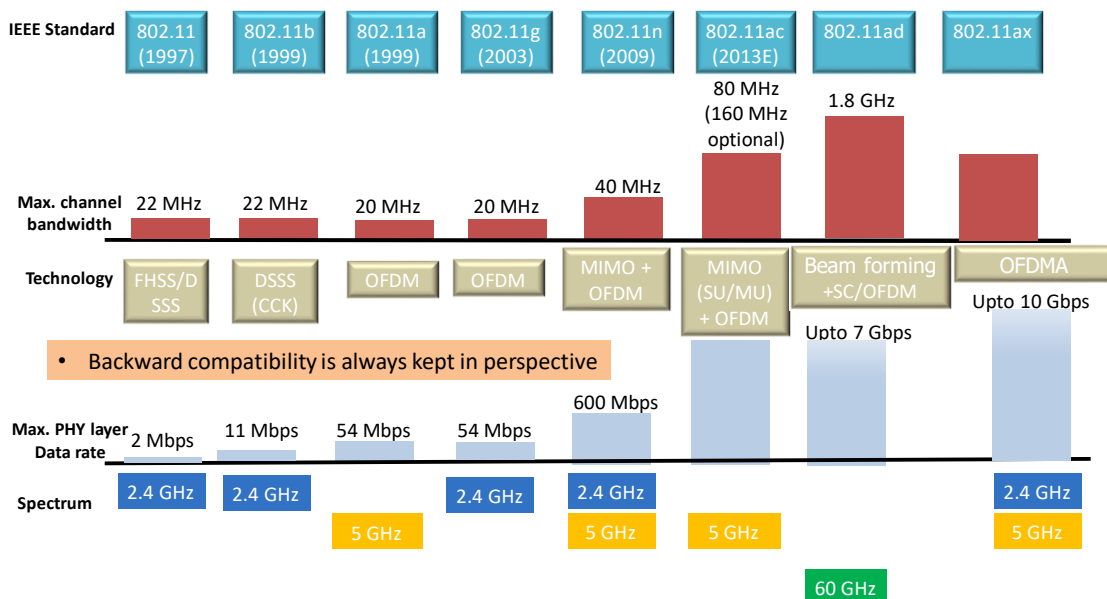


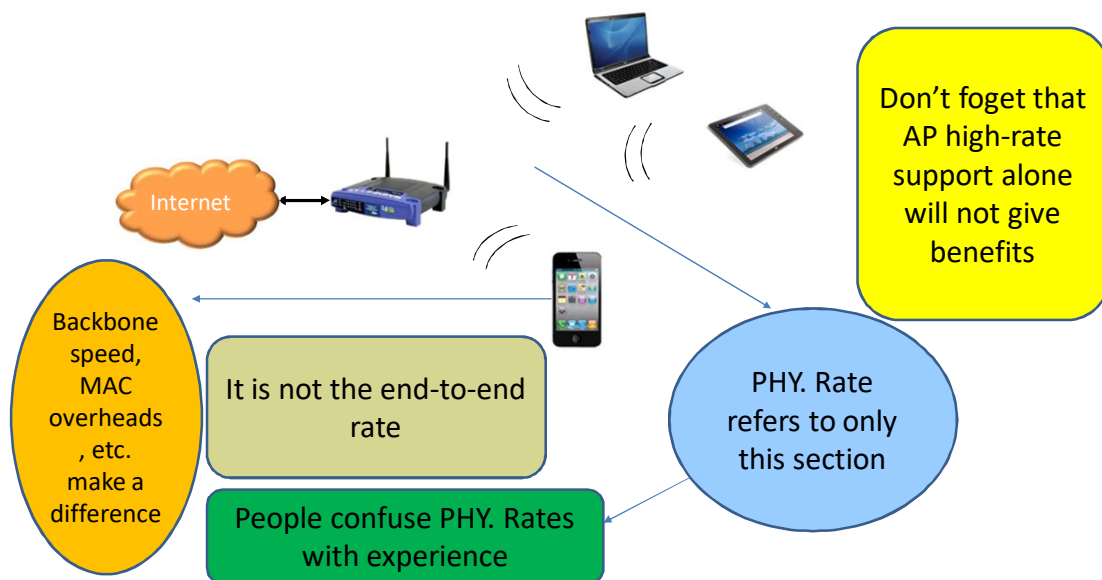
Wi-Fi alphabet soup and related things

Dr. Srikanth Subramanian, CKO, Nanocell Networks

