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# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

MPLS & VPLS



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## **Scenario**

Islington College operates a multi-block campus network consisting of 9 academic and administrative blocks. The college owns a public IPv4 address range (160.30.132.0/24), which must be used for router loopback interfaces within an MPLS backbone.

We are required to design, implement, and verify an MPLS-based core network using MikroTik routers in GNS3, providing VPLS-based Layer-2 connectivity across all blocks while using a centralized DHCP server.

The LONDON\_BLOCK is the main block, connected to the Internet (ISP), and all other blocks connect to it directly and via additional mesh links for redundancy and load balancing.

## **Network Architecture and IP Addressing Plan:**

### **Core Design**

- All block routers act as MPLS core routers
- OSPF is the IGP across all routers
- MPLS with LDP must be enabled on all core and mesh links
- ECMP / Load balancing must be implemented
- VPLS must be used to extend VLANs across all blocks
- No DHCP service should run on any router

Use the following explicit IP addressing scheme. All loopback addresses are from the public IPv4 range 160.30.132.0/24 (160.30.132.0 to 160.30.132.255). Do not use any other IPs for loopbacks or links.

### **Block Routers and Loopback IPs**

- LONDON\_BLOCK (main block, connected to ISP): Loopback IP 160.30.132.1/32
- UK\_BLOCK: Loopback IP 160.30.132.11/32
- NEPAL\_BLOCK: Loopback IP 160.30.132.12/32

- HIMAL\_BLOCK: Loopback IP 160.30.132.13/32
- BRIT\_BLOCK: Loopback IP 160.30.132.14/32
- SKILL\_BLOCK: Loopback IP 160.30.132.15/32
- ALUMNI\_BLOCK: Loopback IP 160.30.132.16/32
- KUMARI\_BLOCK: Loopback IP 160.30.132.17/32

**Point-to-Point Links from LONDON\_BLOCK (Private IPs, /30 subnets):**

- LONDON\_BLOCK to UK\_BLOCK: 10.0.0.0/30 (LONDON\_BLOCK: 10.0.0.1, UK\_BLOCK: 10.0.0.2)
- LONDON\_BLOCK to NEPAL\_BLOCK: 10.0.0.4/30 (LONDON\_BLOCK: 10.0.0.5, NEPAL\_BLOCK: 10.0.0.6)
- LONDON\_BLOCK to HIMAL\_BLOCK: 10.0.0.8/30 (LONDON\_BLOCK: 10.0.0.9, HIMAL\_BLOCK: 10.0.0.10)
- LONDON\_BLOCK to BRIT\_BLOCK: 10.0.0.12/30 (LONDON\_BLOCK: 10.0.0.13, BRIT\_BLOCK: 10.0.0.14)
- LONDON\_BLOCK to SKILL\_BLOCK: 10.0.0.16/30 (LONDON\_BLOCK: 10.0.0.17, SKILL\_BLOCK: 10.0.0.18)
- LONDON\_BLOCK to KUMARI\_BLOCK: 10.0.0.20/30 (LONDON\_BLOCK: 10.0.0.21, KUMARI\_BLOCK: 10.0.0.22)
- LONDON\_BLOCK to ALUMNI\_BLOCK: 10.0.0.24/30 (LONDON\_BLOCK: 10.0.0.25, ALUMNI\_BLOCK: 10.0.0.26)

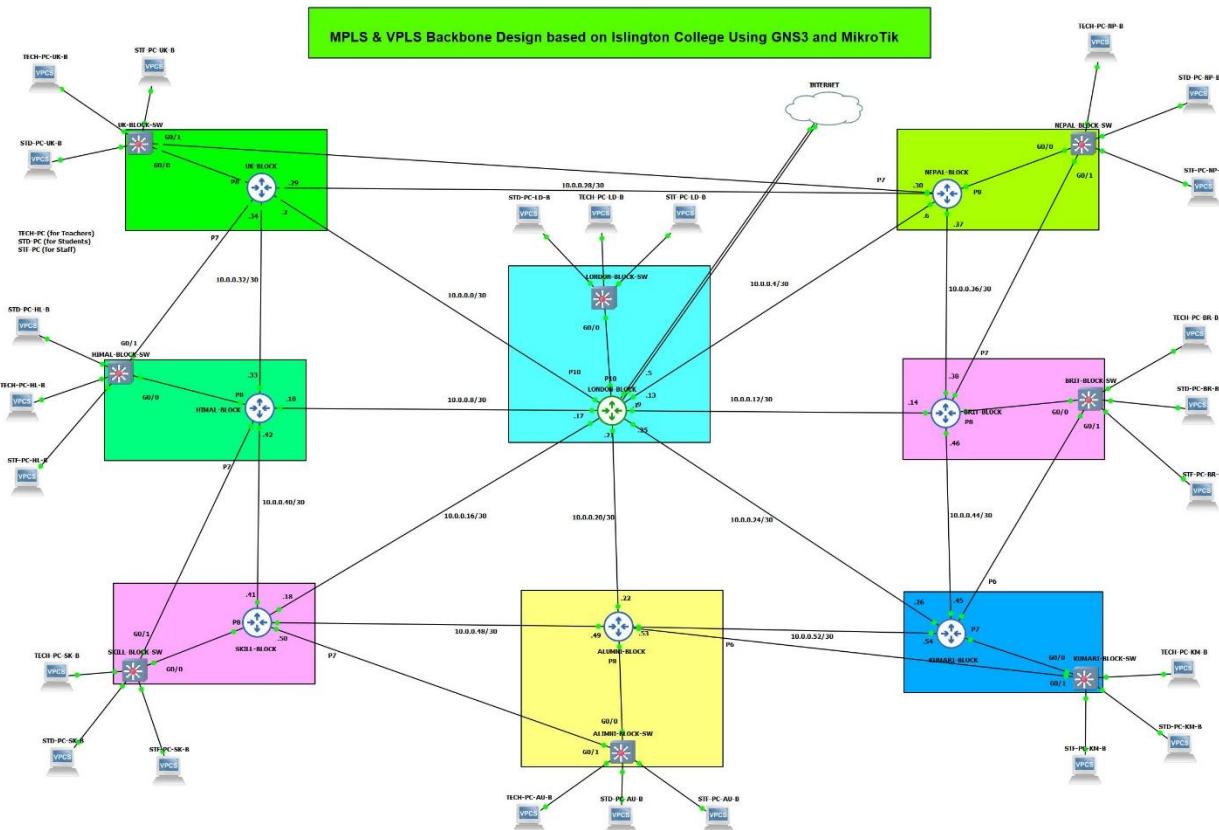
**Mesh Connections (Router-to-Router Private IPs, /30 subnets for redundancy):**

- UK\_BLOCK to NEPAL\_BLOCK: 10.0.0.28/30 (UK\_BLOCK: 10.0.0.29, NEPAL\_BLOCK: 10.0.0.30)
- UK\_BLOCK to HIMAL\_BLOCK: 10.0.0.32/30 (UK\_BLOCK: 10.0.0.34, HIMAL\_BLOCK: 10.0.0.33)
- NEPAL\_BLOCK to BRIT\_BLOCK: 10.0.0.36/30 (NEPAL\_BLOCK: 10.0.0.37, BRIT\_BLOCK: 10.0.0.38)
- HIMAL\_BLOCK to SKILL\_BLOCK: 10.0.0.40/30 (HIMAL\_BLOCK: 10.0.0.42, SKILL\_BLOCK: 10.0.0.41)

- BRIT\_BLOCK to KUMARI\_BLOCK: 10.0.0.44/30 (BRIT\_BLOCK: 10.0.0.46, KUMARI\_BLOCK: 10.0.0.45)
  - SKILL\_BLOCK to ALUMNI\_BLOCK: 10.0.0.48/30 (SKILL\_BLOCK: 10.0.0.50, ALUMNI\_BLOCK: 10.0.0.49)
  - ALUMNI\_BLOCK to KUMARI\_BLOCK: 10.0.0.52/30 (ALUMNI\_BLOCK: 10.0.0.53, KUMARI\_BLOCK: 10.0.0.54)

## **VLANs and End-Device Subnets (Provided by Centralized DHCP):**

- VLAN 100 (STUDENT): 172.16.0.0/19 (capacity for 5,000 student IPs)
  - VLAN 200 (TEACHER): 172.16.32.0/22 (capacity for 1,000 teacher IPs)
  - VLAN 300 (STAFF): 172.16.40.0/21 (capacity for 2,000 staff IPs)



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# 1. Set Identity, Loopback Address and RoMON to all Routers

## 1.1. LONDON-BLOCK

### CMD

```
/system identity set name=LONDON-BLOCK

/interface bridge add name=loopback comment="LONDON-BLOCK_160.30.132.1_LOOPBACK"

/ip address add address=160.30.132.1/32 interface=loopback comment="LONDON-BLOCK_160.30.132.1_LOOPBACK"

/tool/romon/set enabled=yes
```

```
[admin@mikrotik] > /system identity set name=LONDON-BLOCK
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /interface bridge add name=loopback comment="LONDON-BLOCK_160.30.1132.1_LOOPBACK"
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /ip address add address=160.30.132.1/32 interface=loopback comment="LONDON-BLOCK_160.30.132.1_LOOPBACK"
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /tool/romon/set enabled=yes
```

Figure 1: Set Identity, Loopback Address and RoMoN of LONDON\_BLOCK Router Through CMD

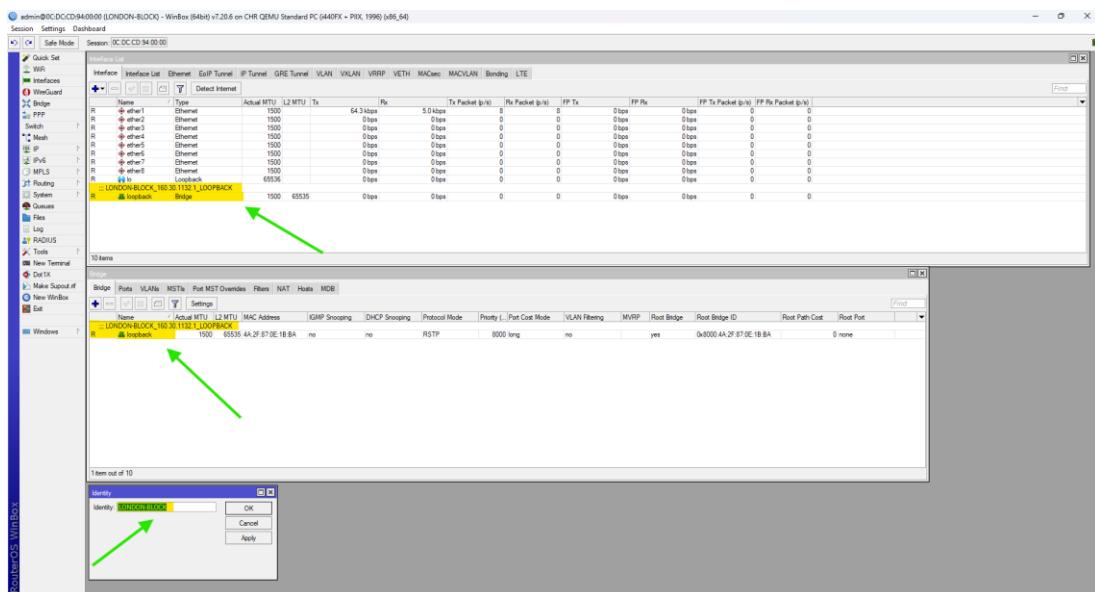


Figure 2: Set Identity, Loopback Address and RoMoN of LONDON\_BLOCK Router Through WINBOX

## 1.2. UK-BLOCK

### CMD

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```
/system identity set name= UK-BLOCK

/interface bridge add name=loopback comment=" UK-BLOCK_160.30.132.11_LOOPBACK"

/ip address add address=160.30.132.11/32 interface=loopback comment=" UK-BLOCK_160.30.132.11_LOOPBACK"

/tool/romon/set enabled=yes
```

```
[admin@MikroTik] > /system identity set name= UK-BLOCK
[admin@UK-BLOCK] >
[admin@UK-BLOCK] > /interface bridge add name=loopback comment=" UK-BLOCK_160.30.132.11_LOOPBACK"
[admin@UK-BLOCK] >
[admin@UK-BLOCK] > /ip address add address=160.30.132.11/32 interface=loopback comment=" UK-BLOCK_160.30.132.11_LOOPBACK"
[admin@UK-BLOCK] >
[admin@UK-BLOCK] > /tool/romon/set enabled=yes
[admin@UK-BLOCK] >
```

Figure 3: Set Identity, Loopback Address and RoMoN of UK-BLOCK Router Through CMD

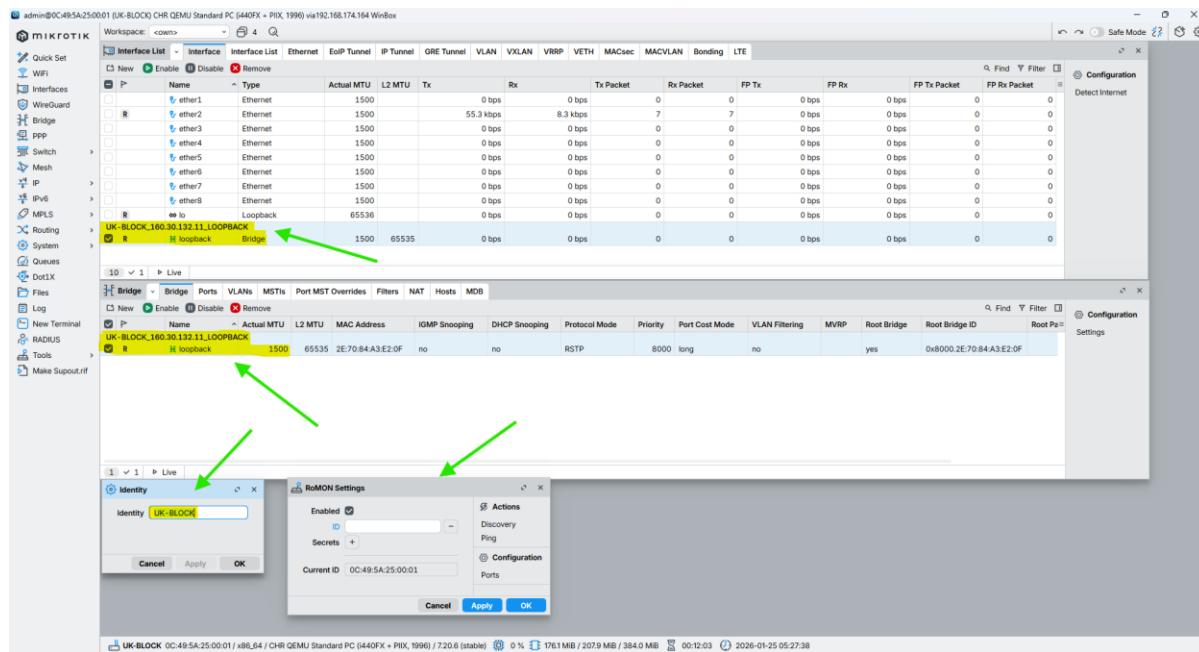


Figure 4: Set Identity, Loopback Address and RoMoN of UK-BLOCK Router Through WINBOX

### 1.3. NEPAL-BLOCK

#### CMD

```
/system identity set name=NEPAL-BLOCK

/interface bridge add name=loopback comment="NEPAL-BLOCK_160.30.132.12_LOOPBACK"
```

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```
/ip address add address=160.30.132.12/32 interface=loopback comment="NEPAL-BLOCK_160.30.132.12_LOOPBACK"

/tool/romon/set enabled=yes
```

```
[admin@mikroTik] >
[admin@mikroTik] > /system/identity/set name=NEPAL-BLOCK
[admin@NEPAL-BLOCK] >
[admin@NEPAL-BLOCK] > /interface/bridge/add name=loopback comment="NEPAL-BLOCK_160.30.132.12_LOOPBACK"
[admin@NEPAL-BLOCK] >
[admin@NEPAL-BLOCK] > /ip address/add address=160.30.132.12/32 interface=lo
[admin@NEPAL-BLOCK] > /ip address/add address=160.30.132.12/32 interface=loopback comment="NEPAL-BLOCK_160.30.132.12_LOOPBACK"
[admin@NEPAL-BLOCK] >
[admin@NEPAL-BLOCK] > /tool/romon/set enabled=yes
[admin@NEPAL-BLOCK] >
```

Figure 5: Set Identity, Loopback Address and RoMoN of NEPAL-BLOCK Router Through CMD

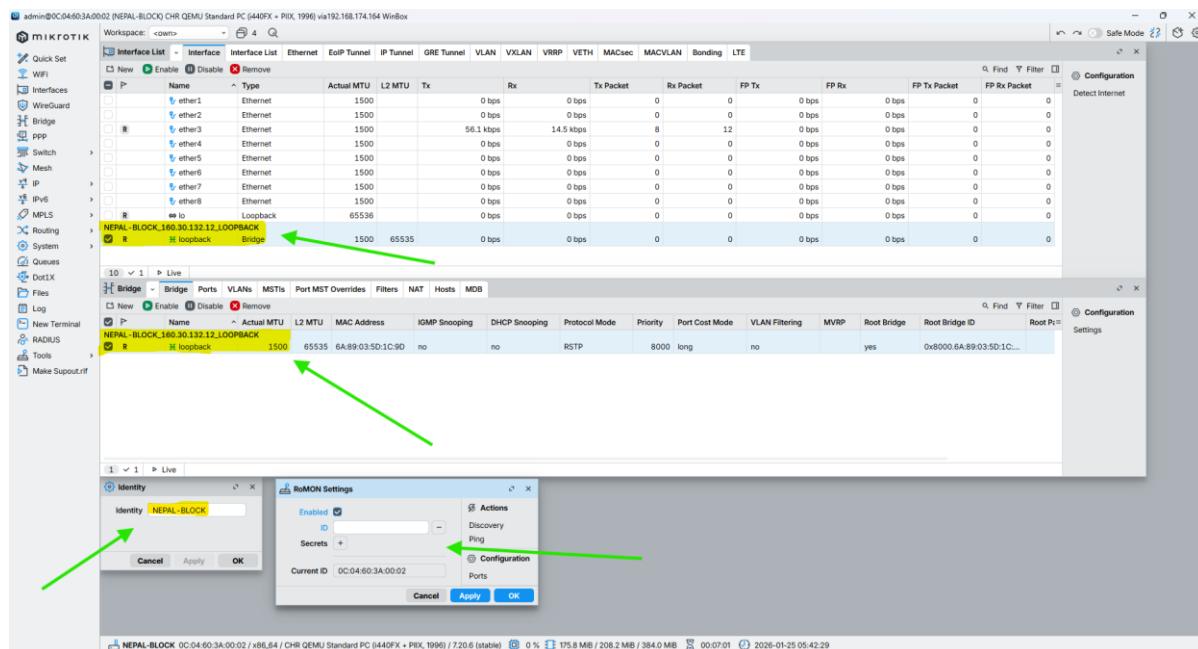


Figure 6: Set Identity, Loopback Address and RoMoN of NEPAL-BLOCK Router Through WINBOX

## 1.4. HIMAL-BLOCK

### CMD

```
/system identity set name=HIMAL-BLOCK

/interface bridge add name=loopback comment="HIMAL-BLOCK_160.30.132.13_LOOPBACK"

/ip address add address=160.30.132.13/32 interface=loopback comment="HIMAL-BLOCK_160.30.132.13_LOOPBACK"

/tool/romon/set enabled=yes
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@mikroTik] >
[admin@mikroTik] > /system/identity/set name=HIMAL-BLOCK
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /interface/bridge/add name=loopback comment="HIMAL-BLOCK_160.30.132.13_LOOPBACK"
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > ip address/add address=160.30.132.13 interface=lo
[admin@HIMAL-BLOCK] > ip address/add address=160.30.132.13 interface=loopback comment="HIMAL-BLOCK_160.30.132.13_LOOPBACK"
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /t
task tool
[admin@HIMAL-BLOCK] > /tool/romon/set enabled=yes
[admin@HIMAL-BLOCK] >
```

Figure 7: Set Identity, Loopback Address and RoMoN of NEPAL-BLOCK Router Through CMD

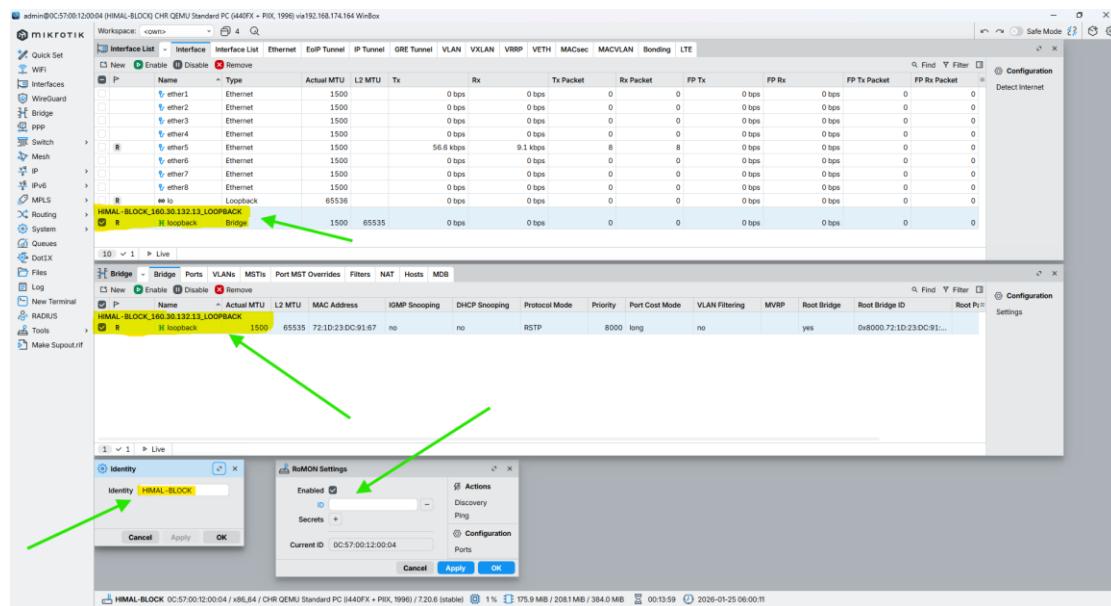


Figure 8: Set Identity, Loopback Address and RoMoN of NEPAL-BLOCK Router Through WINBOX

## 1.5. BRIT-BLOCK

### CMD

```
/system identity set name=BRIT-BLOCK

/interface bridge add name=loopback comment="BRIT-BLOCK_160.30.132.14_LOOPBACK"

/ip address add address=160.30.132.14/32 interface=loopback comment="BRIT-BLOCK_160.30.132.14_LOOPBACK"

/tool/romon/set enabled=yes
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@MikroTik] > system/identity/set name=BRIT-BLOCK
[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > interface/bridge/add name=loopback comment="BRIT-BLOCK_160.30.132.14_LOOPBACK"
[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > ip address/ add interface=loopback address=160.30.132.14 comment="BRIT-BLOCK_160.30.132.14_LOOPBACK"
[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > /tool/romon/set enabled=yes
[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > 
```

Figure 9: Set Identity, Loopback Address and RoMoN of BRIT-BLOCK Router Through CMD

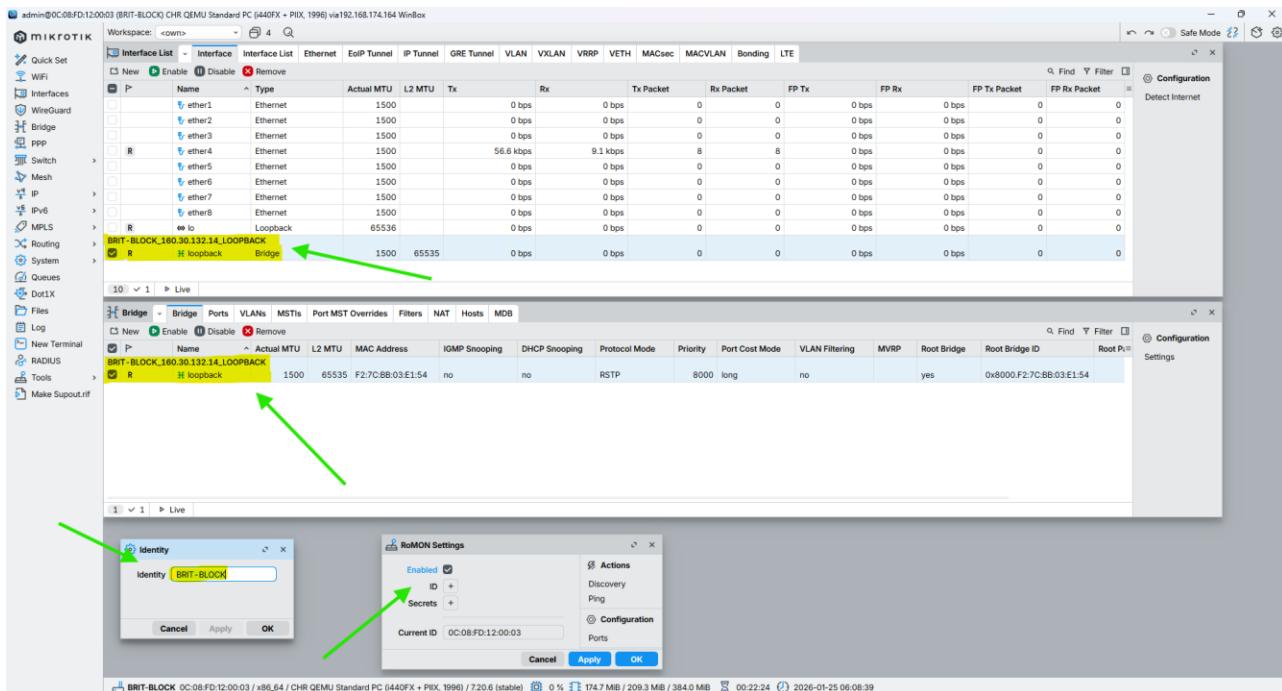


Figure 10: Set Identity, Loopback Address and RoMoN of BRIT-BLOCK Router Through WINBOX

## 1.6. SKILL-BLOCK

### CMD

```
/system identity set name=SKILL-BLOCK

/interface bridge add name=loopback comment="SKILL-BLOCK_160.30.132.15_LOOPBACK"

/ip address add address=160.30.132.15/32 interface=loopback comment="SKILL-BLOCK_160.30.132.15_LOOPBACK"

/tool/romon/set enabled=yes
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@mikroTik] >
[admin@mikroTik] > /system identity set name=SKILL-BLOCK
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /interface bridge add name=loopback comment="SKILL-BLOCK_160.30.132.15_LOOPBACK"
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /ip address add address=160.30.132.15/32 interface=loopback comment="SKILL-BLOCK_160.30.132.15_LOOPBACK"
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /tool/romon/set enabled=yes
[admin@SKILL-BLOCK] >
```

Figure 11: Set Identity, Loopback Address and RoMoN of SKILL-BLOCK Router Through CMD

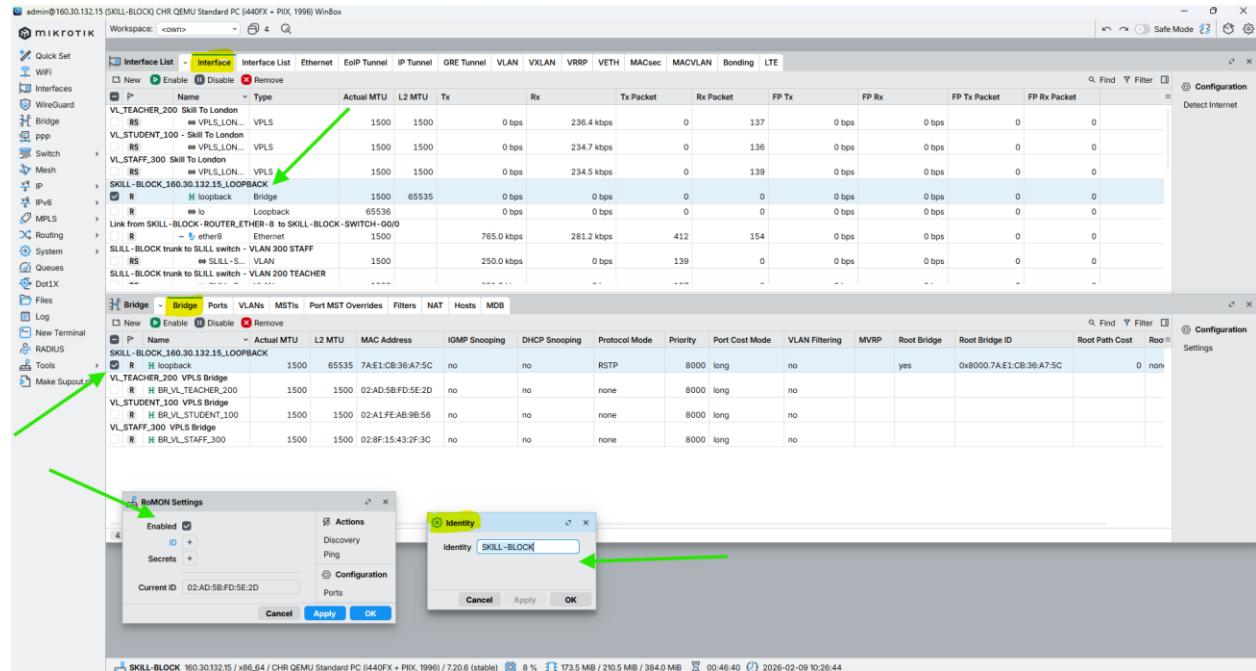


Figure 12: Set Identity, Loopback Address and RoMoN of SKILL-BLOCK Router Through WINBOX

## 1.7. ALUMNI-BLOCK

### CMD

```
/system identity set name=ALUMNI-BLOCK

/interface bridge add name=loopback comment="ALUMNI-BLOCK_160.30.132.16_LOOPBACK"

/ip address add address=160.30.132.16/32 interface=loopback comment="ALUMNI-BLOCK_160.30.132.16_LOOPBACK"

/tool/romon/set enabled=yes
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@nikroTik] >
[admin@nikroTik] > /system identity set name=ALUMNI-BLOCK
[admin@ALUMNI-BLOCK] >
[admin@ALUMNI-BLOCK] > /interface bridge add name=loopback comment="ALUMNI-BLOCK_160.30.132.16_LOOPBACK"
[admin@ALUMNI-BLOCK] >
[admin@ALUMNI-BLOCK] > /ip address add address=160.30.132.16/32 interface=loopback comment="ALUMNI-BLOCK_160.30.132.16_LOOPBACK"
[admin@ALUMNI-BLOCK] >
[admin@ALUMNI-BLOCK] > /tool/romon/set enabled=yes
[admin@ALUMNI-BLOCK] >
```

Figure 13: Set Identity, Loopback Address and RoMoN of ALUMNI-BLOCK Router Through CMD

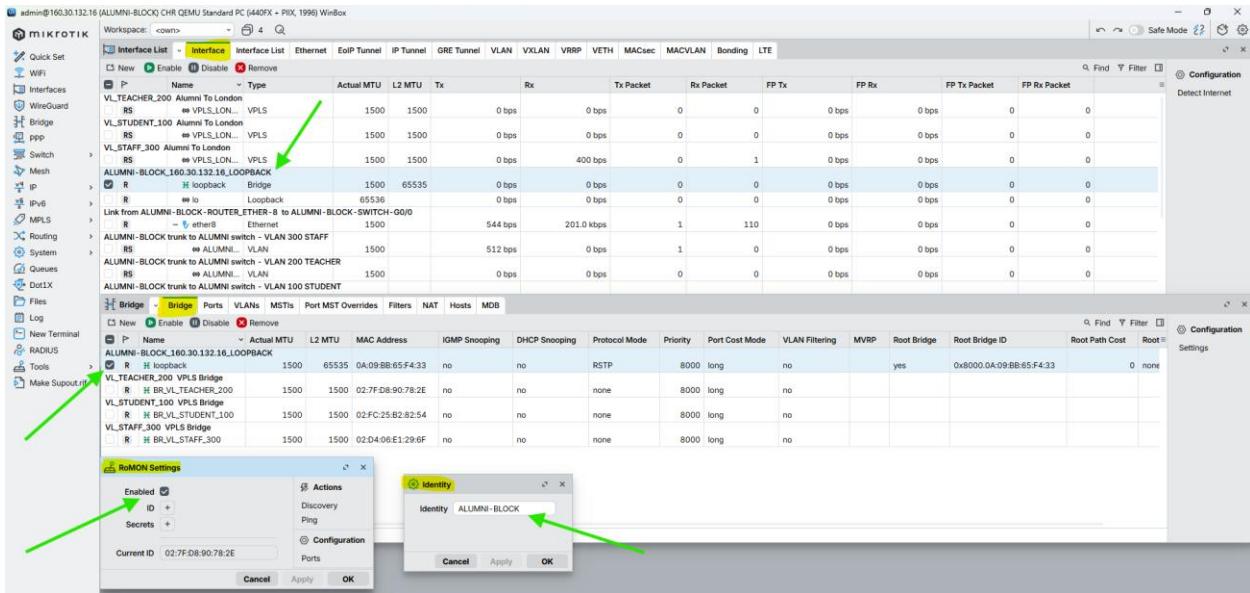


Figure 14: Set Identity, Loopback Address and RoMoN of ALUMNI-BLOCK Router Through WINBOX

## 1.8. KUMARI-BLOCK

CMD

```
/system identity set name=KUMARI-BLOCK  
  
/interface bridge add name=loopback comment="KUMARI-BLOCK_160.30.132.17_LOOPBACK"  
  
/ip address add address=160.30.132.17/32 interface=loopback comment="KUMARI-BLOCK_160.30.132.17_LOOPBACK"  
  
/tool/romon/set enabled=yes
```

```
[admin@nikroTik] >
[admin@nikroTik] > /system identity set name=KUMARI-BLOCK
[admin@KUMARI-BLOCK] >
[admin@KUMARI-BLOCK] > /interface bridge add name=loopback comment="KUMARI-BLOCK_160.30.132.17_LOOPBACK"
[admin@KUMARI-BLOCK] >
[admin@KUMARI-BLOCK] > /ip address add address=160.30.132.17/32 interface=loopback comment="KUMARI-BLOCK_160.30.132.17_LOOPBACK"
[admin@KUMARI-BLOCK] >
[admin@KUMARI-BLOCK] > /tool/romon/set enabled=yes
[admin@KUMARI-BLOCK] >
```

**Figure 15: Set Identity, Loopback Address and RoMoN of KUMARI-BLOCK Router Through CMD**

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

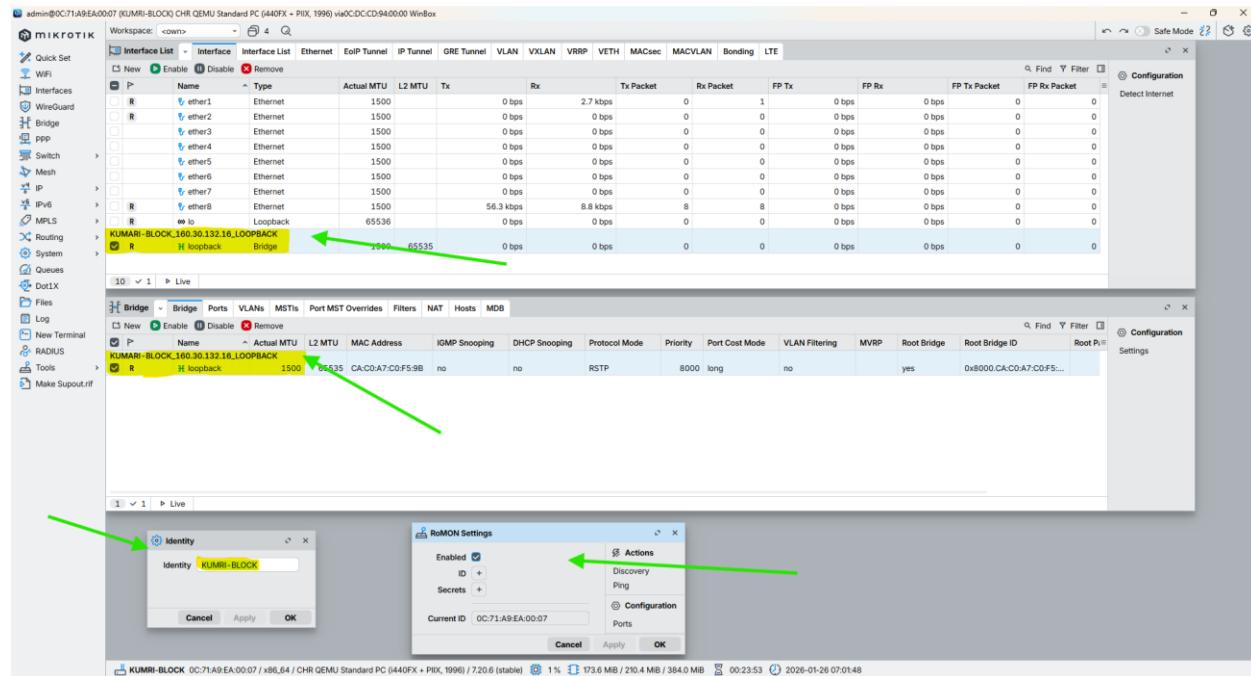


Figure 16: Set Identity, Loopback Address and RoMoN of KUMARI-BLOCK Router Through WINBOX

## 2. Set Interface description, Enable Loop Protection & Disable Unused ports on all router

### 2.1. LONDON-BLOCK

CMD

```
/interface ethernet set ether2 loop-protect=on comment="Link from LONDON-BLOCK (10.0.0.1/30) to UK-BLOCK (10.0.0.2/30)"
/interface/ethernet set ether3 loop-protect=on comment="Link from LONDON-BLOCK (10.0.0.5/30) to NEPAL-BLOCK (10.0.0.6/30)"
/interface ethernet set ether4 loop-protect=on comment="Link from LONDON-BLOCK (10.0.0.9/30) to HIMAL-BLOCK (10.0.0.10/30)"
/interface ethernet set ether5 loop-protect=on comment="Link from LONDON-BLOCK (10.0.0.13/30) to BRIT-BLOCK (10.0.0.14/30)"
/interface ethernet set ether6 loop-protect=on comment="Link from LONDON-BLOCK (10.0.0.17/30) to SKILL-BLOCK (10.0.0.18/30)"
/interface ethernet set ether7 loop-protect=on comment="Link from LONDON-BLOCK (10.0.0.21/30) to ALUMNI-BLOCK (10.0.0.22/30)"
/interface ethernet set ether8 loop-protect=on comment="Link from LONDON-BLOCK (10.0.0.25/30) to KUMARI-BLOCK (10.0.0.26/30)"
/interface ethernet set ether9 loop-protect=on comment="LAN / Management link from LONDON-BLOCK to Local Network (192.168.174.0/24)"
```

```
[admin@LONDON-BLOCK] > /interface ethernet set ether2 loop-protect=on comment="Link from LONDON-BLOCK (10.0.0.1/30) to UK-BLOCK (10.0.0.2/30)"
[admin@LONDON-BLOCK] > /interface/ethernet set ether3 loop-protect=on comment="Link from LONDON-BLOCK (10.0.0.5/30) to NEPAL-BLOCK (10.0.0.6/30)"
[admin@LONDON-BLOCK] > /interface ethernet set ether4 loop-protect=on comment="Link from LONDON-BLOCK (10.0.0.9/30) to HIMAL-BLOCK (10.0.0.10/30)"
[admin@LONDON-BLOCK] > /interface ethernet set ether5 loop-protect=on comment="Link from LONDON-BLOCK (10.0.0.13/30) to BRIT-BLOCK (10.0.0.14/30)"
[admin@LONDON-BLOCK] > /interface ethernet set ether6 loop-protect=on comment="Link from LONDON-BLOCK (10.0.0.17/30) to SKILL-BLOCK (10.0.0.18/30)"
[admin@LONDON-BLOCK] > /interface ethernet set ether7 loop-protect=on comment="Link from LONDON-BLOCK (10.0.0.21/30) to ALUMNI-BLOCK (10.0.0.22/30)"
[admin@LONDON-BLOCK] > /interface ethernet set ether8 loop-protect=on comment="Link from LONDON-BLOCK (10.0.0.25/30) to KUMARI-BLOCK (10.0.0.26/30)"
[admin@LONDON-BLOCK] > /interface ethernet set ether9 loop-protect=on comment="LAN / Management link from LONDON-BLOCK to Local Network (192.168.174.0/24)"
[admin@LONDON-BLOCK] >
```

Figure 17: Set Interface Description, Enable Loop Protection & Disable Unused ports on LONDON-BLOCK Router Through CMD

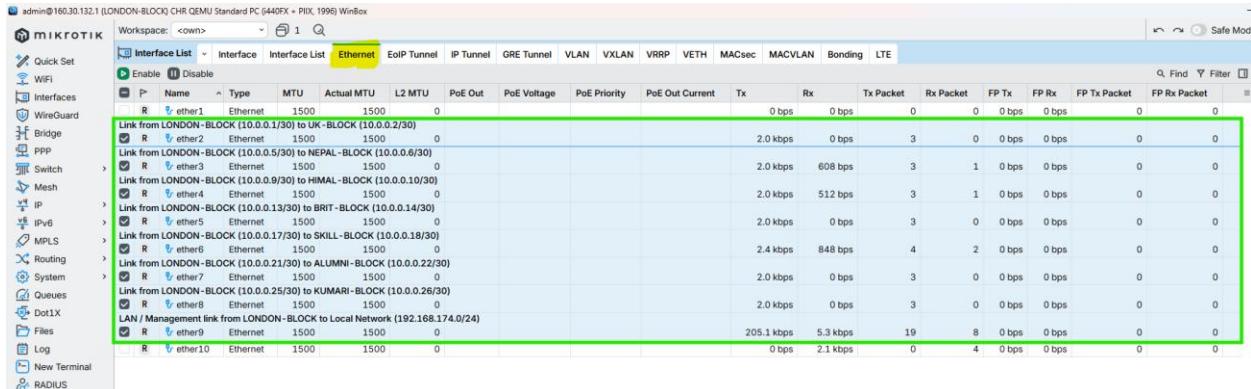


Figure 18: Set Interface Description, Enable Loop Protection & Disable Unused ports on LONDON-BLOCK Router Through WINBOX

## 2.2. UK-BLOCK

### CMD

```
/interface ethernet set ether2 comment="Link from UK-BLOCK (10.0.0.2/30) to LONDON-BLOCK (10.0.0.1/30)"
/interface ethernet set ether1 comment="Link from UK-BLOCK (10.0.0.29/30) to NEPAL-BLOCK (10.0.0.30/30)"
/interface ethernet set ether3 comment="Link from UK-BLOCK (10.0.0.34/30) to HIMAL-BLOCK (10.0.0.33/30)"
/interface ethernet set ether7 loop-protect=on comment="Link from UK-BLOCK-ROUTER_ETHER-7 to HIMAL-BLOCK-SWITCH-GO/1"
/interface ethernet set ether8 loop-protect=on comment="Link from UK-BLOCK-ROUTER_ETHER-8 to UK-BLOCK-SWITCH-GO/0"
interface/ethernet/set ether4 loop-protect=on disabled=yes
interface/ethernet/set ether5 loop-protect=on disabled=yes
interface/ethernet/set ether6 loop-protect=on disabled=yes
```

```
[admin@UK-BLOCK] >
[admin@UK-BLOCK] > /interface ethernet set ether2 comment="Link from UK-BLOCK (10.0.0.2/30) to LONDON-BLOCK (10.0.0.1/30)"
[admin@UK-BLOCK] > /interface ethernet set ether1 comment="Link from UK-BLOCK (10.0.0.29/30) to NEPAL-BLOCK (10.0.0.30/30)"
[admin@UK-BLOCK] > /interface ethernet set ether3 comment="Link from UK-BLOCK (10.0.0.34/30) to HIMAL-BLOCK (10.0.0.33/30)"
[admin@UK-BLOCK] >
```

Figure 19: Set Interface Description, Enable Loop Protection & Disable Unused ports on UK-BLOCK Router Through CMD

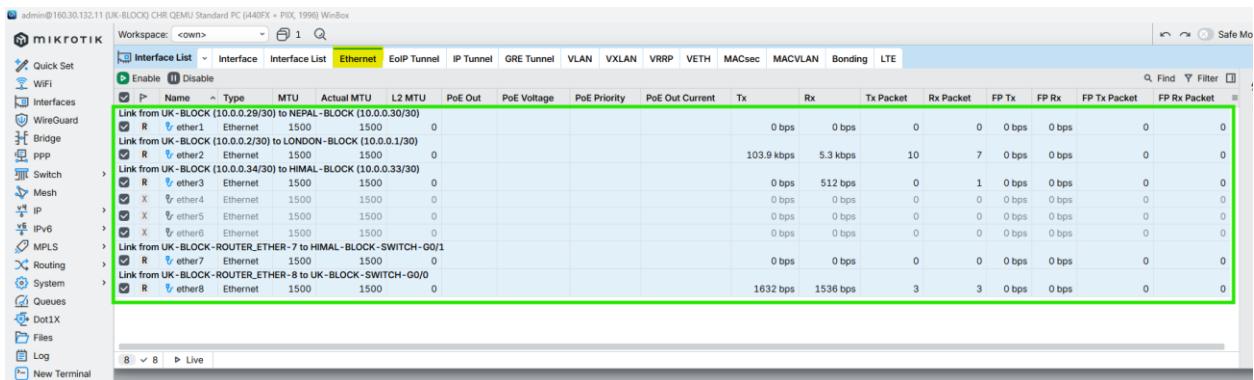


Figure 20: Set Interface Description, Enable Loop Protection & Disable Unused ports on UK-BLOCK Router Through WINBOX

## 2.3. NEPAL-BLOCK

### CMD

```
/interface ethernet set ether3 loop-protect=on comment="Link from NEPAL-BLOCK (10.0.0.6/30) to LONDON-BLOCK (10.0.0.5/30)"
/interface ethernet set ether1 loop-protect=on comment="Link from NEPAL-BLOCK (10.0.0.30/30) to UK-BLOCK (10.0.0.29/30)"
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
/interface ethernet set ether2 loop-protect=on comment="Link from NEPAL-BLOCK (10.0.0.37/30) to BRIT-BLOCK (10.0.0.38/30)"
/interface ethernet set ether8 loop-protect=on comment="Link from NEPAL-BLOCK-ROUTER_ETHER-8 to NEPAL-BLOCK-SWITCH-G0/0"
/interface ethernet set ether7 loop-protect=on comment="Link from NEPAL-BLOCK-ROUTER_ETHER-7 to UK-BLOCK-SWITCH-G0/0"
interface/ethernet/set ether4 loop-protect=on disabled=yes
interface/ethernet/set ether5 loop-protect=on disabled=yes
interface/ethernet/set ether6 loop-protect=on disabled=yes
```

```
[admin@NEPAL-BLOCK] >
[admin@NEPAL-BLOCK] > /interface ethernet set ether3 loop-protect=on comment="Link from NEPAL-BLOCK (10.0.0.6/30) to LONDON-BLOCK (10.0.0.5/30)"
[admin@NEPAL-BLOCK] > /interface ethernet set ether1 loop-protect=on comment="Link from NEPAL-BLOCK (10.0.0.30/30) to UK-BLOCK (10.0.0.29/30)"
[admin@NEPAL-BLOCK] > /interface ethernet set ether2 loop-protect=on comment="Link from NEPAL-BLOCK (10.0.0.37/30) to BRIT-BLOCK (10.0.0.38/30)"
[admin@NEPAL-BLOCK] >
```

Figure 21: Set Interface Description, Enable Loop Protection & Disable Unused ports on NEPAL-BLOCK Router Through CMD

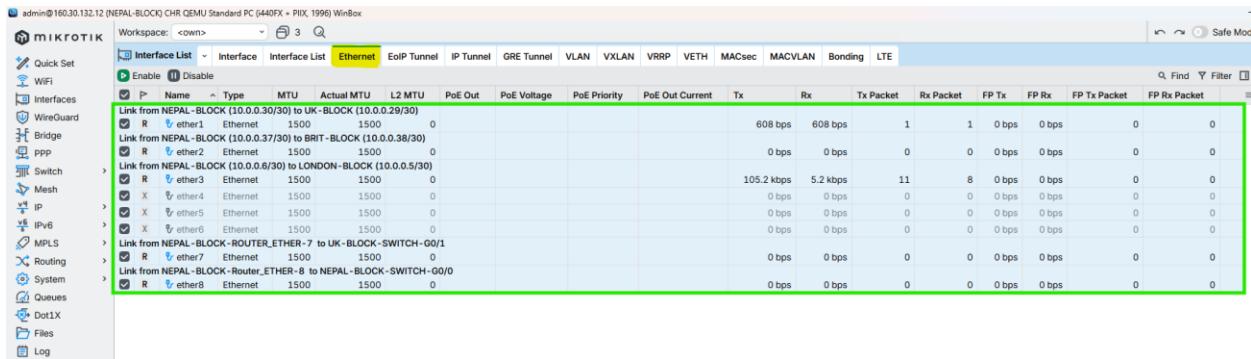


Figure 22: Set Interface Description, Enable Loop Protection & Disable Unused ports on NEPAL-BLOCK Router Through WINBOX

## 2.4. HIMAL-BLOCK

### CMD

```
/interface ethernet set ether3 loop-protect=on comment="Link from HIMAL-BLOCK (10.0.0.33/30) to UK-BLOCK (10.0.0.34/30)"
/interface ethernet set ether4 loop-protect=on comment="Link from HIMAL-BLOCK (10.0.0.10/30) to LONDON-BLOCK (10.0.0.9/30)"
/interface ethernet set ether2 loop-protect=on comment="Link from HIMAL-BLOCK (10.0.0.42/30) to SKILL-BLOCK (10.0.0.41/30)"
/interface ethernet set ether7 loop-protect=on comment="Link from HIMAL-BLOCK-ROUTER_ETHER-7 to SKILL-BLOCK-SWITCH-G0/1"
/interface ethernet set ether8 loop-protect=on comment="Link from HIMAL-BLOCK-ROUTER_ETHER-8 to HIMAL-BLOCK-SWITCH-G0/0"
interface/ethernet/set ether1 loop-protect=on disabled=yes
interface/ethernet/set ether5 loop-protect=on disabled=yes
interface/ethernet/set ether6 loop-protect=on disabled=yes
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /interface ethernet set ether3 loop-protect=on comment="Link from HIMAL-BLOCK (10.0.0.33/30) to UK-BLOCK (10.0.0.34/30)"
[admin@HIMAL-BLOCK] > /interface ethernet set ether4 loop-protect=on comment="Link from HIMAL-BLOCK (10.0.0.10/30) to LONDON-BLOCK (10.0.0.9/30)"
[admin@HIMAL-BLOCK] > /interface ethernet set ether2 loop-protect=on comment="Link from HIMAL-BLOCK (10.0.0.42/30) to SKILL-BLOCK (10.0.0.41/30)"
[admin@HIMAL-BLOCK] >
```

Figure 23: Set Interface Description, Enable Loop Protection & Disable Unused ports on HIMAL-BLOCK Router Through CMD

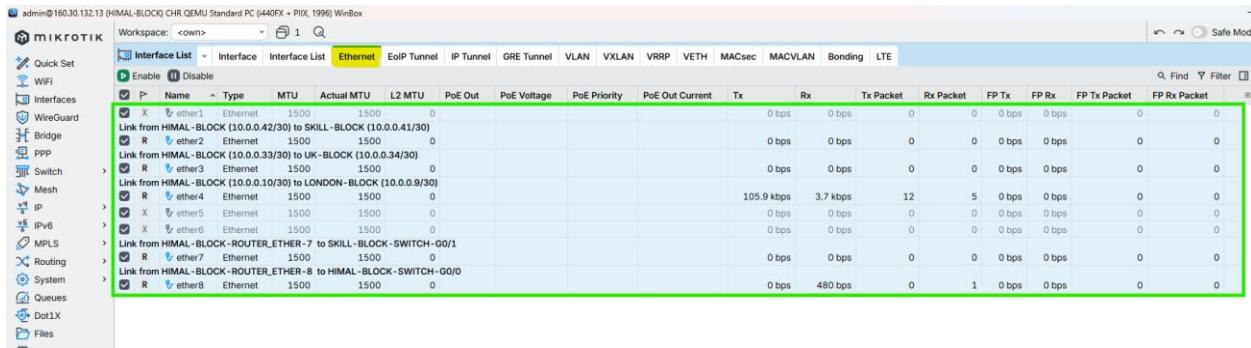


Figure 24: Set Interface Description, Enable Loop Protection & Disable Unused ports on HIMAL-BLOCK Router Through WINBOX

## 2.5. BRIT-BLOCK

### CMD

```
/interface ethernet set ether2 loop-protect=on comment="Link from BRIT-BLOCK (10.0.0.38/30) to NEPAL-BLOCK (10.0.0.37/30)"
/interface ethernet set ether5 loop-protect=on comment="Link from BRIT-BLOCK (10.0.0.14/30) to LONDON-BLOCK (10.0.0.13/30)"
/interface ethernet set ether1 loop-protect=on comment="Link from BRIT-BLOCK (10.0.0.46/30) to KUMARI-BLOCK (10.0.0.44/30)"
/interface ethernet set ether7 loop-protect=on comment="Link from BRIT-BLOCK-ROUTER_ETHER-7 to NEPAL-BLOCK-SWITCH-G0/1"
/interface ethernet set ether8 loop-protect=on comment="Link from BRIT-BLOCK-ROUTER_ETHER-8 to BRIT-BLOCK-SWITCH-G0/0"
interface/ethernet/set ether3 loop-protect=on disabled=yes
interface/ethernet/set ether4 loop-protect=on disabled=yes
interface/ethernet/set ether6 loop-protect=on disabled=yes
```

```
[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > /interface ethernet set ether2 loop-protect=on comment="Link from BRIT-BLOCK (10.0.0.38/30) to NEPAL-BLOCK (10.0.0.37/30)"
[admin@BRIT-BLOCK] > /interface ethernet set ether5 loop-protect=on comment="Link from BRIT-BLOCK (10.0.0.14/30) to LONDON-BLOCK (10.0.0.13/30)"
[admin@BRIT-BLOCK] > /interface ethernet set ether1 loop-protect=on comment="Link from BRIT-BLOCK (10.0.0.46/30) to KUMARI-BLOCK (10.0.0.44/30)"
[admin@BRIT-BLOCK] >
```

Figure 25: Set Interface Description, Enable Loop Protection & Disable Unused ports on BRIT-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

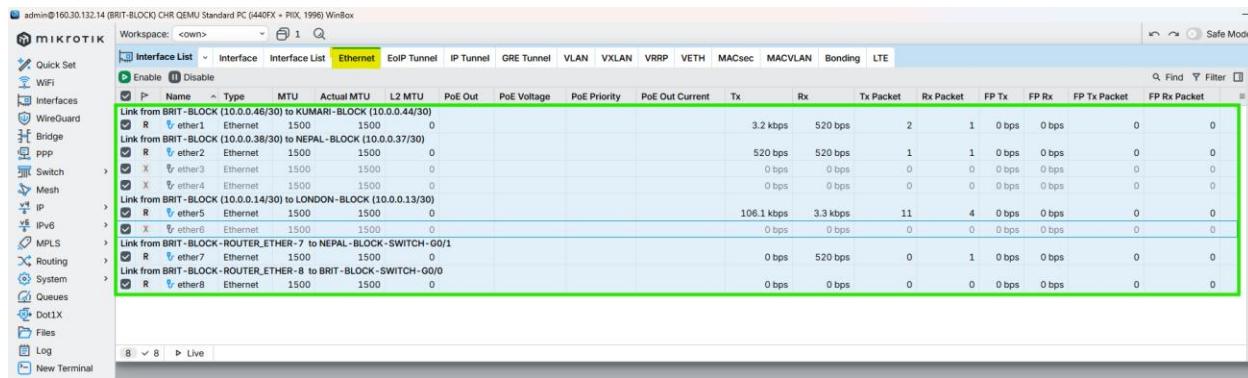


Figure 26: Set Interface Description, Enable Loop Protection & Disable Unused ports on BRIT-BLOCK Router Through WINBOX

## 2.6. SKILL-BLOCK

### CMD

```
/interface ethernet set ether2 loop-protect=on comment="Link from SKILL-BLOCK (10.0.0.41/30) to HIMAL-BLOCK (10.0.0.42/30)"
/interface ethernet set ether6 loop-protect=on comment="Link from SKILL-BLOCK (10.0.0.18/30) to LONDON-BLOCK (10.0.0.17/30)"
/interface ethernet set ether1 loop-protect=on comment="Link from SKILL-BLOCK (10.0.0.50/30) to KUMARI-BLOCK (10.0.0.49/30)"
/interface ethernet set ether7 loop-protect=on comment="Link from SKILL-BLOCK-ROUTER_ETHER-7 to ALUMNI-BLOCK-SWITCH-G0/1"
/interface ethernet set ether8 loop-protect=on comment="Link from SKILL-BLOCK-ROUTER_ETHER-8 to SKILL-BLOCK-SWITCH-G0/0"
interface/ethernet/set ether3 loop-protect=on disabled=yes
interface/ethernet/set ether4 loop-protect=on disabled=yes
interface/ethernet/set ether5 loop-protect=on disabled=yes
```

```
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /interface ethernet set ether2 loop-protect=on comment="Link from SKILL-BLOCK (10.0.0.41/30) to HIMAL-BLOCK (10.0.0.42/30)"
[admin@SKILL-BLOCK] > /interface ethernet set ether6 loop-protect=on comment="Link from SKILL-BLOCK (10.0.0.18/30) to LONDON-BLOCK (10.0.0.17/30)"
[admin@SKILL-BLOCK] > /interface ethernet set ether1 loop-protect=on comment="Link from SKILL-BLOCK (10.0.0.50/30) to KUMARI-BLOCK (10.0.0.49/30)"
```

Figure 27: Set Interface Description, Enable Loop Protection & Disable Unused ports on SKILL-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

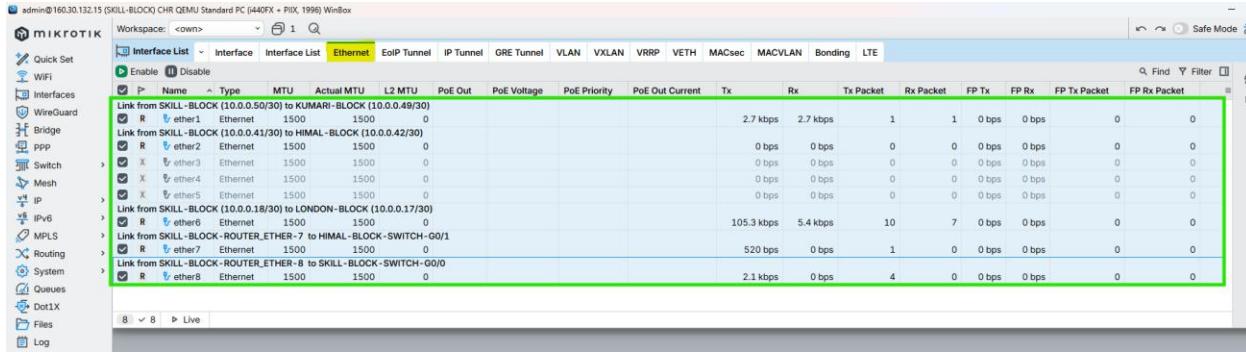


Figure 28: Set Interface Description, Enable Loop Protection & Disable Unused ports on SKILL-BLOCK Router Through WINBOX

