![Lime microsystems www.limemicro.com]

LimeNET CrowdCell

A software-enabled open-access small cell based on LimeSDR

LimeNET

LimeNET network in a box solutions are built on the field proven LimeSDR platform. They offer an array of qualified hardware solutions by combining the LimeSDR boards with commodity computing platforms and additional components such as power amplifiers and duplexers. LimeNET systems run Ubuntu Core and can be integrated with both private and public app stores. There is also a reference store featuring applications from Lime and partners that are all qualified and certified by Lime.

LimeNET replaces proprietary specialized and custom equipment and software with open source commodity hardware and software, thereby providing a radical alternative model to the closed wireless network equipment offered by incumbent vendors today.

LimeNET is the next step in the evolution of software defined radio.
It was designed as a software-enabled, self-contained, network-in-a-box solution and can be used for any wireless application and endless number of use cases limited only by your imagination and thousands of other developers. Broadly speaking, LimeNET can be used in any application that is a convergence of wireless technologies or as a test bed in areas, such as IoT, media streaming, test & measurement, cellular base stations and many more.

LimeNET CrowdCell

LimeNET CrowdCell is fully fledged, open-access small cell network-in-a-box solution. Complete with an integrated LimeSDR card and a dedicated front-end board that covers nearly all LTE bands, this technology uses existing macro 4G networks as backhaul and can be utilised for any network as a service deployment. LimeNET CrowdCell can also provide extended coverage and/or increase capacity of an existing network or accelerate and cost-optimize new network infrastructure developments.

LimeNET CrowdCell GPP module features

Feature	Specification
Processor[1]	Intel Core i7-8550u
Memory[2]	32 GB (max 64 GB)
Storage[2]	512 GB SSD
Video	Intel HD Graphics
Display ports	Mini Display Port 1.2
	HDMI 2.0
Audio	Integrated chipset
Connectivity	1 x USB 3.1 Type-C
	1 x USB 3.1
	2 x USB 3.0[3]
	1 x Gigabit Ethernet[4]
Wireless connectivity	Wi-Fi
	Bluetooth
Power	Input 100-240 VAC
	Output 19 VDC, up to 65 W
OS[5]	Ubuntu (pre-installed)

[1] processor depends on specific GPP model

[2] values can be changed according to specific requirements

[3] two USB3.0 used by other modules

[4] ethernet used for wired backhaul connectivity

[5] Ubuntu required for LimeNET app store support

LimeNET CrowdCell

LimeNET CrowdCell uses a modular architecture that can be delivered in a variety of configurations that meets case-specific requirements. It consists of four main modules, each of which can be easily upgraded:

1. Backhaul unit– connects or backhauls the LimeNET CrowdCell to an existing macro network using either wired or wireless connectivity. It can be configured for any specific band requirement and is fully integrated in the product.

2. General purpose processor (GPP) unit– used to run and manage software and applications on the LimeNET CrowdCell. Thus, each cell can have its own configuration that could be changed and upgraded seamlessly. Since LimeNET CrowdCell functionality is defined by software, this enables not only different voice/data services, but also act as a last-mile service server for traffic offload and management, video or data storage and other services that are well beyond the capabilities of existing solutions. The software and its distribution tools are supplied by our community of developers through our dedicated App store.

3. Software defined radio (SDR) and flexible front end– LimeNET CrowdCell builds upon the ground-breaking LimeSDR software-defined radio technology to deliver an app-enabled path covering any standard from IoT to 5G. Use of Limes SDR platform provides the most flexible radio hardware solution that enables LimeNET CrowdCell to be setup in numerous varieties of small-cell configurations. Thus, it is an on-demand network solution, where services could easily shift to data, voice, IoT or any other Telco centric services. LimeNET CrowdCell comes pre-equipped with a flexible front-end module that provides signal duplexing, filtering and amplification.

4G backhaul module features

Feature	Specification
Peak data rates	downlink: up to 300Mbps uplink: up to 50 Mbps
FDD band support[1]	1, 3, 4, 5, 7, 8, 20, 26, 28, 32
TDD band support[1]	38, 40, 41
Bandwidth	up to 20 MHz
Carrier aggregation	up to 3
Modulation[1]	downlink up to 256QAM uplink to 64QAM
Other interfaces	UMTS/HSPA GSM/GPRS/EDGE IEEE 802.11 b/g/n/ac RJ-45 10/100/1000 Mbps
MIMO[1]	up to 4 x 4

[1] depends on specific backhaul module options

LimeNET Mini SDR/RF features[*]

Feature	Specification
RF transceiver	LMS7002M
FPGA	Altera Cyclone IV
Memory	256 MBytes DDR2 SDRAM
Connectivity	USB 3.0, Cypress controller
RF frequency range[1]	10 MHz – 3.8 GHz
Bandwidth	up to 61.44 MHz
RF connectors	two SMA female jack
Power Output[2]	up to 23 dBm
Noise figure[3]	0.6 dB
LTE band support[4]	2 FDD and 1 TDD
MIMO	2 x 2

[1] SDR programmable frequency range

[2] LTE modulated output

[3] input stage only, optimized for 2.6 GHz

[4] two FDD and one TDD band support with a single front end board. Band selection done via software. A wide front-end board configuration list.

[*] Customers are reminded that any equipment that transmits wireless signals needs to comply with the relevant regulations for that region. This may require that the final equipment is submitted for testing and verification.

CrowdCell

The CrowdCell is a 4G Relay technology, whereby an intermediate "Crowd" enabled device relays traffic between a customer UE and the macro network. Its main benefit is a rapid and low cost solution thanks to its Plug-and-Play (P&P) concept by using of the available 4G coverage.

Useful links

Description	Link
LimeNET CrowdCell uses GIGABYTE™ Mini-PC motherboards. More detailed information on each model can be found:	www.gigabyte.com/Mini-PcBarebone
Similar to all LimeNET products, LimeNET CrowdCell is fully qualified for compatibility with the LimeNET Ubuntu app store. Ubuntu Core features can be found:	www.ubuntu.com/core
A reference App store featuring applications from Lime and partner applications that are certified by Lime, can be accessed via:	https://limenet.snapcraft.io