

EOS Mission Support Network Performance Report

This is a monthly summary of EMSnet performance testing -- comparing the measured performance against the requirements.

Highlights:

- Test results remain stable – **all "adequate" or better since December '03!**
- "Integrated" 5 month graphs have been added to the EMSnet web pages.
- Testing added from ASF to NSIDC (as a stand-in for LASP) for testing QuikSCAT MOC requirements..

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

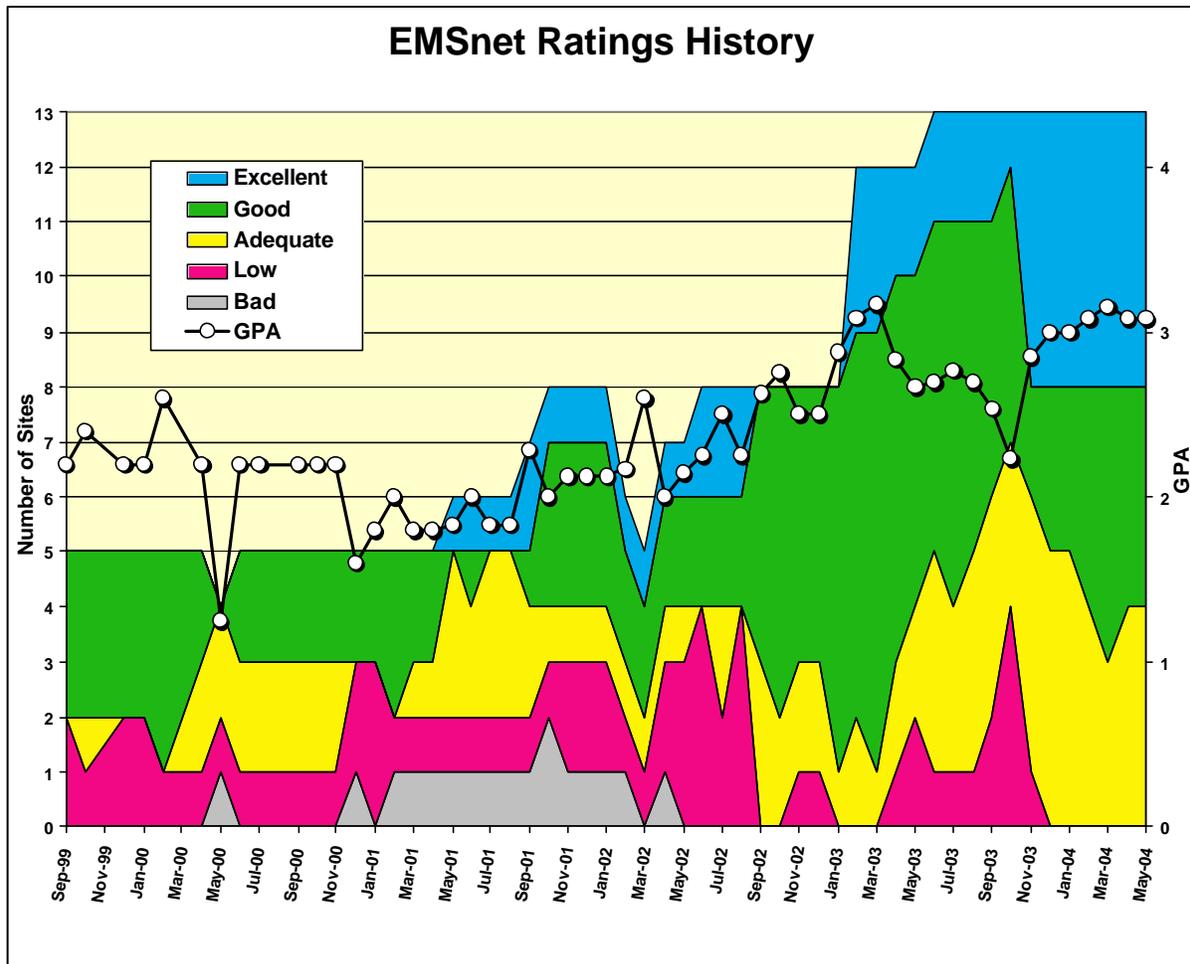
Ratings Changes:

