Thread Use Case

Jonathan Hui
jonhui@google.com

What is Thread?

SNAC BoF, IETF 114, Philadelphia, PA

A Foundation for Matter
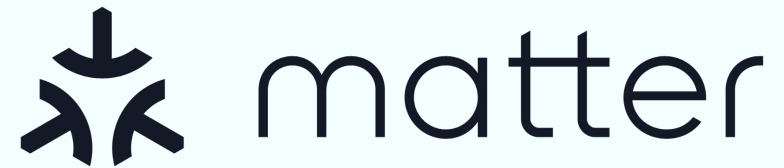
Thread + Matter

Connectivity Standards Alliance
11,456 followers
3w

🔋 #Matter Milestone – Test Event #7 is the largest in CSA history with 134 devices and 187 participants representing over 53 companies. Join hundreds of members who #buildwithmatter.

Half of Matter devices implement Thread

Not Just Matter

A multi-service network

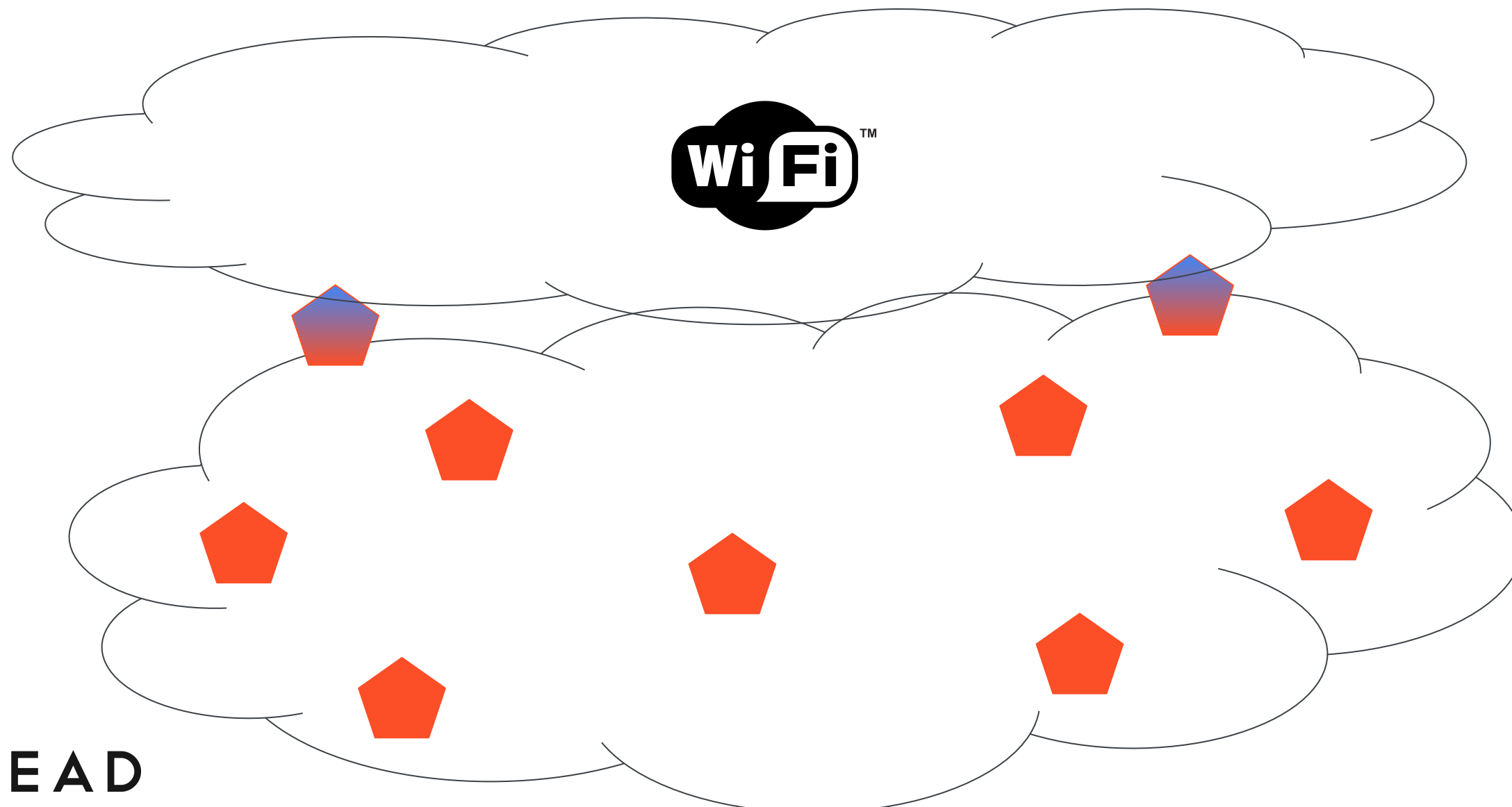Host **multiple applications** using a **common network infrastructure**

IEEE 802.15.4 Radio (same as Zigbee)

PHY	Frequency	2.4 GHz ISM
	Modulation	O-QPSK
	Data Rate	250 kbps
	Frame MTU	127 bytes
MAC	Media Access	CSMA-CA
	Security	AES-128
ADP	IPv6 Header Compression	RFC 6282
	Fragmentation	RFC 4944
	Addressing	RFC 4944

