



# Certification Report

**Bundesamt für Sicherheit in der Informationstechnik**

**BSI-DSZ-CC-0274-2004**

for

**Red Hat Enterprise Linux WS**  
Version 3, Update 3  
with eal3-certification package

from

**Red Hat Incorporated**

sponsored by

**Hewlett Packard Company**





## Deutsches IT-Sicherheitszertifikat

erteilt vom  
Bundesamt für Sicherheit in der Informationstechnik



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in der Informationstechnik

**BSI-DSZ-CC-0274-2004**

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Common Criteria Arrangement

The IT product identified in this certificate has been evaluated at an accredited and licensed/ approved evaluation facility using the *Common Methodology for IT Security Evaluation, Part 1 Version 0.6, Part 2 Version 1.0* extended by CEM supplementation "ALC\_FLR – Flaw remediation", Version 1.1, February 2002 for conformance to the *Common Criteria for IT Security Evaluation, Version 2.1 (ISO/IEC 15408:1999)* and including final interpretations for compliance with Common Criteria Version 2.2 and Common Methodology Part 2, Version 2.2.

#### **Evaluation Results:**

PP Conformance: **Controlled Access Protection Profile (CAPP), Issue 1.d, 08.10.1999**

Functionality: **CAPP conformant plus product specific extensions  
Common Criteria Part 2 extended**

Assurance Package: **Common Criteria Part 3 conformant  
EAL3 augmented by ALC\_FLR.3 (Systematic flaw remediation)**

This certificate applies only to the specific version and release of the product in its evaluated configuration and in conjunction with the complete Certification Report.

The evaluation has been conducted in accordance with the provisions of the certification scheme of the German Federal Office for Information Security (BSI) and the conclusions of the evaluation facility in the evaluation technical report are consistent with the evidence adduced.

The notes mentioned on the reverse side are part of this certificate.

Bonn, 23<sup>rd</sup> September 2004

The President of the Federal Office  
for Information Security



SOGIS-MRA

Dr. Helmbrecht

L.S.

**Bundesamt für Sicherheit in der Informationstechnik**

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The rating of the strength of functions does not include the cryptoalgorithms suitable for encryption and decryption (see BSI Section 4, Para. 3, Clause 2)

This certificate is not an endorsement of the IT product by the Federal Office for Information Security or any other organisation that recognises or gives effect to this certificate, and no warranty of the IT product by the Federal Office for Information Security or any other organisation that recognises or gives effect to this certificate, is either expressed or implied.

## Preliminary Remarks

Under the BSIG<sup>1</sup> Act, the Federal Office for Information Security (BSI) has the task of issuing certificates for information technology products. Certification of a product is carried out on the instigation of the vendor or a distributor, hereinafter called the sponsor.

A part of the procedure is the technical examination (evaluation) of the product according to the security criteria published by the BSI or generally recognised security criteria.

The evaluation is normally carried out by an evaluation facility recognised by the BSI or by BSI itself.

The result of the certification procedure is the present Certification Report. This report contains among others the certificate (summarised assessment) and the detailed Certification Results.

The Certification Results contain the technical description of the security functionality of the certified product, the details of the evaluation (strength and weaknesses) and instructions for the user.

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<sup>1</sup> Act setting up the Federal Office for Information Security (BSI-Errichtungsgesetz, BSIG) of 17 December 1990, Bundesgesetzblatt I p. 2834

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Part A: Certification

Part B: Certification Results

Part C: Excerpts from the Criteria

## A Certification

### 1 Specifications of the Certification Procedure

The certification body conducts the procedure according to the criteria laid down in the following:

- BSIG<sup>2</sup>
- BSI Certification Ordinance<sup>3</sup>
- BSI Schedule of Costs<sup>4</sup>
- Special decrees issued by the Federal Ministry of the Interior (Bundesministerium des Innern)
- DIN EN 45011 standard
- BSI certification: Procedural Description (BSI 7125)
- Common Criteria for IT Security Evaluation (CC), Version 2.1<sup>5</sup>
- Common Methodology for IT Security Evaluation (CEM)
  - Part 1, Version 0.6
  - Part 2, Version 1.0
- BSI certification: Application Notes and Interpretation of the Scheme (AIS)
- CEM supplementation on “ALC\_FLR – Flaw remediation”, Version 1.1, February 2002

The use of Common Criteria Version 2.1, Common Methodology, part 2, Version 1.0 and final interpretations as part of AIS 32 results in compliance of the certification results with Common Criteria Version 2.2 and Common Methodology Part 2, Version 2.2 as endorsed by the Common Criteria recognition arrangement committees.

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<sup>2</sup> Act setting up the Federal Office for Information Security (BSI-Errichtungsgesetz, BSIG) of 17 December 1990, Bundesgesetzblatt I p. 2834

<sup>3</sup> Ordinance on the Procedure for Issuance of a Certificate by the Federal Office for Information Security (BSI-Zertifizierungsverordnung, BSIZertV) of 7 July 1992, Bundesgesetzblatt I p. 1230

<sup>4</sup> Schedule of Cost for Official Procedures of the Federal Office for Information Security (BSI-Kostenverordnung, BSI-KostV) of 29th October 1992, Bundesgesetzblatt I p. 1838

<sup>5</sup> Proclamation of the Federal Ministry of the Interior of 22nd September 2000 in the Bundesanzeiger p. 19445

## 2 Recognition Agreements

In order to avoid multiple certification of the same product in different countries a mutual recognition of IT security certificates - as far as such certificates are based on ITSEC or CC - under certain conditions was agreed.

### 2.1 ITSEC/CC - Certificates

The SOGIS-Agreement on the mutual recognition of certificates based on ITSEC became effective on 3 March 1998. This agreement was signed by the national bodies of Finland, France, Germany, Greece, Italy, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom. This agreement on the mutual recognition of IT security certificates was extended to include certificates based on the CC for all evaluation levels (EAL 1 – EAL 7).

### 2.2 CC - Certificates

An arrangement (Common Criteria Arrangement) on the mutual recognition of certificates based on the CC evaluation assurance levels up to and including EAL 4 was signed in May 2000. It includes also the recognition of Protection Profiles based on the CC. The arrangement was signed by the national bodies of Australia, Canada, Finland France, Germany, Greece, Italy, The Netherlands, New Zealand, Norway, Spain, United Kingdom and the United States. Israel joined the arrangement in November 2000, Sweden in February 2002, Austria in November 2002, Hungary and Turkey in September 2003, Japan in November 2003.

### 3 Performance of Evaluation and Certification

The certification body monitors each individual evaluation to ensure a uniform procedure, a uniform interpretation of the criteria and uniform ratings.

The product Red Hat Enterprise Linux WS, Version 3, Update 3 has undergone the certification procedure at BSI.

The evaluation of the product Red Hat Enterprise Linux WS, Version 3, Update 3 was conducted by atsec information security GmbH. The atsec information security GmbH is an evaluation facility (ITSEF)<sup>6</sup> recognised by BSI.

The sponsor is:

Hewlett Packard Company  
110 Spit Brook Road  
Nashua, NH 03062, USA

The developer/distributor is:

Red Hat Inc.  
1801 Varsity Drive  
Raleigh, NC 27606, USA

The certification is concluded with

- the comparability check and
- the production of this Certification Report.

This work was completed by the BSI on 23.09.2004.

The confirmed assurance package is only valid on the condition that

- all stipulations regarding generation, configuration and operation, as given in the following report, are observed,
- the product is operated in the environment described, where specified in the following report.

This Certification Report only applies to the version of the product indicated here. The validity can be extended to new versions and releases of the product, provided the sponsor applies for re-certification of the modified product, in accordance with the procedural requirements, and the evaluation does not reveal any security deficiencies.

For the meaning of the assurance levels and the confirmed strength of functions, please refer to the excerpts from the criteria at the end of the Certification Report.

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<sup>6</sup> Information Technology Security Evaluation Facility

## 4 Publication

The following Certification Results contain pages B-1 to B-38.

The product Red Hat Enterprise Linux WS, Version 3, Update 3 has been included in the BSI list of the certified products, which is published regularly (see also Internet: <http://www.bsi.bund.de>). Further information can be obtained from BSI-Infoline 0228/9582-111.

Further copies of this Certification Report can be requested from the vendor<sup>7</sup> of the product. The Certification Report can also be downloaded from the above-mentioned website.