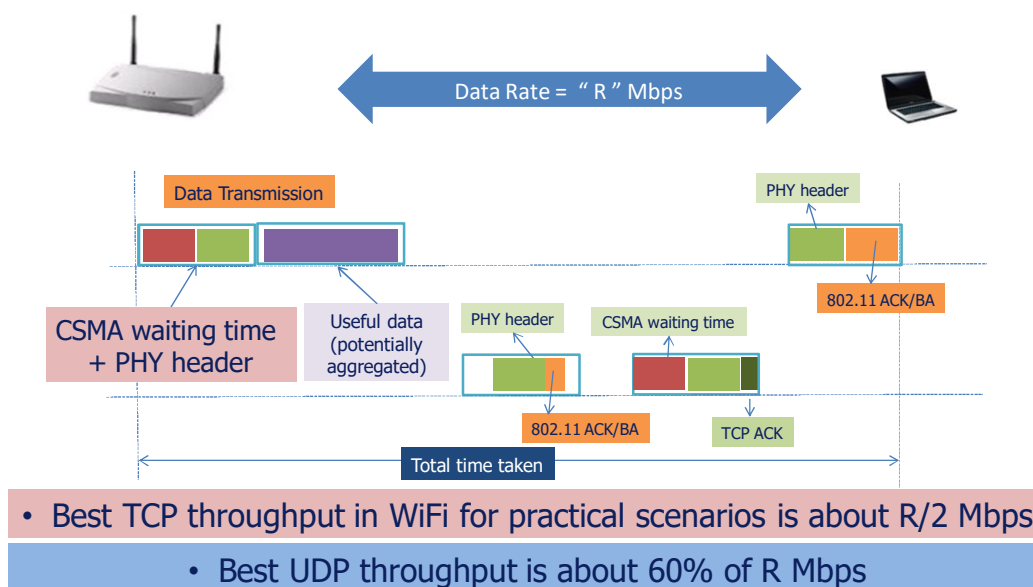
Wi-Fi Technology Evolution – Rates and Speeds



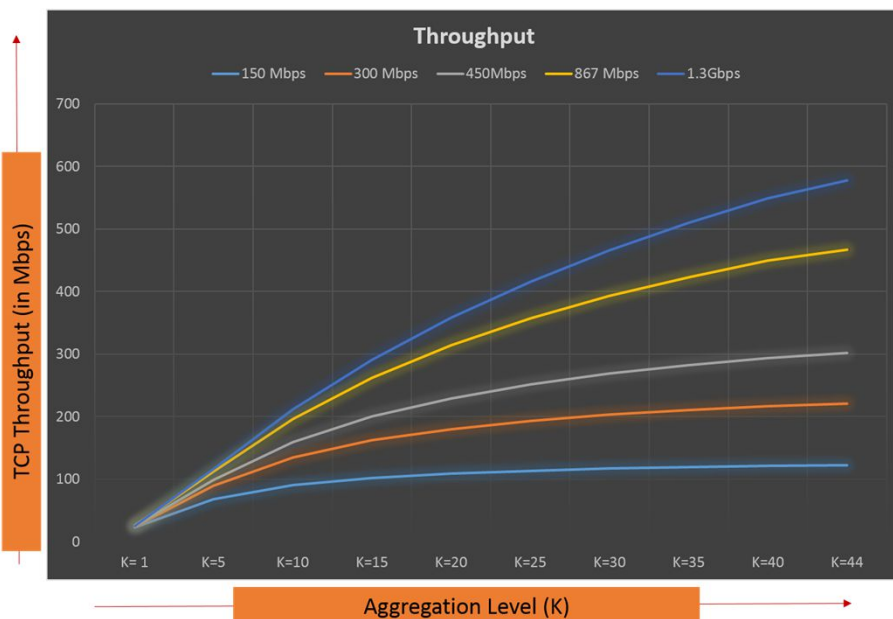
What does PHY. Rate Mean?



