

Advanced Perl Techniques

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Advanced Perl Techniques

- Advanced level training for Perl programmers
- Turn intermediate programmers into advanced programmers
- “Modern” Perl
- Perl is not dying

Advanced Perl Techniques

- One day isn't enough time
- We'll be moving fairly fast
- Lots of pointers to other information
- Feel free to ask questions

What We Will Cover

- What's new in Perl 5.10
- Testing
 - including coverage analysis
- Database access
 - DBIx::Class

What We Will Cover

- Profiling & Benchmarking
- Object oriented programming with Moose
- MVC Frameworks
 - Catalyst

Schedule

- 09:45 – Begin
- 11:15 – Coffee break
- 13:00 – Lunch
- 14:00 – Begin
- 15:30 – Coffee break
- 17:00 – End

Resources

- Slides available on-line
 - <http://mag-sol.com/train/public/2009-11/adv>
- Also see Slideshare
 - <http://www.slideshare.net/davorg/slideshows>
- Get Satisfaction
 - <http://getsatisfaction.com/magnum>

Perl 5.10



Perl 5.10

- Released 18th Dec 2007
 - Perl's 20th birthday
- Many new features
- Well worth upgrading

New Features

- Defined-or operator
- Switch operator
- Smart matching
- say()
- Lexical \$_

New Features

- State variables
- Stacked file tests
- Regex improvements
- Many more

Defined Or

- Boolean expressions “short-circuit”
- `$val = $val || $default;`
- `$val ||= $default;`
- What if 0 is a valid value?
- Need to check “definedness”
- `$val = defined $val
 ? $val : $default;`
- `$val = $default unless defined $val;`

Defined Or

- The defined or operator makes this easier
- `$val = $val // $default;`
- A different slant on truth
- Checks definedness
- Shortcircuit version too
- `$val //=$value;`

Switch Statement

- Switch.pm was added with Perl 5.8
- Source filter
- Parser limitations
 - Regular expressions
 - eval
- 5.10 introduces a build-in switch statement

Given ... When

- Switch is spelled “given”
- Case is spelled “when”
- Powerful matching syntax

Given Example

- ```
given ($foo) {
 when (/^abc/) { $abc = 1; }
 when (/^def/) { $def = 1; }
 when (/^xyz/) { $xyz = 1; }
 default { $nothing = 1; }
}
```

# New Keywords

- Four new keywords
  - given
  - when
  - default
  - continue

# given

- `given(EXPR)`
- Assigns the result of `EXPR` to `$_` within the following block
- Similar to `do { my $_ = EXPR; ... }`



# when

- `when (EXPR)`
- Uses smart matching to compare `$_` with `EXPR`
- Equivalent to `if ($_ ~~ EXPR)`
- `~~` is the new smart match operator
- Compares two values and “does the right thing”

# default

- default defines a block that is executed if no when blocks match
- default block is optional

# continue

- `continue` keyword falls through to the next when block
- Normal behaviour is to break out of given block once the first when condition is matched

# continue

- ```
given($foo) {  
  when (/x/) { say '$foo contains an x';  
              continue }  
  when (/y/) { say '$foo contains a y' }  
  default { say '$foo contains no x or y' }  
}
```

Smart Matching

- `~~` is the new Smart Match operator
- Different kinds of matches
- Dependent on the types of the operands
- See “`perldoc perlsyn`” for the full details

Smart Match Examples

- `$foo == $bar; # == or cmp`
- `@foo == $bar; # array contains value`
- `%foo == $bar; # hash key exists`
- `$foo =~ qr{$bar}; # regex match`
- `@foo == @bar; # arrays are identical`
- `%foo == %bar; # hash keys match`
- Many more alternatives

say()

- `say()` is a new alternative to `print()`
- Adds a new line at the end of each call
- `say($foo); # print $foo, "\n";`
- Two characters shorter than `print`
- Less typing

Lexical \$_

- \$_ is a package variable
- Always exists in main package
- Can lead to subtle bugs when not localised correctly
- Can now use my \$_ to create a lexically scoped variable called \$_

State Variables

- Lexical variables disappear when their scope is destroyed

- ```
sub variables {
 my $x;

 say ++$x;
}
```

```
variables() for 1 .. 3;
```

