CEMC606: Industrial Networks

Lecture 3: Ethernet Networks –Bus Connection

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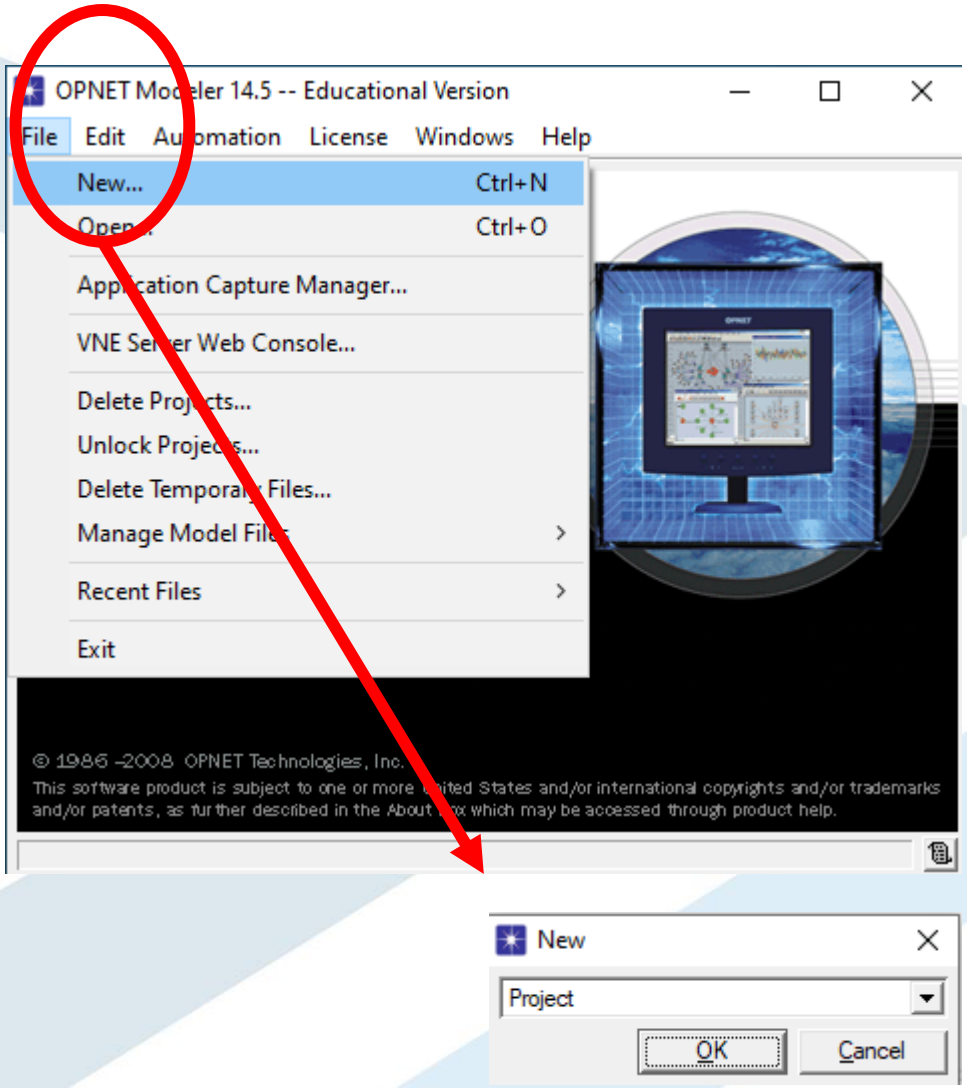
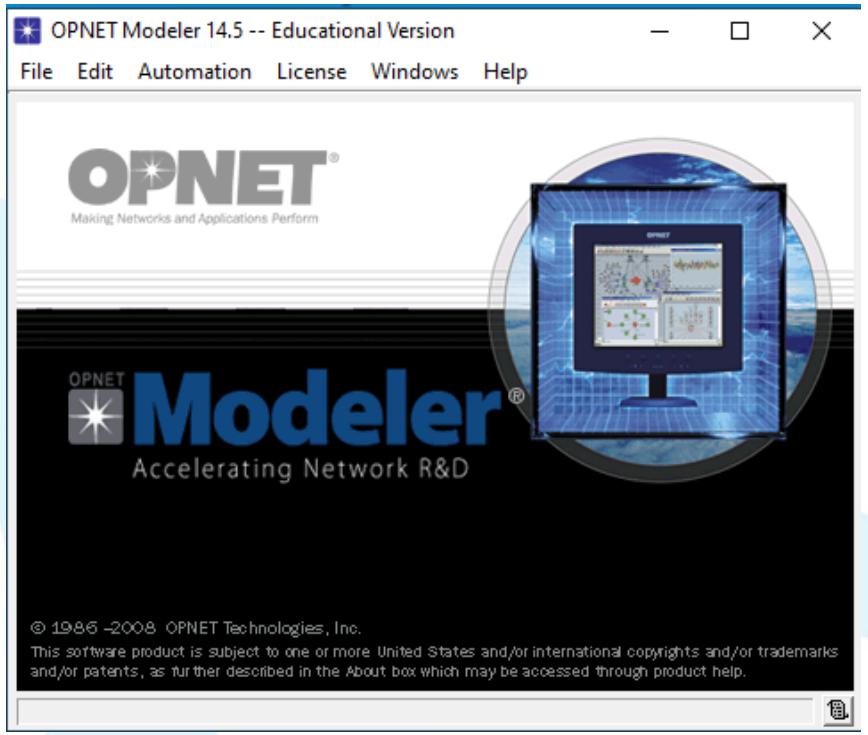
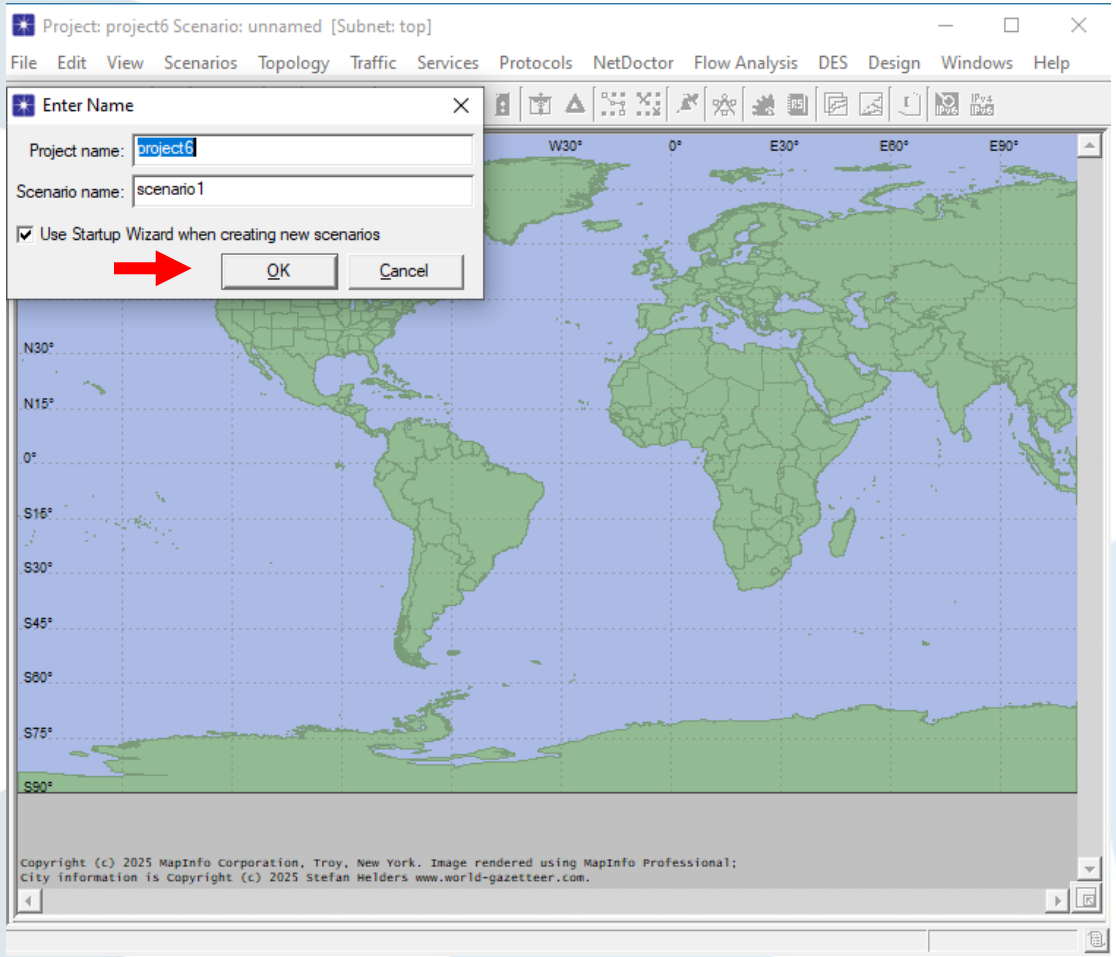
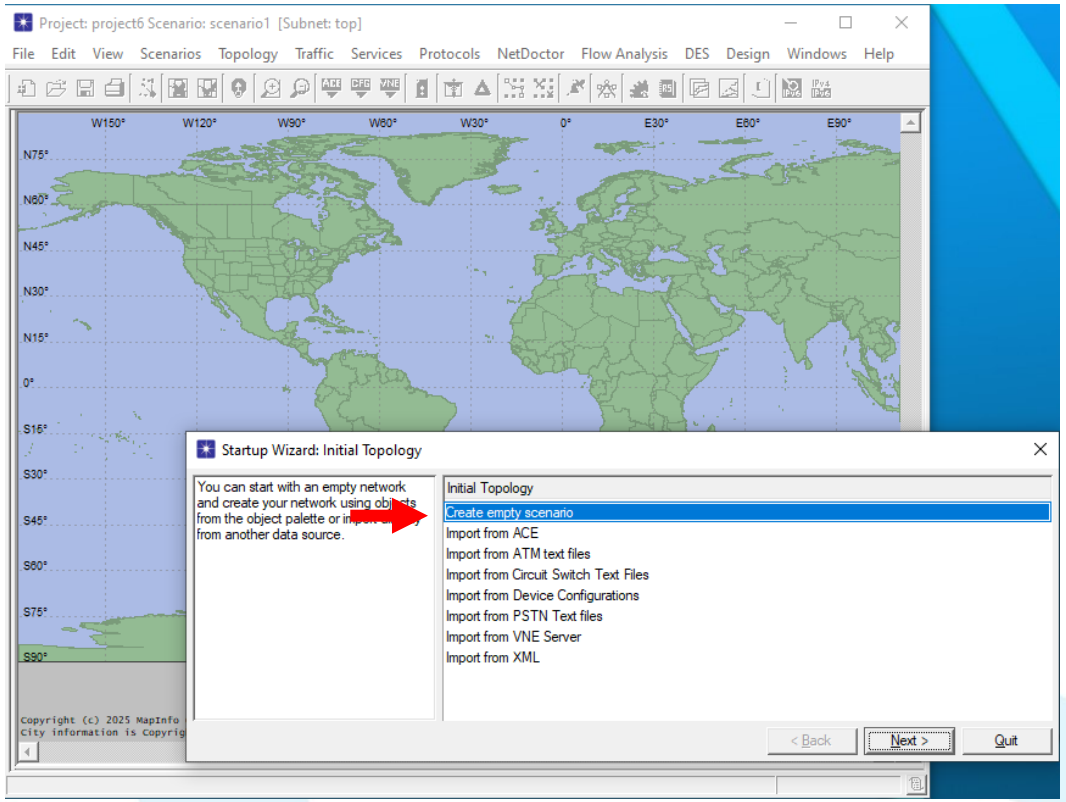
بداية نبدأ بفتح واجهة البرنامج الأساسية لإنشاء ملف جديد فتكون كما يلي

