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Getting Started with Microwave Products



RadiSys
THE POWER OF WE

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1

Installing and Starting Microware OS-9 Products

This chapter describes how to get started using your Microware OS-9® software and provides a brief overview of the OS-9 operating system and its components. It includes the following sections:

- [Installing Your Software](#)
- [OS-9 Runtime Software Components Overview](#)
- [OS-9 Tools Overview](#)

Installing Your Software

Begin the installation by placing the product CD into the CD ROM drive on the host PC. The Windows Autorun feature automatically starts the installer and opens the product installation window. Several options are presented at this point, including installing software and viewing documentation. Some of these options are described in the following sections.



Menu selections, screen images, and exact procedures may vary slightly depending on your specific product.

You can also start Autorun by navigating to the AUTORUN folder on the CD-ROM in Windows Explorer and selecting `main-menu.exe`.

Installing Microware OS-9

To install the Microware OS-9 package, complete the following steps:

- Step 1. Select `Install Microware OS-9 for <product>` in the product installation window. After a few moments, the InstallShield Wizard opens the **Welcome to Microware OS-9 for <product>** dialog. Select `Next` to proceed.
- Step 2. The **Microware OS-9 for <product> Install Type** dialog appears (Figure 1-1). Select the option appropriate to your purchase agreement. A description for each option is provided below.

Client Install

If you already have a version of OS-9 installed and would like to run the Hawk™ IDE (included with the Microware OS-9 package) from one server, rather than many workstations, select this option. Client Install will install only those components necessary to access a server installation of OS-9. In order for this option to work properly, the workstation you are using must be able to access a shared drive that contains the OS-9 product.

Under the Client Install option, Hawk uses the value assigned to the HAWKCLIENT environment variable as the path to local files and the MWOS environment variable as the path to the server installation. The files that reside in the local directory are user configuration files. Any files not found in this directory are opened on the server path. Additionally, “created files” (such as `mwhawk.pst` and `hawkdata.xml`) are placed in the local directory, and the installer-created PROJECTS directory is placed inside it.



If HAWKCLIENT does not exist, Hawk uses the path specified in the MWOS environment variable to open all files.

OS-9 Board Level Solution

This option installs all Board Level Solutions (BLS) and includes the OS-9 SDK. A password is required.

OS-9 Evaluation Package

This option installs a free 60-day evaluation version of the OS-9 Board Level Solution. No password is required.

OS-9 for Embedded Systems

This option installs OS-9 for Embedded Systems. It includes all source files necessary for porting OS-9 to your reference board. A password is required.