# State Variables

- State variables retain their value when their scope is destroyed

- ```
sub variables {  
    state $x;  
  
    say ++$x;  
}
```

```
variables() for 1 .. 3;
```

- Like static variables in C

Stacked File Tests

- People often think you can do this
- `-f -w -x $file`
- Previously you couldn't
- Now you can
- Equivalent to
- `-x $file && -w _ && -f _`

Regex Improvements

- Plenty of regular expression improvements
- Named capture buffers
- Possessive quantifiers
- Relative backreferences
- New escape sequences
- Many more

Named Capture Buffers

- Variables \$1, \$2, etc change if the regex is altered
- Named captures retain their names
- (?<name> ...) to define
- Use new %+ hash to access them

Named Capture Example

- ```
while (<DATA>) {
 if (/(<header>[\w\s]+)
 :\s+(<value>.+)/x) {
 print "${header} -> ";
 print "${value}\n";
 }
}
```

# Possessive Quantifiers

- `?+`, `*+`, `++`
- Grab as much as they can
- Never give it back
- Finer control over backtracking
- `'aaaa' =~ /a++a/`
- Never matches

# Relative Backreferences

- $\backslash g\{N\}$
- More powerful version of  $\backslash 1$ ,  $\backslash 2$ , etc
- $\backslash g\{1\}$  is the same as  $\backslash 1$
- $\backslash g\{-1\}$  is the last capture buffer
- $\backslash g\{-2\}$  is the one before that

# New Escape Sequences

- \h – Horizontal white space
- \v – Vertical white space
- Also \H and \V

# Accessing New Features

- Some new features would break backwards compatibility
- They are therefore turned off by default
- Turn them on with the feature pragma
- use feature 'say';
- use feature 'switch';
- use feature 'state';
- use feature ':5.10';



# Implicit Loading

- Two ways to automatically turn on 5.10 features
- Require a high enough version of Perl
- `use 5.10.0; # Or higher`
- `-E` command line option
- `perl -e 'say "hello"'`
- `perl -E 'say "hello"'`

# Advanced Testing



# Writing Test Modules

- Standard test modules all work together
- Built using Test::Builder
- Ensures that test modules all use the same framework
- Use it as the basis of your own Test::\* modules
- Test your Test::Builder test modules with Test::Builder::Tester

# Test::Between

- ```
package Test::Between;  
  
use strict;  
use warnings;  
  
use base 'Exporter';  
our @EXPORT = qw(is_between);  
  
use Test::Builder;  
  
my $test = Test::Builder->new;
```

Test::Between

- ```
sub is_between {
 my ($item, $lower, $upper, $desc)
 = @_;

 return (
$test->ok($lower le $item &&
 $item le $upper, $desc)
 || $test->diag("$item is not between
$lower and $upper")
);
}
```

1;



# Using Test::Between

- #!/usr/bin/perl  
use strict;  
use warnings;  
use Test::More tests => 3;  
use Test::Between;  
  
is\_between('b', 'a', 'c', 'alpha');  
is\_between( 2, 1, 3, 'numeric');  
is\_between('two', 1, 3, 'wrong');



# Test::Between Output

- `$ prove -v test.pl`  
`test.pl ..`  
`1..3`  
`ok 1 - alpha`  
`ok 2 - numeric`  
`not ok 3 - wrong`

```
Failed test 'wrong'
at test.pl line 11.
two is not between 1 and 3
Looks like you failed 1 test of 3.
Dubious, test returned 1 (wstat 256,
0x100)
Failed 1/3 subtests
```

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# Test::Between Output

- Test Summary Report

-----

test.pl (Wstat: 256 Tests: 3 Failed: 1)

Failed test: 3

Non-zero exit status: 1

Files=1, Tests=3, 1 wallclock secs

( 0.07 usr 0.01 sys + 0.05 cusr 0.01

csys = 0.14 CPU)

Result: FAIL



# Mocking Objects

- Sometimes it's hard to test external interfaces
- Fake them
- `Test::MockObject` pretends to be other objects
- Gives you complete control over what they return

# Testing Reactors

- You're writing code that monitors a nuclear reactor
- It's important that your code reacts correctly when the reactor overheats
- You don't have a reactor in the test environment

# Testing Reactors

- Even if you did, you wouldn't want to make it overheat every time you run the tests
- Especially if you're not 100% sure of your code
- Of if you're running unattended smoke tests
- Fake it with a mock object

