



## Schedule document

### Connectivity services

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Node4 Limited  
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# Schedule document

## Connectivity services

This schedule contains additional terms and conditions, service description and service levels applicable to the Connectivity Services and should be viewed with associated Order Form, Node4's General Terms and Conditions and the Acceptable Use Policy.

### 1. Overview

Node4 Connectivity Services provides the Customer with fibre or copper access circuit providing either internet access (ConnectFAST), MPLS access (ConnectMPLS) or point to point connectivity between two locations. The service may be ordered with CPE for a fully managed service, or without CPE (wires only).

### 2. Definitions

**“Incident” means** an unplanned interruption to a service or a reduction in service quality

**“Installation Fee”** means charges payable by the Customer for the installation of the service as provided in the Order Form;

**“Monthly Review Period”** means the calendar monthly periods commencing on the 1st of each month during the Term, over which Service performance measurements are calculated, provided that the first Monthly Review Period will commence on Ready For Service Notification;

**“Node4 Network”** means the network wholly owned and managed by Node4;

**“Non-Service Affecting Incident”** means an Incident or condition which is not a Service Affecting Incident.

**“Planned Outage”** means proactive work required to maintain the service provided, Node4 may with reasonable notice require a temporary outage in service. Wherever possible Node4 will agree the outage with you in advance of the required work. Any planned downtime shall not be included in Incident or service reliability measurements;

**“Professional Service Fees”** means the professional service charges detailed on the Order Form or otherwise agreed in writing between the Parties in accordance with Clause 4 below;

**“Service Affecting Incident”** means any failure of Node4 service, which, in our reasonable opinion causes a loss of a customer's service. In all such cases the service shall be deemed unavailable and the length of downtime recorded by Node4 from when the Incident is registered by Node4 and a Service Ticket allocated.

**“Service Availability”** means the time for which a Node4 service is usable, expressed as a percentage of the total time in a given Monthly Review Period. The Node4 service shall be deemed available for the purposes of calculating Service Availability if it is not usable due to an event outside our reasonable control, a Customer Responsible Incident, a Third Party Attributable Incident or is due to a Planned Outage.

**“Service Desk”** means the single point of entry for all Service Tickets and Service Requests which can be accessed over the phone, by email or via our portal.

**“Service Request”** means a request for a change for information

**“Service Ticket”** means the tickets which are raised in relation to Incident or Service Request

**“Standard MAC”** means a change to one device which can be completed within 30 minutes by a support engineer between 7am and 7pm Monday to Friday.

**“Time to Resolve Incident”** means the length of time from the issue of the Service Ticket to repair and resolution or the service circuit and/or associated equipment.

### 3. Specific terms

The following terms and conditions shall apply when Node4 Connectivity Services to the Customer.

#### 3.1 Multiple connections

Where the Agreement comprises of a number of individual connectivity services, each will hold the

Initial or Extended Term, starting upon activation of the particular service. If the Agreement is terminated by the Customer while any of the individual connectivity services are still within their Initial or Extended Term, then the Node4 shall exercise right to levy appropriate Early Termination Charges as per Clause 13.2 or the Terms and Conditions on a pro-rata basis, for outstanding rental charges on each of the individual connectivity services still within the Initial or Extended Term.

### 3.2 Cancellation before implementation

If the Customer cancels the service prior to installation, but after the Supplier has committed to an agreed installation date, the Node4 reserves the right to pass on any costs reasonably incurred, including those incurred by the Third Party Services Provider. Where the service being cancelled is an Ethernet service, an additional administration fee of £350 will be levied.

### 3.3 Third parties

Node4 shall not be liable in respect of any contract, agreement or relationship that the Customer may have with any third party. If a dispute arises between the Customer and a third party involving Node4's MPLS services, Node4 shall provide the Customer with reasonable information and assistance (to the extent that such is not adverse to Node4's interests to Customer (at Customer's expense) in the resolution of such dispute.

## 4. Fees

Installation and Rental Fees associated with each individual access component will commence when Ready For Service Notification is provided by Node4, this will follow the installation of a specific connection.

### 4.1 Reoccurring fees

Rental Fees are paid either monthly or annually in advance based on the support provided and any other related service and are identified on the Order Form.

