

# Overview of Wi-Fi

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## Wi-Fi – A Wireless Success Story



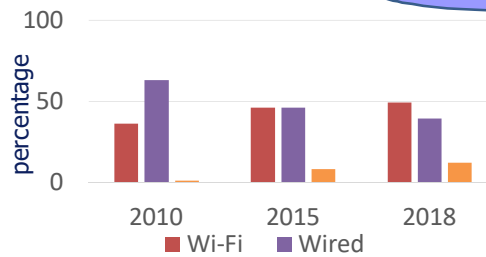
Wi-Fi present in all laptops/APs

Wi-Fi in Phones and tablets

Wi-Fi's next wave – presence in all CE devices (IOT)

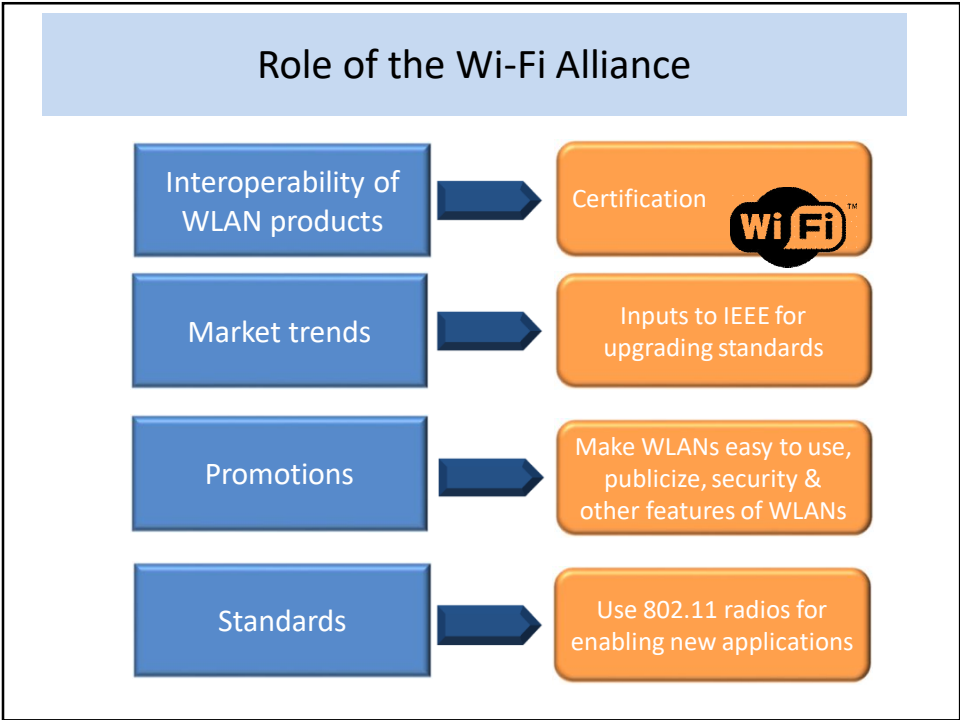
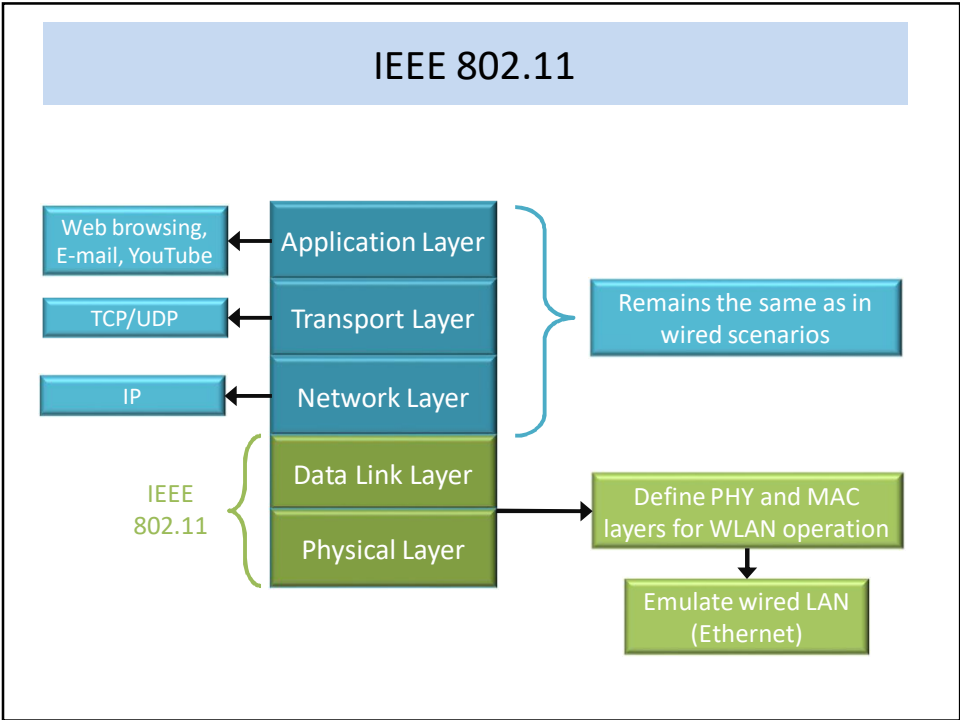
Wi-Fi Calling

