VIRTUAL NETWORK BROKER USAGE GUIDE

Version 1.0

06/01/2017

1 ARCHITECTURE

Secure Monitoring is implemented as distributed architecture. Each node doing specific functions. SecMon EMS node handling configurations according to which SecMon filter's traffic. IPsec EMS node handling IPsec tunnel configurations which are created between SecMon and Analyzers VM. Both SecMon VM and Analyzers VM contain IPsec enforcer which fetch configurations from IPsec EMS server. Analyzer nodes have analyzers running to analyze the filtered traffic coming from SecMon node. Below visual representation of whole architecture is given.

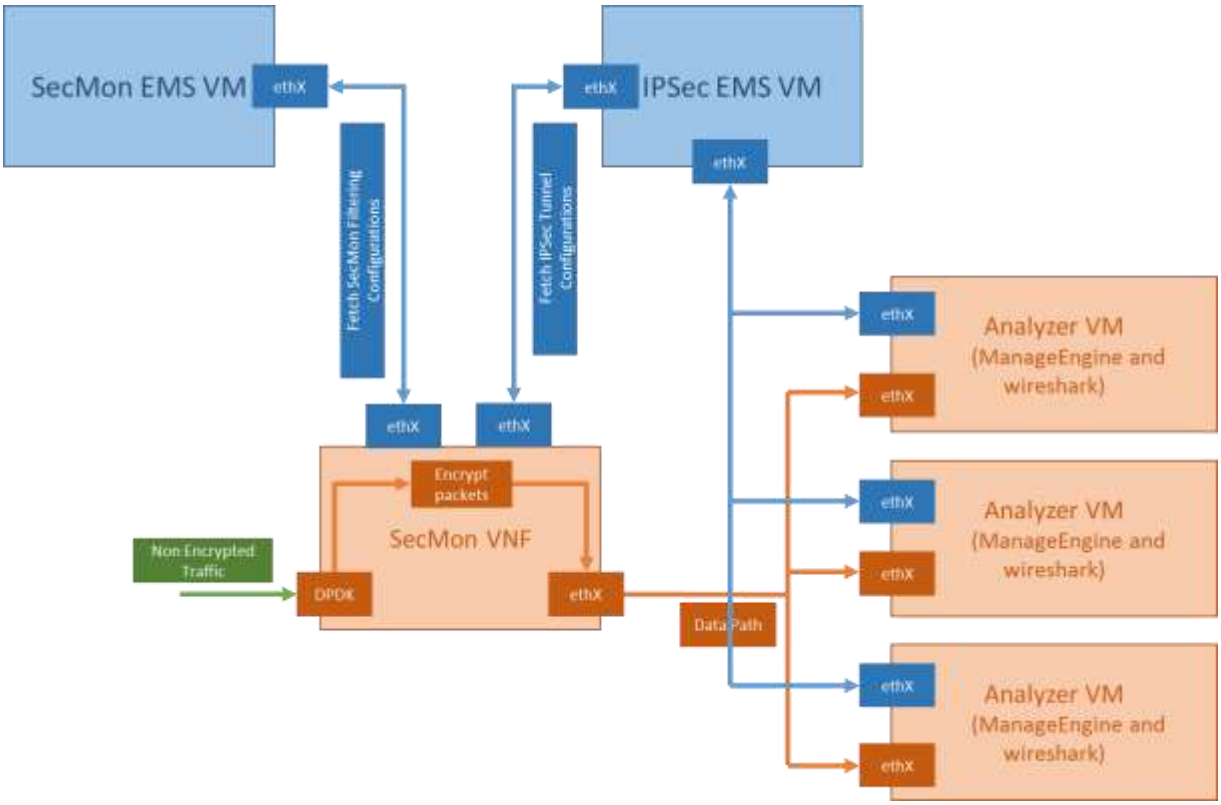


Figure 1 Secure Monitoring Architecture with IPsec Secure Tunneling

1.1 COMPONENTS

1.1.1 SECMON

- The SecMon VNF shall be responsible for all the monitoring/filtering services. The traffic monitoring can be classified based on the scope.
- SecMon VNF supports dynamic plugin architecture, which means, at any point in time, supported plugins can be added and it shall get added/taken into consideration in seamless manner. However it shall be possible to attach any third party plugins to introduce other monitoring protocols.
- SecMon VNF plugin once added, interacts with SecMon EMS system to fetch configurations. Plugins configurations are updated and deleted from Graphical User Interface of SecMon EMS, which interact with SecMon EMS server backend.

- SecMon VNF can also contain IPSec Enforcer to fetch IPSec tunnel configurations from IPSec EMS server. IPSec EMS server configurations are updated and deleted from Graphical User Interface of IPSec EMS, which interact with IPSec EMS backend.

Prerequisites for SecMon are:

1. Operating System **Ubuntu 14.04**.
2. Kernel version **3.13.0-32-generic.**
3. **DPDK** version **2.0.0.**

Prerequisites for installer script:

1. **Google repo tool** should be installed in standard path.
2. **GIT** should be installed.

Steps to install SecMon are given below:

1. Run the **vnb-main/vnb_components_installer.sh** installation script with **secmon_agent** as argument. This will fetch source code from Github repositories and install **secmon agent**.
2. Choose operations sequentially [Install dependencies, Build SecMon, Configure SecMon and Run SecMon].
    1) **Install Dependencies** will install all the required dependencies to run SecMon. This need to be done only once.
    2) **Build SecMon** will compile SecMon Agent and build all plugins shared library files.
    3) **Configure SecMon** will ask for configuration which are required by SecMon. If your configurations are not changing than this step is also required only once.
        i. **SecMon Egress Interface** is interface used by SecMon to send packets to Analyzers.
        ii. **SecMon Plugin server IP** is IP address used by server present inside plugins to communicate to SecMon EMS server.
        iii. **SecMon rawforward plugin server port** is port used by rawforward plugin server to communicate to EMS server.
        iv. **SecMon netflow plugin server port** is port used by netflow plugin server to communicate to EMS server.
        v. **EMS server IP** is IP address of SecMon EMS server.
        vi. **EMS server Port** is port of SecMon EMS server.
        vii. **EMS server Scope** is namespace of which filtering configurations particular instance of SecMon interested in.
        viii. **Interface to be bound to DPDK** is interface that is going to bind to DPDK for packet reception.
    4) **Run SecMon** will run SecMon according to configuration provided in previous step.

1.1.2 SECMON EMS

- SecMon EMS is central entity responsible for configuring all the SecMon VNF for specific tenant network and maintains the database for each SecMon VNF
- SecMon EMS can be executed inside the VM.
- It shall expose the REST APIs to receive the SecMon EMS configurations from configuration management interface i.e., CLI / GUI and maintains them in the database.
- It interacts with SecMon VNF over the REST based interface.
- SecMon EMS uses single instance consul DB (bootstrap mode) database for storing Plugins configurations.

Prerequisites for installer script:

1. **Google repo tool** should be installed in standard path.
2. **GIT** should be installed.

Steps to install SecMon EMS are given below:

1. Run **vnb-main/vnb_components_installer.sh** bash script with **secmon_ems** as argument. This will fetch source code of **secmon ems** from Github repositories and install it.
2. Choose operations sequentially [Install Dependencies and Run SecMon EMS]
    1) **Install Dependencies** will install all the required dependencies to run SecMon EMS. This need to be done only once.
    2) **Run SecMon EMS** will run SecMon EMS server in background.
3. Open web browser and go to **http://localhost:9082/maas/** to access GUI.

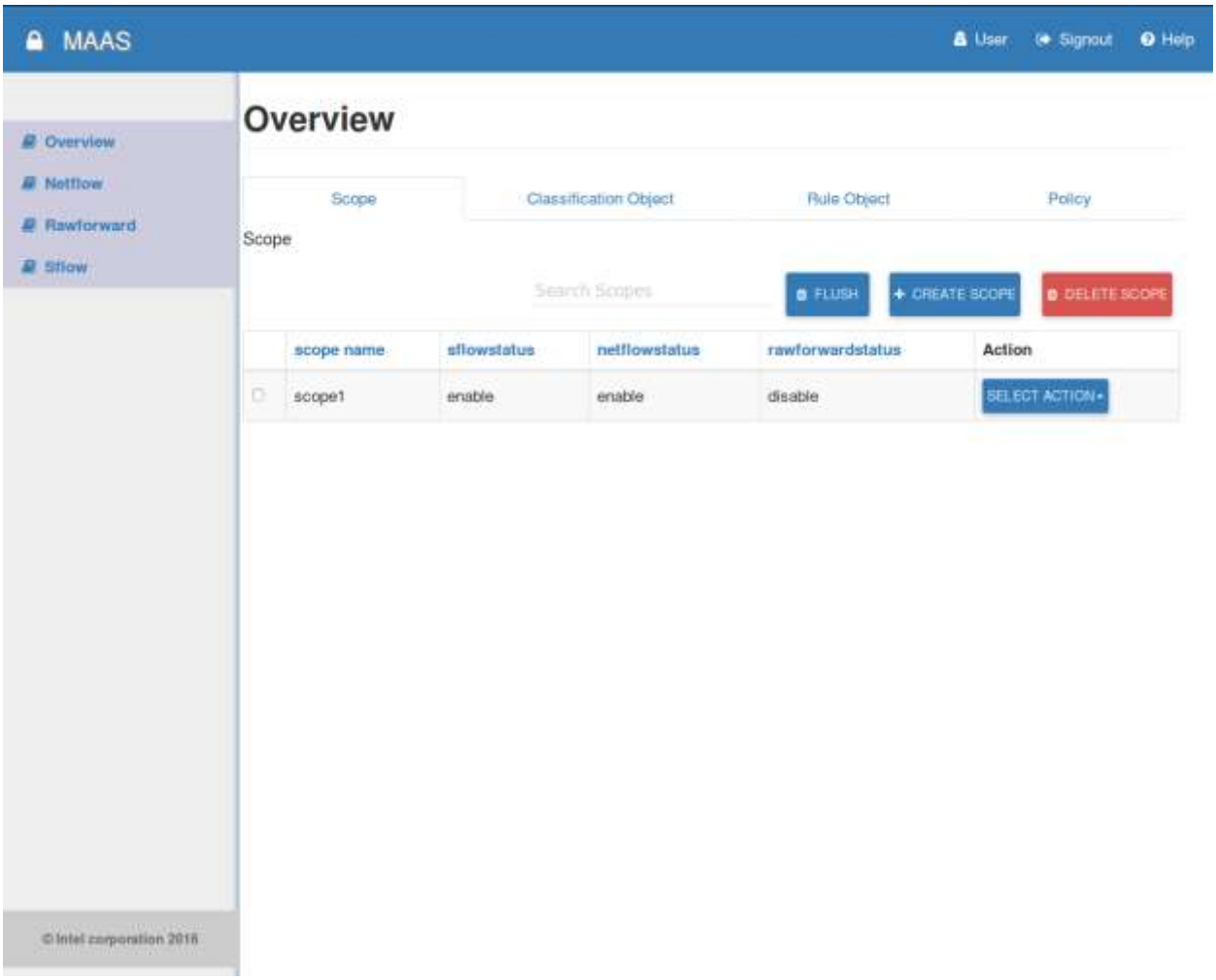
SecMon EMS GUI has four subsections **Overview Management, Rawforward Management, Netflow Management and SFlow Management.**

1.1.2.1 OVERVIEW MANAGEMENT

Traffic filtering configurations are mentioned in this section. This section is divided into subsections **scope, classification object, rule object and policy.**

