

A Data Acquisition Backbone Core library

Jörn Adamczewski, Hans G.Essel, Nikolaus Kurz, Sergey Linev
GSI, Experiment Electronics: Data Processing group

Motivation and use cases

Core design: dataflow, modules, manager object

Application plug-in mechanism

Controls and configuration interface

Status and Outlook

Work supported by EU RP6 project JRA1 FutureDAQ RII3-CT-2004-506078

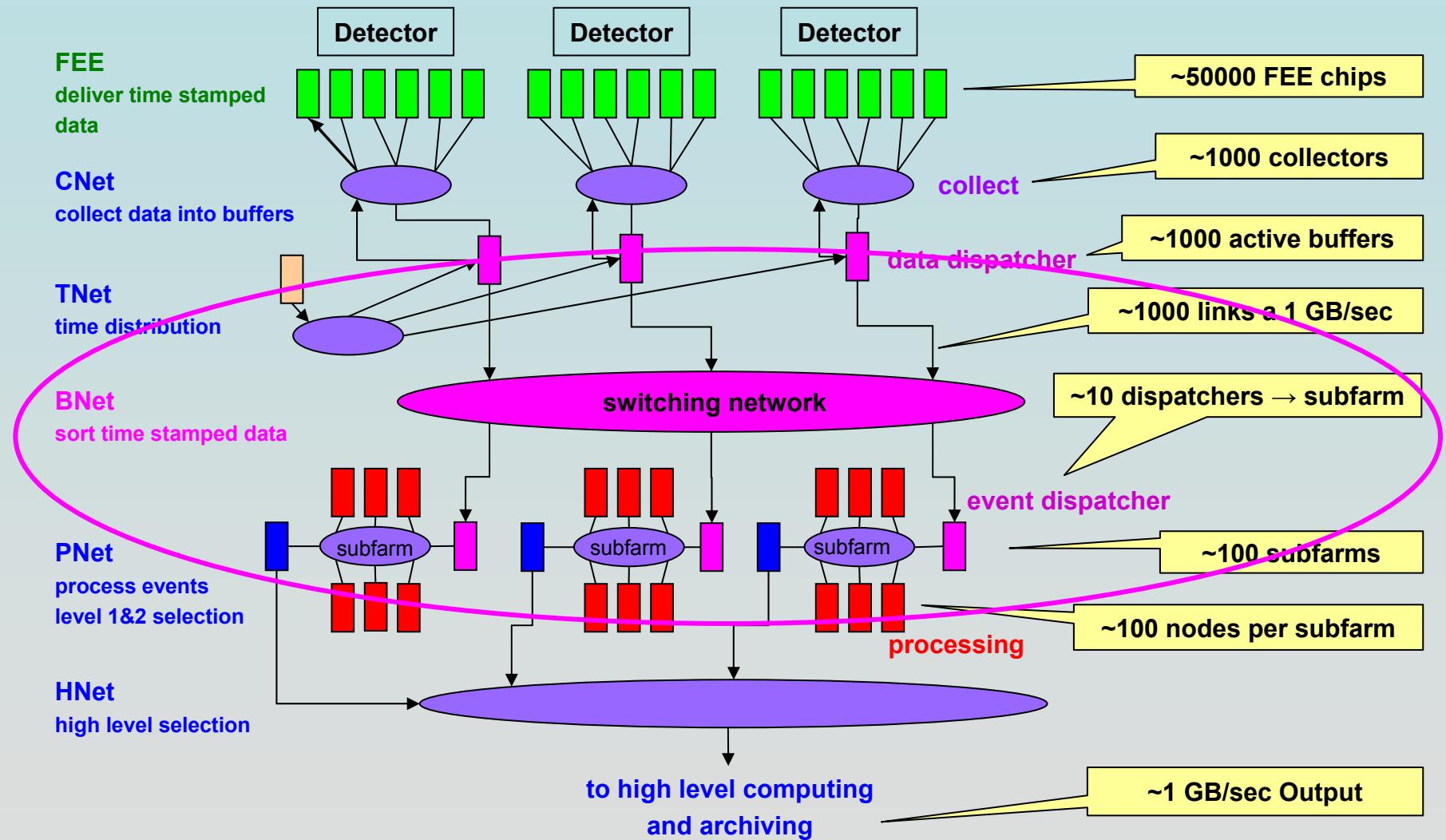
J.Adamczewski, H.G.Essel, N.Kurz, S.Linev

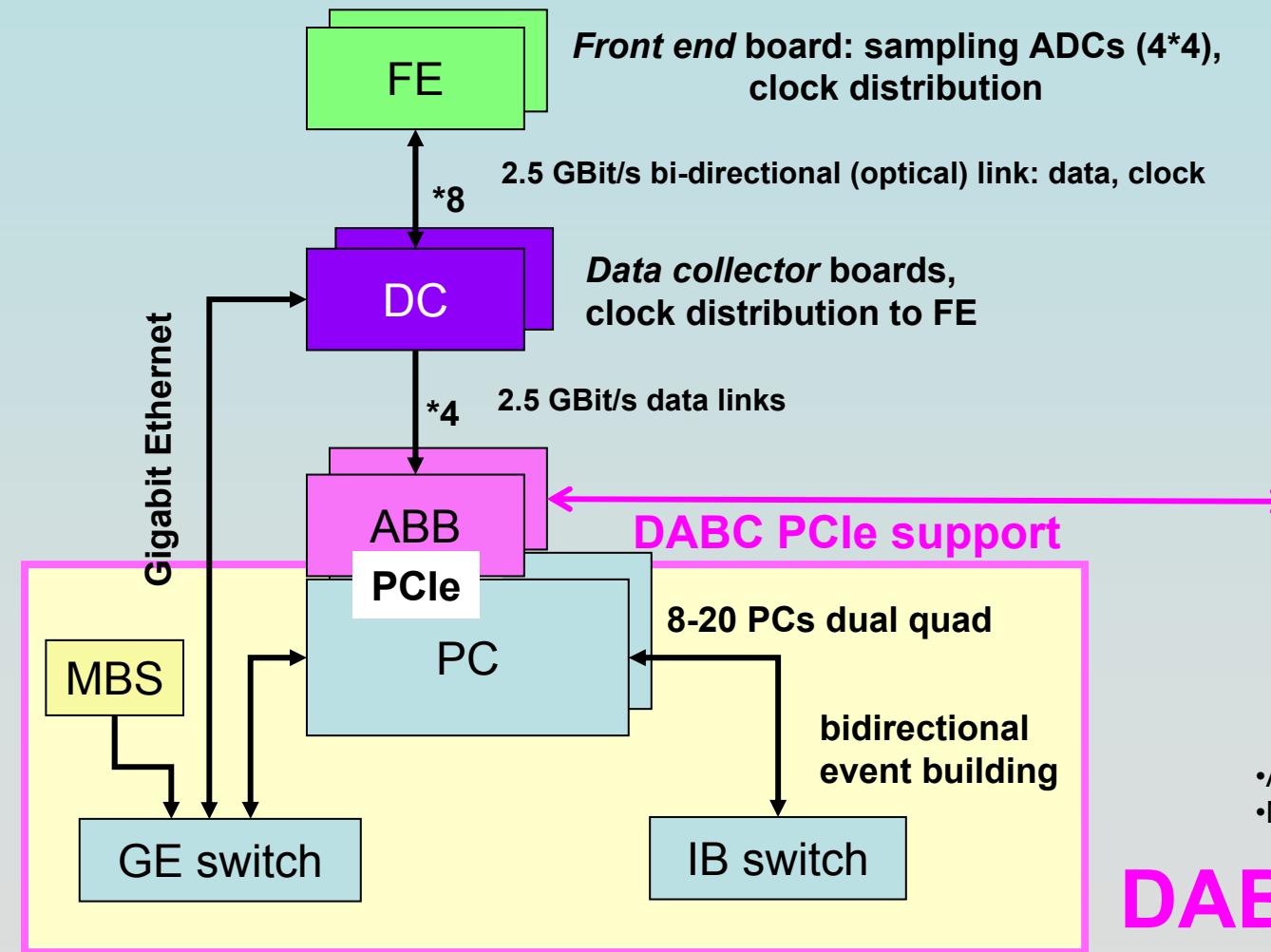
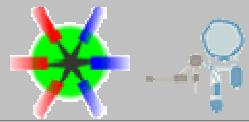
Data Acquisition Backbone Core <http://wiki.gsi.de/DABC>

