

# Operating Systems Update

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**ABSTRACT:** *The purpose of this presentation is to give an update of development activities for UNICOS, UNICOS/MAX, and UNICOS/mk operating systems. This presentation will discuss future plans for operating system releases beyond UNICOS 9.0 and for UNICOS 10.0, as well as support plans for UNICOS, UNICOS/MAX, and UNICOS/mk. A high level discussion of future collaborative operating systems between SGI and Cray Research may also be covered.*

## 1 Introduction

This presentation covers two very different topics. The first is the current status and release plans for UNICOS, UNICOS-MAX and UNICOS/mk. The second topic is a presentation on our future operating system plans.

UNICOS release plans will be discussed first. There has been much confusion on what hardware platforms are supported for each release level and the length of support for each of those release levels. The goal of this paper is to clarify these issues.

## 2 UNICOS Release Plans

### 2.1 Recent UNICOS Releases

UNICOS 8.0.4.4 was the last update released for UNICOS 8.0. This update was released in July 1996 and was the last major release supporting the CRAY YMP Model D platform. As of September 1996, UNICOS 8.0 is no longer supported by Software Development for CRAY YMP-E or CRAY C-90 platforms. UNICOS 8.0 support, via individual fixes, continues for CRAY EL and CRAY J90 systems until 1Q97 and CRAY YMP-D systems until 3Q97.

UNICOS 9.0 is the last major release supporting the CRAY YMP model E platform. UNICOS 9.0.2.2 was released in September 1996. We continue to support UNICOS 9.0 via updates.

UNICOS 9.1 and 9.1.0.1 are restricted releases for CRAY T90 IEEE platforms only. UNICOS 9.1 was released in March 1996. UNICOS 9.1.0.1 was released in May 1996.

### 2.2 Future UNICOS Releases

UNICOS 9.0.2.3 will be the next update for UNICOS 9.0. The schedule has not yet been announced. Update schedules are

based on the number and severity of the fixes waiting to be packaged into a release. As noted on the previous slide, we will continue to support UNICOS 9.0 via updates.

UNICOS 9.2 is a restricted release which is planned for a January 1997 release. There will be a follow-on update which will contain UNICOS under UNICOS support for GigaRing as well as full CRAY T90 Mixed CPU support. These releases are for CRAY T90 IEEE and GigaRing platforms only.

UNICOS 9.3 is a restricted release for CRAY T90 IEEE and GigaRing platforms only. The major content of UNICOS 9.3 will be the accounting support for J90 mixed CPU machines. There will also be a controlled release, for a limited number of customers, of UNICOS 9.3 for the CRAY C90, CRAY T90 and CRAY J90 platforms. This will be used as a beta test of UNICOS 10.0.

UNICOS 10.0 will be the next major release for CRAY C90, CRAY T90 line including PV+, CRAY J90 line including J90++ and the GigaRing line. UNICOS 10.0 will be released 3Q97.

There is now an additional major release planned for UNICOS. The content has not yet been defined, but UNICOS 11.0 will be released in 1999.

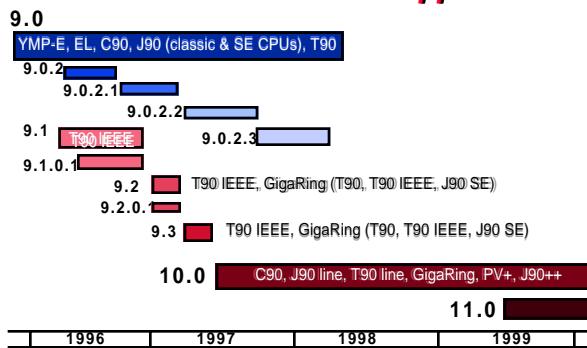
Some time in the UNICOS 10.0 and 11.0 time frame, selected IRIX features will start being ported over to UNICOS. This will help bring UNICOS and IRIX closer together.

### 2.3 UNICOS Support

The slide below is intended to show the support time frames for each of the active UNICOS releases. The bars start from time of release until the point where software development support ends. Each bar chart lists those hardware platforms which are supported on that particular release level. Note that the hard-

ware platforms supported for UNICOS 11.0 have not yet been determined.