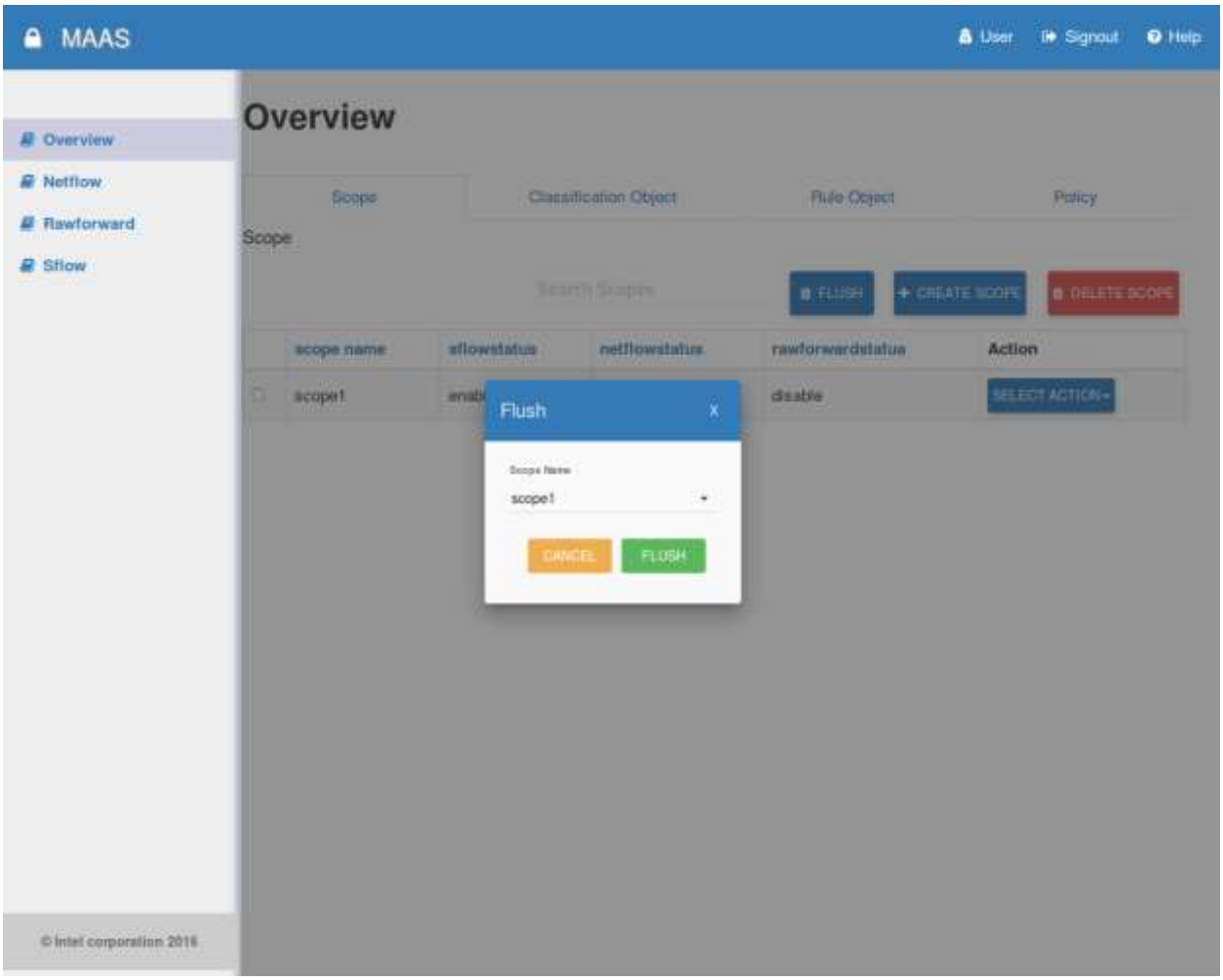
1.1.2.1.1 Overview > Scope

We can have many SecMon instances running with different filtering configurations and each instance is differentiated basis on **scope.**



1.1.2.1.2 Overview > Flush

Flush provide the functionality to trigger configurations update on SecMon plugin servers. Changing configurations on EMS Graphical user interface will only effect when that particular scope configurations are **flushed.**


MAAS
User
Signout
Help
Overview
Netflow
Rawforward
Sflow
Overview
Scope
Classification Object
Rule Object
Policy
Scope
FLUSH
CREATE SCOPE
DELETE SCOPE
scope name
sflowstatus
netflowstatus
rawforwardstatus
Action
scope1
disable
SELECT ACTION
Flush
X
Scope Name
scope1
CANCEL
FLUSH
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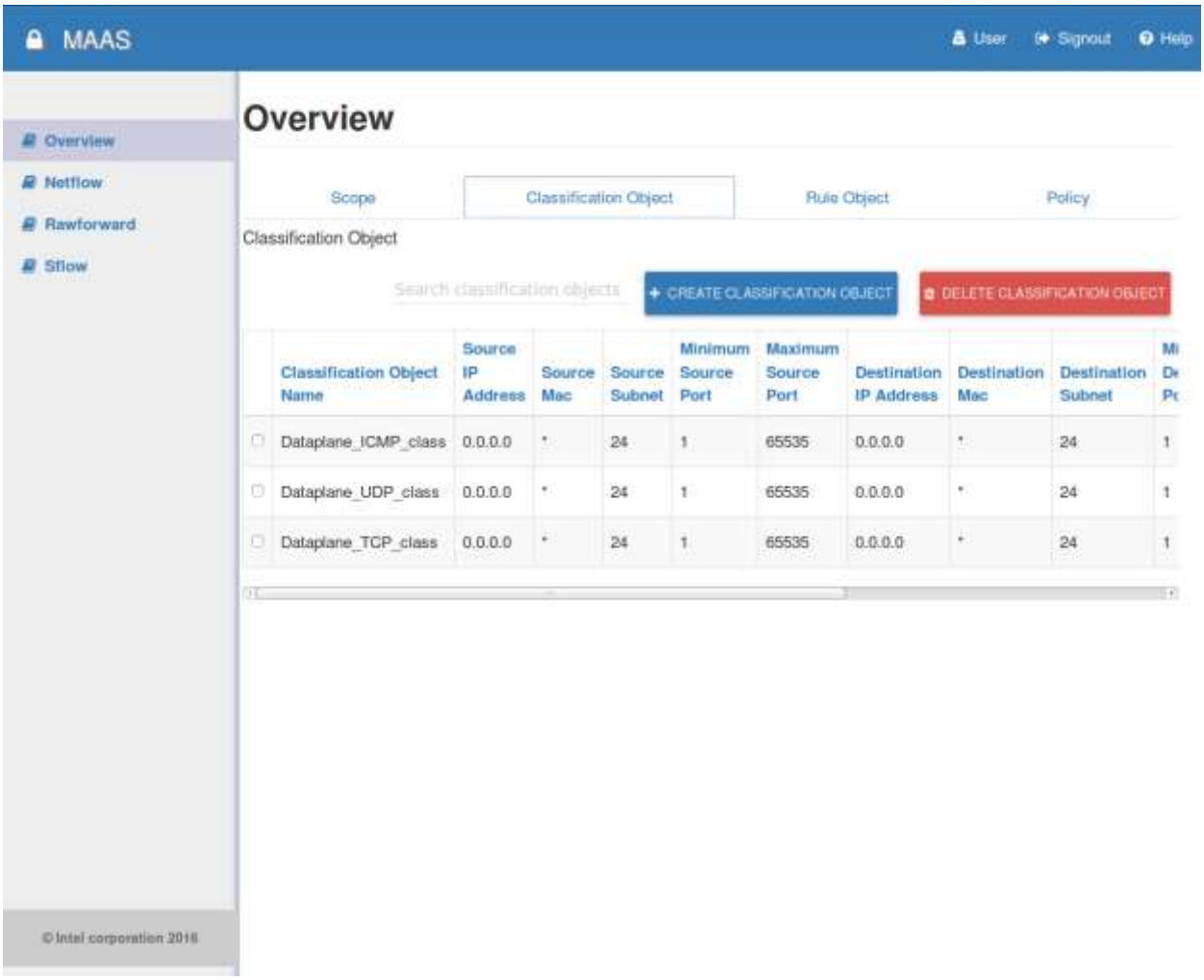
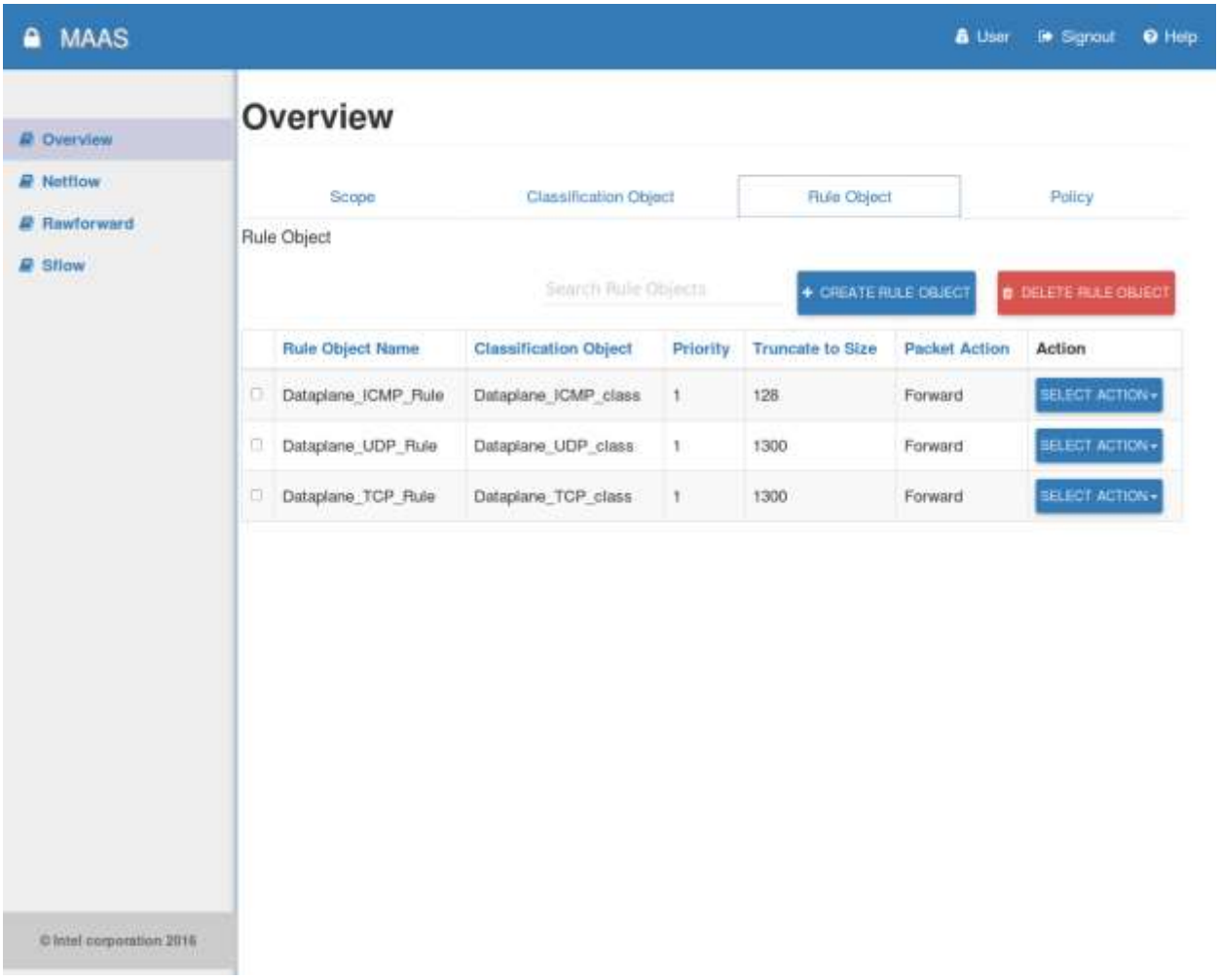
1.1.2.1.3 Overview > Classification Object

Classification Object manage all the traffic filtering configurations. According to these configurations SecMon classify the incoming traffic. We mention configurations to match traffic in which we are interested.



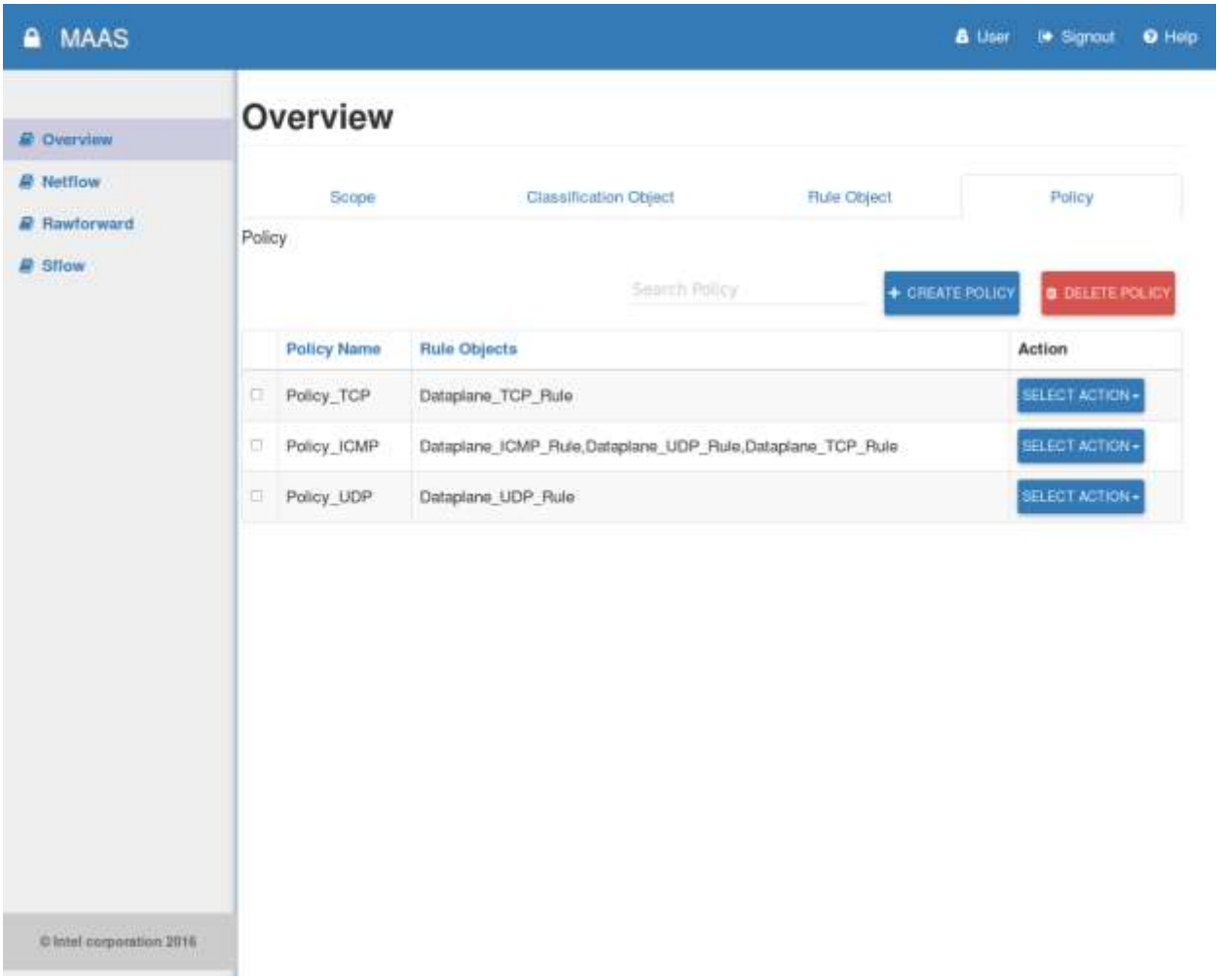
1.1.2.1.4 Overview > Rule Object

Rule Object created in this view is associated with **Classification Object** section and is configured to **drop or forward traffic.** So we can decide which traffic we want to Analyze and which not. This provide fine grain control over filtering criteria.