## 2.7. ALUMNI-BLOCK

### CMD

```
/interface ethernet set ether7 loop-protect=on comment="Link from ALUMNI-BLOCK (10.0.0.22/30) to LONDON-BLOCK (10.0.0.21/30)"
/interface ethernet set ether1 loop-protect=on comment="Link from ALUMNI-BLOCK (10.0.0.49/30) to SKILL-BLOCK (10.0.0.50/30)"
/interface ethernet set ether2 loop-protect=on comment="Link from ALUMNI-BLOCK (10.0.0.53/30) to KUMARI-BLOCK (10.0.0.54/30)"
/interface ethernet set ether6 loop-protect=on comment="Link from ALUMNI-BLOCK-ROUTER.ETHER-6 to KUMARI-BLOCK-SWITCH-G0/1"
/interface ethernet set ether8 loop-protect=on comment="Link from ALUMNI-BLOCK-ROUTER.ETHER-8 to ALUMNI-BLOCK-SWITCH-G0/0"
interface/ethernet/set ether3 loop-protect=on disabled=yes
interface/ethernet/set ether4 loop-protect=on disabled=yes
interface/ethernet/set ether5 loop-protect=on disabled=yes
```

```
[admin@ALUMNI-BLOCK] >
[admin@ALUMNI-BLOCK] > /interface ethernet set ether7 loop-protect=on comment="Link from ALUMNI-BLOCK (10.0.0.22/30) to LONDON-BLOCK (10.0.0.21/30)"
[admin@ALUMNI-BLOCK] > /interface ethernet set ether1 loop-protect=on comment="Link from ALUMNI-BLOCK (10.0.0.49/30) to SKILL-BLOCK (10.0.0.50/30)"
[admin@ALUMNI-BLOCK] > /interface ethernet set ether2 loop-protect=on comment="Link from ALUMNI-BLOCK (10.0.0.53/30) to KUMARI-BLOCK (10.0.0.54/30)"
[admin@ALUMNI-BLOCK] >
```

Figure 29: Set Interface Description, Enable Loop Protection & Disable Unused ports on ALUMNI-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

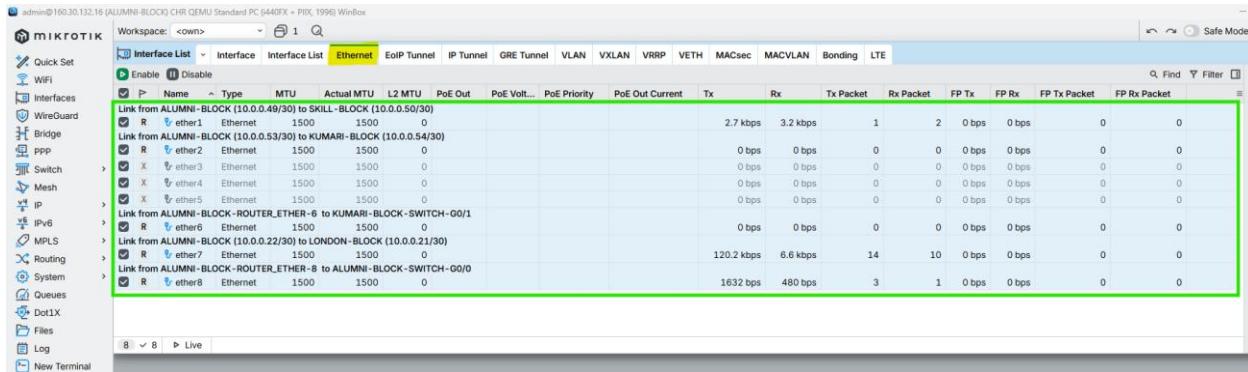


Figure 30: Set Interface Description, Enable Loop Protection & Disable Unused ports on ALUMNI-BLOCK Router Through WINBOX

## 2.8. KUMARI-BLOCK

### CMD

```
/interface ethernet set ether8 loop-protect=on comment="Link from KUMARI-BLOCK (10.0.0.26/30) to LONDON-BLOCK (10.0.0.25/30)"
/interface ethernet set ether2 loop-protect=on comment="Link from KUMARI-BLOCK (10.0.0.54/30) to ALUMNI-BLOCK (10.0.0.53/30)"
/interface ethernet set ether1 loop-protect=on comment="Link from KUMARI-BLOCK (10.0.0.44/30) to BRIT-BLOCK (10.0.0.46/30)"
/interface ethernet set ether6 loop-protect=on comment="Link from KUMARI-BLOCK-ROUTER_ETHER-6 to BRIT-BLOCK-SWITCH-G0/1"
/interface ethernet set ether7 loop-protect=on comment="Link from KUMARI-BLOCK-ROUTER_ETHER-7 to KUMARI-BLOCK-SWITCH-G0/0"
interface/ethernet/set ether3 loop-protect=on disabled=yes
interface/ethernet/set ether4 loop-protect=on disabled=yes
interface/ethernet/set ether5 loop-protect=on disabled=yes
```

```
[admin@KUMARI-BLOCK] >
[admin@KUMARI-BLOCK] > /interface ethernet set ether8 loop-protect=on comment="Link from KUMARI-BLOCK (10.0.0.26/30) to LONDON-BLOCK (10.0.0.25/30)"
[admin@KUMARI-BLOCK] > /interface ethernet set ether2 loop-protect=on comment="Link from KUMARI-BLOCK (10.0.0.54/30) to ALUMNI-BLOCK (10.0.0.53/30)"
[admin@KUMARI-BLOCK] > /interface ethernet set ether1 loop-protect=on comment="Link from KUMARI-BLOCK (10.0.0.44/30) to BRIT-BLOCK (10.0.0.46/30")
[admin@KUMARI-BLOCK] >
```

Figure 31: Set Interface Description, Enable Loop Protection & Disable Unused ports on KUMARI-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

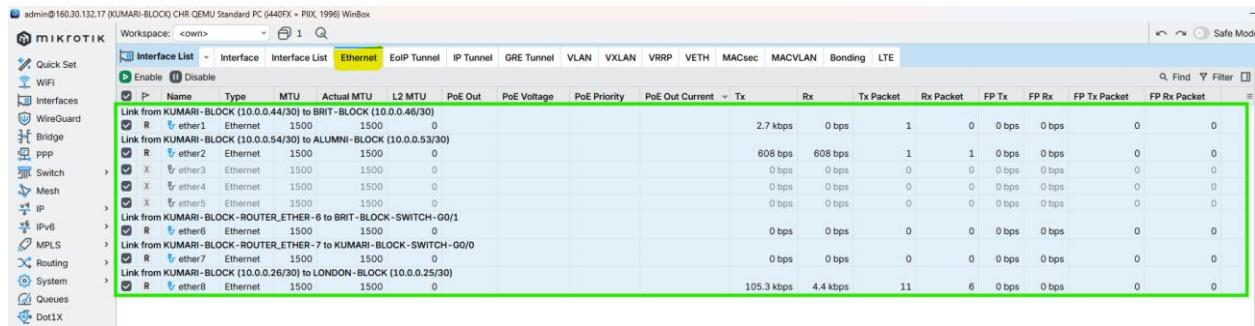


Figure 32: Set Interface Description, Enable Loop Protection & Disable Unused ports on KUMARI-BLOCK Router Through WINBOX

### 3. Configuration IP in the Core Interface of all Routers

#### 3.1. LONDON-BLOCK

##### CMD

```
/ip address add address=10.0.0.1/30 interface=ether2 comment="NETWORK-ID_10.0.0.0/30_LINK_FROM_LONDON-BLOCK_10.0.0.1/30_TO_UK-BLOCK_10.0.0.2/30"

/ip address add address=10.0.0.5/30 interface=ether3 comment="NETWORK-ID_10.0.0.4/30_LINK_FROM_LONDON-BLOCK_10.0.0.5/30_TO_NEPAL-BLOCK_10.0.0.6/30"

/ip address add address=10.0.0.9/30 interface=ether4 comment="NETWORK-ID_10.0.0.8/30_LINK_FROM_LONDON-BLOCK_10.0.0.9/30_TO_HIMAL-BLOCK_10.0.0.10/30"

/ip address add address=10.0.0.13/30 interface=ether5 comment="NETWORK-ID_10.0.0.12/30_LINK_FROM_LONDON-BLOCK_10.0.0.13/30_TO_BRIT-BLOCK_10.0.0.14/30"

/ip address add address=10.0.0.17/30 interface=ether6 comment="NETWORK-ID_10.0.0.16/30_LINK_FROM_LONDON-BLOCK_10.0.0.17/30_TO_SKILL-BLOCK_10.0.0.18/30"

/ip address add address=10.0.0.21/30 interface=ether7 comment="NETWORK-ID_10.0.0.20/30_LINK_FROM_LONDON-BLOCK_10.0.0.21/30_TO_ALUMNI-BLOCK_10.0.0.22/30"

/ip address add address=10.0.0.25/30 interface=ether8 comment="NETWORK-ID_10.0.0.24/30_LINK_FROM_LONDON-BLOCK_10.0.0.25/30_TO_KUMARI-BLOCK_10.0.0.26/30"
```

```
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /ip address add address=10.0.0.1/30 interface=ether2 comment="NETWORK-ID_10.0.0.0/30_LINK_FROM_LONDON-BLOCK_10.0.0.1/30_TO_UK-BLOCK_10.0.0.2/30"
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /ip address add address=10.0.0.5/30 interface=ether3 comment="NETWORK-ID_10.0.0.4/30_LINK_FROM_LONDON-BLOCK_10.0.0.5/30_TO_NEPAL-BLOCK_10.0.0.6/30"
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /ip address add address=10.0.0.9/30 interface=ether4 comment="NETWORK-ID_10.0.0.8/30_LINK_FROM_LONDON-BLOCK_10.0.0.9/30_TO_HIMAL-BLOCK_10.0.0.10/30"
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /ip address add address=10.0.0.13/30 interface=ether5 comment="NETWORK-ID_10.0.0.12/30_LINK_FROM_LONDON-BLOCK_10.0.0.13/30_TO_BRIT-BLOCK_10.0.0.14/30"
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /ip address add address=10.0.0.17/30 interface=ether6 comment="NETWORK-ID_10.0.0.16/30_LINK_FROM_LONDON-BLOCK_10.0.0.17/30_TO_SKILL-BLOCK_10.0.0.18/30"
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /ip address add address=10.0.0.21/30 interface=ether7 comment="NETWORK-ID_10.0.0.20/30_LINK_FROM_LONDON-BLOCK_10.0.0.21/30_TO_ALUMNI-BLOCK_10.0.0.22/30"
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /ip address add address=10.0.0.25/30 interface=ether8 comment="NETWORK-ID_10.0.0.24/30_LINK_FROM_LONDON-BLOCK_10.0.0.25/30_TO_KUMARI-BLOCK_10.0.0.26/30"
[admin@LONDON-BLOCK] >
```

Figure 33: Configuration IP in the Core Interface of LONDON-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

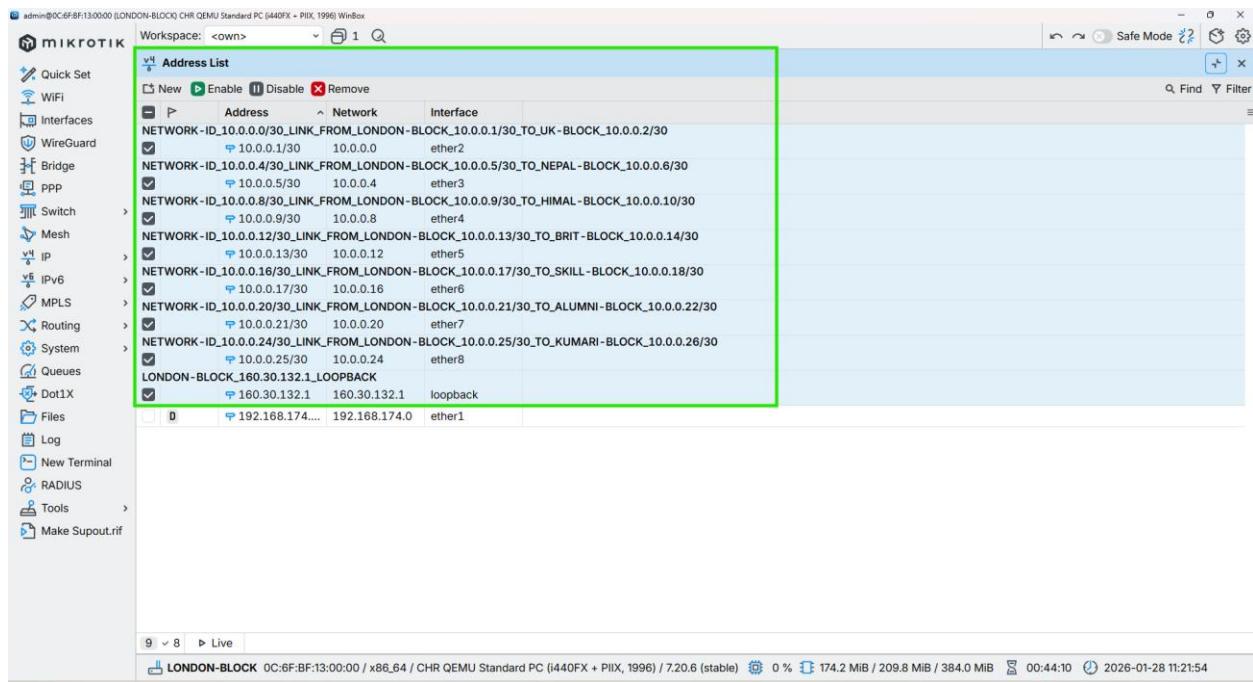


Figure 34: Configuration IP in the Core Interface of LONDON-BLOCK Router Through WINBOX

## 3.2. UK-BLOCK

### CMD

```
/ip address add address=10.0.0.2/30 interface=ether2 comment="NETWORK-ID_10.0.0.0/30_LINK_FROM_UK-BLOCK_10.0.0.2/30_TO_LONDON-BLOCK_10.0.0.1/30"

/ip address add address=10.0.0.29/30 interface=ether1 comment="NETWORK-ID_10.0.0.28/30_LINK_FROM_UK-BLOCK_10.0.0.29/30_TO_NEPAL-BLOCK_10.0.0.30/30"

/ip address add address=10.0.0.34/30 interface=ether3 comment="NETWORK-ID_10.0.0.32/30_LINK_FROM_UK-BLOCK_10.0.0.34/30_TO_HIMAL-BLOCK_10.0.0.33/30"
```

```
[admin@UK-BLOCK] > /ip address add address=10.0.0.2/30 interface=ether2 comment="NETWORK-ID_10.0.0.0/30_LINK_FROM_UK-BLOCK_10.0.0.2/30_TO_LONDON-BLOCK_10.0.0.1/30"
[admin@UK-BLOCK] > /ip address add address=10.0.0.29/30 interface=ether1 comment="NETWORK-ID_10.0.0.28/30_LINK_FROM_UK-BLOCK_10.0.0.29/30_TO_NEPAL-BLOCK_10.0.0.30/30"
[admin@UK-BLOCK] > /ip address add address=10.0.0.34/30 interface=ether3 comment="NETWORK-ID_10.0.0.32/30_LINK_FROM_UK-BLOCK_10.0.0.34/30_TO_HIMAL-BLOCK_10.0.0.33/30"
[admin@UK-BLOCK] >
```

Figure 35: Configuration IP in the Core Interface of UK-BLOCK Router Through CMD

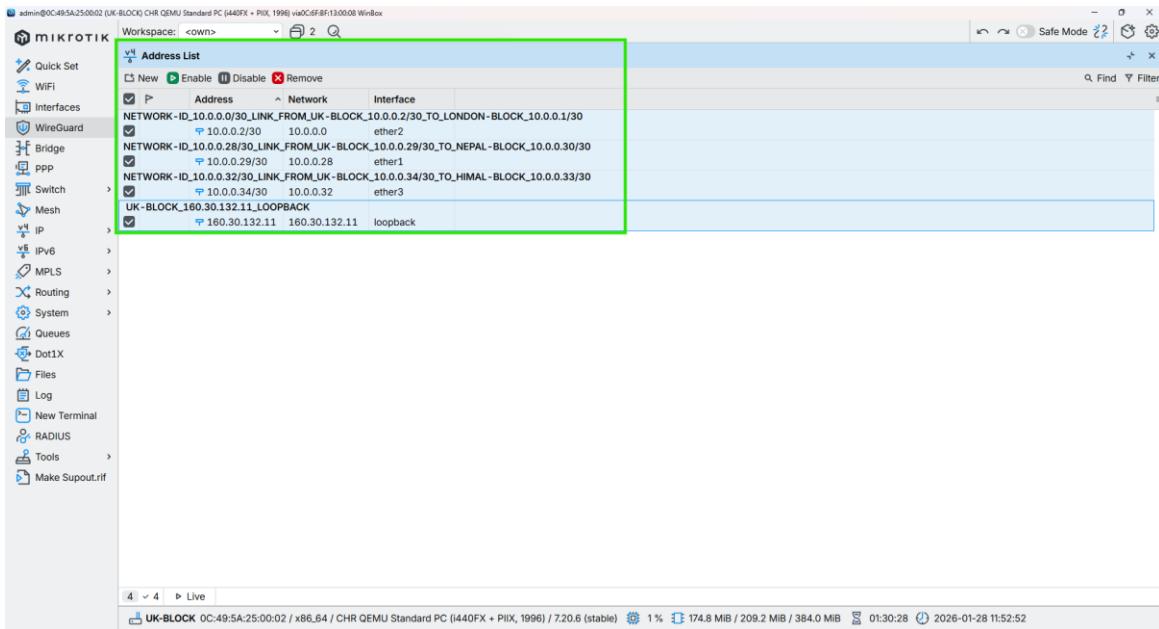


Figure 36: Configuration IP in the Core Interface of UK-BLOCK Router Through WINBOX

## 3.3. NEPAL-BLOCK

### CMD

```
/ip address add address=10.0.0.6/30 interface=ether3 comment="NETWORK-ID_10.0.0.4/30_LINK_FROM_NEPAL-BLOCK_10.0.0.6/30_TO_LONDON-BLOCK_10.0.0.5/30"
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
/ip address add address=10.0.0.30/30 interface=ether1 comment="NETWORK-ID_10.0.0.28/30_LINK_FROM_NEPAL-BLOCK_10.0.0.30/30_TO_UK-BLOCK_10.0.0.29/30"

/ip address add address=10.0.0.37/30 interface=ether2 comment="NETWORK-ID_10.0.0.36/30_LINK_FROM_NEPAL-BLOCK_10.0.0.37/30_TO_BRIT-BLOCK_10.0.0.38/30"
```

```
[admin@NEPAL-BLOCK] > /ip address add address=10.0.0.6/30 interface=ether3 comment="NETWORK-ID_10.0.0.4/30_LINK_FROM_NEPAL-BLOCK_10.0.0.6/30_TO_LONDON-BLOCK_10.0.0.5/30"
[admin@NEPAL-BLOCK] > /ip address add address=10.0.0.30/30 interface=ether1 comment="NETWORK-ID_10.0.0.28/30_LINK_FROM_NEPAL-BLOCK_10.0.0.30/30_TO_UK-BLOCK_10.0.0.29/30"
[admin@NEPAL-BLOCK] > /ip address add address=10.0.0.37/30 interface=ether2 comment="NETWORK-ID_10.0.0.36/30_LINK_FROM_NEPAL-BLOCK_10.0.0.37/30_TO_BRIT-BLOCK_10.0.0.38/30"
[admin@NEPAL-BLOCK] >
```

Figure 37: Configuration IP in the Core Interface of NEPAL-BLOCK Router Through CMD

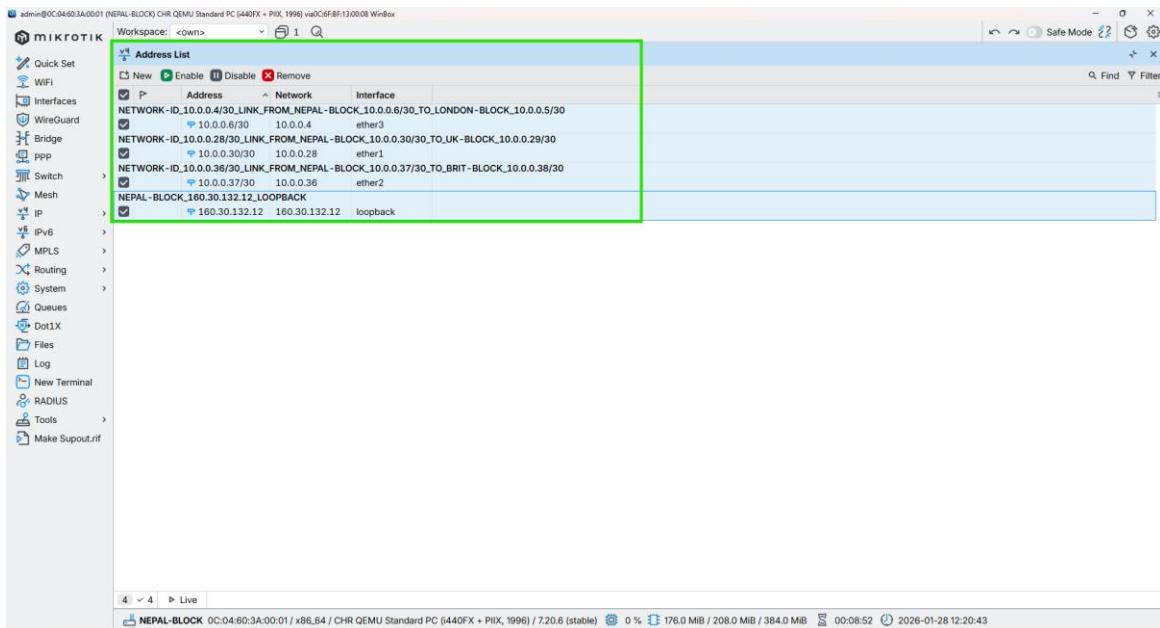


Figure 38: Configuration IP in the Core Interface of NEPAL-BLOCK Router Through WINBOX

## 3.4. HIMAL-BLOCK

### CMD

```
/ip address add address=10.0.0.33/30 interface=ether3 comment="NETWORK-ID_10.0.0.32/30_LINK_FROM_HIMAL-BLOCK_10.0.0.33/30_TO_UK-BLOCK_10.0.0.34/30"

/ip address add address=10.0.0.10/30 interface=ether4 comment="NETWORK-ID_10.0.0.8/30_LINK_FROM_HIMAL-BLOCK_10.0.0.10/30_TO_LONDON-BLOCK_10.0.0.9/30"

/ip address add address=10.0.0.42/30 interface=ether2 comment="NETWORK-ID_10.0.0.40/30_LINK_FROM_HIMAL-BLOCK_10.0.0.42/30_TO_SKILL-BLOCK_10.0.0.41/30"
```

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /ip address add address=10.0.0.33/30 interface=ether3 comment="NETWORK-ID_10.0.0.32/30_LINK_FROM_HIMAL-BLOCK_10.0.0.33/30_TO_UK-BLOCK_10.0.0.34/30"
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /ip address add address=10.0.0.10/30 interface=ether4 comment="NETWORK-ID_10.0.0.8/30_LINK_FROM_HIMAL-BLOCK_10.0.0.10/30_TO_LONDON-BLOCK_10.0.0.9/30"
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /ip address add address=10.0.0.42/30 interface=ether2 comment="NETWORK-ID_10.0.0.40/30_LINK_FROM_HIMAL-BLOCK_10.0.0.42/30_TO_SKILL-BLOCK_10.0.0.41/30"
[admin@HIMAL-BLOCK] >
```

Figure 39: Configuration IP in the Core Interface of HIMAL-BLOCK Router Through CMD

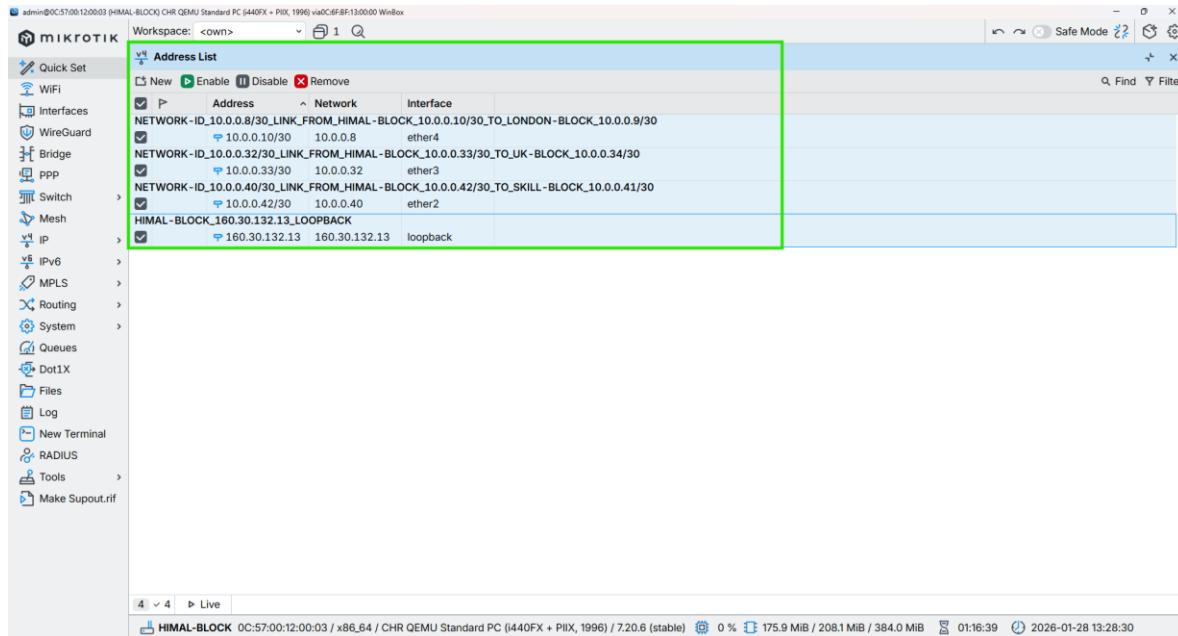


Figure 40: Configuration IP in the Core Interface of HIMAL-BLOCK Router Through WINBOX

## 3.5. BRIT-BLOCK

### CMD

```
/ip address add address=10.0.0.38/30 interface=ether2 comment="NETWORK-ID_10.0.0.36/30_LINK_FROM_BRIT-BLOCK_10.0.0.38/30_TO_NEPAL-BLOCK_10.0.0.37/30"

/ip address add address=10.0.0.14/30 interface=ether5 comment="NETWORK-ID_10.0.0.12/30_LINK_FROM_BRIT-BLOCK_10.0.0.14/30_TO_LONDON-BLOCK_10.0.0.13/30"

/ip address add address=10.0.0.46/30 interface=ether1 comment="NETWORK-ID_10.0.0.44/30_LINK_FROM_BRIT-BLOCK_10.0.0.46/30_TO_KUMARI-BLOCK_10.0.0.45/30"
```

```
[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > /ip address add address=10.0.0.38/30 interface=ether2 comment="NETWORK-ID_10.0.0.36/30_LINK_FROM_BRIT-BLOCK_10.0.0.38/30_TO_NEPAL-BLOCK_10.0.0.37/30"
[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > /ip address add address=10.0.0.14/30 interface=ether5 comment="NETWORK-ID_10.0.0.12/30_LINK_FROM_BRIT-BLOCK_10.0.0.14/30_TO_LONDON-BLOCK_10.0.0.13/30"
[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > /ip address add address=10.0.0.46/30 interface=ether1 comment="NETWORK-ID_10.0.0.44/30_LINK_FROM_BRIT-BLOCK_10.0.0.46/30_TO_KUMARI-BLOCK_10.0.0.45/30"
[admin@BRIT-BLOCK] >
```

Figure 41: Configuration IP in the Core Interface of BRIT-BLOCK Router Through CMD

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

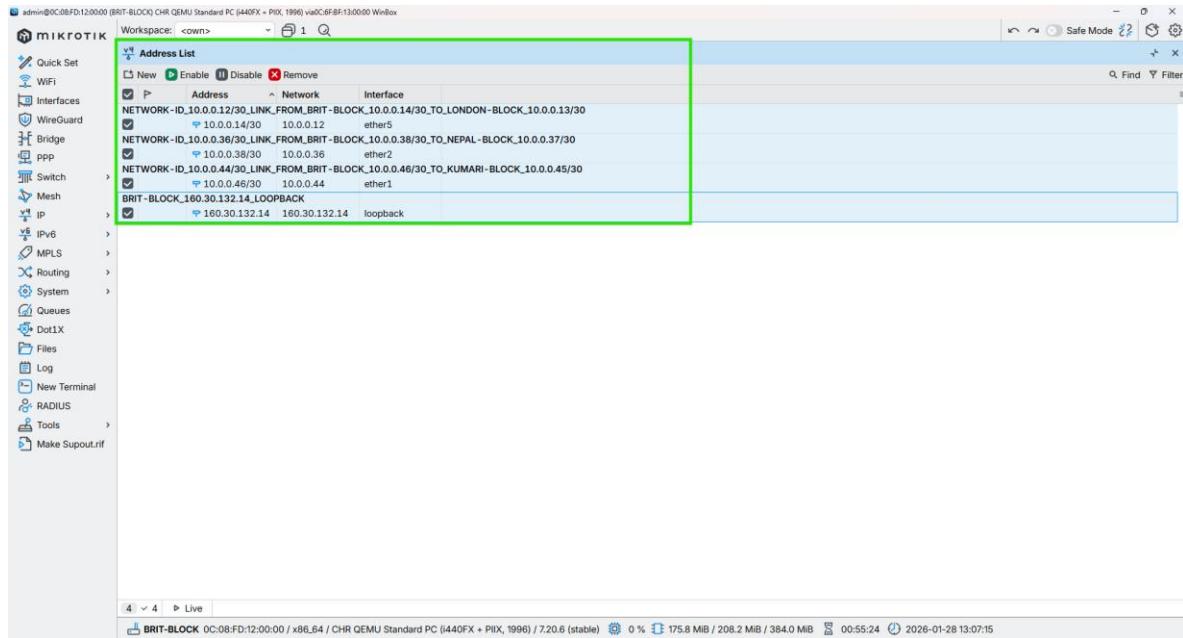


Figure 42: Configuration IP in the Core Interface of BRIT-BLOCK Router Through WINBOX

## 3.6. SKILL-BLOCK

### CMD

```
/ip address add address=10.0.0.41/30 interface=ether2 comment="NETWORK-ID_10.0.0.40/30_LINK_FROM_SKILL-BLOCK_10.0.0.41/30_TO_NEPAL-BLOCK_10.0.0.42/30"

/ip address add address=10.0.0.18/30 interface=ether6 comment="NETWORK-ID_10.0.0.16/30_LINK_FROM_SKILL-BLOCK_10.0.0.18/30_TO_LONDON-BLOCK_10.0.0.17/30"

/ip address add address=10.0.0.50/30 interface=ether1 comment="NETWORK-ID_10.0.0.48/30_LINK_FROM_SKILL-BLOCK_10.0.0.50/30_TO_KUMARI-BLOCK_10.0.0.49/30"
```

```
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /ip address add address=10.0.0.41/30 interface=ether2 comment="NETWORK-ID_10.0.0.40/30_LINK_FROM_SKILL-BLOCK_10.0.0.41/30_TO_HIMAL-BLOCK_10.0.0.42/30"
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /ip address add address=10.0.0.18/30 interface=ether6 comment="NETWORK-ID_10.0.0.16/30_LINK_FROM_SKILL-BLOCK_10.0.0.18/30_TO_LONDON-BLOCK_10.0.0.17/30"
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /ip address add address=10.0.0.50/30 interface=ether1 comment="NETWORK-ID_10.0.0.48/30_LINK_FROM_SKILL-BLOCK_10.0.0.50/30_TO_ALUMNI-BLOCK_10.0.0.49/30"
[admin@SKILL-BLOCK] >
```

Figure 43: Configuration IP in the Core Interface of SKILL-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

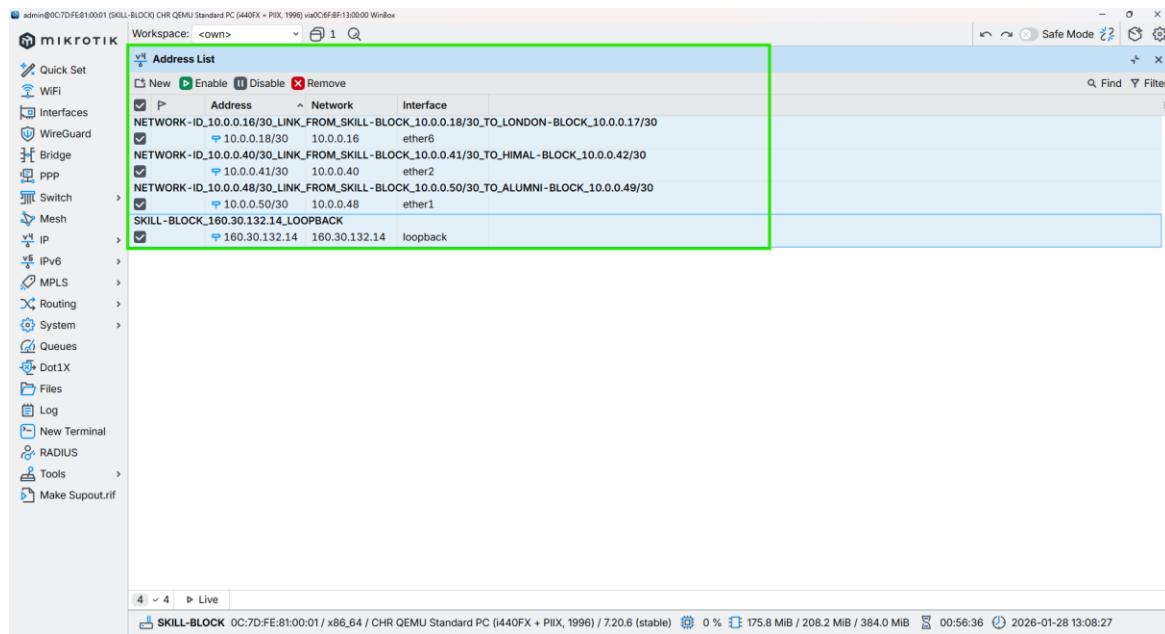


Figure 44: Configuration IP in the Core Interface of SKILL-BLOCK Router Through WINBOX

## 3.7. ALUMNI-BLOCK

### CMD

```
/ip address add address=10.0.0.22/30 interface=ether7 comment="NETWORK-ID_10.0.0.20/30_LINK_FROM_ALUMNI-BLOCK_10.0.0.22/30_TO_LONDON-BLOCK_10.0.0.21/30"

/ip address add address=10.0.0.49/30 interface=ether1 comment="NETWORK-ID_10.0.0.48/30_LINK_FROM_ALUMNI-BLOCK_10.0.0.49/30_TO_SKILL-BLOCK_10.0.0.50/30"

/ip address add address=10.0.0.53/30 interface=ether2 comment="NETWORK-ID_10.0.0.52/30_LINK_FROM_ALUMNI-BLOCK_10.0.0.53/30_TO_KUMARI-BLOCK_10.0.0.54/30"
```

```
[admin@ALUMNI-BLOCK] >
[admin@ALUMNI-BLOCK] > /ip address add address=10.0.0.22/30 interface=ether7 comment="NETWORK-ID_10.0.0.20/30_LINK_FROM_ALUMNI-BLOCK_10.0.0.22/30_TO_LONDON-BLOCK_10.0.0.21/30"
[admin@ALUMNI-BLOCK] >
[admin@ALUMNI-BLOCK] > /ip address add address=10.0.0.49/30 interface=ether1 comment="NETWORK-ID_10.0.0.48/30_LINK_FROM_ALUMNI-BLOCK_10.0.0.49/30_TO_SKILL-BLOCK_10.0.0.50/30"
[admin@ALUMNI-BLOCK] >
[admin@ALUMNI-BLOCK] > /ip address add address=10.0.0.53/30 interface=ether2 comment="NETWORK-ID_10.0.0.52/30_LINK_FROM_ALUMNI-BLOCK_10.0.0.53/30_TO_KUMARI-BLOCK_10.0.0.54/30"
[admin@ALUMNI-BLOCK] >
```

Figure 45: Configuration IP in the Core Interface of ALUMNI-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

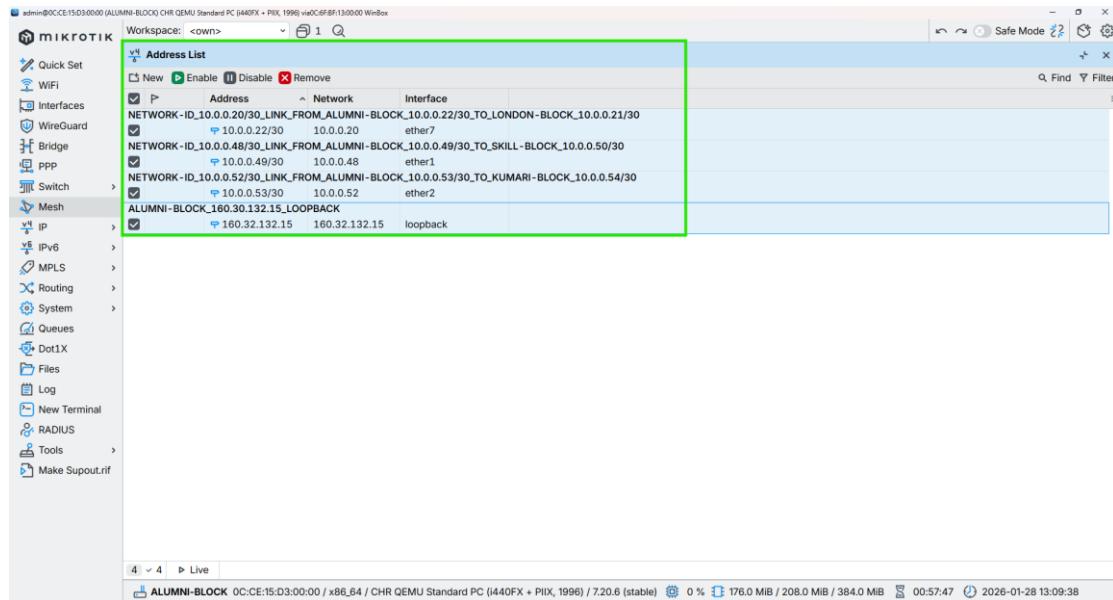


Figure 46: Configuration IP in the Core Interface of ALUMNI-BLOCK Router Through WINBOX

## 3.8. KUMARI-BLOCK

### CMD

```
/ip address add address=10.0.0.26/30 interface=ether8 comment="NETWORK-ID_10.0.0.24/30_LINK_FROM_KUMARI-BLOCK_10.0.0.26/30_TO_LONDON-BLOCK_10.0.0.25/30"

/ip address add address=10.0.0.54/30 interface=ether2 comment="NETWORK-ID_10.0.0.52/30_LINK_FROM_KUMARI-BLOCK_10.0.0.54/30_TO_ALUMNI-BLOCK_10.0.0.53/30"

/ip address add address=10.0.0.44/30 interface=ether1 comment="NETWORK-ID_10.0.0.44/30_LINK_FROM_KUMARI-BLOCK_10.0.0.44/30_TO_BRIT-BLOCK_10.0.0.46/30"
```

```
[admin@KUMARI-BLOCK] > /ip address add address=10.0.0.26/30 interface=ether8 comment="NETWORK-ID_10.0.0.24/30_LINK_FROM_KUMARI-BLOCK_10.0.0.26/30_TO_LONDON-BLOCK_10.0.0.25/30"
[admin@KUMARI-BLOCK] > /ip address add address=10.0.0.54/30 interface=ether2 comment="NETWORK-ID_10.0.0.52/30_LINK_FROM_KUMARI-BLOCK_10.0.0.54/30_TO_ALUMNI-BLOCK_10.0.0.53/30"
[admin@KUMARI-BLOCK] > /ip address add address=10.0.0.44/30 interface=ether1 comment="NETWORK-ID_10.0.0.44/30_LINK_FROM_KUMARI-BLOCK_10.0.0.44/30_TO_BRIT-BLOCK_10.0.0.46/30"
[admin@KUMARI-BLOCK] >
```

Figure 47: Configuration IP in the Core Interface of KUMARI-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

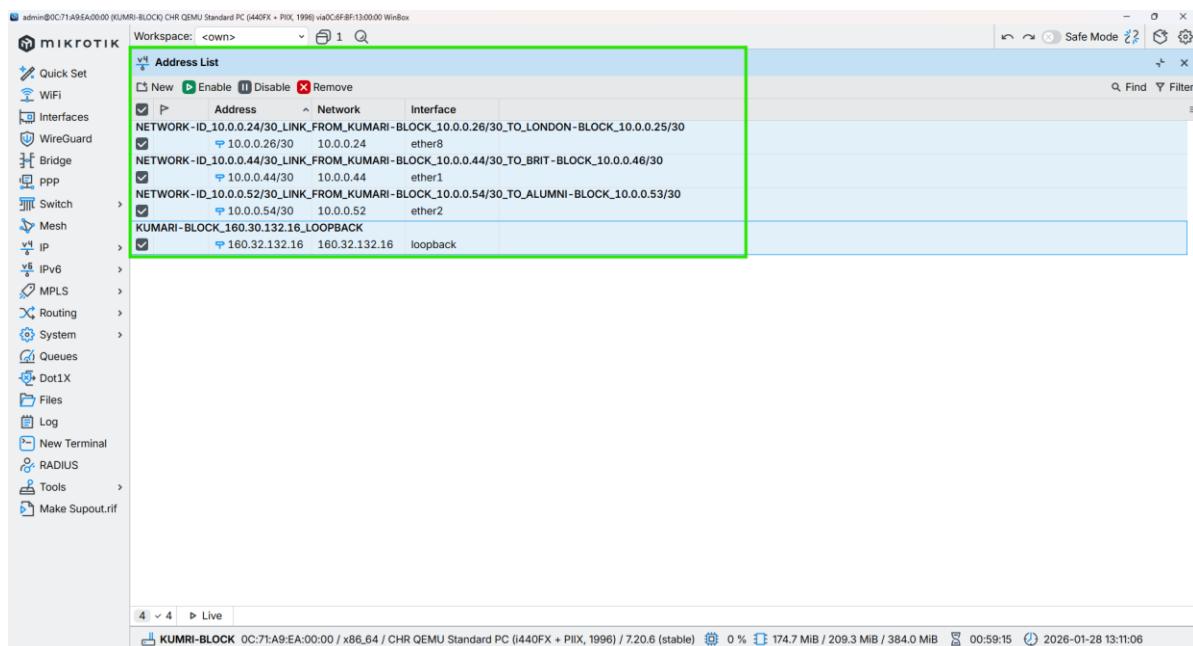


Figure 48: Configuration IP in the Core Interface of KUMARI-BLOCK Router Through WINBOX

## 4. Configurations Graphing on all router

### 4.1. LONDON-BLOCK

CMD

```
/tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"  
/tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"  
/tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"
```

```
[admin@LONDON-BLOCK] >  
[admin@LONDON-BLOCK] > /tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"  
[admin@LONDON-BLOCK] > /tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"  
[admin@LONDON-BLOCK] > /tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"  
[admin@LONDON-BLOCK] >
```

Figure 49: Configurations Graphing on LONDON-BLOCK Router Through CMD

### 4.2. UK-BLOCK

CMD

```
/tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"  
/tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"  
/tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"
```

```
[admin@UK-BLOCK] >  
[admin@UK-BLOCK] > /tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"  
[admin@UK-BLOCK] >  
[admin@UK-BLOCK] > /tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"  
[admin@UK-BLOCK] >  
[admin@UK-BLOCK] > /tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"  
[admin@UK-BLOCK] >
```

Figure 50: Configurations Graphing on UK-BLOCK Router Through CMD

### 4.3. NEPAL-BLOCK

CMD

```
/tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"  
/tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"  
/tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"
```

```
[admin@NEPAL-BLOCK] >  
[admin@NEPAL-BLOCK] > /tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"  
[admin@NEPAL-BLOCK] >  
[admin@NEPAL-BLOCK] > /tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"  
[admin@NEPAL-BLOCK] >  
[admin@NEPAL-BLOCK] > /tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"  
[admin@NEPAL-BLOCK] >
```

Figure 51: Configurations Graphing on NEPAL-BLOCK Router Through CMD

## 4.4. HIMAL-BLOCK

CMD

```
/tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"  
/tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"  
/tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"
```

```
[admin@HIMAL-BLOCK] >  
[admin@HIMAL-BLOCK] > /tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"  
[admin@HIMAL-BLOCK] >  
[admin@HIMAL-BLOCK] > /tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"  
[admin@HIMAL-BLOCK] >  
[admin@HIMAL-BLOCK] > /tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"  
[admin@HIMAL-BLOCK] >
```

Figure 52: Configurations Graphing on HIMAL-BLOCK Router Through CMD

## 4.5. BRIT-BLOCK

CMD

```
/tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"  
/tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"  
/tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"
```

```
[admin@BRIT-BLOCK] >  
[admin@BRIT-BLOCK] > /tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"  
[admin@BRIT-BLOCK] >  
[admin@BRIT-BLOCK] > /tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"  
[admin@BRIT-BLOCK] >  
[admin@BRIT-BLOCK] > /tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"  
[admin@BRIT-BLOCK] >
```

Figure 53: Configurations Graphing on BRIT-BLOCK Router Through CMD

## 4.6. SKILL-BLOCK

CMD

```
/tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"  
/tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"  
/tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"
```

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```
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"
[admin@SKILL-BLOCK] > /tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"
[admin@SKILL-BLOCK] >
```

Figure 54: Configurations Graphing on SKILL-BLOCK Router Through CMD

## 4.7. ALUMNI-BLOCK

### CMD

```
/tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"
/tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"
/tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"
```

```
[admin@ALUMNI-BLOCK] >
[admin@ALUMNI-BLOCK] > /tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"
[admin@ALUMNI-BLOCK] > /tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"
[admin@ALUMNI-BLOCK] >
[admin@ALUMNI-BLOCK] > /tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"
[admin@ALUMNI-BLOCK] >
```

Figure 55: Configurations Graphing on ALUMNI-BLOCK Router Through CMD

## 4.8. KUMARI-BLOCK

### CMD

```
/tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"
/tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"
/tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"
```

```
[admin@KUMARI-BLOCK] >
[admin@KUMARI-BLOCK] > /tool/graphing/interface/add interface=all comment="Monitors all interfaces for traffic"
[admin@KUMARI-BLOCK] >
[admin@KUMARI-BLOCK] > /tool/graphing/queue/add simple-queue=all allow-address=0.0.0.0/0 comment="Monitors all simple queues for bandwidth usage"
[admin@KUMARI-BLOCK] >
[admin@KUMARI-BLOCK] > /tool/graphing/resource/add allow-address=0.0.0.0/0 comment="Monitors system resources"
[admin@KUMARI-BLOCK] >
```

Figure 56: Configurations Graphing on KUMARI-BLOCK Router Through CMD

## 5. Configuration OSPF to all Core Routers

### 5.1. LONDON-BLOCK

#### CMD

```
/routing ospf instance add name=OSPF_LONDON_BLOCK router-id=160.30.132.1 comment="OSPF instance for London block,  
router-id 160.30.132.1"  
  
/routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_LONDON_BLOCK comment="Backbone area 0.0.0.0 for  
London OSPF"  
  
/routing ospf interface-template  
  
add interfaces=loopback area=backbone passive comment="Loopback London router-id 160.30.132.1 (passive)"  
  
add networks=10.0.0.0/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_LONDON-  
BLOCK_10.0.0.1_TO_UK-BLOCK_10.0.0.2"  
  
add networks=10.0.0.4/30 interfaces=ether3 area=backbone type=ptp comment="ETHER-3_LINK_FROM_LONDON-  
BLOCK_10.0.0.5_TO_NEPAL-BLOCK_10.0.0.6"  
  
add networks=10.0.0.8/30 interfaces=ether4 area=backbone type=ptp comment="ETHER-4_LINK_FROM_LONDON-  
BLOCK_10.0.0.9_TO_HIMAL-BLOCK_10.0.0.10"  
  
add networks=10.0.0.12/30 interfaces=ether5 area=backbone type=ptp comment="ETHER-5_LINK_FROM_LONDON-  
BLOCK_10.0.0.13_TO_BRIT-BLOCK_10.0.0.14"  
  
add networks=10.0.0.16/30 interfaces=ether6 area=backbone type=ptp comment="ETHER-6_LINK_FROM_LONDON-  
BLOCK_10.0.0.17_TO_SKILL-BLOCK_10.0.0.18"  
  
add networks=10.0.0.20/30 interfaces=ether7 area=backbone type=ptp comment="ETHER-7_LINK_FROM_LONDON-  
BLOCK_10.0.0.21_TO_ALUMNI-BLOCK_10.0.0.22"  
  
add networks=10.0.0.24/30 interfaces=ether8 area=backbone type=ptp comment="ETHER-8_LINK_FROM_LONDON-  
BLOCK_10.0.0.25_TO_KUMARI-BLOCK_10.0.0.26"  
/
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@LONDON-BLOCK] > /routing/ospf instance add name=OSPF_LONDON_BLOCK router-id=160.30.132.1 comment="OSPF instance for London block, router-id 160.30.132.1"
[admin@LONDON-BLOCK] > /routing/ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_LONDON_BLOCK comment="Backbone area 0.0.0.0 for London OSPF"
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /routing/ospf interface-template
[admin@LONDON-BLOCK] /routing/ospf/interface-template>
[admin@LONDON-BLOCK] /routing/ospf/interface-template> add interfaces=loopback area=backbone passive comment="Loopback London router-id 160.30.132.1 (passive)"
[admin@LONDON-BLOCK] /routing/ospf/interface-template>
[admin@LONDON-BLOCK] /routing/ospf/interface-template> add networks=10.0.0.0/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_LONDON-BLOCK_10.0.0.1_TO_UK-BLOCK_10.0.0.2"
[admin@LONDON-BLOCK] /routing/ospf/interface-template>
[admin@LONDON-BLOCK] /routing/ospf/interface-template> add networks=10.0.0.4/30 interfaces=ether3 area=backbone type=ptp comment="ETHER-3_LINK_FROM_LONDON-BLOCK_10.0.0.5_TO_NEPAL-BLOCK_10.0.0.6"
[admin@LONDON-BLOCK] /routing/ospf/interface-template>
[admin@LONDON-BLOCK] /routing/ospf/interface-template> add networks=10.0.0.8/30 interfaces=ether4 area=backbone type=ptp comment="ETHER-4_LINK_FROM_LONDON-BLOCK_10.0.0.9_TO_HIMAL-BLOCK_10.0.0.10"
[admin@LONDON-BLOCK] /routing/ospf/interface-template>
[admin@LONDON-BLOCK] /routing/ospf/interface-template> add networks=10.0.0.12/30 interfaces=ether5 area=backbone type=ptp comment="ETHER-5_LINK_FROM_LONDON-BLOCK_10.0.0.13_TO_BRIT-BLOCK_10.0.0.14"
[admin@LONDON-BLOCK] /routing/ospf/interface-template>
[admin@LONDON-BLOCK] /routing/ospf/interface-template> add networks=10.0.0.16/30 interfaces=ether6 area=backbone type=ptp comment="ETHER-6_LINK_FROM_LONDON-BLOCK_10.0.0.17_TO_SKILL-BLOCK_10.0.0.18"
[admin@LONDON-BLOCK] /routing/ospf/interface-template>
[admin@LONDON-BLOCK] /routing/ospf/interface-template> add networks=10.0.0.20/30 interfaces=ether7 area=backbone type=ptp comment="ETHER-7_LINK_FROM_LONDON-BLOCK_10.0.0.21_TO_ALUMNI-BLOCK_10.0.0.22"
[admin@LONDON-BLOCK] /routing/ospf/interface-template>
[admin@LONDON-BLOCK] /routing/ospf/interface-template> add networks=10.0.0.24/30 interfaces=ether8 area=backbone type=ptp comment="ETHER-8_LINK_FROM_LONDON-BLOCK_10.0.0.25_TO_KUMARI-BLOCK_10.0.0.26"
[admin@LONDON-BLOCK] /routing/ospf/interface-template>
[admin@LONDON-BLOCK] >
```

Figure 57: Configuration OSPF to Core LONDON-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

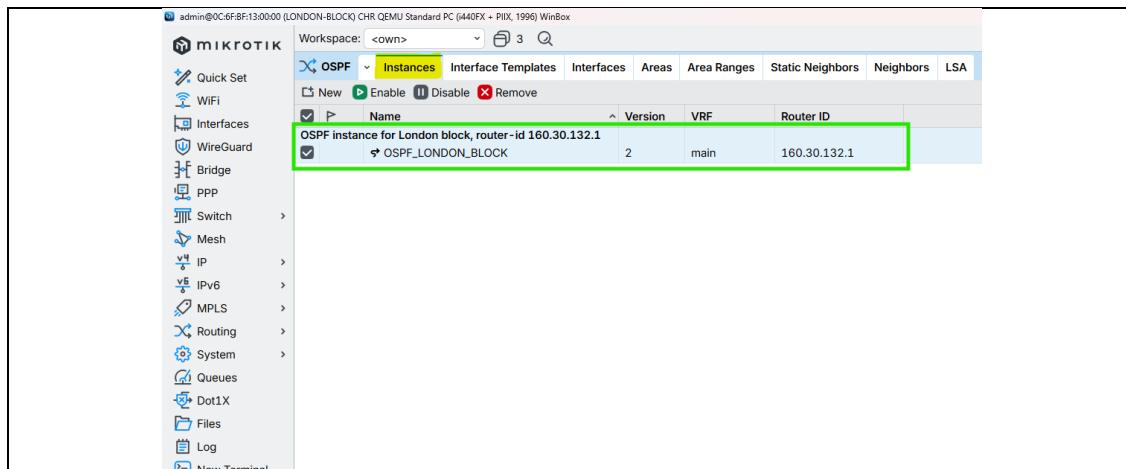


Figure 58: Configuration OSPF Instances to Core LONDON-BLOCK Router Through WINBOX

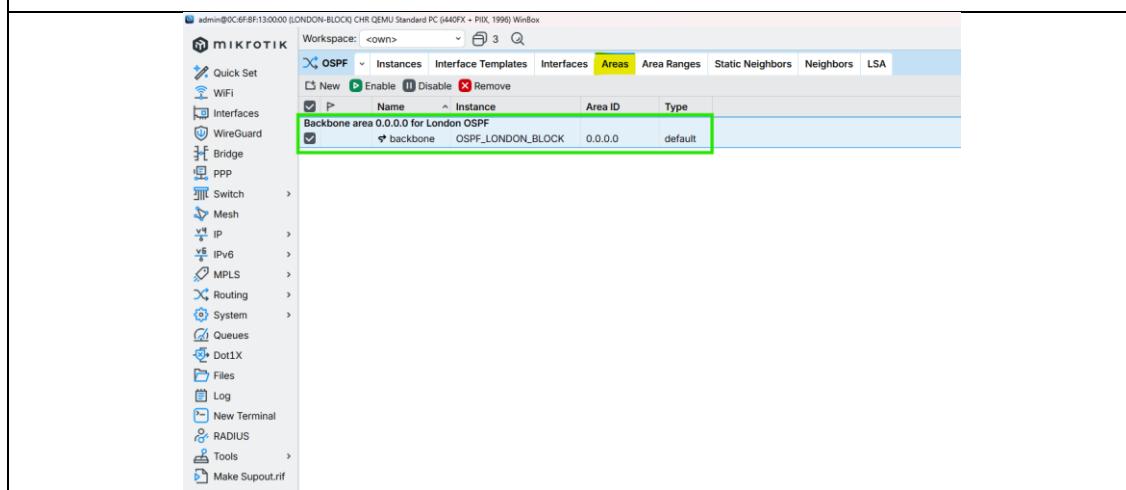


Figure 59: Configuration OSPF Area to Core LONDON-BLOCK Router Through WINBOX

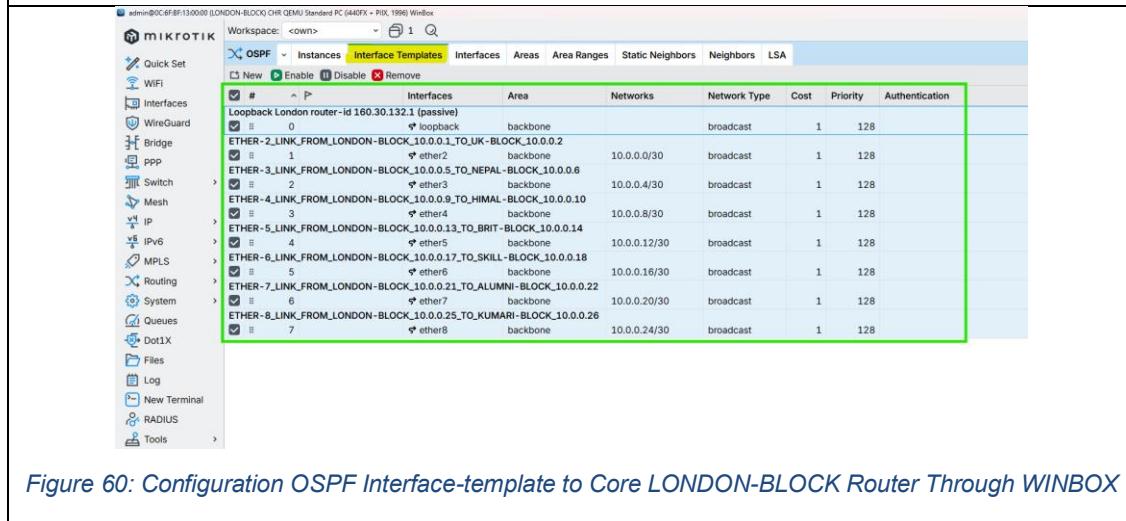


Figure 60: Configuration OSPF Interface-template to Core LONDON-BLOCK Router Through WINBOX

## 5.2. UK-BLOCK

### CMD

```
/routing ospf instance add name=OSPF_UK_BLOCK router-id=160.30.132.11 comment="OSPF instance for UK block, router-id 160.30.132.11"

/routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_UK_BLOCK comment="Backbone area 0.0.0.0 for UK OSPF"

/routing ospf interface-template

add interfaces=loopback area=backbone comment="Loopback UK router-id 160.30.132.11 (passive)"

add networks=10.0.0.0/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_UK-BLOCK_10.0.0.2_TO_LONDON-BLOCK_10.0.0.1"

add networks=10.0.0.28/30 interfaces=ether1 area=backbone type=ptp comment="ETHER-3_LINK_FROM_UK-BLOCK_10.0.0.29_TO_NEPAL-BLOCK_10.0.0.30"

add networks=10.0.0.32/30 interfaces=ether3 area=backbone type=ptp comment="ETHER-3_LINK_FROM_UK-BLOCK_10.0.0.34_TO_HIMAL-BLOCK_10.0.0.33"

/
```

```
[admin@UK-BLOCK] >
[admin@UK-BLOCK] > /routing ospf instance add name=OSPF_UK_BLOCK router-id=160.30.132.11 comment="OSPF instance for UK block, router-id 160.30.132.11"
[admin@UK-BLOCK] >
[admin@UK-BLOCK] > /routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_UK_BLOCK comment="Backbone area 0.0.0.0 for UK OSPF"
[admin@UK-BLOCK] >
[admin@UK-BLOCK] > /routing ospf interface-template
[admin@UK-BLOCK] > /routing/ospf/interface-template>
[admin@UK-BLOCK] > /routing/ospf/interface-template> add interfaces=loopback area=backbone comment="Loopback UK router-id 160.30.132.11 (passive)"
[admin@UK-BLOCK] > /routing/ospf/interface-template>
[admin@UK-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.0/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_UK-BLOCK_10.0.0.2_TO_LONDON-BLOCK_10.0.0.1"
[admin@UK-BLOCK] > /routing/ospf/interface-template>
[admin@UK-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.28/30 interfaces=ether1 area=backbone type=ptp comment="ETHER-3_LINK_FROM_UK-BLOCK_10.0.0.29_TO_NEPAL-BLOCK_10.0.0.30"
[admin@UK-BLOCK] > /routing/ospf/interface-template>
[admin@UK-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.32/30 interfaces=ether3 area=backbone type=ptp comment="ETHER-3_LINK_FROM_UK-BLOCK_10.0.0.34_TO_HIMAL-BLOCK_10.0.0.33"
[admin@UK-BLOCK] >
```

