



Uniform Driver Interface Management Overview

February 4, 1999

Introduction

The purpose of this document is to provide introductory background and technical information to computer industry professionals who are currently unfamiliar with the Uniform Driver Interface architecture and to provide a status update for those who have heard about it before.

The Uniform Driver Interface, better known as **UDI**, is a software architecture that enables a single driver source to be used with any hardware platform and any operating system. In some cases, recompilation may be required. The architecture and the specifications that define it are being developed by **Project UDI**, an open industry group comprised of architects and engineers from several different OS, system and I/O providers. The core set of UDI specifications are nearing completion; final versions are expected by the middle of 1999.

Background & Status

Project UDI began in 1993 and has largely been driven as a grass roots effort amongst engineers from companies such as Adaptec, Compaq (originally Digital), Hewlett Packard, IBM, Interphase, Lockheed Martin, NCR, SCO, Sun, and more recently, Intel. A more detailed history is presented in *The UDI Technical White Paper*, which can be found on the UDI introductory documents page at <http://www.sco.com/udi/docs.html>.

The UDI effort has been an open forum and development effort since its inception. There are web pages, document repositories and source trees maintained by Project UDI members. There are no fees or contracts required to obtain the specification or to participate in its development. Anyone is free to subscribe to the email reflectors or to attend technical and marketing meetings.

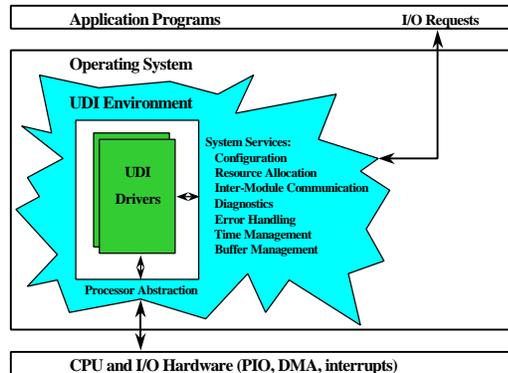
The goal of the Project UDI team has been to create an architecture for device drivers that provides standard interfaces to which drivers can be written. The challenge for the team has been to design these interfaces in a way that hides differences between operating systems and platforms as much as possible, while still enabling performance, scalability, and advanced features. By making interfaces OS-neutral, drivers can be written that will run on any OS without modification, letting IHVs focus on technology and performance rather than porting. By designing interfaces that are not skewed towards any particular OS, OSVs are presented with a level playing field and opportunities to add value "behind the scenes" in their own implementations.

Through the prototyping efforts of many of the Project UDI participants, a proof-of-concept environment implementation was created and ported to seven operating systems, including Solaris™, SCO OpenServer and UnixWare®, HP/UX, Compaq Tru64™ UNIX® (formerly Digital UNIX), AIX, and Linux. UDI-based drivers for Adaptec SCSI and Interphase LAN adapters were simply recompiled and run on multiple operating systems without any modifications.

Project UDI has completed and published Revision 0.86 of the initial UDI Specifications (The UDI Core Specification, The UDI Physical I/O Specification, The UDI SCSI Driver Specification, The UDI Network Driver Specification, and The Metalanguage Library Specification). Revision 0.90, expected in March, will be presented to the industry for broad public review, culminating in a final specification set in mid-1999.

Concept Overview

Every operating system has its own set of unique interfaces to which driver writers have historically written their device drivers. A UDI environment abstracts these by taking OS-specific services and projecting OS-neutral, strongly-typed procedural calls for use by the driver writer to use instead. These interfaces make up the bulk of the UDI Core Specification. In order to ensure that compatibility between environments and drivers is provided, versioning of these interfaces is strongly enforced. These concepts are illustrated in **Figure 1**.



Project UDI - August 1998

Figure 1: UDI Architecture Concept Drawing

The UDI core is extended through the use of *metalanguages*. A UDI metalanguage is a set of interface calls that are specific to a given technology or device model (e.g. SCSI, LAN or USB). All UDI metalanguages share common properties and make use of the generic UDI infrastructure, but are tailored to specific technologies. Supporting a new technology, then, requires the definition and implementation of a new metalanguage. Today, metalanguages exist or are being developed for SCSI, LAN, USB, I₂O and for simple pointing devices, such as mice. Project UDI is examining and is interested in supporting new technologies as they become useful and necessary.

Summary of Benefits

Because the primary objective of Project UDI is to define and specify an architecture that enables portable drivers, a number of complex challenges had to be overcome, including:

- Abstraction of OS to driver interfaces
- Processor and platform neutrality
- Endian-ness (big vs little-endian)
- Management interfaces
- Versioning to ensure interoperability
- Location independence of drivers (e.g. I/O Processors)

Project UDI has resolved these issues and is refining the specification for industry standardization. The UDI architecture provides interfaces and services for fully portable device drivers. That is, at the source code level, any driver can be recompiled to operate in any system. The benefits to those using UDI drivers is that a UDI driver written for one OS and platform may be used in any other OS and platform supporting a UDI environment. A summary of benefits is shown in **Table 1**.

| Benefit | System Provider | VAR & Integrator | OS Vendor | IHV & Driver Writer | End User |
|---------------------|----------------------------|---------------------------------|------------------|------------------------------------|---------------------|
| Industry Standard | YES | YES | YES | YES | YES |
| Common Interfaces | NO | YES | YES | YES | NO |
| Platform Neutrality | YES | YES | YES | YES | YES |
| OS Neutrality | YES | YES | YES* | YES | YES |
| Portability | YES | YES | YES | YES | YES |
| Extensibility | YES | YES | NO | YES | NO |
| Performance | Unknown | Unknown | Unknown | Unknown | Unknown |

Performance has yet to be measured in a production environment. Existing drivers are still considered to be prototypes not tuned for performance.

Summary and Conclusion

The grass roots effort known as Project UDI is finalizing the Uniform Driver Interface Specifications and will present them for broad public review in March of 1999. The final 1.0 UDI Specifications are expected to be available by the middle of 1999 and will be freely available from Project UDI. The 1.0 specifications will be mature enough to be used for product implementation.

The existing prototype implementation will be brought forward to match the 1.0 specification and will be released in source code form as a freely available reference implementation, in order to facilitate and encourage additional environment and driver implementations.

Industry leaders have recognized the benefits of UDI and have supported Project UDI in moving the UDI architecture forward through greater availability of UDI environments, new metalanguages and other usability features. Project UDI continues to be open to participation by any interested parties and welcomes their assistance.

* OS neutrality can be a benefit even to OS vendors, since most OSVs have multiple versions and multiple flavors of operating systems.

Contact Information

Further information on the UDI architecture and specifications are available from the UDI web page or any of the Project UDI officers.

<http://www.sco.com/UDI/>

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