

# 4G

## Differences / Drivers / Players

*A Special presentation for*



**ALABAMA WIRELESS**



*by*

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# **“Rule the Air” ad campaign**

## **2010 Verizon re-branding**

- Positive tipping point for Site Owners
- Signal everywhere = more sites
- More Sites = more sensitivity
- Network sites = “signal” *not transmitters*
- “Most Powerful transmitter is you”
- Network is there to receive...

*what you want to transmit*

# High Sites are Essential to Networks

High Sites = large, “Macro” coverage objective

*Mobility Solution* for fast-moving subscribers

- Towers
- Tall building rooftops
- Satellite

# Alternative Sites are Essential to Networks

**IBW**, In-Building Wireless

**DAS**, Outdoor Distributed Antenna Systems

**FEMTO / MICRO**, Subscriber-Owned CPE

## *Connectivity Solution*

- Signal everywhere = more sites
- Connectivity = IBW, DAS, etc.
- RF resistance is solved by Alternative Sites
  - Signal-averse zoning
  - Physical barriers to signal, i.e. structure of building
  - Underground applications, i.e. tunnels, mine entry systems

# More Sites are Essential to Networks

|                              | <b>2009</b> | <b>2010</b>                                      | <b>2013</b>    | <b>2020</b>      |
|------------------------------|-------------|--|----------------|------------------|
| Voice MOUs                   | 2,450       | 2,350  | 1,960          | 823              |
| Data MOUs                    | 1,056       | 2,078  | 8,261          | 32,274           |
| Total MOUs                   | 3,507       | 4,428  | 10,221         | 33,098           |
| Estimated Cell Site Count    | 262,455     | 282,978  | 325,682        | 371,585          |
| MOUs per cell site per month | 1.11        | 1.3  | 2.62           | 7.42             |
|                              |             | Implied max MOU capacity at 2009 loading         | 4,351          | 4,965            |
|                              |             | <b>Implied needed Cell Sites at 2009 loading</b> | <b>765,026</b> | <b>2,477,242</b> |



## 4G ....

### More Bandwidth, More Sites, More Differences

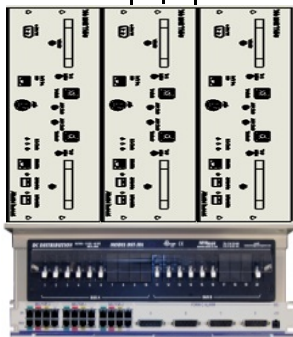
- 4G is supported by All-IP core network
- 4G is different from prior generations
  - MIMO – Extra Antenna Panels
  - OFDM – Clear channel linearity
  - FDD or TDD – Spectrum management more flexible
  - FTTA – Skinny cable up the tower to the antenna platform
  - RRH – Smaller shelters, more electronics up the tower behind each antenna

# 4G Antenna / Line example

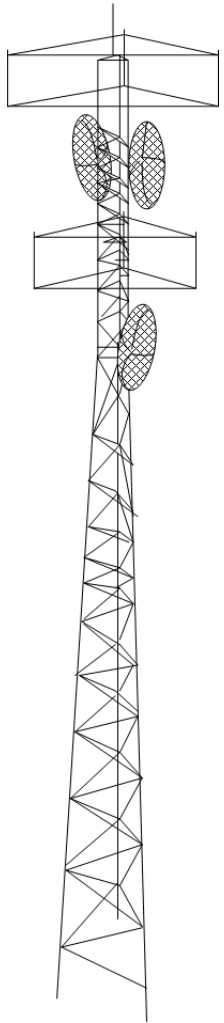


4 or more RRU / RRH  
plus 2 or more RAS antenna panels  
Plus 4 or more couplers / combiners  
Per Sector

