C-GEP 20 1Gb/s Monitoring application user manual

Statistics
- Current
- Monitor status
- Live
- Time
- Archived

Alarms and events

Settings

System

Administration

CGEP-20 statistics

| XFP 0 | XFP 1 | N/A | N/A |

| SFP 0 | SFP 2 | SFP 4 | SFP 6 | SFP 8 | SFP 10 | SFP 12 | SFP 14 | SFP 16 | SFP 18 |
| SFP 1 | SFP 3 | SFP 5 | SFP 7 | SFP 9 | SFP 11 | SFP 13 | SFP 15 | SFP 17 | SFP 19 |

Reset counters

Lost frames: 0

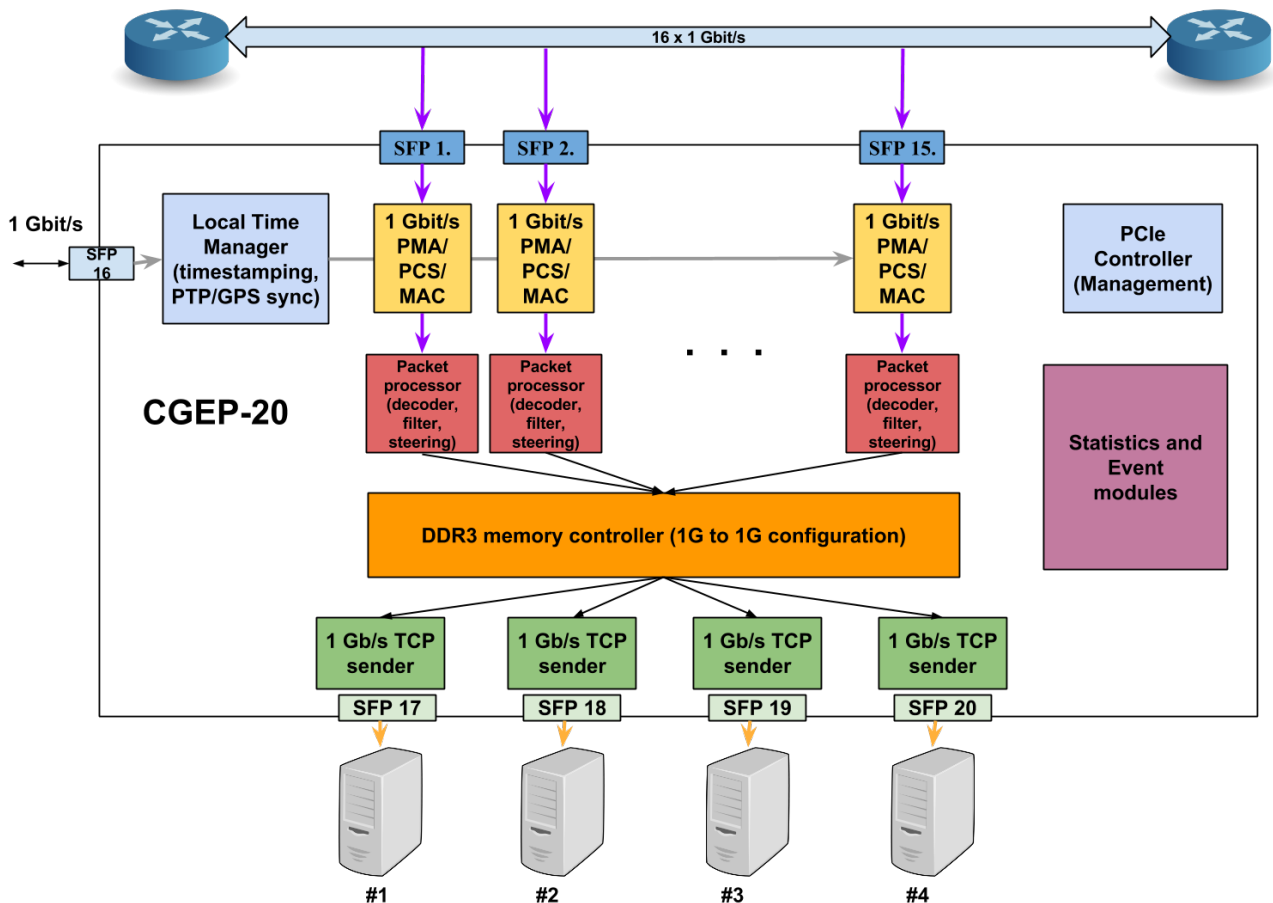|	Received frames	CRC Errors	Filtered frames	Dropped frames
Interface: (SFP #0)	1000000	0	500000	0
Interface: (SFP #1)	0	0	0	0
Interface: (SFP #2)	0	0	0	0
Interface: (SFP #3)	0	0	0	0
Interface: (SFP #4)	0	0	0	0
Interface: (SFP #5)	0	0	0	0
Interface: (SFP #6)	0	0	0	0
Interface: (SFP #7)	0	0	0	0
Interface: (SFP #8)	0	0	0	0
Interface: (SFP #9)	0	0	0	0
Interface: (SFP #10)	0	0	0	0
Interface: (SFP #11)	0	0	0	0
Interface: (SFP #12)	0	0	0	0
Interface: (SFP #13)	0	0	0	0

