Leveraging IPv6 features to deliver secure IoT solutions
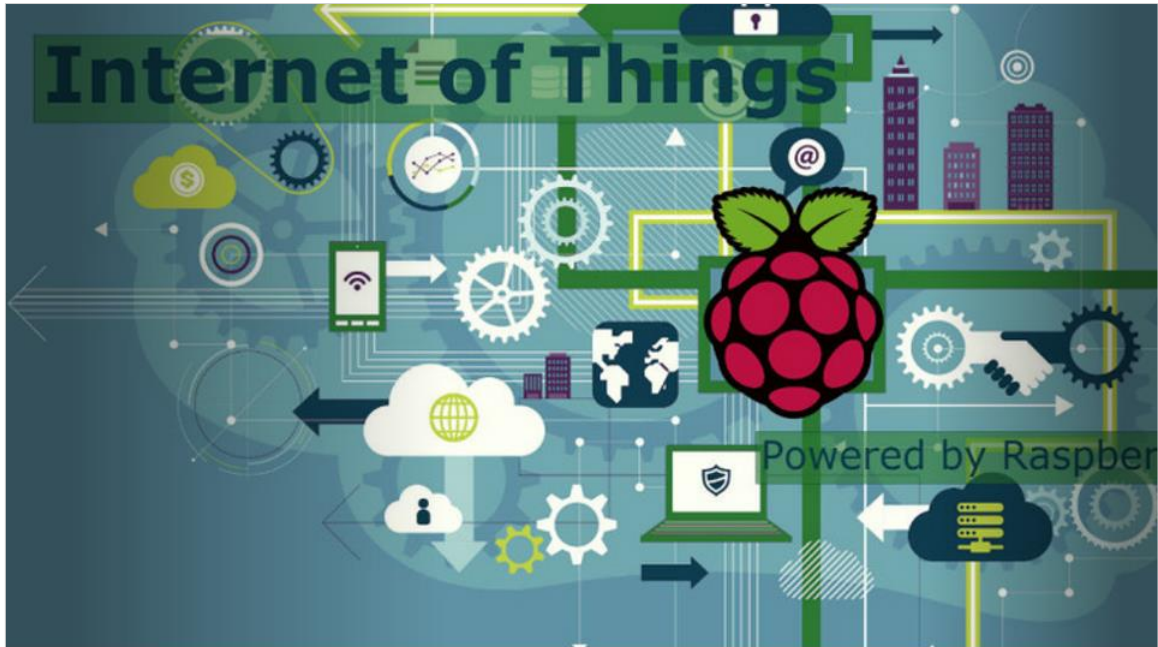
Ian Hallissy

