

pmac

A model III driver for trajectory scanning on
Delta Tau PMAC systems

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Motivation

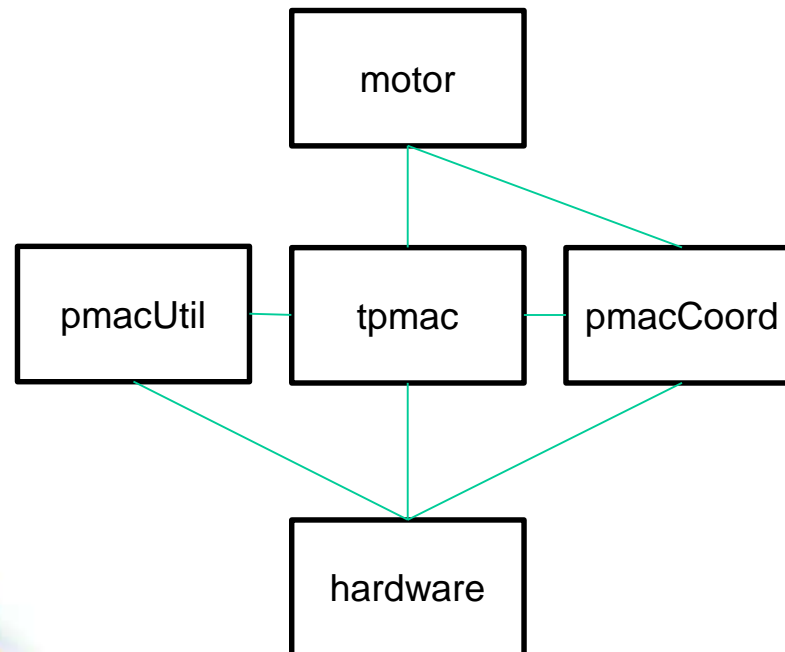
Need more, more complex, faster trajectory scans

Requirements on driver support:

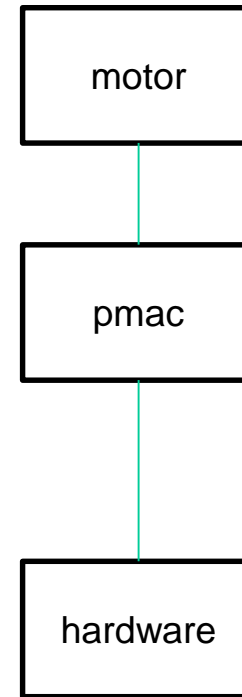
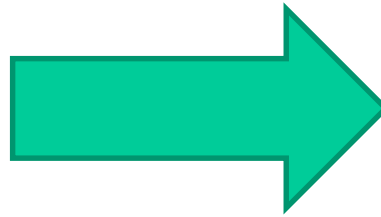
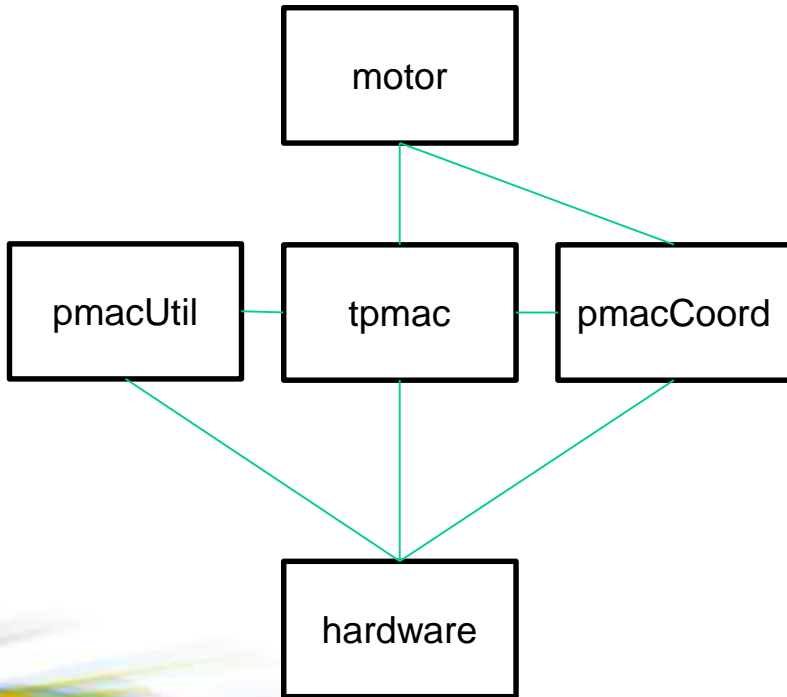
- Arbitrary trajectories
- Low deadtime
- Run-time CS configuration
- Facilitates troubleshooting