TCP/IP throughput – Impact of Overheads

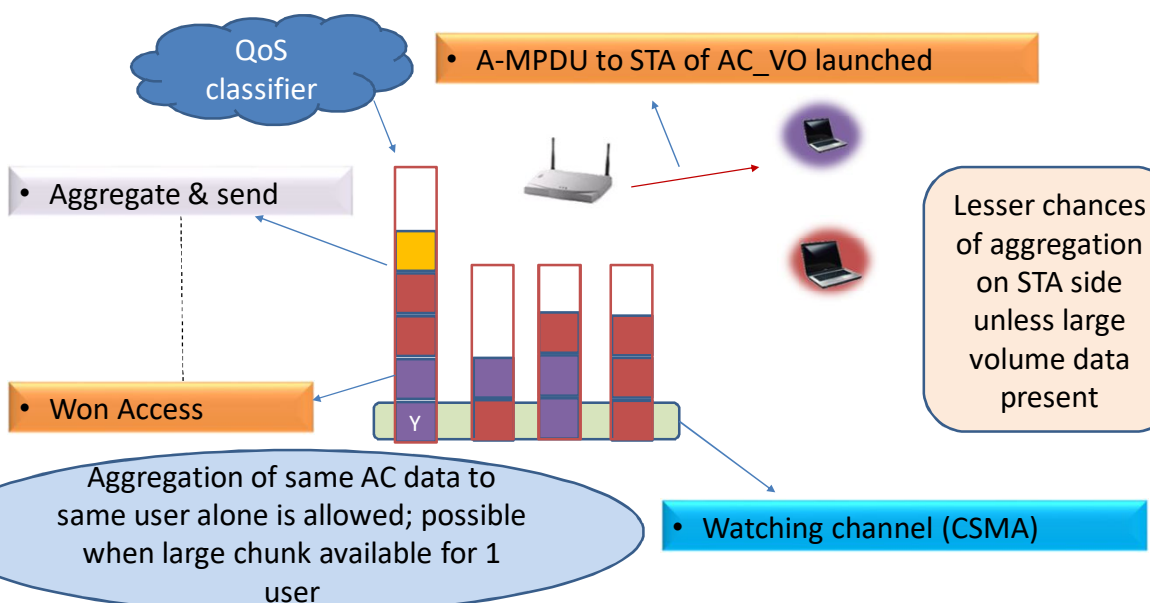


802.11 Throughputs – The Real Story !!

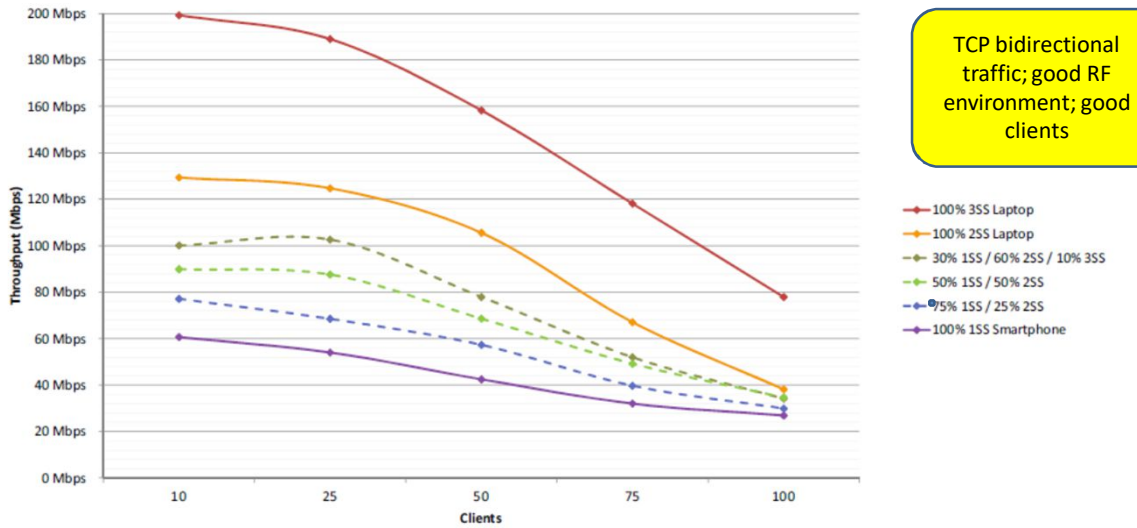


- Real-life Wi-Fi traffic ..difficult to aggregate in high-density scenarios
- Advances of 802.11 PHY. are practically useless.. We are benefitting by better radio and CPUs in products

