LTE + Wi-Fi

Background

**LTE**
- Stands for 3GPP Long Term Evolution
- Deployed since 2009
- '4G', kind of
- Up to 300 MBs of bandwidth
- Between 600 MHz and 2.6 GHz (center frequency)
- Max power (downlink) 40 Watts

**Wi-Fi**
- 802.11 spec "Wi-Fi" certification
- 802.11 - 1997 2.4 20
  - 9 - 1999 5 20
  - 5 - 1999 2.4 20
  - 9 - 2003 2.4 20
  - 1 - 2009 2.4 40
  - ac - 2013 5 160
- More power - 1 watt

MAC

**LTE**
- **Spectrum**
  - FDD - Uplink and downlink use separate blocks
    - except China
  - Uplink and Downlink use Resource Blocks
    - Combination of TDM and FDM
  - Very efficient (optimal resource signaling overhead)
  - What about a new device?
- Some resource blocks are left for
  - Contention
    - This is a form of slotted ALOHA
MAC - continued

WLAN
- Priority CSMA
  - Each node medium, and if it's not free
  - Wait a random amount of time up to
    - a contention window amount
- Optical RTS/CTS
  - May not be used much in practice??
- Polling for contention-free access
- AP will use CSMA to get a superframe,
  then will assign some of it allocation to
  other devices.

FEC
- Each transport block has a CRC of 24-bit
- Convolutional code
  - 1-state
  - 3 polynomials
  - Only for control blocks
- Turbo codes for data
  - Turbo codes are like convolutional, but
    - With feedback
  - Rate 1/3 (as of Dec 8)

Wi-Fi
- Uses convolutional codes and LDPC
- Rates 1/2, 2/3, 3/4, 5/6
**Modulation**

- Both use OFDM
- QAM
  - 8QAM, 16QAM, 64QAM, 256QAM
- LTE-Advanced - up to 64QAM
- Both allow for MIMO techniques
  - up to 8x8
  - Beamforming and Spatial Multiplexing

**Misc.**

- **LTE-U** - LTE in existing unlicensed bands