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Organisation Européenne pour des Recherches Astronomiques dans l'Hémisphère Austral

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VERY LARGE TELESCOPE

TECHNICAL REPORT

on

YEAR 2000 Compliance,

Guidelines for VLT Control Software

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1.1	10/12/98	improved Inventory, test plan proposal.	

1 INTRODUCTION

1.1 PURPOSE & SCOPE

This document is intended to provide support to identify, avoid and/or possibly correct already existing problems connected to the change of century/millennium.

The scope of this document is restricted to the VLT control software & directly involved equipment. Are excluded peripheral components like telephone, faxes, networking equipment not directly part of the VLT Control system, ventilation systems, security systems, personal computers,....
Even though a lot of people and companies advertise that the year 2000 problem is larger than that (cf. SUN Microsystems statement below), we should reasonably concentrate, on a first attempt, to what is strictly concerning the daily operations of telescope number one, starting with an exhaustive inventory of all involved hardware & software items.

SUN Microsystems statement:
"Because the Year 2000 Problem exists beyond your business boundaries, it is a problem larger than your IT department. It must become a strategic management initiative. Support from the executive level is needed to ensure that all departments cooperate not only among themselves, but with suppliers, vendors and distribution channels to bring about mutual success. A central Year 2000 program office can help focus internal and external communications, coordinate testing and compliance, and manage external relationships."

1.2 APPLICABLE DOCUMENTS

The following documents, of the exact issue shown, form a part of this document to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered as a superseding requirement.

1.3 REFERENCE DOCUMENTS

The following documents are referenced in this document.

[1] A Definition of Year 2000-Conformity Requirements-Document: DISC PD2000-1/DISC is a part of the British Standards Institution/ BSI, 389 Chiswick High Road, London W4 4AL

WEB:

[2] www.year2000.com

[3] www.rdg.opengroup.org/public/tech/base/year2000.html

[4] Hewlett-Packard year 2000 home page: www.hp.com/year2000/

[5] SUN Microsystems year 2000 home page: www.sun.com/y2000/

[6] Sun Microsystems' Year 2000 Testing Guide URL: http://www.sun.com/y2000/testguide.html

[7] softbench year 2000 home page/download: http://www.ses.hp.com/softbench/y2kdnlod.html

[8] Application Binary Interface tool. Download page: http://www.sun.com/y2000/abi-download.html

[9] Scriptics: http://www.scriptics.com/Y2K.html

[10] NTP distribution site: http://www.eecis.udel.edu/~mills/y2k.htm

[11]

1.4 ABBREVIATIONS AND ACRONYMS

You may wish to add items to, or subtract items from the following list

The following abbreviations and acronyms are used in this document::

CCS	Central Control Software
GPS	Global Positionning Satellite System
HW	Hardware
I/O	Input/Output
ISO	International Standardisation Organisation
LAN	Local Area Network
LCC	LCU Common Software
LCU	Local Control Unit
N/A	Not Applicable
SW	Software
TBC	To Be Confirmed
TBD	To Be Defined
TCS	Telescope Control Software
UIF	(Portable) User Interface (Toolkit)
VLT	Very Large Telescope
WS	Workstation

1.5 GLOSSARY

2 OVERVIEW

For historical and economical reasons, dates have been often and are sometimes still processed, stored, displayed or printed using only two digits to represent the year. This is likely to produce wrong results for time related calculations once the value rolls over to 00 after 31/12/1999. In addition, there are potential bugs in the time related functions due to the fact that 2000 is a special case of leap year.

3 Y2000 Compliance

3.1 A DEFINITION OF YEAR 2000 CONFORMITY REQUIREMENTS [1]

Year 2000 conformity shall mean that neither performance nor functionality is affected by dates prior to, during and after the year 2000.
In particular:
Rule 1. No value for current date will cause any interruption in operation.
Rule 2. Date-based functionality must behave consistently for dates prior to, during and after year 2000.
Rule 3. In all interfaces and data storage, the century in any date must be specified either explicitly or by unambiguous algorithms or inferencing rules.
Rule 4. Year 2000 must be recognized as a leap year.