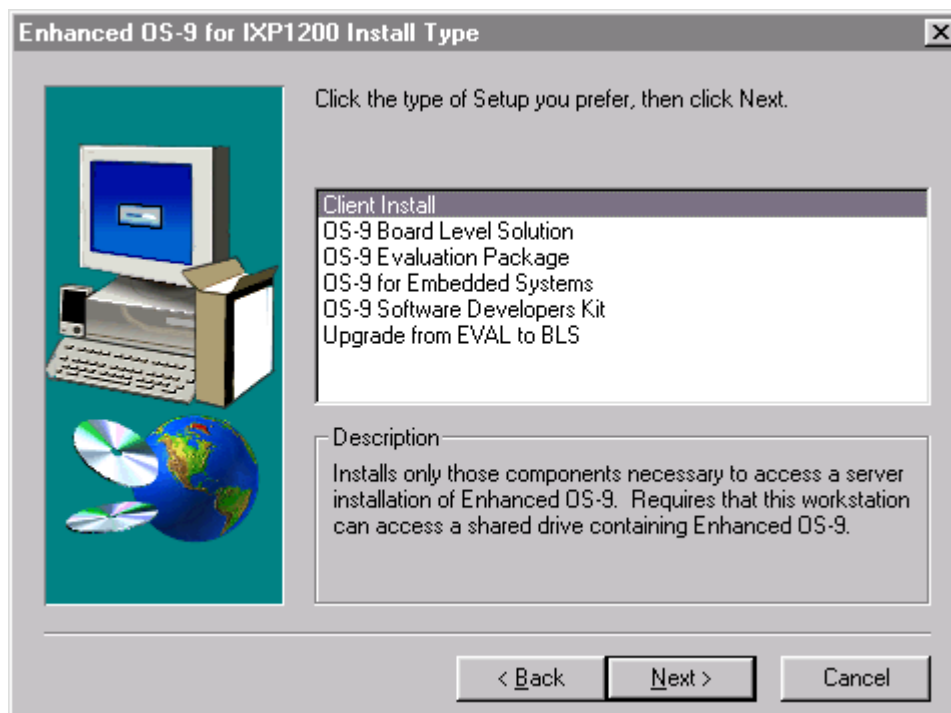
OS-9 Software Developers Kit

This option installs the Software Developer's Kit (SDK). The SDK includes the Hawk IDE and associated tools. A password is required.

Upgrade from EVAL to BLS

This option allows you to upgrade from a previously installed OS-9 Evaluation Package to OS-9 Board Level Solution. A BLS password is required.

Figure 1-1. Installation Options



The remaining steps describe how to proceed with OS-9 for Embedded Systems installation. Other installation options may vary slightly.

Step 3. Select the **OS-9 for Embedded Systems** option and click **Next**.

Step 4. Enter your password.



Product passwords are case-sensitive and are provided on a card and shipped with your CD. If you are upgrading from an Evaluation package, you can place an order and have your passwords faxed to you.

Step 5. Read the RadiSys License Agreement. Click **Yes** to proceed with installation.

Step 6. At the next dialog, select the path and directory in which you want OS-9 installed. You can select any valid drive for the installation. However, it is recommended that you use the name MWOS for the root directory name. To proceed, click **Next**.

Step 7. The **Set File Associations** dialog appears. From this dialog you can set your file association preferences. Assigning the files enables you to start the Hawk integrated development environment by double-clicking on files with specified extensions. If you select the **No** radio button, you can still access Hawk, but not in this manner.

Step 8. Verify your installation configuration choices. At this point you can change your configuration or begin the install.

The installer automatically copies OS-9, the OS-9 components, and the development tools to your host system. Installation progress is shown on the screen. When installation is complete, click **Finish** to return to Windows.

OS-9 Add-Ons

The support for OS-9 add-ons varies from product to product.

Select **Microware OS-9 Add-Ons** from the product installer window to display the list of add-ons available for your product. The add-ons are provided as separate installations and require individual passwords.

Microware Documentation

Selecting **Microware Documentation** from the product installation window displays the main documentation menu. From this menu you can view the documentation set or install it to your development system.

Documentation is provided in Portable Document Format (PDF). Information on how to use the documentation is described in [Chapter 2](#).



To view the documentation, you must have a copy of Adobe Acrobat Reader 5.0 or later installed on your host system. Acrobat Reader is provided free from Adobe Systems.

View Microware Documentation

This selection enables you to browse Microware documentation from the CD. You do not need a password to view the documentation.



Before you begin your development project, you may want to view the following documentation:

- *OS-9 for <product> Board Guide*
Each board guide details how to use OS-9 with a particular target board.
- *Getting Started with Hawk and Using Hawk*
The *Getting Started* manual familiarizes you with features of the RadiSys Hawk IDE (integrated development environment), and the *Using Hawk* manual explains in detail how the features can be implemented.

