This directory contains information and code regarding the work that GroundWork performed to port Cacti to use PostgreSQL instead of MySQL. We are making the modifications we developed available to the Cacti team, so that these extensions can be folded into the main-line Cacti releases.

GENERAL NOTES

The baseline for this port was Cacti 0.8.7g (cacti-0.8.7g.tar.gz) plus the companion Plugin Architecture 2.8 (cacti-plugin-0.8.7g-PA-v2.8.tar.gz). Groundwork's starting code for this porting effort had a small number of differences from that combination, as noted in the SPECIAL GROUNDWORK EXTENSIONS AND BUG FIXES TO CACTI section below.

We then upgraded ADODB to release 5.14, and made it work with PostgreSQL 9.1.1. The ability for Cacti to work with MySQL was left in place. The choice of database type is made in the cacti/htdocs/include/config.php file, by the value of the $database_type variable (with a corresponding change to the $database_port value).

With regard to the ADODB upgrade, in order have the least effect on the ability to work with MySQL, the cacti/htdocs/include/global.php file has been modified to choose an older version of ADODB if MySQL is being used (we include adodb/adodb.inc.php for MySQL, versus adodb5/adodb.inc.php when PostgreSQL is in play). The two versions of ADODB sit side-by-side in our distribution. Presumably, there is no good reason that the later release of ADODB cannot also be used with MySQL, and the older release can be dropped; we were just being cautious, as we did not have time for regression testing with MySQL.

PORTING ADODB

It didn't take much thinking to realize that the best approach to porting the Cacti PHP code was to continue to use the existing ADODB layer and its portable support for multiple types of databases. We did upgrade to the then-current ADODB release (5.14). A very few changes were needed in the ADODB layer itself, to bring its PostgreSQL support up to grade for this usage. The key fixes are:

* proper support for returning application-level ID values upon row inserts

* support for deadlock, serialization failure, and statement timeout failures

These changes have been returned to the upstream maintainer, and will hopefully find their way into the next official ADODB release (5.16 or later). In the meantime, we have provided the necessary patches for the ADODB 5.14 release. See the adodb-patch-instructions and adodb5.14-patch-for-postgres9.tar.gz files in this directory.

To use the ADODB 5.14 release, it must be installed within Cacti in the lib/adodb5/ directory, right next to the existing lib/adodb/ directory.

PORTING CACTi

Finding the places that needed changing in Cacti PHP code was quite an adventure. It turns out that the existing Cacti code was highly adapted to odd MySQL extensions to the SQL standards, and these constructions had to be identified and changed to be standard-compliant in a portable manner. Sometimes this was evidenced in SQL statements embedded in the Cacti code; sometimes it turned up in ways that MySQL clearly violates industry standards by making default assumptions (even in the face of contradictory evidence); and sometimes it was evidenced in the manner in which the ADODB layer was called, with MySQL masking inappropriate use of the ADODB layer. Detailed notes may be found below.

SPECIAL GROUNDWORK EXTENSIONS AND BUG FIXES TO CACTI

GroundWork made a number of small modifications to Cacti before this porting effort began. These changes allow Cacti to better live in the

GroundWork Monitor context. However, some of them may also be of more general use, so we would like to retain those fixes in the main-line Cacti development work going forward.

The baseline files we started with in this PostgreSQL porting effort had the following differences from the files that result from deploying cacti-0.8.7g.tar.gz and then applying the patches from the cacti-plugin-0.8.7g-PA-v2.8.tar.gz distribution. The fix marked with (*) should be adopted into the main-line Cacti development.

auth.php.initial_diff
    This file contains a patch to include/auth.php that GroundWork makes to fit Cacti into our Single-Sign-On context, where Cacti is integrated into a larger portal environment. This patch (the code for which is clearly demarcated in the PostgreSQL patch for include/auth.php.orig) may or may not be appropriate for more general use.

    Note to GroundWork: GroundWork made changes to include/auth.php in two steps, creating backup copies include/auth.php.orig.orig and include/auth.php.orig along the way. We will want to look carefully at the final result of the Cacti team's porting efforts to make sure that all the desired changes in this file were brought forward.

config.php.initial_diff
    This file contains a one-line difference in the include/config.php file that GroundWork uses, to change the value of the $url_path variable to reflect our context.

data_sources.php.initial_diff
    This file contains a one-line difference in the data_sources.php file, involving calls to htmlspecialchars(). This appears to be a simplistic attempt to solve just a small part of the problem which was more thoroughly solved by the official html_output.patch patch file for the 0.8.7g release. The data_sources.php.initial_diff file should be completely ignored if the html_output.patch patch is applied instead.

global_arrays.php.initial_diff
    This file contains a commented-out reference to logout.php in the include/global_arrays.php file, because logging out directly from the Cacti application makes no sense in our integrated GroundWork context with Single-Sign-On enabled. This change is GroundWork-specific, unless Cacti adopts a site-setup model where adapting to such a context becomes a configurable option.

global_settings.php.initial_diff (*)
    This file contains spelling fixes, of general applicability, in the include/global_settings.php file. These should probably have just been folded into the general PostgreSQL-porting patch set, but were not.

top_graph_header.php.initial_diff
    This file contains a removal of a reference to logout.php in the include/top_graph_header.php file, because logging out directly from the Cacti application makes no sense in our integrated GroundWork context with Single-Sign-On enabled. This change is GroundWork-specific, unless Cacti adopts a site-setup model where adapting to such a context becomes a configurable option.

top_header.php.initial_diff
    This file contains a removal of a reference to logout.php in the include/top_header.php file, because logging out directly from the Cacti application makes no sense in our integrated GroundWork context with Single-Sign-On enabled. This change is GroundWork-specific, unless Cacti adopts a site-setup model where adapting to such a context becomes a configurable option.

SPECIAL GROUNDWORK BUG FIXES TO CACTI PLUGINS

GroundWork applies several custom patches to the Cacti Plugins that we currently distribute. These are included in this package partly just to ensure that we can easily replicate our current release, and partly because some of them address issues still outstanding in the latest releases of the plugins, so these fixes ought to be picked up by the plugin maintainers. See the FILES section below for more details.

discovery-0.8.5-findhosts.php.initial_diff
    Fix is already in Discovery Plugin 1.5.

thold-0.4.2-includes-settings.php.initial_diff
    Fix is already in Thold Plugin 0.4.9.

thold-0.4.2-listthold.php.initial_diff
    Alternate (more-standard) way of doing something that is already being
    done in the plugin. This fix is not already present in Thold Plugin
    0.4.9, but ought to be. Using the standard way simplifies porting
    to other databases, so either this change must be adopted or a much
    more complex change will need to be made for the PostgreSQL port.

thold-0.4.2-setup.php.initial_diff
    Two fixes, one already present in Thold Plugin 0.4.9, and one that
    is not but ought to be.

thold-0.4.2-thold_functions.php.initial_diff
    Fixes are already in Thold Plugin 0.4.9.

thold-0.4.2-thold_graph.php.initial_diff
    Fix is not present in Thold Plugin 0.4.9, but ought to be.

