Test-Driven Apache Module Development

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Goals

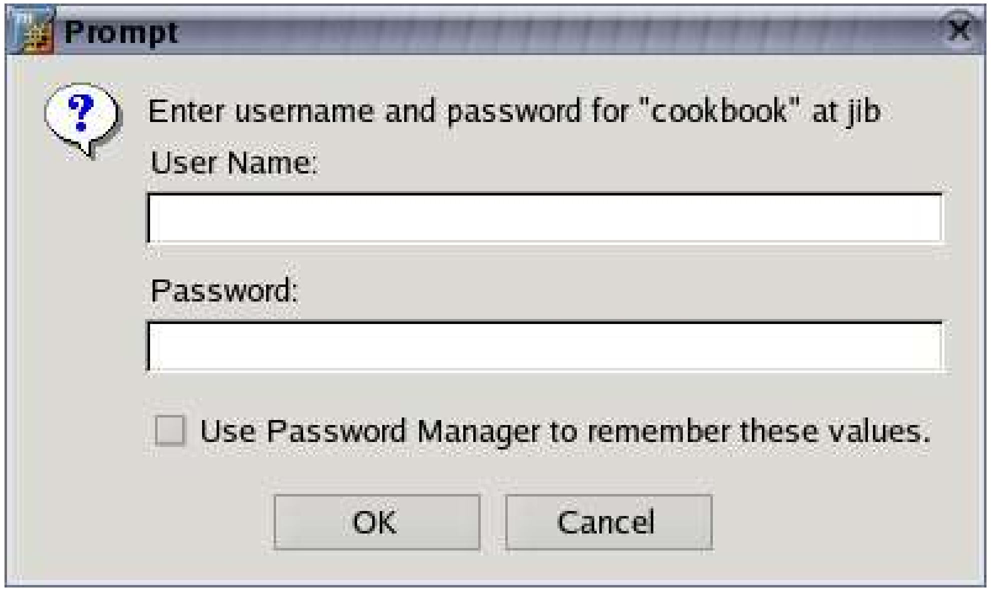
- Introduction to `Apache-Test`
- Perl module support
- C module support
- Automagic configuration
- Test-driven development basics
- Other Goodness™

Apache-Test by Example

- Write a simple Perl handler
- Integrate `Apache-Test`
- Port the handler to C
- Show all kinds of cool stuff

```
package My::AuthenHandler;

use Apache::Const -compile => qw(OK HTTP_UNAUTHORIZED);

use Apache::RequestRec ();
use Apache::Access ();

sub handler {

  my $r = shift;

  # Get the client-supplied credentials.
  my ($status, $password) = $r->get_basic_auth_pw;

  return $status unless $status == Apache::OK;

  # Perform some custom user/password validation.
  return Apache::OK if $r->user eq $password;

  # Whoops, bad credentials.
  $r->note_basic_auth_failure;
  return Apache::HTTP_UNAUTHORIZED;
}

1;
```

Voila!


Prompt

Enter username and password for "cookbook" at jib

User Name:

Password:

☐ Use Password Manager to remember these values.

Testing, Testing... 1, 2, 3

1. Generate the test harness
2. Configure Apache
3. Write the tests

Step 1 - The Test Harness

- Generally starts from `Makefile.PL`
- There are other ways as well
  - illustrated later

Makefile.PL

```
use Apache::TestMM qw(test clean);
use Apache::TestRunPerl ();

# configure tests based on incoming arguments
Apache::TestMM::filter_args();

# generate the test harness
Apache::TestRunPerl->generate_script();
```

`t/TEST`

- `t/TEST` is generated by the call to `generate_script()`
- Is the actual harness that coordinates testing activities
- called via `make test`
- can be called directly

```
$ t/TEST t/foo.t
```