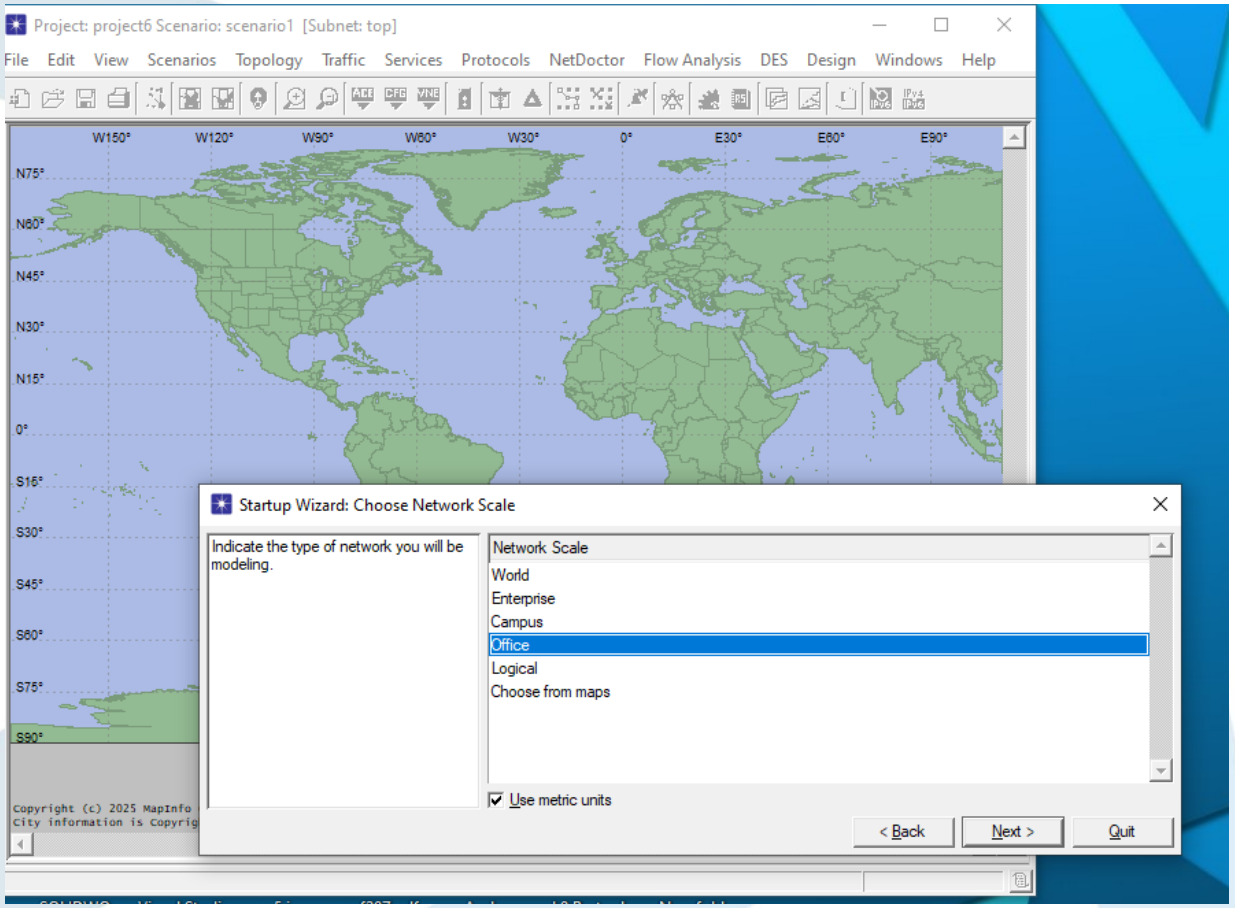




نقوم بإنشاء مشروع جديد ثم نختار إنشاء سيناريو فارغ لتوصيف مسألة العمل بداخلها





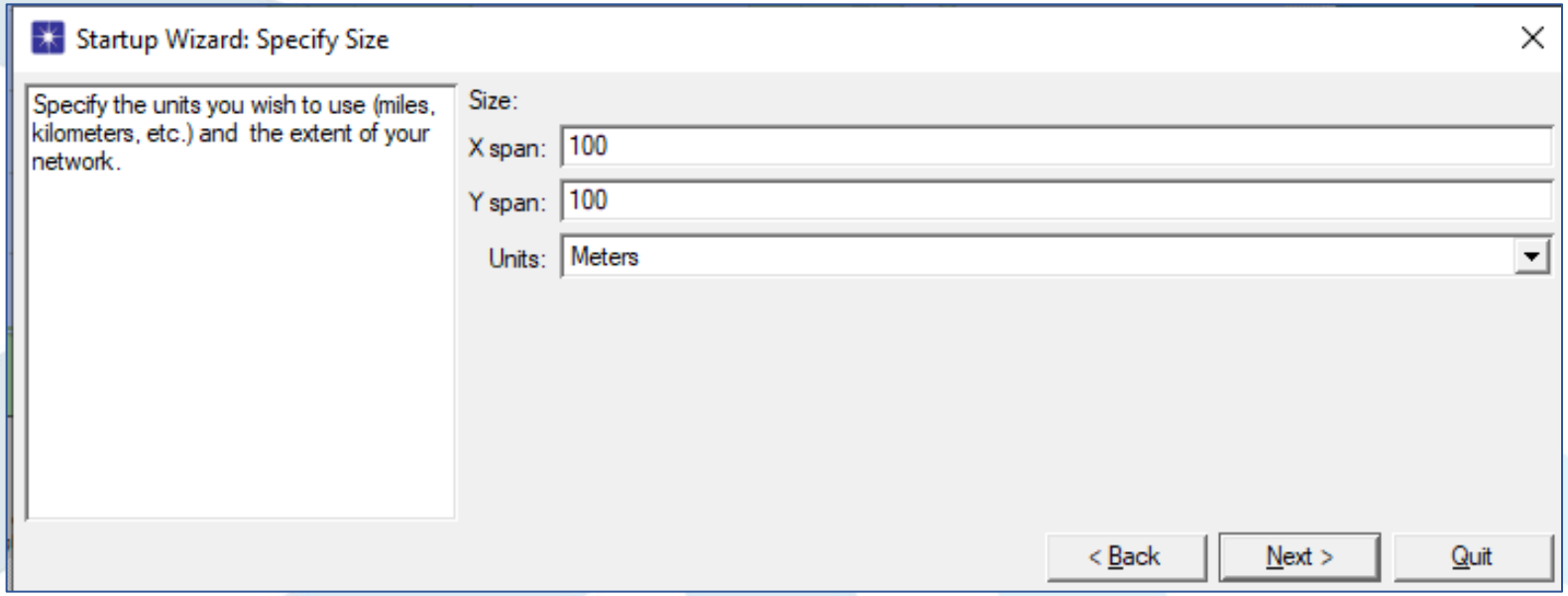


بعدها نختار حجم المكان الذي تمتد عليه الشبكة وفي حالتنا سنعمل على مساحة مكتب

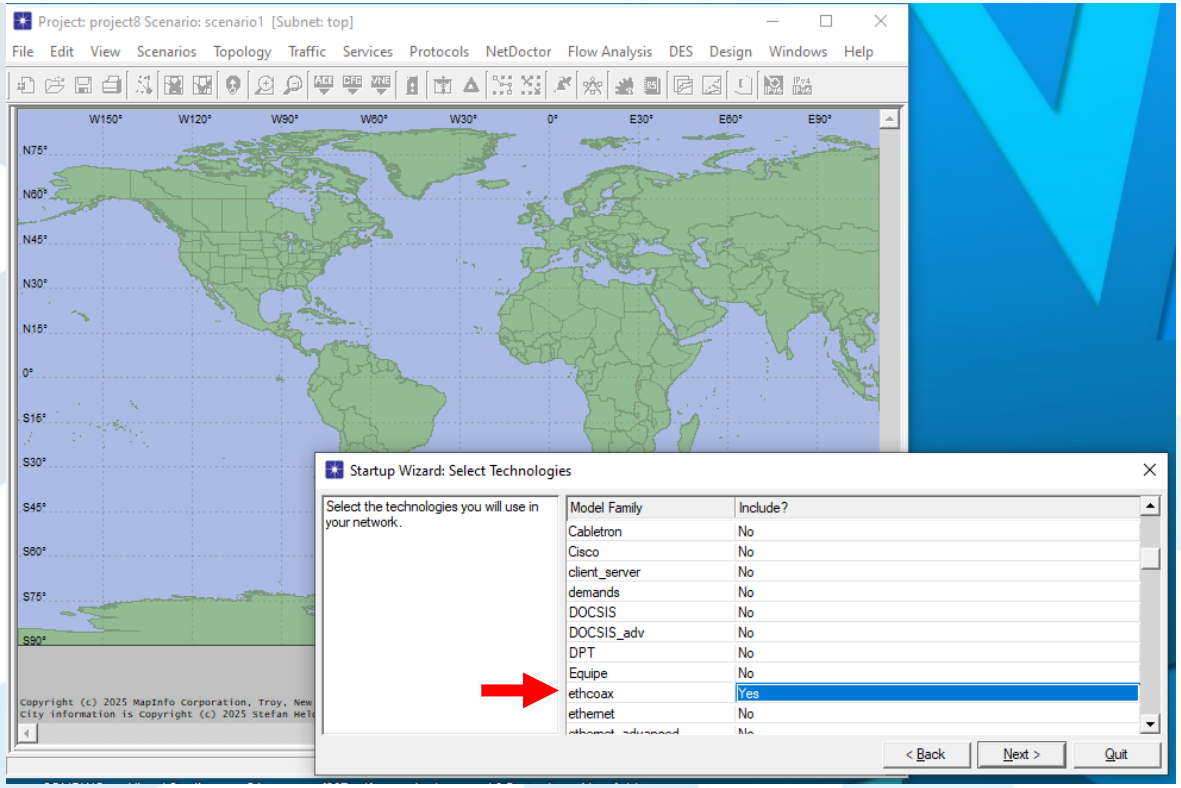
تمرين

قم بإنشاء شبكة مكتبية تمتد على مساحة جغرافية 100 متر على المحور x و 100 مترعلى المحور y بحيث تتكون الشبكة من 20 حواسيب و موصولين بطريقة Bus مع الأخذ بعين الاعتبار التوصيلات بين الأجهزة بافتراض أن الكابلات من نوع كابلات محورية.

