Channel Access Archiver

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Toolkit Structure
Toolkit Components
I/O Library
ArchiveEngine
ArchiveManager
ArchiveExport / CGIExport
CAManager / CAbgManager
casi
Work in Progress

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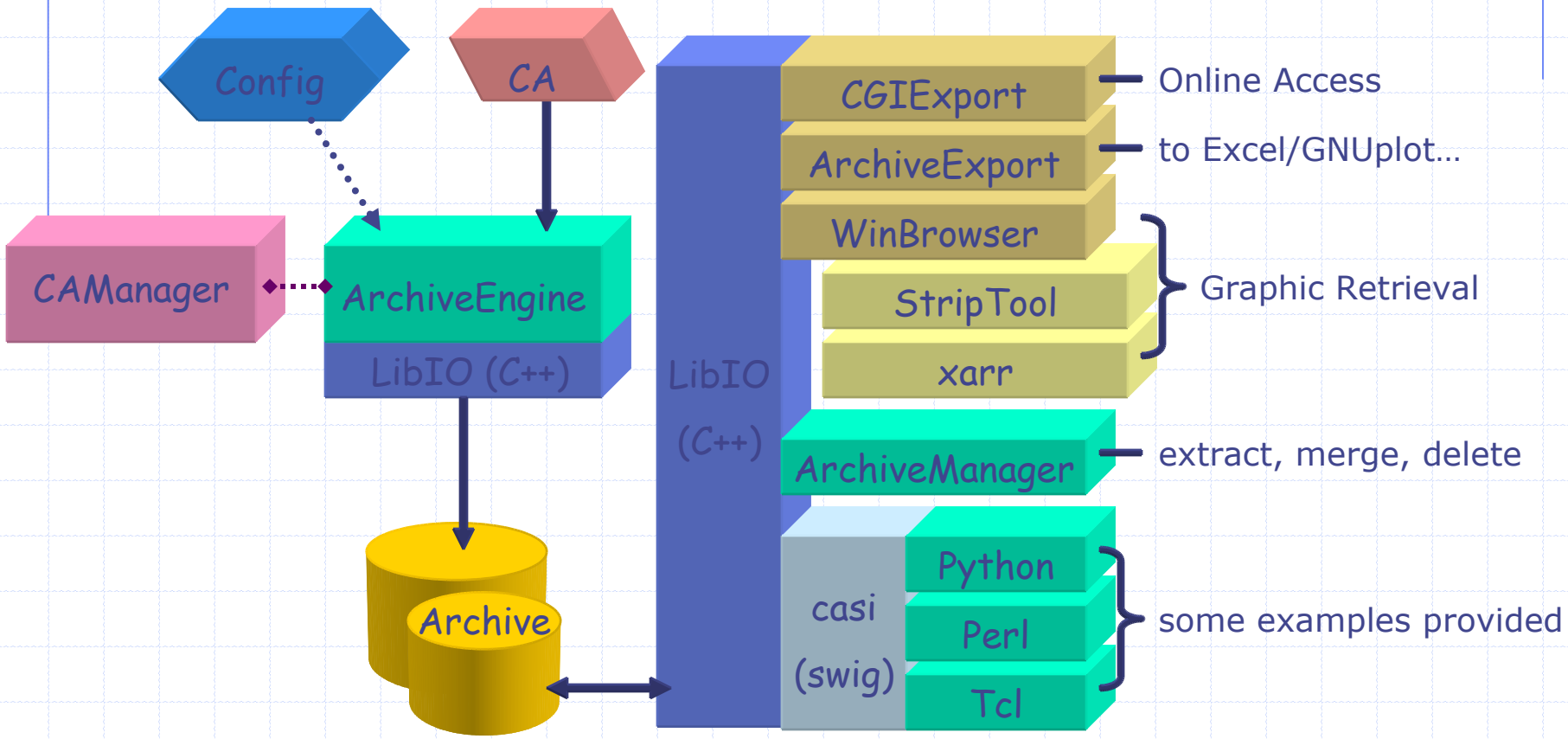
Toolkit Structure