CHANGES TO CACTI PHP CODE

GroundWork modified about 75 files in the PHP code (for ADODB, Cacti,
and Cacti plugins) to port to PostgreSQL. That obviously sounds like a
lot of changes, but a great many of them represented repeated instances
of the same issues. To simplify your looking through the modified files,
here's a short guide to the types of problems we encountered. Most of
them had to do with overadaptation to MySQL violations of SQL standards.
Along the way during this porting effort, we also fixed a few unrelated
bugs in miscellaneous places, as we noticed them during the porting
effort.

  * fixed some infinite-loop bugs (see the separate recursive_calls file
    for details of one such loop)

  * "select ... from (table1, table2) ..." => "from table1, table2"
    (drop parentheses around these table names, which are not accepted
    by PostgreSQL in this form of joins)

  * breaking apart long-join syntax using explicit join syntax (typically,
    adding "left join" or "cross join" keywords)

  * "select ... limit 0, 1" (MySQL extension) vs. "select ... limit 1
    offset 0" (which syntax is portable to PostgreSQL as well)

  * explicit NULL values re-interpreted by MySQL as other DEFAULT values
    (e.g., AUTO_INCREMENT values); often reflected as inappropriate use
    of the ADODB layer rather than as explicit SQL issues

  * NULL or missing values re-interpreted by MySQL as fixed implicit
    DEFAULT values which were never explicitly associated with a column
    (e.g., 0 for integral fields, or empty string for text fields)

  * "replace into ..." is a MySQLism, which we had to substitute with
    a delete/insert sequence; this needs a bit more work for better
    encapsulation

  * dependence on a "group by" behavior extension in MySQL (in standard
    SQL, you need to ensure that all columns in the result are exactly
    specified). See the following URL for details:
    http://dev.mysql.com/doc/refman/5.0/en/group-by-hidden-columns.html

  * literal time epoch value (0000-00-00 [which is otherwise an illegal
    timestamp] allowed in MySQL, vs. 1970-01-01 used by PostgreSQL)

  * some quoting issues (" and ’ and ‘ in various contexts)

  * "show columns" replacement (select from information_schema)

  * "show tables" replacement (select from information_schema)

  * "show indexes" replacement (select from information_schema)

  * database.table (MySQL) vs. database.schema.table (PostgreSQL)

  * conversions of dynamic-table-creation commands and structures to reflect PostgreSQL syntax and column attributes

  * MySQL syntax extensions ("!" vs. "NOT" operator; "DELETE FROM ... LIMIT #" clause)

  * MySQL function extensions (e.g., inet_aton() -- not completely solved)

  * with regard to database column data types, extending field widths (or not) to account for MySQL unsigned fields, particularly for IPv4 addresses

  * closest equivalent to MySQL's table repair

  * minor fixes, unrelated to the port to PostgreSQL, either in the base Cacti code or in plugins:

      * highlight certain "Add" links so it's much more obvious they are to be clicked on (in plugins/discovery/discover.php)

      * occasionally, improve error reporting (e.g., when no data sources are available for a host/graph)

      * added additional $config['url_path'] references where they were needed, mostly to allow proper sorting of columns in displayed tables

  * changes to adapt to the GroundWork portal environment:

      * support a GroundWork authorization extension (in include/auth.php) to support single-signon in a context with sibling authenticated applications

---
SECURITY FIXES TO CACTI PHP CODE

Over time, GroundWork has been made aware of certain security issues that apply to Cacti, and for which patches have been applied in the upstream Subversion repository for later Cacti releases. GroundWork has backported these fixes to the Cacti 0.8.7g release that we are currently distributing. These patches are to be applied at the end of all the other patching involved in building the GroundWork Cacti release. See the FILES section below for more details.

host.php-r7420.patch
    Security fixes to cacti/htdocs/host.php corresponding to upstream check-in r7420.

install-index.php-r7420.patch
    Security fixes to cacti/htdocs/install/index.php corresponding to upstream check-in r7420.

lib-api_device.php-r7420.patch
    Security fixes to cacti/htdocs/lib/api_device.php corresponding to upstream check-in r7420.

lib-api_poller.php-r7394.patch
    Security fixes to cacti/htdocs/lib/api_poller.php corresponding to upstream check-in r7394.

lib-rrd.php-r7393.patch
    Security fixes to cacti/htdocs/lib/rrd.php corresponding to upstream check-in r7393.

lib-snmp.php-r7392.patch
    Security fixes to cacti/htdocs/lib/snmp.php corresponding to upstream check-in r7392.

lib-utility.php-r7394.patch
    Security fixes to cacti/htdocs/lib/utility.php corresponding to upstream check-in r7394.

REMAINING ISSUES

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* Improving REPLACE INTO substitutions

  In most places, we were able to find and implement direct replacements for MySQL extensions (for example, using "select table_name from information_schema.tables" in place of "show tables"). In a very few places, more-complex workarounds were needed. The most common of these was the MySQL REPLACE INTO statement, which has no direct correlate in Standard SQL (though it does seem like a very reasonable type of statement that ought to be supported more widely).

  We took something of a sledgehammer approach to replacing REPLACE INTO, by substituting a DELETE FROM / INSERT INTO pair of statements wrapped into a transaction. This pattern is repeated many times throughout the code, partly because we did not appreciate at the beginning of the port how many times this same complication would arise. Knowing what we know now, this code should be refactored in some manner to abstract the basic pattern, both to simplify all the places where this pattern exists and to centrally implement the type of robust exception handling (failure sensing and retries, mainly) that ought to come into play if this transaction fails. Given that REPLACE INTO is used for at least a dozen or so different tables, the exact API for such an abstraction has not been worked out.

* We see occasional PostgreSQL serialization failures noted in the PostgreSQL log file; we have not yet tracked down these failures to their sources. For example:

  ERROR: could not serialize access due to concurrent update
  STATEMENT: delete from settings where name = 'date'
  ERROR: current transaction is aborted, commands ignored until end of transaction block
  STATEMENT: delete from settings where name = 'date'

  It is these kinds of messages that convince us that we need proper retries for our REPLACE INTO substitutions.

* We need to do a better job of handling serialization failure transaction retries, as noted. Once the REPLACE INTO stuff is fixed, we will need to watch the PostgreSQL log file for any additional occurrences from elsewhere in Cacti.