TUS

TUS
Athlone's
IPv6 Journey

IPV6 test bed
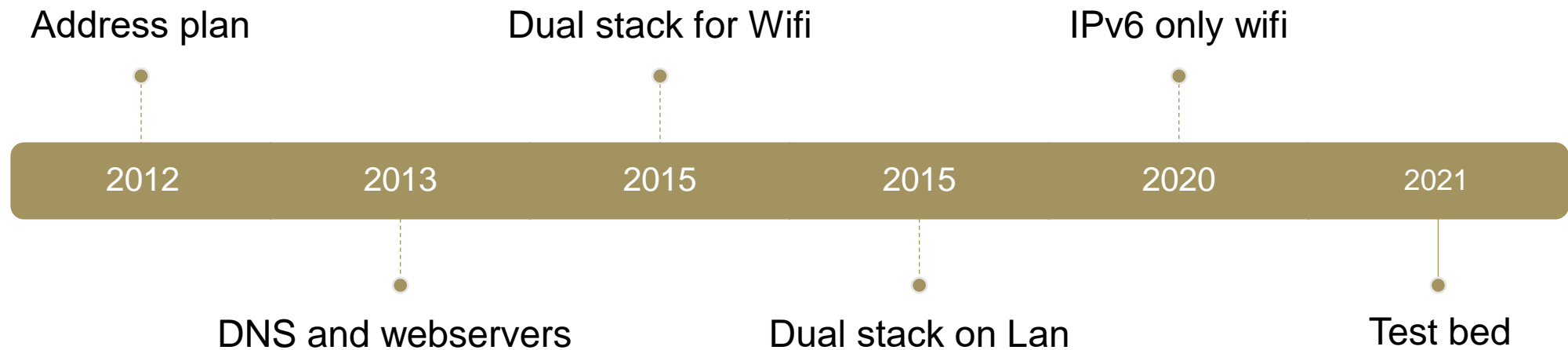
Internet of Things

Powered by Raspber

Future

TUS
Athlone's
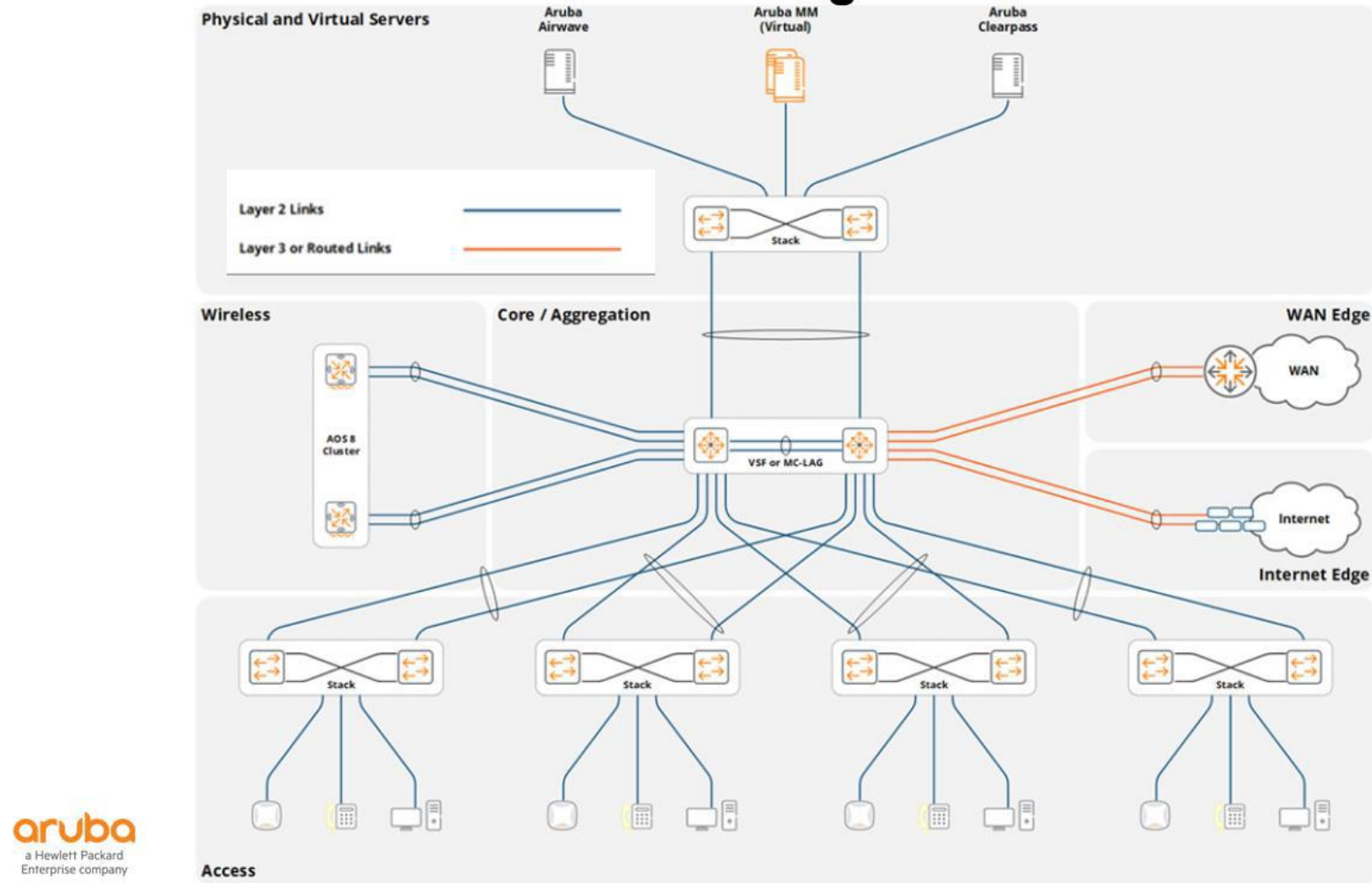IPv6 Journey

Key reasons to migrate to IPV6

- IPv6 2a03:2880:f132:face:b00c:0:25de

- IPv4 193.1.30.2

- Large address space - 128 bit versus 32 bit

- Auto addressing features - SLAAC

- Re-establish end-to-end connectivity – NO NAT

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TUS Athlone IPv6 journey

Address plan

Dual stack for Wifi

IPv6 only wifi

| 2012 | 2013 | 2015 | 2015 | 2020 | 2021 |

DNS and webservers

Dual stack on Lan

Test bed

TUS

WIFI6 IPV6 only wireless network

Athlone IT Redundant Network Design

IPv6 only deployment

1. IPv6 allows for simple network designs

2. Control plane Management plane & Access plane IPv6 only

3. AP's deployed using SLACC and RDNSS – a first for Aruba

4. Management plane SNMP v3 & TACACS

5. Single Access VLAN – SLACC DNS64 NAT64 for Eduroam

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Wireless Security

- ClearPass provides a profiling service that discovers and classifies all endpoints
  - Policy based access control

- Controller is policy enforcer for wired and wireless
  - Tunnel based segmentation with built in Policy enforcement Firewall

