Paradyn Parallel Performance Tools

Installation Guide

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Table of Contents

1 Overview 3
1.1 Supported platforms 3
2 How to install Paradyn 4
2.1 Prepare a Paradyn directory and get the required files 4
2.2 Process installation files (unzip, untar) 5
2.3 Install Tcl/Tk 5
2.4 Running Paradyn with PVM 8
2.5 Set environment variables and path 8
3 Common installation errors 10

1 OVERVIEW

The Paradyn Parallel Performance Tools are available for research use free of charge via anonymous ftp. This Guide describes how to obtain, configure and install the binary version of Paradyn. A source code distribution is also available.

1.1 Supported platforms

The Paradyn process (front-end and user interface) can run on any of the workstation types listed in Figure 1. The workstations and parallel computers on which Paradyn can monitor programs are listed in Figure 2: Paradyn can also monitor application programs running on heterogeneous combinations of these platforms.

System Identifier	Description
sparc-sun-solaris2.4	Solaris operating system version 2.4 or greater, running on a SPARC processor.
i386-unknown-solaris2.5	Solaris operating system version 2.5 or greater, running on a Pentium x86 processor.
rs6000-ibm-aix4.1	AIX operating system version 4.1 or greater, running on a IBM RS6000 processor.

Figure 1: Platforms on which Paradyn (User Interface and visualizations) can run

System Identifier	Description
sparc-sun-solaris2.4	Solaris operating system version 2.4 or greater, running on a SPARC processor. (PVM support included.)
i386-unknown-solaris2.5	Solaris operating system version 2.5 or greater, running on a Pentium x86 processor. (PVM support included.)
i386-unknown-nt4.0	Windows/NT operating system version 4.0 or greater, running on a Pentium x86 processor.
rs6000-ibm-aix4.1	AIX operating system version 4.1 or greater, running on a IBM RS6000 processor. (PVM support included.) This version also supports the SP2 with IBM's POE MPI interface.

Figure 2: Platforms on which Paradyn can monitor application programs

Application programs written to run with PVM (version 3.3.11) can be monitored on the Solaris (SPARC & x86) and AIX systems using the standard Paradyn daemon for these platforms.

Section 2 describes the steps required to obtain and install Paradyn.

A list of common installation errors appears in Section 3.

2 HOW TO INSTALL PARADYN

This section describes the steps that should be followed to install a binary version of Paradyn on a Unix platform. The steps are: prepare a Paradyn directory and obtain the desired files (Section 2.1), process the installation archive files (Section 2.2), install Tcl/Tk scripts if necessary (Section 2.3), if you intend to run Paradyn with PVM programs perform an optional setup step (Section 2.4), and finally set environment variables and executables search path (Section 2.5).

The installation process for WindowsNT is similar, but will rely on the availability of Unix shell utilities under WindowsNT (such as those freely available from Cygnus) for the installation, or installation in a shared directory from a Unix platform. Note that only the Paradyn daemon for monitoring application processes running under WindowsNT and associated run-time instrumentation library are currently available, and that a Unix platform is therefore necessary as a Paradyn front-end: the Tcl/Tk script installation step (Section 2.3) is only relevant for the Unix platform(s). (Refer to the ***Paradyn User's Guide*** Section 2.6.4 for further information about configuring and running applications with Paradyn under WindowsNT.) WindowsNT-specific methods for installing files and appropriately setting the environment must otherwise be substituted for the Unix-style examples documented.

2.1 Prepare a Paradyn directory and get the required files

You are recommended to create a separate directory to install Paradyn and all of its associated files. If you already have a copy of Paradyn, you may wish to create a new directory for each release, otherwise different versions may get mixed up. With an installation directory already created, the next step is to grab the version(s) of Paradyn that match your system.

If you don't download Paradyn components from the appropriate section of our WWW pages, you can obtain Paradyn by anonymous ftp to `grilled.cs.wisc.edu`. Once logged in, you must move ("cd") to the directory `paradyn` where you will find several files (`README`, `LICENSE`, `solaris_sparc_2.1.tar.gz`, `solaris_x86_2.1.tar.gz`, `nt_x86_2.1.tar.gz`, and `aix_2.1.tar.gz`), plus sub-directories: `doc`, `etc` and `src`. The files contain the Paradyn binaries (executable files and libraries) for the platforms listed in Figure 1 and Figure 2 packaged as gzip'd tar archives: these binary packages also contain Paradyn test applications (sources and Makefiles in addition to executables) and the include files needed to build or interface your own tools. The `doc` directory contains gzip'd tar archives of the Paradyn manuals and programmer's guides (including the ***Paradyn User's Guide*** and this document) in both PostScript and PDF formats[1]. The `etc` directory contains some additional software Paradyn may require which you may not already have on your system. The `src` directory contains a gzip'd tar archive of the source code and Makefiles for building Paradyn.

