EPICS Interface to Area Detectors

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Overview

- Goal: Uniform interface for controlling area detectors (CCD, online image plates) from EPICS
  - Any EPICS client (e.g. spec, IDL, scan record) can control (at a bare minimum).
    - Exposure time
    - File name
    - Start collection, wait for completion
  - Much more control for most detectors
- Current status:
  - MAR 165 CCD (complete, in use on Sector 1)
  - Roper CCD detectors (complete, Sector 13 this run)
  - Bruker CCD detectors (in-progress, Sector 13 this run)
    - Will be based on Tim Graber's work
  - MAR 345 online image plate (soon)
    - Will be based on Keith Brister's work

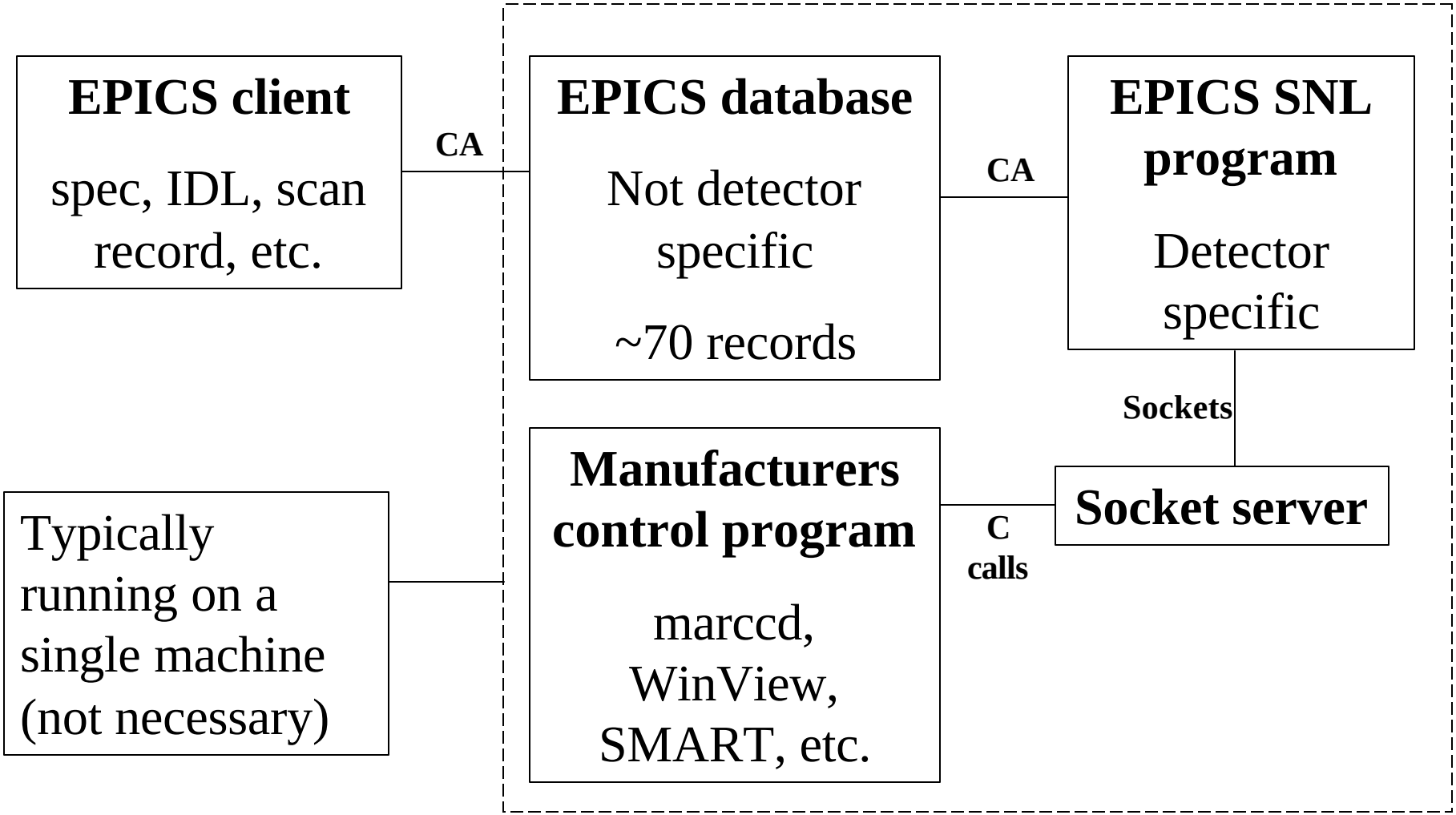
Implementation

- Use manufacturer's software for primary user interface.
  - Minimizes amount of new code
  - Uses existing file formats, unwarping algorithms, etc.
  - These programs include:
    - marccd for MAR165
    - Winview/Winspec for Roper cameras
    - SMART for Bruker cameras (can also use WinView)
    - scan345 for MAR 345 image plate