Step 1 - The Test Harness

- Don't get bogged down with `Makefile.PL` details
- Lather, Rinse, Repeat

Testing, Testing... 1, 2, 3

1. Generate the test harness
2. Configure Apache

Step 2 - Configure Apache

- Apache needs a basic configuration to service requests
  - `ServerRoot`
  - `DocumentRoot`
  - `ErrorLog`
  - `Listen`
- Content is also generally useful

Apache-Test Defaults

- `Apache-Test` provides server defaults

– `ServerRoot`	`t/`
– `DocumentRoot`	`t/htdocs`
– `ErrorLog`	`t/logs/error_log`
– `Listen`	`8529`

- Also provides an initial `index.html`

```
http://localhost:8529/index.html
```

- You will probably need more than the default settings

Adding to the Default Config

- Supplement default `httpd.conf` with custom configurations
- Define `t/conf/extra.conf.in`

```
package My::AuthenHandler;

use Apache::Const -compile => qw(OK HTTP_UNAUTHORIZED);

use Apache::RequestRec ();
use Apache::Access ();

sub handler {

  my $r = shift;

  # Get the client-supplied credentials.
  my ($status, $password) = $r->get_basic_auth_pw;

  return $status unless $status == Apache::OK;

  # Perform some custom user/password validation.
  return Apache::OK if $r->user eq $password;

  # Whoops, bad credentials.
  $r->note_basic_auth_failure;
  return Apache::HTTP_UNAUTHORIZED;
}

1;
```

extra.conf.in

```
Alias /authen @DocumentRoot@

<Location /authen>
  Require valid-user
  AuthType Basic
  AuthName "my test realm"

  PerlAuthenHandler My::AuthenHandler
</Location>
```

Testing, Testing... 1, 2, 3

1. Generate the test harness
2. Configure Apache
3. Write the tests

What Exactly is a Test?

- Tests are contained within a test file
- The test file acts as a client
- The client is scripted to
  - query the server
  - compare server response to expected results
  - indicate success or failure

The t/ Directory

- Tests live in `t/`
  - `t/01basic.t`
- `t/` is the `ServerRoot`
  - `t/htdocs`
  - `t/cgi-bin`
  - `t/conf`

Anatomy of a Test

- `Apache-Test` works the same way as `Test.pm`, `Test::More` and others
- `plan()` the number of tests
- call `ok()` for each test you plan
  - where `ok()` is any one of a number of comparison functions
- All the rest is up to you

t/01basic.t

```
use Apache::Test;
use Apache::TestRequest;

plan tests => 1, (need_lwp &&
                  need_auth &&
                  need_module('mod_perl.c'));
```

Apache::Test

- Provides basic `Test.pm` functions
  - `ok()`
  - `plan()`
- Also provides helpful `plan()` functions
  - `need_lwp()`
  - `need_module()`
  - `need_min_apache_version()`

plan()

- `plan()` the number of tests in the file

```
plan tests => 5;
```

- Preconditions can be specified

```
plan tests => 5, need_lwp;
```

- Failed preconditions will skip the entire test file

```
server localhost.localdomain:8529 started
t/01basic....skipped
        all skipped: cannot find module 'mod_foo.c'
All tests successful, 1 test skipped.
```

On Precondition Failures...

- A failed precondition is *not* the same as a failed test
- Failed precondition means "I cannot create a suitable environment"
- Failed test means "I fed a subroutine known data and it did *not* produce expected output"
- Failure needs to represent something very specific in order to be meaningful

t/01basic.t

```
use Apache::Test;
use Apache::TestRequest;

plan tests => 1, (need_lwp &&
                  need_auth &&
                  need_module('mod_perl.c'));

{
  my $uri = '/authen/index.html';

  my $response = GET $uri;
  ok $response->code == 401;
}
```

Apache::TestRequest

- Provides a basic `LWP` interface
  - `GET()`
  - `POST()`
  - `HEAD()`
  - `GET_OK()`
  - `GET_BODY()`
  - more
- Note that these functions know which host and port to send the request to
  - request URI can be relative