# My::Monitor Spec

- If the temperature of a reactor is over 100 then try to cool it down
- If you have tried cooling a reactor down 5 times and the temperature is still over 100 then return an error

# My::Monitor Code

- `package My::Monitor;`

```
sub new {
 my $class = shift;
 my $self = { tries => 0 };

 return bless $self, $class;
}
```

# My::Monitor Code

- ```
sub check {  
    my $self = shift;  
    my $reactor = shift;  
  
    my $temp = $reactor->temperature;  
  
    if ($temp > 100) {  
        $reactor->cooldown;  
        ++$self->{tries};  
        if ($self->{tries} > 5) {  
            return;  
        }  
    }  
    return 1;  
}
```

My::Monitor Code

- ```
 } else {
 $self->{tries} = 0;
 return 1;
 }
}

1;
```

# Mock Reactor

- Create a mock reactor object that acts exactly how we want it to
- Reactor object has two interesting methods
- temperature - returns the current temperature
- cooldown - cools reactor and returns success or failure



# monitor.t

- `use Test::More tests => 10;`  
`use Test::MockObject;`  
  
`# Standard tests`  
  
`BEGIN { use_ok('My::Monitor'); }`  
  
`ok(my $mon = My::Monitor->new);`  
`isa_ok($mon, 'My::Monitor');`

# monitor.t

- # Create Mock Reactor Object

```
my $t = 10;
```

```
my $reactor = Test::MockObject;
```

```
$reactor->set_bound('temperature',
 \ $t);
```

```
$reactor->set_true('cooldown');
```

# monitor.t

- # Test reactor

```
ok($mon->check($reactor));
```

```
$t = 120;
```

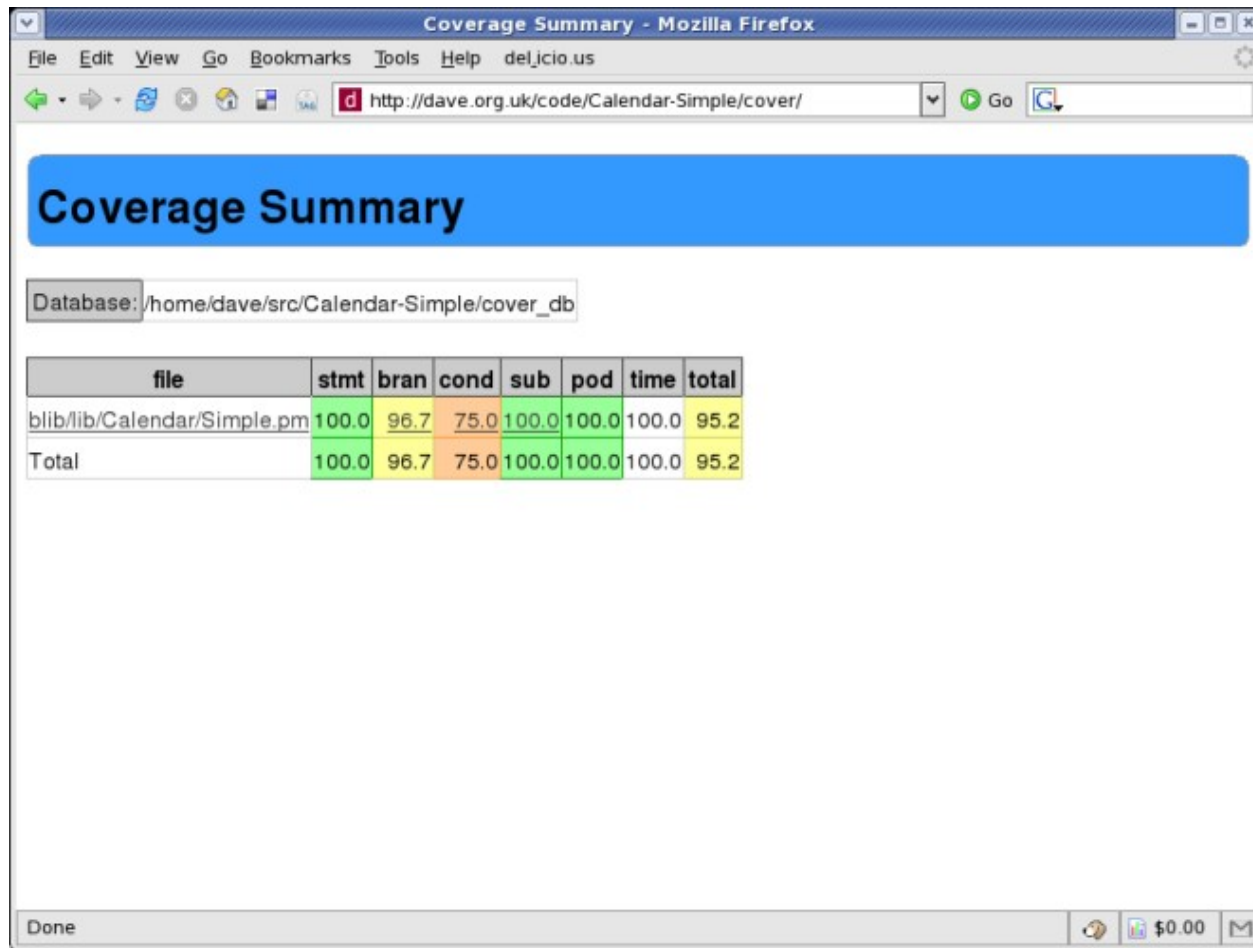
```
ok($mon->check($reactor)) for 1 .. 5;
```

```
ok(!$mon->check($reactor));
```

