



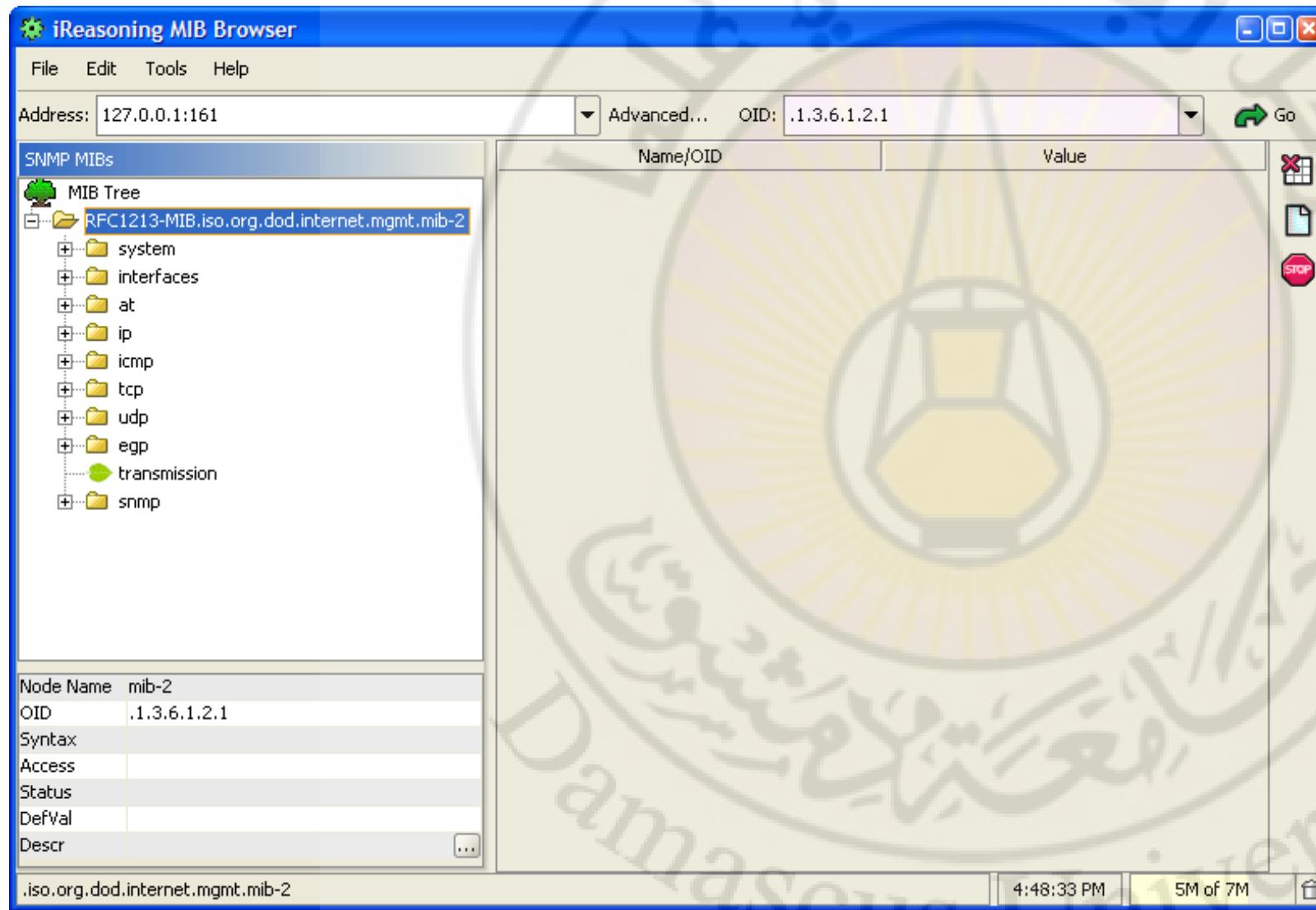
# عملي إدارة الشبكات Network Management

iREASONING  
N E T W O R K S

**Appendix #2: SNMP Tools - iReasoning's MIB Browser**

إعداد: م. غاندي هسام

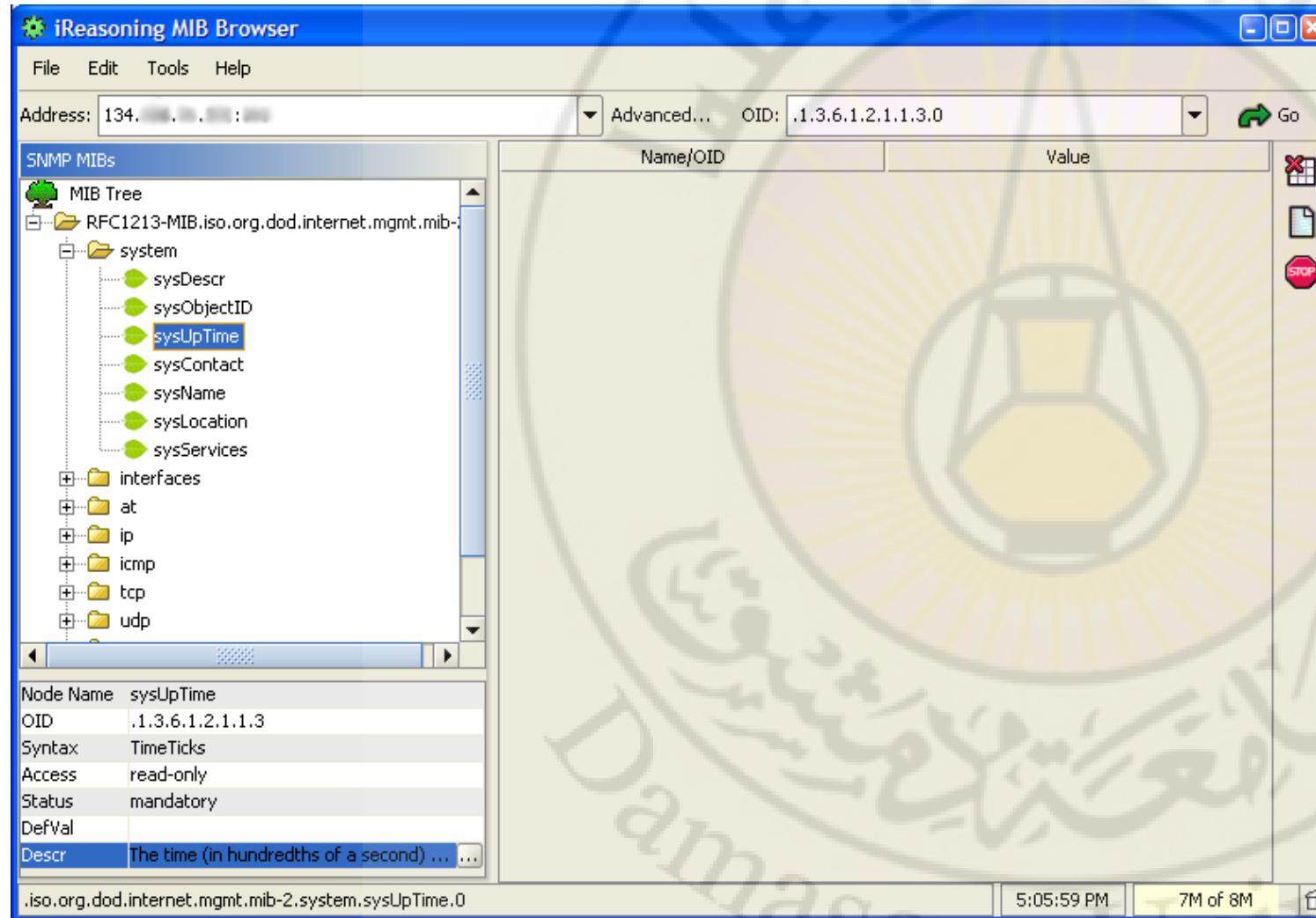
# SNMP – MIB Browser (1)



## Breakdown...

- LHS is the SNMP MIB structure.
- Lower LHS has details of MIB structure.
- RHS will present MIB values.

# SNMP – MIB Browser (3)



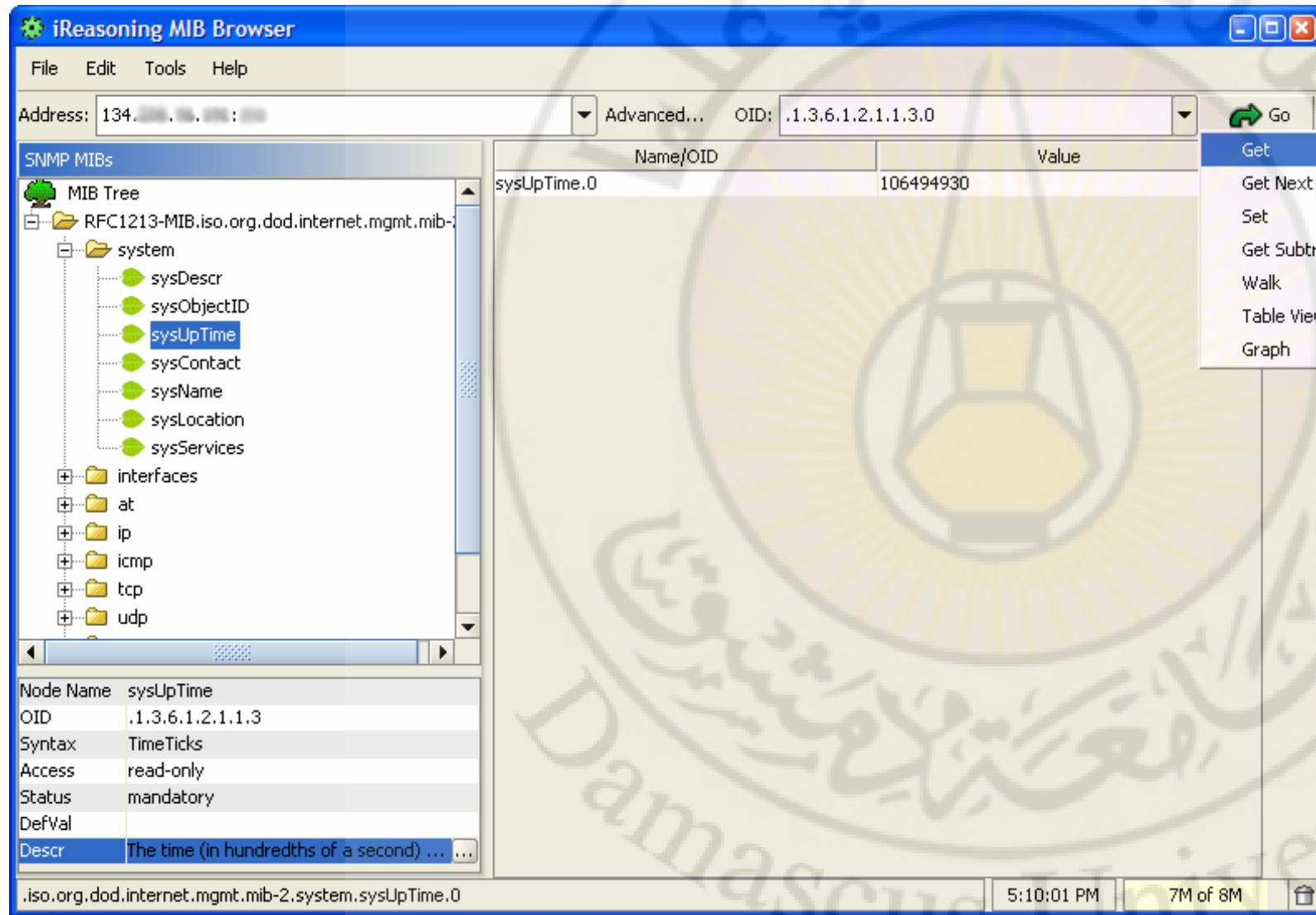
## Navigation...

