



## ***Red Hat Enterprise Linux Release 9.2 Manual Pages on 'polkit.8' command***

### ***\$ man polkit.8***

POLKIT(8)                      polkit                      POLKIT(8)

#### NAME

polkit - Authorization Manager

#### OVERVIEW

polkit provides an authorization API intended to be used by privileged programs (?MECHANISMS?) offering service to unprivileged programs (?SUBJECTS?) often through some form of inter-process communication mechanism. In this scenario, the mechanism typically treats the subject as untrusted. For every request from a subject, the mechanism needs to determine if the request is authorized or if it should refuse to service the subject. Using the polkit APIs, a mechanism can offload this decision to a trusted party: The polkit authority.

The polkit authority is implemented as a system daemon, polkitd(8), which itself has little privilege as it is running as the polkitd system user. Mechanisms, subjects and authentication agents communicate with the authority using the system message bus.

In addition to acting as an authority, polkit allows users to obtain temporary authorization through authenticating either an administrative user or the owner of the session the client belongs to. This is useful for scenarios where a mechanism needs to verify that the operator of the system really is the user or really is an administrative user.

#### SYSTEM ARCHITECTURE

The system architecture of polkit is comprised of the Authority

IMAGE[1]



```

+-----+
| org.freedesktop. |
| PolicyKit1 |<-----+
+-----+      |
      ^      |
      |      +-----+
      |      | /usr/share/polkit-1/actions/*.policy |
      |      +-----+
      |
+-----+
| /etc/polkit-1/rules.d/*.rules      |
| /usr/share/polkit-1/rules.d/*.rules |
+-----+

```

For convenience, the libpolkit-gobject-1 library wraps the polkit D-Bus API and is usable from any C/C++ program as well as higher-level languages supporting GObjectIntrospection[2] such as Javascript and Python. A mechanism can also use the D-Bus API or the pkcheck(1) command to check authorizations. The libpolkit-agent-1 library provides an abstraction of the native authentication system, e.g. pam(8) and also facilities registration and communication with the polkit D-Bus service.

See the developer documentation[3] for more information about writing polkit applications.

## AUTHENTICATION AGENTS

An authentication agent is used to make the user of a session prove that the user of the session really is the user (by authenticating as the user) or an administrative user (by authenticating as a administrator). In order to integrate well with the rest of the user session (e.g. match the look and feel), authentication agents are meant to be provided by the user session that the user uses. For example, an authentication agent may look like this:

[IMAGE][4]

```

+-----+

```

```

|                                     |
| [Icon] Authentication required      |
|                                     |
| Authentication is required to format INTEL |
| SSDSA2MH080G1GC (/dev/sda)         |
|                                     |
| Administrator                       |
|                                     |
| Password: [_____] |
|                                     |
| [Cancel]                [Authenticate] |
+-----+

```

If the system is configured without a root account it may prompt for a specific user designated as the administrative user:

[IMAGE][5]

```

+-----+
|                                     |
| [Icon] Authentication required      |
|                                     |
| Authentication is required to format INTEL |
| SSDSA2MH080G1GC (/dev/sda)         |
|                                     |
| [Icon] David Zeuthen                |
|                                     |
| Password: [_____] |
|                                     |
| [Cancel]                [Authenticate] |
+-----+

```

Applications that do not run under a desktop environment (for example, if launched from a ssh(1) login) may not have have an authentication agent associated with them. Such applications may use the PolkitAgentTextListener type or the pktyagent(1) helper so the user can authenticate using a textual interface.

## DECLARING ACTIONS

A mechanism need to declare a set of actions in order to use polkit.

Actions correspond to operations that clients can request the mechanism to carry out and are defined in XML files that the mechanism installs into the `/usr/share/polkit-1/actions` directory.

polkit actions are namespaced and can only contain the characters `[A-Z][a-z][0-9].-` e.g. ASCII, digits, period and hyphen. Each XML file can contain more than one action but all actions need to be in the same namespace and the file needs to be named after the namespace and have the extension `.policy`.

The XML file must have the following doctype declaration

```
<?xml version="1.0" encoding="UTF-8"?>

<!DOCTYPE policyconfig PUBLIC "-//freedesktop//DTD polkit Policy Configuration 1.0//EN"
"http://www.freedesktop.org/software/polkit/policyconfig-1.dtd">
```

The `policyconfig` element must be present exactly once. Elements that can be used inside `policyconfig` includes:

**vendor**

The name of the project or vendor that is supplying the actions in the XML document. Optional.

**vendor\_url**

A URL to the project or vendor that is supplying the actions in the XML document. Optional.