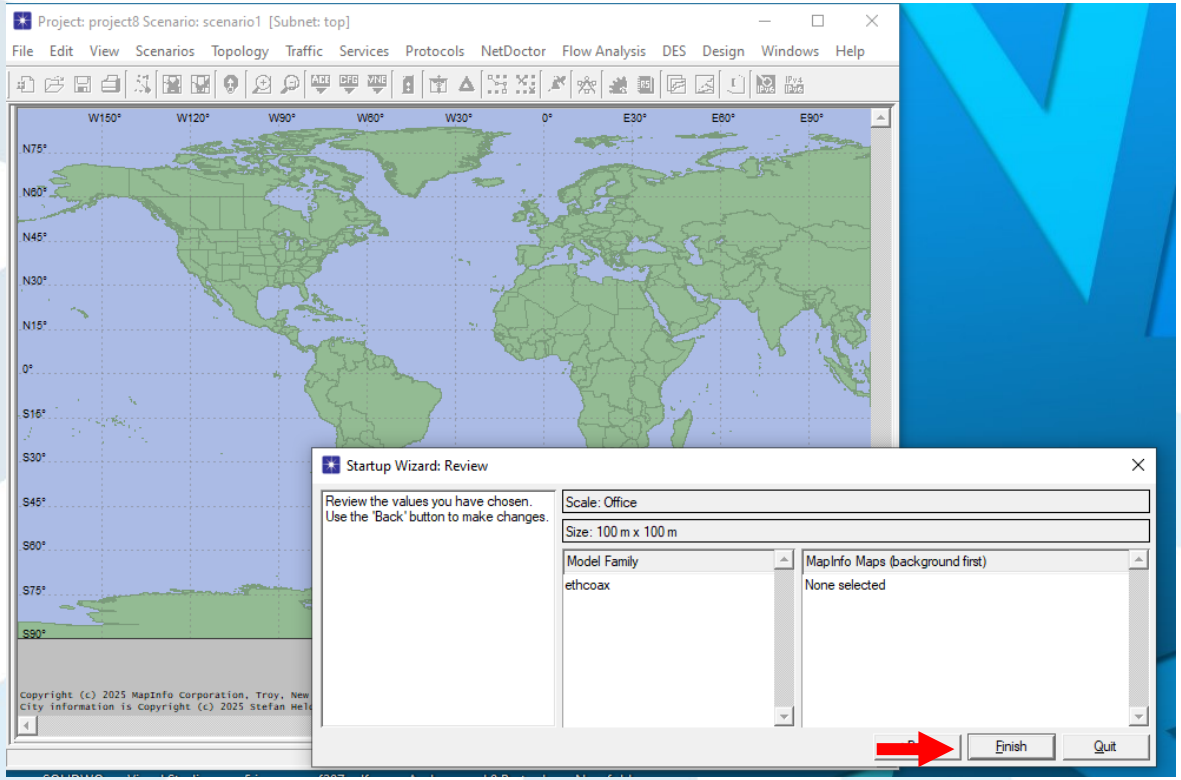
المساحة التي تتوزع عليها شبكة المكتب



اختيار تكنولوجيا النقل Ethcoax

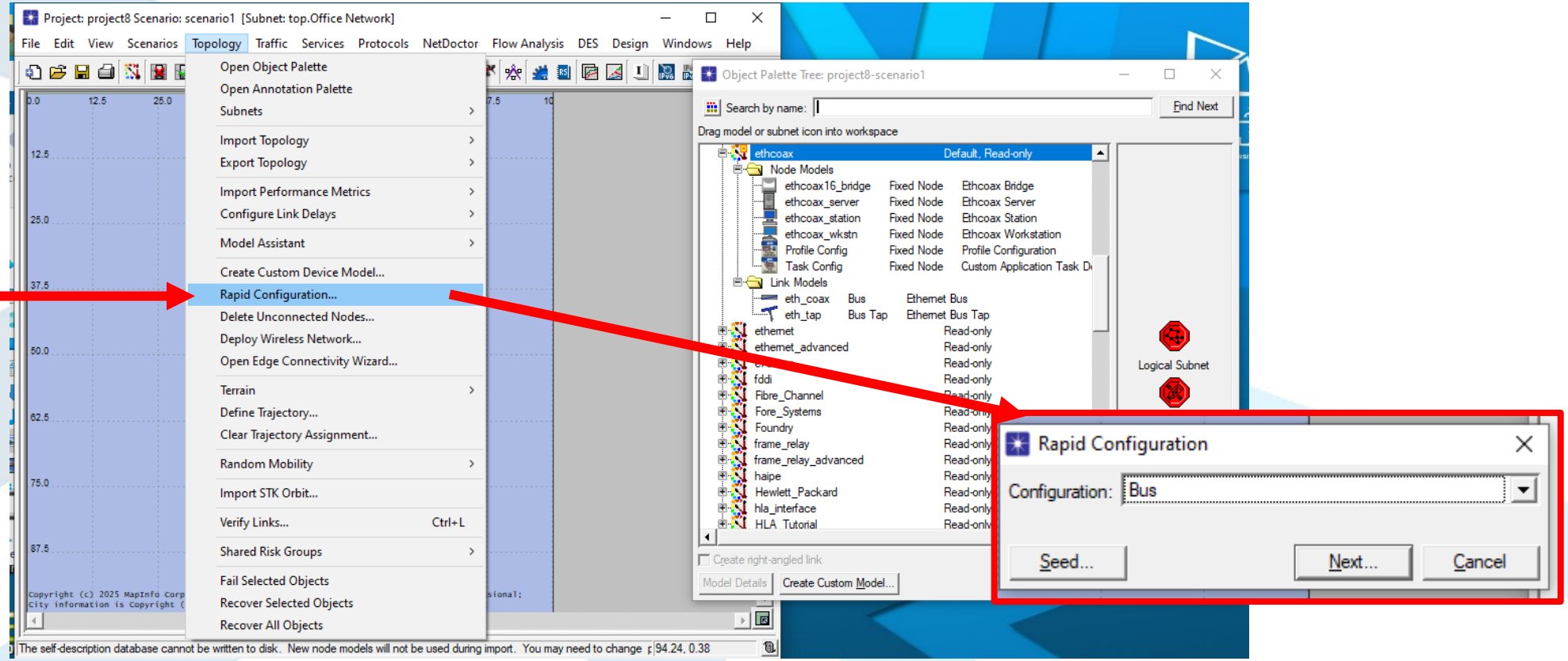


إنـهاء إعداد بيانـات الشبكة الأساسية



مساحة العمل الأساسية لبدء تصميم الشبكة مع شجرة العناصر

لإنشاء الشبكة بشكل سريع



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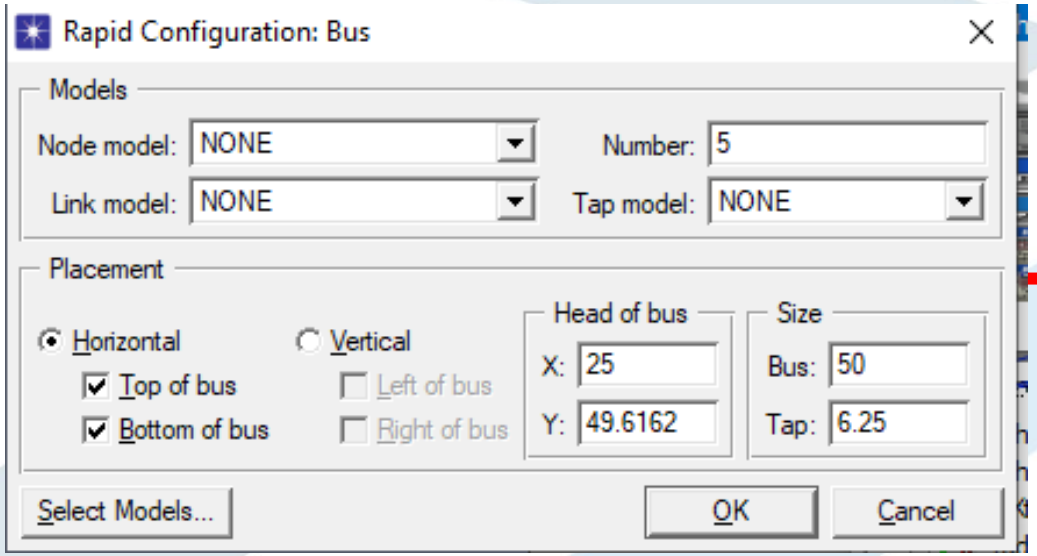
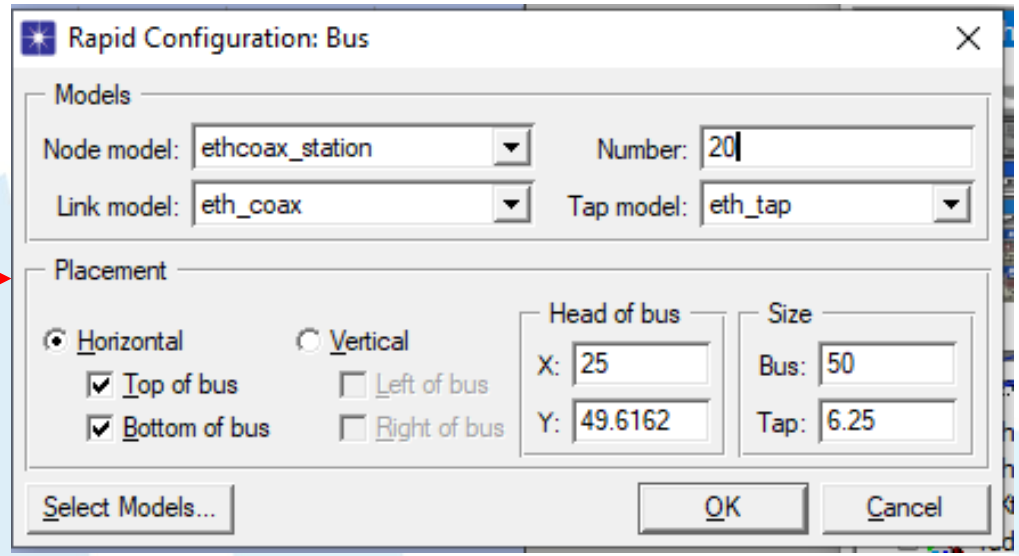
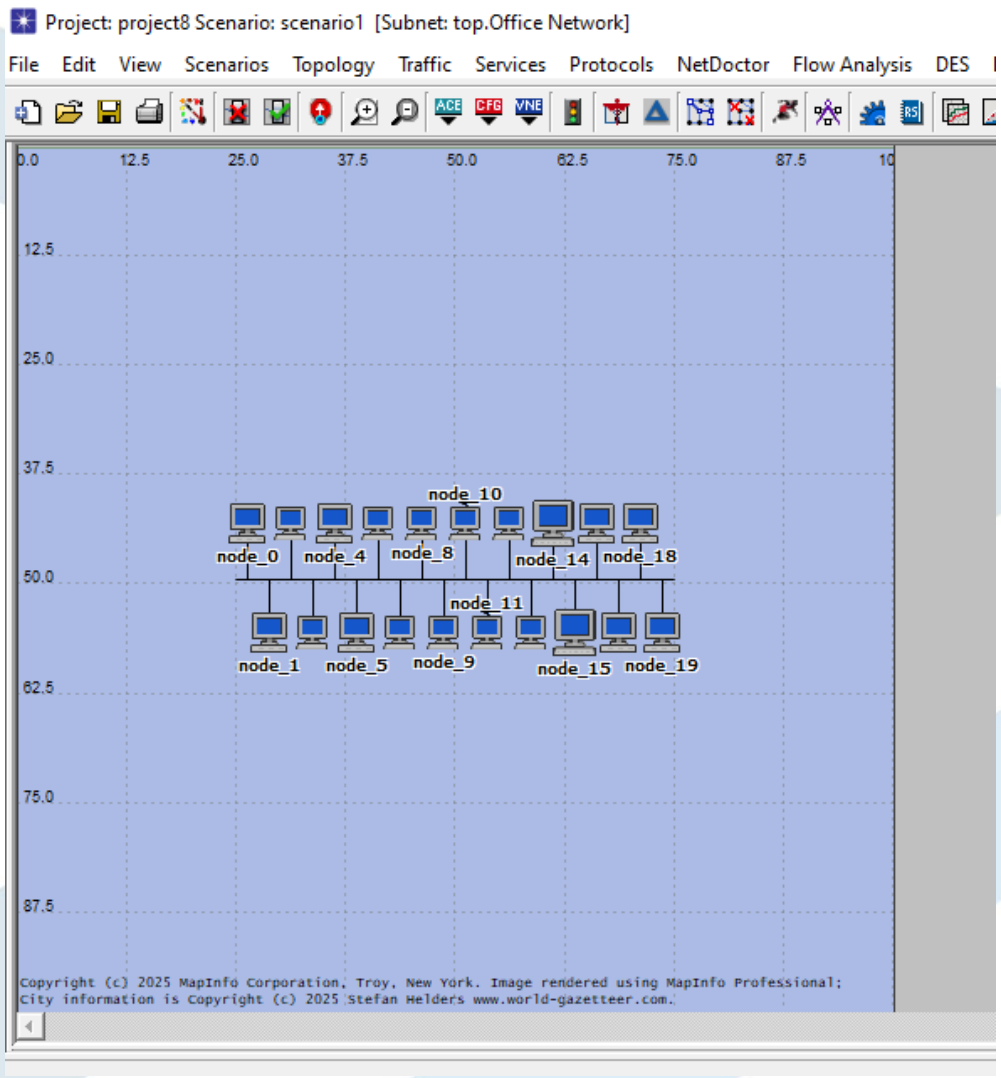
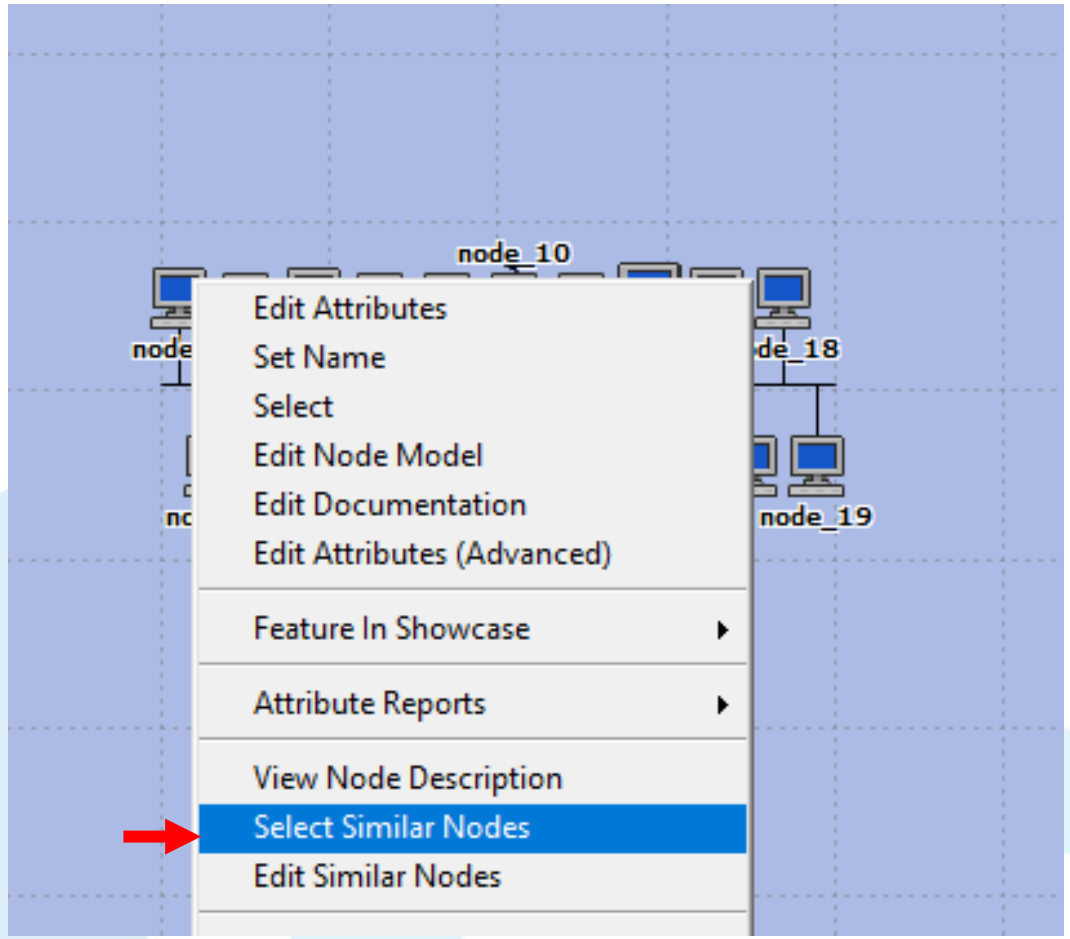
نضع معرفات الشبكة وتجهيزاتها المرغوبة هنا