HTTP::Response

- LWP base class
- Provides accessors to response attributes
  - `code()`
  - `content()`
  - `content_type(), content_length(), etc`
  - `headers()`
    - `authorization()`
- as well as some useful utility methods
  - `as_string()`
  - `previous()`

t/01basic.t

```
use Apache::Test;
use Apache::TestRequest;

plan tests => 1, (need_lwp &&
                  need_auth &&
                  need_module('mod_perl.c'));

{
  my $uri = '/authen/index.html';

  my $response = GET $uri;
  ok $response->code == 401;
}
```

Testing, Testing... 1, 2, 3

1. Generate the test harness
2. Configure Apache
3. Write the tests
4. Run the tests

Running the Tests

```
$ make test
$ t/TEST t/01basic.t
$ t/TEST t/01basic.t –verbose
```

– preamble

```
'PerlLogHandler "sub { warn shift->as_string; 0 }"'
```

Apache-Test fsck

- Every once in a while `Apache-Test` gets borked
- If you get stuck try cleaning and reconfiguring

```
$ t/TEST -clean
$ t/TEST -conf
```

- If that doesn't work, nuke everything

```
$ make realclean
$ rm -rf ~/.apache-test
```

Are you ok?

- `ok()` works, but is not descriptive
- luckily, we have options
  - `Apache::TestUtil`
  - `Test::More`

```
use Apache::Test;
use Apache::TestRequest;


plan tests => 1, (need_lwp &&
                  need_auth &&
                  need_module('mod_perl.c'));

{
  my $uri = '/authen/index.html';

  my $response = GET $uri;

  ok $response->code == 401;
}
```

```
t/authen01....1..1
# Running under perl version 5.008005 for linux
# Current time local: Wed Oct 13 13:10:54 2004
# Current time GMT:   Wed Oct 13 17:10:54 2004
# Using Test.pm version 1.25
# Using Apache/Test.pm version 1.15
not ok 1
# Failed test 1 in t/authen01.t at line 15
```

Apache::TestUtil

- Chocked full of helpful utilities
- `t_cmp()`

```
t_cmp($foo, $bar, 'foo is bar');
t_cmp($foo, qr/bar/, 'foo matches bar');
```

- `t_write_file($file, @lines);`
  - write out a file
  - clean it up after script execution completes
- `t_write_perl_script($file, @lines);`
  - same as `t_write_file()`
  - with compilation-specific shebang line

Test::More functions

- Basic comparisons
  - `ok()`
  - `is()`
  - `like()`
- Intuitive comparisons
  - `isnt()`
  - `unlike()`
- Complex structures
  - `is_deeply()`
  - `eq_array()`

```
use Apache::Test;
use Apache::TestRequest;
use Apache::TestUtil;

plan tests => 1, (need_lwp &&
                  need_auth &&
                  need_module('mod_perl.c'));

{
  my $uri = '/authen/index.html';

  my $response = GET $uri;

  ok t_cmp($response->code,
           401,
           "no valid password entry");
}
```

```
server localhost.localdomain:8529 started
t/authen03....1..1
ok 1 - no valid password entry
ok
All tests successful.



server localhost.localdomain:8529 started
t/authen03....1..1
not ok 1 - no valid password entry

#     Failed test (t/authen03.t at line 18)
#          got: '200'
#     expected: '401'
# Looks like you failed 1 test of 1.
```

Getting Back to the Point...