- MIB Tree  
→ System  
    → sysUpTime

- Notice Lower LHS

- Notice OID

# SNMP – MIB Browser (4)

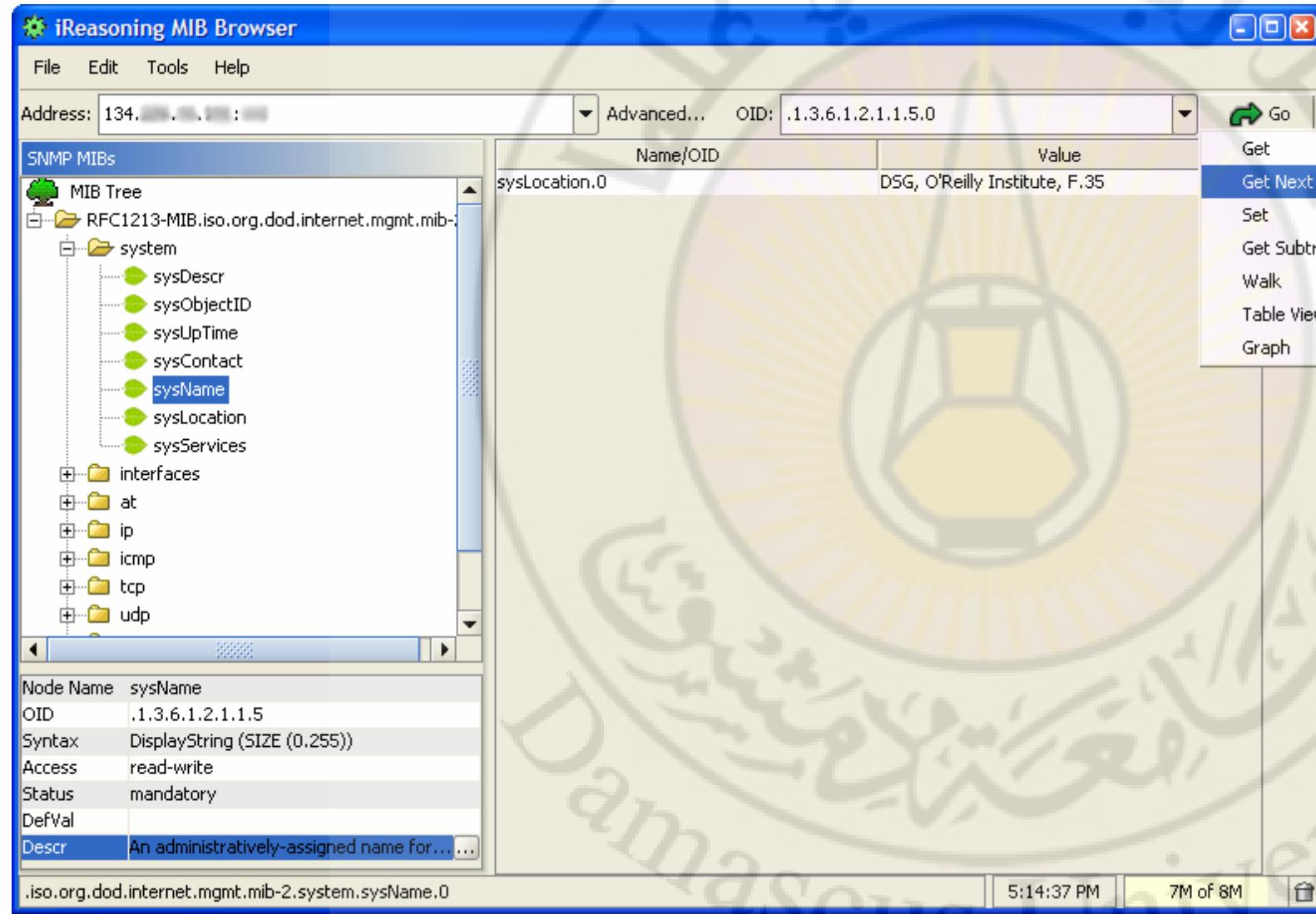


## SNMP PDU's...

### (1) Get

- Select 'Go'
- 'Get'
- RHS has values.
- OID – Value

# SNMP – MIB Browser (5)



**SNMP PDU's...**

**(2) GetNext**

-Selected OID is:

.1.3.6.1.2.1.1.5

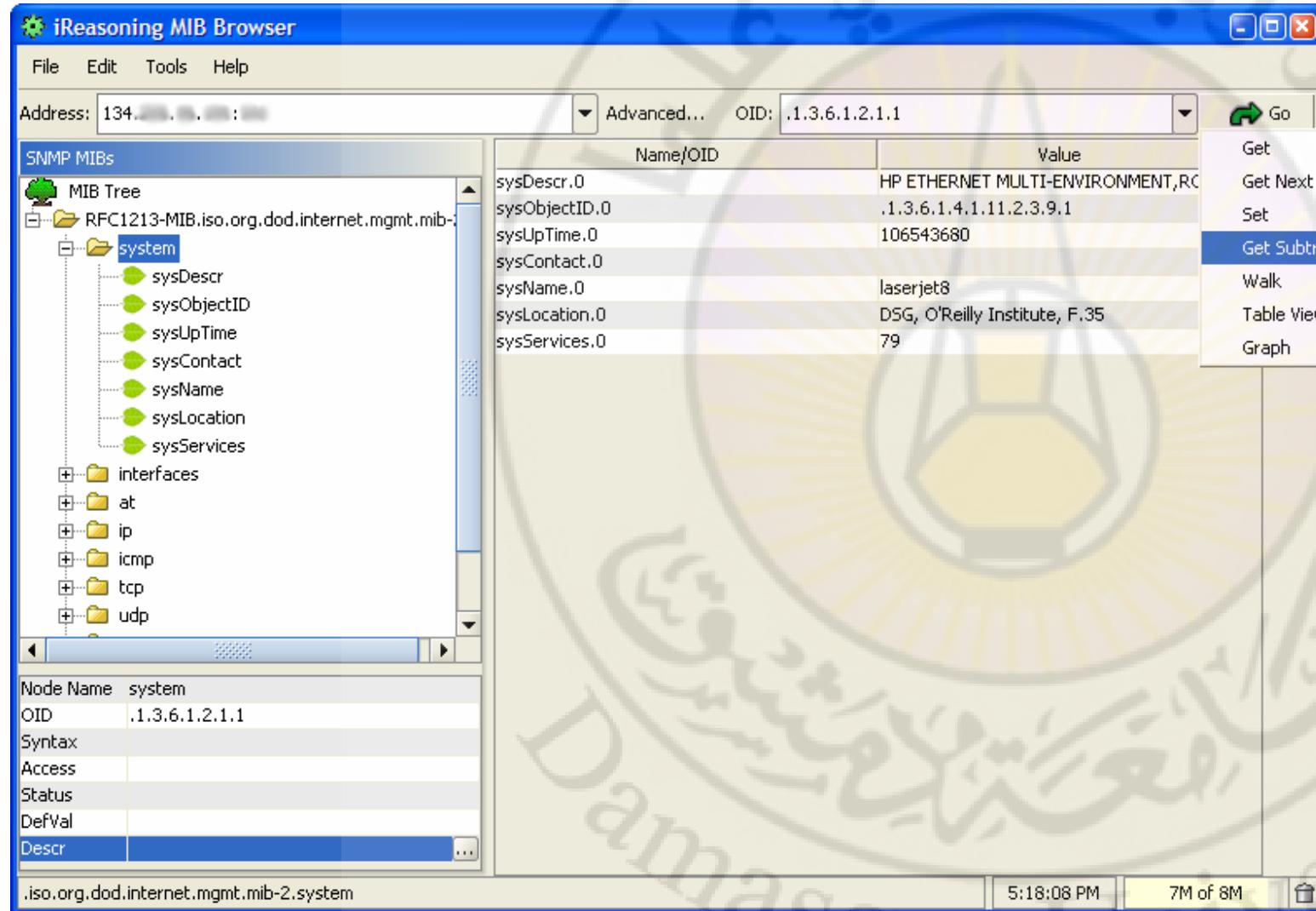
-Returned value:

(.1.3.6.1.2.1.1.6)

or

"DSG, O'Reilly Institute,  
F.35"

# SNMP – MIB Browser (6)



SNMP...

## (3) Get SubTree

-Position of MIB:

.1.3.6.1.2.1.1

(a.k.a. system)

-RHS values:

Returns all values  
below system.

# SNMP – MIB Browser (7)

The screenshot shows the iReasoning MIB Browser interface. The main window displays a table of SNMP variables under the OID .1.3.6.1.2.1. The table has two columns: 'Name/OID' and 'Value'. The 'Name/OID' column lists various MIB objects like sysDescr.0, sysObjectID.0, sysUpTime.0, etc. The 'Value' column contains their corresponding values. To the right of the table, a context menu is open with options: Go, Get, Get Next, Set, Get Subtree, Walk, Table View, and Graph. The 'Walk' option is highlighted. On the left, there's a tree view of the MIB structure under 'RFC1213-MIB.iso.org.dod.internet.mgmt.mib-2'. At the bottom, there's a node information panel for 'mib-2' with fields for Node Name, OID (.1.3.6.1.2.1), Syntax, Access, Status, DefVal, and Descr.

Name/OID	Value
sysDescr.0	HP ETHERNET MULTI-ENVIRONMENT,ROM ...
sysObjectID.0	.1.3.6.1.4.1.11.2.3.9.1
sysUpTime.0	106564230
sysContact.0	
sysName.0	laserjet8
sysLocation.0	DSG, O'Reilly Institute, F.35
sysServices.0	79
ifNumber.0	2
ifIndex.1	1
ifIndex.2	2
ifDescr.1	HP ETHERNET MULTI-ENVIRONMENT,ROM ...
ifDescr.2	HP ETHERNET MULTI-ENVIRONMENT,ROM ...
ifType.1	ethernet-csmacd
ifType.2	softwareLoopback
ifMtu.1	1500
ifMtu.2	32768
ifSpeed.1	10000000
ifSpeed.2	0
ifPhysAddress.1	0x00 0x30 0xC1 0xCC 0x1B 0x85
ifPhysAddress.2	
ifAdminStatus.1	up
ifAdminStatus.2	up
ifOperStatus.1	up
ifOperStatus.2	up
ifLastChange.1	0
ifLastChange.2	0
iFinOctets.1	741500316

SNMP...

