Reference Guide
Version 1.0 - July 2002

1 Introduction

Ethernet is available in different speeds (10/100/1000 and 10000Mbps) and provides connectivity to meet a wide range of needs and from desktop to switches. MorethanIP IP solutions provides a solution for each Ethernet application with a library of configurable MAC (Medium Access Control) and PCS (Physical Coding Sub-layer) Cores.

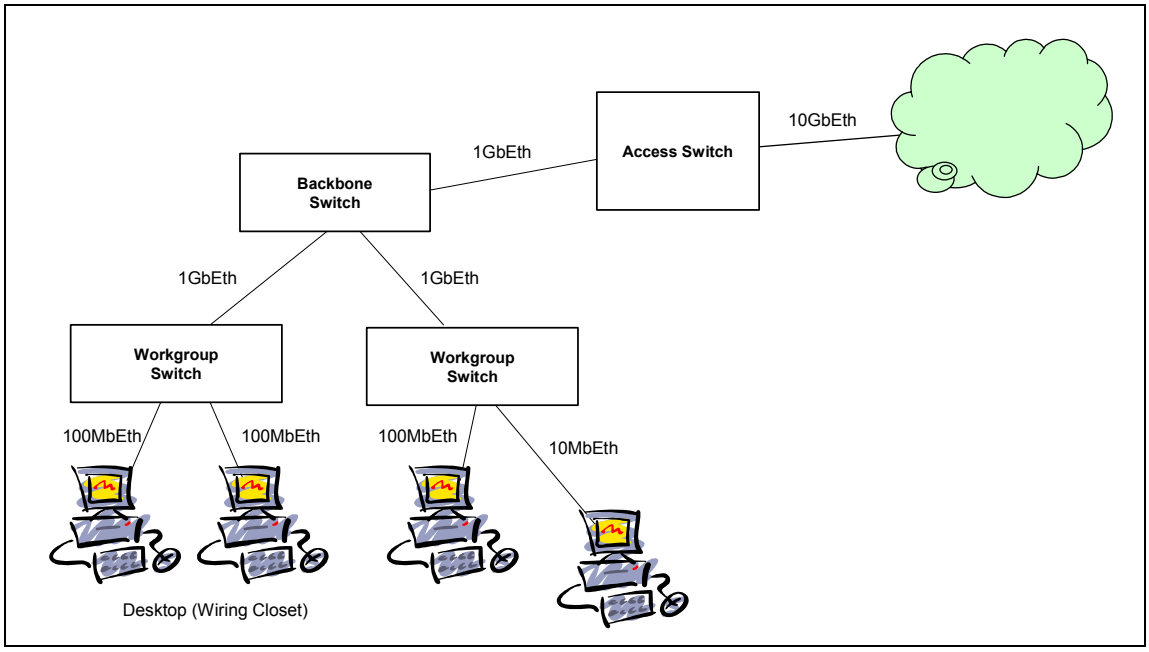

Figure 1: Enterprise LAN Topology Example

The programmable 10/100/100 Ethernet MAC from MorethanIP provides, with a single IP Core solution, a solution for Ethernet applications (Line Card, NIC card or switching) operating at 10/100 or 1000Mbps (Gigabit Ethernet). The 10/100/1000 MAC Core operates Full Duplex mode, supports transparent (For switching applications) and full Ethernet frame termination / generation (For NIC or line cards applications).

The core can be seamlessly connected to any industry standard Gigabit Ethernet PHY device via a Gigabit Medium Independent Interface (GMII for 1000Mbps application) or Medium Independent Interface (MII for 10/100Mbps applications) and to a user application via a SOC (System on a Chip) interface which provides seamless connectivity to any MorethanIP cores such as Flexbus, POS-PHY, PCI interfaces or any third party Core which implements an interface compatible with the Altera Atlantic specification.

The core is optionally delivered in generic synthesizable HDL code (For use in Altera CPLD or ASIC technologies), as a CPLD netlist which provides a lower cost solution.