- So far, we haven't actually tested anything useful
  - no username or password
- Let's add some real tests

```
my $uri = '/authen/index.html';

{
  my $response = GET $uri;

  is ($response->code,
      401,
      "no valid password entry");
}

{
  my $response = GET $uri, username => 'geoff', password => 'foo';

  is ($response->code,
      401,
      "password mismatch");
}

{
  my $response = GET $uri, username => 'geoff', password => 'geoff';

  is ($response->code,
      200,
      "geoff:geoff allowed to proceed");
}
```

```
#include "httpd.h"
#include "http_config.h"
#include "http_request.h"
#include "http_protocol.h"

module AP_MODULE_DECLARE_DATA my_authen_module;

static int authen_handler(request_rec *r) {
 ...
}

static void register_hooks(apr_pool_t *p)
{
  ap_hook_check_user_id(authen_handler, NULL, NULL, APR_HOOK_FIRST);
}

module AP_MODULE_DECLARE_DATA my_authen_module =
{
  STANDARD20_MODULE_STUFF,
  NULL,
  NULL,
  NULL,
  NULL,
  NULL,
  register_hooks
};
```

```
static int authen_handler(request_rec *r) {

  const char *sent_pw;

  /* Get the client-supplied credentials */
  int response = ap_get_basic_auth_pw(r, &sent_pw);

  if (response != OK) {
      return response;
  }

  /* Perform some custom user/password validation */
  if (strcmp(r->user, sent_pw) == 0) {
    return OK;
  }

  /* Whoops, bad credentials */
  ap_note_basic_auth_failure(r);
  return HTTP_UNAUTHORIZED;
}
```

```
static int authen_handler(request_rec *r) {

  const char *sent_pw;

  /* Get the client-supplied credentials */
  int response = ap_get_basic_auth_pw(r, &sent_pw);

  if (response != OK) {
      return response;
  }

  /* Perform some custom user/password validation */
  if (strcmp(r->user, sent_pw) == 0) {
    return OK;
  }

  /* Whoops, bad credentials */
  ap_note_basic_auth_failure(r);
  return HTTP_UNAUTHORIZED;
}
```

Perl Makefile.PL

```
use Apache::TestMM qw(test clean);
use Apache::TestRunPerl ();

# configure tests based on incoming arguments
Apache::TestMM::filter_args();

# generate the test harness
Apache::TestRunPerl->generate_script();
```

The Problem

- Over in Perl-land, `ExtUtils::MakeMaker` took care of "compiling" our Perl module
  - put it in the proper place (`blib`)
  - added `blib` to `@INC`
- C modules rely on `apxs`, so we need to either compile them ourselves or tell `ExtUtils::MakeMaker` to do it for us
- Messing with `ExtUtils::MakeMaker` is hard
- `Apache-Test` has a better way

The `c-modules` Directory

- `Apache-Test` allows for special treatment of modules in `c-modules/`
- Modules placed in `c-modules/` will be
  - compiled via `apxs`
  - added to `httpd.conf` via `LoadModule`
- Similar to `lib/` and `blib/` in Perl

The Mechanics

- Modules should be placed in

  `c-modules/`*`name`*`/mod_`*`name`*`.c`

- where *name* matches C declaration minus `module`
- In our case

```
module AP_MODULE_DECLARE_DATA my_authen_module;
```

becomes

```
c-modules/my_authen/mod_my_authen.c
```

More Mechanics

- When the server environment is configured, the module will be added to `httpd.conf`

```
LoadModule my_authen_module /src/example/c-authen-auto-
  compile/c-modules/my_authen/.libs/mod_my_authen.so
```

But Wait, There's More

- If we can automatically compile and configure the loading of a module, why not fully configure it as well
- Enter automagic `httpd.conf` configuration

Magic

- `t/conf/extra.conf.in` has held our configuration
- We can actually embed the config in our C module if we use `c-modules`

mod_example_ipc

```
 * To play with this sample module first compile it into a
 * DSO file and install it into Apache's modules directory
 * by running:
 *
 *    $ /path/to/apache2/bin/apxs -c -i mod_example_ipc.c
 *
 * Then activate it in Apache's httpd.conf file as follows:
 *
 *    LoadModule example_ipc_module modules/mod_example_ipc.so
 *
 *    <Location /example_ipc>
 *       SetHandler example_ipc
 *    </Location>

#if CONFIG_FOR_HTTPD_TEST

<Location /example_ipc>
   SetHandler example_ipc
</Location>

#endif
```

