CLAIMS

What is claimed is:

1. A system for providing access to a wireless network, comprising:

a plurality of integrated access points, each of the access points comprising components including at least a radio ~~and,~~ a controller, and a flexible printed circuit board (PCB) printed antenna,

at least the radio and controller of each respective integrated access point being assembled on a corresponding rigid assembly board,

a means for transmitting radiofrequency signals being configured to distribute radiofrequency signals from each rigid assembly board~~, and~~ to a respective flexible PCB printed antenna, and

each integrated access point being embedded into a material expanse that integrates the components of the integrated access points;

~~portions of the material expanse comprising a hollow conduit and a plurality of discrete interconnect cables that couple the integrated access points;~~ and

a unified backplane interconnect, the unified backplane interconnect comprising a plurality of interconnects communicatively coupled in series, each interconnect connecting adjacent integrated access points.

2. The system of ~~Claim 1, the distance from the radio of a first integrated access point to the radio of at least one other integrated access point being at least ten feet.~~

~~3. The system of Claim 2, portions of the material expanse comprising a strip made of flexible PCB, the strip comprising printed transmission lines that feed power to the components of each integrated access point, and each assembly board being surface mounted onto the strip.~~

~~4. The system of Claim 1, portions of~~claim 1, the material expanse comprising a strip, and the unified backplane interconnect comprising discrete interconnect cables that couple the integrated access points.

~~5~~3. The system of ~~Claim 4~~claim 2, each assembly board being embedded into a respective built-up strip enclosure comprising a ~~fill~~potting, and each strip enclosure further comprising at least one of a foil, a foam, or a plastic tape in direct contact with each respective assembly board.

~~6. The system of Claim 5, the fill comprising at least one of a cut foam, a poured foam to fill, a poured epoxy, a poured silicone, or a thermal silicone.~~

~~7. The system of Claim 6, each section of the strip between adjacent strip enclosures comprising a respective hollow conduit.~~

~~8. The system of Claim 6, the fill comprising a potting extending beyond the built-up strip enclosures and throughout the strip.~~

~~9. The system of Claim~~4. The system of claim 1, the unified backplane interconnect further comprising a head-end configured to receive electrical power and communicate with the wireless network, the head-end comprising an External Network to Backplane Converter, the head-end being coupled to a first integrated access point by a first interconnect.

~~10. The system of Claim 1, further comprising a plurality of wireless card modules that integrate each controller and one or more respective Wi-Fi transceivers, each controller being a CPU.~~

~~11. The system of Claim 1, each controller being a System-on-a-Chip (SoC) configured to transmit and receive Wi-Fi signals.~~

~~12. The system of Claim 4, the plurality of integrated access points each further comprising a flexible printed PCB antenna, each antenna being selectable and movable.~~

5. The system of claim 2~~13. The system of Claim 5, further comprising thermal heat pumps embedded into the strip.~~

14. The system of Claim 5, each assembly board being tied to the strip.

15. The system of Claim 5, each assembly board comprising thermal pads connected to strips of metal.

16. The system of Claim 5, further comprising graphite heat spreaders coupled to each strip enclosure.

17. The system of Claim 4, each assembly board being encased in a respective rigid case.

18. The system of Claim 17, each rigid case being hung from a respective smart cable coupled to the strip.

19. The system of Claim 12, the flexible PCB printed antennas being printed on a doubled sided flexible PCB, antenna switches being surface mounted on the flexible PCB, and at least one of a second foil or a second foam being laid in the strip adjacent to the flexible PCB.

20. The system of Claim 19, each double sided flexible PCB being embedded in a potting.

21. The system of Claim 19, the strip comprising at least one of flexible stretch restraints or stiffeners.

22. The system of Claim 19, at least one component of each integrated access point being encased in a bend-resistant shell.

23. The system of Claim 4, each assembly board comprising a rigid card and one or more subassembly boards, each rigid card comprising a power supply, a network transceiver, and the respective controller of one of the integrated access points, and each subassembly board comprising a Wi-Fi transceiver, the respective rigid card and one or more subassembly boards of each integrated access point being coupled in series.

~~24~~6. The system of ~~Claim 23, each Wi-Fi transceiver comprising a radio SoC.~~

~~25. The system of Claim 24~~claim 5, each Wi-Fi transceiver comprising a radio module that emits complex analog baseband signals and one or more additional modules that upconvert, switch, and amplify the signals.