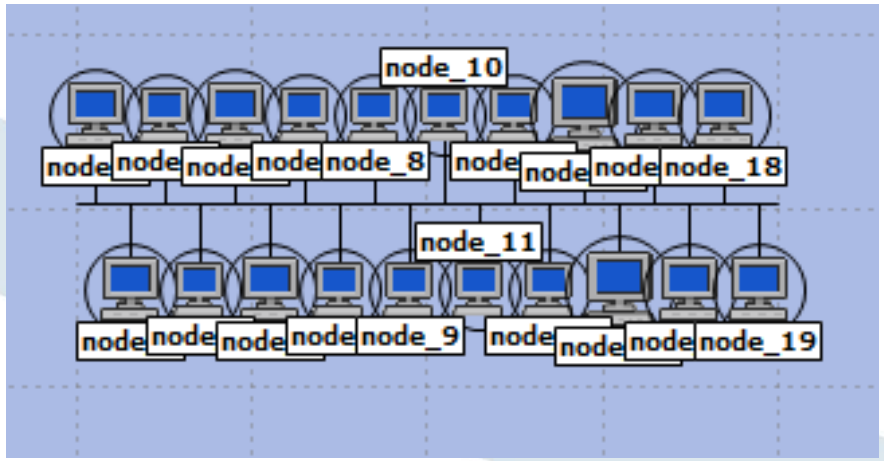


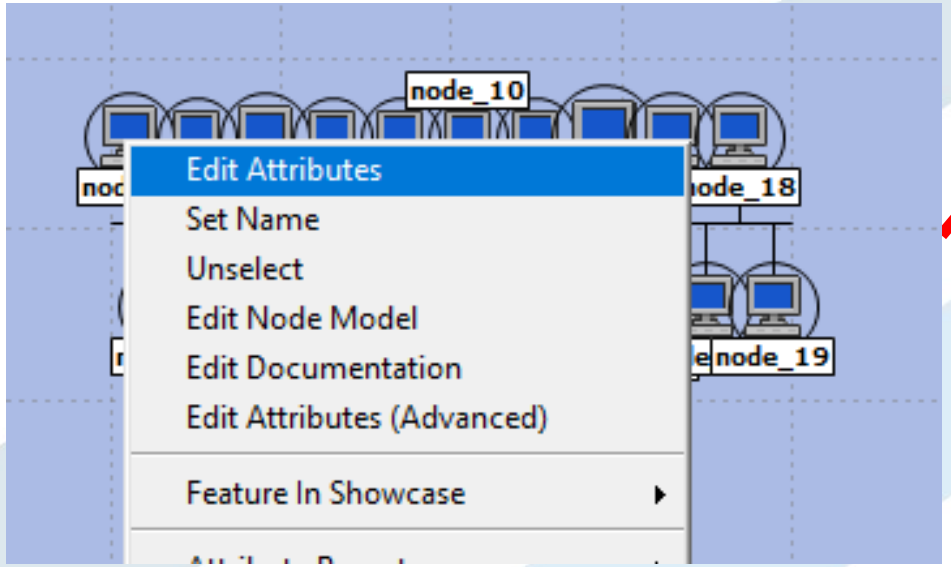


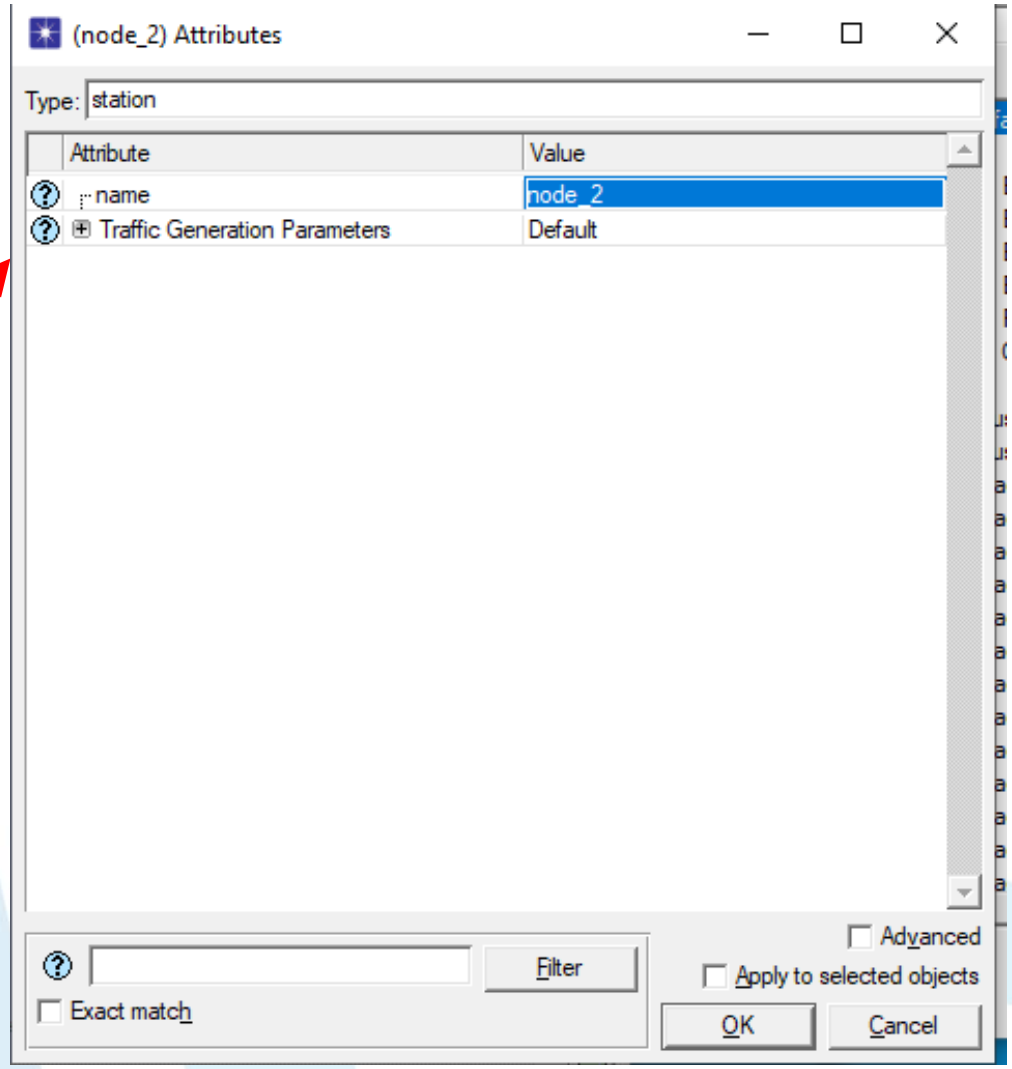
لاختيار الطرفيات المتماثلة

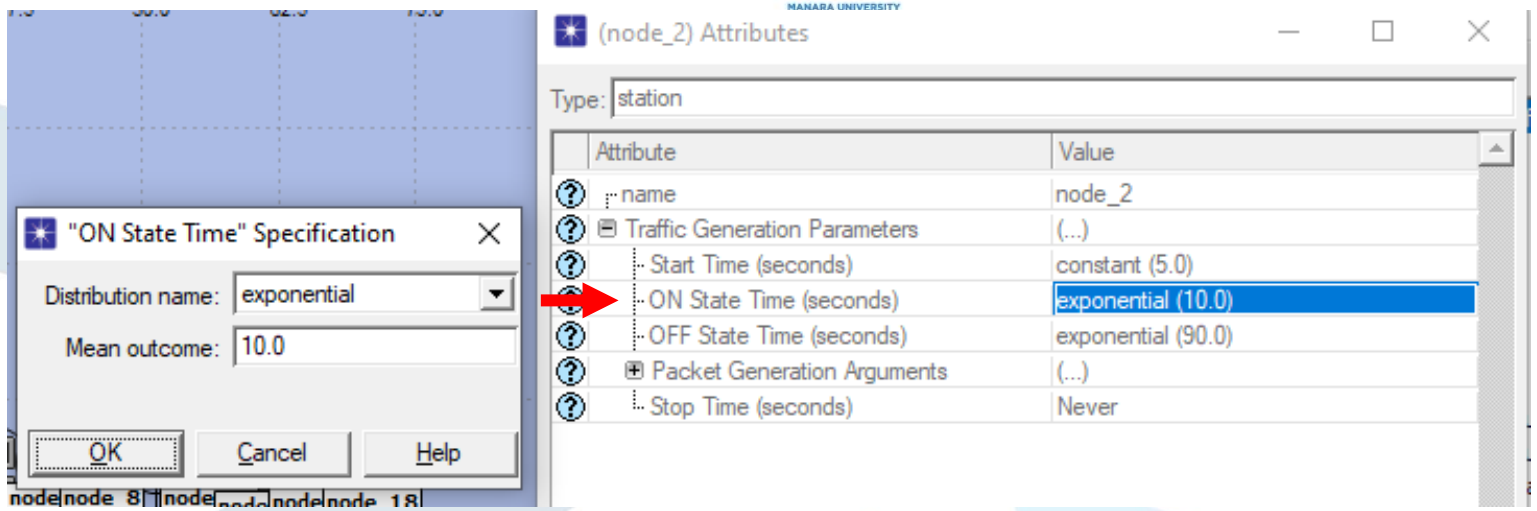


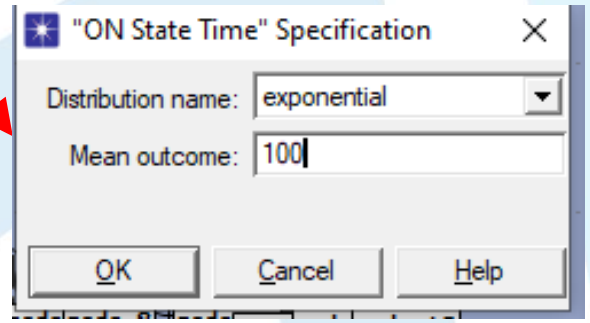


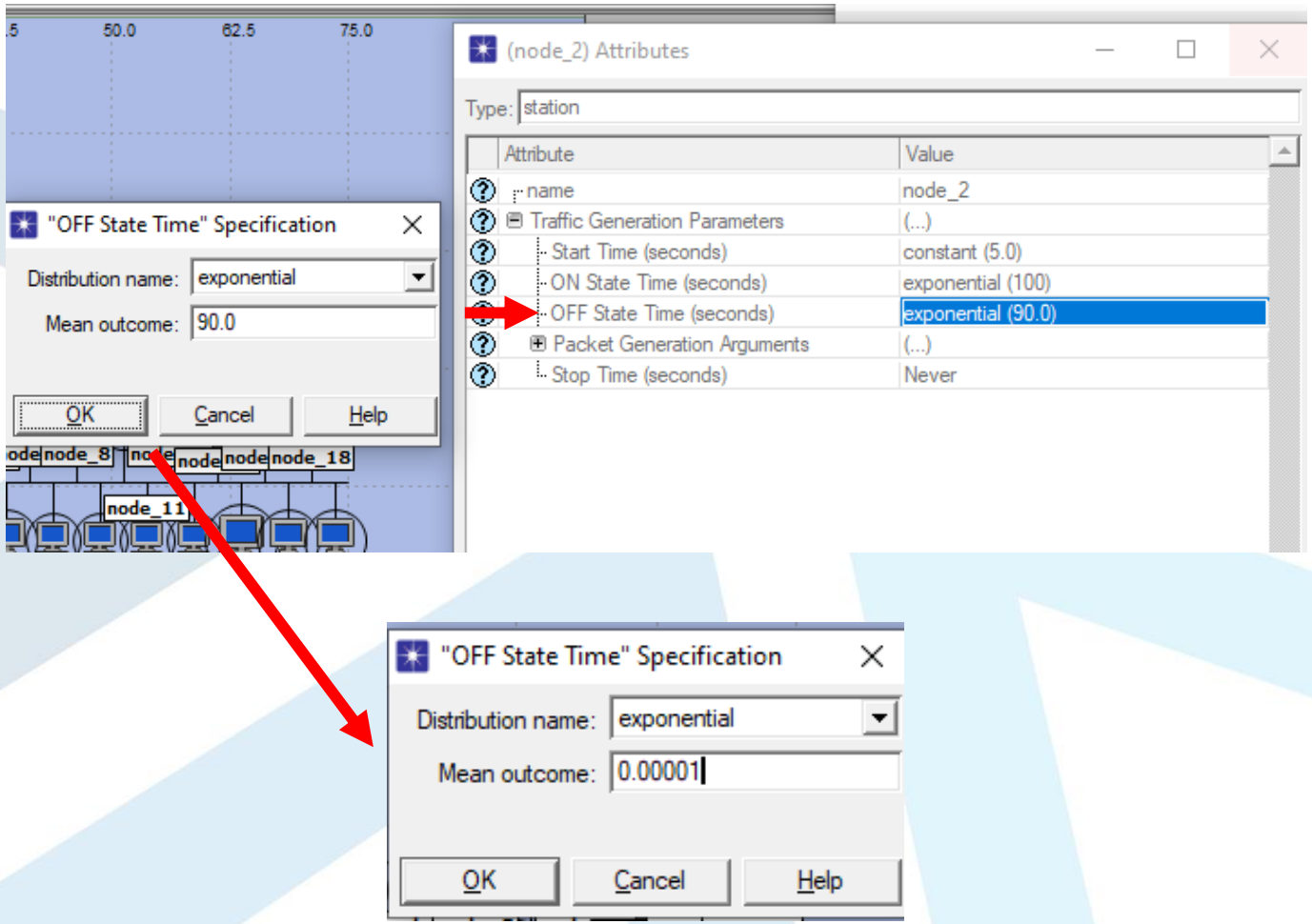

node_10
node
node
node
node
node_8
node
node
node
node_18
node_11
node
node
node
node
node_9
node
node
node
node_19

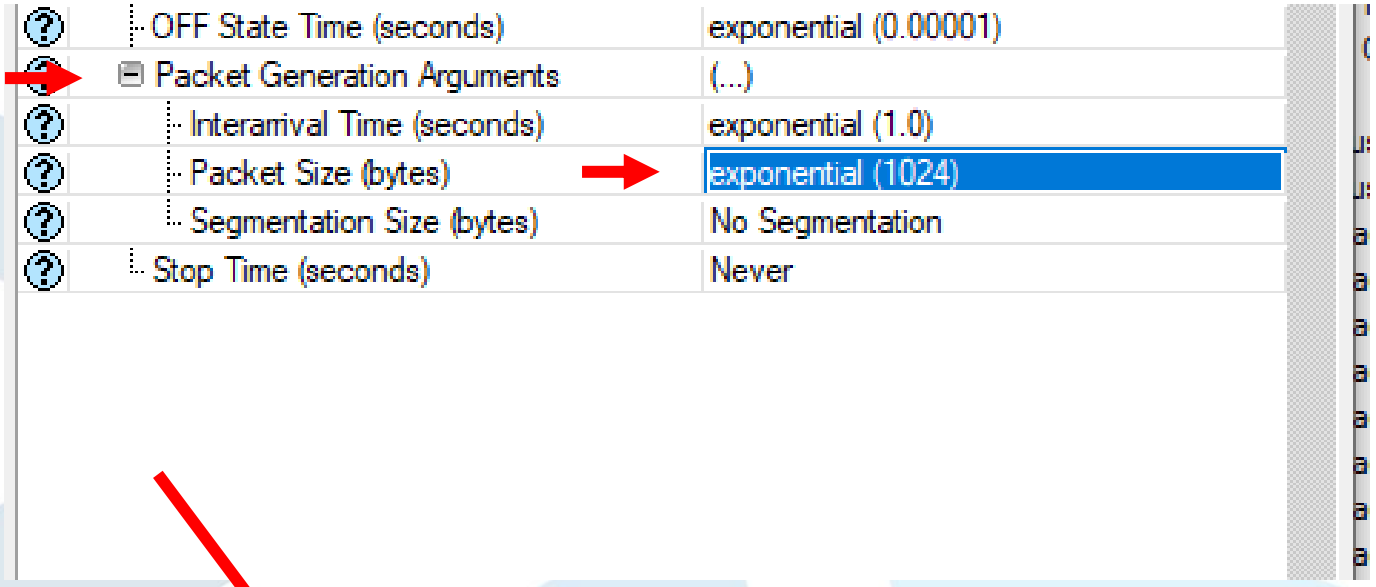

node_10
Edit Attributes
Set Name
Unselect
Edit Node Model
Edit Documentation
Edit Attributes (Advanced)
Feature In Showcase
node_18
node_19