* long-term issue: move from implicit DEFAULT values to explicit DEFAULT values in table definitions

* long-term issue: there are NO foreign key references in any Cacti tables, making it very difficult to understand the database structure

* portability issue: Weathermap doesn't use the ADODB layer, making it much harder to port; we have agreement in principle from the Weathermap maintainer that moving to ADODB is okay with him

* Spine database-connection pool implemented (see below).

* GroundWork's mechanism for porting from MySQL to PostgreSQL involves GroundWork-mediated transfer of data between databases. No attempt is made currently to adapt to any Cacti version changes in this data transfer; this is strictly a 0.8.7g-to-0.8.7g transfer. Future releases of the PostgreSQL will need to deal with transforms to later Cacti schemas (0.8.7g-to-0.8.7i, and so forth).

CACTI PLUGINS

* Given that we ship the Thold plugin (version 0.4.2) already bundled into Cacti, it was also ported in this effort. The Thold plugin was relatively easy to port, being subject to the same sorts of issues that afflicted the main body of Cacti code. We have not yet investigated porting a later version of the Thold plugin (0.4.9-3 appears to be current). That will obviously be a high priority, to get the Thold maintainer on-board with this porting effort.

* The Settings plugin (version 0.5) did not need any porting. We have not yet investigated porting a later version of the Settings plugin (version 0.71 appears to be current). Later releases of Thold require later releases of Settings, so this must be re-examined.

* The Discovery plugin (version 0.8.5) was also ported. We have not yet investigated porting a later version of the Discovery plugin (version v1.5-1 appears to be current).

* The Weathermap plugin has not yet been ported. It is something of a different animal, in that it does not use the ADODB abstraction library to access the database, but instead uses direct calls to the standard PHP-provided MySQL API. PHP does provide a PostgreSQL API as well, but it is not a direct routine-for-routine replacement, so the porting will not be quite as smooth (which is saying something, given the complexity we encountered in the Cacti code).

  We have contacted the Weathermap maintainer, and have agreement in principle from him that he will accept our porting changes in his plugin. This work is currently ongoing.

CACTI AND PLUGINS DATABASE SCHEMA

The Cacti distribution contains a cacti.sql file that itself contains both table definitions and the population of initial seed data into these tables. GroundWork has not ported this file directly; rather, we provide separate cacti-db.sql and cacti-seed.sql files for the object definitions and initial database content.

In the MySQL world, a "schema" is pretty much the same thing as a database; there is really only a two-level (database.table) hierarchy. In contrast, PostgreSQL provides a "schema" abstraction that occupies a distinct level in this hierarchy, sandwiched in between (i.e., database.schema.table). In the GroundWork databases for Cacti, we use the standard "public" schema for all tables in the "cacti" database. This simplifies access to these tables, as the "public" schema is normally established in the default schema search path, so this schema need not be mentioned when accessing tables in this database.

For ease of integration, GroundWork supplies a PostgreSQL schema for Cacti that bundles in the tables needed for the Thold, Discovery, and Weathermap plugins (or at least, for the versions of those plugins that we ported). No attempt has been made to separate out tables and/or fields for such plugins that might otherwise be considered optional. This also means that we have not provided a port of these files to supply separate PostgreSQL table definitions:

```
plugins/thold/thold.sql
plugins/discovery/discover.sql
```

If need be, equivalent code for PostgreSQL versions of those files (except for population of initial values in such tables) could be extracted from the cacti-db.sql file noted below, and those extracted lines could be purged from that file. The trick would be to grab not just the table definitions, but also any companion constraint, index, foreign key setup, and associated sequence definitions and assignments (such as plugin_discover_template_id_seq for the plugin_discover_template table). (PostgreSQL has no AUTO_INCREMENT attribute, and uses explicit sequences instead.) Initial values for these tables would be found in the cacti-seed.sql file below.

Some changes to the standard "cacti"-database tables are already folded into the PostgreSQL schema we provide. Note that the Thold plugin, in particular, attempts to modify existing tables by adding columns using the MySQL-supported "AFTER col_name" clause. This clause is not supported by PostgreSQL, so such statements would cause the table alteration to fail. Even if it had succeeded, the new column would have likely ended up at the end of the table, not somewhere in the middle. Our PostgreSQL schema for such tables already includes the affected columns, and mirrors the column ordering that was present in the equivalent MySQL tables, so in practice this code should never be executed in the PostgreSQL environment. Support for the "AFTER" clause should probably be deprecated in the api_plugin_db_add_column() routine in the lib/plugins.php code and any plugins that attempt to use it, because it is non-portable. In the meantime, we make execution of that part of api_plugin_db_add_column() be conditional on the $database_type, so there is no loss of functionality for existing MySQL installs.

GroundWork has not yet addressed any issues of database-schema upgrades that may be needed over time in the PostgreSQL domain. GroundWork provides to its customers a means to migrate from a MySQL-based release

to a PostgreSQL-based release, but that is not considered to be part of this porting effort. Going forward, PostgreSQL versions of Cacti upgrade scripts will need to be provided, first for a 0.8.7g-to-X.X.X release (whatever the first main-line Cacti release to support PostgreSQL will be named). Then on an ongoing basis, whenever the schema changes, there will need to be parallel upgrade scripts for MySQL-based and PostgreSQL-based installations of Cacti. The same will be true for any schema changes for tables controlled by plugins (Thold, Discovery, Weathermap).

PORTING SPINE

We started our port of Spine to PostgreSQL using the 0.8.7g release with the unified_issues.patch file applied.

Because of significant differences in the models for accessing MySQL and PostgreSQL databases from C code, we realized that replacing the MySQL C API calls in Spine with the PostgreSQL C API would be tremendously disruptive to the code structure. So our porting of Spine was done not by direct hacking in the Spine code (except where needed to overcome MySQL-specific constructions), but instead by creating a MySQL emulation library that actually implements calls to PostgreSQL. Otherwise, the database calls pretty much stay as they were before. This provides a much easier development path for maintaining portability going forward. We only emulate those parts of the MySQL API that are actually used by Spine; no attempt is made to make this a more general emulation.