Motivation – tpmac driver

- Existing model 2 driver
- Widely used at Diamond
- PVT moves, CS configuration not supported
- Handling of comms not ideal



pmac

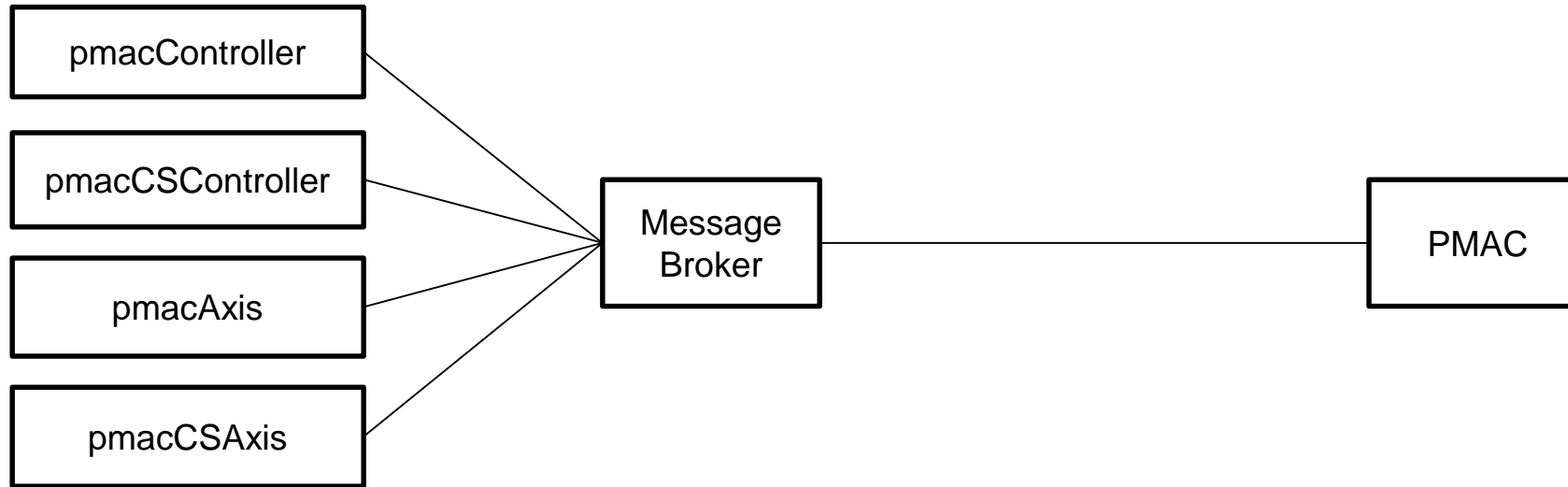


Replacement for tpmac, pmacCoord and pmacUtil.

pmac - features

- Message broker
- Run-time CS configuration
- PVT trajectory scanning

Message broker



3 polling levels for variables:

- Slow (0.1Hz)
- Medium (1Hz)
- Fast (1Hz stationary, 10Hz in motion, configurable)