Transmission of an A-MPDU typical case

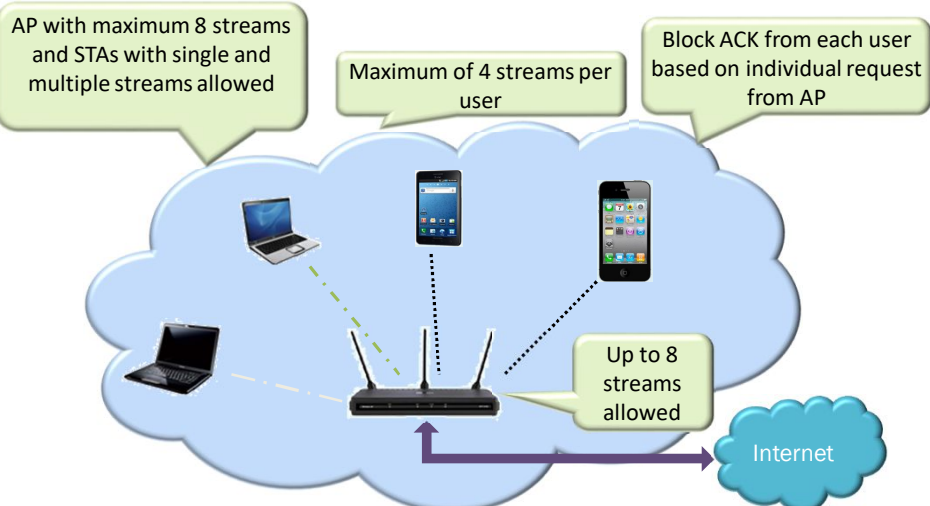


Wi-Fi throughput in High Density



Source: Aruba Networks

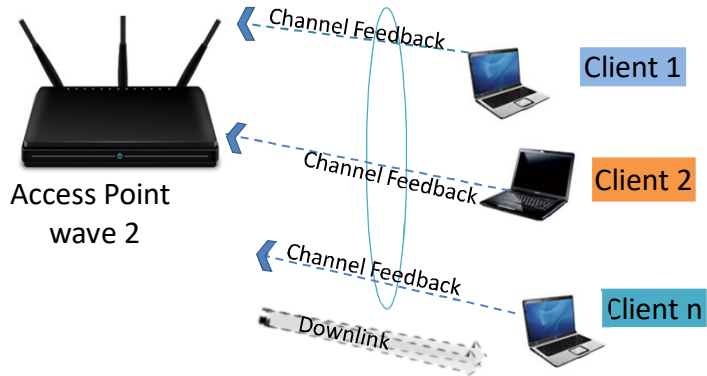
802.11ac MU-MIMO



• Simultaneous transmission upto 4 users

Only on Downlink

DL – MU-MIMO