The Mechanics

- `mod_example_ipc:`

```
module AP_MODULE_DECLARE_DATA example_ipc_module;
```

becomes

```
c-modules/example_ipc/mod_example_ipc.c
```

Living in Harmony

- Using `Makefile.PL` has some obvious disadvantages:
  - not everyone likes Perl
  - most people hate `ExtUtils::MakeMaker`
- Everyone can be happy
- Use both `Makefile.PL` and `makefile`
  - `makefile` for the stuff you like
  - `Makefile.PL` for test configuration

makefile

```
export APACHE_TEST_APXS ?= /apache/2.0.52/worker/perl-5.8.5/bin/apxs

all : Makefile
	$(MAKE) -f Makefile cmodules

Makefile :
	perl Makefile.PL

install :
	$(APACHE_TEST_APXS) -iac c-modules/example_ipc/mod_example_ipc.c

%: force
	@$(MAKE) -f Makefile $@
force: Makefile;
```

makefile

```
export APACHE_TEST_APXS ?= /apache/2.0.52/worker/perl-5.8.5/bin/apxs

all : Makefile
        $(MAKE) -f Makefile cmodules

Makefile :
        perl Makefile.PL

install :
        $(APACHE_TEST_APXS) -iac c-modules/example_ipc/mod_example_ipc.c

%: force
        @$(MAKE) -f Makefile $@
force: Makefile;
```

A Different makefile

```
export APACHE_TEST_APXS?=/apache/2.0.52/worker/perl-5.8.5/bin/apxs

t/TEST :
        perl -MApache::TestRun -e 'Apache::TestRun->generate_script()'

test : t/TEST
        t/TEST

install :
        $(APACHE_TEST_APXS) -iac c-modules/example_ipc/mod_example_ipc.c
```

example.t

```
use Apache::Test qw(:withtestmore);
use Apache::TestRequest;

use Test::More;

plan tests => 20;

foreach my $counter (1 .. 20) {

  my $response = GET_BODY '/example_ipc';

  like ($response,
        qr!Counter:</td><td>$counter!,
        "counter incremented to $counter");
}
```

Take Advantage of `LWP`

- Many of the things we do in Apache modules is complex
- Complex but still HTTP oriented
- LWP is a good tool for testing HTTP-specific things

An Aside on Digest Authentication

- Digest authentication uses a message digest to transfer the username and password across the wire
- Makes the Digest scheme (arguably) more secure than Basic
- Widespread adoption is made difficult because not all clients are RFC compliant
  - guess who?
- The most popular web server *is* RFC compliant

Reader's Digest

- RFC compliant clients and servers use the complete URI when computing the message digest
- Internet Explorer leaves off the query part of the URI when both transmitting the URI and computing the digest

Reader's Digest

- Given a request to `/index.html`

```
Authorization: Digest username="user1", realm="realm1",
qop="auth", algorithm="MD5", uri="/index.html",
nonce="Q9equ9C+AwA=195acc80cf91ce99828b8437707cafce78b11621",
nc=00000001, cnonce="3e4b161902b931710ae04262c31d9307",
response="49fac556a5b13f35a4c5f05c97723b32"
```

- Given a request to `/index.html?foo=bar`

```
Authorization: Digest username="user1", realm="realm1",
qop="auth", algorithm="MD5", uri="/index.html?foo=bar",
nonce="Q9equ9C+AwA=195acc80cf91ce99828b8437707cafce78b11621",
nc=00000001, cnonce="3e4b161902b931710ae04262c31d9307",
response="acbd18db4cc2f85cedef654fccc4a4d8"
```

AuthDigestEnableQueryStringHack

- Developers could always work around the problem using POST
- As of Apache 2.0.51 administrators can work around the problem from httpd.conf

```
BrowserMatch MSIE AuthDigestEnableQueryStringHack=On
```

- Removes the query portion of the URI from comparison

Does It Work?

- How do you know it works?
  - MSIE users can authenticate
  - RFC compliant users still can authenticate
  - if MSIE gets fixed, users can authenticate
- Test-driven development begins!

