phpGACL

Generic Access Control List

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Document Version: 42

Last Updated: **5/20/03 - 18:55:08**

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About

What is it?

phpGACL is an set of functions that allows you to apply access control to arbitrary objects (web pages, databases, etc) by other arbitrary objects (users, remote hosts, etc).

It offers fine-grained access control with simple management, and is very fast.

It is written in PHP (hence **php**GACL), a popular scripting language that is commonly used to dynamically create web pages. The GACL part of phpGACL stands for Generic Access Control List.

Where can I get it?

phpGACL is hosted by sourceforge.net at http://phpGACL.sourceforge.net/

What do I need to run it?

phpGACL requires a relational database to store the access control information. It accesses this database via an abstract wrapper called ADOdb. This is compatible with databases such as PostgreSQL, MySQL and Oracle.

phpGACL is written in the PHP scripting language. It requires PHP 4.2 and above.

Access Control List administration is performed by a web interface, and therefore it is necessary to have a web server with PHP support, such as Apache.

Who is responsible for it?

Mike Benoit <ipso@snappymail.ca> is the author and project manager.

James Russell <james-phpgacl@ps2-pro.com> and Karsten Dambekalns <k.dambekalns@fishfarm.de> did the documentation.

Introduction

Understanding Access Control

Han is captain of the Millennium Falcon and Chewie is his second officer. They've taken on board some passengers: Luke, Obi-wan, R2D2 and C3PO. Han needs to define access restrictions for various rooms of the ship: The Cockpit, Lounge, Engines and the external Guns.

Han says: "Me and Chewie should have access to everywhere, but after a particularly messy hyperdrive repair, I forbid Chewie from going near the Engine Room ever again. Passengers are confined to the Passenger's Lounge."

Let's assume from now on that access is Boolean. That is, the result of looking up a person's access to a room is either ALLOW or DENY. There is no middle ground.

If we mapped this statement into an **access matrix** showing who has access to where, it would look something like this (O means ALLOW, X means DENY):

Who/Where	Cockpit	Lounge	Guns	Engines
Han	O	O	O	O
Chewie	O	O	O	X
Obi-wan	X	O	X	X
Luke	X	O	X	X
R2-D2	X	O	X	X
C3PO	X	O	X	X

The columns list the rooms that Han wants to restrict access to, and the rows list the people that might request access to those rooms. More generally, the "rooms" are "things to control access on". We call these **Access Control Objects** (ACOs). The "people" are "things *requesting* access". We call these **Access Request Objects** (AROs). The *people* request access to the *rooms*, or in our terminology, *AROs* request access to the *ACOs*.

There is a third type of Object, the **Access eXtention Object** (AXO) that we'll discuss later. These objects share many attributes and are collectively referred to as Access Objects.

Managing access using an access matrix like the one above has advantages and disadvantages.

Pros:

- It's very fine-grained. It's possible to control access for an individual person if necessary.
- It's easy to see who has access to what. The answer is stored in the intersection of the person and the room.

Cons:

- It's difficult to manage on a large scale. 6 passengers and 4 places is fairly simple, but what if there were thousands of passengers and hundreds of places, and you need to restrict access to large groups of them at once, but still retain enough fine-grained control to manage access for an individual? That would mean a lot of fiddly

and lengthy adjustment to the matrix, and it' s a difficult task to verify that the final matrix is correct.

- It' s hard to summarize or visualize. The above example is fairly simple to summarize in a few sentences (as Han did above), but what if the matrix looked like this?

Who/Where	Cockpit	Lounge	Guns	Engines
Han	O	O	O	O
Chewie	O	X	O	X
Obi-wan	X	O	X	X
Luke	O	O	O	X
R2-D2	X	O	X	O
C3PO	O	O	X	O

This matrix is not so obvious to summarize, and it' s not clear to the reader why those access decisions might have been made in the first place.

Defining access control with phpGACL

It seems that for large or complex situations, this ' access matrix' approach is clearly unsuitable. We need a better system that maintains the advantages (fine-grain control and a clear idea of who has access to what) but removes the disadvantages (difficult to summarize, and difficult to manage large groups of people at once). One solution is phpGACL.

phpGACL doesn' t describe access from the ' bottom-up' like the Access Matrix above. Instead, it describes it ' top-down' , like the textual description of Han' s access policy. This is a very flexible system that allows you to manage access in large groups, it neatly summarizes the access policy, and it' s easy to see who has access to what.

An **ARO tree** defines a hierarchy of **Groups** and AROs (things that request access). This is very similar to a tree view of folders and files. The ' folders' are the Groups and the ' files' are AROs.

Let' s make an ACL tree for the people on Han' s ship. First we define some categories for the people. It' s clear that Han and Chewie run the ship, and the rest of them are just passengers:

```
Millennium Falcon Passengers        Group
├─Crew                              Group
│  ├─Han                            ARO
│  └─Chewie                         ARO
└─Passengers                        Group
   ├─Obi-wan                        ARO
   ├─Luke                           ARO
   ├─R2D2                           ARO
   └─C3PO                           ARO
```

This tree by itself doesn' t specify any access policy; it just shows how we' re grouping the people who might request access (AROs).

We apply access restrictions by assigning instructions about a particular room (ACO) to Groups or AROs in the tree. Han says: "By default, no-one should be allowed access to any room on the Millennium Falcon. But the Crew should have access to every room. The Passengers should only have access to the Lounge."

```
Millennium Falcon Passengers
├─Crew             [ALLOW: ALL]
│  ├─Han
│  └─Chewie
└─Passengers       [ALLOW: Lounge]
   ├─Obi-wan
   ├─Luke
   ├─R2D2
   └─C3PO
```

To interpret this ARO tree, we start from the top and work our way down.

