

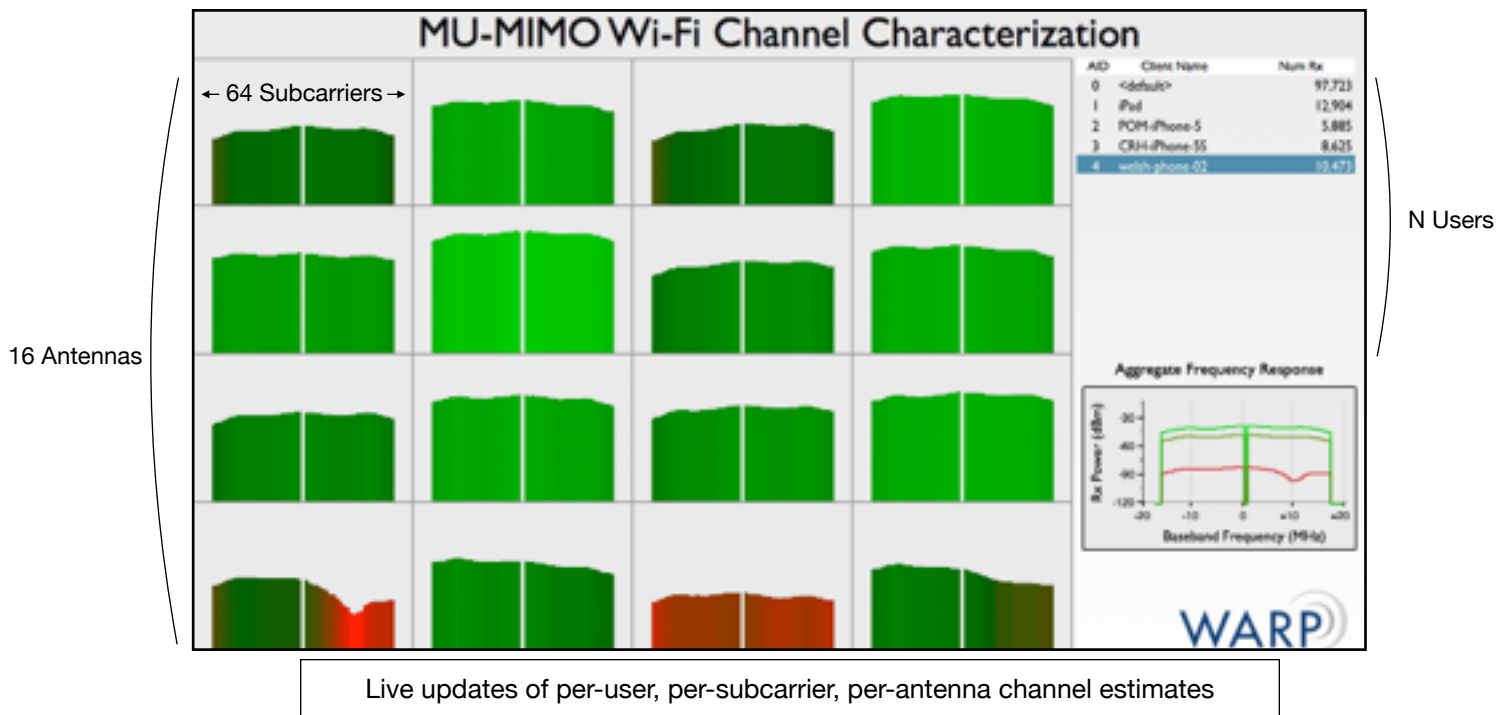
Mango Communications, Inc.
4606 Morningside Dr. Suite B
Houston, TX 77005 USA
713.568.5420
mangocomm.com
warpproject.org

Mango Communications designs platforms for high-performance wireless research and development.

Mango was founded in 2008 as a spin-off of the Rice University Wireless Open-Access Research Platform (WARP) project. WARP provides custom, FPGA-based hardware and open-source designs to facilitate rapid prototyping of new wireless research projects. Since 2008 Mango has continued development of both the WARP hardware and open-source designs.

MOBICOM 2014 DEMONSTRATION

We present a demonstration of the real-time capture and analysis of multi-user MIMO (MU-MIMO) channel state information from commercial Wi-Fi devices. This demonstration is one of the many research applications enabled by the Mango Communications 802.11 Reference Design, an open-source, real-time FPGA implementation of the 802.11a/g MAC and PHY.



