TINE Release 4 in Operation

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"Damn the use cases, full speed ahead!"

TINE Background ...

Mature control system

- Lots of attention paid to transfer protocol
 - Asynchronous, synchronous
 - Datagrams, streams
 - Multicast
- Lots of attention paid to central services
 - Archive, Alarm, Logging, Naming, State, Globals
- Recent additions at the hardware layer
 CDI, TICOM, Network Queue
- But: Release 3.31 ready for an overhaul
 - Too many protocol deficiencies requiring workarounds.
 - Keep pace with IT

Multicasting

- Cut back on bandwidth, cpu load on a server
- 2 ways to multicast:
 - Publisher-subscriber
 - Connection table entry reduces to single entry
 - e.g. video frames
 - Producer-consumer
 - No connection table, just send it out!
 - e.g. beam parameters ("globals") ----
- Caution: this is UDP, not TCP! (reliability?)



Parameter	Value
BeamPermTe ₂	Vorhanden
MachineState	Studien
MachineType	LINAC2
ParticleTypeT	Elektronen
MessageText	
BeamPerm	1
MachineState	500
MachineType	1
ParticleType	1
Energy	448.0346
NumParticles.	0.830
NumParticles.	14.811
DeclaredState	Undefined
GunStatus	1
GunStatusTex	Ein
MachineFile	Elektronen-Studien_2008-10-16T13:31
StateReadine	4

Data Types

- All the primitives ...
- Many complex types
 - Doublets (e.g. value-status pair)
 - Triplets (e.g. name-valuestatus)
 - Quadruplets (e.g. bus address)
- User defined "tagged" structures
 - Registered at server and client
 - Can be 'discovered' from the server



Array Types

- Scalar (single value array of length 1)
- Spectrum (trace, e.g. scope trace, bunch profile)
- Multi-channel
 - Atomic collection of property values with same units and settings
 - e.g. vacuum pressures, beam position, psc currents, ...
 - Extremely useful in archiving !
 - Can retrieve a single value or subset
 - Not the same thing as (but similar to) a wild-card call (device = "*")

Query Precedence (relevant to browsing)

- None
 - All registered devices support all properties
 - All properties apply to all devices
- Device-query precedence
 - Each device supports a subset of properties
 - New device selection -> re-acquire property list
- Property-query precedence
 - Each property applies to a different device list
 - New property selection -> re-acquire device list

/LINAC2/Bunche/IMA_BUN[Trace]

🕌 browserInstance		
Options Debug Options		
Device Context LINAC2 Device Server Device L2	Device Subsystem ALL Device Name	Show Stock Propriies
Data Size Data Type 1 FLOAT ▼ 1.INAC2/Bunche (0,0) 2832.6907	Amplitude in mA	Bunchstorn BoardName BoardTemperature BunchParticlesE9 BunchVoltarig BunchVoltage Coupling
		Autoscale



Namespace

- Longer names (64 characters)
 Extended string sets up to 1024 chars
- Case insensitive
- Data Objects
 - Timestamps +
 - System Data Stamp (e.g. cycle number)
 - User Data Stamp (set by the device server)
 - Transfer 'Reason'
 - Data change, heartbeat, event, etc.
- Multicasting
 - Server-specific multicast groups
 - Last 2 bytes of IP address define the group
 - (Actually: host-specific)
 - No longer uses single multicast group for everyone!

Redirection now supports ...

- Context, server, device, and property
- □ Tagged Structures can now contain ...
 - all TINE data types
 - other tagged structures!

Bitfields

- Encode individual bits and fields of bits
- "Tagged" a la tagged structures.

Alarm Messages

- Higher precision timestamps
- Alarm start time
- 64 bytes of alarm data
- Local Histories
 - Non-fragmented `worst-case' history files
 - History access on a separate thread
- Server configuration
 - API or
 - CSV file hierarchy or
 - XML file

Images and Video

- Image data type (coordinated with DOOCS)
- Image header specifies
 - Frame characteristics
 - compression/image type
- Advanced API features
 - SetPacketMTU()
 - SetPropertyBuffer() (restrict double buffering)
 - □ etc.