### 4.2 Set-up fees

Any applicable Design, Configuration, and Installation Fees for the implementation of the service shall be detailed on the Order Form.

Once an order is placed a survey is carried out which may identify excess construction charges, or other charges levied by 3<sup>rd</sup> parties such as legal fees to agree wayleaves. Any such Fees will be notified to the customer who may choose to accept them or cancel the order at no cost.

### 4.3 Professional service fees

Initial Professional service requirements will be stated on the Order Form.

Additional tasks undertaken at the request of the customer by Node4 personnel from a Node4 location, will be charged at the hourly rates shown below.

| Time support required:    | Per hour         |
|---------------------------|------------------|
| Mon – Fri - 07.00 – 19.00 | £80.00 per hour  |
| All other times           | £120.00 per hour |

Time is charged by the hour. These rates are for a support / provisioning engineer and are subject to an annual review by Node4. For advanced engineers please contact Node4 for pricing.

Contact Node4 relating to pricing for additional tasks requested by the Customer to be undertaken by Node4 personnel on a Customer Site.

### 4.4 Termination and change fees

Node4 will notify the Customer of any Additional Fees incurred from third parties resulting from changes or cancellations to the services provided, any additional fees will be included on the next invoice.

## 5. Customer responsibilities

In order to deliver the service Node4 expect the customer to provide or purchase from Node4:

- IP Addressing & IP Routing information (L3VPN only)
- Assistance for the service provider when they visit the customer site (Abortive site visits are chargeable)
- Guiding the Access Network Engineer to a preferred installation point at the customer site. Power, Ethernet port on LAN and suitable cabinet space for CPE

- The location of the circuit and the LAN port must be within 2metres of the router location.
- Deliver connectivity (cabling) to our racks within the POPs
- Customer Premises Equipment (if customer provided)
- Analogue phone lines for ADSL, unless a WLR line option is specified on the order form.

## 6. Provision of service

### 6.1 General

The Service is for the supply and usage of data connectivity services utilising the Node4's Core Network and where necessary, wholesale partner Access Networks.

Bandwidth availability is dependent upon multiple factors such as the distance of the Customer's premises from the exchange (EFM) or the Green Cabinet (EoFTTC, FTTC and Broadband), bearer size and committed data rate (Fibre Leased Line) and the class of service applied to the circuit.

The Services can only be supplied within the available footprint and therefore some locations may not be eligible.

The following tables represents the different options which will be provided if included on the Order Form

### Broadband Products - Contended with extended repair times

| Product name                   | Broadband   | Fibre Broadband   | Fibre Broadband                |
|--------------------------------|---|---|--------------------------------|
| Alternative                    | ADSL  | FTTC Superfast Broadband                                      | FTTP Superfast Broadband       |
| Available As                   | ConnectFAST Or ConnectMPLS                                    |   |                                |
| Download Speed                 | Up to 24Mbps  | Up to 80 Mbps   | Up to 330 Mbps                 |
| Upload Speed                   | Up to 1.3Mbps   | Up to 24Mbps  | Up to 50 Mbps                  |
| Product variants (Mbps)        | N/A   | FTTC 80 (80:20)<br>FTTC 40 (40:10)                            | N/A                            |
| Access Presentation Not router | Uses WLR/PSTN Telephone line (NTE5/RJ11) Requires Microfilter | Uses WLR/PSTN Telephone line (NTE5/RJ11) Requires Microfilter | 1000BaseT                      |
| Node4 Interconnect resilience  | Automated Geo Diverse failover                                | Automated Geo Diverse failover                                | Automated Geo Diverse failover |
| Service Contention             | Standard Elevated traffic available                           | Standard Elevated traffic available                           | Standard                       |

