Bridging and Routing your wireless Network, WDS and OSPF as Case Study

By
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About Vangage Ltd

- Wireless ISP (WISP)
- Network Solution

- Clients Include
- Oil and Gas Sector (SPDC, Shclumberger, Total Elf)
- Banks
- Private Sector
Overview

- A wireless network
- A bridged network
- A routed Network
Wireless network

- Connection of 2 or more network devices wirelessly i.e. without cables

- End points could be connected by a routing or bridging device
Outlines on Bridging

- Bridging enlarges the broadcast domain of a network
- Depends on broadcasting to locate a network device
- Deployed on Mikrotik routers using WDS
What you need to know about WDS

- Acronym for Wireless Distribution System (WDS)
- Connects networks wirelessly
- Transparently Bridge networks
What you need to know about WDS (Cont’d)

- Locate devices on the network by use of MAC addresses

- Each frame has 2 MAC addresses, i.e. sender’s MAC and recipient MAC address
Hardware for WDS

- Two Mikrotik Routers running wireless (One in AP and other in station mode). Use integrated mikrotik radio for simplicity

- Laptop connected to both MT routers
Simple WDS Config (AP side)

- Create a bridge /int br add name=wds-bridge
- Add relevant interfaces i.e. /int br port interface=ether1 bridge=mum
- /int br port interface=wlan1 bridge=mum
- /interface wireless set wlan1 ssid=MikroTik frequency=5805 mode=bridge disabled=no
- /interface wireless set wlan1 wds-mode=dynamic wds-default-bridge=wds-bridge
Simple WDS Config (Remote Site)

- Create a bridge /int br add name=wds-bridge
- Add relevant interfaces i.e. /int br port interface=ether1 bridge=mum
- /int br port interface=ether1 bridge=mum
- Configure wireless: interface wireless set wlan1 ssid=MikroTik frequency=5805 mode=station-wds disabled=no
- interface wireless> set wlan1 wds-mode=dynamic wds-default-bridge=wds-bridge
Simple WDS Config (Cont’d)

- **For AP**
  - `/ip address add address=10.0.1.1/24 interface=wds-bridge`

- **For Remote site**
  - `/ip address add address=10.0.1.2/24 interface=wds-bridge`

- Test your configuration by pinging 10.0.1.2 from pc at AP
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>MTU</th>
<th>Tx Rate</th>
<th>Rx Rate</th>
<th>Tx Packets</th>
<th>Rx Packets</th>
</tr>
</thead>
<tbody>
<tr>
<td>ether1</td>
<td>Ethernet</td>
<td>1500</td>
<td>46.9 kbps</td>
<td>423.3 kbps</td>
<td>59</td>
<td>78</td>
</tr>
<tr>
<td>wds-bridge</td>
<td>Bridge</td>
<td>1500</td>
<td>5.3 kbps</td>
<td>3.0 kbps</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>wlan1</td>
<td>Wireless (Atheros AR5413)</td>
<td>1500</td>
<td>428.2 kbps</td>
<td>39.9 kbps</td>
<td>76</td>
<td>57</td>
</tr>
<tr>
<td>wds1</td>
<td>WDS</td>
<td>1500</td>
<td>428.6 kbps</td>
<td>39.9 kbps</td>
<td>76</td>
<td>57</td>
</tr>
</tbody>
</table>
When To Bridge

- Extend your office to remove ‘logical boundary’
- Provides avenue for sharing network devices/resources e.g. printers
- Network is centrally managed and trusted
- Limited system processor usage
Outlines on Routing

- Routing breaks broadcast domains
- Devices are located on the network, by IP addresses. Segments your network
- Types include static and dynamic e.g. OSPF, BGP, RIP
What you need to know about OSPF

- Acronym for Open Shortest Path First (OSPF)
- Fast routing protocol for large networks

- OSPF network can be broken into smaller units with the backbone Area 0 at the core

- Areas provide logical grouping for routers in same broadcast domain
What you need to know about OSPF (cont’d)

- OSPF is a link-state routing protocol that runs Dijkstra's algorithm to calculate the shortest path to other networks

- Distributes routing information between routers in same AS
Requirements for OSPF Setup

- Two Mikrotik Routers running wireless (One in AP and other in station mode). Use integrated mikrotik radio for simplicity

- Laptop connected to both MT routers
Simple OSPF Configuration (AP site)

- `/ip address add address=10.0.1.1/24 interface=wlan1 disabled=no`
- `/rou ospf set router-id=10.0.1.1 distribute-default=if-installed-as-type-1`
- `/rou osp network add network=10.0.1.0/24 area=backbone`
- You can add as many networks as you want to advertise
Simple OSPF Configuration

(Remote site)