Tired

- Hack together some fix
- Hit it with a browser to make sure it works
- Move on
- Waste lots of time recreating bugs that *will* eventually show up

Wired

- Add a test to your `Apache-Test`-based framework
- Come up with basic conditions
- Write the code
- Run the test
- Add some edge cases
- Run the test
- Spend a little time fixing bugs that (probably) will show up

Bringing It All Together

- Let's write a test for the MSIE fix
- While we're at it we'll illustrate a few things
  - iterative test-driven development cycle
  - cool features of `Apache-Test` and `LWP`

t/conf/extra.conf.in

```
<IfModule mod_auth_digest.c>

  Alias /digest @DocumentRoot@

  <Location /digest>
    Require valid-user
    AuthType Digest
    AuthName realm1
    AuthDigestFile @ServerRoot@/realm1
  </Location>

</IfModule>
```

digest.t

```
use Apache::Test qw(:withtestmore);
use Apache::TestRequest;
use Apache::TestUtil qw(t_write_file);
use File::Spec;

use Test::More;

plan tests => 4, need need_lwp,
                      need_module('mod_auth_digest');

# write out the authentication file
my $file = File::Spec->catfile(Apache::Test::vars('serverroot'),
                               'realm1');
t_write_file($file, <DATA>);

...

__DATA__
# user1/password1
user1:realm1:4b5df5ee44449d6b5fbf026a7756e6ee
```

`Apache::Test::vars()`

- Allows access to configuration expansion variables
  - `serverroot`
  - `httpd` or `apxs`
- `ServerRoot` is required when writing files
  - `Apache-Test` changes directories from time to time
- Use `File::Spec` functions to concat
  - if you care about portability, that is

t_write_file()

- Exported by `Apache::TestUtil`

```
use Apache::TestUtil qw(t_write_file);
```

- Accepts a file and a list of lines

```
t_write_file($file, @lines);
```

- Write out the file
  - including any required directories
- Cleans up the file when script exits
  - including created directories

digest.t

```
use Apache::Test qw(:withtestmore);
use Apache::TestRequest;
use Apache::TestUtil qw(t_write_file);
use File::Spec;

use Test::More;

plan tests => 4, need need_lwp,
                      need_module('mod_auth_digest');

# write out the authentication file
my $file = File::Spec->catfile(Apache::Test::vars('serverroot'),
                               'realm1');
t_write_file($file, <DATA>);

...

__DATA__
# user1/password1
user1:realm1:4b5df5ee44449d6b5fbf026a7756e6ee
```

...

```
my $url = '/digest/index.html';

{
  my $response = GET $url;

  is ($response->code,
      401,
      'no user to authenticate');
}

{
  # authenticated
  my $response = GET $url,
                   username => 'user1', password => 'password1';

  is ($response->code,
      200,
      'user1:password1 found');
}
```

MSIE Tests

- Ok, so we've proven that we can interact with Digest authentication
- Let's test our fix

t/conf/extra.conf.in

```
<IfModule mod_auth_digest.c>

  Alias /digest @DocumentRoot@

  <Location /digest>
    Require valid-user
    AuthType Digest
    AuthName realm1
    AuthDigestFile @ServerRoot@/realm1
  </Location>

</IfModule>
```

t/conf/extra.conf.in

```
<IfModule mod_auth_digest.c>

  Alias /digest @DocumentRoot@

  <Location /digest>
    Require valid-user
    AuthType Digest
    AuthName realm1
    AuthDigestFile @ServerRoot@/realm1
  </Location>

  SetEnvIf X-Browser MSIE AuthDigestEnableQueryStringHack=

</IfModule>
```

Failure!