Upgrades: ↑:

GSFC → JAXA: Adequate → **Good**

Downgrades: ↓:

GSFC → EDC: Good → **Adequate**



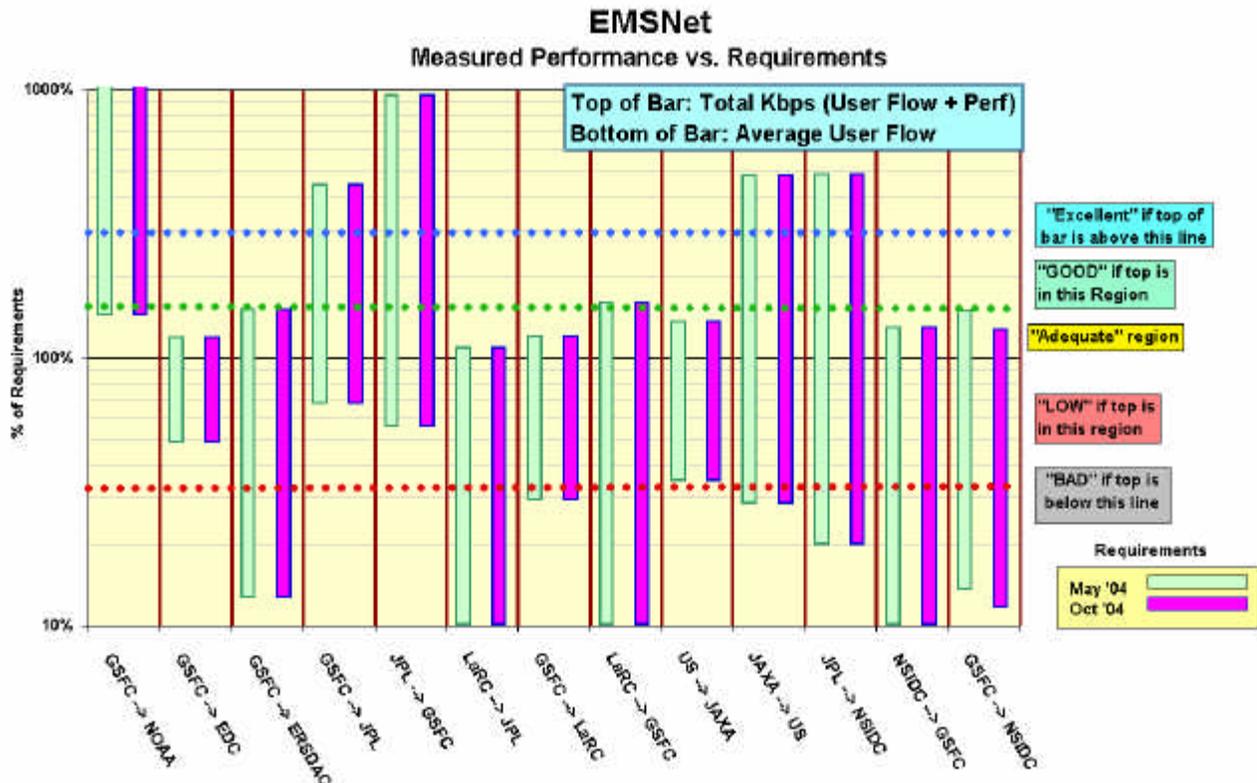
The chart above shows the number of sites in each classification since EMSnet testing started in September 1999. Note that these ratings do NOT relate to absolute performance -- they are relative to the EOS requirements. The GPA is calculated based on Excellent: 4, Good: 3, Adequate: 2, Low: 1, Bad: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