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Security
ClearPass – policy based access control
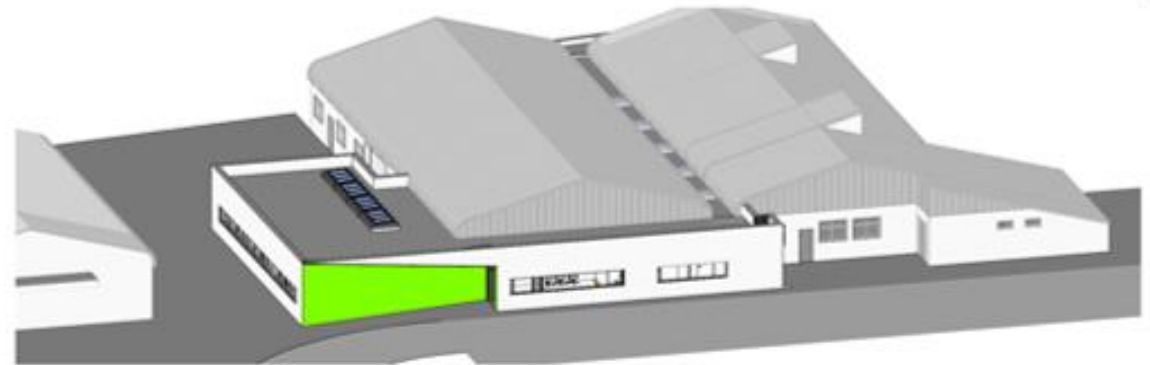
TUS
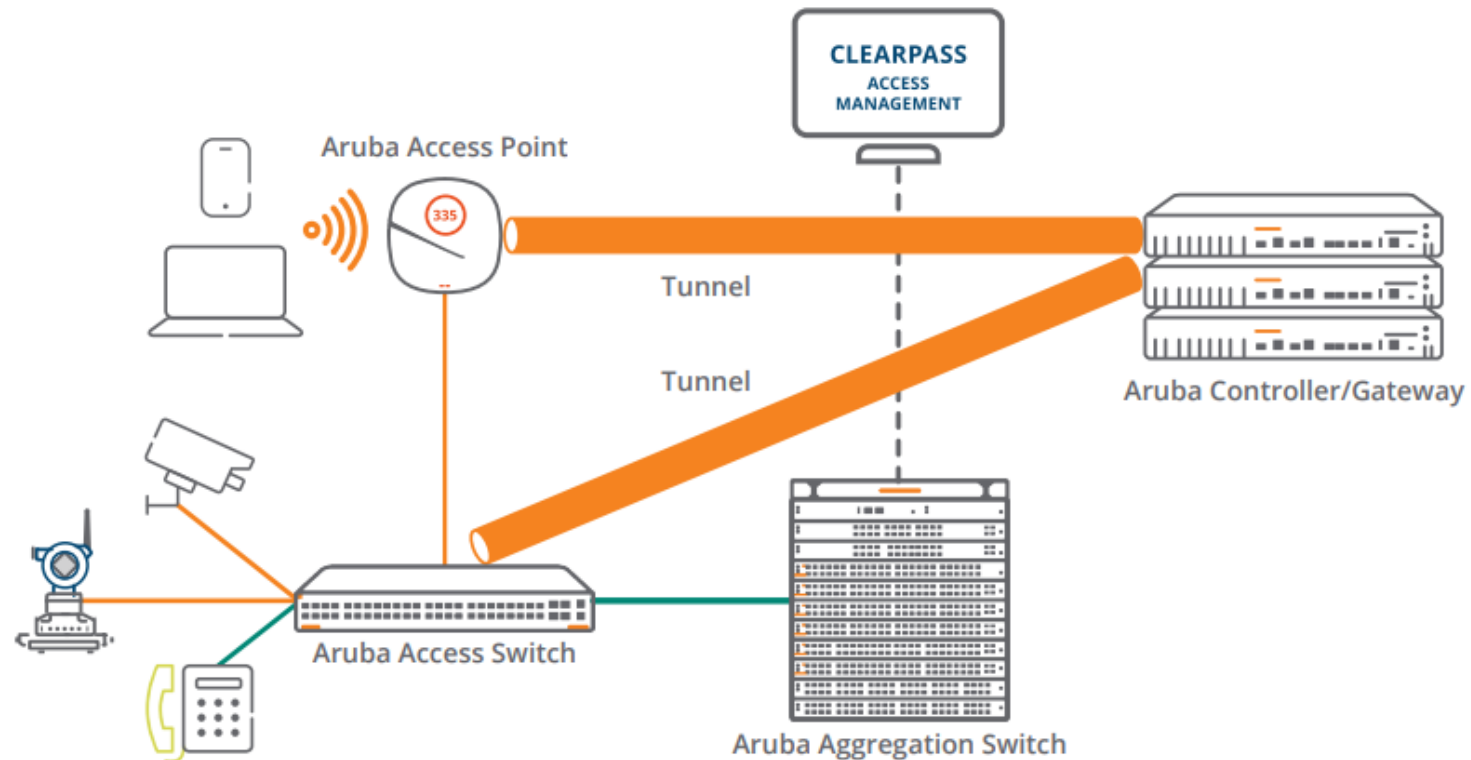
IPV6 test bed