Toolkit Components

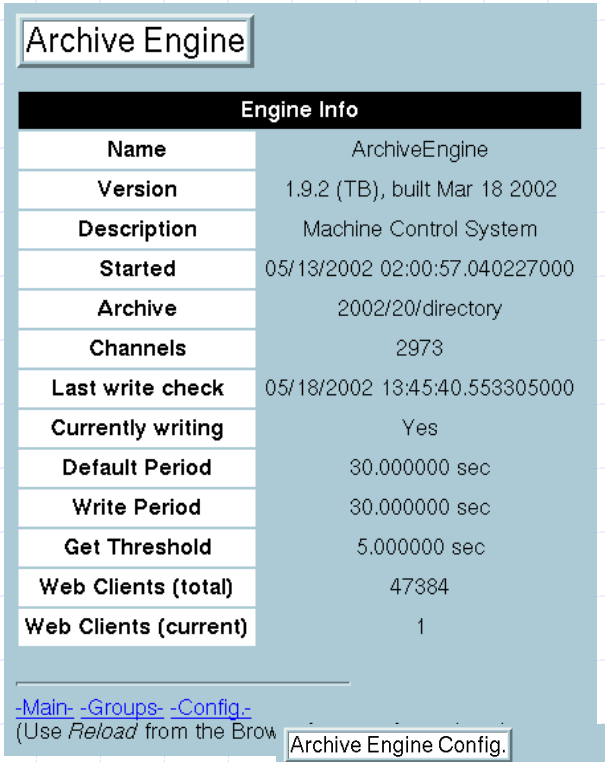
- I/O Library
  read/write from/to archives of any flavor
- ArchiveEngine
  collect data from CA and write these into an archive
- ArchiveManager
  maintain archives
- ArchiveExport, CGIExport
  export data in various formats
- casi
  access the I/O Library from scripting languages
- CAManager
  create/manage archivers and keep them running

I/O Library

- Read/write from/to any archive
- Class library to represent an archive
  - Archive, Channel, Value, ControlInfo, Iterators…
- Basic I/O-functionality
  - No filtering, preprocessing, data-dependant access…
  - Access via channel and point in time
- Store/retrieve data from external storage
  - BinArchive, OracleArchive, SDDSArchive…
- Internal layout currently taylored to BinArchive

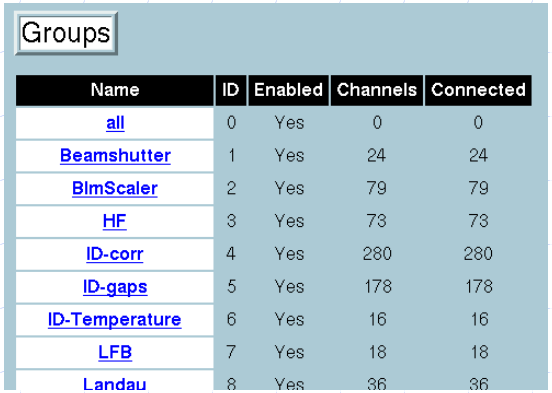
ArchiveEngine

- Collect data via ChannelAccess
  - Frequency based or monitored
  - Writes into archive periodically
  - Archiving of a group may be switched (disabled/enabled) with a PV
- Simple Web-interface to view status and add more channels

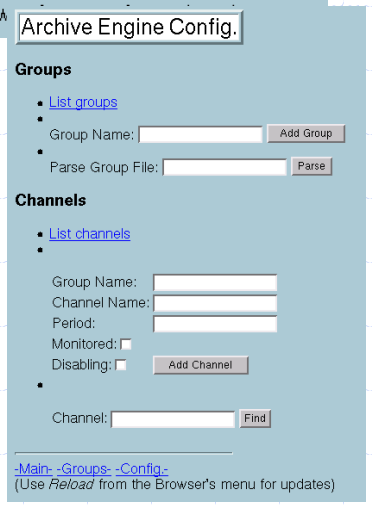

Archive Engine

Engine Info	
Name	ArchiveEngine
Version	1.9.2 (TB), built Mar 18 2002
Description	Machine Control System
Started	05/13/2002 02:00:57.040227000
Archive	2002/20/directory
Channels	2973
Last write check	05/18/2002 13:45:40.553305000
Currently writing	Yes
Default Period	30.000000 sec
Write Period	30.000000 sec
Get Threshold	5.000000 sec
Web Clients (total)	47384
Web Clients (current)	1