3.2 Definition of YEAR 2000 COMPLIANCE:

The following, established by HP on the basis of the BSI conformity requirements is considered (Aberdeen group) to be, now, one of the most stringent definitions:

A "Compliant" product accurately processes date data (including, but not limited to: calculating, comparing and sequencing dates), from, into and between the twentieth and twenty-first centuries, the years 1999 and 2000, and leap year calculations, when used in accordance with its product documentation, and provided all other products used in combination with the product properly exchange data with it.

A consequence of this definition is that in order for an application to be Y2000 compliant, all underlying layers must also be Y2000 compliant. The identified layers are:

1. Applications
2. Middleware
3. Operating environment
4. Network & security Software
5. Hardware & platform interfaces.

See Section5 for the mapping of the VLT software with the corresponding layers.

4 PROPOSED ACTIVITIES:

The year 2000 problem is not a new problem, and it has already been addressed by important hardware and software companies. It seems reasonable to follow an approach inspired from plans already applied by these companies. The text in italic hereafter reproduces a plan as originally proposed by HP, individuating five steps. Guidelines to apply it to the VLT Control software case are appended for each step.

4.1 Step One: Assess the situation

Begin with a comprehensive inventory of all software (proprietary and vendor-supplied), hardware, networks, databases, files, languages, utilities, and objects. Analyze programs, data maps, and modules to determine where date objects occur. Organizations using third-party applications must contact the company to find out what is being done to correct Year 2000 problems.

The following cases can be identified:

- embedded software, no access to source code or binary code. Y2K compliance should be requested to manufacturer.
- Binary code, no access to source code: use tools like Sun ABI[8] to identify date related function calls.
- Source code available: use tools like "Softbench Year 2000"[7] or "compat" to identify date data manipulation and date related function calls.

Mandatory Checklist for a Product to be Certifiably Compliant	
Basics	1. Data Structures within the Product a. Database Structure b. File System Structure c. Holding or Working Fields 2. Date Manipulation Routines 3. Called System Intrinsics 4. Date Comparison Routines 5. Date Fields on Report
Module Interfaces Internal Date Data Exchanges	6. Data Structures for Interfaces Inbound to each Module 7. Data Structures for Interfaces Outbound from each Module
Product Interfaces External Date Data Exchanges	8. Data Structures for Interfaces Inbound to the Product 9. Data Structures for Interfaces Outbound from the Product
Product Environment	10. Third-Party Utilities or tools used by/with the Product 11. Date Logic Embedded in the JCL or Run Logic of the Product

During this process, products which are found doing no date related processing can be automatically considered as year 2000 compliant.

4.1.1 Tools availability:

A new software module is being created: y2kt, to centralize the year 2000 related tools. In its first version, it contains :

- the SUN ABI product.
- a year 2000 dedicated compat configuration file.

Man pages are appended at the end of this document for reference, in section 8

4.2 Step Two: Develop a strategy

Develop a strategy to address the problem for each application. This includes the availability of time and resources, and determining the best strategy for specific applications. You can employ:

1.The Rework Strategy: The most common strategy. It includes custom programming to modify existing applications, managing patches applied to vendor packages, and converting data to work with enhanced applications. This approach takes advantage of existing programs. However, it may require expensive programming expertise and may be more difficult to test. It is also necessary to use a common approach with any interface programs.
This approach generally involves rewriting applications and expanding the date fields in the database to four digits, or rewriting applications to use the appropriate century in calculations based on the data characteristics. The risk of this option is that one may not catch all of the problems, even after the test phase, because testing may not catch every possible circumstance.
2.The Replacement Strategy: While more radical at an initial glance, this strategy offers an opportunity to enhance functionality and operational efficiency. This option is either to purchase or build a new system to fit the organization's business needs. With the replacement strategy, you can replace and optimize your system to fit your business needs now and in the future -- by replacing out-of-date applications with ones that use the latest technology and provide more robust functionality.

Once the critical points have been identified in the previous step, the module responsible shall examine the code and decide if a change is necessary according to the general rules below. An SPR shall be submitted for every necessary change. Proposed change and criticality shall be reported in the SPR to allow the SCCB to decide on an implementation date. **There should be no change before approval by an SCCB.**

General rules:

- Whenever the source code is available, the product shall be reworked to eliminate ambiguous date handling.
- Whenever the source code cannot be reworked, the necessary patches provided by the supplier shall be applied to the binary code to make it Y2K compliant.
- When the source code or the binary cannot be reworked, a Y2K compliant replacement product shall be used.