1 Introduction:

C-GEP is a very versatile platform for network monitoring applications. The reprogrammable FPGA chip allows us to develop very flexible solutions. The C-GEP 20 board can host a wide range of applications from 10 Gb/s monitoring to 1 Gb/s switching. The following firmware is assembled to multiplex data from dedicated 1 Gb/s inputs to 1 Gb/s monitoring outputs. In this case we don't use the 10 Gb/s interfaces.

2 Monitoring function:

The firmware is similar to the C-GEP 20 10 Gb/s monitoring application, but in this case upto 16 pcs of 1Gb/s capable links are used as input to the monitoring core, and upto 4 pcs of 1 Gb/s monitoring outputs are utilized with TCP streaming.

As the number of output interfaces is less than the number of inputs, it is very important not to overload an output. Currently the user is responsible for evenly distributed traffic by configuring the filter setting, but automatic traffic steering is also possible depending on output load. By using 2x4GB DDR3 RAM modules, we have a buffer of 2GB per output interface.

Architecture of the monitoring firmware:

3 Monitoring firmware services:

The firmware running on the Virtex 6 FPGA processor of the C-GEP 20 determines the functionalities of the monitoring applications.

Depending on the needs, special functions can be integrated besides the basic services of the firmware.

The C-GEP 20 1 Gb/s monitoring application requires special routing and filtering modules because of the high input count. The physical interfaces and other processing modules remain the same as by the C-GEP 20 10 Gb/s monitoring applications.
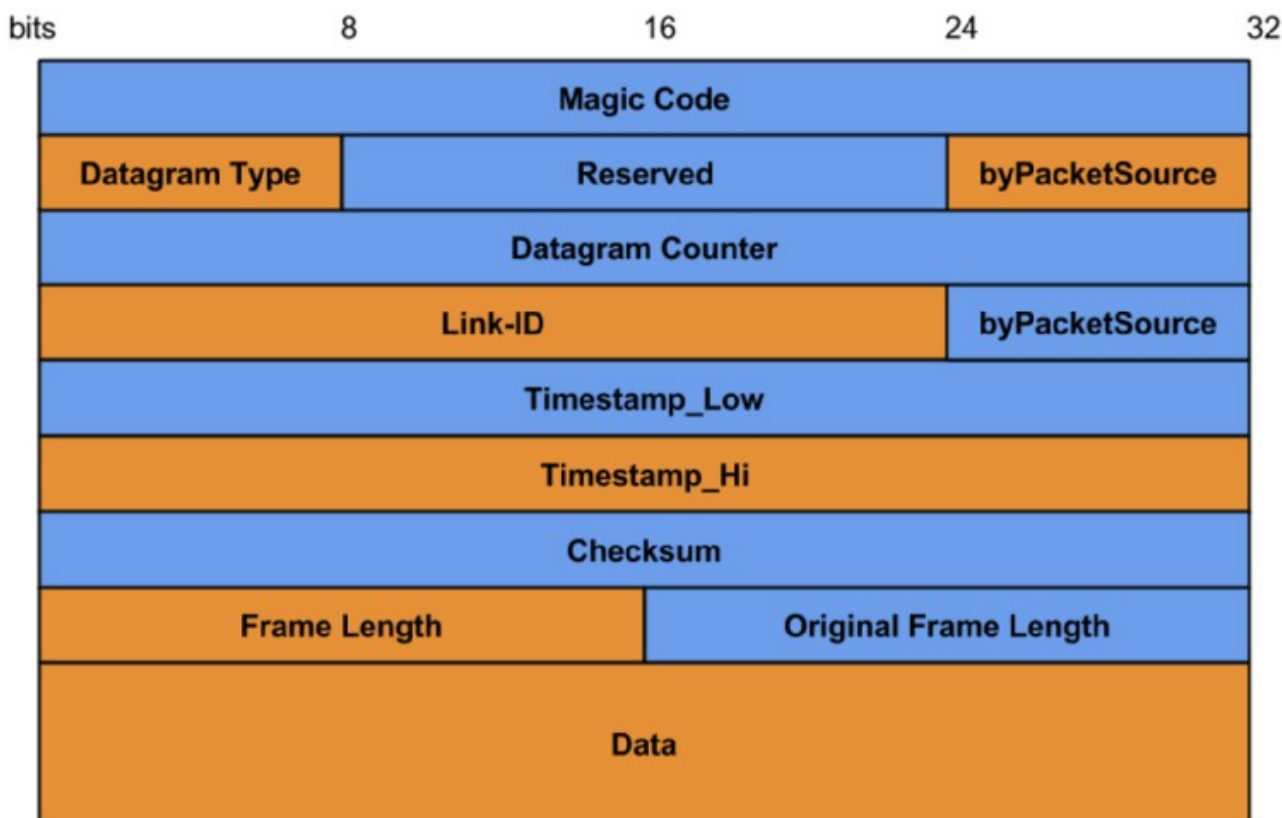
3.1 Main functions:

– physical interface controllers:
- 1Gb/s PCS/PMA and MAC layer implementation
- 10Gb/s PCS/PMA and MAC layer implementation
