

EOS Mission Support Network Performance Report

This is a monthly summary of EMSnet performance testing -- comparing the measured performance against the requirements. This month the BAH requirements were updated again, primarily:

- Remove ADEOS mission flows
- Increase NSIDC requirements due to recognition of limited work week.

All results are reported on the web site:

http://netstats.eos.nasa.gov/performance/Net_Health/EMSnet_list.html. It shows MRTG-like graphs of the performance to various test sites, including thruput, RTT, packet loss, and hops, with 1 week, 2 month and 6 month graphs.

Check out the new ENSIGHT web site, mostly working, but still under development:

<http://ensight.eos.nasa.gov/Networks/emsnet/index.html>

Highlights:

- Most test results were stable.
- The removal of the ADEOS requirements improved the ratings for the affected circuits.
- Testing to NOAA is now performed from GSFC (CSAFS) rather than ASF (also due to ADEOS removal)
- Rating for US →NASDA remains low due to the inclusion of 4 ISTs for AMSR-E into the requirement. Note: this is possibly an excessive requirement.

Ratings:

Rating Categories:

Excellent	: Total Kbps > Requirement * 3
Good	: 1.3 * Requirement <= Total Kbps < Requirement * 3
Adequate	: Requirement < Total Kbps < Requirement * 1.3
Low	: Total Kbps < Requirement.
Bad	: Total Kbps < Requirement / 3

Where Total Kbps = User Flow + iperf monthly average

Ratings Changes:

Discontinued

ASF → NOAA-NESDIS: (was **Good**)