**icon\_name**

An icon representing the project or vendor that is supplying the actions in the XML document. The icon name must adhere to the [Freedesktop.org Icon Naming Specification](#)[6]. Optional.

**action**

Declares an action. The action name is specified using the `id` attribute and can only contain the characters `[A-Z][a-z][0-9].-` e.g. ASCII, digits, period and hyphen.

Elements that can be used inside `action` include:

**description**

A human readable description of the action, e.g. `?Install unsigned`

software?.

message

A human readable message displayed to the user when asking for credentials when authentication is needed, e.g. ?Installing unsigned software requires authentication?.

defaults

This element is used to specify implicit authorizations for clients. Elements that can be used inside defaults include:

allow\_any

Implicit authorizations that apply to any client. Optional.

allow\_inactive

Implicit authorizations that apply to clients in inactive sessions on local consoles. Optional.

allow\_active

Implicit authorizations that apply to clients in active sessions on local consoles. Optional.

Each of the allow\_any, allow\_inactive and allow\_active elements can contain the following values:

no

Not authorized.

yes

Authorized.

auth\_self

Authentication by the owner of the session that the client originates from is required. Note that this is not restrictive enough for most uses on multi-user systems; auth\_admin\* is generally recommended.

auth\_admin

Authentication by an administrative user is required.

auth\_self\_keep

Like auth\_self but the authorization is kept for a brief period (e.g. five minutes). The warning about auth\_self above applies likewise.

auth\_admin\_keep

Like auth\_admin but the authorization is kept for a brief period (e.g. five minutes).

annotate

Used for annotating an action with a key/value pair. The key is specified using the key attribute and the value is specified using the value attribute. This element may appear zero or more times. See below for known annotations.

vendor

Used for overriding the vendor on a per-action basis. Optional.

vendor\_url

Used for overriding the vendor URL on a per-action basis. Optional.

icon\_name

Used for overriding the icon name on a per-action basis. Optional.

For localization, description and message elements may occur multiple times with different xml:lang attributes.

To list installed polkit actions, use the pkaction(1) command.

#### Known annotations

The org.freedesktop.policykit.exec.path annotation is used by the pkexec program shipped with polkit - see the pkexec(1) man page for details.

The org.freedesktop.policykit.imply annotation (its value is a string containing a space separated list of action identifiers) can be used to define meta actions. The way it works is that if a subject is authorized for an action with this annotation, then it is also authorized for any action specified by the annotation. A typical use of this annotation is when defining an UI shell with a single lock button that should unlock multiple actions from distinct mechanisms.

The org.freedesktop.policykit.owner annotation can be used to define a set of users who can query whether a client is authorized to perform this action. If this annotation is not specified then only root can query whether a client running as a different user is authorized for an action. The value of this annotation is a string containing a space

separated list of PolkitIdentity entries, for example "unix-user:42  
unix-user:colord". A typical use of this annotation is for a daemon  
process that runs as a system user rather than root.

## AUTHORIZATION RULES

polkitd reads .rules files from the /etc/polkit-1/rules.d and  
/usr/share/polkit-1/rules.d directories by sorting the files in lexical  
order based on the basename on each file (if there's a tie, files in  
/etc are processed before files in /usr). For example, for the  
following four files, the order is

- ? /etc/polkit-1/rules.d/10-auth.rules
- ? /usr/share/polkit-1/rules.d/10-auth.rules
- ? /etc/polkit-1/rules.d/15-auth.rules
- ? /usr/share/polkit-1/rules.d/20-auth.rules

Both directories are monitored so if a rules file is changed, added or  
removed, existing rules are purged and all files are read and processed  
again. Rules files are written in the JavaScript[7] programming  
language and interface with polkitd through the global polkit object  
(of type Polkit).

While the JavaScript interpreter used in particular versions of polkit  
may support non-standard features (such as the let keyword),  
authorization rules must conform to ECMA-262 edition 5[8] (in other  
words, the JavaScript interpreter used may change in future versions of  
polkit).

Authorization rules are intended for two specific audiences

- ? System Administrators
- ? Special-purpose Operating Systems / Environments

and those audiences only. In particular, applications, mechanisms and  
general-purpose operating systems must never include any authorization  
rules.

## The Polkit type

The following methods are available on the polkit object:

```
void addRule(polkit.Result function(action, subject) {...});  
void addAdminRule(string[] function(action, subject) {...});
```



```
void log(string message);  
string spawn(string[] argv);
```

The `addRule()` method is used for adding a function that may be called whenever an authorization check for action and subject is performed.