# How Good Are Your Tests?

- How much of your code is exercised by your tests?
- Devel::Cover can help you to find out
- Deep internal magic
- Draws pretty charts
  - HARNESS\_PERL\_SWITCHES=  
-MDevel::Cover make test
  - cover

# Devel::Cover Output



Coverage Summary - Mozilla Firefox

File Edit View Go Bookmarks Tools Help del.icio.us

http://dave.org.uk/code/Calendar-Simple/cover/ Go

## Coverage Summary

Database: /home/dave/src/Calendar-Simple/cover\_db

| file                        | stmt  | bran | cond | sub   | pod   | time  | total |
|-----------------------------|-------|------|------|-------|-------|-------|-------|
| blib/lib/Calendar/Simple.pm | 100.0 | 96.7 | 75.0 | 100.0 | 100.0 | 100.0 | 95.2  |
| Total                       | 100.0 | 96.7 | 75.0 | 100.0 | 100.0 | 100.0 | 95.2  |

Done \$0.00

# Devel::Cover Output

Condition Coverage: blib/lib/Calendar/Simple.pm - Mozilla Firefox

File: blib/lib/Calendar/Simple.pm

Coverage: 75.0%

| line | %   | coverage | condition                          |
|------|-----|----------|------------------------------------|
| 78   | 100 | A B dec  | \$year < 1970 and not \$dt         |
|      |     | 0 X 0    |                                    |
|      |     | 1 0 0    |                                    |
|      |     | 1 1 1    |                                    |
| 79   | 100 | A B dec  | \$mon < 1 or \$mon > 12            |
|      |     | 0 0 0    |                                    |
|      |     | 0 1 1    |                                    |
|      |     | 1 X 1    |                                    |
| 80   | 100 | A B dec  | \$start_day < 0 or \$start_day > 6 |
|      |     | 0 0 0    |                                    |
|      |     | 0 1 1    |                                    |

Done

# Devel::Cover Output

| Line | Coverage | A | B | dec | Code                                    |
|------|----------|---|---|-----|-----------------------------------------|
| 80   | 100      | 0 | 0 | 0   |                                         |
|      |          | 0 | 1 | 1   |                                         |
|      |          | 1 | X | 1   |                                         |
| 162  | 33       | 0 | 0 | 0   | \$params{'mon'}    \$now[0] + 1         |
|      |          | 0 | 1 | 1   |                                         |
|      |          | 1 | X | 1   |                                         |
| 163  | 33       | 0 | 0 | 0   | \$params{'year'}    \$now[1] + 1900     |
|      |          | 0 | 1 | 1   |                                         |
|      |          | 1 | X | 1   |                                         |
| 164  | 100      | 0 | 0 | 0   | \$params{'begin'}    1                  |
|      |          | 1 | 1 | 1   |                                         |
| 165  | 67       | 0 | 0 | 0   | \$params{'end'}    _days(\$mon, \$year) |
|      |          | 0 | 1 | 1   |                                         |
|      |          | 1 | X | 1   |                                         |