Building the ported Spine code is more complex than deploying the Cacti PHP code, because it depends as well on a complete build environment, including some external header files (e.g., snmp.h). Greater detail on the Spine porting is provided in the separate spine/README file. We have not provided explicit patches at this time, but they can be easily derived from the *.orig files we left that represent the baseline before database-porting changes:

```
(
cd spine;
diff -u ./cacti-spine-0.8.7g/common.h.orig          ./cacti-spine-0.8.7g/common.h;
diff -u ./cacti-spine-0.8.7g/poller.c.orig          ./cacti-spine-0.8.7g/poller.c;
diff -u ./cacti-spine-0.8.7g/spine.c.orig           ./cacti-spine-0.8.7g/spine.c;
diff -u ./cacti-spine-0.8.7g/spine.conf.dist.orig   ./cacti-spine-0.8.7g/spine.conf.dist;
diff -u ./cacti-spine-0.8.7g/spine.h.orig           ./cacti-spine-0.8.7g/spine.h;
diff -u ./cacti-spine-0.8.7g/sql.c.orig             ./cacti-spine-0.8.7g/sql.c;
diff -u ./cacti-spine-0.8.7g/util.c.orig            ./cacti-spine-0.8.7g/util.c;
) > /tmp/cacti-spine-0.8.7g-patch-for-postgres9
```

Also provided is a top-level controlling makefile for the build, that manages not just compiling the Spine code, but also the MySQL emulation library, which is provided in the postgresql_as_mysql/ subdirectory. The makefile and postgresql_as_mysql/makefile files will need some pathname adjustments to Make variables in order to compile the code in a non-GroundWork environment. Every effort has been made to provide sufficient Make variables at the top of each makefile so that all local customization can be carried out in a clean, sensible manner. The choice of building a MySQL-based or a PostgreSQL-based "spine" binary is made at the beginning of the top-level makefile, via the DBTYPE variable.

A spine/TODO file records some notes we took related to future development of this code.

The resulting binary is fully functional. However, MySQL and PostgreSQL have radically different server-side implementations, and the present manner in which Spine manages the database at a top level could use some reworking to improve performance. GroundWork believes this would help across databases, not just for PostgreSQL. Specifically, the Spine poller is constantly creating and destroying connections to the database server, treating them as lightweight objects. In MySQL, the cost for this is relatively low. In PostgreSQL, the cost is relatively high, because each database connection is supported by a separate server-side process, a new copy of which must be forked and initialized when each new database connection is established. It would be much better if Spine used a database-connection pool, which could grow up to the usual configured limit as new connections are needed. Then instead of destroying connections, the program would return them to the pool for re-use during the same polling cycle. Only at the end of the full polling cycle would connections be fully destroyed, unless some error occurs earlier on a given connection, in which case that connection

should perhaps be closed and removed from the pool after its current use.

```
================================================================
FILES
================================================================
```

The following files are available to understand the changes and their status as of this writing.

README
    This file.

add_graphs.php.graph_title_porting.patch
    Fixes for necessary PostgreSQL-related changes that we overlooked in the original porting effort.

adodb-patch-instructions
    Email sent to the ADODB maintainer, describing the changes made to ADODB to make it work properly with PostgreSQL 9. These changes are needed for the Cacti port to work. The ADODB maintainer has indicated a willingness to accept a contribution of these changes, so we expect that a future release of ADODB will include native support for this extension.

adodb5.14-patch-for-postgres9.tar.gz
    The patches made to the ADODB 5.14 release to support PostgreSQL 9. See the adodb-patch-instructions file for details.

auth.php.initial_diff
    The differences between the standard and GroundWork copies of include/auth.php before we started the porting to PostgreSQL. See the SPECIAL GROUNDWORK EXTENSIONS AND BUG FIXES TO CACTI section above.

cacti-0.8.7g-patch-for-postgres9.tar.gz
    The patches made to Cacti 0.8.7g PHP code (exclusive of ADODB and plugin changes) to port it to run with PostgreSQL 9. A very few GroundWork-specific extensions are included in these patches.

cacti-db.sql
    This file contains the PostgreSQL schema for the complete cacti database, including Thold- and Weathermap-related tables. It is provided as a database dump that can be loaded into PostgreSQL after the cacti database has been created outside of this script with commands such as these:

```
        CREATE USER cactiuser WITH PASSWORD 'cactipass';
        CREATE DATABASE cacti ENCODING='LATIN1' OWNER=cactiuser;
        GRANT ALL PRIVILEGES ON DATABASE cacti to cactiuser;
```

cacti-seed.sql
    This file contains a PostgreSQL database dump of just the initial seed data used by GroundWork.

    The seed data is based on a running Cacti configuration adapted to the GroundWork environment. Except for pathnames (containing "/usr/local/groundwork") and possibly the poller settings, we just took whatever the Cacti team has defined. You may wish to edit those pathnames in the dump file before applying it to an empty database, for use in other contexts.

config.php.initial_diff
    The differences between the standard and GroundWork copies of include/config.php before we started the porting to PostgreSQL.

data_sources.php.filter_and_display.patch
    Fixes to correctly highlight data sources in the display, based on partial backporting of changes in later Cacti releases, and on reanalysis of the original intent. We will report these changes upstream so they can be incorporated into the base Cacti release.

data_sources.php.filter_porting.patch
    Fixes for necessary PostgreSQL-related changes that we overlooked in the original porting effort.

data_sources.php.initial_diff
    The differences between the standard and GroundWork copies of data_sources.php before we started the porting to PostgreSQL. See the SPECIAL GROUNDWORK EXTENSIONS AND BUG FIXES TO CACTI section

above. This file should be completely ignored if the official
html_output.patch patch for 0.8.7g is applied instead.

database.php.debug_backtrace_display.patch
This patch provides a slightly better formatting for on-screen
backtraces produced when database errors occur. Such backtraces
are of great help in immediately identifying the sources of
database-access problems so they can be fixed.

discovery-0.8.5-findhosts.php.initial_diff
This patch fixes a critical bug in the Discovery Plugin. This fix
is already incorporated into the Discovery Plugin 1.5 release.

discovery-0.8.5-patch-for-postgres9.tar.gz
The patches made to the Cacti Discovery 0.8.5 plugin to port it to
run with PostgreSQL 9.

export.php.error_handling.patch
Fixes for template-exporting error handling, essentially just
backported from later Cacti releases.

generate_cacti_porting_diffs
A script to generate these patch files:
adodb5.14-patch-for-postgres9
cacti-0.8.7g-patch-for-postgres9
discovery-0.8.5-patch-for-postgres9
thold-0.4.2-patch-for-postgres9
from our standard GroundWork Monitor release files.

global_arrays.php.error_messages.patch
Fixes to add more standard error messages, backported from later Cacti
releases to support better error handling during template exporting.

global_arrays.php.initial_diff
The differences between the standard and GroundWork copies of
include/global_arrays.php before we started the porting to PostgreSQL.
See the SPECIAL GROUNDWORK EXTENSIONS AND BUG FIXES TO CACTI section
above.