4.3 Step Three: Implement changes

Regardless of the various strategies chosen for the affected applications, ideally necessary changes should be implemented by the end of 1998 to allow sufficient time for testing.

The following critical points are already identified. For each of them, Year 2000 compliant changes are indicated.

4.3.1 Data structures and representations:

- The usage of struct **tm**, field **tm_year** is potentially dangerous. Use **ccsTIMEVAL** structures for LCC/CCS based applications or at least 32-bit signed or better unsigned **time_t** types. This will insure proper behavior until year 2038. (64 bits will be necessary later on!)
- Two digit year representation: yy-mm-dd is forbidden. Always use ISO 8601 standard: **ccyy-mm-dd** with the 4 digits format to express the year in all ASCII representation of a date.

4.3.2 Functions:

- **strptime()** and **getdate()** shall be avoided, in particular without the format specifier %Y(capital). Rather use CCS/tims functions with the following restrictions:
  - **timsTimeToString(3)** is not compliant, is now obsolescent and will become obsolete with OCT99 release. Use **timsTimeToIsoString(3)**
  - **timsStringToTime(3)** is not compliant, is now obsolescent, and will become obsolete with the OCT99 release. Use **timsIsoStringToTime(3)**

4.3.3 scripts:

- **date** command: avoid the %y (lowercase) specifier. Rather use the %Y(uppercase) one.
- **troff** scripts avoid formatting with \n(yr as yr will be a 2 digit year.
- **clock format** command for Tcl: avoid %y(lowercase) specifier. Use only %Y(uppercase).

4.3.4 Other system commands:

pay attention to the usage of the following commands:

- **date** should have been upgraded to accept optional century digits (%Y specifier accepted).
- **prs,get** will never accept century digits. They will rather use the rule that years in the range [69-99] refer to twentieth century while values within [00-68]refer to twenty-first one.
- **touch** is presently not always able to handle -t option with dates later than midnight January 1 2000 should be upgraded with OS patches.

To Be Completed...

4.4 Step Four: Testing

You will need to unit-and system-test the applications to ensure that the applications are Year 2000-safe and that interoperability between applications and/or modules function as required. However, it will be necessary to create a special time-based testing environment with time-sensitive scenarios to prevent the possibility of the loss of data or systems resources. There are several methods to create a closed environment for time-sensitive testing. A logical partition can be created in which the system date is changed or tools are used *to provide time simulation. A more controlled approach is to use a separate system for Year 2000 testing. A dedicated environment is recommended for testing because it provides more time and capacity and won't interfere with the operational system.*

Unit testing:
Modular tests of individual, critical modules (tims, scan, msg,...) shall be run on dedicated systems and repeated for the different critical dates identified in the test cases indicated later in this section. Test shall be performed both for CCS & CCS_LITE configurations.
System testing:
A complete system based on the Control model, including WS, LCUs, Time server, networking equipment shall be used to test the proper behavior of the complete VLT software for the same set of critical dates.

CAUTION:
Since manipulation of the system time is not an innocent operation, serious problems might occur.

- Hardware dedicated to the tests shall be exclusively reserved for that usage.
- Whenever the date command is used to change the system time, be careful of any cron jobs and processes running during the time change. In particular, shutdown CCS environments before any date change.
- During the tests, don't enable password aging on the test systems.
- During tests, avoid mounting home directories or other writeable NFS directories, restrict to the minimum necessary for the tests.
- Once the tests are finished, delete files touched during tests, and having arbitrary dates in the future.
- It might also turn necessary to reformat the disks used for the tests and re-install the Operating system.

For simple applications dealing with time only through the CCS tims functions, use the tims built-in simulation capabilities.

The following table, proposed by HP lists the mandatory test cases.

Mandatory Test Cases for a Product to be Certifiably Compliant	
Dec. 31, 1998 to Jan. 1, 1999	Test for border line (beginning and ending of a year) for year prior to Year 2000 System Rollover in both powered-up and powered-down states, or Program rollover in both executing and non-executing states.