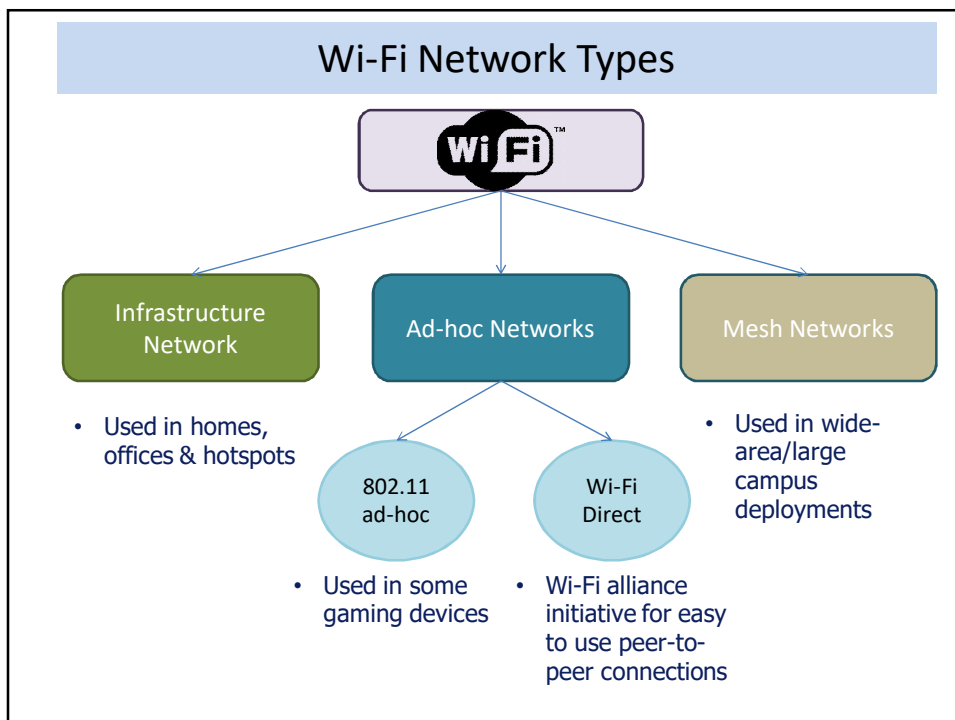
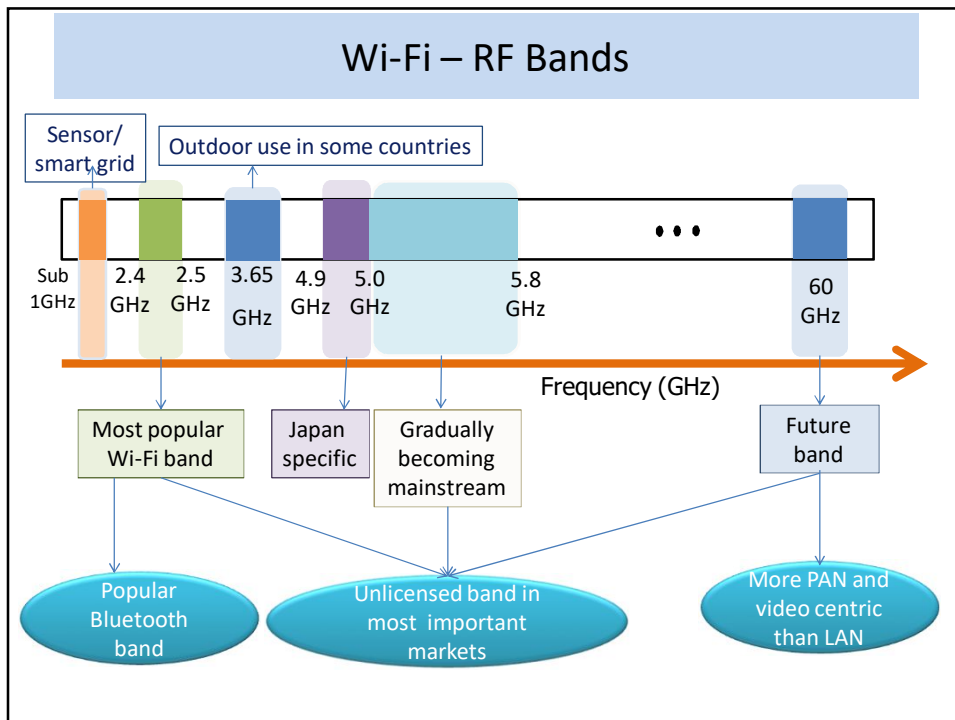
Wi-Fi Traffic trends