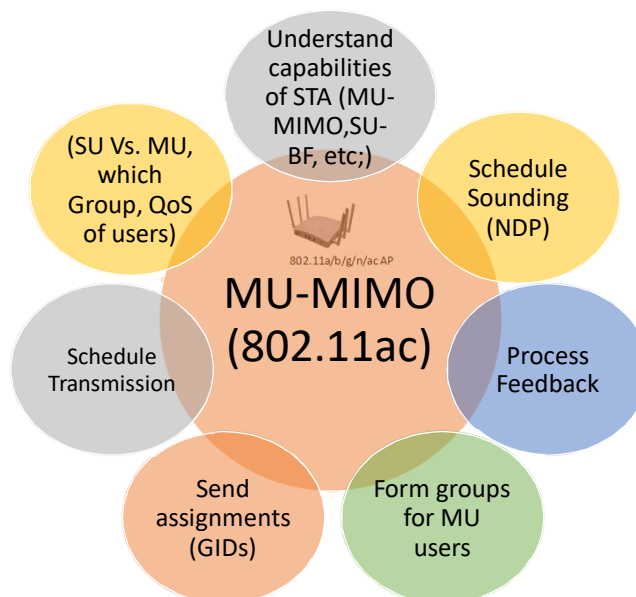
DL- MU-MIMO is a big upgrade from ordinary MIMO

Each client has to handle potential multi stream links.

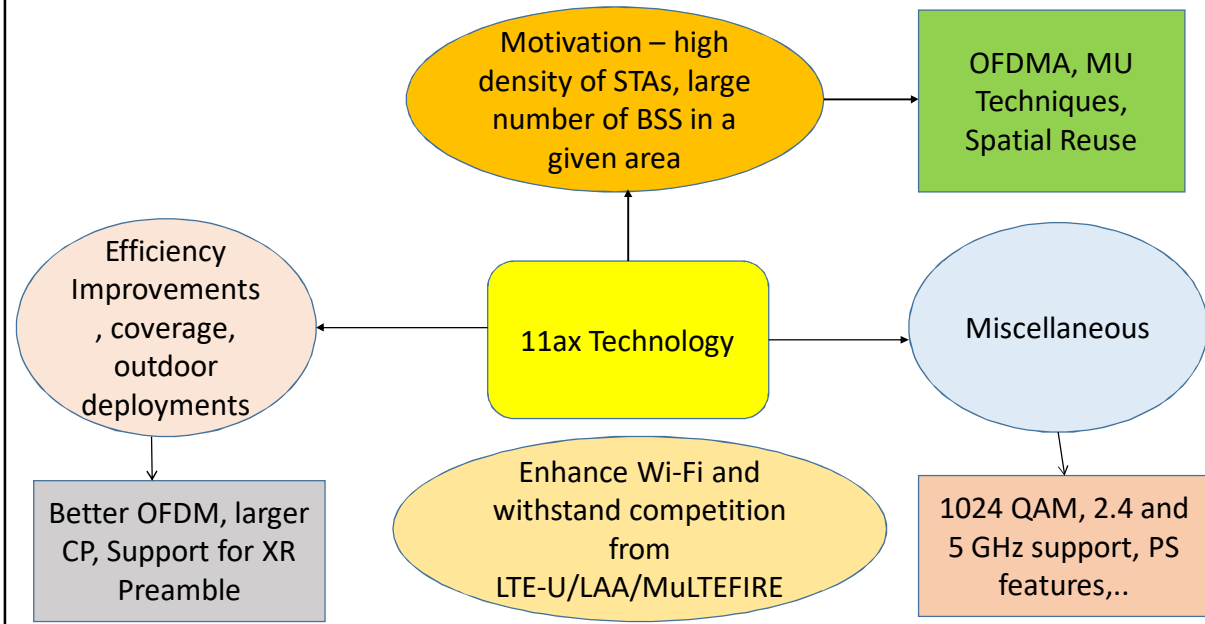
DL- MU-MIMO needs detailed channel feedback

- DL MU-MIMO can be extremely challenging as AP has to find a MU-BF solution.