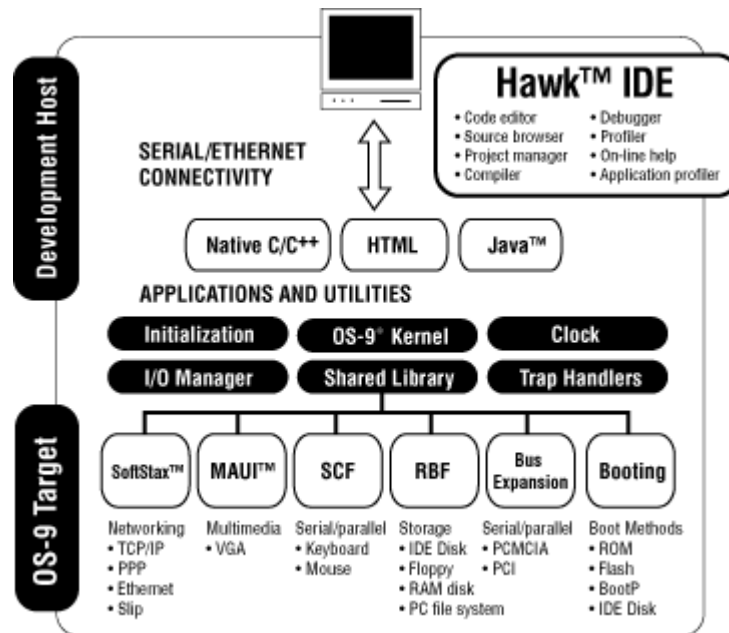
Install Microware Documentation

This selection installs Microware documentation onto your workstation. The process increases the total installation time and uses about 100MB of disk space.

OS-9 Runtime Software Components Overview

OS-9 features a scalable real-time operating system with specific software modules for creating embedded devices without having to customize system software. [Figure 1-2](#) shows an overview of the OS-9 architecture.

Figure 1-2. OS-9 Components



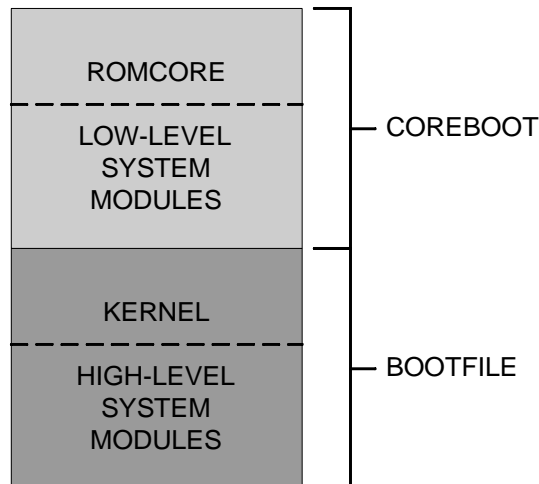
OS-9 Architecture

At the core of OS-9 is the OS-9 operating system and its support modules. OS-9 is an architecturally advanced, high-performance, real-time operating system available for the PowerPC, ARM, 68K, SuperH, MIPS, XScale, and X86/Pentium architectures. At its core is the OS-9 stand-alone microkernel.

Coupled with the power of the microkernel, the unique modular architecture of OS-9 enables dynamic loading of OS-9 system or user application modules while the system is running.

To simplify the process of loading OS-9, the OS-9 boot image is divided into two sets of files: the coreboot image and the bootfile image. The coreboot image is the low-level image that boots the reference board to an OS-9 boot menu. The bootfile image is the high-level image that boots the reference board from the boot menu to an OS-9 shell prompt.

Figure 1-3. OS-9 Boot Image



Coreboot Image

The coreboot image boots the system up to the OS-9 boot menu. The coreboot image contains the romcore code merged with several low-level system modules and an embedded utility set. Romcore is the bootstrap code and is responsible for initializing basic hardware. From the boot menu you can select a booter module which instructs romcore where to find the high-level bootfile to load into memory.

Bootfile Image

The bootfile image contains the kernel and other high-level modules (init module, file managers, drivers, descriptors, and applications). The image is loaded from the device you select in the boot menu. The bootfile normally brings up a shell prompt, but can be configured to automatically start an application.

OS-9 Boot Image

The coreboot and bootfile images can be combined into a single module: the OS-9 boot image. The OS-9 boot image module contains the system bootstrap code, the low-level system modules, the embedded utility set, the kernel, and the high level modules.

Power Management

OS-9 has power management modules that can be included in the bootfile. These modules enable you to create applications that use hardware power management features. This is especially useful for mobile devices.

Fastboot

The OS-9 Fastboot feature is used for those devices or applications that need to be fully operational within just a few seconds. It bypasses some parts of the normal OS-9 boot sequence to achieve this goal.

Networking

The ability to communicate with other computers and devices is essential for embedded devices. OS-9 uses the standard SoftStax® I/O implementation; thus, a variety of transport layers can be used.