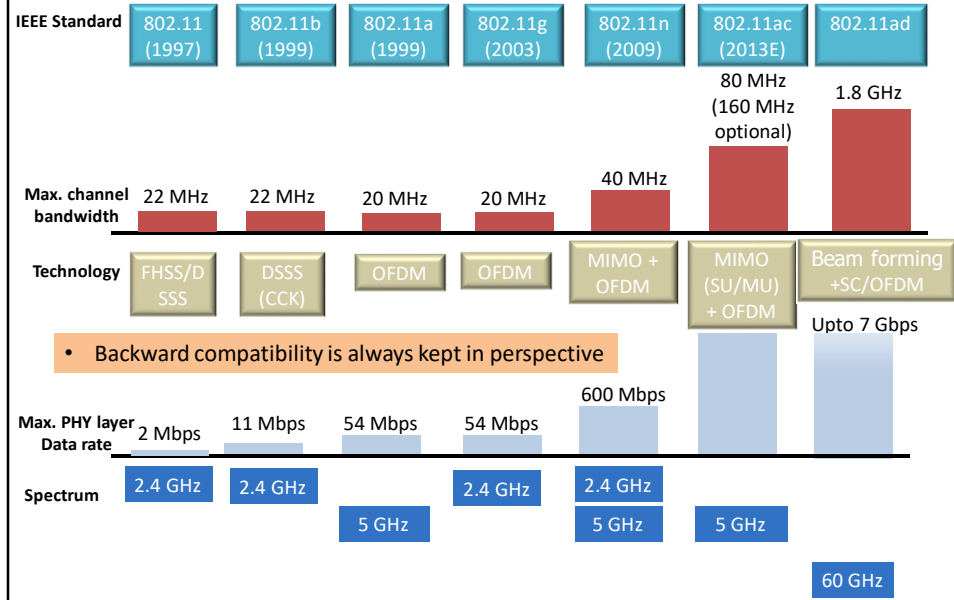
Significant traffic to come from non-computing devices