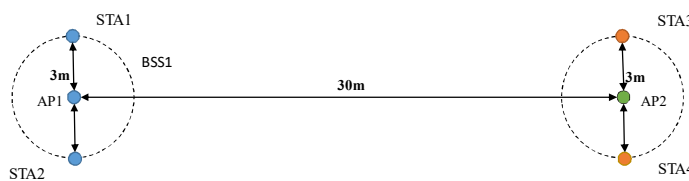
MU-MIMO – Impacts On AP



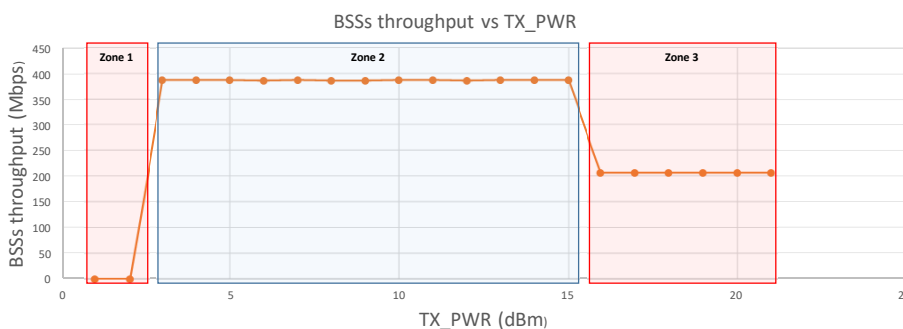
11ax Technology Summary



11ax Spatial Reuse – Simulation Results



UDP traffic, saturated case, fixed MCS

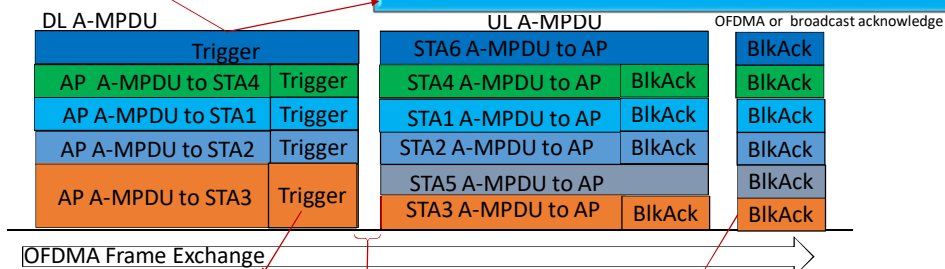


Aggregated throughput above 1 network throughput in zone 2; Zone 1.. Power too weak, Zone 3.. Only 1 network transmitting

Sample Cascaded Transmission in 802.11ax

DL and immediate UL need not involve same STAs.

Trigger frame needs to precede UL MU transmissions; multiple users can be scheduled using a single trigger frame



OFDMA Frame Exchange

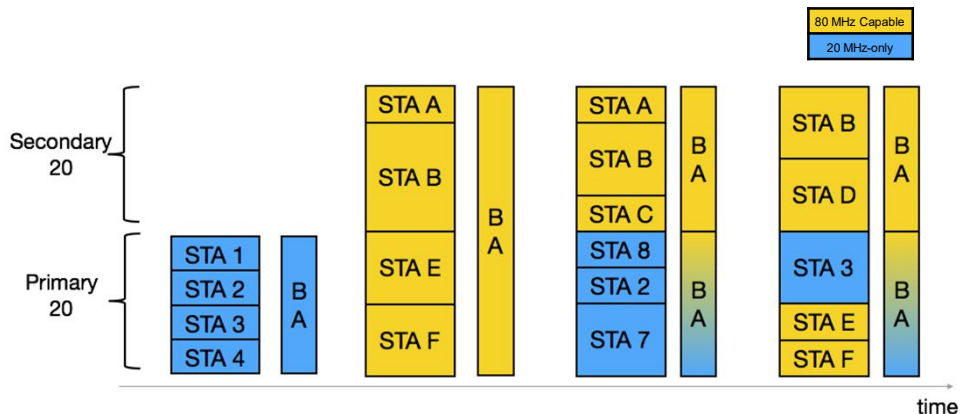
Unicast Trigger in A-MPDU with data frames has the same receiver as the data frames.