New

GSFC → NOAA-NESDIS: **Excellent**

Upgrades: ↑

JPL → GSFC: Good → **Excellent**

JPL → NSIDC: Good → **Excellent**

GDAAC → LDAAC: Low → **Adequate**

LDAAC → GDAAC: Adequate → **Good**

GDAAC → ERSDAC: Adequate → **Good**

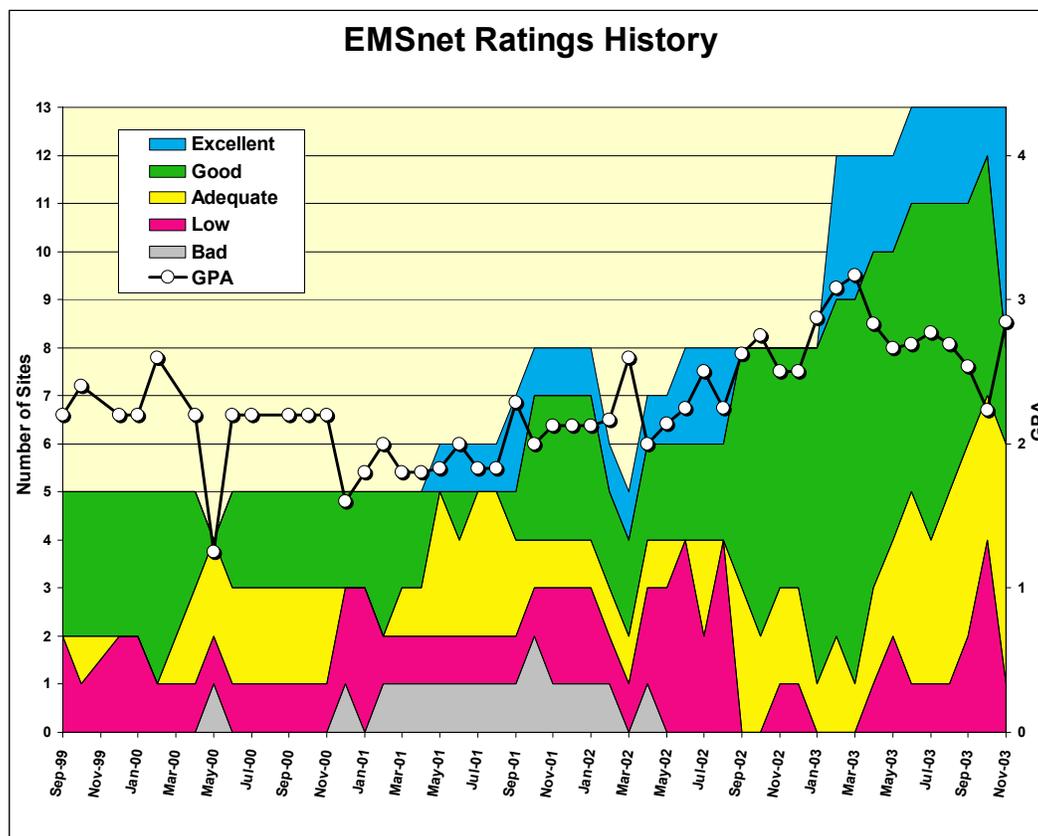
JAXA → US: Good → **Excellent**

US → JAXA: Low → **Adequate**

Downgrades: ↓

NSIDC → GSFC: Good → **Adequate**

The chart below shows the number of sites in each classification since EMSnet testing started in September 1999. Note that these ratings do NOT relate to absolute performance -- they are relative to the EOS requirements. The GPA is calculated based on Excellent: 4, Good: 3, Adequate: 2, Low: 1, Bad: 0