Implementation

- Control these programs from EPICS
  - Each of these programs has a “remote control” interface, typically using TCP/IP sockets
  - Using EPICS means each client (e.g. spec) does not have to know how to talk to each type of detector. Only has to know how to talk to EPICS.
- EPICS software consists of
  - Database of records (PVs), identical for all detectors
  - State-notation-language (SNL) programs, unique for each detector. Reads/writes PVs and communicates with remote control interface over sockets.
  - The database and SNL programs are typically run on the same machine that the user interface software runs on (e.g. Linux box for MAR detectors, Windows for Roper and Bruker). **No VME crate required.**

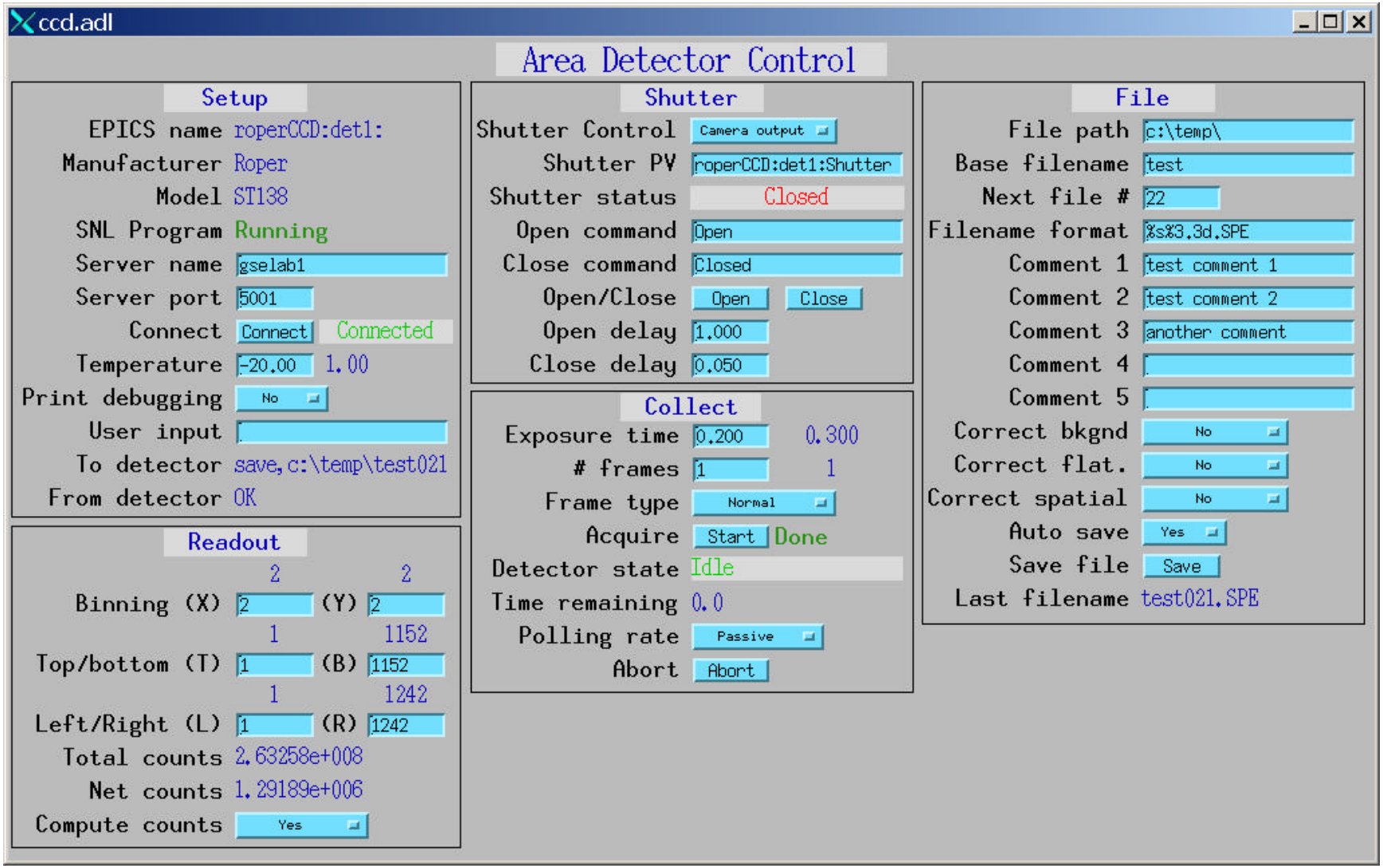
Schematic Architecture



Relationship with Brian Tieman's Package

- Complementary to, and compatible with, Brian's package.
  - My software uses the same PV names as Brian's wherever possible, so EPICS clients that work with his software should work with mine
- Brian's uses the EPICS portable channel access server, rather than running a real EPICS database and SNL program on the server machine
  - Only option when Brian wrote his code, before EPICS 3.14.
- Brian's program calls library (DLL) layer directly, bypasses manufacturers user interface program
  - More flexible
  - More code
  - File format is HDF, not manufacturers format that many data processing applications expect
  - Unwarping is not implemented
- Brian's program is a Windows application, and so only works on Windows detectors (Roper, several others). Not MAR or other Unix detectors.