-Main- -Groups- -Config.-
(Use *Reload* from the Brow


Groups

Name	ID	Enabled	Channels	Connected
all	0	Yes	0	0
Beamshutter	1	Yes	24	24
BlmScaler	2	Yes	79	79
HF	3	Yes	73	73
ID-corr	4	Yes	280	280
ID-gaps	5	Yes	178	178
ID-Temperature	6	Yes	16	16
LFB	7	Yes	18	18
Landau	8	Yes	36	36


Archive Engine Config.

Groups

- List groups
- Group Name: Add Group
- Parse Group File: Parse

Channels

- List channels
- Group Name:
  Channel Name:
  Period:
  Monitored:
  Disabling: Add Channel
- Channel: Find

-Main- -Groups- -Config.-
(Use *Reload* from the Browser's menu for updates)

ArchiveManager

Low-level management functions

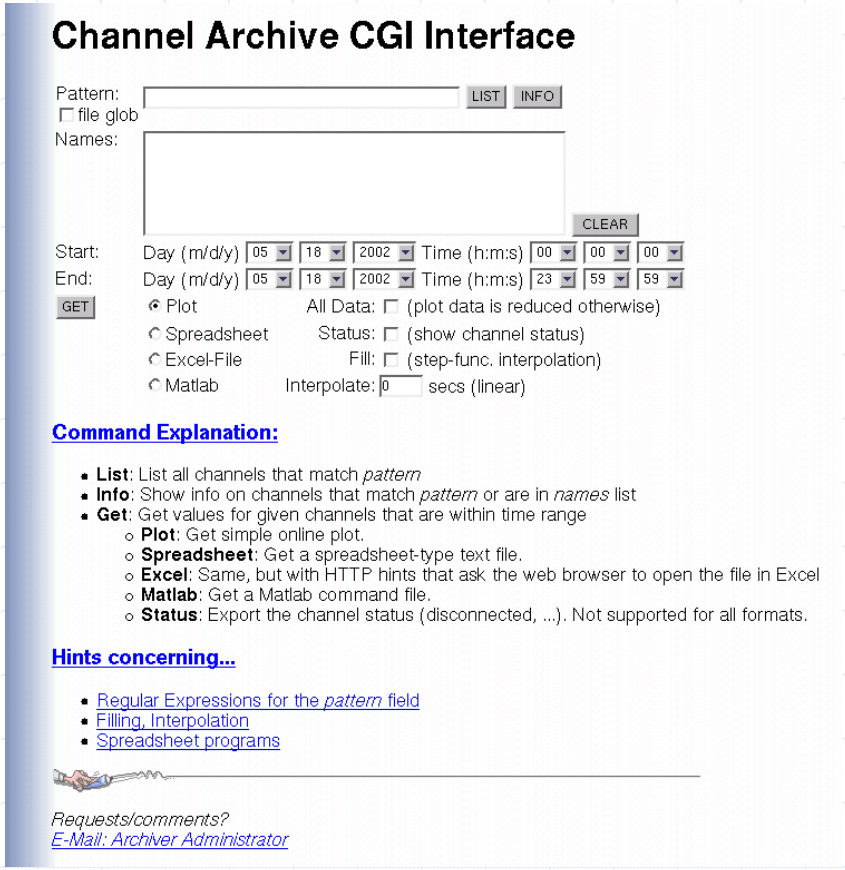
- Show information (# of channels, min/max timestamp...)
- Test integrity
- Dump values for a channel
- Export data into another archive
- Read ASCII-file of data into archive
- Compare archives
- Rename a channel
- Delete a channel

ArchiveExport

- Export data in various target formats
  - GNUplot
  - Excel (CSV)
  - Matlab
- Output is ASCII
- Additional exporters to any format can be added