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<sup>7</sup> Red Hat Inc.  
1801 Varsity Drive  
Raleigh, N.C. 27606, USA

## **B Certification Results**

The following results represent a summary of

- the security target of the sponsor for the target of evaluation,
- the relevant evaluation results from the evaluation facility, and
- complementary notes and stipulations of the certification body.

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## 1 Executive Summary

The Target of Evaluation (TOE) is the Red Hat Enterprise Linux WS, Version 3, Update 3 (also named RHEL in short).

It is a general purpose, multi-user, multitasking Linux based operating system. It provides a platform for a variety of applications in the governmental and commercial environment. RHEL is available on a broad range of computer systems, ranging from departmental servers to multi-processor enterprise servers. The RHEL evaluation covers a potentially distributed, but closed network of HP (Pentium 4 and Xeon based) servers and workstations running the evaluated version of RHEL.

The TOE includes Software components only and provides CAPP compliant security functionality plus product specific extensions. Among these functions are:

- Identification and Authentication
- Discretionary Access Control
- Secure Communication
- Audit
- Object reuse functionality
- Security Management
- TSF Protection

The evaluated version of the TOE can be run on HP Pentium 4 and Xeon based servers and workstations. For a detailed description of the system the tests were performed on, please refer to chapter 7 of this report.

The product Red Hat Enterprise Linux WS, Version 3, Update 3 is delivered by Red Hat Inc. on CD-ROM. In addition to the software delivered on CD-ROM software packages and documentation has to be downloaded from the Red Hat ftp server and installed.

During the installation process the user has to verify the integrity and authenticity of the software as described in the Evaluated Configuration Guide [10]. The base software installed from the CD allows the user to perform this verification by checking the digital signature of the packages.

For a detailed listing of the software packages please refer to chapter 2 of this report.

For a detailed listing of guidance documents to be followed by a user of the TOE refer to chapter 6 of this report.

The TOE Security Functional Requirements (SFR) used in the Security Target are Common Criteria Part 2 extended as shown in the following table:

Security Functional Requirement	Identifier
SFRs from CC Part 2, contained in CAPP	
FAU_GEN.1	Audit Data Generation
FAU_GEN.2	User Identity Association
FAU_SAR.1	Audit Review
FAU_SAR.2	Restricted Audit Review
FAU_SAR.3	Selectable Audit Review
FAU_SEL.1	Selective Audit
FAU_STG.1	Protected Audit Trail Storage
FAU_STG.3	Action in Case of Possible Audit Data Loss
FAU_STG.4	Prevention of Audit Data Loss
FDP_ACC.1	Discretionary Access Control Policy
FDP_ACF.1	Discretionary Access Control Functions
FDP_RIP.2	Full Residual Information Protection
FIA_ATD.1	User Attribute Definition
FIA_SOS.1	Verification of Secrets
FIA_UAU.7	Protected Authentication Feedback
FIA_USB.1	User-Subject Binding
FMT_MSA.1	Management of Security Attributes
FMT_MSA.3	Static Attribute Initialisation
FMT_MTD.1	Management of TSF Data
FMT_REV.1	Revocation
FMT_SMR.1	Security Roles
FPT_AMT.1	Abstract Machine Testing
FPT_RVM.1	Reference Mediation
FPT_SEP.1	Domain Separation
FPT_STM.1	Reliable Time Stamps

Security Functional Requirement	Identifier
SFRs from CC Part 2, contained in CAPP, substituted by hierarchical higher ones in the ST	
FIA_UAU.2	User Authentication before any Action
FIA_UID.2	User Identification before any Action
SFRs not in CC Part 2 (Part 2 extended), contained in CAPP	
„Note1“ (as in [9], chapter 5.2.4)	Subject Residual Information Protection
SFRs from CC Part 2, not contained in CAPP	
FMT_SMF.1 <sup>8</sup>	Specification of Management Functions
FCS_CKM.1	Cryptographic Key Generation
FCS_CKM.2	Cryptographic Key Distribution
FCS_COP.1	Cryptographic Operation
FDP_UCT.1	Basic Data Exchange Confidentiality
FDP_UIT.1	Data Exchange Integrity
FMT_MSA.2	Secure Security Attributes
FTP_ITC.1	Inter-TSF Trusted Channel

Note that some of the SFRs have been iterated in the Security Target. For details on the iteration and the required security functionality please refer to [7], chapter 5.1.

The TOE Red Hat Enterprise Linux WS, Version 3, Update 3 was evaluated by atsec information security GmbH.

The evaluation was completed on 22.09.2004. The atsec information security GmbH is an evaluation facility (ITSEF)<sup>9</sup> recognised by BSI.

The sponsor is:

Hewlett Packard Company  
110 Spit Brook Road  
Nashua, NH 03062, USA

<sup>8</sup> Added because of AIS32, Final Interpretation 065

<sup>9</sup> Information Technology Security Evaluation Facility

The developer/distributor is:

Red Hat Inc.  
 1801 Varsity Drive  
 Raleigh, NC 27606, USA

**1.1 Assurance package**

The TOE security assurance requirements are based entirely on the assurance components defined in part 3 of the Common Criteria (see part C of this report, or [1], part 3 for details).

The TOE meets the assurance requirements of assurance level EAL3+ (Evaluation Assurance Level 3 augmented).

The assurance level is augmented by: ALC\_FLR.3 – Systematic flaw remediation. For the evaluation of the CC component ALC\_FLR.3 the mutually recognised CEM supplementation “ALC\_FLR – Flaw remediation”, Version 1.1, February 2002 ([5]) was used.

**1.2 Functionality**

The TOE Red Hat Enterprise Linux WS, Version 3, Update 3 provides the following Security Functions:

Name	Function
<b>Identification and Authentication (IA)</b>	
IA.1	User Identification and Authentication Data Management
IA.2	Common Authentication Mechanism
IA.3	Interactive Login and Related Mechanisms
IA.4	User Identity Changing
IA.5	Login Processing
<b>Audit (AU)</b>	
AU.1	Audit Configuration
AU.2	Audit Processing
AU.3	Audit Record Format
AU.4	Audit Post-Processing
<b>Discretionary Access Control (DA)</b>	
DA.1	General DAC Policy
DA.2	Permission Bits
DA.3	Access Control Lists supported by Ret Hat Enterprise Linux

Name	Function
DA.4	Discretionary Access Control: IPC Objects
<b>Object Reuse (OR)</b>	
OR.1	Object Reuse: File System Objects
OR.2	Object Reuse: IPC Objects
OR.3	Object Reuse: Memory Objects
<b>Security Management (SM)</b>	
SM.1	Roles
SM.2	Access Control Configuration and Management
SM.3	Management of User, Group and Authentication Data
SM.4	Management of Audit Configuration
SM.5	Reliable Time Stamps
<b>Secure Communication (SC)</b>	
SC.1	Secure Protocols
<b>TSF Protection (TP)</b>	
TP.1	TSF Invocation Guarantees
TP.2	Kernel
TP.3	Kernel Modules
TP.4	Trusted Processes
TP.5	TSF Databases
TP.6	Internal TOE Protection Mechanisms
TP.7	Testing the TOE Protection Mechanisms

Note: Only the acronyms and the titles of the SFs are provided here because they are very granular and almost self-explanatory. Please refer for a precise definition of the SF to the Security Target of the TOE ([7], chapter 6.2)

### 1.3 Strength of Function

The TOE's strength of function is rated 'SOF-medium' only for the authentication function (IA) using passwords (refer to [7], chapter 6.5).

#### **1.4 Summary of threats and Organisational Security Policies (OSPs) addressed by the evaluated IT product**

A summary of the threats defined in [7], chapter 3.2.1 is provided here. For the precise description of the threats please refer to [7]:

##### **T.UAUSER**

An attacker (not necessarily an unauthorised user) may try to impersonate an authorised user of the TOE without knowing the authentication information.

##### **T.UAACCESS**

An authorised user of the TOE tries to access information resources without having appropriate permissions.

##### **T.COMPROT**

An attacker tries to intercept or manipulate a communication link between the TOE and another trusted IT product (which may be another instantiation of the TOE) without being detected.

The TOE has to comply to the following Organisational Security Policies (OSPs). Note that only a summary of the policies is provided here. For the detailed and precise definition refer to [7], chapter 3.3:

##### **P.AUTHORISED\_USERS**

Only users who have been authorised to access information within the system may access the system.

##### **P.NEED\_TO\_KNOW**

The organisation using the TOE must define a discretionary access control policy on a need-to-know basis. The rules of this access control policy should be based on the attributes (i) owner of object, (ii) identity of subject attempting access to an object and (iii) access rights (of a subject for the accessed object).

