

NSA Security-Enhanced Linux (SELinux)

<http://www.nsa.gov/selinux>

NSA SELinux team

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■ *National Security Agency* ■

What is SELinux?

- Flexible mandatory access controls integrated into Linux.
 - Can confine malicious or flawed applications and services.
 - Can enforce strong separation based on confidentiality, integrity, or purpose.
 - Can support fine-grained least privilege.
 - Architecture supports wide range of security policies.
 - API supports security-aware applications and application policy enforcers.
 - Transparency provided for unmodified applications.

SELinux Status

- Initial public release in Dec 2000, regular updates
- Active public mailing list, >900 members
 - External developer and user community
- Motivated development of Linux Security Module (LSM) framework
 - SELinux drove requirements for the LSM framework
 - LSM adopted into Linux 2.5/2.6 kernel
 - Provides infrastructure for supporting SELinux
- SELinux in Linux 2.6 kernel

SELinux Integration

- RedHat
 - Integrated in Fedora Core (FC) 2, but off by default
 - Enabled by default in FC 3 with targeted policy
- Gentoo
 - Integrated in Hardened Gentoo
- Debian
 - Available as separate packages from Russell Coker
- SuSE
 - Partially integrated in SuSE Linux 9.1
 - Available as separate packages from Thomas Bleher

SELinux and Auditing

- SELinux originally used existing kernel logging infrastructure for its audit messages.
- RedHat developed a new kernel audit framework and converted SELinux to use it.
- Advantages:
 - Audit can be directed to a separate daemon
 - Audit flooding can be more effectively addressed
 - Audit framework captures information not available to SELinux
 - Audit framework provides calls that can be safely called from any context

SELinux and NFS

- NFSv3 SELinux support
 - Available from
<http://www.nsa.gov/selinux/code/download6.cfm>
 - Provides fine-grained labeling and access controls on NFS files
 - Not targeted for mainstream inclusion
- NFSv4 SELinux support
 - Started dialogue with NFSv4 developers
 - Seeking to leverage named attribute and RPCSEC_GSS support
 - Goal is for mainline support for NFSv4 and SELinux

Security-Enhanced X

- Available as a branch in xorg CVS tree.
- Provides labeling and access controls for X objects.
- Implemented using a security hook framework.
- Drove development of general infrastructure for userspace policy enforcers.
- Limited to X server, does not address window manager issues.
- Policy still needs to be developed.

Security-Enhanced DBUS

- D-BUS is a message bus system for inter-application communication.

<http://www.freedesktop.org/Software/dbus>

- SE-DBUS adds labeling and access controls for D-BUS to control the ability to register services and to communicate via D-BUS.
- Patch has been submitted and revised, undergoing assessment for integration into mainstream D-BUS.
- Policy still needs to be developed.

Policy Tools

- Setools from Tresys Technology, <http://www.tresys.com/selinux>
 - Included in upstream NSA SELinux releases
 - Packaged for Fedora Core 2 and 3
 - Policy analysis, audit analysis, user management
- Slat from MITRE, <http://simp.mitre.org/selinux>
 - Included in upstream NSA SELinux releases
 - Policy analysis

Policy Infrastructure

- Policy modules
 - Under development by Tresys
 - Allow well-defined modules to be added and removed to policy at runtime
 - Provide proper dependency checking, stronger encapsulation
- Policy daemon
 - Under development by Tresys
 - Allow fine-grained access for making changes to policy
 - Allow delegation of userspace policies

MLS/Trusted System Support

- Being extended and enhanced by TCS.
- May require adding a level of indirection between security contexts and human-readable labels.
- May require adding limited support for non-tranquility of processes.
- May require ability to authorize capabilities based solely on SELinux policy.

Future Directions

- Integrate with IPSEC for labeling and protection.
- Identify and add controls to other userspace object managers beyond X and D-BUS.
- Assess effectiveness of SELinux primitives for application security requirements.
- Identify and replace hardcoded userspace policy logic (e.g. uid 0 assumptions) with calls to SELinux API.

Questions?

- NSA SELinux site: <http://www.nsa.gov/selinux>
- Public mailing list: Send 'subscribe selinux' to majordomo@tycho.nsa.gov
- Contact us at: selinux-team@tycho.nsa.gov
- Sourceforge project: <http://sf.net/projects/selinux>
- SELinux for Distributions:
 - Fedora Core: fedora.redhat.com
 - Debian: www.coker.com.au/selinux
 - Gentoo: www.gentoo.org/proj/en/hardened
 - SuSE: www.cip.ifi.lmu.edu/~bleher/selinux/suse

Possible topics

- Using SELinux user identity and roles as intended
 - Keeping policy user database in sync with real users
 - Dealing with pseudo user identities and su
 - Reducing need to trust su, sudo, etc.
- Increasing acceptability/transparency of strict policy
 - without loss in protection
- Increasing protection provided by targeted policy
 - without loss in acceptability/transparency
- Hindrances to SELinux acceptability/useability

End of Presentation