Demonstration Details:

- 5 WARP v3 nodes running the Mango 802.11 Reference Design
 - 1 is standard AP serving Internet access to Wi-Fi clients
 - 4 are quad-antenna monitors capturing per-subcarrier channel estimates for real-time analysis
- Custom Python framework coordinates runtime configuration of each node
- Custom PC application displays real-time channel estimates and SU/MU-MIMO achievable rates
- Full 802.11 MAC/PHY source available at <http://warpproject.org/802.11>

More Information at <http://mangocomm.com/mobicom2014-demo>

WARP V3 HARDWARE

- Xilinx Virtex®-6 FPGA (LX240T)
 - More than 2× the processing power of previous WARP hardware
- Two integrated RF interfaces
 - 2.4/5GHz bands with 40MHz bandwidth
 - 2×2 MIMO on-board
 - 4×4 MIMO with Mango FMC module
- Two gigabit Ethernet interfaces
- 2GB DDR3 DRAM
- Standard FMC HPC expansion slot



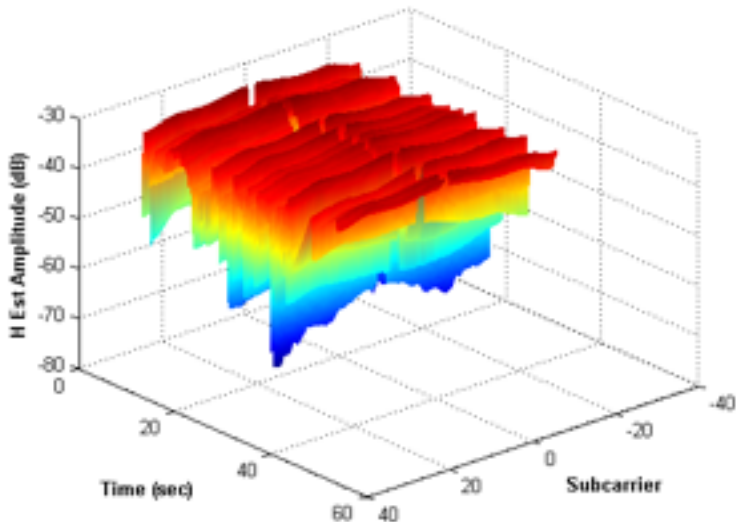
MANGO 802.11 REFERENCE DESIGN

- Mango 802.11 Reference Design consists of:
 - OFDM PHY implemented in FPGA fabric
 - MAC implemented in bare metal C
 - DCF in low-level CPU
 - AP/STA/IBSS in high-level CPU
 - Control & measurement framework implemented in Python
- FPGA models, C and Python code all open-source at <http://warpproject.org/802.11>

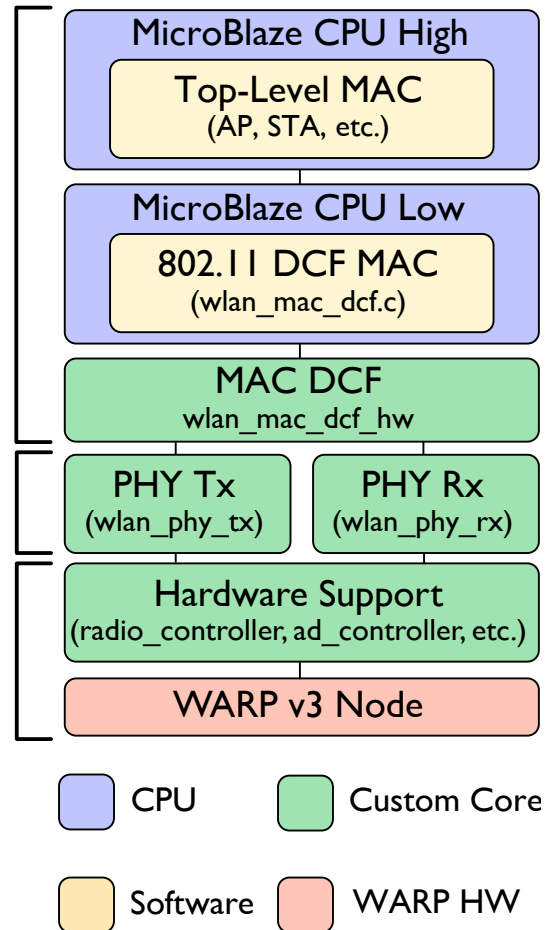
MAC

PHY

HW



Custom experimental framework allows deep visibility into PHY. Per-packet, per-subcarrier channel estimates are shown.



802.11 Reference Design architecture