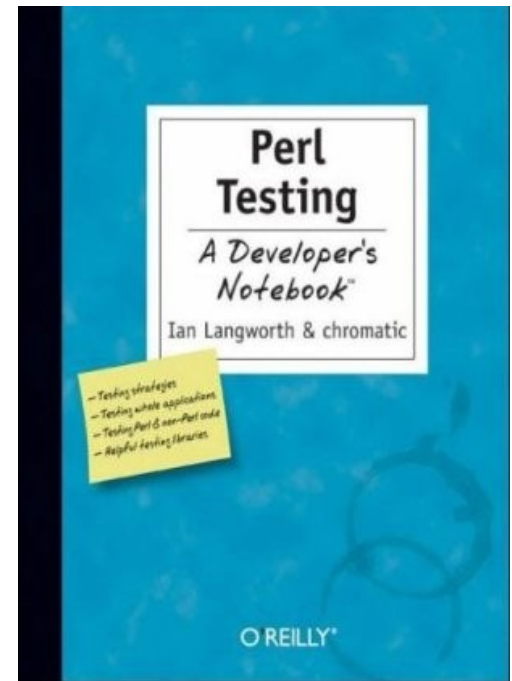
# Alternative Test Paradigms

- Not everyone likes the Perl testing framework
- Other frameworks are available
- Test::Class
  - xUnit style framework
- Test::FIT
  - Framework for Interactive Testing
  - <http://fit.c2.com>



# More Information

- Perl Testing: A Developer's Notebook (Ian Langworth & chromatic)
- perldoc Test::MockObject
- perldoc Test::Builder
- perldoc Devel::Cover
- etc...



# Benchmarking



# Benchmarking

- Ensure that your program is fast enough
- But how fast is fast enough?
- *premature optimization is the root of all evil*
  - Donald Knuth
  - paraphrasing Tony Hoare
- Don't optimise until you know what to optimise

# Benchmark.pm

- Standard Perl module for benchmarking
- Simple usage
- ```
use Benchmark;  
my %methods = (  
    method1 => sub { ... },  
    method2 => sub { ... },  
);  
timethese(10_000, \%methods);
```
- Times 10,000 iterations of each method

Benchmark.pm Output

- Benchmark: timing 10000 iterations of method1, method2...
method1: 6 wallclock secs \
(2.12 usr + 3.47 sys = 5.59 CPU) \
@ 1788.91/s (n=10000)
method2: 3 wallclock secs \
(0.85 usr + 1.70 sys = 2.55 CPU) \
@ 3921.57/s (n=10000)

Timed Benchmarks

- Passing `timethese` a positive number runs each piece of code a certain number of times
- Passing `timethese` a negative number runs each piece of code for a certain number of seconds

Timed Benchmarks

- use Benchmark;
my %methods = (
 method1 => sub { ... },
 method2 => sub { ... },
);

Run for 10,000(!) seconds
timethese(-10_000, \%methods);

Comparing Performance

- Use `cmpthese` to get a tabular output
- Optional export
- use Benchmark 'cmpthese';

```
my %methods = (  
    method1 => sub { ... },  
    method2 => sub { ... },  
);  
cmpthese(10_000, \%methods);
```


cmpthese Output

- | | Rate | method1 | method2 |
|---------|-----------|---------|---------|
| method1 | 2831802/s | - - | -61% |
| method2 | 7208959/s | 155% | - - |
- method2 is 61% slower than method1
- Can also pass negative number to cmpthese

Benchmarking is Hard

- Very easy to produce lots of numbers
- Harder to ensure that the numbers are meaningful
- Compare code fragments that do the same thing

Bad Benchmarking

- ```
use Benchmark qw{ timethese };
timethese(1_000, {
 Ordinary => sub {
 my @results = sort { -M $a <=> -M $b }
 glob "/bin/*";
 },
 Schwartzian => sub {
 map $_->[0],
 sort { $a->[1] <=> $b->[1] }
 map [$_, -M], glob "/bin/*";
 },
});
```

# What to Benchmark

- Profile your code
- See which parts it is worth working on
- Look for code that
  - Takes a long time to run, or
  - Is called many times, or
  - Both