Firstly, the default policy is always to deny access. Permissions have been overridden for the "Crew", so they have access to everywhere ("ALL" is a synonym for all rooms: "Cockpit, Lounge, Guns, Engines"). The "Passengers" have access only to the Lounge.

This way of describing the access policy is much clearer than the access matrix. You can easily see who has access to what, and it' s easier to determine why they' ve got access (it seems obvious that Han and Chewie would have access to everything, since they' re grouped under "Crew").

To summarize:

- **Access Control Objects** (ACOs) are the things we want to control access to (e.g. web pages, databases, rooms, etc).
- **Access Request Objects** (AROs) are the things that request access (e.g. people, remote computers, etc)
- **ARO trees** define a hierarchy of **Groups** and AROs. Groups can contain other Groups and AROs.
- The default ' catch-all' policy for the ARO tree is always "DENY ALL".
- To assign access policy, work your way down the tree, explicitly assigning permissions to Groups and AROs for each ACO as the need arises.

Fine-grain access control

Oops! What about Chewie? By grouping him in "Crew", Han has indirectly given him access to the Engines! He doesn' t want that after what Chewie recently did to the hyperdrive, so he adds a rule to disallow this:

```
Millennium Falcon Passengers
├─Crew             [ALLOW: ALL]
│  ├─Han
│  └─Chewie        [DENY: Engines]
└─Passengers       [ALLOW: Lounge]
   ├─Obi-wan
   ├─Luke
   ├─R2D2
   └─C3PO
```

This is an example of the way you can control access policy in a fine-grained manner. It is not necessary to move Chewie to another Group; we simply over-ride the access policy at a lower level.

Another example of fine-grain control happens when the Empire attacks; Han needs to let Luke man the guns, and let R2D2 repair the hyperdrive in the Engine room. He can do this by over-riding the general permissions granted by their status as a "Passenger":

```
Millennium Falcon Passengers
├─Crew              [ALLOW: ALL]
│  ├─Han
│  └─Chewie         [DENY: Engines]
└─Passengers        [ALLOW: Lounge]
   ├─Obi-wan
   ├─Luke           [ALLOW: Guns]
   ├─R2D2           [ALLOW: Engines]
   └─C3PO
```

Multi-level Groups

Groups can be extended to any level in the ARO tree. For example, you could add a Group "Jedi" to "Passengers". Most passengers would be categorized under "Passengers", but Luke and Obi-wan would be under "Jedi" and therefore might be extended extra privileges (like access to the Cockpit):

```
Millennium Falcon Passengers
├─Crew              [ALLOW: ALL]
│  ├─Han
│  └─Chewie         [DENY: Engines]
└─Passengers        [ALLOW: Lounge]
   ├─Jedi           [ALLOW: Cockpit]
   │  ├─Obi-wan
   │  └─Luke        [ALLOW: Guns]
   ├─R2D2           [ALLOW: Engines]
   └─C3PO
```

How does phpGACL determine permissions?

When the ship' s computer (running phpGACL of course) checks access, the only question it can ask itself is "Does person X have access to room Y?" In phpGACL terms, this is rephrased as "Does ARO ' X' have access to ACO ' Y' ?"

phpGACL determines whether a specific person has access to a specific room by working from the top of the ARO tree towards the specified person, noting explicit access controls for that place along the way. When it reaches that person, it uses the last explicit access control it encountered as the result to return. In this way, you can define access controls for groups of people, but over-ride them further down the tree if you need to.

Example 1: We ask: "Does Luke have access to the Lounge?".

- Set the default result, "DENY".
- Work out a path to Luke:

  Millennium Falcon Passengers → Passengers → Jedi → Luke

- Start at the top of the tree and move towards Luke: The "Millennium Falcon Passengers" node doesn' t say anything about any room, so do nothing here.

- Move on to "Passengers", which explicitly says that "Passengers" have Lounge access, so change the internal result to "ALLOW".
- Move to the "Jedi" node, which doesn' t mention the Lounge at all.
- Finally move to Luke' s node, and again there' s nothing there about the Lounge.
- There' s nowhere left to go, so the result returned is the current value of the internal result: "ALLOW"

Example 2: We ask: "Does Chewie have access to the Engines?"

- Set the default result, "DENY".
- Work out a path to Chewie:

  Millennium Falcon Passengers → Crew → Chewie
- Start at the top of the tree and move towards Chewie. The "Millennium Falcon Passengers" node doesn' t say anything about anywhere, so do nothing here.
- Move on to "Crew", which explicitly says that "Crew" have Engine access, so change the internal result to "ALLOW".
- Move to Chewie' s node, and there' s an explicit rule saying that he doesn' t have access to the Engines, so change the internal result to "DENY".
- There' s nowhere left to go, so the result returned is the current value of the internal result: "DENY"

As you can see from the examples, if a Group doesn' t explicitly specify a permission for a room, then that Group inherits the access restrictions of its parent for that room. If the root node ("Millennium Falcon Passengers") doesn' t specify a permission, it inherits it from the default setting ("DENY ALL" in the above examples).