1.1.2.1.5 Overview > Policy

Policy is group of **rules**. Rules created in **rule object** subsection are grouped together to create filtering configurations. Policy is then associated with **Collectors or Collector Sets** of plugins.

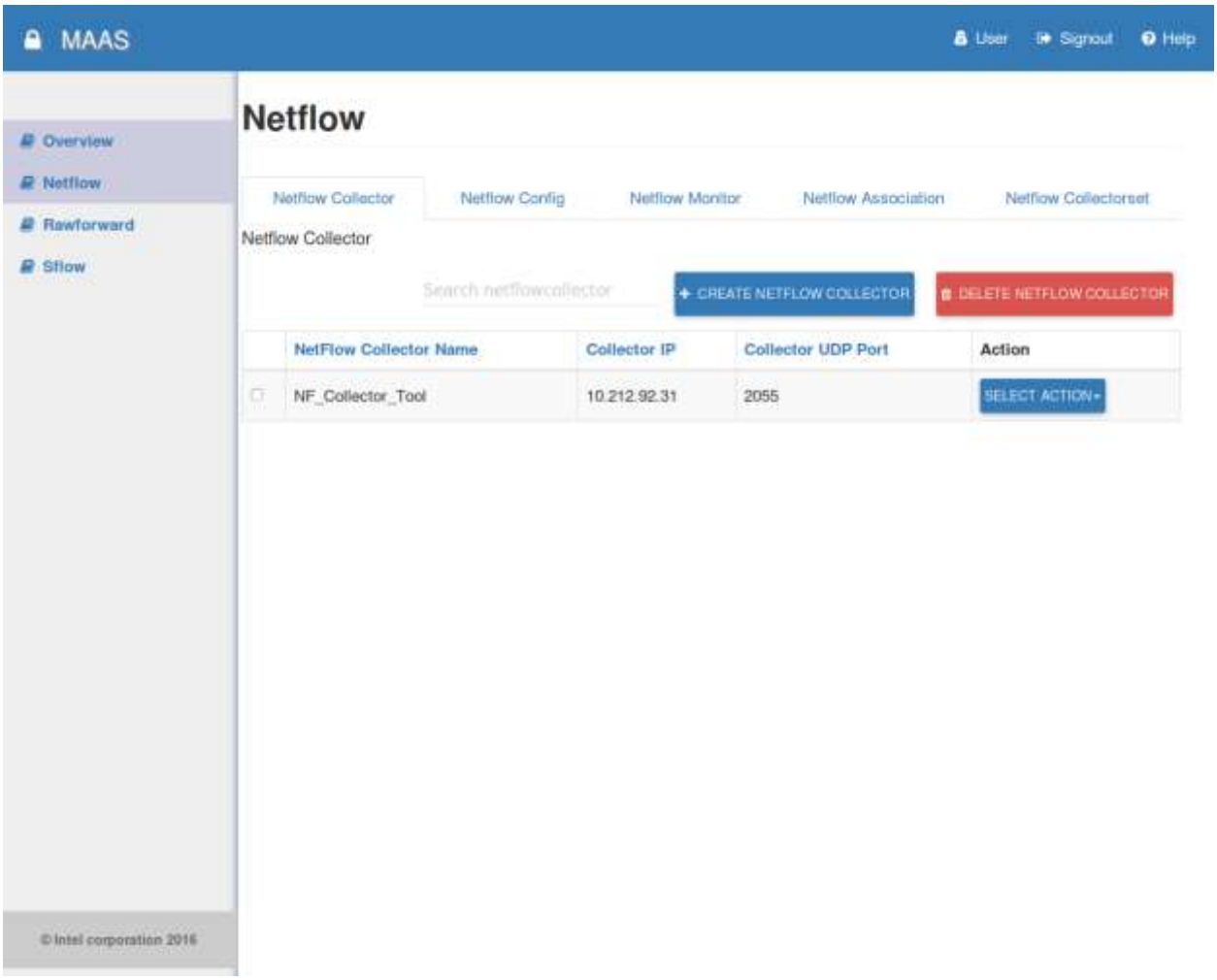


1.1.2.2 NETFLOW MANAGEMENT

Netflow plugin configurations are mentioned in this section. Netflow management is divided into subsections **collector, config, monitor, association and collector set.** Each subsection is handling specific configurations related to Netflow plugin.

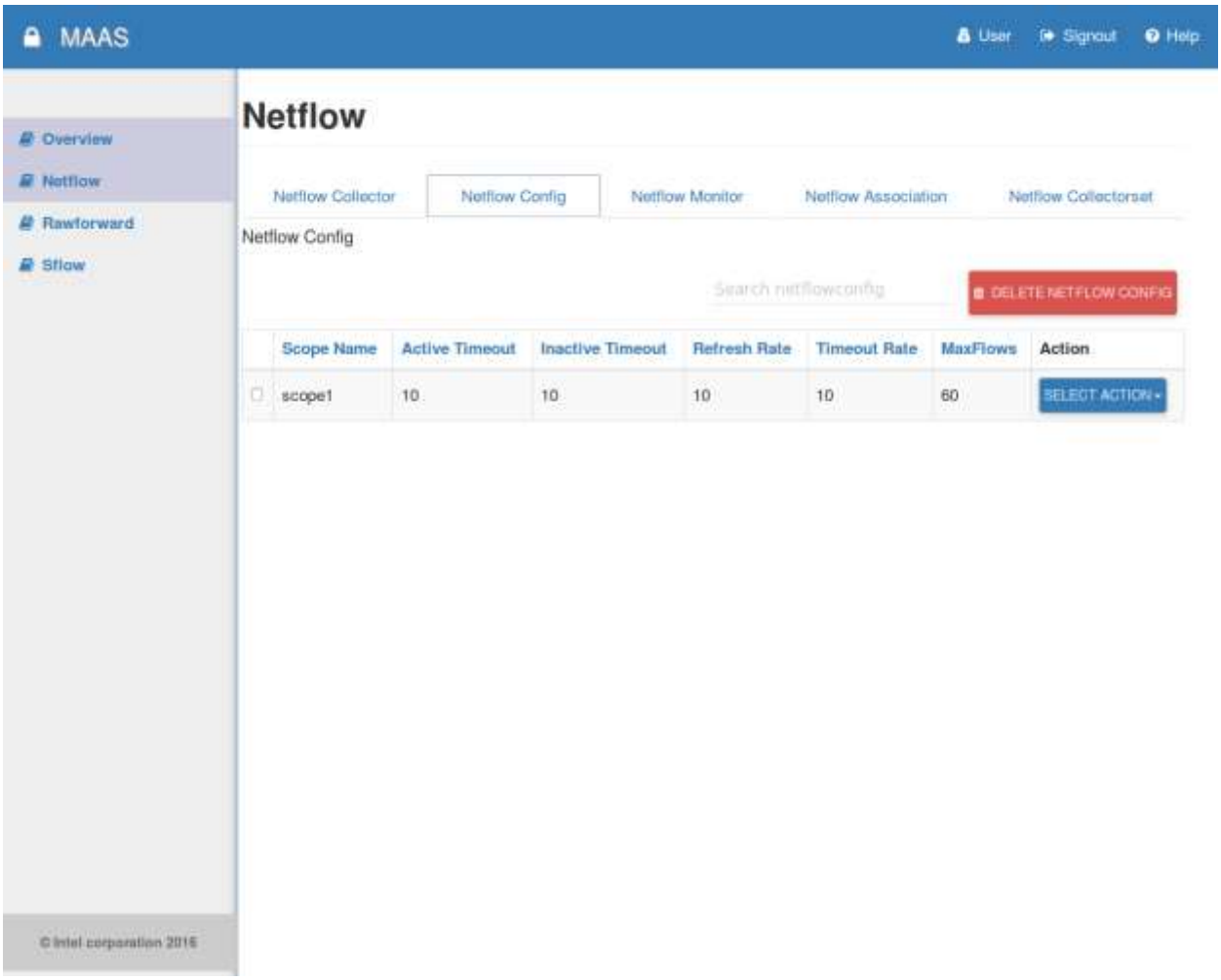
1.1.2.2.1 NetFlow > NetFlow Collector

Netflow collector field manages configurations related to the collectors (or Analyzers) which going to receive Netflow traffic. **IP address and Port** combination is used to identify individual collector. Netflow collectors generally uses **port 2055.**



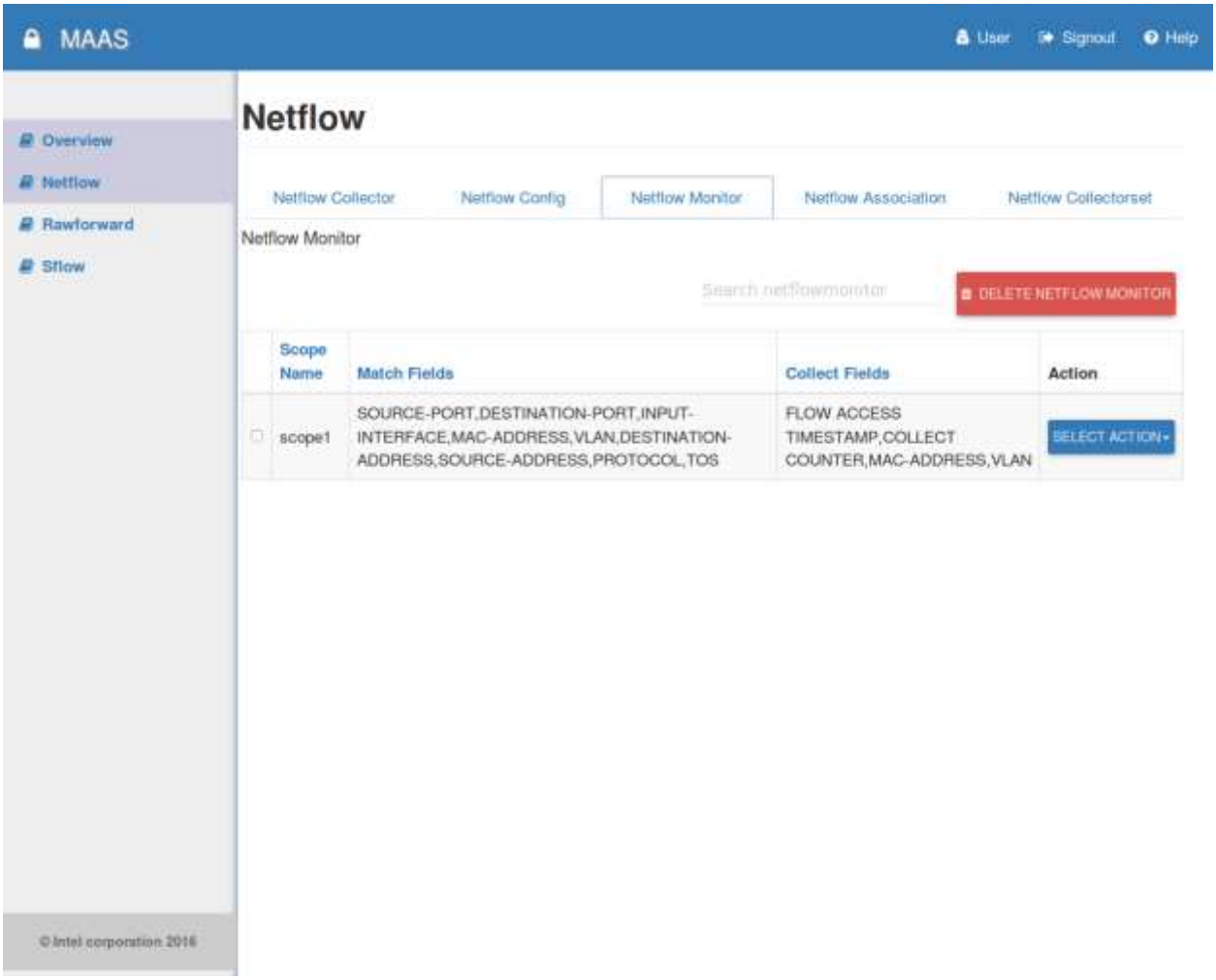
1.1.2.2.2 NetFlow > NetFlow Config

Netflow Config manages Netflow configurations. **Active timeout** field manages how long after which active traffic should be exported. **Inactive timeout** field manages how long after which non active traffic should be exported. Similarly, other fields manage Netflow related configurations.