Dynamic Mesh Topology
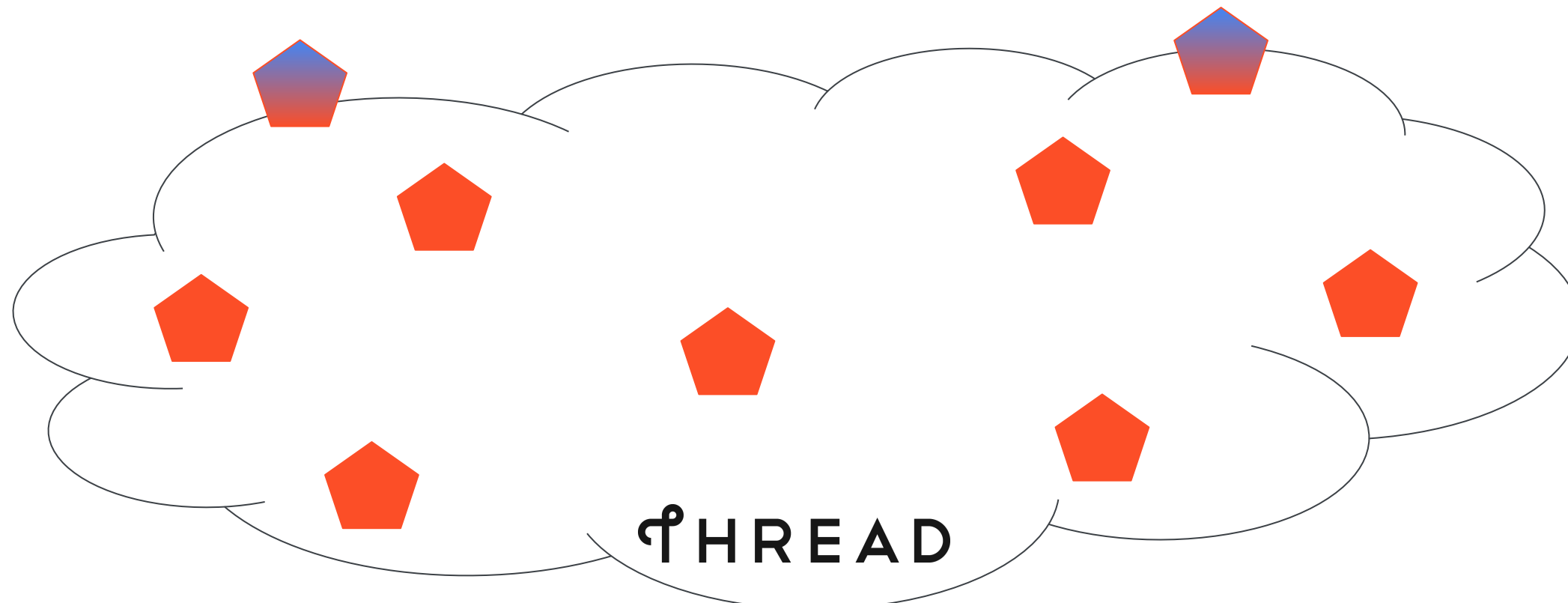
Border Routers

THREAD

Shipping Thread Border Routers

SNAC BoF, IETF 114, Philadelphia, PA
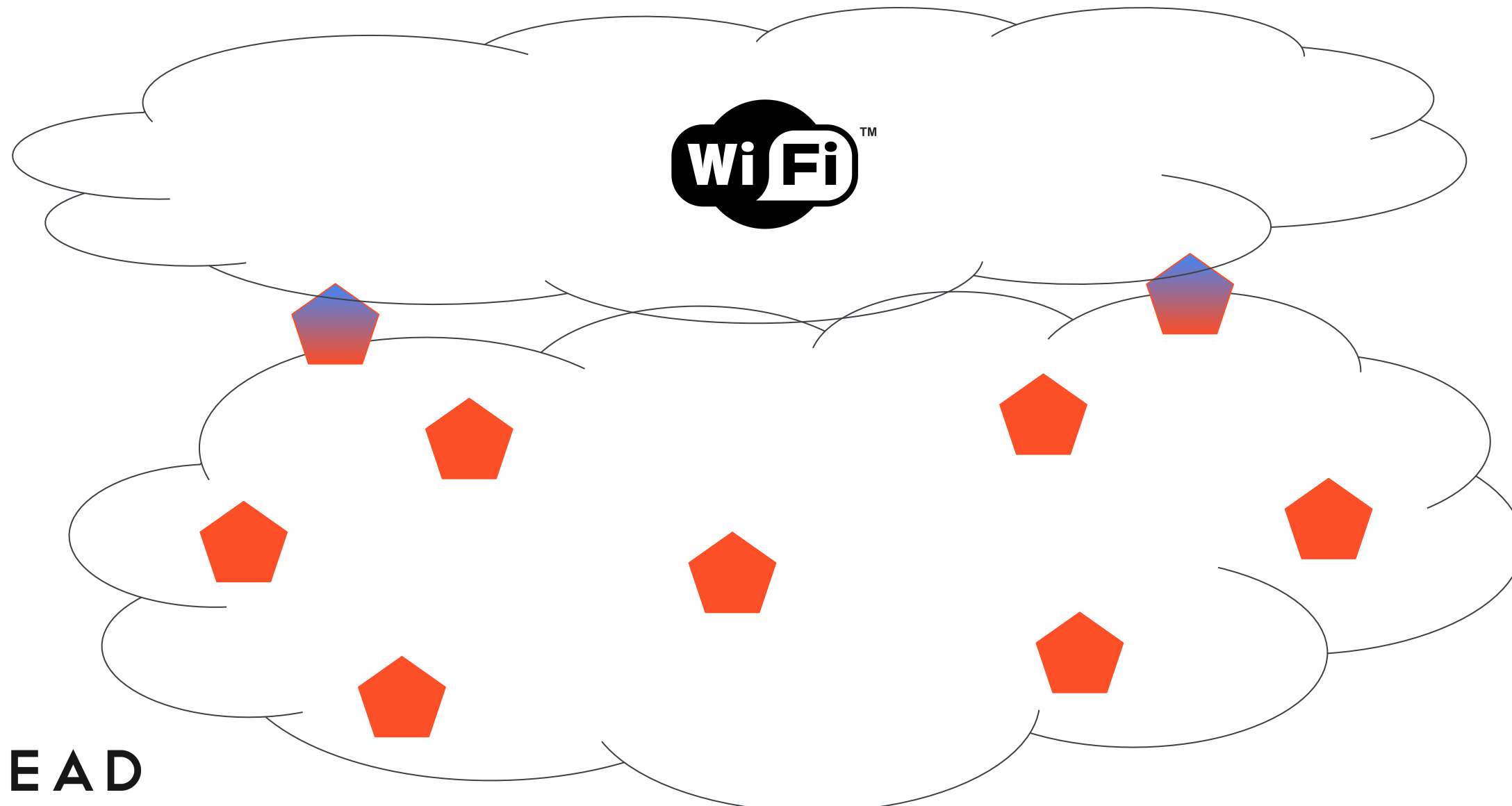
Dynamic Partitioning
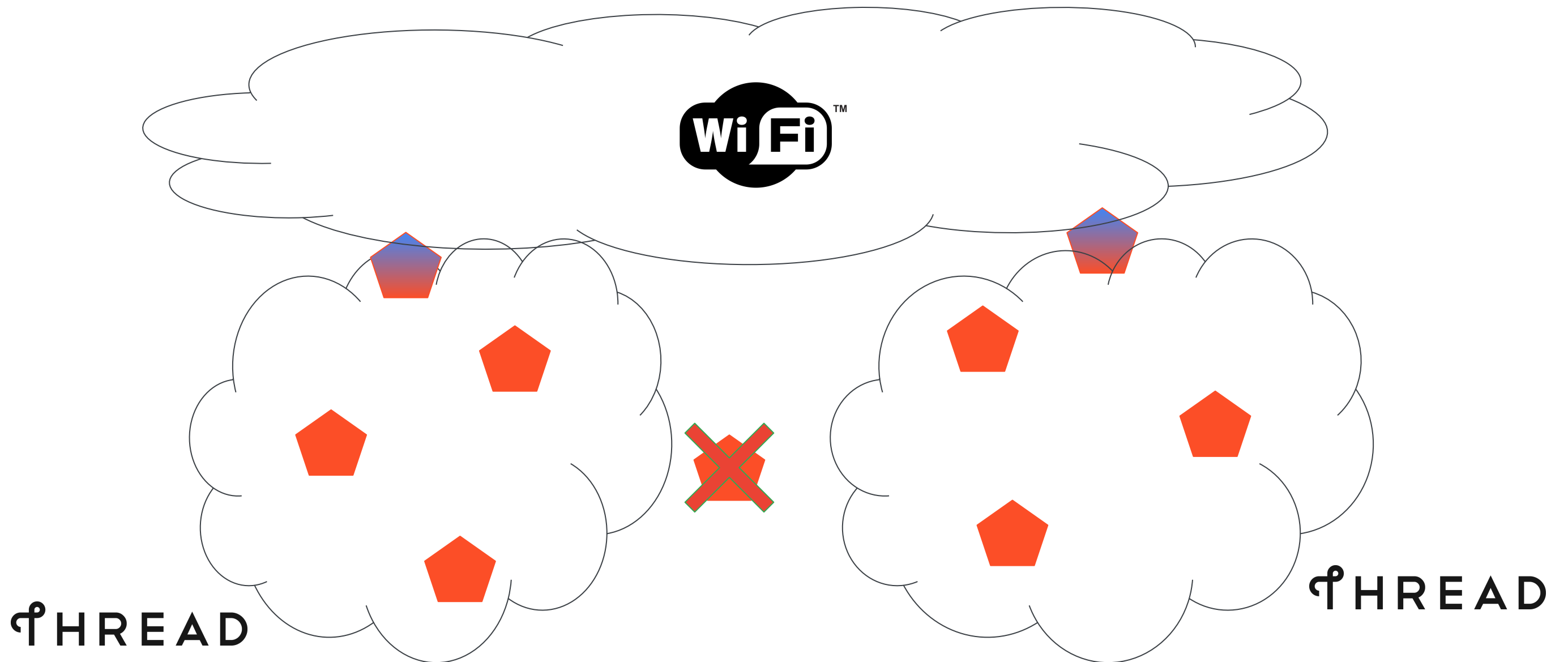
Dynamic Merging