Figure 61: Configuration OSPF to UK-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

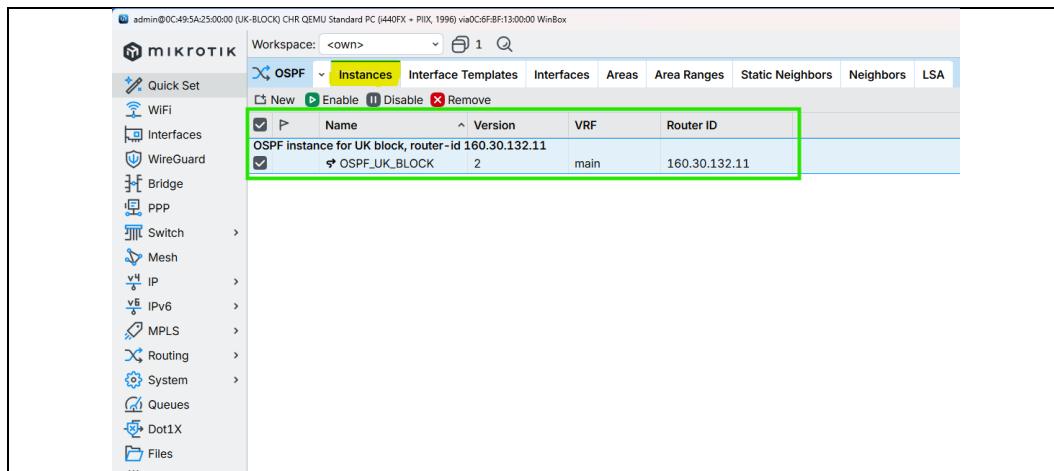


Figure 62: Configuration OSPF Instances to UK-BLOCK Router Through WINBOX

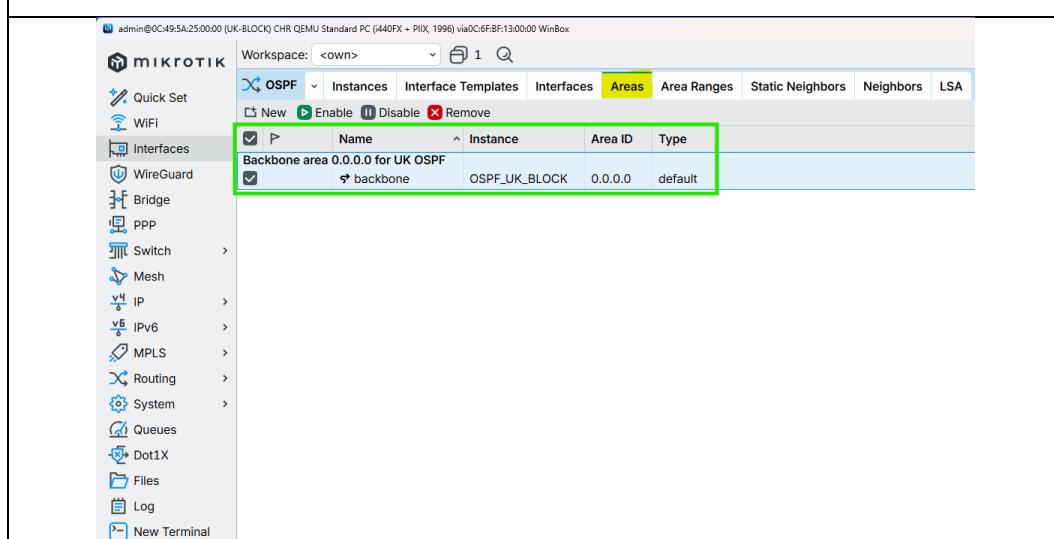


Figure 63: Configuration OSPF Area to UK-BLOCK Router Through WINBOX

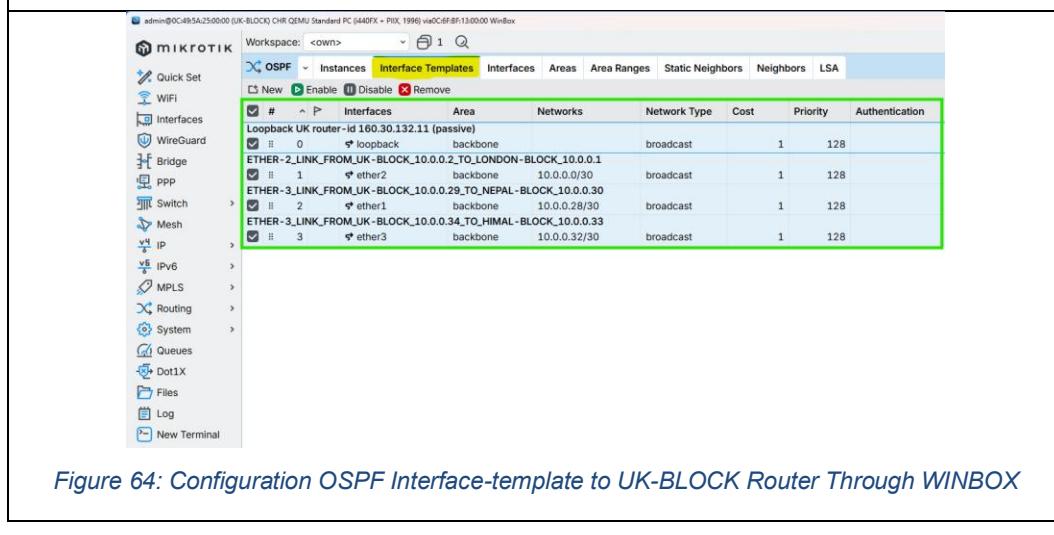


Figure 64: Configuration OSPF Interface-template to UK-BLOCK Router Through WINBOX

### 5.3. NEPAL-BLOCK

#### CMD

```
/routing ospf instance add name=OSPF_NEPAL_BLOCK router-id=160.30.132.12 comment="OSPF instance for NEPAL block,
router-id 160.30.132.12"

/routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_NEPAL_BLOCK comment="Backbone area 0.0.0.0 for
NEPAL OSPF"

/routing ospf interface-template

add interfaces=loopback area=backbone comment="Loopback NEPAL router-id 160.30.132.12 (passive)"

add networks=10.0.0.28/30 interfaces=ether1 area=backbone type=ptp comment="ETHER-1_LINK_FROM_NEPAL-
BLOCK_10.0.0.30_TO_UK-BLOCK_10.0.0.29"

add networks=10.0.0.4/30 interfaces=ether3 area=backbone type=ptp comment="ETHER-3_LINK_FROM_NEPAL-
BLOCK_10.0.0.6_TO_LONDON-BLOCK_10.0.0.5"

add networks=10.0.0.36/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_NEPAL-
BLOCK_10.0.0.37_TO_BRIT-BLOCK_10.0.0.38"
/
```

```
[admin@NEPAL-BLOCK] > /routing ospf instance add name=OSPF_NEPAL_BLOCK router-id=160.30.132.12 comment="OSPF instance for NEPAL block, router-id 160.30.132.12"
[admin@NEPAL-BLOCK] > /routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_NEPAL_BLOCK comment="Backbone area 0.0.0.0 for NEPAL OSPF"
[admin@NEPAL-BLOCK] > /routing ospf interface-template
[admin@NEPAL-BLOCK] /routing/ospf/interface-template>
[admin@NEPAL-BLOCK] /routing/ospf/interface-template> add interfaces=loopback area=backbone comment="Loopback NEPAL router-id 160.30.132.12 (passive)"
[admin@NEPAL-BLOCK] /routing/ospf/interface-template>
[admin@NEPAL-BLOCK] /routing/ospf/interface-template> add networks=10.0.0.28/30 interfaces=ether1 area=backbone type=ptp comment="ETHER-1_LINK_FROM_NEPAL-BLOCK_10.0.0.30_TO_UK-BLOCK_10.0.0.29"
[admin@NEPAL-BLOCK] /routing/ospf/interface-template>
[admin@NEPAL-BLOCK] /routing/ospf/interface-template> add networks=10.0.0.4/30 interfaces=ether3 area=backbone type=ptp comment="ETHER-3_LINK_FROM_NEPAL-BLOCK_10.0.0.6_TO_LONDON-BLOCK_10.0.0.5"
[admin@NEPAL-BLOCK] /routing/ospf/interface-template>
[admin@NEPAL-BLOCK] /routing/ospf/interface-template> add networks=10.0.0.36/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_NEPAL-BLOCK_10.0.0.37_TO_BRIT-BLOCK_10.0.0.38"
[admin@NEPAL-BLOCK] /routing/ospf/interface-template>
[admin@NEPAL-BLOCK] >
```

Figure 65: Configuration OSPF to NEPAL-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

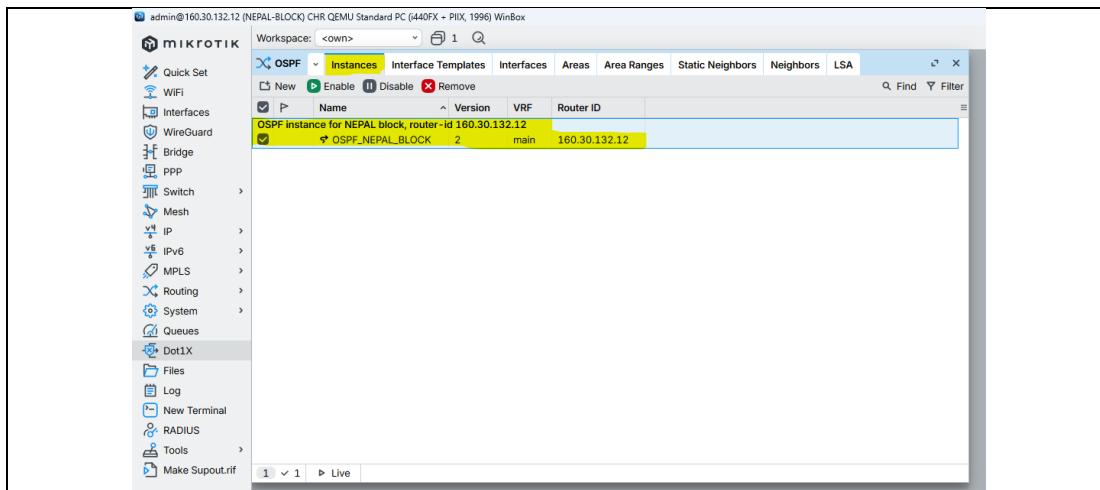


Figure 66: Configuration OSPF Instances to NEPAL-BLOCK Router Through WINBOX

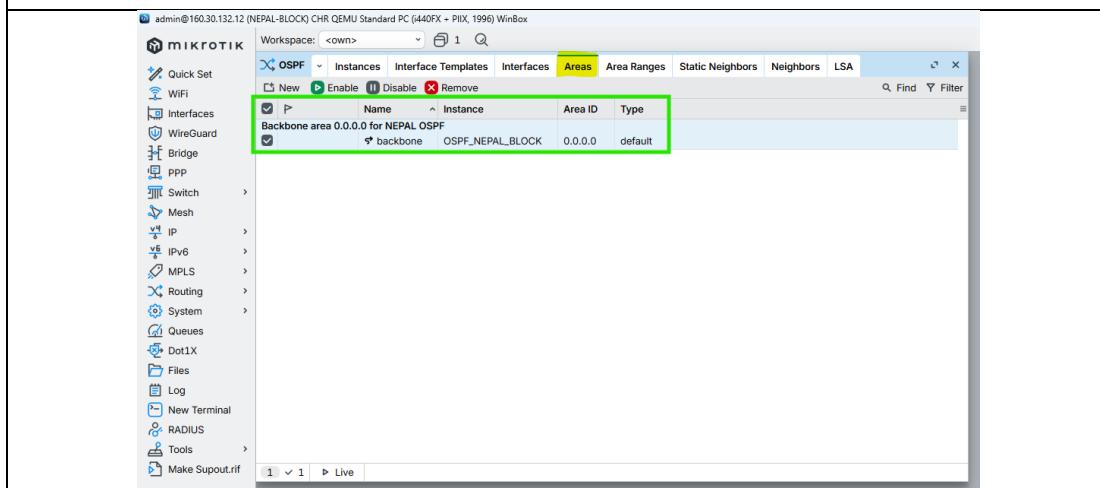


Figure 67: Configuration OSPF Area to NEPAL-BLOCK Router Through WINBOX

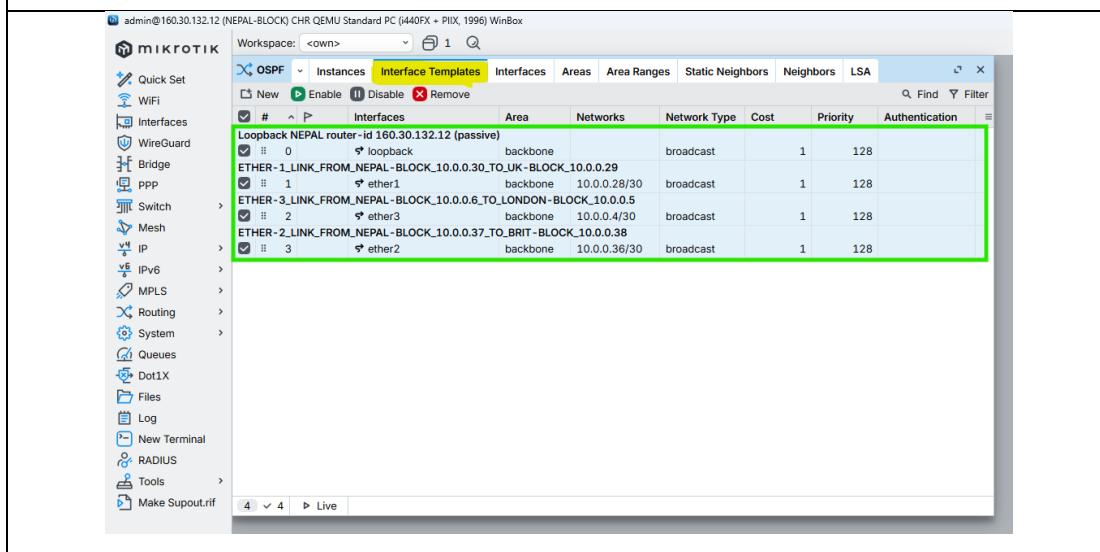


Figure 68: Configuration OSPF Interface-template to NEPAL-BLOCK Router Through WINBOX

## 5.4. HIMAL-BLOCK

### CMD

```
/routing ospf instance add name=OSPF_HIMAL_BLOCK router-id=160.30.132.13 comment="OSPF instance for HIMAL block,
router-id 160.30.132.13"

/routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_HIMAL_BLOCK comment="Backbone area 0.0.0.0 for
HIMAL OSPF"

/routing ospf interface-template

add interfaces=loopback area=backbone comment="Loopback HIMAL router-id 160.30.132.13 (passive)"

add networks=10.0.0.32/30 interfaces=ether3 area=backbone type=ptp comment="ETHER-3_LINK_FROM_HIMAL-
BLOCK_10.0.0.33_TO_UK-BLOCK_10.0.0.34"

add networks=10.0.0.8/30 interfaces=ether4 area=backbone type=ptp comment="ETHER-4_LINK_FROM_HIMAL-
BLOCK_10.0.0.10_TO_LONDON-BLOCK_10.0.0.9"

add networks=10.0.0.40/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_HIMAL-
BLOCK_10.0.0.42_TO_SKILL-BLOCK_10.0.0.41"
/
```

```
[admin@HIMAL-BLOCK] > /routing ospf instance add name=OSPF_HIMAL_BLOCK router-id=160.30.132.13 comment="OSPF instance for HIMAL block, router-id 160.30.132.13"
[admin@HIMAL-BLOCK] > /routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_HIMAL_BLOCK comment="Backbone area 0.0.0.0 for HIMAL OSPF"
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /routing ospf interface-template
[admin@HIMAL-BLOCK] > /routing/ospf/interface-template>
[admin@HIMAL-BLOCK] > /routing/ospf/interface-template> add interfaces=loopback area=backbone comment="Loopback HIMAL router-id 160.30.132.13 (passive)"
[admin@HIMAL-BLOCK] > /routing/ospf/interface-template>
[admin@HIMAL-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.32/30 interface=ether3 area=backbone type=ptp comment="ETHER-3_LINK_FROM_HIMAL-BLOCK_10.0.0.33_TO_UK-BLOCK_10.0.0.34"
[admin@HIMAL-BLOCK] > /routing/ospf/interface-template>
[admin@HIMAL-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.8/30 interfaces=ether4 area=backbone type=ptp comment="ETHER-4_LINK_FROM_HIMAL-BLOCK_10.0.0.10_TO_LONDON-BLOCK_10.0.0.9"
[admin@HIMAL-BLOCK] > /routing/ospf/interface-template>
[admin@HIMAL-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.40/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_HIMAL-BLOCK_10.0.0.42_TO_SKILL-BLOCK_10.0.0.41"
[admin@HIMAL-BLOCK] > /routing/ospf/interface-template>
[admin@HIMAL-BLOCK] >
```

Figure 69: Configuration OSPF to HIMAL-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

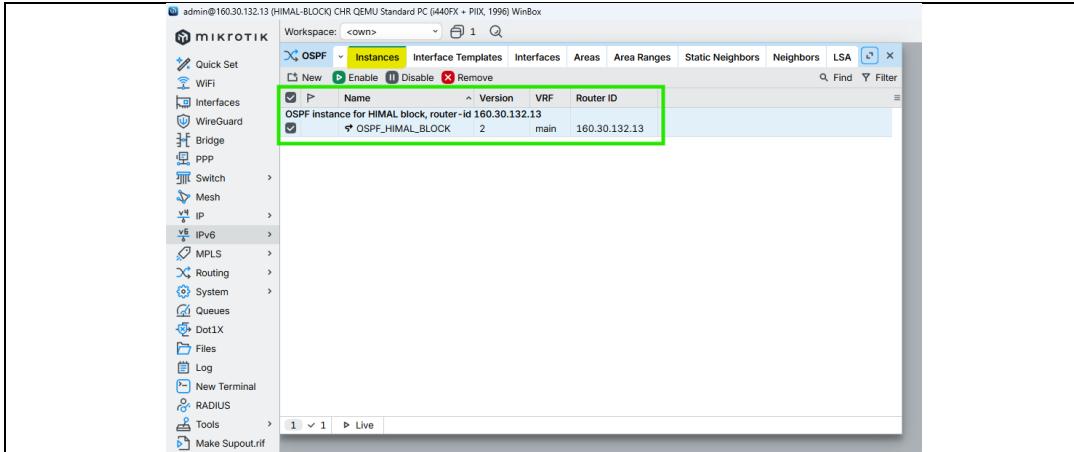


Figure 70: Configuration OSPF Instances to HIMAL-BLOCK Router Through WINBOX

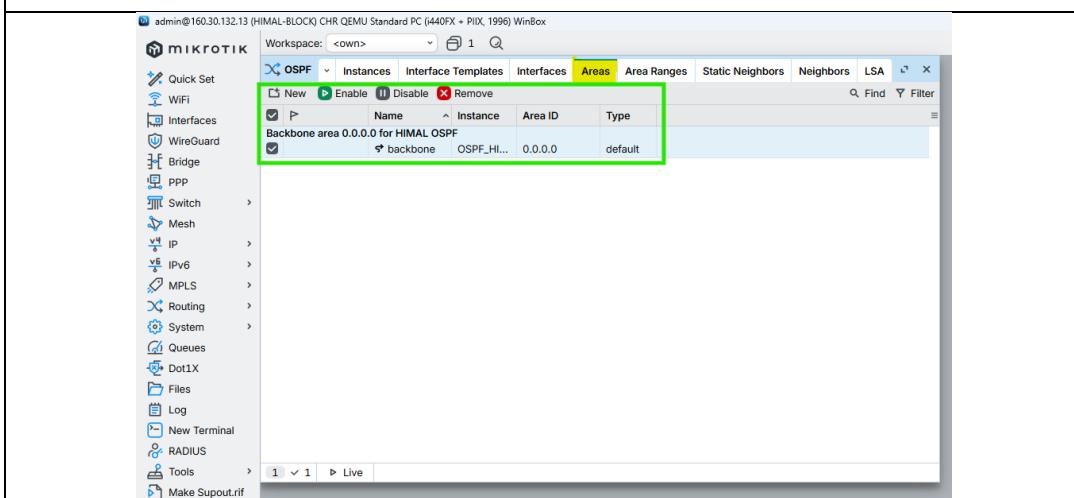


Figure 71: Configuration OSPF Area to HIMAL-BLOCK Router Through WINBOX

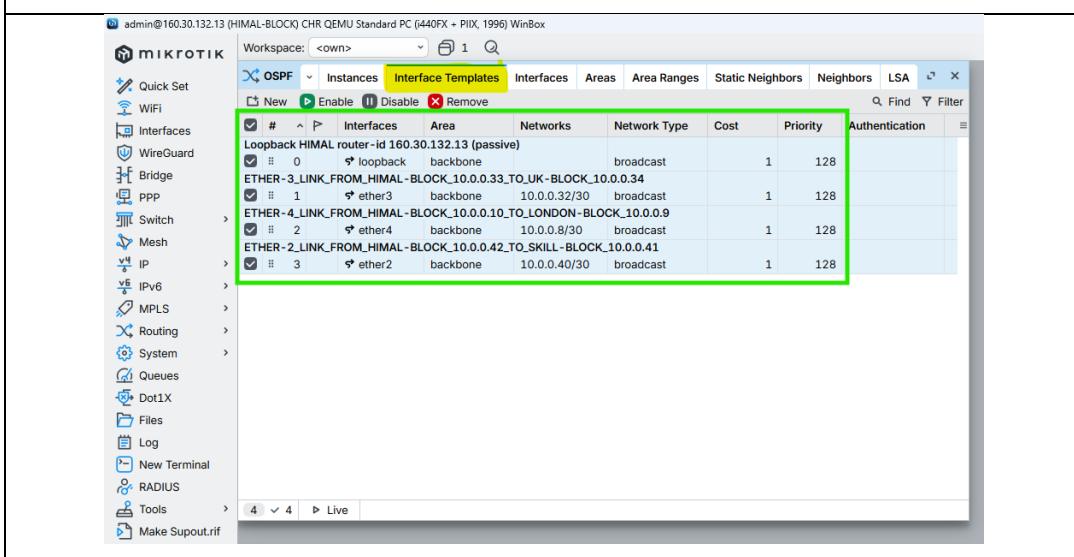


Figure 72: Configuration OSPF Interface-template to HIMAL-BLOCK Router Through WINBOX

## 5.5. BRIT-BLOCK

### CMD

```
/routing ospf instance add name=OSPF_BRIT_BLOCK router-id=160.30.132.14 comment="OSPF instance for BRIT block, router-id 160.30.132.14"

/routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_BRIT_BLOCK comment="Backbone area 0.0.0.0 for BRIT OSPF"

/routing ospf interface-template

add interfaces=loopback area=backbone comment="Loopback BRIT router-id 160.30.132.14 (passive)"

add networks=10.0.0.36/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_BRIT-BLOCK_10.0.0.38_TO_NEPAL-BLOCK_10.0.0.37"

add networks=10.0.0.12/30 interfaces=ether5 area=backbone type=ptp comment="ETHER-5_LINK_FROM_BRIT-BLOCK_10.0.0.14_TO_LONDON-BLOCK_10.0.0.13"

add networks=10.0.0.44/30 interfaces=ether1 area=backbone type=ptp comment="ETHER-1_LINK_FROM_BRIT-BLOCK_10.0.0.46_TO_SKILL-BLOCK_10.0.0.45"
```

```
[admin@BRIT-BLOCK] > /routing ospf instance add name=OSPF_BRIT_BLOCK router-id=160.30.132.14 comment="OSPF instance for BRIT block, router-id 160.30.132.14"
[admin@BRIT-BLOCK] > /routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_BRIT_BLOCK comment="Backbone area 0.0.0.0 for BRIT OSPF"
[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > /routing ospf interface-template
[admin@BRIT-BLOCK] > /routing/ospf/interface-template> add interfaces=loopback area=backbone comment="Loopback BRIT router-id 160.30.132.14 (passive)"
[admin@BRIT-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.36/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_BRIT-BLOCK_10.0.0.38_TO_NEPAL-BLOCK_10.0.0.37"
[admin@BRIT-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.12/30 interfaces=ether5 area=backbone type=ptp comment="ETHER-5_LINK_FROM_BRIT-BLOCK_10.0.0.14_TO_LONDON-BLOCK_10.0.0.13"
[admin@BRIT-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.44/30 interfaces=ether1 area=backbone type=ptp comment="ETHER-1_LINK_FROM_BRIT-BLOCK_10.0.0.46_TO_SKILL-BLOCK_10.0.0.45"
[admin@BRIT-BLOCK] >
```

Figure 73: Configuration OSPF to BRIT-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

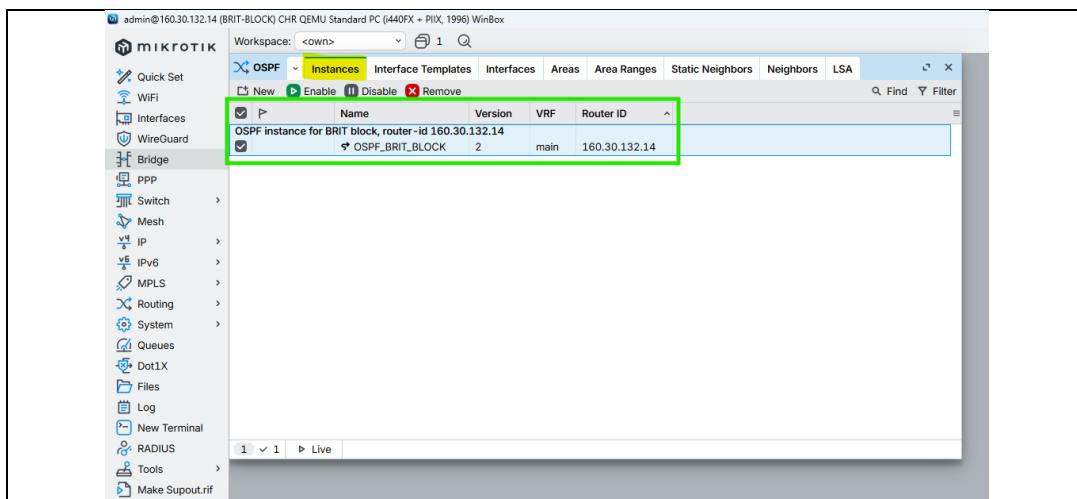


Figure 74: Configuration OSPF Instances to BRIT-BLOCK Router Through WINBOX

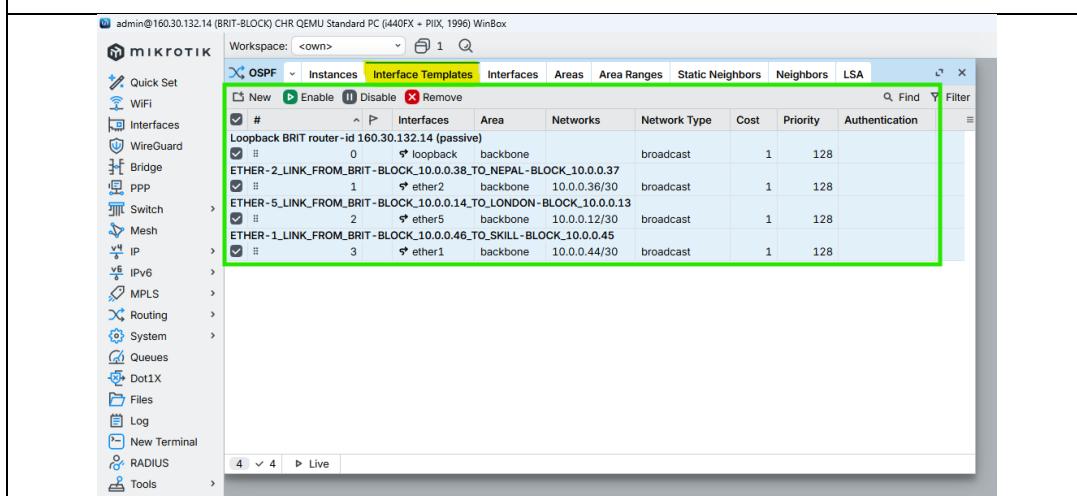


Figure 75: Configuration OSPF Area to BRIT-BLOCK Router Through WINBOX

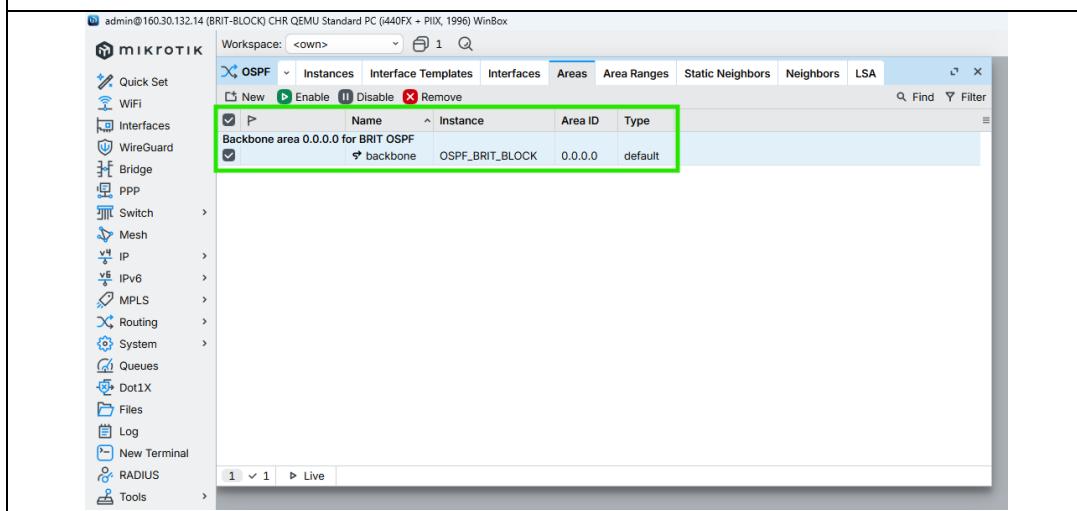


Figure 76: Configuration OSPF Interface-template to BRIT-BLOCK Router Through WINBOX

## 5.6. SKILL-BLOCK

### CMD

```
/routing ospf instance add name=OSPF_SKILL_BLOCK router-id=160.30.132.15 comment="OSPF instance for SKILL block,
router-id 160.30.132.15"

/routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_SKILL_BLOCK comment="Backbone area 0.0.0.0 for
SKILL OSPF"

/routing ospf interface-template

add interfaces=loopback area=backbone comment="Loopback SKILL router-id 160.30.132.15 (passive)"

add networks=10.0.0.40/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_SKILL-
BLOCK_10.0.0.41_TO_HIMAL-BLOCK_10.0.0.42"

add networks=10.0.0.16/30 interfaces=ether6 area=backbone type=ptp comment="ETHER-6_LINK_FROM_SKILL-
BLOCK_10.0.0.18_TO_LONDON-BLOCK_10.0.0.17"

add networks=10.0.0.48/30 interfaces=ether1 area=backbone type=ptp comment="ETHER-1_LINK_FROM_SKILL-
BLOCK_10.0.0.50_TO_ALUMNI-BLOCK_10.0.0.49"
```

```
[admin@SKILL-BLOCK] > /routing ospf instance add name=OSPF_SKILL_BLOCK router-id=160.30.132.15 comment="OSPF instance for SKILL block, router-id 160.30.132.15"
[admin@SKILL-BLOCK] > /routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_SKILL_BLOCK comment="Backbone area 0.0.0.0 for SKILL OSPF"
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /routing ospf interface-template
[admin@SKILL-BLOCK] > /routing/ospf/interface-template>
[admin@SKILL-BLOCK] > /routing/ospf/interface-template> add interfaces=loopback area=backbone comment="Loopback SKILL router-id 160.30.132.15 (passive)"
[admin@SKILL-BLOCK] > /routing/ospf/interface-template>
[admin@SKILL-BLOCK] > /routing/ospf/interface-template> add network=10.0.0.40/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_SKILL-BLOCK_10.0.0.41_TO_HIMAL-BLOCK_10.0.0.42"
[admin@SKILL-BLOCK] > /routing/ospf/interface-template>
[admin@SKILL-BLOCK] > /routing/ospf/interface-template> add network=10.0.0.16/30 interfaces=ether6 area=backbone type=ptp comment="ETHER-6_LINK_FROM_SKILL-BLOCK_10.0.0.18_TO_LONDON-BLOCK_10.0.0.17"
[admin@SKILL-BLOCK] > /routing/ospf/interface-template>
[admin@SKILL-BLOCK] > /routing/ospf/interface-template> add network=10.0.0.48/30 interfaces=ether1 area=backbone type=ptp comment="ETHER-1_LINK_FROM_SKILL-BLOCK_10.0.0.50_TO_ALUMNI-BLOCK_10.0.0.49"
[admin@SKILL-BLOCK] >
```

Figure 77: Configuration OSPF to SKILL-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

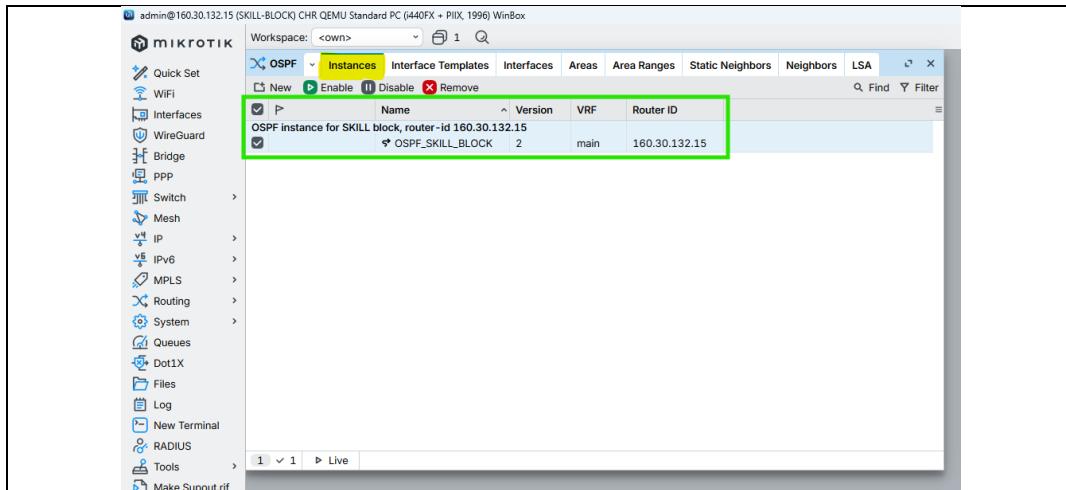


Figure 78: Configuration OSPF Instances to SKILL-BLOCK Router Through WINBOX

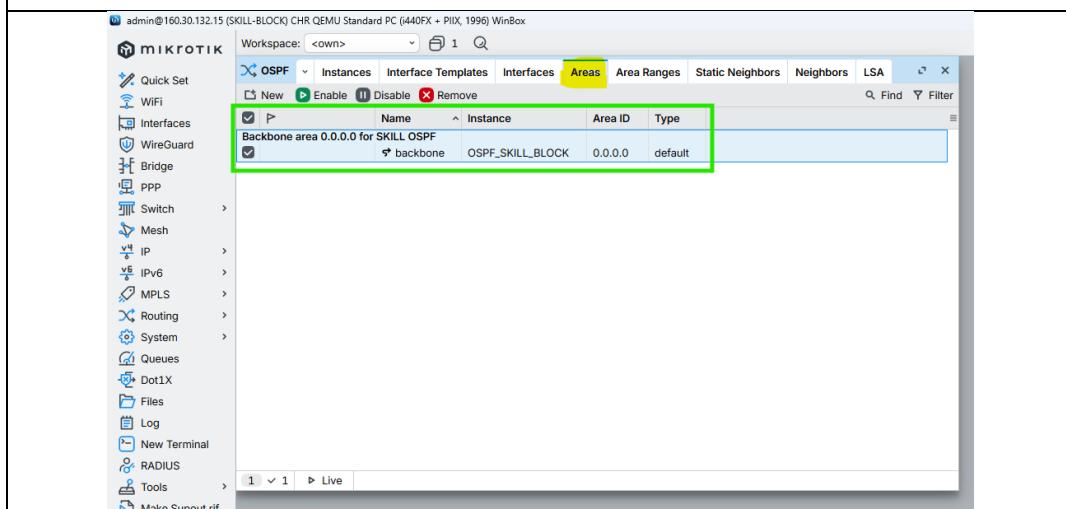


Figure 79: Configuration OSPF Area to SKILL-BLOCK Router Through WINBOX

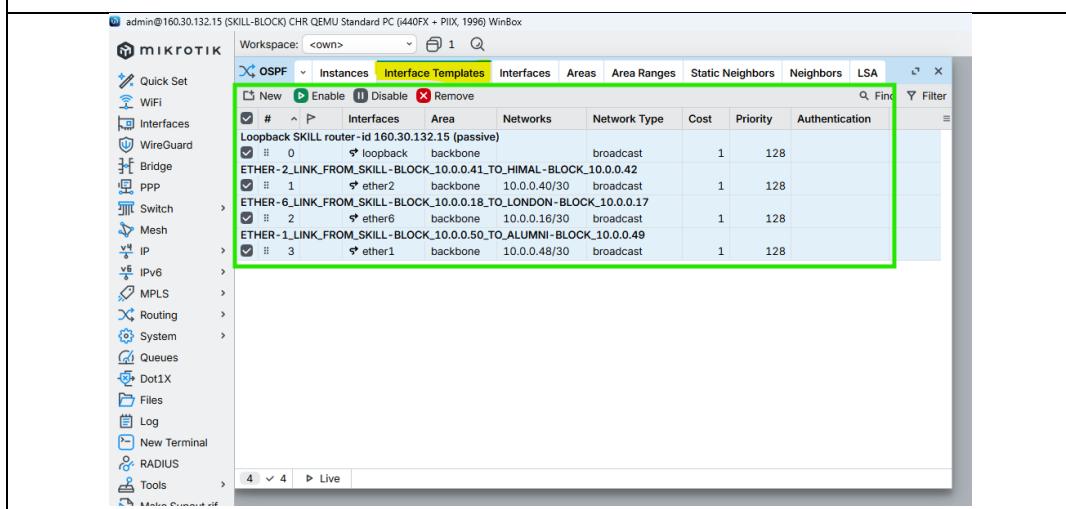


Figure 80: Configuration OSPF Interface-template to SKILL-BLOCK Router Through WINBOX

## 5.7. ALUMNI-BLOCK

### CMD

```
/routing ospf instance add name=OSPF_ALUMNI_BLOCK router-id=160.30.132.16 comment="OSPF instance for ALUMNI block, router-id 160.30.132.16"

/routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_ALUMNI_BLOCK comment="Backbone area 0.0.0.0 for ALUMNI OSPF"

/routing ospf interface-template

add interfaces=loopback area=backbone comment="Loopback ALUMNI router-id 160.30.132.16 (passive)"

add networks=10.0.0.48/30 interfaces=ether1 area=backbone type=ptp comment="ETHER-1_LINK_FROM_ALUMNI-BLOCK_10.0.0.49_TO_SKILL-BLOCK_10.0.0.50"

add networks=10.0.0.20/30 interfaces=ether7 area=backbone type=ptp comment="ETHER-7_LINK_FROM_ALUMNI-BLOCK_10.0.0.22_TO_LONDON-BLOCK_10.0.0.21"

add networks=10.0.0.52/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_ALUMNI-BLOCK_10.0.0.53_TO_KUMARI-BLOCK_10.0.0.54"
```

```
[admin@ALUMNI-BLOCK] > /routing ospf instance add name=OSPF_ALUMNI_BLOCK router-id=160.30.132.16 comment="OSPF instance for ALUMNI block, router-id 160.30.132.16"
[admin@ALUMNI-BLOCK] > /routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_ALUMNI_BLOCK comment="Backbone area 0.0.0.0 for ALUMNI OSPF"
[admin@ALUMNI-BLOCK] >
[admin@ALUMNI-BLOCK] > /routing ospf interface-template
[admin@ALUMNI-BLOCK] > /routing/ospf/interface-template>
[admin@ALUMNI-BLOCK] > /routing/ospf/interface-template> add interfaces=loopback area=backbone comment="Loopback ALUMNI router-id 160.30.132.16 (passive)"
[admin@ALUMNI-BLOCK] > /routing/ospf/interface-template>
[admin@ALUMNI-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.48/30 interfaces=ether1 area=backbone type=ptp comment="ETHER-1_LINK_FROM_ALUMNI-BLOCK_10.0.0.49_TO_SKILL-BLOCK_10.0.0.50"
[admin@ALUMNI-BLOCK] > /routing/ospf/interface-template>
[admin@ALUMNI-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.20/30 interfaces=ether7 area=backbone type=ptp comment="ETHER-7_LINK_FROM_ALUMNI-BLOCK_10.0.0.22_TO_LONDON-BLOCK_10.0.0.21"
[admin@ALUMNI-BLOCK] > /routing/ospf/interface-template>
[admin@ALUMNI-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.52/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_ALUMNI-BLOCK_10.0.0.53_TO_KUMARI-BLOCK_10.0.0.54"
[admin@ALUMNI-BLOCK] >
```

Figure 81: Configuration OSPF to ALUMNI-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

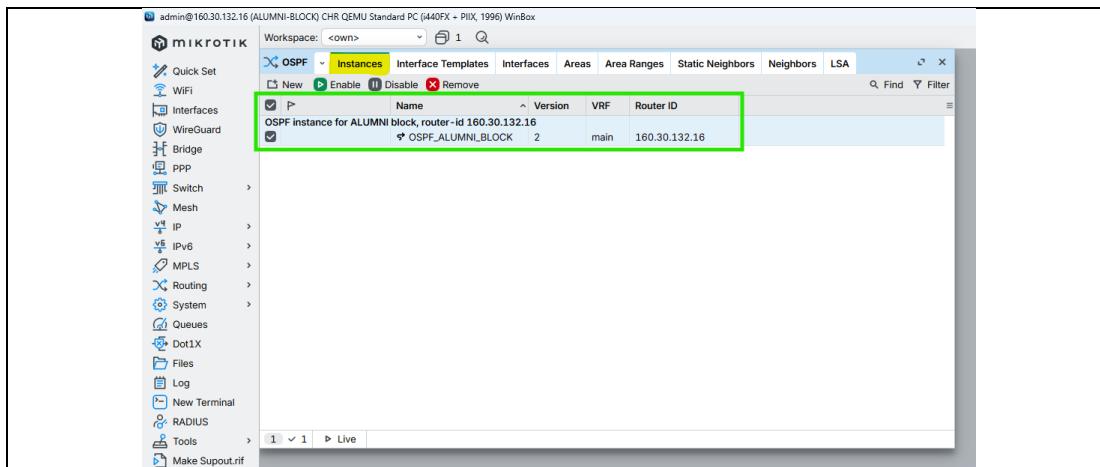


Figure 82: Configuration OSPF Instances to ALUMNI-BLOCK Router Through WINBOX

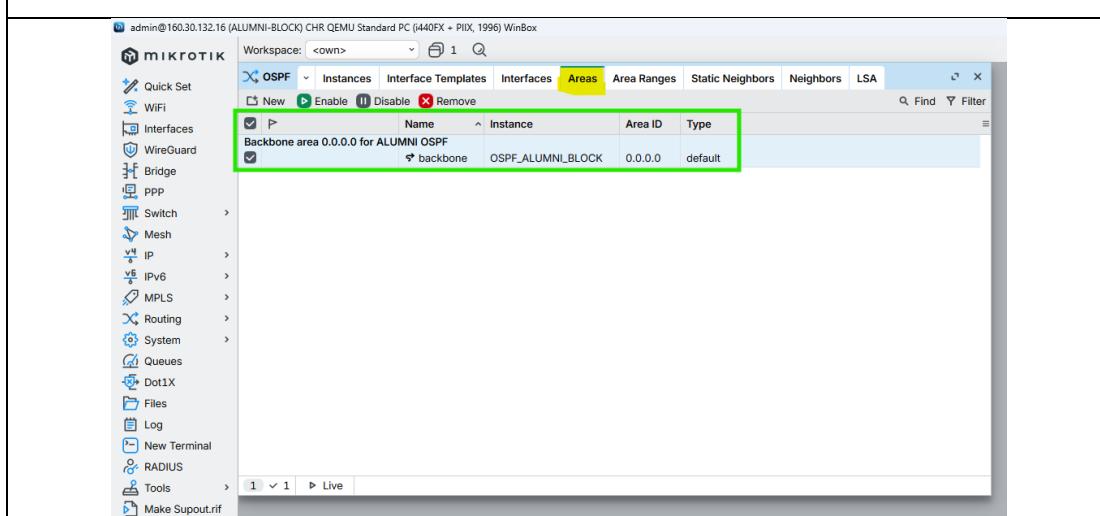


Figure 83: Configuration OSPF Area to ALUMNI-BLOCK Router Through WINBOX

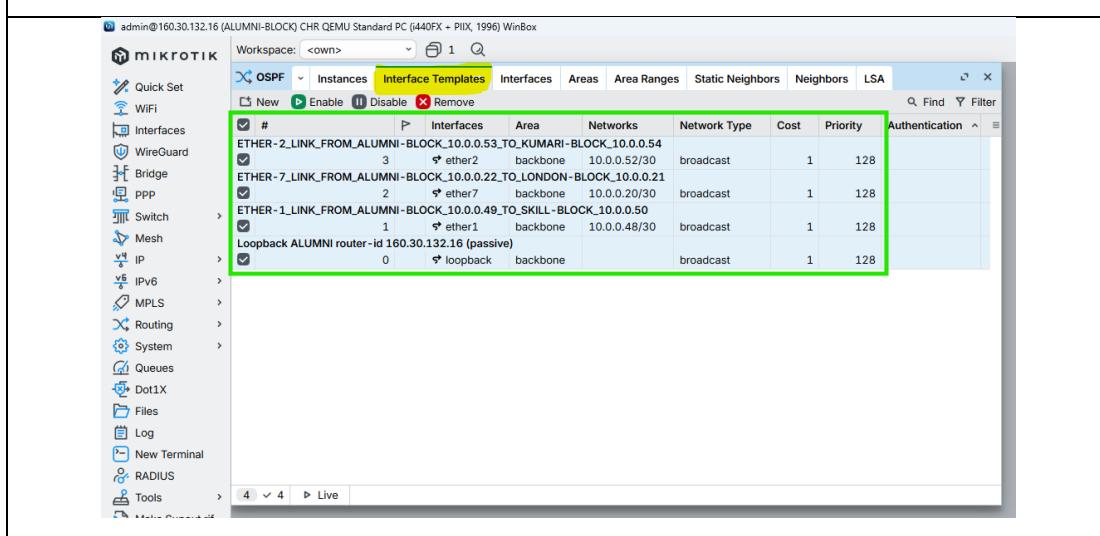


Figure 84: Configuration OSPF Interface-template to ALUMNI-BLOCK Router Through WINBOX

## 5.8. KUMARI-BLOCK

### CMD

```
/routing ospf instance add name=OSPF_KUMARI_BLOCK router-id=160.30.132.17 comment="OSPF instance for KUMARI block,
router-id 160.30.132.17"

/routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_KUMARI_BLOCK comment="Backbone area 0.0.0.0 for
KUMARI OSPF"

/routing ospf interface-template

add interfaces=loopback area=backbone comment="Loopback KUMARI router-id 160.30.132.17 (passive)"

add networks=10.0.0.44/30 interfaces=ether1 area=backbone type=ptp comment="ETHER-1_LINK_FROM_KUMARI-
BLOCK_10.0.0.45_TO_BRIT-BLOCK_10.0.0.46"

add networks=10.0.0.24/30 interfaces=ether8 area=backbone type=ptp comment="ETHER-8_LINK_FROM_KUMARI-
BLOCK_10.0.0.26_TO_LONDON-BLOCK_10.0.0.25"

add networks=10.0.0.52/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_KUMARI-
BLOCK_10.0.0.54_TO_ALUMNI-BLOCK_10.0.0.53"
```

```
[admin@KUMARI-BLOCK] >
[admin@KUMARI-BLOCK] > /routing ospf instance add name=OSPF_KUMARI_BLOCK router-id=160.30.132.17 comment="OSPF instance for KUMARI block, router-id 160.30.132.17"
[admin@KUMARI-BLOCK] > /routing ospf area add name=backbone area-id=0.0.0.0 instance=OSPF_KUMARI_BLOCK comment="Backbone area 0.0.0.0 for KUMARI OSPF"
[admin@KUMARI-BLOCK] >
[admin@KUMARI-BLOCK] > /routing ospf interface-template
[admin@KUMARI-BLOCK] > /routing/ospf/interface-template> add interfaces=loopback area=backbone comment="Loopback KUMARI router-id 160.30.132.17 (passive)"
[admin@KUMARI-BLOCK] > /routing/ospf/interface-template>
[admin@KUMARI-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.44/30 interfaces=ether1 area=backbone type=ptp comment="ETHER-1_LINK_FROM_KUMARI-BLOCK_10.0.0.45_TO_BRIT-BLOCK_10.0.0.46"
[admin@KUMARI-BLOCK] > /routing/ospf/interface-template>
[admin@KUMARI-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.24/30 interfaces=ether8 area=backbone type=ptp comment="ETHER-8_LINK_FROM_KUMARI-BLOCK_10.0.0.26_TO_LONDON-BLOCK_10.0.0.25"
[admin@KUMARI-BLOCK] > /routing/ospf/interface-template>
[admin@KUMARI-BLOCK] > /routing/ospf/interface-template> add networks=10.0.0.52/30 interfaces=ether2 area=backbone type=ptp comment="ETHER-2_LINK_FROM_KUMARI-BLOCK_10.0.0.54_TO_ALUMNI-BLOCK_10.0.0.53"
[admin@KUMARI-BLOCK] >
```

Figure 85: Configuration OSPF to KUMARI-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

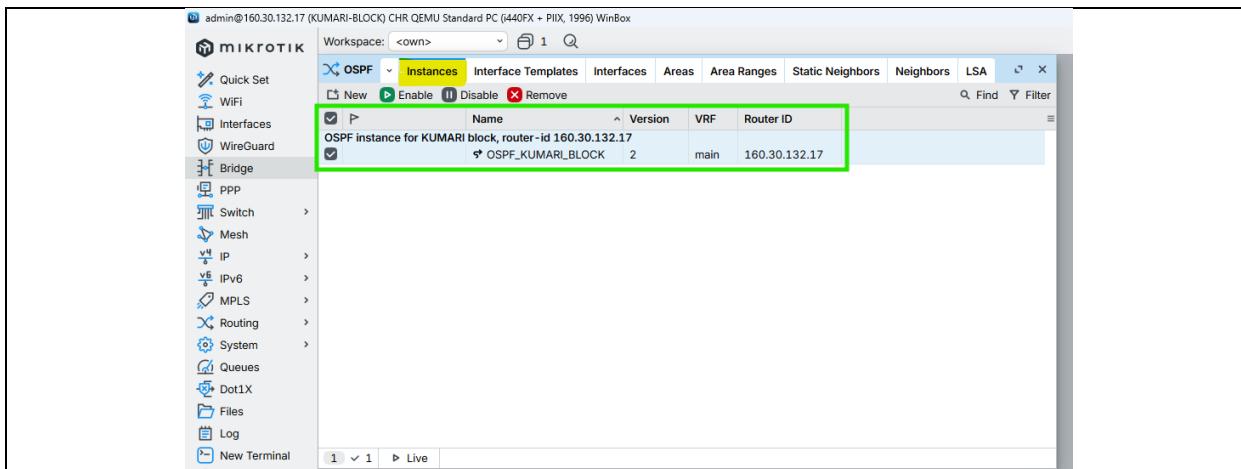


Figure 86: Configuration OSPF Instances to KUMARI-BLOCK Router Through WINBOX

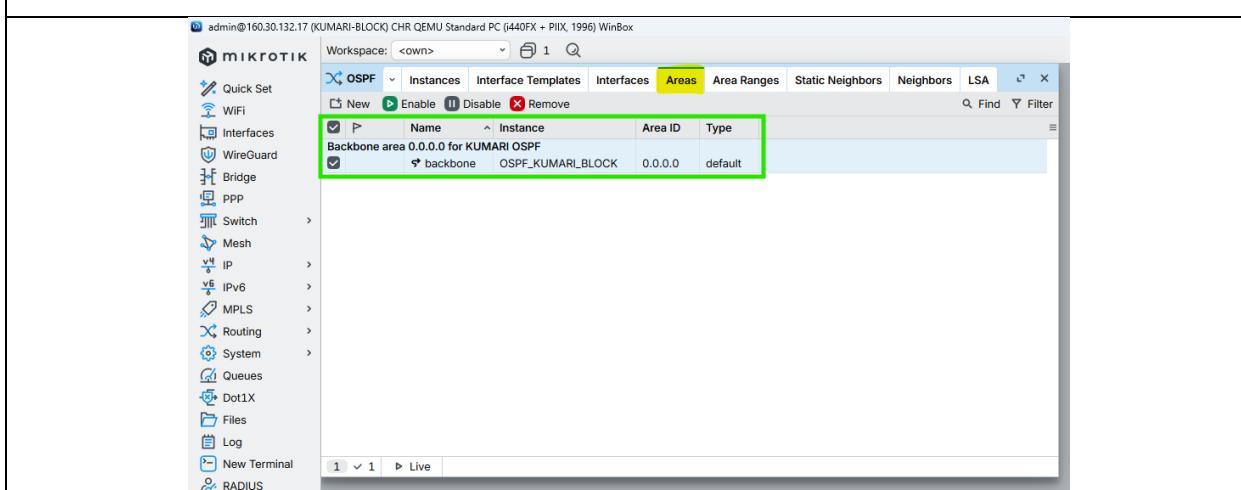


Figure 87: Configuration OSPF Area to KUMARI-BLOCK Router Through WINBOX

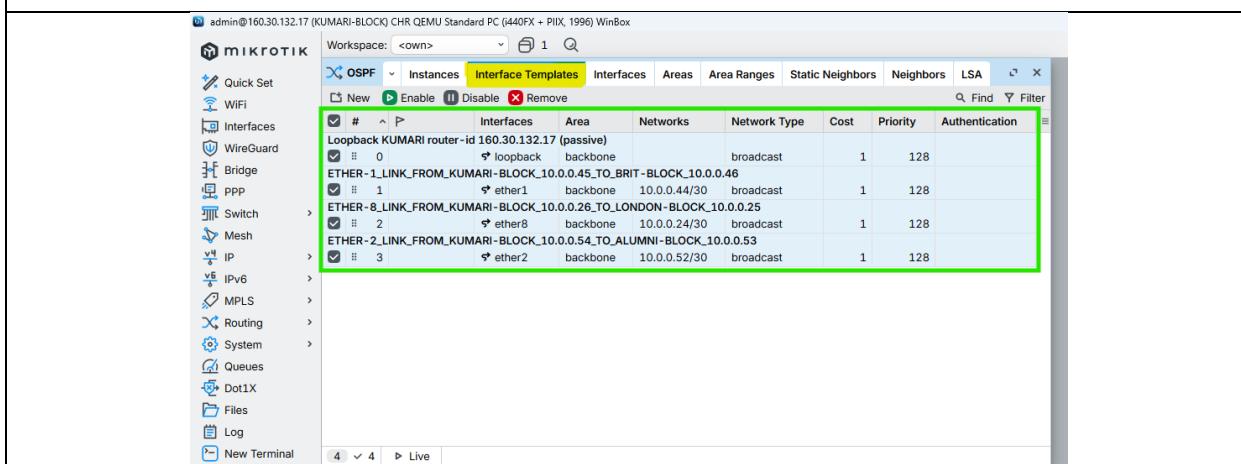


Figure 88: Configuration OSPF Interface-template to KUMARI-BLOCK Router Through WINBOX

## 6. Configure Management Access from PC to MPLS Loopback

### 6.1. PC (VMware Host) – Static Route Configuration

To allow the PC (VMware host) to reach the MPLS loopback network 160.30.132.0/24, a persistent static route is added on the PC pointing to the LONDON-BLOCK management interface.

