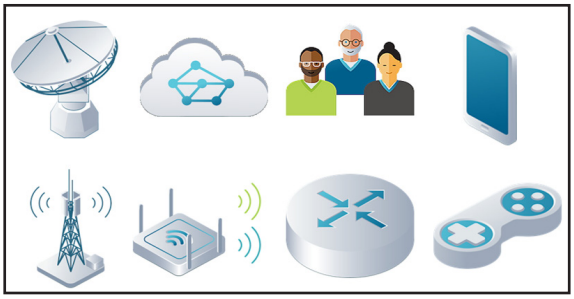
ITRINEGY NE-ONE ENTERPRISE
NETWORK OBJECTS EXPLAINED

INTRODUCTION

NE-ONE Enterprise provides a scalable architecture allowing customers to start small and scale-up their testing needs as usage expands. Every NE-ONE Enterprise system is provided with a number of Network Objects that allow the creation of one or multiple test networks. In some cases, it may be necessary to increase the number of Network Objects either at the time of purchase or later depending upon the complexity of your test networks and how many you need to run concurrently. The number of Network Objects is controlled through the license key. This document explains how to calculate the number of Network Objects and includes numerous examples.

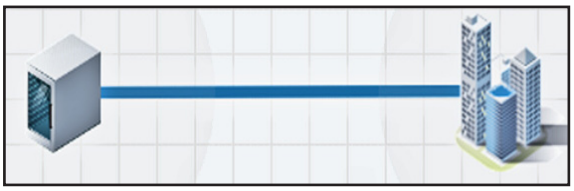
THE BASICS

A Network Object is a Node or Link which can have impairment (latency, loss, jitter, etc.) or routing properties defined. The Web GUI Designer, CLI/API and RESTful API can link these to form sophisticated test networks. The below table show the three types of Network Objects:



Type: Node
Value: 1 Network Object

Description: These are typically endpoint/routing objects. There are a wide range of images available to choose from to help give meaning to your network diagrams.



Type: Link
Value: 1 Network Object

Description: A link can be a half or full-duplex and is used to join together Nodes.

Cloud Object:
Value: Depends on configuration.
Please review 'Cloud Object' Section for information on its Network Object value. Cloud objects can handle advanced impairment capabilities, such as might occur in MPLS and Internet cores. Routing tables can be set up, and impairments added to each internal network link.

NOTE: While we do not enforce the use of this particular image to represent the Cloud Object iTrinegy strongly recommends that this image is only used for a Cloud Object. This is in order to maintain visual integrity within the GUI.

HOW MANY NETWORK OBJECTS ARE NEEDED FOR A TEST NETWORK?

To calculate the number of Network Objects required to emulate a particular network, depends on the network design. We recommend drawing out your network diagram, either as a sketch, or using the Web GUI Designer.

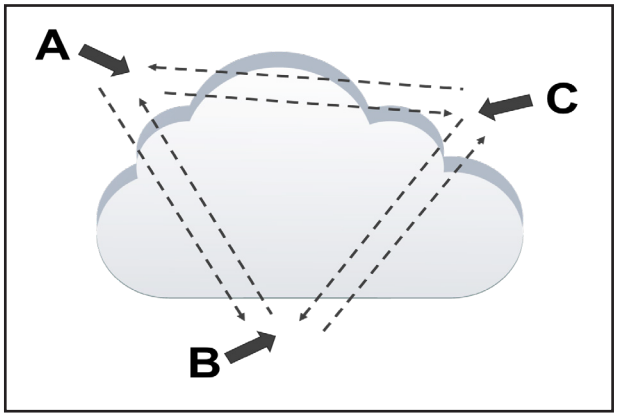
The general formula is:

Total Network Objects = (Number of Nodes) + (Number of Links)

Please see 'Formulas' Section for more information.