CBM data acquisition plan

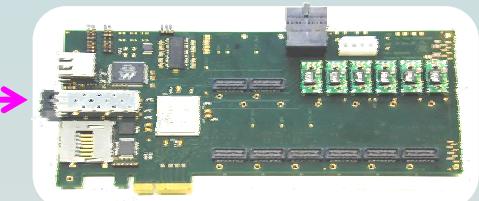


W.F.J.Müller, 2004





FE: Frontend board
DC: Data combiner board
ABB: Active Buffer board
GE: Gigabit Ethernet
IB: InfiniBand
MBS: MultiBranchSystem



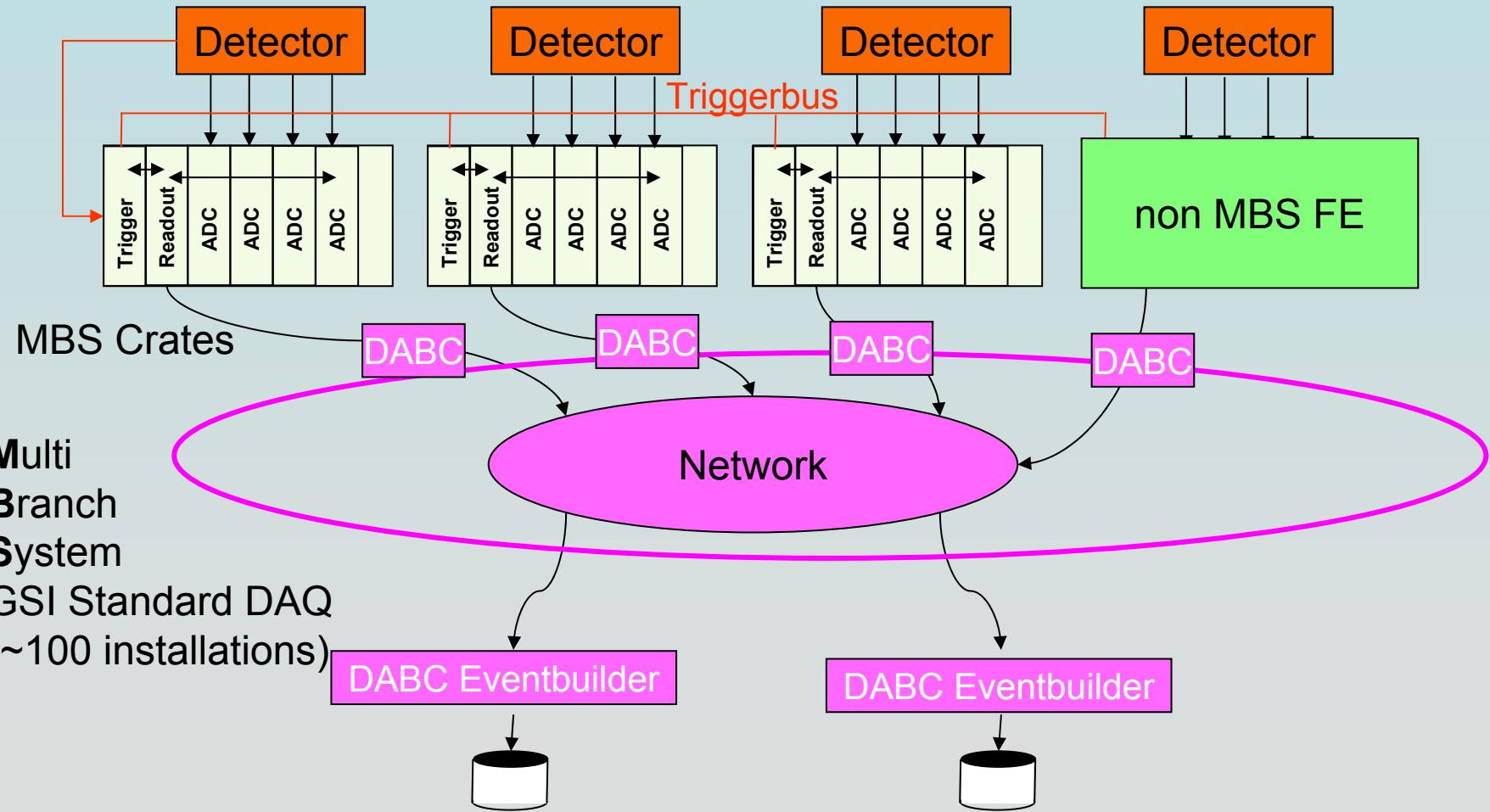
Active Buffer Board*: PCI express card

•A.Kugel, G.Marcus, W.Gao,
•Mannheim University Informatics V

DABC



Use case: DAQ m x n topology





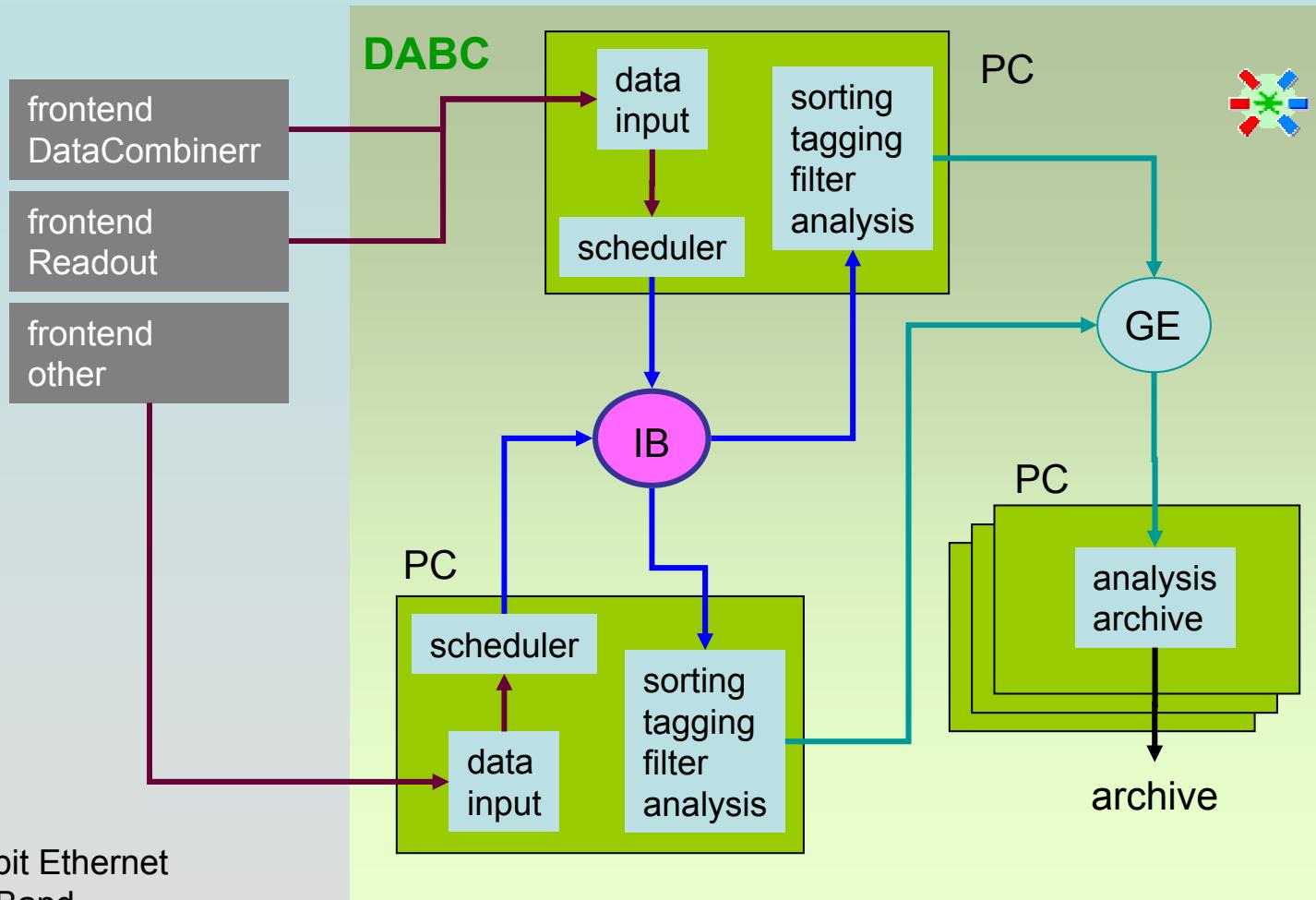
Motivation for DABC

	<u>Use cases:</u>	<u>Requirements:</u>