(4) Walk

-MIB Location:

.1.3.6.1.2.1

(a.k.a. mib-2)

- Returns \*ALL\* values  
under mib-2

# SNMP – MIB Browser (8)

iReasoning MIB Browser

Address: 134.121.1.1 : Advanced... OID: .1.3.6.1.2.1.2.2

**SNMP MIBs**

- MIB Tree
- RFC1213-MIB.iso.org.dod.internet.mgmt.
- system
- interfaces
  - ifNumber
  - ifTable**
    - ifEntry
      - ifIndex
      - ifDescr
      - ifType
      - ifMtu
      - ifSpeed
      - ifPhysAddress
      - ifAdminStatus
      - ifOperStatus
      - ifLastChange
      - ifInOctets
      - ifInUcastPkts
      - ifInNUcastPkts
      - ifInDiscards
      - ifInErrors
      - ifInUnknownProtos
      - ifOutOctets
      - ifOutUcastPkts
      - ifOutNUcastPkts
      - ifOutDiscards
      - ifOutErrors
      - ifOutQLen

Node Name: ifTable  
 OID: .1.3.6.1.2.1.2.2  
 Syntax: SEQUENCE OF IfEntry  
 Access: not-accessible  
 Status: mandatory  
 DefVal:

.iso.org.dod.internet.mgmt.mib-2.interfaces.ifTable

6:25:35 PM | 4M of 6M

**ifTable**

Rotate Refresh Poll

	1	2
ifIndex	1	2
ifDescr	HP ETHERNET MU...	HP ETHERNET MU...
ifType	ethernet-csmacd	softwareLoopbac...
ifMtu	1500	32768
ifSpeed	10000000	0
ifPhysAddress	0x00 0x30 0xC1 ...	
ifAdminStatus	up	up
ifOperStatus	up	up
ifLastChange	0	0
ifInOctets	745482794	4294967295
ifInUcastPkts	296035	572
ifInNUcastPkts	4721623	0
ifInDiscards	92005	0
ifInErrors	0	0
ifInUnknownProtos	0	0
ifOutOctets	14196063	4294967295
ifOutUcastPkts	125605	572
ifOutNUcastPkts	27265	0
ifOutDiscards	0	0
ifOutErrors	0	0
ifOutQLen	0	0

Tables...

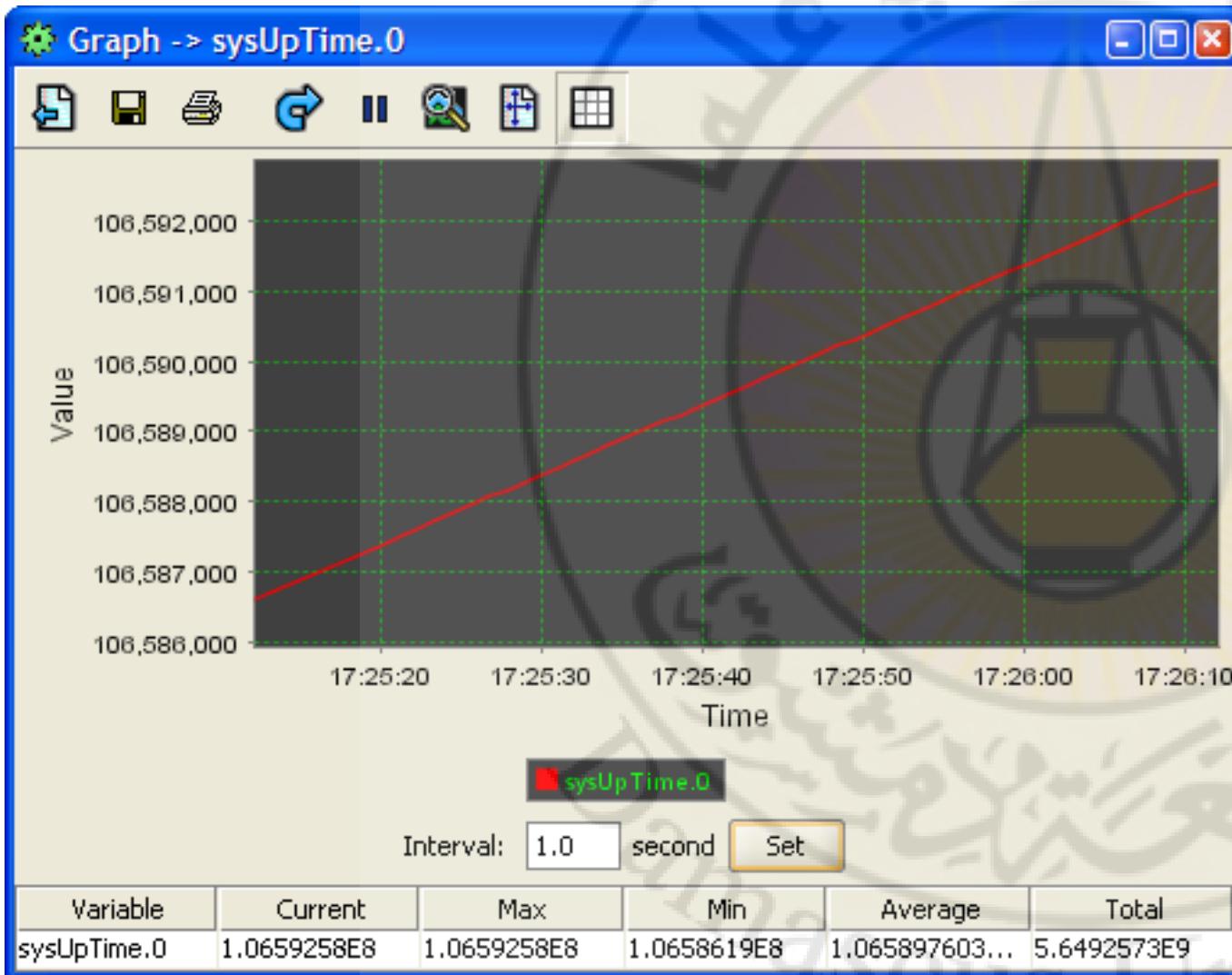
- MIB Location:  
**.1.3.6.1.2.1.2.2**  
 (or interfaces)
- Select ifTable,  
 → Go, then Table View.
- Refresh/Poll

**ifTable**

Rotate Refresh Poll

...	ifDescr	ifType	ifMtu	ifSpeed	ifPhysAddress	ifAdminStatus	ifOperStatus	ifLastChange	ifInOctets	ifInUcastPkts	ifInNUcastPkts	ifInDiscards	ifInErrors	ifInUnknownProtos	ifOutOctets	ifOutUcastPkts	ifOutNUcastPkts	...	if...	if...	ifSpecific	
1	1	HP ETHERNET ...	ethernet-c...	1500	10000000	0x00 0x30 0xC1 ...	up	up	0	745482794	296035	4721623	92005	0	0	14196063	125605	27265	0	0	0	.0.0
2	2	HP ETHERNET ...	softwareLoopbac...	32768	0		up	up	0	4294967295	572	0	0	0	0	4294967295	572	0	0	0	0	.0.0

# SNMP – MIB Browser (9)



## SNMP...

- Graph
- Select a value from the RHS, say sysUpTime
- Highlight and select 'Go', then 'Graph'.
- Interval = 1s → set.

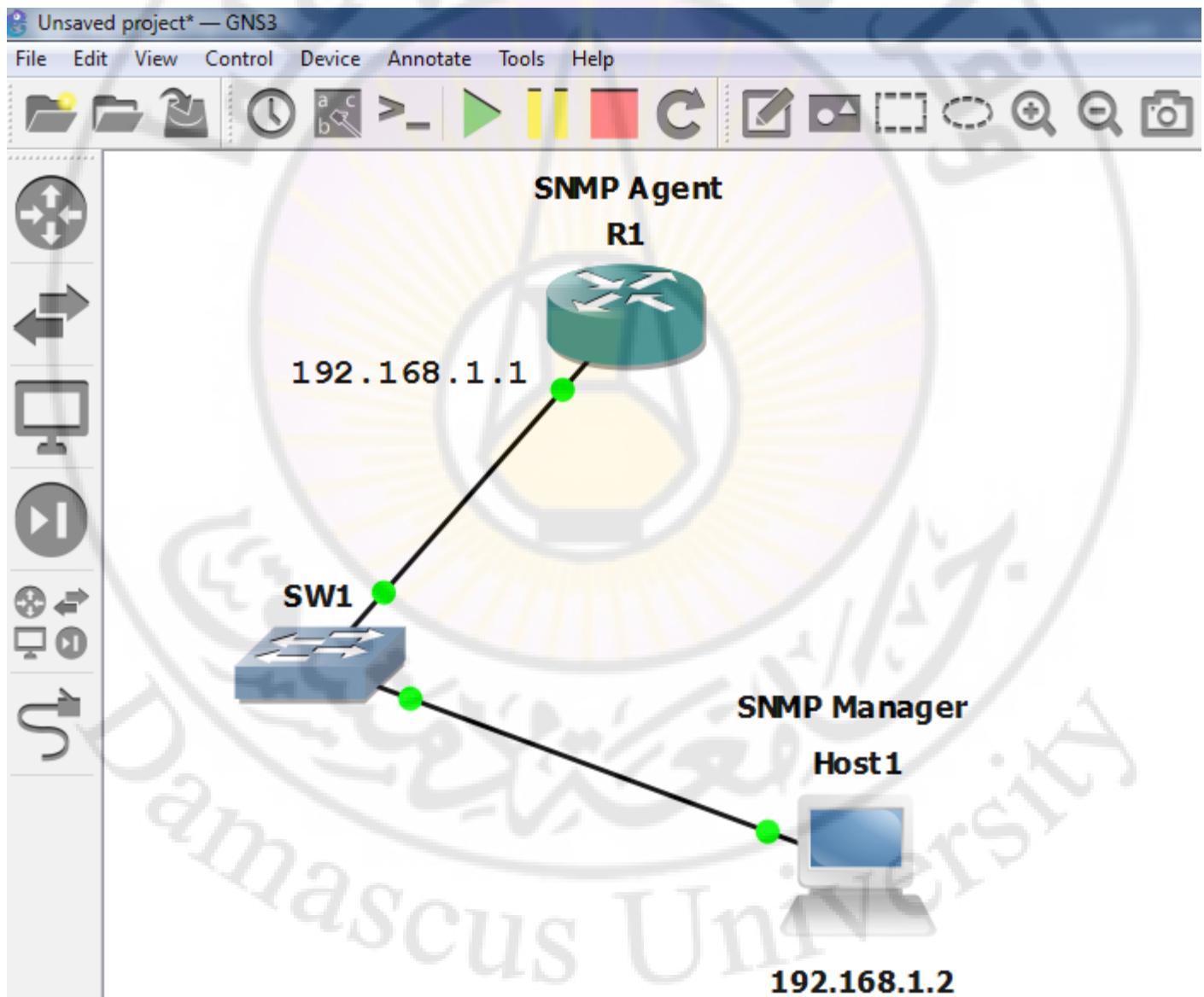


**End of Appendix #2**



## Using GNS3 and A simple applicating with SNMP4J in Java Appendix #3

### Topology





## Class: snmp\_get

```
import java.io.IOException;
import org.snmp4j.*;
import org.snmp4j.event.ResponseEvent;
import org.snmp4j.mp.SnmpConstants;
import org.snmp4j.smi.*;
import org.snmp4j.transport.DefaultUdpTransportMapping;

/**
 *
 * @author Ghandy Hessam
 */
public class snmp_get {

    public static void main(String[] args) throws IOException {
        // TODO code application logic here
        OID oid = new OID("1.3.6.1.2.1.1.5.0"); // sysName
        PDU pdu = new PDU();
        pdu.add(new VariableBinding(oid));
        pdu.setType(PDU.GET);
        CommunityTarget target = new CommunityTarget();
        target.setCommunity(new OctetString("public"));
        // Address targetaddress = ;
        target.setAddress(new UdpAddress("192.168.1.1/161"));
        target.setVersion(SnmpConstants.version1);
        Snmp snmp = new Snmp(new DefaultUdpTransportMapping());
        snmp.listen();

        ResponseEvent response = snmp.send(pdu, target);
        if (response.getResponse() == null) {
            // request timed out
            System.out.println("Failed!");
        } else {
            //System.out.println("Received response from: " +
response.getPeerAddress());

            // dump response PDU
            System.out.println(response.getResponse().get(0).toString());
        }
    }
}
```