Mandatory Test Cases for a Product to be Certifiably Compliant	
Sept. 9, 1999 to Sept 10,1999	Tests related to 9-9-99 System rollover in both powered-up and powered-down states, System date can be set to before date. System re-initializes from cold start on before date, or Program rollover in both executing and non-executing states. Program retrieves/accepts before date in executing state. Program re-initializes from non-executing state on before date.
Dec. 31, 1999 to Jan. 1, 2000	Test for critical transition of 1999 to 2000 System rollover in both powered-up and powered-down states, System date can be set to both before and after dates. System re-initializes from cold start on both before and after dates, or Program rollover in both executing and non-executing states. Program retrieves/accepts both before and after dates in executing state. Program re-initializes from non-executing state on both before and after dates.
Feb. 28, 2000 to Feb. 29, 2000	Test to verify Year 2000 is identified as a leap year System rollover in both powered-up and powered-down states, System date can be set to after date. System re-initializes from cold start on after date, or Program rollover in both executing and non-executing states. Program retrieves/accepts after date in executing state. Program re-initializes from non-executing state on after date.
Feb. 29, 2000 to Mar 1, 2000	Another Year 2000 leap year test System rollover in both powered-up and powered-down states, or Program rollover in both executing and non-executing states.
Dec. 31, 2000 to Jan. 1, 2001	Test for transitionfrom 12-31-00 to 1-1-1 System rollover in both powered-up and powered-down states, or Program rollover in both executing and non-executing states.

4.5 Step Five: Redeployment of Applications

Finally, you will need to redeploy each corrected and/or new application into the production environment, converting the data if appropriate. In some instances, it may be necessary to install bridges to allow co-existence between four-digit and two-digit data. Where functionality improvements have been made to the *applications, it is important that adequate training is planned for and implemented.*

Enough time and resources shall be allocated for that activity at the observatory(ies?). In case part of the hardware or software could not be certified during tests, impossibility to get the proper test setup for example, dedicated test sessions shall be organized. backward incompatibilities due to change of date format (2-> 4 digits) shall be addressed during installation to avoid any inconsistency in the collected data (logs and others)

5 Inventory:

In this first release of the document, the inventory is still in a preliminary stage, containing only information that could be gathered by that time. Manufacturers statements, and whenever possible addresses where to find necessary patches are also mentioned.
It should be noted that the statements are reported as given at the date this document is written. It is not excluded that new problems are discovered later and new patches will be made available. A regular follow up of the status published by the different companies should take place.

5.1 Hardware & platform interfaces:

5.1.1 HP

“HP encourages customers to be fully aware of the potential impact that the Year 2000 could have on their business environment and their ability to compete in the 21st century. HP also encourages its customers to take responsibility for addressing needed changes as quickly as possible. HP has made every effort to ensure the accuracy of our product testing. However, because each customer’s environment is different from HP’s laboratory test environment, it is the customer’s responsibility to validate the Year 2000 readiness of these products in their own environment. Therefore, information about the Year 2000 status of HP products is provided “as is” without warranties of any kind.”

5.1.1.1 HP 9000 Servers

Systems Tested and Year 2000 Compliant	Systems Will Not Be Tested For Compliance (End of Support Date)
840S, 850S, 855S, 860S, 870S, 890 822S, 832S, 842S, 852S 8X7S D-, E-, F-, G-, H-, I-, K-, T- and V-Class	808S, 815S (7/97) 825S, 835S/SE, 845S/SE, 635S, 645S (11/98)

5.1.1.2 HP 9000 Workstations

Systems Tested and Year 2000 Compliant
Model 705 (all configurations) Model 710 (all configurations) Model 712 (all configurations) Model 715 (all configurations Model 720 (all configurations) Model 730 (all configurations) Model 750 (all configurations) Model 725 (all configurations) Model 735 (all configurations) Model 755 (all configurations) HP B-Class (all configurations) HP C-Class (all configurations) HP J-Class (all configurations) Model 742 VMEbus Board Computer Model 743 VMEbus Board Computer Model 744 VMEbus Board Computer Model 745 Modular Workstation Model 747 Modular Workstation Model 748 Modular Workstation Model 362 Modular Workstation Model 382 Modular Workstation

5.1.2 SUN:

A list of compliant products and possibly needed upgrades is maintained by SUN Microsystems at the following URL: http://www.sun.com/y2000/cpl.html
Part of that list concerning the SUN hardware is reproduced hereafter.