EMSnet Sites Network Requirements vs. Measured Performance

May 2004		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	
		May-04	Oct-04					May-04		Oct-04	
GSFC → NOAA	Quikscat	189	189	GSFC-CSAFS → NESDIS	269	2929	3198	Excellent	E	Excellent	
GSFC → EDC	MODIS, LandSat	285361	285361	GSFC-PTH → EDC DAAC	136424	202241	338665	Adequate	G	Adequate	
GSFC → ERSDAC	ASTER	568	568	GDAAC → ERSDAC	71	786	857	GOOD	G	GOOD	
GSFC → JPL	ASTER, QuikScat, MLS, etc.	1597	1597	CSAFS → JPL-SEAPAC	1064	5966	7030	Excellent	E	Excellent	
JPL → GSFC	AMSR, etc.	625	625	JPL-PODAAC → GDAAC	345	12237	12581	Excellent	E	Excellent	
LaRC → JPL	TES, MISR	40311	40311	LDAAC → JPL-TES	3547	40099	43646	Adequate	A	Adequate	
GSFC → LaRC	CERES, MISR, MOPITT	59401	59401	GDAAC → LDAAC	17317	53772	71088	Adequate	A	Adequate	
LaRC → GSFC	MODIS, TES	31784	31784	LDAAC → GDAAC	300	50716	51016	GOOD	G	GOOD	
US → JAXA	QuikScat, TRMM, AMSR	1986	1986	GSFC-CSAFS → JAXA	685	2010	2695	GOOD	A	GOOD	
JAXA → US	AMSR	512	512	JAXA → JPL-SEAPAC	146	2308	2453	Excellent	E	Excellent	
JPL → NSIDC	AMSR	1342	1342	JPL-PODAAC → NSIDC SIDADS	267	6205	6472	Excellent	E	Excellent	
NSIDC → GSFC	MODIS, ICESAT, QuikScat	13326	13326	NSIDC DAAC → GDAAC	376	16859	17234	Adequate	A	Adequate	
GSFC → NSIDC	MODIS, ICESAT, QuikScat	66907	78410	GSFC-PTH → NSIDC DAAC	9027	90935	99962	GOOD	G	Adequate	
Notes: Flow Requirements (from BAH) include TRMM, Terra, Aqua, QuikScat, ADEOS-II								Ratings Summary			
								May-04	Reg	Oct-04	
								Score	Prev	Score	
*Criteria:	Excellent	Total Kbps > Requirement * 3						Excellent	5	5	5
	GOOD	1.3 * Requirement <= Total Kbps < Requirement * 3						GOOD	4	4	3
	Adequate	Requirement < Total Kbps < Requirement * 1.3						Adequate	4	4	5
	LOW	Total Kbps < Requirement						LOW	0	0	0
	BAD	Total Kbps < Requirement / 3						BAD	0	0	0
								Total	13	13	13
								GPA	3.08	3.08	3.00

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 (March '04, and October '04). Thus as the requirements increase, the same measured performance will be lower in comparison.



Note that this chart shows that the performance to all sites meets current requirements.

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		
GSFC-CSAFS → ASF	2.83	2.77	1.42	0.04	2.81
ASF → NESDIS	2.25	2.24	0.86	0.32	2.56
ASF → NSIDC (new)	2.74	2.44	0.91		
ASF → GSFC-CSAFS	2.73	2.48	1.13		
ASF → JPL-SEAPAC	2.78	2.64	1.67		

ADEOS Requirement: (Deleted)

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

Comments: The 2.56 mbps total from ASF → NOAA is as expected for a 2 * T1 (3.1 mbps) circuit.

The requirement above is from ADEOS, and has 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: **↓ Good → Adequate**

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		
GSFC-PTH → EDC-PTH	212.9	202.2	182.3	136.4	338.7
G-DAAC → EDC LPDAAC	217.5	186.9	120.9		

Requirements:

Date	mbps	Rating
May, October '04	285.4	Adequate

Comments:

The rating is now based on testing between the GSFC performance test host ("GSFC-PTH"), located outside the ECS firewall and the EDC performance test host ("EDC-PTH"), also located outside the ECS firewall. The EDC-PTH machine was reconfigured last month, with lower thruput results – but still with a higher median and worst than from GDAAC to LPDAAC. This comparison of the two results show the effect of high levels of loading on the GDAAC and the ECS firewalls.