## Class: snmp\_set

```
import java.io.IOException;
import org.snmp4j.*;
import org.snmp4j.TransportMapping;
import org.snmp4j.event.ResponseEvent;
import org.snmp4j.event.ResponseListener;
import org.snmp4j.mp.SnmpConstants;
import org.snmp4j.smi.Address;
import org.snmp4j.smi.GenericAddress;
import org.snmp4j.smi.Integer32;
import org.snmp4j.smi.OID;
import org.snmp4j.smi.OctetString;
import org.snmp4j.smi.VariableBinding;
import org.snmp4j.transport.DefaultUdpTransportMapping;
/**
 *
 * @author Ghandy Hessam
 */
public class snmp_set {

    public static void main(String[] args) throws IOException {
        String strAddress = "192.168.1.1/161";
        Address targetAddress = GenericAddress.parse(strAddress);

        try {
            TransportMapping transport = new DefaultUdpTransportMapping();
            Snmp snmp = new Snmp(transport);
            transport.listen();
            CommunityTarget target = new CommunityTarget();
            target.setCommunity(new OctetString("public"));
            target.setAddress(targetAddress);
            target.setRetries(2);
            target.setTimeout(5000);
            target.setVersion(SnmpConstants.version1);
            PDU pdu = new PDU();
            pdu.add(new VariableBinding(new OID("1.3.6.1.2.1.1.5.0"), new OctetString("RRR1")));
            pdu.setType(PDU.SET);
            ResponseListener listener = new ResponseListener() {

                public void onResponse(ResponseEvent event) {
                    ((Snmp) event.getSource()).cancel(event.getRequest(), this);
                    System.out.println("Set Status is: " +
event.getResponse().getErrorStatusText());
                }
            }
        }
    }
}
```



```
    } ;  
  
    snmp.send(pdu, target, null, listener);  
  
} catch (Exception e) {  
    e.printStackTrace();  
}  
}  
}
```

End of Appendix #3



# عملي إدارة الشبكات Network Management



*Session 3: How to use the library **snmp4j** in JAVA*

إعداد: م. غاندي هسام

# Package org.snmp4j Description

- Provides classes and interfaces for creating, sending, and receiving SNMP v1/v2c/v3 messages.
- A SNMP message is composed of its message header and its PDU payload.
- Contains three main groups of classes and interfaces:
  - Classes for SNMP message and **target** creation
  - Classes for SNMP message **sending** (command generation)
  - Classes for SNMP message **dispatching** (command responding)

# SNMP Messages and Targets

- To exchange a SNMP message with a remote system, that system has to be:
  - Identified
  - Retransmission
  - timeout policy information
- A remote system is specified with SNMP4J by creating a target instance appropriate for the SNMP protocol to be used.
  - For SNMPv1 and SNMPv2c the *community target* has to be used.
  - For SNMPv3 the *User target* has to be used instead.

- A SNMP message consists of:
  - message's payload
  - the SNMP Protocol Data Unit (PDU)
  - message header.
- In SNMP4J the message header information is represented by Target and the PDU is represented by one of the following classes:
  - PDUsv1 (snmp v1)
  - PDU (snmp v2)
  - ScopedPDU (snmp v3)

To send a SNMP message with SNMP4J, a PDU instance and a Target instance have to be created.

# PDU Examples

## ❑ SNMPv1/v2c GET PDU:

```
OID oid = new OID("1.3.6.1.2.1.1.1"); // sysDescr  
PDU pdu = new PDU();  
pdu.add(new VariableBinding(oid));  
pdu.setType(PDU.GET);
```

## ❑ SNMPv3 GETBULK PDU:

```
ScopedPDU pdu = new ScopedPDU();  
pdu.add(new VariableBinding(new OID("1.3.6.1.2.1.2.1"))); // ifNumber  
pdu.add(new VariableBinding(new OID("1.3.6.1.2.1.2.2.1.10"))); // ifInOctets  
pdu.add(new VariableBinding(new OID("1.3.6.1.2.1.2.2.1.16"))); // ifOutOctets  
pdu.setType(PDU.GETBULK);
```

### ❖ Note:

ifNumber: The number of network interfaces  
ifInOctets and ifOutOctets: counters.

# Target Examples

## ❑ Community Target:

```
CommunityTarget target = new CommunityTarget();
target.setCommunity(new OctetString("public"));
target.setAddress(targetAddress);
target.setVersion(SnmpConstants.version1);
```

## ❑ User Target:

```
UserTarget target = new UserTarget();
target.setAddress(targetAddress);
target.setRetries(1);
// set timeout to 500 milliseconds -> 2*500ms = 1s total timeout
target.setTimeout(500);
target.setVersion(SnmpConstants.version3);
target.setSecurityLevel(SecurityLevel.AUTH_PRIV);
target.setSecurityName(new OctetString("MD5DES"));
```

# Sending SNMP messages

- By using the *Snmp* class.
- To setup a *Snmp* instance it is sufficient to call its constructor with a *TransportMapping* instance.
- A SNMP4J *Snmp* instance supports SNMP v1, v2c, and v3 by default.
- SNMP messages can be sent synchronously (blocking) and asynchronously (non-blocking).

# Example for Sending a Synchronous Message

```
Snmp snmp = new Snmp(new DefaultUdpTransportMapping());
snmp.listen();

...
ResponseEvent response = snmp.send(requestPDU, target);
if (response.getResponse() == null) {
    // request timed out
    ...
}
else {
    System.out.println("Received response from: " + response.getPeerAddress());
    // dump response PDU
    System.out.println(response.getResponse().toString());
}
```

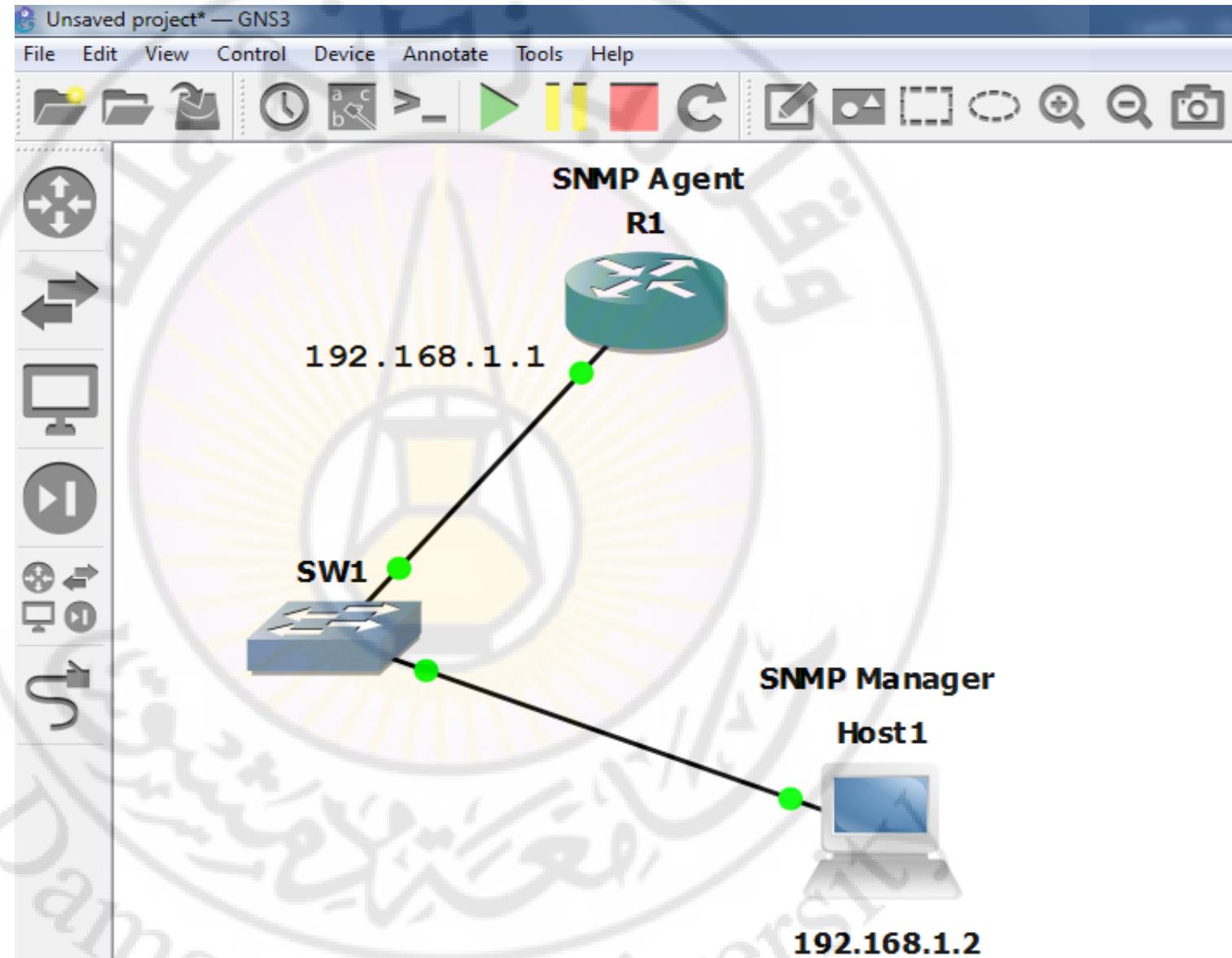
# Example for Sending an Asynchronous Message

```
Snmp snmp = new Snmp(new DefaultUdpTransportMapping());
snmp.listen();
...
ResponseListener listener = new ResponseListener() {
    public void onResponse(ResponseEvent event) {
        ((Snmp)event.getSource()).cancel(event.getRequest(), this);
        PDU response = event.getResponse();
        PDU request = event.getRequest();
        if (response == null) {
            System.out.println("Request "+request+" timed out");
        }
        else {
            System.out.println("Received response "+response+" on request "+
                request);
        }
    }
};
snmp.sendPDU(request, target, null, listener);
```

# Using GNS3 and A simple applicating with SNMP4J in Java Lab #2

# Topology

- With GNS3 design the following network.

