



## News about EPICS 7 with RTEMS

EPICS Collaboration Meeting Sep. 2022



- since RTEMS Release 5.1 it is also supported in EPICS 7 (in addition to RTEMS 4.9/10)
- with RTEMS 5.1 the existing libcom-posix implementations are used if possible (RTEMS must be created with '--enable-posix')
- Use of the 'LEGACY\_STACK'. (--enable-networks)



- NTP

- The NTP client support was not brought across to RTEMS-posix in EPICS 7.
- NTP in RTEMS 4.10 and EPICS 3.\* used code in EPICS and the legacy stack to work.
- EPICS is silent about this so some users ( me included :-() may not know it is missing.

Chris Johns (RTEMS Developer):

“I have a change to EPICS 7 to return it however it breaks LibBSD builds because it depends on code in the legacy stack. It also enables the NTP functionality all the time (as it was in EPICS 3). I think the EPICS core developers will need to consider this issue once raised and guide RTEMS on the preferred solution.”

- I fixed the issue for RTEMS 5 with LEGACY\_STACK (PR at 09/21/22):

```
tIocSh> generalTimeReport
```

```
Backwards time errors prevented 0 times.
```

```
Current Time Providers:
```

```
"NTP", priority = 100
```

```
Current Time not available
```

```
"OS Clock", priority = 999
```

```
Current Time is 2022-09-21 22:27:18.317206.
```

```
Event Time Providers:
```

```
No Providers registered.
```

- RTEMS 5.2
  - Planning to release before the end of the year.
  - RSB will be updated to support deployment using external RSB configuration scripts.

See:

<https://git.rtems.org/chrisj/rtems-rsb-deployment.git/tree/README.md>.



- RTEMS 6

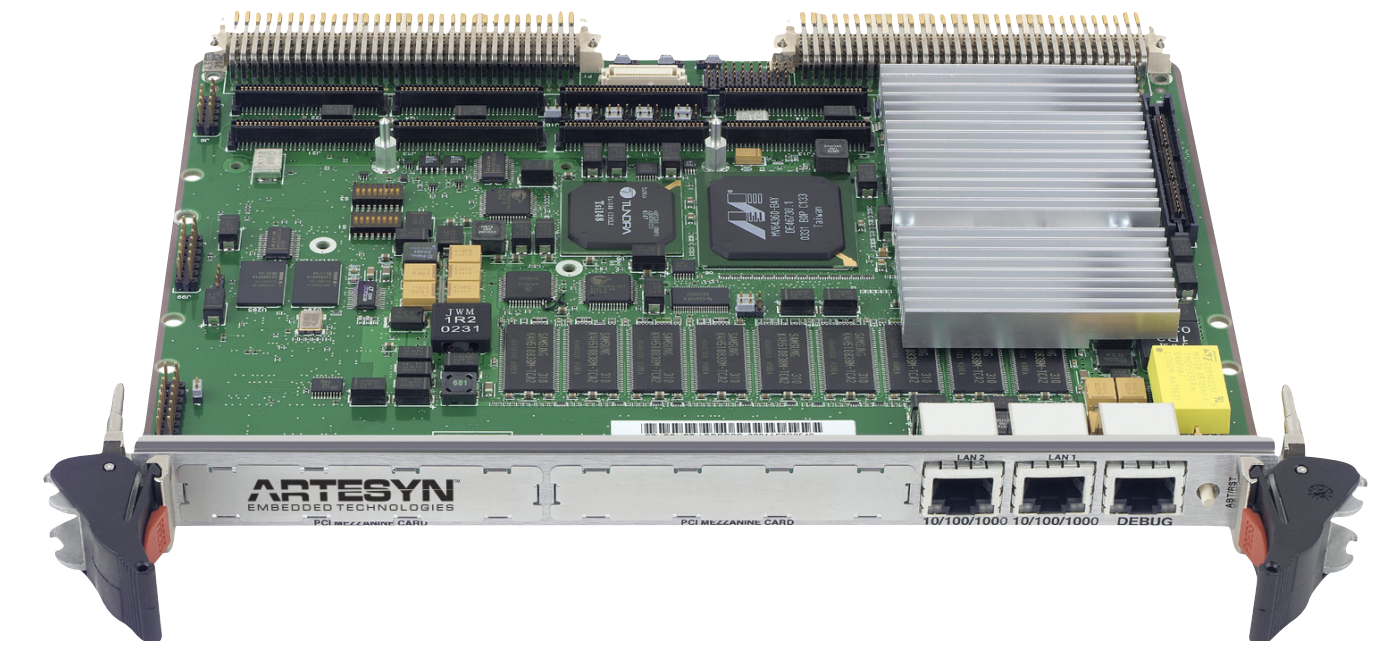
- Uses the waf build system. This changes how BSPs are built.
- The legacy networking stack has been removed from `rtems.git` and moved to `rtems-net-legacy.git`. Users will need to build the legacy or libbsd networking option they wish to use.
- RSB supports deployment. Users who deploy RTEMS using the RSB can simply update their build set configurations to RTEMS 6 and the BSPs should build. The legacy stack is missing from the RSB packages and needs to be added.
- SMP is fully functional. The recent ESA project has improved the quality of RTEMS 6 with formal proof and extended testing such as the addition of the verification tests.

“RTEMS uses FreeBSD as the source of its TCP/IP and USB stacks. This is a developers guide which captures information on the process of merging code from FreeBSD, building this library, RTEMS specific support files, and general guidelines on what modifications to the FreeBSD source are permitted.

Goals of this effort are:

- \* Update TCP/IP and provide USB in RTEMS
- \* Ease updating to future FreeBSD versions
- \* Ease tracking changes in FreeBSD code
- \* Minimize manual changes in FreeBSD code
- \* Define stable kernel/device driver API which is implemented by both RTEMS and FreeBSD. This is the foundation of the port.

We will work to push our changes upstream to the FreeBSD Project and minimize changes required at each update point. “



## CPU MVME6100 (beatnik)

- Unfortunately, no Nexus network driver was available for this CPU.
- At the EPICS codeathon last year (March 2021) Till Straumann created the Nexus driver for the MVME6100.
- Included in RTEMS-libbsd branch 6-freebsd-12 since March 2022.



- We were able to switch to RTEMS6 and use the new RTEMS-libbsd (6-freebsd-12) to :
  - use dhcpcd
  - use telnetd/ftpd etc.
  - ! use NFSv4 !
- Epics 7 support with these extensions, well tested on PPC (arm is working as well, xilinx\_zynq\_a9\_qemu in GA - tests)

- The change from the legacy networking stack to libbsd has exposed some issues:
  - NTP support
  - rpc-calls
- *Note from Chris Jones:*  
EPICS's integration to the legacy stack was closer than we understood and RTEMS has moved on partly because we did not know or understand how EPICS used some interfaces and some pieces of code in the legacy stack.

- NTP-Support (Chris Johns, funded by Gemini)
- PCI/VME Support for MVME2500 (Sebastian Huber, funded by FHI,  
at the moment time is lacking here)
- Are there any other show stoppers?  
-> Please mail to [junkes@fhi.mpg.de](mailto:junkes@fhi.mpg.de)