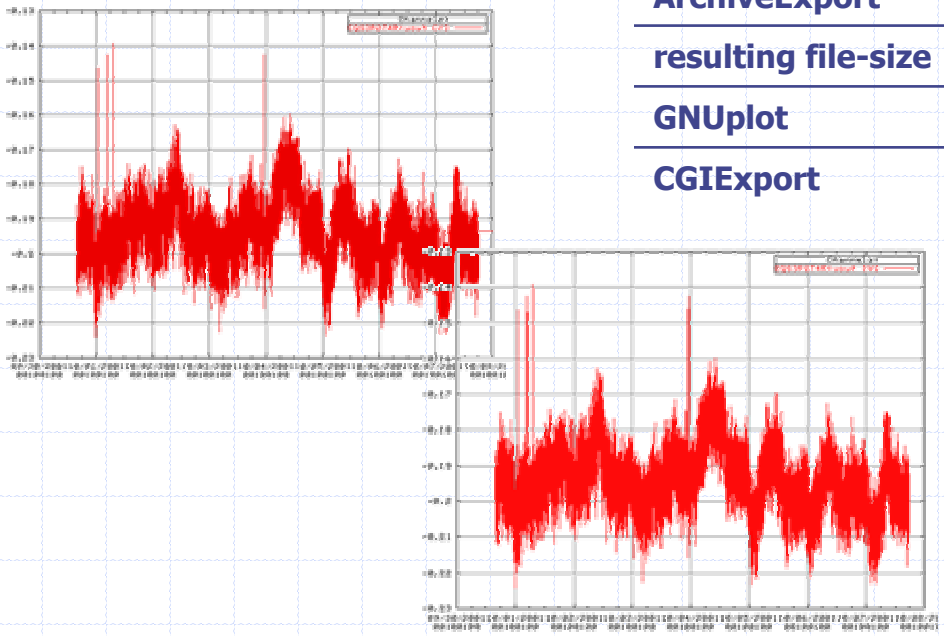
CGIExport

- Same Functionality as ArchiveExport
  - GNUplot
  - Spreadsheet/Excel
  - Matlab
- Gives access to archived data over the web
- No data reduction (except for preview)
- GNUplot output "optimized" but auto-scales y-axis
- Stateless queries
- Temporary files impact performance



CGIExport

- *BucketingValueIterator*
  reduces data on retrieval in a way that at most four values (*first*, *min*, *max* and *last*) per "bucket" (a timeslice) are returned



Example	*w/o*	*w/*
ArchiveExport	**~30s**	**~5s**
resulting file-size	**~20MB**	**~80kB**
GNUplot	**~11s**	**~0.5s**
CGIExport	**~45s**	**~7s**