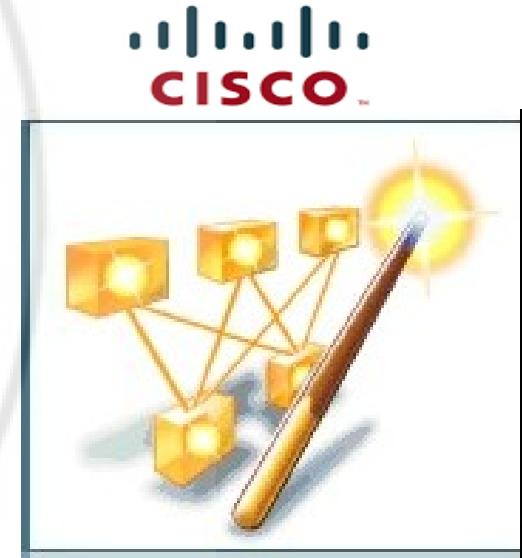


End of Session 3



# عملي إدارة الشبكات Network Management

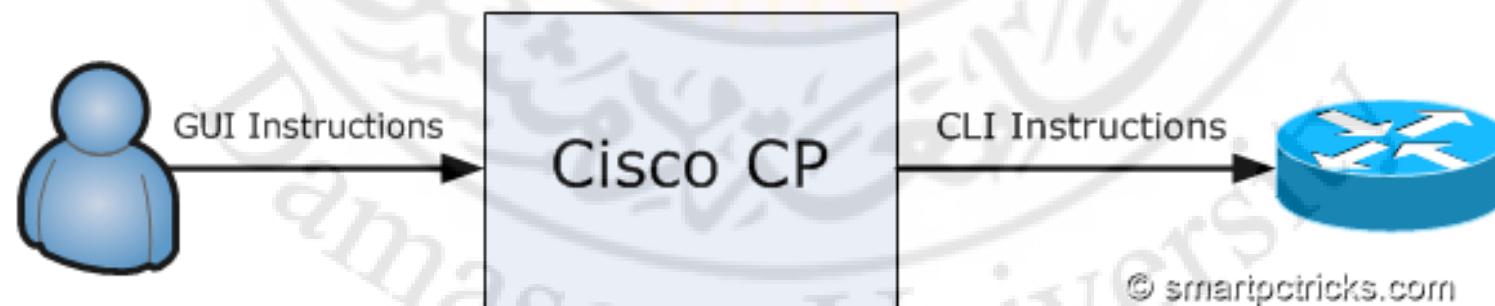
**Session 4:** Cisco Configuration Professional CCP



إعداد: م. غاندي هسام

# Introduction

- also called **CCP** or **Cisco CP**, it can be downloaded from Cisco website.
- Those who don't like CLI (Command Line Interface) may go for CCP, it's just awesome.
- CCP, the Cisco router configuration tool, delivers GUI interface to the administrator and converts the GUI instructions to configuration commands and updates the router.

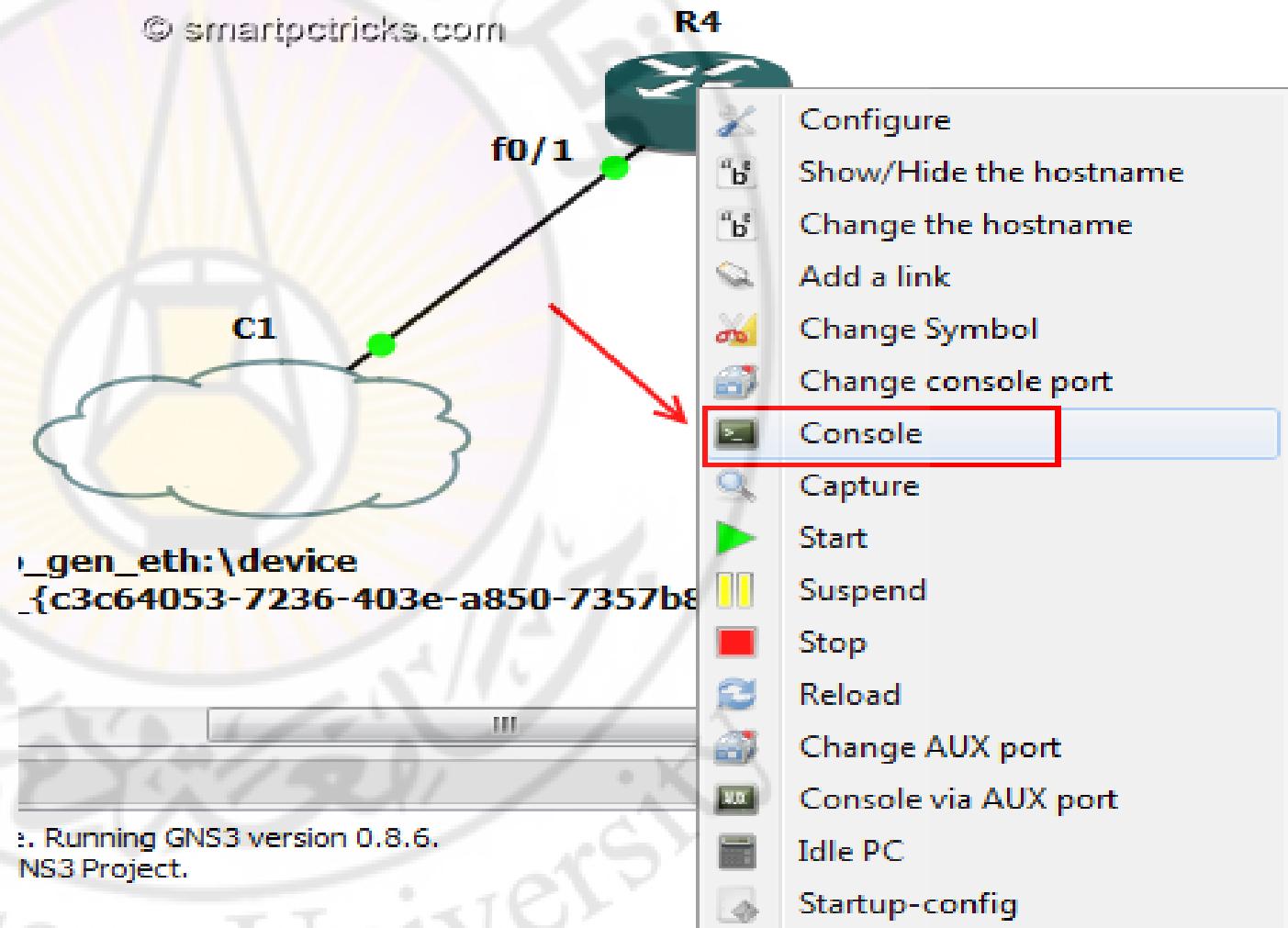


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# Setup CCP for GNS3 to configure Cisco routers

## Lab#3

- Install Microsoft LoopBack adapter in Windows and assign an IP address of **20.0.0.2/8** (you may use your own).
- Build a topology in GNS3, Before getting in to the CCP configuration.



- Enter the following commands in the router via console.
- These commands let Cisco router management software to get access the Router.

```
1. #ip http server  
2. #ip http secure-server  
3. #ip http authentication local  
4. #username user privilege 15 password 123  
5. Assign an IP to any interface (same range of loopback adapter)
```

```
R6#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R6(config)#ip http server
R6(config)#ip http secure-server
% Generating 1024 bit RSA keys, keys will be non-exportable... [OK]

R6(config)#
*Sep 8 16:31:15.207: %SSH-5-ENABLED: SSH 1.99 has been enabled
R6(config)#
*Sep 8 16:31:15.867: %PKI-4-NOAUTOSAVE: Configuration was modified. Issue "write mem

R6(config)#ip http authentication local
R6(config)#username user privilege 15 password 123
R6(config)#interface fastEthernet 0/0
R6(config-if)#ip address 20.0.0.1 255.0.0.0
R6(config-if)#no shutdown
R6(config-if)#
*Sep 8 16:32:47.207: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Sep 8 16:32:48.207: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0
R6(config-if)#

```

- Try to ping from your PC to the router interface 20.0.0.1

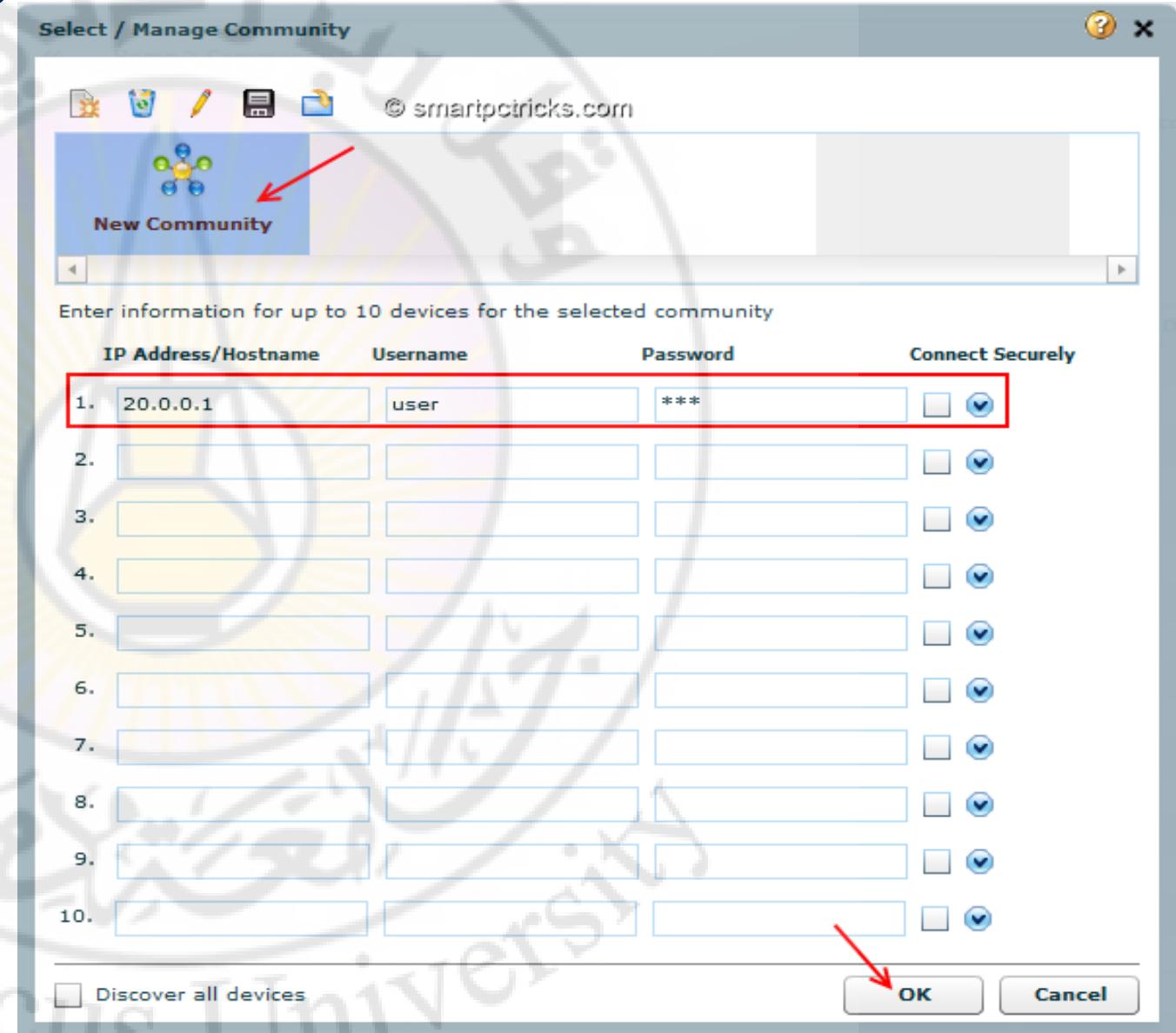
```
Administrator: Command Prompt  
Microsoft Windows [Version 6.1.7600]  
Copyright (c) 2009 Microsoft Corporation. All rights reserved.  
  
C:\Users\User>ping 20.0.0.1  
  
Pinging 20.0.0.1 with 32 bytes of data:  
Reply from 20.0.0.1: bytes=32 time=16ms TTL=255  
Reply from 20.0.0.1: bytes=32 time=18ms TTL=255  
Reply from 20.0.0.1: bytes=32 time=19ms TTL=255  
Reply from 20.0.0.1: bytes=32 time=21ms TTL=255  
  
Ping statistics for 20.0.0.1:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
    Approximate round trip times in milli-seconds:  
        Minimum = 16ms, Maximum = 21ms, Average = 18ms  
  
C:\Users\User>
```

- Launch Cisco Configuration Professional CCP.