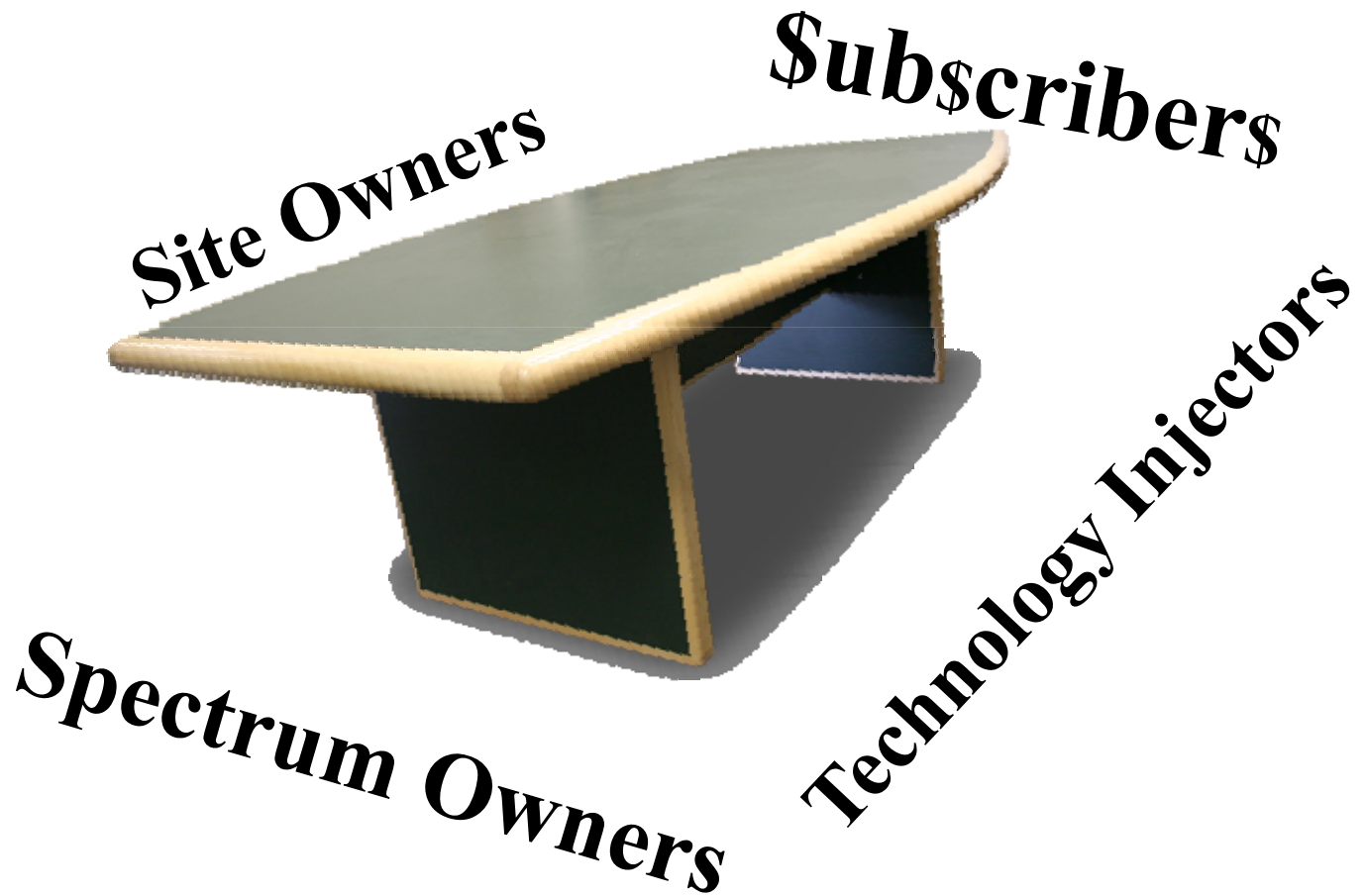
Fiber Optic Cable + DC electrical power



IDU / Rack Assembly at grade



# Seats at the 4G “Table”



# Wireless 101

- Paging – pager on belt clip
  - 0.025 Mhz / 1000 users / 50 miles / 0.1 kbps
- preG – Antenna on car roof – operator assisted
  - 0.1 Mhz / 4 users / 50 miles / 4 kbps
- 1G – AMPS – Motorola StarTac
  - 10 Mhz / 100 users / 20 miles / 10 kbps
- 2G – TDMA/CDMA – RAZR, Treo
  - 20 Mhz / 1000 users / 10 miles / 40 kbps
- 3G – UMTS/EVDO revA – iPhone
  - 20 Mhz / 1000 users / 5 miles / 1000 kbps
- 4G – LTE/WiMAX – MyFI and beyond
  - 20 Mhz / 1000 users / 1 mile / 10000 kbps

# Spectrum Positions

Spectrum Holdings (Mhz) in top 100 U.S. Markets

| band         | 700 | 850   | 1600 | AWS | PCS | 2500 | Total |
|--------------|-----|-------|------|-----|-----|------|-------|
| Clear        |     |       |      |     |     | 150  | 150   |
| Verizon      | 34  | 20    |      | 14  | 20  |      | 88    |
| AT&T         | 18  | 23    |      | 9   | 34  |      | 84    |
| Sprint       |     | 14-20 |      | 19  | 36  |      | 55    |
| T-Mobile     |     |       |      | 26  | 25  |      | 51    |
| LightSquared |     |       | 40   |     |     |      | 40    |





at&t



# Data, Data, Data



ANDROID

- iPhone phenomenon
- HSPA+ 7.2
- 4G / LTE - FDD
- 4G / WiMAX – TDD
- Android Platform



Sprint®



clear



wimax

openrange



# AT&T

- Directed Network Expansion
- Specialty Siting for iPhone support
- Tower Mounted Electronics
- Fiber backhaul
- 2/3 of way through 3G spend – 1 year left
- Just beginning 700 mhz LTE spend – 3 to 5 years of spending on cell overlays





# LightSquared

- \$1.75 Billion financing arranged
- 40+ Mhz nationwide spectrum
- Wholesale to Techco's, Webplayers, Contentprovs
- Ancillary Terrestrial Component play
- Skyterra Satellite integration with towers
- 40,000 sites for competitive footprint
- FCC initiative to reassign 500 Mhz
- FCC may reallocate 90 Mhz of MSS



# Verizon

- 700 Mhz LTE MIMO 2x2 staged rollout
- Myths: 700 mhz propagation versus capacity/speed/bandwidth
- Equipment reconfiguration
- Tower Mounted Electronics / Fiber
- RF transparency / PIM testing
- “Rule the Air” campaign – continued consumer marketing based on quality not price





# Clearwire

- Sprint CDMA overlays
- Nextel iDEN overlays
- Standalone sites
- 100M pops done by EOY 2010
- Huge spectrum position
- Precarious backhaul position



# Sprint

- iDEN drops
- Equipment reconfiguration
- Ericsson implications
- LTE
- Network Modernization = \$3.5B+
- 10 dB gain





## T-Mobile

- JD Power ratings, Customer Service, price
- Limited Capital Budget
- Tower mounted electronics
- MIMO – more antenna placements
- Equipment reconfiguration
- [UMTS] HSPA+ 7.2 ... → LTE



# Conclusion

- 4G is changing the nature of site demand
- Pick up the pace or miss the train...
  - The cycle of necessity and invention is accelerating business
  - Technology injectors have a seat at the table  
e.g. Apple, Google, OEMs
  - 4G Sites will be chosen by carriers for reasons different from the past, reasons best understood through technology interpretation

# Abrams Wireless, Inc.

*Technology Interpretation*

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