global_settings.php.initial_diff
The differences between the standard and GroundWork copies of
include/global_settings.php before we started the porting to
PostgreSQL. See the SPECIAL GROUNDWORK EXTENSIONS AND BUG FIXES TO
CACTI section above.

host.php-r7420.patch
Security fixes to cacti/htdocs/host.php corresponding to upstream
check-in r7420.

import.php.graph_and_data_template_save.patch
Fixes for necessary PostgreSQL-related changes that we overlooked
in the original porting effort.

install-index.php-r7420.patch
Security fixes to cacti/htdocs/install/index.php corresponding to
upstream check-in r7420.

lib-html.php.patch
lib-api_device.php-r7420.patch
Security fixes to cacti/htdocs/lib/api_device.php corresponding to
upstream check-in r7420.

lib-api_poller.php-r7394.patch
Security fixes to cacti/htdocs/lib/api_poller.php corresponding to
upstream check-in r7394.

lib-html.php.patch
This patch when applied fixes an issue with clicking sort arrow icon
links on cacti tables.

lib-rrd.php-r7393.patch
Security fixes to cacti/htdocs/lib/rrd.php corresponding to upstream
check-in r7393.

lib-snmp.php-r7392.patch
Security fixes to cacti/htdocs/lib/snmp.php corresponding to upstream
check-in r7392.

lib-utility.php-r7394.patch
    Security fixes to cacti/htdocs/lib/utility.php corresponding to
    upstream check-in r7394.

lib_database.php.post_patch_fixes
    This patch file contains the equivalent of certain fixes found
    within the cacti-0.8.7g-patch-for-postgres9.tar.gz patch set, that
    get rejected if you apply the poller_interval.patch.1-line-context
    patch file as noted in the instructions below. See those instructions
    for how and when this patch file is to be used.

poller_interval.patch.1-line-context
    This is a copy of the poller_interval.patch file originally downloaded
    from http://www.cacti.net/download_patches.php?version=0.8.7g and then
    reworked to use only 1 line of context instead of the usual 3 lines of
    context. This is necessary to allow this patch to be applied without
    any rejected hunks after the bulk cacti-plugin-0.8.7g-PA-v2.8.diff
    patch (contained in the cacti-plugin-0.8.7g-PA-v2.8.tar.gz tarball)
    is applied.

recursive_calls
    Notes on particular bugs (infinite loops) we encountered in the
    early part of the port of Cacti to PostgreSQL, that had little to
    do with the database itself but needed fixing anyway.

thold-0.4.2-includes-polling.php-query.patch
    This patch fixes something relating to polling.php.

thold-0.4.2-includes-settings.php.initial_diff
    This patch fixes a source-code bug in the Thold Plugin. This fix
    is already incorporated into the Thold 0.4.9 release.

thold-0.4.2-listthold.php.initial_diff
    This patch fixes a bug of sorts in the Thold Plugin. It provides
    what looks like a more-sensible manner of setting an in-bounds value
    for the alert_num_rows parameter, using the set_config_option()
    abstraction instead of a direct call to the database. This fix is
    NOT incorporated into the Thold 0.4.9 release. However, it makes
    sense to fold this change into the standard Thold distribution,
    because the existing code uses a MySQL REPLACE INTO statement which
    is not portable to other database types. Applying this patch avoids
    the necessity for a much more complicated patch in this area during
    the PostgreSQL porting effort.

thold-0.4.2-patch-for-postgres9.tar.gz
    The patches made to the Cacti Thold 0.4.2 plugin to port it to run
    with PostgreSQL 9.

thold-0.4.2-setup.php.initial_diff
    This patch provides two fixes in the Thold Plugin.
      * One fix is a clear error in a call to api_plugin_register_hook(),
        that has already been fixed in subsequent releases of the
        Thold Plugin.
      * The other fix initializes $_SERVER['REQUEST_URI'] properly if it
        is undefined right before it is used. While this change was made
        before I started our PostgreSQL porting effort and therefore I
        don't know how to demonstrate the particular problem that forced
        us to adopt this solution, it looks like it ought to be adopted
        in the standard Thold release. This fix is not present in the
        Thold 0.4.9 release.

thold-0.4.2-thold_functions.php.initial_diff
    This patches fixes two bugs in the Thold Plugin. The first of
    them has been previously discussed in the Cacti Forums (e.g.,
    http://forums.cacti.net/viewtopic.php?f=17&t=39948). The second
    addresses a known issue previously reported by GroundWork
    (http://bugs.cacti.net/view.php?id=1935). Both of these problems
    have already been addressed in the Thold 0.4.9 release.

thold-0.4.2-thold_graph.php.initial_diff
    This patch fixes a bug in the Thold Plugin. It provides a proper
    default value for the alert_num_rows parameter if it is not already
    set right before it is used. This issue is still broken in Thold
    0.4.9, so it looks like this change ought to be adopted in the
    standard Thold release.

top_graph_header.php.initial_diff
    The differences between the standard and GroundWork copies of

include/top_graph_header.php before we started the porting to PostgreSQL. See the SPECIAL GROUNDWORK EXTENSIONS AND BUG FIXES TO CACTI section above.

top_header.php.initial_diff
The differences between the standard and GroundWork copies of include/top_header.php before we started the porting to PostgreSQL. See the SPECIAL GROUNDWORK EXTENSIONS AND BUG FIXES TO CACTI section above.

utility.php.graph_template_save.patch
Fixes for necessary PostgreSQL-related changes that we overlooked in the original porting effort.

APPLYING PATCHES

The following sources and commands are listed so you can see how the supplied patch files are intended to be applied. Adjust as needed to use them against later releases. For purposes of this exposition, we assume all the GroundWork patch files have been placed in the /tmp/cacti directory, along with certain files downloaded from other sites.

EXTERNAL FILE SOURCES

adodb514.zip
http://sourceforge.net/projects/adodb/files/adodb-php5-only/adodb-514-for-php5/adodb514.zip

cacti-0.8.7g.tar.gz
http://www.cacti.net/downloads/cacti-0.8.7g.tar.gz

cacti-plugin-0.8.7g-PA-v2.8.tar.gz
http://www.cacti.net/downloads/pia/cacti-plugin-0.8.7g-PA-v2.8.tar.gz

data_source_deactivate.patch
http://www.cacti.net/downloads/patches/0.8.7g/data_source_deactivate.patch

discovery-0.8.5.tar.gz
http://cactiusers.org/downloads/discovery.tar.gz
http://mirror.cactiusers.org/downloads/plugins/discovery-0.8.5.tar.gz

graph_list_view.patch
http://www.cacti.net/downloads/patches/0.8.7g/graph_list_view.patch

host.php-r7420.patch
http://svn.cacti.net/viewvc?view=rev&revision=7420
(Basic code changes; then backported by GroundWork to Cacti 0.8.7g.)