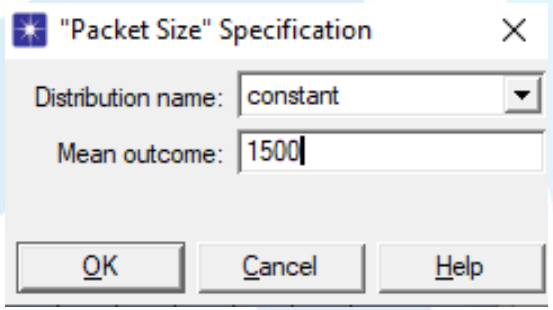

(node_2) Attributes
Type: station
Attribute
Value
name
node_2
Traffic Generation Parameters
Default
Filter
Exact match
Advanced
Apply to selected objects
OK
Cancel


"ON State Time" Specification
Distribution name: exponential
Mean outcome: 10.0
OK
Cancel
Help
(node_2) Attributes
Type: station
Attribute
Value
name
node_2
Traffic Generation Parameters
(...)
Start Time (seconds)
constant (5.0)
ON State Time (seconds)
exponential (10.0)
OFF State Time (seconds)
exponential (90.0)
Packet Generation Arguments
(...)
Stop Time (seconds)
Never

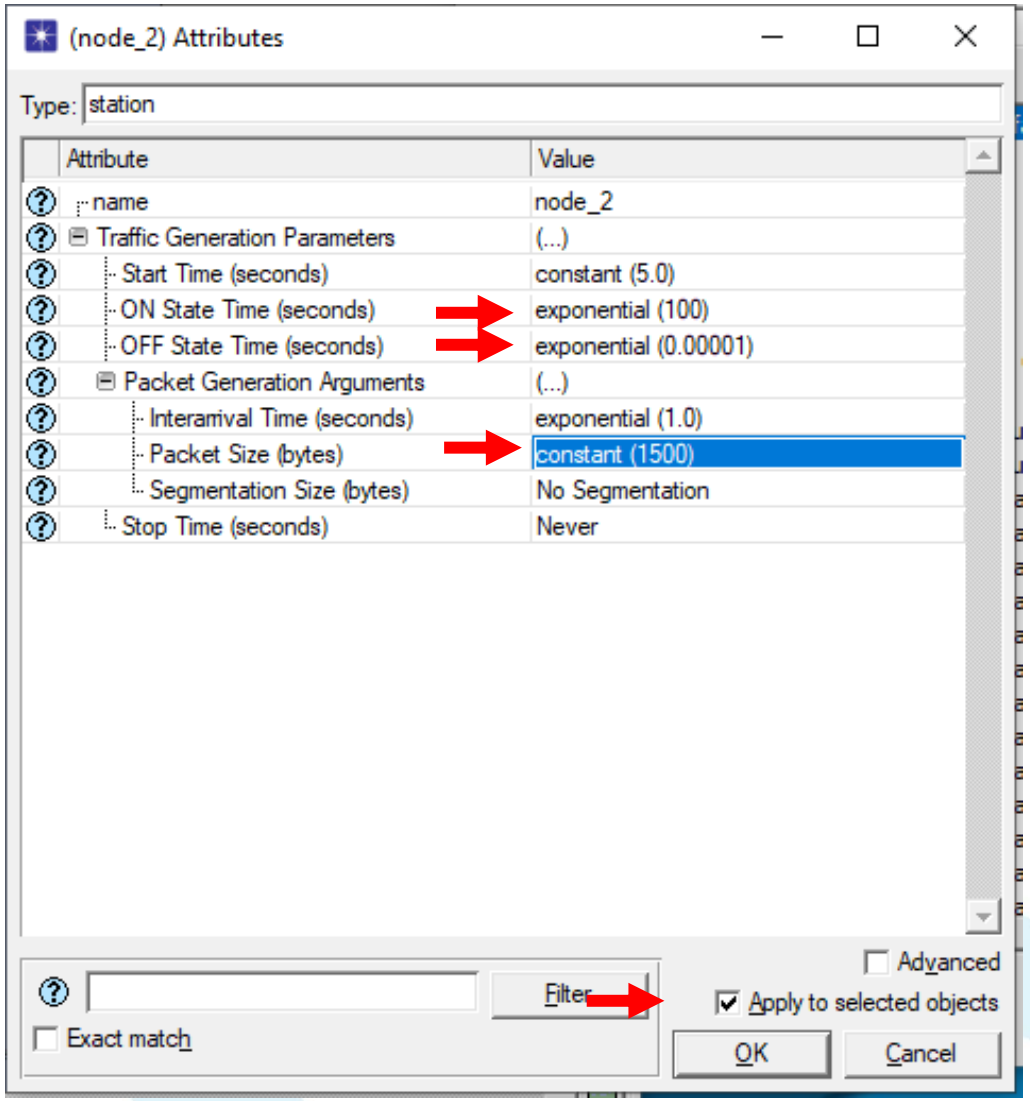

"ON State Time" Specification
Distribution name: exponential
Mean outcome: 100
OK
Cancel
Help


50.0
62.5
75.0
(node_2) Attributes
Type: station
Attribute
Value
name
node_2
Traffic Generation Parameters
(...)
Start Time (seconds)
constant (5.0)
ON State Time (seconds)
exponential (100)
OFF State Time (seconds)
exponential (90.0)
Packet Generation Arguments
(...)
Stop Time (seconds)
Never
"OFF State Time" Specification
Distribution name:
exponential
Mean outcome:
90.0
OK
Cancel
Help
node_8
node_18
node_11
"OFF State Time" Specification
Distribution name:
exponential
Mean outcome:
0.00001
OK
Cancel
Help


OFF State Time (seconds)
exponential (0.00001)
Packet Generation Arguments
(...)
Interarrival Time (seconds)
exponential (1.0)
Packet Size (bytes)
exponential (1024)
Segmentation Size (bytes)
No Segmentation
Stop Time (seconds)
Never

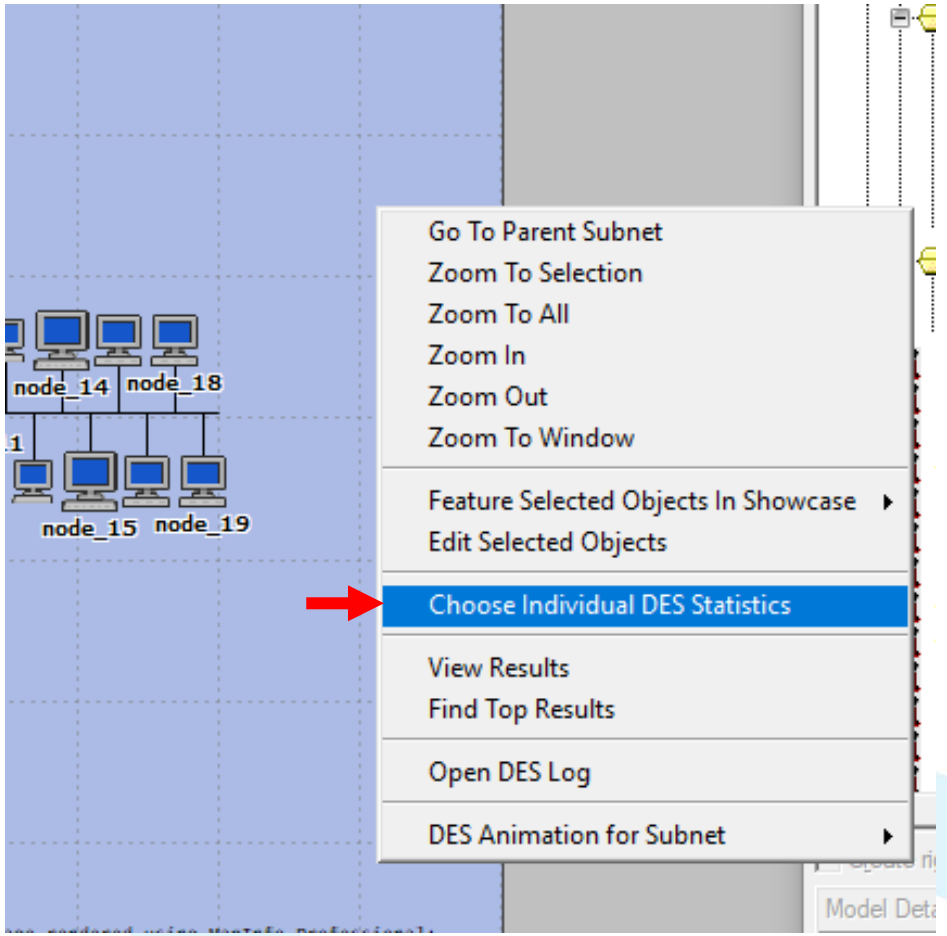

"Packet Size" Specification
Distribution name:
constant
Mean outcome:
1500
OK
Cancel
Help

نتأكد من تطبيق كافة التعديلات على كل أجهزة الشبكة

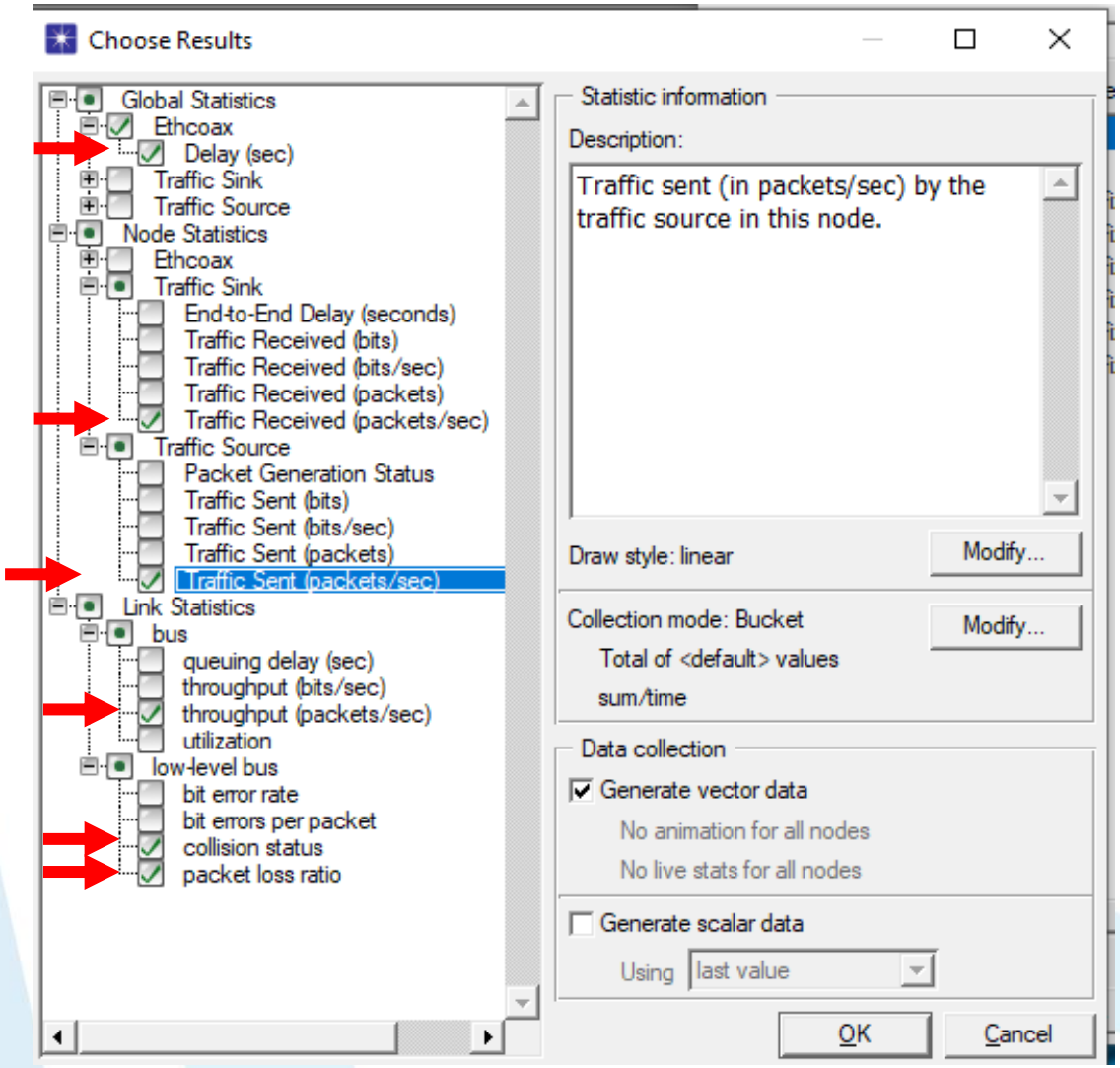


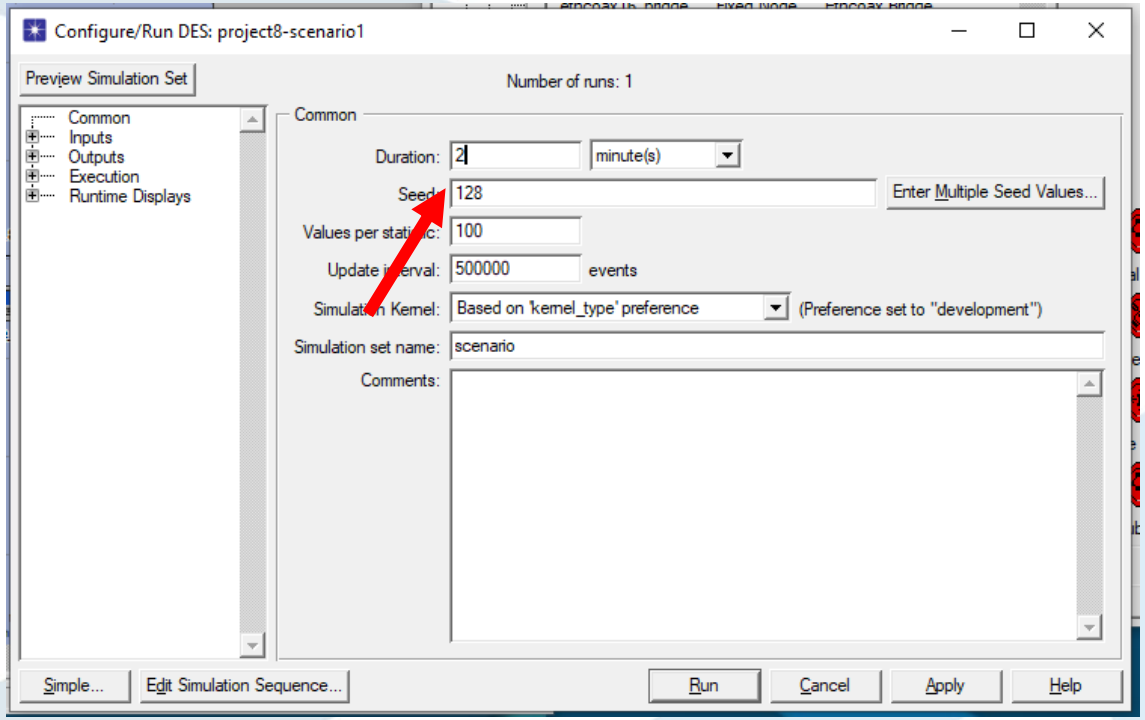
لتحليل أداء الشبكة ننقر بزر الفأرة اليميني على أي مكان ضمن سطح العمل الأزرق ونختار