This implies a couple of interesting points about the ARO tree:

- The ARO tree always shows the full list of the AROs. It would not make sense to ask "Does Jabba have access to the Cockpit?" because Jabba has not been defined in this system. However, phpGACL does not check to see if AROs or ACOs exist before performing the check, so if this question was actually asked then the result would be the default "DENY".
- The ARO tree may not display some defined ACOs, and relies on the default setting to define access policy. For example, say Han defined a "Bathroom" ACO. Any question like "Does Luke have access to the Bathroom?" would have the answer "DENY", because the default is "DENY" and nowhere in the ARO tree does it ever explicitly mention the Bathroom. Keep in mind when examining the ARO tree that some ACOs may not be visible.

Note: When asking phpGACL questions about access to an ACO, it is not possible to use Groups as AROs (even though it might ' seem' right). For example, it is impossible to answer the question "Do Passengers have access to Guns?" The complete answer is not a Boolean "ALLOW" or "DENY", but the more complex "Luke and Obi-wan can but R2D2 and C3PO cannot." phpGACL is not designed to return that kind of answer.

Adding groups

Han feels this ACL is starting to look a little complicated. There are so many exceptions! Perhaps he should make another group, "Engineers", containing the people who are allowed access to the Engines and Guns. That group should contain Han and R2D2 since they' re both capable of repairing the engines and guns. This means Han can remove some of those messy exceptions-to-the-rules, and that has the benefit of making the description clearer:

```
Default: DENY ALL
Millennium Falcon Passengers
├─Crew             [ALLOW: ALL]
│  ├─Han
│  └─Chewie        [DENY: Engines]
├─Passengers       [ALLOW: Lounge]
│  ├─Jedi          [ALLOW: Cockpit]
│  │  ├─Obi-wan
│  │  └─Luke       [ALLOW: Guns]
│  ├─R2D2
│  └─C3PO
└─Engineers        [ALLOW: Engines, Guns]
   ├─Han
   └─R2D2
```

We can read this as "By default, no-one has access to anywhere. Crew have access to everywhere (except Chewie, who has no access to the Engines). Passengers only have access to the Lounge, except Jedi who also have access to the Cockpit. Luke has access to the Guns too. Engineers are allowed access to the Engines and Guns."

Most importantly, we can see that Han and R2D2 are now in *two* places in the ACL. It is not necessary for them to be uniquely categorized at all. This defines the policy more clearly to the reader: "Ahh, Han and R2D2 have access to the Engines and Guns because they' re *engineers*."

Adding people

Han goes to Cloud City to pick up Lando and get some repairs. Lando' s the Millennium Falcon' s previous owner, so Han reckons he qualifies as Crew. Lando also offers the services of his top engineer, Hontook, for help with repairing the ship while they' re in dock.

```
Default: DENY ALL
Millennium Falcon Passengers
├─Crew             [ALLOW: ALL]
│  ├─Han
│  ├─Chewie        [DENY: Engines]
│  └─Lando
├─Passengers       [ALLOW: Lounge]
│  ├─Jedi          [ALLOW: Cockpit]
│  │  ├─Obi-wan
│  │  └─Luke       [ALLOW: Guns]
│  ├─R2D2
│  └─C3PO
└─Engineers        [ALLOW: Engines, Guns]
   ├─Han
   ├─R2D2
   └─Hontook
```

This shows how easy it is to grant new people access. If we used the original matrix scheme, we' d have to set permissions for each room for both Lando and Hontook. Instead, we simply add them to their appropriate groups and their access is implicitly and easily defined.

Resolving conflicts

What happens if we add Chewie to the list of Engineers?

```
Default: DENY ALL
Millennium Falcon Passengers
├─Crew             [ALLOW: ALL]
│  ├─Han
│  ├─Chewie        [DENY: Engines]
│  └─Lando
├─Passengers       [ALLOW: Lounge]
│  ├─Jedi          [ALLOW: Cockpit]
│  │  ├─Obi-wan
│  │  └─Luke       [ALLOW: Guns]
│  ├─R2D2
│  └─C3PO
└─Engineers        [ALLOW: Engines, Guns]
   ├─Han
   ├─R2D2
   ├─Hontook
   └─Chewie
```

This makes Chewie' s access to the Engines ambiguous, because now there are two paths from the root of the tree to Chewie. If the ship' s computer follows one path (along the "Crew" branch), the result is "DENY access to Engines." If it follows the other path (along the "Engineers" branch) then the result is "ALLOW access to Engines". So, is he allowed or denied?

phpGACL will warn you if you add or edit an multiply-grouped ARO in such a way that the ARO' s access to an arbitrary ACO would be ambiguous. But it is up to you to resolve the conflict.

If we now asked phpGACL the question "Does Chewie have access to Engines?" the result returned is the result given by the last ACL entry to be modified (this is phpGACL' s policy). In this case the result is ALLOW, because the "ALLOW: Engines, Guns" directive assigned to the Engineers Group is more recent than the "DENY: Engines" directive assigned to Chewie' s Group.

When ambiguous access entries exist in the ACL, the ACL is said to be **inconsistent**. Inconsistent ACLs can be very dangerous, and you may unwittingly provide access to inappropriate people if you allow your ACL to remain in this state. When phpGACL warns you that the ACL is inconsistent, it is best to resolve the conflicts as soon as possible to regain consistency.

To resolve the conflict in this case, we could either:

- Remove the "DENY: Engines" directive from Chewie' s entry under the Crew Group.
- Add a "DENY: Engines" directive to Chewie' s entry under the Engineers Group.
- Remove Chewie from the Engineers Group, since Han doesn' t think him a worthy Engineer anyway.

Han chooses option 3, and removes Chewie from the Engineers list.

