

AC31008 - Networks and Data Communications

When a system is freshly reinitialised, there is no stored cache data in the remote router through which a ping request is issued. This leads to a major slow down by the router as it is required for it to issue an ARP broadcast, to obtain the MAC address of the device which the ping was directed to, during which the ping request is put on hold until the ARP broadcast is completed. This process usually takes too long to complete if the requested ping was put to a device multiple networks away causing it to time out and require multiple pings to establish a connection from one device to another. For example, in *'image1'* a ping is issued from the financial network to the 'Experimentation area'. The ping is registered in the simulation as an ICMP and then put on hold in the next step to configure a route which can be used to access to the router. After the ARP broadcast from the 'Admin' end device has allocated the router the path between the device and itself the ICMP protocol is released to allow the packet of Admin to be moved up to the 'IT Service' router. Following that we can see that the packet gets held in 'IT Service' router as a new ARP protocol begins to establish its path in between the IT router and 'Research Area'. The issue usually is here as already a lot of time has passed since the ping was issued and it causes it to time out. However, because the router was actively sending protocols in between devices a cache of paths is stored in the local router thus allowing the future pings which are going over the router to be more direct and not require a ARP broadcast to find the correct route.

Vis.	Time(sec)	Last Device	At Device	Type
0.000	--	Admin		ICMP
0.000	--	Admin		ARP
0.001		Admin	Switch3	ARP
0.002		Switch3	Financial	ARP
0.002		Switch3	LeaderSer...	ARP
0.002		Switch3	Accountant	ARP
0.003		Financial	Switch3	ARP
0.004		Switch3	Admin	ARP
0.004	--	Admin		ICMP
0.005		Admin	Switch3	ICMP
0.006		Switch3	Financial	ICMP
0.007		Financial	IT Service	ICMP
0.008		IT Service	Research ...	ICMP
0.008	--	Research ...		ARP
0.009		Research C...	Primary S...	ARP
0.010		Primary Swi...	Wireless ...	ARP
0.010		Primary Swi...	Secondar...	ARP
0.011		Wireless N...	Laptop1	ARP
0.011		Wireless N...	Laptop2	ARP
0.011		Secondary ...	Leader(PC1)	ARP
0.011		Secondary ...	Postdoc(...	ARP
0.011		Secondary ...	PC3	ARP
0.012		Leader(PC1)	Secondar...	ARP
0.013		Secondary ...	Primary S...	ARP
0.014		Primary Swi...	Research ...	ARP

Image 1

Vis.	Time(sec)	Last Device	At Device	Type
0.000	--	Admin		ICMP
0.001		Admin	Switch3	ICMP
0.002		Switch3	Financial	ICMP
0.003		Financial	IT Service	ICMP
0.004		IT Service	Research ...	ICMP
0.005		Research C...	Router3	ICMP
0.006		Router3	VisitorsWi...	ICMP
0.007		VisitorsWir...	Tablet PC3	ICMP
0.007		VisitorsWir...	Tablet PC2	ICMP
0.010	--	Tablet PC3		ICMP
0.011		Tablet PC3	VisitorsWi...	ICMP
0.012		VisitorsWir...	Router3	ICMP
0.013		Router3	Research ...	ICMP
0.014		Research C...	IT Service	ICMP
0.014	--	VisitorsWi...		ICMP
0.015		VisitorsWir...	Tablet PC3	ICMP
0.015		VisitorsWir...	Tablet PC2	ICMP
0.015		IT Service	Financial	ICMP
0.016		Financial	Switch3	ICMP
0.017		Switch3	Admin	ICMP

Image 2

An Example of that is *'image2'* where the network had already pinged twice prior to this and now the destination is easily accessible for the ping and goes smoothly moving the packet from device to device and leads to a successful ping from the 'Admin' device in Finances to 'Tablet3' in Experimentation Area.

From my simulation testing I also managed to gather a bit more information about the communication from network to network and the process it carries to deliver a successful ping from one end device to another. A key thing which I took a note of during my work with the simulation was that the system would not keep the caches provided by the ARP for the lifetime of the system, instead it looked like they would expire after an amount of time if the networks through which the package was tracked were used actively, leading to a similar process of a failing ping.