## UNICOS Support



Major releases are supported for 1 year beyond the release of the next major release. Therefore, UNICOS 9.0 is supported for 1 year beyond the release of UNICOS 10.0.

Support for updates ends when the next update is released. Also, support for restricted releases end when the next restricted release goes out. So, for example, support for UNICOS 9.1 ends when UNICOS 9.2 is released. Support for UNICOS 9.2 ends when UNICOS 9.3 is released, etc.

Although UNICOS 9.1, 9.2 and 9.3 are restricted releases, they really are pre-releases of UNICOS 10.0 since they make up the content of UNICOS 10.0.

### 3 UNICOS-MAX Release Plans

UNICOS-MAX 1.3.0.3 was released in September 1996. This release contained support for rolling NQE jobs, several resiliency features and a number of fixes.

The Programming Environment 2.0.2 is being released this month and will support the CRAY T3D. This release is based on the same versions as the CRAY T3E compilers for Programming Environment 2.0 and contains essentially the same functionality. This release will automatically be shipped to all CRAY T3D sites. Note that there will be revisions to the Programming Environment 2.0 release, but no new major feature releases.

There are two additional feature releases planned for UNICOS -MAX in 1997. UNICOS-MAX 1.3.0.4 will be released 1Q97 and UNICOS-MAX 1.3.0.5 will be released 2Q97.

There will be two releases in 1997 focusing solely on SPR backlog reduction and software stabilization. Those releases will be UNICOS-MAX 1.3.0.6 in 3Q97 and UNICOS-MAX 1.3.0.7 in 4Q97.

### 4 UNICOS/mk Release Plans and Status

UNICOS/mk 1.2.4 was released in October 1996. This release supports the initial CRAY T3E systems. The next release, UNICOS/mk 1.3, will be in December 1996 and will contain support for additional I/O devices. This release will also focus on reliability. Cray realizes that there are problems with UNICOS/mk and those problems are being addressed as quickly

as possible. Due to the current instability, performance and new features have now taken a back seat to focusing on reliability.

UNICOS/mk 1.4 will be released 1Q97. Most of Multi-Level Security (MLS) will be supported in this release along with Political Scheduling and other UNICOS equivalence features.

UNICOS/mk 1.5 will be released 2Q97. Some of the content of this release includes checkpoint, DCE, Limits and Mandatory Access Controls (MAC).

The content for UNICOS/mk 1.6 has not yet been defined, but is scheduled for 4Q97.

Cray has every intention of continuing our plans for UNICOS/mk. Those plans include:

- Achieving UNICOS functionality via features such as checkpoint/restart, DMF and MLS.
- Completing planned and new UNICOS/mk scalability features including highly parallel I/O and scheduling.
- Continued support for new hardware improvements.
- Adding IRIX features for SW convergence such as XFS and fast block NFS.

### 5 Future Operating System Direction

The rest of this paper will focus on the future operating systems direction.

There are many similarities between Cray's UNICOS/mk operating system and SGI's Cellular IRIX operating system. Both are distributed operating systems scaling via distribution of local and global services. UNICOS/mk services are local to each PE whereas Cellular IRIX services are local to each cell (set of SMP processors).

Both companies were heading towards the same point, but taking different paths to get there. We wanted a single operating system to be able to support the entire product line, including desk top up to supercomputer, in a reasonable time frame. To do this, virtual memory and graphics, among other things, are needed. Therefore, Cellular IRIX was chosen as the base operating system going into the future for our Scalable Node (SN) systems.

The developers in Eagan and Mountain View will work together to combine the best of both worlds. Our goals for this system include providing a single system image, a secure environment, allowing for resources to be shared, ease of administration, a highly scalable system at a low entry cost and a system that has high availability. To preserve the investment that our customers have made in UNICOS and to ease the transition from UNICOS to Cellular IRIX, we will be preserving the UNICOS API. From the operating system area, this means preserving as many system calls, library routines and commands as possible.