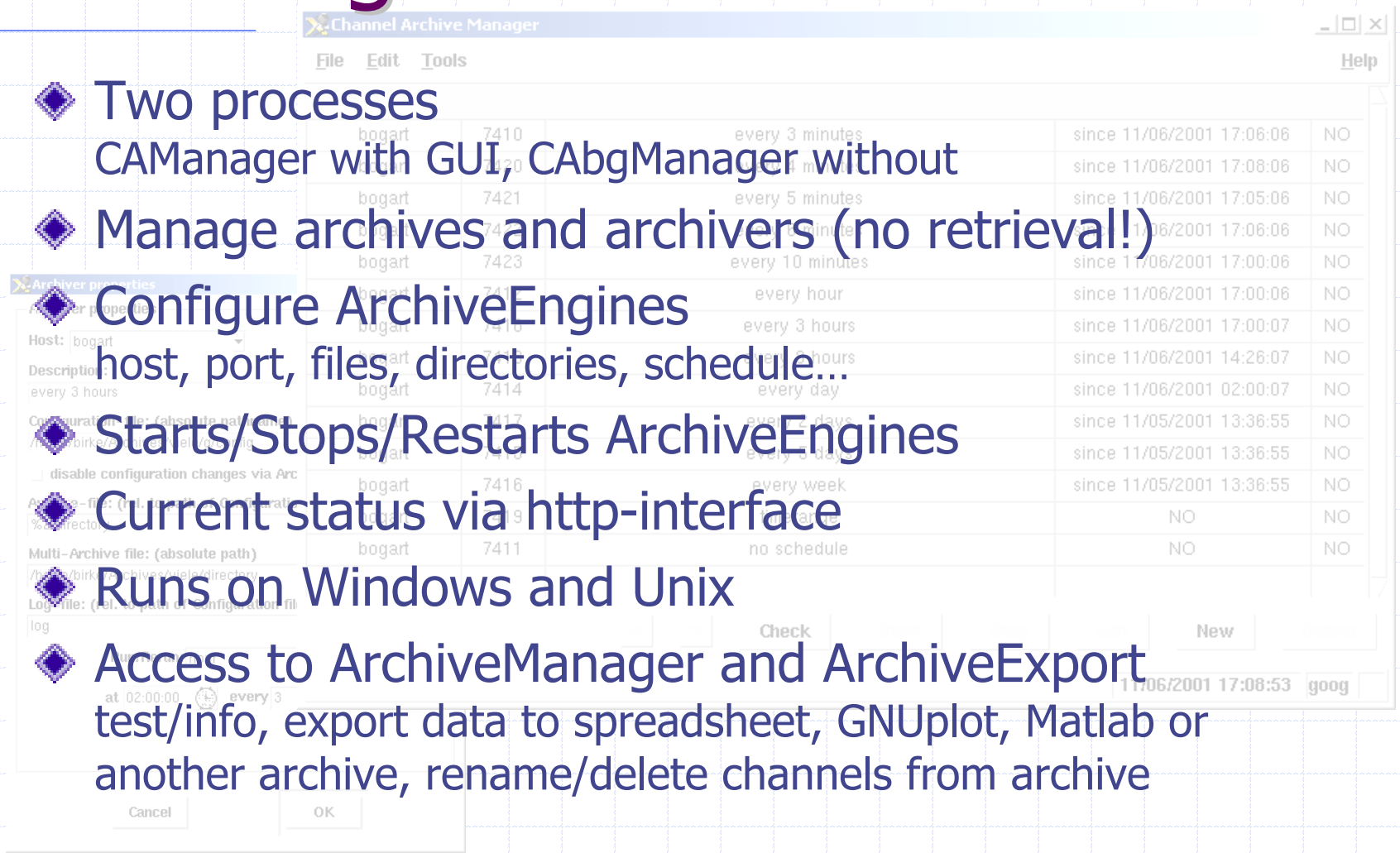
casi - Channel Archiver Scripting Interface

- Interface to Perl, Python, Tcl
- Access to all classes/functions of I-/O library
  - Archive – open, close, getChannel…, addChannel, …
  - Channel – next, prev, getValue…, addValue, …
  - Value – next, prev, [gs]etValue, [gs]etCtrlInfo, …
  - ControlInfo – [gs]et(Status, Severity, …), …
- Read/write data to archives
- Create archives

casi – a Python example

```
 1: # USAGE: xample.py <source archive> <target archive> <pattern> <delta>
 2: # copy channels in archive, but reduce values using simple deadband-algorithm
 3:
 4: import sys
 5: from casi import *
 6:
 7: cmd, source, target, pattern, delta = sys.argv    # get cmdline-args
 8:
 9: s_arc  = archive(); t_arc  = archive()
10: s_chan = channel(); t_chan = channel()
11: s_val  = value();   t_val  = value()
12:
13: s_arc.open(source)                               # read-only access
14: t_arc.write(target, 24)                          # write access, 24 hours per file
15:
16: s_arc.findChannelByPattern(pattern, s_chan)
17: while s_chan.valid():
18:     t_arc.addChannel(s_chan.name(), t_chan)      # create channel in target
19:     t_arc.newValue(DBR_TIME_FLOAT, 1, t_val)     # create value in target
20:     s_chan.getFirstValue(s_val)
21:     firstval = 1
22:     while s_val.valid():
23:         t_val.clone(s_val)                       # copy all info about s_val
24:         if (s_val.isInfo()):                     # info (ARCHIVE_OFF, DISCONNECT...)
25:             t_chan.addValue(t_val)               # copied
26:             firstval = 1
27:         elif ((s_val.ntype() == DBR_TIME_FLOAT) and (s_val.count() == 1)):   # process only floats
28:             if (firstval or (abs(lastval - s_val.get()) >= float(delta))):
29:                 t_chan.addValue(t_val)
30:                 lastval = t_val.get()
31:             firstval = 0
32:         s_val.next()
33:     s_chan.next()
```