##### **P.ACCOUNTABILITY**

The users of the system shall be held accountable for their actions.

## 1.5 Special configuration requirements

The configuration requirements for the TOE are defined in chapter 2.4 and subsequent chapters of the Security Target [7] and are summarised here (please refer to the Security Target for the precise and more detailed description):

- The CC evaluated package set must be selected at install time in accordance with the description provided in the documentation and installed accordingly (see [7], chapter 2.3);
- RHEL supports the use of IPv4 and IPv6, only IPv4 is included;
- Both installation from CD and installation from a defined disk partition are supported;
- The default configuration for identification and authentication are the defined password based PAM modules. Support for other authentication options e.g. smartcard authentication, is not included in the evaluation configuration
- If the system console is used, it must be connected directly to the TOE and requires the same physical protection as the TOE
- The following file systems are supported: the ext3 journaling filesystem, the ISO 9660 file system for CD-ROM and DVD drives and the process file system procs.
- The TOE comprises a single server machine (and optional peripherals) running the allowed system software (refer to package list). A server running the allowed set of software is referred to as a “TOE server” below. Details on the allowed peripherals can be found in [7], chapter 2.4.2.
- Several TOE servers may be interlinked by a LAN, which may be joined by bridges/ routers or by TOE systems which act as routers/ gateways.
- Each TOE server within this network implements its own security policy. No synchronisation function for those policies exists.
- If other systems are connected to the network they need to be configured and managed by the same authority using an appropriate security policy not conflicting with the security policy of the TOE.

### Note:

Because the TOE is defined as a server or a part of a network of servers, a graphical user interface for system administration or any other operation is not included in the evaluated configuration.

The TOE environment also includes applications that are not evaluated, but are used as unprivileged tools to access public system services. For example a HTTP server using a port above 1024 (e. g. on port 8080) may be used as a normal application running without root privileges on top of the TOE.

## 1.6 Assumptions about the operating environment

The constraints concerning the allowed hardware and peripherals are made in the Security Target (refer to [7], chapter 2.4.2):

### Hardware Platform:

- HP Intel Pentium 4 processor based workstations:
  - HP nw laptops
  - HP xw workstation product line
  - HP Compaq D530
  - HP Compaq D330
  - HP Compaq D220
- HP Intel Xeon based workstations:
  - HP xw workstation product line

For a more detailed description of the systems please refer to [7], chapter 2.4.2. For more information on which system tests have been performed, please refer to chapter 7 of this report.

### Peripherals:

- All terminals and printers supported by the TOE (except hot pluggable devices connected via USB or IEEE 1394 (Firewire) interfaces).  
Please note that USB keyboard and USB mice are allowed as long as they are attached to the system prior to boot time to prevent module loading at runtime.
- All storage devices and backup devices supported by the TOE (hard disks, CDROM/DVDROM drives, streamer drives, floppy disk drives) (except hot pluggable devices connected via USB or IEEE 1394 (Firewire) interfaces)
- All Ethernet and Token-Ring network adapters supported by the TOE

The following constraints concerning the operating environment are made in the Security Target.

The constraints are based on the assumptions defined in [7], chapter 3.4. (Please refer to the Security Target for the precise and more detailed definition):

Identifier	Summary
A.LOCATE	Location of TOE processing resources in facilities with controlled access.
A.PROTECT	Protection against physical modification (of TOE and Hardware used by the TOE).
A.MANAGE	Management of the TOE is done by competent individuals.
A.NO_EVIL_ADMIN	Administrative personnel are not careless, willfully negligent, or hostile.
A.COOP	Authorised users possess the necessary authorisation to access at least some of the information managed by the TOE and are expected to act in a co-operating manner.
A.UTRAIN	Users are trained well enough to use the Security functionality of the TOE appropriately.
A.UTRUST	Users are trusted to accomplish some task or group of tasks within a secure IT environment by exercising complete control over their data.
A.NET_COMP	Network components (like routers, bridges) used are assumed to pass data without modification.
A.PEER	Any other system with which the TOE communicates is assumed to be under the same management control and operate under the same security policy constraints.
A.CONNECT	All connections (to peripherals and network connections) not using the secured protocols SSH v2 or SSL v3 reside within the controlled access facilities.

The following constraints are based on Security Objectives which have to be met by the TOE environment. These objectives are defined in [7], chapter 4.2. (Please refer to the Security Target for the precise and more detailed definition):

Identifier	Summary
OE.CREDEN	User Authentication Data has to be treated securely.
OE.INSTALL	The installation, distribution and configuration of hardware, software and firmware components has to be done in a secure manner.

Identifier	Summary
OE.INFO_PROTECT	Information on security critical files (e.g. configuration files, authentication databases) shall be protected.
OE.MAINTENANCE	Diagnostic facilities shall be used periodically.
OE.RECOVER	Recovery Procedures after system failure must be available.
OE.SOFTWARE_IN	Only administrators shall be able to introduce new trusted software into the system.
OE.SERIAL_LOGIN	Clear screens before logging off (using serial login devices).
OE.HW_SEP	The underlying hardware has to provide separation mechanisms.

### 1.7 Disclaimers

The Certification Results only apply to the version of the product indicated in the Certificate and on the condition that all the stipulations are kept as detailed in this Certification Report. This certificate is not an endorsement of the IT product by the Federal Office for Information Security (BSI) or any other organisation that recognises or gives effect to this certificate, and no warranty of the IT product by BSI or any other organisation that recognises or gives effect to this certificate, is either expressed or implied.

## 2 Identification of the TOE

The Target of Evaluation is called:

**Red Hat Enterprise Linux WS**  
Version 3, Update 3  
with eal3-certification package

The software components of the TOE are listed in [7], chapter 2.3 and 8 of this report. Please note that no hardware is delivered as part of the TOE.

The following guidance documents are supplied together with the TOE. The Guidances have to be followed to ensure an certification conformant operation of the TOE:

- Common Criteria EAL3+ Evaluated Configuration Guide for Red Hat Enterprise Linux on HP Hardware (HP-RHEL-EAL3-Configuration-Guide.pdf), Version 1.9, 15.09.2004, [10]
- Installation Guide for the x86, Itanium, and AMD64 Architectures, [11]
- Reference Guide, [12]

Please refer to chapter 6 for a more detailed listing of the guidance documents.

### 3 Security Policy

The TOE is a Linux based multi-user, multi-tasking operating system. The TOE may provide services to several users at the same time. After successful login, the users have access to a general computing environment, allowing the start-up of user applications, issuing user commands at shell level, creating and accessing files. The TOE provides adequate mechanisms to separate the users and protect their data. Privileged commands are restricted to administrative users.

The TOE uses the standard Unix model of normal (unprivileged) users and administrative users that have the capability to get full root privileges.

The TOE is intended to operate in a networked environment with other instantiations of the TOE as well as other well-behaved client systems operating within the same management domain (refer to [7], chapter 6.1.5 for more details). All those systems need to be configured in accordance with a defined common security policy.

The TOE permits one or more processors and attached peripheral and storage devices to be used by multiple users to perform a variety of functions requiring controlled shared access to the data stored on the system. Such installations are typical for workgroup or enterprise computing systems accessed by users local to, or with otherwise protected access to, the computer system.

It is assumed that responsibility for the safeguarding of the data protected by the TOE can be delegated to the TOE users.

All data is under the control of the TOE. The data is stored in named objects, and the TOE can associate with each controlled object a description of the access rights to that object.

All individual users are assigned a unique user identifier within the single host system that forms the TOE. This user identifier is used as the basis for access control decisions. The TOE authenticates the claimed identity of the user before allowing the user to perform any further actions.

The TOE enforces controls such that access to data objects can only take place in accordance with the access restrictions placed on that object by its owner or administrative users. Ownership of named objects may be transferred under the control of the access control policy.

Access rights (e.g. read, write, execute) can be assigned to data objects with respect to subjects (users). Once a subject is granted access to an object, the content of that object may be freely used to influence other objects accessible to this subject.

## 4 Assumptions and Clarification of Scope

### 4.1 Usage assumptions

Based on the personnel assumptions the following usage conditions exist. Refer to [7], chapter 3.4.2 for more details:

- The TOE is managed by competent individuals (A.MANAGE).
- Administrative personnel are not careless, wilfully negligent or hostile (A.NO\_EVIL\_ADMIN).
- Users of the TOE have the necessary authorisation to access at least some of the information managed by the TOE and act cooperatively (A.COOP).
- Users are trained well enough to use the Security functionality of the TOE appropriately (A.UTRAIN).
- Users are trusted to accomplish some tasks or group of tasks within a secure IT environment by exercising complete control over their data (A.UTRUST).