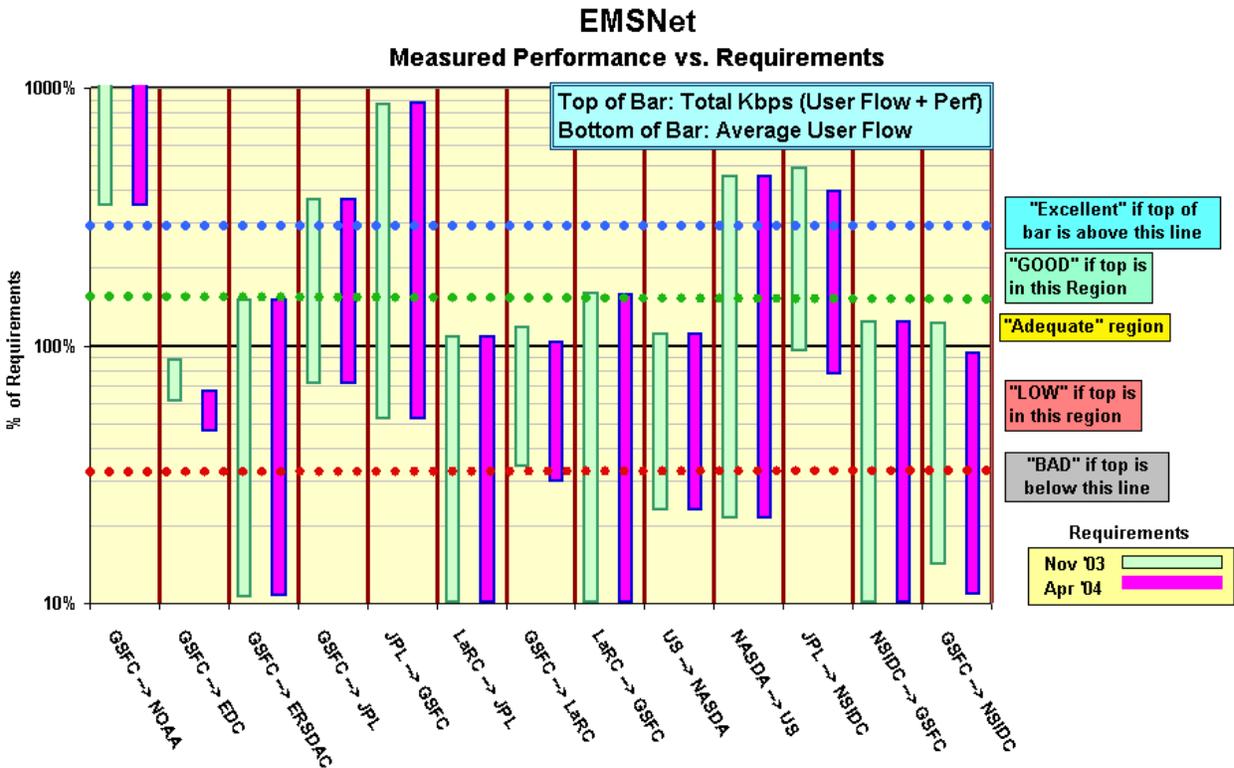


EMSnet Sites Network Requirements vs. Measured Performance

November 2003		Requirements (kbps)		Testing							
Source → Destination	Team (s)	Current	Future	Source → Dest Nodes	Avg User Flow kbps	Perf Avg kbps	Total Avg kbps	Current Status re	Prev Stat	Current Status re	
		Nov-03	Apr-04					Nov-03		Apr-04	
GSFC → NOAA	ADEOS-II, Quikscat	189	189	GSFC-CSAFS → NESDIS	655	2861	3516	Excellent	G	Excellent	
GSFC → EDC	MODIS, LandSat	216611	285361	GDAAC → EDCTest	131197	59788	190985	LOW	L	LOW	
GSFC → ERSDAC	ASTER	568	568	GDAAC → ERSDAC	60	793	853	GOOD	A	GOOD	
GSFC → JPL	ASTER, QuikScat, MLS, etc.	1601	1597	CSAFS → JPL-SEAPAC	1132	4766	5898	Excellent	E	Excellent	
JPL → GSFC	ADEOS-II, AMSR, etc.	626	625	JPL-PODAAC → GDAAC	324	5118	5441	Excellent	G	Excellent	
LaRC → JPL	TES, MISR	40311	40311	LDAAC → JPL-TES	3988	39853	43840	Adequate	L	Adequate	
GSFC → LaRC	CERES, MISR, MOPITT	52407	59401	GDAAC → LDAAC	17590	43814	61404	Adequate	L	Adequate	
LaRC → GSFC	MODIS, TES	31728	31784	LDAAC → GDAAC	559	49856	50415	GOOD	A	GOOD	
US → NASDA	QuikScat, TRMM, AMSR	1986	1986	GSFC-CSAFS → NASDA	454	1737	2191	Adequate	L	Adequate	
NASDA → US	AMSR, ADEOS-II	512	512	NASDA → JPL-SEAPAC	108	2227	2335	Excellent	G	Excellent	
JPL → NSIDC	AMSR	1079	1342	JPL-PODAAC → NSIDC SIDADS	1027	4275	5302	Excellent	G	Excellent	
NSIDC → GSFC	MODIS, ICESAT, QuikScat	13326	13326	NSIDC DAAC → GDAAC	169	16401	16570	Adequate	G	Adequate	
GSFC → NSIDC	MODIS, ICESAT, QuikScat	51138	66907	GDAAC → NSIDC DAAC	7145	55320	62465	Adequate	A	LOW	
Notes:		Flow Requirements (from BAH) include TRMM, Terra, Aqua, QuikScat, ADEOS-II						Ratings			
								Summary			
								Nov-03	Reg	Apr-04	
*Criteria:		Excellent	Total Kbps > Requirement * 3					Score	Prev	Score	
		GOOD	1.3 * Requirement <= Total Kbps < Requirement * 3					5	1	5	
		Adequate	Requirement < Total Kbps < Requirement * 1.3					2	5	2	
		LOW	Total Kbps < Requirement					5	3	4	
		BAD	Total Kbps < Requirement / 3					1	4	2	
								0	0	0	
Change History:											
		27-Sep-99	Original - TRMM, Terra, and QuikScat								
		19-Jan-01	Incorporated BAH requirements including additional missions					Total	13	13	13
		9-Apr-01	Updated BAH requirements								
		4-Jun-01	Added 50% contingency to BAH requirements								
		16-Nov-01	Added MRTG to lperf, updated requirements, Revised criteria								
		2-Oct-02	Updated to revised BAH requirements								
		7-Mar-03	Updated Requirements, Added tests to GSFC, improved User flow calculation								
		22-Dec-03	Updated Requirements: Remove ADEOS; increase NSIDC								
								GPA	2.85	2.23	2.77

Comparison of measured performance with Requirements:

This graph shows two bars for each source-destination pair. Each bar uses the same actual measured performance, but compares it to the requirements for two different times (June '03, and Oct. '03). Thus as the requirements increase, the same measured performance will be lower in comparison.



Note: this chart shows that the performance to most sites is remarkably close to requirements. In the past, some sites have had performance way above the requirements, others way below.

Also note that the interpretation of these bars has changed since Sept '01. The bottom of each bar is the average measured MRTG flow to that site (previously daily minimum). Thus the bottom of each bar can be used to assess the relationship between the requirements and actual flows. Note that the requirements include a 50% contingency factor above what was specified by the projects, so a value of 66% would indicate that the project is flowing as much data as requested.

