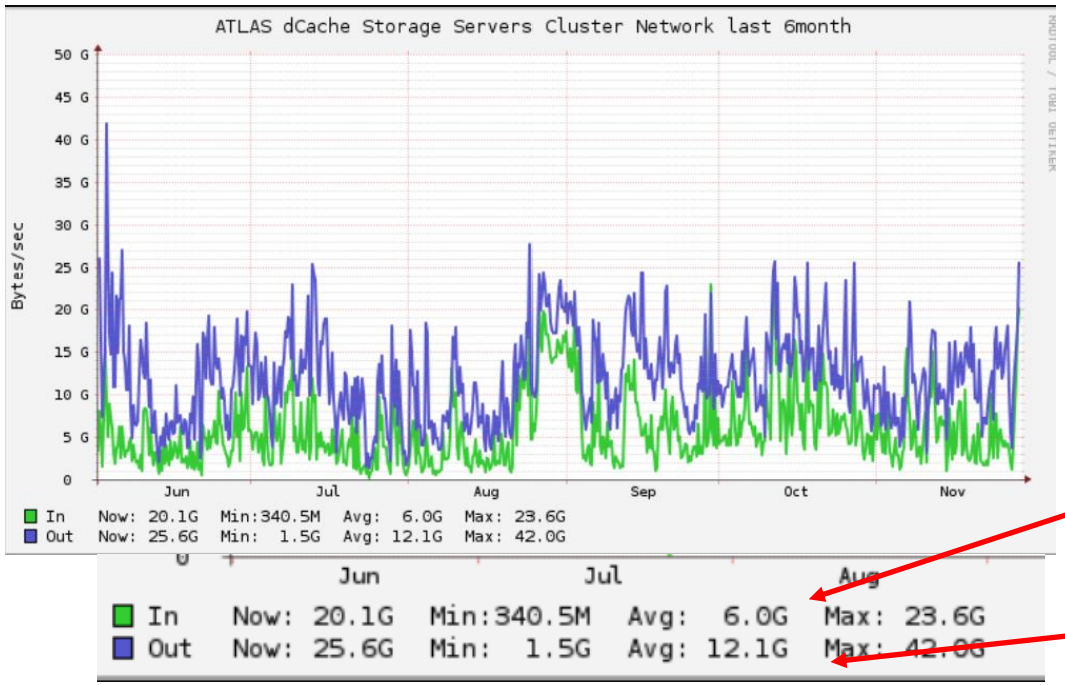


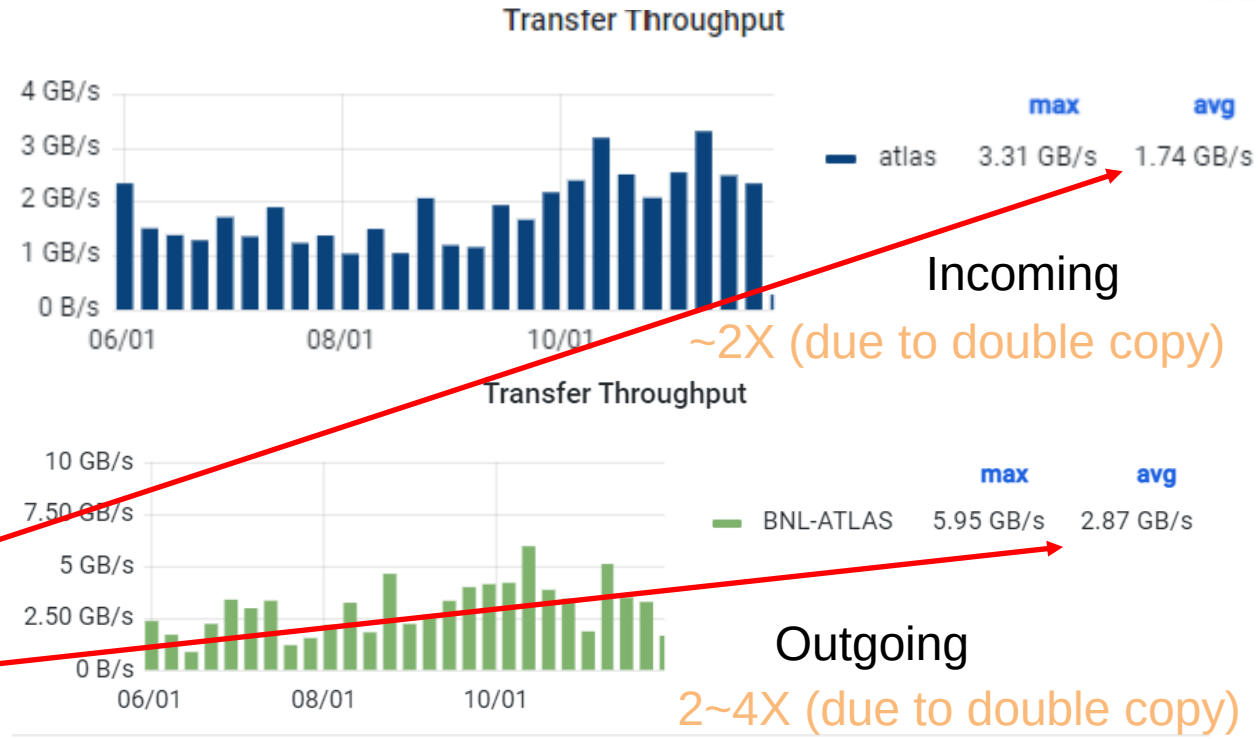


LAN Traffic

LAN data rate will increase proportionally with increase in WAN rate (x10~30) and provided HS06 value at a site (x3~5)



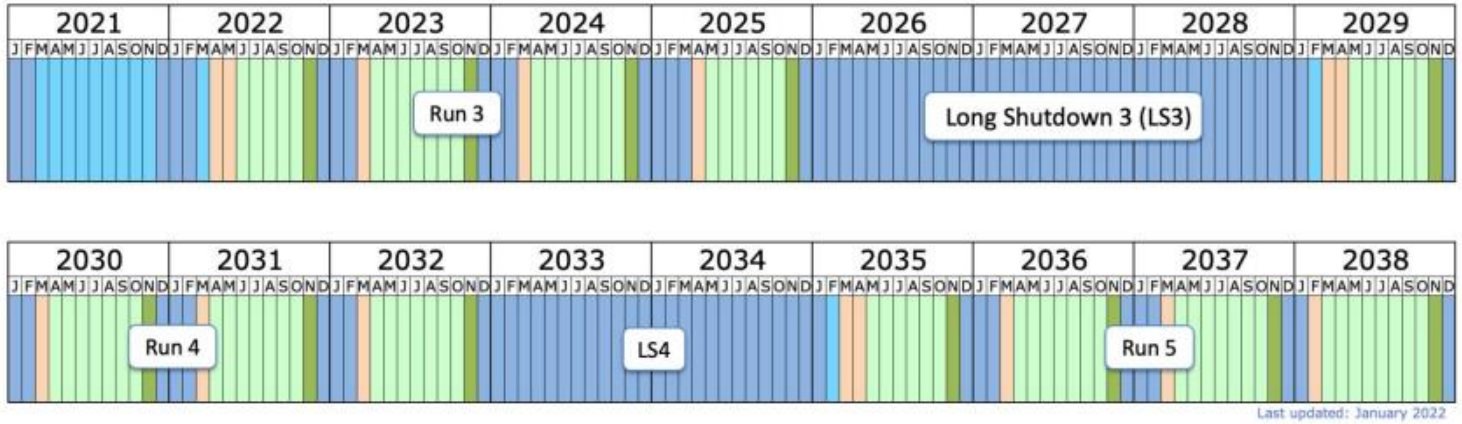




Proposed US ATLAS Data Challenge Test

- Schedule the periodic throughput test to see
  - If a site is on track to meet their targets
  - If there are any issues.
    - It is much easier to resolve any issues if they are found earlier.
- Tests
  - Two type of tests:
    - Just target one site
    - Simultaneously all sites. May coordinate with ESNet.
  - Frequency; quaterly? Bi-yearly or yearly?
    - Perhaps quaterly for each site test while doing bi-yearly or yearly test for simultaneous all site test.
    - Single site test can be done by request.
  - Load
    - WAN: FTS transfers between sites.
      - Very similar to what we have done in the past to prepare US storage and the network.
    - LAN: Special jobs to do copy files to worker nodes.
- Monitor
  - WAN: FTS monitor, ESNet Monitor, etc…
  - LAN: Local site monitor.
    - Is it on CRIC?

Schedule



- Revised HL-LHC schedule
- No new schedule for data challenge yet?
- BNL site will be connected to 2x400 Gbps soon by ESNet. Currently, it is 2x100Gbps + 100Gbps backup
- SDCC will be connected to 400Gbps x 2 during 2024.