After receiving UL MU PPDU, the AP acknowledges the received frames by using broadcast acknowledge or OFDMA acknowledge.

SIFS

Trigger frames may have padding

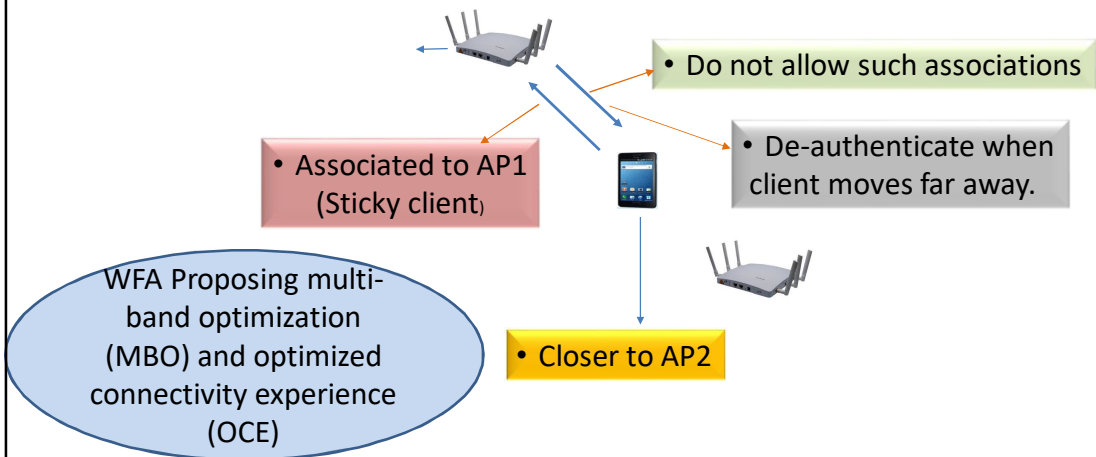
11ax IOT support ?



- AP may choose the BW operation, with either
 - One or multiple 20MHz-only STAs in 20 MHz SU/OFDMA, or
 - 80MHz capable STAs group, without 20MHz-only, or
 - Mixed group of 20MHz-only and 80MHz-capable STAs, where 20MHz-only STAs are only in the primary channel

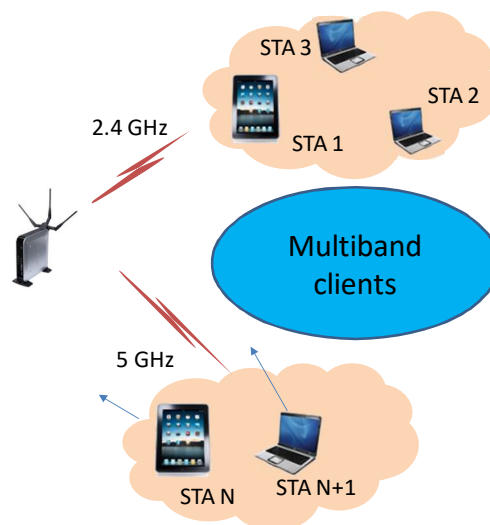
Managing Clients

• Info. Sharing with AP2



MBO - Objectives

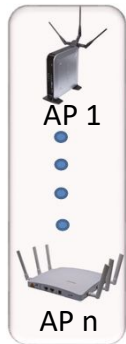
• Dual-band dual-radio AP



How can AP and client work together to smoothly manage steering across bands even including Wi-Fi to cellular

How to avoid unilateral actions and the consequent unpredictable behaviour from clients?

