

APP NOTE



Managing for high availability, high performance

xDSL technologies are often designed with a particular application and its unique environment in mind. Thus the selection of transmission technology, RF spectrum and link parameters will be optimized for one application. Network administrators find they must deploy multiple products to attain the performance and reliability required for critical data applications across a diverse enterprise.

The XLT-400 and XLP-6800 feature a high availability, high performance link along with tools to manage and program the link in diverse wire environments.

To ensure a reliable link, Tut OS 1.x provides:

- Link parameters to determine operational status
- Proactive monitoring of existing links
- Optimized, distinct bandplans to address limitations of the unique wire environment

Detailed link characteristics are visible by Tut engineers and may be provided to diagnose unique installation environments. The most useful link characteristics are visible to the administrator and useful in determining the quality of the link:

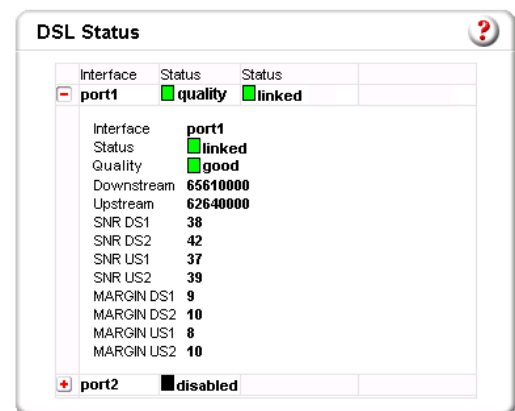
Link Parameter	Description
SNR	Abbreviation of Signal to Noise Ratio. For each transmission band, the ratio of desired signal to undesired noise is calculated and reported. Minimum SNR is 20dB at the lowest bitrate and maximum distance.
SNR margin	The difference between the minimum required SNR and the measured SNR. Higher margins provide greater protection from impulse noise and lower error rates.
Errors / sec	Errors / seconds are reported as a Line Quality measurement since bit errors most directly relate to packet and link loss. System alerts and SNMP traps are sent when the error rate/second exceeds the maximum allowed threshold and drops below the minimum allowed threshold. Maximum and minimum thresholds are settable by the network administrator. The default values are: min: 1.7 errors/sec and max: 2 errors/sec.
Link Speed	Link speed in bits/sec is reported for each direction of the data. See <i>"Managing the Link"</i>

Monitoring the Link

The link parameters can be viewed from the CLI, webUI or via SNMP.

Status

Link states are: enabled (not linked), disabled, linking, link lost, or linked.



Quality

Two states are reported; good and fair.

Good quality = errors /second less than the minimum threshold. Fair quality = errors/second greater than the maximum threshold. Monitor this parameter during installation to predict the ability to transmit packets reliably. Over time, monitor this parameter using SNMP traps to get alerts to possible changes in the installation environment e.g. introduction of new electromagnetic noise sources.

Downstream | Upstream

Downstream is the line rate from the link master to the link client. On the XLP-6800, the XLP-6812 is always the link master and the XLP-6802 is always the link client. On the XLT-400 series, all UTP interfaces are user settable as either a link master or link client.

SNR DS1 | DS2 | US1 | US2

Minimum SNR for any bandplan is 20dB, allowing sufficient margin for error-free transmission. Changes greater than 6dB over time may indicate degradation of the wire plant, or seasonal changes due to humidity and temperature.

MARGIN DS1 | DS2 | US1 | US2

Greater SNR Margin provides lower bit error rate and greater rejection of noise. Common noise types include impulse noise (broad spectrum interference from AC electric motors, etc) and common mode noise (narrow spectrum interference such as AM radio, CB). Additional factors impact the SNR such as changes in Insertion Loss due to seasonal environmental changes.

Continuous monitoring of Margin is recommended to ensure an SNR Margin of 9dB is maintained for any transmission band.

Managing the Link

Use these guidelines to change operational parameters for a link that exhibits poor reliability.

Programmable Bandplans: The Tut OS 1.x (T) and Tut OS 1.x(P) feature six distinct bandplans with differing RF spectrum and transmission power. Each bandplan is designed for common wire environments that may be encountered in the field. Every link parameter is subject to change; Symbol Rate, Carrier Frequency, Inter-band gap, QAM level, and number of bands. In general, as the bandplan number lowers, the RF spectrum is also reduced. For example, the 75-75 profile utilized the entire range up to 12.5Mhz whereas the 5-5 profile utilizes an upper frequency of 1.8Mhz. At wire distances up to 5,000ft (1,500m), start with the 75-75 profile.

Target Link Speed: Within each bandplan's operational limits, the Tut OS will adapt and fine-tune the bandplan to reach the target link speed while maintaining the greatest possible SNR Margin.

If the link shows ...	Operational changes suggested ...
<i>SNR of a band is less than 20dB</i>	Unlikely that a link will be established at less than 20dB SNR. Select a lower numbered bandplan. Each bandplan has a distinct RF spectrum that may result in different SNR values.
<i>SNR Margin of a band is</i>	First, lower the target bitrate by approximately 10Mbps. Recheck the SNR Margin. If

less than 9dB

greater improvement in Margin is desired, reduce the target bitrate or select a lower numbered bandplan. Note that changing the bandplan will have the greatest impact on SNR Margin.

Link Quality shows "fair"

Monitor and record (SNMP servers store historical event data) the times and duration of the "fair" link quality. Random quality changes can be addressed by improving the SNR Margin as shown above. Time-related or season-related changes may require corrective action in the wire environment.

SNR Margin is above 9dB, but Link Quality shows "fair"

Change the Link Quality parameters to isolate the amount of errors showing. Common values for Link Quality are:

Aggressive:	min: 0.5, max: 0.6
Normal:	min: 0.5, max: 1
Mild:	min: 1.7, max: 2

Adjust the link quality parameters based on your actual field experience. After determining the range of errors that trigger an alert, modify the SNR Margin. If Link Quality continues to show "fair", contact Tut Systems support for additional information on link monitoring and analysis.

Asymmetrical link speeds where other parameters are normal

This may indicate the link is at its optimum performance. Changing the bandplan may result in different link speeds.

On the XLT-400 series, each UTP interface can be programmed as a Link Master or a Link Client. If the asymmetrical speed is in the wrong direction for your application, change the UTP interface assignments so that the bandwidth is aligned with your application.

For example; video surveillance cameras require upstream data but the downstream bitrate is greater than upstream.

On the XLT-400, change the UTP interface link mode using this CLI command: `system> interface dsl mode [master|client]`

Availability

The features described here are available in the Tut OS 1.x (T) and Tut OS 1.x(P) and released for the XLT-400 series **FastCopper** Switches and XLP-6800 series **PowerBroadband** network extension. For additional product details including link speed and available PoE power, consult the Product Datasheets available at www.tutsys.com.

Model:	Description	Model:	Description
42211	XLT-401 FastCopper , 4 x 10/100BT UTP Links: 1	42102	XLP-6812 master : 4 x 10/100BT UTP/Extended PoE Links: 2
42212	XLT-401 FastCopper , 4 x 10/100BT UTP Links: 2	42002	XLP-6802 client : 2 x 10/100BT with PoE
42214	XLT-401 FastCopper , 4 x 10/100BT UTP Links: 4		