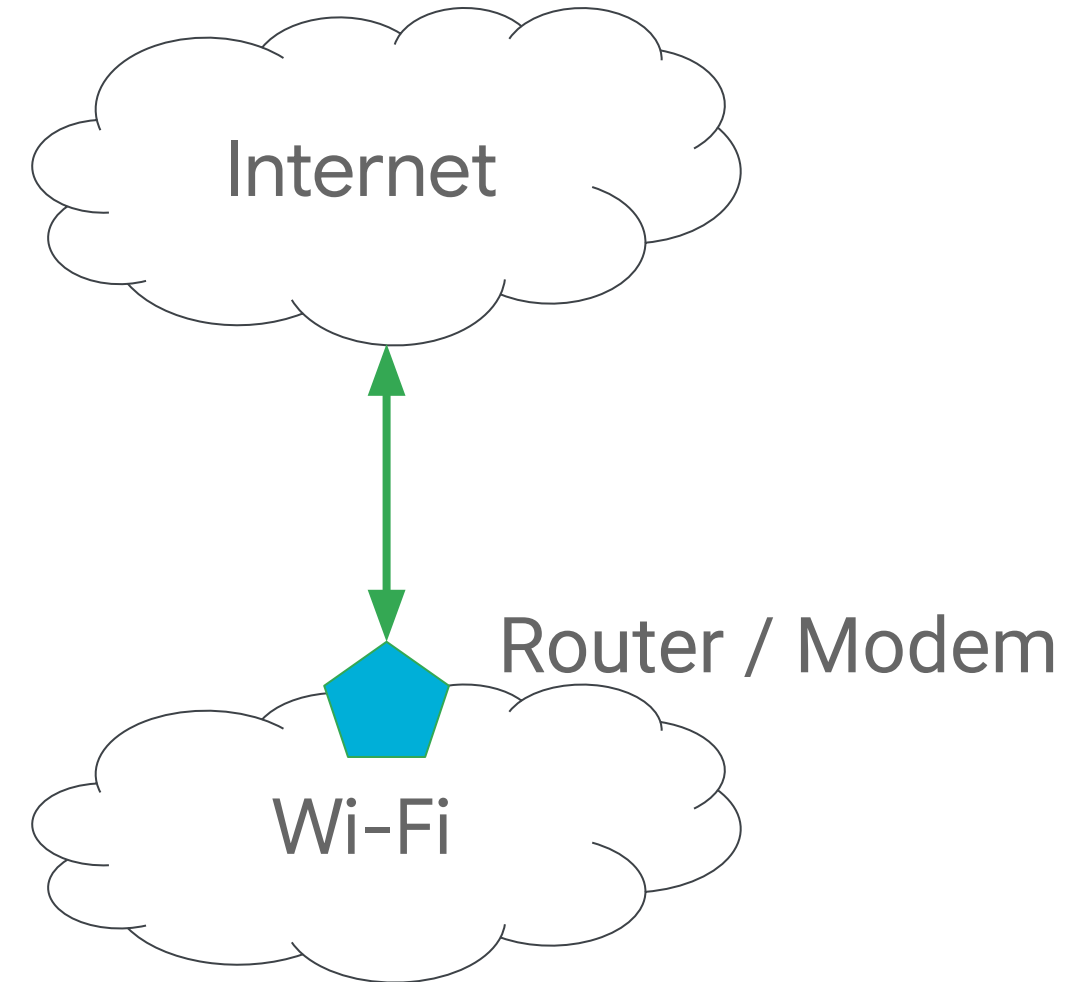# Network Architecture

Home Network

Single IP subnet

Single broadcast domain

All devices in home are within a single IP hop
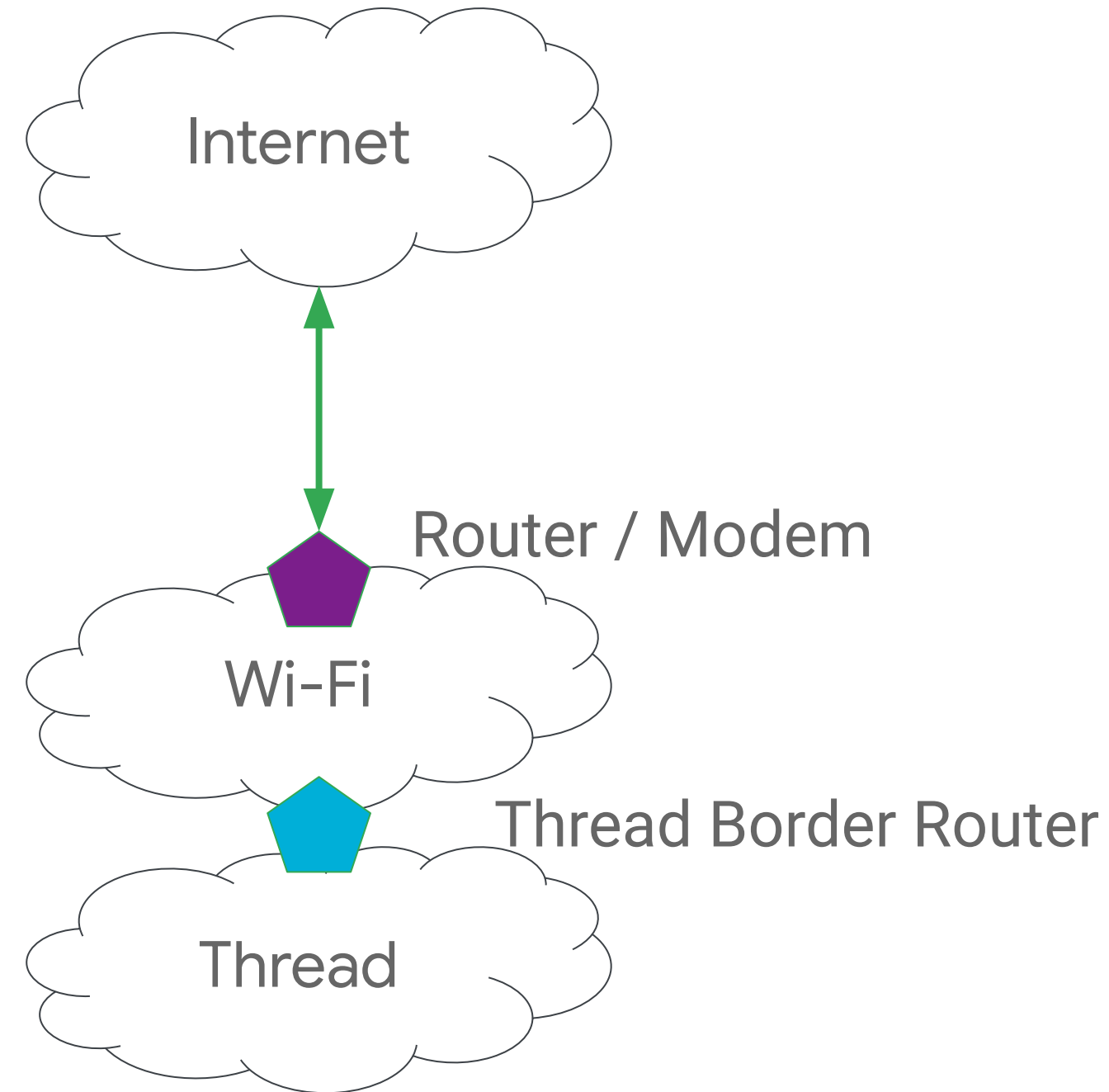
Internet

Router / Modem

Wi-Fi

Home Network with Thread

Separate IP subnets

Separate broadcast domains

Multiple IP hops between Thread and Wi-Fi