SoftStax

SoftStax provides a consistent application-level interface using a variety of networking protocols. Additional protocols are included in the LAN Communications.

LAN Communications

The Microware LAN Communications software consists of a TCP/IP protocol stack with UDP support, SLIP/CSLIP support, PPP support, and drivers for supported hardware.

Graphics

Many of today's embedded applications require graphics support. To provide this support, OS-9 uses a multimedia application user interface (MAUI®).

MAUI

MAUI is a high-level library that manages the display of graphics, text, messaging, and user input as well as audio.

OS-9 Tools Overview

The following development tools are included with the Microware OS-9 package:

RadiSys Hawk

The RadiSys Hawk development environment is an easy-to-use toolset that enables you to edit, debug, and compile C and C++ code; manage complex software build scenarios; manage solo or team-based changes to your source code with version control; and work with a wide variety of third-party software development tools. Some features of the Hawk integrated development system are listed below:

- a project manager for creating and managing complex software projects
- a first-class programming editor
- a state-of-the-art Ultra C/C++ compiler
- a source level debugger for debugging C or C++ code
- an API of C functions for customizing and extending your environment (the AppBasic scripting language is also available)
- plug-and-play functionality for a wide range of third-party software development tools

Ultra C/C++

Ultra C/C++ is an ANSI/ISO C compiler. It also tracks the ANSI/ISO C++ draft standard. This compiler is designed specifically for OS-9. The latest algorithms for optimizations have been built into Ultra C/C++ to provide fast, tight code for your real-time applications.

RomBug

RomBug is a privileged mode ROM-based debugger for debugging both system- and user-state programs. RomBug runs in supervisor state and takes control of the Central Processing Unit (CPU) when invoked.

Utilities

The utilities comprise the OS-9 command program set. While the programs are generally executed from a shell command line, they may also be called from OS-9 programs.

2

Using Microware OS-9 Documentation

Microware OS-9 Documentation is provided in Portable Document Format (PDF) and is viewable using Adobe Acrobat Reader 5.0 (or later). This chapter describes the following topics:

- [Notational Conventions](#)
- [Viewing Documents with Acrobat Reader](#)
- [Viewing Documents with Acrobat Reader](#)
- [Microware OS-9 Documents and Descriptions](#)



To use the documentation, you must have a copy of Adobe Acrobat Reader, version 5.0 or later, installed on your host development system. Acrobat Reader is a free product from Adobe Systems.

Notational Conventions

All of the RadiSys software manuals contain the following notational conventions:

- blue text** indicates a link to other related information. Clicking on blue text will take you to the referenced information.
- bold text** is used to denote names of dialog boxes, radio buttons, and other features.
- italic text* is used where references are made to other manuals.
- courier text** is used for text that appears on a screen or within code.
- magenta text** is used for procedures that you complete in response to an on-screen procedure.



Note - indicates important information about the product.



Tip - indicates alternate techniques or procedures that you can use to save time or better understand the product.



URL - indicates a World Wide Web address.



File - indicates referenced manuals or files.



ESD



Caution



Warning



Danger



High Voltage



High Voltage (very serious)

Viewing Documents with Acrobat Reader

Acrobat Reader is the tool used for viewing Microware OS-9 Documentation. Once Reader is installed on your host system, you can access the documents.

Documentation Overview

The documentation is a collection of PDF files located on your product CD in the [CDROM DRIVE] : \DOC\PDF directory. You can access the PDF files through the documentation home page (`home.pdf`) in the following ways:

- Select **Microware Documentation** from the product installation window. Select **View Microware Documentation**. This starts Acrobat Reader and opens the documentation home page.
- From the home page you have several options, including viewing a complete list of documents, performing a full text search, and accessing support information online.
- Open Acrobat Reader then select **File** -> **Open** and navigate to <CDROM DRIVE>\DOC\PDF and open the `home.pdf` file.



The product CD must be in your CD-ROM drive to use the methods described above.

- Install the documentation PDF files to your host system hard disk and access them through Acrobat Reader. During the installation process you can choose to install the documentation. This copies the PDF files from the product CD to [DRIVE] : \MWOS\DOC.