CBM GSI {	<ul style="list-style-type: none">• Detector tests• FE equipment tests• Data transport tests• Time distribution tests• Switched event building• MBS event builder	<ul style="list-style-type: none">• build events over fast networks• triggered or self-triggered front-ends• time stamped data streams• data flow control (to front-ends)• connect (nearly) any front-ends• interface for application plug-in code• connect MBS readout or collector nodes• interface for several controls frameworks

=> DABC for CBM DAQ testing and as future „general purpose“ DAQ system

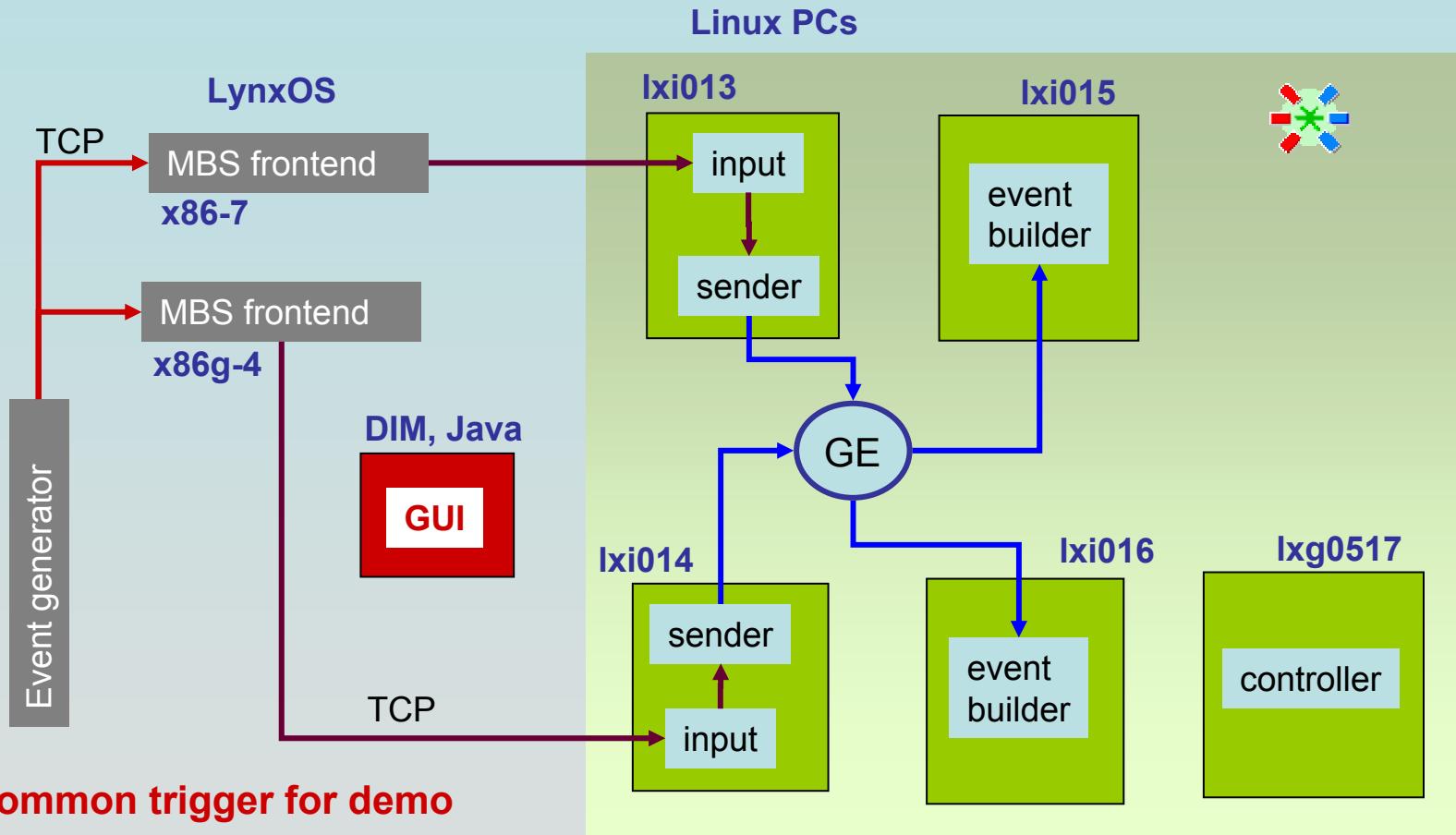
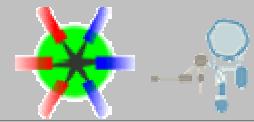