CMD (Windows PC)

```
route -p add 160.30.132.0 mask 255.255.255.0 192.168.174.173
```

```
>route -p add 160.30.132.0 mask 255.255.255.0 192.168.174.173  
OK!
```

Figure 89: 6.1. PC (VMware Host) - Static Route Configuration

### 6.2. UK-BLOCK – OSPF Configuration (No Management Network Advertisement)

LONDON-BLOCK acts as the central management gateway between the PC and the MPLS core. UK-BLOCK participates only in MPLS core OSPF. The VMware management network must not be added to OSPF.

```
/routing ospf interface-template  
add networks=192.168.174.0/24 interfaces=ether9 area=backbone  
/
```

```
[admin@LONDON-BLOCK] >  
[admin@LONDON-BLOCK] > /routing ospf interface-template  
[admin@LONDON-BLOCK] /routing/ospf/interface-template> add networks=192.168.174.0/24 interfaces=ether9 area=backbone  
[admin@LONDON-BLOCK] /routing/ospf/interface-template> /  
[admin@LONDON-BLOCK] >
```

Figure 90: 6.2. UK-BLOCK - OSPF Configuration (No Management Network Advertisement)

### **6.3. Disable RoMON temporarily to avoid confusion**

Cmd

```
/tool romon set enabled=no
```

### **6.4. End-to-End Verification (From PC)**

Ping Test

```
ping 160.30.132.1
```

```
ping 160.30.132.11
```

```
ping 160.30.132.14
```

```
ping 160.30.132.16
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
Windows [Administrator] >ping 160.30.132.1
Pinging 160.30.132.1 with 32 bytes of data:
Reply from 160.30.132.1: bytes=32 time<1ms TTL=64
Reply from 160.30.132.1: bytes=32 time<1ms TTL=64
Reply from 160.30.132.1: bytes=32 time=1ms TTL=64
Reply from 160.30.132.1: bytes=32 time<1ms TTL=64

Ping statistics for 160.30.132.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

>ping 160.30.132.11
Pinging 160.30.132.11 with 32 bytes of data:
Reply from 160.30.132.11: bytes=32 time<1ms TTL=63
Reply from 160.30.132.11: bytes=32 time=1ms TTL=63
Reply from 160.30.132.11: bytes=32 time=1ms TTL=63
Reply from 160.30.132.11: bytes=32 time=1ms TTL=63

Ping statistics for 160.30.132.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

>ping 160.30.132.14
Pinging 160.30.132.14 with 32 bytes of data:
Reply from 160.30.132.14: bytes=32 time<1ms TTL=63
Reply from 160.30.132.14: bytes=32 time=2ms TTL=63
Reply from 160.30.132.14: bytes=32 time=1ms TTL=63
Reply from 160.30.132.14: bytes=32 time=1ms TTL=63

Ping statistics for 160.30.132.14:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 1ms

>ping 160.30.132.16
Pinging 160.30.132.16 with 32 bytes of data:
Reply from 160.30.132.16: bytes=32 time<1ms TTL=63
Reply from 160.30.132.16: bytes=32 time<1ms TTL=63
Reply from 160.30.132.16: bytes=32 time=1ms TTL=63
Reply from 160.30.132.16: bytes=32 time=1ms TTL=63

Ping statistics for 160.30.132.16:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Figure 91: 6.4.: End-to-End Verification (From PC)

## 7. Configuration MPLS to all Core Routers

### 7.1. LONDON-BLOCK

CMD

```
/mpls ldp add lsr-id=160.30.132.1 transport-addresses=160.30.132.1 comment="Enable MPLS LDP using loopback 160.30.132.1"

/mpls ldp set [find lsr-id=160.30.132.1] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.1"
```

```
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /mpls ldp add lsr-id=160.30.132.1 transport-addresses=160.30.132.1 comment="Enable MPLS LDP using loopback 160.30.132.1"
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /mpls ldp set [find lsr-id=160.30.132.1] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.1"
[admin@LONDON-BLOCK] >
```

Figure 92: Configuration MPLS to LONDON-BLOCK Router Through CMD

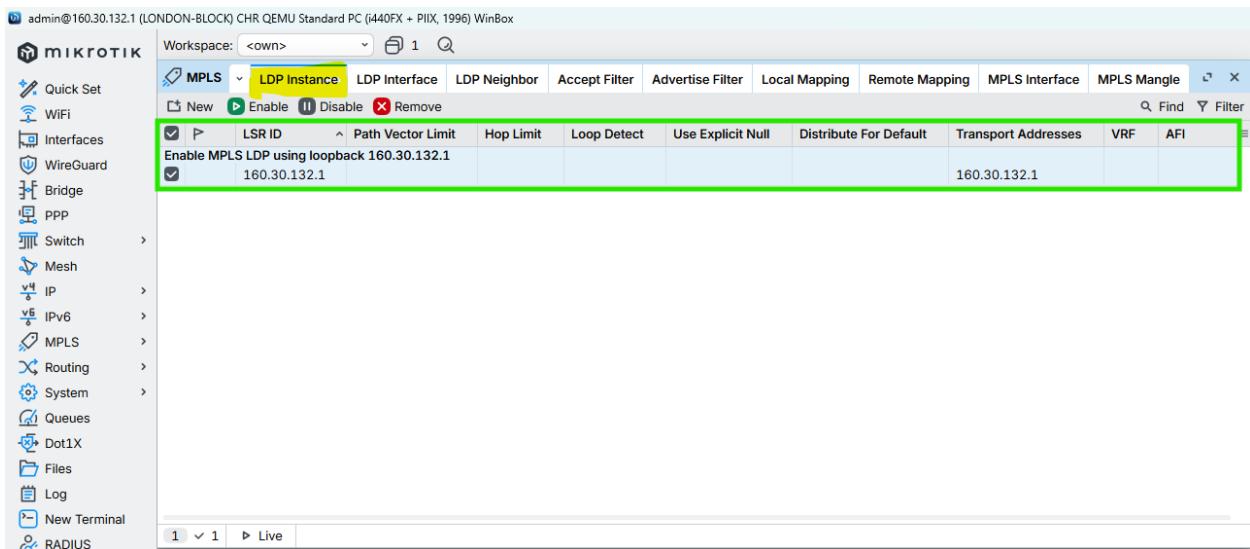


Figure 93: Configuration MPLS to LONDON-BLOCK Router Through WINBOX

### 7.2. UK-BLOCK

CMD

```
/mpls ldp add lsr-id=160.30.132.11 transport-addresses=160.30.132.11 comment="Enable MPLS LDP using loopback 160.30.132.11"

/mpls ldp set [find lsr-id=160.30.132.11] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.11"
```

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```
[admin@UK-BLOCK] >
[admin@UK-BLOCK] > /mpls ldp add lsr-id=160.30.132.11 transport-addresses=160.30.132.11 comment="Enable MPLS LDP using loopback 160.30.132.11"
[admin@UK-BLOCK] >
[admin@UK-BLOCK] > /mpls ldp set [find lsr-id=160.30.132.11] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.11"
[admin@UK-BLOCK] >
```

Figure 94: Configuration MPLS to UK-BLOCK Router Through CMD

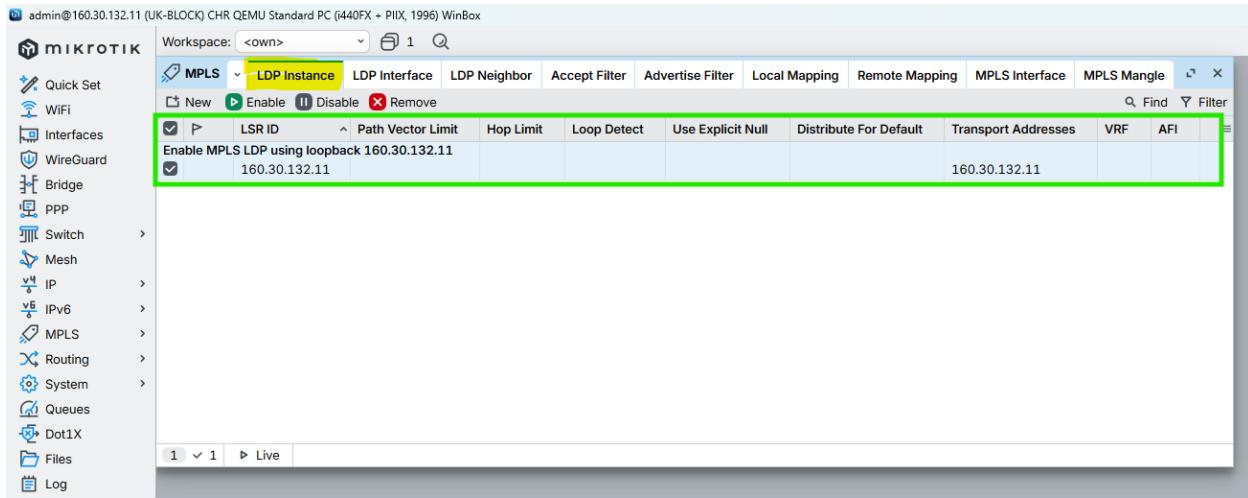


Figure 95: Configuration MPLS to UK-BLOCK Router Through WINBOX

### 7.3. NEPAL-BLOCK

#### CMD

```
/mpls ldp add lsr-id=160.30.132.12 transport-addresses=160.30.132.12 comment="Enable MPLS LDP using loopback 160.30.132.12"

/mpls ldp set [find lsr-id=160.30.132.12] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.12"
```

```
[admin@NEPAL-BLOCK] >
[admin@NEPAL-BLOCK] > /mpls ldp add lsr-id=160.30.132.12 transport-addresses=160.30.132.12 comment="Enable MPLS LDP using loopback 160.30.132.12"
[admin@NEPAL-BLOCK] >
[admin@NEPAL-BLOCK] > /mpls ldp set [find lsr-id=160.30.132.12] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.12"
[admin@NEPAL-BLOCK] >
```

Figure 96: Configuration MPLS to NEPAL-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

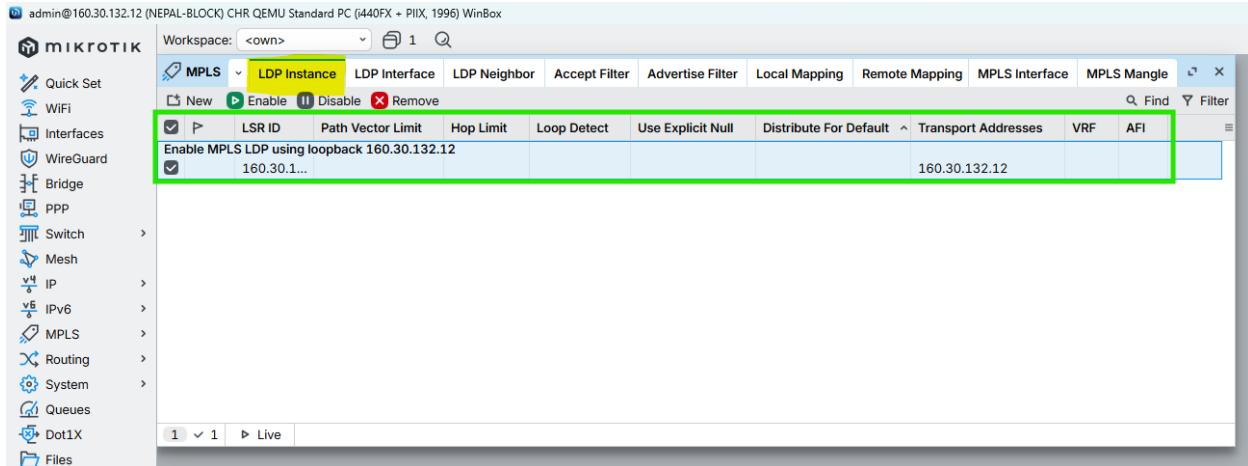


Figure 97: Configuration MPLS to NEPAL-BLOCK Router Through WINBOX

## 7.4. HIMAL-BLOCK

### CMD

```
/mpls ldp add lsr-id=160.30.132.13 transport-addresses=160.30.132.13 comment="Enable MPLS LDP using loopback 160.30.132.13"

/mpls ldp set [find lsr-id=160.30.132.13] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.13"
```

```
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /mpls ldp add lsr-id=160.30.132.13 transport-addresses=160.30.132.13 comment="Enable MPLS LDP using loopback 160.30.132.13"
[admin@HIMAL-BLOCK] > /mpls ldp set [find lsr-id=160.30.132.13] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.13"
[admin@HIMAL-BLOCK] >
```

Figure 98: Configuration MPLS to HIMAL-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

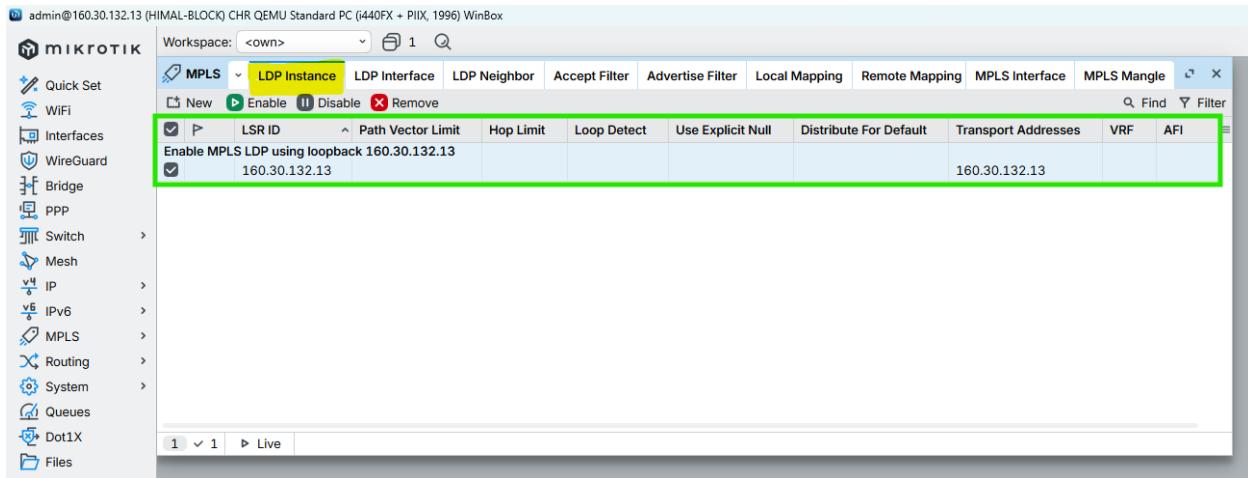


Figure 99: Configuration MPLS to HIMAL-BLOCK Router Through WINBOX

## 7.5. BRIT-BLOCK

### CMD

```
/mpls ldp add lsr-id=160.30.132.14 transport-addresses=160.30.132.14 comment="Enable MPLS LDP using loopback 160.30.132.14"

/mpls ldp set [find lsr-id=160.30.132.14] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.14"
```

```
[admin@BRIT-BLOCK] > /mpls ldp add lsr-id=160.30.132.14 transport-addresses=160.30.132.14 comment="Enable MPLS LDP using loopback 160.30.132.14"
[admin@BRIT-BLOCK] > /mpls ldp set [find lsr-id=160.30.132.14] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.14"
[admin@BRIT-BLOCK] >
```

Figure 100: Configuration MPLS to BRIT-BLOCK Router Through CMD

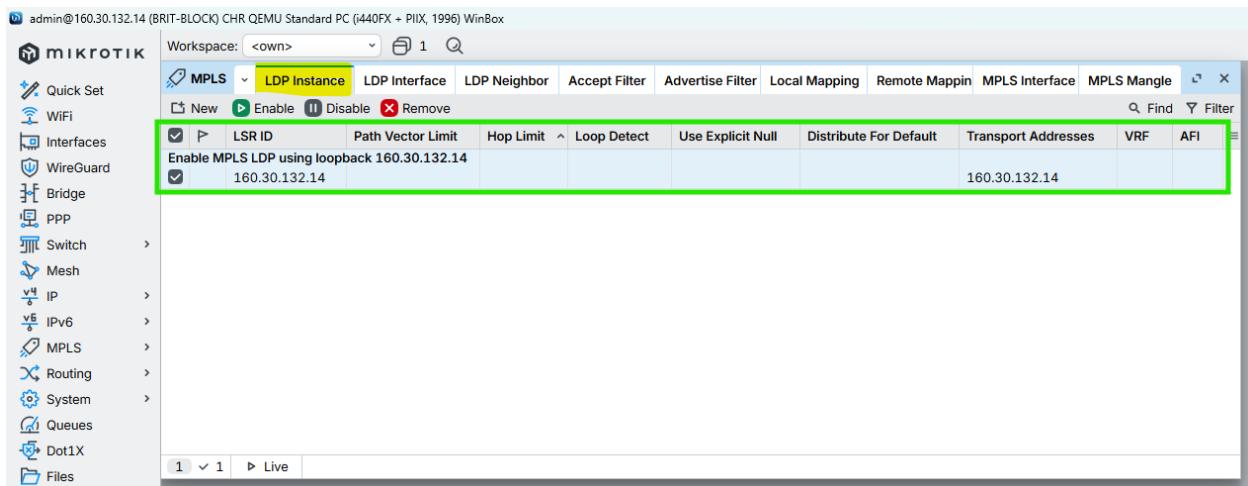


Figure 101: Configuration MPLS to BRIT-BLOCK Router Through WINBOX

## 7.6. SKILL-BLOCK

### CMD

```
/mpls ldp add lsr-id=160.30.132.15 transport-addresses=160.30.132.15 comment="Enable MPLS LDP using loopback 160.30.132.15"

/mpls ldp set [find lsr-id=160.30.132.15] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.15"
```

```
[admin@SKILL-BLOCK] > /mpls ldp add lsr-id=160.30.132.15 transport-addresses=160.30.132.15 comment="Enable MPLS LDP using loopback 160.30.132.15"
[admin@SKILL-BLOCK] > /mpls ldp set [find lsr-id=160.30.132.15] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.15"
[admin@SKILL-BLOCK] >
```

Figure 102: Configuration MPLS to SKILL-BLOCK Router Through CMD

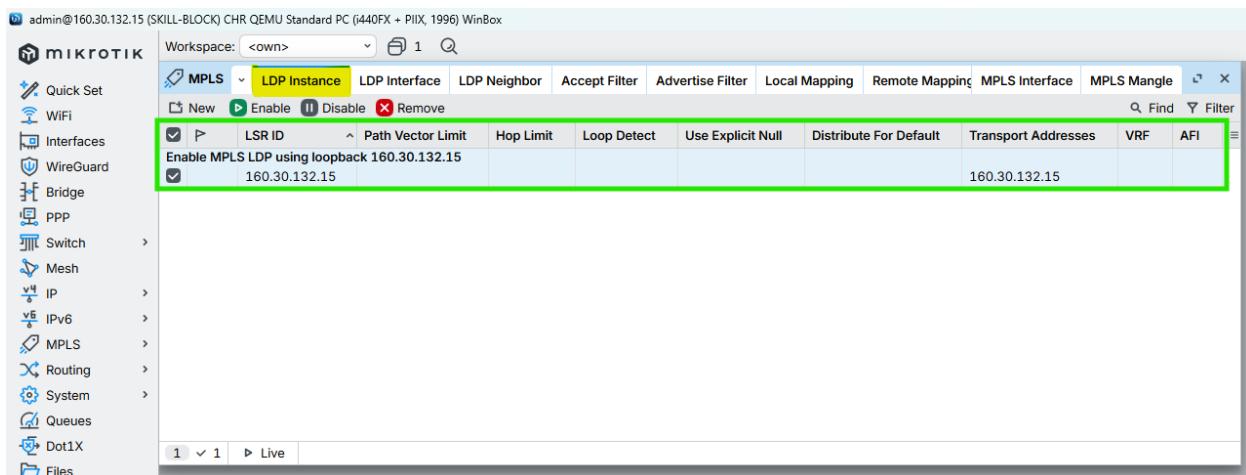


Figure 103: Configuration MPLS to SKILL-BLOCK Router Through WINBOX

## 7.7. ALUMNI-BLOCK

### CMD

```
/mpls ldp add lsr-id=160.30.132.16 transport-addresses=160.30.132.16 comment="Enable MPLS LDP using loopback 160.30.132.16"

/mpls ldp set [find lsr-id=160.30.132.16] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.16"
```

```
[admin@ALUMNI-BLOCK] > /mpls ldp add lsr-id=160.30.132.16 transport-addresses=160.30.132.16 comment="Enable MPLS LDP using loopback 160.30.132.16"
[admin@ALUMNI-BLOCK] > /mpls ldp set [find lsr-id=160.30.132.16] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.16"
[admin@ALUMNI-BLOCK] >
```

Figure 104: Configuration MPLS to ALUMNI-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

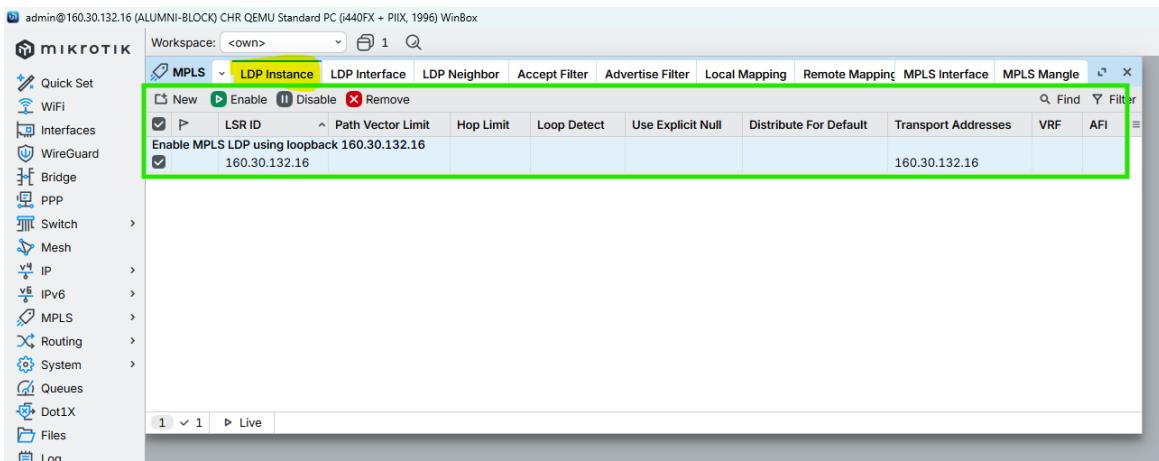


Figure 105: Configuration MPLS to ALUMNI-BLOCK Router Through WINBOX

## 7.8. KUMARI-BLOCK

### CMD

```
/mpls ldp add lsr-id=160.30.132.17 transport-addresses=160.30.132.17 comment="Enable MPLS LDP using loopback 160.30.132.17"

/mpls ldp set [find lsr-id=160.30.132.17] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.17"
```

```
[admin@KUMARI-BLOCK] > /mpls ldp add lsr-id=160.30.132.17 transport-addresses=160.30.132.17 comment="Enable MPLS LDP using loopback 160.30.132.17"
[admin@KUMARI-BLOCK] > /mpls ldp set [find lsr-id=160.30.132.17] disabled=no comment="Enable MPLS LDP using loopback 160.30.132.17"
[admin@KUMARI-BLOCK] >
```

Figure 106: Configuration MPLS to KUMARI-BLOCK Router Through CMD

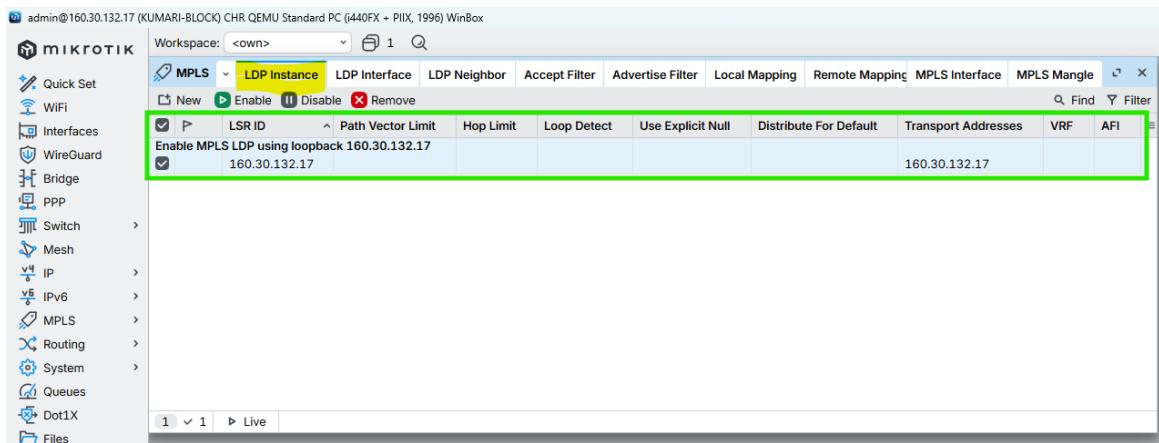


Figure 107: Configuration MPLS to KUMARI-BLOCK Router Through CMD

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

## 8. MPLS & LDP Configuration on Core Interfaces (with MTU)

This section enables LDP signaling, MPLS forwarding, and configures MPLS MTU ( 1508) on all core-facing interfaces only to support VPLS without fragmentation.

### 8.1. LONDON-BLOCK

#### 8.1.1. Enable LDP on Core Interfaces ONLY

CMD

```
/mpls ldp interface
add interface=ether2 comment="LDP_CORE_LINK_LONDON-BLOCK_10.0.0.1/30_TO_UK-BLOCK_10.0.0.2/30"
add interface=ether3 comment="LDP_CORE_LINK_LONDON-BLOCK_10.0.0.5/30_TO_NEPAL-BLOCK_10.0.0.6/30"
add interface=ether4 comment="LDP_CORE_LINK_LONDON-BLOCK_10.0.0.9/30_TO_HIMAL-BLOCK_10.0.0.10/30"
add interface=ether5 comment="LDP_CORE_LINK_LONDON-BLOCK_10.0.0.13/30_TO_BRIT-BLOCK_10.0.0.14/30"
add interface=ether6 comment="LDP_CORE_LINK_LONDON-BLOCK_10.0.0.17/30_TO_SKILL-BLOCK_10.0.0.18/30"
add interface=ether7 comment="LDP_CORE_LINK_LONDON-BLOCK_10.0.0.21/30_TO_ALUMNI-BLOCK_10.0.0.22/30"
add interface=ether8 comment="LDP_CORE_LINK_LONDON-BLOCK_10.0.0.25/30_TO_KUMARI-BLOCK_10.0.0.26/30"
/
```

```
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /mpls ldp interface
[admin@LONDON-BLOCK] /mpls/ldp/interface> add interface=ether2 comment="LDP_CORE_LINK_LONDON-BLOCK_10.0.0.1/30_TO_UK-BLOCK_10.0.0.2/30"
[admin@LONDON-BLOCK] /mpls/ldp/interface> add interface=ether3 comment="LDP_CORE_LINK_LONDON-BLOCK_10.0.0.5/30_TO_NEPAL-BLOCK_10.0.0.6/30"
[admin@LONDON-BLOCK] /mpls/ldp/interface> add interface=ether4 comment="LDP_CORE_LINK_LONDON-BLOCK_10.0.0.9/30_TO_HIMAL-BLOCK_10.0.0.10/30"
[admin@LONDON-BLOCK] /mpls/ldp/interface> add interface=ether5 comment="LDP_CORE_LINK_LONDON-BLOCK_10.0.0.13/30_TO_BRIT-BLOCK_10.0.0.14/30"
[admin@LONDON-BLOCK] /mpls/ldp/interface> add interface=ether6 comment="LDP_CORE_LINK_LONDON-BLOCK_10.0.0.17/30_TO_SKILL-BLOCK_10.0.0.18/30"
[admin@LONDON-BLOCK] /mpls/ldp/interface> add interface=ether7 comment="LDP_CORE_LINK_LONDON-BLOCK_10.0.0.21/30_TO_ALUMNI-BLOCK_10.0.0.22/30"
[admin@LONDON-BLOCK] /mpls/ldp/interface> add interface=ether8 comment="LDP_CORE_LINK_LONDON-BLOCK_10.0.0.25/30_TO_KUMARI-BLOCK_10.0.0.26/30"
[admin@LONDON-BLOCK] /mpls/ldp/interface>
```

Figure 108: Configuration MPLS LDP Interfaces to LONDON-BLOCK Router Through CMD

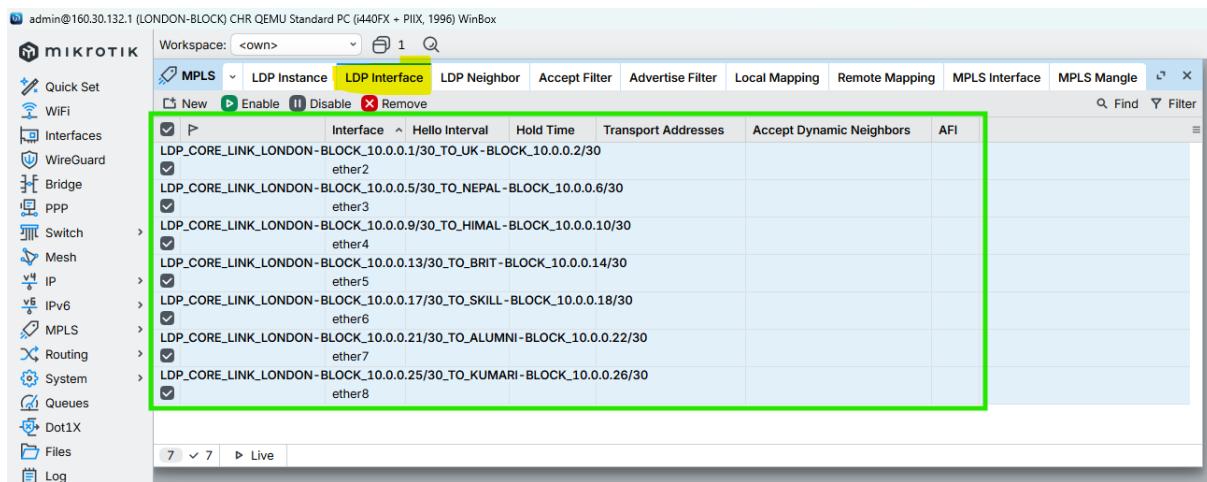


Figure 109: Configuration MPLS LDP interfaces to LONDON-BLOCK Router Through WINBOX

### 8.1.2. Enable MPLS & Set MPLS MTU on interfaces

CMD

```
/mpls interface
add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_UK-BLOCK_MTU 1508"
add interface=ether3 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_NEPAL-BLOCK_MTU 1508"
add interface=ether4 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_HIMAL-BLOCK_MTU 1508"
add interface=ether5 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_BRIT-BLOCK_MTU 1508"
add interface=ether6 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_SKILL-BLOCK_MTU 1508"
add interface=ether7 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_ALUMNI-BLOCK_MTU 1508"
add interface=ether8 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_KUMARI-BLOCK_MTU 1508"
/
```

```
[admin@JK-BLOCK] >
[admin@JK-BLOCK] > /mpls interface
[admin@JK-BLOCK] /mpls/interface> add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_UK-BLOCK_MTU 1508"
[admin@JK-BLOCK] /mpls/interface> add interface=ether3 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_NEPAL-BLOCK_MTU 1508"
[admin@JK-BLOCK] /mpls/interface> add interface=ether4 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_HIMAL-BLOCK_MTU 1508"
[admin@JK-BLOCK] /mpls/interface> add interface=ether5 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_BRIT-BLOCK_MTU 1508"
[admin@JK-BLOCK] /mpls/interface> add interface=ether6 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_SKILL-BLOCK_MTU 1508"
[admin@JK-BLOCK] /mpls/interface> add interface=ether7 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_ALUMNI-BLOCK_MTU 1508"
[admin@JK-BLOCK] /mpls/interface> add interface=ether8 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_KUMARI-BLOCK_MTU 1508"
[admin@JK-BLOCK] /mpls/interface>
[admin@JK-BLOCK] >
[admin@JK-BLOCK] >
```

Figure 110: Configuration MPLS MTU on Interfaces to LONDON-BLOCK Router Through CMD

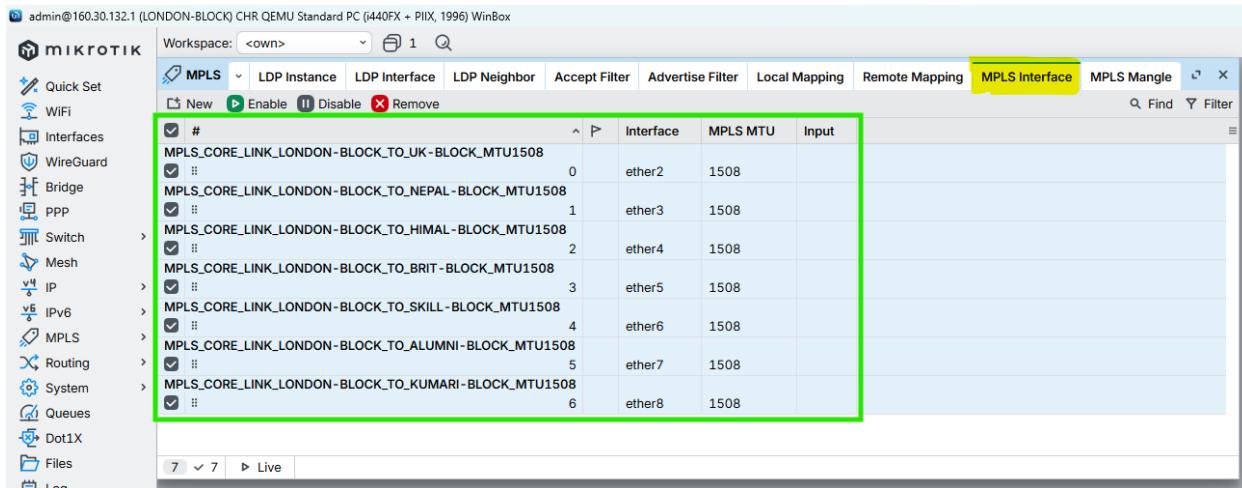


Figure 111: Configuration MPLS MTU on Interfaces to LONDON-BLOCK Router Through WINBOX

## 8.2. UK-BLOCK

### 8.2.1. Enable LDP on Core Interfaces ONLY

CMD

```
/mpls ldp interface
add interface=ether2 comment="LDP_CORE_LINK_UK-BLOCK_10.0.0.2/30_TO_LONDON-BLOCK_10.0.0.1/30"
add interface=ether1 comment="LDP_CORE_LINK_UK-BLOCK_10.0.0.29/30_TO_NEPAL-BLOCK_10.0.0.30/30"
add interface=ether3 comment="LDP_CORE_LINK_UK-BLOCK_10.0.0.34/30_TO_HIMAL-BLOCK_10.0.0.33/30"
/
```

```
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /mpls interface
[admin@LONDON-BLOCK] /mpls/interface> add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_UK-BLOCK_MTU_1508"
[admin@LONDON-BLOCK] /mpls/interface> add interface=ether3 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_NEPAL-BLOCK_MTU_1508"
[admin@LONDON-BLOCK] /mpls/interface> add interface=ether4 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_HIMAL-BLOCK_MTU_1508"
[admin@LONDON-BLOCK] /mpls/interface> add interface=ether5 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_BRIT-BLOCK_MTU_1508"
[admin@LONDON-BLOCK] /mpls/interface> add interface=ether6 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_SKILL-BLOCK_MTU_1508"
[admin@LONDON-BLOCK] /mpls/interface> add interface=ether7 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_ALUMNI-BLOCK_MTU_1508"
[admin@LONDON-BLOCK] /mpls/interface> add interface=ether8 mpls-mtu= 1508 comment="MPLS_CORE_LINK_LONDON-BLOCK_TO_KUMARI-BLOCK_MTU_1508"
[admin@LONDON-BLOCK] /mpls/interface> /
[admin@LONDON-BLOCK] >
```

Figure 112: Configuration MPLS LDP Interfaces to UK-BLOCK Router Through CMD

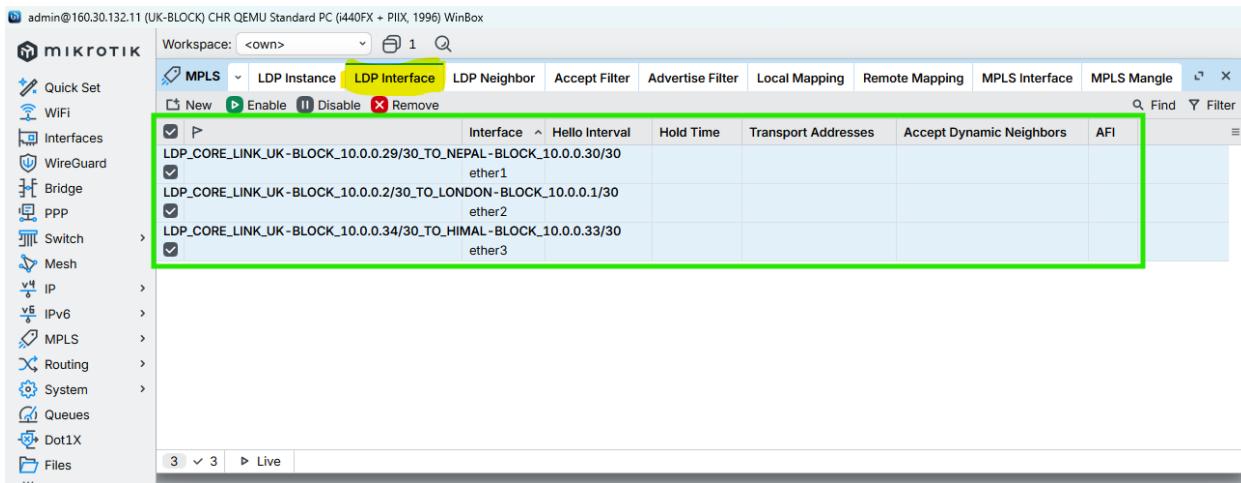


Figure 113: Configuration MPLS LDP Interfaces to UK-BLOCK Router Through WINBOX

### 8.2.2. Enable MPLS & Set MPLS MTU on interfaces

CMD

```
/mpls interface
add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_UK-BLOCK_TO_LONDON-BLOCK_MTU_1508"
add interface=ether1 mpls-mtu= 1508 comment="MPLS_CORE_LINK_UK-BLOCK_TO_NEPAL-BLOCK_MTU_1508"
add interface=ether3 mpls-mtu= 1508 comment="MPLS_CORE_LINK_UK-BLOCK_TO_HIMAL-BLOCK_MTU_1508"
/
```

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@JK-BLOCK] >
[admin@JK-BLOCK] > /mpls interface
[admin@JK-BLOCK] /mpls/interface> add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_UK-BLOCK_TO_LONDON-BLOCK_MTU_1508"
[admin@JK-BLOCK] /mpls/interface> add interface=ether1 mpls-mtu= 1508 comment="MPLS_CORE_LINK_UK-BLOCK_TO_NEPAL-BLOCK_MTU_1508"
[admin@JK-BLOCK] /mpls/interface> add interface=ether3 mpls-mtu= 1508 comment="MPLS_CORE_LINK_UK-BLOCK_TO_HIMAL-BLOCK_MTU_1508"
[admin@JK-BLOCK] /mpls/interface>
[admin@JK-BLOCK] >
```

Figure 114: Configuration MPLS MTU on Interfaces to UK-BLOCK Router Through CMD

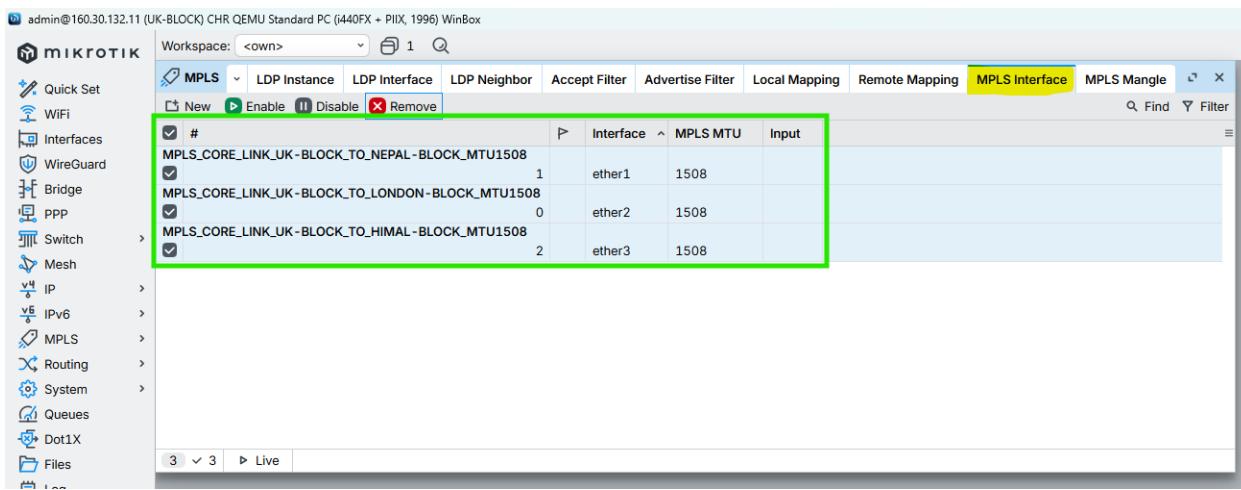


Figure 115: Configuration MPLS MTU on Interfaces to UK-BLOCK Router Through WINBOX

## 8.3. NEPAL-BLOCK

### 8.3.1. Enable LDP on Core Interfaces ONLY

CMD

```
/mpls ldp interface
add interface=ether3 comment="LDP_CORE_LINK_NEPAL-BLOCK_10.0.0.6/30_TO_LONDON-BLOCK_10.0.0.5/30"
add interface=ether1 comment="LDP_CORE_LINK_NEPAL-BLOCK_10.0.0.30/30_TO_UK-BLOCK_10.0.0.29/30"
add interface=ether2 comment="LDP_CORE_LINK_NEPAL-BLOCK_10.0.0.37/30_TO_BRIT-BLOCK_10.0.0.38/30"
/
```

```
[admin@NEPAL-BLOCK] >
[admin@NEPAL-BLOCK] > /mpls ldp interface
[admin@NEPAL-BLOCK] /mpls/ldp/interface> add interface=ether3 comment="LDP_CORE_LINK_NEPAL-BLOCK_10.0.0.6/30_TO_LONDON-BLOCK_10.0.0.5/30"
[admin@NEPAL-BLOCK] /mpls/ldp/interface> add interface=ether1 comment="LDP_CORE_LINK_NEPAL-BLOCK_10.0.0.30/30_TO_UK-BLOCK_10.0.0.29/30"
[admin@NEPAL-BLOCK] /mpls/ldp/interface> add interface=ether2 comment="LDP_CORE_LINK_NEPAL-BLOCK_10.0.0.37/30_TO_BRIT-BLOCK_10.0.0.38/30"
[admin@NEPAL-BLOCK] >
```

Figure 116: Configuration MPLS LDP Interfaces to NEPAL-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

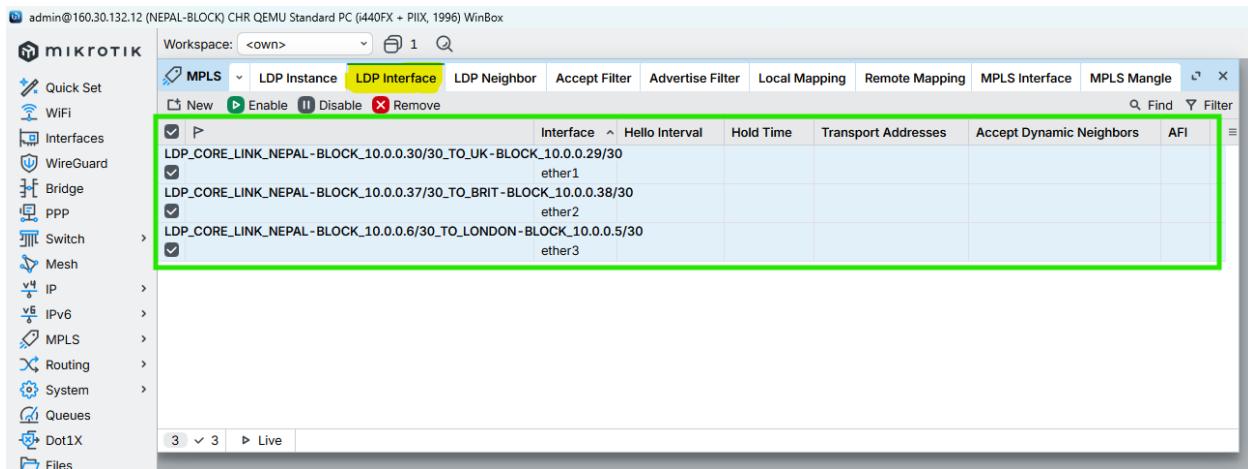


Figure 117: Configuration MPLS LDP Interfaces to NEPAL-BLOCK Router Through WINBOX

### 8.3.2. Enable MPLS & Set MPLS MTU on interfaces

CMD

```
/mpls interface
add interface=ether3 mpls-mtu= 1508 comment="MPLS_CORE_LINK_NEPAL-BLOCK_TO_LONDON-BLOCK_MTU 1508"
add interface=ether1 mpls-mtu= 1508 comment="MPLS_CORE_LINK_NEPAL-BLOCK_TO_UK-BLOCK_MTU 1508"
add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_NEPAL-BLOCK_TO_BRIT-BLOCK_MTU 1508"
/
```

```
[admin@NEPAL-BLOCK] >
[admin@NEPAL-BLOCK] > /mpls interface
[admin@NEPAL-BLOCK] /mpls/interface> add interface=ether3 mpls-mtu= 1508 comment="MPLS_CORE_LINK_NEPAL-BLOCK_TO_LONDON-BLOCK_MTU 1508"
[admin@NEPAL-BLOCK] /mpls/interface> add interface=ether1 mpls-mtu= 1508 comment="MPLS_CORE_LINK_NEPAL-BLOCK_TO_UK-BLOCK_MTU 1508"
[admin@NEPAL-BLOCK] /mpls/interface> add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_NEPAL-BLOCK_TO_BRIT-BLOCK_MTU 1508"
[admin@NEPAL-BLOCK] /mpls/interface>
```

Figure 118: Configuration MPLS MTU on Interfaces to NEPAL-BLOCK Router Through CMD

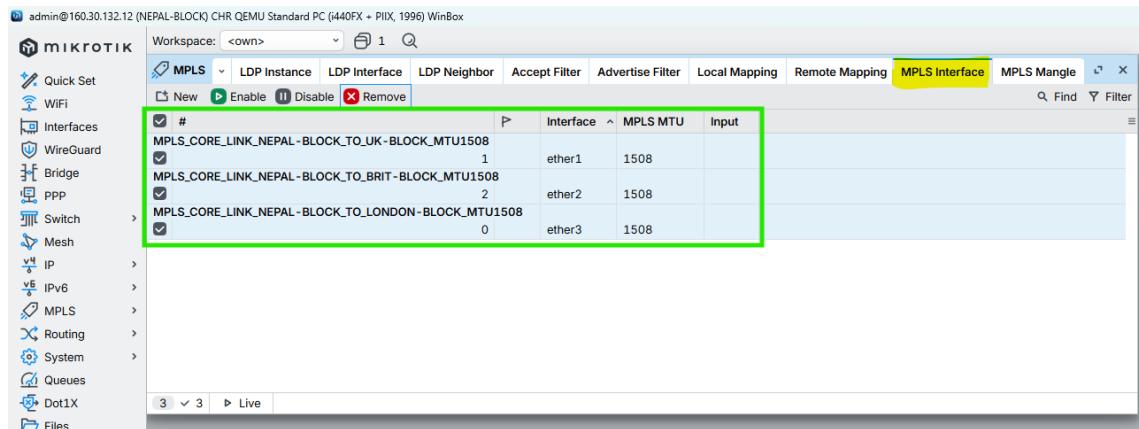


Figure 119: Configuration MPLS MTU on Interfaces to NEPAL-BLOCK Router Through WINBOX

## 8.4. HIMAL-BLOCK

### 8.4.1. Enable LDP on Core Interfaces ONLY

CMD

```
/mpls ldp interface
add interface=ether3 comment="LDP_CORE_LINK_HIMAL-BLOCK_10.0.0.33/30_TO_UK-BLOCK_10.0.0.34/30"
add interface=ether4 comment="LDP_CORE_LINK_HIMAL-BLOCK_10.0.0.10/30_TO_LONDON-BLOCK_10.0.0.9/30"
add interface=ether2 comment="LDP_CORE_LINK_HIMAL-BLOCK_10.0.0.42/30_TO_SKILL-BLOCK_10.0.0.41/30"
/
```

```
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /mpls ldp interface
[admin@HIMAL-BLOCK] /mpls/ldp/interface> add interface=ether3 comment="LDP_CORE_LINK_HIMAL-BLOCK_10.0.0.33/30_TO_UK-BLOCK_10.0.0.34/30"
[admin@HIMAL-BLOCK] /mpls/ldp/interface> add interface=ether4 comment="LDP_CORE_LINK_HIMAL-BLOCK_10.0.0.10/30_TO_LONDON-BLOCK_10.0.0.9/30"
[admin@HIMAL-BLOCK] /mpls/ldp/interface> add interface=ether2 comment="LDP_CORE_LINK_HIMAL-BLOCK_10.0.0.42/30_TO_SKILL-BLOCK_10.0.0.41/30"
[admin@HIMAL-BLOCK] /mpls/ldp/interface>
```

Figure 120: Configuration MPLS LDP Interfaces to HIMAL-BLOCK Router Through CMD

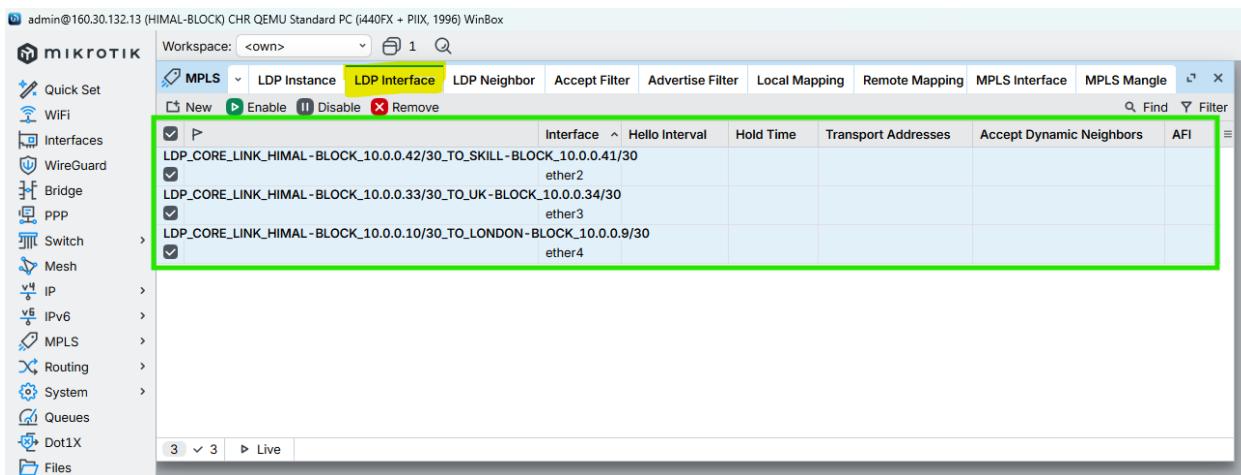


Figure 121: Configuration MPLS LDP Interfaces to HIMAL-BLOCK Router Through WINBOX

### 8.4.2. Enable MPLS & Set MPLS MTU on interfaces

CMD

```
/mpls interface
add interface=ether3 mpls-mtu= 1508 comment="MPLS_CORE_LINK_HIMAL-BLOCK_TO_UK-BLOCK_MTU 1508"
add interface=ether4 mpls-mtu= 1508 comment="MPLS_CORE_LINK_HIMAL-BLOCK_TO_LONDON-BLOCK_MTU 1508"
add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_HIMAL-BLOCK_TO_SKILL-BLOCK_MTU 1508"
/
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /mpls interface
[admin@HIMAL-BLOCK] /mpls/interface> add interface=ether3 mpls-mtu= 1508 comment="MPLS_CORE_LINK_HIMAL-BLOCK_TO_UK-BLOCK_MTU_1508"
[admin@HIMAL-BLOCK] /mpls/interface> add interface=ether4 mpls-mtu= 1508 comment="MPLS_CORE_LINK_HIMAL-BLOCK_TO_LONDON-BLOCK_MTU_1508"
[admin@HIMAL-BLOCK] /mpls/interface> add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_HIMAL-BLOCK_TO_SKILL-BLOCK_MTU_1508"
[admin@HIMAL-BLOCK] /mpls/interface>
[admin@HIMAL-BLOCK] >
```

Figure 122: Configuration MPLS MTU on Interfaces to HIMAL-BLOCK Router Through CMD

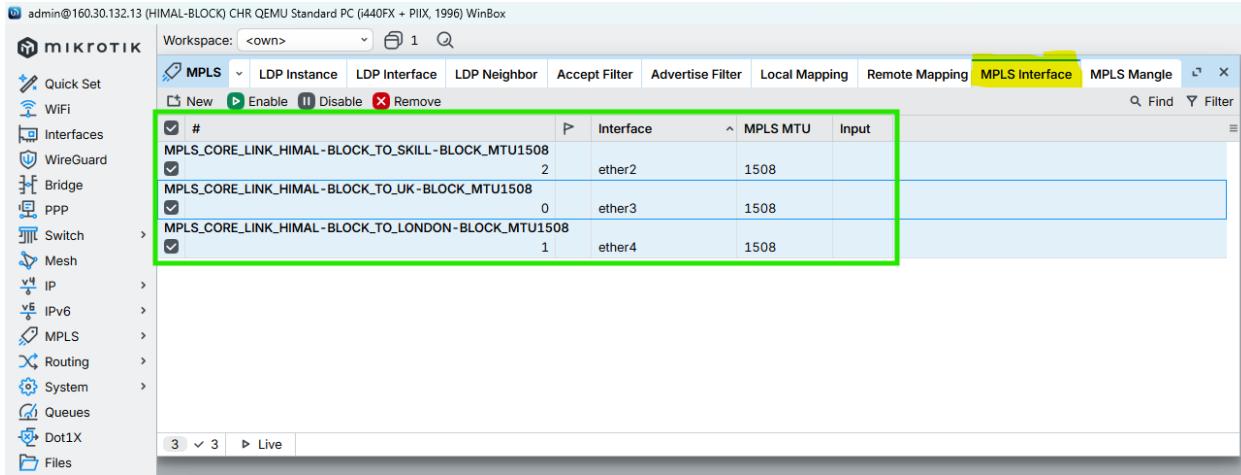


Figure 123: Configuration MPLS MTU on Interfaces to HIMAL-BLOCK Router Through WINBOX

## 8.5. BRIT-BLOCK

### 8.5.1. Enable LDP on Core Interfaces ONLY

CMD

```
/mpls ldp interface
add interface=ether2 comment="LDP_CORE_LINK_BRIT-BLOCK_10.0.0.38/30_TO_NEPAL-BLOCK_10.0.0.37/30"
add interface=ether5 comment="LDP_CORE_LINK_BRIT-BLOCK_10.0.0.14/30_TO_LONDON-BLOCK_10.0.0.13/30"
add interface=ether1 comment="LDP_CORE_LINK_BRIT-BLOCK_10.0.0.46/30_TO_KUMARI-BLOCK_10.0.0.44/30"
/
```

```
[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > /mpls ldp interface
[admin@BRIT-BLOCK] /mpls/ldp/interface> add interface=ether2 comment="LDP_CORE_LINK_BRIT-BLOCK_10.0.0.38/30_TO_NEPAL-BLOCK_10.0.0.37/30"
[admin@BRIT-BLOCK] /mpls/ldp/interface> add interface=ether5 comment="LDP_CORE_LINK_BRIT-BLOCK_10.0.0.14/30_TO_LONDON-BLOCK_10.0.0.13/30"
[admin@BRIT-BLOCK] /mpls/ldp/interface> add interface=ether1 comment="LDP_CORE_LINK_BRIT-BLOCK_10.0.0.46/30_TO_KUMARI-BLOCK_10.0.0.44/30"
[admin@BRIT-BLOCK] /mpls/ldp/interface>
```

Figure 124: Configuration MPLS LDP Interfaces to BRIT-BLOCK Router Through CMD

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

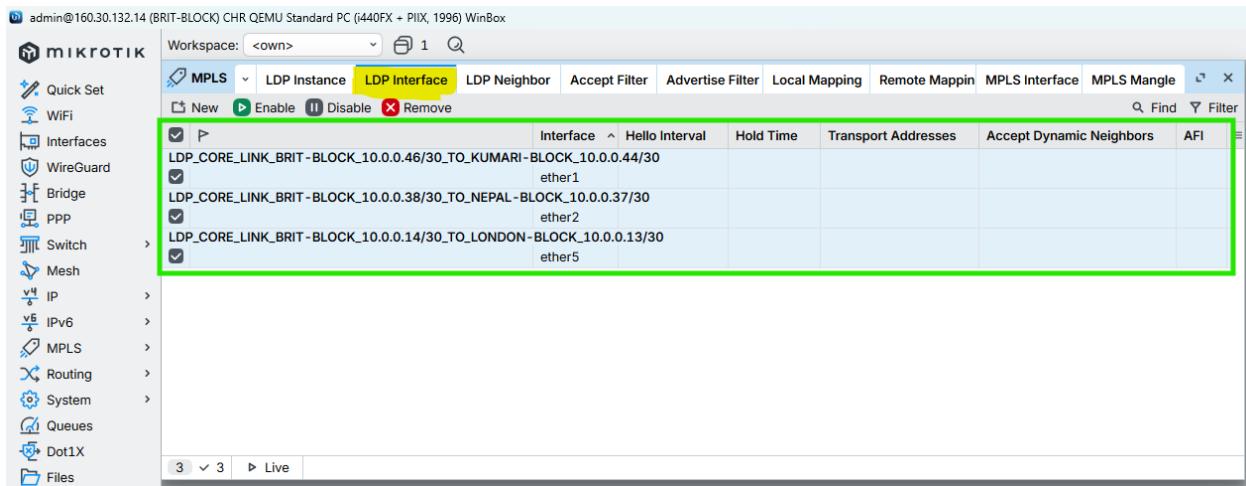


Figure 125: Configuration MPLS LDP Interfaces to BRIT-BLOCK Router Through WINBOX

## 8.5.2. Enable MPLS & Set MPLS MTU on interfaces

CMD

```
/mpls interface
add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_BRIT-BLOCK_TO_NEPAL-BLOCK_MTU 1508"
add interface=ether5 mpls-mtu= 1508 comment="MPLS_CORE_LINK_BRIT-BLOCK_TO_LONDON-BLOCK_MTU 1508"
add interface=ether1 mpls-mtu= 1508 comment="MPLS_CORE_LINK_BRIT-BLOCK_TO_KUMARI-BLOCK_MTU 1508"
/
```

```
[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > /mpls interface
[admin@BRIT-BLOCK] /mpls/interface> add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_BRIT-BLOCK_TO_NEPAL-BLOCK_MTU 1508"
[admin@BRIT-BLOCK] /mpls/interface> add interface=ether5 mpls-mtu= 1508 comment="MPLS_CORE_LINK_BRIT-BLOCK_TO_LONDON-BLOCK_MTU 1508"
[admin@BRIT-BLOCK] /mpls/interface> add interface=ether1 mpls-mtu= 1508 comment="MPLS_CORE_LINK_BRIT-BLOCK_TO_KUMARI-BLOCK_MTU 1508"
[admin@BRIT-BLOCK] /mpls/interface>
[admin@BRIT-BLOCK] >
```

Figure 126: Configuration MPLS MTU on Interfaces to BRIT-BLOCK Router Through CMD

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

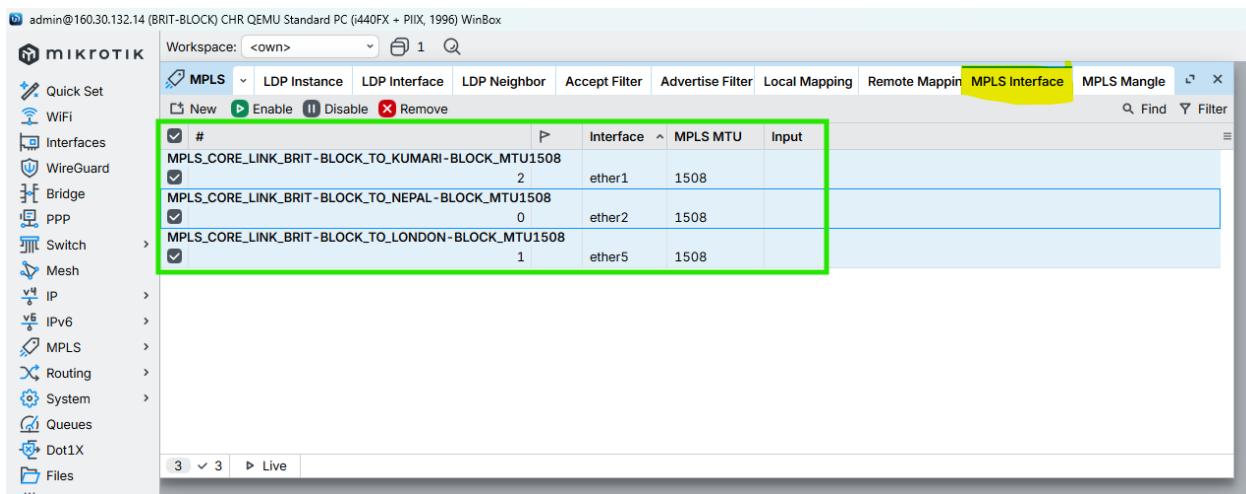


Figure 127: Configuration MPLS MTU on Interfaces to BRIT-BLOCK Router Through WINBOX

## 8.6. SKILL-BLOCK

### 8.6.1. Enable LDP on Core Interfaces ONLY

CMD

```
/mpls ldp interface
add interface=ether2 comment="LDP_CORE_LINK_SKILL-BLOCK_10.0.0.41/30_TO_HIMAL-BLOCK_10.0.0.42/30"
add interface=ether6 comment="LDP_CORE_LINK_SKILL-BLOCK_10.0.0.18/30_TO_LONDON-BLOCK_10.0.0.17/30"
add interface=ether1 comment="LDP_CORE_LINK_SKILL-BLOCK_10.0.0.50/30_TO_KUMARI-BLOCK_10.0.0.49/30"
/
```