Details on individual sites:

1) ASF

Rating: **N/A**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/ASF_EMS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
ASF → NESDIS	2.36	2.33	0.98	0.22	2.55
ASF → GSFC-CSAFS	2.65	2.41	1.04		
ASF → JPL-SEAPAC	2.79	2.66	1.36		
GSFC-CSAFS → ASF	2.75	2.66	1.37	.04	2.70

ADEOS Requirement: (Deleted)

Source → Dest	FY	Mbps	Rating
ASF → NESDIS	'03, '04	1.86	Good

Comments: The 2.55 mbps total from ASF → NOAA is as expected for a 2 * T1 (3.1 mbps) circuit.

The requirement above is from ADEOS, and has now been deleted. The remaining ASF requirements are very low, and mostly based on estimated ECS interDAAC queries, not production flows. These flow estimates are not considered reliable enough to use as a basis for testing, so the rating is "N/A". The rating would have remained "Good" vs. the October '03 requirement.

2) GSFC → EDC:

Rating: Continued **Low**

Web Page: <http://ensight.eos.nasa.gov/Networks/emsnet/EDC.shtml>

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
DOORS → EDC Test	n/a	n/a	n/a		
DOORS → EDC DAAC	n/a	n/a	n/a		
G-DAAC → EDC DAAC	133.5	59.8	30.2	131.2	191.0

Requirements:

Date	mbps	Rating
Oct '03	216.6	Low

Comments: The Doors node was removed at the beginning of November, so no results are available from that node. Hopefully, its replacement will be operating in its new location soon.

The performance from GDAAC has improved steadily since mid November, mostly due to the upgrade of the GSFC ECS firewall (median was only 30 mbps last month, and will be over 100 mbps next month).

However, for November the combined user flow and iperf remains below the Oct '03 requirement, so the rating remains "Low".

3) JPL:

Ratings: GSFC → JPL: Continued **Excellent**
 JPL → GSFC: ↑ Good → **Excellent**
 LaRC → JPL: Continued **Low**

Web Pages:

- http://ensight.eos.nasa.gov/Networks/emsnet/JPL_SEAPAC.shtml
- http://ensight.eos.nasa.gov/Networks/emsnet/JPL_PODAAC.shtml
- http://ensight.eos.nasa.gov/Networks/emsnet/JPL_TES.shtml
- http://ensight.eos.nasa.gov/Missions/terra/JPL_MISR.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-CSAFS → JPL-SEAPAC	6.06	4.77	2.34	1.13	5.90
LaRC DAAC → JPL-TES	40.40	39.85	28.47	3.99	43.84
LaRC DAAC → JPL-MISR	39.05	38.43	20.89		
JPL-PODAAC → GSFC DAAC	8.08	5.12	2.58	0.32	5.44

Requirements:

Source → Dest	Date	mbps	Previous Requirement	Rating
GSFC → JPL combined	Nov '03	1.60	1.30	Excellent
JPL → GSFC combined	Nov '03	0.62	4.69	Excellent
LaRC DAAC → JPL-TES	Nov '03	30.6	30.6	
LaRC DAAC → JPL-MISR	Nov '03	18.5	18.5	
LaRC DAAC → JPL-Combined	Nov '03	49.1	49.1	Low

Comments:

GSFC → JPL: Performance on this circuit has been mostly stable since the BOP switchover on 15 August '02. However, on 16 June 2003, performance from MTVS1 to JPL PODAAC, and from G-DAAC to JPL-TES dropped and became noisier. (For example, from MTVS1 to PODAAC, the median dropped from 5.8 mbps to 2.8). However, the GSFC-CSAFS → JPL-SEAPAC results above (still stable) shows that the problem is not in EMSnet. This month the total was slightly higher than last month; well above the requirement.

LDAAC → JPL: Performance from LDAAC to JPL-TES has been very stable since June 23. '03, when the PVC was set to the current value of 45 mbps. The combined MRTG and iperf values total very close to this value, indicating that the circuit is working to its specifications.

The route from LDAAC to the JPL-MISR SCF was switched to EMSnet in July. The performance for LDAAC to JPL-MISR via EMSnet shown above is, as expected, very similar to the performance to TES.

The MISR requirement is open to some interpretation. The formal QA flow is only 9.7 mbps. But the science data also flows on the same circuit. This pushes the total MISR flow requirement to 18.5 mbps.