Globals

🕌 FLASH Globals	
Context Help	
Keyword	Value
ChargeBunch	0.8188937
MessageText	SASE for PG2 Delay Line Study
Energy	502.83932
Wavelength	25.86352
Globals Time	15.10.08 16:51:35.157 CEST

🕌 DESY2 Globals	
Context Help	
Keyword	Value
BeamPermText	Vorhanden
MachineStateText	Ein.NutzerBetrieb
MachineTypeText	DESY2
ParticleTypeText	Positronen
MessageText	
BeamPerm	1
MachineState	101
MachineType	2
ParticleType	2
Energy	5.9988847
NumParticles	3.3482747077941895
DeclaredState	Undefined
MagCurrPermText	Vorhanden
MagCurrPerm	1
BeamForText	Unbestimmt
BeamFor	4
MachineFile	Positronen-Ein.NutzerBetrieb-Teststrah
StateReadiness	4
StateReadinessText	Unbestimmt
Globals Time	15.10.08 16:52:24.803 CEST

🕌 LINAC2 Globals	
Context Help	
Keyword	Value
BeamPermText	Vorhanden
MachineStateText	Ein.D2Betrieb
MachineTypeText	LINAC2
ParticleTypeText	Positronen
MessageText	
BeamPerm	1
MachineState	101
MachineType	1
ParticleType	2
Energy	449.5974
NumParticles.L2	1.1230469942092896
NumParticles.PIA	5.3085126876831055
DeclaredState	Undefined
GunStatus	1
GunStatusText	Ein
MachineFile	Positronen-Ein.D2Betrieb 2008-10
StateReadiness	4
StateReadinessText	Unbestimmt
Globals Time	15.10.08 16:51:15.971 CEST

Special Globals (optional, systematic)

"SYSTIME"

- Scope = SITE
- Used for synchronization
- "CycleNumber"
 - Scope = Context
 - Applies a System Data Stamp to a server's data
 - Can be used as a trigger

Alarm System

16:36:55: Alarms loaded.

7	larm Svs	te	2	m	ן						Property Alarm System		L 2-HE	Value	
		-			-						Device Server		L 2Beam		
											Alarm Device		Mod-1		
A	Alarm Viewer: LINAC2										Device Text		Mod: off		
Fil	e View Options Navigate Help										Alarm Text			Retriebswert⊡cal Lov	/Bit=Local
	e Ten Obrene Handare Helb									-	Severity		8		DIC-LOUGI
1	Fatal	1			Error			Alarni	ing III		Alarm Data Text		Betriebswe	ert (Eile) - Soll (kV)	
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				200000000							Code		940		
	Ned Oct 15 16:36:59 Warning	Sev	erit	y >=	0 Selected/Total Numb	per of Alari	ms:	10/1	0 Active Alarms	С	Format		5		
											Dimension		1		
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	Magnete	U	U	U	Ricker-Septa	0	U	U	Kontrollen				1-		
											Alarm Descriptor	Alarm	Time 🔻	Duratio	n
											Heartbeat	16:30:17.714	- Oct 15	20.0 min	
	Korrekt Mag	0	0	0	Chopper	0	4	0	Front-End		New	16:10:15.714	- Oct 15	0 sec	
	non on ang.	Ŭ.,	Ŭ	× 1	onoppor				Thomas End		Heartbeat Terminated	16:10:15.330	- Oct 15	30.1 min	
				_						-	Heartbeat	16:00:09.330	- Oct 15	20.0 min	
						_		_			New	15:40:08.330	- Oct 15	0 sec	
	Steerer	0	0	1	Timing	0	0	0	Diagnose		Heartbeat Terminated	15:02:14.010	- Oct 15	30.2 min	
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	FIA-FIF	U	U	0	remperaturen	U	U	0	LZ-FIOLOKOII						
										_					
											Alarm Data: Betriebswert	(File) - Soll (kV)		
	L2-HF	0	5	0	PilothWasser	0	0	0	Interlock		-1.0				
											-1.0				
					Malauma	•	~	~							
					Vakuum	U	U	0							
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															0030
A.2	Puetem Device N				Maaaaaa	Alexen Deee			Aleren Times 📼		Duration				
Ste	oystem Device Na Perer ST 48V	anne	_	pe	INTESSAGE SEV	Arann Desc	nptt	UI.	16:37:00 066 - Oct 16	-	3.4 br				
1.2	UE Mod 1			1/101	DiresEllo 9 Hor	arthoat			16:30:17 714 Oct 15	2	20.0 min				
1.2	UE Mod 4					artbeat			18:20:17.714 - Ott 15		20.0 min				
12	IT WOU-4			- Kiyr		anpear			10.30.17.714 - Ott 13		20.0 min				
12	LE Mod 0			- Kiyr		antieat			10.30.17.714 - 00115		20.0 min				
12	TIP Mod 10			K IVI		antibeat			10.30.17.714 - 00115		20.0 min	=			
2	-m- MOU-TU			Kiyi	Head Head Head Head Head	andeat			10.30.17.714 - 00115		20.0 mm				
Ch	opper HV1			Spa	Innung Soll / Istabwei 8 Hea	andeat			16.22.24.000 - OCt 15		0.3 11				
Ch	opper HV1			Stro	m Soll / Istabweichu 8 Hea	antbeat			16:22:24:000 - Oct 15		6.3 Nr				
Ch	opper HV2			Spa	innung Soll / Istabwei 8 Hea	anpeat			16:22:24.000 - Oct 15		6.3 nr				
Ch	opper HV2			Stro	im Soll / Istabweichu 8 Hea	anbeat			16:22:24.000 - Oct 15		6.3 hr				