Source: Cisco

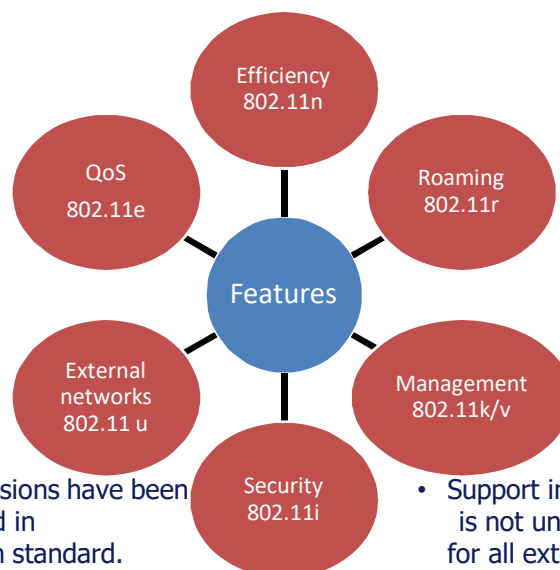




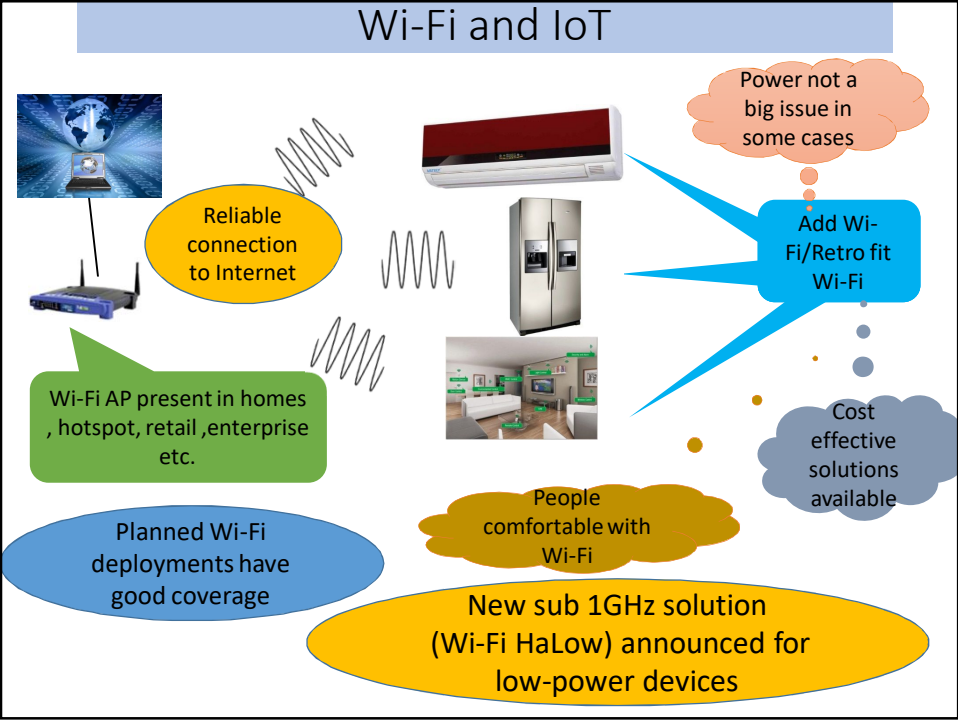
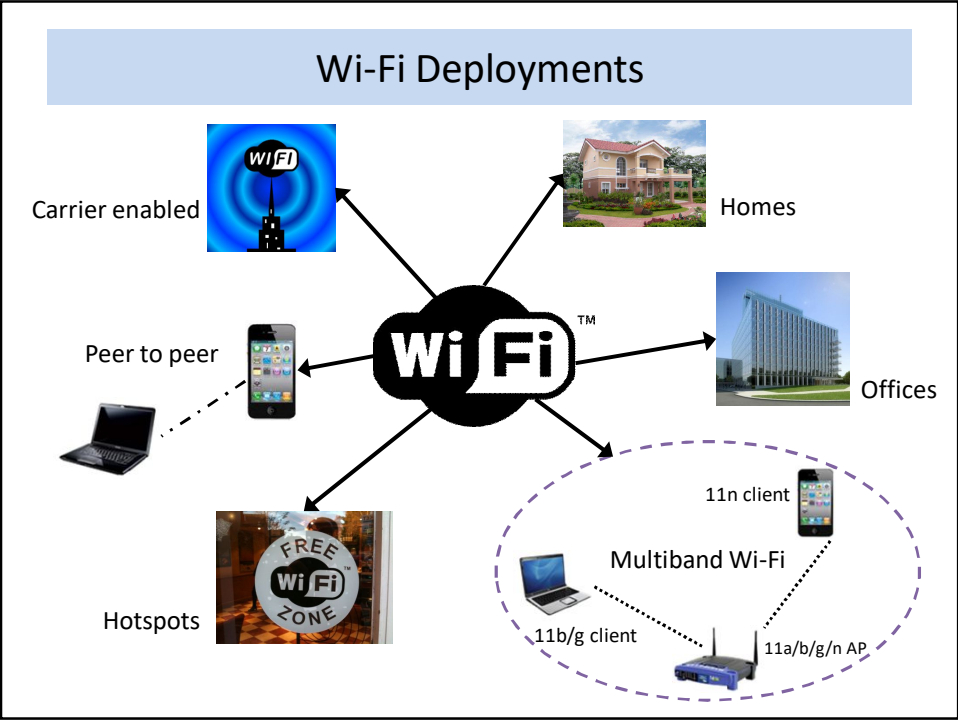
## Wi-Fi Technology Evolution – Part 1 (PHY)



