PTP650 2+0 Solution Application Note

Overview

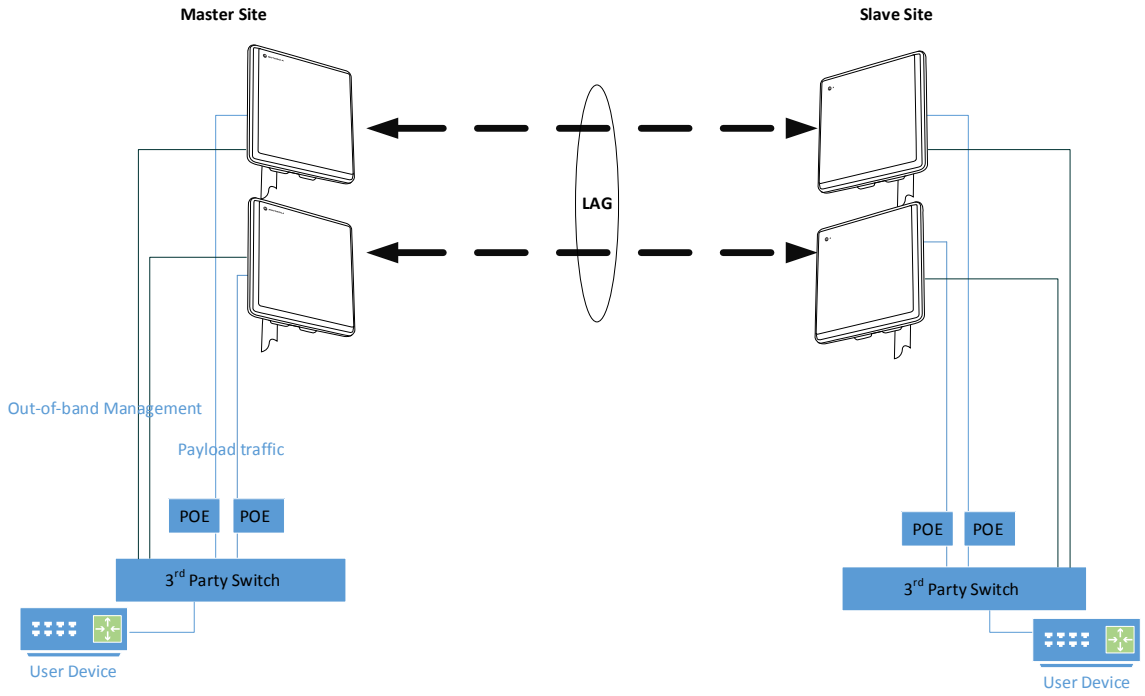
Cambium Networks had been receiving requests from customers for PTP650 to support 2+0 configuration to achieve higher capacity between sites.

Currently, PTP650 does not support 2+0 by itself. However, the 2+0 requirement can be fulfilled using 3rd party switches and two PTP650 1+0 links.

This solution will provide double capacity and meanwhile, provide some sort of redundancy.

Concept of Operation

The following diagram shows how the 2+0 solution looks like.



There will be two individual PTP650 1+0 links operating at the same time (PTP sync may be required depending on link planning because you are running two links at the same location at the same time). They are all connected to the same switch pair.

The switches will use the two PTP links to form a link aggregation group (LAG). In case that one of the links fails to pass traffic, the switch will direct all the traffic to the remaining working link. As a result, although the total capacity is cut in half, the link will continue to pass data and this provides some sort of redundancy for high priority traffic if the total high priority traffic load is less than the capacity of one link.

Note that because LAG relies on certain hashing mechanism to load balance the traffic, fully use of the capacity of both links is not guaranteed. For example, if you send one data stream across the LAG, chances are that the data stream will be hashed to only one link of the LAG, so you could overload one link and stave the other. As such, user traffic with highly diversified addresses will typically result in

better load balancing performance. Good understanding of the payload traffic profile is needed ahead of time to choose the best hashing algorithm to achieve optimized load balancing.

LAG configuration typically allows using MAC address, IP address and TCP/UDP Port numbers for hashing.

Some customer may want to have 2+0 capability for IP traffic while still support TDM using NIDU. This is doable. Just plug the NIDU in between the switch and the PTP650 radio (please follow instruction in the user guide on how the NIDU is connect to the radio). But keep in mind that while you can have 2+0 for Ethernet traffic with LAG, you are not getting 2+0 for TDM.