“Expert” medm screen

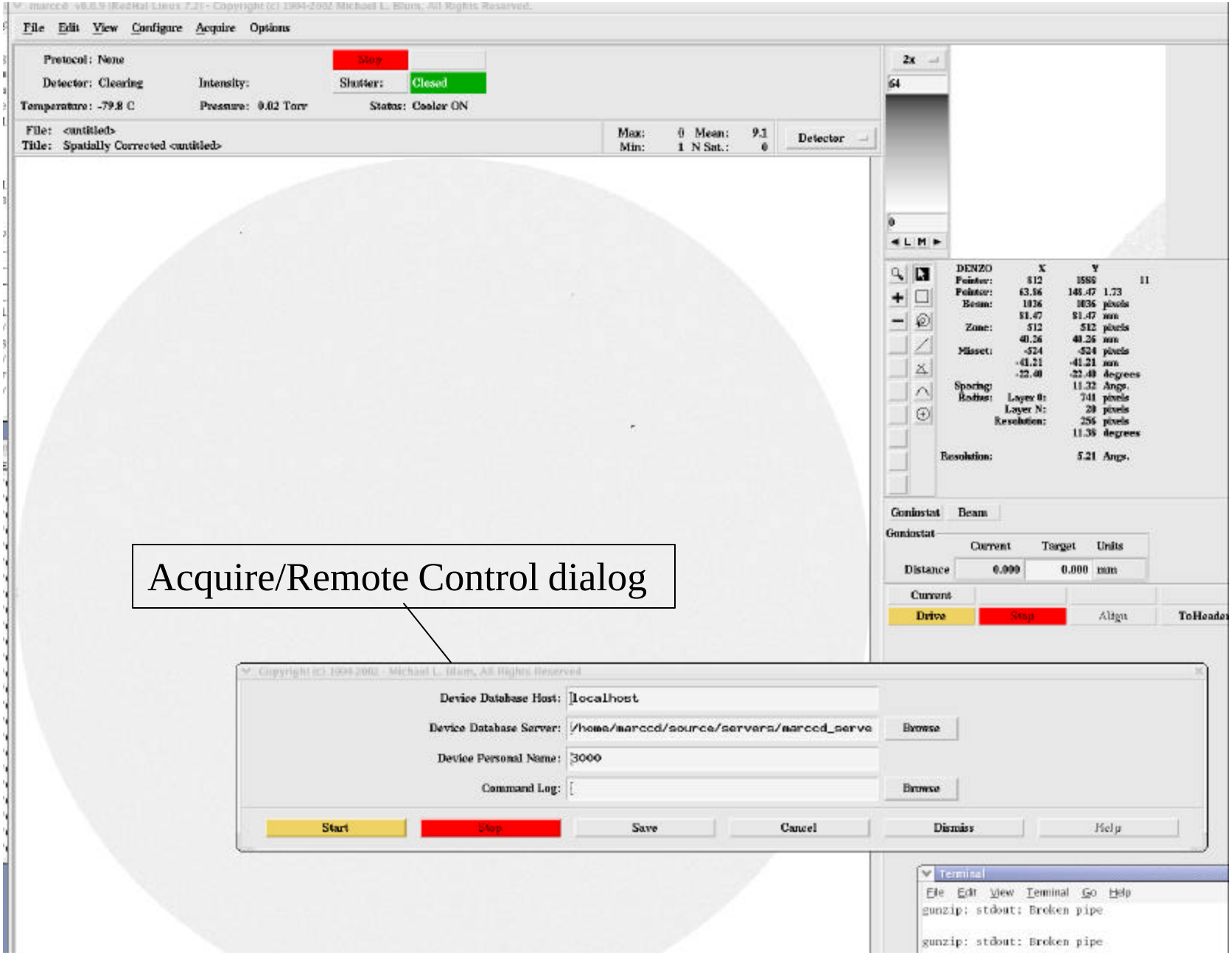


Many fields do not apply to all detectors. Simpler