Research activities
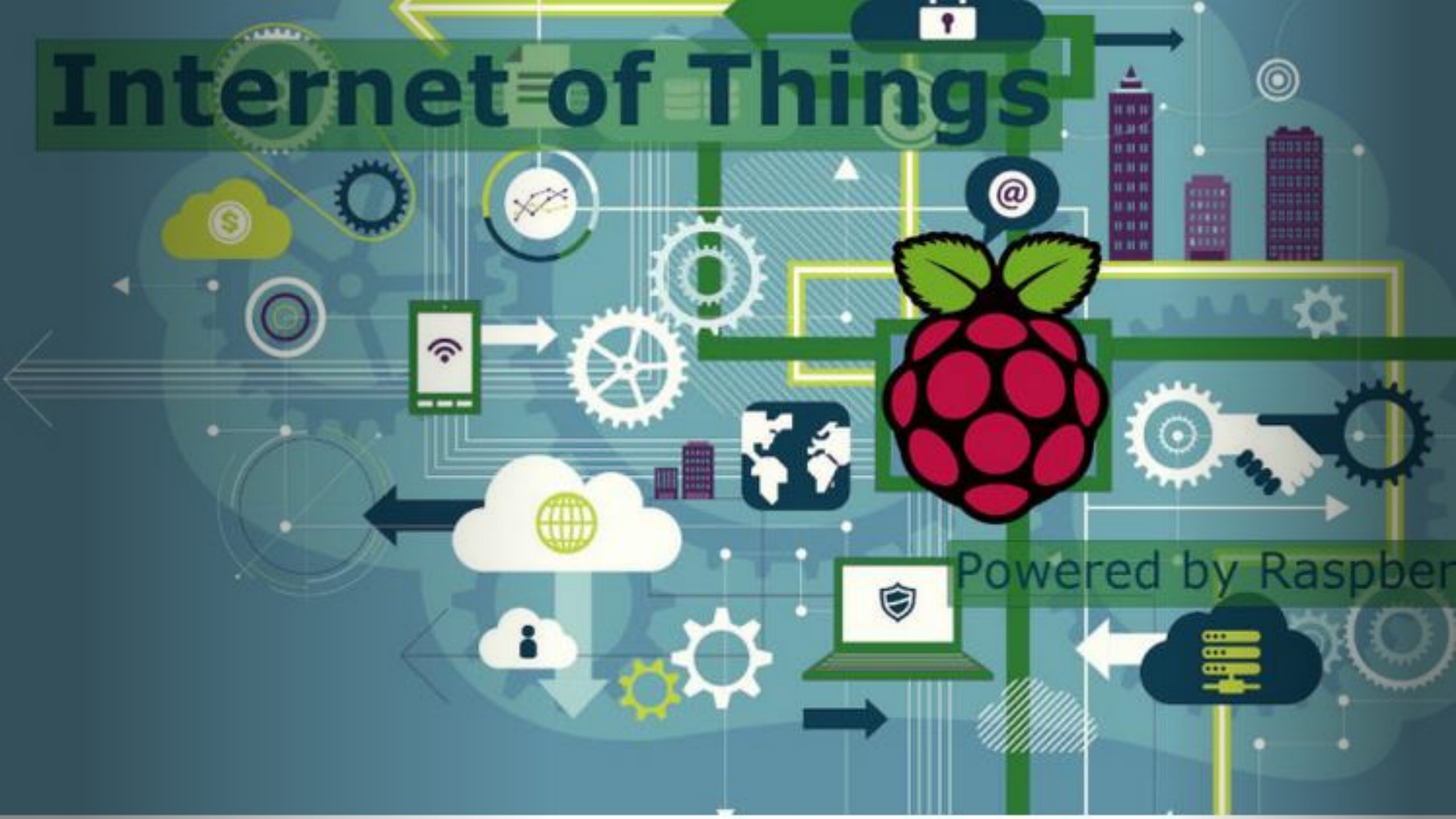# Material Science and Polymers