html_output.patch
http://www.cacti.net/downloads/patches/0.8.7g/html_output.patch

install-index.php-r7420.patch
http://svn.cacti.net/viewvc?view=rev&revision=7420
(Basic code changes; then backported by GroundWork to Cacti 0.8.7g.)

ldap_group_authenication.patch
http://www.cacti.net/downloads/patches/0.8.7g/ldap_group_authenication.patch

lib-api_device.php-r7420.patch
http://svn.cacti.net/viewvc?view=rev&revision=7420
(Basic code changes; then backported by GroundWork to Cacti 0.8.7g.)

lib-api_poller.php-r7394.patch
http://svn.cacti.net/viewvc?view=rev&revision=7394
(Basic code changes; then backported by GroundWork to Cacti 0.8.7g.)

lib-rrd.php-r7393.patch
http://svn.cacti.net/viewvc?view=rev&revision=7393
(Basic code changes; then backported by GroundWork to Cacti 0.8.7g.)

lib-snmp.php-r7392.patch
http://svn.cacti.net/viewvc?view=rev&revision=7392
(Basic code changes; then backported by GroundWork to Cacti 0.8.7g.)

lib-utility.php-r7394.patch

```
    http://svn.cacti.net/viewvc?view=rev&revision=7394
    (Basic code changes; then backported by GroundWork to Cacti 0.8.7g.)

ping.patch
    http://www.cacti.net/downloads/patches/0.8.7g/ping.patch

poller_interval.patch
    http://www.cacti.net/downloads/patches/0.8.7g/poller_interval.patch
    This official patch should not be used.  Instead, use the reworked
    poller_interval.patch.1-line-context patch that GroundWork supplies.
    The effective changes are the same, but the GroundWork version works
    in conjunction with our other patches.

script_server_command_line_parse.patch
    http://www.cacti.net/downloads/patches/0.8.7g/script_server_command_line_parse.patch

settings-0.5.tar.gz
    http://cactiusers.org/downloads/settings.tar.gz
    http://mirror.cactiusers.org/downloads/plugins/settings-0.5.tar.gz

thold-0.4.2.tar.gz
    http://koji.rutgers.edu/packages/cacti_plugins_ru/1.0/3.ru/src/cacti_plugins_ru-1.0-3.ru.src.rpm
    rpm2cpio cacti_plugins_ru-1.0-3.ru.src.rpm | cpio -icdmv
    yields thold-0.4.2.tar.gz as one of the included files.
    This was originally the only copy we could find of the Thold 0.4.2 release.
    http://mirror.cactiusers.org/downloads/plugins/thold-0.4.2.tar.gz
    This seems to be an official copy.

thold-0.4.3.tar.gz
    http://cactiusers.org/downloads/thold.tar.gz
    This was originally the closest we can find to the Thold 0.4.2 release
    that we started with, from something like an official source.

Note that GroundWork apparently overlooked the following official patches
to Cacti 0.8.7g when we created our baseline code for the PostgreSQL port
that is included in the GroundWork Monitor 6.6.1 release.  They can all be
downloaded from:  http://www.cacti.net/download_patches.php?version=0.8.7g

    data_source_deactivate.patch
    graph_list_view.patch
    html_output.patch
    ldap_group_authenication.patch
    ping.patch
    poller_interval.patch
    script_server_command_line_parse.patch

However, GroundWork has now tested the PostgreSQL-porting patches we made
to our baseline code, and we have made appropriate adjustments so our
PostgreSQL-porting patches can work with or without these official Cacti
patches having been applied, per the instructions below.  So for the
Cacti team, the instructions below allow those official Cacti patches
to be put into place to generate a complete, up-to-date 0.8.7g release
for further analysis and proper comparison to later Cacti releases.

------------------------------------------------------
CREATING A PATCHED POSTGRESQL-COMPATIBLE RELEASE
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We assume that to start, the /tmp/cacti directory contains the following
files, taken from the GroundWork repository and from download sites as
described earlier in this document:

    add_graphs.php.graph_title_porting.patch
    adodb5.14-patch-for-postgres9.tar.gz
    adodb514.zip
    auth.php.initial_diff
    cacti-0.8.7g-patch-for-postgres9.tar.gz
    cacti-0.8.7g.tar.gz
    cacti-db.sql
    cacti-plugin-0.8.7g-PA-v2.8.tar.gz
    cacti-seed.sql
    config.php.initial_diff
    data_source_deactivate.patch
    data_sources.php.filter_and_display.patch
    data_sources.php.filter_porting.patch
    data_sources.php.initial_diff
    database.php.debug_backtrace_display.patch
    discovery-0.8.5-findhosts.php.initial_diff
```

```
    discovery-0.8.5-patch-for-postgres9.tar.gz
    discovery-0.8.5.tar.gz
    export.php.error_handling.patch
    global_arrays.php.error_messages.patch
    global_arrays.php.initial_diff
    global_settings.php.initial_diff
    graph_list_view.patch
    host.php-r7420.patch
    html_output.patch
    import.php.graph_and_data_template_save.patch
    install-index.php-r7420.patch
    ldap_group_authenication.patch
    lib-api_device.php-r7420.patch
    lib-api_poller.php-r7394.patch
    lib-rrd.php-r7393.patch
    lib-snmp.php-r7392.patch
    lib-utility.php-r7394.patch
    lib_database.php.post_patch_fixes
    ping.patch
    poller_interval.patch.1-line-context
    script_server_command_line_parse.patch
    settings-0.5.tar.gz
    thold-0.4.2-includes-settings.php.initial_diff
    thold-0.4.2-listthold.php.initial_diff
    thold-0.4.2-patch-for-postgres9.tar.gz
    thold-0.4.2-setup.php.initial_diff
    thold-0.4.2-thold_functions.php.initial_diff
    thold-0.4.2-thold_graph.php.initial_diff
    thold-0.4.2.tar.gz
    top_graph_header.php.initial_diff
    top_header.php.initial_diff
    utility.php.graph_template_save.patch

The commands to create a patched Cacti under MYDIR are the following.
Here, each time we patch, we back up the previous copies with a unique
suffix, so if there is any question of the provenance of a particular
change, it can be quickly identified.

    # Unpack certain tarballs to reveal their content, for later use.
    cd /tmp/cacti
    tar xzf /tmp/cacti/cacti-plugin-0.8.7g-PA-v2.8.tar.gz
    tar xzf /tmp/cacti/adodb5.14-patch-for-postgres9.tar.gz