DABC design: functional overview



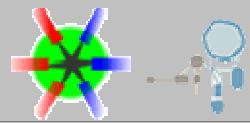
GE: Gigabit Ethernet
IB: InfiniBand

➤ DABC data flow

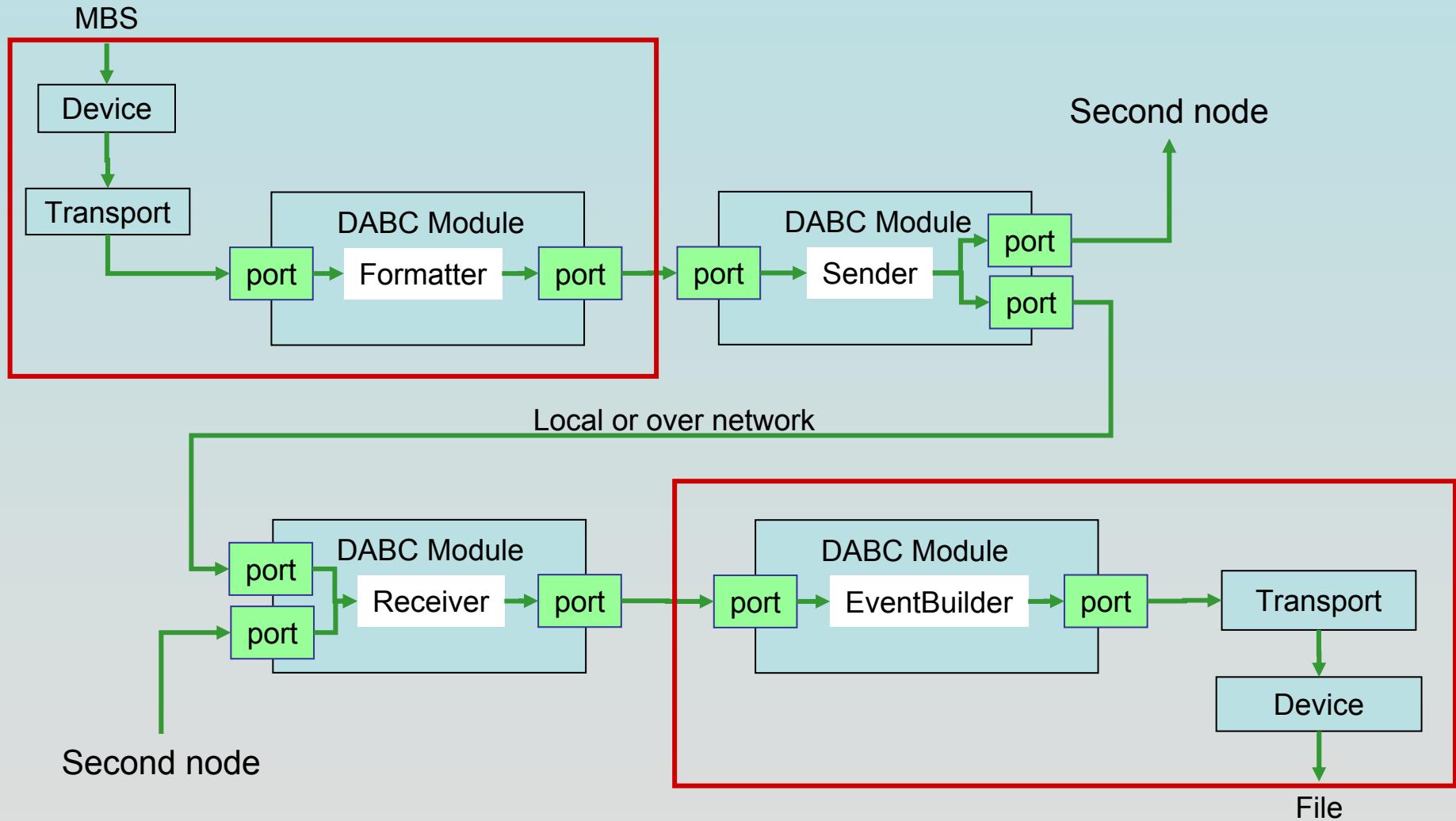


GE: Gigabit Ethernet