Internet

Router / Modem

Wi-Fi

Thread Border Router

Thread

IPv6 Reachability
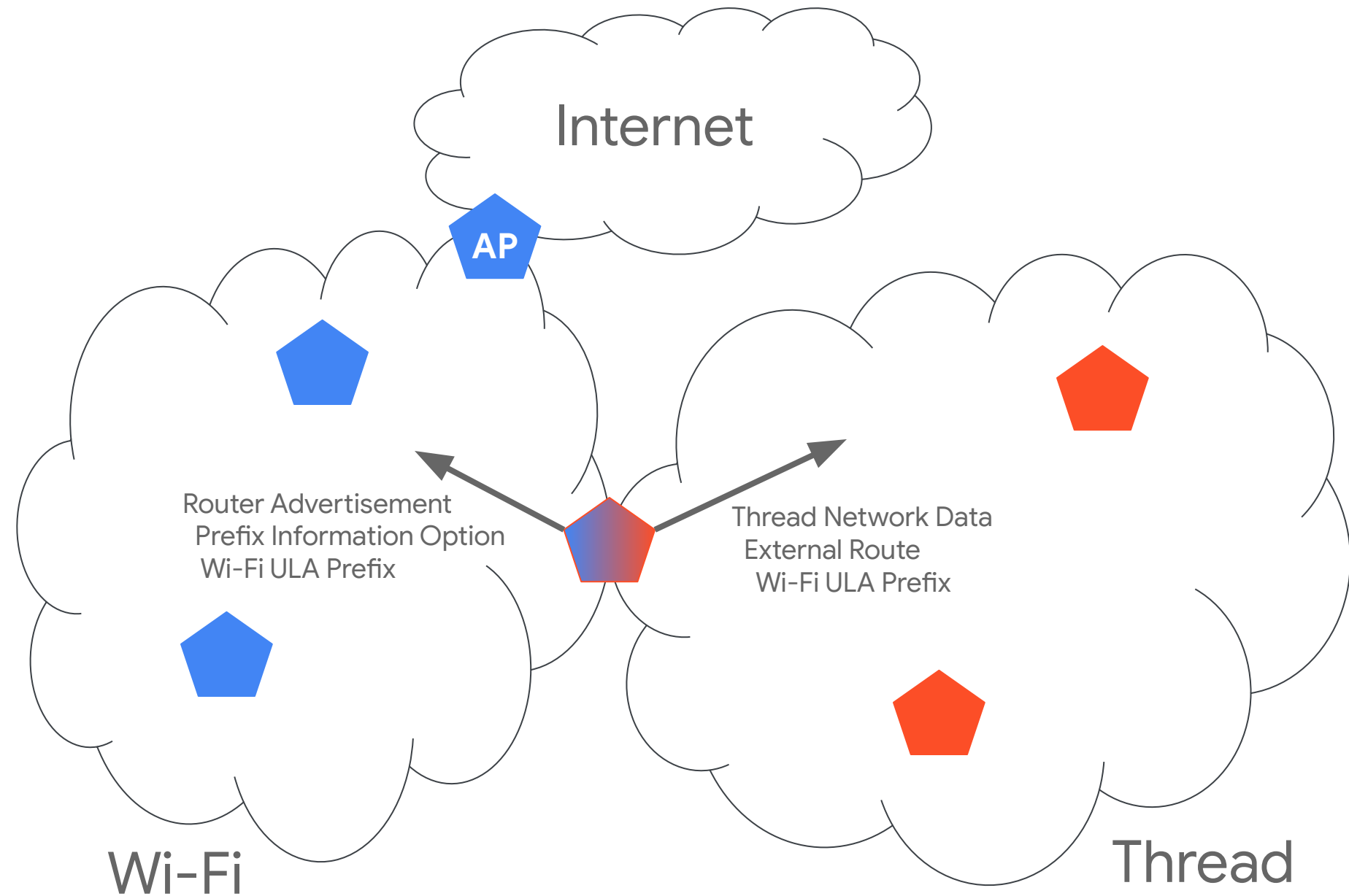
IPv6 Reachability

To Wi-Fi devices

Config Wi-Fi devices with ULAs
    Send Router Advertisements on Wi-Fi
        Prefix Information Option (PIO) with
        Wi-Fi ULA Prefix (based on Ext PANID)