    tar xzf /tmp/cacti/cacti-0.8.7g-patch-for-postgres9.tar.gz
    tar xzf /tmp/cacti/discovery-0.8.5-patch-for-postgres9.tar.gz
    tar xzf /tmp/cacti/thold-0.4.2-patch-for-postgres9.tar.gz

    # Unpack the full Cacti 0.8.7g release.
    cd MYDIR
    tar xvzf /tmp/cacti/cacti-0.8.7g.tar.gz

    # Apply the Plugin Architecture overlay.
    cd MYDIR/cacti-0.8.7g
    patch -b -V simple -z .pre_pia -p1 -N < /tmp/cacti/cacti-plugin-arch/cacti-plugin-0.8.7g-PA-v2.8.diff

    # Include a few plugins.  GroundWork has also provided patches
    # (see below) to port these versions to use PostgreSQL.
    cd MYDIR/cacti-0.8.7g/plugins
    tar xzf /tmp/cacti/discovery-0.8.5.tar.gz
    tar xzf /tmp/cacti/settings-0.5.tar.gz
    tar xzf /tmp/cacti/thold-0.4.2.tar.gz
    dos2unix -o thold/LICENSE thold/README thold/thold.sql

    # Apply baseline patches for the discovery and thold plugins, that
    # fix a number of bugs in these plugin versions that GroundWork
    # addressed before we started the PostgreSQL porting effort.
    cd MYDIR/cacti-0.8.7g
    patch -b -V simple -z .pre_initial -p2 < /tmp/cacti/discovery-0.8.5-findhosts.php.initial_diff
    patch -b -V simple -z .pre_initial -p2 < /tmp/cacti/thold-0.4.2-includes-settings.php.initial_diff
    patch -b -V simple -z .pre_initial -p2 < /tmp/cacti/thold-0.4.2-listthold.php.initial_diff
    patch -b -V simple -z .pre_initial -p2 < /tmp/cacti/thold-0.4.2-setup.php.initial_diff
    patch -b -V simple -z .pre_initial -p2 < /tmp/cacti/thold-0.4.2-thold_functions.php.initial_diff
    patch -b -V simple -z .pre_initial -p2 < /tmp/cacti/thold-0.4.2-thold_graph.php.initial_diff

    # The following official patches are not part of the GroundWork
    # Monitor 6.6.1 release, because we did not realize in time that
    # they were available to be applied against the Cacti 0.8.7g
    # release.  If we had understood earlier that these patches
    # were available, we would have executed the following commands
```

```
    # to install all of them, at this point in the patch sequence.
    # Executing these commands is strongly recommended for the Cacti
    # team, because we want to ensure that all the known patches are
    # applied and we don't have any regressions due to simple oversight.
    # There are some adjustments to be made to the standard means of
    # installing these patches:
    # * The "-F 3" option is needed on one of these patches to counter
    #   the effect of having previously applied the standard Plugin
    #   Architecture cacti-plugin-0.8.7g-PA-v2.8.diff patch, above.
    # * The poller_interval.patch.1-line-context patch file is different
    #   from the poller_interval.patch patch file which is downloadable
    #   from the Cacti web site not in its ultimate effect, but in that
    #   it is reworked to also get around the effect of having previously
    #   applied the cacti-plugin-0.8.7g-PA-v2.8.diff patch, above.
    cd MYDIR/cacti-0.8.7g
    patch -b -V simple -z .pre_official -p1 -N      < /tmp/cacti/data_source_deactivate.patch
    patch -b -V simple -z .pre_official -p1 -N      < /tmp/cacti/graph_list_view.patch
    patch -b -V simple -z .pre_official -p1 -N -F 3 < /tmp/cacti/html_output.patch
    patch -b -V simple -z .pre_official -p1 -N      < /tmp/cacti/ldap_group_authenication.patch
    patch -b -V simple -z .pre_official -p1 -N      < /tmp/cacti/script_server_command_line_parse.patch
    patch -b -V simple -z .pre_official -p1 -N      < /tmp/cacti/ping.patch
    patch -b -V simple -z .pre_official -p1 -N      < /tmp/cacti/poller_interval.patch.1-line-context

    # GroundWork wants to apply all of these for its own distribution of
    # Cacti, but the Cacti team should apply only the uncommented patch.
    # NOTE:  Even for GroundWork, the data_sources.php.initial_diff
    # patch should be completely ignored if the html_output.patch patch
    # was applied above, as the latter is more thorough and should take
    # precedence.
    cd MYDIR/cacti-0.8.7g
    #  patch -b -V simple -z .pre_gw -p2 < /tmp/cacti/auth.php.initial_diff
    #  patch -b -V simple -z .pre_gw -p2 < /tmp/cacti/config.php.initial_diff
    ## patch -b -V simple -z .pre_gw -p2 < /tmp/cacti/data_sources.php.initial_diff
    #  patch -b -V simple -z .pre_gw -p2 < /tmp/cacti/global_arrays.php.initial_diff
       patch -b -V simple -z .pre_gw -p2 < /tmp/cacti/global_settings.php.initial_diff
    #  patch -b -V simple -z .pre_gw -p2 < /tmp/cacti/top_graph_header.php.initial_diff
    #  patch -b -V simple -z .pre_gw -p2 < /tmp/cacti/top_header.php.initial_diff

    # Now we address the purpose of this whole effort.  Applying the
    # cacti-0.8.7g-patch-for-postgres9 patches here provides the basic
    # porting of PHP code to allow access to PostgreSQL.  Note that if
    # you have applied the official 0.8.7g patches above, a few of the
    # patches within this file will be rejected:
    # * One hunk applied to data_sources.php will fail if you applied
    #   the html_output.patch patch via the commands above.  You can
    #   safely ignore this, as the html_output.patch patch above already
    #   addressed this issue.
    # * Four hunks applied to graph_view.php will fail if you applied
    #   the graph_list_view.patch patch via the commands above.  You can
    #   safely ignore this, as the graph_list_view.patch patch above
    #   already addressed these issues in what is probably a better way.
    # * Four hunks applied to lib/database.php will fail if you
    #   applied the poller_interval.patch.1-line-context patch via the
    #   commands above.  The fixes in these hunks are critical to the
    #   PostgreSQL porting, so in this case you MUST apply the separate
    #   lib_database.php.post_patch_fixes patch file, as noted below.
    cd MYDIR/cacti-0.8.7g
    patch -b -V simple -z .pre_pg -p0 < /tmp/cacti/cacti-0.8.7g-patch-for-postgres9