When this 18.5 mbps MISR requirement is added to the 30.6 mbps TES requirement, the 49 mbps total requirement is higher than the measured performance, and also higher than the nominal circuit speed. Thus the rating remains "Low".

This configuration is based on a management decision to set the circuit capacity at this level to reduce cost, in the expectation that both projects' requirements are bursty and include contingency. Thus the actual requirements of both projects are expected to be met with this circuit capacity.

JPL → GSFC: The requirement from JPL to GSFC includes flows from NASDA and ASF which go via JPL, and includes GSFC and NOAA destinations. Since many of these flows were related to ADEOS, this requirement dropped substantially with the removal of ADEOS. The iperf flow dropped from a median of about 8.5 mbps around 20 October, apparently due to a PVC change. The combined Nov '03 requirement is now only 0.62 mbps, and the combined 5.4 mbps thruput is more than 3 times that, so the rating improves to "Excellent".

4) NSIDC:

Ratings: GSFC → NSIDC: Continued **Adequate**
 NSIDC → GSFC: ↓ Good → **Adequate**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/NSIDC_EMS.shtml

GSFC ↔ NSIDC Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-DAAC → NSIDC	89.2	55.3	18.1	7.1	62.4
NSIDC → GSFC-DAAC	16.6	16.4	11.5	0.2	16.6

Requirements:

Source → Dest	Date	mbps	Previous Requirement	Rating
GSFC → NSIDC	Nov '03	51.1	38.2	Adequate
NSIDC → GSFC	Nov '03	16.4	8.3	Adequate

Comments:

GSFC → NSIDC: Performance from GSFC to NSIDC improved in mid November, mostly due to the upgrade of the GSFC ECS firewall (The median was 35 mbps last month). Independently, the requirement was increased to recognize that the desired flows must finish in a limited (less than 24 x 7) workweek. This higher performance was above the increased requirement, so the rating remains "Adequate".

NSIDC → GSFC: Performance from NSIDC to GSFC remains steady, but the requirement increased due to the incorporation of an ICESAT flow from LASP to GSFC. The performance is now slightly above the requirement, dropping the rating to "Adequate".

Other Testing:

Source → Dest	Medians of daily tests (mbps)			Requirement	Rating
	Best	Median	Worst		
JPL → NSIDC-SIDADS	5.70	4.28	2.99	1.08	Excellent
GSFC-ISIPS → NSIDC	7.10	6.62	5.10		
LDAAC → NSIDC	4.90	4.72	4.54	0.07	Excellent

Comments:

JPL → NSIDC-SIDADS: Performance has been very steady from JPL since the Aug '02 BOP switchover, exceeding the modest requirement (revised down from 1.5 mbps last month).

GSFC-ISIPS → NSIDC: Testing is ftp pulls by NSIDC from ISIPS. Performance is very steady at 7 mbps, apparently limited by ftp window size. Manual testing using iperf between the same machines in the same direction gets over 20 mbps.

LDAAC → NSIDC: Thruput from LDAAC to NSIDC has been steady since August. The very low requirement produces a rating of "Excellent".

5) GSFC ↔ LaRC:

Ratings: GDAAC → LDAAC: ↑ Low → **Adequate**
 LDAAC → GDAAC: ↑ Adequate → **Good**

Web Page: <http://ensight.eos.nasa.gov/Networks/emsnet/LARC.shtml>

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GDAAC → LDAAC	55.0	43.8	17.7	17.6	60.4
LDAAC → GDAAC	51.1	49.9	33.9	0.6	50.4

Requirements:

Source → Dest	Date	Mbps	Previous Requirement	Rating
GDAAC → LDAAC	Nov '03	52.4	52.6	Adequate
LDAAC → GDAAC	Nov '03	31.7	44.8	Good

Comments: GSFC → LaRC: Performance improved in mid November, mostly due to the upgrade of the GSFC ECS firewall (The median was 34 mbps last month). Also, the user flow increased a bit (was 13 mbps last month), increasing the combined thrupt above the Oct. '03 requirement, so the rating improves to "Adequate".

LaRC → GSFC: Performance remains stable since the June '03 upgrade to meet the backhaul requirements. The FY '04 requirement jumped from 6.8 mbps to 44.8 mbps in Oct '03, to incorporate this backhaul of all LaRC science outflow via GSFC. The requirement was revised downward this month to 31.7 mbps. The thrupt is more than 30% above this new requirement, so the Nov '03 improves to "good".

