



Evolution of Real-time Standards in NCITS TC R1, Real-time Computing Systems

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Status Report to the Real-time and Embedded Systems Forum
The Open Group
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Chair, NCITS TC R1,
Real-time Computing Systems



Projects Approved and Underway

- **R1, Real-time Reference Model**
 - **NCITS Project: 1372 - DT (Technical Report)**
 - **Title:** Real-Time Generic Open Architecture (RT-GOA)
- **R1.1, Real-Time Device Drivers**
 - **NCITS Project: 1373 - D (Standard)**
 - **Title:** Real-Time Device Driver Portability
- **R1.2, Real-Time Testing**
 - **NCITS Project: 1374 - DT (Technical Report)**
 - **Title:** Real-Time Application Portability Testing
 - **NCITS Project: 1376 - D (Standard)**
 - **Title:** Real-Time Test Suite Structures



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R1 and Uniform Driver Interfaces (UDIs)

- **Uniform Driver Interface (UDI)** is family of specifications intended to
 - **Make I/O device drivers and protocol modules portable between computer platforms and operating systems.**
- **The InterNational Committee for Information Technology Standards (INCITS)** is an ANSI SDO, and has a technical committee, R1:
 - **Whose purpose is to provide advice and additional documentation, including standards, which will improve the value UDI for real-time and embedded uses.**
 - **Which has:**
 - **Identified a number of issues relating to real-time and embedded UDI drivers and protocol modules.**
 - **Recently developed its first draft of an ANSI standard to specify implementations of I/O drivers, protocol modules, and UDI environments (OSs) for soft and hard real-time systems.**



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Need for Real-time Device Drivers and Protocol Modules & Relationship to UDI

- Portable protocols and device drivers that support determinism and other real-time issues would make:
 - COTS protocols and device drivers
 - Custom-built protocols and device drivers

... easier to build with lower life-cycle costs.
- However, it requires a stable, uniform device interface (UDI) as a foundation
 - Project UDI has the best generalized candidate
 - No other solutions are visible right now



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Scope

- The scope of real-time and its relationship to UDI includes applications
 - With custom security considerations and
 - Where performance requirements must be predictable (deterministic) particularly those that:
 - “Require” rapid response to an input
 - Are safety critical
 - Require a high degree of fault tolerance
 - Ensure quality of service
- The R1 standard is intended to provide a foundation for real-time implementations within this scope



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R1 Draft Standard

- For its first standard (represented in Draft 1), R1 decided to address following elements from the issues it developed and reported on previously
 - Thread priority and scheduling
 - Resource allocation
 - Conformance documentation
- Issues assigned to future work (Appendix E) include:
 - Mappings of POSIX APIs to UDI
 - SNMP Device Driver
 - Network Protocol Device Driver
 - Distributed Time
 - Certification and Testing for Real-time



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Directions from This Meeting in Anaheim, CA

- Improve normative elements to support real-time portability
- Refine the definitional elements of what it means to be a soft or hard real-time UDI implementation
 - I/O driver
 - Protocol module
 - UDI environment
- ... Could the same thing be done for a real-time O/S?
- Need to develop a method of referencing the non-normative UDI specifications or crank up fast tracking.
- Pros and cons of pursuing international standardization will be developed



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Progression of the Standard

- **Draft 1**

- Distributed with meeting announcement outside INCITS exploder list to SMEs* who have shown interest
- CDs created, distributed, and available to interested SMEs
- Updates, based on 21 Jan 2001 meeting (D1.1), were added to the CD to reflect decisions, direction, and improvement

- **Draft 2**

- R1 members and non-members are encouraged to participate in weekly telephone conferences

- **Targets:**

- | | |
|---------------------|---|
| • 31 March 2002 | R1 approves for INCITS 30-day Letter Ballot |
| • 05 April 2002 | Ballot successful; start 60-day public review |
| • 30 June 2002 | R1 meets to address public review** |
| • 31 July 2002 | INCITS Conformance Review |
| • 15 August 2002 | INCITS Management Review |
| • 13 September 2002 | INCITS Final Approval |
| • 18 September 2001 | ANSI initiates 2-week default ballot |



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*SME = Subject Matter Expert

** Any revision requires 2nd public review cycle



Who Should Be Involved

- Operating System (OS) developers and vendors
- I/O developers and vendors
- Protocol developers and vendors
- Middleware developers and vendors
- System developers and vendors
- End users



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Join the cause!