# Devel::DProf

- Devel::DProf is the standard Perl profiling tool
- Included with Perl distribution
- Uses Perl debugger hooks
- `perl -d:DProf your_program`
- Produces a data file called `tmon.out`
- Command line program `dprofpp` to view results

# Sample Output

```
• $ perl -d:DProf ./invoice.pl 244
$ dprofpp
Total Elapsed Time = 1.173152 Seconds
 User+System Time = 0.963152 Seconds
Exclusive Times
%Time ExclSec CumulS #Calls sec/call Csec/c Name
6.02 0.058 0.067 482 0.0001 0.0001 Params::Validate::_validate
5.09 0.049 0.114 7 0.0070 0.0163 Class::DBI::Loader::mysql::BEGIN
4.15 0.040 0.050 10 0.0040 0.0050 Template::Parser::BEGIN
4.15 0.040 0.166 7 0.0057 0.0237 DateTime::Locale::BEGIN
4.05 0.039 0.094 43 0.0009 0.0022 base::import
3.74 0.036 0.094 449 0.0001 0.0002 DateTime::Locale::_register
3.11 0.030 0.280 4 0.0074 0.0700 DateTime::Format::MySQL::BEGIN
2.91 0.028 0.028 170 0.0002 0.0002 Lingua::EN::Inflect::_PL_noun
2.70 0.026 0.040 1 0.0262 0.0401 Template::Parser::_parse
2.49 0.024 0.024 1113 0.0000 0.0000 Class::Data::Inheritable::__ANON__
2.08 0.020 0.020 12 0.0017 0.0017 DBD::mysql::db::_login
2.08 0.020 0.020 4 0.0050 0.0050 Template::Stash::BEGIN
2.08 0.020 0.099 9 0.0022 0.0110 Template::Config::load
2.08 0.020 0.067 9 0.0022 0.0074 Template::BEGIN
2.08 0.020 0.039 4 0.0049 0.0097 Lingua::EN::Inflect::Number::BEGIN
```

# Devel::NYTProf

- New profiling module
- Based on work from the New York Times
- Enhanced by Tim Bunce
- Pretty HTML output
  - “borrowed” from Devel::Cover
- Far more flexible
- Far more powerful

# Using NYTProf

- Similar to Devel::DProf
- `$ perl -d:NYTProf ./invoice.pl 244`
- Writes nytprof.out
- `$ nytprofhtml`
- Or
- `$ nytprofcsv`



# Conclusions

- Don't optimise until you know you need to optimise
- Don't optimise until you know what to optimise
- Use profiling to find out what is worth optimising
- Use benchmarking to compare different solutions

# More Information

- perldoc Benchmark
- perldoc Devel::DProf
- perldoc Devel::NYTProf
- Chapters 5 and 6 of *Mastering Perl*

# Object Relational Mapping



# ORM

- Mapping database relations into objects
- Tables (relations) map onto classes
- Rows (tuples) map onto objects
- Columns (attributes) map onto attributes
- Don't write SQL

# SQL Is Tedious

- Select the id and name from this table
- Select all the details of this row
- Select something about related tables
- Update this row with these values
- Insert a new record with these values
- Delete this record

# Replacing SQL

- Instead of
- `SELECT *`  
`FROM my_table`  
`WHERE my_id = 10`
- and then dealing with the  
prepare/execute/fetch code

# Replacing SQL

- We can write
- use `My::Object;`

```
warning! not a real orm
my $obj = My::Object->retrieve(10)
```

- Or something similar



# Writing An ORM Layer

- Not actually that hard to do yourself
- Each class needs an associated table
- Each class needs a list of columns
- Create simple SQL for basic CRUD operations
- Don't do that



# Perl ORM Options

- Plenty of choices on CPAN
- Tangram
- SPOPS (Simple Perl Object Persistence with Security)
- Alzabo
- Class::DBI
- DBIx::Class
  - The current favourite

# DBIx::Class

- Standing on the shoulders of giants
- Learning from problems in Class::DBI
- More flexible
- More powerful

# DBIx::Class Example

- Modeling a CD collection
- Three tables
- artist (artistid, name)
- cd (cdid, artist, title)
- track (trackid, cd, title)

# Main Schema

- Define main schema class
- DB/Main.pm
- ```
package DB::Main;  
use base qw/DBIx::Class::Schema/;  
  
__PACKAGE__->load_classes();  
  
1;
```