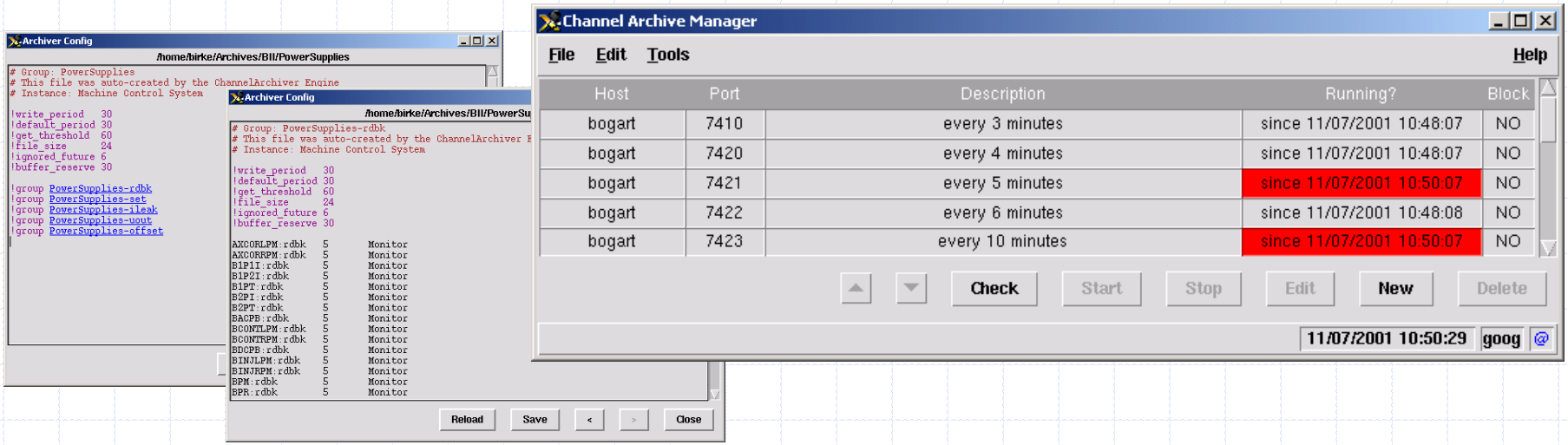
CAManager



- Two processes
  CAManager with GUI, CAbgManager without
- Manage archives and archivers (no retrieval!)
- Configure ArchiveEngines
  host, port, files, directories, schedule...
- Starts/Stops/Restarts ArchiveEngines
- Current status via http-interface
- Runs on Windows and Unix
- Access to ArchiveManager and ArchiveExport
  test/info, export data to spreadsheet, GNUplot, Matlab or another archive, rename/delete channels from archive