Config Thread devices with route to Wi-Fi
    Publish Thread Network Data on Thread
        External Route with
        Wi-Fi ULA Prefix (based on Ext PANID)

Internet

AP

Router Advertisement
Prefix Information Option
Wi-Fi ULA Prefix

Thread Network Data
External Route
Wi-Fi ULA Prefix

Wi-Fi
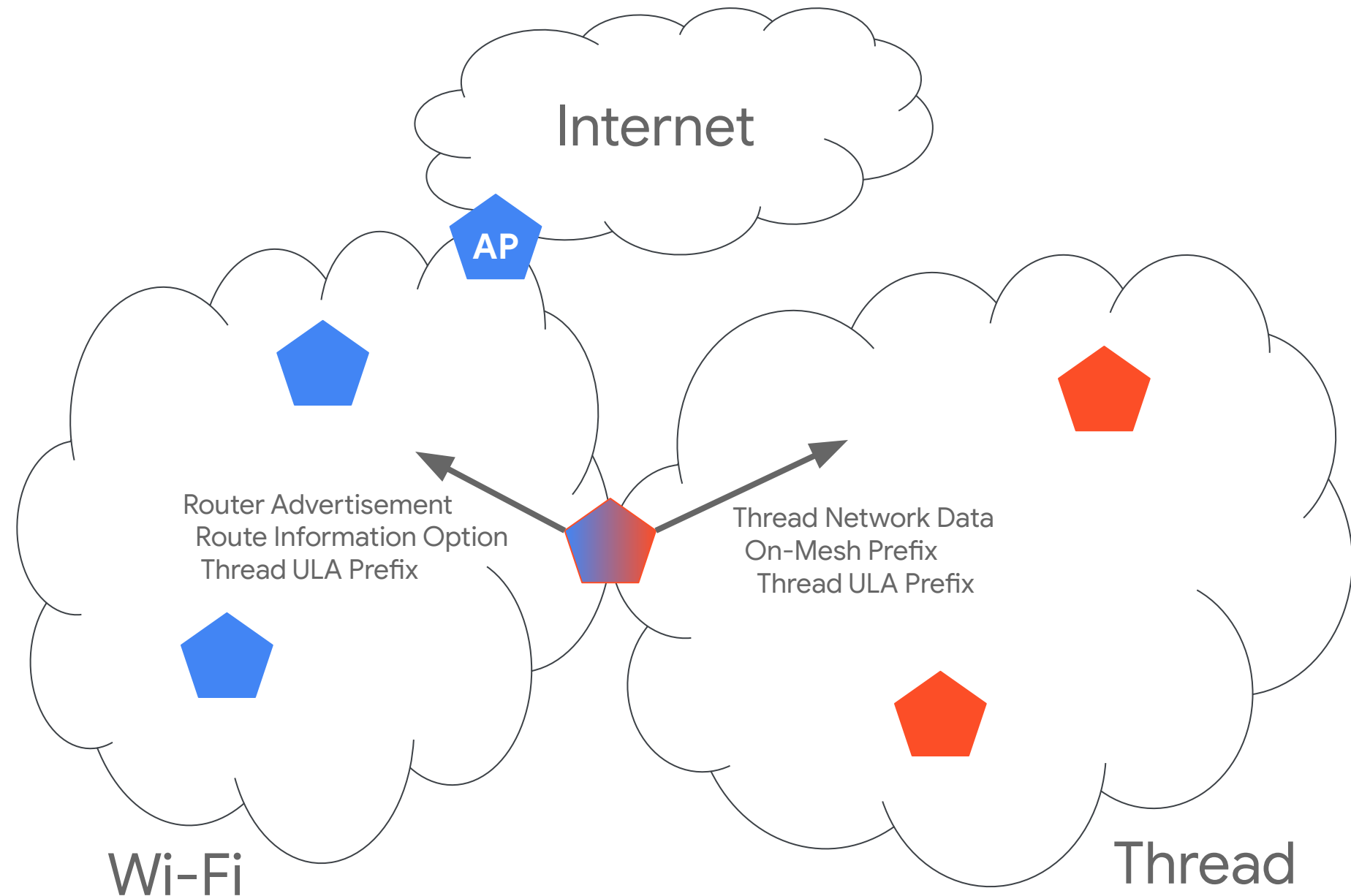
Thread

IPv6 Reachability

To Thread devices

Config Thread devices with ULAs
    Publish Thread Network Data on Thread
      On-Mesh Prefix with
      Thread Network ULA Prefix

Config Wi-Fi devices with route to Thread
    Send Router Advertisements on Wi-Fi
      Route Information Option (RIO) with
      Thread Network ULA Prefix

