

synApps Update

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EPICS Collaboration Meeting

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Argonne National Laboratory

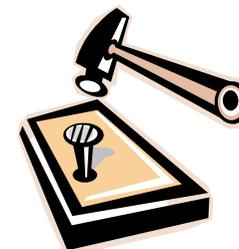


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synApps ?

- **synApps is a distribution of EPICS modules**
- **synApps is designed to provide a compatible collection of software that can be used to run 80% of a beamline**
- **synApps provides generic tools that have proven themselves useful in the development of custom support**
- **synApps consists of software from many people and institutions**



What's in synApps

- Custom EPICS records
- Custom EPICS device-support modules
- Other custom infrastructure (e.g., autosave, recDynLink, saveData)
- Custom EPICS databases, MEDM displays
- Matched to a version of EPICS base
- 540 files
- ~200k lines of source code



Basic record/device support

- **Motor**
- **Scaler**
- **Multichannel analyzer**
- **Multichannel scaler**
- **Serial (RS-232)**
- **GPIB**
- **ADC's**
- **DAC's**
- **Encoders**
- **Optical table**
- **String calc, sequence**
- **Complex expressions**
- **Enhanced PID**
- **Scan**
- **Scan parameter**
- **Generic VME**



Layered devices, techniques

- **Databases, SNL programs, ...**
 - Optical tables
 - Slits
 - Mirrors
 - Monochromators
 - Piezo controller
 - Digital Multimeter
 - Current preamplifier
 - Interpolation
 - N-step measurement
 - Serial I/O block
 - GPIB I/O block
 - Autocollimator
 - Temperature controller
 - X-ray microscope
 - Insertion device
 - Filter/shutter



Other support

- **Autosave (save parameters through reboot)**
- **saveData (store scan data to disk)**
- **Clients to display scan/MCA data**
- **Programs to handle MDA, NeXus data files**
- **recDynLink (adds notify-when-done link)**
 - used by sscan, swait records



What's not in synApps

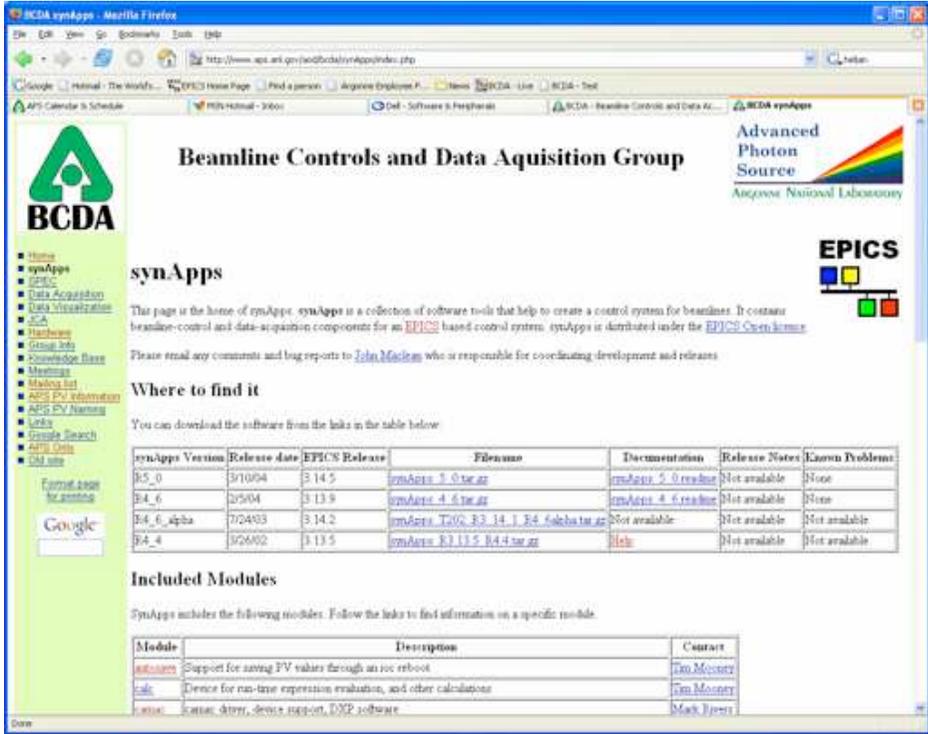
- **To build you will also need* ...**
 - EPICS base R3.14.6 Base, of course
 - allenBradley2-1 If you intend to connect with Allen Bradley PLC's
 - ipac2-7a Required for IndustryPack support
 - Asyn4-0 Required by mca, dac128V, ip, ip330, motor, quadEM
 - seq2-0-8 For SNL programs in synApps
 - vxStats1-7-2a vxWorks statistics
 - genSub1-6 The genSub record