screens (e.g. for MAR 165 only) can easily be made.

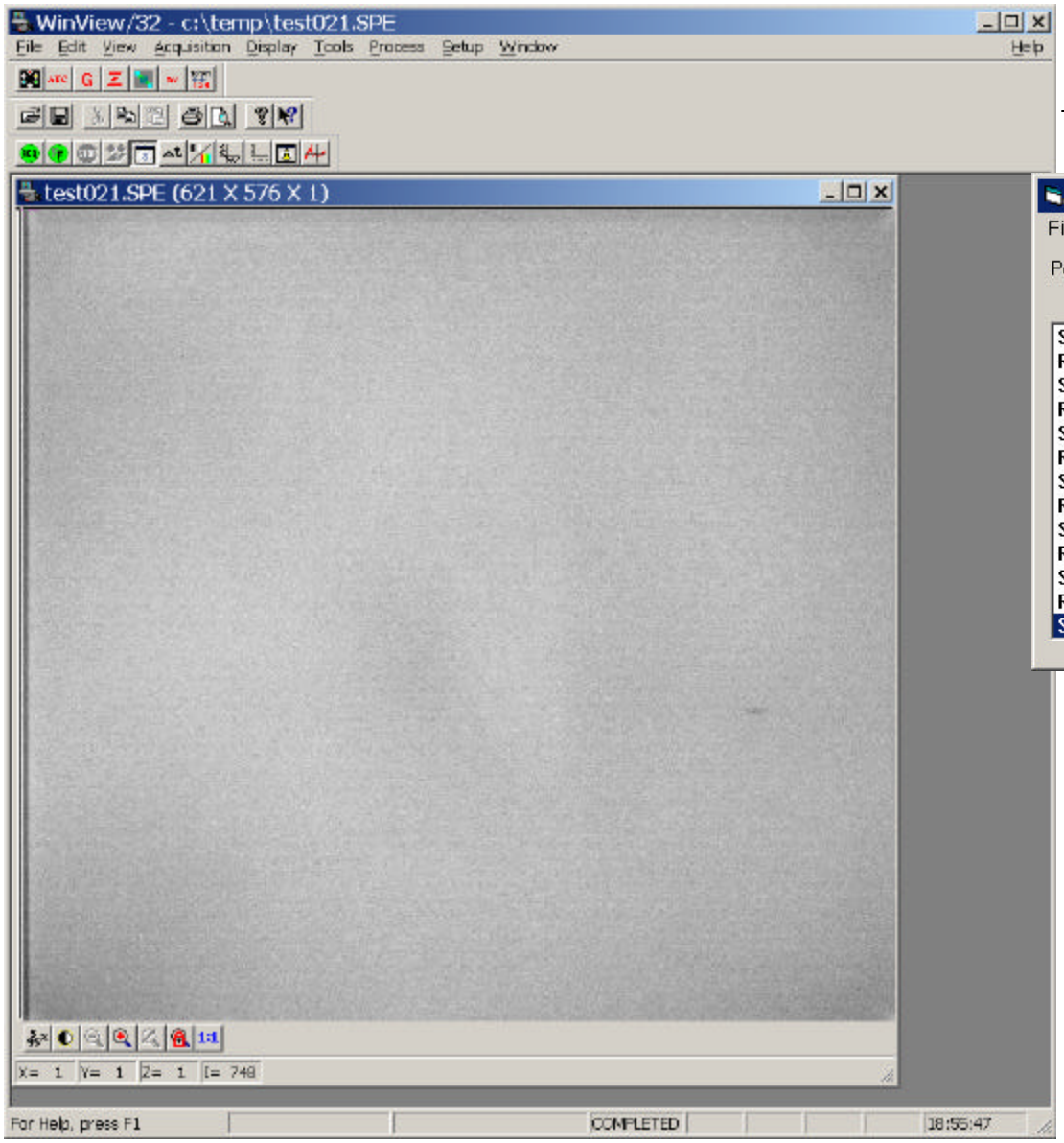
Process variables (PVs)