2 Application Example

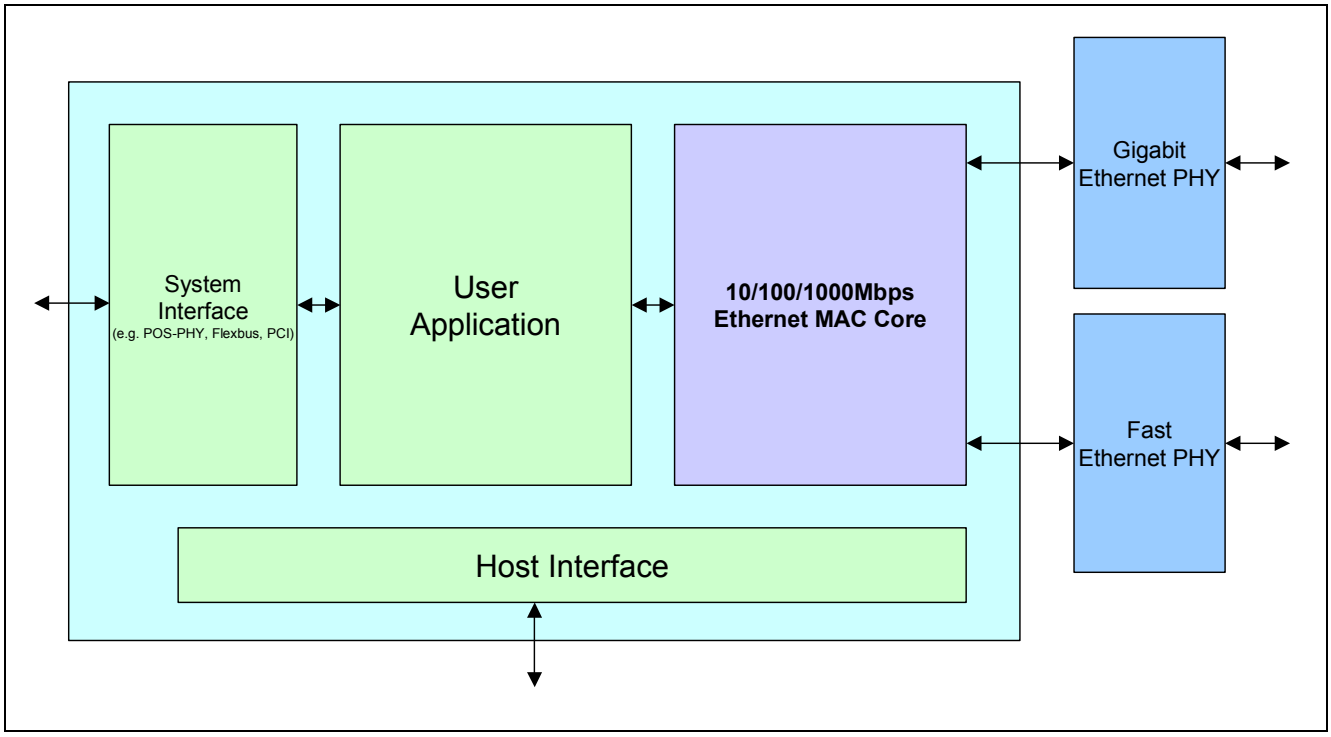

Figure 2: Application Example

3 10/100/1000Mbps Ethernet MAC core Features

- Implements the full 802.3-2000 specification with preamble / SFD generation, frame padding generation, CRC generation and checking on transmit and receive
- Dynamically configurable to support 10Mbps, 100Mbps (Fast Ethernet) or 1000Mbps (Gigabit Ethernet) operation
- Support any type of Ethernet Frames such as SNAP / LLC or IP traffic.
- Supports full duplex operation only (Half Duplex operation supported in Core version 2.0, contact MorethanIP for details)
- Seamless interface to commercial Gigabit Ethernet PHY device via a 8-Bit Gigabit Medium Independent Interface (GMII) operating at 125MHz
- Seamless interface to commercial Fast Ethernet PHY device via a 4-Bit Medium Independent Interface (MII) operating at 25MHz (Fast Ethernet Operation) or 2.5MHz (10Mbps Operation)
- Other Medium Independent Interfaces (e.g. RGMII, RMII, ...) optionally available, contact MorethanIP for info
- Simple FIFO interface to user application compatible with Altera Atlantic SOC (System On Chip) interface
- CRC-32 checking at full speed using a multi-stage CRC calculation architecture with optional forwarding of the FCS field to the user application
- Implements fully automated Pause Frame (802.3 Annex 31A) generation and termination providing flow control without user application intervention
- Pause quanta used to form Pause frames, dynamically programmable