- Of course it failed!
  - the correct code does not exist yet
- Writing the test first had two important effects
  - defined the interface
  - defined the behavior
- We often produce better code with just a little up-front thought

mod_auth_digest.c

```
else if (r_uri.query) {
  /* MSIE compatibility hack.  MSIE has some RFC issues - doesn't
   * include the query string in the uri Authorization component
   * or when computing the response component.  the second part
   * works out ok, since we can hash the header and get the same
   * result.  however, the uri from the request line won't match
   * the uri Authorization component since the header lacks the
   * query string, leaving us incompatable with a (broken) MSIE.
   *
   * workaround is to fake a query string match if in the proper
   * environment - BrowserMatch MSIE, for example.  the cool thing
   * is that if MSIE ever fixes itself the simple match ought to
   * work and this code won't be reached anyway, even if the
   * environment is set.
   */

  if (apr_table_get(r->subprocess_env,
                    "AuthDigestEnableQueryStringHack")) {
      d_uri.query = r_uri.query;
  }
}
```

Only the Beginning

- You're not finished yet!
- Our Criteria
  - MSIE users can authenticate
  - RFC compliant users still can authenticate
  - if MSIE gets fixed, users can authenticate
- We have more tests to write

```
{
  # pretend MSIE fixed itself
  my $response = GET "$url?$query",
                  username    => 'user1', password => 'password1',
                  'X-Browser' => 'MSIE';

  is ($response->code,
      200,
      'a compliant response coming from MSIE');
}

{
  # this still bombs
  my $response = GET "$url?$query",
                   Authorization => $bad_query,
                   'X-Browser'   => 'MSIE';

  is ($response->code,
      400,
      'mismatched query string + MSIE');
}
```

```
{
  # pretend MSIE fixed itself
  my $response = GET "$url?$query",
                 username    => 'user1', password => 'password1',
                 'X-Browser' => 'MSIE';

  is ($response->code,
      200,
      'a compliant response coming from MSIE');
}

{
  # this still bombs
  my $response = GET "$url?$query",
                  Authorization => $bad_query,
                  'X-Browser'   => 'MSIE';

  is ($response->code,
      400,
      'mismatched query string + MSIE');
}
```

Accomplishments

- Code that works as required
- Code that nobody else can break
  - as long as they run the tests
- Code that can be freely refactored or cleaned
  - formatting or whitespace changes
- Permanent place for what would otherwise be a manual intervention or one-off script

Server-Side Tests

- So far, we have been using `*.t` tests to act as clients
- `Apache-Test` provides a mechanism for running server-side tests
- Highly magical
- Currently, only supported for Perl handlers or PHP scripts
  - no magic for C modules (or other embedded languages, like python or parrot) yet

Say What?

- mod_ssl exposes a few optional functions
  - `is_https()`
  - `ssl_var_lookup()`
- `Apache::SSLLookup` provides Perl glue
  - `Apache::SSLLookup->new()`
  - `is_https()`
  - `ssl_lookup()`

What to Test?

- Class
  - compiles
- Constructor
  - defined
  - returns an object of the proper class
  - returns an object with proper attributes
- Method
  - defined
  - do something useful

Options

- Client-side test
  - run a bunch of tests and return `OK`
  - if one test fails, return `500`
  - testing in aggregate
- Server-side test
  - much more granular
  - each test can individually pass or fail
- It's all about where you call `ok()`

```
package TestSSL::01new;

use Apache::Test qw(-withtestmore);

use Apache::Const -compile => qw(OK);

sub handler {

  my $r = shift;

  plan $r, tests => 2;

  {
    use_ok('Apache::SSLLookup');
  }

  {
    can_ok('Apache::SSLLookup', 'new');
  }

  return Apache::OK
}
1;
```

t/ssl/01new.t

```
# WARNING: this file is generated, do not edit
# 01: Apache/TestConfig.pm:898
# 02: /Apache/TestConfig.pm:916
# 03: Apache/TestConfigPerl.pm:138
# 04: Apache/TestConfigPerl.pm:553
# 05: Apache/TestConfig.pm:584
# 06: Apache/TestConfig.pm:599
# 07: Apache/TestConfig.pm:1536
# 08: Apache/TestRun.pm:501
# 09: Apache/TestRunPerl.pm:80
# 10: Apache/TestRun.pm:720
# 11: Apache/TestRun.pm:720
# 12: t/TEST:28

use Apache::TestRequest 'GET_BODY_ASSERT';
print GET_BODY_ASSERT "/TestSSL__01new";
```