### 4.2 Environmental assumptions

The following assumptions about physical and connectivity aspects defined by the Security Target have to be met (refer to Security Target [7], chapter 3.4.1 and 3.4.3):

- The processing resources of the TOE are located in an access controlled facility (A.LOCATE).
- The TOE (Hardware used by the TOE) is protected against physical modification (A.PROTECT).
- Network components (like routers, bridges) used are assumed to pass data without modification (A.NET\_COMP).
- Any other system with which the TOE communicates is assumed to be under the same management control and operate under the same security policy constraints. (A.PEER)
- All connections (to peripherals and network connections) not using SSH v2 or SSL v3 reside within the controlled access facilities (A.CONNECT).

Please consider also the requirements for the evaluated configuration specified in chapter 8 of this report.

### 4.3 Clarification of scope

The threats listed below have to be averted in order to support the TOE security capabilities but are not addressed by the TOE itself. They have to be addressed by the operating environment of the TOE (for detailed information about the threats and how the environment may cover them refer to the Security Target [7]).

#### **TE.HWMF**

Loss of stored data due to hardware malfunction.

#### **TE.COR\_FILE**

Accidental or intentionally corruption or manipulation of files relevant for the security without detection.

#### **TE.HW\_SEP**

The underlying hardware functions of the hardware used by the TOE do not provide sufficient capabilities to support the self-protection of the TSF.

## 5 Architectural Information

### General Overview

Red Hat Enterprise Linux (RHEL) is a general-purpose, multi-user, multi-tasking Linux based operating system. It provides a platform for a variety of applications in the governmental and commercial environment. RHEL is available on a broad range of computer systems, ranging from departmental servers to multi-processor enterprise servers.

The RHEL evaluation covers a potentially distributed, but closed network of HP (Pentium4 and Xeon based) servers and workstations running the evaluated version of RHEL.

The TOE Security Functions (TSF) consist of functions of RHEL that run in kernel mode plus some trusted processes. These are the functions that enforce the security policy as defined in the Security Target [7]. Tools and commands executed in user mode that are used by an administrative user need also to be trusted to manage the system in a secure way. But they are not considered to be part of this TSF.

Also the hardware and the BootPROM firmware are considered not to be part of the TOE but part of the TOE environment.

The TOE includes installation from CDROM and from a local hard disk partition.

The TOE includes standard networking applications, such as ftp and ssh. It also includes the stunnel client and server program that allows to set up a trusted channel using the SSL v3 protocol.

System administration tools include the standard commands. A graphical user interface for system administration or any other operation is not included in the evaluated configuration.

The TOE environment also includes applications that are not evaluated, but are used as unprivileged tools to access public system services. For example a HTTP server using a port above 1024 (e. g. on port 8080) may be used as a normal application running without root privileges on top of the TOE.

### Major structural units of the TOE

The TOE is structured in much the same way as many other operating systems, especially Unix-type operating systems. It consists of a kernel, which runs in the privileged state of the processor and provides services to applications (which those can use by calling kernel services via the system call interface). Direct access to the underlying abstract machine (hardware or partitioned environment) is restricted to the kernel, so whenever an application wants to access hardware like disk drives, network interfaces or other peripheral devices, it has to call kernel services. The kernel then checks if the application has the

required access rights and privileges and either performs the service or rejects the request.

The kernel is also responsible to separate the different user processes. This is done by the management of the virtual and real memory of the TOE which ensures that processes executing with different attributes can not directly access memory areas of other processes but have to do so using the inter-process communication mechanism provided by the kernel as part of its system call interface.

The TSF of the TOE also includes a set of trusted processes, which when initiated by a user with a system call operate with extended privileges. The programs that represent those trusted processes on the file system are protected by the file system discretionary access control security function enforced by the kernel.

In addition the execution of the TOE is controlled by a set of configuration files, which are also called the TSF database. Also those configuration files are protected by the file system discretionary access control security function enforced by the kernel.

Normal users – after they have been successfully authenticated by a defined trusted process – can start untrusted applications where the kernel enforces the security policy of the TOE when those applications request services from the kernel via the system call interface.

This structure is shown in the following figure:

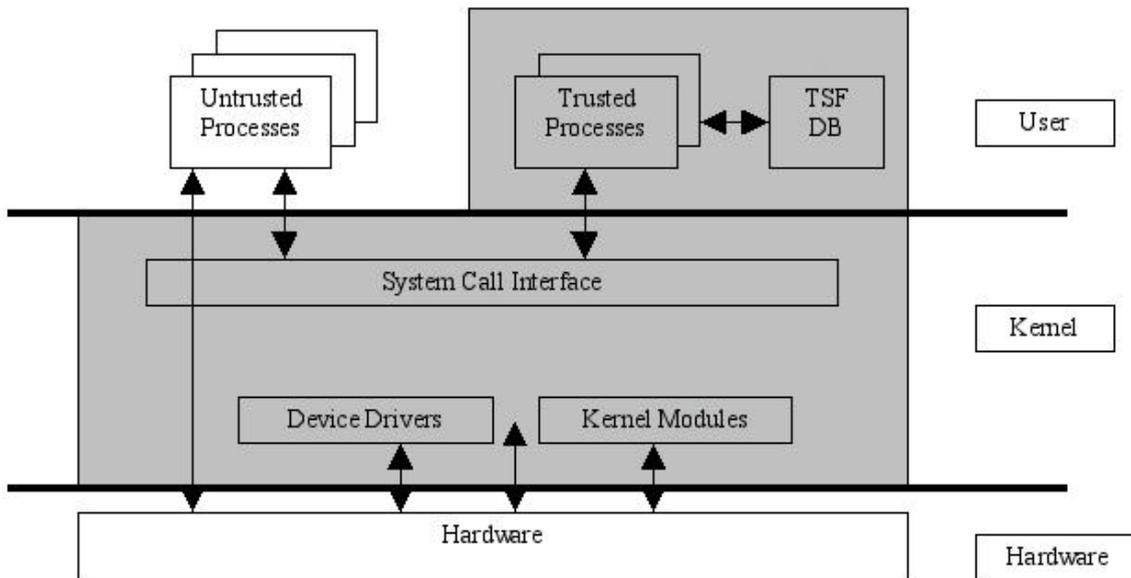


Figure 1: Overall structure of the TOE

The kernel itself is structured into a number of subsystems which are explained in detail in the high level design of the TOE. Those are:

**File and I/O Subsystem**

Implements all file system object related functions. Functions include those that allow a process to create, maintain, interact and delete file-system objects, such as regular files, directories, symbolic links, hard links, device special files, named pipes, and sockets.

**Process Subsystem**

Implements functions related to process and thread management. Functions include those that allow the creation, scheduling, execution, and deletion of process and thread subjects.

**Memory Subsystem**

Implements functions related to the management of a system's memory resources. Functions include those that create and manage virtual memory, including management of page tables and paging algorithms.

**Networking Subsystem**

Implements UNIX and internet domain sockets as well as algorithms for scheduling network packets.

**IPC Subsystem**

Implements functions related to inter-process communication mechanisms. Functions include those that facilitate controlled sharing of information between processes, allowing them to share data and synchronise their execution in order to interact with a common resource.

**Audit Subsystem**

Implements the kernel functions required to intercept system calls and audit them in accordance with the auditing policy defined by the system administrator.

**Kernel Modules Subsystem**

Implements an infrastructure to support loadable modules. Functions include those that load and unload kernel modules.

**Device Driver Subsystem**

Implements support for various hardware devices through common, device independent interface.

The trusted processes include the following subsystems:

**Identification and Authentication**

This includes all the processes that require to identify and authenticate users. All those processes share a common set of functions (pluggable authentication modules (PAM)) that ensure the same policy to be enforced with respect to identification and authentication of users. Successful as well as unsuccessful authentication attempts can be audited.

### **Network Applications**

This includes the trusted processes implementing networking functions. The TOE supports FTP and SSH v2 as well as setting up a secure channel to another trusted system via the Stunnel client and server processes using the SSL v3 protocol. The secure configuration as defined in the Security Target restricts the cipher suites that can be used for secure communication.

### **System Management**

This includes the trusted commands a system administrator can use to manage users and groups, set the time and date and check the integrity of the underlying abstract machine.