### Ethernet Products- Uncontended with fast repair times

| Product name                   | Ethernet over FTTC                         | Ethernet First Mile                       | Fibre Leased Line  | Wireless Leased Line                      |
|--------------------------------|--|---|--|---|
| Alternative                    | EoFTTC /GEA                                | EFM                                       | Ethernet   | Ethernet                                  |
| Available as                   | ConnectFAST, ConnectMPLS Or Point to Point |   |  |   |
| Download Speed                 | Up to 20Mbps Burstable to 80Mbps           | Up to 35Mbps                              | From 10Mb -10Gb  | From 10Mb - 1Gb                           |
| Upload Speed                   | Up to 15Mbps Burstable to 20Mbps           | Up to 35Mbps                              | From 10-10Gb   | From 10-1Gb                               |
| Product variants (Mbps)        | Uncapped (80:20) Fixed (20:20 or 3:3)      | 1-8 Pairs (Each pair effects the speed)   | 10-10Gb  | 10-1Gb                                    |
| Access Presentation Not router | 100BASET or NTE5/RJ11                      | 10BASET or 100BASET                       | 100Mb: 100BASET or 1Gb: 1000BASE SX(orLX) 1000BASE T May be available on require | 1000Base -T                               |
| Node4 Interconnect resilience  | Not automated - Please design if required  | Not automated - Please design if required | Not automated - Please design if required  | Not automated - Please design if required |
| Service Contention             | Low Guaranteed to the upload               | Low Guaranteed minimum                    | No   | No  |

### 6.2 Core network utilisation

The below defines how each variation of connectivity effects the core network utilisation of the product.

**connectfast:** The Node4 ConnectFast service utilises the Node4 Core Network to connect the Service directly to the public internet. As standard a Single Public IP will be issued.

**connectmpls:** The Node4 ConnectMPLS service utilises the Node4 Core Network to connect the Service to a dedicated L3VPN MPLS. As standard Private IP addresses will be issued. (ConnectMPLS services do not provide access to the internet as standard. Central Internet Breakout services are available)

### 6.3 Customer premise equipment (CPE)

Each Connectivity service provided may require a router, switch or firewall which can be supplied by Node4 or the Customer.

Unless identified on the Order Form it is the Customer's responsibility to supply this. Node4 will

supply configuration details in an email to the Customer named contact on the Order Form prior to the service live date.

If Node4 provides CPE, it will by default be shipped to the site as pre-configured for customer to connect to the Connectivity service. Do not discard the packaging. It is absolutely essential that the box is retained to comply with our return procedures. Node4 can also provide an installation service at a Customers site.

## 6.4 Cabling

Within Node4's Data Centre cabling between the customer's equipment or circuit(s) to Node4's MPLS PE equipment will be provided by Node4. Any applicable costs will be identified on the order form.

Within Node4's POP locations it is the customer's responsibility to cable to our rack. We will provide the customer with the appropriate information for our location. In certain cases we may be able to facilitate the cabling, in this case applicable costs will be identified on the order form.

Where customer's cable to Node4 racks, Fees may occur for site visits to connect this cabling to Node4 Equipment. Applicable costs will be identified on the order form.

## 6.5 IP addressing and routing protocols

Node4 can provide Connectivity Customers with public internet access through ConnectFAST or Central Internet Breakout. All internet usage is subject to the Acceptable Use Policy (AUP)

For ConnectMPLS the customer must provide documentation clearly identifying what IP address and mask will be used on Node4's MPLS PE LAN interfaces.

For L3VPN's we support static routes, BGP and OSPF routing protocols to the customers networks.

The number of public IPv4 addresses assigned will be identified on the Order Form. Additional public IPv4 addresses can be rented from Node4. It is the customer's responsibility to use their assigned IP addresses. Use of non-assigned IP addresses will result in immediate disconnection from the network.

Public IPv6 is also available if required.

## 6.6 Customer support

Node4 provides the service direct to the Customer. The Customer commits to fully manage all their customers and suppliers directly. Node4 will not interface directly with any third parties working with the Customer. If the Customer requires Node4 to provide their customers with a customer care or NOC service this is available on request and subject to Professional Service Fees.

## 6.7 Monitoring

Node4's core infrastructure is monitored and supported on a 24/7 basis. This excludes customer equipment.

As an option Node4 can provide a device monitoring service for customer equipment (N4Monitor). This service, optionally, provides pro-active Incident management by Node4 during the contracted support hours. As standard this service includes monitoring device response time/device availability, interface statistics (utilisation & errors), CPU and Memory usage. In the event the device stops responding, or a monitored threshold is exceeded, Node4 technical support can pro-actively investigate the issue during the contracted support hours.

## 6.8 Broadband enhanced care

Broadband enhanced care can be provided on broadband services. Repairs covered by enhanced care completed within a target of 20 hours. If the enhanced care option is provided it will be identified on the Order Form.