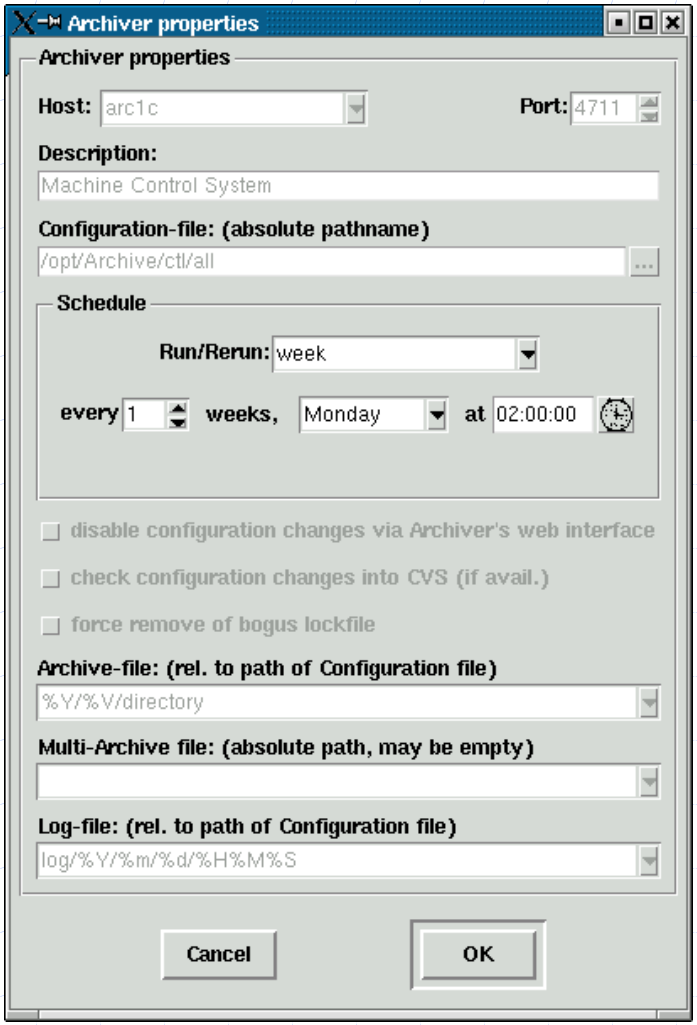
CAManager

- Overview of configured archivers
- Start/stop archivers manually
- Block archivers from being started/stopped
- Access ArchiveManager and ArchiveExport
- Simple configuration file editor



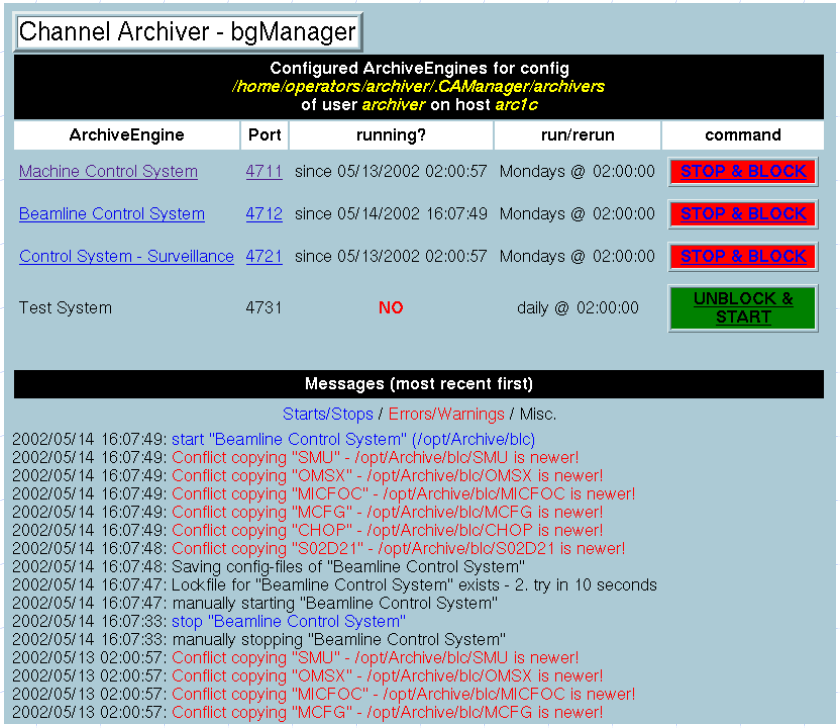
CAManager

- Host, port, description, config-file
- Schedule
  - hour, day, week, month - start at *x*, every *y*
  - from – to, always or no schedule at all
- en-/disable online-config
- Use cvs for config-files
- Archive- and log-file %-substitution
- MultiArchive



CAbgManager

- Background process (no GUI)
- Status via web-interface
- Starts/stops/restarts archivers according to required schedule
- Prepares directories
- Checks online config-changes into CVS and uses new config for next start
- Updates all MultiArchives that are affected



Channel Archiver - bgManager

Configured ArchiveEngines for config
/home/operators/archiver/.CAManager/archivers
of user *archiver* on host *arc1c*