### **Batch Processing**

This includes the cron and at trusted processes that allow to execute user programs at predefined time schedules. They ensure that the users are restricted to the same security policy restrictions that also apply when they start programs interactively.

### **User Level Audit**

This includes all the trusted processes and commands outside of the kernel required to collect, store and process audit records. In addition to those functions the TOE includes a secure system initialisation function which brings the TOE into a secure state after it is powered on or after a reset. This function ensures that user interaction with the TOE can only occur after the TOE is securely initialised and in a secure state.

### **Security Functions**

The security functions of the TOE defined in the Security Target are (refer to Security Target [7], chapter 6.2):

- Identification and Authentication
- Audit
- Discretionary Access Control
- Object reuse functionality
- Security Management
- Secure Communication
- TSF Protection

A short summary for each function is provided here. A more detailed description can be found in the subsequent chapters of [7], chapter 6.2.

### **Identification and Authentication**

The TOE provides PAM based identification and authentication for user passwords. The quality of the passwords used can be enforced through configuration options controlled by the TOE.

Other authentication methods (e. g. Kerberos authentication, token based authentication) that are supported by RHEL as pluggable authentication modules are not part of the evaluated configuration.

Functions to ensure a basic password strength and limit the use of the su command and restrict root login to specific terminals are also included.

### **Audit**

The TOE provides the capability to audit a large number of events including individual system calls as well as events generated by trusted processes. Audit data is collected in a configurable number of audit bin files. When one of those files is full, the TOE switches to the next bin file and starts an administrator defined program to process the audit records in the bin file that just has been filled. The TOE provides a program for this purpose that converts the audit records into a human readable format and writes them to a sequential file or to a printer. The output could also be redirected to a program that transfers the audit records to another machine via a network connection.

The system administrator can define a rule base to restrict auditing to the events he is interested in. This includes the ability to restrict auditing to specific events, specific users, specific objects or a combination of all of this.

### **Discretionary Access Control**

Discretionary Access Control (DAC) restricts access to file system objects based on Access Control Lists (ACLs) that include the standard UNIX permissions for user, group and others. Access control mechanisms also protect IPC objects from unauthorised access.

The TOE includes the ext3 file system, which supports POSIX ACLs. This allows to define access rights to files within this type of file system down to the granularity of a single user.

### **Object Reuse**

File system objects as well as memory and IPC objects will be cleared before they can be reused by a process belonging to a different user.

### **Security Management**

The management of the security critical parameters of RHEL is performed by administrative users. A set of commands that require root privileges are used for system management. Security parameters are stored in specific files that are protected by the access control mechanisms of the TOE against unauthorised access by users that are not administrative users.

**Secure Communication**

The TOE supports the definition of trusted channels using either the SSH v2 or the SSL v3 protocol. In the case of SSH the TOE includes the SSH server and client functions. Password based authentication is supported. To use the SSL v3 protocol the TOE provides the stunnel client and server functions. Only a restricted number of cipher suites are supported for those protocols in the evaluated configuration. They are listed in the Security Target.

**TSF Protection**

While in operation, the kernel software and data are protected by the hardware memory protection mechanisms. The memory and process management components of the kernel ensure a user process cannot access kernel storage or storage belonging to other processes. Non-kernel TSF software and data are protected by DAC and process isolation mechanisms.

In the evaluated configuration, the reserved user ID root owns the directories and files that define the TSF configuration. In general, files and directories containing internal TSF data (e.g., configuration files, batch job queues) are also protected from reading by DAC permissions.

The TOE and the hardware and firmware components are required to be physically protected from unauthorised access. The system kernel mediates all access to the hardware mechanisms themselves, other than program visible CPU instruction functions.

## 6 Documentation

The following documentation is provided with the product by the developer to the customer:

- Common Criteria EAL3+ Evaluated Configuration Guide for Red Hat Enterprise Linux on HP Hardware (HP-RHEL-EAL3-Configuration-Guide.pdf), Version 1.9, 15.09.2004, [10]
- Installation Guide for the x86, Itanium, and AMD64 Architectures, rhel-ig-x8664-multi-en.pdf, Red Hat Incorporated, Version RHEL3, [11]
- Reference Guide, rhel-rg-en.pdf, Red Hat Incorporated, Version RHEL3, [12]

A full description of the installation and configuration process to get the evaluated configuration of the TOE can be found in Evaluated Configuration Guide [10]. The user will need the installation guidance just to obtain information on the specifics of the installation and configuration procedure. All steps required to install and configure the TOE for the evaluated configuration are contained in the Evaluated Configuration Guide.

Please note that [10] is the central document providing administrator guidance to the secure administration of the TOE. This guide has been developed to address all security issues related to the TOE and its security functions as described in the Security Target. Advice given in this guide takes precedence over any other guidance document.

## 7 IT Product Testing

### Test configuration

The Security Target defines the following hardware basis for the TOE:

- HP Intel Pentium 4 processor based workstations:
  - HP nw laptops
  - HP xw workstation product line
  - HP Compaq D530
  - HP Compaq D330
  - HP Compaq D220
- HP Intel Xeon based workstations:
  - HP xw workstation product line

Tests have been performed on the following system:

- **HP Compaq D530 (Intel Pentium 4 based system):** 1 CPU Intel Pentium 4 2,6 GHz, 2 GB RAM, 1 IDE hard drive

The test system has been installed and configured following the information provided in the Evaluated Configuration Guide [10] with additional software packages required for the test suite.

### Depth/Coverage of Testing

The developer has done substantial functional testing of all externally visible interfaces (TSFI). Internal interfaces of the High-level design have been covered by direct and indirect testing. The evaluators repeated the developer tests (because of the highly automated testing approach of the developer) and conducted additional independent tests and penetrations tests.

### Summary of Developer Testing Effort

#### Test configuration:

The sponsor/developer has performed the tests on the hardware platform defined above. The software was installed and configured as in the Guidance Documents (refer to chapter 6). Additional software was installed on the system to perform the tests. It was argued by the developer's Test Plan that this additional software was within the boundary defined by the Security Target and did not constitute a violation of the evaluated configuration.

Testing approach:

The sponsor/developer used several test suites and manual tests to test the TOE. One of the test suites used was the LTP test suite. It is an adapted version of tests from the Linux Test Project.

The tests have a common framework in which individual test cases adhere to a common structure for setup execution and cleanup of tests. Each test case may contain several tests of the same function, stressing different parts (for example, base functionality, behaviour with illegal parameters and reaction to missing privileges). Each test within a test case reports PASS respectively OK or FAIL and the test case summary in batch mode reports PASS if all the tests within the test case passed, otherwise FAIL.

Tests can be executed either manually by running the individual test case files or run in batch mode by running an overall script.

Testing results:

All actual test results were consistent with the expected test results.

**Summary of Evaluator Testing Effort**Test configuration:

The evaluator used the same machine as the developer. The machine was conformant to the Security Target requirements and has been set up according to the Evaluated Configuration Guide [10].

Testing approach:

Since the developer tests are highly automated the evaluation facility decided to re-run all automated developer tests. In addition evaluator tests were defined and executed by the evaluation facility.

Testing results:

All actual test results were consistent with the expected test results.

Evaluator penetration testing:

The evaluators devised a set of penetration tests based on

- common sources for vulnerabilities of the Linux Operating System,
- findings of their evaluation work examination.

The penetration testing showed no obvious vulnerabilities which are exploitable in the intended operating environment.

### **Expansion of the results on other hardware platforms**

The Security Target defines HP systems based on Intel Xeon/Pentium4 processors with a set of supported peripherals as the hardware base for the TOE.

All mentioned systems are a single- or multiple processor systems. Since tests have been performed using the single-processor and the multi-processor version of the kernel on the respective hardware, the evaluation includes both a single and a double processor configuration of the mentioned systems.

In addition, the hardware description given by the sponsor about the various platforms indicates that the main differences are:

- a different number of supported processors
- different layout of I/O interfaces
- different size of the casing for holding differing amounts of disks and the like
- different bus controller chips

Neither the evaluator nor the developer did perform the full testing on any other platform which is based on other processors. Therefore an automatic extension of the results of this evaluation to other platforms or other systems based on one of the processor architectures mentioned above is not given.

## 8 Evaluated Configuration

According to the Security Target the evaluated configuration of the TOE is defined as follows (refer also to the Security Target [7]):

The TOE Red Hat Enterprise Linux WS, Version 3, Update 3 is delivered by Red Hat Incorporated on CD-ROM. In addition to the packages delivered on CD-ROM a set of packages has to be downloaded from the Red Hat ftp server. The integrity and authenticity of these packages has to be verified during the installation process.