Site access may be required in response to enhanced care faults. If the customer is unable to provide unrestricted site access the fault may be re-graded by BT to Standard Care. Standard Care provides no SLA backed response or fix time.

Where specialist engineers or contractors are required to resolve a fault, such as, but not limited to, underground or overhead wiring engineers, the response will be reasonable endeavours.

Internet security and virus protection is the responsibility of the customer.

All internet usage is subject to the Acceptable Use Policy (AUP)



Firewall and virus protection options are available from Node4 on request.

## 6.9 Maintenance window

Where Node4 plans to perform essential works Node4 will endeavour to perform such works during low traffic periods and will endeavour to give the Customer at least five (5) days prior notice. In the event of an emergency or Service affecting fault such notice may be less than 24 hours.

## 6.10 Professional services

Node4 can provide a full range of Support & Professional Services including but not limited to:

- on-site installation of routers & firewalls
- remote support services including:
  - network, router and firewall management
  - monitoring and reporting
  - Network engineering and Design
  - Project Management
  - pre-configuration of routers and firewalls (this means that the router is pre-configured at Node4 and delivered to the customer site. The customer will have to provide someone on-site to connect the router)

Support on configuration is provided within business hours only and for a period not exceeding 15 working days from installation. Technical support is provided for the configuration implemented by Node4; we will not provide support for configuration outside of the original Customer requirement.

The Professional Services are subject the Professional Service Fees. Specific rates for large or repeat orders can be agreed on a case by case basis in writing.

All incremental expenses incurred during these Professional Services will be passed directly to the Customer. Provisioning costs such as cabling will be discussed and agreed with the Customer in the Order Form.

## 6.11 Changes

Moves, Adds & Changes (MAC) are not provided as part of the standard service. If "Full Management" is included on the Order Form Standard MACs are included (fair use policy applies).

Change requests conducted outside of the support contract, or change request implemented outside normal business hours will be dealt with as chargeable projects and subject to the Support and Professional Services Fees in 4.3.

## 7. Asset management

### 7.1 General

If defined on the Order Form Node4 asset management service captures and updates key information about managed devices into a CMDB portal, assigns a unique asset number from the service tag and provides reporting via a Customer accessible online portal and as part of the existing scheduled service reviews.

### 7.2 Asset entity definition and data

Assets which can be included are assets that can have an agent installed / respond to polling (switch, router, firewall etc) - Data is updated at point the agent is polled or checks in, most recent data is therefore at the point the devices was last seen online. The following online assets can be included

- Router
- DSL modem
- Switch
- Firewall
- Wireless Access Point
- UPS (with ethernet management interface)

For these assets, the following information will be captured

| Asset data fields                |
|----------------------------------|
| Date Purchased                   |
| Vendor Serial #                  |
| Warrantv or Support Subscription |
| Warrantv or Support Expirv       |
| Asset Tag (Physical)             |
| Client Acc #                     |
| Registered User / Stock Location |
| Previous Registered Users        |
| User Profiles Present            |
| Accountable Manager              |
| Last Audited Date                |
| Registered Location of Asset     |
| Installed Operating Svstem       |
| Patch Status                     |
| Last Seen - When                 |
| Last Seen - Where                |

|                            |
|----------------------------|
| Repair History             |
| Parent/Child Relationships |
| MAC Address                |
| Device Name                |

### 7.3 Asset tags

If defined on the Order Form Node4 will provide tamper proof asset management stickers which include a barcode and unique identifier.

A service for applying the tags to devices is available on request at an additional cost.

### 7.4 Reporting

Reports will be included in any existing scheduled service reviews.

A portal is provided with read only access for the Customer with the ability to produce summary reports of the assets being managed. Access to the portal is optionally secured using Single Sign On (SSO) authentication, (SSO service available separately).

### 7.5 Online asset service dependencies

The asset management services are depended upon the use of the tools provided by Node4.

## 8. Incident management

### 8.1 Incident handling

Incidents are handled as outlined in the Incident Management Schedule Document.