## Wi-Fi Technology Evolutions – Part 2 (MAC)



- Many extensions have been incorporated in 802.11 main standard.
- Support in products is not universal for all extensions.

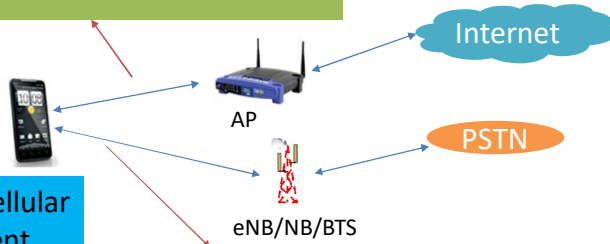


## Wi-Fi calling - Motivation?

Roaming charges on cellular leads to users using OTT apps (skype/viber over Wi-Fi)

Cannot use the cellular phone number

Wi-Fi and cellular radios present



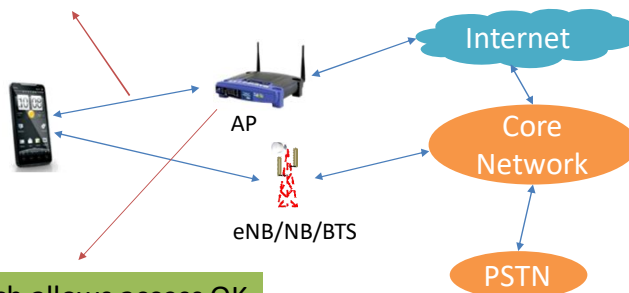
• Poor signal in many indoor locations

• Lots of voice calls made from indoor locations

## Wi-Fi calling

• Use of Wi-Fi for calling /receiving using phone credentials (No apps)