To install a binary version of Paradyn, download the binary version that corresponds to your system (e.g. `solaris_sparc_2.1.tar.gz` for Sun SPARC workstations running the Solaris OS). For those interested, full source code for Paradyn release 2.1 is also available; download `src/paradyn_src_2.1.tar.gz`. (For further information on the source code organization and contents, please refer to the ***Paradyn Developer's Guide***).

1. PDF documents are designed for on-line reference and require the Acrobat reader (*acroread*), which is freely-available for many platforms, or a similar viewer such as newer versions of GhostView (*gv*).

To fetch the SPARC Solaris version of Paradyn, an ftp session might look as follows:

```
% ftp grilled.cs.wisc.edu
Name: anonymous
331 Guest login ok, send your complete e-mail address as password.
ftp> binary
200 Type set to I.
ftp> cd paradyn
ftp> get solaris_sparc_2.1.tar.gz
ftp> cd doc
ftp> get PDF_manuals.tar.gz
ftp> quit
```

2.2 Process installation files (unzip, untar)

Once you have obtained the appropriate files that match your platform (e.g., `sparc_solaris_2.1.tar.gz`) plus perhaps the documents distributed with Paradyn (e.g., `users_guide.tar.gz`), you need to *unzip* and *untar* these files to create the corresponding directory and file structure. For example:

```
% gunzip -c sparc_solaris_2.1.tar.gz | tar xvf -
% gunzip -c PDF_manuals.tar.gz | tar xvf -
```

After executing these commands, your local Paradyn directory should look like the one in Figure 3. Notice that the subdirectories *bin/sparc-sun-solaris2.4*, *lib/sparc-sun-solaris2.4*, *doc*, *include*, etc., have been created automatically by the *tar* command. A complete description of all the Paradyn files appears in Figure 4. (Optional DynInstAPI components are *`distinguished`*.)

2.3 Install Tcl/Tk

The user interface of Paradyn is based partially on the Tcl/Tk packages from Sun Laboratories. To run, Paradyn needs to find several files from Tcl version 8.0 and Tk 8.0. Two steps are needed. The first step, discussed in this section, is to obtain the necessary files. The second step (Section 2.5) is to set two environment variables which tell Paradyn where these files are located.

If you already have the appropriate versions of Tcl/Tk installed on your system, then you already have the necessary files. When you find out where these files are located (you can ask your system administrator where Tcl/Tk has been installed on your system), you are ready to set the necessary environment variables (see Section 2.5).

If you don't already have the appropriate version of Tcl/Tk installed on your system (this includes if you have a *newer* version), then you can obtain the needed files from Paradyn's ftp site: note that these are only the files Paradyn requires and not a full release of the Tcl/Tk package. The steps to take are:

1. Download the file `etc/tcltk80scripts.tar.gz` from the Paradyn ftp site (see Section 2.1).
2. `gunzip -c tcltk80scripts.tar.gz | tar xvf -`

Two directories (`tcl8.0` and `tk8.0`) containing the necessary files will be created. You can move these directories anywhere you wish; the location, however, is needed when setting the two environment variables (see Section 2.5).

The full Tcl and Tk packages are available at the URL: `http://sunscript.sun.com/`

