Monitoring and Logging in WR using Etherbone&Co

Cesar Prados, GSI
White Rabbit Workshop
Amsterdam 2016
EtherBone

- Intro to Etherbone
- Monitoring

Monitoring & Logging

- Why?
- Protocols & Tech
- Configurations

WiP
Wishbone is an open source hardware bus intended to connect IP Cores inside of a FPGA or chip.

It takes an existing bus Wishbone and extends the bus to run over the network.

Etherbone breaks the borders of the FPGA.

Applications:
- Control Systems
- Sensor data acquisition
- Remote debugging
Easy Hardware to Hardware Connection
Easier Software to Hardware Connection
but only over Ethernet?
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Intro
Etherbone
- Intro
- Monitoring
Monitoring & Logging
WiP
Conclusion

EtherBone

FPGA
EB Master
Etherbone Lib
LM32

Host Bus

FPGA
EB Slave
WB Slave
Crossbar

Host Bus

MSI Interrupts over PCIe/VME

Host CPU
Bus
PCIe / VME / USB
Etherbone Access
WR Node

Host Bus

- No need for crates or PCs
- You can use your mobile cable
- Small footprint

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EtherBone

- Easy way to get access to your hardware
- Efficient transport protocol
- Connectivity and IRQ (PCIe, VME and USB)
- PC library and IP Core (VHDL) well tested
- Easy to develop new tools based on Etherbone lib

Monitoring & Logging

- Easy to monitor new parameters (HW Registers)
- No need to develop ad-hoc back-ends
- Works in combination with SNMP or other protocols
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Monitoring
- Monitoring is observation and checking
- Good monitoring provides two things:
  - State at any time
  - Notification of events

Logging
- Logging is recording, It's not about observation
- Logs are typically events
- Logging helps with forensics
- Power up & Shutdowns
- Incidents

Tools:
- Nagios
- iCINGA
- EtherBone
- NSCA
- SNMP
- Logstash
- Kibana
- Elastic
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Monitoring

Why?

- It helps to Debug
- It helps to detect and prevent problems
- It is a network... it is going to grow, you need to keep a clear picture
- It helps during deoployment
- It is “easy”, plenty of tools

Logging

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Passive Monitoring

nsca_recv

Monitor Server

nsca_send

Cron service

EB Master

EB Slave

HOST CPU

WR NODE

FPGA

REGISTERS

WB

EtherBone

Cron service

Why?

Protocols&Tech

Configurations

EB Master

EB Slave

Monitor Server

NSCA

iCINGA

Nagios®
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### Intro

### Etherbone

### Monitoring & Logging
- Why?
- Protocols & Tech
- Configurations

### WiP

### Conclusion
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Logging Server
ELK Stack

- Web interface for searching and analyzing logs stored
- Collects and processes the logs coming into the system

It stores, indexes and allows for searching the logs

SYSLOGS EVENTS
- Sync
- Track_Phase
- Temp > X
- Port Down/Up
- Power up

LM32 Log Events
WR SWITCH

LM32 Log Events
WR NODE

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Active Monitoring System in a WR Network

Etherbone
Nagios reads HW register using Etherbone over the timing network.

WiP
LogStash gathers syslogs from WR Switches.

Conclusion
Nagios triggers reads of HW register using Etherbone over the timing network.
Passive Monitoring System in a WR Network

Nagios triggers reads of HW Register using Etherbone over the host bus and send them to the Nagios Server using NSCA

Mgmt Network

WR Switch snmp

WR Switch syslog

Passive NSCA/Nagios

Monitoring / Nagios

Logging / LogStash
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Logging System in a WR Network

Host CPU

Etherbone Access

WR Node

Bus

PCle / VME / USB

Syslog

WR Nodes send systemlog msg upon changes of certain parameters (e.g. TRACK_PHASE)

Mgmt Port

WR Port

WR Switch

Mgmt Network

LogStash

LogStash gathers syslogs from WR Switches.