Internet

AP

Router Advertisement
Route Information Option
Thread ULA Prefix

Thread Network Data
On-Mesh Prefix
Thread ULA Prefix

Wi-Fi

Thread

SNAC BoF, IETF 114, Philadelphia, PA

DNS-Based Service Discovery
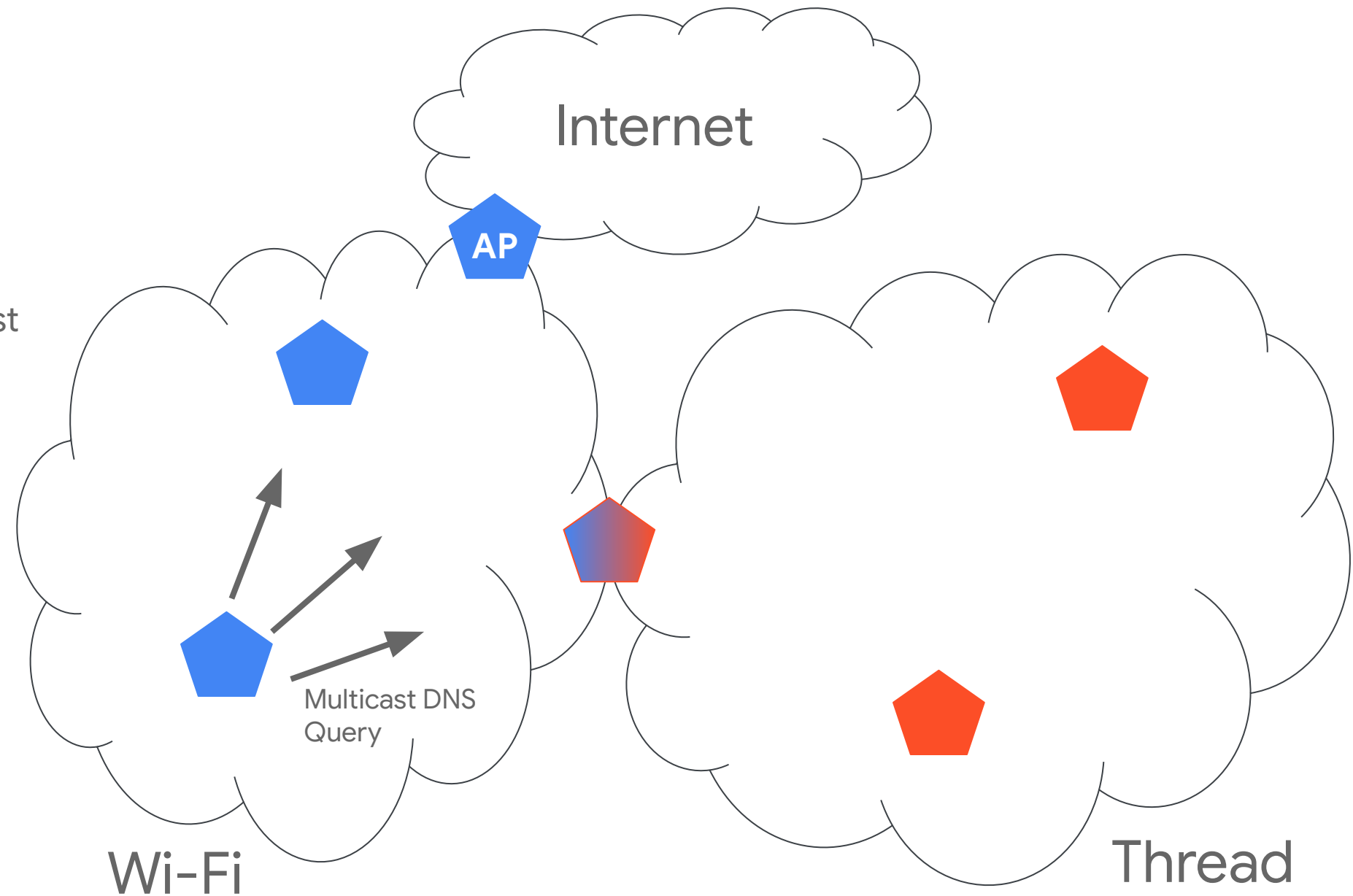
Multicast DNS (mDNS)

Problem

mDNS widely used for discovering services

Multicast DNS Query sent to link-local multicast
Does not extend into Thread network

Increasing performance gap between
unicast and **multicast**

Multicast in mesh networks very expensive

Internet

AP

Multicast DNS
Query

Wi-Fi

Thread

Service Registration Protocol (SRP)
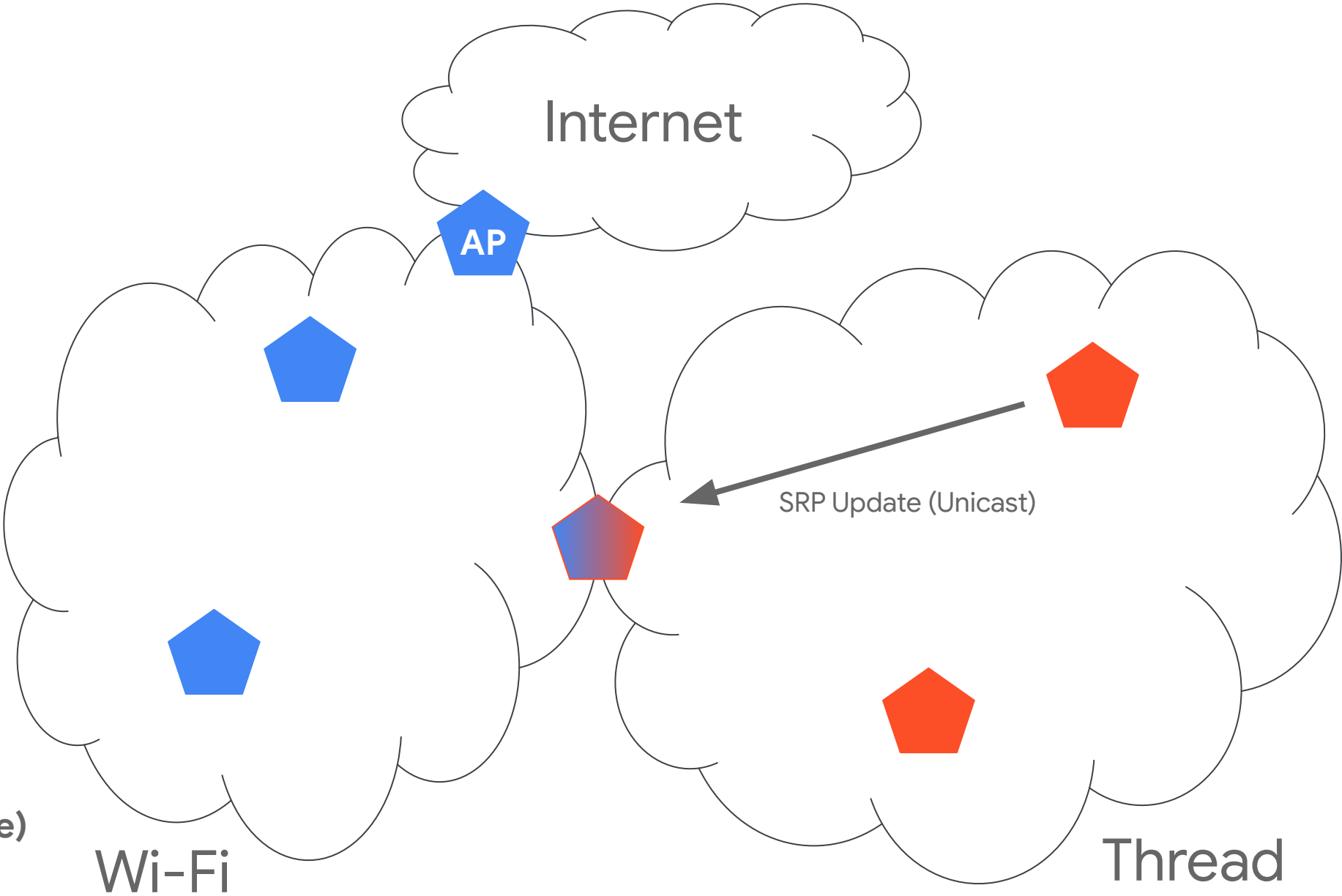
Thread device publishing services

