

LAN Connectivity through a Switch

1 Physical

Symptom:
No Link

All packets will end up in a cable, copper and/or fiber, somewhere on the network. Make sure your cable infrastructure complies with the TIA/ISO standards.

Media	Key Parameters	What to check
General	Distance to network <=100m for channel, signal/noise ratio	Certify & test after moving, adding, or changing against TIA/ISO channel standards. Label & document cable/connectors.
Copper (RJ-45)	≥ Cat5 for up to 5Gbps, ≥ Cat6A for 10Gbps	All 4 pairs with no open, shorts, or grounds. Plus, correct wire mapping.
Fiber	1000BASE-SX Multimode SFP (<200m) 1000BASE-LX Singlemode SFP (<5km) 10GBASE-SR Multimode SFP+ (<300m) 10GBASE-LR Singlemode SFP+ (<10km)	Clean end-face, and measure against Power Budget & Length.

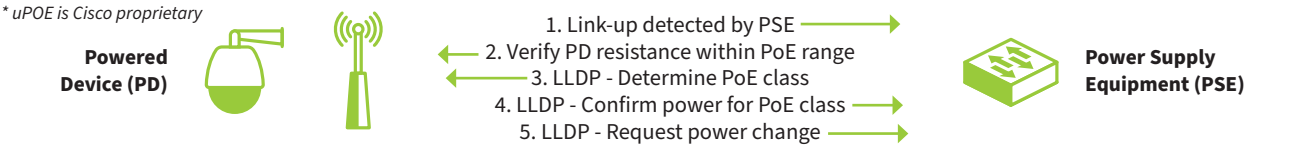
2 Power

Symptom:
PD No Power/Link,
Intermittent Disconnects

Power over Ethernet is the preferred means to power connected devices, such as security cameras or Wi-Fi access points over a Twisted Pair network cable. Be mindful of the interoperability between PD and PSE, the quality of the cable (resistance and balance), and the power budget.

PoE Class	PoE Type/Standard	Pair Used (PSE defined)		Cable Standard	DC Voltage at PSE	DC Voltage at PD	Min. Power at PSE Port	Power used by PD
		Mode A	Mode B					
0	1 / 802.3af (PoE)	12 & 36	45 & 78	TIA Cat3 / ISO Class C. Cat-5 or higher suggested	44-57V	37-57V	15.4W	0.44 – 12.95W
1							4.5W	0.44 – 3.84W
2							7.5W	3.84 – 6.49W
3							15.4W	6.49 – 12.95W
4	2 / 802.3at (POE+)	All 4 pairs		TIA Cat 6A / ISO Class EA:2002 suggested	50-57V	42.5–57V	30W	12.95 – 25.5W
5	3 / 802.3bt (uPOE)*						45W	40W
6							60W	51W
7	4 / 802.3bt						75W	62W
8	(Hi Power-POE)						90W	71W

* uPOE is Cisco proprietary



3 Link

Symptom:
No Link or Slow Network

Link settings, plus speed/duplex on both the switch and end device must match for devices to link successfully. Auto-negotiation works most of the time unless it is not applicable. For example, most 10G SFP+ transceivers do not support auto-negotiation.

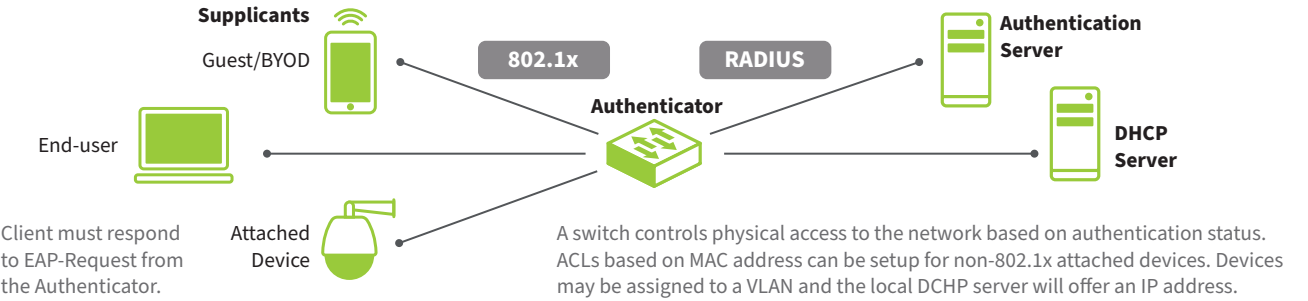
Switch Port	Port Type	Switch Speed	Duplex	What to check
10/100/1000 Mbps	RJ-45 or 1G Fiber SFP	Auto or Forced	Auto / Half / Full	The end device must match the settings of the Switch Port: Auto to Auto, Full to Full. Mis-matching configuration, will cause devices to intermittently link at half duplex or not at all.
1/10 Gbps	RJ-45 or 1G/10G SFP+	Auto/1Gbps	Full	Even when the switch is set to Auto-negotiate, the transceiver on the switch port decides on the speed to use.