```
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /mpls ldp interface
[admin@SKILL-BLOCK] /mpls/ldp/interface> add interface=ether2 comment="LDP_CORE_LINK_SKILL-BLOCK_10.0.0.41/30_TO_HIMAL-BLOCK_10.0.0.42/30"
[admin@SKILL-BLOCK] /mpls/ldp/interface> add interface=ether6 comment="LDP_CORE_LINK_SKILL-BLOCK_10.0.0.18/30_TO_LONDON-BLOCK_10.0.0.17/30"
[admin@SKILL-BLOCK] /mpls/ldp/interface> add interface=ether1 comment="LDP_CORE_LINK_SKILL-BLOCK_10.0.0.50/30_TO_KUMARI-BLOCK_10.0.0.49/30"
[admin@SKILL-BLOCK] >
```

Figure 128: Configuration MPLS LDP Interfaces to SKILL-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

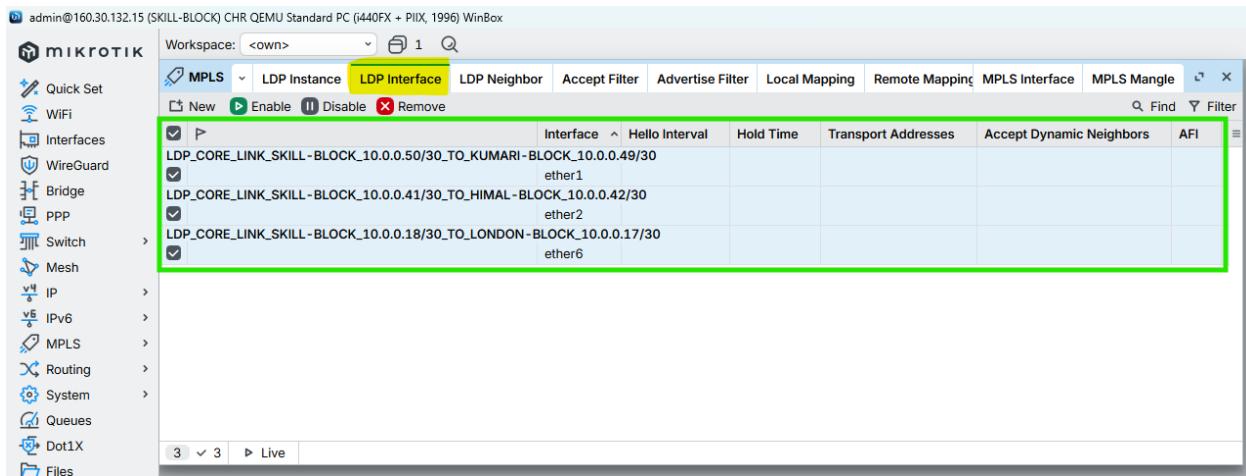


Figure 129: Configuration MPLS LDP Interfaces to SKILL-BLOCK Router Through WINBOX

### 8.6.2. Enable MPLS & Set MPLS MTU on interfaces

CMD

```
/mpls interface  
add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_SKILL-BLOCK_TO_HIMAL-BLOCK_MTU 1508"  
add interface=ether6 mpls-mtu= 1508 comment="MPLS_CORE_LINK_SKILL-BLOCK_TO_LONDON-BLOCK_MTU 1508"  
add interface=ether1 mpls-mtu= 1508 comment="MPLS_CORE_LINK_SKILL-BLOCK_TO_KUMARI-BLOCK_MTU 1508"  
/
```

```
[admin@SKILL-BLOCK] >  
[admin@SKILL-BLOCK] > /mpls interface  
[admin@SKILL-BLOCK] /mpls/interface> add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_SKILL-BLOCK_TO_HIMAL-BLOCK_MTU 1508"  
[admin@SKILL-BLOCK] /mpls/interface> add interface=ether6 mpls-mtu= 1508 comment="MPLS_CORE_LINK_SKILL-BLOCK_TO_LONDON-BLOCK_MTU 1508"  
[admin@SKILL-BLOCK] /mpls/interface> add interface=ether1 mpls-mtu= 1508 comment="MPLS_CORE_LINK_SKILL-BLOCK_TO_KUMARI-BLOCK_MTU 1508"  
[admin@SKILL-BLOCK] /mpls/interface> /  
[admin@SKILL-BLOCK] >
```

Figure 130: Configuration MPLS MTU on Interfaces to SKILL-BLOCK Router Through CMD

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

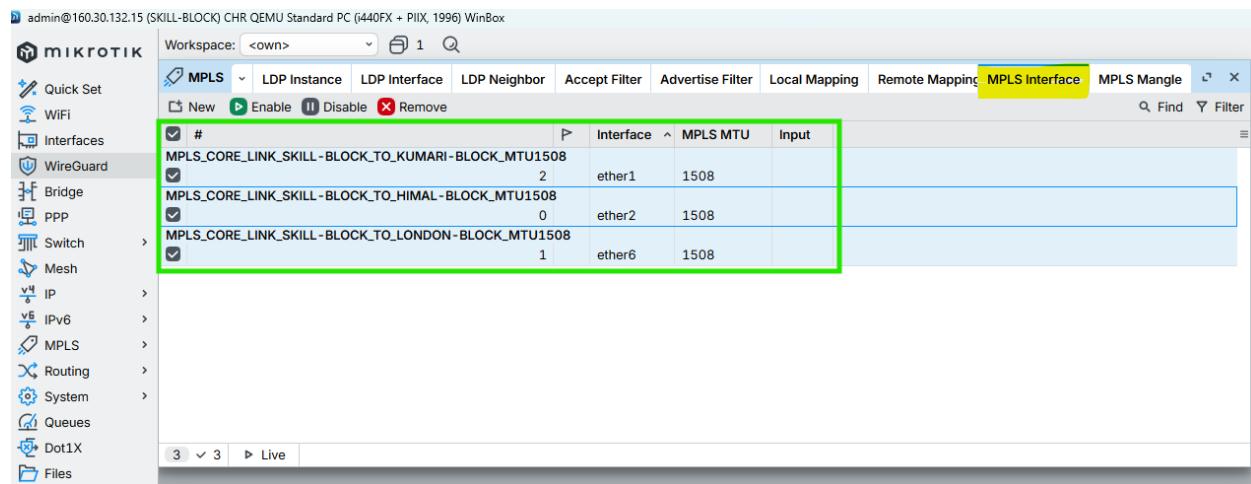


Figure 131: Configuration MPLS MTU on Interfaces to SKILL-BLOCK Router Through WINBOX

## 8.7. ALUMNI-BLOCK

### 8.7.1. Enable LDP on Core Interfaces ONLY

CMD

```
/mpls ldp interface
add interface=ether7 comment="LDP_CORE_LINK_ALUMNI-BLOCK_10.0.0.22/30_TO_LONDON-BLOCK_10.0.0.21/30"
add interface=ether1 comment="LDP_CORE_LINK_ALUMNI-BLOCK_10.0.0.49/30_TO_SKILL-BLOCK_10.0.0.50/30"
add interface=ether2 comment="LDP_CORE_LINK_ALUMNI-BLOCK_10.0.0.53/30_TO_KUMARI-BLOCK_10.0.0.54/30"
/
```

```
[admin@ALUMNI-BLOCK] >
[admin@ALUMNI-BLOCK] > /mpls ldp interface
[admin@ALUMNI-BLOCK] /mpls/ldp/interface> add interface=ether7 comment="LDP_CORE_LINK_ALUMNI-BLOCK_10.0.0.22/30_TO_LONDON-BLOCK_10.0.0.21/30"
[admin@ALUMNI-BLOCK] /mpls/ldp/interface> add interface=ether1 comment="LDP_CORE_LINK_ALUMNI-BLOCK_10.0.0.49/30_TO_SKILL-BLOCK_10.0.0.50/30"
[admin@ALUMNI-BLOCK] /mpls/ldp/interface> add interface=ether2 comment="LDP_CORE_LINK_ALUMNI-BLOCK_10.0.0.53/30_TO_KUMARI-BLOCK_10.0.0.54/30"
[admin@ALUMNI-BLOCK] /mpls/ldp/interface>
```

Figure 132: Configuration MPLS LDP Interfaces to ALUMNI-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

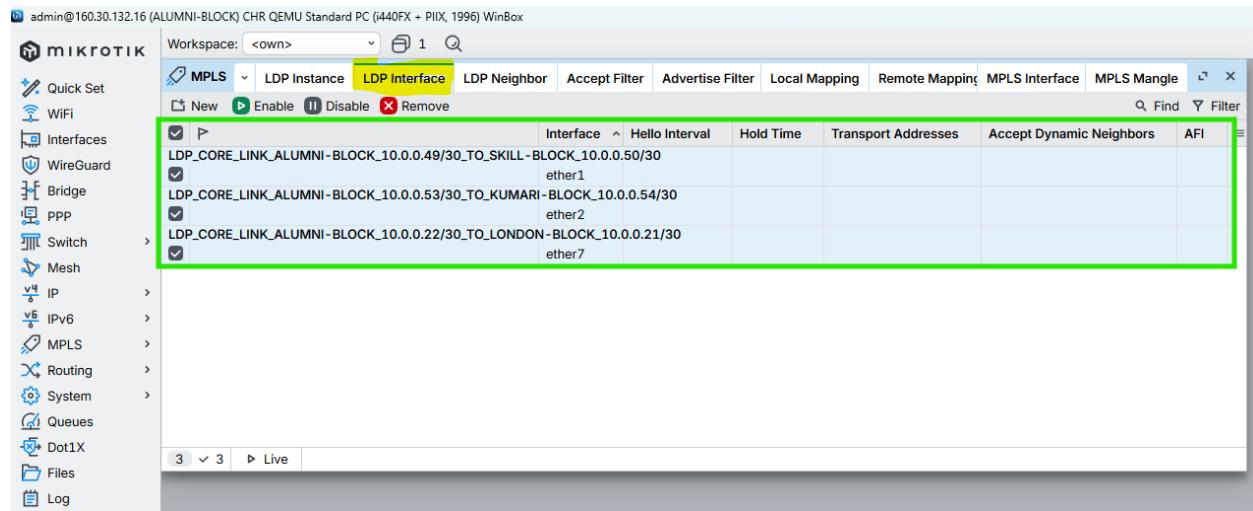


Figure 133: Configuration MPLS LDP Interfaces to ALUMNI-BLOCK Router Through WINBOX

### 8.7.2. Enable MPLS & Set MPLS MTU on interfaces

CMD

```
/mpls interface
add interface=ether7 mpls-mtu= 1508 comment="MPLS_CORE_LINK_ALUMNI-BLOCK_TO_LONDON-BLOCK_MTU 1508"
add interface=ether1 mpls-mtu= 1508 comment="MPLS_CORE_LINK_ALUMNI-BLOCK_TO_SKILL-BLOCK_MTU 1508"
add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_ALUMNI-BLOCK_TO_KUMARI-BLOCK_MTU 1508"
/
```

```
[admin@ALUMNI-BLOCK] >
[admin@ALUMNI-BLOCK] > /mpls interface
[admin@ALUMNI-BLOCK] /mpls/interface> add interface=ether7 mpls-mtu= 1508 comment="MPLS_CORE_LINK_ALUMNI-BLOCK_TO_LONDON-BLOCK_MTU 1508"
[admin@ALUMNI-BLOCK] /mpls/interface> add interface=ether1 mpls-mtu= 1508 comment="MPLS_CORE_LINK_ALUMNI-BLOCK_TO_SKILL-BLOCK_MTU 1508"
[admin@ALUMNI-BLOCK] /mpls/interface> add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_ALUMNI-BLOCK_TO_KUMARI-BLOCK_MTU 1508"
[admin@ALUMNI-BLOCK] /mpls/interface>
```

Figure 134: Configuration MPLS MTU on Interfaces to ALUMNI-BLOCK Router Through CMD

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

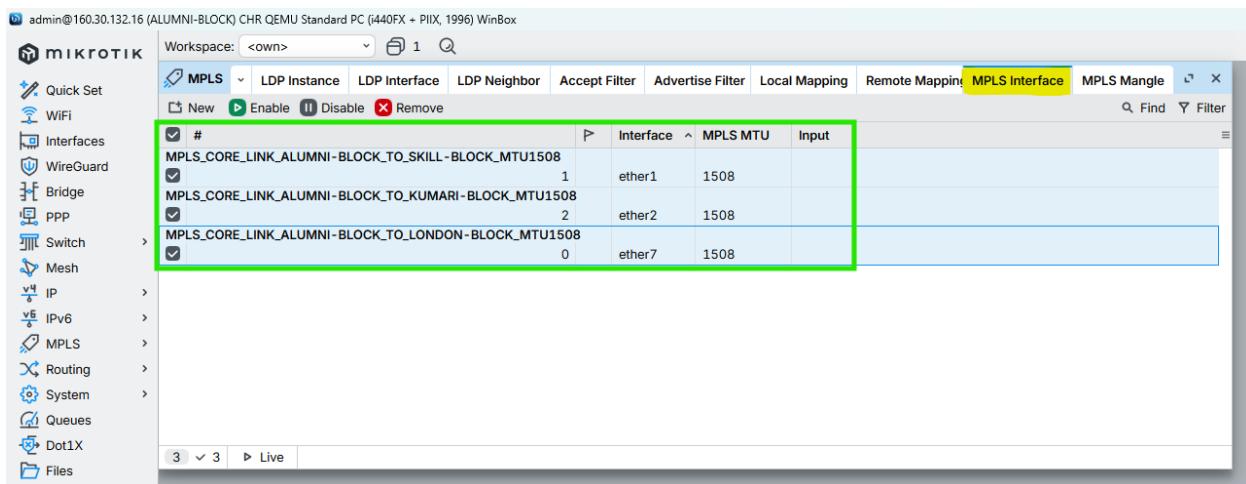


Figure 135: Configuration MPLS MTU on Interfaces to ALUMNI-BLOCK Router Through WINBOX

## 8.8. KUMARI-BLOCK

### 8.8.1. Enable LDP on Core Interfaces ONLY

CMD

```
/mpls ldp interface
add interface=ether8 comment="LDP_CORE_LINK_KUMARI-BLOCK_10.0.0.26/30_TO_LONDON-BLOCK_10.0.0.25/30"
add interface=ether2 comment="LDP_CORE_LINK_KUMARI-BLOCK_10.0.0.54/30_TO_ALUMNI-BLOCK_10.0.0.53/30"
add interface=ether1 comment="LDP_CORE_LINK_KUMARI-BLOCK_10.0.0.44/30_TO_BRIT-BLOCK_10.0.0.46/30"
/
```

```
[admin@KUMARI-BLOCK] >
[admin@KUMARI-BLOCK] > /mpls ldp interface
[admin@KUMARI-BLOCK] /mpls/ldp/interface> add interface=ether8 comment="LDP_CORE_LINK_KUMARI-BLOCK_10.0.0.26/30_TO_LONDON-BLOCK_10.0.0.25/30"
[admin@KUMARI-BLOCK] /mpls/ldp/interface> add interface=ether2 comment="LDP_CORE_LINK_KUMARI-BLOCK_10.0.0.54/30_TO_ALUMNI-BLOCK_10.0.0.53/30"
[admin@KUMARI-BLOCK] /mpls/ldp/interface> add interface=ether1 comment="LDP_CORE_LINK_KUMARI-BLOCK_10.0.0.44/30_TO_BRIT-BLOCK_10.0.0.46/30"
[admin@KUMARI-BLOCK] /mpls/ldp/interface>
```

Figure 136: Configuration MPLS LDP Interfaces to KUMARI-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

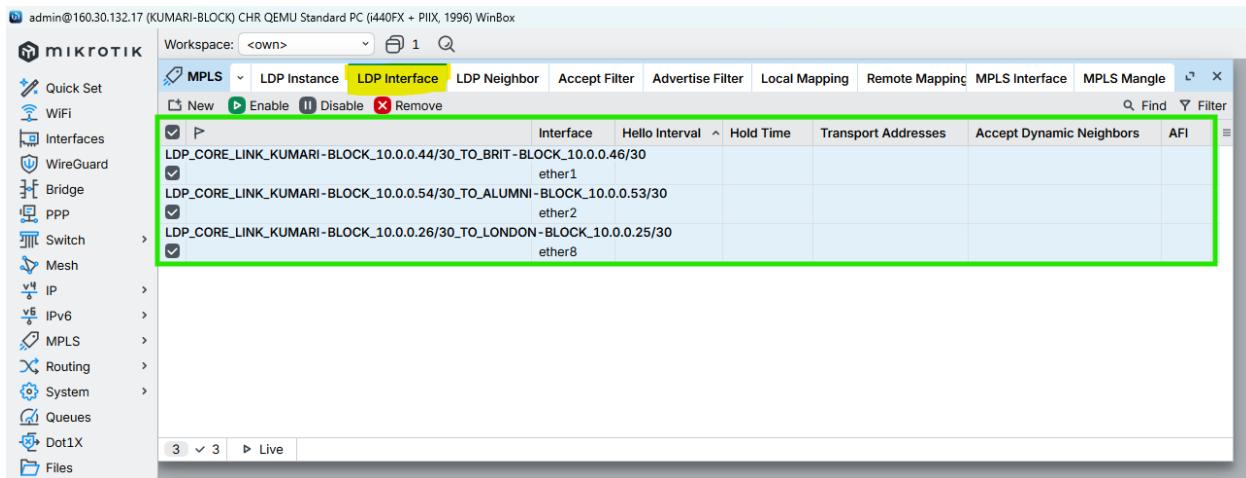


Figure 137: Configuration MPLS LDP Interfaces to KUMARI-BLOCK Router Through WINBOX

### 8.8.2. Enable MPLS & Set MPLS MTU on interfaces

CMD

```
/mpls interface
add interface=ether8 mpls-mtu= 1508 comment="MPLS_CORE_LINK_KUMARI-BLOCK_TO_LONDON-BLOCK_MTU 1508"
add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_KUMARI-BLOCK_TO_ALUMNI-BLOCK_MTU 1508"
add interface=ether1 mpls-mtu= 1508 comment="MPLS_CORE_LINK_KUMARI-BLOCK_TO_BRIT-BLOCK_MTU 1508"
/
```

```
[admin@KUMARI-BLOCK] ~
[admin@KUMARI-BLOCK] > /mpls interface
[admin@KUMARI-BLOCK] /mpls/interface> add interface=ether8 mpls-mtu= 1508 comment="MPLS_CORE_LINK_KUMARI-BLOCK_TO_LONDON-BLOCK_MTU 1508"
[admin@KUMARI-BLOCK] /mpls/interface> add interface=ether2 mpls-mtu= 1508 comment="MPLS_CORE_LINK_KUMARI-BLOCK_TO_ALUMNI-BLOCK_MTU 1508"
[admin@KUMARI-BLOCK] /mpls/interface> add interface=ether1 mpls-mtu= 1508 comment="MPLS_CORE_LINK_KUMARI-BLOCK_TO_BRIT-BLOCK_MTU 1508"
[admin@KUMARI-BLOCK] /mpls/interface>
[admin@KUMARI-BLOCK] >
```

Figure 138: Configuration MPLS MTU on Interfaces to KUMARI-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

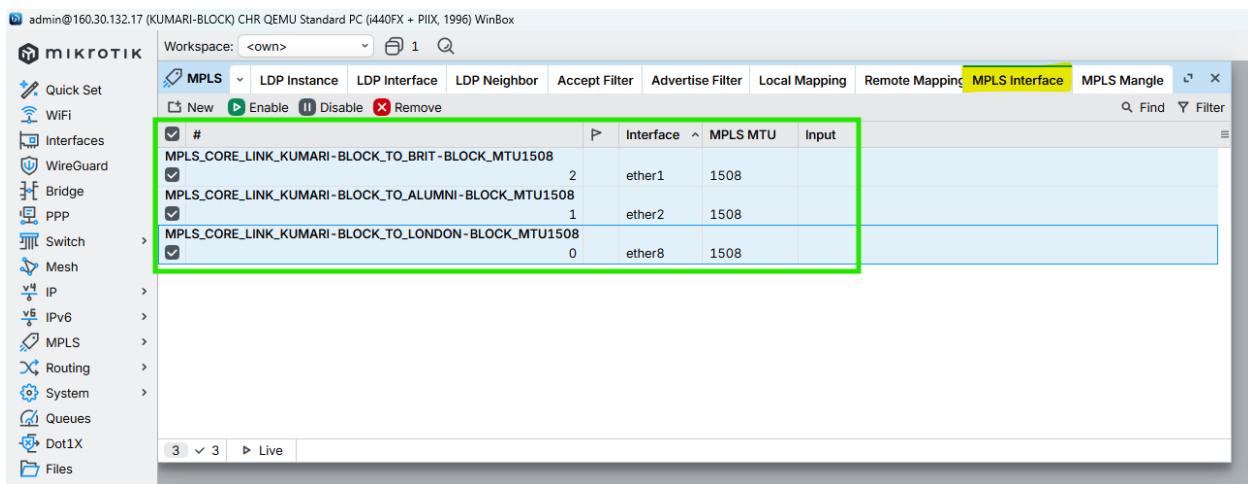


Figure 139: Configuration MPLS MTU on Interfaces to KUMARI-BLOCK Router Through WINBOX

## 9. VPLS Configuration for VLAN Transport (Points to Points) Routers

### 9.1. LONDON-BLOCK

#### 9.1.1. Create VPLS BRIDGES (L2 DOMAINS)

CMD

```
/interface bridge
add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 - VPLS Bridge"
add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 - VPLS Bridge"
add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 - VPLS Bridge"
/
```

```
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /interface bridge
[admin@LONDON-BLOCK] /interface/bridge> add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 VPLS Bridge"
[admin@LONDON-BLOCK] /interface/bridge> add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 VPLS Bridge"
[admin@LONDON-BLOCK] /interface/bridge> add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 VPLS Bridge"
[admin@LONDON-BLOCK] /interface/bridge> /
[admin@LONDON-BLOCK] >
```

Figure 140: Create VPLS BRIDGES (L2 DOMAINS) on LONDON-BLOCK Router Through CMD

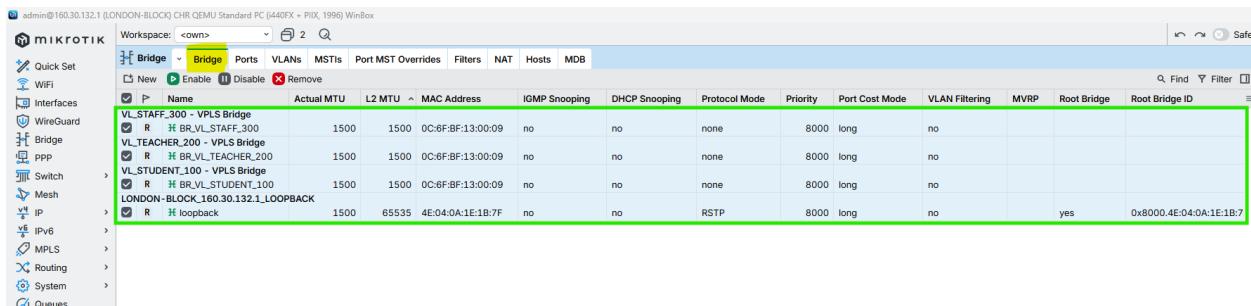


Figure 141: Create VPLS BRIDGES (L2 DOMAINS) on KUMARI-BLOCK Router Through WINBOX

#### 9.1.2. VPLS Full-Mesh for LONDON-BLOCK

CMD

```
/interface vpls
add name=VPLS_UK_VL_STUDENT_100 peer=160.30.132.11 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100
comment="VL_STUDENT_100 - London to UK Block"
add name=VPLS_NEPAL_VL_STUDENT_100 peer=160.30.132.12 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100
comment="VL_STUDENT_100 - London to Nepal Block"
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
add name=VPLS_HIMAL_VL_STUDENT_100 peer=160.30.132.13 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100
comment="VL_STUDENT_100 - London to Himal Block"
add name=VPLS_BRIT_VL_STUDENT_100 peer=160.30.132.14 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100
comment="VL_STUDENT_100 - London to British Block"
add name=VPLS_SKILL_VL_STUDENT_100 peer=160.30.132.15 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100
comment="VL_STUDENT_100 - London to Skill Block"
add name=VPLS_ALUMNI_VL_STUDENT_100 peer=160.30.132.16 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100
comment="VL_STUDENT_100 - London to Alumni Block"
add name=VPLS_KUMARI_VL_STUDENT_100 peer=160.30.132.17 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100
comment="VL_STUDENT_100 - London to Kumari Block"

/interface vpls
add name=VPLS_UK_VL_TEACHER_200 peer=160.30.132.11 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200
comment="VL_TEACHER_200 - London to UK"
add name=VPLS_NEPAL_VL_TEACHER_200 peer=160.30.132.12 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200
comment="VL_TEACHER_200 - London to Nepal"
add name=VPLS_HIMAL_VL_TEACHER_200 peer=160.30.132.13 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200
comment="VL_TEACHER_200 - London to Himal"
add name=VPLS_BRIT_VL_TEACHER_200 peer=160.30.132.14 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200
comment="VL_TEACHER_200 - London to British"
add name=VPLS_SKILL_VL_TEACHER_200 peer=160.30.132.15 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200
comment="VL_TEACHER_200 - London to Skill"
add name=VPLS_ALUMNI_VL_TEACHER_200 peer=160.30.132.16 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200
comment="VL_TEACHER_200 - London to Alumni"
add name=VPLS_KUMARI_VL_TEACHER_200 peer=160.30.132.17 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200
comment="VL_TEACHER_200 - London to Kumari"

/interface vpls
add name=VPLS_UK_VL_STAFF_300 peer=160.30.132.11 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300
comment="VL_STAFF_300 - London to UK"
add name=VPLS_NEPAL_VL_STAFF_300 peer=160.30.132.12 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300
comment="VL_STAFF_300 - London to Nepal"
add name=VPLS_HIMAL_VL_STAFF_300 peer=160.30.132.13 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300
comment="VL_STAFF_300 - London to Himal"
add name=VPLS_BRIT_VL_STAFF_300 peer=160.30.132.14 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300
comment="VL_STAFF_300 - London to British"
add name=VPLS_SKILL_VL_STAFF_300 peer=160.30.132.15 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300
comment="VL_STAFF_300 - London to Skill"
add name=VPLS_ALUMNI_VL_STAFF_300 peer=160.30.132.16 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300
comment="VL_STAFF_300 - London to Alumni"
add name=VPLS_KUMARI_VL_STAFF_300 peer=160.30.132.17 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300
comment="VL_STAFF_300 - London to Kumari"
/

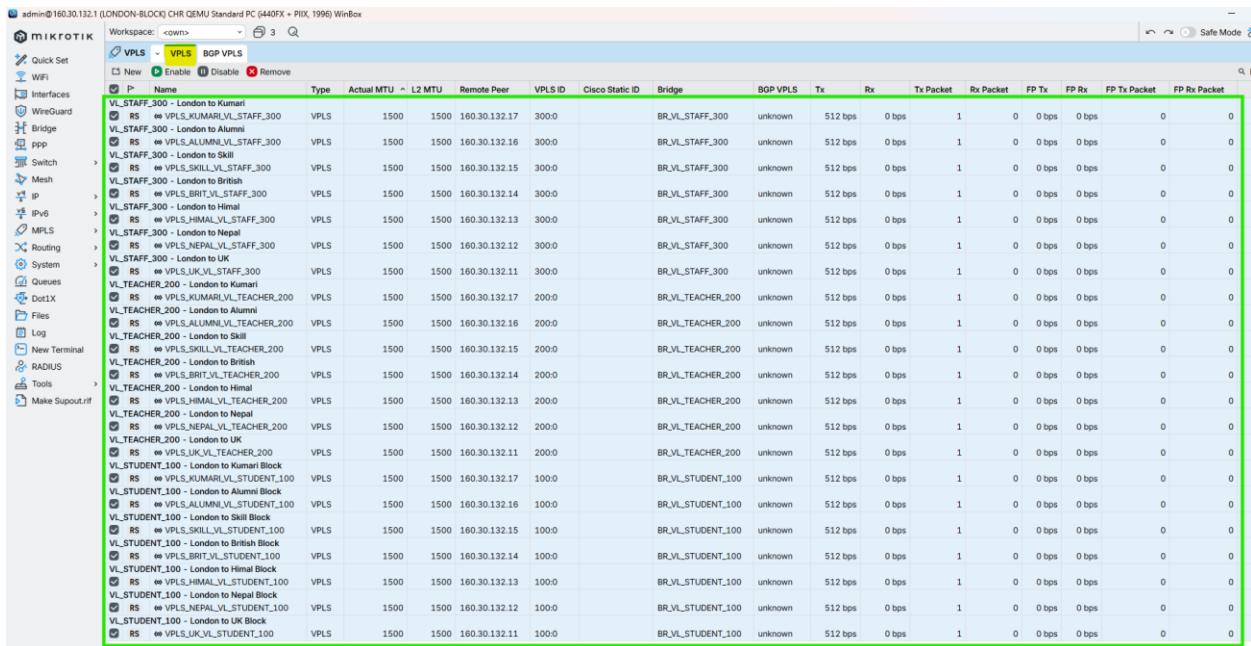
/mpls ldp neighbor print
/interface vpls print
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
/interface bridge port print  
/interface bridge host print
```

```
[admin@Z9000-BR-01] >
[admin@Z9000-BR-01] /interface vpls
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_UK_VL_STUDENT_100 peer=160.30.132.11 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100 comment="VL_STUDENT_100 - London to UK Block"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_NEPAL_VL_STUDENT_100 peer=160.30.132.12 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100 comment="VL_STUDENT_100 - London to Nepal Block"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_HMAL_VL_STUDENT_100 peer=160.30.132.13 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100 comment="VL_STUDENT_100 - London to Himal Block"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_BRIT_VL_STUDENT_100 peer=160.30.132.14 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100 comment="VL_STUDENT_100 - London to British Block"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_SKILL_VL_STUDENT_100 peer=160.30.132.15 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100 comment="VL_STUDENT_100 - London to Skill Block"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_ALUMNI_VL_STUDENT_100 peer=160.30.132.16 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100 comment="VL_STUDENT_100 - London to Alumni Block"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_KUMARI_VL_STUDENT_100 peer=160.30.132.17 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100 comment="VL_STUDENT_100 - London to Kumari Block"
[admin@Z9000-BR-01] /interface/vpls /
[admin@Z9000-BR-01] >
[admin@Z9000-BR-01] /interface vpls
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_UK_VL_TEACHER_200 peer=160.30.132.11 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200 comment="VL_TEACHER_200 - London to UK"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_NEPAL_VL_TEACHER_200 peer=160.30.132.12 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200 comment="VL_TEACHER_200 - London to Nepal"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_HMAL_VL_TEACHER_200 peer=160.30.132.13 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200 comment="VL_TEACHER_200 - London to Himal"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_BRIT_VL_TEACHER_200 peer=160.30.132.14 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200 comment="VL_TEACHER_200 - London to British"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_SKILL_VL_TEACHER_200 peer=160.30.132.15 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200 comment="VL_TEACHER_200 - London to Skill"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_ALUMNI_VL_TEACHER_200 peer=160.30.132.16 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200 comment="VL_TEACHER_200 - London to Alumni"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_KUMARI_VL_TEACHER_200 peer=160.30.132.17 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200 comment="VL_TEACHER_200 - London to Kumari"
[admin@Z9000-BR-01] /interface/vpls /
[admin@Z9000-BR-01] >
[admin@Z9000-BR-01] /interface vpls
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_UK_VL_STAFF_300 peer=160.30.132.11 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300 comment="VL_STAFF_300 - London to UK"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_NEPAL_VL_STAFF_300 peer=160.30.132.12 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300 comment="VL_STAFF_300 - London to Nepal"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_HMAL_VL_STAFF_300 peer=160.30.132.13 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300 comment="VL_STAFF_300 - London to Himal"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_BRIT_VL_STAFF_300 peer=160.30.132.14 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300 comment="VL_STAFF_300 - London to British"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_SKILL_VL_STAFF_300 peer=160.30.132.15 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300 comment="VL_STAFF_300 - London to Skill"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_ALUMNI_VL_STAFF_300 peer=160.30.132.16 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300 comment="VL_STAFF_300 - London to Alumni"
[admin@Z9000-BR-01] /interface/vpls add name=VPLS_KUMARI_VL_STAFF_300 peer=160.30.132.17 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300 comment="VL_STAFF_300 - London to Kumari"
[admin@Z9000-BR-01] /interface/vpls /
```

*Figure 142: Configuration VPLS Full-Mesh on LONDON-BLOCK Router Through CMD*



**Figure 143: Configuration VPLS Full-Mesh on LONDON-BLOCK Router Through CMD**

## 9.2. UK-BLOCK

### **9.2.1. Create VPLS BRIDGES (L2 DOMAINS)**

CMD

```
/interface bridge  
add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 - VPLS Bridge"  
add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 - VPLS Bridge"
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 - VPLS Bridge"
/

```

```
[admin@UK-BLOCK] >
[admin@UK-BLOCK] > /interface bridge
[admin@UK-BLOCK] /interface/bridge> add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 - VPLS Bridge"
[admin@UK-BLOCK] /interface/bridge> add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 - VPLS Bridge"
[admin@UK-BLOCK] /interface/bridge> add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 - VPLS Bridge"
[admin@UK-BLOCK] /interface/bridge> /
[admin@UK-BLOCK]
```

Figure 144: Create VPLS BRIDGES (L2 DOMAINS) on UK-BLOCK Router Through CMD

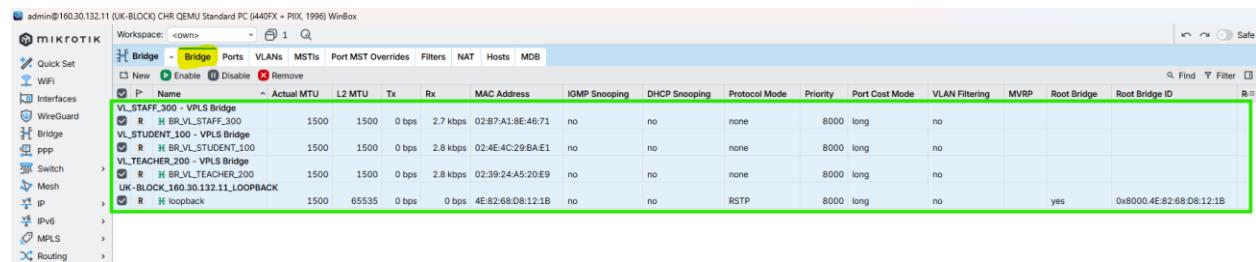


Figure 145: Create VPLS BRIDGES (L2 DOMAINS) on UK-BLOCK Router Through WINBOX

### 9.2.2. VPLS Configuration (UK-Points to LONDON-Points)

CMD

```
/interface vpls
add name=VPLS_LONDON_VL_STUDENT_100 peer=160.30.132.1 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100
comment="VL_STUDENT_100 - UK to London"
/

/interface vpls
add name=VPLS_LONDON_VL_TEACHER_200 peer=160.30.132.1 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200
comment="VL_TEACHER_200 - UK to London"
/

/interface vpls
add name=VPLS_LONDON_VL_STAFF_300 peer=160.30.132.1 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300
comment="VL_STAFF_300 - UK to London"
/

/mpls ldp neighbor print
/interface vpls print
/interface bridge port print
/interface bridge host print
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@UK-BLOCK] >
[admin@UK-BLOCK] > /interface vpls
[admin@UK-BLOCK] > /interface/vpls> add name=VPLS_LONDON_VL_STUDENT_100 peer=160.30.132.1 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100 comment="VL_STUDENT_100 - UK to London"
[admin@UK-BLOCK] > /interface/vpls>
[admin@UK-BLOCK] > /interface vpls
[admin@UK-BLOCK] > /interface/vpls> add name=VPLS_LONDON_VL_TEACHER_200 peer=160.30.132.1 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200 comment="VL_TEACHER_200 - UK to London"
[admin@UK-BLOCK] > /interface/vpls>
[admin@UK-BLOCK] > /interface vpls
[admin@UK-BLOCK] > /interface/vpls> add name=VPLS_LONDON_VL_STAFF_300 peer=160.30.132.1 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300 comment="VL_STAFF_300 - UK to London"
[admin@UK-BLOCK] > /interface/vpls>
[admin@UK-BLOCK] >
```

Figure 146: VPLS Configuration (UK-Points to LONDON-Points) on UK-BLOCK Router Through CMD

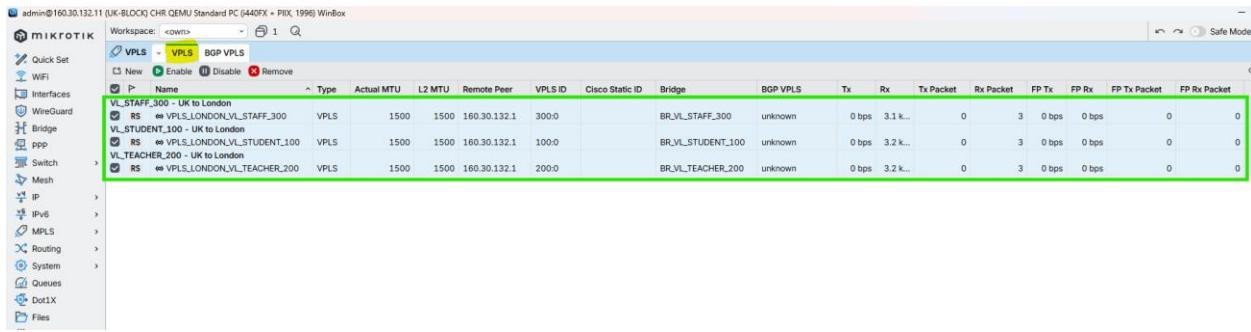


Figure 147: VPLS Configuration (UK-Points to LONDON-Points) on UK-BLOCK Router Through WINBOX

## 9.3. NEPAL-BLOCK

### 9.3.1. Create VPLS BRIDGES (L2 DOMAINS)

CMD

```
/interface bridge
add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 - VPLS Bridge"
add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 - VPLS Bridge"
add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 - VPLS Bridge"
/
```

```
[admin@NEPAL-BLOCK] >
[admin@NEPAL-BLOCK] > /interface bridge
[admin@NEPAL-BLOCK] > /interface/bridge> add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 - VPLS Bridge"
[admin@NEPAL-BLOCK] > /interface/bridge> add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 - VPLS Bridge"
[admin@NEPAL-BLOCK] > /interface/bridge> add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 - VPLS Bridge"
[admin@NEPAL-BLOCK] > /interface/bridge>
[admin@NEPAL-BLOCK] >
```

Figure 148: Create VPLS BRIDGES (L2 DOMAINS) on NEPAL-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

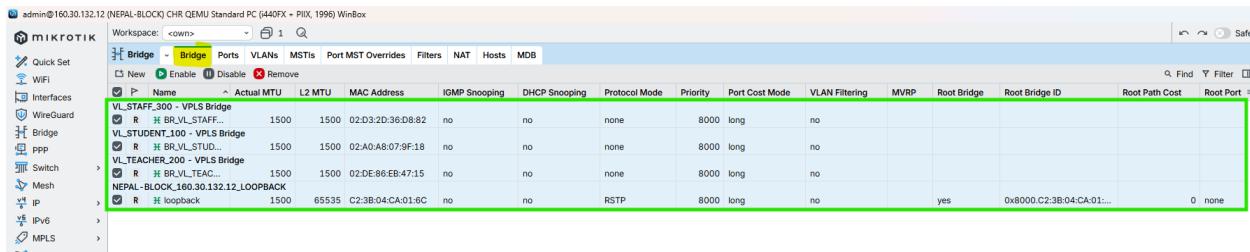


Figure 149: Create VPLS BRIDGES (L2 DOMAINS) on NEPAL-BLOCK Router Through WINBOX

### 9.3.2. VPLS Configuration (NEPAL-Points to LONDON-Points)

CMD

```
/interface vpls
add name=VPLS_LONDON_VL_STUDENT_100 peer=160.30.132.1 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100
comment="VL_STUDENT_100 - Nepal To London"
/

/interface vpls
add name=VPLS_LONDON_VL_TEACHER_200 peer=160.30.132.1 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200
comment="VL_TEACHER_200 - Nepal To London"
/

/interface vpls
add name=VPLS_LONDON_VL_STAFF_300 peer=160.30.132.1 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300
comment="VL_STAFF_300 - Nepal To London"
/

/mpls ldp neighbor print
/interface vpls print
/interface bridge port print
/interface bridge host print
```

```
[admin@NEPAL_BLOCK] > /interface vpls
[admin@NEPAL_BLOCK] > /interface/vpls> add name=VPLS_LONDON_VL_STUDENT_100 peer=160.30.132.1 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100 comment="VL_STUDENT_100 - Nepal To London"
[admin@NEPAL_BLOCK] > /interface/vpls> /
[admin@NEPAL_BLOCK] > /interface vpls
[admin@NEPAL_BLOCK] > /interface/vpls> add name=VPLS_LONDON_VL_TEACHER_200 peer=160.30.132.1 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200 comment="VL_TEACHER_200 - Nepal To London"
[admin@NEPAL_BLOCK] > /interface/vpls> /
[admin@NEPAL_BLOCK] > /interface vpls
[admin@NEPAL_BLOCK] > /interface/vpls> add name=VPLS_LONDON_VL_STAFF_300 peer=160.30.132.1 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300 comment="VL_STAFF_300 - Nepal To London"
[admin@NEPAL_BLOCK] > /interface/vpls> /
```

Figure 150: VPLS Configuration (NEPAL-Points to LONDON-Points) on NEPAL-BLOCK Router Through CMD

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

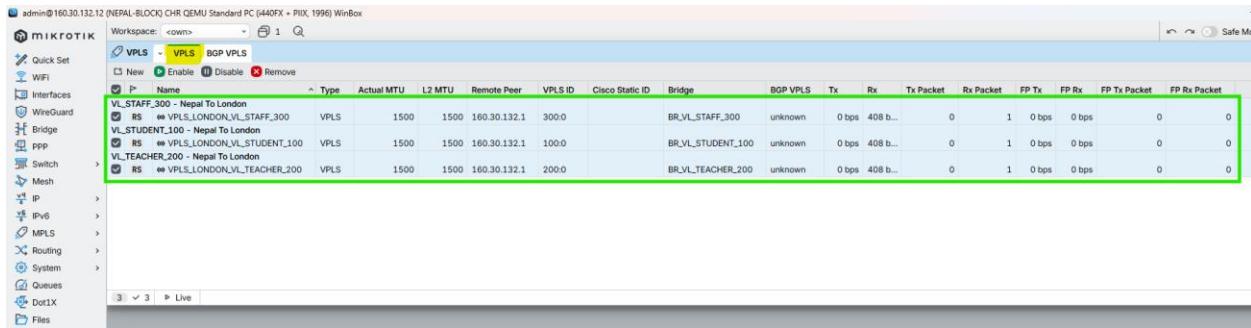


Figure 151: VPLS Configuration (NEPAL-Points to LONDON-Points) on NEPAL-BLOCK Router Through WINBOX

## 9.4. HIMAL-BLOCK

### 9.4.1. Create VPLS BRIDGES (L2 DOMAINS)

CMD

```
/interface bridge
add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 – VPLS Bridge"
add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 – VPLS Bridge"
add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 – VPLS Bridge"
/
```

```
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /interface bridge
[admin@HIMAL-BLOCK] /interface/bridge> add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 - VPLS Bridge"
[admin@HIMAL-BLOCK] /interface/bridge> add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 - VPLS Bridge"
[admin@HIMAL-BLOCK] /interface/bridge> add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 - VPLS Bridge"
[admin@HIMAL-BLOCK] /interface/bridge>
[admin@HIMAL-BLOCK] >
```

Figure 152: Create VPLS BRIDGES (L2 DOMAINS) on HIMAL-BLOCK Router Through CMD

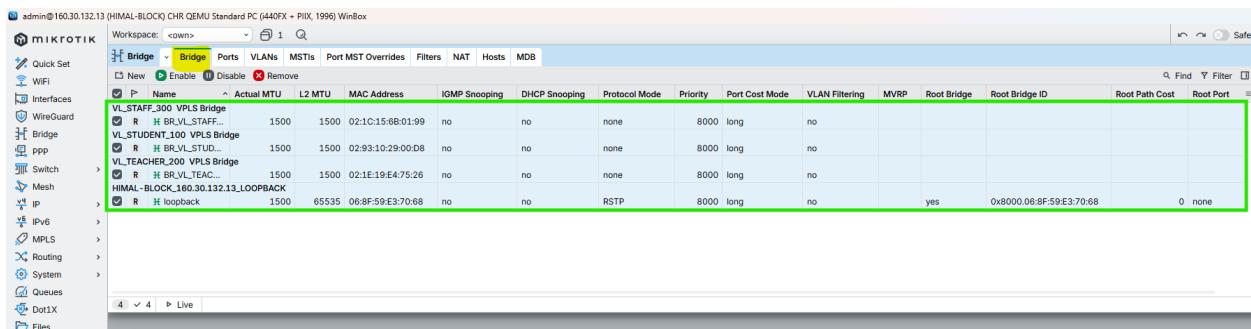


Figure 153: Create VPLS BRIDGES (L2 DOMAINS) on HIMAL-BLOCK Router Through WINBOX

#### 9.4.2. VPLS Configuration (HIMAL-Points to LONDON-Points)

CMD

```
/interface vpls
add name=VPLS_LONDON_VL_STUDENT_100 peer=160.30.132.1 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100
comment="VL_STUDENT_100 - Himal To London"
/

/interface vpls
add name=VPLS_LONDON_VL_TEACHER_200 peer=160.30.132.1 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200
comment="VL_TEACHER_200 - Himal To London"
/

/interface vpls
add name=VPLS_LONDON_VL_STAFF_300 peer=160.30.132.1 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300
comment="VL_STAFF_300 - Himal To London"
/

/mpls ldp neighbor print
/interface vpls print
/interface bridge port print
/interface bridge host print
```

```
[admin@HIMAL-BLOCK] > /interface vpls
[admin@HIMAL-BLOCK] /interface/vpls> add name=VPLS_LONDON_VL_STUDENT_100 peer=160.30.132.1 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100 comment="VL_STUDENT_100 - Himal To London"
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /interface vpls
[admin@HIMAL-BLOCK] /interface/vpls> add name=VPLS_LONDON_VL_TEACHER_200 peer=160.30.132.1 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200 comment="VL_TEACHER_200 - Himal To London"
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /interface vpls
[admin@HIMAL-BLOCK] /interface/vpls> add name=VPLS_LONDON_VL_STAFF_300 peer=160.30.132.1 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300 comment="VL_STAFF_300 - Himal To London"
[admin@HIMAL-BLOCK] >
```

Figure 154: VPLS Configuration (HIMAL-Points to LONDON-Points) on HIMAL-BLOCK Router Through CMD

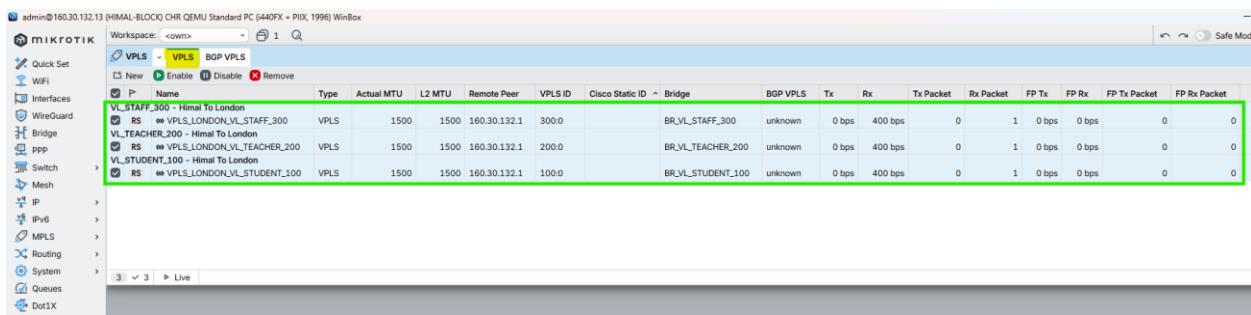


Figure 155: VPLS Configuration (HIMAL-Points to LONDON-Points) on HIMAL-BLOCK Router Through WINBOX

## 9.5. BRIT-BLOCK

### 9.5.1. Create VPLS BRIDGES (L2 DOMAINS)

CMD

```
/interface bridge
add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 – VPLS Bridge"
add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 – VPLS Bridge"
add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 – VPLS Bridge"
/
```

```
[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > /interface bridge
[admin@BRIT-BLOCK] /interface/bridge> add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 - VPLS Bridge"
[admin@BRIT-BLOCK] /interface/bridge> add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 - VPLS Bridge"
[admin@BRIT-BLOCK] /interface/bridge> add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 - VPLS Bridge"
[admin@BRIT-BLOCK] /interface/bridge>
[admin@BRIT-BLOCK] >
```

Figure 156: Create VPLS BRIDGES (L2 DOMAINS) on BRIT-BLOCK Router Through CMD

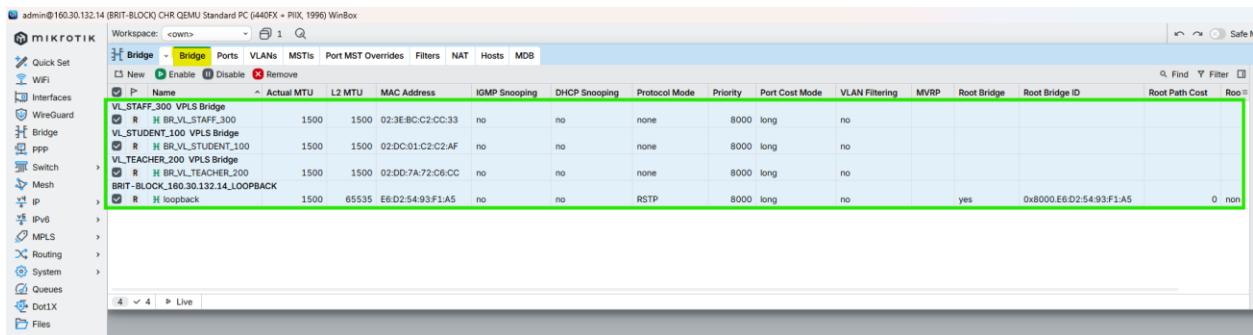


Figure 157: Create VPLS BRIDGES (L2 DOMAINS) on BRIT-BLOCK Router Through WINBOX

### 9.5.2. VPLS Configuration (BRIT-Points to LONDON-Points)

CMD

```
/interface vpls
add name=VPLS_LONDON_VL_STUDENT_100 peer=160.30.132.1 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100
comment="VL_STUDENT_100 - British To London"
/
/interface vpls
add name=VPLS_LONDON_VL_TEACHER_200 peer=160.30.132.1 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200
comment="VL_TEACHER_200 - British To London"
/
/interface vpls
```

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```

add name=VPLS_LONDON_VL_STAFF_300 peer=160.30.132.1 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300
comment="VL_STAFF_300 - British To London"
/
/mpls ldp neighbor print
/interface vpls print
/interface bridge port print
/interface bridge host print

```

```

[admin@BRIT-BLOCK] > /interface vpls
[admin@BRIT-BLOCK] > /interface/vpls> add name=VPLS_LONDON_VL_STUDENT_100 peer=160.30.132.1 vpls id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100 comment="VL_STUDENT_100 - British To London"
[admin@BRIT-BLOCK] > /interface/vpls>
[admin@BRIT-BLOCK] > /interface vpls
[admin@BRIT-BLOCK] > /interface/vpls> add name=VPLS_LONDON_VL_TEACHER_200 peer=160.30.132.1 vpls id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200 comment="VL_TEACHER_200 - British To London"
[admin@BRIT-BLOCK] > /interface/vpls>
[admin@BRIT-BLOCK] > /interface vpls
[admin@BRIT-BLOCK] > /interface/vpls> add name=VPLS_LONDON_VL_STAFF_300 peer=160.30.132.1 vpls id=300:0 mtu=1500 bridge=BR_VL_STAFF_300 comment="VL_STAFF_300 - British To London"
[admin@BRIT-BLOCK] >

```

Figure 158: VPLS Configuration (BRIT-Points to LONDON-Points) on BRIT-BLOCK Router Through CMD

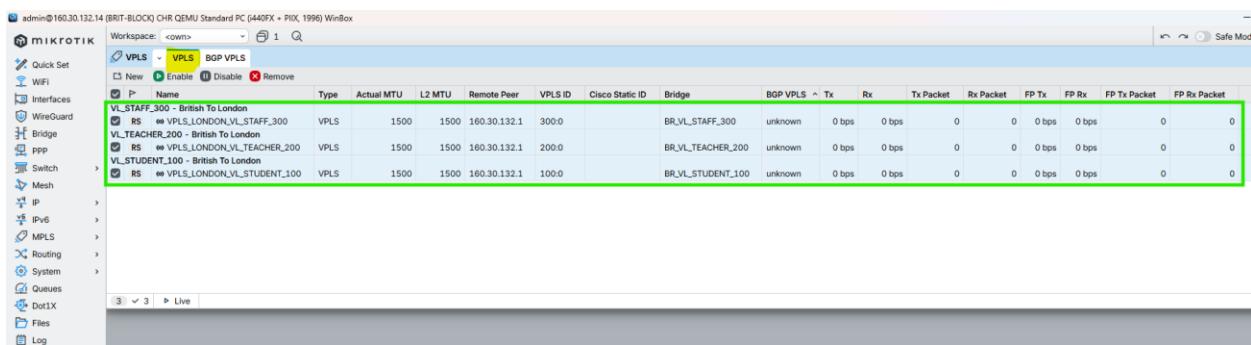


Figure 159: VPLS Configuration (BRIT-Points to LONDON-Points) on BRIT-BLOCK Router Through WINBOX

## 9.6. SKILL-BLOCK

### 9.6.1. Create VPLS BRIDGES (L2 DOMAINS)

CMD

```

/interface bridge
add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 – VPLS Bridge"
add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 – VPLS Bridge"
add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 – VPLS Bridge"
/

```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /interface bridge
[admin@SKILL-BLOCK] /interface/bridge> add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 - VPLS Bridge"
[admin@SKILL-BLOCK] /interface/bridge> add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 - VPLS Bridge"
[admin@SKILL-BLOCK] /interface/bridge> add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 - VPLS Bridge"
[admin@SKILL-BLOCK] /interface/bridge>
[admin@SKILL-BLOCK] >
```

Figure 160: Create VPLS BRIDGES (L2 DOMAINS) on SKILL-BLOCK Router Through CMD

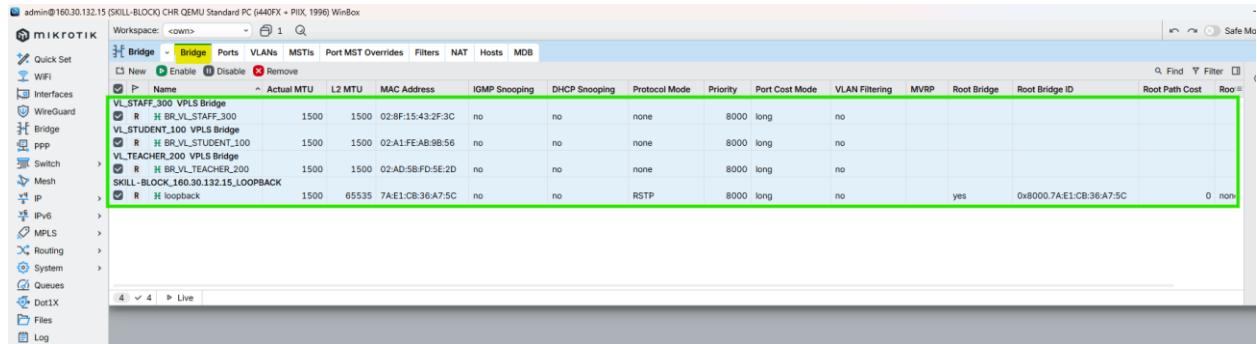


Figure 161: Create VPLS BRIDGES (L2 DOMAINS) on SKILL-BLOCK Router Through WINBOX

### 9.6.2. VPLS Configuration (SKILL-Points to LONDON-Points)

CMD

```
/interface vpls
add name=VPLS_LONDON_VL_STUDENT_100 peer=160.30.132.1 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100
comment="VL_STUDENT_100 - Skill To London"
/

/interface vpls
add name=VPLS_LONDON_VL_TEACHER_200 peer=160.30.132.1 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200
comment="VL_TEACHER_200 - Skill To London"
/

/interface vpls
add name=VPLS_LONDON_VL_STAFF_300 peer=160.30.132.1 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300
comment="VL_STAFF_300 - Skill To London"
/

/mpls ldp neighbor print
/interface vpls print
/interface bridge port print
/interface bridge host print
```

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /interface vpls
[admin@SKILL-BLOCK] /Interface/vpls> add name=VPLS_LONDON_VL_STUDENT_100 peer=160.30.132.1 vpls-id=100:0 stu=1500 bridge=BR_VL_STUDENT_100 comment="VL_STUDENT_100 - Skill To London"
[admin@SKILL-BLOCK] /Interface/vpls> /
[admin@SKILL-BLOCK] > /interface vpls
[admin@SKILL-BLOCK] /Interface/vpls> add name=VPLS_LONDON_VL_TEACHER_200 peer=160.30.132.1 vpls-id=200:0 stu=1500 bridge=BR_VL_TEACHER_200 comment="VL_TEACHER_200 Skill To London"
[admin@SKILL-BLOCK] /Interface/vpls> /
[admin@SKILL-BLOCK] > /interface vpls
[admin@SKILL-BLOCK] /Interface/vpls> add name=VPLS_LONDON_VL_STAFF_300 peer=160.30.132.1 vpls-id=300:0 stu=1500 bridge=BR_VL_STAFF_300 comment="VL_STAFF_300 Skill To London"
[admin@SKILL-BLOCK] /Interface/vpls> /
[admin@SKILL-BLOCK] >
```

Figure 162: VPLS Configuration (SKILL-Points to LONDON-Points) on SKILL-BLOCK Router Through CMD

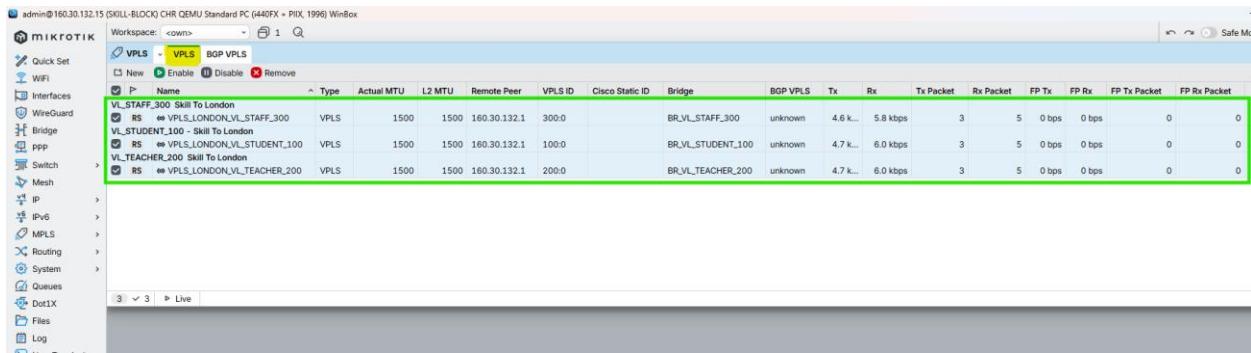


Figure 163: VPLS Configuration (SKILL-Points to LONDON-Points) on SKILL-BLOCK Router Through WINBOX

