Altera and Escape Communications’ Microwave Modem Solution

Altera and Escape Communications have partnered to provide a turnkey scalable solution suite for microwave and millimeter-wave backhaul and fronthaul applications based on Altera’s Cyclone V and Arria V FPGAs with Escape’s microwave modem IP. The modem IP features hitless Adaptive Coding and Modulation (ACM), Forward Error Correction (FEC), adaptive equalization, and a complete field-proven radio management software stack. When combined with Altera’s standard IP blocks, SOC devices featuring dual ARM-9 cores, and MEF2.0 certified switch IP, the modem solution provides a complete single-chip mobile backhaul solution that can be scaled to meet a wide range of link capacities supporting megabits to multi-gigabit data rates. The microwave modem solution meets system requirements of traditional microwave backhaul applications and emerging millimeter-wave applications in E and V bands. For example, an E-band link operating in a 1 GHz bandwidth can provide capacities exceeding 5Gbps enabling operators to meet the rapidly evolving backhaul and fronthaul requirements of LTE and LTE-A networks.

System Block Diagram Including Modem Solution and Optional MEF2.0 Ethernet Switch

The modem operates from QPSK to 4096 QAM and from 3.5 MHz to 1 GHz RF bandwidth and is scalable with customers selecting the best FPGA for the application. Lower capacity systems could use the Cyclone V FPGA while higher capacities the Arria V FPGA. Ultra high-capacities could use the Stratix V or upcoming Arria 10 devices.
Altera offers MEF 2.0 certified switch based on Altera’s Triple-Speed Ethernet MegaCore function providing > 5Gbps capacity. Altera Ethernet switch IP when incorporated with the Escape modem IP solution provides a single chip mobile backhaul solution.

### Key Modem Features
- QPSK to 4096 QAM
- 3.5 MHz to 1 GHz BW
- Hitless Adaptive Coding and Modulation (ACM)
- Standard and Enhanced Forward Error Correction (FEC)
- Cross-polarization cancellation (XPIC)
- Adaptive equalization
- SYNC-E and IEEE 1588V2 support
- Configurable phase noise and phase hit mitigation
- Frequency tracking
- IQ imbalance compensation
- Complete field-proven radio management software stack
  - HTML GUI
  - SNMP client
  - Extensive diagnostics application
  - Applications, libraries, and drivers

### Key FPGA / Altera IP Features
- Scalable from Cyclone V to Arria V and Stratix V
- ARM Hard Processor System (HPS)
- JESD204B and LVDS data converter support
- Carrier grade Ethernet Switch MEF 2.0 available including
  - > 5Gbps Capacity
  - Full L2 control protocol handling as specified by MEF
  - 1588V2 support
  - Sync E support
  - TDM interface
  - XAUI Interface

### Want to Know More?
Visit our website or call your local Altera sales representative today to learn more about how Altera FPGAs can help you enable your microwave backhaul.

[www.altera.com/end-markets/microwave-backhaul](http://www.altera.com/end-markets/microwave-backhaul)