4 Authenticate

Symptom:
Can Link but cannot
Connect to a Network or Service

When a device connects to the network, the network may require it to Authenticate. This is done to help secure access to the infrastructure and 802.1x is the most common scheme used for network Authentication.

Service	What it does	What to check
DHCP	Offers IP, subnet mask, gateway IP, DNS server IP, optional servers to end device	No or wrong address offered, 2nd/rogue DHCP server response
VLAN	Route IP flow, preset on Switch	VLAN configuration

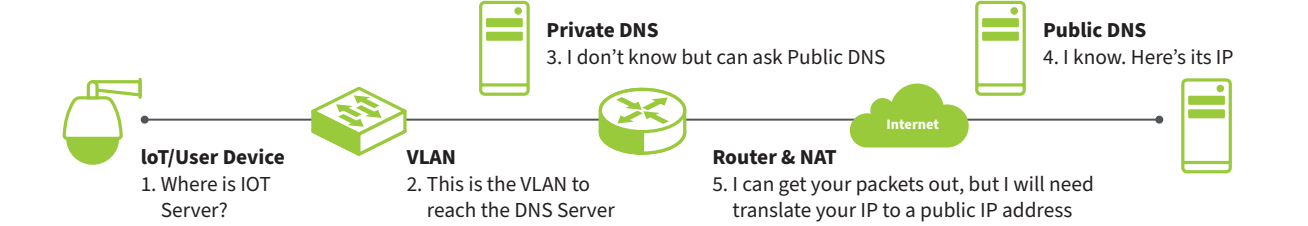


5 Route

Symptom:
Slow Speeds or Can't get to some
or all Services/Applications

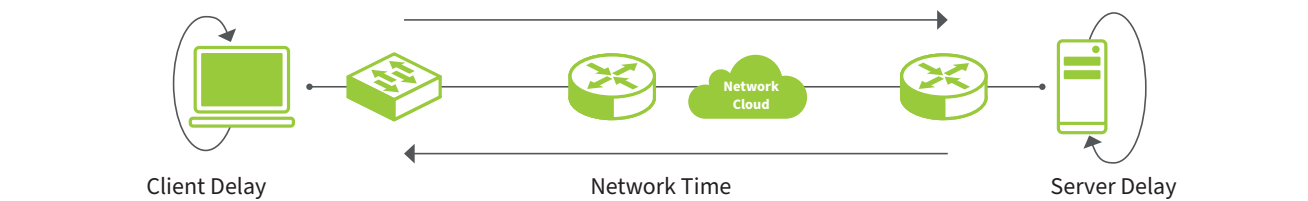
The route that an IP packet takes depends on VLAN topology and packet routing services such as DNS, Gateway, and NAT. Network protocols such as spanning trees facilitate the creation and maintenance of the routing topology.

Service	What it does	What to check
VLAN	Virtual Network that segments network traffic	Verify local IP/subnet provisioned by VLANs, and ping local and remote
DNS	Translate target name to IP address	Validate private DNS server configuration or default DNS server
Router	Forwards IP address between subnets	Verify local IP/subnet provisioned, and ping remote services.
NAT	Changes source IP and protocol port number from Private to Public	Verify connectivity to application servers through NAT. May require a packet capture on both sides of the NAT to troubleshoot.



User Experience = Client Delay + Network Time + Server Delay

Using a TCP connect test (SYN, SYN/ACK) is a good way to assess how much time application traffic spends on the network and validate that the network interface of an application server is responsive. NetAlly's Performance app (based on ITU Y1564) and iPerf tests can help you measure throughput, delay, jitter and packet loss on the network. The LANBERT™ test can be used to qualify the bandwidth capacity of your cabling.



6 Efficiency

Symptom:
Slow Speeds or Can't get to
a Service/Application

Network efficiency is determined by the time packets spend on the network, and how long it takes for them to arrive at their destination. Many modern applications require high throughput and low packet loss. Time sensitive applications, such as real-time voice and video calls require low latency and jitter.