“DISCLAIMER:
This table is based on current plans and estimates. Accordingly, the table and the options stated are subject to change in the future at Sun's discretion.”

SUN Year 2000 Compliance Status Codes:	
1	Defines a product that was Year 2000 compliant at the time of release. Sometimes free modifications may be needed after release.
2	Defines a product that requires Year 2000 modifications for Year 2000 compliance.
3	Product under review
4	Year 2000 Non-Compliant-Upgrade/migrate to a Year-2000 Compliant Product.

Product Name/Description	Version	Year 2000 Compliance Status	Comments
Sun 3 Series	All	Not Supported	
***Products below require a y2000 compliant version of a Solaris Operating System			
Sun 4 Series (Not supported after Solaris 2.4)	4/1XX, 4/2XX, 43XX, 4/4XX	1	
SPARCstation Series	1, 1+, 2, Classic, ELC, IPC, IPX, LX, SLC, 4, 5, 10, 20, 630MP, 670MP, Voyager	1	*600 Series not supported after Solaris 2.5.1
SPARCserver Series	1, 1+, 2, ELC, IPC, IPX, LX, SLC, 4, 5, 10, 20, 630MP, 670MP, 690MP	1	*600 Series not supported after Solaris 2.5.1

Product Name/Description	Version	Year 2000 Compliance Status	Comments
SPARCserver Series	1000, 1000E	2	Requires PROM Version 2.31 or later. Call 1-800-USA-4-SUN Kit p/n Order In Stock NAFO FRU: 560-1962-07
SPARCcenter 2000, 2000E	All	2	Requires PROM Version 2.31 or later. Call 1-800-USA-4-SUN Order In Stock NAFO FRU: 560-1962-07
Ultra Series	1, 2, 5, 10, 30, 60	1	
Sun Enterprise Series (Ultra Enterprise Series)	1, 2, 150, 250, 450, 10000, 5S, 10S (including HPC versions)	1	
Sun Enterprise Series (Ultra Enterprise Series)	3000, 4000, 5000, 6000, 3500, 4500, 5500, 6500, (including HPC versions)	2	Patch required only for systems w/PROM Version. 3.2.9 or earlier. Patch ID 103346-08
X Terminal Series	All	1	

5.2 Other hardware devices:

5.2.1 LCU Boards:

- Tim board is compliant.
- CPU Board has a time-of-day clock. This is not used by VxWorks nor internally at ESO.
- The other borads do not use time.

5.2.2 GPS Receiver & Time standard:

The GPS receivers should not be sensitive to the year 2000 rollover since that date is nothing particular for them. However, there is an earlier date presenting a risk : the night from 21/08/99 to 22/

08/99 during which the GPS Week Number will rollover from 1023 to 0.
The GPS receivers in use at ESO are of 2 different production types. The newest ones, still in Garching (Control model, NTT Spare) are said to have no problem with the GPS week 1024 rollover, while the others, in use at Paranal (VLT +VLT spare) and La Silla (NTT) are NOT yet compliant. In addition, both types include firmware developed specially for ESO to handle MJD calculation and distribution. This firmware shall be tested for the different Y2K critical dates.

5.2.3 Networking equipment:

The Bay-Networks Y2K statement about the Baystack ethernet fibre hubs, including the incorporated Network Management Module, as used in Paranal and the Control Model is:

The product does not contain clock feature, no year 2000 issues.

5.3 Network & Security Software:

To Be Completed

5.4 Operating Environment:

5.4.1 HP-UX

"HP-UX 11.0, 10.20, 10.10 and 10.01 are all Year 2000 Compliant with customer action. All of these releases require the customer to install Year 2000 patches to be compliant. These Year 2000 patches are available to all customers regardless of whether or not they have support agreements. Please see the HP-UX Patch Information site for the latest information on patches.
Through our testing process we have identified issues that require patches for HP-UX 11.00, and additional patches for 10.20, 10.10 and 10.01. As we continue to work with our labs, we may find additional patches necessary, and we will make this information available to customers via the HP-UX Patch Information site. This web site will have a registration process so that you can automatically receive any significant patch updates...."