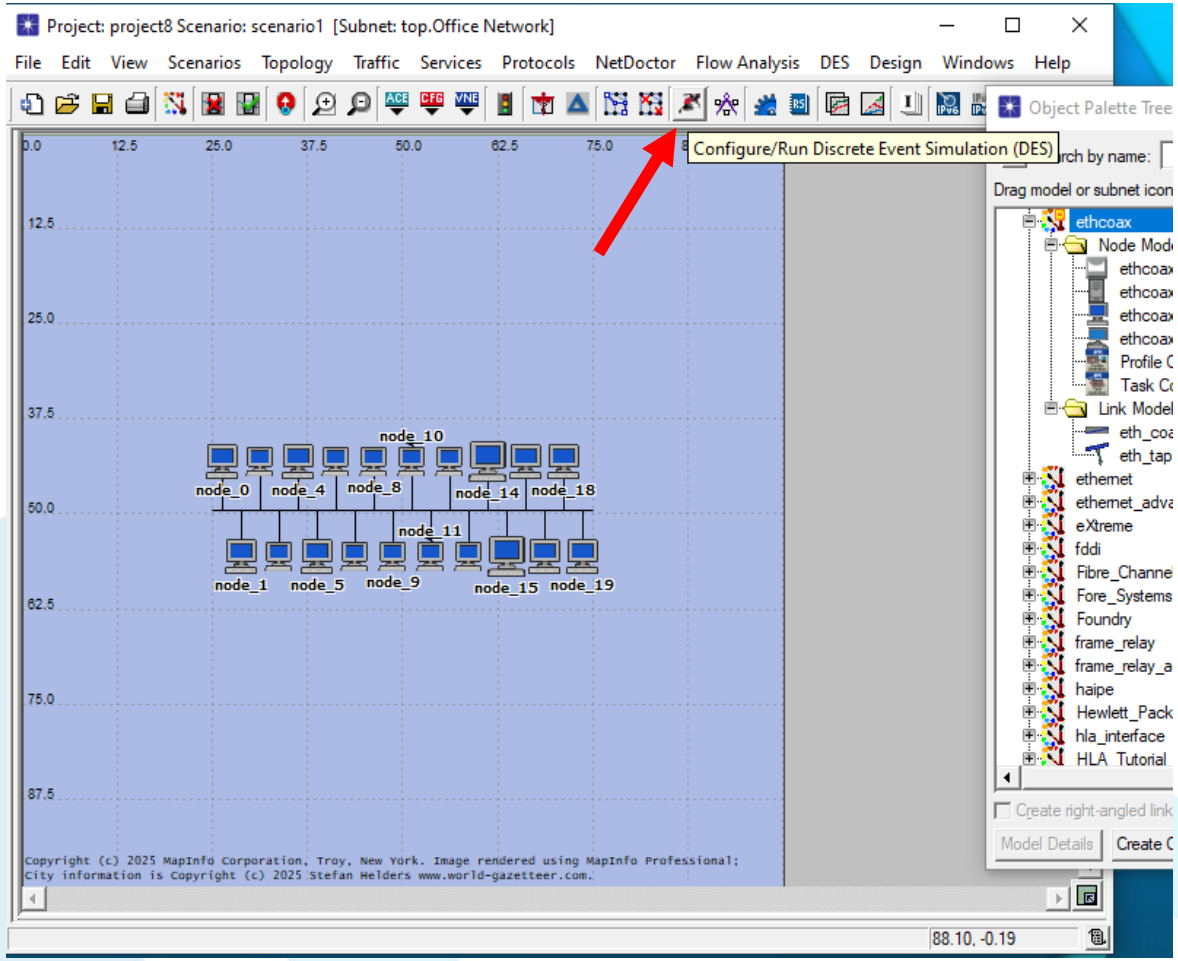
Choose individual DES Statistics

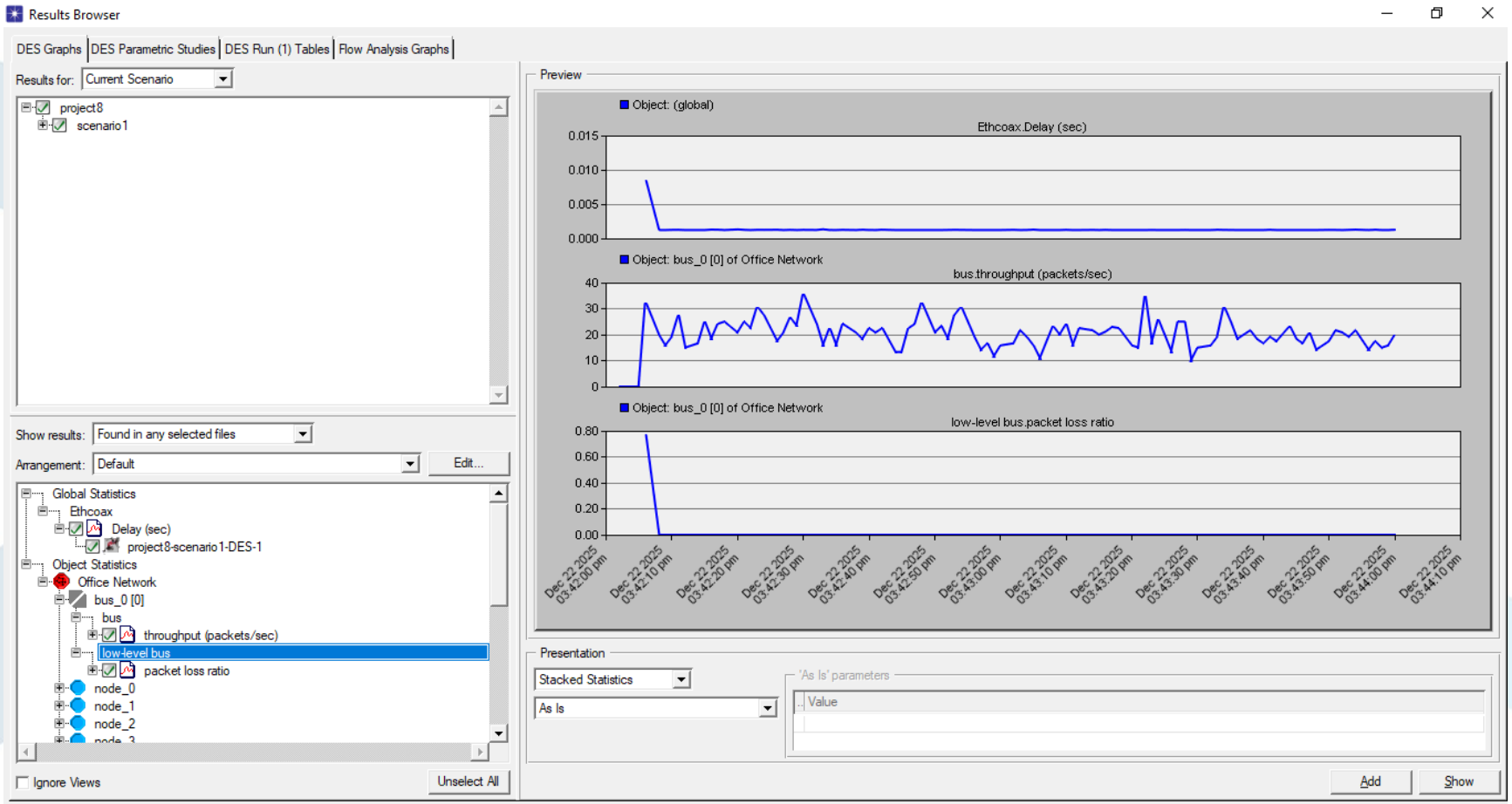


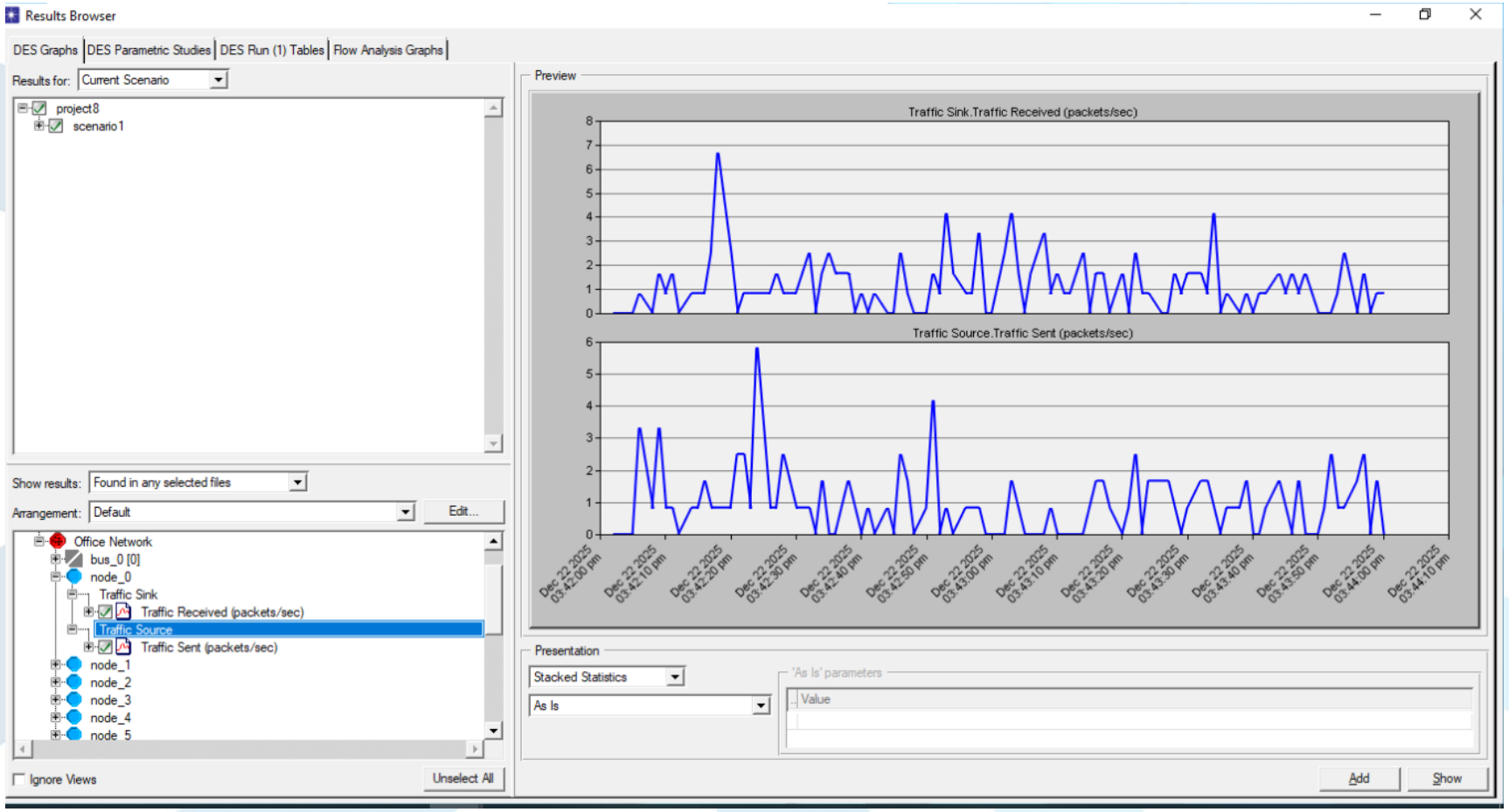
نختار البارامترات التي نريد عرض الإحصائيات الخاصة بها من خلال الواجهة قبل القيام بعملية تشغيل المحاكاة كما هو موضح حيث نقوم بدراسة التأخير على الشبكة بالإضافة إلى بيانات الإرسال و الاستقبال و حالة التصادمات.