### 8.2 Hours of support

The following table details the different Support Hours relating to the support hours defined on the Order Form.

| Support Hours |   |
|---------------|---|
| Bronze        | Standard business hours support 9am to 5.30pm week days, excluding bank and national holidays                       |
| Silver        | Support hours between 7am and 7pm weekdays, excluding bank and national holidays                                    |
| Silver Plus   | Priority 1 and 2 - Support hours between 7am and 7pm 7-days a week, including bank and national holidays, excluding |

|      |   |
|------|---|
|      | Christmas day, Boxing day and new year's day  |
|      | Priority 3,4 and Service Request - Support hours between 7am and 7pm weekdays, excluding bank and national holidays |
| Gold | Priority 1 and 2 - Support hours 24/7   |
|      | Priority 3,4 and Service Request - Support hours between 7am and 7pm weekdays, excluding bank and national holidays |

### 8.3 Incident priority

Each new Incident will be assigned a priority level by the Service Desk based on the following definitions. These levels allow us to prioritise resources and escalate where appropriate.

| Priority            | Description   |
|---------------------|---|
| 1 - Critical        | A major Incident resulting in total loss of service.  |
| 2 - High            | A major Incident resulting in a severe service degradation or loss of service to a significant percentage of users.       |
| 3 - Medium          | A minor Incident resulting in a limited or degraded service or a single end user unable to work.                          |
| 4 - Low             | General, single user with degraded service, non-service affecting support.  |
| 5 - Service Request | Request for a change to an existing service or system, a request for information or simple questionnaire to be completed. |

### 8.4 Incident duration

All Incidents recorded by the network management system will be reconciled against the corresponding Service Ticket raised by the Service Desk.

The exact Incident duration will be calculated as the elapsed time between the Service Ticket being opened and the time when Service is restored.

### 8.5 Time to repair

Node4 aims to respond, update and resolve Incidents in relation to the Connectivity services within the following times:

| Priority                                   | P1*      | P2       | P3   | P4       | Service Request |
|--|----------|----------|--|----------|-----------------|
| Response / Acknowledgment                  | 30 Mins  | 1 Hour   | 2 Hours                                      | 4 Hours  | 12 Hours        |
| Commencement                               | 1 Hour   | 2 Hours  | 4 Hours                                      | N/A      | N/A             |
| Frequency of Updates                       | 1 Hour   | 2 Hours  | 12 hours if Resolve / Target to Fix exceeded |          |                 |
| Resolve / Target to Fix Ethernet           | 5 Hours  | 8 Hours  | 12 Hours                                     | 36 Hours | 60 Hours        |
| Resolve / Target to Fix EFM and EoFTTC     | 7 Hours  | 12 Hours | 24 Hours                                     | 60 Hours | 60 Hours        |
| Resolve / Target to Fix FTTC and Broadband | 24 Hours | 36 Hours | 48 Hours                                     | 60 Hours | 60 Hours        |

Resolution times in the table above do not apply where there is a Customer Responsible Incident, a Third Party Attributable Incidents or events outside Node4's reasonable control, any incidents including these aspects will be excluded from reporting provided.

\*Any P1 Incident relating to FTTC and Broadband will be downgraded to P3 Incident if confirmed as 3rd party circuit issue, frequency of updates will then be every 12 hours if Resolve / Target to Fix exceeded.

All priority 1 & 2 Incidents should be raised via the Service Desk system by a phone call. Should a priority 1 or 2 incident be raised via the portal or e-mail, the Customer is required to follow this up with a corresponding phone call to enable work to commence immediately on the issue.

*Where Incident resolution involves third parties, or hardware replacement, then this is subject to the support contracts in place with those parties.*

## 9. Service Level Agreement

### 9.1 Service credits

Node4 will provide the Customer with Service Credits, as set out below, for the failure to meet the following targets:

### 9.2 Service availability

The Service is "Available" when the customer connection is authenticated and the customer can send and receive IP traffic.

The following equation will be used to calculate Service Availability. References to minutes are to the number of minutes in the applicable Monthly Review Period:

$$\left( \frac{\text{Total minutes} - \text{Total minutes Unavailable}}{\text{Total minutes}} \right) \times 100$$

Credits for outages will be calculated on a monthly basis and will be based upon the cumulative elapsed time of any outages and the monthly Fee for the Service for each Customer Site.