The lower iperf thruput, combined with the stable MRTG still exceeds the requirement, but not by a 30% margin, so the rating drops to "Adequate".

3) JPL: Ratings: GSFC → JPL: Continued **Excellent**
 JPL → GSFC: Continued **Excellent**
 LaRC → JPL: Continued **Adequate**

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	6.26	5.97	3.09	1.06	7.03
LaRC DAAC → JPL-TES	40.43	40.10	24.19	3.55	43.65
LaRC DAAC → JPL-MISR (ftp)	19.63	17.06	9.20		
JPL-PODAAC → GSFC DAAC	12.32	12.24	7.62	0.34	12.58

Requirements:

Source → Dest	Date	mbps	Rating
GSFC → JPL combined	May '04	1.60	Excellent
JPL → GSFC combined	May '04	0.63	Excellent
LaRC DAAC → JPL-TES	May '04	30.6	Adequate
LaRC DAAC → JPL-MISR	May '04	18.5	Adequate
LaRC DAAC → JPL-Combined	May '04	49.1	Low

Comments:

GSFC → JPL: Performance on this circuit has been mostly stable since the BOP switchover on 15 August '02; well above the requirement; the rating remains "Excellent".

LDAAC → JPL: Performance testing from LDAAC to JPL-TES has been stable at 40 mbps since testing was restored on Feb 29. Iperf testing to TES was interrupted in April by security activities at JPL, but has recovered. Iperf testing to JPL-MISR was also blocked by JPL security, and has not recovered (working with POCs to restore). So the MISR results above are from ftp testing, which is limited to about half the typical iperf performance due to TCP window size and RTT factors. This ftp performance has also been stable.

The measured thrupt is above both the MISR and TES requirements, but below their combined value. However, 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". But the rating would be "Adequate" based only on the formal QA requirement.

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 increased abruptly from a stable 8 mbps to a stable 12 mbps on March 6, apparently due to a PVC change. The combined requirement is now only 0.63 mbps, and the combined 12.6 mbps thrupt is more than 3 times that, so the rating remains "Excellent".

4) NSIDC:

Ratings: GSFC → NSIDC: Continued **Good**
 NSIDC → GSFC: Continued **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-PTH → NSIDC	91.6	90.9	36.4	9.0	100.0
GSFC-DAAC → NSIDC	91.4	90.6	21.5		
NSIDC → GSFC-DAAC	17.0	16.9	15.4	0.3	17.2

Requirements:

Source → Dest	Date	mbps	Rating
GSFC → NSIDC	May '04	66.9	Good
NSIDC → GSFC	May '04	13.3	Adequate

Comments:

GSFC → NSIDC: The rating is based on testing from the GSFC-PTH to the NSIDC DAAC. This node is outside the GSFC ECS firewall, and has the same peaks and median, but higher worst values compared to the GDAAC. The requirement was increased again (was raised to 55.1 mbps in January '04). The current performance is still more than 30% above the increased requirement, so the rating remains "Good".

NSIDC → GSFC: Performance from NSIDC to GSFC remains steady, and the rating remains "Adequate".

Other Testing:

Source → Dest	Medians of daily tests (mbps)			Requirement	Rating
	Best	Median	Worst		
JPL → NSIDC-SIDADS	6.21	6.21	4.28	1.08	Excellent
GSFC-ISIPS → NSIDC (ftp)	7.26	6.70	5.57		
GSFC-ISIPS → NSIDC (iperf)	34.87	34.43	26.90		
NSIDC → GSFC-ISIPS (iperf)	17.11	17.08	15.72		
LDAAC → NSIDC	4.94	4.82	4.65	0.07	Excellent
ASF → NSIDC (new)	2.74	2.44	0.91	0.73	Excellent

Comments:

JPL → NSIDC-SIDADS: Performance has been very steady from JPL since the Aug '02 BOP switchover, exceeding the modest requirement.