Naming Access Objects

phpGACL uniquely identifies each Access Object (AROs, AXOs and ACOs) with a two-keyword combination and it' s Access Object type.

The tuple "(Access Object type, Section, Value)" uniquely identifies any Access Object.

The first element of the tuple is the type of Access Object (ARO, AXO or ACO).

The second element of the tuple, called the **Section**, is a user-defined string which names the general category of the Access Object. Multiple Access Objects can share the same Section name. The Section name should be short but descriptive. It' s used in the user interface in selection boxes, so try not to make it too long.

Sections are stored in a flat namespace; they are not nestable like Groups. Sections have nothing to do with Groups or the ARO/AXO trees - they are purely a mechanism for helping to maintain large numbers of Access Objects.

The third element of the tuple is a user-defined name for the Access Object, and is called the **Value**. A Value cannot contain spaces (however, a Section can).

Both Section and Values are case sensitive.

> **Aside:** It is commonly asked why strings are used to identify Access Objects, rather than integers which ostensibly seem faster. The answer is for legibility. It is much easier to understand:
>
> ```
> acl_check('system', 'login', 'users', 'john_doe');
> ```
>
> than:
>
> ```
> acl_check(10, 21004, 15, 20304);
> ```

Since it is often obvious from the context which type of Access Object we are referring to, the interface for phpGACL (and this documentation) drops the Access Object type and uses the format "**Section > Value**" when displaying the name of an Access Object. However, the API requires an Access Object' s "Section" and "Value" to be specified in separate function arguments (the Access Object type is usually implicit in the argument description).

Example ACO "Section > Values":

- "Floors > 1st"
- "Floors > 2nd"
- "Rooms > Engines"

Example ARO "Section > Values":

- "People > John_Smith”
- “People > Cathy_Jones”
- “Hosts > sandbox.something.com”

Example API usage:

- acl_check (aro_section, aro_value, aco_section, aco_value);

- acl_check (' People' , ' John_Smith' , ' Floors' , ' 2nd');

Valid Naming Restrictions Examples:

- "ACO -Frob > Flerg", "ARO - Frob > Flerg" (The Section and Value are the same in both, but this is fine as namespaces are separate across Access Object types)
- "ACO -Frob > Flerg", "ACO - Frob > Queegle" (The Access Object type and Section are the same, but this is fine as the Values are different)
- "AXO - Frob Hrung > Flerg" (Sections can contain spaces)

Invalid Naming Restrictions Examples:

- "ACO - Frob > Flerg", "ACO - Frob > Flerg" ("Access Object type - Section > Value" must be unique)
- "ACO - Frob > Flerg Habit" (Values cannot contain spaces)

Adding Sections

Before you can add a new Access Object, its Section must be defined. To add a new section, use the add_object_section() function.

add_object_section (

`string NAME,`	A short description of what this Section is for. (e.g. "Levels in building").
`string VALUE,`	The name of the Section (e.g. "Floor").
`int ORDER,`	An arbitrary value which affects the order this Section appears in the UI.
`bool HIDDEN,`	Whether this should appear in the UI or not (TRUE means that is will be hidden).
`string GROUP_TYPE)`	The Access Object type ("aco", "aro" or "axo")

Han creates 3 Sections for the AROs. "Humans", "Aliens" and "Androids". Let' s list the AROs with their full names

```
Millennium Falcon Passengers
├─Crew                          [ALLOW: ALL]
│  ├─"Humans > Han"
│  ├─"Aliens > Chewie"          [DENY: Engines]
│  └─"Humans > Lando"
├─Passengers                    [ALLOW: Lounge]
│  ├─Jedi                       [ALLOW: Cockpit]
│  │  ├─"Humans > Obi-wan"
│  │  └─"Humans > Luke"         [ALLOW: Guns]
│  ├─"Androids > R2D2"
│  └─"Androids > C3PO"
└─Engineers                     [ALLOW: Engines, Guns]
   ├─"Humans > Han"
   ├─"Androids > R2D2"
   └─"Aliens > Hontook"
```

Sections are just a way of categorizing Access Objects, to make the user interface more usable, and the code for acl_check() more readable. They do not affect the way phpGACL determines access to an object. They cannot be nested (so it would not be able to create a "Males" sub-Section under "Humans" for example; you' d have to create a Section called "Humans-Male" or similar)

Multiple Purposes

You may need to use phpGACL for multiple independent purposes. For example, you may need to restrict user access to web pages, and also remote host access to your server. The two tasks are not related.

phpGACL can handle this in three different ways.

- It can use an alternative database to store the access tables.
- It can use the same database but with differently named access tables. (this feature is not implemented yet).
- You can store the Access Objects for both purposes in the same tables, and carefully manage your list so that they don' t conflict.

To implement Option 1 (and Option 2 when it becomes available), use the $gacl_options array when creating a new phpGACL class. This allows you to specify the database and table name prefixes to use:

```
$gacl_options = array(
      'db_table_prefix' => 'gacl_',
      'db_type' => 'mysql',
      'db_host' => 'host1',
      'db_user' => 'user',
      'db_password' => 'passwd',
      'db_name' => 'gacl');

$gacl_host1 = new gacl($gacl_options);
```

To implement Option 3, you must be careful, since phpGACL doesn' t know the relationship between your different tasks, and it will be possible to make meaningless Access Policy Directives.