- **Would your company be interested in advancing this vision?**
 - **OS Vendors:**
 - Does this make it easier to adapt your OS to next year's hot protocols?
 - **Independent Hardware Vendors:**
 - Does this make it cheaper to acquire adapter cards and drivers?
 - **Protocol Vendors:**
 - Would portability help you expand your markets?
 - **Middleware Vendors:**
 - Would portable real-time protocols help you expand your markets?
 - **Systems Developers and End Users:**
 - Would this enhanced interoperability and portability reduce your costs?
- **Your help would be appreciated.**
 - Join NCITS R1 and pitch in
 - Participate in selected meetings; we are an open forum
 - Call us or email and contribute to the dialog and product



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Operating System (OS) Developers and Vendors

- **The standard will enable them:**
 - **Concentrate their resources on developing operating systems that provide improved real-time portability**
 - **Dedicate resources to adding real-time features and to improving reliability and performance, etc.**
 - **Expand their market base**
 - **Currently operating system vendors invest considerable resources developing and maintaining I/O drivers.**
 - **This expenditure is necessary to survive, but is not critical to producing a successful operating system.**





Input/Output Developers and Vendors

- **The standard is intended to help them:**
 - **Adapt specific hardware (often their own) to one or more real-time operating systems.**
 - **Often I/O vendors are also hardware vendors who in the past, in order to sell their hardware, needed to write I/O drivers for each supported operating system/hardware environment.**
 - **Supporting multiple operating systems is very expensive and adds significantly to the cost of their business.**
 - **Expand their markets**
 - **These vendors need to port their I/O drivers to multiple operating systems.**
 - **UDI supports this economically by allowing a single driver to interface with multiple operating systems.**





Protocol Developers and Vendors

- **The standard will assist them to:**
 - **Meet the requirements of the normally very limited market for their business.**
 - This market is very demanding because protocol modules need to be written differently for each operating system.
 - The result is that the marketplace for real-time protocols is limited when compared to the very large protocol markets such as TCP/IP and UDP/IP.
 - This limited market severely constrains the economics of developing real-time COTS protocols.
 - **Dramatically increase protocol portability and maximize the applicability of their protocols to the entire real-time protocol market or large segments of it.**



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Middleware Developers and Vendors

- **The standard is intended to:**
 - **Help satisfy the real-time deterministic requirements within the limitations inherent in the underlying operating system.**
 - **I/O drivers**
 - **Protocol modules**
 - **Portable protocols would help expand the middleware vendor markets with significantly improved capabilities.**





Systems Developers and Vendors

- **The standard is intended to:**
 - Assist them in procuring conforming products that need to be integrated.
 - Ensure that the portability and real-time requirements of the system are met.





End Users

- **The standard will help:**
 - **Make users the ultimate beneficiaries of the economics of real-time I/O drivers and protocol modules using the UDI environment.**
 - Real-time users need to maintain their systems for many years.
 - They need to port their systems to new computer hardware
 - they need to interface new computer hardware to old computer hardware.
 - These activities require expensive real-time I/O drivers and protocol modules.
 - Without this standard and the UDI environment, real-time users may need to spend large amounts of money to develop and maintain special protocol modules and device drivers. The cost may be prohibitive.
 - **Development of protocol modules and device drivers can become more affordable for users.**
 - **Improve availability as well as affordability of COTS real-time I/O drivers and protocol modules as COTS.**



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