Functions are called in the order they have been added until one of the functions returns a value. Hence, to add an authorization rule that is processed before other rules, put it in a file in `/etc/polkit-1/rules.d` with a name that sorts before other rules files, for example

`00-early-checks.rules`. Each function should return a value from

`polkit.Result`

```
polkit.Result = {  
    NO          : "no",  
    YES         : "yes",  
    AUTH_SELF   : "auth_self",  
    AUTH_SELF_KEEP : "auth_self_keep",  
    AUTH_ADMIN   : "auth_admin",  
    AUTH_ADMIN_KEEP : "auth_admin_keep",  
    NOT_HANDLED  : null  
};
```

corresponding to the values that can be used as defaults. If the function returns `polkit.Result.NOT_HANDLED`, null, undefined or does not return a value at all, the next user function is tried.

Keep in mind that if `polkit.Result.AUTH_SELF_KEEP` or `polkit.Result.AUTH_ADMIN_KEEP` is returned, authorization checks for the same action identifier and subject will succeed (that is, return `polkit.Result.YES`) for the next brief period (e.g. five minutes) even if the variables passed along with the check are different. Therefore, if the result of an authorization rule depend on such variables, it should not use the `"*_KEEP"` constants (if similar functionality is required, the authorization rule can easily implement temporary authorizations using the `Date[9]` type for timestamps).

The `addAdminRule()` method is used for adding a function may be called whenever administrator authentication is required. The function is used

to specify what identities may be used for administrator authentication for the authorization check identified by action and subject. Functions added are called in the order they have been added until one of the functions returns a value. Each function should return an array of strings where each string is of the form "unix-group:<group>", "unix-netgroup:<netgroup>" or "unix-user:<user>". If the function returns null, undefined or does not return a value at all, the next function is tried.

There is no guarantee that a function registered with `addRule()` or `addAdminRule()` is ever called - for example an early rules file could register a function that always return a value, hence ensuring that functions added later are never called.

If user-provided code takes a long time to execute an exception will be thrown which normally results in the function being terminated (the current limit is 15 seconds). This is used to catch runaway scripts.

The `spawn()` method spawns an external helper identified by the argument vector `argv` and waits for it to terminate. If an error occurs or the helper doesn't exit normally with exit code 0, an exception is thrown. If the helper does not exit within 10 seconds it is killed. Otherwise, the program's standard output is returned as a string. The `spawn()` method should be used sparingly as helpers may take a very long or indeterminate amount of time to complete and no other authorization check can be handled while the helper is running. Note that the spawned programs will run as the unprivileged `polkitd` system user.

The `log()` method writes the given message to the system logger prefixed with the JavaScript filename and line number. Log entries are emitted using the `LOG_AUTHPRIV` flag meaning that the log entries usually ends up in the file `/var/log/secure`. The `log()` method is usually only used when debugging rules. The Action and Subject types has suitable `toString()` methods defined for easy logging, for example,

```
polkit.addRule(function(action, subject) {  
    if (action.id == "org.freedesktop.policykit.exec") {  
        polkit.log("action=" + action);
```

```

    polkit.log("subject=" + subject);
}

});

```

will produce the following when the user runs 'pkexec -u bateman bash

-i' from a shell:

```

May 24 14:28:50 thinkpad polkitd[32217]: /etc/polkit-1/rules.d/10-test.rules:3: action=[Action
id='org.freedesktop.policykit.exec'    command_line='/usr/bin/bash    -i    program='/usr/bin/bash'    user='bateman'
user.gecos='Patrick Bateman' user.display='Patrick Bateman (bateman)']

```

```

May 24 14:28:50 thinkpad polkitd[32217]: /etc/polkit-1/rules.d/10-test.rules:4: subject=[Subject pid=1352
user='davidz' groups=davidz,wheel, seat='seat0' session='1' local=true active=true]

```

### The Action type

The action parameter passed to user functions is an object with information about the action being checked. It is of type Action and has the following attribute:

string id

The action identifier, for example org.freedesktop.policykit.exec.

The following methods are available on the Action type:

string lookup(string key);

The lookup() method is used to lookup the polkit variables passed from the mechanism. For example, the pkexec(1) mechanism sets the variable program which can be obtained in Javascript using the expression action.lookup("program"). If there is no value for the given key, then undefined is returned.

Consult the documentation for each mechanism for what variables are available for each action.

### The Subject type

The subject parameter passed to user functions is an object with information about the process being checked. It is of type Subject and has the following attributes

int pid

The process id.

string user

The user name.

string[] groups

Array of groups that user belongs to.

string seat

The seat that the subject is associated with - blank if not on a local seat.

string session

The session that the subject is associated with.

boolean local

Set to true only if seat is local.

boolean active

Set to true only if the session is active.