- /ip address add address=10.0.1.2/24 interface=wlan1 disabled=no
- /ip address add address=192.168.1.1/24 interface=ether1 disabled=no
- /rou ospf set router-id=10.0.1.1 redistribute-connected=as-type-1 distribute-default=never
- /rou osp network add network=10.0.1.0/24 area=backbone
- /rou osp network add network=192.168.1.0/24 area=backbone
- /ip firewall nat add src-address 192.168.1.0/24 action=masquerade chain=srchnat
Simple OSPF Setup (cont’d)

• Test your configuration by pinging 10.0.1.2 from pc at AP
<table>
<thead>
<tr>
<th>Router ID</th>
<th>Address</th>
<th>State</th>
<th>State Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0.4.2</td>
<td>10.0.3.1</td>
<td>2-Way</td>
<td>0</td>
</tr>
<tr>
<td>10.0.4.4</td>
<td>10.0.4.4</td>
<td>Full</td>
<td>6</td>
</tr>
<tr>
<td>10.0.4.5</td>
<td>10.0.4.5</td>
<td>Full</td>
<td>6</td>
</tr>
<tr>
<td>208.74.112.41</td>
<td>10.0.4.1</td>
<td>2-Way</td>
<td>2</td>
</tr>
<tr>
<td>Routes</td>
<td>Gateway</td>
<td>Pref Source</td>
<td>Distance</td>
</tr>
<tr>
<td>--------</td>
<td>---------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>DAO</td>
<td>10.0.0.0/0</td>
<td>10.0.0.1</td>
<td></td>
</tr>
<tr>
<td>DAC</td>
<td>10.0.4.0/24</td>
<td>10.0.4.2</td>
<td></td>
</tr>
<tr>
<td>DIO</td>
<td>10.0.4.0/24</td>
<td>10.0.2.1</td>
<td></td>
</tr>
<tr>
<td>DIO</td>
<td>10.2.1.0/24</td>
<td>10.2.1.1</td>
<td></td>
</tr>
<tr>
<td>DIO</td>
<td>10.2.1.0/24</td>
<td>10.2.2.1</td>
<td></td>
</tr>
<tr>
<td>DIO</td>
<td>10.2.2.0/24</td>
<td>10.2.3.1</td>
<td></td>
</tr>
<tr>
<td>DIO</td>
<td>10.6.1.0/24</td>
<td>10.0.4.4</td>
<td></td>
</tr>
<tr>
<td>DAO</td>
<td>10.6.2.0/24</td>
<td>10.0.4.4</td>
<td></td>
</tr>
<tr>
<td>DAO</td>
<td>10.6.3.0/24</td>
<td>10.0.4.5</td>
<td></td>
</tr>
<tr>
<td>DAO</td>
<td>10.9.1.0/24</td>
<td>10.0.4.5</td>
<td></td>
</tr>
<tr>
<td>DAO</td>
<td>10.9.2.0/24</td>
<td>10.0.4.5</td>
<td></td>
</tr>
<tr>
<td>DAO</td>
<td>10.9.3.0/24</td>
<td>10.0.4.5</td>
<td></td>
</tr>
<tr>
<td>DAC</td>
<td>172.16.4.0/24</td>
<td>172.16.4.12</td>
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<tr>
<td>DAO</td>
<td>172.16.4.0/24</td>
<td>10.0.4.4</td>
<td></td>
</tr>
<tr>
<td>DAC</td>
<td>172.16.5.0/24</td>
<td>10.0.4.5</td>
<td></td>
</tr>
<tr>
<td>DAC</td>
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<td>10.0.4.5</td>
<td></td>
</tr>
<tr>
<td>DAC</td>
<td>172.16.11.0/24</td>
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<td></td>
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<tr>
<td>DAC</td>
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<td></td>
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<tr>
<td>DAO</td>
<td>193.93.98.0/24</td>
<td>10.0.4.1</td>
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<tr>
<td>DAO</td>
<td>193.93.98.96/24</td>
<td>10.0.4.1</td>
<td></td>
</tr>
<tr>
<td>DAO</td>
<td>208.74.112.32/24</td>
<td>10.0.4.1</td>
<td></td>
</tr>
</tbody>
</table>
When to route

- For segmented network
- For a robust and scalable network
- Good for medium to large networks
Summary

- When designing your network, you can choose to put multiple segments into one bridged network.
- or to divide it into different networks interconnected by routers.
- If a host is physically moved from one network area to another in a routed network, it has to get a new IP address.
- if this system is moved within a bridged network, it doesn't have to reconfigure anything.
Summary

● Your choice of config can be dressed with hotspot, PPPOE, VLAN etc.

● Whichever design you choose, secure your network.
Suggested Reading


Questions???
Thank You!

For your Comments;

Please write us on mjohnson@gmail.com