ArchiveEngine	Port	running?	run/rerun	command
Machine Control System	4711	since 05/13/2002 02:00:57	Mondays @ 02:00:00	STOP & BLOCK
Beamline Control System	4712	since 05/14/2002 16:07:49	Mondays @ 02:00:00	STOP & BLOCK
Control System - Surveillance	4721	since 05/13/2002 02:00:57	Mondays @ 02:00:00	STOP & BLOCK
Test System	4731	NO	daily @ 02:00:00	UNBLOCK & START

Messages (most recent first)

Starts/Stops / Errors/Warnings / Misc.

2002/05/14 16:07:49: start "Beamline Control System" (/opt/Archive/blc)
2002/05/14 16:07:49: Conflict copying "SMU" - /opt/Archive/blc/SMU is newer!
2002/05/14 16:07:49: Conflict copying "OMSX" - /opt/Archive/blc/OMSX is newer!
2002/05/14 16:07:49: Conflict copying "MICFOC" - /opt/Archive/blc/MICFOC is newer!
2002/05/14 16:07:49: Conflict copying "MCFG" - /opt/Archive/blc/MCFG is newer!
2002/05/14 16:07:49: Conflict copying "CHOP" - /opt/Archive/blc/CHOP is newer!
2002/05/14 16:07:48: Conflict copying "S02D21" - /opt/Archive/blc/S02D21 is newer!
2002/05/14 16:07:48: Saving config-files of "Beamline Control System"
2002/05/14 16:07:47: Lockfile for "Beamline Control System" exists - 2. try in 10 seconds
2002/05/14 16:07:47: manually starting "Beamline Control System"
2002/05/14 16:07:33: stop "Beamline Control System"
2002/05/14 16:07:33: manually stopping "Beamline Control System"
2002/05/13 02:00:57: Conflict copying "SMU" - /opt/Archive/blc/SMU is newer!
2002/05/13 02:00:57: Conflict copying "OMSX" - /opt/Archive/blc/OMSX is newer!
2002/05/13 02:00:57: Conflict copying "MICFOC" - /opt/Archive/blc/MICFOC is newer!
2002/05/13 02:00:57: Conflict copying "MCFG" - /opt/Archive/blc/MCFG is newer!

Work in Progress
ORACLE – an alternative to BinArchive

Motivation

- Archives hold important data not only covering measurements but also long-term surveillance of a machine
- Keep data in a reasonable resolution online forever
- BESSY e.g: 2 years of data -> ~100GB BinArchive
  - First approach: One big archive
    - Unmaintainable after a few months!
  - Second (and current) approach:
    weekly archives combined with MultiArchive-functionality
    - Better, but…
  - … retrieval (still) requires some patience …
    And retrieval-time scales with time of archived data!!!

Work in Progress
ORACLE – an alternative to BinArchive

- DB-layer almost done by SLAC Bob Hall, Lee-Ann Yasukawa
  I/O-library extensions by BESSY Thomas Birke
  Not yet connected! Planned to run in July 2002.
- Tests/dry-runs are promising
- Inserting up to ~20k values per second
  scales with server size
- Partitioning, Direct-Path inserts,
  indexing "older" partitions
- Archive consumes a lot more diskspace
  estimate is ~4-5 times
- Access time should be fairly constant
  benefits from partitioning and indexing
- Need "real" machine and storage-system
- Should be able to serve multi-TB-online-archives

Work in Progress
Network API – access remote archives

Motivation

- Perform certain data-reduction on server-side
  - Averaging
  - Any other statistical analysis
  - FFT, …
  - Whatever one may ask for (modular, pluggable…)
- Reduce amount of data transferred over the net
- Two approaches
  - DESY – "AAPI" – Albert Kagarmanov et al.
  - Jlab – Corba based? – Chris Larrieu et al.

Conclusion

- An awful lot of work has already been done
  - Kay Kasemir et el. @ LANL
  - SLAC, DESY, BESSY…
- Lots of things still to do
- Trying to create a modular system where Labs may pick/improve/develop features they need and have a core system that works for everyone
- Let's work out some directions…