## 9.7. ALUMNI-BLOCK

### 9.7.1. Create VPLS BRIDGES (L2 DOMAINS)

CMD

```
/interface bridge
add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 – VPLS Bridge"
add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 – VPLS Bridge"
add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 – VPLS Bridge"
/
```

```
[admin@ALUMNI-BLOCK] >
[admin@ALUMNI-BLOCK] > /interface bridge
[admin@ALUMNI-BLOCK] /Interface/bridge> add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 - VPLS Bridge"
[admin@ALUMNI-BLOCK] /Interface/bridge> add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 - VPLS Bridge"
[admin@ALUMNI-BLOCK] /Interface/bridge> add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 - VPLS Bridge"
[admin@ALUMNI-BLOCK] /Interface/bridge> /
```

Figure 164: Create VPLS BRIDGES (L2 DOMAINS) on ALUMNI-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

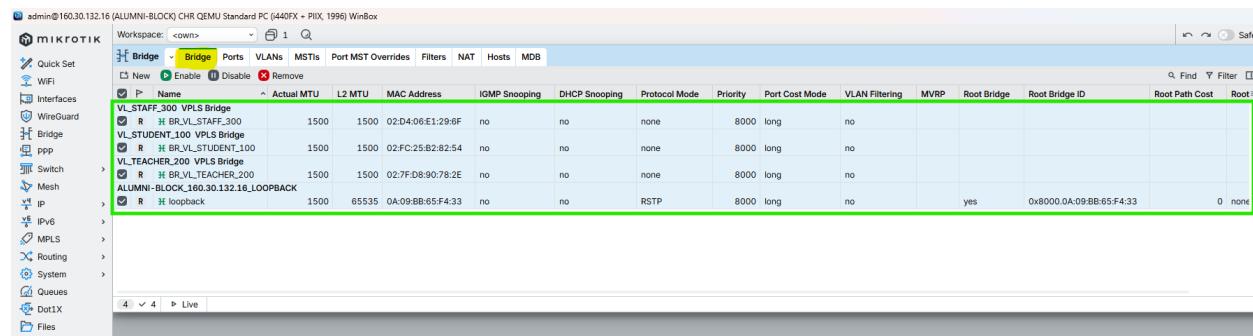


Figure 165: Create VPLS BRIDGES (L2 DOMAINS) on ALUMNI-BLOCK Router Through WINBOX

### 9.7.2. VPLS Configuration (ALUMNI-Points to LONDON-Points)

CMD

```
/interface vpls
add name=VPLS_LONDON_VL_STUDENT_100 peer=160.30.132.1 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100
comment="VL_STUDENT_100 – Alumni To London"
/

/interface vpls
add name=VPLS_LONDON_VL_TEACHER_200 peer=160.30.132.1 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200
comment="VL_TEACHER_200 – Alumni To London"
/

/interface vpls
add name=VPLS_LONDON_VL_STAFF_300 peer=160.30.132.1 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300
comment="VL_STAFF_300 – Alumni To London"
/

/mpls ldp neighbor print
/interface vpls print
/interface bridge port print
/interface bridge host print
```

```
[admin@ALUMNI-BLOCK] > /interface vpls
[admin@ALUMNI-BLOCK] /interface/vpls> add name=VPLS_LONDON_VL_STUDENT_100 peer=160.30.132.1 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100 comment="VL_STUDENT_100 Alumni To London"
[admin@ALUMNI-BLOCK] /interface/vpls>
[admin@ALUMNI-BLOCK] /interface/vpls> add name=VPLS_LONDON_VL_TEACHER_200 peer=160.30.132.1 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200 comment="VL_TEACHER_200 Alumni To London"
[admin@ALUMNI-BLOCK] /interface/vpls>
[admin@ALUMNI-BLOCK] /interface/vpls> add name=VPLS_LONDON_VL_STAFF_300 peer=160.30.132.1 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300 comment="VL_STAFF_300 Alumni To London"
[admin@ALUMNI-BLOCK] /interface/vpls>
```

Figure 166: VPLS Configuration (ALUMNI-Points to LONDON-Points) on ALUMNI-BLOCK Router Through CMD

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

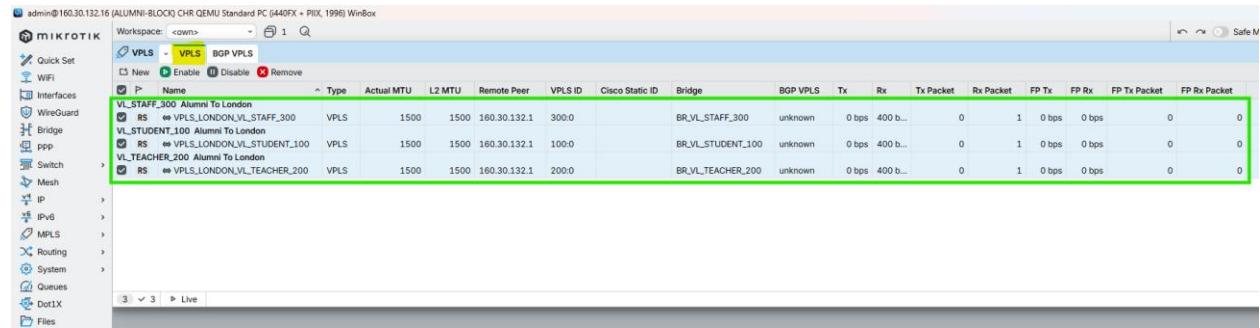


Figure 167: VPLS Configuration (ALUMNI-Points to LONDON-Points) on ALUMNI-BLOCK Router Through WINBOX

## 9.8. KUMARI-BLOCK

### 9.8.1. Create VPLS BRIDGES (L2 DOMAINS)

CMD

```
/interface bridge
add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 – VPLS Bridge"
add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 – VPLS Bridge"
add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 – VPLS Bridge"
/
```

```
[admin@KUMARI-BLOCK] >
[admin@KUMARI-BLOCK] > /interface bridge
[admin@KUMARI-BLOCK] /interface/bridge> add name=BR_VL_STUDENT_100 protocol-mode=none comment="VL_STUDENT_100 - VPLS Bridge"
[admin@KUMARI-BLOCK] /interface/bridge> add name=BR_VL_TEACHER_200 protocol-mode=none comment="VL_TEACHER_200 - VPLS Bridge"
[admin@KUMARI-BLOCK] /interface/bridge> add name=BR_VL_STAFF_300 protocol-mode=none comment="VL_STAFF_300 - VPLS Bridge"
[admin@KUMARI-BLOCK] /interface/bridge>
```

Figure 168: Create VPLS BRIDGES (L2 DOMAINS) on KUMARI-BLOCK Router Through CMD

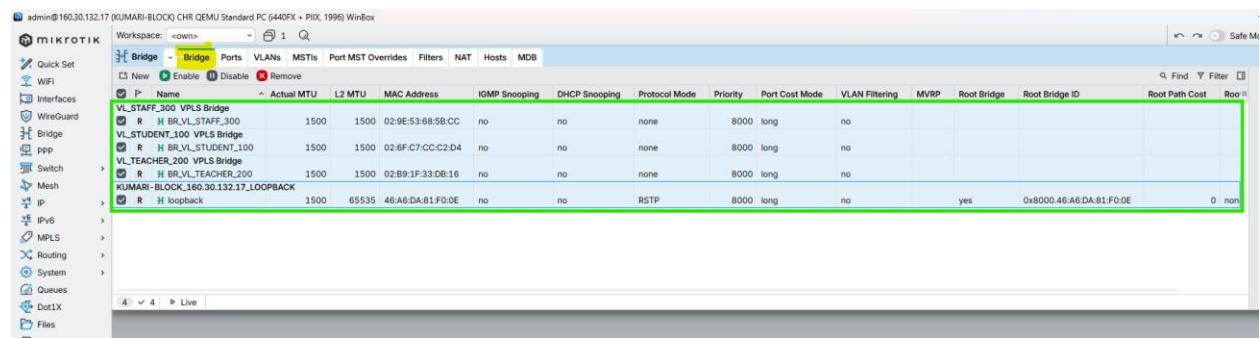


Figure 169: Create VPLS BRIDGES (L2 DOMAINS) on KUMARI-BLOCK Router Through WINBOX

### 9.8.2. VPLS Configuration (KUMARI-Points to LONDON-Points)

CMD

```
/interface vpls
add name=VPLS_LONDON_VL_STUDENT_100 peer=160.30.132.1 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100
comment="VL_STUDENT_100 – Kumari To London"
/

/interface vpls
add name=VPLS_LONDON_VL_TEACHER_200 peer=160.30.132.1 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200
comment="VL_TEACHER_200 – Kumari To London"
/

/interface vpls
add name=VPLS_LONDON_VL_STAFF_300 peer=160.30.132.1 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300
comment="VL_STAFF_300 – Kumari To London"
/

/mpls ldp neighbor print
/interface vpls print
/interface bridge port print
/interface bridge host print
```

```
[admin@KUMARI-BLOCK] > /interface vpls
[admin@KUMARI-BLOCK] /interface/vpls add name=VPLS_LONDON_VL_STUDENT_100 peer=160.30.132.1 vpls-id=100:0 mtu=1500 bridge=BR_VL_STUDENT_100 comment="VL_STUDENT_100 Kumari To London"
[admin@KUMARI-BLOCK] /interface/vpls /
[admin@KUMARI-BLOCK] > /interface vpls
[admin@KUMARI-BLOCK] /interface/vpls add name=VPLS_LONDON_VL_TEACHER_200 peer=160.30.132.1 vpls-id=200:0 mtu=1500 bridge=BR_VL_TEACHER_200 comment="VL_TEACHER_200 Kumari To London"
[admin@KUMARI-BLOCK] /interface/vpls /
[admin@KUMARI-BLOCK] > /interface vpls
[admin@KUMARI-BLOCK] /interface/vpls add name=VPLS_LONDON_VL_STAFF_300 peer=160.30.132.1 vpls-id=300:0 mtu=1500 bridge=BR_VL_STAFF_300 comment="VL_STAFF_300 Kumari To London"
[admin@KUMARI-BLOCK] /interface/vpls /
```

Figure 170: VPLS Configuration (KUMARI-Points to LONDON-Points) on KUMARI-BLOCK Router Through CMD

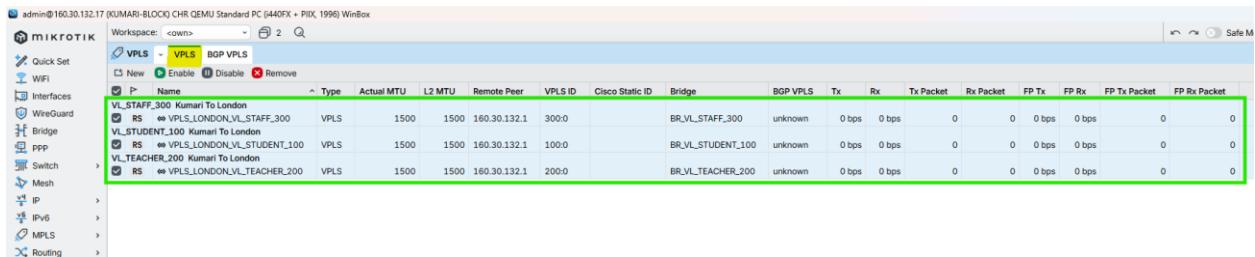


Figure 171: VPLS Configuration (KUMARI-Points to LONDON-Points) on KUMARI-BLOCK Router Through WINBOX

## 10. Switch TO Router Configuration of Each Block

### 10.1. LONDON-BLOCK

CMD

```
enable
configure terminal
hostname LONDON-BLOCK-SW
no ip domain-lookup

ip domain name isling-london-block-sw.com
crypto key generate rsa

1024

ip ssh version 2
line vty 0 15
transport input all
login local
exit

vlan 100
name STUDENTS
exit

vlan 200
name TEACHERS
exit

vlan 300
name STAFFS
exit

vlan 999
name MANAGEMENT-IP
exit

interface GigabitEthernet0/0
description TRUNK_to_LONDON_BLOCK_Router_P10
no shutdown
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
exit

interface range GigabitEthernet0/1-3
no shutdown
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
exit

interface range GigabitEthernet1/0-3
no shutdown
description STUDENTS
switchport mode access
switchport access vlan 100
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

interface range GigabitEthernet2/0-3
no shutdown
description TEACHERS
switchport mode access
switchport access vlan 200
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

interface range GigabitEthernet3/0-3
no shutdown
description STAFF
switchport mode access
switchport access vlan 300
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

spanning-tree mode rapid-pvst
no spanning-tree vlan 100,200,300

do show interface description
```

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
do show interface gigabitEthernet0/0

do show interface gigabitEthernet0/1

do show interface trunk
```

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname LONDON-BLOCK-SW
LONDON-BLOCK-SW(config)#ip domain name isling-london-block-sw.com
LONDON-BLOCK-SW(config)#crypto key generate rsa
The key on the key will be used in LONDON-BLOCK-SW.isling-london-block-sw.com
Choose the size of the key modulus in the range of 380 to 4096 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.

How many bits in the modulus [512]: 1024
% Generating 1024 bit RSA keys, keys will be non-exportable...
[OK] (elapsed time was 0 seconds)

LONDON-BLOCK-SW(config)#
*Feb 4 17:58:16.751: %SSH-5-ENABLED: SSH 1.99 has been enabled
LONDON-BLOCK-SW(config)#ip ssh version 2
LONDON-BLOCK-SW(config)#
LONDON-BLOCK-SW(config-line)# login 0 15
LONDON-BLOCK-SW(config-line)# transport input all
LONDON-BLOCK-SW(config-line)# login local
LONDON-BLOCK-SW(config-line)#exit
LONDON-BLOCK-SW(config)#
LONDON-BLOCK-SW(config)#vlan 100
LONDON-BLOCK-SW(config-vlan)#name STUDENTS
LONDON-BLOCK-SW(config-vlan)#exit
LONDON-BLOCK-SW(config)#
LONDON-BLOCK-SW(config)#vlan 200
LONDON-BLOCK-SW(config-vlan)#name TEACHERS
LONDON-BLOCK-SW(config-vlan)#exit
LONDON-BLOCK-SW(config)#
LONDON-BLOCK-SW(config)#vlan 300
LONDON-BLOCK-SW(config-vlan)#name STAFFS
LONDON-BLOCK-SW(config-vlan)#exit
LONDON-BLOCK-SW(config)#
LONDON-BLOCK-SW(config)#vlan 999
LONDON-BLOCK-SW(config-vlan)#name MANAGEMENT-IP
LONDON-BLOCK-SW(config-vlan)#exit
LONDON-BLOCK-SW(config)#
LONDON-BLOCK-SW(config)#interface GigabitEthernet0/0
LONDON-BLOCK-SW(config-if)# description TRUNK_to_LONDON_BLOCK_Router_P10
LONDON-BLOCK-SW(config-if)# no shutdown
LONDON-BLOCK-SW(config-if)# switchport trunk encapsulation dot1q
LONDON-BLOCK-SW(config-if)# switchport mode trunk
LONDON-BLOCK-SW(config-if)# switchport trunk allowed vlan 100,200,300,999
LONDON-BLOCK-SW(config-if)# switchport trunk native vlan 999
LONDON-BLOCK-SW(config-if)# spanning-tree guard root
LONDON-BLOCK-SW(config-if)#exit
LONDON-BLOCK-SW(config)#
LONDON-BLOCK-SW(config)#interface range GigabitEthernet0/1-3
LONDON-BLOCK-SW(config-if-range)# no shutdown
LONDON-BLOCK-SW(config-if-range)# switchport trunk encapsulation dot1q
LONDON-BLOCK-SW(config-if-range)# switchport mode trunk
LONDON-BLOCK-SW(config-if-range)# trunk allowed vlan 100,200,300,999
LONDON-BLOCK-SW(config-if-range)# switchport trunk native vlan 999
LONDON-BLOCK-SW(config-if-range)# spanning-tree guard root
LONDON-BLOCK-SW(config-if-range)#exit
LONDON-BLOCK-SW(config)#
LONDON-BLOCK-SW(config)#interface range GigabitEthernet1/0-3
LONDON-BLOCK-SW(config-if-range)# no shutdown
LONDON-BLOCK-SW(config-if-range)# description STUDENTS
```

```
LONDON-BLOCK-SW(config)#
LONDON-BLOCK-SW(config)#interface gigabitEthernet0/0
LONDON-BLOCK-SW(config-if)# description TRUNK_to_LONDON_BLOCK_Router_P10
LONDON-BLOCK-SW(config-if)# no shutdown
LONDON-BLOCK-SW(config-if)# switchport trunk encapsulation dot1q
LONDON-BLOCK-SW(config-if)# switchport mode trunk
LONDON-BLOCK-SW(config-if)# switchport trunk allowed vlan 100,200,300,999
LONDON-BLOCK-SW(config-if)# switchport trunk native vlan 999
LONDON-BLOCK-SW(config-if)# spanning-tree guard root
LONDON-BLOCK-SW(config-if)#exit
LONDON-BLOCK-SW(config)#
LONDON-BLOCK-SW(config)#interface range GigabitEthernet1/0-3
LONDON-BLOCK-SW(config-if-range)# no shutdown
LONDON-BLOCK-SW(config-if-range)# switchport trunk encapsulation dot1q
LONDON-BLOCK-SW(config-if-range)# switchport mode trunk
LONDON-BLOCK-SW(config-if-range)# trunk allowed vlan 100,200,300,999
LONDON-BLOCK-SW(config-if-range)# switchport trunk native vlan 999
LONDON-BLOCK-SW(config-if-range)# spanning-tree guard root
LONDON-BLOCK-SW(config-if-range)#exit
LONDON-BLOCK-SW(config)#
LONDON-BLOCK-SW(config)#interface range GigabitEthernet1/0-3
LONDON-BLOCK-SW(config-if-range)# no shutdown
LONDON-BLOCK-SW(config-if-range)# description STUDENTS
LONDON-BLOCK-SW(config-if-range)# switchport mode access
LONDON-BLOCK-SW(config-if-range)# switchport access vlan 100
LONDON-BLOCK-SW(config-if-range)# spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION
LONDON-BLOCK-SW(config)#
LONDON-BLOCK-SW(config)#interface range GigabitEthernet2/0-3
LONDON-BLOCK-SW(config-if-range)# no shutdown
LONDON-BLOCK-SW(config-if-range)# description TEACHERS
LONDON-BLOCK-SW(config-if-range)# switchport mode access
LONDON-BLOCK-SW(config-if-range)# switchport access vlan 200
LONDON-BLOCK-SW(config-if-range)# spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION
LONDON-BLOCK-SW(config)#
LONDON-BLOCK-SW(config)#interface range GigabitEthernet3/0-3
LONDON-BLOCK-SW(config-if-range)# no shutdown
LONDON-BLOCK-SW(config-if-range)# description STAFF
LONDON-BLOCK-SW(config-if-range)# switchport mode access
LONDON-BLOCK-SW(config-if-range)# switchport access vlan 300
LONDON-BLOCK-SW(config-if-range)# spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION
LONDON-BLOCK-SW(config)#
%Portfast will be configured in 4 interfaces due to the range command
```

Figure 172: Configuration of Switch to Router Links at LONDON-BLOCK (i)

Figure 173: Configuration of Switch to Router Links at LONDON-BLOCK (ii)

## 10.2. UK-BLOCK

CMD

```
enable
conf t

hostname UK-BLOCK-SW
no ip domain-lookup

vlan 100
name STUDENTS
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
exit
vlan 200
name TEACHERS
exit
vlan 300
name STAFF
exit
vlan 999
name MGMT
exit

interface gi0/0
description TRUNK_to_UK_BLOCK_Router
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
no shutdown
exit

interface gi0/1
description TRUNK_to_NEPAL_BLOCK_Router
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
no shutdown
exit

interface range gi1/0-3
description STUDENTS
switchport mode access
switchport access vlan 100
spanning-tree portfast
spanning-tree bpduguard enable
no shutdown
exit

interface range gi2/0-3
description TEACHERS
switchport mode access
switchport access vlan 200
spanning-tree portfast
spanning-tree bpduguard enable
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```

no shutdown
exit

interface range gi3/0-3
description STAFF
switchport mode access
switchport access vlan 300
spanning-tree portfast
spanning-tree bpduguard enable
no shutdown
exit

end
wr

spanning-tree mode rapid-pvst
no spanning-tree vlan 100,200,300

```

```

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*****  

Switch>
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname UK-BLOCK-SW
UK-BLOCK-SW(config)no ip domain-lookup
UK-BLOCK-SW(config)#
UK-BLOCK-SW(config)ip domain name isling.uk-block-sw.com
UK-BLOCK-SW(config)crypto key generate rsa
The name for the keys will be: UK-BLOCK-SW.isling.uk-block-sw.com
Choose the size of the key modulus in the range of 384 to 4096 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.

How many bits in the modulus [512]: 1024
% Generating 1024 bit RSA keys, keys will be non-exportable...
[OK] (elapsed time was 0 seconds)

UK-BLOCK-SW(config)#
*Feb 3 19:25:22.198: %SSH-5-ENABLED: SSH 1.99 has been enabled
UK-BLOCK-SW(config)ip ssh version 2
UK-BLOCK-SW(config)line vty 0 15
UK-BLOCK-SW(config-line)# transport input all
UK-BLOCK-SW(config-line)# login local
UK-BLOCK-SW(config-line)#exit
UK-BLOCK-SW(config)#
UK-BLOCK-SW(config)#vlan 100
UK-BLOCK-SW(config-vlan)# name STUDENTS
UK-BLOCK-SW(config-vlan)#exit
UK-BLOCK-SW(config)#
UK-BLOCK-SW(config)#vlan 200
UK-BLOCK-SW(config-vlan)# name TEACHERS
UK-BLOCK-SW(config-vlan)#exit
UK-BLOCK-SW(config)#
UK-BLOCK-SW(config)#vlan 300
UK-BLOCK-SW(config-vlan)# name STAFFS
UK-BLOCK-SW(config-vlan)#exit
UK-BLOCK-SW(config)#
UK-BLOCK-SW(config)#vlan 999
UK-BLOCK-SW(config-vlan)#name MANAGEMENT-IP
UK-BLOCK-SW(config-vlan)#exit
UK-BLOCK-SW(config)#
UK-BLOCK-SW(config)#interface GigabitEthernet0/0
UK-BLOCK-SW(config-if)# description TRUNK_to_UK_BLOCK_Router
UK-BLOCK-SW(config-if)# no shutdown
UK-BLOCK-SW(config-if)# switchport trunk encapsulation dot1q
UK-BLOCK-SW(config-if)# switchport mode trunk
UK-BLOCK-SW(config-if)# switchport trunk allowed vlan 100,200,300,999
UK-BLOCK-SW(config-if)# switchport trunk native vlan 999
UK-BLOCK-SW(config-if)# spanning-tree guard root
UK-BLOCK-SW(config-if)#exit
UK-BLOCK-SW(config)#
UK-BLOCK-SW(config)#interface GigabitEthernet0/1
UK-BLOCK-SW(config-if)# description TRUNK_to_NEPAL_BLOCK_Router
UK-BLOCK-SW(config-if)# no shutdown
UK-BLOCK-SW(config-if)# switchport trunk encapsulation dot1q
UK-BLOCK-SW(config-if)# switchport mode trunk
UK-BLOCK-SW(config-if)# switchport trunk allowed vlan 100,200,300,999
UK-BLOCK-SW(config-if)# switchport trunk native vlan 999
UK-BLOCK-SW(config-if)# spanning-tree guard root
UK-BLOCK-SW(config-if)#exit
UK-BLOCK-SW(config)#
UK-BLOCK-SW(config)#interface range GigabitEthernet1/0-3
UK-BLOCK-SW(config-if-range)# no shutdown
UK-BLOCK-SW(config-if-range)# description STUDENTS
UK-BLOCK-SW(config-if-range)# switchport mode access
UK-BLOCK-SW(config-if-range)# switchport access vlan 100
UK-BLOCK-SW(config-if-range)# spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION
%Portfast will be configured in 4 interfaces due to the range command
but will only have effect when the interfaces are in a non-trunking mode.
UK-BLOCK-SW(config-if-range)# spanning-tree bpduguard enable
UK-BLOCK-SW(config-if-range)#exit
UK-BLOCK-SW(config)#
UK-BLOCK-SW(config)#interface GigabitEthernet2/0-3
UK-BLOCK-SW(config-if-range)# no shutdown
UK-BLOCK-SW(config-if-range)# description TEACHERS
UK-BLOCK-SW(config-if-range)# switchport mode access
UK-BLOCK-SW(config-if-range)# switchport access vlan 200
UK-BLOCK-SW(config-if-range)# spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION
%Portfast will be configured in 4 interfaces due to the range command
but will only have effect when the interfaces are in a non-trunking mode.
UK-BLOCK-SW(config-if-range)# spanning-tree bpduguard enable
UK-BLOCK-SW(config-if-range)#exit
UK-BLOCK-SW(config)#
UK-BLOCK-SW(config)#interface GigabitEthernet3/0-3
UK-BLOCK-SW(config-if-range)# no shutdown
UK-BLOCK-SW(config-if-range)# description STAFF
UK-BLOCK-SW(config-if-range)# switchport mode access
UK-BLOCK-SW(config-if-range)# switchport access vlan 300
UK-BLOCK-SW(config-if-range)# spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

```

Figure 174: Configuration of Switch to Router Links at UK-BLOCK (i)

```

UK-BLOCK-SW(config)#interface GigabitEthernet0/0
UK-BLOCK-SW(config-if)# description TRUNK_to_UK_BLOCK_Router
UK-BLOCK-SW(config-if)# no shutdown
UK-BLOCK-SW(config-if)# switchport trunk encapsulation dot1q
UK-BLOCK-SW(config-if)# switchport mode trunk
UK-BLOCK-SW(config-if)# switchport trunk allowed vlan 100,200,300,999
UK-BLOCK-SW(config-if)# switchport trunk native vlan 999
UK-BLOCK-SW(config-if)# spanning-tree guard root
UK-BLOCK-SW(config-if)#exit
UK-BLOCK-SW(config)#
UK-BLOCK-SW(config)#interface GigabitEthernet1/0
UK-BLOCK-SW(config-if)# description TRUNK_to_NEPAL_BLOCK_Router
UK-BLOCK-SW(config-if)# no shutdown
UK-BLOCK-SW(config-if)# switchport trunk encapsulation dot1q
UK-BLOCK-SW(config-if)# switchport mode trunk
UK-BLOCK-SW(config-if)# switchport trunk allowed vlan 100,200,300,999
UK-BLOCK-SW(config-if)# switchport trunk native vlan 999
UK-BLOCK-SW(config-if)# spanning-tree guard root
UK-BLOCK-SW(config-if)#exit
UK-BLOCK-SW(config)#
UK-BLOCK-SW(config)#interface GigabitEthernet2/0
UK-BLOCK-SW(config-if)# description STUDENTS
UK-BLOCK-SW(config-if)# switchport mode access
UK-BLOCK-SW(config-if)# switchport access vlan 100
UK-BLOCK-SW(config-if)# spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION
%Portfast will be configured in 4 interfaces due to the range command
but will only have effect when the interfaces are in a non-trunking mode.
UK-BLOCK-SW(config-if)# spanning-tree bpduguard enable
UK-BLOCK-SW(config-if)#exit
UK-BLOCK-SW(config)#
UK-BLOCK-SW(config)#interface GigabitEthernet3/0
UK-BLOCK-SW(config-if)# no shutdown
UK-BLOCK-SW(config-if)# description TEACHERS
UK-BLOCK-SW(config-if)# switchport mode access
UK-BLOCK-SW(config-if)# switchport access vlan 200
UK-BLOCK-SW(config-if)# spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION
%Portfast will be configured in 4 interfaces due to the range command
but will only have effect when the interfaces are in a non-trunking mode.
UK-BLOCK-SW(config-if)# spanning-tree bpduguard enable
UK-BLOCK-SW(config-if)#exit
UK-BLOCK-SW(config)#
UK-BLOCK-SW(config)#interface GigabitEthernet4/0
UK-BLOCK-SW(config-if)# no shutdown
UK-BLOCK-SW(config-if)# description STAFF
UK-BLOCK-SW(config-if)# switchport mode access
UK-BLOCK-SW(config-if)# switchport access vlan 300
UK-BLOCK-SW(config-if)# spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

```

Figure 175: Configuration of Switch to Router Links at UK-BLOCK (ii)

### 10.3. NEPAL-BLOCK

#### CMD

```
enable
configure terminal
hostname NEPAL-BLOCK-SW
no ip domain-lookup

ip domain name isling-nepal-block-sw.com
crypto key generate rsa

1024

ip ssh version 2
line vty 0 15
transport input all
login local
exit

vlan 100
name STUDENTS
exit

vlan 200
name TEACHERS
exit

vlan 300
name STAFFS
exit

vlan 999
name MANAGEMENT-IP
exit

interface GigabitEthernet0/0
description TRUNK_to_NEPAL_BLOCK_Router_P8
no shutdown
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
exit

interface GigabitEthernet0/1
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
description TRUNK_to_BRIT_BLOCK_Router_p7
no shutdown
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
exit

interface range GigabitEthernet1/0-3
no shutdown
description STUDENTS
switchport mode access
switchport access vlan 100
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

interface range GigabitEthernet2/0-3
no shutdown
description TEACHERS
switchport mode access
switchport access vlan 200
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

interface range GigabitEthernet3/0-3
no shutdown
description STAFF
switchport mode access
switchport access vlan 300
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

spanning-tree mode rapid-pvst
no spanning-tree vlan 100,200,300

do show interface description
do show interface gigabitEthernet0/0
do show interface gigabitEthernet0/1
do show interface trunk
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

<pre> Switch&gt;enable Switch&gt;configure terminal Enter configuration commands, one per line. End with CNTL/Z. Switch(config)hostname NEPAL-BLOCK-SW NEPAL-BLOCK-SW(config)no ip domain-lookup NEPAL-BLOCK-SW(config)# NEPAL-BLOCK-SW(config)ip domain name isling-nepal-block-sw.com NEPAL-BLOCK-SW(config)crypto key generate rsa The modulus size will set to NEPAL-BLOCK-SW.isling-nepal-block-sw.com Choose the size of the key modulus in the range of 360 to 4096 for your General Purpose Keys. Choosing a key modulus greater than 512 may take a few minutes.  How many bits in the modulus [512]: 1024 % Generating 1024 bit RSA keys, keys will be non-exportable... [OK] (elapsed time was 0 seconds)  NEPAL-BLOCK-SW(config)# *Feb 4 18:08:42.442: %SSH-5-ENABLED: SSH 1.99 has been enabled *Feb 4 18:09:13.436: %SSH-6-PNP:Discovery_STOPPED: PnP Discovery stopped (Config Wizard) NEPAL-BLOCK-SW(config)line vty 0 15 NEPAL-BLOCK-SW(config-line)# transport input all NEPAL-BLOCK-SW(config-line)# login local NEPAL-BLOCK-SW(config-line)#exit NEPAL-BLOCK-SW(config)# NEPAL-BLOCK-SW(config)interface vlan 100 NEPAL-BLOCK-SW(config-vlan)# name STUDENTS NEPAL-BLOCK-SW(config-vlan)#exit NEPAL-BLOCK-SW(config)# NEPAL-BLOCK-SW(config)interface vlan 200 NEPAL-BLOCK-SW(config-vlan)# name TEACHERS NEPAL-BLOCK-SW(config-vlan)#exit NEPAL-BLOCK-SW(config)# NEPAL-BLOCK-SW(config)interface vlan 300 NEPAL-BLOCK-SW(config-vlan)# name STAFFS NEPAL-BLOCK-SW(config-vlan)#exit NEPAL-BLOCK-SW(config)# NEPAL-BLOCK-SW(config)interface GigabitEthernet0/0 NEPAL-BLOCK-SW(config-if)# description TRUNK_to_NEPAL_BLOCK_Router_P8 NEPAL-BLOCK-SW(config-if)# no shutdown NEPAL-BLOCK-SW(config-if)# switchport trunk encapsulation dot1q NEPAL-BLOCK-SW(config-if)# switchport mode trunk NEPAL-BLOCK-SW(config-if)# switchport trunk allowed vlan 100,200,300,999 NEPAL-BLOCK-SW(config-if)# switchport trunk native vlan 999 NEPAL-BLOCK-SW(config-if)# spanning-tree guard root NEPAL-BLOCK-SW(config-if)#exit NEPAL-BLOCK-SW(config)# NEPAL-BLOCK-SW(config)interface GigabitEthernet0/1 NEPAL-BLOCK-SW(config-if)# description TRUNK_to_BRIT_BLOCK_Router_p7 NEPAL-BLOCK-SW(config-if)# no shutdown NEPAL-BLOCK-SW(config-if)# switchport trunk encapsulation dot1q NEPAL-BLOCK-SW(config-if)# switchport mode trunk NEPAL-BLOCK-SW(config-if)# switchport trunk allowed vlan 100,200,300,999 NEPAL-BLOCK-SW(config-if)# switchport trunk native vlan 999 NEPAL-BLOCK-SW(config-if)# spanning-tree guard root NEPAL-BLOCK-SW(config-if)#exit NEPAL-BLOCK-SW(config)# </pre>	<pre> NEPAL-BLOCK-Sw(config)# NEPAL-BLOCK-Sw(config)interface range GigabitEthernet1/0-3 NEPAL-BLOCK-Sw(config-if-range)# no shutdown NEPAL-BLOCK-Sw(config-if-range)# description STUDENTS NEPAL-BLOCK-Sw(config-if-range)# switchport mode access NEPAL-BLOCK-Sw(config-if-range)# switchport access vlan 100 NEPAL-BLOCK-Sw(config-if-range)# spanning-tree portfast Warning: portfast should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when portfast is enabled, can cause temporary bridging loops. Use with CAUTION  Portfast will be configured in 4 interfaces due to the range command but will only have effect when the interfaces are in a non-trunking mode. NEPAL-BLOCK-Sw(config-if-range)# spanning-tree bpduguard enable NEPAL-BLOCK-Sw(config-if-range)#exit NEPAL-BLOCK-Sw(config)# NEPAL-BLOCK-Sw(config)interface range GigabitEthernet2/0-3 NEPAL-BLOCK-Sw(config-if-range)# no shutdown NEPAL-BLOCK-Sw(config-if-range)# description TEACHERS NEPAL-BLOCK-Sw(config-if-range)# switchport mode access NEPAL-BLOCK-Sw(config-if-range)# switchport access vlan 200 NEPAL-BLOCK-Sw(config-if-range)# spanning-tree portfast Warning: portfast should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when portfast is enabled, can cause temporary bridging loops. Use with CAUTION  Portfast will be configured in 4 interfaces due to the range command but will only have effect when the interfaces are in a non-trunking mode. NEPAL-BLOCK-Sw(config-if-range)# spanning-tree bpduguard enable NEPAL-BLOCK-Sw(config-if-range)#exit NEPAL-BLOCK-Sw(config)# NEPAL-BLOCK-Sw(config)interface range GigabitEthernet3/0-3 NEPAL-BLOCK-Sw(config-if-range)# no shutdown NEPAL-BLOCK-Sw(config-if-range)# spanning-tree portfast Warning: this command enables portfast by default on all interfaces. You should now disable portfast explicitly on switched ports leading to hubs, switches and bridges as they may create temporary bridging loops.  NEPAL-BLOCK-Sw(config)# NEPAL-BLOCK-Sw(config)do show interface description Interface          Status      Protocol Description Gig0/0            up         up      TRUNK_to_NEPAL_BLOCK_Router_P8 Gig0/1            up         up      TRUNK_to_BRIT_BLOCK_Router_p7 Gig0/2           down       down </pre>
<p>Figure 176: Configuration of Switch to Router Links at NEPAL-BLOCK (i)</p>	<p>Figure 177: Configuration of Switch to Router Links at NEPAL-BLOCK (ii)</p>

## 10.4. HIMAL-BLOCK

CMD

<pre> enable configure terminal hostname HIMAL-BLOCK-SW no ip domain-lookup  ip domain name isling-himal-block-sw.com crypto key generate rsa  1024  ip ssh version 2 line vty 0 15 transport input all login local exit </pre>
---

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
vlan 100
name STUDENTS
exit

vlan 200
name TEACHERS
exit

vlan 300
name STAFFS
exit

vlan 999
name MANAGEMENT-IP
exit

interface GigabitEthernet0/0
description TRUNK_to_HIMAL_BLOCK_Router_P8
no shutdown
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
ip dhcp snooping trust
exit

interface GigabitEthernet0/1
description TRUNK_to_UK_BLOCK_Router_p7
no shutdown
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
ip dhcp snooping trust
exit

interface range GigabitEthernet1/0-3
no shutdown
description STUDENTS
switchport mode access
switchport access vlan 100
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
exit

interface range GigabitEthernet2/0-3
no shutdown
description TEACHERS
switchport mode access
switchport access vlan 200
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

interface range GigabitEthernet3/0-3
no shutdown
description STAFF
switchport mode access
switchport access vlan 300
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

spanning-tree mode rapid-pvst

spanning-tree mode rapid-pvst
no spanning-tree vlan 100,200,300

do show interface description
do show interface gigabitEthernet0/0
do show interface gigabitEthernet0/1
do show interface trunk
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

<pre> Switch&gt;enable Switch#configure terminal Enter configuration commands, one per line. End with CNTL/Z. Switch(config)#hostname HIMAL-BLOCK-SW HIMAL-BLOCK-SW(config)#no ip domain-lookup HIMAL-BLOCK-SW(config)# HIMAL-BLOCK-SW(config)# HIMAL-BLOCK-SW(config)ip domain name isling-himal-block-sw.com HIMAL-BLOCK-SW(config)crypto key generate rsa The name for the keys will be: HIMAL-BLOCK-SW-isling-himal-block-sw.com Choose the size of the key modulus in the range of 360 to 4096 for your General Purpose Keys. Choosing a key modulus greater than 512 may a few minutes.  How many bits in the modulus [512]: 1024 % Generating 1024 bit RSA keys, keys will be non-exportable... [OK] [elapsed time was 0 seconds]  HIMAL-BLOCK-Sw(config)# P#ED 4 18:16:00.1021 *P#SSH-5-ENABLED: SSH 1.99 has been enabled P#ED 4 18:16:00.1021 *P#PnP-6-PnP DISCOVERY_STOPPED: PnP Discovery stopped (Config Wizard) HIMAL-BLOCK-Sw(config)ip ssh version 2 HIMAL-BLOCK-Sw(config)line vty 0 15 HIMAL-BLOCK-Sw(config-line)# transport input all HIMAL-BLOCK-Sw(config-line)# login local HIMAL-BLOCK-Sw(config-line)#exit HIMAL-BLOCK-Sw(config)# HIMAL-BLOCK-Sw(config-vlan)# HIMAL-BLOCK-Sw(config-vlan)vlan 100 HIMAL-BLOCK-Sw(config-vlan)# name STUDENTS HIMAL-BLOCK-Sw(config-vlan)#exit HIMAL-BLOCK-Sw(config)# HIMAL-BLOCK-Sw(config-vlan)vlan 200 HIMAL-BLOCK-Sw(config-vlan)# name TEACHERS HIMAL-BLOCK-Sw(config-vlan)#exit HIMAL-BLOCK-Sw(config)# HIMAL-BLOCK-Sw(config-vlan)vlan 300 HIMAL-BLOCK-Sw(config-vlan)# name STAFFS HIMAL-BLOCK-Sw(config-vlan)#exit HIMAL-BLOCK-Sw(config)# HIMAL-BLOCK-Sw(config)vlan 999 HIMAL-BLOCK-Sw(config-vlan)# HIMAL-BLOCK-Sw(config-vlan)name MANAGEMENT-IP HIMAL-BLOCK-Sw(config-vlan)#exit HIMAL-BLOCK-Sw(config)# HIMAL-BLOCK-Sw(config)interface GigabitEthernet0/0 HIMAL-BLOCK-Sw(config-if)# description TRUNK_to_HIMAL_BLOCK_Router_P8 HIMAL-BLOCK-Sw(config-if)# no shutdown HIMAL-BLOCK-Sw(config-if)# switchport trunk encapsulation dot1q HIMAL-BLOCK-Sw(config-if)# switchport mode trunk HIMAL-BLOCK-Sw(config-if)# switchport trunk allowed vlan 100,200,300,999 HIMAL-BLOCK-Sw(config-if)# switchport trunk native vlan 999 HIMAL-BLOCK-Sw(config-if)# spanning-tree guard root HIMAL-BLOCK-Sw(config-if)#exit HIMAL-BLOCK-Sw(config)# HIMAL-BLOCK-Sw(config)interface GigabitEthernet0/1 HIMAL-BLOCK-Sw(config-if)# description TRUNK_to_UK_BLOCK_Router_p7 HIMAL-BLOCK-Sw(config-if)# no shutdown HIMAL-BLOCK-Sw(config-if)# switchport trunk encapsulation dot1q HIMAL-BLOCK-Sw(config-if)# switchport mode trunk HIMAL-BLOCK-Sw(config-if)# switchport trunk allowed vlan 100,200,300,999 HIMAL-BLOCK-Sw(config-if)# switchport trunk native vlan 999 HIMAL-BLOCK-Sw(config-if)# spanning-tree guard root HIMAL-BLOCK-Sw(config-if)#exit HIMAL-BLOCK-Sw(config)# </pre>	<pre> HIMAL-BLOCK-Sw(config)interface GigabitEthernet0/0 HIMAL-BLOCK-Sw(config-if)# description TRUNK_to_HIMAL_BLOCK_Router_P8 HIMAL-BLOCK-Sw(config-if)# no shutdown HIMAL-BLOCK-Sw(config-if)# switchport trunk encapsulation dot1q HIMAL-BLOCK-Sw(config-if)# switchport mode trunk HIMAL-BLOCK-Sw(config-if)# switchport trunk allowed vlan 100,200,300,999 HIMAL-BLOCK-Sw(config-if)# switchport trunk native vlan 999 HIMAL-BLOCK-Sw(config-if)# spanning-tree guard root HIMAL-BLOCK-Sw(config-if)#exit HIMAL-BLOCK-Sw(config)# HIMAL-BLOCK-Sw(config)interface GigabitEthernet0/1 HIMAL-BLOCK-Sw(config-if)# description TRUNK_to_UK_BLOCK_Router_p7 HIMAL-BLOCK-Sw(config-if)# no shutdown HIMAL-BLOCK-Sw(config-if)# switchport trunk encapsulation dot1q HIMAL-BLOCK-Sw(config-if)# switchport mode trunk HIMAL-BLOCK-Sw(config-if)# switchport trunk allowed vlan 100,200,300,999 HIMAL-BLOCK-Sw(config-if)# switchport trunk native vlan 999 HIMAL-BLOCK-Sw(config-if)# spanning-tree guard root HIMAL-BLOCK-Sw(config-if)#exit HIMAL-BLOCK-Sw(config)# HIMAL-BLOCK-Sw(config)interface range GigabitEthernet1/0-3 HIMAL-BLOCK-Sw(config-if-range)# description STUDENTS HIMAL-BLOCK-Sw(config-if-range)# switchport mode access HIMAL-BLOCK-Sw(config-if-range)# switchport access vlan 100 HIMAL-BLOCK-Sw(config-if-range)# spanning-tree portfast Warning: portfast should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when portfast is enabled, can cause temporary bridging loops. Use with CAUTION  #Portfast will be configured in 4 interfaces due to the range command but will only have effect when the interfaces are in a non-trunking mode. HIMAL-BLOCK-Sw(config-if-range)# spanning-tree bpduguard enable HIMAL-BLOCK-Sw(config-if-range)#exit HIMAL-BLOCK-Sw(config)# HIMAL-BLOCK-Sw(config)interface range GigabitEthernet2/0-3 HIMAL-BLOCK-Sw(config-if-range)# no shutdown HIMAL-BLOCK-Sw(config-if-range)# description TEACHERS HIMAL-BLOCK-Sw(config-if-range)# switchport mode access HIMAL-BLOCK-Sw(config-if-range)# switchport access vlan 200 HIMAL-BLOCK-Sw(config-if-range)# spanning-tree portfast Warning: portfast should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when portfast is enabled, can cause temporary bridging loops. Use with CAUTION  #Portfast will be configured in 4 interfaces due to the range command but will only have effect when the interfaces are in a non-trunking mode. HIMAL-BLOCK-Sw(config-if-range)# spanning-tree bpduguard enable HIMAL-BLOCK-Sw(config-if-range)#exit HIMAL-BLOCK-Sw(config)# HIMAL-BLOCK-Sw(config)interface range GigabitEthernet3/0-3 HIMAL-BLOCK-Sw(config-if-range)# no shutdown HIMAL-BLOCK-Sw(config-if-range)# description STAFF HIMAL-BLOCK-Sw(config-if-range)# switchport mode access HIMAL-BLOCK-Sw(config-if-range)# switchport access vlan 300 HIMAL-BLOCK-Sw(config-if-range)# spanning-tree portfast Warning: portfast should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when portfast is enabled, can cause temporary bridging loops. Use with CAUTION </pre>
<p>Figure 178: Configuration of Switch to Router Links at HIMAL-BLOCK (i)</p>	<p>Figure 179: Configuration of Switch to Router Links at HIMAL-BLOCK (ii)</p>

## 10.5. BRIT-BLOCK

CMD

<pre> enable configure terminal hostname BRIT-BLOCK-SW no ip domain-lookup  ip domain name isling-brit-block-sw.com crypto key generate rsa  1024  ip ssh version 2  line vty 0 15 transport input all login local exit  vlan 100 </pre>
--

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
name STUDENTS
exit

vlan 200
name TEACHERS
exit

vlan 300
name STAFFS
exit

vlan 999
name MANAGEMENT-IP
exit

interface GigabitEthernet0/0
description TRUNK_to_BRIT_BLOCK_Router_P8
no shutdown
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
ip dhcp snooping trust
exit

interface GigabitEthernet0/1
description TRUNK_to_KUMARI_BLOCK_Router_p6
no shutdown
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
ip dhcp snooping trust
exit

interface range GigabitEthernet1/0-3
no shutdown
description STUDENTS
switchport mode access
switchport access vlan 100
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
interface range GigabitEthernet2/0-3
no shutdown
description TEACHERS
switchport mode access
switchport access vlan 200
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

interface range GigabitEthernet3/0-3
no shutdown
description STAFF
switchport mode access
switchport access vlan 300
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

spanning-tree mode rapid-pvst

spanning-tree mode rapid-pvst
no spanning-tree vlan 100,200,300

do show interface description
do show interface gigabitEthernet0/0
do show interface gigabitEthernet0/1
do show interface trunk
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```

Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname BRIT-BLOCK-SW
BRIT-BLOCK-SW(config)#no ip domain-lookup
BRIT-BLOCK-SW(config)#
BRIT-BLOCK-SW(config)#ip domain name isling.brit-block-sw.com
BRIT-BLOCK-SW(config)#
The name of the key to be: BRIT-BLOCK-SW.isling.brit-block-sw.com
Choose the size of the key modulus in the range of 360 to 4096 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.

How many bits in the modulus [512]: 1024
% Generating 1024 bit RSA keys, keys will be non-exportable...
[OK] (elapsed time was 0 seconds)

BRIT-BLOCK-SW(config)#
*Feb 4 18:31:16.887: %SSH-5-ENABLED: SSH 1.99 has been enabled
BRIT-BLOCK-SW(config)#
BRIT-BLOCK-SW(config)#
line vty 0 15
BRIT-BLOCK-SW(config)#
transport input all
BRIT-BLOCK-SW(config-line)#
login local
BRIT-BLOCK-SW(config-line)#
exit
BRIT-BLOCK-SW(config)#
BRIT-BLOCK-SW(config)#
vlan 100
BRIT-BLOCK-SW(config-vlan)#
name STUDENTS
BRIT-BLOCK-SW(config-vlan)#
exit
BRIT-BLOCK-SW(config)#
vlan 200
BRIT-BLOCK-SW(config-vlan)#
name TEACHERS
BRIT-BLOCK-SW(config-vlan)#
exit
BRIT-BLOCK-SW(config)#
vlan 300
BRIT-BLOCK-SW(config-vlan)#
name STAFFS
BRIT-BLOCK-SW(config-vlan)#
exit
BRIT-BLOCK-SW(config)#
vlan 999
BRIT-BLOCK-SW(config-vlan)#
name MANAGEMENT-IP
BRIT-BLOCK-SW(config-vlan)#
exit
BRIT-BLOCK-SW(config)#
interface GigabitEthernet0/0
BRIT-BLOCK-SW(config-if)#
description TRUNK_to_BRIT_BLOCK_Router_P8
BRIT-BLOCK-SW(config-if)#
no shutdown
BRIT-BLOCK-SW(config-if)#
switchport trunk encapsulation dot1q
BRIT-BLOCK-SW(config-if)#
switchport mode trunk
BRIT-BLOCK-SW(config-if)#
switchport trunk allowed vlan 100,200,300,999
BRIT-BLOCK-SW(config-if)#
switchport trunk native vlan 999
BRIT-BLOCK-SW(config-if)#
spanning-tree guard root
BRIT-BLOCK-SW(config-if)#
exit
BRIT-BLOCK-SW(config)#
interface GigabitEthernet0/1
BRIT-BLOCK-SW(config-if)#
description TRUNK_to_KUMARI_BLOCK_Router_P6
BRIT-BLOCK-SW(config-if)#
no shutdown
BRIT-BLOCK-SW(config-if)#
switchport trunk encapsulation dot1q
BRIT-BLOCK-SW(config-if)#
switchport mode trunk
BRIT-BLOCK-SW(config-if)#
switchport trunk allowed vlan 100,200,300,999
BRIT-BLOCK-SW(config-if)#
switchport trunk native vlan 999
BRIT-BLOCK-SW(config-if)#
spanning-tree guard root
BRIT-BLOCK-SW(config-if)#
exit
BRIT-BLOCK-SW(config)#

```

Figure 180: Configuration of Switch to Router Links at BRIT-BLOCK (i)

```

BRIT-BLOCK-SW(config)#
BRIT-BLOCK-SW(config)#
interface range GigabitEthernet1/0-3
BRIT-BLOCK-SW(config-if-range)#
no shutdown
BRIT-BLOCK-SW(config-if-range)#
spanning-tree portfast
BRIT-BLOCK-SW(config-if-range)#
switchport access vlan 100
BRIT-BLOCK-SW(config-if-range)#
spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

%Portfast will be configured in 4 interfaces due to the range command
but will only have effect when the interfaces are in a non-trunking mode.
BRIT-BLOCK-SW(config-if-range)#
spanning-tree bpduguard enable
BRIT-BLOCK-SW(config-if-range)#
exit
BRIT-BLOCK-SW(config)#
interface range GigabitEthernet2/0-3
BRIT-BLOCK-SW(config-if-range)#
no shutdown
BRIT-BLOCK-SW(config-if-range)#
description TEACHERS
BRIT-BLOCK-SW(config-if-range)#
switchport mode access
BRIT-BLOCK-SW(config-if-range)#
switchport access vlan 200
BRIT-BLOCK-SW(config-if-range)#
spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

%Portfast will be configured in 4 interfaces due to the range command
but will only have effect when the interfaces are in a non-trunking mode.
BRIT-BLOCK-SW(config-if-range)#
spanning-tree bpduguard enable
BRIT-BLOCK-SW(config-if-range)#
exit
BRIT-BLOCK-SW(config)#
interface range gigabitEthernet3/0-3
BRIT-BLOCK-SW(config-if-range)#
no shutdown
BRIT-BLOCK-SW(config-if-range)#
description STAFF
BRIT-BLOCK-SW(config-if-range)#
switchport mode access
BRIT-BLOCK-SW(config-if-range)#
switchport access vlan 300
BRIT-BLOCK-SW(config-if-range)#
spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

%Portfast will be configured in 4 interfaces due to the range command
but will only have effect when the interfaces are in a non-trunking mode.
BRIT-BLOCK-SW(config-if-range)#
spanning-tree bpduguard enable
BRIT-BLOCK-SW(config-if-range)#
exit
BRIT-BLOCK-SW(config)#
interface range gigabitEthernet4/0-3
BRIT-BLOCK-SW(config-if-range)#
spanning-tree mode rapid-pvst
BRIT-BLOCK-SW(config)#
spanning-tree portfast default
%Warning: this command enables portfast by default on all interfaces. You
should now disable portfast explicitly on switched ports leading to hubs,
switches and bridges as they may create temporary bridging loops.

BRIT-BLOCK-SW(config)#
BRIT-BLOCK-SW(config)#
do show interface description
Interface          Status      Protocol Description
G10/0              up         up      TRUNK_to_BRIT_BLOCK_Router_P8
G10/1              up         up      TRUNK_to_KUMARI_BLOCK_Router_P6
G10/2              down       down
G10/3              down       down

```

Figure 181: Configuration of Switch to Router Links at BRIT-BLOCK (ii)

## 10.6. SKILL-BLOCK

CMD

```

enable
configure terminal
hostname SKILL-BLOCK-SW
no ip domain-lookup

ip domain name isling-skill-block-sw.com
crypto key generate rsa

1024

ip ssh version 2
line vty 0 15
transport input all
login local
exit

```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
vlan 100
name STUDENTS
exit

vlan 200
name TEACHERS
exit

vlan 300
name STAFFS
exit

vlan 999
name MANAGEMENT-IP
exit

interface GigabitEthernet0/0
description TRUNK_to_SKILL_BLOCK_Router_P8
no shutdown
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
ip dhcp snooping trust
exit

interface GigabitEthernet0/1
description TRUNK_to_HIMAL_BLOCK_Router_p7
no shutdown
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
ip dhcp snooping trust
exit

interface range GigabitEthernet1/0-3
no shutdown
description STUDENTS
switchport mode access
switchport access vlan 100
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
exit

interface range GigabitEthernet2/0-3
no shutdown
description TEACHERS
switchport mode access
switchport access vlan 200
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

interface range GigabitEthernet3/0-3
no shutdown
description STAFF
switchport mode access
switchport access vlan 300
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

spanning-tree mode rapid-pvst

spanning-tree mode rapid-pvst
no spanning-tree vlan 100,200,300

do show interface description
do show interface gigabitEthernet0/0
do show interface gigabitEthernet0/1
do show interface trunk
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

<pre> Switch&gt;enable Switch#configure terminal Enter configuration commands, one per line. End with CNTL/Z. Switch(config)#hostname SKILL-BLOCK-SW SKILL-BLOCK-SW(config)#no ip domain-lookup SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config)# The name for the keys will be: SKILL-BLOCK-SW.isling-skill-block-sw.com Choose the size of the key modulus in the range of 360 to 4096 for your General Purpose Keys. Choosing a key modulus greater than 512 may take a few minutes.  How many bits in the modulus [512]: 1024 % Generating 1024 bit RSA keys, keys will be non-exportable... [OK] (elapsed time was 0 seconds)  SKILL-BLOCK-SW(config)# *Feb 4 18:39:40.983: %SSH-5-ENABLED: SSH 1.99 has been enabled SKILL-BLOCK-SW(config)ip ssh version 2 SKILL-BLOCK-SW(config-line)# SKILL-BLOCK-SW(config-line)line vty 0 15 SKILL-BLOCK-SW(config-line)# SKILL-BLOCK-SW(config-line)transport input all SKILL-BLOCK-SW(config-line)# SKILL-BLOCK-SW(config-line)login local SKILL-BLOCK-SW(config-line)# SKILL-BLOCK-SW(config-line)exit SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config-vlan)# SKILL-BLOCK-SW(config-vlan)name STUDENTS SKILL-BLOCK-SW(config-vlan)exit SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config-vlan)vlan 200 SKILL-BLOCK-SW(config-vlan)# SKILL-BLOCK-SW(config-vlan)name TEACHERS SKILL-BLOCK-SW(config-vlan)exit SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config-vlan)vlan 300 SKILL-BLOCK-SW(config-vlan)# SKILL-BLOCK-SW(config-vlan)name STAFFS SKILL-BLOCK-SW(config-vlan)exit SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config)interface GigabitEthernet0/0 SKILL-BLOCK-SW(config-if)# SKILL-BLOCK-SW(config-if)description TRUNK_to_SKILL_BLOCK_Router_P8 SKILL-BLOCK-SW(config-if)# SKILL-BLOCK-SW(config-if)switchport trunk encapsulation dot1q SKILL-BLOCK-SW(config-if)switchport mode trunk SKILL-BLOCK-SW(config-if)switchport trunk allowed vlan 100,200,300,999 SKILL-BLOCK-SW(config-if)switchport trunk native vlan 999 SKILL-BLOCK-SW(config-if)spanning-tree guard root SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config)interface GigabitEthernet0/1 SKILL-BLOCK-SW(config-if)# SKILL-BLOCK-SW(config-if)description TRUNK_to_HIMAL_BLOCK_Router_P7 SKILL-BLOCK-SW(config-if)# SKILL-BLOCK-SW(config-if)no shutdown SKILL-BLOCK-SW(config-if)switchport trunk encapsulation dot1q SKILL-BLOCK-SW(config-if)switchport mode trunk SKILL-BLOCK-SW(config-if)switchport trunk allowed vlan 100,200,300,999 SKILL-BLOCK-SW(config-if)switchport trunk native vlan 999 SKILL-BLOCK-SW(config-if)spanning-tree guard root SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config) </pre>	<pre> SKILL-BLOCK-SW(config)#interface range GigabitEthernet1/0-3 SKILL-BLOCK-SW(config-if-range)# SKILL-BLOCK-SW(config-if-range)no shutdown SKILL-BLOCK-SW(config-if-range)# SKILL-BLOCK-SW(config-if-range)switchport mode access SKILL-BLOCK-SW(config-if-range)switchport access vlan 100 SKILL-BLOCK-SW(config-if-range)spanning-tree portfast Warning: portfast should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when portfast is enabled, can cause temporary bridging loops. Use with CAUTION  %Portfast will be reconfigured in 4 interfaces due to the range command but will only have effect when the interfaces are in a non-trunking mode. SKILL-BLOCK-SW(config-if-range)# SKILL-BLOCK-SW(config-if-range)spanning-tree bpduguard enable SKILL-BLOCK-SW(config-if-range)# SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config)#interface range GigabitEthernet2/0-3 SKILL-BLOCK-SW(config-if-range)# SKILL-BLOCK-SW(config-if-range)no shutdown SKILL-BLOCK-SW(config-if-range)# SKILL-BLOCK-SW(config-if-range)switchport mode access SKILL-BLOCK-SW(config-if-range)switchport access vlan 200 SKILL-BLOCK-SW(config-if-range)spanning-tree portfast Warning: portfast should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when portfast is enabled, can cause temporary bridging loops. Use with CAUTION  %Portfast will be reconfigured in 4 interfaces due to the range command but will only have effect when the interfaces are in a non-trunking mode. SKILL-BLOCK-SW(config-if-range)# SKILL-BLOCK-SW(config-if-range)spanning-tree bpduguard enable SKILL-BLOCK-SW(config-if-range)# SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config)spanning-tree mode rapid-pvst SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config)# Warning: this command enables portfast by default on all interfaces. You should now disable portfast explicitly on switched ports leading to hubs, switches and bridges as they may create temporary bridging loops.  SKILL-BLOCK-SW(config)# SKILL-BLOCK-SW(config)do show interface description Interface          Status      Protocol Description G10/0              up         up      TRUNK_to_SKILL_BLOCK_Router_P8 G10/1              up         up      TRUNK_to_HIMAL_BLOCK_Router_P7 G10/2              down       down G10/3              down       down G11/0              down       down      STUDENTS </pre>
<p><i>Figure 182: Configuration of Switch to Router Links at SKILL-BLOCK (i)</i></p>	<p><i>Figure 183: Configuration of Switch to Router Links at SKILL-BLOCK (ii)</i></p>

## 10.7. ALUMNI-BLOCK

CMD

<pre> ip ssh version 2 line vty 0 15 transport input all login local exit  vlan 100 name STUDENTS exit  vlan 200 name TEACHERS exit  vlan 300 name STAFFS </pre>
--