Once installed you can access the documents by selecting

Start -> **Programs** -> **RadiSys** -> **Microware Documentation vX.Y**. From Acrobat Reader, select **File** -> **Open** and navigate to <DRIVE>\MWOS\DOC\PDF and open the `home.pdf` file.



The method shown above provides an advantage because it does not require you to use the product CD to view the documents. It is also a quicker method to accessing the documents.



Installing the documentation to your host hard drive increases the total installation time and uses about 100MB of disk space.

The Documentation Home Page

The documentation home page is a PDF file located in `<CDROM DRIVE>\DOC\PDF` and is the starting point for viewing OS-9 documentation. The home page contains links to:

- the Microware OS-9 Release Notes documentation
- the Microware OS-9 software manuals

This lists the documents provided with your release. Selecting one of the document titles in the list opens the PDF file for that document.

- the OS-9 glossary
- the RadiSys license agreement

This describes the licensing issues for RadiSys products.

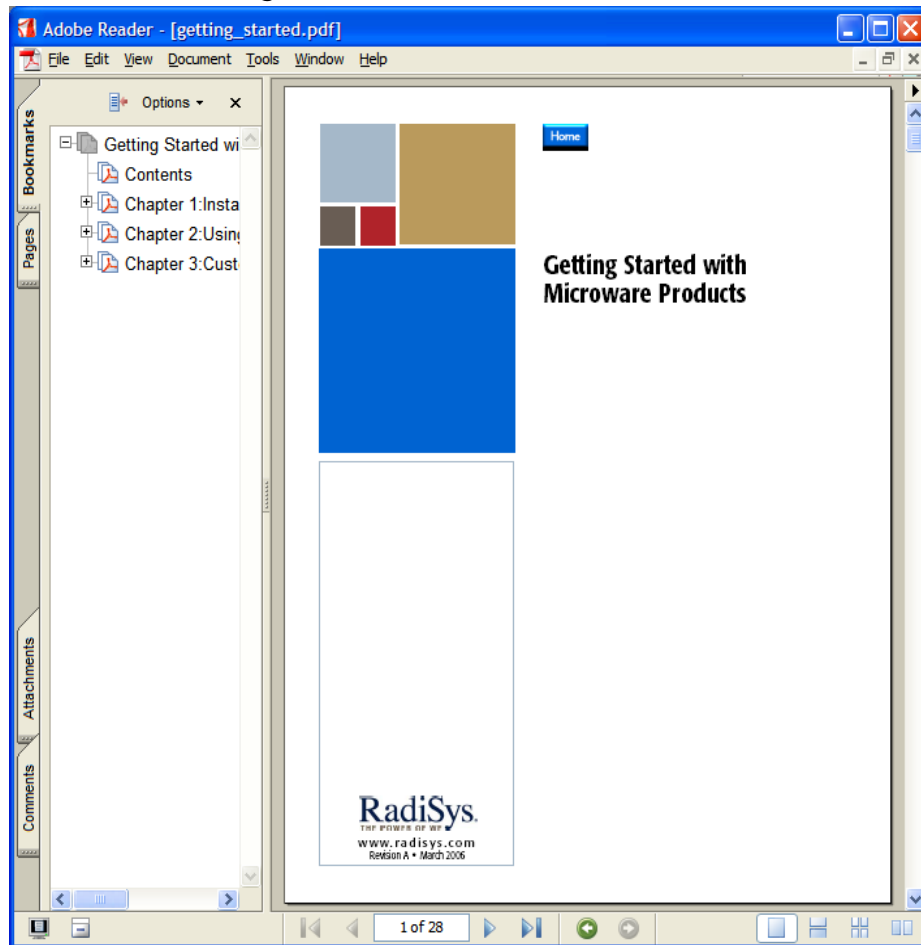
- the OS-9 page of the RadiSys Corporation web site

From this web site (<http://www.radisys.com/OS-9>) you can access customer support, as well as RadiSys products and services.

Viewing Documents in Acrobat Reader

Figure 2-1 shows the Acrobat Reader interface with an open OS-9 document.