- 100Gb/s PCS/PMA and MAC layer implementation
- XAUI to XFI converter chip controller (over MDIO)
- SFP, XFP, CFP module controllers (over MDIO and I_2C)
- 1G/10G/100G interface status ucontrollers (over RS232)
- PCI-express v2.0 base controller
- basic DDR3 module controller
- chip-scale atomic clock
- system monitor: monitor FPGA specific variables (fe. core temperature)
- status leds

– application level interface controllers:
- DDR3 host controller for 1G to 1G applications (FIFO function)
- PCI express application layer for register I/O and busmaster DMA
- 1G TCP/IP implementation for sending monitor data
- NTP time synchronization module for precise timestamping
- PTP time synchronization module for more precise timestamping
- SGA-ClockCard interface for centrally synchronized timstamp source of all SGA devices

– application level data processing modules:
- 1G packet processor module:
  - Protocol decoder (ethernet, layer 3, application specific, and custom protocols)
  - Configurable packet filter, with header chunker and output interface selector
  - Packet head injector (add timestamp and other information)
- statistics modules:
  - counters for received, filtered, bad frames, etc.
  - speed measurements fe. Incloming interface data throughput (in KB/s, or pck/sec)
  - event modules: interface events, error reporting; internal processing events (fe. packet loss, no traffic, time sync error, etc.)

3.2　Monitor header:

The current firmware configuration adds a monitoring header before the ethernet frame. This method has the advantage, that the frame data is kept unchanged, all additional information, like reception timestamp is in the monitoring header. The headered frame format is called „SGA-PacketStream", and all SGA monitoring solutions can interprete and process it.