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
exit

vlan 999
name MANAGEMENT-IP
exit

interface GigabitEthernet0/0
description TRUNK_to_ALUMNI_BLOCK_Router_P8
no shutdown
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
ip dhcp snooping trust
exit

interface GigabitEthernet0/1
description TRUNK_to_SKILL_BLOCK_Router_p7
no shutdown
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
ip dhcp snooping trust
exit

interface range GigabitEthernet1/0-3
no shutdown
description STUDENTS
switchport mode access
switchport access vlan 100
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

interface range GigabitEthernet2/0-3
no shutdown
description TEACHERS
switchport mode access
switchport access vlan 200
spanning-tree portfast
spanning-tree bpduguard enable
exit
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
interface range GigabitEthernet3/0-3
no shutdown
description STAFF
switchport mode access
switchport access vlan 300
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

spanning-tree mode rapid-pvst

spanning-tree mode rapid-pvst
no spanning-tree vlan 100,200,300

do show interface description
do show interface gigabitEthernet0/0
do show interface gigabitEthernet0/1
do show interface trunk
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

<pre> Switch&gt;enable Switch#configure terminal Enter configuration commands, one per line. End with CNTL/Z. Switch(config)#hostname ALUMNI-BLOCK-SW ALUMNI-BLOCK-SW(config)no ip domain-lookup ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)ip domain name isling-alumni-block-sw.com ALUMNI-BLOCK-SW(config)auto key generate rsa The new key will be used by all hosts in the block-isling.alumni-block-sw.com Choose the size of the key modulus in the range of 560 to 4096 for your General Purpose keys. Choosing a key modulus greater than 512 may take a few minutes.  How many bits in the modulus [512]: 1024 % Generating 1024 bit RSA keys, keys will be non-exportable... [OK] (elapsed time was 0 seconds)  ALUMNI-BLOCK-SW(config)# *Feb 4 18:51:34.918: %SSH-5-ENABLED: SSH 1.99 has been enabled ALUMNI-BLOCK-SW(config)line vty 0 15 ALUMNI-BLOCK-SW(config-line)# ALUMNI-BLOCK-SW(config-line) transport input all ALUMNI-BLOCK-SW(config-line)login local ALUMNI-BLOCK-SW(config-line)exit ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)vlan 100 ALUMNI-BLOCK-SW(config-vlan) name STUDENTS ALUMNI-BLOCK-SW(config-vlan)exit ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)vlan 200 ALUMNI-BLOCK-SW(config-vlan) name TEACHERS ALUMNI-BLOCK-SW(config-vlan)exit ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)vlan 300 ALUMNI-BLOCK-SW(config-vlan) name STAFFS ALUMNI-BLOCK-SW(config-vlan)exit ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)vlan 999 ALUMNI-BLOCK-SW(config-vlan)name MANAGEMENT-IP ALUMNI-BLOCK-SW(config-vlan)exit ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)interface GigabitEthernet0/0 ALUMNI-BLOCK-SW(config-if) description TRUNK_to_ALUMNI_BLOCK_Router_P8 ALUMNI-BLOCK-SW(config-if) no shutdown ALUMNI-BLOCK-SW(config-if) switchport trunk encapsulation dot1q ALUMNI-BLOCK-SW(config-if) switchport mode trunk ALUMNI-BLOCK-SW(config-if) switchport trunk allowed vlan 100,200,300,999 ALUMNI-BLOCK-SW(config-if) switchport trunk native vlan 999 ALUMNI-BLOCK-SW(config-if) spanning-tree guard root ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)interface GigabitEthernet0/1 ALUMNI-BLOCK-SW(config-if) description TRUNK_to_SKILL_BLOCK_Router_p7 ALUMNI-BLOCK-SW(config-if) no shutdown ALUMNI-BLOCK-SW(config-if) switchport trunk encapsulation dot1q ALUMNI-BLOCK-SW(config-if) switchport mode trunk ALUMNI-BLOCK-SW(config-if) switchport trunk allowed vlan 100,200,300,999 ALUMNI-BLOCK-SW(config-if) switchport trunk native vlan 999 ALUMNI-BLOCK-SW(config-if) spanning-tree guard root ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)interface range GigabitEthernet1/0-3 ALUMNI-BLOCK-SW(config-if-range) no shutdown </pre>	<pre> ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)interface range GigabitEthernet1/0-3 ALUMNI-BLOCK-SW(config-if-range) no shutdown ALUMNI-BLOCK-SW(config-if-range) description STUDENTS ALUMNI-BLOCK-SW(config-if-range) switchport mode access ALUMNI-BLOCK-SW(config-if-range) switchport access vlan 100 ALUMNI-BLOCK-SW(config-if-range) spanning-tree portfast %Warning: portfast should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when portfast is enabled, can cause temporary bridging loops. Use with CAUTION  %Portfast will be configured in 4 interfaces due to the range command but will only have effect when the interfaces are in a non-trunking mode. ALUMNI-BLOCK-SW(config-if-range) spanning-tree bpduguard enable ALUMNI-BLOCK-SW(config-if-range)exit ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)interface range GigabitEthernet2/0-3 ALUMNI-BLOCK-SW(config-if-range) no shutdown ALUMNI-BLOCK-SW(config-if-range) description TEACHERS ALUMNI-BLOCK-SW(config-if-range) switchport mode access ALUMNI-BLOCK-SW(config-if-range) switchport access vlan 200 ALUMNI-BLOCK-SW(config-if-range) spanning-tree portfast %Warning: portfast should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when portfast is enabled, can cause temporary bridging loops. Use with CAUTION  %Portfast will be configured in 4 interfaces due to the range command but will only have effect when the interfaces are in a non-trunking mode. ALUMNI-BLOCK-SW(config-if-range) spanning-tree bpduguard enable ALUMNI-BLOCK-SW(config-if-range)exit ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)interface range GigabitEthernet3/0-3 ALUMNI-BLOCK-SW(config-if-range) no shutdown ALUMNI-BLOCK-SW(config-if-range) description STAFF ALUMNI-BLOCK-SW(config-if-range) switchport mode access ALUMNI-BLOCK-SW(config-if-range) switchport access vlan 300 ALUMNI-BLOCK-SW(config-if-range) spanning-tree portfast %Warning: portfast should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when portfast is enabled, can cause temporary bridging loops. Use with CAUTION  %Portfast will be configured in 4 interfaces due to the range command but will only have effect when the interfaces are in a non-trunking mode. ALUMNI-BLOCK-SW(config-if-range) spanning-tree bpduguard enable ALUMNI-BLOCK-SW(config-if-range)exit ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)spanning-tree mode rapid-pvst ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)spanning-tree portfast default %Warning: this command enables portfast by default on all interfaces. You should now disable portfast explicitly on switched ports leading to hubs, switches and bridges as they may create temporary bridging loops.  ALUMNI-BLOCK-SW(config)# ALUMNI-BLOCK-SW(config)do show interface description Interface          Status      Protocol Description Glo/0             up         up      TRUNK_to_ALUMNI_BLOCK_Router_P8 Glo/1             up         up      TRUNK_to_SKILL_BLOCK_Router_p7 Glo/2            down        down Glo/3            down        down </pre>
<p><i>Figure 184: Configuration of Switch to Router Links at ALUMNI-BLOCK (i)</i></p>	<p><i>Figure 185: Configuration of Switch to Router Links at ALUMNI-BLOCK (ii)</i></p>

## 10.8. KUMARI-BLOCK

CMD

<pre> enable configure terminal hostname KUMARI-BLOCK-SW no ip domain-lookup  ip domain name isling-kumari-block-sw.com crypto key generate rsa  1024  ip ssh version 2 line vty 0 15 transport input all login local exit </pre>
---

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
vlan 100
name STUDENTS
exit

vlan 200
name TEACHERS
exit

vlan 300
name STAFFS
exit

vlan 999
name MANAGEMENT-IP
exit

interface GigabitEthernet0/0
description TRUNK_to_KUMARI_BLOCK_Router_P7
no shutdown
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
ip dhcp snooping trust
exit

interface GigabitEthernet0/1
description TRUNK_to_ALUMNI_BLOCK_Router_p6
no shutdown
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 100,200,300,999
switchport trunk native vlan 999
ip dhcp snooping trust
ip dhcp snooping trust
exit

interface range GigabitEthernet1/0-3
no shutdown
description STUDENTS
switchport mode access
switchport access vlan 100
spanning-tree portfast
spanning-tree bpduguard enable
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
ip dhcp snooping trust
exit

interface range GigabitEthernet2/0-3
no shutdown
description TEACHERS
switchport mode access
switchport access vlan 200
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

interface range GigabitEthernet3/0-3
no shutdown
description STAFF
switchport mode access
switchport access vlan 300
spanning-tree portfast
spanning-tree bpduguard enable
ip dhcp snooping trust
exit

spanning-tree mode rapid-pvst

spanning-tree mode rapid-pvst
no spanning-tree vlan 100,200,300

do show interface description
do show interface gigabitEthernet0/0
do show interface gigabitEthernet0/1
do show interface trunk
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

<pre> Switch&gt;enable Switch#configure terminal Enter configuration commands, one per line. End with CNTL/Z. Switch[config]#hostname KUMARI-BLOCK-SW KUMARI-BLOCK-&lt;SW(config)#no ip domain-lookup KUMARI-BLOCK-&lt;SW(config)# KUMARI-BLOCK-&lt;SW(config)#ip domain name isling-kumari-block-sw.com KUMARI-BLOCK-&lt;SW(config)#crypto key generate rsa The name for the keys will be: KUMARI-BLOCK-SW.isling-kumari-block-sw.com Choose the size of the key modulus in the range of 360 to 4096 for your General Purpose keys. Choosing a key modulus greater than 512 may take a few minutes.  How many bits in the modulus [512]: 1024 % Generating 1024 bit RSA keys, keys will be non-exportable... [OK] (elapsed time was 0 seconds)  KUMARI-BLOCK-&lt;SW(config)# *Feb 4 18:58:45.852: %SSH-5-ENABLED: SSH 1.99 has been enabled KUMARI-BLOCK-&lt;SW(config)#ip ssh version 2 KUMARI-BLOCK-&lt;SW(config)#line vty 0 15 KUMARI-BLOCK-&lt;SW(config-line)# transport input all KUMARI-BLOCK-&lt;SW(config-line)# login local KUMARI-BLOCK-&lt;SW(config-line)#exit KUMARI-BLOCK-&lt;SW(config)# KUMARI-BLOCK-&lt;SW(config)#vlan 100 KUMARI-BLOCK-&lt;SW(config-vlan)# name STUDENTS KUMARI-BLOCK-&lt;SW(config-vlan)#exit KUMARI-BLOCK-&lt;SW(config)# KUMARI-BLOCK-&lt;SW(config)#vlan 200 KUMARI-BLOCK-&lt;SW(config-vlan)# name TEACHERS KUMARI-BLOCK-&lt;SW(config-vlan)#exit KUMARI-BLOCK-&lt;SW(config)# KUMARI-BLOCK-&lt;SW(config)#vlan 300 KUMARI-BLOCK-&lt;SW(config-vlan)# name STAFFS KUMARI-BLOCK-&lt;SW(config-vlan)#exit KUMARI-BLOCK-&lt;SW(config)# KUMARI-BLOCK-&lt;SW(config)#interface GigabitEthernet0/0 KUMARI-BLOCK-&lt;SW(config-if)# description TRUNK_to_KUMARI_BLOCK_Router_P7 KUMARI-BLOCK-&lt;SW(config-if)# no shutdown KUMARI-BLOCK-&lt;SW(config-if)# switchport trunk encapsulation dot1q KUMARI-BLOCK-&lt;SW(config-if)# switchport mode trunk KUMARI-BLOCK-&lt;SW(config-if)# switchport trunk allowed vlan 100,200,300,999 KUMARI-BLOCK-&lt;SW(config-if)# switchport trunk native vlan 999 KUMARI-BLOCK-&lt;SW(config-if)# spanning-tree guard root KUMARI-BLOCK-&lt;SW(config-if)#exit KUMARI-BLOCK-&lt;SW(config)# KUMARI-BLOCK-&lt;SW(config)#interface GigabitEthernet0/1 KUMARI-BLOCK-&lt;SW(config-if)# description TRUNK_to_ALUMNI_BLOCK_Router_p6 KUMARI-BLOCK-&lt;SW(config-if)# no shutdown KUMARI-BLOCK-&lt;SW(config-if)# switchport trunk encapsulation dot1q KUMARI-BLOCK-&lt;SW(config-if)# switchport mode trunk KUMARI-BLOCK-&lt;SW(config-if)# switchport trunk allowed vlan 100,200,300,999 KUMARI-BLOCK-&lt;SW(config-if)# switchport trunk native vlan 999 KUMARI-BLOCK-&lt;SW(config-if)# spanning-tree guard root KUMARI-BLOCK-&lt;SW(config-if)#exit KUMARI-BLOCK-&lt;SW(config)# </pre>	<pre> KUMARI-BLOCK-&lt;SW(config)#interface range GigabitEthernet1/0-3 KUMARI-BLOCK-&lt;SW(config-if-range)# no shutdown KUMARI-BLOCK-&lt;SW(config-if-range)# description STUDENTS KUMARI-BLOCK-&lt;SW(config-if-range)# switchport mode access KUMARI-BLOCK-&lt;SW(config-if-range)# switchport access vlan 100 KUMARI-BLOCK-&lt;SW(config-if-range)# spanning-tree portfast Warning: portfast should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when portfast is enabled, can cause temporary bridging loops. Use with CAUTION  %PortFast will be configured in 4 interfaces due to the range command but will only have effect when the interfaces are in a non-trunking mode. KUMARI-BLOCK-&lt;SW(config-if-range)# spanning-tree bpduguard enable KUMARI-BLOCK-&lt;SW(config-if-range)#exit KUMARI-BLOCK-&lt;SW(config)# KUMARI-BLOCK-&lt;SW(config)#interface range GigabitEthernet2/0-3 KUMARI-BLOCK-&lt;SW(config-if-range)# no shutdown KUMARI-BLOCK-&lt;SW(config-if-range)# description TEACHERS KUMARI-BLOCK-&lt;SW(config-if-range)# switchport mode access KUMARI-BLOCK-&lt;SW(config-if-range)# switchport access vlan 200 KUMARI-BLOCK-&lt;SW(config-if-range)# spanning-tree portfast Warning: portfast should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when portfast is enabled, can cause temporary bridging loops. Use with CAUTION  %PortFast will be configured in 4 interfaces due to the range command but will only have effect when the interfaces are in a non-trunking mode. KUMARI-BLOCK-&lt;SW(config-if-range)# spanning-tree bpduguard enable KUMARI-BLOCK-&lt;SW(config-if-range)#exit KUMARI-BLOCK-&lt;SW(config)# KUMARI-BLOCK-&lt;SW(config)#show interface description Interface          Status   Protocol Description G10/0              up      up      TRUNK_to_KUMARI_BLOCK_Router_P7 G10/1              up      up      TRUNK_to_ALUMNI_BLOCK_Router_p6 G10/2              down    down G10/3              down    down G11/0              down    down   STUDENTS </pre>
<p><i>Figure 186: Configuration of Switch to Router Links at KUMARI-BLOCK (i)</i></p>	<p><i>Figure 187: Configuration of Switch to Router Links at KUMARI-BLOCK (ii)</i></p>

## 11. Router TO Switch Trunk Configuration of Each Block

### 11.1. LONDON-BLOCK

```
# Create VLAN subinterfaces on trunk port (to UK switch)
/interface vlan
add name=LONDON-SW.v100-ETHER-10 interface=ether10 vlan-id=100 comment="LONDON-BLOCK trunk to LONDON switch - VLAN 100 STUDENT"
add name=LONDON-SW.v200-ETHER-10 interface=ether10 vlan-id=200 comment="LONDON-BLOCK trunk to LONDON switch - VLAN 200 TEACHER"
add name=LONDON-SW.v300-ETHER-10 interface=ether10 vlan-id=300 comment="LONDON-BLOCK trunk to LONDON switch - VLAN 300 STAFF"
/
# Add VLANs into correct VPLS bridges
/interface bridge port
add bridge=BR_VL_STUDENT_100 interface=LONDON-SW.v100-ETHER-10 comment="LONDON-BLOCK VLAN100 to VPLS STUDENT bridge"
add bridge=BR_VL_TEACHER_200 interface=LONDON-SW.v200-ETHER-10 comment="LONDON-BLOCK VLAN200 to VPLS TEACHER bridge"
add bridge=BR_VL_STAFF_300 interface= LONDON-SW.v300-ETHER-10 comment="LONDON-BLOCK VLAN300 to VPLS STAFF bridge"
/
```

```
[admin@ONDON-BLOCK] >
[admin@ONDON-BLOCK] > /interface vlan
[admin@ONDON-BLOCK] > /interface/vlan> add name=LONDON-SW.v100-ETHER-10 interface=ether10 vlan-id=100 comment="LONDON-BLOCK trunk to LONDON switch - VLAN 100 STUDENT"
[admin@ONDON-BLOCK] > /interface/vlan> add name=LONDON-SW.v200-ETHER-10 interface=ether10 vlan-id=200 comment="LONDON-BLOCK trunk to LONDON switch - VLAN 200 TEACHER"
[admin@ONDON-BLOCK] > /interface/vlan> add name=LONDON-SW.v300-ETHER-10 interface=ether10 vlan-id=300 comment="LONDON-BLOCK trunk to LONDON switch - VLAN 300 STAFF"
[admin@ONDON-BLOCK] >
[admin@ONDON-BLOCK] > /interface bridge port
[admin@ONDON-BLOCK] > /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=LONDON-SW.v100-ETHER-10 comment="LONDON-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@ONDON-BLOCK] > /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=LONDON-SW.v200-ETHER-10 comment="LONDON-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@ONDON-BLOCK] > /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface= LONDON-SW.v300-ETHER-10 comment="LONDON-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@ONDON-BLOCK] >
```

Figure 188: Router TO Switch Trunk Configuration on LONDON-BLOCK Router Through CMD

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

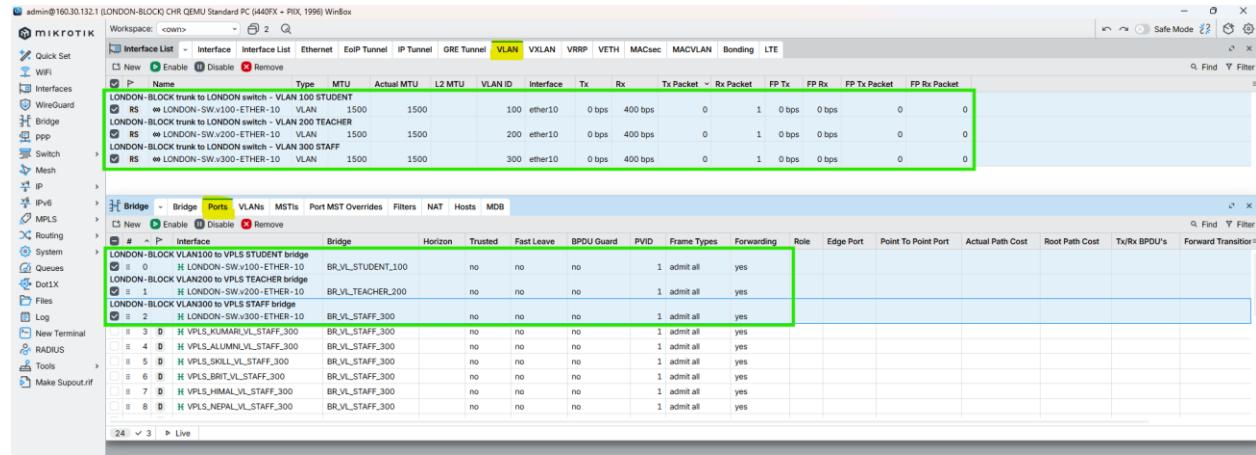


Figure 189: Router TO Switch Trunk Configuration on LONDON-BLOCK Router Through WINBOX

## 11.2. UK-BLOCK

### 11.2.1. Primary UK-BLOCK- SWITCH

```
/interface vlan
add name=UK-SW.v100-ETHER-8 interface=ether8 vlan-id=100 comment="UK-BLOCK trunk to UK switch - VLAN 100 STUDENT"
add name=UK-SW.v200-ETHER-8 interface=ether8 vlan-id=200 comment="UK-BLOCK trunk to UK switch - VLAN 200 TEACHER"
add name=UK-SW.v300-ETHER-8 interface=ether8 vlan-id=300 comment="UK-BLOCK trunk to UK switch - VLAN 300 STAFF"

/interface bridge port
add bridge=BR_VL_STUDENT_100 interface=UK-SW.v100-ETHER-8 comment="UK-BLOCK VLAN100 to VPLS STUDENT bridge"
add bridge=BR_VL_TEACHER_200 interface=UK-SW.v200-ETHER-8 comment="UK-BLOCK VLAN200 to VPLS TEACHER bridge"
add bridge=BR_VL_STAFF_300 interface=UK-SW.v300-ETHER-8 comment="UK-BLOCK VLAN300 to VPLS STAFF bridge"
```

```
[admin@UK-BLOCK] >
[admin@UK-BLOCK] > /interface vlan
[admin@UK-BLOCK] /interface/vlan> add name=UK-SW.v100-ETHER-8 interface=ether8 vlan-id=100 comment="UK-BLOCK trunk to UK switch - VLAN 100 STUDENT"
[admin@UK-BLOCK] /interface/vlan> add name=UK-SW.v200-ETHER-8 interface=ether8 vlan-id=200 comment="UK-BLOCK trunk to UK switch - VLAN 200 TEACHER"
[admin@UK-BLOCK] /interface/vlan> add name=UK-SW.v300-ETHER-8 interface=ether8 vlan-id=300 comment="UK-BLOCK trunk to UK switch - VLAN 300 STAFF"
[admin@UK-BLOCK] >
[admin@UK-BLOCK] > /interface bridge port
[admin@UK-BLOCK] /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=UK-SW.v100-ETHER-8 comment="UK-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@UK-BLOCK] /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=UK-SW.v200-ETHER-8 comment="UK-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@UK-BLOCK] /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface=UK-SW.v300-ETHER-8 comment="UK-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@UK-BLOCK] >
```

Figure 190: Router TO Switch Primary Trunk Configuration on UK-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

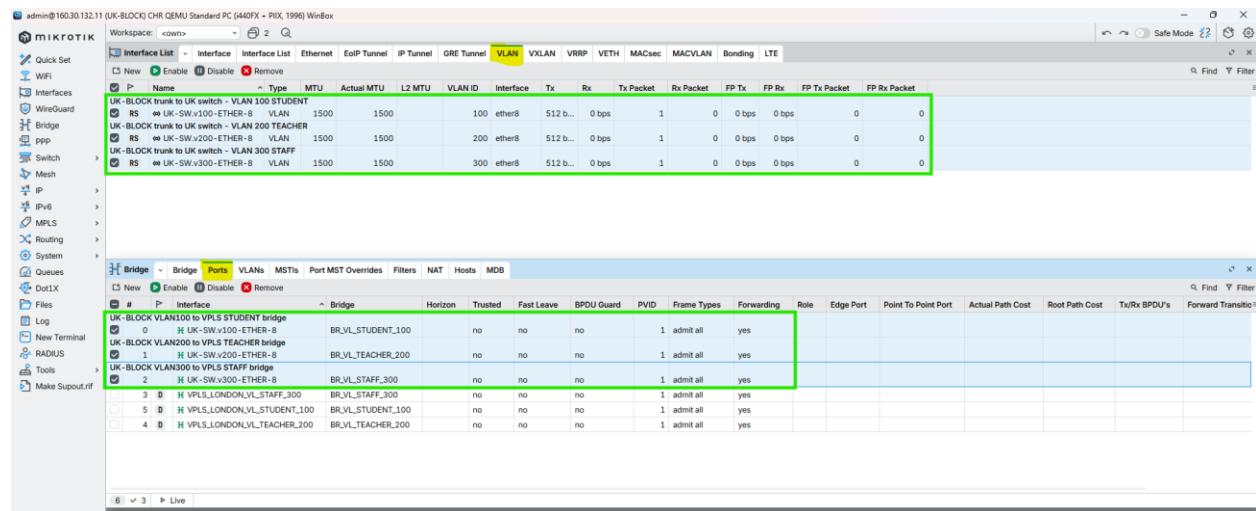


Figure 191: Router TO Switch Primary Trunk Configuration on UK-BLOCK Router Through WINBOX

### 11.2.2. Secondary HIMAL-BLOCK-SWITCH

#### CMD

```
/interface vlan
add name=HIMAL-SW.v100-ETHER-7 interface=ether7 vlan-id=100 comment="UK-BLOCK trunk to HIMAL switch – VLAN 100 STUDENT"
add name=HIMAL-SW.v200-ETHER-7 interface=ether7 vlan-id=200 comment="UK-BLOCK trunk to HIMAL switch – VLAN 200 TEACHER"
add name=HIMAL-SW.v300-ETHER-7 interface=ether7 vlan-id=300 comment="UK-BLOCK trunk to HIMAL switch – VLAN 300 STAFF"
/
/interface bridge port
add bridge=BR_VL_STUDENT_100 interface=HIMAL-SW.v100-ETHER-7 comment="UK-BLOCK VLAN100 to VPLS STUDENT bridge"
add bridge=BR_VL_TEACHER_200 interface=HIMAL-SW.v200-ETHER-7 comment="UK-BLOCK VLAN200 to VPLS TEACHER bridge"
add bridge=BR_VL_STAFF_300 interface=HIMAL-SW.v300-ETHER-7 comment="UK-BLOCK VLAN300 to VPLS STAFF bridge"
```

```
[admin@JK-BLOCK] >
[admin@JK-BLOCK] > /interface vlan
[admin@JK-BLOCK] /interface/vlan> add name=HIMAL-SW.v100-ETHER-7 interface=ether7 vlan-id=100 comment="UK-BLOCK trunk to HIMAL switch VLAN 100 STUDENT"
[admin@JK-BLOCK] /interface/vlan> add name=HIMAL-SW.v200-ETHER-7 interface=ether7 vlan-id=200 comment="UK-BLOCK trunk to HIMAL switch VLAN 200 TEACHER"
[admin@JK-BLOCK] /interface/vlan> add name=HIMAL-SW.v300-ETHER-7 interface=ether7 vlan-id=300 comment="UK-BLOCK trunk to HIMAL switch VLAN 300 STAFF"
[admin@JK-BLOCK] /interface/vlan> /
[admin@JK-BLOCK] > /interface bridge port
[admin@JK-BLOCK] /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=HIMAL-SW.v100-ETHER-7 comment="UK-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@JK-BLOCK] /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=HIMAL-SW.v200-ETHER-7 comment="UK-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@JK-BLOCK] /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface=HIMAL-SW.v300-ETHER-7 comment="UK-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@JK-BLOCK] /interface/bridge/port> /
[admin@JK-BLOCK] >
```

Figure 192: Router TO Switch Secondary Trunk Configuration on UK-BLOCK Router Through CMD

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

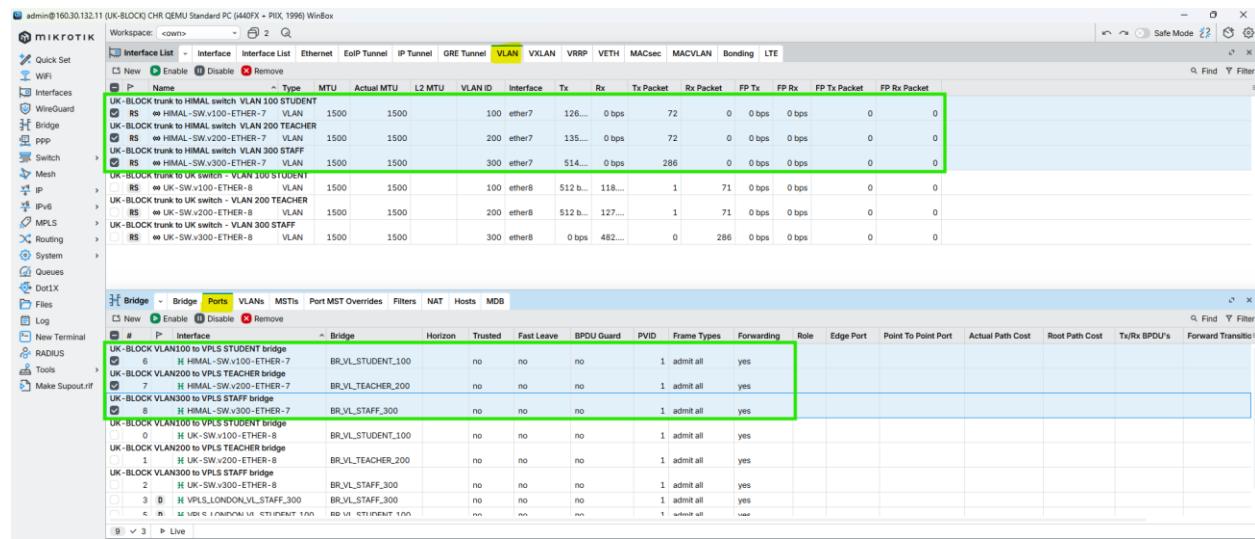


Figure 193: Router TO Switch Secondary Trunk Configuration on UK-BLOCK Router Through WINBOX

## 11.3. NEPAL-BLOCK

### 11.3.1. Primary NEPAL-BLOCK-SWITCH

CMD

```
/interface vlan
add name=NEPAL-SW.v100-ETHER-8 interface=ether8 vlan-id=100 comment="NEPAL-BLOCK trunk to NEPAL switch – VLAN 100 STUDENT"
add name=NEPAL-SW.v200-ETHER-8 interface=ether8 vlan-id=200 comment="NEPAL-BLOCK trunk to NEPAL switch – VLAN 200 TEACHER"
add name=NEPAL-SW.v300-ETHER-8 interface=ether8 vlan-id=300 comment="NEPAL-BLOCK trunk to NEPAL switch – VLAN 300 STAFF"
/

/interface bridge port
add bridge=BR_VL_STUDENT_100 interface=NEPAL-SW.v100-ETHER-8 comment="NEPAL-BLOCK VLAN100 to VPLS STUDENT bridge"
add bridge=BR_VL_TEACHER_200 interface=NEPAL-SW.v200-ETHER-8 comment="NEPAL-BLOCK VLAN200 to VPLS TEACHER bridge"
add bridge=BR_VL_STAFF_300 interface=NEPAL-SW.v300-ETHER-8 comment="NEPAL-BLOCK VLAN300 to VPLS STAFF bridge"
/
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@NEPAL-BLOCK] >
[admin@NEPAL-BLOCK] > /interface vlan
[admin@NEPAL-BLOCK] /interface/vlan> add name=NEPAL-SW.v100-ETHER-8 interface=ether8 vlan-id=100 comment="NEPAL-BLOCK trunk to NEPAL switch - VLAN 100 STUDENT"
[admin@NEPAL-BLOCK] /interface/vlan> add name=NEPAL-SW.v200-ETHER-8 interface=ether8 vlan-id=200 comment="NEPAL-BLOCK trunk to NEPAL switch - VLAN 200 TEACHER"
[admin@NEPAL-BLOCK] /interface/vlan> add name=NEPAL-SW.v300-ETHER-8 interface=ether8 vlan-id=300 comment="NEPAL-BLOCK trunk to NEPAL switch - VLAN 300 STAFF"
[admin@NEPAL-BLOCK] /interface/vlan /
[admin@NEPAL-BLOCK] >
[admin@NEPAL-BLOCK] > /interface bridge port
[admin@NEPAL-BLOCK] /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=NEPAL-SW.v100-ETHER-8 comment="NEPAL-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@NEPAL-BLOCK] /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=NEPAL-SW.v200-ETHER-8 comment="NEPAL-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@NEPAL-BLOCK] /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface=NEPAL-SW.v300-ETHER-8 comment="NEPAL-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@NEPAL-BLOCK] /interface/bridge/port>
[admin@NEPAL-BLOCK] >
```

Figure 194: Router TO Switch Primary Trunk Configuration on NEPAL-BLOCK Router Through CMD

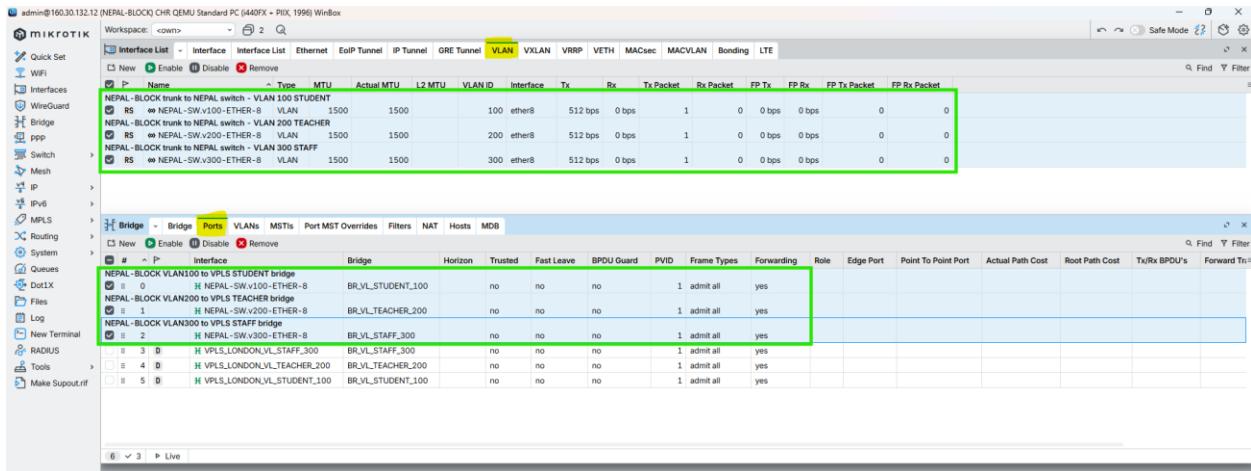


Figure 195: Router TO Switch Primary Trunk Configuration on NEPAL-BLOCK Router Through WINBOX

### 11.3.2. Secondary-UK-BLOCK-SWITCH

CMD

```
/interface vlan
add name=NP-SW.v100-ETHER-7 interface=ether7 vlan-id=100 comment="NEPAL-BLOCK trunk to UK switch – VLAN 100 STUDENT"
add name=NP-SW.v200-ETHER-7 interface=ether7 vlan-id=200 comment="NEPAL-BLOCK trunk to UK switch – VLAN 200 TEACHER"
add name=NP-SW.v300-ETHER-7 interface=ether7 vlan-id=300 comment="NEPAL-BLOCK trunk to UK switch – VLAN 300 STAFF"
/
/interface bridge port
add bridge=BR_VL_STUDENT_100 interface=NP-SW.v100-ETHER-7 comment="NEPAL-BLOCK VLAN100 to VPLS STUDENT bridge"
add bridge=BR_VL_TEACHER_200 interface=NP-SW.v200-ETHER-7 comment="NEPAL-BLOCK VLAN200 to VPLS TEACHER bridge"
add bridge=BR_VL_STAFF_300 interface=NP-SW.v300-ETHER-7 comment="NEPAL-BLOCK VLAN300 to VPLS STAFF bridge"
/
```

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@NEPAL-BLOCK] >
[admin@NEPAL-BLOCK] > /interface vlan
[admin@NEPAL-BLOCK] /interface/vlan> add name=NP-SW.v100-ETHER-7 interface=ether7 vlan-id=100 comment="NEPAL-BLOCK trunk to UK switch VLAN 100 STUDENT"
[admin@NEPAL-BLOCK] /interface/vlan> add name=NP-SW.v200-ETHER-7 interface=ether7 vlan-id=200 comment="NEPAL-BLOCK trunk to UK switch VLAN 200 TEACHER"
[admin@NEPAL-BLOCK] /interface/vlan> add name=NP-SW.v300-ETHER-7 interface=ether7 vlan-id=300 comment="NEPAL-BLOCK trunk to UK switch VLAN 300 STAFF"
[admin@NEPAL-BLOCK] /interface/vlan>
[admin@NEPAL-BLOCK] >
[admin@NEPAL-BLOCK] > /interface bridge port
[admin@NEPAL-BLOCK] /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=NP-SW.v100-ETHER-7 comment="NEPAL-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@NEPAL-BLOCK] /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=NP-SW.v200-ETHER-7 comment="NEPAL-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@NEPAL-BLOCK] /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface=NP-SW.v300-ETHER-7 comment="NEPAL-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@NEPAL-BLOCK] /interface/bridge/port>
[admin@NEPAL-BLOCK] >
```

Figure 196: Router TO Switch Secondary Trunk Configuration on SKILL-BLOCK Router Through CMD

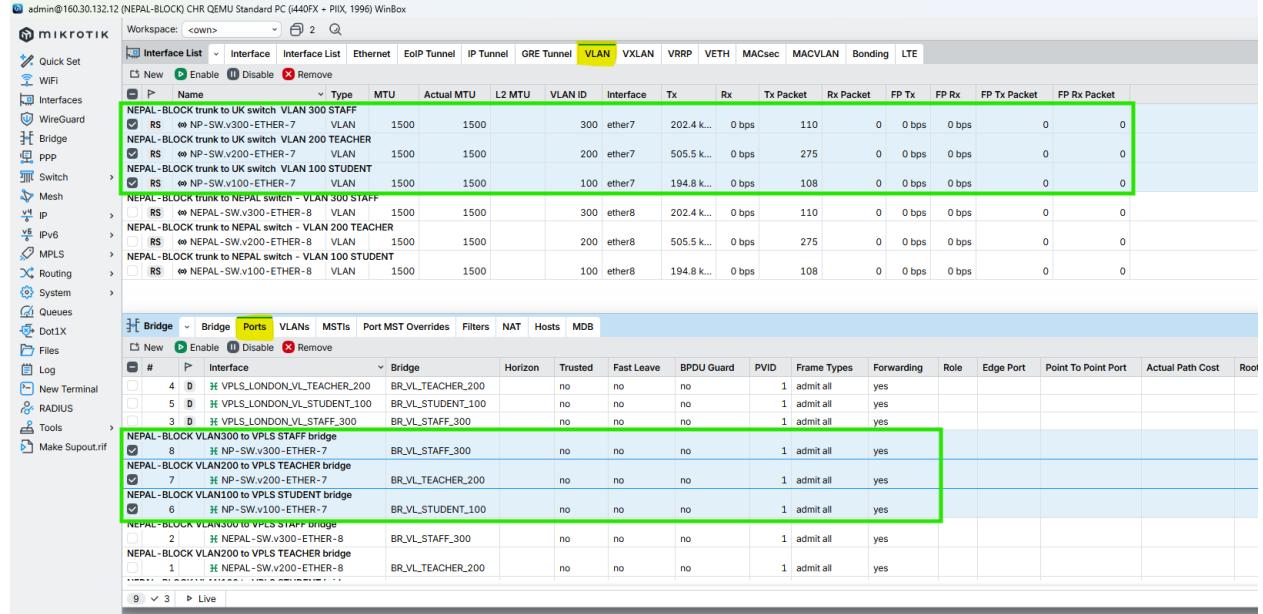


Figure 197: Router TO Switch Secondary Trunk Configuration on SKILL-BLOCK Router Through WINBOX

## 11.4. HIMAL-BLOCK

### 11.4.1. Primary HIMAL-BLOCK-SWITCH

CMD

```
/interface vlan
add name=HIMAL-SW.v100-ETHER-8 interface=ether8 vlan-id=100 comment="HIMAL-BLOCK trunk to HIMAL switch – VLAN 100 STUDENT"
add name=HIMAL-SW.v200-ETHER-8 interface=ether8 vlan-id=200 comment="HIMAL-BLOCK trunk to HIMAL switch – VLAN 200 TEACHER"
add name=HIMAL-SW.v300-ETHER-8 interface=ether8 vlan-id=300 comment="HIMAL-BLOCK trunk to HIMAL switch – VLAN 300 STAFF"
/
/interface bridge port
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```

add bridge=BR_VL_STUDENT_100 interface=HIMAL-SW.v100-ETHER-8 comment="HIMAL-BLOCK VLAN100 to VPLS STUDENT bridge"
add bridge=BR_VL_TEACHER_200 interface=HIMAL-SW.v200-ETHER-8 comment="HIMAL-BLOCK VLAN200 to VPLS TEACHER bridge"
add bridge=BR_VL_STAFF_300 interface=HIMAL-SW.v300-ETHER-8 comment="HIMAL-BLOCK VLAN300 to VPLS STAFF bridge"
/

```

```

[admin@HIMAL-BLOCK] > /interface vlan
[admin@HIMAL-BLOCK] /interface/vlan add name=HIMAL-SW.v100-ETHER-8 interface=ether8 wlan-id=100 comment="HIMAL-BLOCK trunk to HIMAL switch - VLAN 100 STUDENT"
[admin@HIMAL-BLOCK] /interface/vlan add name=HIMAL-SW.v200-ETHER-8 interface=ether8 wlan-id=200 comment="HIMAL-BLOCK trunk to HIMAL switch - VLAN 200 TEACHER"
[admin@HIMAL-BLOCK] /interface/vlan add name=HIMAL-SW.v300-ETHER-8 interface=ether8 wlan-id=300 comment="HIMAL-BLOCK trunk to HIMAL switch - VLAN 300 STAFF"
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /interface bridge port
[admin@HIMAL-BLOCK] /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=HIMAL-SW.v100-ETHER-8 comment="HIMAL-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@HIMAL-BLOCK] /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=HIMAL-SW.v200-ETHER-8 comment="HIMAL-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@HIMAL-BLOCK] /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface=HIMAL-SW.v300-ETHER-8 comment="HIMAL-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@HIMAL-BLOCK] /interface/bridge/port>
[admin@HIMAL-BLOCK] >

```

Figure 198: Router TO Switch Primary Trunk Configuration on HIMAL-BLOCK Router Through CMD

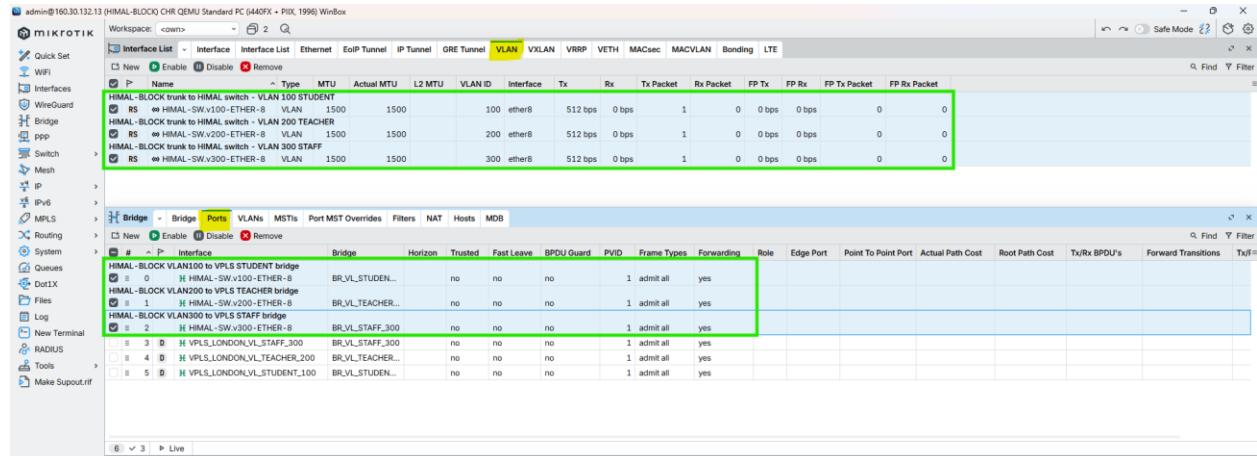


Figure 199: Router TO Switch Primary Trunk Configuration on HIMAL-BLOCK Router Through WINBOX

### 11.4.2. Secondary SKILL-BLOCK-SWITCH

```

/interface vlan
add name=SKILL-SW.v100-ETHER-7 interface=ether7 wlan-id=100 comment="HIMAL-BLOCK trunk to SKILL switch – VLAN 100 STUDENT"
add name=SKILL-SW.v200-ETHER-7 interface=ether7 wlan-id=200 comment="HIMAL-BLOCK trunk to SKILL switch – VLAN 200 TEACHER"
add name=SKILL-SW.v300-ETHER-7 interface=ether7 wlan-id=300 comment="HIMAL-BLOCK trunk to SKILL switch – VLAN 300 STAFF"
/

```

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
/interface bridge port
add bridge=BR_VL_STUDENT_100 interface=SKILL-SW.v100-ETHER-7 comment="HIMAL-BLOCK VLAN100 to VPLS STUDENT bridge"
add bridge=BR_VL_TEACHER_200 interface=SKILL-SW.v200-ETHER-7 comment="HIMAL-BLOCK VLAN200 to VPLS TEACHER bridge"
add bridge=BR_VL_STAFF_300 interface=SKILL-SW.v300-ETHER-7 comment="HIMAL-BLOCK VLAN300 to VPLS STAFF bridge"
/

```

```
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /interface/vlan
[admin@HIMAL-BLOCK] /interface/vlan add name=SKILL-SW.v100-ETHER-7 interface=ether7 vlan-id=100 comment="HIMAL-BLOCK trunk to SKILL switch VLAN 100 STUDENT"
[admin@HIMAL-BLOCK] /interface/vlan add name=SKILL-SW.v200-ETHER-7 interface=ether7 vlan-id=200 comment="HIMAL-BLOCK trunk to SKILL switch VLAN 200 TEACHER"
[admin@HIMAL-BLOCK] /interface/vlan add name=SKILL-SW.v300-ETHER-7 interface=ether7 vlan-id=300 comment="HIMAL-BLOCK trunk to SKILL switch VLAN 300 STAFF"
[admin@HIMAL-BLOCK] >
[admin@HIMAL-BLOCK] > /interface/bridge port
[admin@HIMAL-BLOCK] /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=SKILL-SW.v100-ETHER-7 comment="HIMAL-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@HIMAL-BLOCK] /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=SKILL-SW.v200-ETHER-7 comment="HIMAL-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@HIMAL-BLOCK] /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface=SKILL-SW.v300-ETHER-7 comment="HIMAL-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@HIMAL-BLOCK] /interface/bridge/port>
[admin@HIMAL-BLOCK] >
```

Figure 200: Router TO Switch Secondary Trunk Configuration on HIMAL-BLOCK Router Through CMD

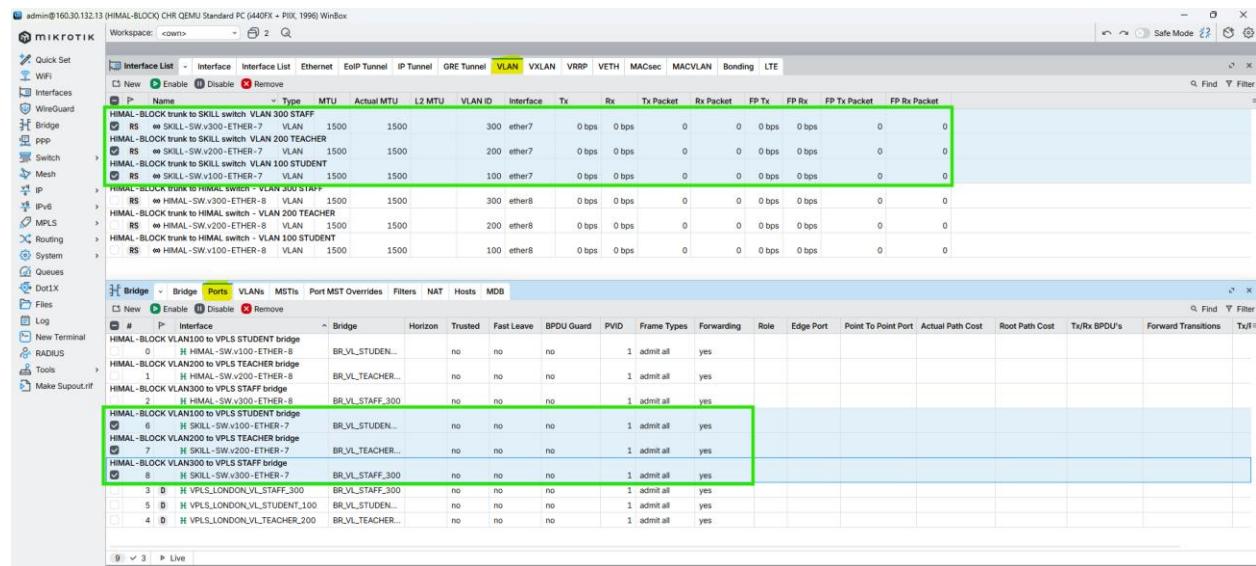


Figure 201: Router TO Switch Secondary Trunk Configuration on HIMAL-BLOCK Router Through WINBOX

## 11.5. BRIT-BLOCK

### 11.5.1. Primary BRIT-BLOCK-SWITCH CMD

```
/interface vlan
add name=BRIT-SW.v100-ETHER-8 interface=ether8 vlan-id=100 comment="BRIT-BLOCK trunk to BRIT switch – VLAN 100 STUDENT"
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```

add name=BRIT-SW.v200-ETHER-8 interface=ether8 vlan-id=200 comment="BRIT-BLOCK trunk to BRIT switch – VLAN 200
TEACHER"
add name=BRIT-SW.v300-ETHER-8 interface=ether8 vlan-id=300 comment="BRIT-BLOCK trunk to BRIT switch – VLAN 300
STAFF"
/
/interface bridge port
add bridge=BR_VL_STUDENT_100 interface=BRIT-SW.v100-ETHER-8 comment="BRIT-BLOCK VLAN100 to VPLS STUDENT
bridge"
add bridge=BR_VL_TEACHER_200 interface=BRIT-SW.v200-ETHER-8 comment="BRIT-BLOCK VLAN200 to VPLS TEACHER
bridge"
add bridge=BR_VL_STAFF_300 interface=BRIT-SW.v300-ETHER-8 comment="BRIT-BLOCK VLAN300 to VPLS STAFF bridge"
/

```

```

[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > /interface vlan
[admin@BRIT-BLOCK] /interface/vlan> add name=BRIT-SW.v100-ETHER-8 interface=ether8 vlan-id=100 comment="BRIT-BLOCK trunk to BRIT switch - VLAN 100 STUDENT"
[admin@BRIT-BLOCK] /interface/vlan> add name=BRIT-SW.v200-ETHER-8 interface=ether8 vlan-id=200 comment="BRIT-BLOCK trunk to BRIT switch - VLAN 200 TEACHER"
[admin@BRIT-BLOCK] /interface/vlan> add name=BRIT-SW.v300-ETHER-8 interface=ether8 vlan-id=300 comment="BRIT-BLOCK trunk to BRIT switch - VLAN 300 STAFF"
[admin@BRIT-BLOCK] /interface/vlan>
[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > /interface bridge port
[admin@BRIT-BLOCK] /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=BRIT-SW.v100-ETHER-8 comment="BRIT-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@BRIT-BLOCK] /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=BRIT-SW.v200-ETHER-8 comment="BRIT-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@BRIT-BLOCK] /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface=BRIT-SW.v300-ETHER-8 comment="BRIT-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@BRIT-BLOCK] /interface/bridge/port>
[admin@BRIT-BLOCK] >

```

Figure 202: Router TO Switch Primary Trunk Configuration on BRIT-BLOCK Router Through CMD

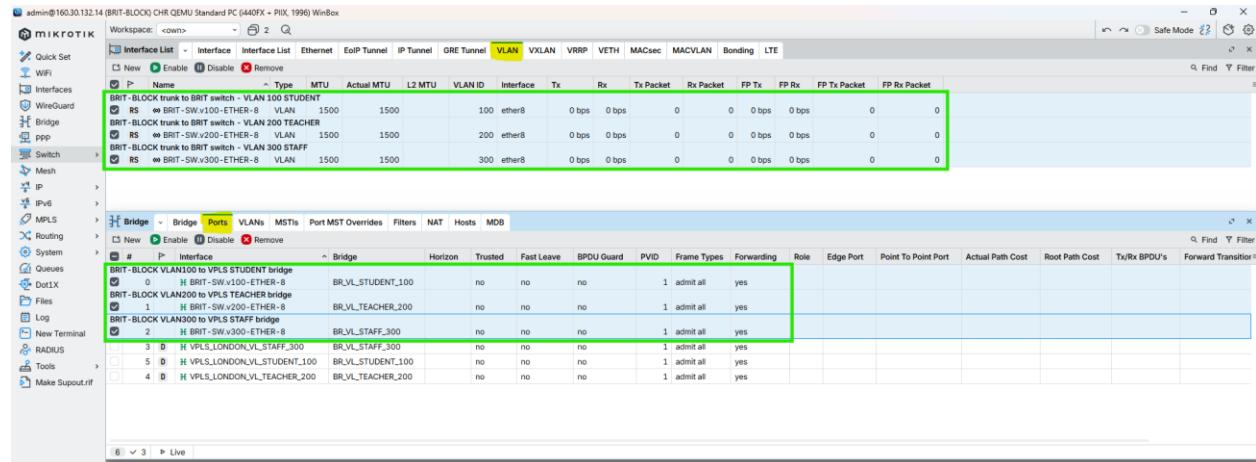


Figure 203: Router TO Switch Primary Trunk Configuration on BRIT-BLOCK Router Through WINBOX

### 11.5.2. Secondary NEPAL-BLOCK-SWITCH CMD

```
/interface vlan
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```

add name=NEPAL-SW.v100-ETHER-7 interface=ether7 vlan-id=100 comment="BRIT-BLOCK trunk to NEPAL switch – VLAN 100 STUDENT"
add name=NEPAL-SW.v200-ETHER-7 interface=ether7 vlan-id=200 comment="BRIT-BLOCK trunk to NEPAL switch – VLAN 200 TEACHER"
add name=NEPAL-SW.v300-ETHER-7 interface=ether7 vlan-id=300 comment="BRIT-BLOCK trunk to NEPAL switch – VLAN 300 STAFF"
/
/interface bridge port
add bridge=BR_VL_STUDENT_100 interface=NEPAL-SW.v100-ETHER-7 comment="BRIT-BLOCK VLAN100 to VPLS STUDENT bridge"
add bridge=BR_VL_TEACHER_200 interface=NEPAL-SW.v200-ETHER-7 comment="BRIT-BLOCK VLAN200 to VPLS TEACHER bridge"
add bridge=BR_VL_STAFF_300 interface=NEPAL-SW.v300-ETHER-7 comment="BRIT-BLOCK VLAN300 to VPLS STAFF bridge"
/

```

```

[admin@BRIT-BLOCK] >
[admin@BRIT-BLOCK] > /interface vlan
[admin@BRIT-BLOCK] /interface/vlan> add name=NEPAL-SW.v100-ETHER-7 interface=ether7 vlan-id=100 comment="BRIT-BLOCK trunk to NEPAL switch VLAN 100 STUDENT"
[admin@BRIT-BLOCK] /interface/vlan> add name=NEPAL-SW.v200-ETHER-7 interface=ether7 vlan-id=200 comment="BRIT-BLOCK trunk to NEPAL switch VLAN 200 TEACHER"
[admin@BRIT-BLOCK] /interface/vlan> add name=NEPAL-SW.v300-ETHER-7 interface=ether7 vlan-id=300 comment="BRIT-BLOCK trunk to NEPAL switch VLAN 300 STAFF"
[admin@BRIT-BLOCK] /interface/vlan>
[admin@BRIT-BLOCK] > /interface bridge port
[admin@BRIT-BLOCK] /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=NEPAL-SW.v100-ETHER-7 comment="BRIT-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@BRIT-BLOCK] /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=NEPAL-SW.v200-ETHER-7 comment="BRIT-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@BRIT-BLOCK] /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface=NEPAL-SW.v300-ETHER-7 comment="BRIT-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@BRIT-BLOCK] /interface/bridge/port>
[admin@BRIT-BLOCK] >

```

Figure 204: Router TO Switch Secondary Trunk Configuration on BRIT-BLOCK Router Through CMD

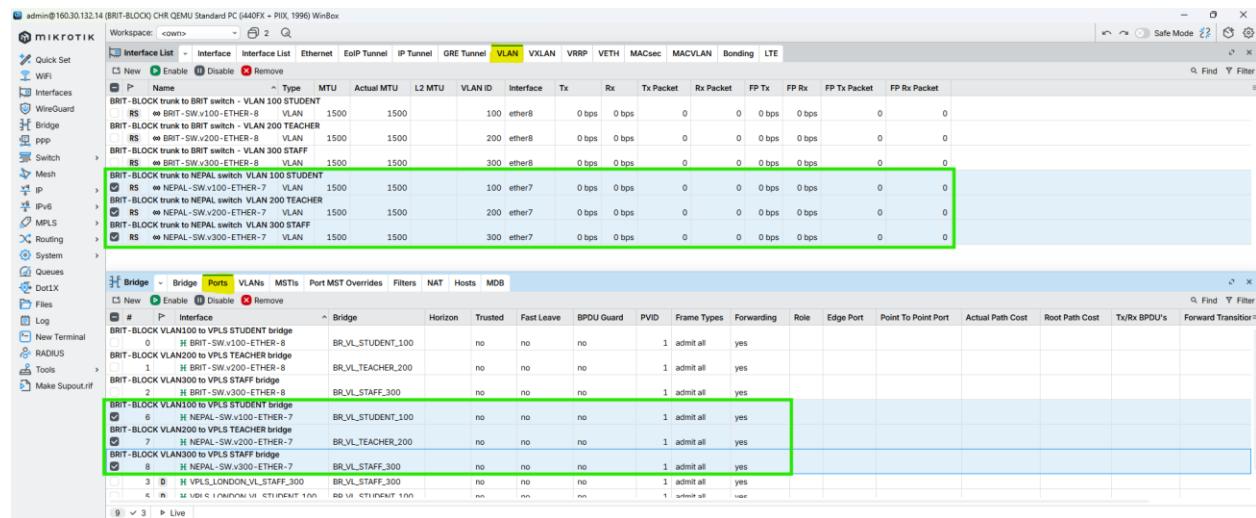


Figure 205: Router TO Switch Secondary Trunk Configuration on BRIT-BLOCK Router Through WINBOX

## 11.6. SKILL-BLOCK

### 11.6.1. Primary SKILL-BLOCK-SWITCH

CMD

```
/interface vlan
add name=SLILL-SW.v100-ETHER-8 interface=ether8 vlan-id=100 comment="SLILL-BLOCK trunk to SLILL switch - VLAN 100 STUDENT"
add name=SLILL-SW.v200-ETHER-8 interface=ether8 vlan-id=200 comment="SLILL-BLOCK trunk to SLILL switch - VLAN 200 TEACHER"
add name=SLILL-SW.v300-ETHER-8 interface=ether8 vlan-id=300 comment="SLILL-BLOCK trunk to SLILL switch - VLAN 300 STAFF"
/
/interface bridge port
add bridge=BR_VL_STUDENT_100 interface=SLILL-SW.v100-ETHER-8 comment="SLILL-BLOCK VLAN100 to VPLS STUDENT bridge"
add bridge=BR_VL_TEACHER_200 interface=SLILL-SW.v200-ETHER-8 comment="SLILL-BLOCK VLAN200 to VPLS TEACHER bridge"
add bridge=BR_VL_STAFF_300 interface=SLILL-SW.v300-ETHER-8 comment="SLILL-BLOCK VLAN300 to VPLS STAFF bridge"
/
```

```
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /interface vlan
[admin@SKILL-BLOCK] /interface/vlan> add name=SLILL-SW.v100-ETHER-8 interface=ether8 vlan-id=100 comment="SLILL-BLOCK trunk to SLILL switch - VLAN 100 STUDENT"
[admin@SKILL-BLOCK] /interface/vlan> add name=SLILL-SW.v200-ETHER-8 interface=ether8 vlan-id=200 comment="SLILL-BLOCK trunk to SLILL switch - VLAN 200 TEACHER"
[admin@SKILL-BLOCK] /interface/vlan> add name=SLILL-SW.v300-ETHER-8 interface=ether8 vlan-id=300 comment="SLILL-BLOCK trunk to SLILL switch - VLAN 300 STAFF"
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /interface bridge port
[admin@SKILL-BLOCK] /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=SLILL-SW.v100-ETHER-8 comment="SLILL-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@SKILL-BLOCK] /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=SLILL-SW.v200-ETHER-8 comment="SLILL-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@SKILL-BLOCK] /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface=SLILL-SW.v300-ETHER-8 comment="SLILL-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@SKILL-BLOCK] /interface/bridge/port />
[admin@SKILL-BLOCK] >
```