SRP Update (DNS Update)
    Zone
        default.service.arpa
    Updates
        Service Discovery Instruction
            (PTR)
        Service Description Instruction
            (SRV, TXT)
        Host Description Instruction
            (AAAA, KEY)
    Additional Records
        Update Lease
            Lease
            Key Lease
        SIG(0)

SRP Update Response (DNS Update Response)
    Error Code

Internet

AP
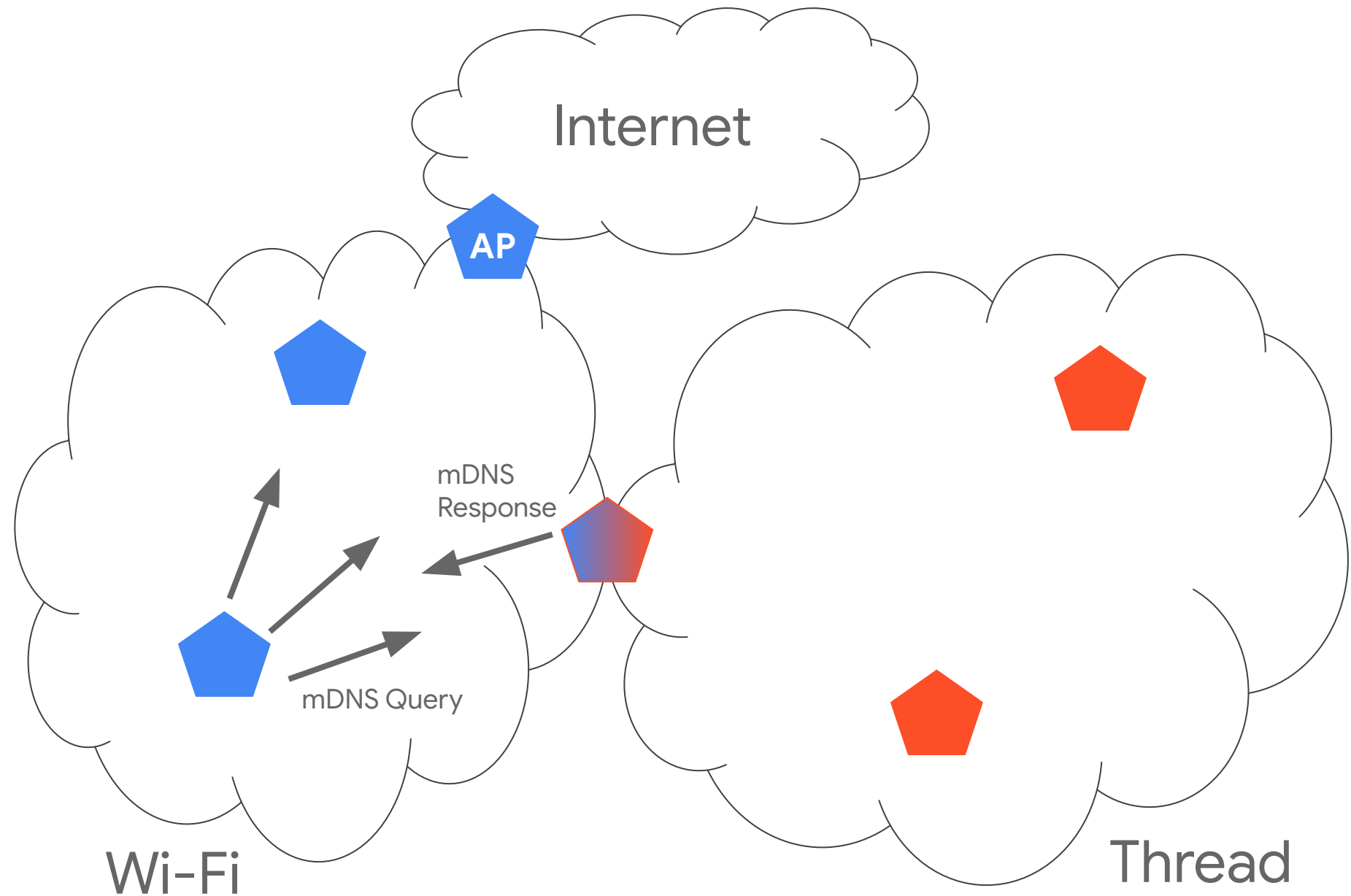
SRP Update (Unicast)

Wi-Fi

Thread

Advertising Proxy

Wi-Fi device discovering services on Thread

Border Router implements Advertising Proxy
to make services discoverable on Wi-Fi