OCE Basics

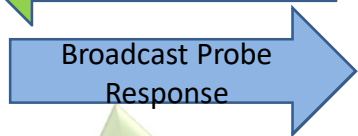
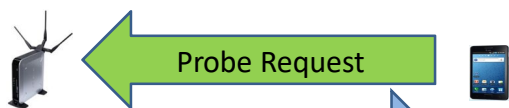


Long connectivity time

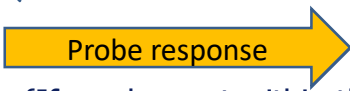
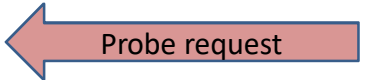
Lots of management frames ; probes etc.

- Poor performance in crowded scenarios
- Can we do a better job of WiFi in such scenarios?

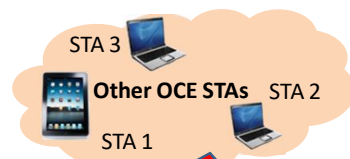
OCE- Probe Response/Discovery



Transmitted @5.5 Mbps and above with exceptions



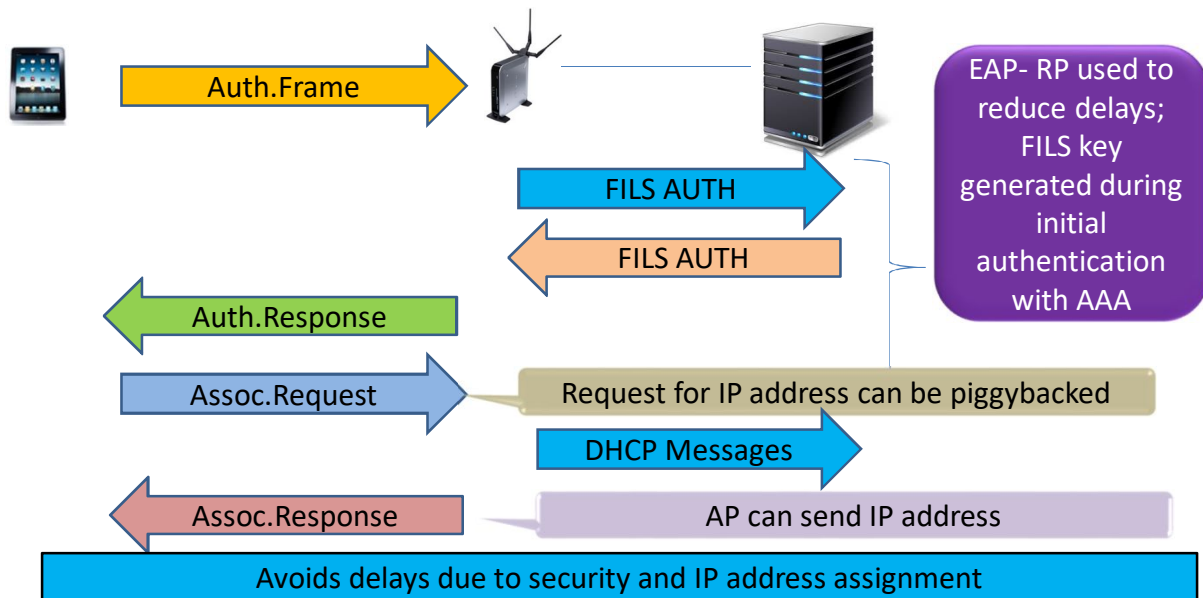
{If can be sent within this time OK, else avoid}



- Avoids unnecessary probing by others listening
- Can use BC probes response for AP selection

- Avoids unnecessary probe response when STA not listening
- Can include time till which STA wait

OCE: Short Connection Times



Summary

How is your Wi-Fi going to be used.. Who are the clients..this will help settled for a matching AP

Configurability, manageability, upgradeability, cost etc. are probably more important

Don't be fooled by high PHY. rates

New standards will take time to come to the market and mature in terms of overall eco-system.. Keep a close watch..



All WFA programs do not become popular in the market !!..will MBO/OCE click?

Market will talk about high rates, MU-MIMO, 11ax coming etc. .. Wade through the noise