Node4's goal is to achieve the Service availability per month for each Connectivity Service as defined in the table below;

| Service Credits (percentage) of monthly recurring Fees for the Connectivity Service at the relevant (Customer Site) | Total monthly Availability at the relevant Customer Site (Percentage) |                  |
|---|---|------------------|
|   | Ethernet over FTTC  | Broadband        |
|   | Ethernet First Mile<br>Fibre Leased Line                              | Fibre Broadband  |
| 0%  | 99.90% and above  | 99.50% and above |
| 5%  | <99.90% – 99.5%   | <99.5% - 99.0%   |
| 10%   | <99.5% - 99.0%  | <99.0% - 98.5%   |
| 20%   | <99.0%  | < 98.5%          |

### 9.3 Calculation of services credits

Where a Monthly Review Period incorporates part of a month, any Service credit will apply to a pro-rated Monthly Fee.



Service credits will be calculated monthly, aggregated and credited to the Customer on a quarterly basis.

If a Service is cancelled during a Monthly Review Period, no Service credit will be payable in respect of that Circuit for that Monthly Review Period.

The Customer must claim any Service credit due to a failure to meet the Service levels, in writing, within twenty one (21) business days of the date at which the Customer could reasonably be expected to become aware of such failure. The Customer shall not be entitled to any Service credits in respect of a claim unless and until Node4 has received notice of the claim in writing in accordance with the above. Should Node4 require additional information from the Customer, the Customer shall assist, and shall not be entitled to any Service credits until Node4 has received all the information it has reasonably requested.

#### **9.4 Exclusions of payment of service credits**

Service credits will not be payable by Node4 to the Customer in relation to the Service Availability for Incidents or disruptions to the Service caused by any of the following:

- The Incident, action or negligence of the Customer, its employees, agents or contractors;
- The Customer failing to comply with Node4's Standard Terms and Conditions;
- An Incident, or any other problem associated with, equipment connected on the Customer's side of the Node4 Network Termination Point, except where such Incident or problem is directly caused by the action or negligence of Node4, its employees, agents or contractors;
- Any event described in Clause 10 (Force Majeure) of Node4's Standard Terms and Conditions;
- A failure by the Customer to give Node4 access to any equipment after being requested to do so by Node4; or
- Maintenance during any Planned Outage
- Where the customer is unable to provide 24 hour site access
- Broadband, FTTC and EoFTTC Incidents relating to the WLR line.
- Environment being outside of manufacturers operating guidelines for the equipment

Service credits are not applicable for more than one breach of any targets outlined in this document arising from the same occurrence.

The provision of Service credits shall be the sole and exclusive remedy for the failure to meet targets for the Connectivity service. Node4 shall have no additional liability to the Customer.

## Appendix A

### 1. Core network statistics

#### Class of service

##### Transit delay

Transit Delay is a monthly measure of Node4's network-wide delay, which is the average interval of time it takes during the applicable calendar month for test packets of data to travel between all selected test pairs of Node4's MPLS PE Routers. Specifically, the time it takes test packets to travel from one MPLS PE router to another within our core network. Latency for the month is the average of all of these measurements.

##### Delivery ratio

The "Delivery Ratio Percentage" for the core network is the average Data Delivery percentage for that month for all selected test pairs of Node4's MPLS PE routers calculated by dividing Data Received by Data Delivered and multiplying by 100. "Data Delivered" is the number of test packets of data delivered in a month by Node4 to from one MPLS PE router to another. "Data Received" is the number of such test packets of data that are actually received by the MPLS PE router. "Node4 MPLS PE routers" are the core MPLS routing nodes in the Node4's network consisting of Juniper MX series Ethernet routers.

##### Jitter

"MPLS Jitter" is a monthly measure of the Node4 Network-wide IP packet delay variation within our core network, which is the average difference in the interval of time it takes during the applicable calendar month for selected pairs of test packets of data in data streams to travel between selected pairs of MPLS PE routers. Specifically, the difference in time it takes a selected pair of test packets in a data stream to travel from one MPLS PE router in a pair to another is measured for all selected pairs of MPLS PE routers over the month. One of the test packets in the selected pair will always be a packet in the data stream that takes the least time to travel from one Node4 MPLS PE router in the pair to another. MPLS Jitter for the month is the average of all of

these measurements. "Node4 MPLS PE routers" are the core MPLS routing nodes in the Node4's Network consisting of Juniper MX series Ethernet routers.