Figure 206: Router TO Switch Primary Trunk Configuration on SKILL-BLOCK Router Through CMD

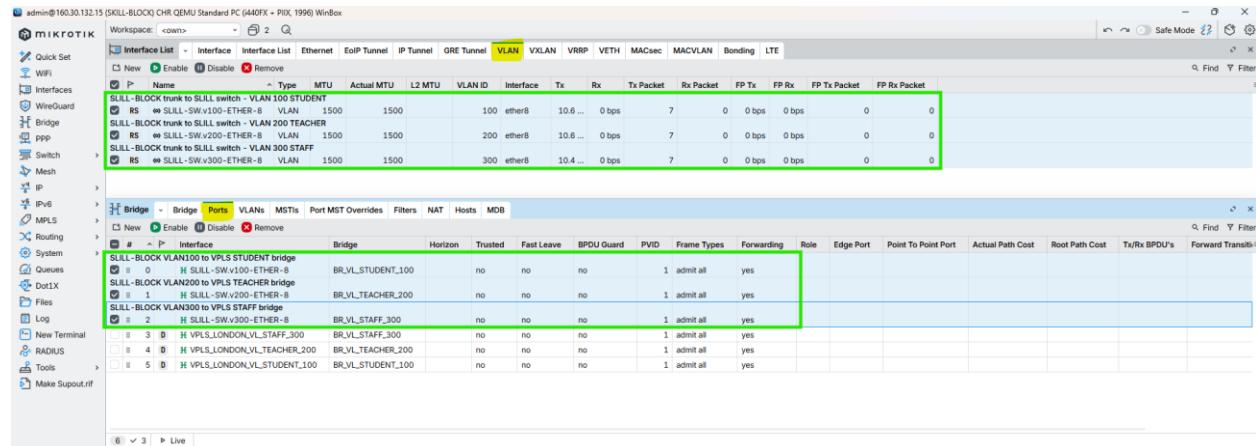


Figure 207: Router TO Switch Primary Trunk Configuration on SKILL-BLOCK Router Through WINBOX

### 11.6.2. Secondary ALUMNI-BLOCK-SWITCH CMD

```
/interface vlan
add name=ALUMNI-SW.v100-ETHER-7 interface=ether7 vlan-id=100 comment="SKILL-BLOCK trunk to ALUMNI switch – VLAN 100 STUDENT"
add name=ALUMNI-SW.v200-ETHER-7 interface=ether7 vlan-id=200 comment="SKILL-BLOCK trunk to ALUMNI switch – VLAN 200 TEACHER"
add name=ALUMNI-SW.v300-ETHER-7 interface=ether7 vlan-id=300 comment="SKILL-BLOCK trunk to ALUMNI switch – VLAN 300 STAFF"
/
/interface bridge port
add bridge=BR_VL_STUDENT_100 interface=ALUMNI-SW.v100-ETHER-7 comment="SKILL-BLOCK VLAN100 to VPLS STUDENT bridge"
add bridge=BR_VL_TEACHER_200 interface=ALUMNI-SW.v200-ETHER-7 comment="SKILL-BLOCK VLAN200 to VPLS TEACHER bridge"
add bridge=BR_VL_STAFF_300 interface=ALUMNI-SW.v300-ETHER-7 comment="SKILL-BLOCK VLAN300 to VPLS STAFF bridge"
/
```

```
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /interface vlan
[admin@SKILL-BLOCK] /interface/vlan> add name=ALUMNI-SW.v100-ETHER-7 interface=ether7 vlan-id=100 comment="SKILL-BLOCK trunk to ALUMNI switch VLAN 100 STUDENT"
[admin@SKILL-BLOCK] /interface/vlan> add name=ALUMNI-SW.v200-ETHER-7 interface=ether7 vlan-id=200 comment="SKILL-BLOCK trunk to ALUMNI switch VLAN 200 TEACHER"
[admin@SKILL-BLOCK] /interface/vlan> add name=ALUMNI-SW.v300-ETHER-7 interface=ether7 vlan-id=300 comment="SKILL-BLOCK trunk to ALUMNI switch VLAN 300 STAFF"
[admin@SKILL-BLOCK] >
[admin@SKILL-BLOCK] > /interface bridge port
[admin@SKILL-BLOCK] /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=ALUMNI-SW.v100-ETHER-7 comment="SKILL-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@SKILL-BLOCK] /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=ALUMNI-SW.v200-ETHER-7 comment="SKILL-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@SKILL-BLOCK] /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface=ALUMNI-SW.v300-ETHER-7 comment="SKILL-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@SKILL-BLOCK] >
```

Figure 208: Router TO Switch Secondary Trunk Configuration on SKILL-BLOCK Router Through CMD

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

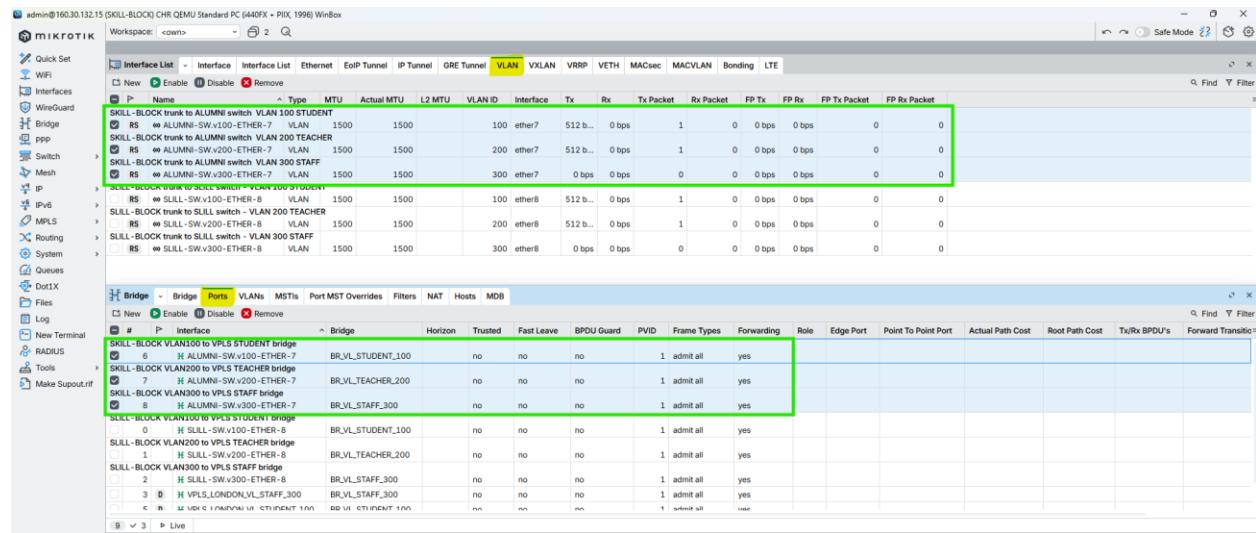


Figure 209: Router TO Switch Secondary Trunk Configuration on SKILL-BLOCK Router Through WINBOX

## 11.7. ALUMNI-BLOCK

### 11.7.1. Primary ALUMNI-BLOCK-SWITCH

CMD

```
/interface vlan
add name=ALUMNI-SW.v100-ETHER-8 interface=ether8 vlan-id=100 comment="ALUMNI-BLOCK trunk to ALUMNI switch - VLAN 100 STUDENT"
add name=ALUMNI-SW.v200-ETHER-8 interface=ether8 vlan-id=200 comment="ALUMNI-BLOCK trunk to ALUMNI switch - VLAN 200 TEACHER"
add name=ALUMNI-SW.v300-ETHER-8 interface=ether8 vlan-id=300 comment="ALUMNI-BLOCK trunk to ALUMNI switch - VLAN 300 STAFF"
/

/interface bridge port
add bridge=BR_VL_STUDENT_100 interface=ALUMNI-SW.v100-ETHER-8 comment="ALUMNI-BLOCK VLAN100 to VPLS STUDENT bridge"
add bridge=BR_VL_TEACHER_200 interface=ALUMNI-SW.v200-ETHER-8 comment="ALUMNI-BLOCK VLAN200 to VPLS TEACHER bridge"
add bridge=BR_VL_STAFF_300 interface=ALUMNI-SW.v300-ETHER-8 comment="ALUMNI-BLOCK VLAN300 to VPLS STAFF bridge"
/
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
[admin@ALUMNI-BLOCK] > /interface vlan
[admin@ALUMNI-BLOCK] /interface/vlan> add name=ALUMNI-SW.v100-ETHER-8 interface=ether8 vlan-id=100 comment="ALUMNI-BLOCK trunk to ALUMNI switch - VLAN 100 STUDENT"
[admin@ALUMNI-BLOCK] /interface/vlan> add name=ALUMNI-SW.v200-ETHER-8 interface=ether8 vlan-id=200 comment="ALUMNI-BLOCK trunk to ALUMNI switch - VLAN 200 TEACHER"
[admin@ALUMNI-BLOCK] /interface/vlan> add name=ALUMNI-SW.v300-ETHER-8 interface=ether8 vlan-id=300 comment="ALUMNI-BLOCK trunk to ALUMNI switch - VLAN 300 STAFF"
[admin@ALUMNI-BLOCK] /interface/vlan>
[admin@ALUMNI-BLOCK] > /interface bridge port
[admin@ALUMNI-BLOCK] /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=ALUMNI-SW.v100-ETHER-8 comment="ALUMNI-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@ALUMNI-BLOCK] /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=ALUMNI-SW.v200-ETHER-8 comment="ALUMNI-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@ALUMNI-BLOCK] /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface=ALUMNI-SW.v300-ETHER-8 comment="ALUMNI-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@ALUMNI-BLOCK] /interface/bridge/port>
[admin@ALUMNI-BLOCK] >
```

Figure 210: Router TO Switch Primary Trunk Configuration on ALUMNI-BLOCK Router Through CMD

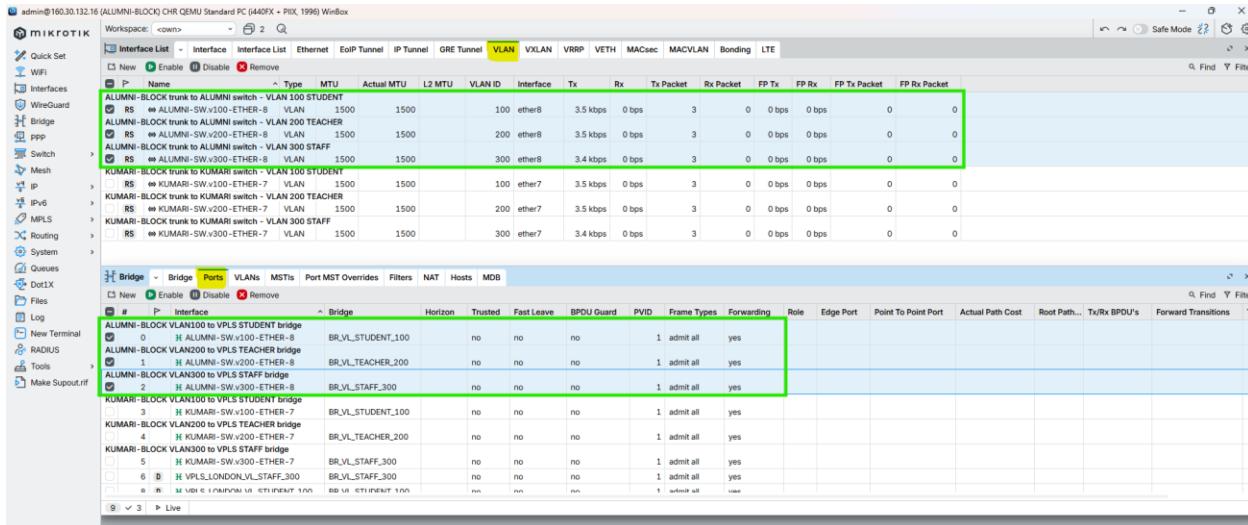


Figure 211: Router TO Switch Primary Trunk Configuration on ALUMNI-BLOCK Router Through WINBOX

### 11.7.2. Secondary KUMARI-BLOCK-SWITCH

#### CMD

```
/interface vlan
add name=KUMARI-SW.v100-ETHER-6 interface=ether6 vlan-id=100 comment="ALUMNI-BLOCK trunk to KUMARI switch - VLAN 100 STUDENT"
add name=KUMARI-SW.v200-ETHER-6 interface=ether6 vlan-id=200 comment="ALUMNI-BLOCK trunk to KUMARI switch - VLAN 200 TEACHER"
add name=KUMARI-SW.v300-ETHER-6 interface=ether6 vlan-id=300 comment="ALUMNI-BLOCK trunk to KUMARI switch - VLAN 300 STAFF"
/

/interface bridge port
add bridge=BR_VL_STUDENT_100 interface=KUMARI-SW.v100-ETHER-6 comment="ALUMNI-BLOCK VLAN100 to VPLS STUDENT bridge"
add bridge=BR_VL_TEACHER_200 interface=KUMARI-SW.v200-ETHER-6 comment="ALUMNI-BLOCK VLAN200 to VPLS TEACHER bridge"
add bridge=BR_VL_STAFF_300 interface=KUMARI-SW.v300-ETHER-6 comment="ALUMNI-BLOCK VLAN300 to VPLS STAFF bridge"
```

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
/
```

```
[admin@ALUMNI-BLOCK] > /interface vlan
[admin@ALUMNI-BLOCK] /interface/vlan> add name=KUMARI-SW.v100-ETHER-6 interface=ether6 vlan-id=100 comment="ALUMNI-BLOCK trunk to KUMARI switch VLAN 100 STUDENT"
[admin@ALUMNI-BLOCK] /interface/vlan> add name=KUMARI-SW.v200-ETHER-6 interface=ether6 vlan-id=200 comment="ALUMNI-BLOCK trunk to KUMARI switch VLAN 200 TEACHER"
[admin@ALUMNI-BLOCK] /interface/vlan> add name=KUMARI-SW.v300-ETHER-6 interface=ether6 vlan-id=300 comment="ALUMNI-BLOCK trunk to KUMARI switch VLAN 300 STAFF"
[admin@ALUMNI-BLOCK] /interface/vlan /
[admin@ALUMNI-BLOCK] >
[admin@ALUMNI-BLOCK] /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=KUMARI-SW.v100-ETHER-6 comment="ALUMNI-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@ALUMNI-BLOCK] /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=KUMARI-SW.v200-ETHER-6 comment="ALUMNI-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@ALUMNI-BLOCK] /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface=KUMARI-SW.v300-ETHER-6 comment="ALUMNI-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@ALUMNI-BLOCK] /interface/bridge/port /
[admin@ALUMNI-BLOCK] >
```

Figure 212: Router TO Switch Secondary Trunk Configuration on ALUMNI-BLOCK Router Through CMD

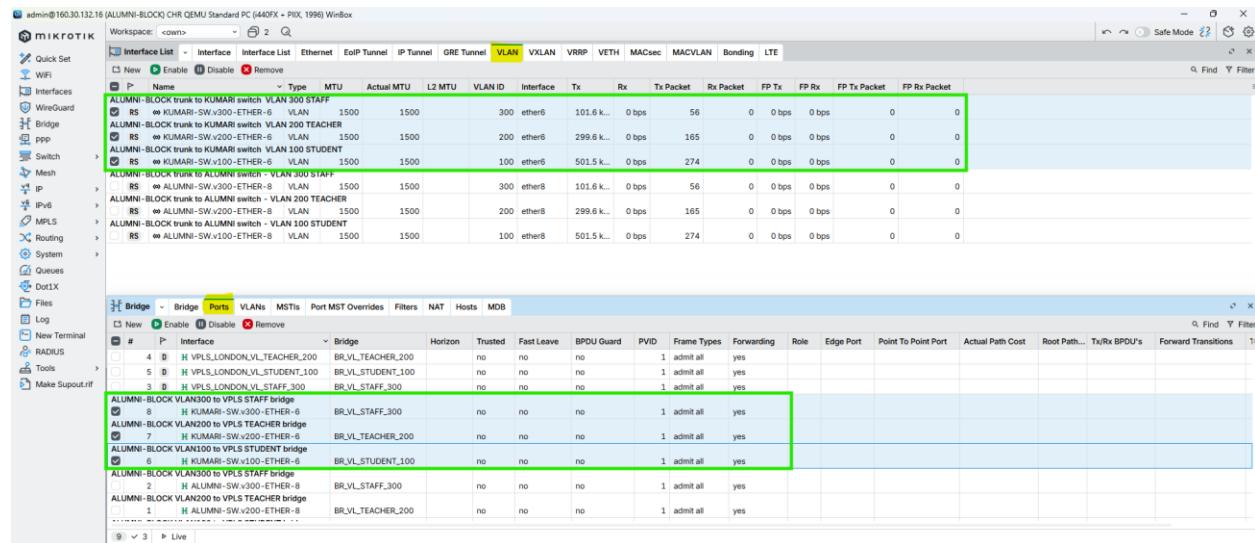


Figure 213: Router TO Switch Secondary Trunk Configuration on ALUMNI-BLOCK Router Through WINBOX

## 11.8. KUMARI-BLOCK

### 11.8.1. Primary KUMARI-BLOCK-SWITCH

CMD

```
/interface vlan
add name=KUMARI-SW.v100-ETHER-7 interface=ether7 vlan-id=100 comment="KUMARI-BLOCK trunk to KUMARI switch – VLAN 100 STUDENT"
add name=KUMARI-SW.v200-ETHER-7 interface=ether7 vlan-id=200 comment="KUMARI-BLOCK trunk to KUMARI switch – VLAN 200 TEACHER"
add name=KUMARI-SW.v300-ETHER-7 interface=ether7 vlan-id=300 comment="KUMARI-BLOCK trunk to KUMARI switch – VLAN 300 STAFF"
/
/interface bridge port
```

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```

add bridge=BR_VL_STUDENT_100 interface=KUMARI-SW.v100-ETHER-7 comment="KUMARI-BLOCK VLAN100 to VPLS STUDENT bridge"
add bridge=BR_VL_TEACHER_200 interface=KUMARI-SW.v200-ETHER-7 comment="KUMARI-BLOCK VLAN200 to VPLS TEACHER bridge"
add bridge=BR_VL_STAFF_300 interface=KUMARI-SW.v300-ETHER-7 comment="KUMARI-BLOCK VLAN300 to VPLS STAFF bridge"
/

```

```

[admin@KUMARI-BLOCK] >
[admin@KUMARI-BLOCK] > /interface vlan
[admin@KUMARI-BLOCK] /interface/vlan> add name=KUMARI-SW.v100-ETHER-7 interface=ether7 vlan-id=100 comment="KUMARI-BLOCK trunk to KUMARI switch VLAN 100 STUDENT"
[admin@KUMARI-BLOCK] /interface/vlan> add name=KUMARI-SW.v200-ETHER-7 interface=ether7 vlan-id=200 comment="KUMARI-BLOCK trunk to KUMARI switch VLAN 200 TEACHER"
[admin@KUMARI-BLOCK] /interface/vlan> add name=KUMARI-SW.v300-ETHER-7 interface=ether7 vlan-id=300 comment="KUMARI-BLOCK trunk to KUMARI switch VLAN 300 STAFF"
[admin@KUMARI-BLOCK] >
[admin@KUMARI-BLOCK] > /interface bridge port
[admin@KUMARI-BLOCK] /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=KUMARI-SW.v100-ETHER-7 comment="KUMARI-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@KUMARI-BLOCK] /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=KUMARI-SW.v200-ETHER-7 comment="KUMARI-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@KUMARI-BLOCK] /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface=KUMARI-SW.v300-ETHER-7 comment="KUMARI-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@KUMARI-BLOCK] /interface/bridge/port>
[admin@KUMARI-BLOCK] >

```

Figure 214: Router TO Switch Primary Trunk Configuration on KUMARI-BLOCK Router Through CMD

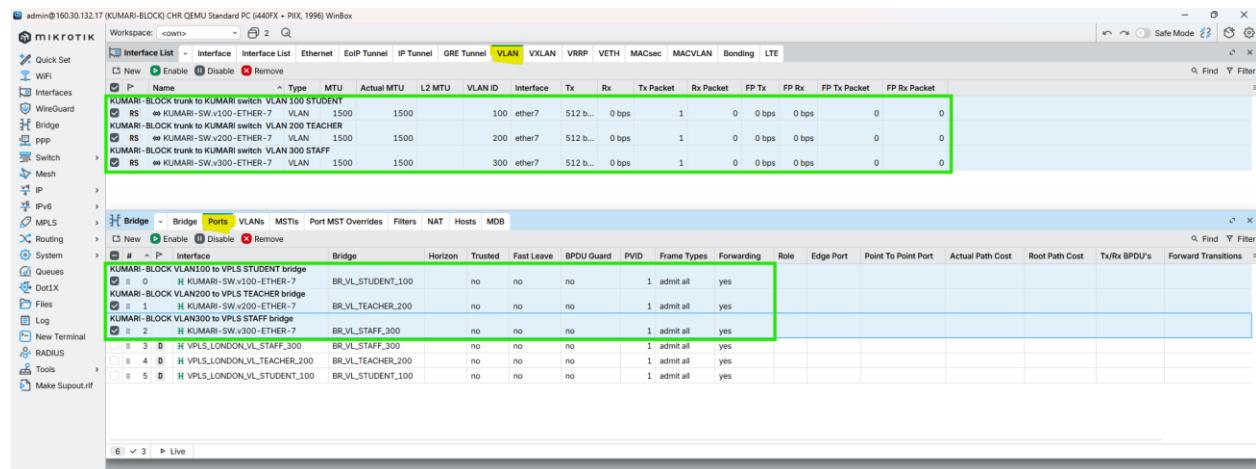


Figure 215: Router TO Switch Primary Trunk Configuration on KUMARI-BLOCK Router Through WINBOX

### 11.8.2. Secondary BRIT-BLOCK-SWITCH CMD

```

/interface vlan
add name=BRIT-SW.v100-ETHER-6 interface=ether6 vlan-id=100 comment="KUMARI-BLOCK trunk to BRIT switch – VLAN 100 STUDENT"
add name=BRIT-SW.v200-ETHER-6 interface=ether6 vlan-id=200 comment="KUMARI-BLOCK trunk to BRIT switch – VLAN 200 TEACHER"
add name=BRIT-SW.v300-ETHER-6 interface=ether6 vlan-id=300 comment="KUMARI-BLOCK trunk to BRIT switch – VLAN 300 STAFF"
/

```

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
/interface bridge port
add bridge=BR_VL_STUDENT_100 interface=BRIT-SW.v100-ETHER-6 comment="KUMARI-BLOCK VLAN100 to VPLS STUDENT bridge"
add bridge=BR_VL_TEACHER_200 interface=BRIT-SW.v200-ETHER-6 comment="KUMARI-BLOCK VLAN200 to VPLS TEACHER bridge"
add bridge=BR_VL_STAFF_300 interface=BRIT-SW.v300-ETHER-6 comment="KUMARI-BLOCK VLAN300 to VPLS STAFF bridge"
/

```

```
[admin@KUMARI-BLOCK] > /interface vlan
[admin@KUMARI-BLOCK] > /interface/vlan> add name=BRIT-SW.v100-ETHER-6 interface=ether6 vlan-id=100 comment="KUMARI-BLOCK trunk to BRIT switch VLAN 100 STUDENT"
[admin@KUMARI-BLOCK] > /interface/vlan> add name=BRIT-SW.v200-ETHER-6 interface=ether6 vlan-id=200 comment="KUMARI-BLOCK trunk to BRIT switch VLAN 200 TEACHER"
[admin@KUMARI-BLOCK] > /interface/vlan> add name=BRIT-SW.v300-ETHER-6 interface=ether6 vlan-id=300 comment="KUMARI-BLOCK trunk to BRIT switch VLAN 300 STAFF"
[admin@KUMARI-BLOCK] >
[admin@KUMARI-BLOCK] > /interface bridge port
[admin@KUMARI-BLOCK] > /interface/bridge/port> add bridge=BR_VL_STUDENT_100 interface=BRIT-SW.v100-ETHER-6 comment="KUMARI-BLOCK VLAN100 to VPLS STUDENT bridge"
[admin@KUMARI-BLOCK] > /interface/bridge/port> add bridge=BR_VL_TEACHER_200 interface=BRIT-SW.v200-ETHER-6 comment="KUMARI-BLOCK VLAN200 to VPLS TEACHER bridge"
[admin@KUMARI-BLOCK] > /interface/bridge/port> add bridge=BR_VL_STAFF_300 interface=BRIT-SW.v300-ETHER-6 comment="KUMARI-BLOCK VLAN300 to VPLS STAFF bridge"
[admin@KUMARI-BLOCK] >
```

Figure 216: Router TO Switch Secondary Trunk Configuration on KUMARI-BLOCK Router Through CMD

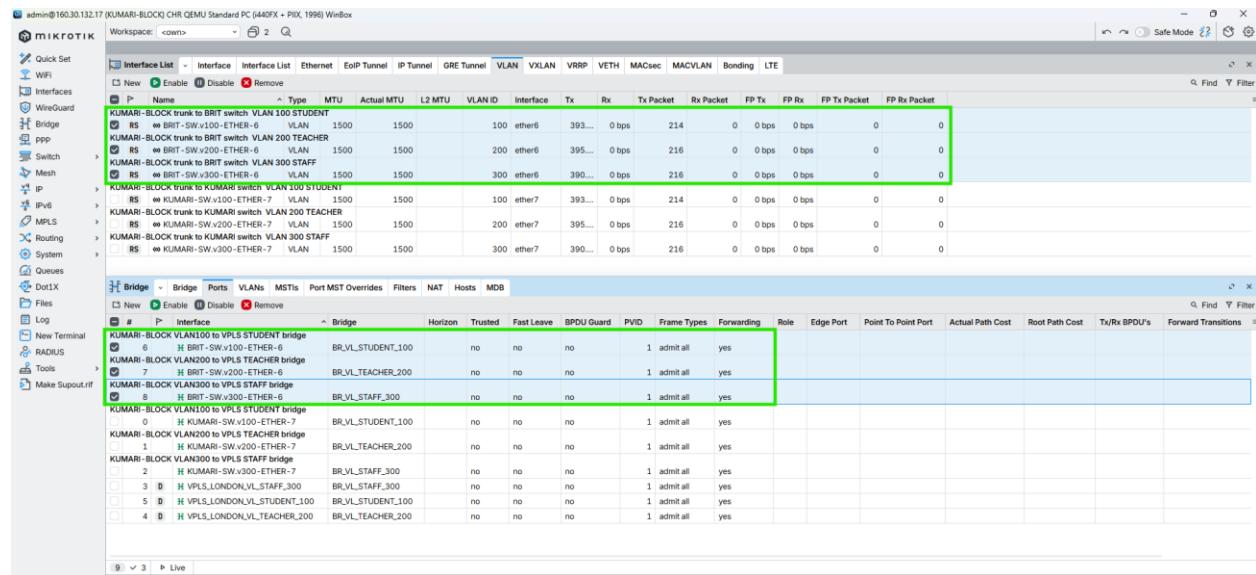


Figure 217: Router TO Switch Secondary Trunk Configuration on KUMARI-BLOCK Router Through WINBOX

## 12. Centralized DHCP Server Configuration

### 12.1. LONDON-BLOCK

#### 12.1.1. Assign Gateway IPs to VLAN bridges

CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
/ip address
add address=172.16.0.1/19 interface=BR_VL_STUDENT_100 comment="GW VLAN100 STUDENT - LONDON DHCP"
add address=172.16.32.1/22 interface=BR_VL_TEACHER_200 comment="GW VLAN200 TEACHER - LONDON DHCP"
add address=172.16.40.1/21 interface=BR_VL_STAFF_300 comment="GW VLAN300 STAFF - LONDON DHCP"
/
```

```
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /ip address
[admin@LONDON-BLOCK] /ip/address> add address=172.16.0.1/19 interface=BR_VL_STUDENT_100 comment="GW VLAN100 STUDENT - LONDON DHCP"
[admin@LONDON-BLOCK] /ip/address> add address=172.16.32.1/22 interface=BR_VL_TEACHER_200 comment="GW VLAN200 TEACHER - LONDON DHCP"
[admin@LONDON-BLOCK] /ip/address> add address=172.16.40.1/21 interface=BR_VL_STAFF_300 comment="GW VLAN300 STAFF - LONDON DHCP"
[admin@LONDON-BLOCK] /ip/address>
[admin@LONDON-BLOCK] >
```

Figure 218: Assign Gateway IPs to VLAN bridges for DHCP on LONDON-BLOCK Router Through CMD

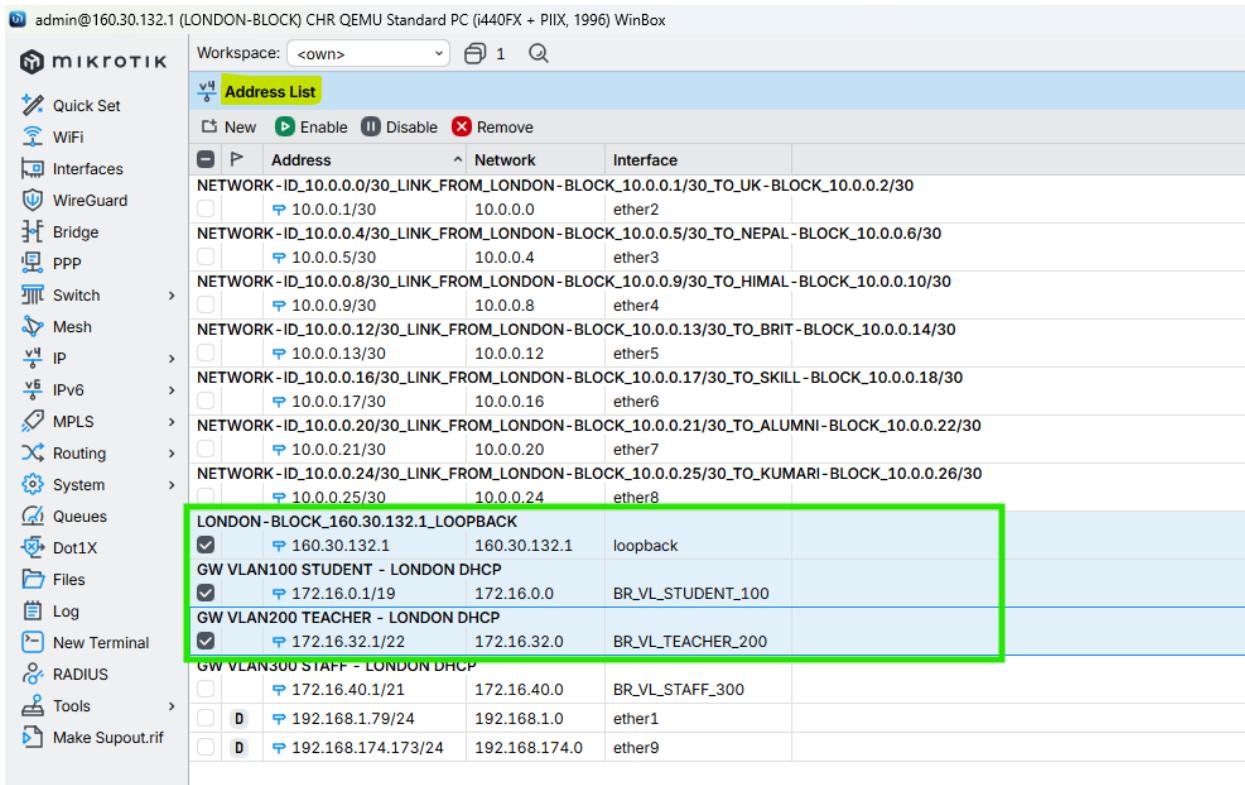


Figure 219: Assign Gateway IPs to VLAN bridges for DHCP on LONDON-BLOCK Router Through WINBOX

### 12.1.2. Create DHCP pools

CMD

```
/ip pool
add name=POOL_VLAN100 ranges=172.16.0.10-172.16.31.254 comment="Student DHCP pool"
add name=POOL_VLAN200 ranges=172.16.32.10-172.16.35.254 comment="Teacher DHCP pool"
add name=POOL_VLAN300 ranges=172.16.40.10-172.16.47.254 comment="Staff DHCP pool"
```

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

```
/
```

```
[admin@LONDON-BLOCK] >
[admin@LONDON-BLOCK] > /ip pool
[admin@LONDON-BLOCK] /ip/pool> add name=POOL_VLAN100 ranges=172.16.0.10-172.16.31.254 comment="Student DHCP pool"
[admin@LONDON-BLOCK] /ip/pool> add name=POOL_VLAN200 ranges=172.16.32.10-172.16.35.254 comment="Teacher DHCP pool"
[admin@LONDON-BLOCK] /ip/pool> add name=POOL_VLAN300 ranges=172.16.40.10-172.16.47.254 comment="Staff DHCP pool"
[admin@LONDON-BLOCK] /ip/pool>
[admin@LONDON-BLOCK] >
```

Figure 220: Create DHCP pools for DHCP on LONDON-BLOCK Router Through CMD

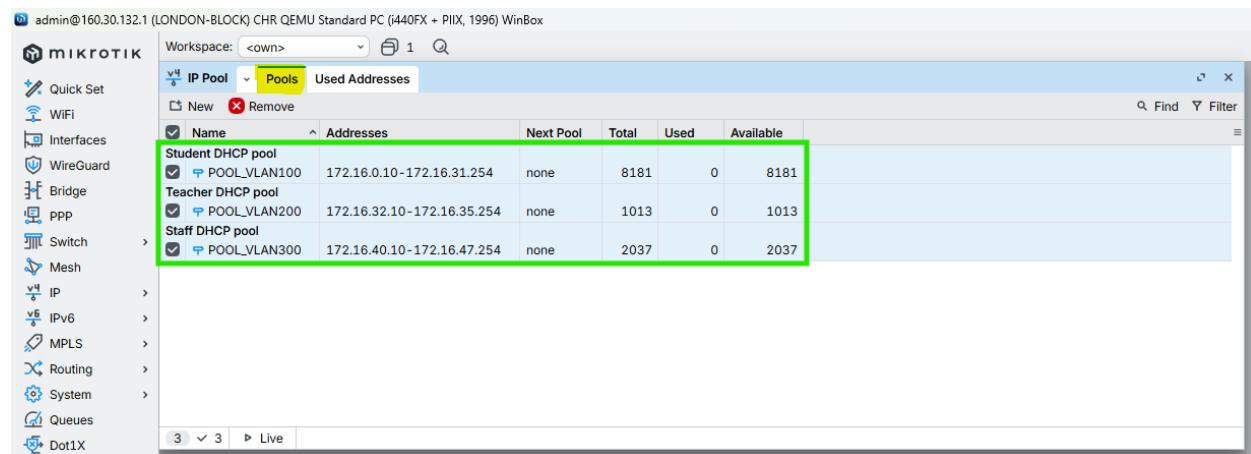


Figure 221: Create DHCP pools for DHCP on LONDON-BLOCK Router Through WINBOX

## 12.1.3. Create DHCP servers (one per VLAN bridge)

CMD

```
/ip dhcp-server
add name=DHCP_VLAN100 interface=BR_VL_STUDENT_100 address-pool=POOL_VLAN100 lease-time=12h disabled=no
comment="DHCP STUDENT VLAN100"
add name=DHCP_VLAN200 interface=BR_VL_TEACHER_200 address-pool=POOL_VLAN200 lease-time=12h disabled=no
comment="DHCP TEACHER VLAN200"
add name=DHCP_VLAN300 interface=BR_VL_STAFF_300 address-pool=POOL_VLAN300 lease-time=12h disabled=no
comment="DHCP STAFF VLAN300"
/
```

```
[admin@LONDON-BLOC] >
[admin@LONDON-BLOC] > /ip dhcp-server
[admin@LONDON-BLOC] /ip/dhcp-server> add name=DHCP_VLAN100 interface=BR_VL_STUDENT_100 address-pool=POOL_VLAN100 lease-time=12h disabled=no comment="DHCP STUDENT VLAN100"
[admin@LONDON-BLOC] /ip/dhcp-server> add name=DHCP_VLAN200 interface=BR_VL_TEACHER_200 address-pool=POOL_VLAN200 lease-time=12h disabled=no comment="DHCP TEACHER VLAN200"
[admin@LONDON-BLOC] /ip/dhcp-server> add name=DHCP_VLAN300 interface=BR_VL_STAFF_300 address-pool=POOL_VLAN300 lease-time=12h disabled=no comment="DHCP STAFF VLAN300"
[admin@LONDON-BLOC] /ip/dhcp-server>
[admin@LONDON-BLOC] >
```

Figure 222: Create DHCP servers (one per VLAN bridge) on LONDON-BLOCK Router Through CMD

# MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

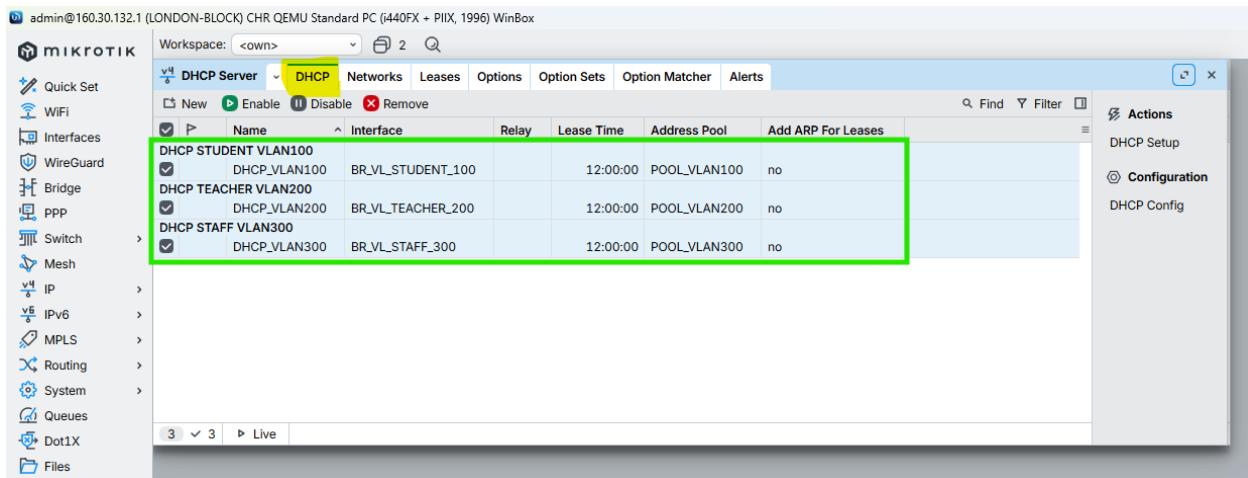


Figure 223: Create DHCP servers (one per VLAN bridge) on LONDON-BLOCK Router Through WINBOX

## 12.1.4. Define DHCP network options

CMD

```
/ip dhcp-server network
add address=172.16.0.0/19 gateway=172.16.0.1 dns-server=8.8.8.8,1.1.1.1 comment="Student VLAN100 DHCP options"
add address=172.16.32.0/22 gateway=172.16.32.1 dns-server=8.8.8.8,1.1.1.1 comment="Teacher VLAN200 DHCP options"
add address=172.16.40.0/21 gateway=172.16.40.1 dns-server=8.8.8.8,1.1.1.1 comment="Staff VLAN300 DHCP options"
/
```

```
[admin@LONDON-BLOCK] > '
[admin@LONDON-BLOCK] > /ip dhcp-server network
[admin@LONDON-BLOCK] > /ip/dhcp-server/network> add address=172.16.0.0/19 gateway=172.16.0.1 dns-server=8.8.8.8,1.1.1.1 comment="Student VLAN100 DHCP options"
[admin@LONDON-BLOCK] > /ip/dhcp-server/network> add address=172.16.32.0/22 gateway=172.16.32.1 dns-server=8.8.8.8,1.1.1.1 comment="Teacher VLAN200 DHCP options"
[admin@LONDON-BLOCK] > /ip/dhcp-server/network> add address=172.16.40.0/21 gateway=172.16.40.1 dns-server=8.8.8.8,1.1.1.1 comment="Staff VLAN300 DHCP options"
[admin@LONDON-BLOCK] > /ip/dhcp-server/network> /
[admin@LONDON-BLOCK] >
```

Figure 224: Define DHCP network options on LONDON-BLOCK Router Through CMD

## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik

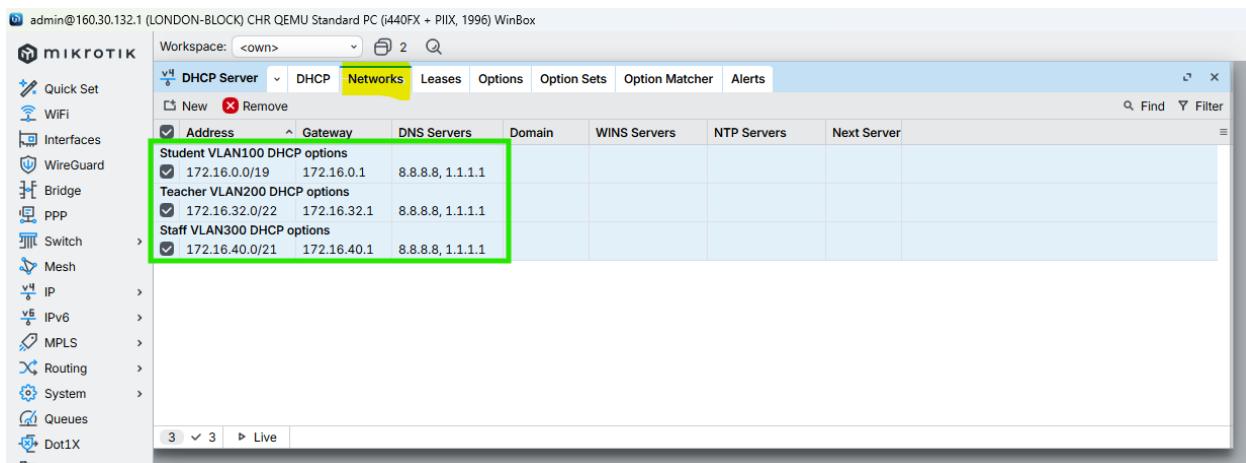
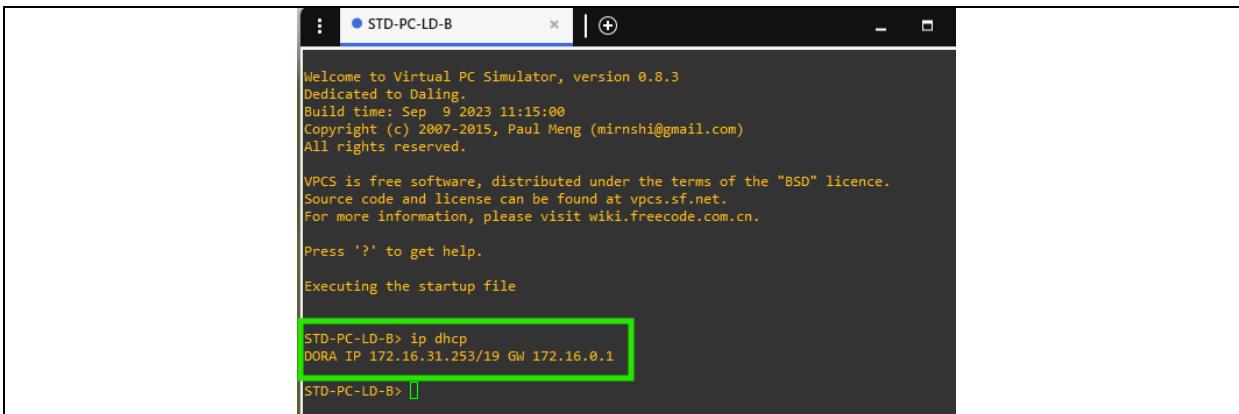


Figure 225: Define DHCP network options on LONDON-BLOCK Router Through WINBOX

## 13. DHCP Verification

### 13.1. LONDON-BLOCK



```
Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep 9 2023 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

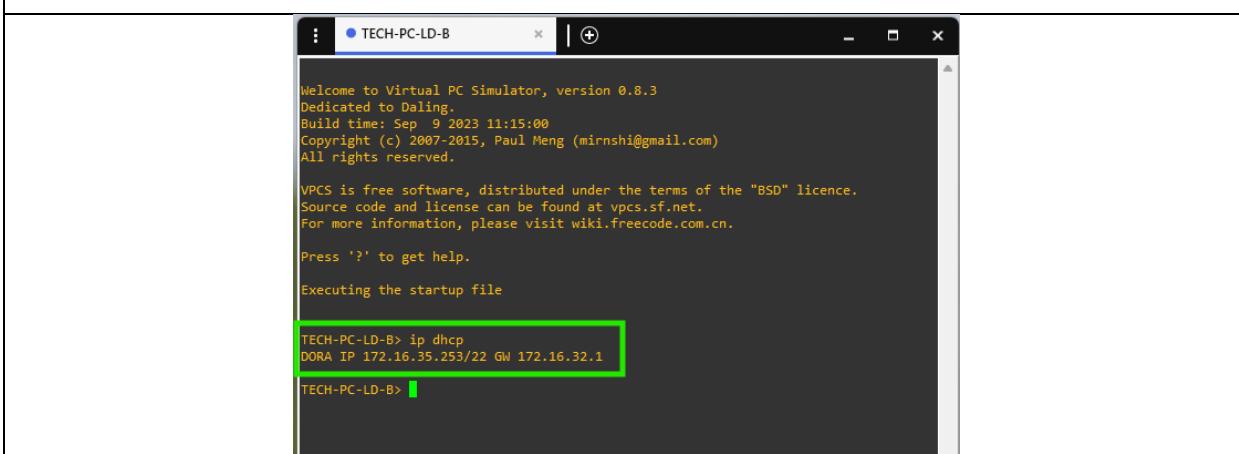
Press '?' to get help.

Executing the startup file

STD-PC-LD-B> ip dhcp
DORA IP 172.16.31.253/19 GW 172.16.0.1

STD-PC-LD-B>
```

Figure 226: DHCP Verification of Student PC on LONDON-BLOCK



```
Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep 9 2023 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

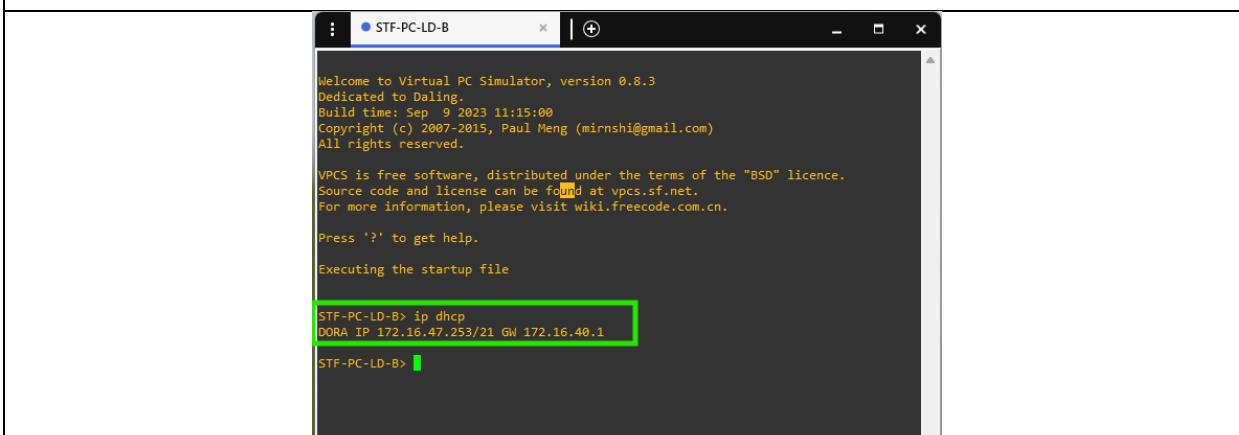
Press '?' to get help.

Executing the startup file

TECH-PC-LD-B> ip dhcp
DORA IP 172.16.35.253/22 GW 172.16.32.1

TECH-PC-LD-B>
```

Figure 227: DHCP Verification of Teacher PC on LONDON-BLOCK



```
Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

STF-PC-LD-B> ip dhcp
DORA IP 172.16.47.253/21 GW 172.16.40.1

STF-PC-LD-B>
```

Figure 228: DHCP Verification of Staff PC on LONDON-BLOCK

## 13.2. UK-BLOCK

The screenshot shows a terminal window titled "STD-PC-UK-B". It displays the startup message of the Virtual PC Simulator, version 0.8.3. In the command line, the user types "ip dhcp" and receives the output "DORA IP 172.16.31.254/19 GW 172.16.0.1". The entire command and its output are highlighted with a green box.

```
Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep 9 2023 11:15:00
Copyright (c) 2007-2015, Paul Meng (mirnshi@gmail.com)
All rights reserved.

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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

STD-PC-UK-B> ip dhcp
DORA IP 172.16.31.254/19 GW 172.16.0.1

STD-PC-UK-B>
```

Figure 229: DHCP Verification of Student PC on UK-BLOCK

The screenshot shows a terminal window titled "TECH-PC-UK-B". It displays the startup message of the Virtual PC Simulator, version 0.8.3. In the command line, the user types "ip dhcp" and receives the output "DORA IP 172.16.35.254/22 GW 172.16.32.1". The entire command and its output are highlighted with a green box.

```
Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep 9 2023 11:15:00
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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

TECH-PC-UK-B> ip dhcp
DORA IP 172.16.35.254/22 GW 172.16.32.1

TECH-PC-UK-B>
```

Figure 230: DHCP Verification of Teacher PC on UK-BLOCK

The screenshot shows a terminal window titled "STF-PC-UK-B". It displays the startup message of the Virtual PC Simulator, version 0.8.3. In the command line, the user types "ip dhcp" and receives the output "DORA IP 172.16.47.254/21 GW 172.16.40.1". The entire command and its output are highlighted with a green box.

```
Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
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Press '?' to get help.

Executing the startup file

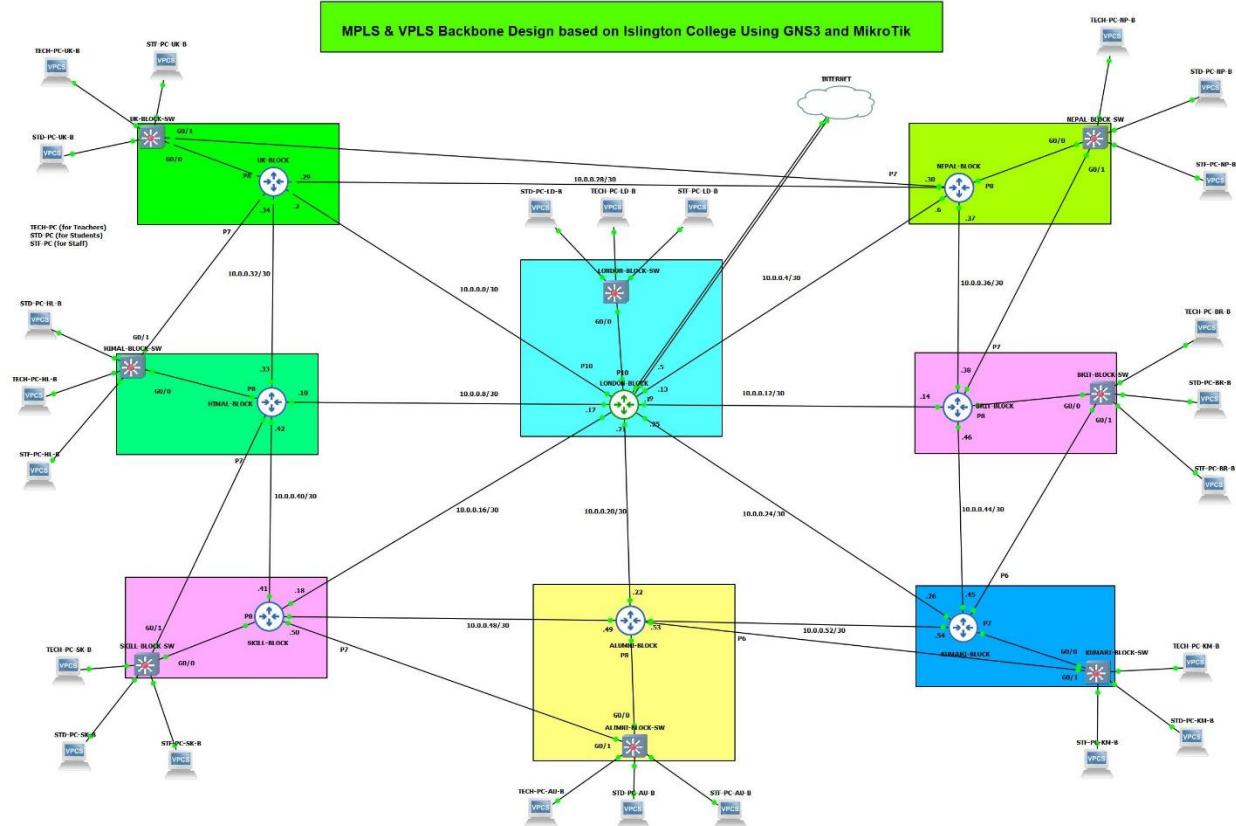
STF-PC-UK-B> ip dhcp
DORA IP 172.16.47.254/21 GW 172.16.40.1

STF-PC-UK-B>
```

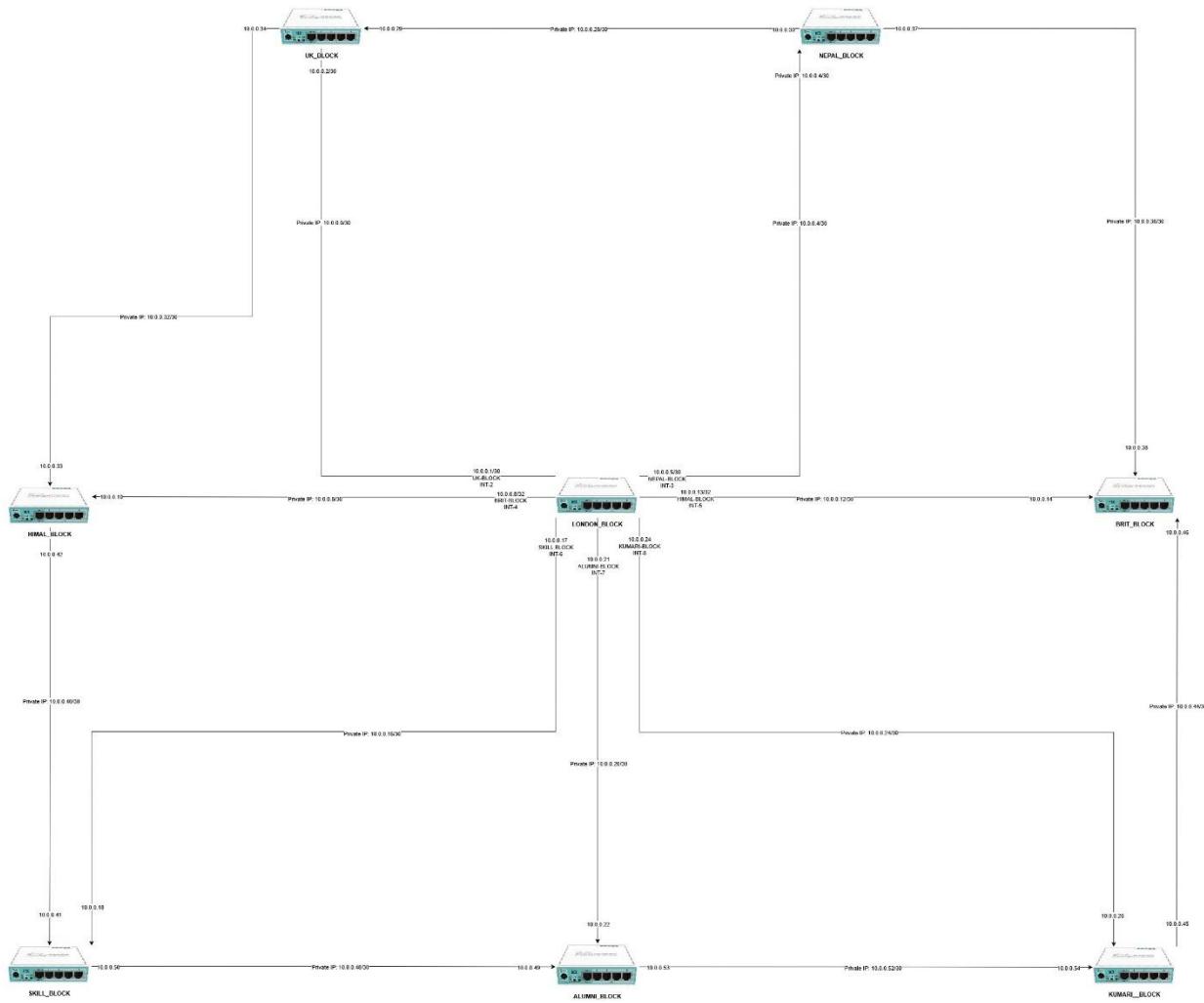
Figure 231: DHCP Verification of Staff PC on UK-BLOCK

## 14. Network Topology and Diagrams

### 14.1. Full Network Topology Diagram



## MPLS & VPLS Backbone Design based on Islington College Using GNS3 and MikroTik



## 15. Conclusion and Future Enhancements

### 15.1. Conclusion

This project successfully designed, implemented, and verified an MPLS and VPLS-based backbone network for a multi-block campus environment inspired by the infrastructure of Islington College. Using GNS3 and MikroTik routers, a scalable and resilient core network was created to interconnect nine academic and administrative blocks through a combination of OSPF, MPLS with LDP, and VPLS-based Layer-2 VPNs.

The implementation demonstrated how OSPF can efficiently provide dynamic routing and fast convergence within an MPLS core, while MPLS with LDP enabled label-switched paths for optimized packet forwarding and load balancing using ECMP. The use of VPLS allowed VLANs to be transparently extended across geographically separated blocks, ensuring consistent Layer-2 connectivity for Students, Teachers, and Staff without deploying local DHCP services on each router.

A centralized DHCP architecture was successfully integrated, proving that IP address management can be simplified while maintaining VLAN separation across the MPLS backbone. End-to-end testing confirmed correct IP allocation, VLAN transport, inter-block connectivity, redundancy, and failover behavior across multiple paths.

Throughout the project, several real-world networking challenges—such as MTU mismatches, VPLS bridging behavior, and routing visibility—were identified and resolved. Addressing these issues provided practical insight into service provider-style network design and reinforced the importance of structured planning, verification, and troubleshooting in large-scale networks.

Overall, this project strengthened practical understanding of service provider technologies, particularly MPLS, VPLS, and OSPF, and demonstrated how enterprise and campus networks can be designed with scalability, redundancy, and centralized management in mind. The completed design serves as a strong foundation for further enhancements and reflects real-world networking principles applicable to ISP and enterprise environments.

## **15.2. Future Enhancements**

- Load Balancing Internal Network
- Security and Access Control Management (SSH / Winbox)
- ACLs / Firewall Rules for Router Interfaces
- System Monitoring
- Jumbo MTU