- Pause frame generation additionally controllable by user application offering flexible traffic flow control
- Optional forwarding of received pause frames to the user application when operating in Full Duplex mode
- Implements standard flow-control mechanism in full-duplex operation mode
- Support for VLAN tagged frames according to IEEE 802.1Q
- Programmable MAC address: Insertion on transmit; discards frames with mismatching destination address on receive (except broadcast and pause frames)
- Programmable Promiscuous mode support to omit MAC destination address checking on receive
- Multicast address filtering on receive based on 64 entries hash table reducing higher layer processing load
- Programmable frame maximum length providing support for any standard or proprietary frame length (e.g. 9K-Bytes Jumbo Frames)
- Statistics indicators for frame traffic as well as errors (alignment, CRC, length) and pause frames providing for basic and mandatory Management Information Database (MIB) package enabling implementation in SNMP management environments
- Simple handshake user application FIFO interface with fully programmable depth and threshold levels ensuring data rates of 1Gbps with full back-to-back frame transfer support
- Separate status word available for each received frame on the user interface providing information such as frame length, frame type, VLAN tag and error information
- Delivered with extensive Ethernet frame generators and checking models enabling fully automated design verification and testing for standard compliance and error behavior, enabling for fast turn-around design cycles

4 MAC Core Block Diagram

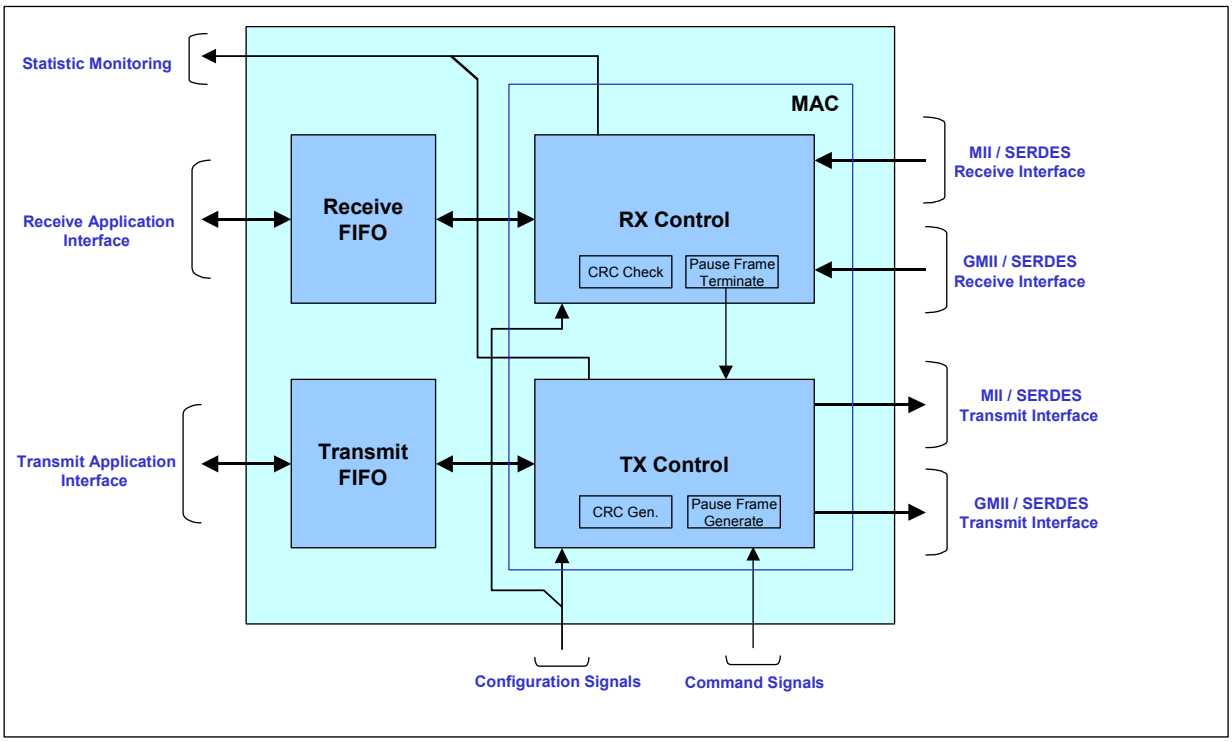