Coordinate System Configuration

/dls_sw/prod/R3.14.12.3/support/pmac/2-0-beta7/data/pmacTrajectory.edl

Version Information

Driver Version: 1.1 Program Version: 1.1

Coordinate System Selection

BRICK14_CS BRICK14_CS1

Trajectory Scan Profile Build

Maximum Number of Points in Scan: 10

Build Profile Status: Success State: Done

Profile built

Trajectory Scan Append Points

Append Points Status: Success State: Done

Trajectory Scan Profile Execution

Execute Profile Status: Abort State: Done

Trajectory scan aborted

PMAC Trajectory Scan Status		EPICS Driver Status	
Buffer A Address (hex)	0x30050	Driver Buffer A Index	1
Buffer B Address (hex)	0x32760	Driver Buffer B Index	0
Buffer length (points)	1000	Total Points In Scan	1
PMAC Current Buffer	A	Trajectory Scan Time (s)	0.04
PMAC Current Index	1	Current Scan CS	1
PMAC Points Scanned	1	% Of Scan Complete	100.00
PMAC Status Reported	Finished	Coordinate System Status	Good

Trajectory Scan Percent Complete

0 20 40 60 80 100

Abort

Motor Coordinate System Assignments

Motor	CS No	CS Port Name	CS Assignment
Motor 1	1	None <input type="checkbox"/> BRICK14_CS1	U
Motor 2	1	None <input type="checkbox"/> BRICK14_CS1	V
Motor 3	0	None <input type="checkbox"/>	
Motor 4	0	None <input type="checkbox"/>	
Motor 5	0	None <input type="checkbox"/>	
Motor 6	0	None <input type="checkbox"/>	
Motor 7	EP-14:M7	STEP-14:M7:C	<BL14I-MO- STEP-14:M7:C
Motor 8	EP-14:M8	STEP-14:M8:C	<BL14I-MO- STEP-14:M8:C

Select Group

PMAC Trajectory Scan Axis Setup

Axis	Use Axis	No Of Pts	Max Pts	Resolution		Offset	
Axis A	No <input type="checkbox"/>	0	100000	1.000	1.000	0.000	0.000
Axis B	No <input type="checkbox"/>	0	100000	1.000	1.000	0.000	0.000
Axis C	No <input type="checkbox"/>	0	100000	1.000	1.000	0.000	0.000
Axis U	No <input type="checkbox"/>	60	100000	-0.000	-0.000	12.037	12.037
Axis V	No <input type="checkbox"/>	60	100000	0.000	0.000	3.550	3.550
Axis W	No <input type="checkbox"/>	0	100000	1.000	1.000	0.000	0.000
Axis X	No <input type="checkbox"/>	0	100000	1.000	1.000	0.000	0.000
Axis Y	No <input type="checkbox"/>	0	100000	1.000	1.000	0.000	0.000
Axis Z	No <input type="checkbox"/>	0	100000	1.000	1.000	0.000	0.000

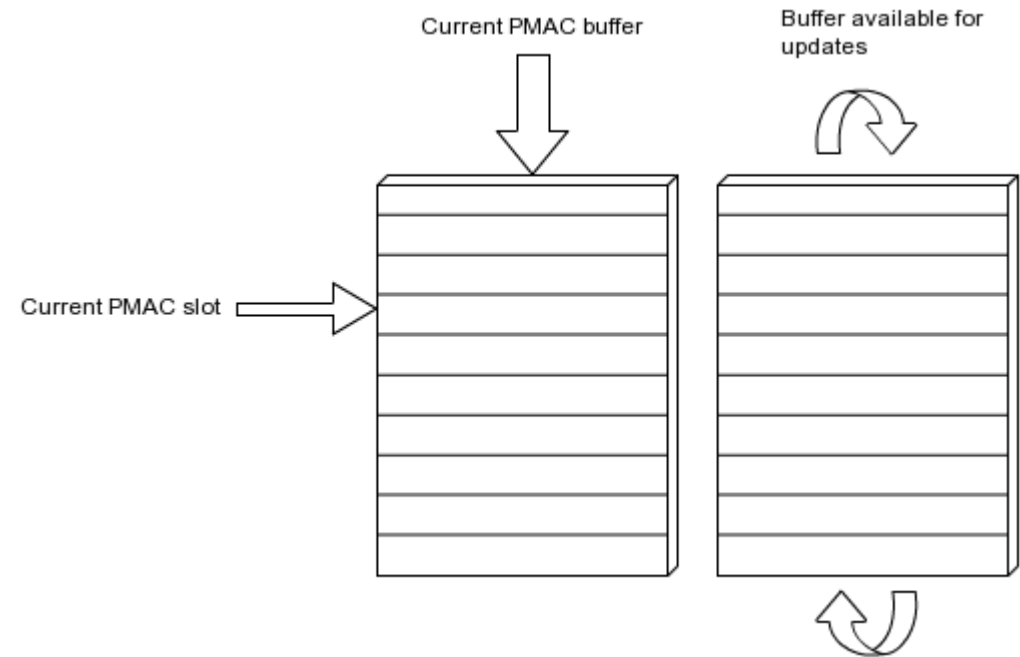
Number of points to build/append to scan: 1