C-GEP 20 Monitor-packet format

PacketStream header fields:

- Magic code: this identifies the start of the packet, and the version
- Datagram type: the contained packet: ethernet, IP, or service information
- byPacketSource: interface number on the device the packet was captured
- DatagramCounter: packet counter for detecting packet loss
- Link-ID: identify the receive link, or filterset by a name
- Timestamp: 64 bit synchronized Timestamp in Filetime, or nsec resolution Unixtime format
- Checksum: Header and data checksum for error detection
- Frame length: Captured data length without header
- Original frame length: Received ethernet frame length

4 The Web-based User interface for 100 Gb/s monitoring application:

C-GEP 20 has a web-UI management surface accessible from any web browser for controlling functionalities, make setting changes, or check the state of the device.

4.1 Statistics menu:

The „Current" statistics submenu shows the current counter values and state indicators of the device. Besides interface link states, generic receive counters, and other important monitoring counters are shown. The input interfaces have separate countersets from other processing counters.

Link indicator leds:

- red: interface module not present (CFP, XFP, SFP)

- orange: interface module present, no link

- green: receive signal present, link ok

The „Live graph" submenu shows the current traffic load on the 1 Gb/s output interfaces.

The traffic counters are saved and reseted in every 15 minutes. The „archived" menu shows the saved values selectable by date and time.

4.2 Alarms and events:

The „Alarms and events" menu shows the important occurences (like link loss, or packet loss), and informations regarding the operation of the C-GEP board. Also events are sent to a central event manager server by a program called „C-GEP_poller".

4.3 Settings:

This menu controls the main functionalities of the C-GEP device.

4.3.1 Filter settings:

The „Filters" submenu is used to set up the 64 filtersets per input of the C-GEP monitor core.

You can select which input interfaces filterset you want to configure, and also copy the actual edited interfaces filter settings to all other interfaces. Filter setting can be selective reloaded, data processing remains consistent during the filter rule update, because every rule setting gets updated in one step inside the firmware.

CGEP-20 filter settings

Configure interface filterset: SFP #0 ▾ **Select**

Reload this **Reload all** **Copy to all** **Clear this**

#	Parameter	Value	Edit
0	Output interface: VLAN ID: Src IP Address: Src IP Mask: Dst IP Address: Dst IP Mask: IP protocol: Filter mode is:	**SFP #14** **1234** **10.0.0.1** **255.255.255.0** **10.0.1.0** **255.255.255.0** **Udp** **Pass**	📝 ✖ ➕
1	Output interface: IP protocol: Filter mode is:	**SFP #15** **Tcp** **Drop**	📝 ✖ ➕
2	Output interface: Filter settings are disabled, catch all packets Filter mode is:	**SFP #15** **Catch all**	📝 ✖ ➕

The default page shows an overview of the filter values. By opening a specific filter you can configure:

Edit filter settings #0

Link Name:	C00
Output interface:	M14 - (SFP #14) ▾
Filter mode:	Pass ▾
Filter rule:	IP Src and Dst swapping ▾
VLAN TAG:	1234
Source IP Address:	10.0.0.1
Source IP Mask:	255.255.255.0
Destination IP Address:	10.0.1.0
Destination IP Mask:	255.255.255.0
IP protocol:	Udp ▾

Save

– the output interface to forward packets the rule fits

– The „Link ID" written into the packets header (optional)

– Filter mode: you can select to accept, or drop the packet when the rule fits (All packets pass the filter if the „Catch all packets" is selected from the filter mode)

– Filter rule: in „IP src and Dst swapping" mode source and destination IP addresses (A → B), and the opposite direction of addresses (B → A) are examined too.

- VLAN tag: VLAN tag value if present

– IP Addresses: You can specify a single address, or an arbitrary IP range by subnet mask

– IP protocol: not specified, or TCP/UDP (if needed, other protocols can be selected too)

After configuring the filter setting you have to press one of the „Reload configuration" buttons to upload the new ruleset(s) to the device.