🕌 Alarm Details: L2-HF: L2Beam/Mod-1

Archive System



Archive Viewer: LINAC2 Motto: Hold the Pickles, Hold the Lettuce.

File Navigate Options Help

Development Tools

Servers Legacy device server wizards C, VB, LabView (databases) Java device server wizard **TUP013** Hardware **WEZ01** CDI TICOM (DESY Magnets, GKSS) Network Queue (PITZ) **Rich Clients** ACOP beans (+ Eclipse, NetBeans) TINE Labview VIs Simple Clients COMA + ACOP beans **TUZ04** jDDD Web2C WEX01 CSS TUP011, TUP009, TUZ03

Standard Device Server Wizard (refitted to TINE Release 4.0)

R TINE Device Server Setup Wizard	
Guidance	
Device Server Information Export Name DoBeqm Local Name BPMEQM Number of Devices 42	Project Directory H:\DoBeqm Date and Othit X (Haringstal Othit)
Property Information	(leave unchecked)
Property Name Orbit.Y Description Vertical Orbit	
Access READ Max Value 10 Min Value -10	
Data Input Data Output Units mm Data Format NULL Single Image: Device List Max Data Size 0 42 Image: Keep History	Remove Add Edit 🔽 VB Project
Output ArrayType : CHANNEL Number Steps : 0	Done CF Add Xew Property with these characteristics ? Device Panel Adding the following Property information : Server C Property selected
History Panel Alarm Watch Panel Calling Device Name #0 Archive Rate (secs) 10	Device 0 Export Name : DoBeqm Device 0 Local Name : BPMEQM Property Name : Orbit.Y Return Data : 42 float values (CHANNEL) Input Data : ope Input Data : ope
Polling Rate (msec) 1000 Severity (high) 10	Property Access : READ Maximum Value : 10
Archive Heartbeat (secs) 18000	Data Units - mm Data Units - mm
Long term Depth (months) 1 Write to FEC_HOME repository?	Keep History: Yes Use Alarm Watch : No
Tolerance 10% Do you want to update the database files under c:\tine\a	database\server\BPMEQM\ ?
<u>Yes</u>	

Java Device Server Wizard ...



LabView Servers (RF Cavities)



New Java Applications ...