### HP Intel Pentium 4 / Xeon based systems:

- CD set containing Red Hat Enterprise Linux WS, Version 3, Update 3
- Software packages to be downloaded mandatory from the Red Hat ftp server:
  - amtu-0.1-7RHEL.i386.rpm
  - kernel-2.4.21-20.EL.peterm.1.i686.rpm
  - kernel-smp-2.4.21-20.EL.peterm.1.i686.rpm
  - kernel-source-2.4.21-20.EL.peterm.1.i386.rpm
  - laus-0.1-66RHEL3.i386.rpm
  - laus-devel-0.1-66RHEL3.i386.rpm
  - laus-libs-0.1-66RHEL3.i386.rpm
  - eal3-certification-1.1-1.noarch.rpm
  - eal3-certification-doc-1.1-1.noarch.rpm

The software contained on the CD-ROM set plus the packages to be downloaded make up the evaluated TOE. For a precise listing of all the packages please refer to [7], chapter 2.3.

The configuration requirements for the TOE are defined in chapter 2.4 and subsequent chapters of the Security Target [7] and are summarised here (please refer to the Security Target for the precise and more detailed description):

- The CC evaluated package set must be selected at install time in accordance with the description provided in the Evaluated Configuration Guide and installed accordingly;
- The following file systems are supported: the ext3 journaling filesystem, the ISO 9660 file system for CD-ROM and DVD drives and the process file system, procf.
- RHEL supports the use of IPv4 and IPv6, only IPv4 is included;
- Both installation from CD and installation from a defined disk partition are supported;

- The default configuration for identification and authentication are the defined password based PAM modules. Support for other authentication options e.g. smartcard authentication, is not included in the evaluation configuration
- If the system console is used, it must be connected directly to the TOE and requires the same physical protection as the TOE
- The TOE comprises a single server machine (and optional peripherals) running the allowed system software (refer to package list). A server running the allowed set of software is referred to as a “TOE server” below. Details on the allowed peripherals can be found in [7], chapter 2.4.2.
- Several TOE servers may be interlinked by a LAN, which may be joined by bridges/routers or by TOE systems which act as routers / gateways.
- Each TOE server within this network implements its own security policy. No synchronisation function for those policies exists.
- If other systems are connected to the network they need to be configured and managed by the same authority using an appropriate security policy not conflicting with the security policy of the TOE.

**Note:**

Because the TOE is defined as a server or a part of a network of servers, a graphical user interface for system administration or any other operation is not included in the evaluated configuration.

The TOE environment also includes applications that are not evaluated, but are used as unprivileged tools to access public system services. For example a HTTP server using a port above 1024 (e. g. on port 8080) may be used as a normal application running without root privileges on top of the TOE.

For setting up / configuring the TOE all guidance documents (refer to chapter 6) especially document [10] has to be followed.

The following constraints concerning the allowed hardware and peripherals are made in the Security Target (refer to [7], chapter 2.4.2):

**Hardware Platform:**

- HP Intel Pentium 4 processor based workstations:
  - HP nw laptops
  - HP xw workstation product line
  - HP Compaq D530
  - HP Compaq D330
  - HP Compaq D220
- HP Intel Xeon based workstations:
  - HP xw workstation product line

For a more detailed description of the systems please refer to [7], chapter 2.4.2. For more information on which system tests have been performed, please refer to chapter 7 of this report.

**Peripherals:**

- All terminals and printers supported by the TOE (except hot pluggable devices connected via USB or IEEE 1394 (Firewire) interfaces).  
Please note that USB keyboard and USB mice are allowed as long as they are attached to the system prior to boot timer to prevent module loading at runtime.
- All storage devices and backup devices supported by the TOE (hard disks, CDROM/DVDROM drives, streamer drives, floppy disk drives) (except hot pluggable devices connected via USB or IEEE 1394 (Firewire) interfaces)
- All Ethernet and Token-Ring network adapters supported by the TOE

## 9 Results of the Evaluation

The Evaluation Technical Report (ETR) [8] was provided by the ITSEF according to the Common Criteria [1], the Common Evaluation Methodology [2], the requirements of the Scheme [3] and all interpretations and guidelines of the Scheme (AIS) [4] as relevant for the TOE (this includes especially the methodology for flaw remediation, [5]).

The verdicts for the CC, Part 3 assurance components (according to EAL3 augmented by ALC\_FLR.3 and the Security Target evaluation) are summarised in the following table:

Assurance Classes and Components		Verdict
Security Target	CC Class ASE	PASS
TOE description	ASE_DES.1	PASS
Security environment	ASE_ENV.1	PASS
ST introduction	ASE_INT.1	PASS
Security objectives	ASE_OBJ.1	PASS
PP claims	ASE_PPC.1	PASS
IT security requirements	ASE_REQ.1	PASS
Explicitly stated IT security requirements	ASE_SRE.1	PASS
TOE summary specification	ASE_TSS.1	PASS
Configuration management	CC Class ACM	PASS
Authorisation controls	ACM_CAP.3	PASS
TOE CM coverage	ACM_SCP.1	PASS
Delivery and Operation	CC Class ADO	PASS
Delivery Procedures	ADO_DEL.1	PASS
Installation, generation, and start-up procedures	ADO_IGS.1	PASS
Development	CC class ADV	PASS
Informal functional specification	ADV_FSP.1	PASS
Security enforcing high-level design	ADV_HLD.2	PASS
Informal correspondence demonstration	ADV_RCR.1	PASS
Guidance documents	CC Class AGD	PASS
Administrator guidance	AGD_ADM.1	PASS
User guidance	AGD_USR.1	PASS
Life cycle support	CC Class ALC	PASS
Identification of security measures	ALC_DVS.1	PASS
Systematic flaw remediation	ALC_FLR.3	PASS
Tests	CC Class ATE	PASS
Analysis of coverage	ATE_COV.2	PASS
Testing: high-level design	ATE_DPT.1	PASS
Functional testing	ATE_FUN.1	PASS
Independent testing - sample	ATE_IND.2	PASS

Assurance Classes and Components		Verdict
Vulnerability assessment	CC Class AVA	PASS
Examination of guidance	AVA_MSU.1	PASS
Strength of TOE security function evaluation	AVA_SOF.1	PASS
Developer vulnerability analysis	AVA_VLA.1	PASS

The evaluation has shown that the TOE fulfils the claimed strength of function for the authentication function using passwords.

The TOE has no obvious vulnerabilities which are exploitable in the intended operating environment.

The results of the evaluation are only applicable to the product Red Hat Enterprise Linux WS, Version 3, Update 3 with eal3-certification package in the configuration as defined in the Security Target and summarised in this report (refer to the Security Target [7] and the chapters 2, 4 and 8 of this report). The validity can be extended to new versions and releases of the product, provided the sponsor applies for re-certification of the modified product, and if the evaluation of the modified product does not reveal any security deficiencies.

## 10 Comments/Recommendations

The User Guidance documentation (refer to chapter 6) contains necessary information about the secure usage of the TOE. Additionally, for secure usage of the TOE the fulfilment of the assumptions about the environment in the Security Target [7] and the Security Target as a whole has to be taken into account. Therefore a user/administrator has to follow the guidance in these documents.

Document [10] is the central document providing administrator guidance to the secure administration of the TOE. This guide has been developed to address all security issues related to the TOE and its security functions as described in the Security Target. Advice given in this guide takes precedence over any other guidance document.

## 11 Annexes

None.

## **12 Security Target**

For the purpose of publishing, the Security Target [7] of the Target of Evaluation (TOE) is provided within a separate document.

