



University of New Hampshire
InterOperability
Laboratory

**The University of New Hampshire
InterOperability Laboratory
(UNH-IOL)**

**IoT: Evolving Networks to Meet the
Opportunity**

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IoT Devices

- The number of devices currently online is about 15 billion.
- Estimates for the number of devices on a network by 2020 is between 50 and 200 billion devices.
 - Wearable's, Car, Industrial are all areas of growth for more devices on the network.

Network Load

- Will current networks be able to handle the increase of devices on the network?

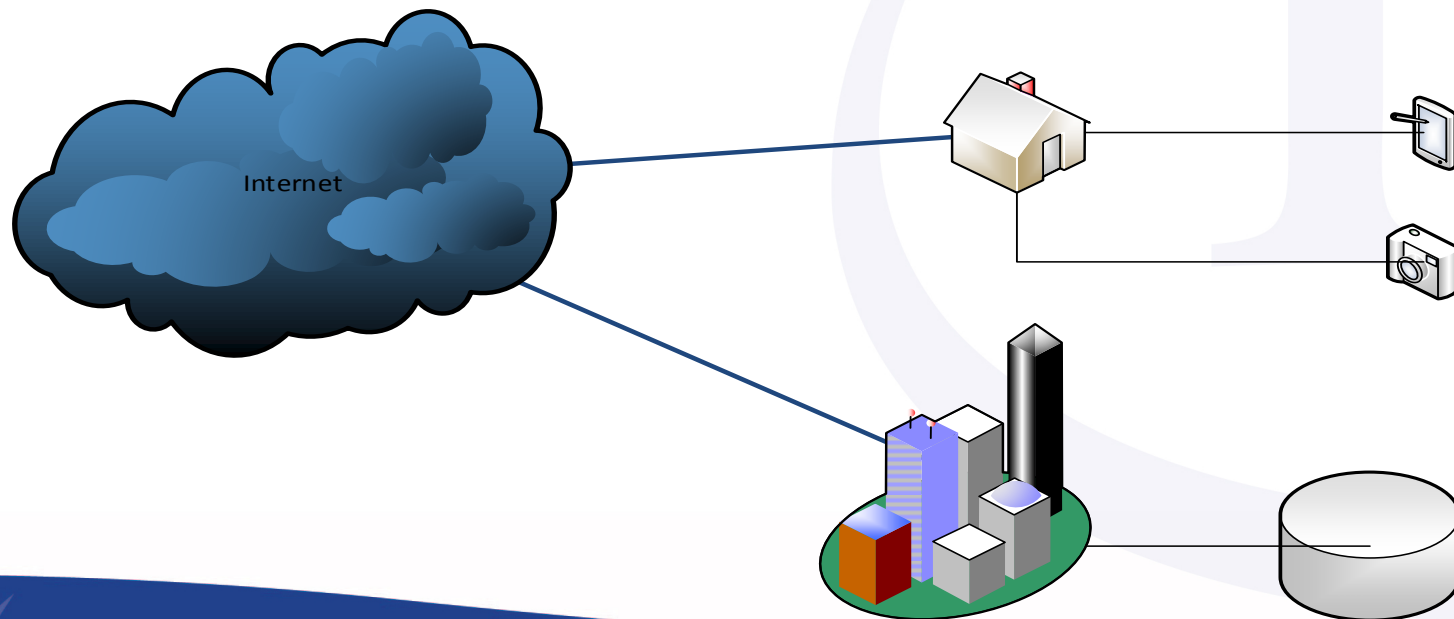


Deploying IoT

- Current areas that networks will need to be to support the following additional:
 - Cloud Solutions
 - Big Data
 - Device Management

End to End

- Concept that a IoT device might need to send information to a server in a remote location
 - Example: IoT sensor on shipping crate sends it's location to the Shipping center.



IP

- IP Addressing allows IoT devices to communicate with other device on different link technologies.
 - Example: Devices on Wi-Fi, Ethernet, and 5G
- Currently IPv4 uses NAT to extend the space of networks.
 - The use of multiple NATs is extra complexity in the network.

IPv6

- 128-bit addresses gives enough address space.
- IPv6 restores the possibility of End-to-End System communication directly.
- Supports Link-Local communication with no need for DHCP service.
- IPv6 is designed to support additional features such as privacy and security.

Network Management

- IoT devices increase the amount of data on the network.
- Utilize network resources to best support the devices on the network.
 - Redirect traffic to parts of the network that under utilized.
- Users configuring the network in realtime is not an option.

SDN

- Software Defined Networking (SDN) allows programming of the network.
 - Protocols such as OpenFlow, VXLAN, Cisco ACI.
- Allows for the network to quickly and easily move the burden of IoT deployments to other parts of the network and eliminate bottlenecks.

Rapid Deployment of IoT

- Networks must support Service Management and Provisioning of IoT devices.
- Virtualization allows for rapid deployment or can quickly increase the resources available for a service.
- Provisioning millions of devices by human interaction is unrealistic.

- Network Function Virtualization (NFV) is architecture used by service providers.
 - Decouples network functions from hardware and places them in software.
- Allows for service chaining so that a service provider can properly deploy services.
 - Example: Bandwidth calendar that plans for extra bandwidth when a IoT sensors deliver networking information.

Summary

- The evolution of networks in areas such as IPv6, SDN and NFV are vital to the success of IoT.

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