APT facility

Concept

- Exploit IPv6 only infrastructure

- Develop an ipv6 playground for Undergraduate Programs and reserachers

- Assist lecturers in embracing IPv6 first approach

- Interconnect all devices RaspberryPi's,wireless sensors, Robots, Vr Headsets,

- Lab Pc's and student laptops

TUS
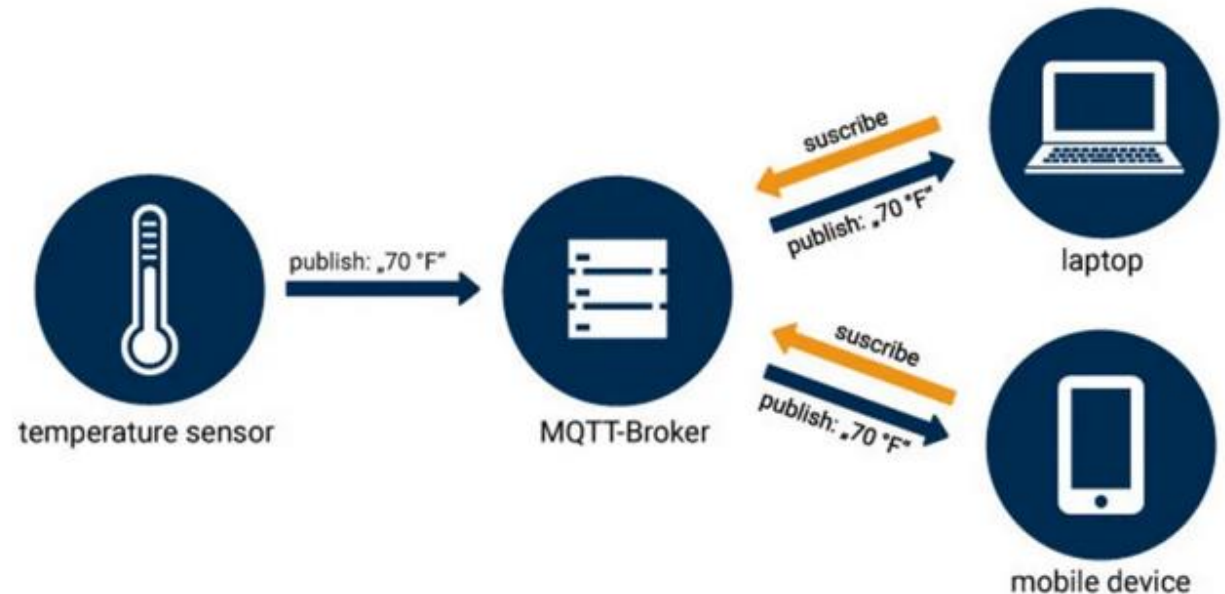
Internet of Things

Powered by Raspberry

Raspberry Pi Sensor cluster

DHCPV6 stateful for Name
resolution of devices DNS

MQTT – protocol to transport
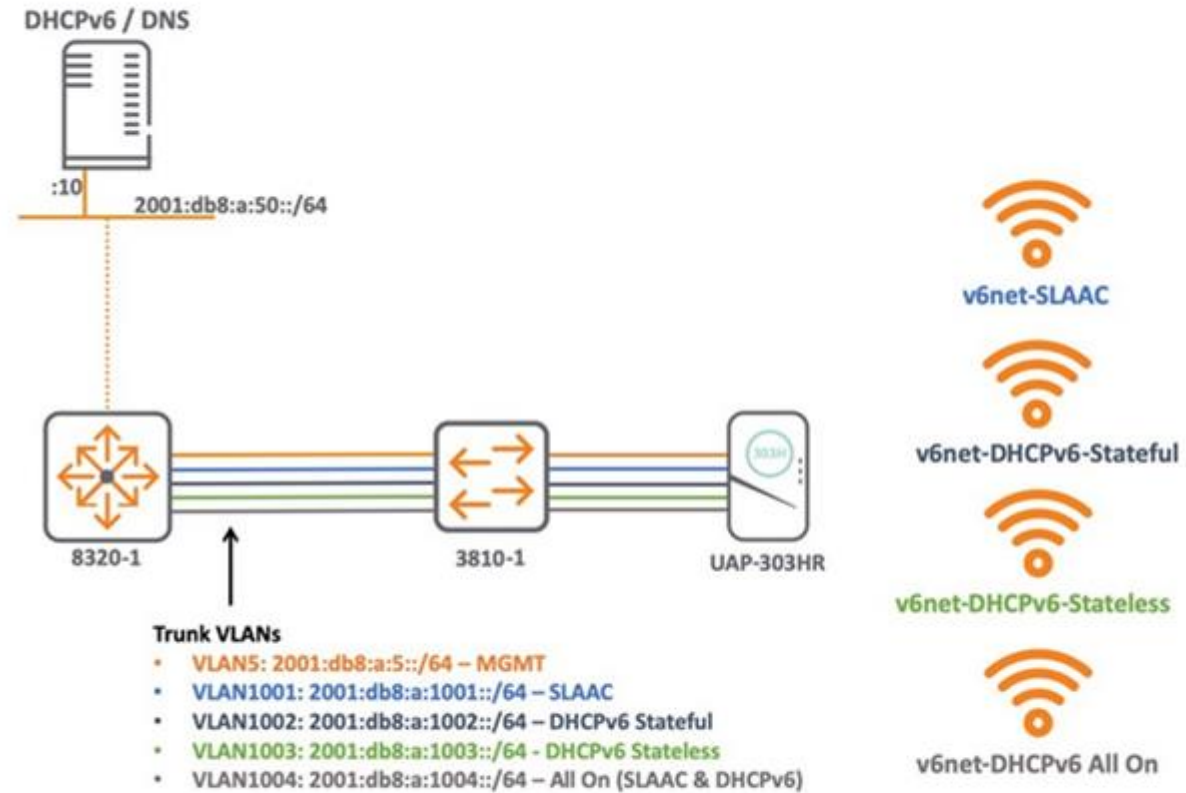messages between devices over
IP

Raspberry pi as broker

Arduino sensor

Mythic-Beasts IPV6 only hosting
Raspberrypi.com

IPV6 Address Allocation Examples

Network diagram

DHCPv6 / DNS

:10   2001:db8:a:50::/64

8320-1   3810-1   UAP-303HR

Trunk VLANs
- VLAN5: 2001:db8:a:5::/64 – MGMT
- VLAN1001: 2001:db8:a:1001::/64 – SLAAC
- VLAN1002: 2001:db8:a:1002::/64 – DHCPv6 Stateful
- VLAN1003: 2001:db8:a:1003::/64 - DHCPv6 Stateless
- VLAN1004: 2001:db8:a:1004::/64 – All On (SLAAC & DHCPv6)

v6net-SLAAC

v6net-DHCPv6-Stateful

v6net-DHCPv6-Stateless

v6net-DHCPv6 All On

Client

RaspberryPi sensor cluster

MQTT
Publisher 2a00:1098:8:f7::1
tus6666.hostepi.com

Cloud hosting
IPV6 only
Mythic-beasts
Raspberry pi.com

Wireless
Controller

CLEARPASS
ACCESS
MANAGEMENT

Institute
Firewall

Institute
LAN

DHCPV6
Server

Router

2001:770:50:4210:b:b:b:b

PI1
DMZ/Edge
MQTT Broker

TUS
MQTTT
Sensor
network

Arduino
sensor
Message
Client

2001:770:50:4210:a:a:a:a

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Industrial IoT remote maintenance