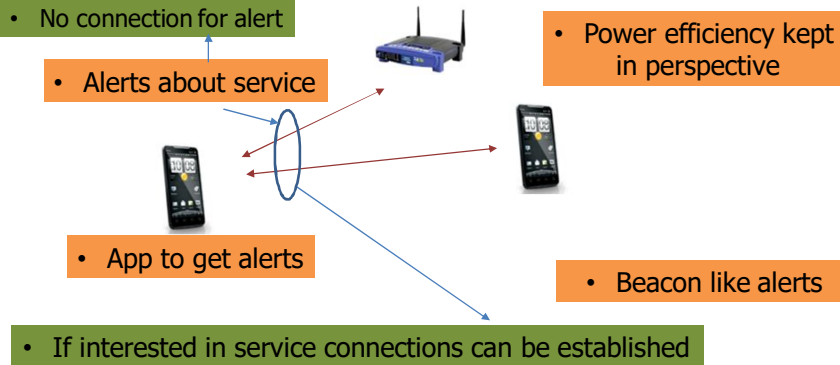
Operator Supported



• Any AP which allows access OK

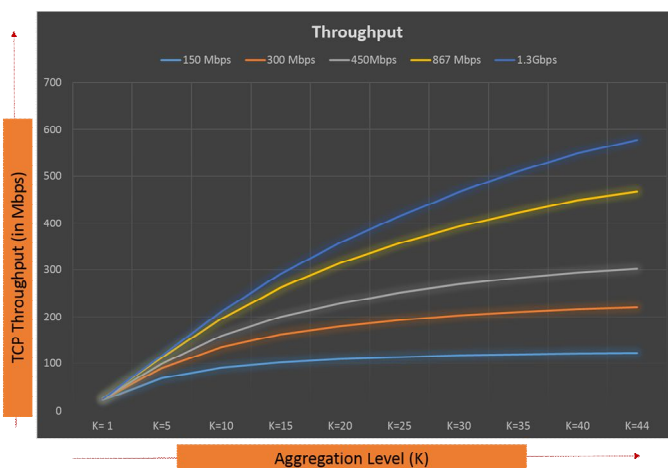
Handover to cellular to be taken care

## WiFi Aware™



WFA certification program based on neighbor awareness networking

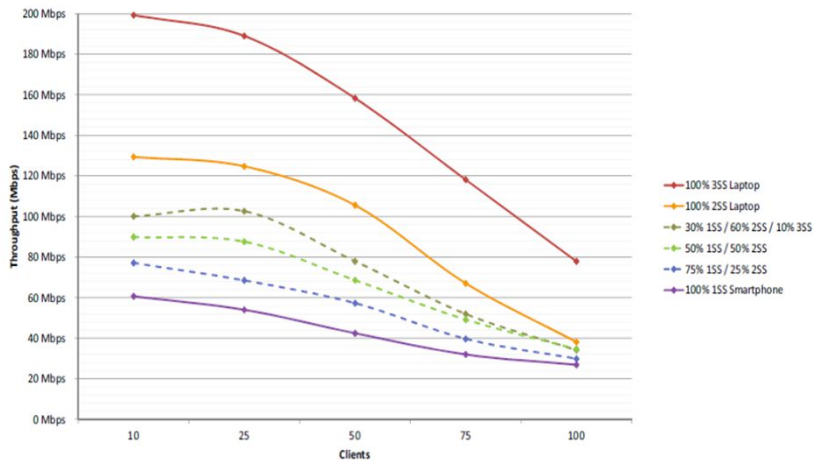
## 802.11 – The Real Story !!



• Real-life Wi-Fi traffic ..difficult to aggregate in high-density scenarios

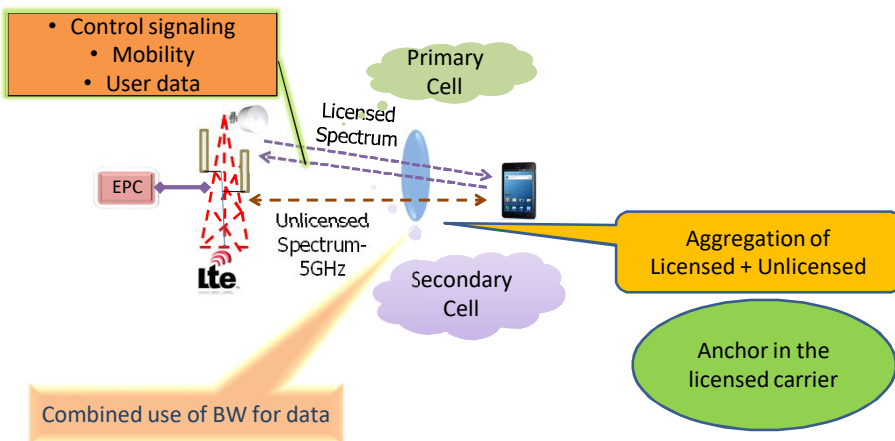
• Advances of 802.11 PHY. are practically useless.. We are benefitting by better radio and CPUs in products

