Cisco Router IR829

CME451 Tutorial 10

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Cisco IR829 Router

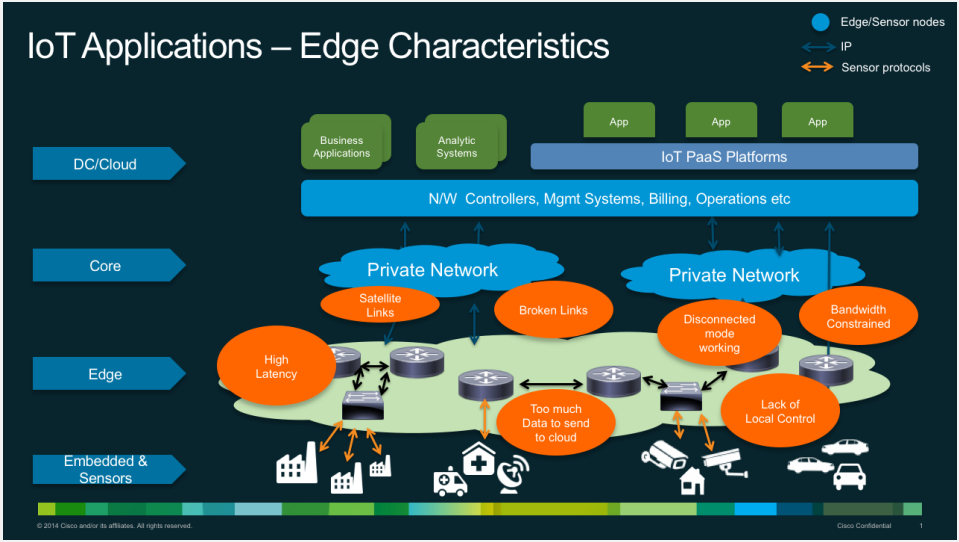
Cisco IR829 Router

- Highly ruggedized compact cellular and WLAN router.
- Support for fleet vehicles and mass transit applications.
- A fleet-targeted mobile gateway to address the majority of use cases for fleets.
- The implementation of Fog Computing.
- Can be used in IoT cases.

Internet of Things (IoT)

- IoT is defined as the infrastructure of the information society.
- IoT is the inter-networking of physical devices, vehicles, and other items.
- Links smart objects to the Internet and exchange data with other objects.
- Data will be generated locally and processed in cloud server.
- Management of IoT data is a key topic.

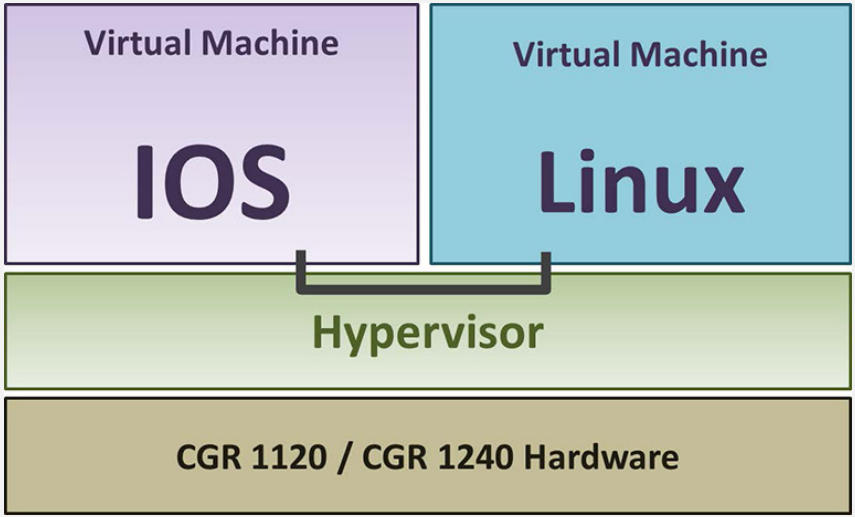
Fog Computing



Fog Computing

- For IoT applications:
  - Data generated at devices must be sent to cloud for processing.
  - Applications might work in offline mode due to connectivity loss.
  - Link bandwidth is constrained; not feasible to send every byte of generated data.
  - Local processing near the data source is required.
- **Fog computing**: to perform local computation and intelligence in a safe, secure, and resilient fashion.
  - Process majority of the data at the edge.
  - Solve the bandwidth and connection problems.
  - IOx is Cisco's implementation of Fog Computing.