# Build community in CCP

- Community window will open up. Enter the **IP address of the router interface** that you want to configure, with user name and password that you. Click OK.



- Now the router will be added to the community with ‘Not Discovered’ status. Click ‘Discover’ button.

Community Information

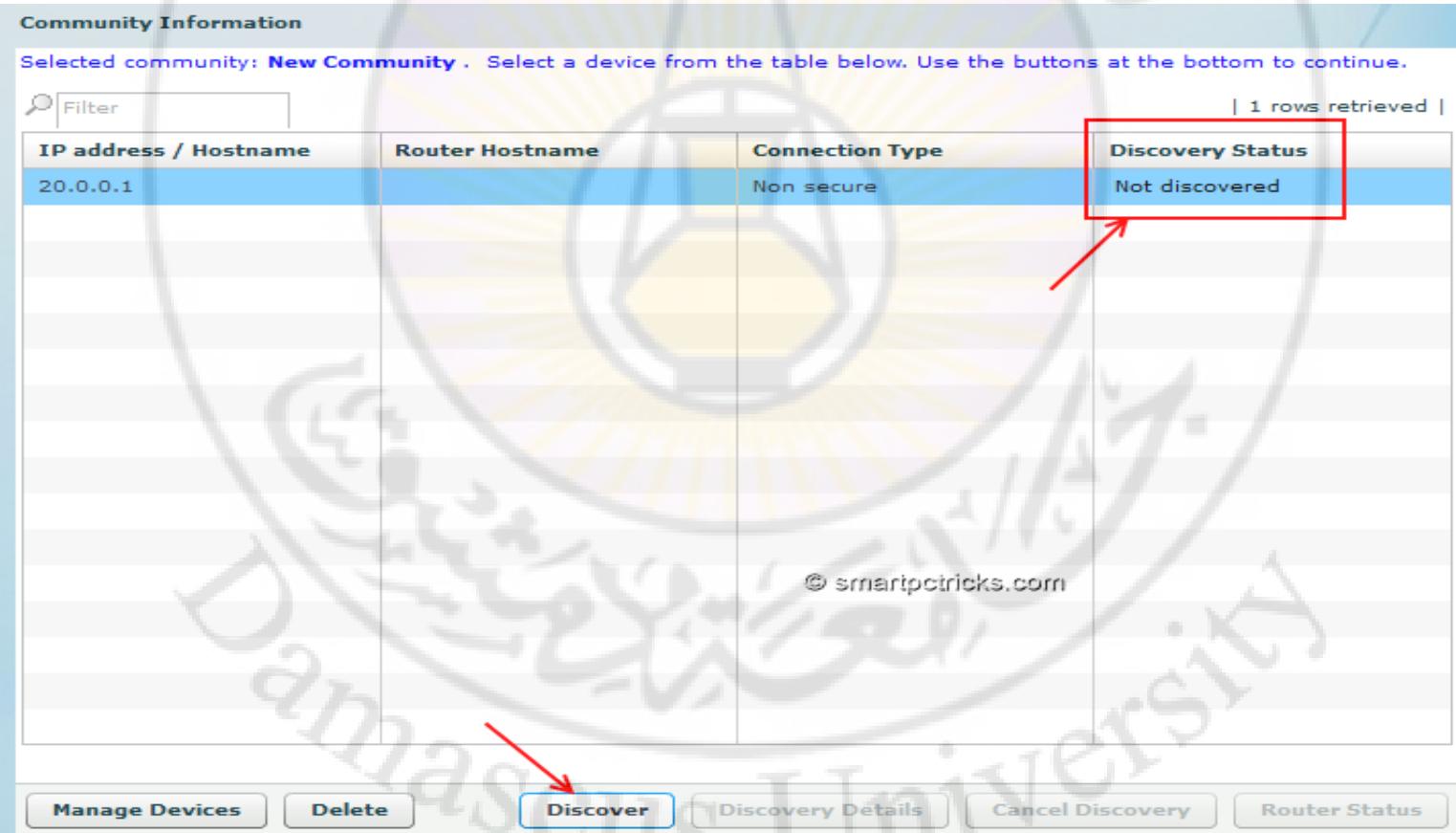
Selected community: New Community . Select a device from the table below. Use the buttons at the bottom to continue.

IP address / Hostname	Router Hostname	Connection Type	Discovery Status
20.0.0.1		Non secure	Not discovered

| 1 rows retrieved |

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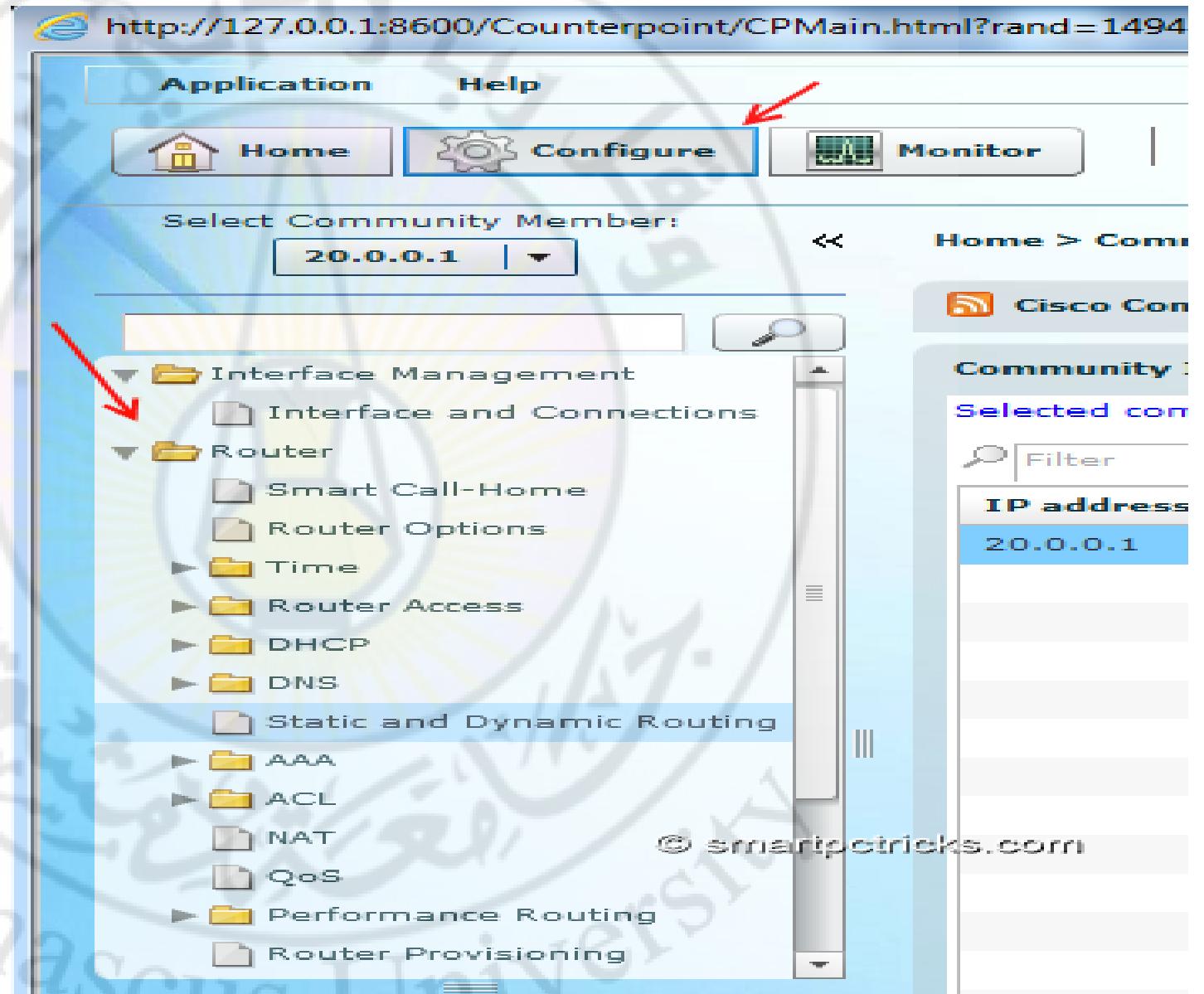
Manage Devices   Delete   **Discover**   Discovery Details   Cancel Discovery   Router Status