For example, say Han wanted to restrict access to other ships contacting his ship' s computer, in addition to restricting access to the different rooms. To do this, he might add "Luke' s X-Wing Fighter" as a remote ship ARO (in addition to other ships and an ACO for the ship' s computer). Because all AROs are in the same ARO tree, it would be possible to create an APD like "Ships > Luke' s X-Wing Fighter" [ALLOW: "Rooms > Lounge"], which would be totally meaningless! To help reduce mistakes like this, good Section naming can make it clearer what Access Objects are for which tasks. It should be obvious to any administrator that it' s meaningless to assign a Ship permission to use a Room.

Access eXtension Objects

Access eXtension Objects (AXOs) can add a 3rd dimension to the permissions that can be configured in phpGACL. We' ve seen how phpGACL allows you to combine an ARO and an ACO (2 dimensions) to create an Access Policy Directive. This is great for simple permission requests like:

> Luke (ARO) requests access to "Guns" (ACO)

If that' s all you need, that' s fine - AXOs are totally optional.

But because all ACOs are considered equal, it makes it difficult to manage if there are many ACOs. If this is the case, we can change the way we look at Access Objects to manage it more easily.

AXOs are identical to AROs in many respects. There is an AXO tree (separate from the ARO tree), with it' s own Groups and AXOs. When dealing with AXOs, consider an AXO to take the old role of the ACO (i.e. "things to control access on"), and change the view of ACOs from "things to control access on" to "actions that are requested".

ARO and ACO-only View:

- AROs: Things requesting access
- ACOs: Things to control access on

ARO, ACO and AXO View:

- AROs: Things requesting access
- ACOs: Actions that are requested
- AXOs: Things to control access on

Example:

A website manager is trying to manage access to projects on the website. The ARO tree consists of all the users:

```
Website
├─Administrators
│  ├─Alice
│  └─Carol
└─Users
   ├─Bob
   └─Alan
```

The projects are organized by Operating System into categories in the AXO tree:

```
Projects
├─Linux
│  ├─SpamFilter2
│  └─AutoLinusWorshipper
└─Windows
   ├─PaperclipKiller
   └─PopupStopper
```

The actions that can be taken with each project are "View" and "Edit". These are the ACOs.

Now we want Bob to have "View" access to all the Linux projects, so it' s possible to add an ADP that links Bob' s ARO to the View ACO and the Linux AXO, and thus we can ask the question:

> Bob (ARO) requests access to "View" (ACO) the project(s) called "Linux" (AXO)

Keep in mind AXO' s are optional, if you don' t specify an AXO when calling acl_check() and a matching ADP exists with no AXO, it will be allowed. However if only APDs exist with AXO' s, and you call acl_check() without an AXO, it will fail.

So basically as soon as you specify an AXO when calling acl_check(), acl_check() will only search ACLs containing AXO' s. If no AXO is specified, only ACLs without AXOs are searched. This in theory (I haven' t benchmarked) gives us a slight performance increase as well.

Installation

Basic setup

1. Untar the distribution .tar.gz file into the root or a subdirectory of your web site. You might want to rename it to something more suitable.

```
karsten@tolkien:~/Work/phpgacl> tar xvzf ../mgw/libs/phpgacl-3.1.0.tar.gz
phpgacl-3.1.0/
phpgacl-3.1.0/CHANGELOG
phpgacl-3.1.0/AUTHORS
phpgacl-3.1.0/Cache_Lite/
phpgacl-3.1.0/Cache_Lite/Cache_Lite.php
phpgacl-3.1.0/Cache_Lite/Hashed_Cache_Lite.php
phpgacl-3.1.0/Cache_Lite/LICENSE
phpgacl-3.1.0/COPYING.lib
phpgacl-3.1.0/CREDITS
phpgacl-3.1.0/FAQ
phpgacl-3.1.0/MANUAL.HTML
```

2. Edit phpgacl/gacl.class.php using your favourite editor and set the db_type, db_host, db_user, db_password, and db_name you will be using.

```
class gacl {

        // --- Private properties ---

        /*
         * Enable Debug output.
         */
        var $_debug = FALSE;

        /*
         * Database configuration.
         */
        var $_db_table_prefix = 'gacl_';
        var $_db_type = 'mysql'; //mysql, postgres7, sybase, oci8po
        var $_db_host = 'localhost';
        var $_db_user = 'root';
        var $_db_password = '';
        var $_db_name = 'gacl';

        /*
         * NOTE:        This cache must be manually cleaned each time ACL's are modified.
         *                      Alternatively you could wait for the cache to expire.
         */
        var $_caching = FALSE;
        var $_force_cache_expire = TRUE;
        var $_cache_dir = '/tmp/phpgacl_cache'; // NO trailing slash
        var $_cache_expire_time=600; //600 == Ten Minutes
```

   Now edit phpgacl/admin/gacl_admin.inc.php to hold the same information. This file is used by the setup script as well as the ACL admin backend.

   The reason for two files holding that (same) information, is that the core ACL library gacl.class.php is much smaller than the full-fledged API class, and there is no need to include all the code when you just want to call acl_check().

3. Create the database you specified in db_name on the server.

```
karsten@tolkien:~/Work/phpgacl> mysql
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 158 to server version: 3.23.55-log

Type 'help;' or '\h' for help. Type '\c' to clear the buffer.

mysql> CREATE DATABASE my_app_db;
Query OK, 1 row affected (0.11 sec)

mysql>
```

4. Surf to http://yoursite.net/phpgacl/setup.php. The required tables will be installed based on your choice of database. Don' t be afraid of the truckload of output, if all goes well you will see only success messages.

Testing database connection...

Success! Connected to "**mysql**" database on "**localhost**".

Testing database type...