TINE and Java ACOP + COMA (for simple clients)

🕌 AcopDialKnob Customizer Array Index Access protocol TINE -Auto synchronization No Frameworks ! Connectio TEST • Device context 🕌 Coma Application [Converter ALL -Device subsystem Value Display • LxSineGen Device server File Edit Help Value Display/Advanced Lightweight! • Value Display/Value Range Policy SineGen0 Device name Visual • Property name Amplitude Load... Show stock properties Save Just start a coma 1000 Access rate 1000 Save As... 800 POLL -Access mode application (e.g. Auto Data size • 600 New Acop Advanced browsing an empty coma 400 New Gauger TINE/TEST/LxSineGen/SineGen0/Amplitude, 200 New Dial Knob application) Sine Curve Amplitude New Number Label Connect 200 New Wheel Switch Close -400 New Slider -600 Browse New Table -800 New Label Control system 1000 494 1495 1996 2998 3499 4000 0 995 2497 at run-time ST/LxSineGen/SineGen1/ ST/LxSineGen/SineGenU/A with TINE/TEST/LxSineGen/SineGen0/Frage 500.00 500.00 TINE/DORIS/DOIDC/Buffer-O/Current Hz 🖶 🕨 🕪 4 -3.47 customizer ... 5.00 101.61 mA 10.00

ACOP Video bean

(the new kid on the block)



Commissioning ...

July 2008: LINAC2

- Mostly new hardware components
 CAN bus replaces SEDAC in many cases
- CDI gets its first real test !
 Windows XP, Linux, ELINOS (+ WindowsCE @ EMBL)
- TINE 3.31.x -> TINE 4.0.x
- Most Client Apps: Windows -> Java
- Many Server Apps: Windows -> Java
- Anyone panicking yet?

Commissioning ...

□ Fortunately ...

- FLASH (DOOCS) already using TINE 4.0.1 (since ~ March).
- On-site help from COSYLAB
 Igor Kriznar, Jaka Bobnar
- But some interesting 'hiccups' ...
 - Concurrency bugs
 was it CDI or TINE? (or the ELINOS Can Driver!)
 - Data swamping (some extreme cases)
 - Alarm viewer dealing with 1000s of alarms
 - Personnel Interlock dealing with 1000s of links
 - Interesting, never-seen-before use-cases
 - e.g. server redirecting to itself

LINAC2 Device Servers ...