Remote maintenance and diagnostics

High value Polymer manufacturing

Avoid NAT and overlapping private network ranges
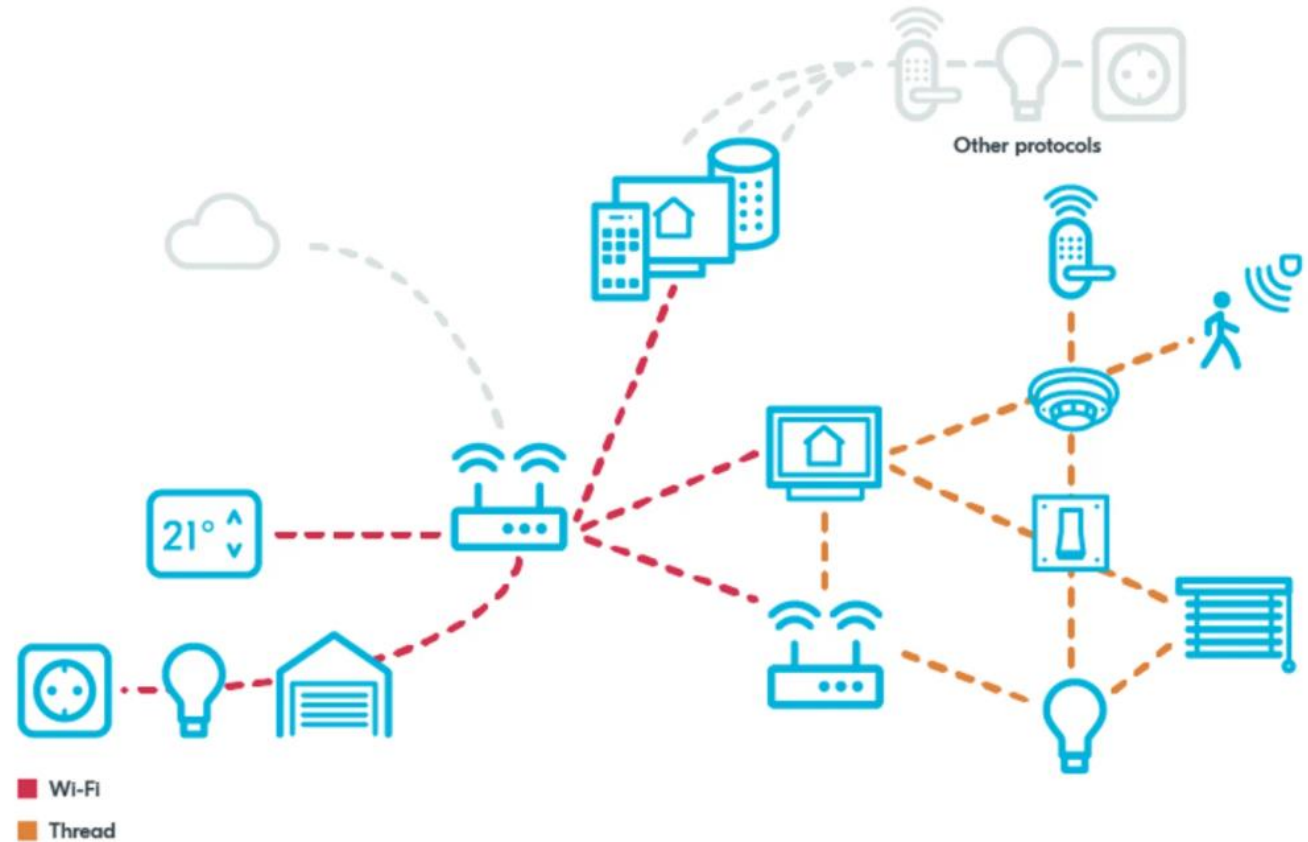
Utilise transport mode IPSec feature

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Future

6LoWPAN

- **6LoWPAN** routing IPv6 over low-power wireless networks.

- Home IOT - Matter project

- Thread protocol

- IPV6 extends battery life

Other protocols

■ Wi-Fi
■ Thread

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IPv6 Influencers

- 80% of US Federal government networks IPv6 only by 2025

- IPv6 Key component of their Zero trust approach to cyber security

- ETSI Esuropean Telecommunications Standards Institute – IPE

- Accelerate IPv6 adoption

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IPV6 benefits

- Simpler design- avoid VLAN sprawl

- Endpoint connectivity with global unique address

- Auto Address assignment

- IPv6 solves scalability issue of IPV4

- Future innovation

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