GSFC-ISIPS ↔ NSIDC: Performance of ftp pulls by NSIDC from ISIPS remains very steady at 7 mbps, apparently limited by ftp window size. The iperf results show that a single stream is indeed limited to about 7 mbps, limited by the window size on the ISIPS HP-UX machine. But multiple stream reverse iperf testing between the same machines in the same direction shows that the network is capable of much more thrupt. Testing from NSIDC to ISIPS gets very similar thrupt as NSIDC to GDAAC.

LDAAC → NSIDC: Thrupt from LDAAC to NSIDC has been steady since August '03. The very low requirement produces a rating of "Excellent".

ASF → NSIDC: Added testing this month from ASF to NSIDC related to the ASF flow to the QuikSCAT MOC at LASP. The median thrupt is more 3 times the requirement, so the rating is "Excellent".

5) GSFC ↔ LaRC:

Ratings: GDAAC → LDAAC: Continued **Adequate**
 LDAAC → GDAAC: Continued **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	56.4	53.8	32.7	17.3	71.1
GSFC-PTH → LDAAC	58.8	56.0	20.2		
GSFC-PTH → LaTIS	58.7	50.5	13.7		
LDAAC → GDAAC	51.1	50.7	41.7	0.3	51.0

Requirements:

Source → Dest	Date	Mbps	Rating
GDAAC → LDAAC	May '04	59.4	Adequate
LDAAC → GDAAC	May '04	31.7	Good

Comments: GSFC → LaRC: Performance from GDAAC to LDAAC stable, but increased requirement kicked in last month, dropping the rating to "Adequate" (requirement was 52.5 mbps previously – rating would have remained "Good"). Testing from GSFC-PTH to LDAAC is similar to testing from GDAAC, but slightly lower results (!). Testing from GSFC-PTH to LaTIS is similar, but with apparently more congestion at LaRC.

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 31.7 mbps in Oct '03, to incorporate this backhaul of all LaRC science outflow via GSFC (which has apparently not started thus far). The thruput is more than 30% above this requirement, so the Jan '04 rating remains "good".

6) NOAA NESDIS:

Rating: Continued **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	2.93	2.93	1.63	0.27	3.20
ASF → NESDIS	2.74	2.44	0.91		
JAXA (NASDA) → NESDIS	1.59	1.56	0.52		

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 Quikscat data, from GSFC CSAFS.

Note that the 3.2 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) US ← → JAXA (NASDA):

Ratings: GSFC → JAXA ↑: Adequate → **Good**
 JAXA → US: Continued **Excellent**

Web Pages http://ensight.eos.nasa.gov/Networks/emsnet/NASDA_EOC.shtml
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		
GSFC-CSAFS → JAXA-EOC	2.26	2.01	1.43	0.69	2.70
JAXA-EOC → JPL-SEAPAC	2.33	2.31	1.26	0.15	2.46
JAXA-EOC → GSFC-CSAFS	1.44	1.41	0.88		

Requirements

Source → Dest	Date	mbps	Rating
GSFC → JAXA	May '04	1.99	Good
JAXA → US	FY '03, '04	0.51	Excellent

Comments: US → JAXA: Performance steady -- about as expected for the 3 mbps ATM PVC (using multiple TCP streams to mitigate the TCP window size limitation at JAXA). The requirements above were reduced in November '03, due to the removal of ADEOS flows. The thruput increased slightly this month, pushing the rating to "Good".

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. 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.

JAXA → US: Performance continues very stable. The requirement was reduced in November '03 due to the removal of ADEOS requirements, increasing the rating to "Excellent".

Note: Since JAXA has not yet implemented testing with multiple tcp streams, performance to GSFC is limited by the TCP window size on JAXA's test machine, in conjunction with the long RTT. In order to reflect the actual capability of network, the rating is derived from testing from JAXA to JPL, which uses the same Trans-Pacific circuit, but has a shorter RTT, so will not be 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.

8) GSFC → ERSDAC:

Rating: Continued **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	792	786	554	71	857

Requirements:

Source → Dest	FY	Kbps	Rating
GSFC → ERSDAC	'03, '04	568	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 in November '03, so the total user flow plus iperf is more than 30 % over the requirement, and the rating remains "Good".