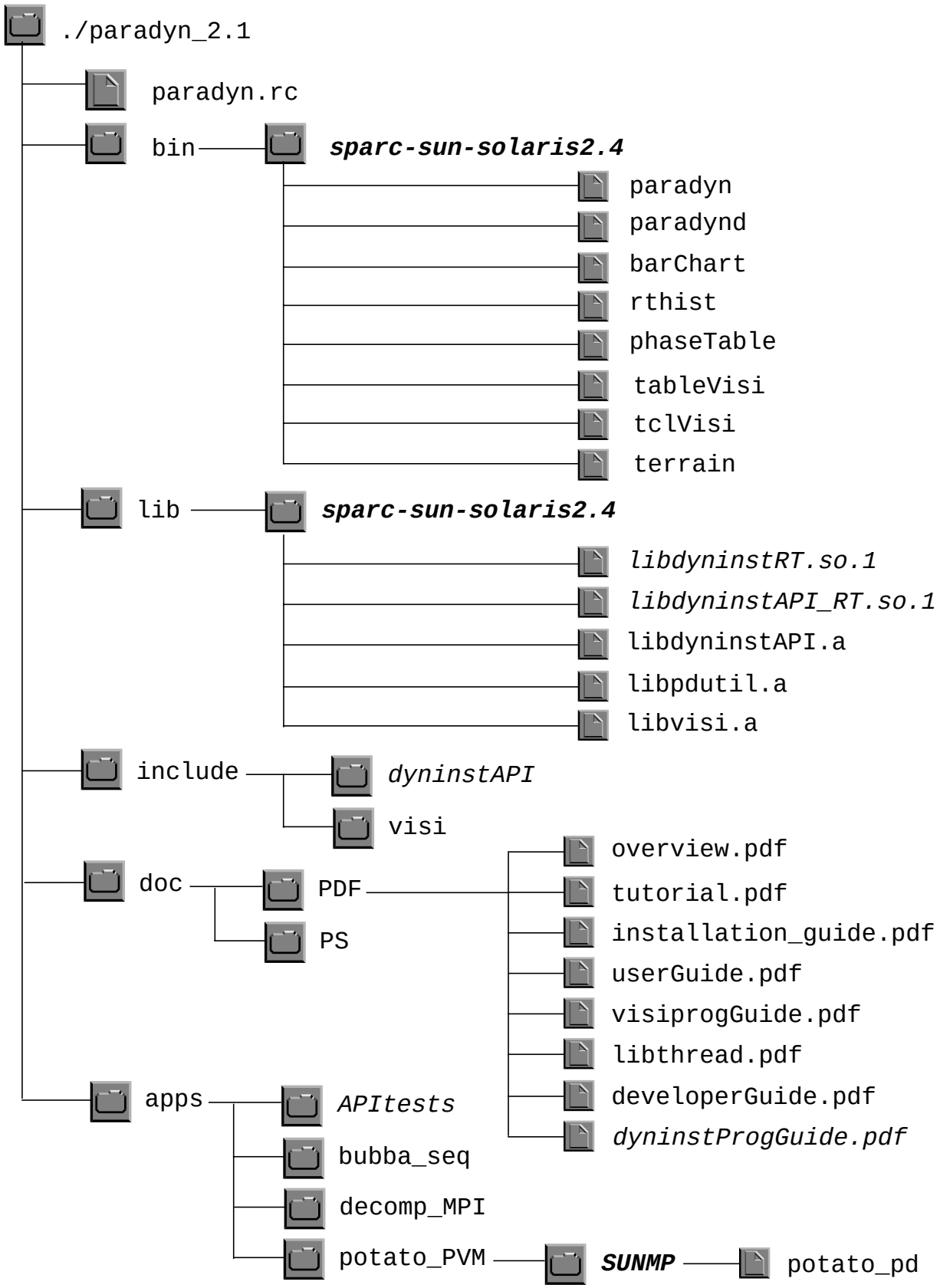

Figure 3: Paradyn directory structure (SPARC/Solaris binary release example)

File	Description
`paradyn`	Paradyn's front-end and main user-interface: starts Paradyn. *Note: currently unavailable for WinNT (along with visualizers*).
`paradynd` `paradynd.exe`	Paradyn's daemon: runs on every host or node where Paradyn is monitoring an application process. *(Including WindowsNT!)*
`paradyn.rc`	Paradyn configuration file containing default definitions for performance metrics and visualizations.
`barChart`	*BarChart* visualization process.
`phaseTable`	*PhaseTable* visualization process.
`rthist`	*Runtime Histogram* visualization process.
`tableVisi`	*Statistics Table* visualization process.
`terrain`	*3D Terrain* visualization process.
`libdyninstRT.so.1` `libdyninstRT.dll`	Paradyn's dynamically loaded run-time dynamic instrumentation library (shared object version): no application re-linking necessary. *Note: currently only available for SPARC-Solaris and WindowsNT.*
`libdyninstRT.o` *(x86-Solaris and AIX)*	Paradyn's run-time dynamic instrumentation library (static object version); re-link your application program with this library.