The following methods are available on the Subject type:

boolean isInGroup(string groupName);

boolean isInNetGroup(string netGroupName);

The `isInGroup()` method can be used to check if the subject is in a given group and `isInNetGroup()` can be used to check if the subject is in a given netgroup.

## Authorization Rules Examples

Allow all users in the admin group to perform user administration without changing policy for other users:

```
polkit.addRule(function(action, subject) {  
    if (action.id == "org.freedesktop.accounts.user-administration" &&  
        subject.isInGroup("admin")) {  
        return polkit.Result.YES;  
    }  
});
```

Define administrative users to be the users in the wheel group:

```
polkit.addAdminRule(function(action, subject) {  
    return ["unix-group:wheel"];  
});
```

Forbid users in group children to change hostname configuration (that is, any action with an identifier starting with `org.freedesktop.hostname1.`) and allow anyone else to do it after

authenticating as themselves:

```
polkit.addRule(function(action, subject) {  
  if (action.id.indexOf("org.freedesktop.hostname1.") == 0) {  
    if (subject.isInGroup("children")) {  
      return polkit.Result.NO;  
    } else {  
      return polkit.Result.AUTH_SELF_KEEP;  
    }  
  }  
});
```

Run an external helper to determine if the current user may reboot the system:

```
polkit.addRule(function(action, subject) {  
  if (action.id.indexOf("org.freedesktop.login1.reboot") == 0) {  
    try {  
      // user-may-reboot exits with success (exit code 0)  
      // only if the passed username is authorized  
      polkit.spawn(["/opt/company/bin/user-may-reboot",  
        subject.user]);  
      return polkit.Result.YES;  
    } catch (error) {  
      // Nope, but do allow admin authentication  
      return polkit.Result.AUTH_ADMIN;  
    }  
  }  
});
```

The following example shows how the authorization decision can depend on variables passed by the pkexec(1) mechanism:

```
polkit.addRule(function(action, subject) {  
  if (action.id == "org.freedesktop.policykit.exec" &&  
    action.lookup("program") == "/usr/bin/cat") {  
    return polkit.Result.AUTH_ADMIN;  
  }  
}
```

```
});
```

The following example shows another use of variables passed from the mechanism. In this case, the mechanism is `UDisks[10]` which defines a set of actions and variables[11] that is used to match on:

```
// Allow users in group 'engineers' to perform any operation on
// some drives without having to authenticate
//
polkit.addRule(function(action, subject) {
    if (action.id.indexOf("org.freedesktop.udisks2.") == 0 &&
        action.lookup("drive.vendor") == "SEAGATE" &&
        action.lookup("drive.model") == "ST3300657SS" &&
        subject.isInGroup("engineers")) {
        return polkit.Result.YES;
    }
}
});
```

## AUTHOR

Written by David Zeuthen <davidz@redhat.com> with a lot of help from many others.

## BUGS

Please send bug reports to either the distribution or the polkit-devel mailing list, see the link <http://lists.freedesktop.org/mailman/listinfo/polkit-devel> on how to subscribe.

## SEE ALSO

`polkitd(8)`, `pkaction(1)`, `pkcheck(1)`, `pkexec(1)`, `pkttysagent(1)`

## NOTES

1. `/usr/share/gtk-doc/html/polkit-1/polkit-architecture.png`
2. `GObjectIntrospection`  
<https://live.gnome.org/GObjectIntrospection>
3. developer documentation  
<http://www.freedesktop.org/software/polkit/docs/latest/>
4. `/usr/share/gtk-doc/html/polkit-1/polkit-authentication-agent-`

example.png

5. /usr/share/gtk-doc/html/polkit-1/polkit-authentication-agent-  
example-wheel.png

6. Freedesktop.org Icon Naming Specification

<http://standards.freedesktop.org/icon-naming-spec/icon-naming-spec-latest.html>

7. JavaScript

<http://en.wikipedia.org/wiki/JavaScript>

8. ECMA-262 edition 5

[http://en.wikipedia.org/wiki/ECMAScript#ECMAScript.2C\\_5th\\_Edition](http://en.wikipedia.org/wiki/ECMAScript#ECMAScript.2C_5th_Edition)

9. Date

[https://developer.mozilla.org/en/JavaScript/Reference/Global\\_Objects/Date](https://developer.mozilla.org/en/JavaScript/Reference/Global_Objects/Date)

10. UDisks

<http://udisks.freedesktop.org/docs/latest/udisks.8.html>

11. actions and variables

<http://udisks.freedesktop.org/docs/latest/udisks-polkit-actions.html>

polkit

January 2009

POLKIT(8)