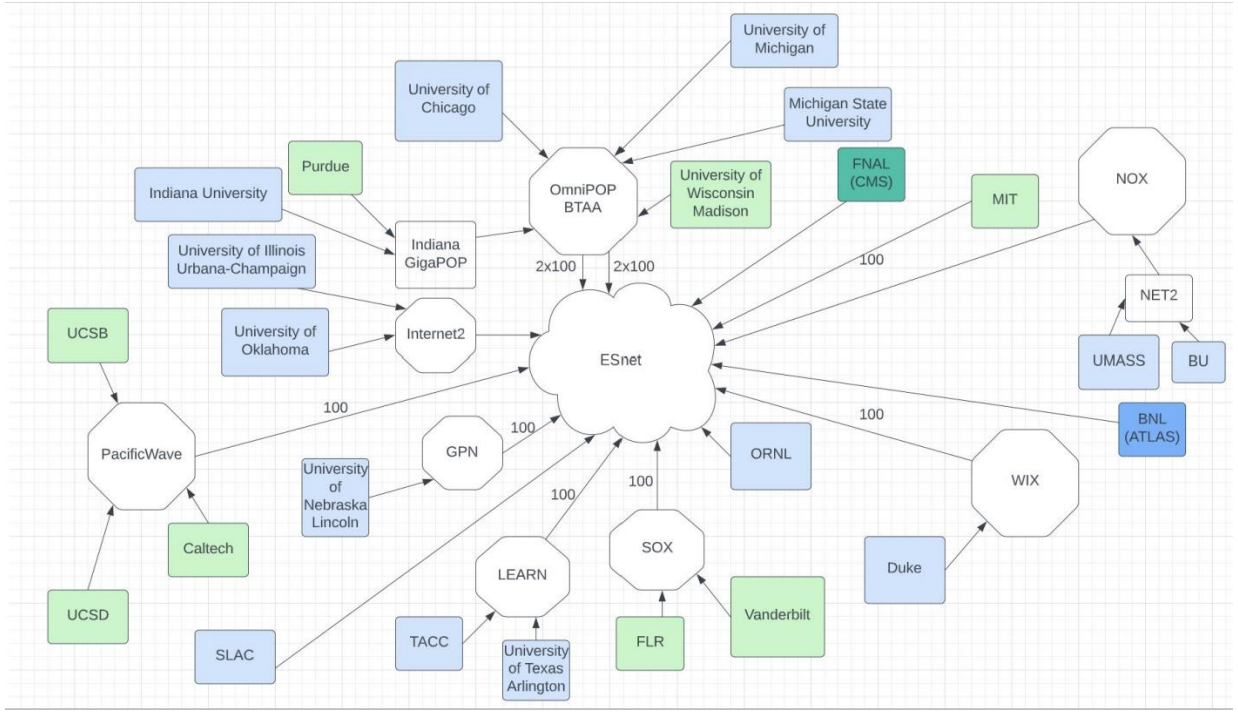
Connectivity

Tier 2 Site Connectivity

- Report identified connectivity needs for T2 Sites
- Projections codified into data challenges
- Data Challenges (full software stack)
  - 1: 10% of the target 2021 # should match Run 3
  - 2: 30% in 2023 # 2x100 LAG should be ok
  - 3: 60% in 2025 # probably want 400G
  - 100% in 2027 # 400G or more
- Engagement with T2 and their networks is critical

US Tier 2 Site Connectivity

- ESnet making the rounds talking to *every* US T2 site
- Gathering and helping synchronize plans from
  - Individual PI's
  - Departmental Support Staff
  - Campus IT & CIO
  - Regional Networks
  - R&E Exchange points
- Plans assessed:
  - Vanderbilt, SoX, CalTech, UCSD, CENIC, Nebraska, GPN, Purdue, Wisconsin, OmniPoP, NET2, UMASSNET, MIT, NoX , LEARN
- Todo:
  - Florida, MWT2, AGLT2, UTA



[ESNet Update LHCOPN-LHCONE meeting Oct 2022]

ESnet

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Summary

- As we have done in the past to prepare US sites for ATLAS data taking, we should test and evaluate the performance of data throughput at all US ATLAS sites.
  - We have done very similar tests ~10 years ago.
- With the regular test, we can identify possible issues earlier.
- We prefer not to find new site related issue by WLCG wide Data Challenge since it might be too late in some cases to resolve it.
  - Delivery of some network equipment might take 1 year nowadays.