~~26.~~ 7. The system of ~~Claim 23, each subassembly board comprising at least one of a PCIe switch or one or more PCIe buses.~~

~~27. The system of Claim 23, each subassembly board comprising an M.2 or mini-PCIe edge connected rigid card.~~

~~28. The system of Claim~~claim 1, each controller comprising a CPU with two USB PHYs, ~~and each interconnect connecting adjacent integrated access points comprising a USB cable.~~

~~29. The system of Claim 28, each CPU comprising~~ a DMA engine, one or more cores, and memory, the DMA engine connecting the USB PHYs to the memory, and each interconnect connecting adjacent integrated access points comprising a USB cable.

~~30. The system of Claim 1, each controller comprising a CPU, each integrated access point except for a final integrated access point comprising a USB Hub, and each interconnect connecting adjacent integrated access points comprising a USB cable, the system comprising six or less integrated access points including the final integrated access point.~~

~~31. The system of Claim~~8. The system of claim 1, each controller comprising a CPU and a plurality of integrated access points each comprising a USB Hub, each integrated access point not comprising a USB Hub comprising a midspan card that terminates a leftmost USB tree and generates a new USB tree, and each interconnect connecting adjacent integrated access points comprising a USB cable, wherein for any series of up to the maximum

number of adjacent integrated access points supported by the underlying USB standard at least one integrated access point comprises a CPU that comprises a midspan card.

~~32. The system of Claim 26, the discrete interconnect cables that couple the integrated access points being PCIe lines comprising one of shielded twisted pair cables or twin-axial cables.~~

~~33. The system of Claim 32, further comprising signal conditioners that amplify or digitally retime the PCIe lines.~~

~~34. The system of Claim 1, each controller comprising a dual Ethernet CPU with a packet forwarding engine that accelerates local network traffic.~~

~~35. The system of Claim 34, each interconnect connecting adjacent integrated access points comprising a USXGMII/XFI one-lane serial connection differential pair routed over a twisted pair cable.~~

~~36. The system of Claim 34, each interconnect connecting adjacent integrated access points comprising a USB 3.2 cable carrying USXGMII/XFI signals.~~

~~37. The system of Claim 36, the USXGMII/XFI signals comprising reference clocks and configuration signals.~~

~~38. The system of Claim 1, each interconnect using an Ethernet encoding comprising one of USXGMII/XFI, 40GBps, 1Gbps (H)SGMII, 2.5Gbps (H)SGMII, or 10GBASE-KR.~~

~~39. The system of Claim 1, each interconnect connecting adjacent integrated access points comprising a USB cable carrying PCIe signals.~~

~~40. The system of Claim~~9. The system of claim 1, each controller comprising a CPU with one or more Wi-Fi transceivers, each CPU configured to use Wi-Fi as

a captive backhaul, and each interconnect connecting adjacent integrated access points comprising a coaxial cable.

~~41~~10. The system of ~~Claim 40, each coaxial cable being either multiply shielded or wrapped with external shielding.~~

~~42. The system of Claim 40, the Wi-Fi transceivers being configured, in scheduling, to switch channels to communicate with different adjacent nodes using at least one of notch filters, hi/lopass filters, flat attenuators, or switches.~~

~~43. The system of Claim 42, each CPU being configured to perform hop-by-hop traffic bridging.~~

~~44. The system of Claim 42, the CPUs being configured to schedule traffic by at least one of coordinated channel changing, attenuator reconfiguration, or transmission timing using at least one of a plurality of ad hoc schedulers, a master scheduler, or a plurality of regional master schedulers.~~

~~45. The system of Claim 1, the radio of each integrated access point comprising a Wi-Fi radio, and each integrated access point further comprising at least one of a Bluetooth radio, a Zigbee radio, a Z-Wave radio, or a Thread radio.~~

~~46. The system of Claim 4, the radio of each integrated access point comprising a Wi-Fi radio, and each integrated access point further comprising at least one of a Bluetooth radio, a Zigbee radio, a Z-Wave radio, or a Thread radio.~~

~~47. The system of Claim 45, at least one radio of each integrated access point being configured to operate at~~claim 2~~.4GHz, 3.5GHz, 5GHz, or 6GHz frequency, and at least one other radio of each integrated access point being configured to operate at 60GHz frequency or greater.~~

~~48. The system of Claim 46, at least one radio of each integrated access point being configured to operate at 2.4GHz, 3.5GHz, 5GHz, or 6GHz frequency, and at least one~~

~~other radio of each integrated access point being configured to operate at 60GHz frequency or greater.~~

~~49. The system of Claim 1~~, the radio of each integrated access point comprising one of a vector baseband radio or digital baseband radio, and each integrated access point comprising at least one other radio.