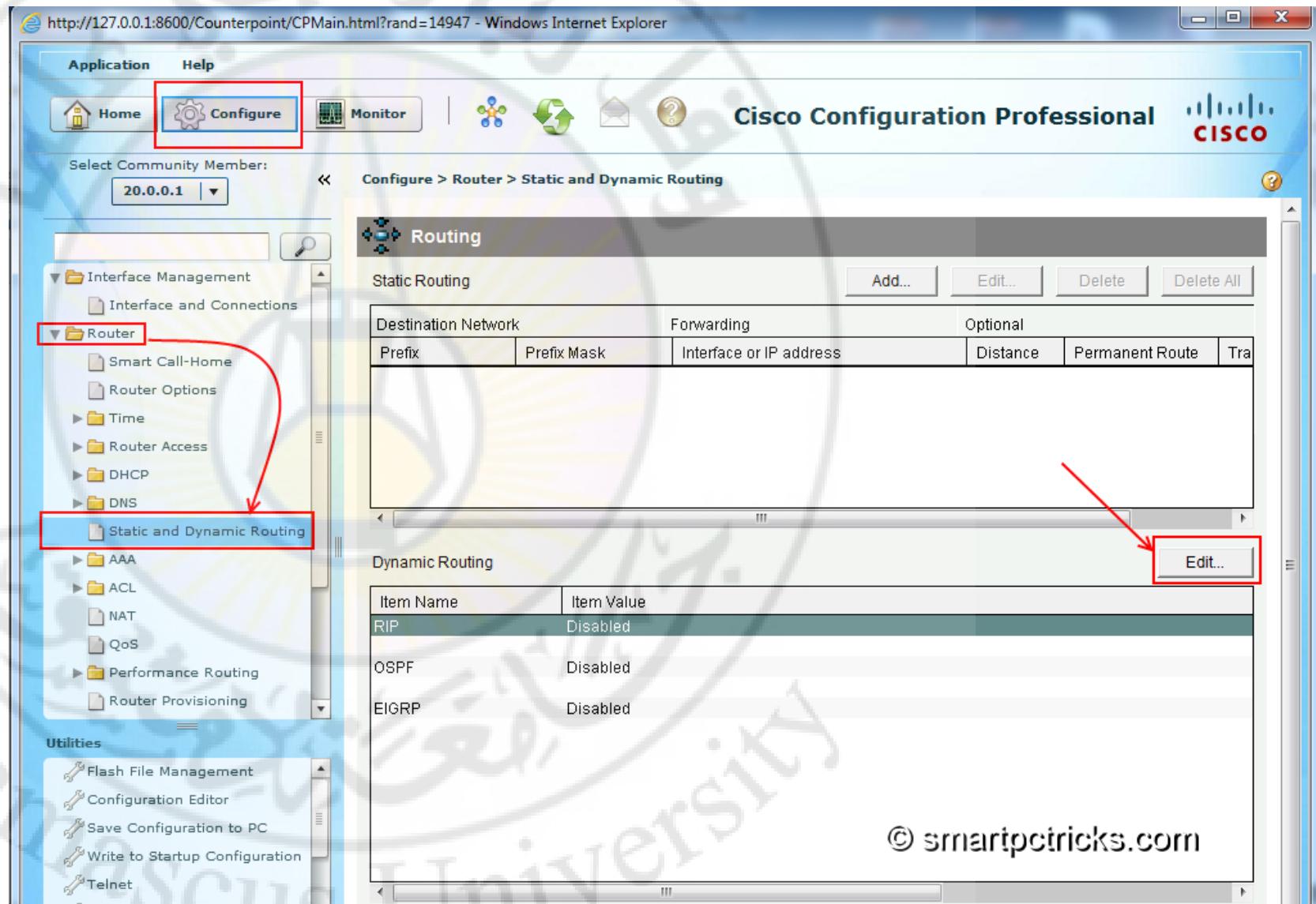
- Once discovered choose **Configure** button in the CCP window.

Community Information			
Selected community: New Community . Select a device from the table below. Use the buttons at the bottom to continue.			
IP address / Hostname	Router Hostname	Connection Type	Discovery Status
20.0.0.1	R6	Non secure	Discovered

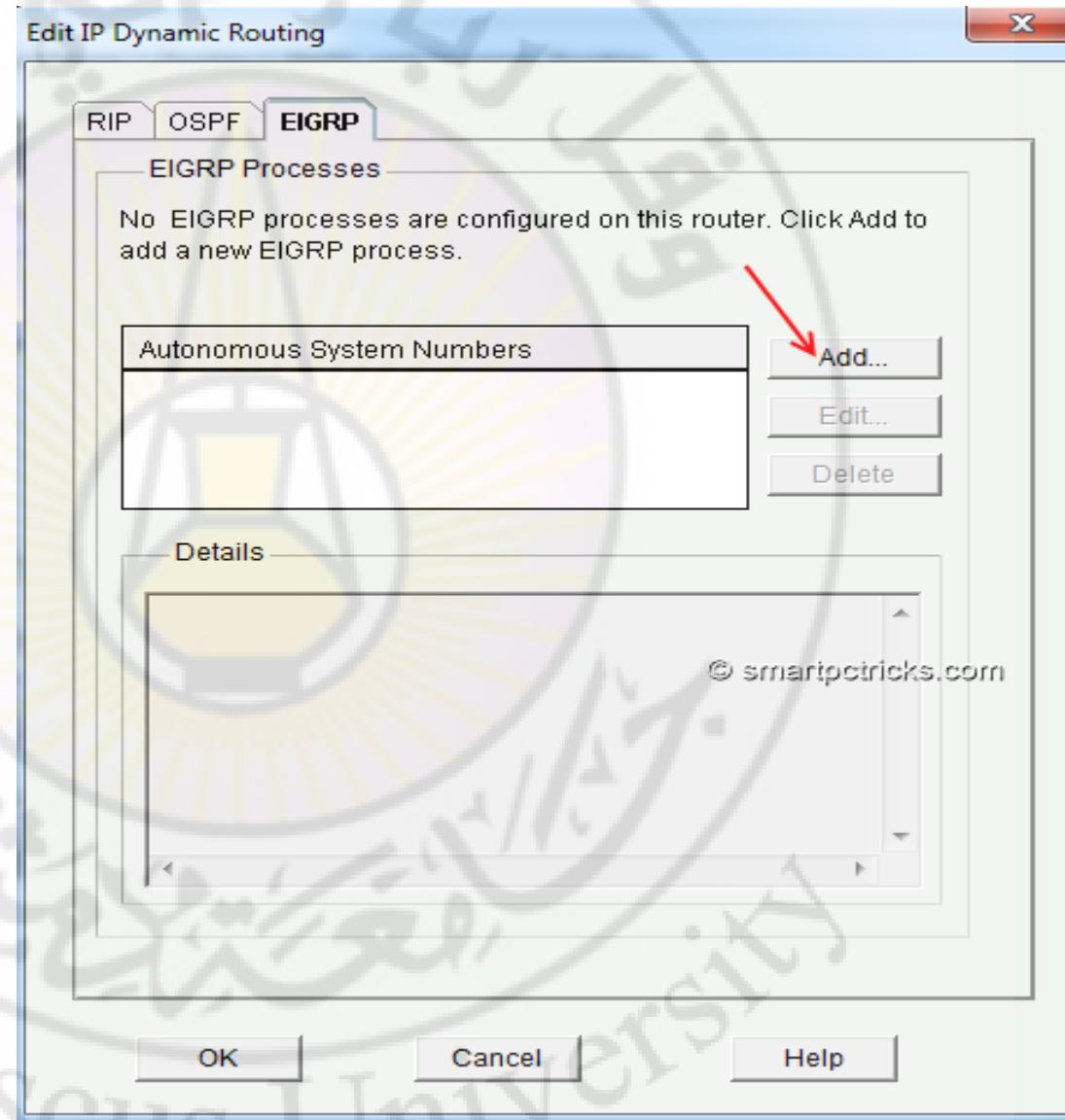
- Here you will see the entire supporting configuration for the specified router like a tree diagram.



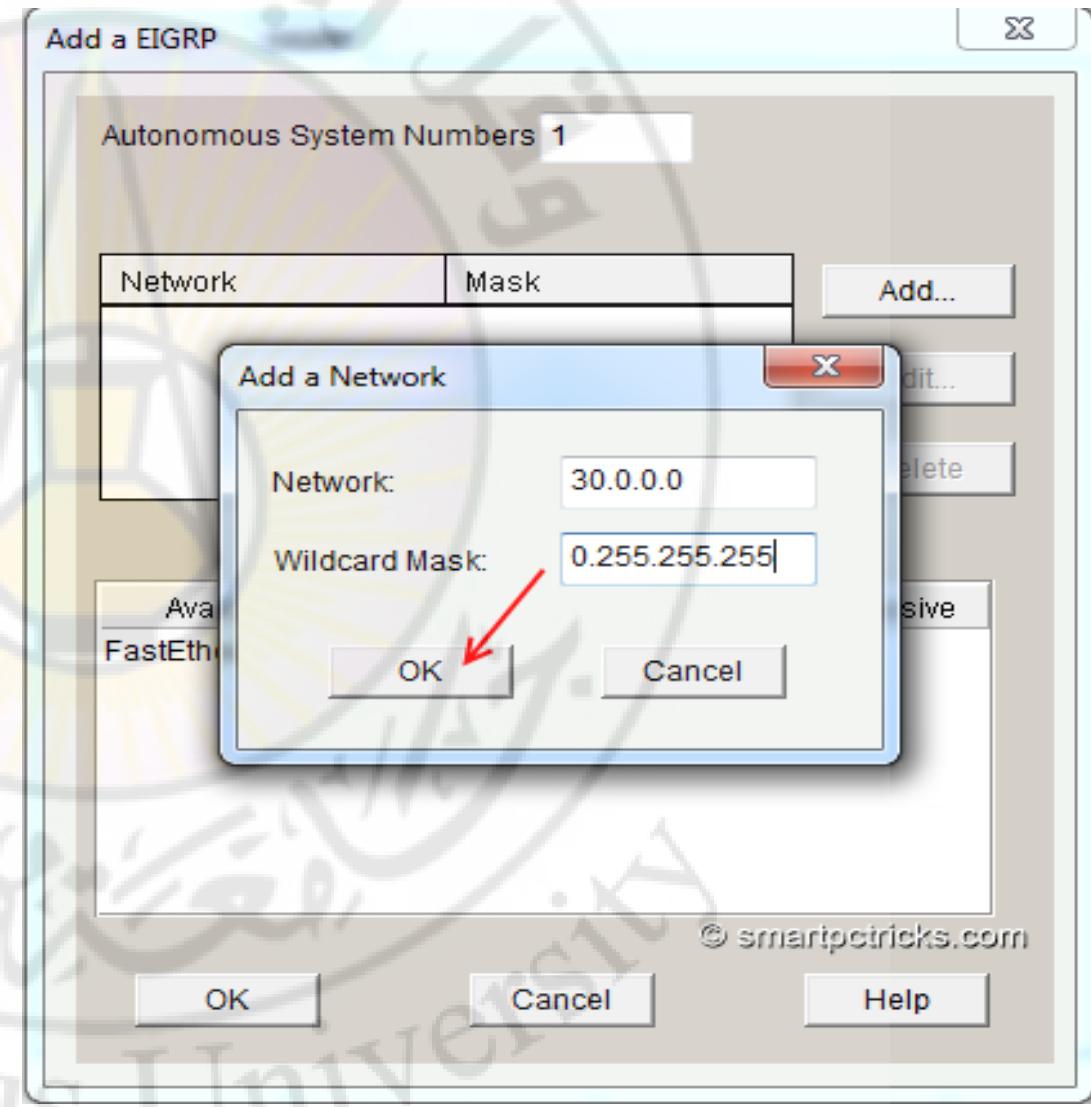
- I just selected '**Static and Dynamic Routing**' under Router tree.
- Our aim is to enable **Dynamic Routing EIGRP** in the router, so click **Edit** button near to the Dynamic Routing section.