Publish DNS-SD records from SRP
on Wi-Fi using mDNS

Internet

AP

mDNS
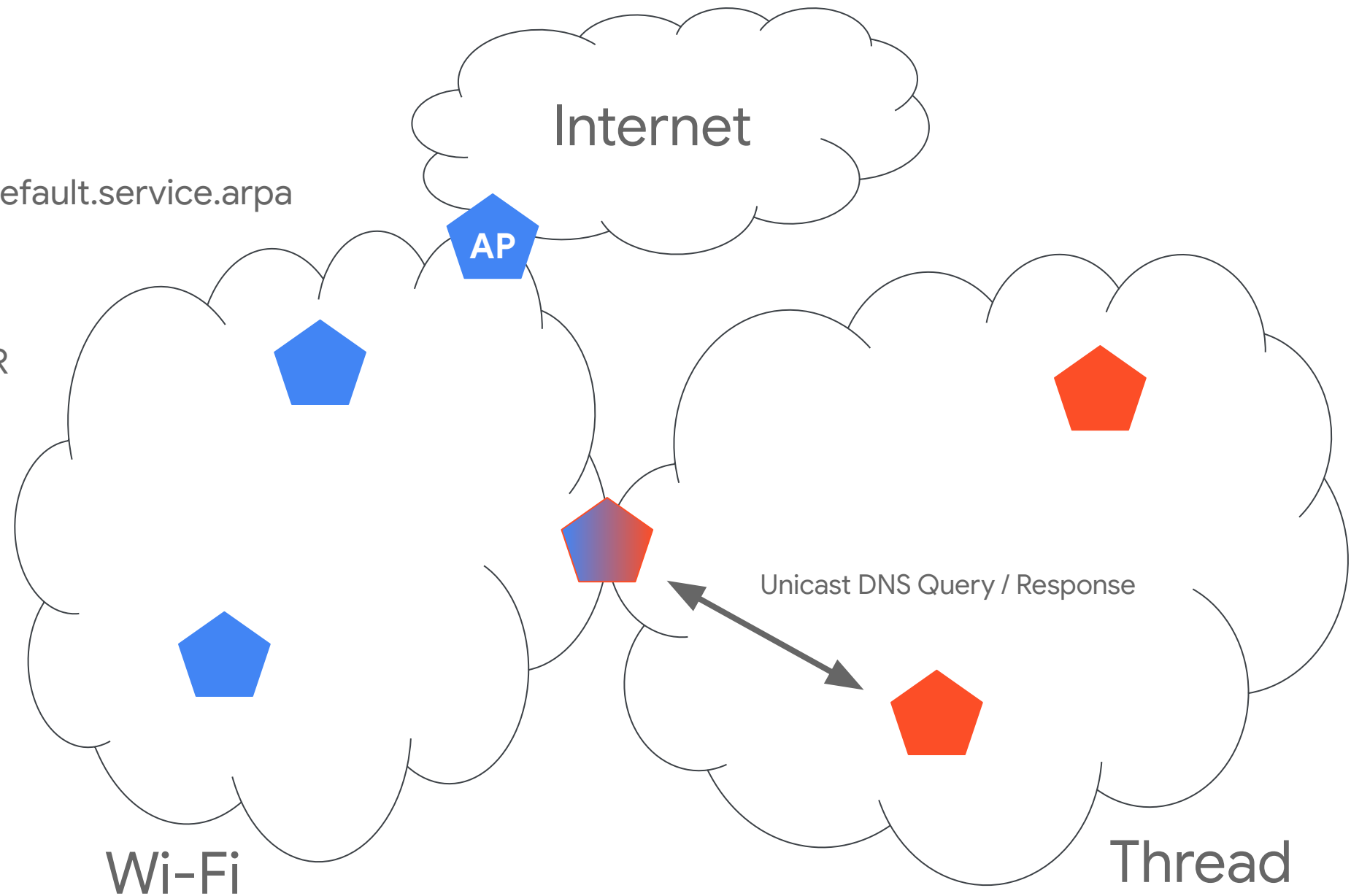Response

mDNS Query

Wi-Fi

Thread

Discovering Services

Thread device discovering services on Thread

Border Router is DNS authoritative server for default.service.arpa

Thread device sends unicast DNS queries to BR

Border Router sends unicast DNS response

Internet

AP

Wi-Fi

Unicast DNS Query / Response
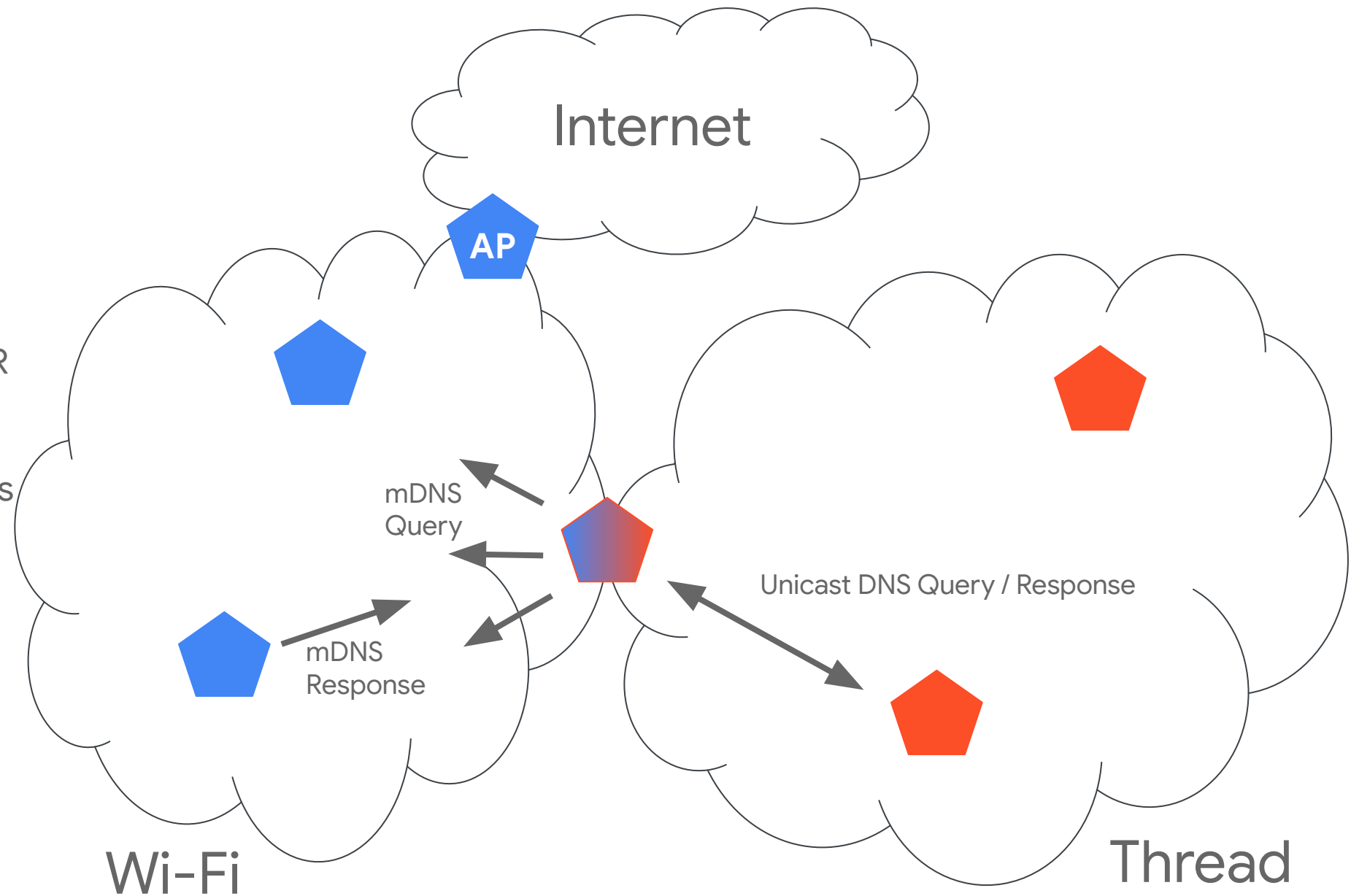
Thread

Discovery Proxy

Thread device discovering services on Wi-Fi

Border Router implements Discovery Proxy

Thread device sends unicast DNS queries to BR

BR sends mDNS Query and receives Responses

Border Router sends unicast DNS response

Internet

AP

mDNS
Query

mDNS
Response

Unicast DNS Query / Response

Wi-Fi

Thread

Thank you

Jonathan Hui
jonhui@google.com

SNAC BoF, IETF 114, Philadelphia, PA