Lab 1: IEC 61850 GOOSE Communication Setup and Analysis
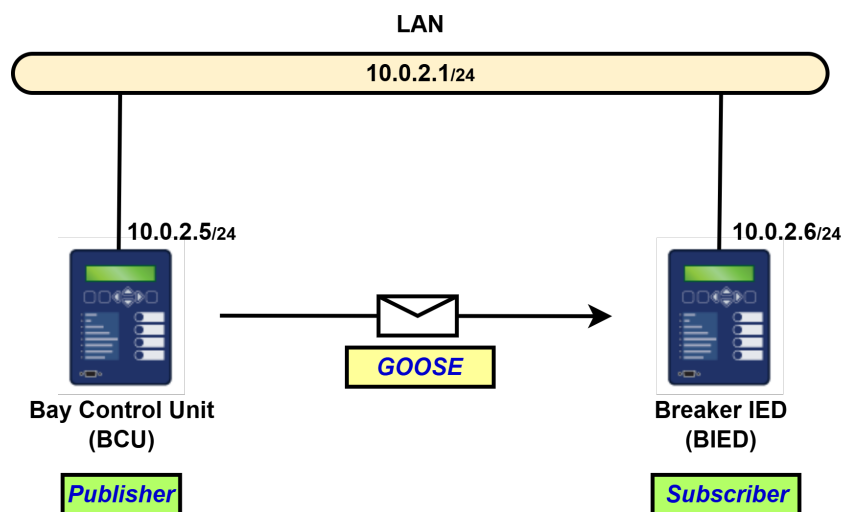
Objectives

Figure 1: Basic IEC 61850 GOOSE publisher–subscriber communication model

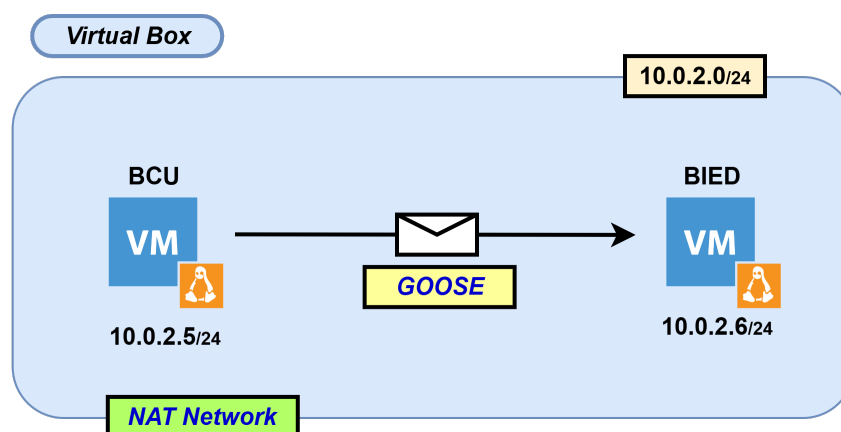
Figure 2: Virtualized lab setup for GOOSE communication using NAT networking

General Installations

Open the terminal (**Ctrl + Alt + T**) —

To update

Note: Choose 'yes(Y)' when prompted

```
sudo apt update
```

Guest Additions

```
sudo apt install -y dkms build-essential
sudo mkdir -p /media/cdrom
sudo mount /dev/cdrom /media/cdrom
```

```
cd /media/cdrom
sudo ./VBoxLinuxAdditions.run
sudo reboot -h now
```

networking tools (if not present)

```
sudo apt install net-tools
```

Wireshark

```
sudo apt install wireshark
```

Choose 'yes (Y)' when prompted. And verify the installation.

```
wireshark -v
```

Install OpenSSL

```
sudo apt install openssl
sudo apt install libssl-dev
```

NAT Network Configuration

1. Create an NAT network.

   - Name: LAN
   - IPv4 Prefix: `10.0.2.0/24`

2. Attach both the VMs to the created NAT network "**LAN**"

3. Manually set the IP addresses of the VMs as below:

   - Gateway: `10.0.2.1`
   - Netmask: `255.255.255.0`
   - BCU : `10.0.2.5`
   - BIED : `10.0.2.6`
   - DNS: If IISc WLAN is used, `10.16.25.15,10.16.25.13`; otherwise, `8.8.8.8, 8.8.4.4`)

4. Reboot the VMs.

```
ip a
```

Ping Test
From BCU

```
ping 10.0.2.6
```

and from BIED

```
ping 10.0.2.5
```

Capture ICMP packets on both devices using Wireshark.

```
sudo wireshark
```

2

Install `libIEC61850` library and build

```
sudo apt install git build-essential cmake
mkdir bcu
cd bcu
git clone https://github.com/mz-automation/libiec61850.git
cd libiec61850
mkdir build
cd build
cmake ..
make
```

Lab01: optional

- Modify the lab 01 to change the CB Status in between and send the updated packets from BCU to the BIED.

publisher - code snapshot

```
        int i = 0;

        for (i = 0; i < 8; i++) {
            Thread_sleep(1000);

            if(i==4){
                /*
                 * Change CB Status from ON to OFF
                 */
                /* ON position      10 */
                MmsValue_setBitStringBit(stVal, 0, false);   // MSB
                MmsValue_setBitStringBit(stVal, 1, true);
                MmsValue* t = MmsValue_newUtcTimeByMsTime(
                    Hal_getTimeInMs());


                GoosePublisher_increaseStNum(publisher);
                GoosePublisher_publish(publisher, dataSetValues);
            }
            else
            {
                if (GoosePublisher_publish(publisher, dataSetValues) ==
                    -1) {
                        printf("Error sending message!\n");
                }
            }
        }

        GoosePublisher_destroy(publisher);
    }
```