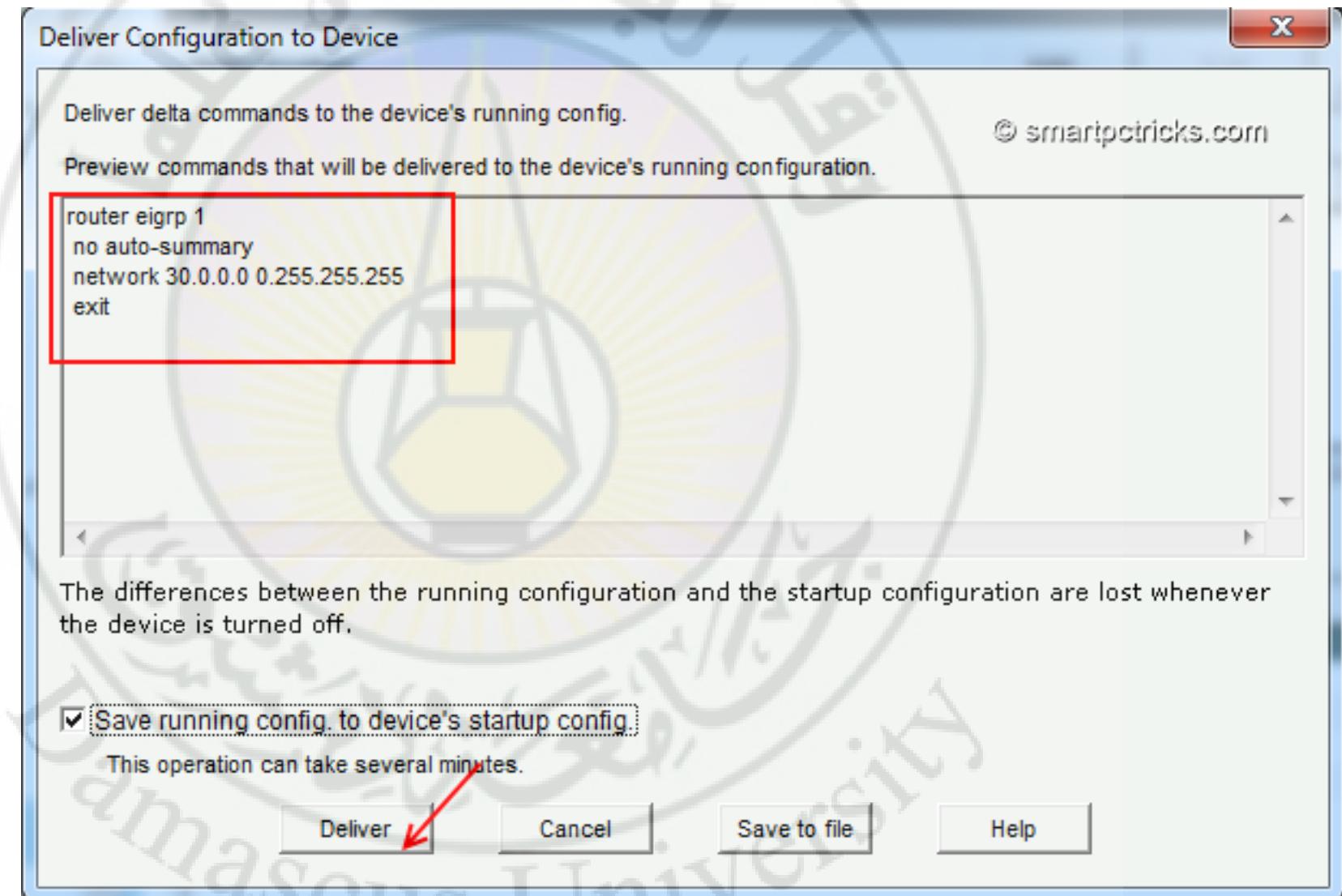
- Popup will give you **Edit IP Dynamic Routing** configuration window, choose **Add** button under EIGRP tab.



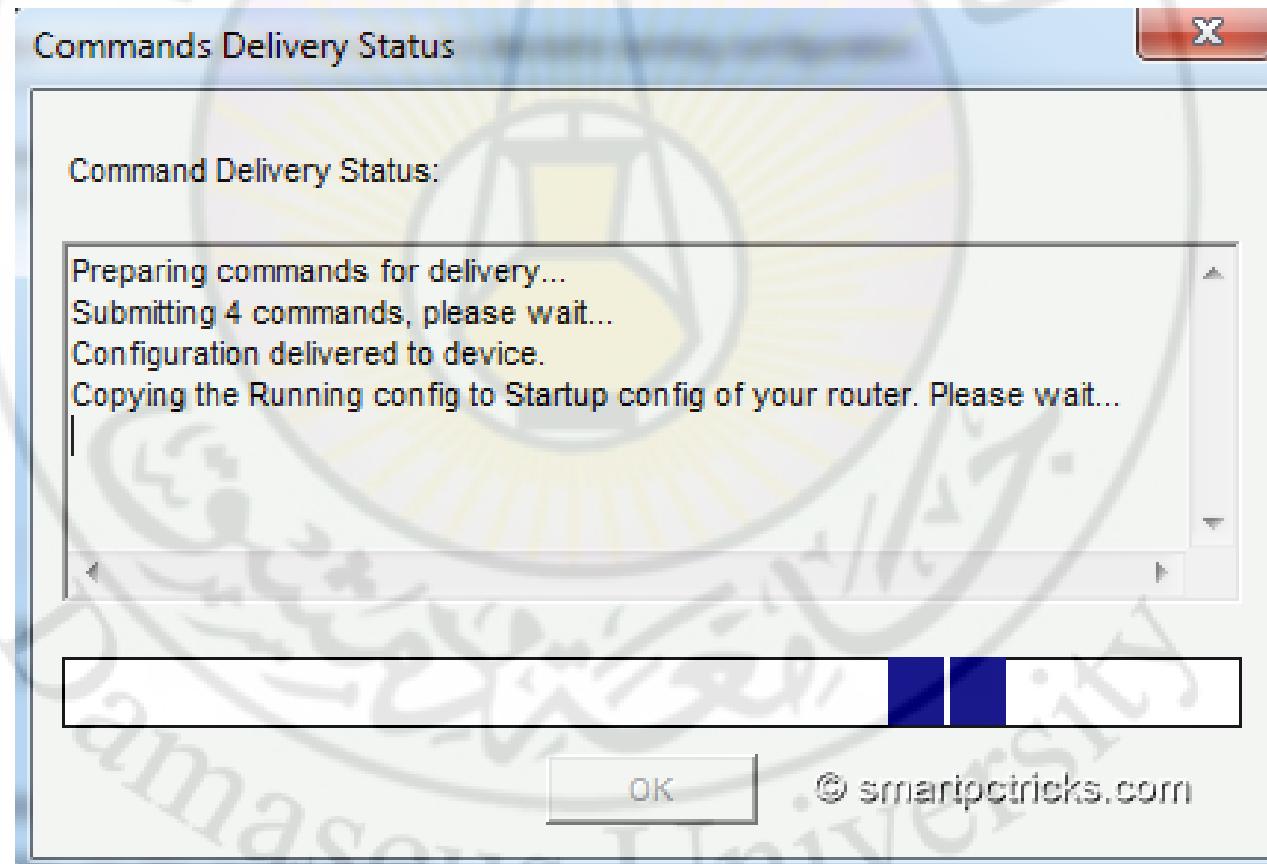
- Now we are at Add a EIGRP window, enter any **Autonomous System Number** (I entered 1), then click **Add Network** button. Enter the network **IP** with wildcard mask that you would like to **advertise via EIGRP**. Click **OK**.



- So next is to deliver the configuration to our router.



- Setback and relax while CCP deliver the commands to our device.

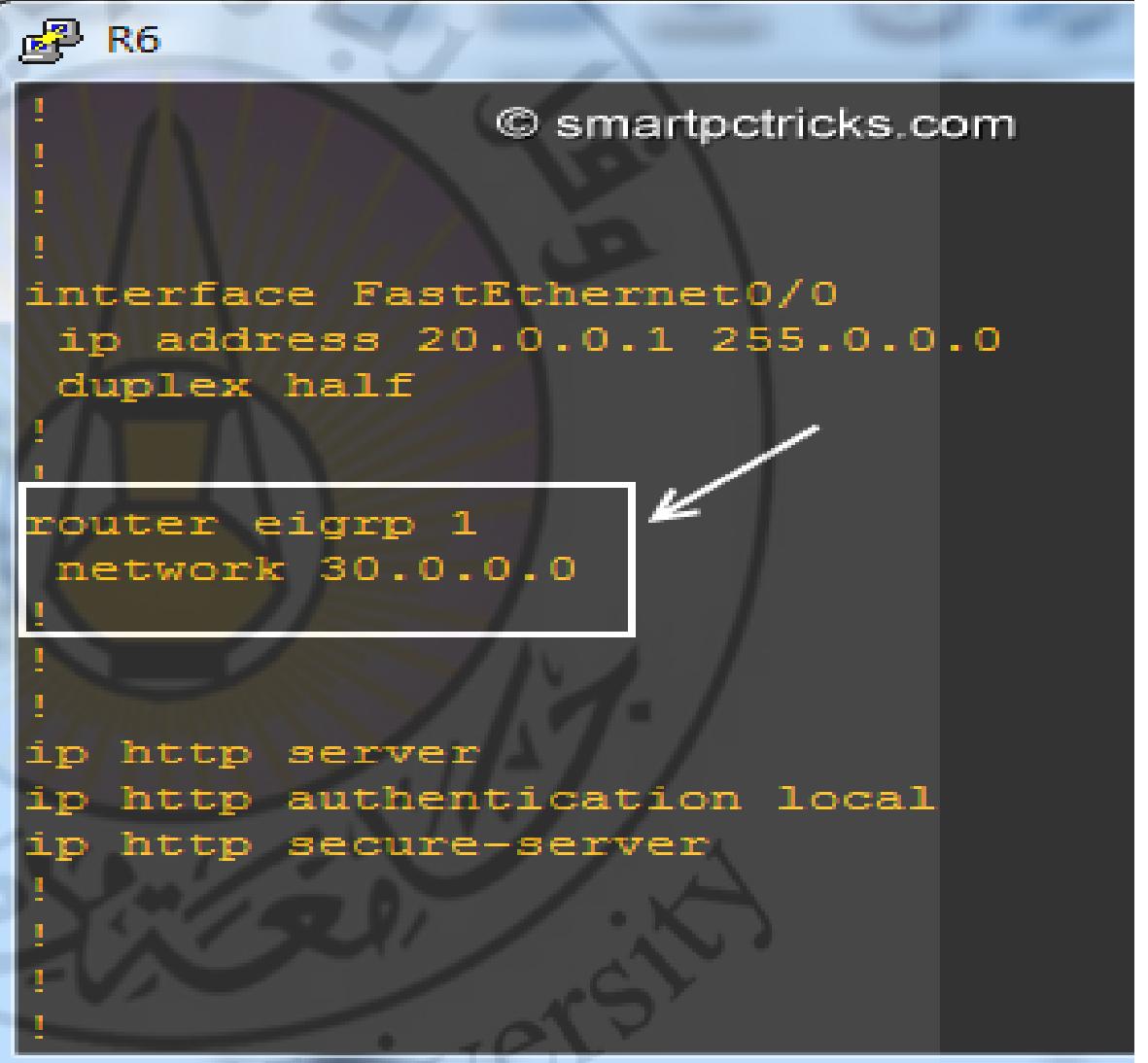


- After these steps you may see **EIGRP Enabled** in the Dynamic Routing section of CCP.

Dynamic Routing		<a href="#">Edit...</a>
Item Name	Item Value	
RIP	Disabled	
OSPF	Disabled	
EIGRP	Enabled	
Autonomous Sys Number	1	

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- Now let's go to Putty configuration and verify the configuration changes by entering '**show run**' command.



```
R6
!
interface FastEthernet0/0
 ip address 20.0.0.1 255.0.0.0
 duplex half
!
router eigrp 1
 network 30.0.0.0
!
ip http server
ip http authentication local
ip http secure-server
!
```

**End of Session 4**