HP maintains on the web a list of Year 2000 patches necessary for the different HP-UX releases reachable at the following URL:
http://www.software.hp.com/products/Y2K/corelist.html

"IMPORTANT HP-UX 9.0x Assessment
Hewlett-Packard's Support Life Policy for HP-UX provides full support for the current release and last major release. In accordance with this policy, HP-UX 9.xx will not be made Year 2000 compliant. The only way for customers on these releases to ensure their HP 9000 servers will continue to operate properly in the Year 2000 is to upgrade to a compliant version of the HP-UX operating system. The recommended upgrade paths are to HP-UX 10.20 (with patches required) and HP-UX 11.00 (with patches required) for servers. Customers may also upgrade to HP-UX 10.10 or 10.01, which are also Year 2000 compliant. However, these earlier HP-UX releases do not provide all of the advantages of large file system support or 64-bit features introduced in the later HP-UX releases. As a reminder, be aware that all HP-UX 10.x and 11.00 releases require customers to install patches to be compliant."

5.4.2 SUN OS

"First of all, Year 2000 enhancements are available for many Sun products at no additional cost to customers under a service contract for systems and software products. For example, we offer several Year 2000 compliance options without forcing you to upgrade to the latest version of the Solaris Operating Environment. Solaris 2.6 products are Year 2000 compliant with free enhancements. Earlier versions of Solaris - 2.3, 2.4, 2.5, and 2.5.1, as well as SunOS 4.1.3_u1 Version B and SunOS 4.1.4, are all Year 2000 compliant with enhancements available at no charge to customers with service contracts. "
Check the following URL for Patches to be applied:
http://www.sun.com/y2000/solaris.html

5.4.3 VxWorks/Tornado

VxWorks/Tornado is declared already fully year 2000 compliant.

5.4.4 To Be Completed ......

5.4.5 VLT Software development environment:

GNU Tools, compilers, languages, cmm,.....
To Be Completed and Certified.

- Tcl 7.6p2 (as in OCT 98 release) is Y2K compliant. (Source: Scriptics [9])

5.5 Middleware:

5.5.1 RTAP/Plus

HP Certifies RTAP To be Year 2000 Compliant since version 6.6 (included) both on HP & SUN platforms. No need for any Patch. Dates with year expressed with only 2 digits format are interpreted according to the X/Open CAE Specification: values in the range [00-68] refer to the twenty first century, while values in the range [69-99] refer to the twentieth century.

5.5.2 CCS

Not yet year 2000 Compliant:

Obsolescent functions in the tims module will be kept until last release of 1999. However they won't be certified year 2000 compliant. By default, their prototypes won't be accessible during compilation. Users will have to explicitely request them by the mean of a non compliance compilation flag.
obsolete functions to be removed from tims module. some output formats for dates in the logging system still using 2 digits only for year field.

5.5.3 LCC

No yet Year 2000 Compliant.
Some obsolete functions to be removed. Output formats in error logs and normal logs using 2 digits for year. Time handling functions and some db functions also using 2 digits for year. Functions db-DeToStr and dbStrToDe not compliant.

5.5.4 Drivers

The tim driver is the only one using the time-of-day concept, and it is Year 2000 compliant.

5.5.5 NTP

The NTP distribution site publishes a year 2000 conformance document[10] concluding:
".....that incorrect time values due to the NTP timescale, protocol design and reference implementation are highly unlikely. However, it is possible that external reference time sources used by NTP could misbehave and cause NTP servers to distribute incorrect time values to significant portions of the Internet. "
As a consequence, the time distribution system should be carefully checked. The tests shall include both configurations: when driven by the GPS receiver acquiring satellite data and also when running on the local backup time standard.

5.5.6 UIF Tools

To Be Certified.

5.5.7 RTD

To Be Certified.

5.5.8 To Be Completed ....

5.6 Applications

This title covers the rest of the VLT Control software together with the instrumentation software
To Be completed and certified.

6 CONCLUSION

It is important to note that products like the newest recent releases of HP & SUN operating systems, supposed to be Y2K compliant at delivery time, have shown weaknesses lately discovered, leading to the necessity of patches. The Year 2000 compliance problem is not (yet) a frozen process. A continuous monitoring of activities in that domain shall be organized, and a follow up of new patches to be applied or newly discovered critical points regularly performed.