6) NOAA NESDIS:

Rating: (New) **Excellent**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/NOAA_NESDIS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-CSAFS → NESDIS	2.86	2.86	1.74	0.65	3.51
ASF → NESDIS	2.36	2.33	0.98		
NASDA → NESDIS	1.43	1.41	0.45		

Requirements:

Source → Dest	FY	Mbps	Rating
GSFC-CSAFS → NESDIS	'04	0.19	Excellent

Comments: With the deletion of the ADEOS flows from ASF, the dominant flow to NOAA is now Quikscat data, from GSFC CSAFS.

Note that the 3.5 mbps total from CSAFS → NOAA exceeds the nominal 3.1 mbps for the 2 * T1 circuit. This shows the danger of adding together sampled medians. In this case the iperf tests are usually unaffected by the sporadic user flows, and normally get full circuit bandwidth. Adding the low but significant user flow then exceeds the circuit capacity. Since this is more than 3 times the FY '04 requirement, the rating is "Excellent".

Also note that the flow from NASDA is limited by the TCP window size of the NASDA test source, and the long RTT..

7) GSFC → ERSDAC:

Rating: ↑ Adequate → **Good**

Web Page : <http://ensight.eos.nasa.gov/Networks/emsnet/ERSDAC.shtml>

Test Results:

Source → Dest	Medians of daily tests (kbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC → ERSDAC	802	793	471	60	853

Requirements:

Source → Dest	FY	Kbps	Previous Requirement	Rating
GSFC → ERSDAC	'03, '04	568	668	Good

Comments: Thruput since June '02, using the 1 mbps ATM connection had been very stable (except for a problem period from 12 November '02 to 3 Jan '03). The requirement was revised down from 668 kbps this month, so the total user flow plus iperf is now more than 30 % over the requirement, so the rating increases to "Good"..

8A) US → JAXA (formerly NASDA):

Rating: ↑ Low → **Adequate**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/NASDA_EOC.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-CSAFS → JAXA-EOC	2.05	1.74	1.29	0.45	2.19
ASF → JAXA-EOC	2.14	1.96	1.34		

Requirements

Source → Dest	FY	mbps	Previous Requirement	Rating
GSFC → JAXA	Oct '03	1.99	2.62	Adequate

Comments: Performance steady -- about as expected for the 3 mbps ATM PVC (using multiple TCP streams to mitigate the TCP window size limitation at JAXA). Results from ASF to NASDA were about the same as from CSAFS. The requirements above are lower than previously, due to the removal of ADEOS requirements. Thus the rating improves to "Adequate".

But the requirements still include 4 ISTs at JAXA for AMSR-E. Each IST has a requirement for 311 kbps, for a total of 1244 kbps. This requirement causes the rating to be "Adequate", even though the performance was stable. It could be questioned whether JAXA intends to operate all four of the ISTs simultaneously, or whether some ISTs are backups, in which case the network requirements would be reduced to a lower value.

8B) JAXA (formerly NASDA) → US: Rating: ↑ Good → **Excellent**

Web Pages: http://ensight.eos.nasa.gov/Networks/emsnet/JPL_SEAPAC.shtml
http://ensight.eos.nasa.gov/Networks/emsnet/GSFC_SAFS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
JAXA-EOC → JPL-SEAPAC	2.24	2.23	1.46	0.11	2.34
JAXA-EOC → GSFC-CSAFS	1.28	1.26	0.93		

Requirements:

Source → Dest	FY	mbps	Previous Requirement	Rating
JAXA → US	'02, '03	0.51	1.56	Excellent

Comments: Performance continues stable on the new circuit. The requirement dropped due to the removal of ADEOS requirements, increasing the rating to "Excellent".

Note: JAXA has not yet implemented testing with multiple tcp streams. So performance to GSFC is limited by the TCP window size on JAXA's test machine, in conjunction with the long RTT. Therefore, in order to reflect the actual capability of network, the rating is derived from testing from JAXA to JPL. This test uses the same Trans-Pacific circuit, but has a shorter RTT, so will not be as severely limited by the TCP window size. The Trans-Pacific circuit connects into the higher speed domestic EMSnet at JPL, which is not expected to be the limiting factor.