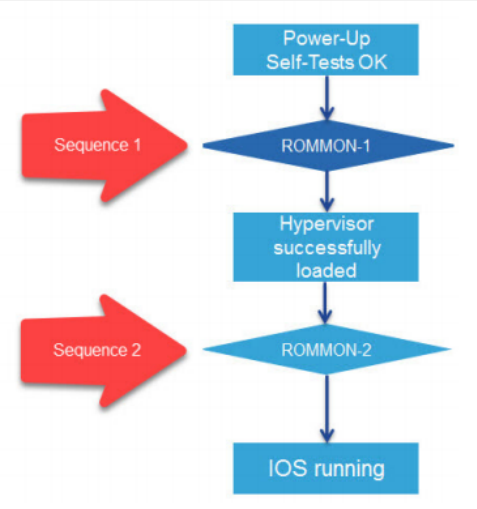
Cisco IOx


Virtual Machine
IOS
Virtual Machine
Linux
Hypervisor
CGR 1120 / CGR 1240 Hardware

Cisco IOx

- IOx brings together the Cisco IOS and Linux.
  - IOS: Cisco's networking operating system.
  - Linux: Yocto Linux running on guest-os.
- Hosting applications in guest operation system (the linux) running in a hypervisor directly on the connected grid router (CGR).
- Allow you to run your Python applications (Linux based).

Booting Sequence



Booting Sequence

- Boot IOS from ROMMON-2

```
rommon-2 > dir

flash:
vlan.dat
ir800-universalk9-mz.SPA.155-3.M
managed
eem

rommon-2> boot flash:/ir800-universalk9-mz.SPA.155-3.M
```

IOS and IOXVM Upgrade*

- Using `tftp` to transfer software to flash drive.

```
copy tftp://<WORKSTATION IP ADDRESS>/< file name> flash:/

Bundle install flash:/<IOS BUNDLE FILE NAME>

Conf t
Boot system flash:/<GENERATED IOS FILE NAME>
Exit
reload

Guest-os 1 stop
Guest-os 1 image uninstall
Guest-os 1 image install flash:/<IOXVM FILE NAME> verify
Guest-os 1 start
```

Network Connectivity

- Multiple ethernet interfaces:
  - GE0: WAN
  - GE1-4: LAN
  - GE5: Connection between IOS and Guest-OS
- Note*: IOS commands are not case-sensitive but the passwords are case-sensitive.

Network Connectivity

- Assign a static IP to the uplink:

```
IR800> en
IR800# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
IR800(config)# int vlan1
IR800(config-if)# ip address 128.107.151.10 255.255.255.0
IR800(config-if)# ip nat outside
IR800(config-if)# exit
IR800(config)# ip route 0.0.0.0 0.0.0.0 128.127.151.1
IR800(config)# exit
```

Network Connectivity

- Test connectivity:

```
IR800# ping 8.8.8.8
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
.....
Success rate is 100 percent (5/5), round-trip min/avg/max=2/2/4 ms
```

Guest-OS Network Connectivity

- Virtual interface provides network connectivity to Guest-OS.
- IOS forwards traffic from Guest-OS through IP forwarding.
- GigabitEthernet 5 in IR829.
- Guest-OS IP address and gateway can be statically configured ot obtained from IOS using DHCP request.

Guest-OS Network Connectivity

- Assign a static IP to the Guest-OS:

```
IR800# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
IR800(config)# interface gigabitethernet5
IR800(config-if)# ip address 192.168.0.1 255.255.255.0
IR800(config-if)# ip nat inside
IR800(config-if)# no shutdown
```

NAT Configuration

- NAT allow applications running in the Guest-OS to interact with the external world.
- Guest-OS is accessible via port 2070 on GigabitEthernet 5 interface.
- Port 8443 allows traffic to be forwarded to Local Manager.

NAT Configuration

```
ip nat inside source list NAT_ACL interface Vlan1 overload
ip nat inside source static tcp 192.168.0.1 2070 interface Vlan1 2070
ip nat inside source static tcp 192.168.0.1 8443 interface Vlan1 8443

ip access-list standard NAT_ACL
permit 192.168.0.1 0.0.0.255
```

Guest-OS Network Connectivity

- After configuration, restart the Guest-OS by
  `guest-os 1 restart`
- Guest-OS console is disabled by default. To Enable:

```
IR800# conf t
IR800 (config)# Line 1/4
IR800 (config-line)# transport input all
IR800 (config-line)# end
```

Guest-OS Enable SSH

- SSH is secure connection.
- First connect to Guest-OS console by telnet.
- Then SSH configuration file.

```
telnet 192.168.0.1 2070
root
vi /etc/ssh/sshd_config
#Change PermitRootLogin to yes
#Change PasswordAuthertication to yes
#Change PermitEmptyPasswords to no
```

Guest-OS Enable SSH

- Restart SSHD and Set password

```
/etc/init.d/sshd stop
/etc/init.d/sshd start

passwd
New UNIX password:
Retype new UNIX password:
```

- Disconnect form Guest-OS by
  `Ctrl+Shift+6` and then press `x`
- In IOS, type `disconnect` to disconnect from telnet.

Configure SSH in IOS

```
IR800# show iox host list detail
IR800# iox host exec enablessh IR800-GOS-1
```

- SSH into Guest-OS:

```
ssh -l root 192.168.0.1
Password: <YOUR SELECTED PASSWORD>
```

Router Configuration File

- Configuration can be accomplished one-by-one.
- You can also write all configuration in a configuration text file.
- Then import the configuration to the router.

Cisco Packet Tracer

- Network Simulation Tool from Cisco.
- You can try some router operations in Packet Tracer.