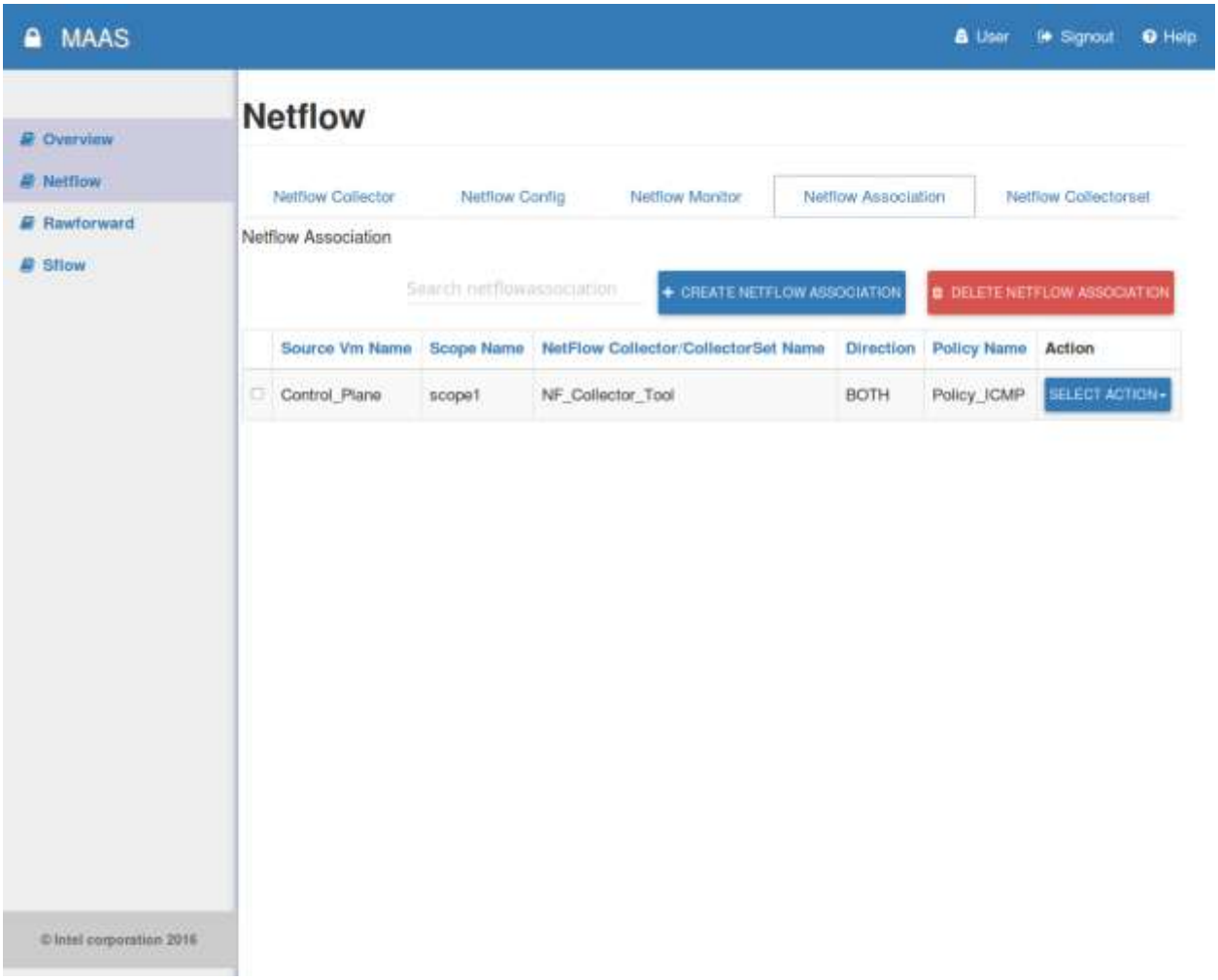
1.1.2.2.3 NetFlow > NetFlow Monitor

Netflow Monitor manages Netflow monitoring configurations. **Match fields** are key fields of packet such as source/destination IP address, source/destination ports and protocol which decide if packet resemble some other packet, on the basis of this unique flows are created. **Collect fields** are non-key fields of packets such as TCP flags, subnet masks and packets but are collected anyways and exported in netflow flow.



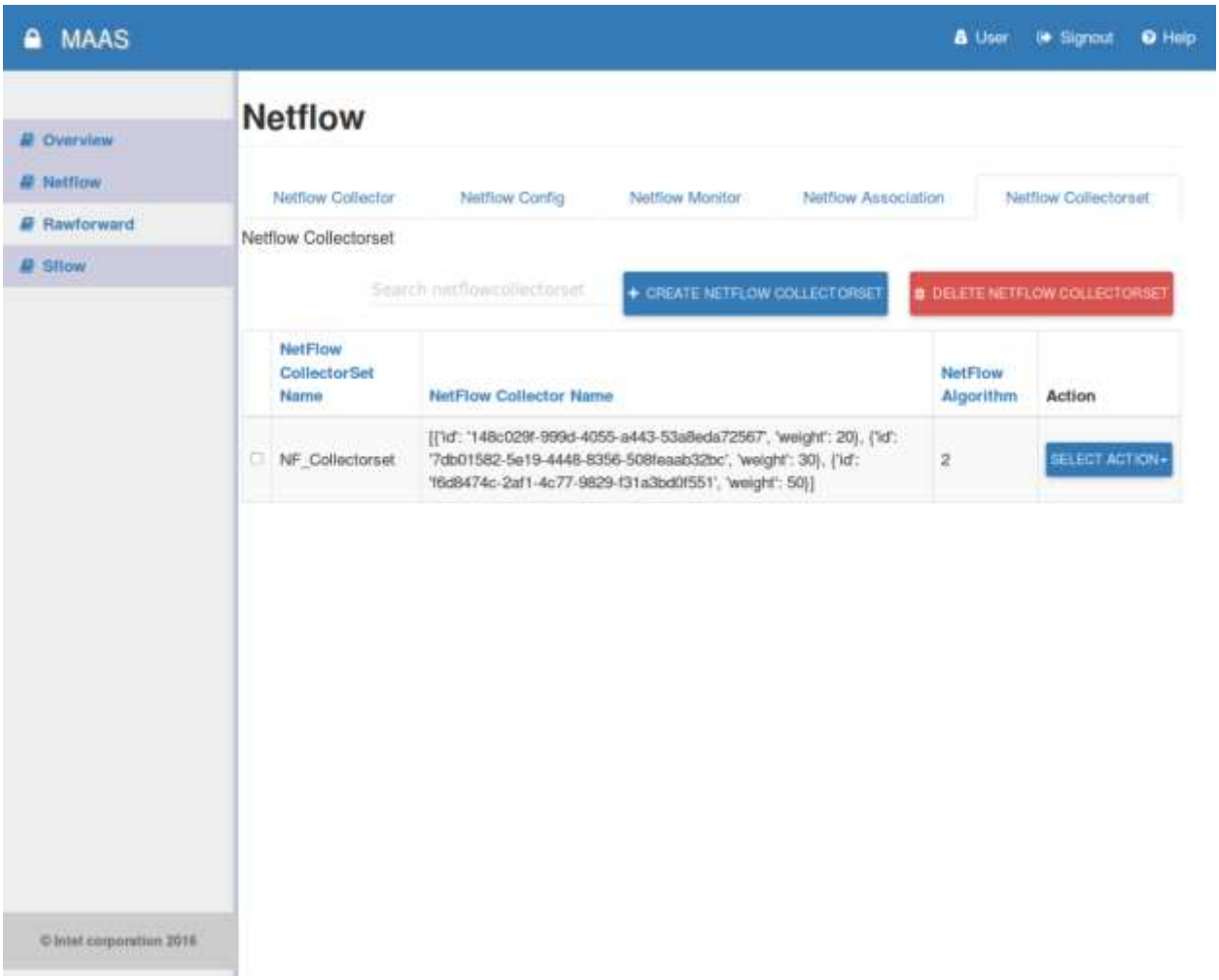
1.1.2.2.4 NetFlow > NetFlow Association

Netflow Association creates association between **Netflow collector and policy** for specific **scope**. Collector only receives traffic according to filtering configurations mentioned in **policy**.



1.1.2.2.5 NetFlow > NetFlow CollectorSet

Netflow collectorset manages collector set's configurations. Plugins support load balancing between different collectors. Load balancing happen by creating set of collectors. Traffic is divided among these collectors on the basis of load balancing algorithms. Currently **round-robin, session based and weighted round robin** algorithms are implemented for load balancing.

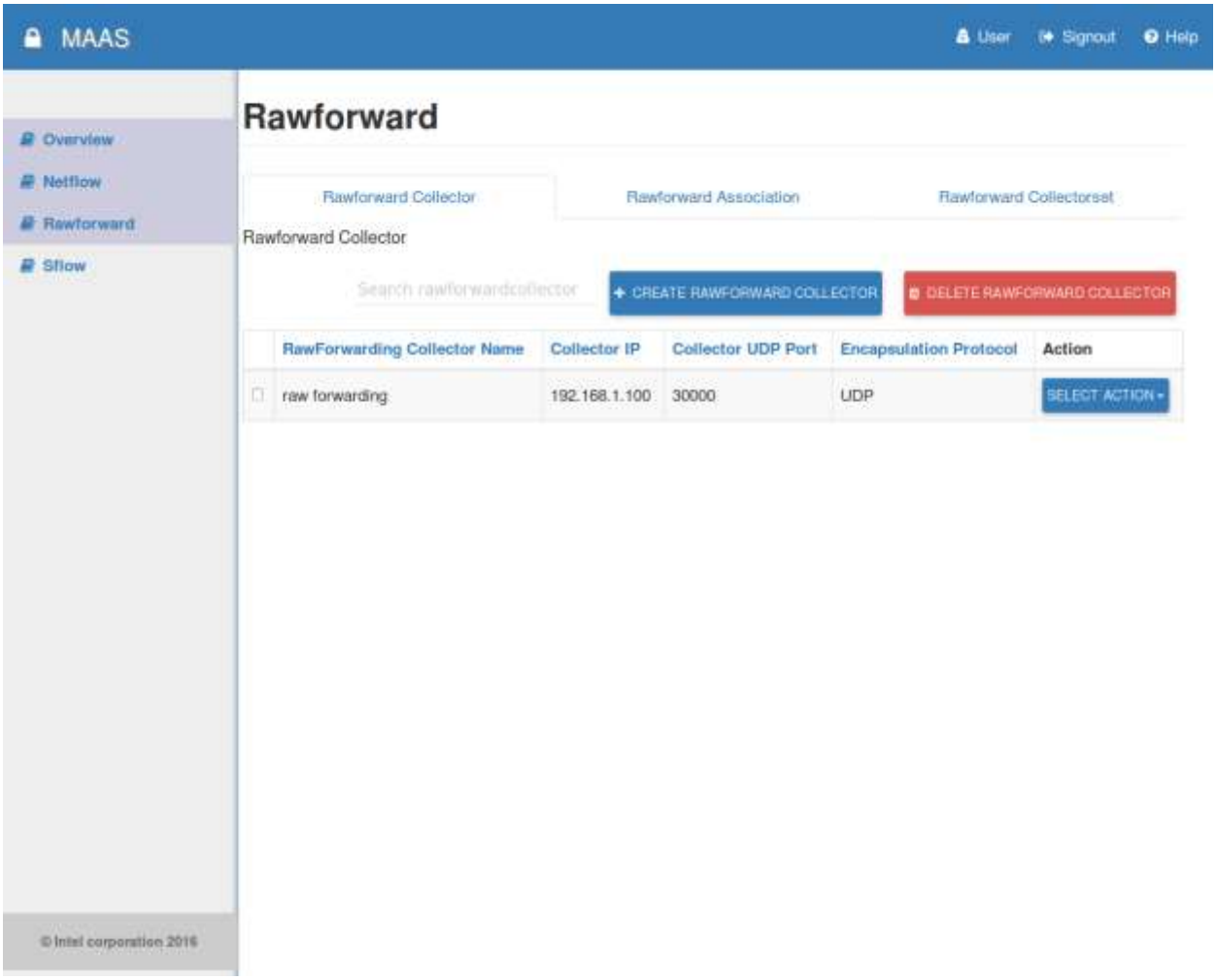


1.1.2.3 RAWFORWARD MANAGEMENT

Rawforward Management manages Rawforward plugin related configurations.