Trajectory Scanning – PVT moves

(P)osition (V)elocity (T)ime

- Motion program trajectory_scan.pmc acts as interface to PVT moves.
- Computes velocities and commands PVT moves.
- Uses double buffering architecture.



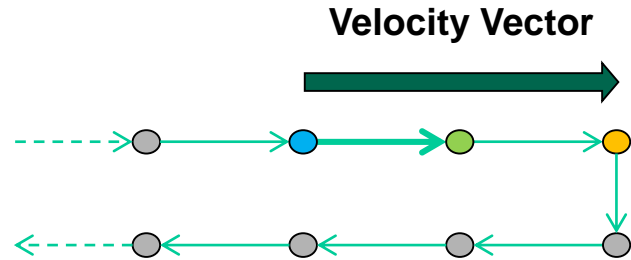
Trajectory scanning – PMAC motion program

To specify a trajectory, populate the following PVs:

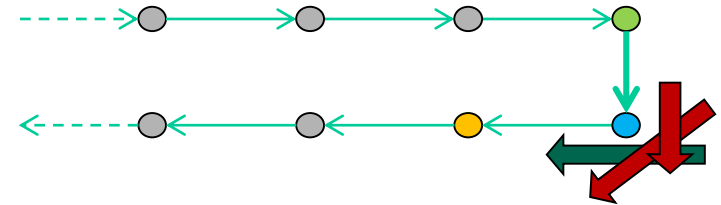
- Array of (T)ime segments: `ProfileTimeArray`
- Array of (P)ositions for each axis: `A:Positions ... Z:Positions`
- Array of (V)elocity calculation modes: `VelocityMode`
- (Optionally) user modes for each point: `UserArray`

Trajectory Scan – Velocity modes

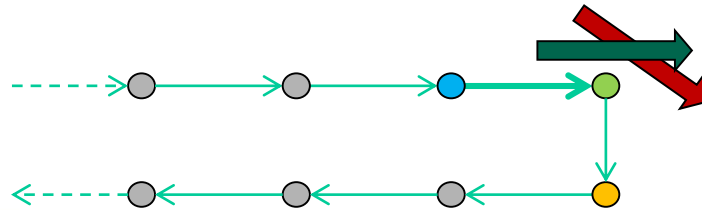
Previous-next



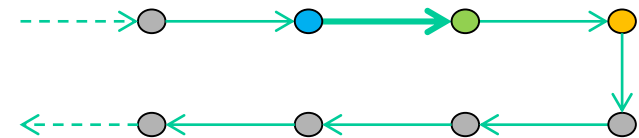
Current-next



Previous-current



Zero



Status

- In use on Diamond beamlines I08, I14, I15, I16, I18
- Rolling out for all new hardware triggered scans
- Diamond maintainer: Giles Knap
- Release 2-0 available:
 - <https://github.com/dls-controls/pmac>
- Migration guide from tpmac:
 - <https://github.com/dls-controls/pmac/blob/master/docs/source/migration.rst>