The following table shows the target performance for ConnectMPLS and POP Interconnect Services:

| Description    | BE    | AF-HDP | AF-LDP | EF             |
|----------------|-------|--------|--------|----------------|
| Transit Delay  | 40ms  | 30ms   | 20ms   | 10ms           |
| Delivery Ratio | 99.9% | 99.99% | 99.99% | 99.99%         |
| Jitter         | n/a   | n/a    | n/a    | 8ms<br>(1-way) |

### 2. MPLS Options

#### Class of Service

Four Customer class of service categories are supported throughout Node4's core MPLS network. These being:

##### Best effort (BE)

This class is the default class, all traffic not prioritized in the other queues will be serviced in this class. Typical traffic for this queue is web browsing, e-mail and FTP.

##### Assured forwarding – High drop precedence (AF-HDP)

This class is the second class for data applications, e.g. ERP, database applications. Generally used for business critical applications, it provides guarantees of bandwidth. AF HDP traffic is prioritised above BE traffic. If/when congestion occurs BE traffic will be dropped in preference of AF traffic.

##### Assured forwarding – Low Ddrop precedence (AF-LDP)

This class is the highest class for data applications, e.g. ERP, financial transactions. Generally used for business critical applications, it provides guarantees of bandwidth. AF-LDP traffic is prioritised above AF HDP traffic. If/when congestion occurs BE then AF-

HDP traffic will be dropped in preference of AF-LDP traffic.

### Expedited forwarding

This class is configured as a Priority Queue reserved for latency-sensitive applications only. The Priority Queue is guaranteed bandwidth based on the customer's bandwidth allocation. The priority command implements a maximum bandwidth guarantee. The priority queue is reserved only for Voice over IP (VoIP) or Video over IP traffic

Access circuits (Ethernet/DSL) may only support two or three classes of service – dependant on the service type.

### 3. Class of service options

ConnectMPLS L3VPN services being utilised for standard data services only will be assigned to the BE class of service. When used for site-to-site or multisite deployments by default will assigned to the BE class of service – the customer can request class of service be enabled.

The following profile options are application to ConnectMPLS:

| Profile | MPLS QoS Class | Bandwidth |
|---------|----------------|-----------|
| 1       | BE / Default   | 50%       |
|         | AF             | 50%       |
| 2       | BE / Default   | 50%       |
|         | EF             | 50%       |
| 3       | AF             | 100%      |
| 4       | AF             | 50%       |
|         | EF             | 50%       |
| 5       | EF             | 100%      |

POPI L2VPN services (Ethernet CCC or VLAN CCC) will be assigned to the AF LDP class of service.

### 4. Class mappings

For ConnectMPLS, customers must pre-classify traffic using a DSCP value. We will honour these markings and associated the traffic to the appropriate queue.

The following table shows the standard DSCP to class mapping used within Node4's MPLS Network:

| DSCP  | MPLS QoS Class | Application Use   |
|-------|----------------|---|
| 0     | BE / Default   | Delay-tolerant Application – Email, Internet, FTP                   |
| 10,18 | AF-HDP         | Mission Critical Application  |
| 26,34 | AF-LDP         | Mission Critical, Delay Sensitive Application, Real-time Multimedia |
| 46    | EF             | VoIP, Unified Communications  |
| 48    | NC             | Routing Protocols   |

### 5. Quality of service

QoS is provided end-to-end by using consistent DSCP and IP Prec values throughout the wide area and local area networks. We monitor network capacity to ensure that QoS is maintained.

The following table shows the QoS functions available for ConnectMPLS Services:

| Function               | Description                                    |
|------------------------|--|
| Traffic Classification | DSCP, IP PRec – L3VPN                          |
|                        | Interface or VLAN – L2 or L3VPN                |
| Traffic Marking        | DSCP   |
|                        | MPLS Experimental (EXP)                        |
| Congestion Management  | Low Latency Queuing – L3VPN                    |
|                        | Class-based weighted Queuing – L3VPN           |
| Congestion Avoidance   | Weighted Random Early Detection (WRED) – L3VPN |
| Traffic Conditioning   | Shaping and Policing                           |