

Subject: RT IPT Change in Configurable RT Kernel Detailed Requirements from Oct IPT presentation

To: RT TWG and RT IPT attendees

1. At the 27 Oct 98 IPT meeting, Dr Callison presented the Configurable RT Kernel detailed requirements which included the Configurable RT operating system (OS), Selectable RT Kernel Services, and a RTOS layer. On-going discussions have occurred among the Service Representatives about these detailed requirements.
2. On 23 Nov 98, the same Oct IPT presentation was given to DISA/CDR Wheeler and INRI/Dr Lawrence. An issue regarding the RTOS layer was raised; work has been done to resolve that issue. The compromise position is to remove the RTOS layer, and levy POSIX API requirement for RTOS, Selectable RT Kernel Services and RT COE segments. The details were submitted to TWG attendees with a request that they provide comments for possible revision by **8 Jan 99**. Two TWG members responded and the document has been updated. The last sentence of paragraph 1. and the second paragraph of paragraph 3. have changed
3. As RT TWG chair, I am requesting a straw vote. Please indicate your approval or disapproval via email by 29 Jan 99. A formal TWG vote will be taken at the Feb 99 TWG meeting. At that time, the document will be signed by the Service representatives. This signed document will be the foundation to proceed with RT DII COE effort on an avenue that is technically feasible and promotes an open standards-base approach.

Thank you for your assistance.

John Maurer  
The MITRE Corporation  
RT TWG Chair

This memo documents agreements reached as a result of the RT DII COE video telecon conducted on Monday, 7 December 1998.

**1. Removing RTOS Interface Layer; substituting POSIX API requirement:**

The RTOS Interface Layer will be removed from pictures and text describing the DII COE Configurable Real-time (RT) kernel. However, it is agreed that the DII COE Configurable RT Kernel shall be required to furnish POSIX APIs as standardized methods through which DII COE RT Segments shall access all services provided by the operating system.

**2. Making use of POSIX APIs a conformance issue:**

Since use of the POSIX APIs improves the portability of DII COE RT Segments, we recommend that use of POSIX APIs for operating system services<sup>1</sup> be a criterion for levels of DII COE compliance for DII COE RT segments above Level 5.<sup>2</sup>

**3. Using an RTOS that does not have all of the POSIX.1 capabilities; RT "provides stickers" for well-defined subsets:**

It is neither necessary nor practical for every RTOS of the DII COE to provide every POSIX.1 capability. Each DII COE RTOS will be given one or more 'provides stickers' describing the POSIX.13<sup>3</sup> (IEEE Std 1003.13-1998) profiles and POSIX.13 units of functionality that the RTOS supports. Alternately, a RTOS can claim to support POSIX.1 (IEEE Std 1003.1-1996 or later). The "provides sticker" for an RTOS describes the capability that the RTOS can provide. The form of a "provides sticker" is something like "certified to profile 51 plus the following additional units of functionality (not part of profile 51)".

The DII COE Configurable RT Kernel is neither required nor expected to extend an RTOS to support POSIX units of functionality for which the RTOS has no inherent capability. For example, there is no intention to extend VxWorks with a multi-process capability or with support for multiple users. If a DII COE Configurable RT Kernel for VxWorks were built, VxWorks would probably be certified for POSIX.13 profiles 51 and 52 plus some additional units of functionality. It would not be certified for profiles 53 or 54, since both of these profiles require that multiple processes be supported.

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<sup>1</sup> Except in those areas in which POSIX provides no standard. It is in the nature of POSIX, which by design only codifies existing practice, that POSIX standards will never be quite complete. It is also true that embedded realtime systems typically require a few system-specific interfaces "too uncommon" to be covered by any broadly based standard.

<sup>2</sup> The DII COE currently recognizes strict use of POSIX APIs as a criterion for Level 7 compliance. The IPT should consider conformance to threads and RT extensions APIs as a Level 6 compliance issue, even if full conformance is deferred to Level 7. The IPT should make a specific recommendation to the TWG regarding compliance criteria as soon as possible.

<sup>3</sup> The TWG acknowledges the efforts of the OSJTF, Navy OSSWG and DISA Center of Standards for their work on POSIX.13.

RT “needs stickers” will also be given to DII COE RT segments. The “needs sticker” for a segment describes the capabilities that the segment requires of the RTOS. These “needs stickers” identify required OS capabilities in terms of POSIX.13 profiles and units of functionality. These dependencies on POSIX functionality shall be captured in new segment information descriptors defined for DII COE RT Segments. The RT “needs stickers” are a shorthand that summarizes this dependency information.

**1. 4. Using POSIX Units of Functionality as the basis for RTOS configuration:**

The integrator of a DII COE RT system must ensure that the operating system configured for the weapon system satisfies the requirements of the DII COE RT Segments and services that will run on that operating system. The “provides & needs stickers” will aid the integrator in determining which segments are compatible with which RTOSs and with specific RTOS configurations.

DII COE RT tools for kernel configuration will use POSIX units of functionality as the basic building blocks for describing RTOS configuration. These tools shall analyze the RT “needs stickers” for the DII COE RT Segments and Selectable RT Kernel Services a system requires and determine the minimum set of POSIX units of functionality that must be part of its RTOS configuration.

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**2. 5. Providing a path for inclusion of RTOSs that are not POSIX compliant:**

The RTOS, with possible support from a third party, shall supply POSIX APIs to the RTOS functionality. Nothing in the process for certifying a DII COE Configurable RT Kernel shall require that the POSIX APIs be provided directly by the RTOS vendor. It shall be acceptable for the POSIX APIs to be implemented in a third-party software product that binds to the RTOS.

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**2. 6. Miscellaneous additional items:**

- We understand that DISA is not obligated to port Selectable RT Kernel Services to the POSIX APIs when it builds the reference implementation on LynxOS. We recommend, however, that the services be ported to approved standard and /or most current draft [<http://www.pasc.org/standing/sd11.html#statustable>] POSIX APIs rather than Lynx proprietary APIs.
- We have cited the POSIX.1 interface, including threads and RT extensions, as a portability standard for DII COE RT segments. We understand that the POSIX standard does not address some OS capabilities that will be needed.<sup>1</sup> Establishing a standard in areas in which POSIX is silent remains as an issue for the RT TWG to address. In the long term, we recommend that the TWG

work with the POSIX Standards Forum to see that satisfactory solutions become part of the standard.

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3. Agreements acknowledged by Service and Agency Representatives:

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5. US Air Force: John Maurer /s/ \_\_\_\_\_ Original Signed Date: 25 Feb 1999

6.

7. US Army: George Van Kirk /s/ \_\_\_\_\_ Date: \_\_\_\_\_

8.

9. Philip Johnson (alt)/s/ \_\_\_\_\_ Date: \_\_\_\_\_

10.

11. US Navy: Dr. Tiffany Frazier /s/ \_\_\_\_\_ Original Signed Date: 25 Feb 1999

12.

13. DoDIIS: Mike Grieco /s/ \_\_\_\_\_ Original Signed Date: 25 Feb 1999

Note: Army position remains "in coordination" (10 Feb 2000)