* Required for synApps 5.1



What's new

- Latest versions (5.x) work with base 3.14.x
- Increased modularisation
 - Previously 10 modules
 - Now 18 modules
- New web page
- Released under the EPICS open license
- MPF replaced with asyn



The screenshot shows the website for the Beamline Controls and Data Acquisition Group (BCDA) at the Advanced Photon Source, Argonne National Laboratory. The page is titled "synApps" and provides information about the software tools used for beamline control and data acquisition. It includes a navigation menu on the left, a main content area with a description of synApps, and a table of software versions.

synApps Version	Release date	EPICS Release	Filename	Documentation	Release Notes	Known Problems
B5_0	3/10/04	3.14.5	synApps_5_0.tar.gz	synApps_5_0.readme	Not available	None
B4_6	2/5/04	3.13.9	synApps_4_6.tar.gz	synApps_4_6.readme	Not available	None
B4_6_alpha	7/24/03	3.14.2	synApps_TAO_3.3_14.1_B4_6alpha.tar.gz	Not available	Not available	Not available
B4_4	10/6/02	3.13.5	synApps_3.3.13.5_B4.4.tar.gz	None	Not available	Not available

Included Modules

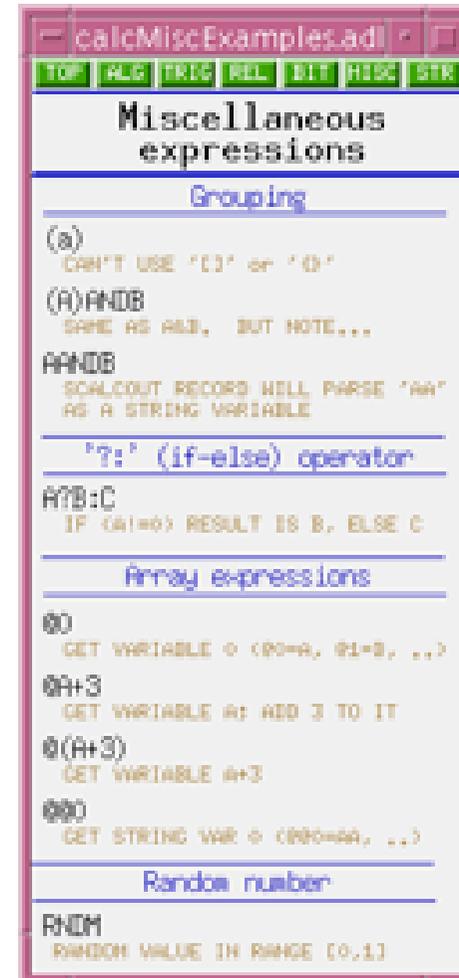
SynApps includes the following modules. Follow the links to find information on a specific module.

Module	Description	Contact
asynusr	Support for saving PV values through an IOC reboot	Jim Mooney
calc	Device for run-time expression evaluation, and other calculations	Jim Mooney
camac	Camac driver, device support, DSP software	Mark Jervis



And...

- **Documentation**
 - Some now exists!!!
 - Every module has documentation
- **MEDM screens**
 - Improved
 - Extensive help screens now available



The screenshot shows a window titled 'calcMiscExamples.ad' with a menu bar containing 'TOP', 'ALG', 'TRIG', 'REL', 'BIT', 'MISC', and 'STR'. The main content is titled 'Miscellaneous expressions' and is organized into sections with blue underlines:

- Grouping**
 - (a) CAN'T USE '(' or ')'
 - (A)ANDB SAME AS AND, BUT NOTE...
 - ANDB SCALCOUT RECORD WILL PARSE 'AA' AS A STRING VARIABLE
 - '?:' (if-else) operator
 - A?B:C IF (A!=0) RESULT IS B, ELSE C
- Array expressions**
 - @ GET VARIABLE @ (@0=A, @1=B, ...)
 - @A+3 GET VARIABLE A: ADD 3 TO IT
 - @(A+3) GET VARIABLE A+3
 - @@ GET STRING VAR @ (@@=AA, ...)
- Random number**
 - RNDM RANDOM VALUE IN RANGE [0,1]



Modules

Module	Description	Contact
autosave	Support for saving PV values through an ioc reboot	Tim Mooney
calc	Device for run-time expression evaluation, and other calculations	Tim Mooney
camac	camac driver, device support, DXP software	Mark Rivers
ccd	CCD control	Mark Rivers
dac128V	Industry Pack digital to analog converter	Mark Rivers
dxc	DXP digital-signal processing spectroscopy systems	Mark Rivers
ip	Device support and databases for some serial Industry Pack devices	Tim Mooney
ip330	Industry Pack analog to digital converter	Mark Rivers
ipUnidig	Industry Pack digital I/O	Mark Rivers
love	Love serial digital controllers	Tim Mooney
mca	Multi-channel analyzer support	Mark Rivers
motor	Motor support	Ron Sluiter
optics	Support for x-ray optics	Tim Mooney
quadEM	APS Quad electrometer support	Mark Rivers
sscan	Support for moving positioners, triggering detectors, acquiring and storing data	Tim Mooney
std	Miscellaneous support	Tim Mooney
vme	Device support and databases for some VME devices	Tim Mooney
xxx	Sample user application, which builds, loads, and runs software from all the other modules listed here.	Tim Mooney