`DYNINSTstartCode.o`
`DYNINSTendCode.o`
(AIX only)
	These code block objects help Paradyn identify application code in the final executable. An application program's object files should be located between these two files in the (static) link command.

`DYNINST_EXPORTS` *(AIX only)*	List of Paradyn symbols which must be specified to be retained when (statically) linking application programs.
`tclVisi`	A Tcl interface to Paradyn's Visilib that allows programmers to use Paradyn performance data in Tcl applications. For more information, refer to the ***VisiLib Programmer's Guide***.
`libvisi.a` `include/visi/*.h`	Library API and include files used to build Visis which interface with Paradyn.

`libdyninstAPI`
`libdyninstAPI_RT`
`dyninstAPI/*.h`
	DynInstAPI libraries and include files distributed with Paradyn, but not needed when using Paradyn. For more information, refer to the ***DynInstAPI Programmer's Guide***.

`bubba/bubba_pd`	Sample sequential application program (for all current platforms).
`decomp/ssTwod`	Sample MPI application program (SP2/AIX platform only).
`potato/potato_pd`	Sample PVM application program used in the ***Paradyn Tutorial***.

Figure 4: Files provided with Paradyn

2.4 Running Paradyn with PVM

If you don't have PVM installed, and don't plan to use it, you can skip this section, which describes peculiarities associated with installing and running Paradyn with PVM programs. The Paradyn daemon process (`paradynd`) distributed in the binary release includes PVM-support built-in, but will also be used with (non-PVM) programs where PVM is not installed.

The PVM architectures supported by Paradyn are `RS6K` (rs6000-ibm-aix4.1 platform), `SUNMP` and `SUN4SOL2` (sparc-sun-solaris2.4), and `X86SOL2` (i386-unknown-solaris2.5). If your PVM architecture is not one of these, you will not be able to use Paradyn with PVM.

If you are running Paradyn with PVM you have to copy `paradynd` to the directory where you keep your PVM binaries. This directory is usually `$PVM_ROOT/bin/$PVM_ARCH`, or `$HOME/pvm3/bin/$PVM_ARCH`. You also need to copy the binaries of the PVM application you want to run with Paradyn to the same directory, e.g.:

```
% cp paradynd $HOME/pvm3/bin/$PVM_ARCH
% cp potato_pd $HOME/pvm3/bin/$PVM_ARCH
```

For the Solaris platform, two versions of the `paradynd` program are provided with PVM support built-in. The file `paradynd` is to be used with the `SUNMP` (multiprocessor) PVM architecture, and the file `paradynd.SUN4SOL2` is to be used with the `SUN4SOL2` (uniprocessor) PVM architecture. If you use the `SUN4SOL2` PVM architecture you need to copy the file `paradynd.SUN4SOL2` to the `$HOME/pvm3/bin/SUN4SOL2` directory renaming it to `paradynd`.

```
cp paradynd $HOME/pvm3/bin/SUNMP/paradynd
cp paradynd.SUN4SOL2 $HOME/pvm3/bin/SUN4SOL2/paradynd
```

2.5 Set environment variables and path

The following environment variables need to be set: `PARADYN_ROOT`, to tell Paradyn where to find the Paradyn Configuration File (*paradyn.rc*), `PLATFORM`, to indicate the hardware/software platform (see the "System Identifier" descriptions in Figure 1 and Figure 2 for a valid list of current values for `PLATFORM`), and `TCL_LIBRARY` and `TK_LIBRARY`, to tell Paradyn where Tcl/Tk scripts have been installed (see Section 2.3). Files in the `TCL_LIBRARY` directory include `init.tcl`, `parray.tcl`, and `tclIndex`, and files in the `TK_LIBRARY` directory include `button.tcl`, `dialog.tcl`, `entry.tcl`, `focus.tcl`, and several more.

Note that if a different version of Tcl/Tk has been installed on your system, then the environment variables `TCL_LIBRARY` and `TK_LIBRARY` may already be set. If you have to change their values in order to run Paradyn, you may wish to change them back after running Paradyn.