## 13 Definitions

### 13.1 Acronyms

<b>ACL</b>	Access Control List
<b>AMD</b>	Advanced Micro Devices, Inc.
<b>AU</b>	Audit
<b>BSI</b>	Bundesamt für Sicherheit in der Informationstechnik
<b>CC</b>	Common Criteria for IT Security Evaluation
<b>CCRA</b>	Common Criteria Recognition Arrangement
<b>DA/DAC</b>	Discretionary Access Control
<b>EAL</b>	Evaluation Assurance Level
<b>HTTP</b>	Hyper Text Transfer Protocol
<b>IA</b>	Identification and Authentication
<b>IPC</b>	Interprocess Communication
<b>ISO</b>	International Organisation for Standardisation
<b>IEEE</b>	Institute of Electrical & Electronics Engineers
<b>IT</b>	Information Technology
<b>LTP</b>	Linux Test Project
<b>OSP</b>	Organisational Security Policy
<b>OR</b>	Object Reuse
<b>PAM</b>	Pluggable authentication module
<b>PCMCIA</b>	Personal Computer Memory Card International Association
<b>PP</b>	Protection Profile
<b>RPM</b>	Red Hat Package Manager
<b>SC</b>	Secure Communication
<b>SF</b>	Security Function
<b>SFP</b>	Security Function Policy
<b>SFR</b>	Security Functional Requirement
<b>SOF</b>	Strength of Function
<b>SM</b>	Security Management
<b>RHEL</b>	Red Hat Enterprise Linux

<b>SSH</b>	Secure Shell
<b>SSL</b>	Secure Sockets Layer
<b>ST</b>	Security Target
<b>TOE</b>	Target of Evaluation
<b>TP</b>	TSF Protection
<b>TSC</b>	TSF Scope of Control
<b>TSF</b>	TOE Security Functions
<b>TSP</b>	TOE Security Policy
<b>USB</b>	Universal Serial Bus

## 13.2 Glossary

**Augmentation** - The addition of one or more assurance component(s) from CC Part 3 to an EAL or assurance package.

**Extension** - The addition to an ST or PP of functional requirements not contained in part 2 and/or assurance requirements not contained in part 3 of the CC.

**Formal** - Expressed in a restricted syntax language with defined semantics based on well-established mathematical concepts.

**Informal** - Expressed in natural language.

**Object** - An entity within the TSC that contains or receives information and upon which subjects perform operations.

**Protection Profile** - An implementation-independent set of security requirements for a category of TOEs that meet specific consumer needs.

**Security Function** - A part or parts of the TOE that have to be relied upon for enforcing a closely related subset of the rules from the TSP.

**Security Target** - A set of security requirements and specifications to be used as the basis for evaluation of an identified TOE.

**Semiformal** - Expressed in a restricted syntax language with defined semantics.

**Strength of Function** - A qualification of a TOE security function expressing the minimum efforts assumed necessary to defeat its expected security behaviour by directly attacking its underlying security mechanisms.

**SOF-basic** - A level of the TOE strength of function where analysis shows that the function provides adequate protection against casual breach of TOE security by attackers possessing a low attack potential.

**SOF-medium** - A level of the TOE strength of function where analysis shows that the function provides adequate protection against straightforward or

intentional breach of TOE security by attackers possessing a moderate attack potential.

**SOF-high** - A level of the TOE strength of function where analysis shows that the function provides adequate protection against deliberately planned or organised breach of TOE security by attackers possessing a high attack potential.

**Subject** - An entity within the TSC that causes operations to be performed.

**Target of Evaluation** - An IT product or system and its associated administrator and user guidance documentation that is the subject of an evaluation.

**TOE Security Functions** - A set consisting of all hardware, software, and firmware of the TOE that must be relied upon for the correct enforcement of the TSP.

**TOE Security Policy** - A set of rules that regulate how assets are managed, protected and distributed within a TOE.

**TSF Scope of Control** - The set of interactions that can occur with or within a TOE and are subject to the rules of the TSP.

## 14 Bibliography

- [1] Common Criteria for Information Technology Security Evaluation, Version 2.1, August 1999
- [2] Common Methodology for Information Technology Security Evaluation (CEM), Part 1, Version 0.6; Part 2: Evaluation Methodology, Version 1.0, August 1999
- [3] BSI certification: Procedural Description (BSI 7125)
- [4] Application Notes and Interpretations of the Scheme (AIS) as relevant for the TOE.
- [5] Application Notes and Interpretations of the Scheme AIS33, Version 2 – “Methodologie zur Fehlerbehebung – Flaw Remediation”, 26.07.2002
- [6] German IT Security Certificates (BSI 7148, BSI 7149), periodically updated list published also on the BSI Web-site
- [7] Security Target BSI-DSZ-0274-2004, Version 1.7, 19.09.2004, Red Hat Enterprise Linux WS Version 3 Update 3 Security Target for CAPP Compliance, Hewlett Packard Company & Red Hat Incorporated
- [8] Evaluation Technical Report BSI-DSZ-CC-0273/0274-2004, Version 1.1, 21.09.2004, atsec information security GmbH (confidential document)
- [9] Controlled Access Protection Profile (CAPP), Version 1.d National Security Agency, 1999-10-08

### User Guidance Documentation:

- [10] Common Criteria EAL3+ Evaluated Configuration Guide for Red Hat Enterprise Linux on HP Hardware (HP-RHEL-EAL3-Configuration-Guide.pdf), Version 1.9, 15.09.2004
- [11] Installation Guide for the x86, Itanium, and AMD64 Architectures, rhel-ig-x8664-multi-en.pdf, Red Hat Incorporated, Version RHEL3
- [12] Reference Guide, rhel-rg-en.pdf, Red Hat Incorporated, Version RHEL3

## C Excerpts from the Criteria

CC Part 1:

### **Caveats on evaluation results** (chapter 5.4) / **Final Interpretation 008**

The conformance result indicates the source of the collection of requirements that is met by a TOE or PP that passes its evaluation. This conformance result is presented with respect to Part 2 (functional requirements), Part 3 (assurance requirements) and, if applicable, to a pre-defined set of requirements (e.g., EAL, Protection Profile).

The conformance result consists of one of the following:

**Part 2 conformant** - A PP or TOE is Part 2 conformant if the functional requirements are based only upon functional components in Part 2

**Part 2 extended** - A PP or TOE is Part 2 extended if the functional requirements include functional components not in Part 2

plus one of the following:

**Part 3 conformant** - A PP or TOE is Part 3 conformant if the assurance requirements are based only upon assurance components in Part 3

**Part 3 extended** - A PP or TOE is Part 3 extended if the assurance requirements include assurance requirements not in Part 3.

Additionally, the conformance result may include a statement made with respect to sets of defined requirements, in which case it consists of one of the following:

**Package name Conformant** - A PP or TOE is conformant to a pre-defined named functional and/or assurance package (e.g. EAL) if the requirements (functions or assurance) include all components in the packages listed as part of the conformance result.

**Package name Augmented** - A PP or TOE is an augmentation of a pre-defined named functional and/or assurance package (e.g. EAL) if the requirements (functions or assurance) are a proper superset of all components in the packages listed as part of the conformance result.

Finally, the conformance result may also include a statement made with respect to Protection Profiles, in which case it includes the following:

**PP Conformant** - A TOE meets specific PP(s), which are listed as part of the conformance result.

CC Part 3:

**Assurance categorisation** (chapter 2.5)

„The assurance classes, families, and the abbreviation for each family are shown in Table 2.1.

<b>Assurance Class</b>	<b>Assurance Family</b>	<b>Abbreviated Name</b>
Class ACM: Configuration management	CM automation	ACM_AUT
	CM capabilities	ACM_CAP
	CM scope	ACM_SCP
Class ADO: Delivery and operation	Delivery	ADO_DEL
	Installation, generation and start-up	ADO_IGS
Class ADV: Development	Functional specification	ADV_FSP
	High-level design	ADV_HLD
	Implementation representation	ADV_IMP
	TSF internals	ADV_INT
	Low-level design	ADV_LLD
	Representation correspondence	ADV_RCR
	Security policy modeling	ADV_SPM
Class AGD: Guidance documents	Administrator guidance	AGD_ADM
	User guidance	AGD_USR
Class ALC: Life cycle support	Development security	ALC_DVS
	Flaw remediation	ALC_FLR
	Life cycle definition	ALC_LCD
	Tools and techniques	ALC_TAT
Class ATE: Tests	Coverage	ATE_COV
	Depth	ATE_DPT
	Functional tests	ATE_FUN
	Independent testing	ATE_IND
Class AVA: Vulnerability assessment	Covert channel analysis	AVA_CCA
	Misuse	AVA_MSU
	Strength of TOE security functions	AVA_SOF
	Vulnerability analysis	AVA_VLA

**Table 2.1 -Assurance family breakdown and mapping“**

## Evaluation assurance levels (chapter 6)

„The Evaluation Assurance Levels (EALs) provide an increasing scale that balances the level of assurance obtained with the cost and feasibility of acquiring that degree of assurance. The CC approach identifies the separate concepts of assurance in a TOE at the end of the evaluation, and of maintenance of that assurance during the operational use of the TOE.