Array Support

- **Base 3.14 allows larger array sizes via CA**
- **MCA arrays**
 - Were limited to ≤ 4000 points
 - Now unlimited
- **Scan data arrays**
 - Were limited to ≤ 2000 points
 - Now unlimited (65k points tested)



Scan Support

- **Scan double buffering now works**
 - New scan can start before previous scan has completed uploading
- **Any detector can now be an array detector**
 - Scaler and array detectors can be mixed
- **Array triggering**



Auto Save

- **Much more robust**
 - Previously it trusted NFS files server
 - Now it assumes server can misbehave
- **Can now save arrays**
 - Changing array sizes is ok
- **Sequenced save**
 - A series of backup save files
- **Autosave status PVs are available**



Strings and Things

- **StringCalc can have device support**
 - Output device type and address changeable at run time
- **Optical table**
 - Previously one point of rotation
 - User can now select between several
- **Serial O/I replaced by Device Command/Reply**
 - Allows build – send – receive – parse sequences
- **Interpolation support**
 - Routines for gensub record
 - Linear and polynomial interpolation
 - 3k point limitation removed
 - Now uses un-copyrighted code



More Motors

- Support for many motor drivers added
 - PMAC
 - Piezo
 - Soft motor
 - e.t.c.

The screenshot displays a motor control software interface with the following sections:

- Drive Parameters:** Includes fields for Hi limit (91.00000), User (91.00000), Dial (100.00000), Readback (0.00000), MoveAbs (0.00000), Lo limit (-109.00000), MoveRel (0.00000), and Tweak (1.000).
- Dynamics:** Features tabs for Normal and Backlash, with fields for Maximum (0.00000), Speed (1.00000), Base Speed (0.10000), Accel. (0.20000), Backlash distance (0.00000), and Move Fraction (1.00000).
- Calibration:** Includes Cal (Use, Set), Off (-9.00000), and Dir (Pos, Neg) options.
- Resolution:** Contains fields for Motor resolution (0.00025), Encoder res. (0.00025), Readback res. (0.00000), Retry deadband (0.00013), Retries (0), Use Encoder (No/Yes), Use Readback (No/Yes), Readback Delay (s) (0.00000), REV inlink, and Mode (supervisory).
- Status:** Displays State (0x0), CurrDir (1), Moving (0), At Home (0), MotorPos (36000), Encoder (0), MIP (0x0), Err (0.00000), Version (4.32), VME Card# (0), Precision (5), and Torque (Disable/Enable).

At the bottom, there are buttons for Scan, Left, Right, Home, and a numeric display for Pos and L.Tick.



ccd module

- **Support for area detectors (CCD's and image plates)**
- **Supported devices**
 - MAR 165 CCD
 - MAR 345 image-plate reader
 - Roper (all WinView-supported CCD's, including former Princeton and most former Photometrics devices)
 - Bruker SMART CCD
- **Can control, at minimum**
 - exposure time
 - file name
 - data-acquisition start
 - wait for acquisition to complete
 - much more for most devices



dxp module

- **record, device support, databases, and MEDM displays for XIA DXP and Saturn spectroscopy systems**
- **dxp record for setting DXP parameters**
- **device support for the mca record**



ip330 module

- **device support, databases, and MEDM displays for the IP330 ADC IndustryPack module**
- **16/32 channel, 16-bit ADC**
 - ip330Scan for periodic, averaged reads of ADC channels
 - ip330Sweep, with the MCA record, for using ip330 as a waveform-digitizer
 - ip330PID for using the ip330 in a fast-feedback loop



Clients, Libraries and Visualization Tools

- **IDL:**
 - *scanSee*
 - *dataCatcher*
 - *mca display*
 - *ezcaIDL*
 - *ezcaScan*
 - *HDF translator/browser*
 - *Ascii-format plotter*
 - *ez_fit*
 - *etc.*
- **Some python support**
- **Most IDL tools now available for the IDL Virtual Machine – No license fee to run IDL tools**



Summary

- **Taking advantage of changes in base to give better array support**
- **Taking advantage of asyn to simplify device support and st.cmd files**
- **Improving documentation**
- **Improving ease of build and os independence**
- **Improving distribution**
- **Improving maintainability**
- **Released under EPICS open license**
- **Web page**
 - <http://www.aps.anl.gov/aod/bcda/synApps/>