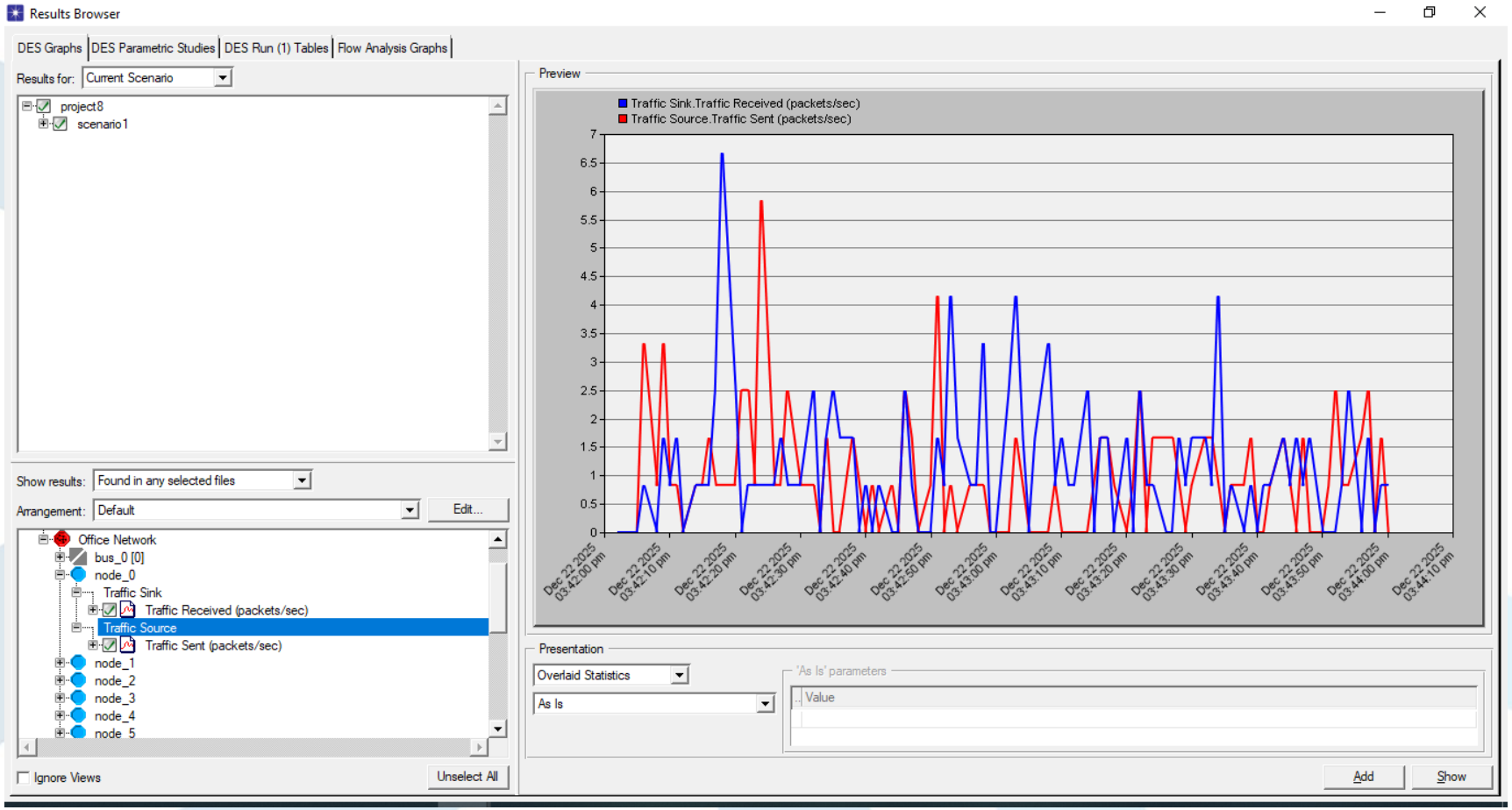



Configure/Run DES: project8-scenario1
Preview Simulation Set
Number of runs: 1
Common
Inputs
Outputs
Execution
Runtime Displays
Common
Duration: 2 minute(s)
Seed: 128
Enter Multiple Seed Values...
Values per statistic: 100
Update interval: 500000 events
Simulation Kernel: Based on 'kernel_type' preference (Preference set to "development")
Simulation set name: scenario
Comments:
Simple...
Edit Simulation Sequence...
Run
Cancel
Apply
Help


Project: project8 Scenario: scenario1 [Subnet: top.Office Network]
File Edit View Scenarios Topology Traffic Services Protocols NetDoctor Flow Analysis DES Design Windows Help
Configure/Run Discrete Event Simulation (DES)
Object Palette Tree
Drag model or subnet icon
ethcoax
Node Model
Link Model
ethernet
eXtreme
fddi
frame_relay
haipe
hla_interface
HLA_Tutorial
node_0
node_1
node_4
node_5
node_8
node_9
node_10
node_11
node_14
node_15
node_18
node_19
Copyright (c) 2025 MapInfo Corporation, Troy, New York. Image rendered using MapInfo Professional;
City information is Copyright (c) 2025 Stefan Helders www.world-gazetteer.com.
88.10, -0.19


Results Browser
DES Graphs
DES Parametric Studies
DES Run (1) Tables
Flow Analysis Graphs
Results for:
Current Scenario
project8
scenario1
Show results:
Found in any selected files
Arrangement:
Default
Edit...
Global Statistics
Ethcoax
Delay (sec)
project8-scenario1-DES-1
Object Statistics
Office Network
bus_0 [0]
bus
throughput (packets/sec)
low-level bus
packet loss ratio
node_0
node_1
node_2
Ignore Views
Unselect All
Preview
Object: (global)
Ethcoax.Delay (sec)
0.015
0.010
0.005
0.000
Object: bus_0 [0] of Office Network
bus.throughput (packets/sec)
40
30
20
10
0
Object: bus_0 [0] of Office Network
low-level bus.packet loss ratio
0.80
0.60
0.40
0.20
0.00
Dec 22 2025 03:42:00 pm
Dec 22 2025 03:42:10 pm
Dec 22 2025 03:42:20 pm
Dec 22 2025 03:42:30 pm
Dec 22 2025 03:42:40 pm
Dec 22 2025 03:42:50 pm
Dec 22 2025 03:43:00 pm
Dec 22 2025 03:43:10 pm
Dec 22 2025 03:43:20 pm
Dec 22 2025 03:43:30 pm
Dec 22 2025 03:43:40 pm
Dec 22 2025 03:43:50 pm
Dec 22 2025 03:44:00 pm
Dec 22 2025 03:44:10 pm
Presentation
Stacked Statistics
As Is
'As Is' parameters
Value
Add
Show


Results Browser
DES Graphs
DES Parametric Studies
DES Run (1) Tables
Flow Analysis Graphs
Results for:
Current Scenario
project8
scenario1
Show results:
Found in any selected files
Arrangement:
Default
Edit...
Office Network
bus_0 [0]
node_0
Traffic Sink
Traffic Received (packets/sec)
Traffic Source
Traffic Sent (packets/sec)
node_1
node_2
node_3
node_4
node_5
Ignore Views
Unselect All
Preview
Traffic Sink.Traffic Received (packets/sec)
Traffic Source.Traffic Sent (packets/sec)
Dec 22 2025 03:42:00 pm
Dec 22 2025 03:42:10 pm
Dec 22 2025 03:42:20 pm
Dec 22 2025 03:42:30 pm
Dec 22 2025 03:42:40 pm
Dec 22 2025 03:42:50 pm
Dec 22 2025 03:43:00 pm
Dec 22 2025 03:43:10 pm
Dec 22 2025 03:43:20 pm
Dec 22 2025 03:43:30 pm
Dec 22 2025 03:43:40 pm
Dec 22 2025 03:43:50 pm
Dec 22 2025 03:44:00 pm
Dec 22 2025 03:44:10 pm
Presentation
Stacked Statistics
As Is
'As Is' parameters
Value
Add
Show


Results Browser
DES Graphs
DES Parametric Studies
DES Run (1) Tables
Flow Analysis Graphs
Results for:
Current Scenario
project8
scenario1
Show results:
Found in any selected files
Arrangement:
Default
Edit...
Office Network
bus_0 [0]
node_0
Traffic Sink
Traffic Received (packets/sec)
Traffic Source
Traffic Sent (packets/sec)
node_1
node_2
node_3
node_4
node_5
Ignore Views
Unselect All
Preview
Traffic Sink.Traffic Received (packets/sec)
Traffic Source.Traffic Sent (packets/sec)
Presentation
Overlaid Statistics
As Is
'As Is' parameters
Value
Add
Show