It is important to note that not all families and components from Part 3 are included in the EALs. This is not to say that these do not provide meaningful and desirable assurances. Instead, it is expected that these families and components will be considered for augmentation of an EAL in those PPs and STs for which they provide utility.

### Evaluation assurance level (EAL) overview (chapter 6.1)

Table 6.1 represents a summary of the EALs. The columns represent a hierarchically ordered set of EALs, while the rows represent assurance families. Each number in the resulting matrix identifies a specific assurance component where applicable.

As outlined in the next section, seven hierarchically ordered evaluation assurance levels are defined in the CC for the rating of a TOE's assurance. They are hierarchically ordered inasmuch as each EAL represents more assurance than all lower EALs. The increase in assurance from EAL to EAL is accomplished by *substitution* of a hierarchically higher assurance component from the same assurance family (i.e. increasing rigour, scope, and/or depth) and from the *addition* of assurance components from other assurance families (i.e. adding new requirements).

These EALs consist of an appropriate combination of assurance components as described in chapter 2 of this Part 3. More precisely, each EAL includes no more than one component of each assurance family and all assurance dependencies of every component are addressed.

While the EALs are defined in the CC, it is possible to represent other combinations of assurance. Specifically, the notion of “augmentation“ allows the addition of assurance components (from assurance families not already included in the EAL) or the substitution of assurance components (with another hierarchically higher assurance component in the same assurance family) to an EAL. Of the assurance constructs defined in the CC, only EALs may be augmented. The notion of an “EAL minus a constituent assurance component“ is not recognised by the CC as a valid claim. Augmentation carries with it the obligation on the part of the claimant to justify the utility and added value of the added assurance component to the EAL. An EAL may also be extended with explicitly stated assurance requirements.

Assurance Class	Assurance Family	Assurance Components by Evaluation Assurance Level						
		EAL1	EAL2	EAL3	EAL4	EAL5	EAL6	EAL7
Configuration management	ACM_AUT				1	1	2	2
	ACM_CAP	1	2	3	4	4	5	5
	ACM_SCP			1	2	3	3	3
Delivery and operation	ADO_DEL		1	1	2	2	2	3
	ADO_IGS	1	1	1	1	1	1	1
Development	ADV_FSP	1	1	1	2	3	3	4
	ADV_HLD		1	2	2	3	4	5
	ADV_IMP				1	2	3	3
	ADV_INT					1	2	3
	ADV_LLD				1	1	2	2
	ADV_RCR	1	1	1	1	2	2	3
	ADV_SPM				1	3	3	3
Guidance documents	AGD_ADM	1	1	1	1	1	1	1
	AGD_USR	1	1	1	1	1	1	1
Life cycle support	ALC_DVS			1	1	1	2	2
	ALC_FLR							
	ALC_LCD				1	2	2	3
	ALC_TAT				1	2	3	3
Tests	ATE_COV		1	2	2	2	3	3
	ATE_DPT			1	1	2	2	3
	ATE_FUN		1	1	1	1	2	2
	ATE_IND	1	2	2	2	2	2	3
Vulnerability assessment	AVA_CCA					1	2	2
	AVA_MSU			1	2	2	3	3
	AVA_SOF		1	1	1	1	1	1
	AVA_VLA		1	1	2	3	4	4

**Table 6.1 - Evaluation assurance level summary“**

**Evaluation assurance level 1 (EAL1) - functionally tested** (chapter 6.2.1)

## „Objectives

EAL1 is applicable where some confidence in correct operation is required, but the threats to security are not viewed as serious. It will be of value where independent assurance is required to support the contention that due care has been exercised with respect to the protection of personal or similar information.

EAL1 provides an evaluation of the TOE as made available to the customer, including independent testing against a specification, and an examination of the guidance documentation provided. It is intended that an EAL1 evaluation could be successfully conducted without assistance from the developer of the TOE, and for minimal outlay.

An evaluation at this level should provide evidence that the TOE functions in a manner consistent with its documentation, and that it provides useful protection against identified threats.“

**Evaluation assurance level 2 (EAL2) - structurally tested** (chapter 6.2.2)

## „Objectives

EAL2 requires the co-operation of the developer in terms of the delivery of design information and test results, but should not demand more effort on the part of the developer than is consistent with good commercial practice. As such it should not require a substantially increased investment of cost or time.

EAL2 is therefore applicable in those circumstances where developers or users require a low to moderate level of independently assured security in the absence of ready availability of the complete development record. Such a situation may arise when securing legacy systems, or where access to the developer may be limited.“

**Evaluation assurance level 3 (EAL3) - methodically tested and checked** (chapter 6.2.3)

## „Objectives

EAL3 permits a conscientious developer to gain maximum assurance from positive security engineering at the design stage without substantial alteration of existing sound development practices.

EAL3 is applicable in those circumstances where developers or users require a moderate level of independently assured security, and require a thorough investigation of the TOE and its development without substantial re-engineering.“

**Evaluation assurance level 4 (EAL4) - methodically designed, tested, and reviewed** (chapter 6.2.4)

## „Objectives

EAL4 permits a developer to gain maximum assurance from positive security engineering based on good commercial development practices which, though rigorous,

do not require substantial specialist knowledge, skills, and other resources. EAL4 is the highest level at which it is likely to be economically feasible to retrofit to an existing product line.

EAL4 is therefore applicable in those circumstances where developers or users require a moderate to high level of independently assured security in conventional commodity TOEs and are prepared to incur additional security-specific engineering costs.“

### **Evaluation assurance level 5 (EAL5) - semiformally designed and tested** (chapter 6.2.5)

„Objectives

EAL5 permits a developer to gain maximum assurance from security engineering based upon rigorous commercial development practices supported by moderate application of specialist security engineering techniques. Such a TOE will probably be designed and developed with the intent of achieving EAL5 assurance. It is likely that the additional costs attributable to the EAL5 requirements, relative to rigorous development without the application of specialised techniques, will not be large.

EAL5 is therefore applicable in those circumstances where developers or users require a high level of independently assured security in a planned development and require a rigorous development approach without incurring unreasonable costs attributable to specialist security engineering techniques.“

### **Evaluation assurance level 6 (EAL6) - semiformally verified design and tested** (chapter 6.2.6)

„Objectives

EAL6 permits developers to gain high assurance from application of security engineering techniques to a rigorous development environment in order to produce a premium TOE for protecting high value assets against significant risks.

EAL6 is therefore applicable to the development of security TOEs for application in high risk situations where the value of the protected assets justifies the additional costs.“

### **Evaluation assurance level 7 (EAL7) - formally verified design and tested** (chapter 6.2.7)

„Objectives

EAL7 is applicable to the development of security TOEs for application in extremely high risk situations and/or where the high value of the assets justifies the higher costs. Practical application of EAL7 is currently limited to TOEs with tightly focused security functionality that is amenable to extensive formal analysis.“

**Strength of TOE security functions (AVA\_SOF)** (chapter 14.3)**AVA\_SOF** Strength of TOE security functions

„Objectives

Even if a TOE security function cannot be bypassed, deactivated, or corrupted, it may still be possible to defeat it because there is a vulnerability in the concept of its underlying security mechanisms. For those functions a qualification of their security behaviour can be made using the results of a quantitative or statistical analysis of the security behaviour of these mechanisms and the effort required to overcome them. The qualification is made in the form of a strength of TOE security function claim.“

**Vulnerability analysis (AVA\_VLA)** (chapter 14.4)**AVA\_VLA** Vulnerability analysis

„Objectives

Vulnerability analysis is an assessment to determine whether vulnerabilities identified, during the evaluation of the construction and anticipated operation of the TOE or by other methods (e.g. by flaw hypotheses), could allow users to violate the TSP.

Vulnerability analysis deals with the threats that a user will be able to discover flaws that will allow unauthorised access to resources (e.g. data), allow the ability to interfere with or alter the TSF, or interfere with the authorised capabilities of other users.“

„Application notes

A vulnerability analysis is performed by the developer in order to ascertain the presence of security vulnerabilities, and should consider at least the contents of all the TOE deliverables including the ST for the targeted evaluation assurance level. The developer is required to document the disposition of identified vulnerabilities to allow the evaluator to make use of that information if it is found useful as a support for the evaluator's independent vulnerability analysis.“

„Independent vulnerability analysis goes beyond the vulnerabilities identified by the developer. The main intent of the evaluator analysis is to determine that the TOE is resistant to penetration attacks performed by an attacker possessing a low (for AVA\_VLA.2), moderate (for AVA\_VLA.3) or high (for AVA\_VLA.4) attack potential.“