CLOUD NETWORKS

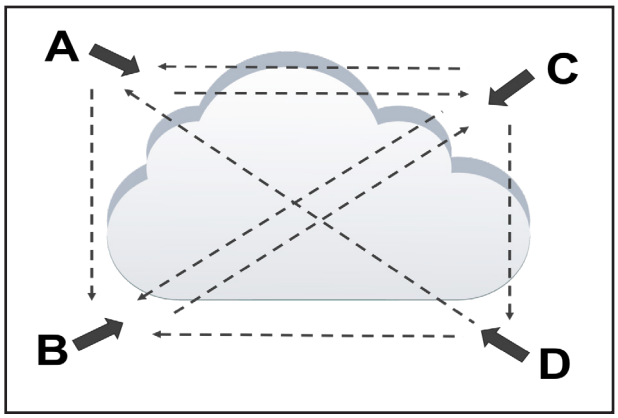
The Cloud Object can be used to simplify network diagrams. You can connect multiple links to a cloud, and then define the routing and impairments in separate tables. Hence, it is capable of producing both partially and fully-meshed networks. When defining the impairment table, you can set the link qualities for each internal link. For example, if you were inputting links A, B & C, you could set the conditions of A to B individually to A to C, or indeed B to A.



To calculate the Network Objects of a particular Cloud Object, you should consider the internal links.

If the Cloud is fully meshed (as shown above), for n inputs, there will be n(n-1) internal links. The value of each uni-directional link in the Cloud Object is 1/2 (half) of a Network Object.

If the cloud is only partially meshed, we strongly recommend drawing out a diagram (as shown top right).

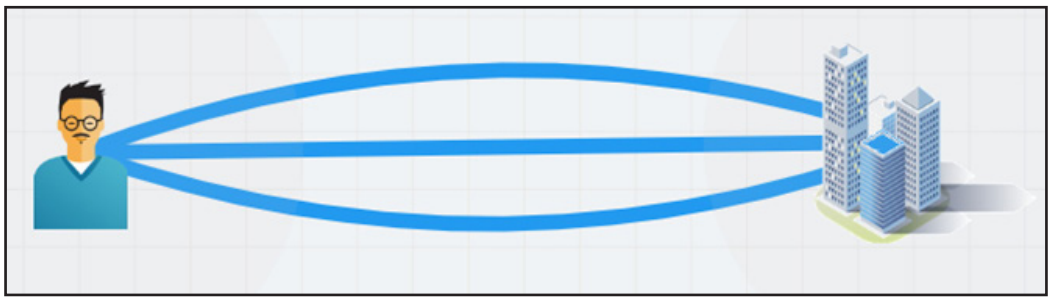


In this example, there are 4 links into the Cloud Object. However, there is only a partial mesh between the links, within the Cloud Object. By drawing out the diagram with uni-directional links, you can easily count how many internal links you need. The value of each uni-directional link in the Cloud Object is 1/2 (half) of a Network Object.

Cloud Object	1
Link AC	1/2
Link AB	1/2
Link BC	1/2
Link CA	1/2
Link CB	1/2
Link CD	1/2
Link DA	1/2
Link DB	1/2
Total	**4 Network Objects**

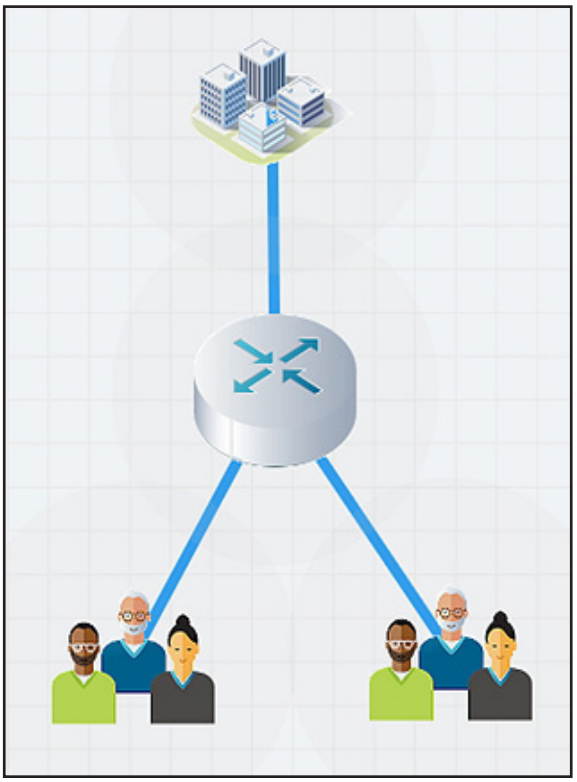
WORKED EXAMPLES

A.) Point to Point (3 Links)