Many Virtual Teams, or V-Teams, have been created including membership from Eagan and Mountain View development. These V-Teams are responsible for examining each major component of the system and coming to agreement on the best possible future direction for each area. Depending on the component, we may choose Cray's current implementation, SGI's

current implementation or a combination of the two. Currently, V-Teams exist for accounting, security, commands, political scheduling, data migration, checkpoint, scheduling, multi-tasking, resiliency, limits, testing and more.

### **5.1 Cellular IRIX Release Plans**

The first release of Cellular IRIX will be in 4Q96 and is being referred to as R0. This is really IRIX as we know it today with memory management and CPU scheduling enhancements. There will be no capabilities in this release to go beyond a single cell. This is the initial operating system supporting the Origin 2000 or SNO machine.

The next release of Cellular IRIX, R1, will be introducing the cellularized concept. It is the first cellularized version for the Origin 2000. This release focus on encapsulation, distribution of major components and adding administrative cell shutdown/restart. R1 is expected to be released in 2Q97.

R2, released in 1998, will be the first release with fully distributed cells to support the SN1 machine. This release will include full-weight RPC, memory isolation so that you cannot access other cell's memory and fault containment within a cell.

The release schedule for R3 has not yet been announced. This release completes the long-term vision of being able to run a single operating system from the workstation and servers on up to the supercomputers.

### **5.2 Origin 2000 ("SNO") Plans**

Cray will play a role in supporting the Origin 2000 platform. The exact details of how that will work are still being defined. Our plan is to support the Cray Origin 2000 customers with the same care and responsiveness that our traditional Cray customers have become accustomed to. Some problems will undoubtedly be fixed out of Mountain View and some out of Eagan. This division of support should be transparent to the end customer.

Reliability and scalability are very important to Cray and our customers. Cray will be involved in any changes that need to be made in these areas to support the larger Cray Origin 2000 machines.

There will be limited Cray feature development for the Origin 2000 product. There are, however, several products that deserve mention here. NQE, Cray's load-balancing batch queuing system, has already been ported to IRIX. In addition, the Data Migration Facility (DMF), which is Cray's effective, multiple

TByte data management system, is currently being ported to IRIX. Cray's secure, batch production tape facility is currently being ported to IRIX as well. Lastly, Cray's fast, transparent I/O libraries, FFIO, are currently being ported to IRIX. All of the work that Cray does will benefit the entire product line.

### **5.3 SN1 Plans**

The goal in the SN1 time frame is to provide full source code compatibility with minimal exceptions allowing most applications running on Cray systems today to port to the Origin 2000 without source code modification. Reaching this goal will be an evolutionary process over the next 2 years involving integration of the Cray CF90 and MIPS compiler technology, porting of the Cray user and runtime libraries and providing support for compiler directives and extensions.

There are a number of components of the UNICOS operating system that Cray will carry over to ensure the same functionality exists on Cellular IRIX for SN1. This list includes accounting, checkpoint/restart enhancements, User Database (UDB), limits and other large system management features, kernel based asynchronous I/O and full T3E programming model support. There are components in the Programming Environment area that are not listed here.

## **6 SUMMARY**

The majority of Cray's development and support attention is devoted to UNICOS and UNICOS/mk. We will leverage with Mountain View as much as we can so that we can continue to focus most of our attention on UNICOS and UNICOS/mk. We are committed to continue with our plans for our current Operating Systems.

UNICOS will continue releasing features and fixes until 1999 and beyond. UNICOS-MAX fixes will be released until the end of 1997. UNICOS/mk features and fixes are currently scheduled out beyond the year 2000.

Cray is just beginning to work on Cellular IRIX. Although most of Cray's attention remains on our current Operating Systems, there are a large number of teams of Eagan and Mountain View developers working together to define the future functionality of Cellular IRIX. Also, there are some Cray developers that are actively working on porting code from UNICOS and/or UNICOS/mk to Cellular IRIX. Cray is committed to ensure that the future Operating System, and the support of this system, meets the needs of our high end customers.