Success! Compatible database type "**mysql**" detected!
Making sure database "**my_app_db**" exists...
Success! Good, database "**my_app_db**" already exists!
Attempting to create tables in "**my_app_db**"
Attempting to create table: "**acl**"...
Success! Table "**acl**" created successfully!
Attempting to create table: "**aco**"...
Success! Table "**aco**" created successfully!
Attempting to create table: "**aco_map**"...
Success! Table "**aco_map**" created successfully!
Attempting to create table: "**aco_sections**"...
Attempting to create table: "**axo_groups**"...
Success! Table "**axo_groups**" created successfully!
Attempting to create table: "**groups_axo_map**"...
Success! Table "**groups_axo_map**" created successfully!
Attempting to create table: "**axo_groups_map**"...
Success! Table "**axo_groups_map**" created successfully!
Attempting to create table: "**axo_groups_path**"...
Success! Table "**axo_groups_path**" created successfully!
Attempting to create table: "**axo_groups_path_map**"...
Success! Table "**axo_groups_path_map**" created successfully!
Success! Installation Successful!!!

IMPORTANT
Please make sure you create the **<phpGACL root>/admin/smarty/templates_c** directory, and give it **write permissions** for the user your web server runs as. **Go here!** to get started.

5. Now follow the last advice shown on that screen and create the phpgacl/admin/smarty/templates_c directory. It must be writable by the user the webserver runs as. If you don' t do this, you will not be able to use the CAL admin!

6. Click the link at the bottom of the successful setup page or surf to: http://yoursite.net/phpgacl/admin/acl_admin.php

Advanced setup

Reusing an already existing ADOdb installation

If you already have ADOdb installed you can get phpGACL to use this copy of ADOdb.

1. Edit phpgacl/gacl.class.php so that ADODB_DIR reflects the location of the ADOdb library in your path.

2. Rename the phpgacl/adodb folder to something else like adodb_x and reload the phpgacl/admin/acl_admin.php page to ensure it still works.

3. Erase the adodb directory installed with phpGACL.

Reusing an already existing Smarty installation

If you already have ADOdb installed you can get phpGACL to use this copy of ADOdb.

1. Edit phpgacl/admin/gacl_admin.inc.php so that the variables $smarty_dir and $smarty_compile_dir reflect the location of the Smarty library in your path and the template_c directory you already use.

   Move the templates directory that came with phpGACL to another directory (e.g. one level up). Adjust the $smarty_template_dir so it points to the new location. If you like you can move those templates to your existing templates folder, of course.

2. Rename the phpgacl/smarty folder to something else like smarty_x and reload the phpgacl/admin/acl_admin.php page to ensure it still works.

3. Erase the smarty directory installed with phpGACL.

How do I move the phpGACL files out of my website tree while leaving a link in the tree for administration?

1. Go to your website root.

2. Move the phpGACL directory to your includes directory and create a symlink to the admin directory where you want the admin tool to go. For example:

   mv phpgacl/ /www/includes_directory
   ln -s /www/includes_directory/phpgacl/admin/ gacl

3. Now surfing to http://yoursite.net/gacl/acl_admin.php will take you to the admin page. If it doesn' t work, make sure your Webserver allows symbolic links in the website tree.

Using phpGACL in your application

Basic usage

This example shows a basic example of using phpGACL in your code. It uses the ADOdb abstraction layer as well, and shows a simple way to validate a login attempt against a database.

```
// include basic ACL api
include('phpgacl/gacl.class.php');
$gacl = new gacl();

$username = $db->quote($_POST['username']);
$password = $db->quote(md5($_POST['password']));
$sql = 'SELECT name FROM users WHERE name=';
$sql .= $username.' AND password='.$password;
$row = $db->GetRow($sql);

if($gacl->acl_check('system','login','user',$row['name'])){
  $_SESSION['username'] = $row['name'];
  return true;
}
else
  return false;
```

