



Section G.1.2

Athena Changes to Digital 2.0 Ultrix+TM

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1. Introduction

This document describes the changes made by Project Athena to the Ultrix¹ 2.0 version of the UNIX² operating system. Athena uses the kernel and machine-dependent utilities of Ultrix as a base on which to build a coherent user system based on the 4.3BSD version of UNIX from the University of California at Berkeley.

There are several important types of software that has been changed:

- Kernel
- Ultrix utilities
- 4.3BSD and Athena utilities

Each of these is discussed in detail below. The section on changes to Ultrix utilities also includes a description of which ones are used in the Athena system. Finally, there is a section that discusses converting a vanilla Ultrix 2.0 system to an Athena workstation.

The system described here is based on a field test version of Ultrix 2.0, T2.0-1A.

2. Kernel Changes

The most important kernel change was the addition of the Remote Virtual Disk (RVD) subsystem. In addition, we installed a binary distribution of DECnet for use with a prototype DEC PrintServer-40. There were also minor configuration changes and bug fixes.

2.1. Kernel Configuration

The RVD option was added to the *BINARY.vax* configuration file. This is necessary since there is not a straightforward way to configure a kernel directly from the sources.

Kernel configuration files were added for the VAXstation II (*ATHENA.VS2*), VAXstation 2000 (*ATHENA.VS2000*), and VAX 11/750 (*ATHENA.750*)

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The *newvers.sh* script was modified to generate Athena-style version control strings.

RVD files were added to *conf/files* and *conf/files.vax*

2.2. RVD Installation

RVD extensions were added to the structures in *h/buf.h*. The RVD error number was added to *h/errno.h*.

Entries for the RVD protocol were added to *netinet/in.h* and *netinet/in_proto.c*. The files *netinet/rvd.c*, *netinet/rvd.h*, and *netinet/rvdconst.h* implement the protocol. The MCLGET macro changed in Ultrix 2.0; the appropriate modification to the earlier Athena implementation was made in *netinet/rvd.c*.

Page table allocation for RVD was added to *vax/machdep.c*.

Entries for the RVD pseudo-devices were added to *vax/conf.c*. To maintain compatibility with current Athena systems, the standard DEC entries for the device numbers used by RVD were commented out. Those devices (cs and crl) are not used at Project Athena.

2.3. Bug Fixes

The ARP code in *netinet/if_ether.c* did not conform to the RFC standard and was fixed.

The file *vax/machdep.c* was missing some preprocessor directives. They were added.

An additional symbol (USING_LTA_C) was added to *lat/lta.c* and *data/lta_data.c* so we could use them without defining the symbol BINARY.

A missing symbol (ifu_uba) was defined in *data/if_de_data.c*.

2.4. Miscellaneous

The macro *sigmask()* was added to *h/signal.h*.

The default screen for the QVSS device was changed to 2 in *vaxuba/qv.c*.

3. Changes to Ultrix Utilities

3.1. Modifications

The C library was rebuilt with the 4.3BSD resolver in place for the *gethost*()* functions. As a side effect, many of the functions that would use the Yellow Pages facilities were replaced.

RVD devices were added to the */dev/MAKEDEV* script.

3.2. Machine-Dependent Utilities

3.2.1. Filesystem Utilities

Because of changes to the filesystem, almost all utilities that deal with it are taken from Ultrix 2.0:

chpt	clri	dcheck	dumpfs
fsck	icheck	mkfs	mount
ncheck	newfs	tunefs	

3.2.2. NFS Utilities**3.2.3. Network Utilities**

arp
ifconfig
trpt

3.2.4. Miscellaneous

adb	ps	dbx
gcrc	config	pstat

4. Changes to 4.3BSD and Athena Utilities for Ultrix**4.1. RVD**

The *up* and *down* commands of the RVD client software were modified to use the new *mount/umount* semantics of Ultrix 2.0. The interface is not very clean at the moment, and the programs maintain an */etc/mtab* on their own.

4.2. Kernel-Dependent

The following standard Athena programs must be recompiled in order to work on an Ultrix 2.0 system:

tcsch top

4.3. Workstation Software

The following programs are used only on workstations or have special modifications for the workstation environment. They are therefore part of the workstation source tree.

update	toehold
in	out
activate	deactivate
access_on	access_off
login	

5. Converting an Ultrix Workstation to the Athena Environment

The system described here was built on a MicroVAX II and initially installed on a VAXstation 2000. A new source tree containing only relevant programs was created on the

source machine. Essentially, these sources represent the differences from a standard Athena/4.3 system.

On the source machine, we made several changes to make it useable for building a system:

1. The source tree was configured in an Athena standard format.
2. Home directories were imported using NFS from a VAX/750 server. There is insufficient disk space on the MicroVAX for home directories as well as source code.
3. Special Athena software was imported using NFS and mounted on `/usr/athena`. In particular, we wanted to use GNU *emacs*. *emacs* (version 18.41) was rebuilt using the Ultrix C library so it could handle directories properly.
4. The Revision Control System (RCS) commands were installed in `/usr/new` for us to use in tracking source code changes. This also required a new version of `/bin/diff`.
5. A new C library using the BIND nameserver was built and installed. This is crucial, not only because we rely on domain naming of hosts, but also because the information returned by the old and new libraries is different. Hence, using binary libraries (such as X or Kerberos) from an Athena 4.3 system will cause problems. As part of this, the header file *netdb.h* was updated to 4.3 standard, and the header files *arpa/namser.h* and *resolv.h* were added to `/usr/include`. Also, the symbol `MAXHOSTNAMELEN` was defined in `/sys/h/param.h`. Because of the changes to the library, we do not build a `libcg.a` (the GFLOAT library).
6. The BIND nameserver was installed.
7. Kerberos-authenticated versions of *rlogin* and related programs were installed to limit access to the source machine.

On the installation machine, the following steps were taken:

1. Edit `/etc/rc.local` to use the proper subnet mask and broadcast address. An invocation of `/etc/route` was added to initialize the IP routing table.
2. Build an Athena standard kernel as described above and install it.
3. Create the RVD devices in `/dev`.
4. Install the RVD software in `/bin/athena` and `/etc/athena`.

6. List of Files Changed

The following files from Ultrix 2.0 were modified:

```

/sys/conf/newvers.sh
/sys/conf/files.vax
/sys/conf/files
/sys/conf/ATHENA.750 [added]
/sys/conf/ATHENA.VS2 [added]
/sys/conf/ATHENA.VS200 [added]
/sys/h/buf.h
/sys/h/errno.h

```

/sys/h/syslog.h
/sys/h/param.h
/sys/netinet/if_ether.c
/sys/netinet/in.h
/sys/netinet/in_proto.h
/sys/netinet/rvdconst.h [added]
/sys/netinet/rvd.h [added]
/sys/netinet/rvd.c [added]
/sys/vax/machdep.c
/sys/vax/conf.c
/sys/vaxuba/vd.c [added]
/sys/vaxuba/vdreg.h [added]
/sys/vaxuba/vdconst.h [added]
/sys/vaxuba/qv.c
/sys/data/lta_data.c
/sys/data/if_de_data.c
/sys/lat/lta.c
/src/lib/libc/net/* [added]
/src/dist/MAKEDEV
/src/include/netdb.h
/src/include/resolv.h [added]
/src/include/arpa/nameser.h [added]

7. Changes to this document

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