7 TEST PLAN

7.1 Setup:

The test setup shall be as independant as possible. In particular remotely mounted directories shall be avoided. A dedicated network shall be established connecting the following components:
2WS (1 HP & 1 SUN) configured and updated with the latest Y2K patches for the OS.
2 X-terminals
1 DAT to import/export software.
1 LCU with TIMS board and 1 without.
1 GPS receiver not fed by the antenna signal.
VLT Software shall be installed both for full CCS & CCS_Lite versions (2 different users). Year 2000 modified versions of the modules shall be taken.

7.2 Test Strategy:

Time is always UTC. The tables hereafter identify the different tests to be performed. Some of the dates given in the table of mandotory dates(See above, section4.4) are not relevant for us, and they are simply ignored, while an extra date due to GPS peculiarities, has been introduced. It might be convenient, for practical reasons to perform the tests in a different sequence. e.g. group tests of the different modules regarding a given date. This will minimize necessary software re-installation possibly due to system time manipulation. However, the complete sequence of critical dates shall be tested at least twice, with a software re-installation(possibly including disk clean-up and OS re-installation) between both sequences.
Considering the time necessary to run the complete set of modular tests, the proposed strategy is the following:
Day 1; 10:00 Set GPS & WS sytem time to Critical Date 0:00. WS time has also to be manually set, since ntp won't syncronize if the difference between actual WS time and Time server is too big. Then start running the modular tests for the rest of the day.
Day 2 at 10:00, the critical rollover will occur. Any necessary monitoring of what happen during the rollover shall be ready to catch the event. After that, the complete set of Modular tests is run again for the date after the rollover. Once the test has passed, the set-up is shutdown, powered down and restarted to run again the set of tests. Due to time constraints, it might be impossible to run again the complete set of tests. In that case, a subset of critical tests verifying correct restart must be defined and executed.
The process is repeated over the next two days for the next critical date. For some dates, it is possible to use the test after rollover as a valid test before the rollover for the following critical date.

7.3 Test Cases

7.3.1 GPS Receiver:

No	Condition	Observation
1.1	Set manually GPS to 1999-08-21 23:59:00 or earlier if necessary for check.	Observe distributed date & time and verify GPS week 1024 rollover: Day before shall be 1999-08-21, MJD = 51411.xxx Day after shall be 1999-08-22, MJD = 51412.yyy Verify also no time glitch during transition (ProcedureTBD Indication “Set manually)
1.2	Set manually GPS to 1999-12-31 23:59:00	Observe distributed date & time and verify Y2K rollover: Day before shall be 1999-12-31, MJD = 51543.xxx Day after shall be 2000-01-01, MJD = 51544.yyy
1.3	Set manually GPS to 2000-02-28 23:59:00	Observe distributed date & time and verify Y2K is a leap year: Day before shall be 2000-02-28, MJD = 51602.xxx Day after shall be 2000-02-29, MJD = 51603.yyy
1.4	Set manually GPS to 2000-02-29 23:59:00	Observe distributed date & time and verify Y2K is a leap year: Day before shall be 2000-02-29, MJD = 51603.xxx Day after shall be 2000-03-01, MJD = 51604.yyy
1.5	Set manually GPS to 2000-12-31 23:59:00	Observe distributed date & time and verify rollover: Day before shall be 2000-12-31, MJD = 51909.xxx Day after shall be 2001-01-01, MJD = 51910.yyy

N.B: It is obviously not possible to perform these tests while the receiver gets signals from the satellites. The test validity is thus restricted to the stand-alone mode.
The test shall be repeated on both versions of GPS receivers: Garching and LaSilla/Paranal.

7.3.2 Tims module:

This test verifies proper behavior of both tims & timer functionalities. The simulation capabilities of the tims module are used, if necessary. Given set time is just an indication. Obviously, enough margin shall be taken twhen setting time to allow for verification before the observed rollover. Indication “Set manually time..” refer to the procedure of setting both GPS time distribution system & WS time to the same time, and wait for proper operations of ntp synchronization.

