

# Systematic Assessment of Network Performance Between GridPP Sites

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## ***Intro and Aims***

The contents of this document forms a structured overview of the metrics and tests that should prove useful in determining Network Performance between GridPP sites across the UK.

The result of this analysis should give a broad view of the end to end performance against expected results from hardware considerations. Discrepancies between actual and optimal metrics shall be investigated into and from this form a basis from upon which network performance can be 'tweaked' in order to develop systematic ways of improving network performance between GridPP sites.

## ***Metrics***

Metrics to consider are:

Round Trip Time	Assessment of the 'distance' of the endnode with considerations of jitter.
Loss	Indication of the 'cleanness' of the pipe between endnodes.
Link Utilisation	A maximal network 'bandwidth' using both TCP and UDP datagrams. These tests will measure memory to memory constraints between endnodes.
FTP Performance	A 'real life' measure of expected network performance using standard FTP clients – may include GridFTP. This will give an indication of disk to disk performance.
Hops and Network Path	Indication of the number of hops and performance of routers between endnodes.

Of these metrics, items to investigate further are,

Socket Buffer Sizes on both client and server side.	Investigation into the effects of both sender and receiver socket buffer sizes on transfer rates/link utilization.
Autotuning – especially kernel implementations	The effects of 'autotuning' with relation to performance against memory requirements.
TCP Implementation(s)	The effects of different TCP implementation such as RENO, Tahoe etc and the advantages/disadvantages of SACKS and DSACKS.

**Tools**

PingER	Automated RTT gathering tool with visual representation. Uses 'ping'.
IperfER	Automated Link Utilisation gathering tool with visual representation. Uses 'iperf'.
Pipechar	A link utilization tool with traceroute attributes. Can give indication of route 'bottleneck'.
Traceroute	Representation of the network path between endnodes.
Web100	A kernel patch that allows investigation into network metrics at the kernel level. Can show information such as SACK, timeouts and packet flow.

**Deployment**

It is expected that each GridPP site in the UK will house at least one 'Network Monitoring Machine' which will contain the tools as mentioned above in order to present information such as the metrics outlined.

GridPP sites currently include;

- Glasgow
- Manchester
- Liverpool
- Oxford
- Imperial College (London)
- Bristol

Once a mesh of measurements is underway between these GridPP sites, we hope to expand to other sites within the UK.

When possible, this list will be expanded to include Grid RC's across the UK.

**Testing Methodology**

Each GridPP site will conduct a series of tests automatically using tools such as iperf and ping which are run as cron jobs and represented using tools such as PingER and IperfER. These shall give an indication of the network performance over time.

To compliment this automaton shall be a set of web-based tools that will allow manual inspection of the network. For example, pipechar could be run from the server's homepage to determine the router performance along a path.

The timescale of this deployment and analysis is expected to be 3 months initially, with the inclusion of Grid RC sites to be 6 months from the start of the project.

**Misc**

The effects of router queuing are important, but not directly related to this document. Should routers with various implementations of Queuing Mechanisms be found within this production network, tests should be performed to investigate this effect.