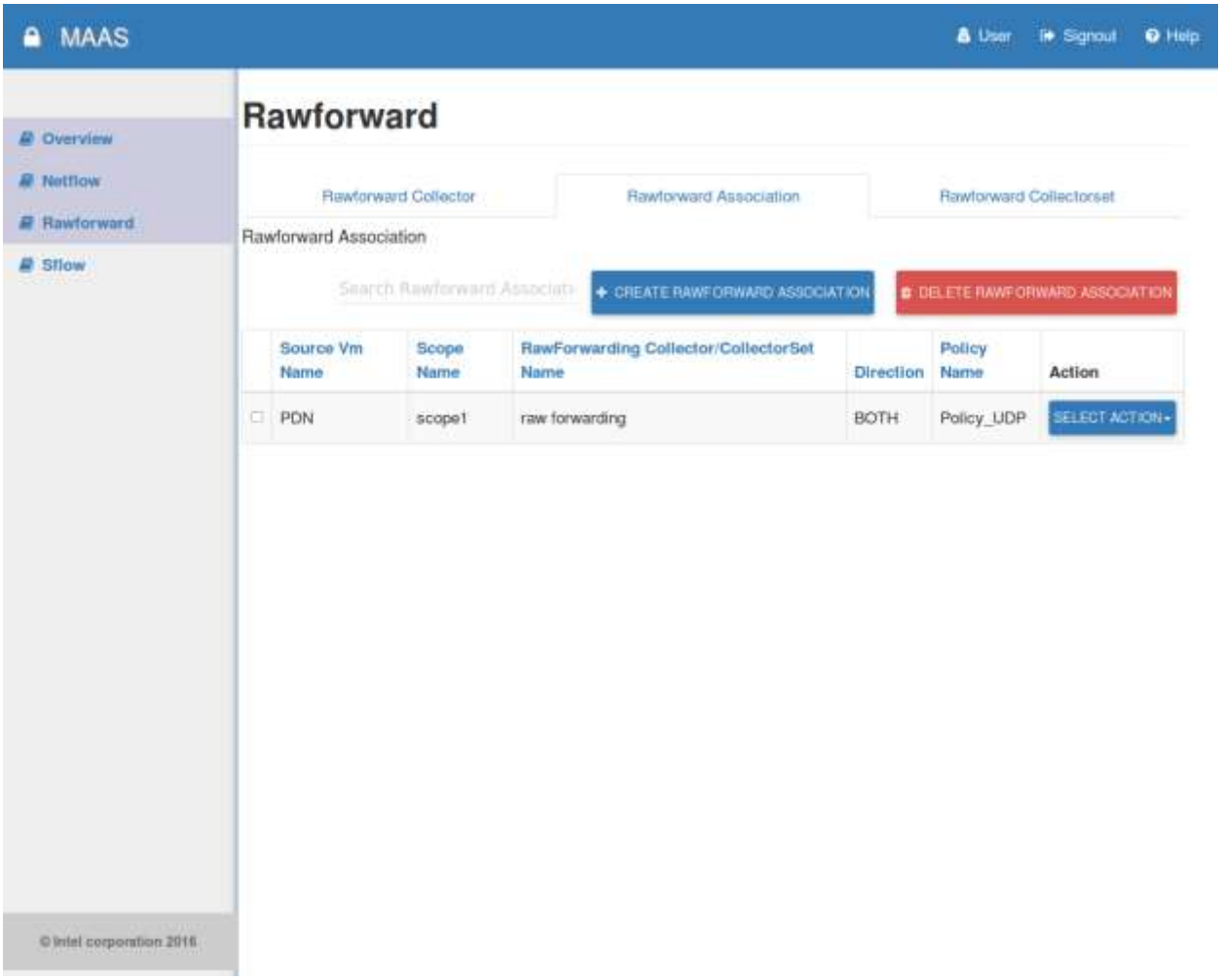
1.1.2.3.1 RawForward > RawForward Collector

Rawforward Collector section manages configurations related to collector. **IP address and Port** combination is used to identify individual Collector (or Analyzer) where traffic should go for being analyzed.



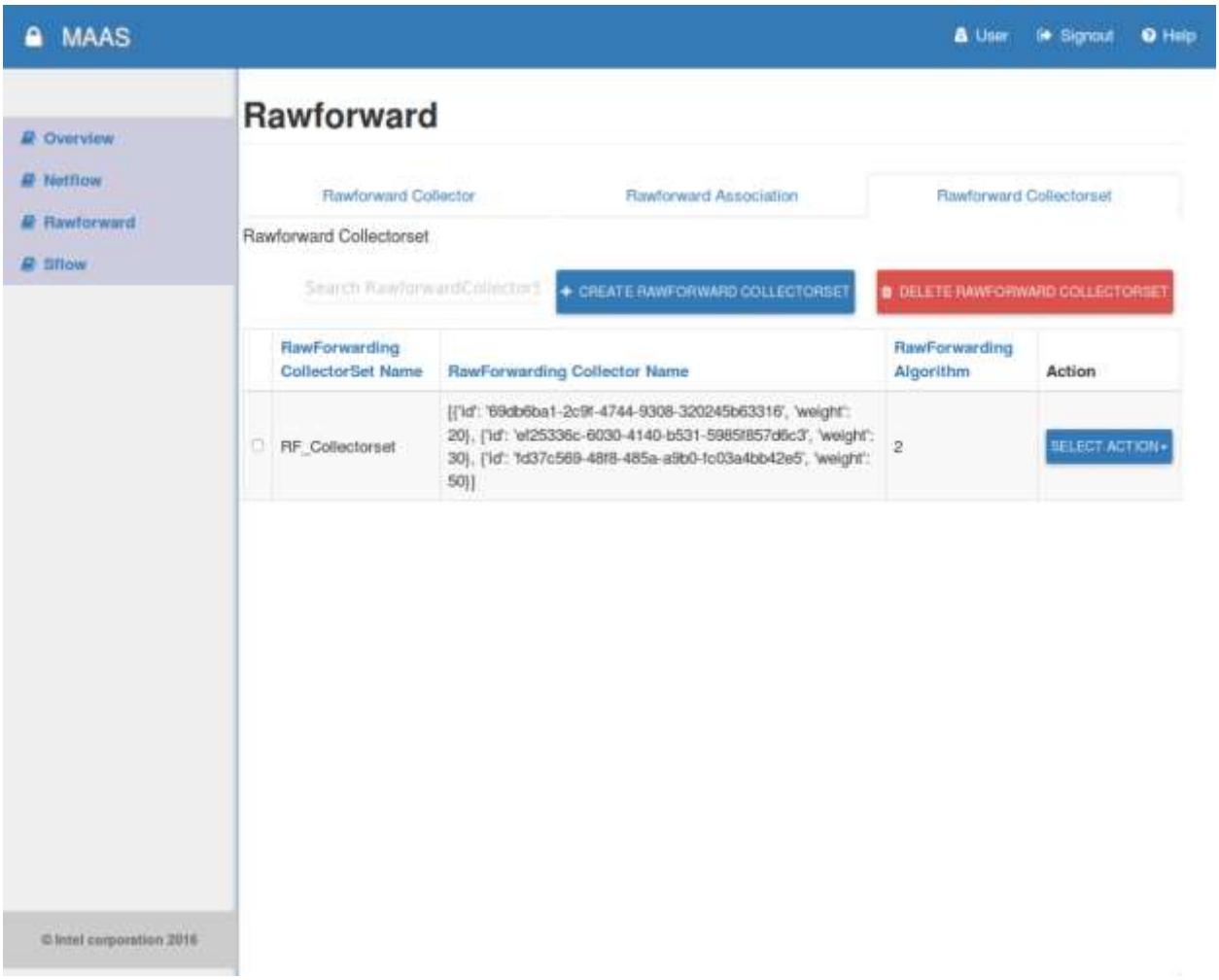
1.1.2.3.2 RawForward > RawForward Association

Rawforward Association creates association between Rawforward **collector** and **policy** for specific **scope**. Collector only receive traffic according to filtering configurations mentioned in **policy**.



1.1.2.3.3 RawForward > RawForward Collectorset

Rawforward collectorset manages collector sets configurations. Plugins support load balancing between different collectors. Load balancing happen by creating set of collectors. Traffic is divided among these collectors on the basis of load balancing algorithms. Currently **round-robin, session based and weighted round robin** algorithms are implemented for load balancing.



1.1.3 IPSEC EMS

- IPsec EMS is central entity responsible for configuring IPsec tunnel configurations in each IPsec Enforcers.
- IPsec EMS service can be run on VM also.
- IPsec EMS expose REST API's for IPsec Enforcers. Then these IPsec Enforcers fetch IPsec tunnel configurations from IPsec EMS using these API's.
- IPsec Enforcers listening for changes happen in configurations in IPsec EMS.
- IPsec EMS provide easy to use GUI to configure IPsec configuration.
- IPsec EMS uses single instance consul DB (bootstrap mode) database for storing IPsec configurations of IPsec Enforcers.

Prerequisites for installer script:

1. **Google repo tool** should be installed in standard path.
2. **GIT** should be installed.

Steps to Run IPsec EMS Server are given below:

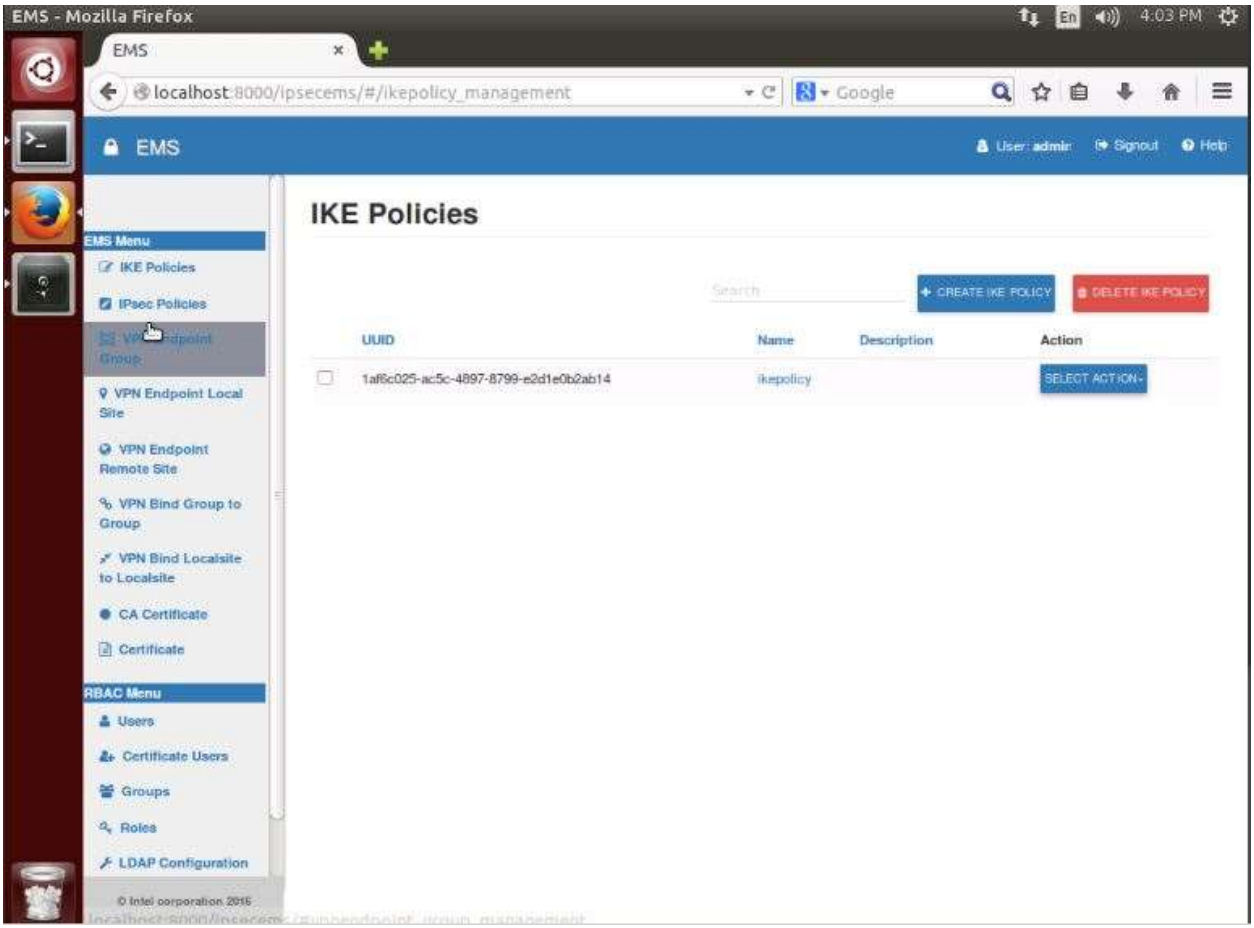
1. Run **vnb-main/vnb_components_installer.sh** bash script with **ipsec_ems** as argument. This will fetch source code of **ipsec ems** from Github repositories and install it.
2. Choose operations sequentially [Install Dependencies and Run IPsec EMS].
    1) **Install Dependencies** will install all the required dependencies to run IPsec EMS. This need to be done only once.
    2) **Run IPsec EMS** will run IPsec EMS server in background.
3. Open web browser and go to **http://localhost:8000/ipsecems/** to access GUI.