Type	Value	Quantity	Subtotal
Nodes (1 x Person & 1 x Building)	1	2	2
Links	1	3	3
Total			**5 Network Objects**

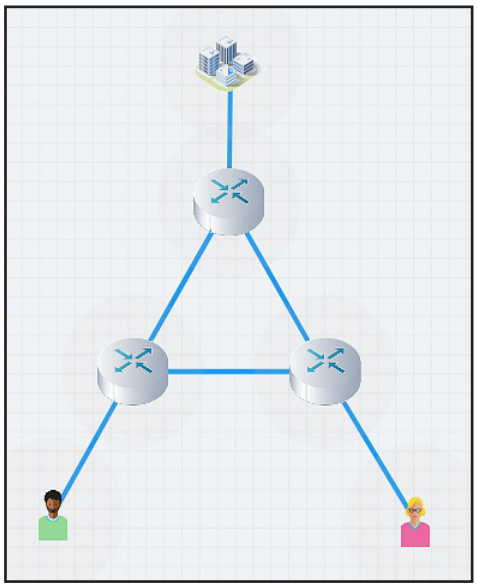
B.) Hub and Spoke



Type	Value	Quantity	Subtotal
Nodes (2 x People, 1 x Router & 1 x Building)	1	4	4
Links	1	3	3
Total			**7 Network Objects**

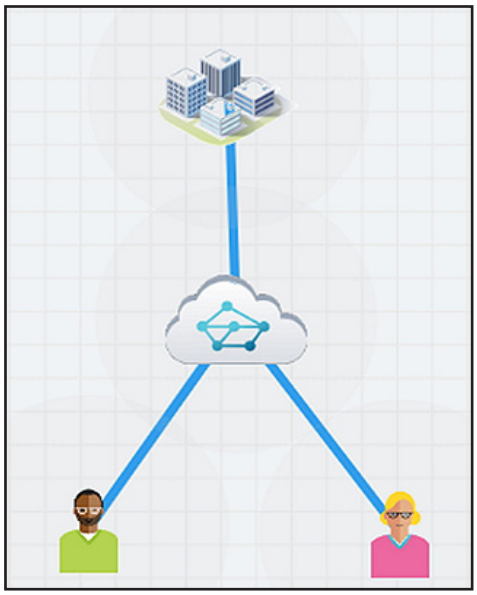
WORKED EXAMPLES

C.) MPLS Core (3 Cores)



Type	Value	Quantity	Subtotal
Nodes (2 x People, 3 x Router & 1 x Building)	1	6	6
Links	1	6	6
Total			**12 Network Objects**

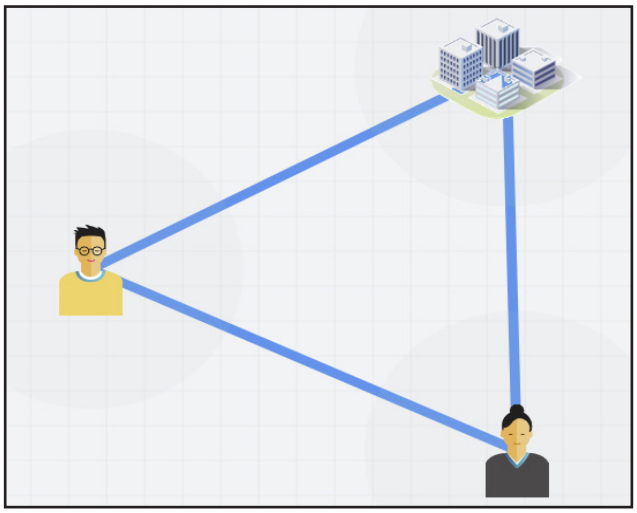
D.) MPLS Core (3 Cores) With Cloud Object Fully Meshed