Management Traffic Consideration

Out-of-band non local

Note that if you are using out-of-band non local, you need to make sure that the proper VLAN/Spanning tree configuration be done to prevent a loop.

Out-of-band local

If you are using out-of-band-local, there will be no need to worry about Ethernet loop, just make sure that the management port be a one of the VLANs passing through the LAG so you would be able to manage both the local and remote radios.

Inband

If Inband is used so that management and payload traffic use the same Ethernet cable, one need to make sure that the radio is always manageable.

1. You need to make sure that management traffic for radio on a link is hashed to the proper port that is connected to the target radio. Note that without proper configuration, it is possible that management traffic targeting radio on link #1 be hashed to the port that is connected the port for link #2 and as a result, the radio cannot be reached.
2. What if one of the link is down? You may be able to continue to manage the impaired radio link locally but you will NOT be able to manage the remote impaired radio.

Switch Configuration

Using Extreme switch as an example 3rd party switch (Most Extreme switch supports this). The following commands should be used to configure the switches to enable the LAG.

enable sharing <master - port> grouping <port - list> algorithm address-based <L2 | L3_L4>

For example, if you use port 7 and 8 (each connects to the payload port of the PTP650) for the LAG and use MAC address for load balance hashing, you can use the following command:

enable sharing 7 grouping 7-8 algorithm address-based L2

Note that with this grouping setup, you will now refer to port #7 for any VLAN related configuration because port 7 is the logical port for the LAG including port 7 and port 8.

To prevent problems caused by PTP650 radios, e.g. one way traffic or unstable link that results in frequent packet loss, we recommend using the link state monitoring feature provided by Extreme, the ELSM (Extreme Link State Monitoring) commands.

ELSM configuration adds a port-to-port heartbeat in between each Link port of the LAG so the switch will be able to detect physical wireless link failure when heart-beat loss happens. Use the following command to configure ELSM. Note that these commands need to be executed on both sides of the link.

enable elsm port <port-number>

configure elsm port <port-number> hellotime <hello-time> <milliseconds | seconds>

configure elsm port <port-number> uptimer-threshold <3 – 60>

The ELSM Hello Message Interval is configurable (default = 1 second) with a minimum of 100ms and the UpTimer is configurable (default = 6) with a minimum of 3. The overall time it takes to detect and move ports into a blocked state would be the (Hello Message Interval * the UpTimer).

In theory, if you rely on ELSM to cause a LAG switch over, the best failover delay would be at least 300 milliseconds (100x3 milliseconds).

Note that the ELSM commands need to be applied to both the ports connecting to the radios (if we use port 7 and port 8 as example, we need to run these command set for both port 7 and port 8).

Configuration commands for inband management

As mentioned earlier, for inband management, special care must be taken to make sure that management traffic be hashed properly to the desired port. This is achieved use ACL (Access Command Lists) command, so that LAG hashing will not be used for management traffic. One need to figure out the MAC address of the radios before applying these commands.

Using Extreme switch as an example, the first step is to create the ACL policies (we continue to use port 7, and port 8 as example for the LAG). Note that on each switch, you need to create a policy for all for radios.

```
edit policy redirect-to-radio-mac.pol
entry redirect-to-radio1-mac {
    if{
        ethernet-destination-address <radio1-mac> / FF:FF:FF:FF:FF:FF;
    } then {
        redirect-port-no-sharing 8;
    }
}
```

```
entry redirect-to-radio2-mac {
    if{
        ethernet-destination-address <radio2-mac> / FF:FF:FF:FF:FF:FF;
    } then {
        redirect-port-no-sharing 7;
    }
}
entry redirect-to-radio3-mac {
    if{
        ethernet-destination-address <radio3-mac> / FF:FF:FF:FF:FF:FF;
    } then {
        redirect-port-no-sharing 8;
    }
}
entry redirect-to-radio4-mac {
    if{
        ethernet-destination-address <radio4-mac> / FF:FF:FF:FF:FF:FF;
    } then {
        redirect-port-no-sharing 7;
    }
}
```

The second step is the apply the policy by entering the following command

```
config access-list redirect-to-radio-mac port 7-8 ingress
```