➤ DABC structure



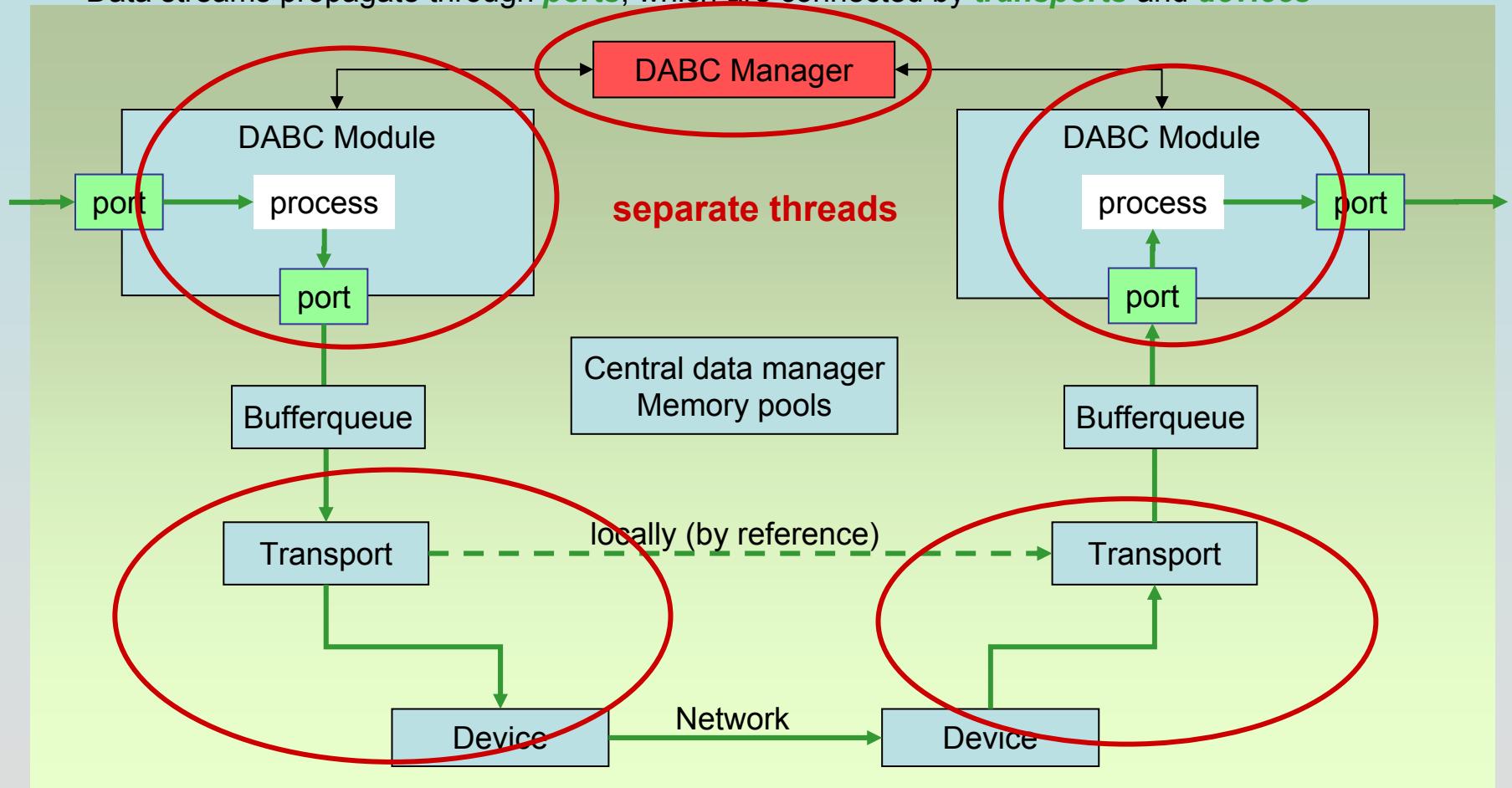
Example: DABC with MBS plugins

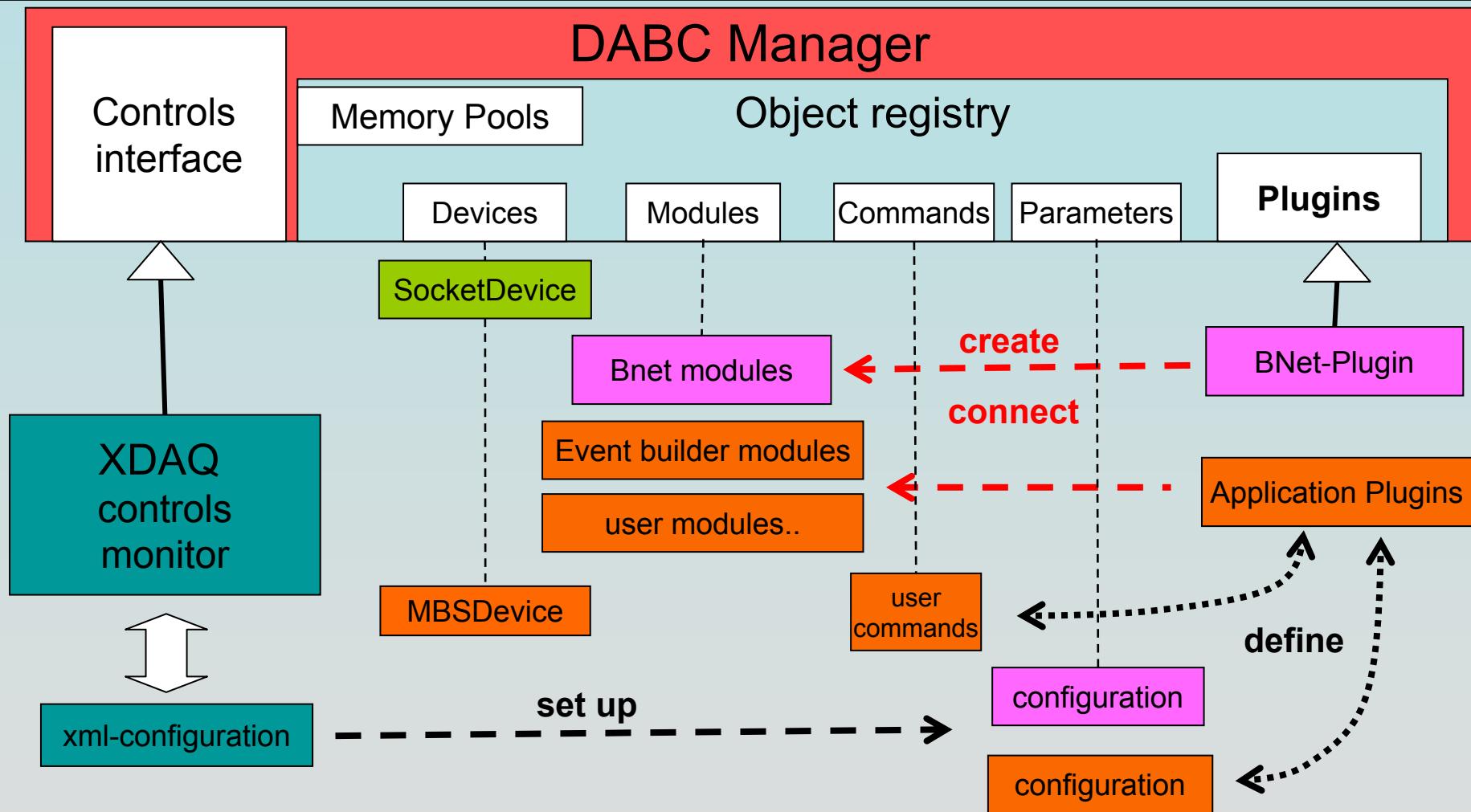
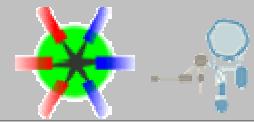