No	Condition	Observation
2.1	Run tims modular test for a date before 2000-01-01	Verify proper behavior of tims module.
2.2	Run tims modular test for a date after 2000-01-01	Verify proper behavior of tims module.
2.3	Set manually time to 1999-12-31 23:59:00:	Observe reported date & time and verify Y2K rollover: Day before shall be 1999-12-31 Day after shall be 2000-01-01
2.4	Set manually time to 1999-12-31 23:55:00:	
	Request timer periodic activation of a task	Verify that periodicity is respected across rollover
	Request one shot activation of a task at date “2000-01-01 00:00:01”	Verify that task is activated on second 01 after rollover
2.5	Set manually time to 2000-02-28 23:59:00	Observe reported date & time and verify Y2K is a leap year: Day before shall be 2000-02-28, Day after shall be 2000-02-29
2.6	Set manually time to 2000-02-28 23:55:00	
	Request timer periodic activation of a task	Verify that periodicity is respected across change of day
	Request one shot activa tion of a task at date “2000-02-29 00:00:01”	Verify that task is activated on second 01 after change of day
	Request one shot activa tion of a task at date “2000-03-01 00:00:01”	Verify that task is NOT activated on second 01 after change of day

No	Condition	Observation
2.7	Set manually time to 2000-02-29 23:59:00	Observe reported date & time and verify Y2K is a leap year: Day before shall be 2000-02-29, Day after shall be 2000-03-01.
2.8	Set manually time to 2000-02-29 23:55:00	
	Request timer periodic activation of a task	Verify that periodicity is respected acrosschange of day
	Request one shot activa tion of a task at date “2000-03-01 00:00:01”	Verify that task is activated on second 01 after change of day
2.9	Set manually time to 2000-12-31 23:59:00	Observe reported date & time and verify rollover: Day before shall be 2000-12-31 Day after shall be 2001-01-01

7.3.3 Scan system:

Verify scanning across Y2000 Rollover.
Points to be verified:

- Scan on change still performed after rollover.
- Poll periods respected.

7.3.4 ccs

Verify continuity of environments across rollover & proper shutdown/startup after rollover. Check both ccs log & rtap_log files

7.3.5 Logging system

Verify proper handling of log files (backup & archiving) across rollover.

7.3.6 Other CCS modules:

Verify modular test OK for dates before & after rollover.

7.3.7 LCC:

Verify modular tests OK for dates before & after rollover.

7.3.8 VCC & TAT

The functionality of these two facilities is implicitely tested (How complete?) with the other modular tests.

7.3.9 CMM

7.3.10 TCS

Once all modular tests for intermediate layers will be OK, the VLT software will be installed on the control model for testing applications like TCS.

8 Appendix: Tools man pages

NAME
  y2kt - Year 2000 tools for VLT-SW

SYNOPSIS
  y2000 <dirname>...
  y2000_usage <dirname>...
  compat JAN2000 <filename>...

DESCRIPTION
  ABI for Sun
    Sun's ABI (application binary interface) tool offers automated identification of a program's executables and associated shared objects that may have date handling errors related to the Year 2000 compliance.
    ABI has 2 utilities:
      y2000
        makes a report of the binaries that have dependencies on a group of time related functions.
      y2000_usage
        makes a report of the binaries that have dependencies on a group of time related functions with dangerous arguments or format srings.

  compat
    The generic compat utility is used for the Year 2000 issue through the configuration file compat.JAN2000.config, searching a group of time related functions and data types in the sources files specified.

INSTALLATION
  ABI for Sun
    From the shell command line, type:
      sh y2000_install.sh
    in the directory where the file y2000_install.sh is (y2kt/src).
    Accept the default answers and the disclaimer in the installation procedure.
  compat

ENVIRONMENT
  ABI for Sun
    The bin directory of the y2000 package (default /var/tmp/Y2000/bin) has to be included in the PATH variable.
  compat
    The file compat.JAN2000.config must be present in one of these directories:
      [pwd]

[pwd]/../config
[pwd]/config
$INTROOT/config
$VLTROOT/config

EXAMPLES

ABI for Sun

y2000 my_module/bin
y2000_usage my_module/bin

compat

compat JAN2000 my_module/src/*
find ~/VLTSW -path '*/src/*' -exec compat JAN2000 { } \; > compatresult

SEE ALSO

ABI for Sun

"doc" and "man" subdirectories of the y2000 package
http://www.sun.com/y2000/tools.html

compat

compat man page

BUGS

compat

One of the time related functions included in the compat.JAN2000.config file is named "time", producing a high rate of false alarm during the search of a source file, since the string "time" is plentiful.

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Last change: 11/11/98-14:14

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