## Wi-Fi Sucks !!



Source: Aruba Networks

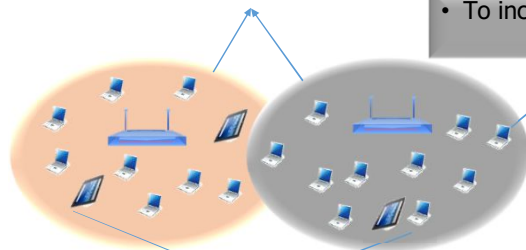
## LTE in Unlicensed Spectrum





## New Standard 802.11ax

- Majority of deployments will evolve towards high density scenarios in the near future..



- To increase the real world throughput achieved by users.

PAR aims for 4 times higher average throughput at MAC in a dense Wi-Fi environment than previous generation..5-10 times likely

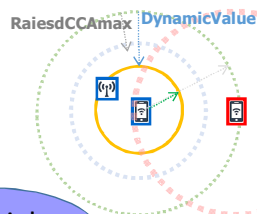
- To improve power efficiency for the battery powered devices.

- Amendment to 802.11 for operations in between 1 to 6GHz frequency bands.
- Focus primarily on 2.4GHz and 5GHz.

## 802.11ax – Key technologies and approaches

DL A-MPDU		UL A-MPDU		
Trigger		STA6 A-MPDU to AP		BlkAck
AP A-MPDU to STA4	Trigger	STA4 A-MPDU to AP	BlkAck	BlkAck
AP A-MPDU to STA1	Trigger	STA1 A-MPDU to AP	BlkAck	BlkAck
AP A-MPDU to STA2	Trigger	STA2 A-MPDU to AP	BlkAck	BlkAck
AP A-MPDU to STA3	Trigger	STA5 A-MPDU to AP		BlkAck
		STA3 A-MPDU to AP	BlkAck	BlkAck

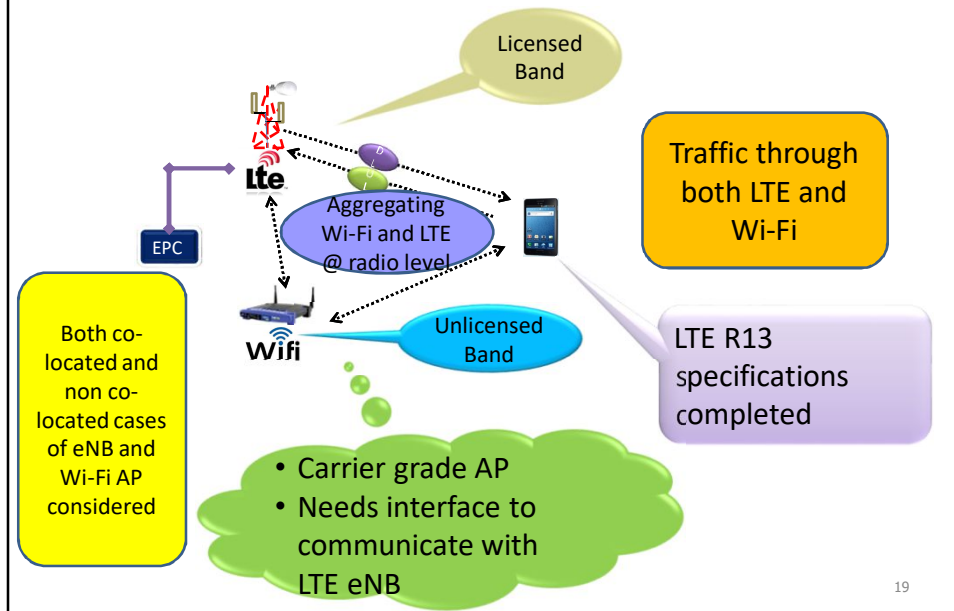
Multuser Transmission; OFDMA, MU-MIMO



Spatial reuse

Dynamic threshold; plus power control..good coexistence

## LTE and Wi-Fi together – LWA and LWIP



## Future Trends in Wi-Fi