    patch -b -V simple -z .pre_pg -p0 < /tmp/cacti/discovery-0.8.5-patch-for-postgres9
    patch -b -V simple -z .pre_pg -p0 < /tmp/cacti/thold-0.4.2-patch-for-postgres9

    # NOTE:  Apply this next patch if and only if you previously applied
    # the poller_interval.patch.1-line-context patch for 0.8.7g as noted
    # above.  It mirrors a few critical cacti-0.8.7g-patch-for-postgres9
    # fixes for PostgreSQL support that were rejected if the
    # poller_interval.patch.1-line-context patch was applied before the
    # cacti-0.8.7g-patch-for-postgres9 patch was applied, because those
    # particular patches no longer matched the resulting source code.
    # This extra patch file is designed to compensate for that.
    cd MYDIR/cacti-0.8.7g
    patch -b -V simple -z .mid_pg -p0 < /tmp/cacti/lib_database.php.post_patch_fixes

    # Apply patches to fix things we overlooked in the large
    # cacti-0.8.7g-patch-for-postgres9 patch file.
    cd MYDIR/cacti-0.8.7g
    patch -b -V simple -z .pre_graph_title_porting_fix -p2 < /tmp/cacti/add_graphs.php.graph_title_porting.patch
    patch -b -V simple -z .pre_filter_porting_fix      -p2 < /tmp/cacti/data_sources.php.filter_porting.patch
    patch -b -V simple -z .pre_backtrace_display_fix   -p2 < /tmp/cacti/database.php.debug_backtrace_display.patch
```

```
    patch -b -V simple -z .pre_template_save_fix       -p2 < /tmp/cacti/import.php.graph_and_data_template_save.patch
    patch -b -V simple -z .pre_template_save_fix       -p2 < /tmp/cacti/utility.php.graph_template_save.patch

    # Apply patches to apply fixes we backported from later Cacti releases
    # or have reported to the Cacti team.
    cd MYDIR/cacti-0.8.7g
    patch -b -V simple -z .pre_filter_display_fix -p2 < /tmp/cacti/data_sources.php.filter_and_display.patch
    patch -b -V simple -z .pre_error_handling_fix -p2 < /tmp/cacti/export.php.error_handling.patch
    patch -b -V simple -z .pre_error_message_fix  -p2 < /tmp/cacti/global_arrays.php.error_messages.patch

    # Unpack the base ADODB release.
    cd MYDIR/cacti-0.8.7g/lib
    unzip /tmp/cacti/adodb514.zip

    # Overlay the GroundWork changes to ADODB to improve its PostgreSQL
    # support sufficiently to support Cacti.
    cd MYDIR/cacti-0.8.7g/lib/adodb5
    patch -b -V simple -z .old -p1 < /tmp/cacti/adodb5.14-patch-for-postgres9

    # Apply security patches backported from upstream changes.  These patches
    # must be applied at the end, after GroundWork's PostgreSQL-porting fixes.
    patch -b -V simple -z .pre_sec -p2 < /tmp/cacti/host.php-r7420.patch
    patch -b -V simple -z .pre_sec -p2 < /tmp/cacti/install-index.php-r7420.patch
    patch -b -V simple -z .pre_sec -p2 < /tmp/cacti/lib-api_device.php-r7420.patch
    patch -b -V simple -z .pre_sec -p2 < /tmp/cacti/lib-api_poller.php-r7394.patch
    patch -b -V simple -z .pre_sec -p2 < /tmp/cacti/lib-rrd.php-r7393.patch
    patch -b -V simple -z .pre_sec -p2 < /tmp/cacti/lib-snmp.php-r7392.patch
    patch -b -V simple -z .pre_sec -p2 < /tmp/cacti/lib-utility.php-r7394.patch

    # Create the Cacti database in PostgreSQL.
    psql -U postgres
    CREATE USER cactiuser WITH PASSWORD 'cactipass';
    CREATE DATABASE cacti ENCODING='LATIN1' OWNER=cactiuser;
    GRANT ALL PRIVILEGES ON DATABASE cacti to cactiuser;
    \q

    # Create all the Cacti database tables and associated objects.  This
    # will include all the tables and extra fields needed for the Thold
    # and Weathermap plugins (at least, the version of Thold installed
    # above, and the version of Weathermap we are still in the process
    # of porting to PostgreSQL).  Then stuff initial seed data into the
    # database.  We find it generally easier to do this than to depend
    # on Cacti to populate the tables during self-initialize actions.
    psql -U cactiuser -d cacti < /tmp/cacti/cacti-db.sql
    psql -U cactiuser -d cacti < /tmp/cacti/cacti-seed.sql

================================================================
NOTES FOR GROUNDWORK
================================================================

These notes are for GroundWork, so we can remember the changes we made
to fold Cacti into GroundWork Monitor, beyond the code changes described
elsewhere, that we will need to repeat in the future with new Cacti and
Plug-In Architecture (PIA) releases.

Overall current stack:
    Cacti 0.8.7g base distribution
    PIA 2.8
    Discovery plugin
    Settings plugin
    Thold plugin
    Weathermap plugin
    GroundWork plugin changes (corresponding *.initial_diff patches)
    Cacti 0.8.7g official patches (not in our current GWMEE release)
    GroundWork changes (SSO, logout, etc.; other *.initial_diff patches)
    GroundWork patches to Cacti for PostgreSQL support
    ADODB 5.14 distribution
    GroundWork changes to ADODB (for improved PostgreSQL support)
    GroundWork additional files, and moved files
    GroundWork-supplied Cacti database schema and seed data

"diff -r cacti-plugin-0.8.7g-PA-v2.8 cacti/htdocs" yields these
additional and moved files:
Only in cacti-plugin-0.8.7g-PA-v2.8: cacti.sql
Only in cacti/htdocs/include: auth.php.orig
Only in cacti/htdocs/lib: adodb5
Only in cacti/htdocs/plugins: discovery
Only in cacti/htdocs/plugins: settings
```

```
Only in cacti/htdocs/plugins: thold
Only in cacti/htdocs/plugins: weathermap
Only in cacti/htdocs/rra: NOTEMPTY
Only in cacti/htdocs/rra: localhost_load_1min_5.rrd
Only in cacti/htdocs/rra: localhost_mem_buffers_3.rrd
Only in cacti/htdocs/rra: localhost_mem_swap_4.rrd
Only in cacti/htdocs/rra: localhost_proc_7.rrd
Only in cacti/htdocs/rra: localhost_users_6.rrd
Only in cacti/htdocs: .buildcomplete
Only in cacti/htdocs: META-INF
Only in cacti/htdocs: WEB-INF
Only in cacti/htdocs: login-redirect.jsp
Only in cacti/htdocs: splash

Also add:
cacti/extract_cacti.pl
cacti/scripts/...

Note that we reported our ADODB changes to the ADODB maintainer, and
the ADODB 5.18 release appears to have our changes folded in.
```