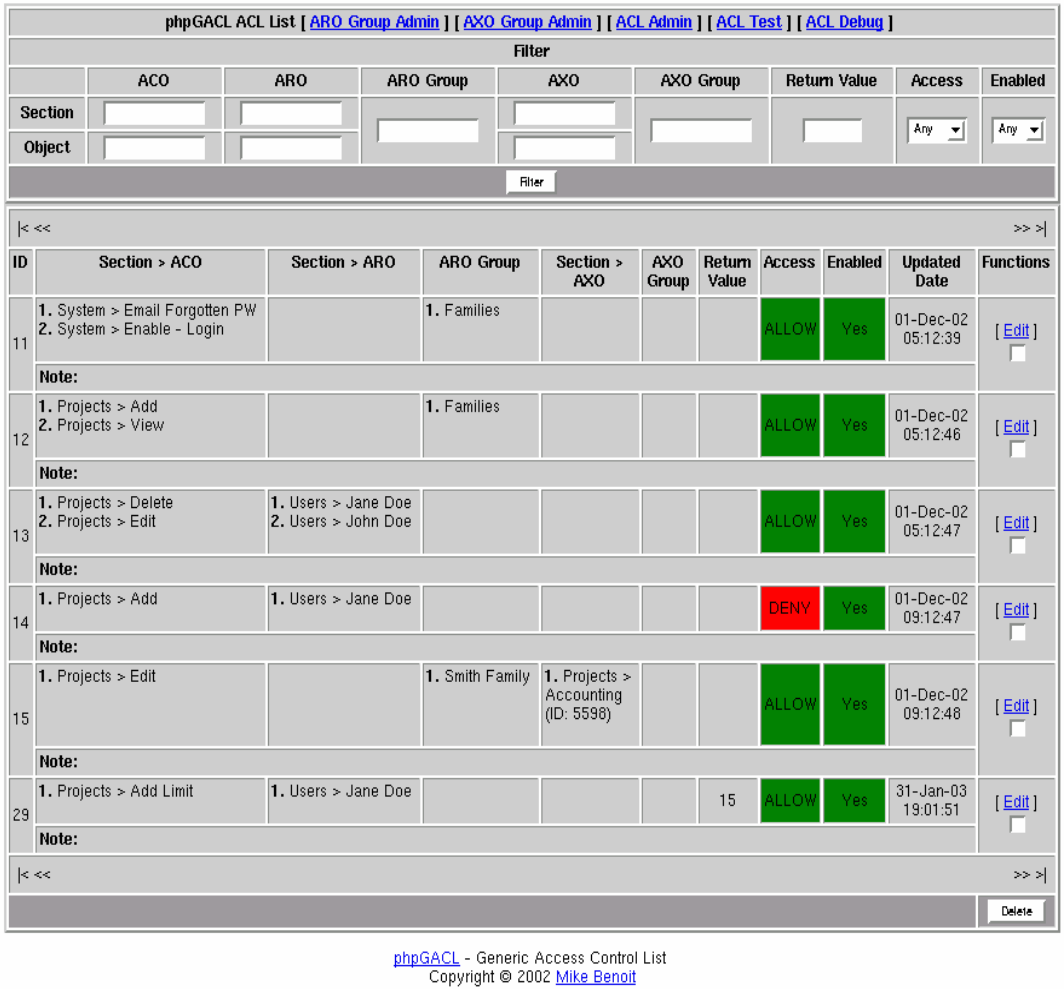
As you can see there is only one call to acl_check() in this code. What does it do? Well, it

- checks the ARO object $row[' name'] from the ARO section ' user'
- against the ACO object ' login'   from the ACO section ' system' .

Advanced usage

Using the ACL admin utility

If you want to get a grip on the included ACL admin utitlity, it will help you a lot to import the demonstration data into the database. You find a MySQL dump in the file phpgacl/admin/mysql_db_demo_data.sql. It contains some ACO, ARO and AXO objects, as well as some ACL defined using those objects. After importing the dump, calling the ACL admin and going to the ACL list should show this:



phpGACL ACL List [ARO Group Admin] [AXO Group Admin] [ACL Admin] [ACL Test] [ACL Debug]

Filter

	ACO	ARO	ARO Group	AXO	AXO Group	Return Value	Access	Enabled
Section							Any	Any
Object								

Filter

|< << >> >|

ID	Section > ACO	Section > ARO	ARO Group	Section > AXO	AXO Group	Return Value	Access	Enabled	Updated Date	Functions
11	1. System > Email Forgotten PW 2. System > Enable - Login		1. Families				ALLOW	Yes	01-Dec-02 05:12:39	[Edit]
	Note:									
12	1. Projects > Add 2. Projects > View		1. Families				ALLOW	Yes	01-Dec-02 05:12:46	[Edit]
	Note:									
13	1. Projects > Delete 2. Projects > Edit	1. Users > Jane Doe 2. Users > John Doe					ALLOW	Yes	01-Dec-02 05:12:47	[Edit]
	Note:									
14	1. Projects > Add	1. Users > Jane Doe					DENY	Yes	01-Dec-02 09:12:47	[Edit]
	Note:									
15	1. Projects > Edit		1. Smith Family	1. Projects > Accounting (ID: 5598)			ALLOW	Yes	01-Dec-02 09:12:48	[Edit]
	Note:									
29	1. Projects > Add Limit	1. Users > Jane Doe				15	ALLOW	Yes	31-Jan-03 19:01:51	[Edit]
	Note:									

|< << >> >|

Delete

phpGACL - Generic Access Control List
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Play around with it, and if you get stuck, come back and read on...

(yet to be written)

API Reference

ACL

add_acl()

Adds permissions to the access control list.

add_acl (

array ACO IDs,

array ARO_IDs,

array ARO_GROUP_IDs,

array AXO_IDs,

array AXO_GROUP_IDs,

bool ALLOW,

bool ENABLED

[, int ACL_ID])

Returns:

int ACL_ID on success, FALSE on failure.

edit_acl()

Edits permissions already set in the access control list.

edit_acl (

array ACO IDs,

array ARO_IDs,

array ARO_GROUP_IDs,

array AXO_IDs,

array AXO_GROUP_IDs,

bool ALLOW,

bool ENABLED

[, int ACL_ID])

Returns:

int ACL_ID on success, FALSE on failure.

del_acl()

Deletes permissions already set in the access control list.

del_acl (

int ACL ID)

Returns:

TRUE on success, FALSE on failure.

Groups

get_group_id()

Gets a group ID.

get_group_id (

string GROUP NAME) The Access Object type ("aco", "aro" or "axo").

Returns:

int GROUP_ID on success, FALSE on failure.

get_group_parent_id()

Gets a groups immediate parent ID.

get_group_parent_id (

int GROUP_ID)

Returns:

int GROUP_PARENT_ID on success, FALSE on failure.

add_group()

Adds a group to the group tree.

add_group (

string NAME

[, int GROUP_PARENT_ID])

Returns:

int GROUP_ID on success, FALSE on failure.

get_group_objects()

Gets all objects assigned to a group.

get_group_aro (

int GROUP_ID,

string GROUP_TYPE)

Returns:

array SECTION_VALUE, VALUE on success, FALSE on failure.

add_group_object()

Assigns an ARO to a group.

add_group_aro (

int GROUP_ID,

string OBJECT_SECTION_VALUE,

string OBJECT_VALUE,

string GROUP_TYPE) The Access Object type ("aco", "aro" or "axo").