(P)(C)Abort	(P)(C)AcquireCLBK	(P)(C)AcquirePOLL	(P)(C)ActualBinX
(P)(C)ActualBinY	(P)(C)ActualNumFrames	(P)(C)ActualROIBottom	(P)(C)ActualROILeft
(P)(C)ActualROIRight	(P)(C)ActualROITop	(P)(C)ActualSeconds	(P)(C)ADC
(P)(C)AutoSave	(P)(C)BinX	(P)(C)BinY	(P)(C)BitDepth
(P)(C)CCDManufacturer	(P)(C)CCDModel	(P)(C)CloseShutter	(P)(C)CloseShutterDly
(P)(C)CloseShutterStr	(P)(C)Comment1	(P)(C)Comment2	(P)(C)Comment3
(P)(C)Comment4	(P)(C)Comment5	(P)(C)Compression	(P)(C)ComputeROICts
(P)(C)ConnectState	(P)(C)CorrectBackground	(P)(C)CorrectFlatfield	(P)(C)CorrectSpatial
(P)(C)DebugFlag	(P)(C)DetectorState	(P)(C)DetInStr	(P)(C)DetOutStr
(P)(C)FilenameFormat	(P)(C)FilePath	(P)(C)FileTemplate	(P)(C)FrameType
(P)(C)FullFilename	(P)(C)HDFTemplate	(P)(C)Hours	(P)(C)Initialize
(P)(C)MeasuredTemp	(P)(C)Milliseconds	(P)(C)Minutes	(P)(C)NumExposures
(P)(C)NumFrames	(P)(C)OpenShutter	(P)(C)OpenShutterDly	(P)(C)OpenShutterStr
(P)(C)PollDetState	(P)(C)ROIBottom	(P)(C)ROILeft	(P)(C)ROINet
(P)(C)ROIRight	(P)(C)ROITop	(P)(C)ROITotal	(P)(C)SaveFile
(P)(C)Seconds	(P)(C)SeqNumber	(P)(C)ServerName	(P)(C)ServerPort
(P)(C)SetTemp	(P)(C)Shutter	(P)(C)ShutterMode	(P)(C)ShutterStatus
(P)(C)SNLWatchdog	(P)(C)TimeRemaining	(P)(C)UserInStr	

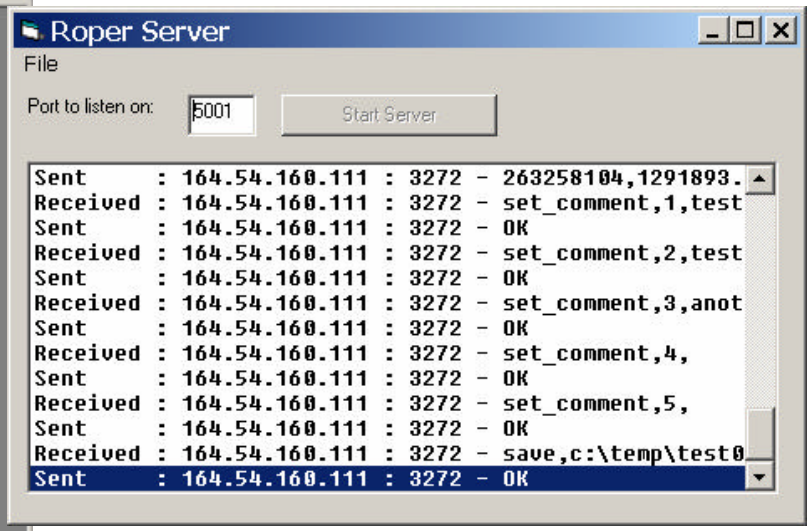
marccd remote control



Roper Interface



WinView (from Roper)



Socket server written in Visual Basic. Simple ASCII commands. Calls COM interface to automate WinView & WinSpec). Not EPICS specific, other applications can talk to it.