Enabling advanced applications with RapidIO

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Quick Fact Sheet

- Private owned company, established in 1993
- Sales 2012: €77 Million, Est. 2013: €100 Million
- Employees:
  - 470 FTE of which 250 in development
  - 80% higher education (Bsc, Msc, PhD)
- Core Business:
  - Design of electronics, software and mechanics
  - Manufacturing
  - Added Value Services
- Business Model:
  - Off-the-shelf products
  - Technology solutions
  - Manufacturing services
- Headquarters: Son, The Netherlands
  - Sales office Germany
  - Branch office Hong Kong

Employees (FTE)
High performance applications (1/3)

• Application: motion control
  ▪ Move heavy mass in 6 DoF with nanometer accuracy

• Execution platform
  ▪ Heterogeneous, modular environment
    ○ Multi-core, multi-processor
    ○ FPGA
  ▪ Real-time Linux based

• Focus
  ▪ Low latency
  ▪ Reliability
  ▪ Determinism
High performance applications (2/3)

• Application: server & storage
  ▪ Scalable infrastructure for e.g. big data, microserver, ...

• Execution platform
  ▪ Vendor, architecture and OS agnostic!
  ▪ 1U stacked ATX based boxes and ToR switching
    ○ Multi-core, multi-processor
    ○ Multi-tier network infrastructure

• Focus
  ▪ Throughput
  ▪ Performance per m³
  ▪ Cost of goods
High performance applications (3/3)

• Application: high performance computing
  ▪ Scalable infrastructure for scientific applications

• Execution platform
  ▪ Linux based software platform
  ▪ Heterogeneous, modular environment
    o Multi-core, multi-processor, multi-architecture
    o Multi-tier network infrastructure

• Focus
  ▪ Balanced compute, IO and memory
    o Work partitioning in hardware
    o Network clustering and utilization
RapidIO building blocks (1/2)

Processing

2012

PowerPC e5500 (Freescale QORIQ P5020)

PowerPC e500mc (Freescale QORIQ P4080)

PowerPC e500v2 (Freescale MPC8548)

Custom FPGA (Altera Stratix-II GX)

2014

ARM A15 + DSP C66x (TI Keystone)

Open Modular Server

ARM + DSP + FPGA (TI, Xilinx)

Core i7 + PCIe to SRIO bridge (Intel, IDT)

>2016

Multi-purpose FPGA (Xilinx Virtex-7)
RapidIO building blocks (2/2)

Switching

- Carrier blade 160G1 (10Gbps SRIO, 1Gbps Ethernet)
- Switch blade 320G1 (20Gbps SRIO, 1Gbps Ethernet)
- Switch blade 560G1 (20Gbps SRIO, 1Gbps Ethernet)
- Carrier blade 320G10 (20Gbps SRIO, 10GbE)
- Carrier blade 560G10 (20Gbps SRIO, 10GbE)
- Carrier 10xN (40Gbps SRI0)
- Break-out AMC 40G10

ATCA blade
19” rack mount
Research

Template PN: 6001-1246-5503 | Template date: 10-05-2013
www.prodrive.nl
Reference: P1310245681R02
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A broader perspective (1/2)

• Technology becomes more and more complex
  ▪ Spatial volume of technology decreases
  ▪ More effort needed to manage complexity
  ▪ Higher level of service for ODMs

• Customers focus on application software
  ▪ More utilization of COTS hardware
  ▪ More re-use of low level software stacks
  ▪ Reluctant to introduce disruptive technology
A broader perspective (2/2)

- Enable RapidIO technology through familiar APIs
  - Lower the threshold for RapidIO design-in
  - Shorter time-to-market
- Motion control application: Network management
- Server & storage application: RDMA
- Scientific computing application: OpenMPI
RapidIO control & data plane software

- Control plane: tools & APIs for network management
- Data plane: high performance APIs (RDMA, MPI, ...)

The Seven Layers of OSI
RapidIO control plane software

- Based on mainline Linux
- Discovery/enumeration
  - Automatic or manual
- Routing
  - Automatic or manual
- Hot plug support
- Award-winning network analysis tools
RapidIO data plane software

• Based on mainline Linux
• Networking paradigms
  ▪ Connection oriented
  ▪ Connectionless
  ▪ Broadcast
• APIs
  ▪ POSIX-like sockets
  ▪ OpenMPI
  ▪ RDMA
• Open interfaces
Open source developments

• Development of Linux SDK
  ▪ Added value for customers
    o Documentation
    o Example code
  ▪ Linux product BSP to mainline
    o Better integration with commercial Linux distributions

• RapidIO software to mainline
  ▪ Close cooperation with IDT
  ▪ Prodrive takes on leading role in Linux RapidIO

• [http://git.prodrive.nl](http://git.prodrive.nl)