For SPARC-Solaris one more environment variable is required: `PARADYN_LIB`. This variable indicates the name (including the whole path) of the shared object version of the Paradyn run-time dynamic instrumentation library (e.g., `$HOME/pvm3/bin/SUNMP/libdyninstRT.so.1`), which you do not need to link with your application if you are running on this platform (see Section 2.3 of the ***Paradyn User's Guide*** for more details about this option).

Figure 5 has a summary of the commands that you need to type for several different UNIX shells. You will also need to add these commands to your shell configuration file (e.g., *.cshrc* if you are using *csh*). When you add these commands, remember to re-source (e.g. *source .cshrc*) your shell configuration file.

Operation: **Script commands:**

1. Setting `PARADYN_ROOT, PLATFORM, PARADYN_LIB, TCL_LIBRARY & TK_LIBRARY`:

csh, tcsh:

```
setenv PARADYN_ROOT ~/paradyn
setenv PLATFORM sparc-sun-solaris2.4
setenv PARADYN_LIBS $PARADYN_ROOT/lib/$PLATFORM
setenv PARADYN_LIB $PARADYN_LIBS/libdyninstRT.so.1
setenv TCL_LIBRARY ~/paradyn/tcl8.0
setenv TK_LIBRARY ~/paradyn/tk8.0
```

```
     Note: The actual values of TCL_LIBRARY and TK_LIBRARY you
     should use may differ, depending on where Tcl/Tk has been
     installed. See Section 2.3.
```

sh, ksh:

```
PARADYN_ROOT=$HOME/paradyn
PLATFORM=sparc-sun-solaris2.4
PARADYN_LIBS=$PARADYN_ROOT/lib/$PLATFORM
PARADYN_LIB=$PARADYN_LIBS/libdyninstRT.so.1
TCL_LIBRARY=$HOME/paradyn/tcl8.0
TK_LIBRARY=$HOME/paradyn/tk8.0
```

```
     Note: The actual values of TCL_LIBRARY and TK_LIBRARY you
     should use may differ, depending on where Tcl/Tk has been
     installed on your system: see Section 2.3.
```

```
export PLATFORM
export PARADYN_ROOT PARADYN_LIB
export TCL_LIBRARY TK_LIBRARY
```

2. Adding `paradyn` executables to your search path:

csh, tcsh:

```
set path=(~/paradyn/bin/sparc-sun-solaris2.4 $path)
```

sh, ksh:

```
PATH=$HOME/paradyn/bin/sparc-sun-solaris2.4:$PATH
export PATH
```

Figure 5: Examples of shell and environment variable operations for some UNIX shells

3 COMMON INSTALLATION ERRORS

Figure 6 is a list of common installation errors, with a description of the error and its possible cause which may help you in case you have problems during the installation process. If you have any problem that does not appear on this list or if you have any comments, please send us a detailed message at `paradyn@cs.wisc.edu`.

Error	Description	Possible solution
visi processes not available.	There are no visi processes defined in Paradyn.	Check the value of `PARADYN_ROOT` and make sure that it's set to where the file `paradyn.rc` is located.
paradyn: Command not found.	Cannot find or execute the `paradyn` executable.	Check the value of the `PATH` variable. Maybe `paradyn` is not in your command search path.
tcl_init() failed	Cannot start paradyn.	Check the value of environment variables `TCL_LIBRARY` and `TK_LIBRARY`, and make sure that they are pointing to the correct location. Also, make sure that you have the required versions of Tcl and Tk installed. For more information, see Section 2.3.
paradyn: Exec format error. Wrong Architecture.	Cannot start paradyn.	You are perhaps trying to start Paradyn using the executables for a different architecture. Check that you have got the binaries that match your platform.
paradyn: cannot create daemon process.	Cannot start paradynd.	`paradynd` may not be on your command search path. or you may be using a `paradynd` executable for a different platform. If you are using PVM, `paradynd` may not be in your `$HOME/bin/$PVM_ARCH` directory, or PVM may not be running.
`PARADYN_LIB` has not been defined for process	Cannot access runtime instrumentation library `libdyninstRT`.	The `PARADYN_LIB` environment variable should contain the whole path name of the library, which should also be readable (by any user if you are using PVM).
The dynamic link library `oncrpc.dll` could not be found on the path.	Cannot start paradynd.	When running on Windows NT, the RPC library `oncrpc.dll` should be installed and locatable on the environment `PATH`.

Figure 6: Common installation errors

■