Returns:

int TRUE on success, FALSE on failure.

del_group_object()

Removes an ARO from a group.

del_group_aro (

int GROUP_ID,

string OBJECT_SECTION_VALUE,

string OBJECT_VALUE,

string GROUP_TYPE) The Access Object type ("aco", "aro" or "axo").

Returns:

int TRUE on success, FALSE on failure.

edit_group()

Edits a group.

edit_group (

int GROUP_ID,

string NAME,

int GROUP_PARENT_ID,

string GROUP_TYPE) The Access Object type ("aco", "aro" or "axo").

Returns:

int TRUE on success, FALSE on failure.

del_group()

Deletes a group, re-parenting or deleting children if specified.

del_group (

int GROUP_ID,

bool REPARENT_CHILDREN,

string GROUP_TYPE) The Access Object type ("aco", "aro" or "axo").

Returns:

int TRUE on success, FALSE on failure.

Access Objects (ARO/ACO/AXO)

This section of the API manages Access Objects like AROs, ACOs and AXOs.

get_object()

Returns an array containing information about all Access Objects of a specified type.

get_object (

[string SECTION_VALUE], Optional. A Section name to filter on.

bool RETURN_HIDDEN, Whether to return Objects which have their Hidden attribute set.

string GROUP_TYPE) The Access Object type ("aco", "aro" or "axo").

Returns:

array OBJECT_ID on success, FALSE on failure.

get_object_data()

Returns an array containing information about a specific Access Objects, given it' s Object ID.

get_object_data (

int OBJECT_ID,

string GROUP_TYPE) The Access Object type ("aco", "aro" or "axo").

Returns:

array (section_value, value, order_value, name) on success, FALSE on failure.

get_object_id()

Gets an object ID.

get_object_id (

string OBJECT_SECTION_VALUE,

string OBJECT_VALUE,

string GROUP_TYPE) The Access Object type ("aco", "aro" or "axo").

Returns:

int OBJECT_ID on success, FALSE on failure.

get_object_section_value()

Gets an object section ID.

get_object_section_value (

int OBJECT_ID,

string GROUP_TYPE) The Access Object type ("aco", "aro" or "axo").

Returns:

int SECTION_VALUE on success, FALSE on failure.

add_object()

Adds an object.

add_object (

string SECTION_VALUE,

string NAME,

string VALUE,

int ORDER,

bool HIDDEN,

string GROUP_TYPE) The Access Object type ("aco", "aro" or "axo").

Returns:

array OBJECT_ID on success, FALSE on failure.

edit_object()

Edits an object.

edit_object (

string SECTION_VALUE,

string NAME,

string VALUE,

int ORDER,

bool HIDDEN,

string GROUP_TYPE) The Access Object type ("aco", "aro" or "axo").

Returns:

array OBJECT_ID on success, FALSE on failure.

del_object()

Deletes an object.

del_object (

int OBJECT_ID,

string GROUP_TYPE, The Access Object type ("aco", "aro" or "axo").

bool ERASE)

Returns:

int TRUE on success, FALSE on failure.

Access Object Sections

This part of the API manages the Sections that comprise part of the unique name of an Access Object. See "Sections" for more information.

get_object_section_section_id()

Returns the ID of an existing Section. You must specify either the Section' s name, value, or both.

If only the name is specified, there may be multiple results (since the NAME does not have to be unique). In this case, an error is returned.

get_object_section_section_id (

string NAME, A short description of what this Section is for. (e.g. "Levels in building").

string VALUE, The name of the Section (e.g. "Floor").

string GROUP_TYPE) The Access Object type ("aco", "aro" or "axo").

Returns:

int SECTION_ID on success, FALSE on failure.

add_object_section

Adds a new object Section.

string NAME, A short description of what this Section is for. (e.g. "Levels in building").

string VALUE, The name of the Section (e.g. "Floor").

int ORDER, An arbitrary value which affects the order this Section appears in the UI. Items will be displayed from lowest to highest.

bool HIDDEN, Whether this should appear in the UI or not (TRUE means that is will be hidden).

string GROUP_TYPE) The Access Object type ("aco", "aro" or "axo").

Returns:

int SECTION_ID on success, FALSE on failure.

edit_object_section()

Changes the attributes of a Section. It is not possible to change the Access Object type of a Section. For more information on each field, see add_object_section.

edit_object_section (

int OBJECT_SECTION_ID, The Section ID (you can obtain this using the get_object_section_section_id function)

string NAME, The new Section name.

string VALUE, The new Section value.

int ORDER, The new Section order.

bool HIDDEN, The state of the hidden attribute.

string GROUP_TYPE) The Access Object type ("aco", "aro" or "axo").

Returns:

TRUE on success, FALSE on failure.

del_object_section()

Deletes a Section. All Access Objects associated with this Section will also be erased!

del_object_section (

int SECTION_ID, The Section ID of the Section.

string GROUP_TYPE, The Access Object type ("aco", "aro" or "axo").

bool ERASE) If this is TRUE, then all Access Objects associated with this Section will be erased along with the Section itself. If it is FALSE, then a error will be returned if the Section still has Access Objects associated with it, otherwise the Section will be erased.

Returns:

TRUE on success, FALSE on failure.

FAQ