LogStash

LogStash gathers syslogs from WR Nodes.

Monitoring / Nagios

Logging / LogStash

Mgmt Monitoring Logging Server

Network
ALL- Monitoring and Logging System in a WR Network

**Etherbone**
- Nagios reads HW register using Etherbone over the timing network.

**Syslog**
- WR Nodes send systemlog msg upon changes of certain parameters (e.g. TRACK_PHASE)

**LogStash**
- Gather syslogs from WR Switches.

**Passive NSCA/Nagios**
- Nagios triggers reads of HW Register using Etherbone over the host bus and send them to the Nagios Server using NSCA

**Monitoring & Logging**
- Why?
- Protocols & Tech
- Configurations
Monitoring and Logging System in GSI WR Network

Passive NSCA/Nagios
Nagios triggers reads of HW Register using Etherbone over the host bus and send them to the Nagios Server using NSCA

Syslog
WR Nodes send systemlog msg upon changes of certain parameters (e.g. TRACK_PHASE)

LogStash
LogStash gathers syslogs from WR Switches.

LogStash
LogStash gathers syslogs from WR Nodes.
LLDP

The Link Layer Discovery Protocol (LLDP) is a vendor-neutral link layer protocol in the Internet Protocol Suite used by network devices for advertising their identity, capabilities, and neighbors.

Why LLDP?

LLDP:
- provides a solution for the configuration issues caused by expanding LANs.
- helps to detect VLAN Misconfiguration
- helps to keep a clear picture of the network topology
- helps during deployment (form factor installed, version of the firmware etc..)
- Is a Standard IEEE-802.1AB-Norm (no need for scripts crawling the WR Routing Table)
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WiP-LLDP
- Why?
- LLDP in WR
- Demo

Conclusion
LLDP in WR Network

**lldpd**

Project under ISC license hosted in Github:

- **Watchers** 40  **Stars** 170
- **Forks** 48  **Contributors** 20

- Highly configurable and supports: several discovery protocols:
  - LLDP
  - CDP (Cisco)
  - ...

- Advertise TLVs:
  - System and port name
  - System and port description
  - IP Management
  - MAC
  - VLAN ID and names
  - Link Aggregation
  - LLDP-MED

- SNMP capabilities
- Command Line Interface

**wrpc-sw/lldpd**

- LLDP only-transmit mode
- Advertise TLVs:
  - Port name and description
  - Formfactor name and description
  - Management IP
  - Host IP
  - MAC
  - Firmware Version

**TODO List**

- Add info to the WR switch
- Add info to WR Core/wrpc-sw
- Add VLAN support
- Add to the buildroot WR Switch
- Export MIB SNMP LLDP WR Switch
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LLDP Demo

```
[lldpcli] #
[lldpcli] # resume
[lldpcli] # show chassis
Local chassis:
Chassis:
 ChassisID:  mac 00:1b:c5:09:00:21
 SysName:   (none)
 SysDescr:  Linux 2.6.39-wr-switch #1 Fri Feb 26 02:29:08 CET 2016 armv6tejl
 MgmtIP:    192.168.20.13
 Capability: Bridge, off
 Capability: Router, off
 Capability: Wlan, off
 Capability: Station, on
[lldpcli] #
```
**EtherBone**

- Easy way to get access to your hardware
- Efficient transport protocol
- Connectivity (Ethernet, PCIe, VME and USB)
- Easy to add new register to the monitor
- No need to develop back-ends
- Can work in combination with SNMP or other protocols

**Monitoring & Logging**

- We need it
- It helps to understand problems and know your network
- Plenty of possibilities and different configurations
- WR devices provide a good level of monitoring and logging

**Useful Links**

- [https://github.com/GSI-CS-CO/bel_projects](https://github.com/GSI-CS-CO/bel_projects)
- [https://github.com/GSI-CS-CO/monitoring](https://github.com/GSI-CS-CO/monitoring)