Figure 2-1. Acrobat Reader Interface



Once you have installed Acrobat Reader on your host system, you can complete the following steps to open a document:

- Step 1. Insert the product CD into your CDROM drive.
- Step 2. Select **Microware Documentation**.
- Step 3. Select **View Microware Documentation**.
- Step 4. From the documentation home page, select any category to view a particular manual.

Once the document is open, Acrobat Reader contains several navigation methods. Some of the more common features are described below.

For a complete description of how to use the Acrobat Reader interface, refer to the Acrobat Reader Help file by pressing **F1**.

Bookmarks

Notice that the screen is divided into two basic parts. The right side displays the document and the left side displays the bookmarks. The bookmarks are similar to a table of contents and list the major sections of the document. You can click on a bookmark and that particular section displays.

Each document contains a “HOME” button. Clicking on this button will take you back to the documentation home page.

Text Selection

The text selection tool enables you to copy text from the manual and paste it into your application or any text editor. You cannot edit or change information directly in the online manual.

Full-Text Search in Acrobat Reader

Microware OS-9 Documentation includes a searchable index of the entire document set. To enable this function, complete the following steps:

- Step 1. Open the Acrobat Reader application.
- Step 2. View Acrobat Reader help (press **F1**) for instructions on searching an index. There are various steps depending on the installed version of Acrobat Reader.
- Step 3. When prompted for an index file, navigate to the following directory: <CDROM DRIVE>\DOC\PDF and select **index.pdx**.
- Step 4. Follow the remaining instructions for using the index.

This procedure enables the full-text search function and you will not have to load the index again.

If you chose to install Microware OS-9 Documentation on your host system, you must reselect the index file in its location on your hard drive. You can also select and search multiple indexes in multiple locations.



The index search option is only available in the full version of Acrobat Reader.

Microware OS-9 Documents and Descriptions

This section provides a list and short description of the Microware OS-9 Documentation set.

Microware OS-9 Documentation

The Microware OS-9 documentation includes the following manuals:

Using OS-9

This manual is the basic user reference manual for OS-9. The manual discusses the file structure and utilities available for using OS-9, the advanced utilities, and topics of interest to system managers.

Using OS-9 Threads

This manual describes the Microware implementation of POSIX threads.

OS-9 Technical Manual

This manual is a high-level introduction to the technical aspects of OS-9. It is also a function call reference. The first seven chapters familiarize you with the OS-9 operating system. The remainder of the manual provides specific information about function calls, interprocess communication example code, and error messages.

OS-9 Technical I/O Manual

This manual is a supplement to the *OS-9 Technical Manual*. It provides further information to help you create new file managers and device drivers, and supplies examples that you can adapt to your specific system needs. A basic understanding of the OS-9 is assumed.

OS-9 Porting Guide

This manual describes porting OS-9 to custom hardware.

OS-9 Device Descriptor and Configuration Module Reference

This manual provides reconfiguration information for device descriptors and configuration modules.

Power Management Subsystem Specification

This manual describes power management policy as well as provides example sources enabling development of power aware device drivers and applications.

OS-9 for 68K Documentation

The OS-9 for 68K documentation includes the following manuals:

Using OS-9 for 68K Processors

This manual is the basic user reference manual for OS-9. The manual discusses the file structure and utilities available for using OS-9, the advanced utilities, and topics of interest to system managers.

OS-9 for 68K Processors Technical Manual

This manual describes four levels of OS-9 modularity, I/O processing, memory modules, and program modules. It is designed to be used with the *OS-9 for 68K Processors Technical I/O Manual*.

OS-9 for 68K Processors Technical I/O Manual

This manual is a supplement to the *OS-9 for 68K Technical Manual*. It provides further information to help you create new file managers and device drivers, and supplies examples that you can adapt to your specific system needs. A basic understanding of the *OS-9 for 68K Technical Manual* is assumed.

OS-9 for 68K Processors OEM Installation Manual

This manual describes how to install OS-9 on your host and target systems. It also describes building boot code and getting OS-9 up and running on your target.

OS-9 for 68K Processors BLS Reference

This manual provides information and instructions for installing OS-9 for 68K on a specified target from a Board Level Solution (BLS).