IPsec EMS GUI broadly divided into two sections **IPsec EMS Menu and RBAC Menu.**

1.1.3.1 IPSEC EMS MENU

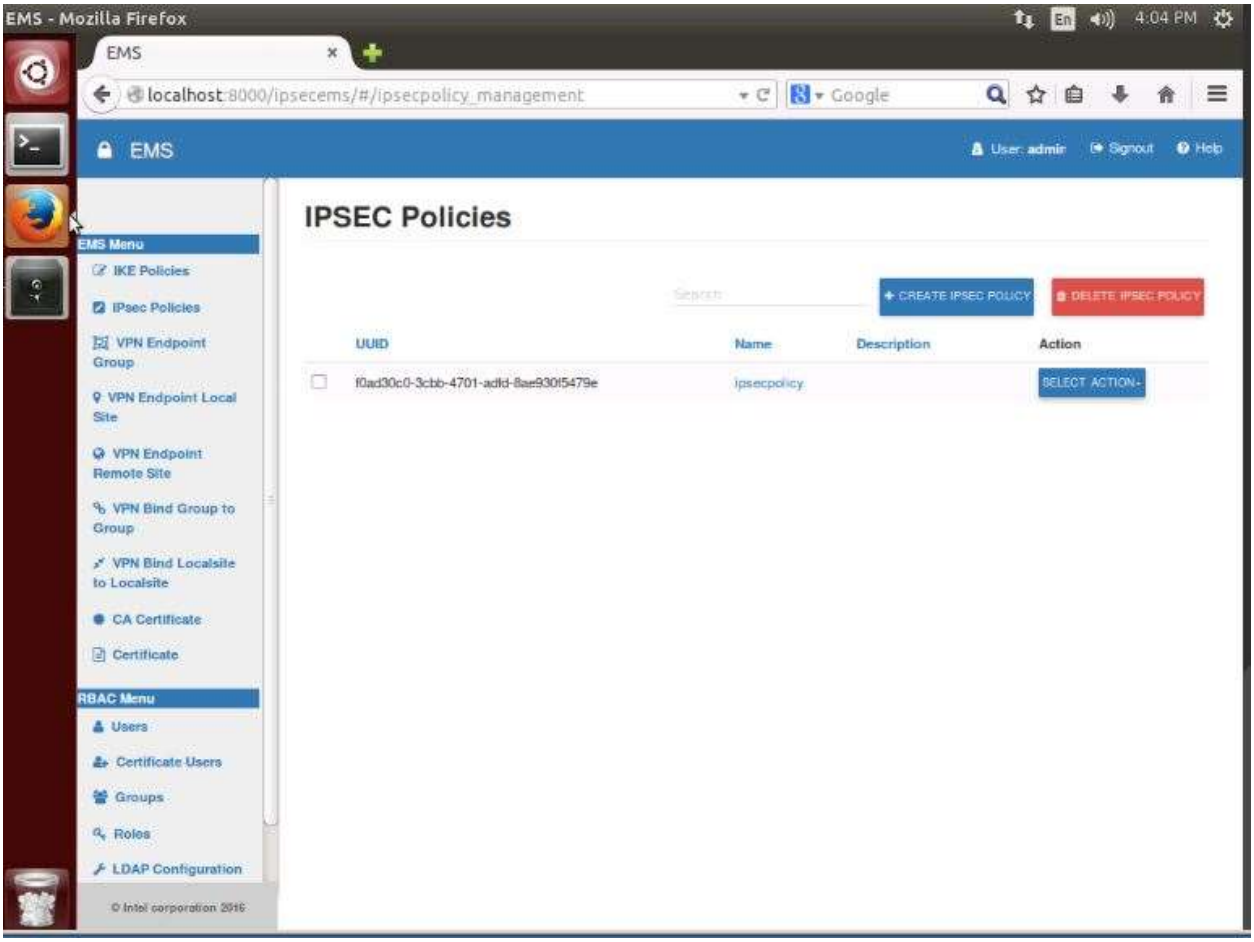
1.1.3.1.1 IKE POLICY

IKE Policy manages IKE related configurations. Like **IKE version, Encryption Algo, Integrity Algo and etc.** These policies then are used in **VPN Endpoint group to group and VPN Endpoint Localsite to Localsite.**



1.1.3.1.2 IPSEC POLICY

IPsec Policy manages configurations related to IPsec tunnel. Like **Encryption Algo, Integrity Algo, Encapsulation Protocol and etc.** These policies then are used in **VPN Endpoint group to group and VPN Endpoint Localsite to Localsite.**


EMS - Mozilla Firefox
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localhost:8000/ipsecems/#/ipsecpolicy_management
Google
EMS
User: admir
Signout
Help
EMS Menu
IKE Policies
IPsec Policies
VPN Endpoint Group
VPN Endpoint Local Site
VPN Endpoint Remote Site
VPN Bind Group to Group
VPN Bind Localsite to Localsite
CA Certificate
Certificate
RBAC Menu
Users
Certificate Users
Groups
Roles
LDAP Configuration
© Intel corporation 2016
IPSEC Policies
Search
+ CREATE IPSEC POLICY
DELETE IPSEC POLICY
UUID
Name
Description
Action
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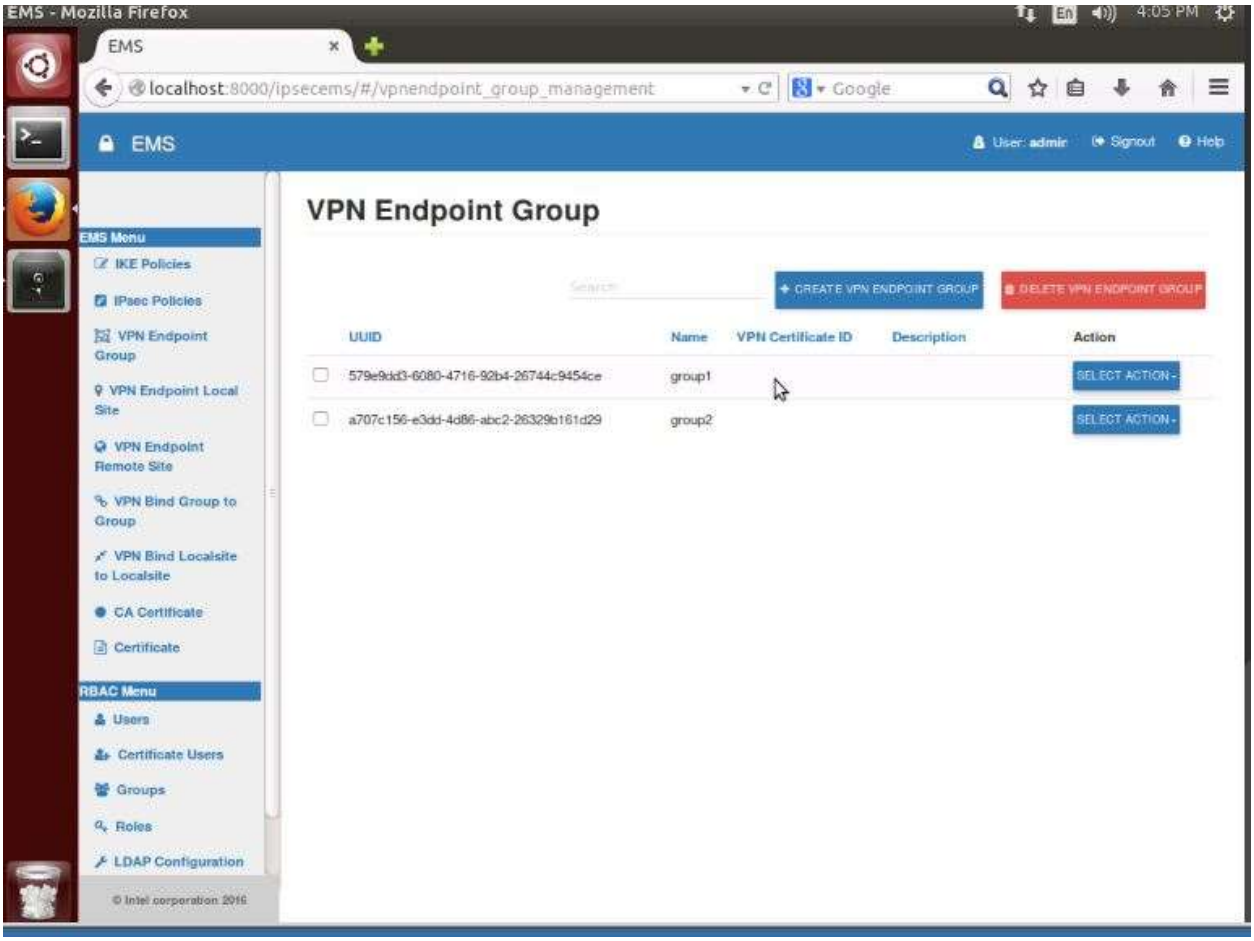
ipsecpolicy
SELECT ACTION-

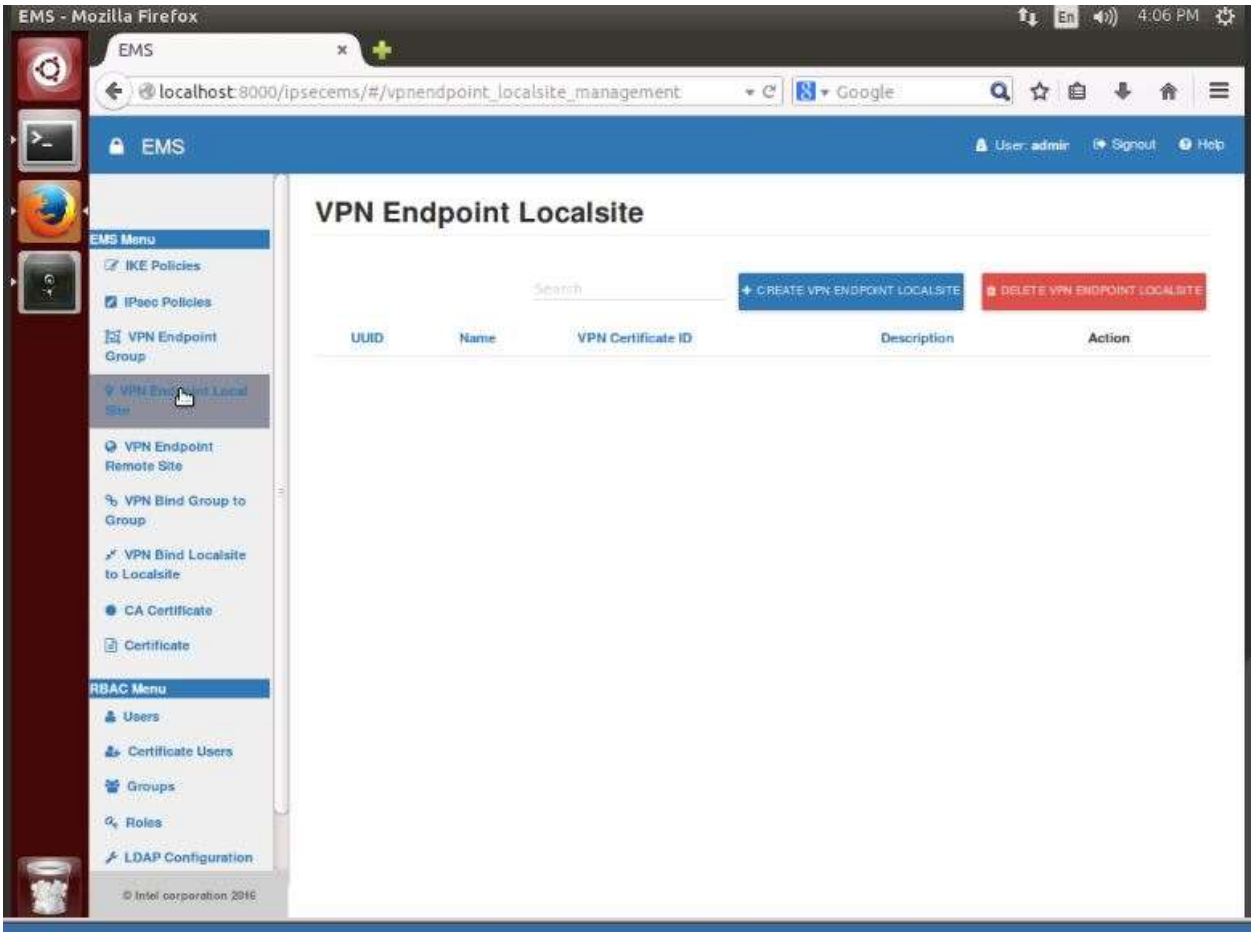
1.1.3.1.3 VPN ENDPOINT GROUP

VPN Endpoint Group manages configurations related to grouping of IPsec Enforcers. Enforcers can be grouped together and then we can apply common configurations between them. We can create **m-n tunnel** configurations using Endpoint Groups.