Figure 3: 10/100/1000Mbps Ethernet MAC Core Overview

5 10/100/1000Mbps Ethernet MAC Design Kit Overview

Table 1: Design Kit Overview

Design and Simulation	
Language	Optimized VHDL or lower cost CPLS encrypted netlist.
Simulation	Configurable VHDL Testbench with embedded frame generator and checker providing and easy to use and robust de-bugging environment.
Verification	Comprehensive test environment with Ethernet frame generator and verification models for standard compliant and errored frame generation and automated core behavior verification.
Supported Design Tools	
Simulation	Modelsim Version 5.4d or higher. Aldec Active-HDL 4.1 or higher
Synthesis	Exemplar 2002.1 or higher.
Implementation	Altera: Quartus II V2.1 or Higher

6 References

1. IEEE 802.3 2000 Edition
2. IEEE 802.1Q 1998 Edition
3. RFC2665, Definitions of Managed Objects for the Ethernet-like Interface Type, www.ietf.org
4. RFC2863, The interfaces Group MIB, www.ietf.org

7 Ordering Code

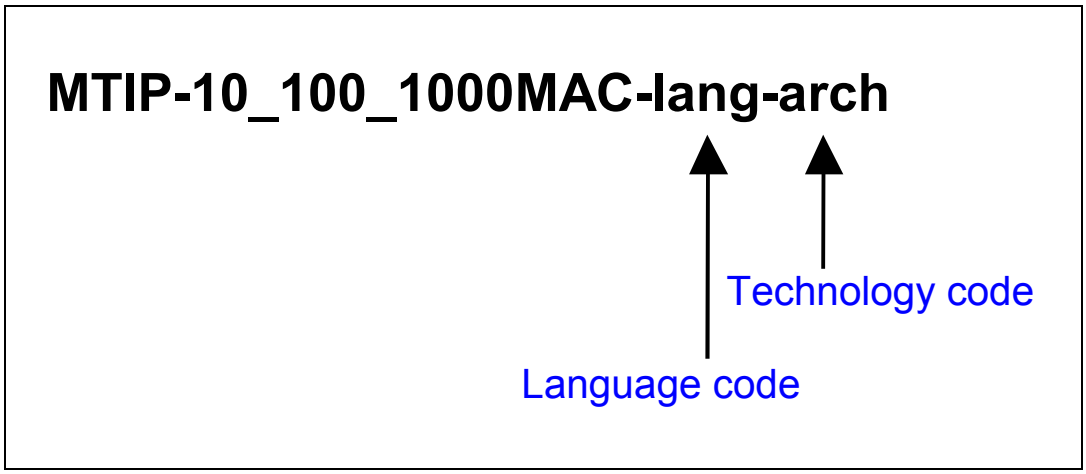

Table 2: Language Code

Technology Code	Target Technology
BIN	Encrypted CPLD netlist.
VHDL	Synthesizable generic VHDL source code for CPLD or ASIC implementations
VLOG	Synthesizable generic Verilog source code for CPLD or ASIC implementations

Table 3: Technology Code

Technology Code	Target Technology
GEN	Source code option for Altera CPLDs (ACEX1K, APEX20KE, APEX-II or STRATIX) or ASIC implementations.
ALTR	Encrypted netlist for Altera CPLDs (ACEX1K, APEX20KE, APEX-II or STRATIX).

8 Contact

MorethanIP GmbH

An der Steinernen Bruecke 1

85757 Karlsfeld

Germany

Tel : +49 (0) 8131 333939 0

FAX : +49 (0) 8131 333939 1

E-Mail : info@morethanip.com

Internet : www.morethanip.com