Magic

- Just like with the `c-modules/` directory, magical things happen if you follow a specific pattern
- In our case

```
t/response/TestSSL/01new.pm
```

automagically generates

```
t/ssl/01new.t
```

and an entry in `t/conf/httpd.conf`

t/conf/httpd.conf

```
<Location /TestSSL__01new>
    SetHandler modperl
    PerlResponseHandler TestSSL::01new
</Location>
```

```
sub handler {
  my $r = shift;
  plan $r, tests => 4;

  {
    use_ok('Apache::SSLLookup');
  }

  {
    can_ok('Apache::SSLLookup', 'new');
  }

  {
    eval { $r = Apache::SSLLookup->new(bless {}, 'foo') };

    like ($@,
          qr/`new' invoked by a `foo' object with no `r' key/,
          'new() requires an Apache::RequestRec object');
  }

  {
    $r = Apache::SSLLookup->new($r);

    isa_ok($r, 'Apache::SSLLookup');
  }

  return Apache::OK;
}
```

```
sub handler {

  my $r = shift;

  plan $r, tests => 3;

  {
    use_ok('Apache::SSLLookup');
  }

  {
    can_ok('Apache::SSLLookup', 'is_https');
  }

  {
    $r = Apache::SSLLookup->new($r);

    ok(defined $r->is_https,
       'is https returned a defined value');
  }

  return Apache::OK;
}
```

SSL

- We're testing an SSL interface
- Why not actually test it under SSL

t/response/TestLive/01api.pm

```
sub handler {

  my $r = shift;

  plan $r, tests => 2;

  {
    $r = Apache::SSLLookup->new($r);

    SKIP : {
      skip 'apache 2.0.51 required', 1
        unless have_min_apache_version('2.0.51');

      ok($r->is_https,
         'is_https() returned true');
    }

    ok ($r->ssl_lookup('https'),
        'HTTPS variable returned true');
  }

  return Apache::OK;
}
```

t/live/01api.t

```
use Apache::Test;
use Apache::TestRequest;

my $hostport = Apache::Test::config
                ->{vhosts}
                ->{TestLive}
                ->{hostport};

my $url = "https://$hostport/TestLive__01api/";

print GET_BODY_ASSERT $url;
```

t/conf/ssl/ssl.conf.in

```
PerlModule Apache::SSLLookup

<IfModule @ssl_module@>
  <VirtualHost TestLive>
    SSLEngine on
    SSLCertificateFile @SSLCA@/asf/certs/server.crt
    SSLCertificateKeyFile @SSLCA@/asf/keys/server.pem

    <Location /TestLive__01api>
      SetHandler modperl
      PerlResponseHandler TestLive::01api
    </Location>
  </VirtualHost>
</IfModule>
```

Where is Apache-Test?

- mod_perl 2.0
- CPAN
- `httpd-test` project
  - `http://httpd.apache.org/test/`
  - `test-dev@httpd.apache.org`

More Information

- `perl.com`
  - `http://www.perl.com/pub/a/2003/05/22/testing.html`
- `Apache-Test` tutorial
  - `http://perl.apache.org/docs/general/testing/testing.html`
- `Apache-Test` manpages
- *mod_perl Developer's Cookbook*
  - `http://www.modperlcookbook.org/`
- All the tests in the `perl-framework` part of the `httpd-test` project

Slides

- These slides freely available at some long URL you will never remember...

```
http://www.modperlcookbook.org/~geoff/slides/ApacheCon
```

- Linked to from my homepage

```
http://www.modperlcookbook.org/~geoff/
```