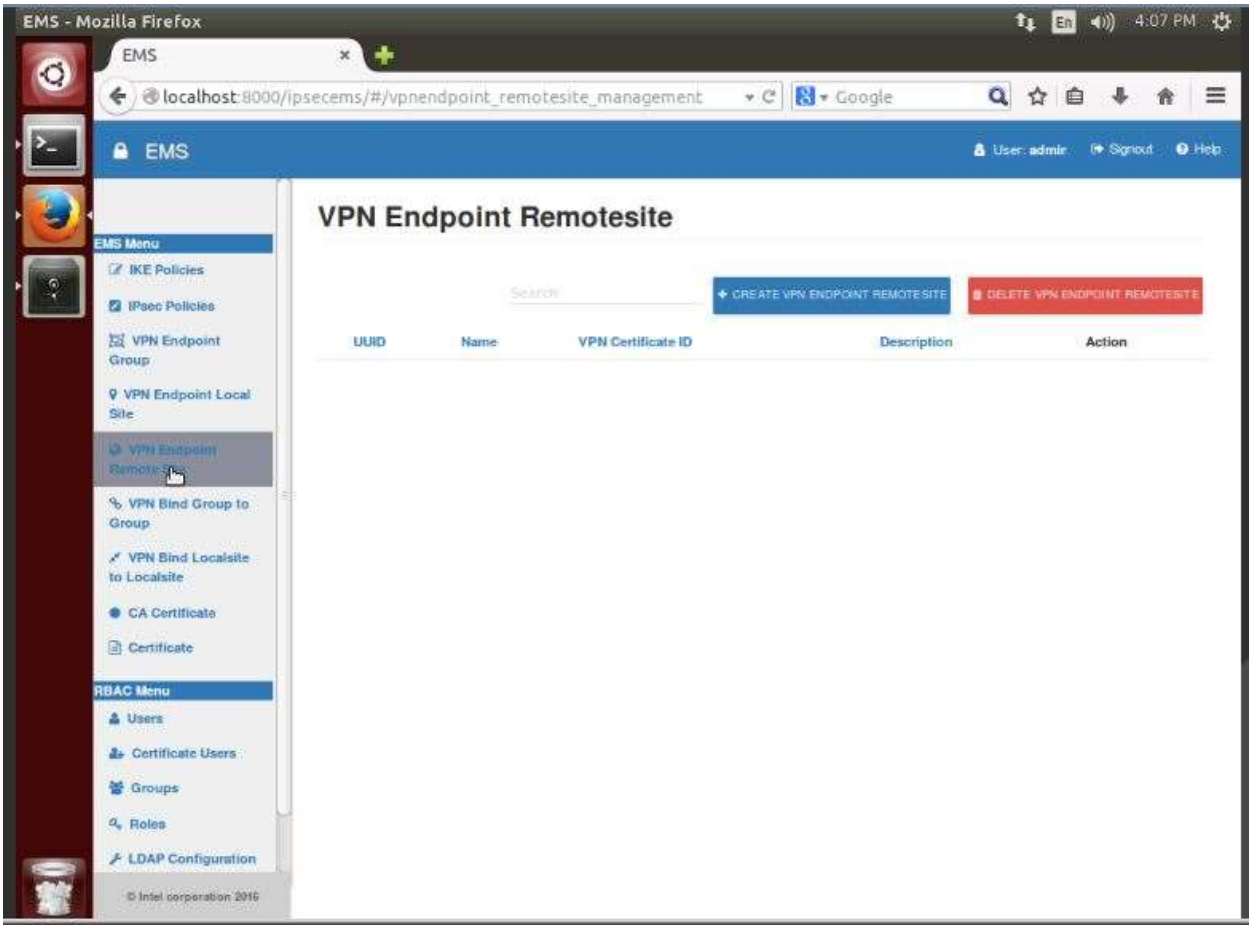
1.1.3.1.4 VPN ENDPOINT LOCALSITE

VPN Endpoint Localsite manages configurations related to localsite endpoints. In this section we mention configurations for IPsec Enforcers which are present inside same network. Like **CIDRS (classless inter domain routing) and VPN Certificate ID** (if we are using Certificate based IPsec authentication). **CIDRS** are used to specify the network in which **Endpoint** belongs.



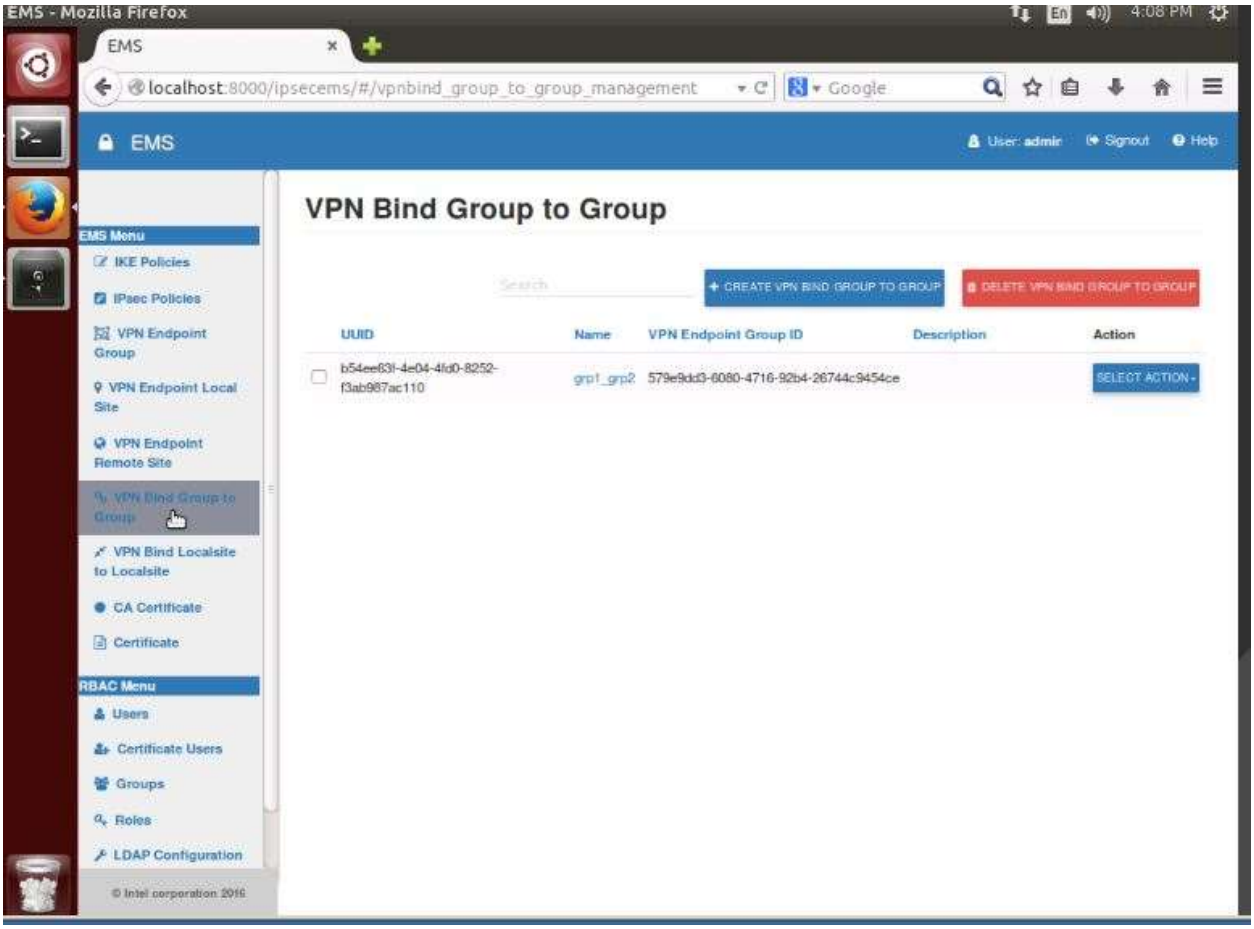
1.1.3.1.5 VPN ENDPOINT REMOTESITE

VPN Endpoint Remotesite manages configurations related to remotesite endpoints. In this section we mention configurations for IPsec Enforcers which are present in outside network. Like **Peer address, Peer CIDRS (classless inter domain routing) and VPN Certificate ID** (if we are using Certificate based IPsec authentication).



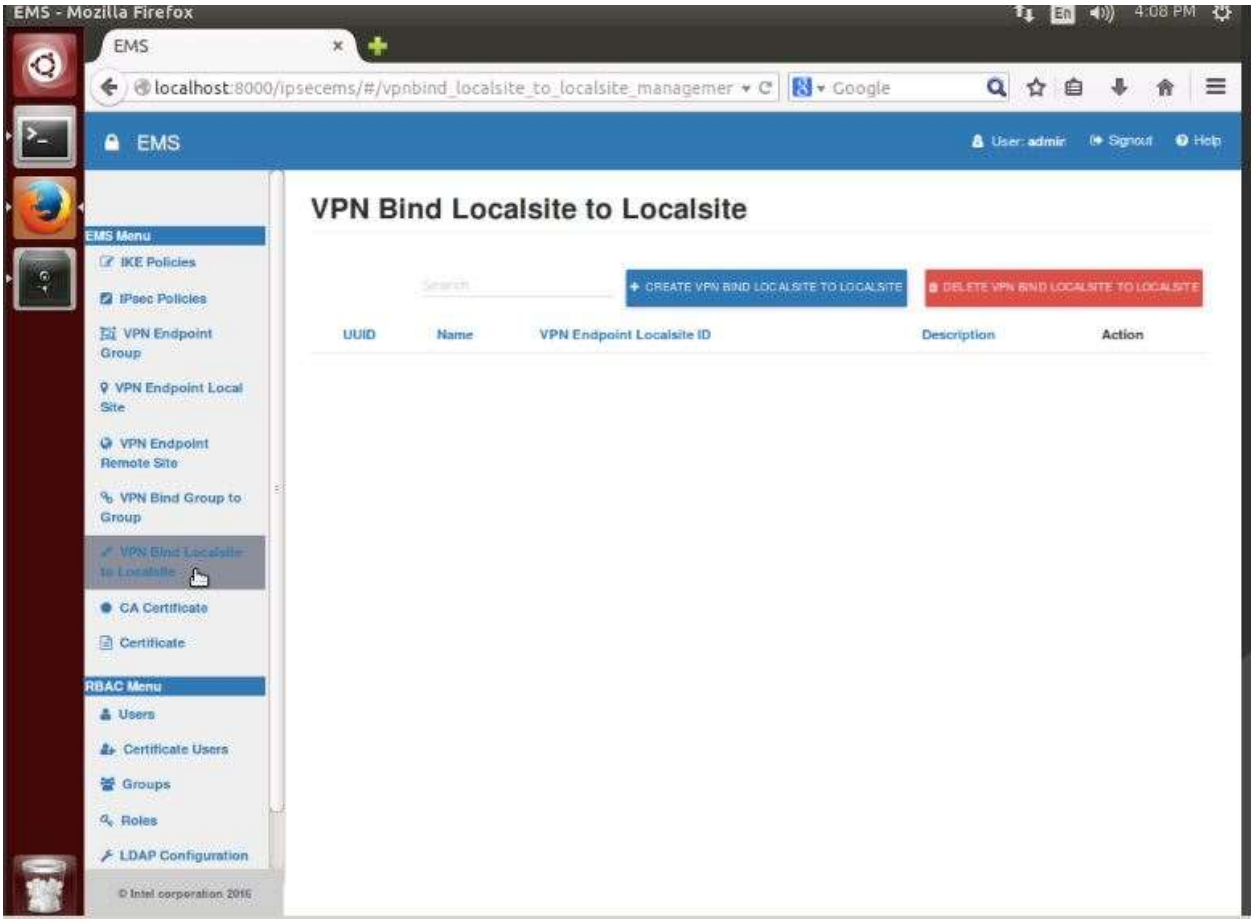
1.1.3.1.6 VPN BIND GROUP TO GROUP

In **VPN Bind group to group** we mention configurations to bind groups together to create **m-n** relationships between IPsec Enforcers. Groups created in **VPN Endpoint Group** are associated with one another as per need.



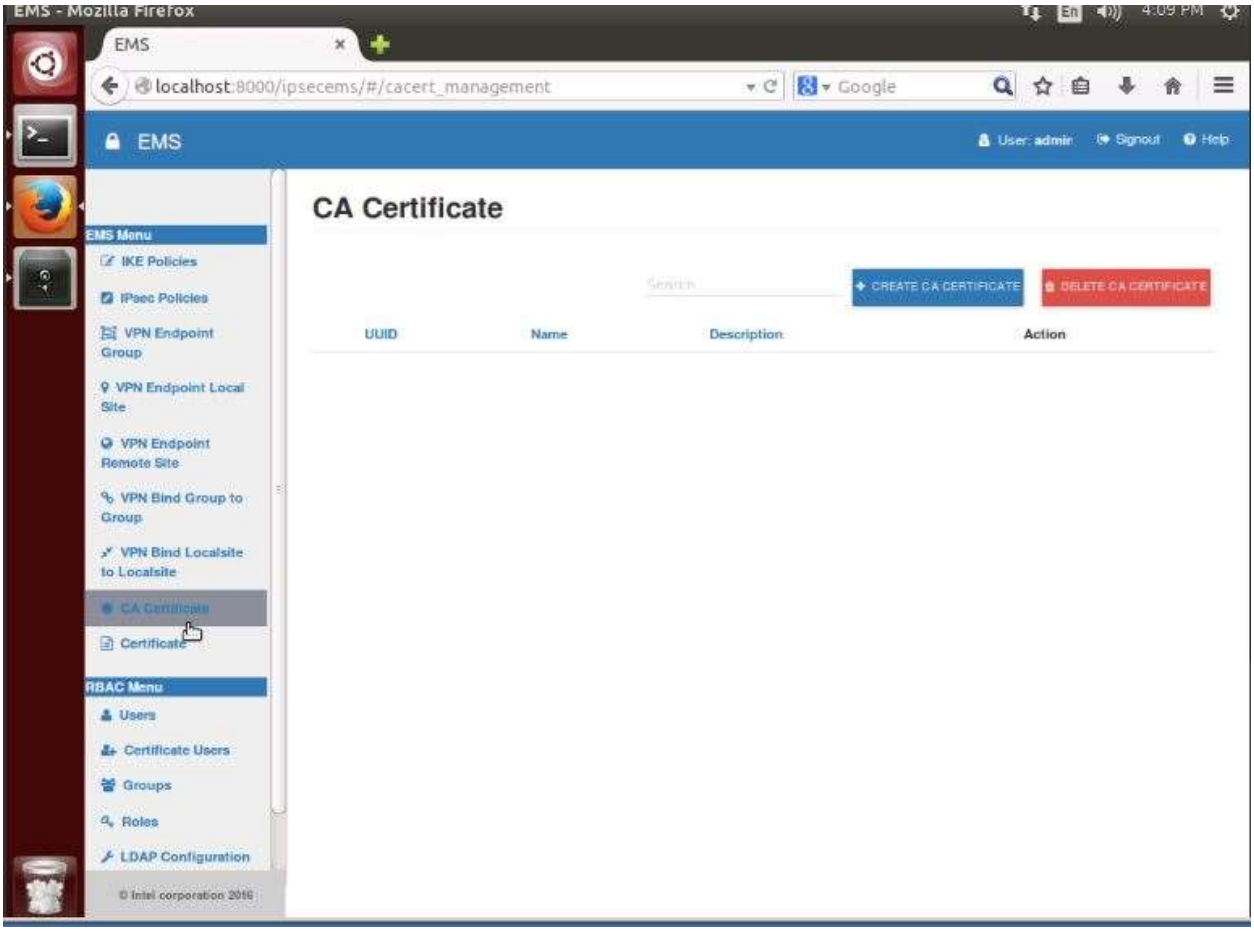
1.1.3.1.7 VPN BIND LOCALSITE TO LOCALSITE

In **VPN Bind localsite to localsite** we mention configurations to create relationships between IPsec Enforcers which are present in same network. Localsites created in **VPN Endpoint Localsite** are associated with one another as per need.