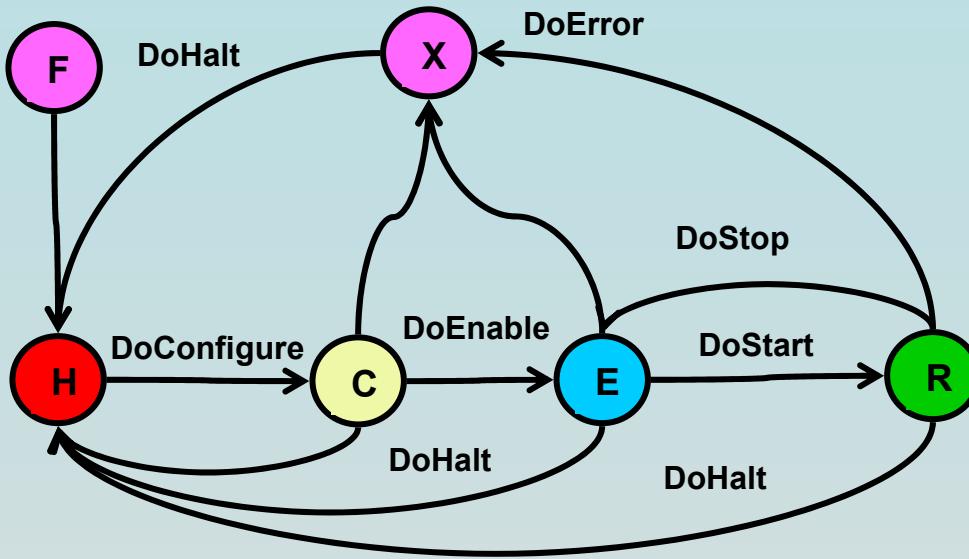
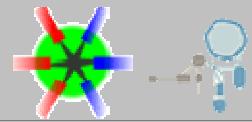


A *module* processes data of one or several data streams.

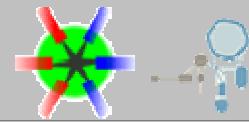
Data streams propagate through *ports*, which are connected by *transports* and *devices*







- State machine is defined by controls interface of DABC core
- ApplicationPlugins implement state transition actions („user code“)
- Nodes in B-net may set up state machine hierarchy:
(e.g. 1 master node, n worker nodes)

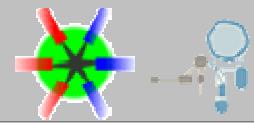
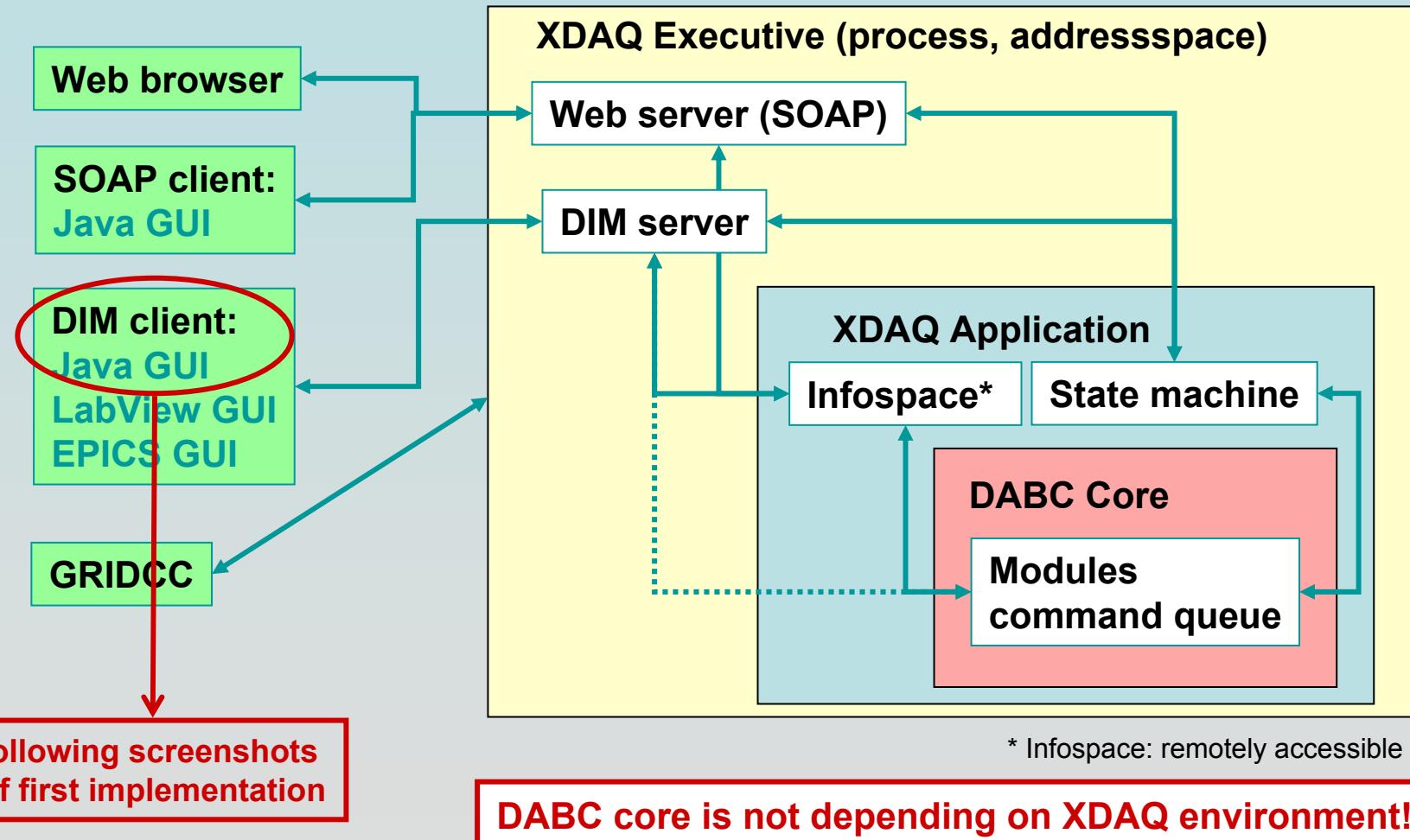


Parameters:

- Registered by **plugin** or device class
- **DIM** field service with **naming convention and DABC structure**
- Also: **SOAP/ XDAQ infospace representation, web interface, xml input**
- Recognized by **generic GUI**, automatic graphical presentation
- Types: Simple, Status, Rate, Histogram, Info, Command description,...