~~50. The system of Claim 4, the radio of each integrated access point comprising one of a vector baseband radio or digital baseband radio, and each integrated access point comprising at least one other radio.~~

~~51. The system of Claim 4~~11. The system of claim 2, at least one assembly board comprising a Wi-Fi transceiver, and at least one other assembly board comprising a transceiver that is not a Wi-Fi transceiver.

~~52~~12. The system of ~~Claim 1, the components of each integrated access point further comprising a network transceiver.~~

~~53. The system of Claim 1, the components of each integrated access point further comprising a power supply.~~

~~54. The system of Claim~~claim 1, the components of each integrated access point further comprising a power supply and a network transceiver.

13. ~~55. The~~A system ~~of Claim 1, each assembly board further~~for providing access to a wireless network, comprising ~~a network transceiver.~~:

~~56. The system of Claim 1, each assembly board further comprising a power supply.~~

~~57. The system of Claim 1, each assembly board further comprising a network transceiver and a power supply.~~

~~58. A system for providing access to a wireless network, comprising:~~

a plurality of integrated access points each comprising components including at least a radio, a controller, an antenna, and a USB Hub, each integrated access point being embedded into a material expanse that integrates the components of the integrated access points; and

~~at least a portion of the material expanse comprising a strip, each assembly board being embedded into a respective built-up strip enclosure comprising a fill, and each strip enclosure further comprising at least one of a foil, a foam, or a plastic tape in direct contact with each respective assembly board; and~~

a unified backplane interconnect, the unified backplane interconnect comprising a plurality of interwoven USB interconnect lines, each USB interconnect line comprising a plurality of USB cables communicatively coupled in series through one or more USB Hubs, each USB cable of each USB interconnect line connecting a pair of integrated access points that are not adjacent.

~~59~~14. The system of ~~Claim 58, at least a portion of~~claim 13, the material expanse comprising a strip, and the distance from the radio of a first integrated access point to the radio of at least one other integrated access point being at least ten feet.

~~60. The system of Claim 58, the unified backplane interconnect further comprising a head-end configured to receive electrical power and communicate with the wireless network, the head-end comprising an External Network to Backplane Converter.~~

~~61. The system of Claim 58, each USB cable comprising dual shielded twisted pair cable.~~

~~62. The system of Claim 58, each USB cable comprising twin-axial cable.~~

~~63. The system of Claim 58, each USB interconnect line further comprising one or more midspan USB signal conditioners.~~

~~64. The system of Claim 58, each USB interconnect line comprising one USB signal conditioner integral to or after a first USB Hub.~~

15. ~~65. The system of Claim 58~~The system of claim 13, wherein:

at least the radio, controller, and USB Hub of each respective integrated access point being assembled on ~~a~~one or more corresponding rigid assembly ~~board~~boards;

the antenna of each integrated access point being a flexible PCB printed antenna; and

a means for transmitting radiofrequency signals being configured to distribute radiofrequency signals from each rigid assembly board to a respective antenna.

~~66~~16. The system of claim 15,

the material expanse comprising a strip,

each assembly board being embedded into a respective built-up strip enclosure comprising a fill, and

each strip enclosure further comprising at least one of a foil, a foam, or a plastic tape in direct contact with each respective assembly board.

17. The system of ~~Claim 65~~claim 15, each assembly board further comprising a USB signal conditioner.

~~67~~18. The system of ~~Claim 65~~claim 15, each assembly board coupled to at least one separate signal conditioner card comprising a USB signal conditioner.

19. A system for providing access to a wireless network, comprising:

~~68. The system of Claim 67, each USB interconnect line further comprising one or more midspan USB signal conditioners.~~

~~69. The system of Claim 68, each USB signal conditioner of each separate signal conditioner card comprising a retimer, and each midspan USB signal conditioner comprising a redriver.~~

~~70. The system of Claim 58, the radio of each integrated access point comprising a Wi-Fi radio, and each integrated access point further comprising at least one of a Bluetooth radio, a Zigbee radio, a Z-Wave radio, or a Thread radio.~~

~~71. The system of Claim 70, at least one radio of each integrated access point being configured to operate at 2.4GHz, 3.5GHz, 5GHz, or 6GHz frequency, and at least one other radio of each integrated access point being configured to operate at 60GHz frequency or greater.~~

~~72. The system of Claim 58, the radio of each integrated access point comprising one of a vector baseband radio or digital baseband radio, and each integrated access point comprising at least one other radio.~~