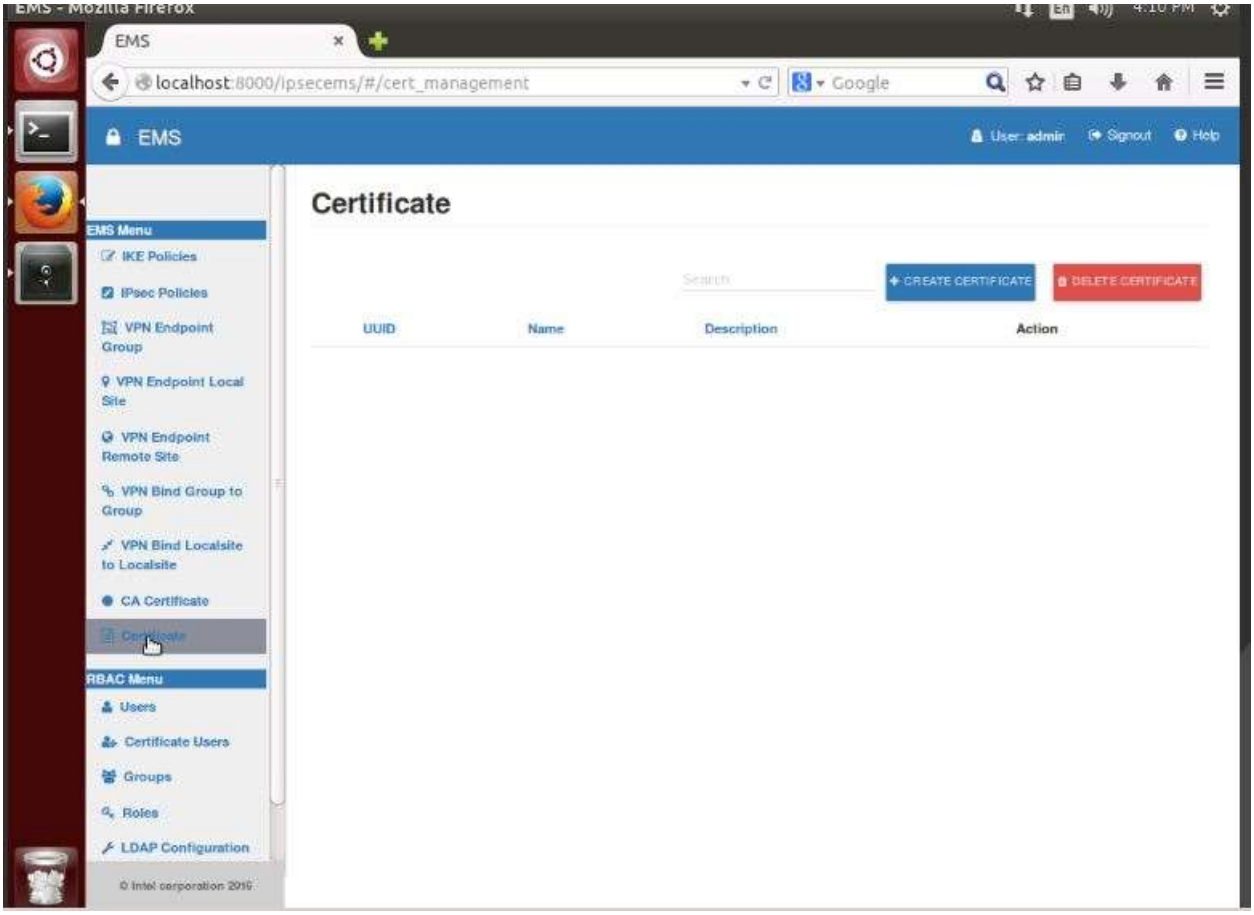
1.1.3.1.8 CA CERTIFICATE

CA Certificate manages Central Authority certificates. Create CA certificate entry by uploading CA certificate already created using tools like OpenSSL. CA certificates are used when certificate based authentication mode of secure tunneling is used.



1.1.3.1.9 CERTIFICATE

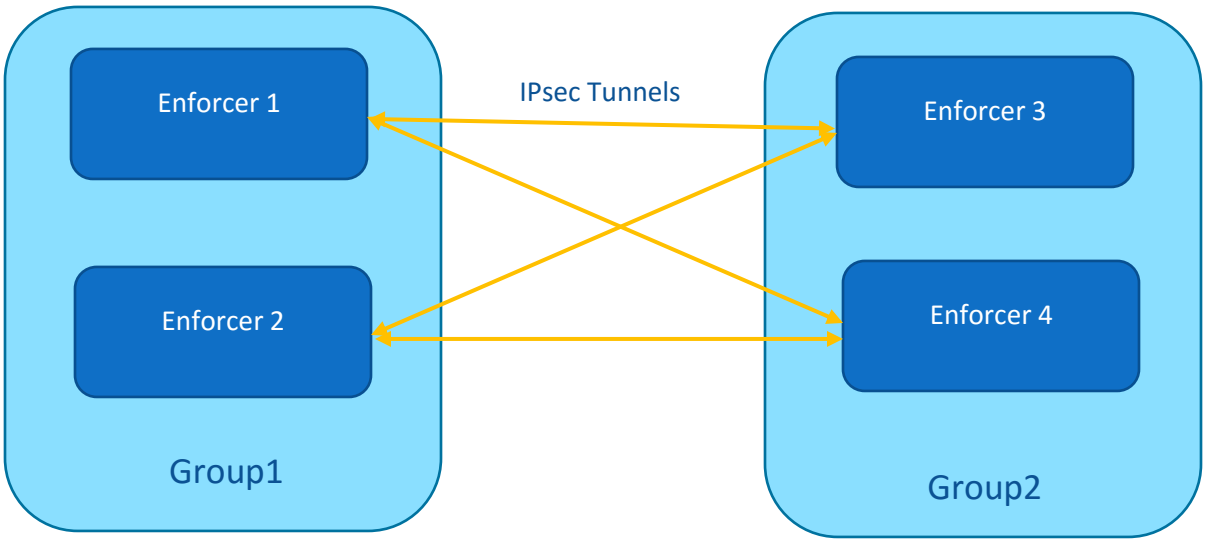
Certificate manages the public certificates and private key entities when establishing secure tunneling between them. Create Certificate for VPN Endpoints by uploading Certificate and Key.



1.1.4 IPSEC Enforcer

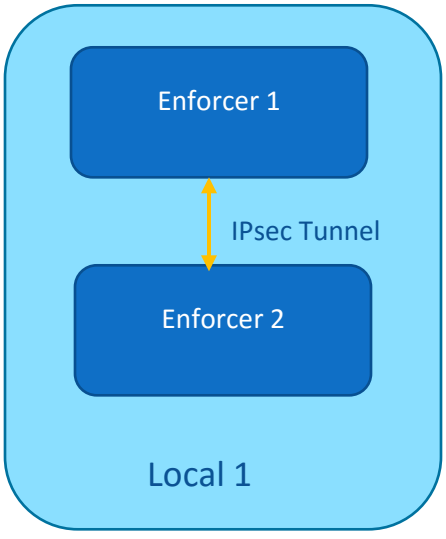
IPsec Enforcer service manages IPsec configurations in entities who need IPsec tunnel for secure communications. This service fetches IPsec configurations from IPsec EMS using RESTful API's exposed by IPsec EMS.

IPsec enforcer supports topology creation using concept of groups. Enforcer in one group can create IPsec tunnels with enforcers in other groups. Like in below image **Enforcer 1 and Enforcer 2** are in **group 1** and **Enforcer 3 and Enforcer 4** are in **group 2**. So if create IPsec tunnels between groups, it will automatically create IPsec tunnels between individual enforcers.



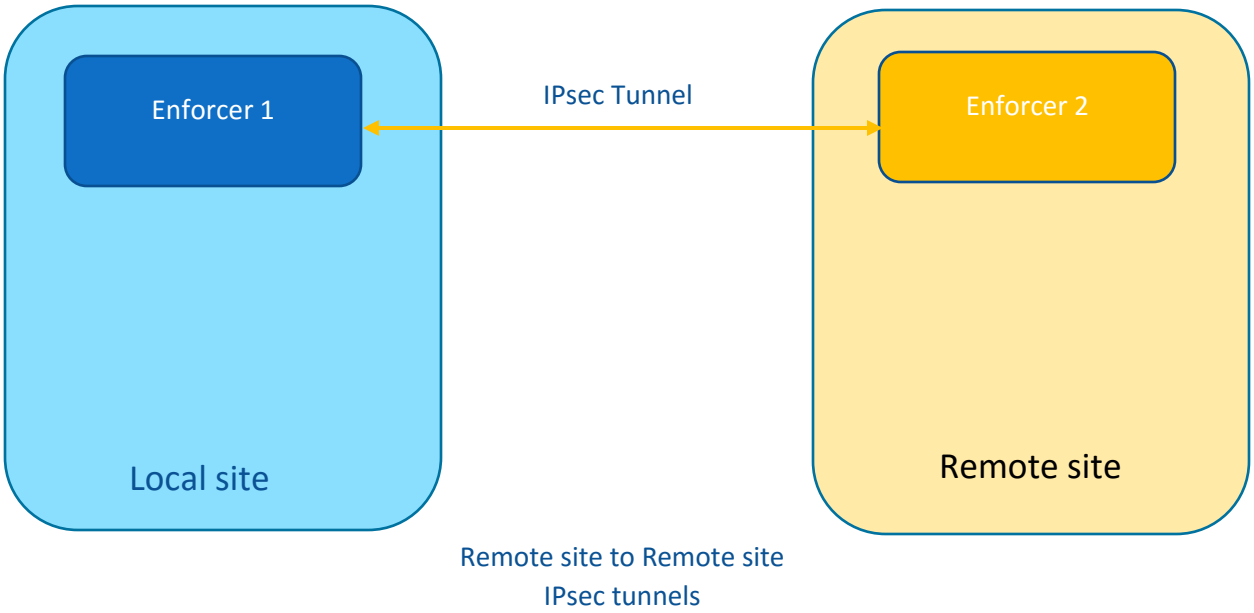
Group to Group IPsec tunnels

IPsec enforcer supports IPsec tunnel creation between enforcers present inside same network. For example in below image **Enforcer 1 and Enforcer 2** both are part of **local 1** local site.



Local site to Local site IPsec tunnels

IPsec enforcer supports IPsec tunnel creation between enforcers present in different networks. For example in below image **Enforcer 1 and Enforcer 2** are part of **local 1** local site **and remote 1** remote site respectively.



Prerequisites for installer script:

1. **Google repo tool** should be installed in standard path.
2. **GIT** should be installed.

Steps to Run IPsec Enforcer are given below:

1. Run **vnb-main/vnb_components_installer.sh** with **ipsec_enforcer_peer** as argument. This will fetch source code of ipsec enforcer from Github repositories and install it.
2. Choose operations sequentially [Install Dependencies, Configure IPsec Enforcer and Run IPsec Enforcer].
    1) **Install Dependencies** will install all the required dependencies to run IPsec Enforcer. This need to be done only once.
    2) **Configure IPsec Enforcer** will ask for configurations according to which IPsec configurations are fetched from IPsec EMS server and IPsec tunnel created between enforcers. If your configurations are not changing then this step also required only once.
        i. **Enter group name** is name of group according to which n-m IPsec tunnel will be created between enforcers as shown above in images.
        ii. **Enter localsite name** is name of localsite according to which IPsec tunnel will be created between enforcers.
        iii. **Enter Tunnel Interface** is interface used to create IPsec tunnel between IPsec enforcers.

iv. **Enter IPsec EMS Controller address with port** is IP address with port of IPsec EMS server from which IPsec Enforcers fetch configurations.

3) **Run IPsec Enforcer** will run IPsec EMS server in background.

3. Now run **strongswan** service to create IPsec tunnel between enforcers. IPsec Enforcer only populate ipsec.conf and ipsec.secrets file according to configurations mentioned in IPsec EMS server. After changing configurations in IPsec EMS server, restart strongswan service so that strongswan can use updated configurations.