rile view 1001s	Lieth								
ALARMSTATE	Fan.State	LTGBU-VXW	RF.Phase.CDI		Front End		0\$		Address
ALMSTATE	Fan.Automatic	LTGDEL-VXW	RF.Modulator.CDI		L2CASFEC	;	UNIX		131.169.119.63
ARCHIVER	GLOBALS	LTGPH-VXW	RF.Attenuator.CDI		Heat Com		Deeneneit		Leasting
AlarmSammler.CDI	GlobalsCollector	Mag.Main	RF.PulseMod.HIST		Host Com	puter	Responsi	ne	Location
Bunche_L2	GlobalsInfo	Mag.Corr	RF.Multiplexer.CDI		acclxl2facil	01.desy.de	P.Duval		Bldg 30 Rm 103
CAS	HISTORY	Mag.Group	RF104-PIA		Device se	rvers	Descriptio	n	
CAS.ARCHIVE	IELMINT_GPU	Mag.Group.Main	RF104-PIA.CDI		CAR		LINAC2 Co	ntral Alarm	Ping
CHOPPER-VXW	Kicker	Mag.Group.Corr	RF125-PIA		CAS		Server	inital Alanni	Control
CHOPRAW-VXW	Kicker.Pulse	Mag.Group.Steer	RF125-PIA.CDI				Server		Control
ChopperHardware	LZALARMSTATE	Mag.Steer	REAlarm	1					
ChopperTiming	L2Beam	PIAZYK-VXW	RFDelay						
Chop.FanAnCo	L2CanCorr	PiCond.Linac2.RP	REGUN	1					
Chop.Par	L2CanMag1	PiCond.Linac2a	RFMachine						
Chop.TimeStore	L2CanMag2	PiConditions	REModulator						
Chop.Power	L2CanSteer	PiControls	RF.PulseCharge						
Chop.PowerState	L2FECSTATS	PiCtrl.Central	RF.PulseRF						
Chop.Push	L2IMon	PiCtrl.Linac2a	RFModulatorMoved						
DDG-VXW	L2RefTiming	PiPrivCommand	RFParticlePositrons						
DDGDEL-VXW	L2STEER.CDI	PiPrivSwitchable	RFPhaseCabinet						
DESYDATA	L2TRCrf	PiaBPM.cdi	RF.PulseMod						
DESYHISTORY	L2TRCrfFopr	PiaBPMs	RFMultiplexer						
EVENTS	L2.MODUL	Pialac	SEQUENCER						
EVENTSTORE	L2Temp	Pialdc	STATE	18					
FECSTATS	L2TempOpr	PiaScope	SchirmMonL2						
Fan	L2Iwegl	PiaTestPuls	StrahlBedarf						
Fan.Hardware	L2IwegI.1.CDI	PiaTrig	Strom.DC-PIA						
Fan.Remote	LINACGLOBALS	PiloL2Auf	TEMSENSORS.CDI	14					
Fan.Veto	LINACSTATE	PiloL2Sta	TRIM_SEDAC_L2						
Fan.Counter	LKRSCOPE	RF.SLED.CDI	TriggerModule_L2		Activity	Contracts	Clients	Alarms	g File Stats
Fan.Originator	LTG-VXW	RF.Various.CDI	ZYKUNT-VXW			o ontraoto	51101110		grillo otato
				18	Server			LZCASFEC	0.05.40
	(Local Time			Inu Oct 16 0	J8:35:43
Ping all Act	ive: 116 of 120 (08:3	3:36)			Start Time	**		vved Oct U1	01:37:08
					bys Poll Ra	ite		000	
A. 			*****	43	INF DKG TASK	S		0	
Device context					LODA NET OT	ai curitracts		37	
LINAC2	-				ISPAN INFIO	ai clients	ooto	13	
					[SRV] LINA(CZICAS contr	acis	30	
Selected Subsyste	ms				[SRV] LINA(CZICAS clien	IS	1	
					[SRV] NY UL	UM packets re	sceived	0101016	
MEX	HIST	RF	SER SER		ISKATUL IC	ле packets re	ceived	U	
		✓ TIM	✓ INFRA						
₩ INJ	✓ DIAG								
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✓ INJ✓ MAG	✓ DIAG✓ PINTLK	✓ TRANS	TEST						
Ľ INJ Ľ MAG	✓ DIAG ✓ PINTLK	✓ TRANS	TEST						
 ✓ INJ ✓ MAG 	✓ DIAG ✓ PINTLK	TRANS NONE	TEST						
✓ INJ✓ MAGOS Color Code	✓ DIAG ✓ PINTLK ALL	TRANS	TEST						



Current Status (October 2008)

- All "known" bugs resolved
 - But there's always that unexpected use-case ...
- □ LINAC2, PIA, DESY2
 - Running stably with new hardware and software
- DORIS
 - Running stably with TINE 4.0.4
 - Still mostly windows and old hardware
- FLASH
 - Running stably with TINE 4.0.3 embedded in DOOCS (+some native TINE servers)
- PITZ
 - TINE 4.0.4 + DOOCS and TINE 4.0.2
- EMBL
 - TINE 4.0.4
- GKSS
 - TINE 4.0.4
- KEK PF Beam lines
 - Mostly STARS
 - Some TINE, now 4.03 (Thank you Nagatani san, who discovered one of those hiccups!)

Interoperability (current status ...)

DOOCS

- TINE embedded; can run DOOCS via TINE
- Epics2Tine
 - Runs as in-process add-on
 - EPICS ioc can run over TINE instead of (or in addition to) CA
- Tango2Tine
 - Currently a gateway
 - Mappings 99% finished
- STARS
 - STARS bridge
 - Bridge to COACK

All available with TINE Release 4.0 !

Immediate TO DO List ...

Archive retrieval

 Selections based on cycle or pulse numbers as well as timestamps

http://tine.desy.de