Type	Value	Quantity	Subtotal
Nodes (2 x People, 1 x Building & 1 Cloud)	1	4	4
Links	1	3	3
Cloud Internal Links	1/2	6	3
Total			**10 Network Objects**

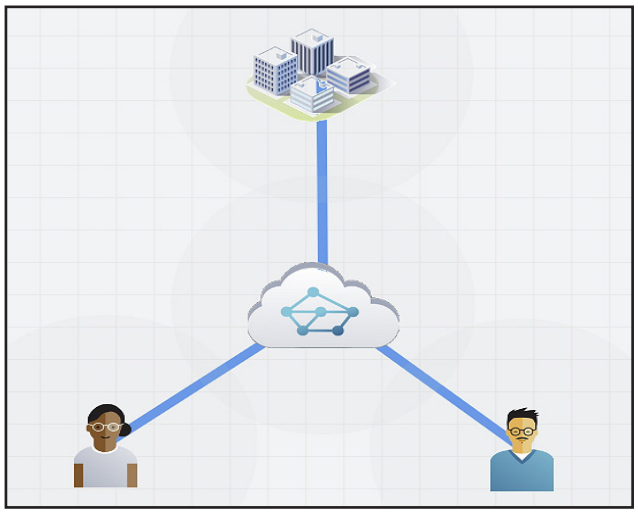
WORKED EXAMPLES

E.) Fully Meshed (3 Point)



Type	Value	Quantity	Subtotal
Nodes (2 x People & 1 x Building)	1	3	3
Links	1	3	3
Total			**6 Network Objects**

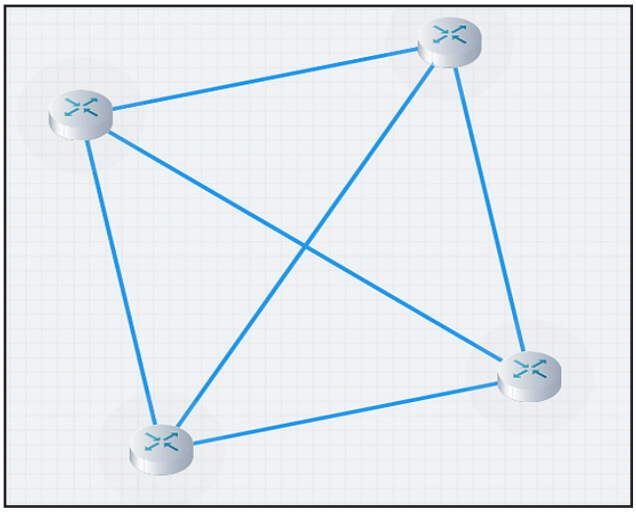
F.) 3 Nodes with Cloud Object



Type	Value	Quantity	Subtotal
Nodes (2 x People, 1 x Building & 1 x Cloud)	1	4	4
Links	1	3	3
Cloud Internal Links	1/2	6	3
Total			**10 Network Objects**

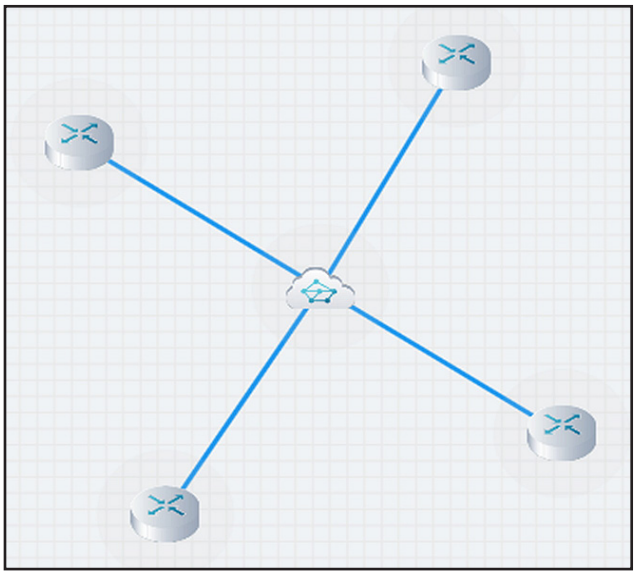
WORKED EXAMPLES

G.) 4 Nodes



Type	Value	Quantity	Subtotal
Nodes (4 x Routers)	1	4	4
Links	1	6	6
Total			**10 Network Objects**