Commands:

- **DIM** (and SOAP) implementation
- **State machine commands**
(generic, with **overwritten standard callbacks** in plugins)
- **Framework commands** (generic, e.g. „SetValue“)
- **User defined module commands** (registered by plugin or device):
 - execution in **user callback**
 - recognized by **generic GUI** via command description
 - **command streamer and description (XML)**
independent from controls implementation!

framework for CMS, see <http://xdaqwiki.cern.ch>

MbsLauncher

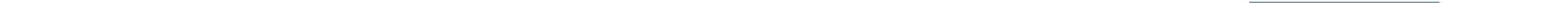
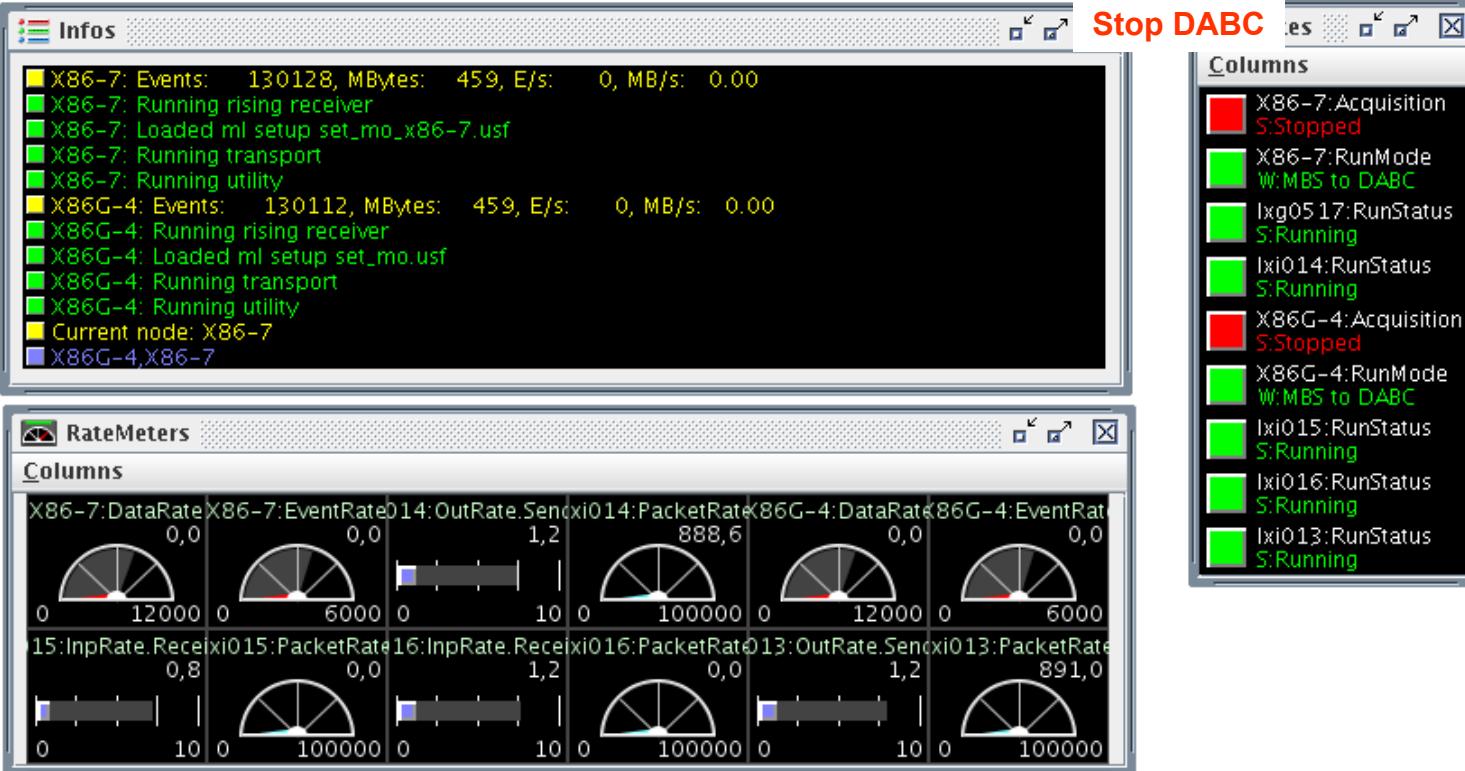
MBS connected

Name server: lxg0500.gsi.de
Master Node: x86g-4
User name: goofy
Password:
User path: v50/x86/newmbs
MBS path: /daq/usr/goofy/mbswork/v51/
Script: script/remote_exe.sc
Command: m_rising v50/x86/newmbs . x86g-4 x86-7

DabcLauncher

DABC connected

Name server: lxg0500.gsi.de
Master node: lxg0517.gsi.de
Master name: Controller:41
User name: goofy
Password:
User path: /misc/goofy/sniff/dabcappl/config
DABC path: /misc/goofy/sniff/dabc/
Setup file: DABC_MBS_Setup.xml
Script: ps