~~73. The system of Claim 65, at least one assembly board comprising a Wi-Fi transceiver, and at least one other assembly board comprising a transceiver that is not a Wi-Fi transceiver.~~

~~74. The system of Claim 58, the components of each integrated access point further comprising a network transceiver.~~

~~75. The system of Claim 58, the components of each integrated access point further comprising a power supply.~~

~~76. The system of Claim 58, the components of each integrated access point further comprising a power supply and a network transceiver.~~

~~77. The system of Claim 65, each assembly board further comprising a network transceiver.~~

~~78. The system of Claim 65, each assembly board further comprising a power supply.~~

~~79. The system of Claim 65, each assembly board further comprising a network transceiver and a power supply.~~

~~80. A system for providing access to a wireless network, comprising:~~

a plurality of integrated access points each comprising components including at least a radio, a CPU, an antenna, and an off-CPU Ethernet switch, each integrated access point being embedded into a material expanse that integrates the components of the integrated access points;

~~at least a portion of the material expanse comprising a hollow conduit;~~

at least the radio, CPU, and Ethernet switch of each respective integrated access point being assembled on one or more corresponding rigid assembly boards; and

a unified backplane interconnect, the unified backplane interconnect comprising one or more Ethernet interconnect lines, each Ethernet interconnect line comprising a plurality of Ethernet cables communicatively coupled in series through one or more off-CPU Ethernet switches, each Ethernet cable of each Ethernet interconnect line connecting a pair of integrated access points.

~~81. The system of Claim 80, at least a portion of the material expanse comprising a strip, and the distance from the radio of a first integrated access point to the radio of at least one other integrated access point being at least ten feet.~~

~~82. The system of Claim 80~~20. The system of claim 19, further comprising at least two Ethernet interconnect lines, each of the at least two Ethernet interconnect lines being interwoven and only connecting integrated access points that are not adjacent.

~~83. The system of Claim 80, each Ethernet interconnect line having at least enough bandwidth to meet the 10GBASE-T standard.~~

~~84. The system of Claim 80, each off-CPU Ethernet switch comprising multiple side-to-side Ethernet connections, each off-CPU Ethernet switch being configured to use the side-to-side Ethernet connections through link bonding.~~

~~85. The system of Claim 80, each Ethernet cable comprising one of Category 5 or Category 5e cable.~~

~~86. The system of Claim 80, each Ethernet cable comprising less than Category 5 Ethernet cable wrapped in ground shielding comprising one of a foil or a mesh.~~

87. The system of Claim 80, the antenna of each integrated access point being a flexible PCB printed antenna; and, a means for transmitting radiofrequency signals being configured to distribute radiofrequency signals from each assembly board to a respective antenna.

88. The system of Claim 87, at least a portion of the material expanse comprising a strip, each assembly board being embedded into a respective built-up strip enclosure comprising a fill, and each strip enclosure further comprising at least one of a foil, a foam, or a plastic tape in direct contact with each respective assembly board.

89. The system of Claim 87, the radio of each integrated access point comprising a Wi-Fi radio, and each integrated access point further comprising at least one of a Bluetooth radio, a Zigbee radio, a Z-Wave radio, or a Thread radio.

90. The system of Claim 89, at least one radio of each integrated access point being configured to operate at 2.4GHz, 3.5GHz, 5GHz, or 6GHz frequency, and at least one other radio of each integrated access point being configured to operate at 60GHz frequency or greater.

91. The system of Claim 87, the radio of each integrated access point comprising one of a vector baseband radio or digital baseband radio, and each integrated access point comprising at least one other radio.

92. The system of Claim 87, at least one assembly board comprising a Wi-Fi transceiver, and at least one other assembly board comprising a transceiver that is not a Wi-Fi transceiver.

93. The system of Claim 80, the unified backplane interconnect further comprising a head-end configured to receive electrical power and communicate with the wireless network, the head-end comprising an External Network to Backplane Converter.

~~94. The system of Claim 80, the components of each integrated access point further comprising a network transceiver.~~

~~95. The system of Claim 80, the components of each integrated access point further comprising a power supply.~~

~~96. The system of Claim 80, the components of each integrated access point further comprising a power supply and a network transceiver.~~

~~97. The system of Claim 80, each assembly board further comprising a network transceiver.~~

~~98. The system of Claim 80, each assembly board further comprising a power supply.~~

~~99. The system of Claim 80, each assembly board further comprising a network transceiver and a power supply.~~