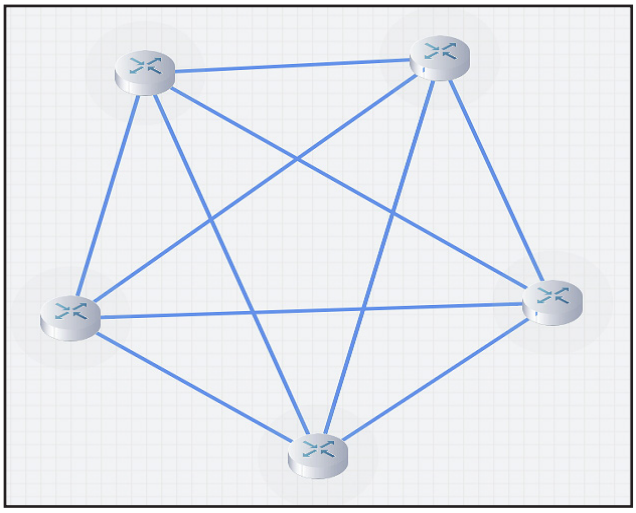
H.) 4 Nodes with Cloud Object



Type	Value	Quantity	Subtotal
Nodes (4 x Routers & 1 x Cloud)	1	5	5
Links	1	4	4
Cloud Internal Links (n x (n-1))	1/2	12	6
Total			**15 Network Objects**

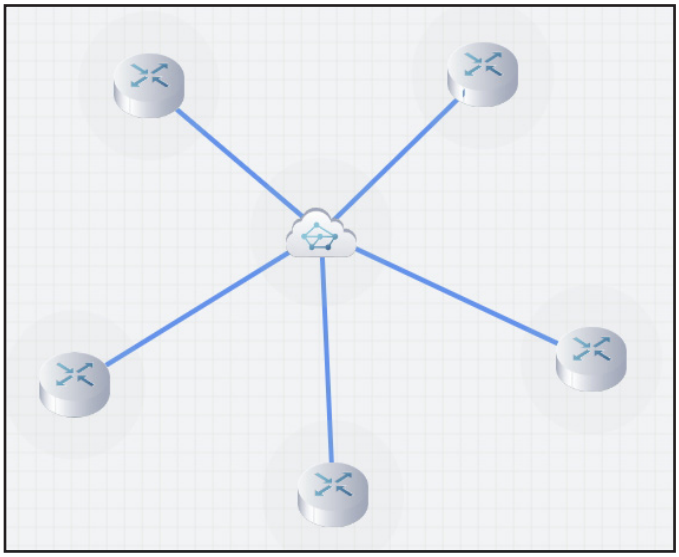
WORKED EXAMPLES

I.) 5 Nodes



Type	Value	Quantity	Subtotal
Nodes (5 x Routers)	1	5	5
Links	1	10	10
Total			**15 Network Objects**

J.) 5 Nodes with Cloud Object



Type	Value	Quantity	Subtotal
Nodes (5 x Routers & 1 x Cloud)	1	6	6
Links	1	5	5
Cloud Internal Links (n x (n-1))	1/2	20	10
Total			**21 Network Objects**

Obviously using a Cloud Object, is not always going to be the best option, and may not always reduce the number of Network Objects. However, for more complex networks, it can reduce the complexity of your networks whilst providing sophisticated control over the conditions of its internal links.

FORMULAS

Where:

n = Number of Nodes

y = Number of Links

c = Number of Internal Cloud Links = (Number of Links in) x ((Number of Links in)-1)

General Networks:

Total Network Objects = n + y + (Round (c/2) to nearest 1)

Fully Meshed Networks Without Cloud Object:

Total Network Objects = n +(n(n-1)/2)

Fully Meshed Networks With Cloud Object:

Total Network Objects = 2n + n(n-1)/2 +1

If you are unsure as to how many Network Objects you need, please contact an iTrinegy Representative.