MbsLauncher

MBS connected

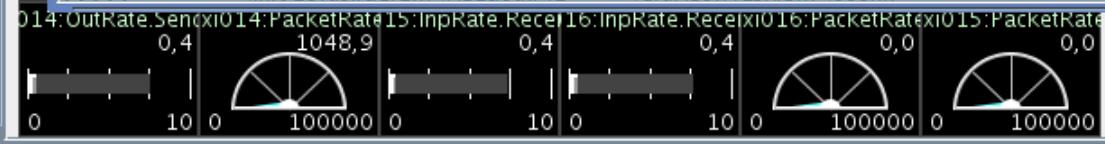
Name server: lxg0500.gsi.de

DabcLauncher

DABC connected

Name server: lxg0500.gsi.de

Parameters						
ID	Node	Application	Parameter	Current	Set value	Show
00030	X86G-4	MSG	RunMode	MBS to DABC	-	<input checked="" type="checkbox"/>
00031	X86G-4	MSG	User	goofy	-	<input type="checkbox"/>
00032	X86G-4	MSG	sPerform	Events: 208441, MBytes: 6...	-	<input checked="" type="checkbox"/>
00033	X86G-4	MSG	sRising	Running rising receiver	-	<input checked="" type="checkbox"/>
00034	X86G-4	MSG	sSetup	Loaded ml setup set_mo.usf	-	<input checked="" type="checkbox"/>
00035	X86G-4	MSG	sTransport	Running transport	-	<input checked="" type="checkbox"/>
00036	X86G-4	MSG	sUtility	Running utility	-	<input checked="" type="checkbox"/>
00037	X86G-4	PRM	Current	Current node: X86-7	-	<input checked="" type="checkbox"/>
00038	X86G-4			-	-	<input checked="" type="checkbox"/>
00039	lxg0517.gsi.de			.06(Feb 22 ...	-	<input type="checkbox"/>
00040	lxg0517.gsi.de					<input type="checkbox"/>
Full parameter table of DABC and MBS Parameters can be set here, if not locked						
00041	lxg0517.gsi.de:1...	Controller:41	INETDEVICE.Clust...	BUCKET	-	<input type="checkbox"/>
00042	lxg0517.gsi.de:1...	Controller:41	Nodelist	lxio13.gsi.de:1972,lxio14.gsi.de...	-	<input type="checkbox"/>
00043	lxg0517.gsi.de:1...	Controller:41	RunStatus	Ready	-	<input checked="" type="checkbox"/>
00044	lxg0517.gsi.de:1...	Controller:41	State	Ready	-	<input type="checkbox"/>
00045	lxg0517.gsi.de:1...	Controller:41	controllerTid	41	-	<input type="checkbox"/>
00046	lxg0517.gsi.de:1...	Controller:41	debugLevel	1	-	<input type="checkbox"/>
00047	lxg0517.gsi.de:1...	Controller:41	heartbeatPeriod	5	-	<input type="checkbox"/>
00048	lxg0517.gsi.de:1...	Controller:41	nodeDNS	lxg0500.gsi.de	-	<input type="checkbox"/>
00049	lxg0517.gsi.de:1...	Controller:41	nodeId	0	-	<input type="checkbox"/>
00050	lxg0517.gsi.de:1...	Controller:41	portDNS	2505	-	<input type="checkbox"/>
00051	lxg0517.gsi.de:1...	Controller:41	runningTime	390	-	<input type="checkbox"/>
00052	lxg0517.gsi.de:1...	Controller:41	startTime	1203957518	-	<input type="checkbox"/>
00053	lxg0517.gsi.de:1...	Controller:41	statusMessage	State machine reached current st...	-	<input type="checkbox"/>
00054	lxg0517.gsi.de:1...	Controller:41	workerTid	42	-	<input type="checkbox"/>
00055	lxio13.gsi.de:1...	Readout:42	CfgClusterMgr.B...	XDAQ/lxg0517.gsi.de:1968	-	<input type="checkbox"/>
00056	lxio13.gsi.de:1...	Readout:42	CfgConnected.B...	1	-	<input type="checkbox"/>
00057	lxio13.gsi.de:1...	Readout:42	CfgController.B...	0	-	<input type="checkbox"/>
00058	lxio13.gsi.de:1...	Readout:42	CfgNodeId.Bnet...	1	-	<input type="checkbox"/>
00059	lxio13.gsi.de:1...	Readout:42	CfgNumNodes...	5	-	<input type="checkbox"/>
00060	lxio13.gsi.de:1...	Readout:42	CfgRecvMask.B...	000xxx	-	<input type="checkbox"/>



DABC Controls

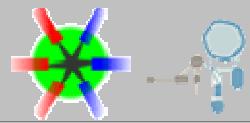
The screenshot shows the DABC Controls application window with three main panes:

- MbsLauncher** (Left pane):
 - MBS connected** section:

Name server:	lxg0500.g
Master Node:	x86g-4
 - Commands** tree view:
 - > lxi015.gsi.de:1972
 - > lxi016.gsi.de:1972
 - Readout:42
 - DoEnable
 - DoError
 - DoHalt
 - DoStart
 - DoStop
 - EXIT
 - ManagerCommand
 - MbsCommand** (highlighted)
 - MbsShell
- DabcLauncher** (Middle pane):
 - Command MbsCommand, scope Common**
 - Argument (C):** [Text input field]
 - Commands of DABC and MBS** (Text box containing the command)
- Logger** (Bottom pane):
 - Logging** section:

25.02.2008 17:37:51 U XDAQ/X86G-4/MSG/M: -X86-7 :rirec	:-----
25.02.2008 17:37:51 U XDAQ/X86G-4/MSG/M: -X86-7 :rirec	:buffer size: 0x10000, 1 buffer per stream, 10 streams
25.02.2008 17:37:51 U XDAQ/X86G-4/MSG/M: -X86-7 :rirec	:stream segment base: 0x0, outmode: 1
25.02.2008 17:37:51 U XDAQ/X86G-4/MSG/M: -X86-7 :rirec	:-----
25.02.2008 17:37:51 U XDAQ/X86G-4/MSG/M: -X86-7 :rirec	:task m_rirec started
25.02.2008 17:37:51 U XDAQ/X86G-4/MSG/M: -X86-7 :transport	:task m_transport started
25.02.2008 17:37:54 S MBS: *::enable dabc	
25.02.2008 17:37:54 U XDAQ/X86G-4/MSG/M: -X86G-4 :transport	:starting server in exclusive mode
25.02.2008 17:37:54 U XDAQ/X86G-4/MSG/M: -X86G-4 :transport	:Set DABC mode, buffer format variable, type 100
25.02.2008 17:37:54 U XDAQ/X86G	for client (port 6000)
25.02.2008 17:37:54 U XDAQ/X86G	server in exclusive mode
25.02.2008 17:37:54 U XDAQ/X86G-4/MSG/M: -X86-7 :transport	:Set DABC mode, buffer format variable, type 100
25.02.2008 17:37:54 U XDAQ/X86G-4/MSG/M: -X86-7 :transport	:waiting for client (port 6000)
25.02.2008 17:38:04 U rsh x86g-4 -l goofy /daq/usr/goofy/mbswork/v51/script/remote_exe.sc	/daq/usr/goofy/mbswork/v51/v50/x86/newn
25.02.2008 17:38:04 U [1] 5	
25.02.2008 17:38:04 U XDAQ/X86G-4/MSG/M: -X86G-4 :rirec	:tcp socket connection to RISING data sender node established
25.02.2008 17:38:04 U XDAQ/X86G-4/MSG/M: -X86-7 :rirec	:tcp socket connection to RISING data sender node established
25.02.2008 17:38:05 U XDAQ/X86G-4/MSG/M: -X86G-4 :rirec	:tcp thread: acquisition running
25.02.2008 17:38:05 U XDAQ/X86G-4/MSG/M: -X86-7 :rirec	:tcp thread: acquisition running
25.02.2008 17:38:06 U XDAQ/X86G-4/MSG/M: -X86G-4 :rirec	:main thread: acquisition running
25.02.2008 17:38:06 U XDAQ/X86G-4/MSG/M: -X86-7 :rirec	:main thread: acquisition running
25.02.2008 17:38:37 S /misc/goofy/sniff/dabc/script/dabcstartup.sh	/misc/goofy/sniff/dabc/ /misc/goofy/sniff/dabcappl/config DABC_MBS_Set
25.02.2008 17:38:37 U ssh lxg0517.gsi.de -l goofy /misc/goofy/sniff/dabc/script/dabcstartup.sh	/misc/goofy/sniff/dabc/ /misc/goofy/sniff/dabcappl/config DABC_MBS_Set

Output of DABC and MBS (Text box containing the log output)



Summary and Outlook

DABC is a new „general purpose“ DAQ system

Achieved

- Core infrastructure
- Data flow engine
- XDAQ runtime environment
- Generic Java GUI
- PCI(e) support
- MBS event building
- Programming Interface definitions

Todo

- Controls, GUI c't
- Data formats
- Combiner / time sort
- Programming Interface implementation c't
- Configuration DB
- Packaging and deployment
- Documentation

Network performance tests: see next talk (S.Linev)