OS-9 for 68K PC File Manager

This manual provides information and instructions for the PC File Manager, which enables you to transfer files between your PC-DOS and OS-9 systems.

Power Management Subsystem Specification

This manual describes power management policy as well as provides example sources enabling development of power aware device drivers and applications.

Using TrueFFS for OS-9

This manual provides information and instructions to install, configure, and understand TrueFFS for OS-9. TrueFFS for OS-9 is a flash file system I/O component package that allows you to read and write to flash memory under OS-9 in the same way you use disk memory.

Networking/Communications

This group of documents describes the integrated communications and networking framework for OS-9. It includes the following manuals:

OS-9 Network Programming Reference

This guide describes the networking functions, utilities, and structures in detail.

Using SoftStax

SoftStax supports delivery of network multimedia data to applications and hardware devices. This manual explains the following:

- SoftStax architecture and design philosophy
- Open Systems Interconnect (OSI) Model for networking
- SoftStax components
- Various data transmission methods used by SoftStax
- SoftStax protocol stacking
- SoftStax driver conventions
- Creating library extensions
- mbuf facility installation and use of its functions

SoftStax Porting Guide

This guide explains how to write drivers in a SoftStax environment and provides information on porting SoftStax components and drivers to your delivery system.

Using LAN Communications

This manual provides information and instructions for LAN Communications. LAN Communications software is a TCP/IP suite that supports the following protocols: IP, TCP, UDP, ICMP, RIP, SLIP/CSLIP, and PPP. This package supports the BSD socket API and network /host functions for local or DNS client support.

Using Network File System/Remote Procedure Call

This manual provides information and instructions for using Network File System/Remote Procedure Call (NFS/RPC).

This product assumes that you are familiar with OS-9 real time operating system and NFS/RPC programming. It also assumes that you are using LAN Communications v3.2 or higher.

Graphics/Audio

Using MAUI

The Multimedia Application User Interface (MAUI) is an Application Programming Interface (API) that provides an extensive set of low-level graphical and communications services that can be used in interactive television decoders connected to telephone, cable, and wireless networks.

MAUI Programming Reference

This manual contains the functions and data types defined in MAUI. This includes syntax, a brief description, parameter definitions, errors, and cross-references to related information.

MAUI Porting Guide

This manual provides information and instructions for porting the MAUI environment to your hardware.

Using the Sound Driver Interface

The Sound Driver Interface enables MAUI applications to play and record sound data in various digital formats. The Sound Driver Interface uses the MAUI Multimedia File Manager and error codes, but is otherwise independent of other MAUI APIs. This manual provides instructions for adding play and record capabilities to your MAUI applications.

Development Tools

Getting Started with Hawk™

This manual provides an overview of the Hawk™ integrated development environment as well as a sample Hawk™ project.

Using Hawk

This manual provides information and instructions for using Hawk™ and customizing the Hawk interface.

Using Hawk Macros

This manual provides information and instructions for using the macros supplied with the Hawk Integrated Development Environment.

Using Ultra C/C++

Ultra C/C++ is an ANSI/ISO C compiler. It also tracks the ANSI/ISO C++ draft standard. It is designed for use with OS-9. Optimization algorithms are built into Ultra C/C++ to provide fast, efficient code for your real-time applications.

Ultra C Library Reference

This manual provides information about the functions provided in the C libraries for OS-9 systems.

Ultra C/C++ Processor Guide

This guide describes Ultra C/C++ support for various target processors.

Using RomBug

RomBug is a ROM resident debugger enabling debugging of OS-9 components. RomBug may alternatively be loaded in RAM.

Utilities Reference

This reference manual contains descriptions and examples of each of the OS-9 command programs. While the programs are generally executed from a shell command line, most may also be called from OS-9 programs.

Documentation by Common Task

OS-9 Application Programming

The documents in this section provide the fundamental information you need to use OS-9 and the development tools that come with it. The ordering of this section indicates the recommended sequence for using the documents, but feel free to change the sequence to best fit your needs.