4.3.2 Interface settings:

C-GEP 20 1 Gb/s monitoring interface settings include enable disable setting for all inputs, and TCP connection settings for the monitoring output interfaces.

CGEP-20 monitor interfaces (SFP)

Reload configuration

#	Monitor ID	Link ID	Edit	Status
0	M00	Link: C00	📝	Enabled
1	M01	Link: C01	📝	Enabled
2	M02	Link: C02	📝	Enabled
3	M03	Link: C03	📝	Enabled
4	M04	Link: C04	📝	Enabled
5	M05	Link: C05	📝	Enabled
6	M06	Link: C06	📝	Enabled
7	M07	Link: C07	📝	Enabled
8	M08	Link: C08	📝	Enabled
9	M09	Link: C09	📝	Enabled
10	M10	Link: C10	📝	Enabled
11	M11	Link: C11	📝	Enabled
12	M12	Link: C12	📝	Enabled
13	M13	Link: C13	📝	Enabled

#	Monitor ID	Source	Destination	Edit
14	M14 Link: C14	192.168.11.1:7001	192.168.11.101:7001	📝
15	M15 Link: C15	192.168.11.2:7001	192.168.11.101:7001	📝
16	M16 Link: C16	192.168.11.3:7001	192.168.11.101:7001	📝
17	M17 Link: C17	192.168.11.4:7001	192.168.11.101:7001	📝

4.3.3   Time synchronization settings:

The time synchronization used in C-GEP 20 is the NTP version 3, which is a timing synchronization protocol designed for generic IP networks. PTP, and SGA-ClockCard synchronization is available too.

CGEP-20 NTP settings

NTP IP address:	10.0.0.254
Gateway address:	10.0.0.254
Subnet mask:	255.255.255.0
CGEP-20 client IP:	10.0.0.166
Refresh interval (sec):	16 sec

Save

Reload configuration

4.3.4   Poller settings:

C-GEP events are sent to a central event collector server. This settings are responsible for the connection.
The „No traffic alarm" means, that an event is generated if no traffic is received in x minutes.
The „Poller interval" means the event polling frequency.
The „Critical core temperature" means that if the FPGA core temperature reaches this value then an event is generated, and the device is shut down to prevent damage.

CGEP-20 Poller settings

Main interface ID:	XXX
Poller IP address:	12.12.12.12
Poller port:	7000
Poller interval:	1
No traffic alarm interval:	5
Keep alive:	2
Critical core temperature:	86

Save

4.3.5 Export, Import settings:

All device setting can be exported into a structured xml file
Also you can import the settings from a previously saved or edited xml.

Export settings to file

🖫 Download configuration

Import settings from file

Select file: [Tallózás...] Nincs kijelölve fájl.

[Upload]

4.4 System menu:

This menu contains the main controls of the device and its interfaces.

4.4.1 C-GEP 20 ID and IP:

The Devices name and management IP Address can be specified here.

4.4.2 Reset / Reload config:

Reset the whole FPGA core (necessary only after firmware change), or the interface settings only (filter settings).

4.4.3 Shutdown / Reboot:

Shut down, or reboot the device by issuing a halt or reboot command to the Linux-OS.

4.4.4 Temperatures:

The FPGA core temperature, or the management PC-s temperature can be observed here.

4.4.5 Firmware:

Firmware upload is handled by the built in JTAG programmer. You have to specify the new firmware file, and push the „Start" button to begin the upload process.

Also you can view the current firmware release date and last upload date here.

During firmware upload the device is not operational, and does not take any new commands!

When firmare upload is finished you have to make a full reset by menu, or restart the system.

CGEP-20 FPGA firmware relase date

	Date
FPGA:	2015.01.14

CGEP-20 firmware upload status

Last response:	INFO: Upload completed!
Date:	Wed May 20 07:21:58 CEST 2015

New firmware uploading

Select file:	Tallózás...	Nincs kijelölve fájl.
	Start	

4.5 Administration:

Change password for the currently logged in user.