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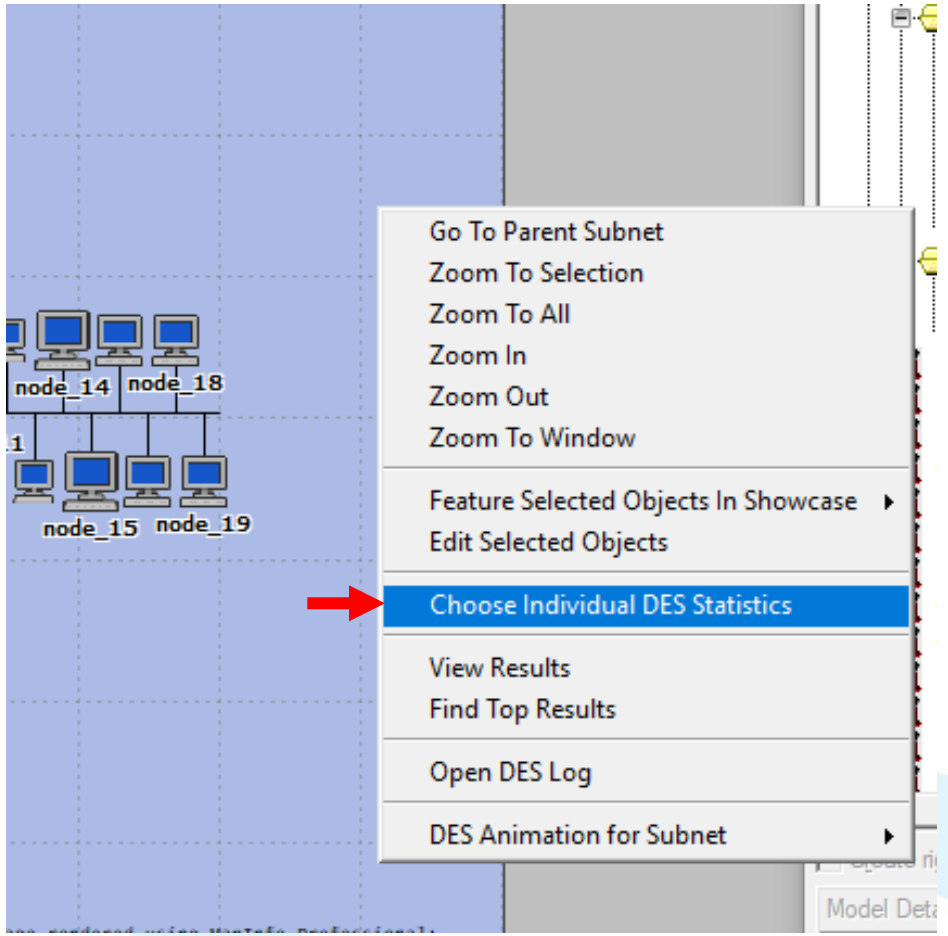
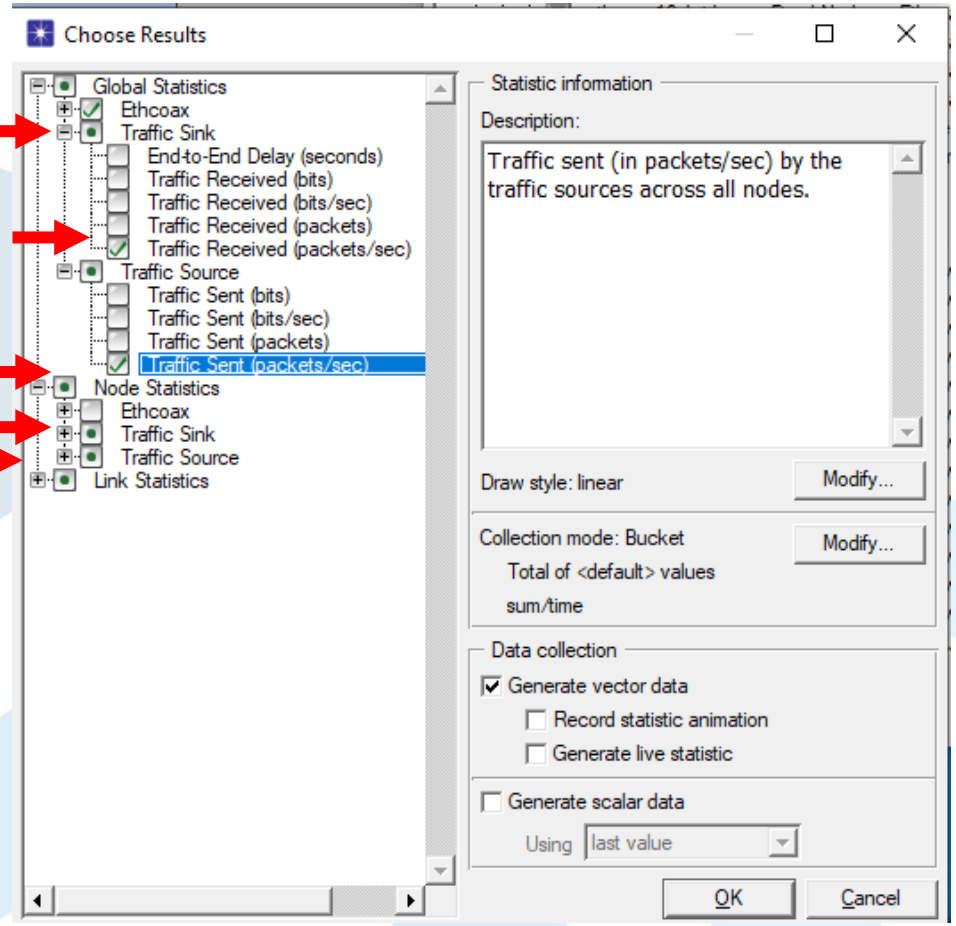
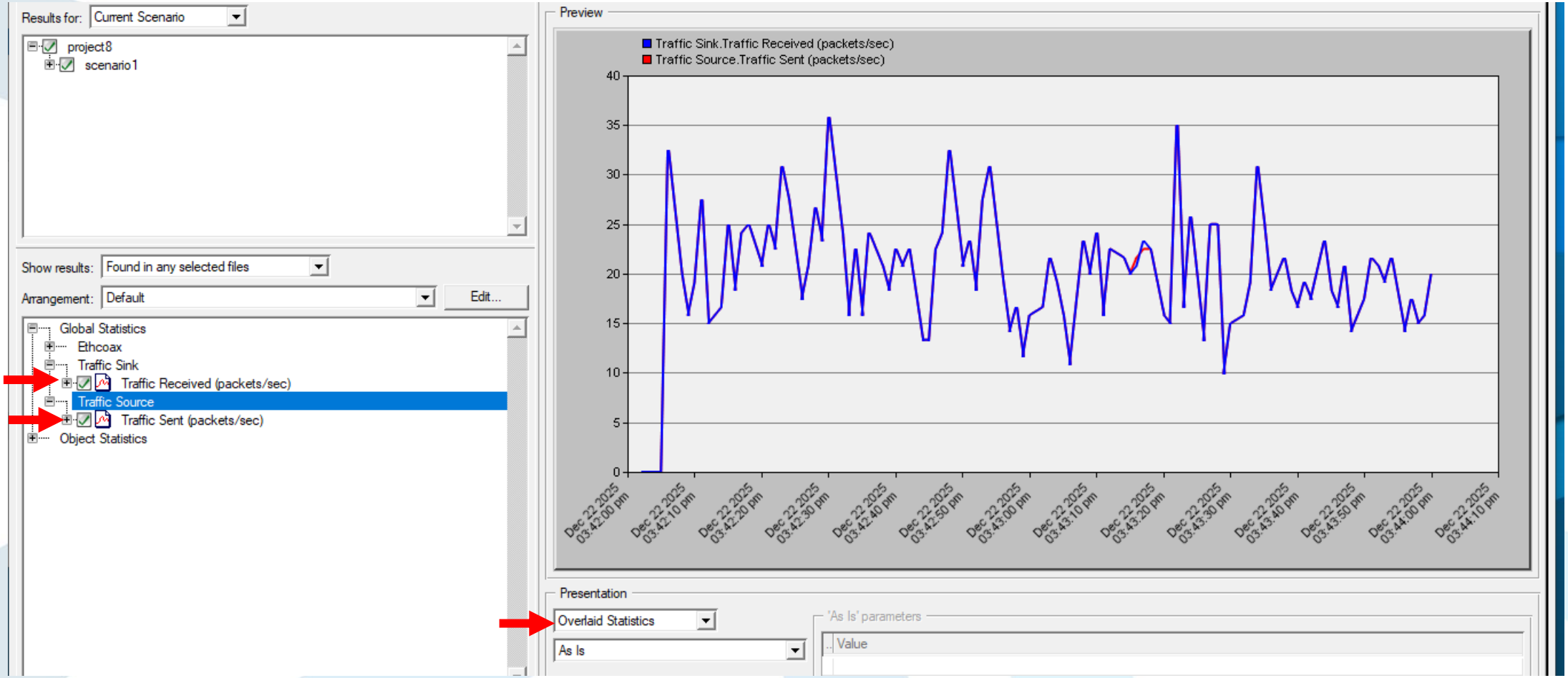
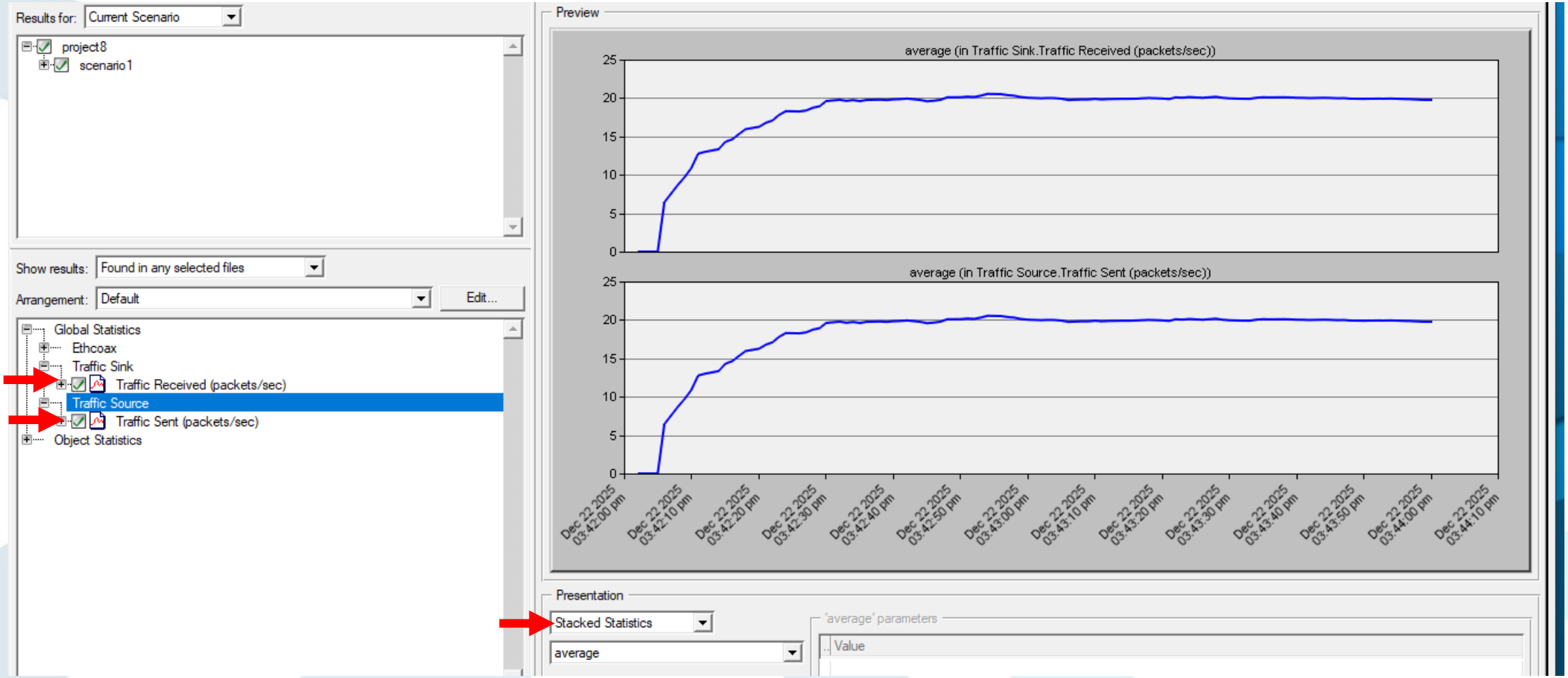
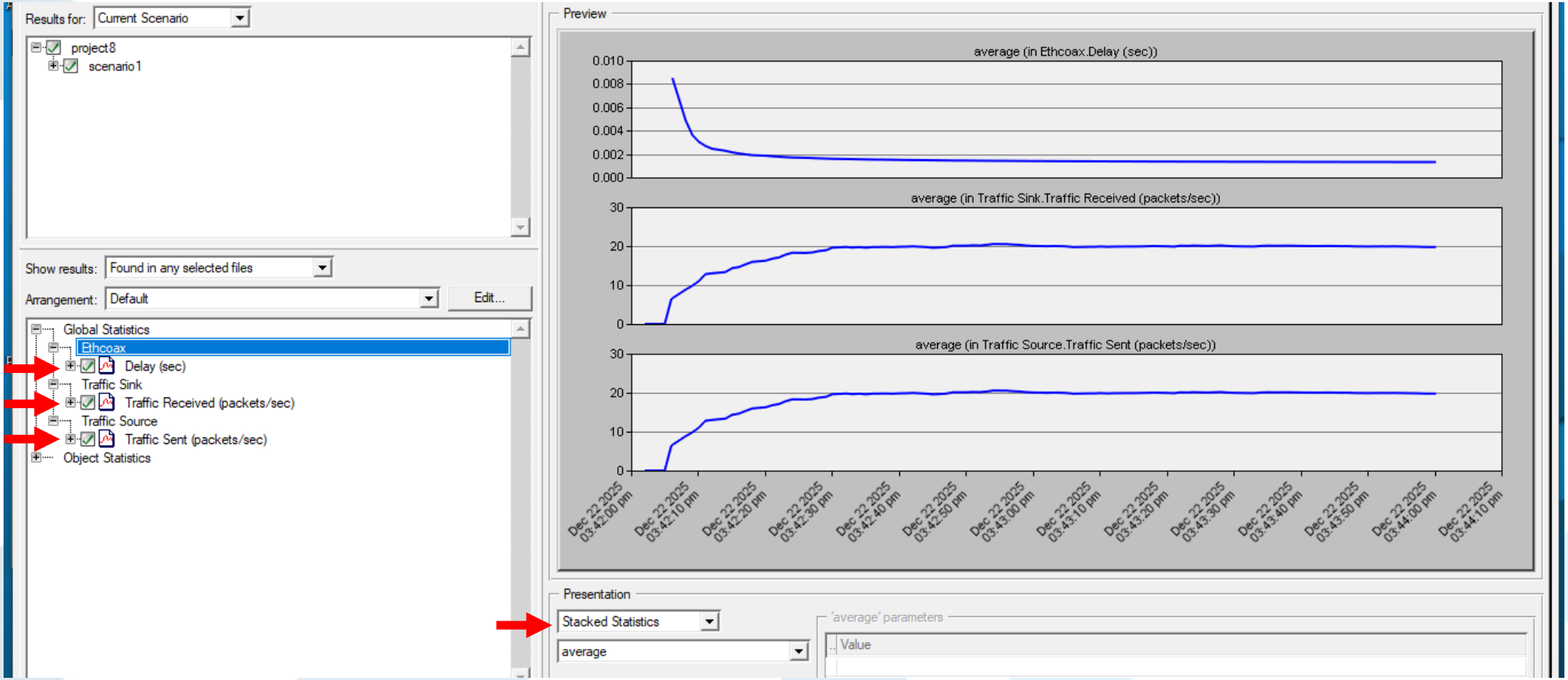
Choose individual DES Statistics




Choose Results
Global Statistics
Ethcoax
Traffic Sink
End-to-End Delay (seconds)
Traffic Received (bits)
Traffic Received (bits/sec)
Traffic Received (packets)
Traffic Received (packets/sec)
Traffic Source
Traffic Sent (bits)
Traffic Sent (bits/sec)
Traffic Sent (packets)
Traffic Sent (packets/sec)
Node Statistics
Ethcoax
Traffic Sink
Traffic Source
Link Statistics
Statistic information
Description:
Traffic sent (in packets/sec) by the traffic sources across all nodes.
Draw style: linear
Modify...
Collection mode: Bucket
Total of <default> values
sum/time
Modify...
Data collection
Generate vector data
Record statistic animation
Generate live statistic
Generate scalar data
Using
last value
OK
Cancel


Results for: Current Scenario
project8
scenario1
Show results: Found in any selected files
Arrangement: Default
Edit...
Global Statistics
Ethcoax
Traffic Sink
Traffic Received (packets/sec)
Traffic Source
Traffic Sent (packets/sec)
Object Statistics
Preview
Traffic Sink.Traffic Received (packets/sec)
Traffic Source.Traffic Sent (packets/sec)
40
35
30
25
20
15
10
5
0
Dec 22 2025 03:42:00 pm
Dec 22 2025 03:42:10 pm
Dec 22 2025 03:42:20 pm
Dec 22 2025 03:42:30 pm
Dec 22 2025 03:42:40 pm
Dec 22 2025 03:42:50 pm
Dec 22 2025 03:43:00 pm
Dec 22 2025 03:43:10 pm
Dec 22 2025 03:43:20 pm
Dec 22 2025 03:43:30 pm
Dec 22 2025 03:43:40 pm
Dec 22 2025 03:43:50 pm
Dec 22 2025 03:44:00 pm
Dec 22 2025 03:44:10 pm
Presentation
Overlaid Statistics
As Is
'As Is' parameters
Value


Results for: Current Scenario
project8
scenario1
Show results: Found in any selected files
Arrangement: Default
Edit...
Global Statistics
Ethcoax
Traffic Sink
Traffic Received (packets/sec)
Traffic Source
Traffic Sent (packets/sec)
Object Statistics
Preview
average (in Traffic Sink.Traffic Received (packets/sec))
average (in Traffic Source.Traffic Sent (packets/sec))
25
20
15
10
5
0
Dec 22 2025 03:42:00 pm
Dec 22 2025 03:42:10 pm
Dec 22 2025 03:42:20 pm
Dec 22 2025 03:42:30 pm
Dec 22 2025 03:42:40 pm
Dec 22 2025 03:42:50 pm
Dec 22 2025 03:43:00 pm
Dec 22 2025 03:43:10 pm
Dec 22 2025 03:43:20 pm
Dec 22 2025 03:43:30 pm
Dec 22 2025 03:43:40 pm
Dec 22 2025 03:43:50 pm
Dec 22 2025 03:44:00 pm
Dec 22 2025 03:44:10 pm
Presentation
Stacked Statistics
average
'average' parameters
Value


Results for: Current Scenario
project8
scenario1
Show results: Found in any selected files
Arrangement: Default
Edit...
Global Statistics
Ethcoax
Delay (sec)
Traffic Sink
Traffic Received (packets/sec)
Traffic Source
Traffic Sent (packets/sec)
Object Statistics
Preview
average (in Ethcoax.Delay (sec))
0.010
0.008
0.006
0.004
0.002
0.000
average (in Traffic Sink.Traffic Received (packets/sec))
30
20
10
0
average (in Traffic Source.Traffic Sent (packets/sec))
30
20
10
0
Dec 22 2025 03:42:00 pm
Dec 22 2025 03:42:10 pm
Dec 22 2025 03:42:20 pm
Dec 22 2025 03:42:30 pm
Dec 22 2025 03:42:40 pm
Dec 22 2025 03:42:50 pm
Dec 22 2025 03:43:00 pm
Dec 22 2025 03:43:10 pm
Dec 22 2025 03:43:20 pm
Dec 22 2025 03:43:30 pm
Dec 22 2025 03:43:40 pm
Dec 22 2025 03:43:50 pm
Dec 22 2025 03:44:00 pm
Dec 22 2025 03:44:10 pm
Presentation
Stacked Statistics
average
'average' parameters
Value

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Thanks for Listening