- *Using OS-9* contains fundamental information about OS-9.
- *Using OS-9 Threads* contains information about the Microware implementation of POSIX threads.
- *Using Hawk™* contains information on using the Microware Hawk™ IDE.
- *Using Ultra C/C++* contains information on using the C/C++ compiler supplied with Microware Hawk™.
- *Using Hawk Macros* describes how to extend Microware Hawk™ using macro languages or DLLs.
- *Using LAN Communications* tells you how to program LAN network aware applications for OS-9.
- *Using MAUI* introduces you to the concepts behind graphics programming for OS-9.
- *Using SoftStax* tells you how to program network aware applications for OS-9.
- *Using Network File System/Remote Procedure Call* tells you how to program NFS/RPC applications for OS-9.

Documents for Porting OS-9 to Other Hardware

The following manuals describe how to port the various components of OS-9 to custom hardware.

- *OS-9 Porting Guide* provides the information you need to configure OS-9 to your hardware.
- *Using RomBug* tells how to use the ROM debugger.
- *OS-9 Device Descriptor and Configuration Module Reference* gives you information on OS-9 device descriptors.
- *MAUI Porting Guide* contains information on how to create MAUI graphics drivers for your hardware.
- *SoftStax Porting Guide* tells how to port Softstax to your custom hardware.

Reference Manuals

The manuals in this section provide reference information and advanced level topics for OS-9 and its components.

- *MAUI Programming Reference* describes the functions for the MAUI API.
- *OS-9 Technical Manual* provides a high-level introduction to the technical aspects of OS-9 and provides a function call reference.
- *Utilities Reference* describes the command line utilities supplied with OS-9.
- *OS-9 Network Programming Reference* describes the functions, structures, and utilities for SoftStax and LAN Communications.
- *Ultra C Library Reference* describes the functions available in the C library that is supplied with OS-9.
- *Ultra C/C++ Processor Guide* describes Ultra C/C++ support for various target processors.

Password-Protected Documentation

Some Microware OS-9 documentation, as well as some third-party documentation provided on the product CD, is password protected. These documents are installed to your host system during software installation. Password-protected documents, and the directories in which they are installed, are noted on the Microware OS-9 Documentation home page.

3

Customer Support

This chapter includes the following sections:

- [Comments About the Documentation](#)
- [Application Support Engineering](#)
- [Contacting RadiSys Support](#)

Comments About the Documentation

We are committed to providing you with the best documentation possible. If you have ideas for improving the documentation, please contact the Application Support Engineering Department at the following address:

RadiSys Corporation
Application Support Engineering
1240 Office Plaza Drive
West Des Moines, Iowa 50266

or contact the support engineers by emailing the following address:

os9support-us@radisys.com

In your email, please include the following information about the document:

- manual name
- revision
- chapter and page number, or copy of page

Application Support Engineering

RadiSys offers complete solutions to help you build your embedded systems projects. This includes an expert staff of experienced engineers and trainers that back up OS-9, the OS-9 development tools, and the component products.

If you need help installing, configuring, or using OS-9 or any RadiSys product during the warranty period, contact the support engineers in any of the following ways:

- Send your e-mail to os9support-us@radisys.com.
- Call 515-223-8000. The application support engineers are available from 8:00 AM to 6:00 PM CST.
- Visit the OS-9 Support page of the RadiSys Corporation web site to submit an Incident Report or report a problem using Microware **TECH-CHECK™**.
<http://www.radisys.com>

TECH-CHECK™

A state-of-the-art call tracking system, TECH-CHECK™, maintains a complete record of your product concerns and questions.

TECH-CHECK is a program wizard that asks a series of questions about your system, your questions/concerns, and your contact information. TECH-CHECK creates a text file, which can be mailed to os9support-us@radisys.com.

Access TECH-CHECK by selecting **Start -> Program Files -> RadiSys -> <Microware Product> -> TECH-CHECK** from your desktop. The TECH-CHECK opening screen is shown in [Figure 3-1](#).

Figure 3-1. Microware TECH_CHECK



Contacting RadiSys Support

The RadiSys Customer Support team consists of many technical support groups around the world. Contact information for each of these groups can be obtained at the RadiSys web site: <http://www.radisys.com>