Object Classes

- DB/Main/Artist.pm
- ```
package DB::Main::Artist;
use base qw/DBIx::Class/;
__PACKAGE__->load_components(qw/PK::Auto
Core/);
__PACKAGE__->table('artist');
__PACKAGE__->add_columns(qw/ artistid name
/);
__PACKAGE__->set_primary_key('artistid');
__PACKAGE__->has_many(cds =>
 'DB::Main::Cd');

1;
```

# Object Classes

- DB/Main/CD.pm
- ```
package DB::Main::CD;
use base qw/DBIx::Class/;
__PACKAGE__->load_components(qw/PK::Auto
Core/);
__PACKAGE__->table('cd');
__PACKAGE__->add_columns(qw/ cdid artist
title year /);
__PACKAGE__->set_primary_key('cdid');
__PACKAGE__->belongs_to(artist =>
'DB::Main::Artist');

1;
```

Inserting Artists

- ```
my $schema =
 DB::Main->connect($dbi_str);

my @artists = ('The Beta Band',
 'Beth Orton');

my $art_rs = $schema->resultset('Artist');

foreach (@artists) {
 $art_rs->create({ name => $_ });
}
```

# Inserting CDs

- Hash of Artists and CDs
- ```
my %cds = ( 'The Three EPs' =>  
           'The Beta Band',  
           'Trailer Park'   =>  
           'Beth Orton');
```


Inserting CDs

- Find each artist and insert CD
- ```
foreach (keys $cds) {
 my ($artist) = $art_rs->search(
 { name => $cds{$_} }
);

 $artist->add_to_cds(
 title => $_,
);
}
```

# Retrieving Data

- Get CDs by artist
- ```
my ($artist) = $art_rs->search({  
    name => 'Beth Orton',  
});
```

```
foreach ($artist->cds) {  
    say $_->title;  
}
```

Searching for Data

- Search conditions can be more complex
- Alternatives
 - `$rs->search({year => 2006},
 {year => 2007});`
- Like
 - `$rs->search({name =>
 { 'like', 'Dav%' } });`

Searching for Data

- Combinations

- `$rs->search({forename => { 'like', 'Dav%' }, surname => 'Cross' });`

Don't Repeat Yourself

- There's a problem with this approach
- Information is repeated
- Columns and relationships defined in the database schema
- Columns and relationships defined in class definitions

Repeated Information

- ```
CREATE TABLE artist (
 artistid INTEGER PRIMARY KEY,
 name TEXT NOT NULL
);
```

# Repeated Information

- ```
package DB::Main::Artist;
use base qw/DBIx::Class/;
__PACKAGE__->
    load_components(qw/PK::Auto Core/);
__PACKAGE__->table('artist');
__PACKAGE__->
    add_columns(qw/ artistid name /);
__PACKAGE__->
    set_primary_key('artistid');
__PACKAGE__->has_many('cds' =>
    'DB::Main::Cd');
```

Database Metadata

- Some people don't put enough metadata in their databases
- Just tables and columns
- No relationships. No constraints
- You may as well make each column VARCHAR(255)

Database Metadata

- Describe your data in your database
- It's what your database is for
- It's what your database does best

No Metadata (Excuse 1)

- "This is the only application that will ever access this database"
- Bollocks
- All data will be shared eventually
- People will update your database using other applications
- Can you guarantee that someone won't use mysql to update your database?

No Metadata (Excuse 2)

- "Database doesn't support those features"
- Bollocks
- MySQL 3.x is not a database
 - It's a set of data files with a vaguely SQL-like query syntax
- MySQL 4.x is a lot better
- MySQL 5.x is most of the way there
- Don't be constrained by using inferior tools

DBIC::Schema::Loader

- Creates classes by querying your database metadata
- No more repeated data
- We are now DRY
- Schema definitions in one place
- But...
- Performance problems

Performance Problems

- You don't really want to generate all your class definitions each time your program is run
- Need to generate the classes in advance
- `dump_to_dir` method
- Regenerate classes each time schema changes

Alternative Approach

- Need one canonical definition of the data tables
- Doesn't need to be SQL DDL
- Could be in Perl code
- Write DBIx::Class definitions
- Generate DDL from those
- Harder approach
 - Might need to generate ALTER TABLE

Conclusions

- ORM is a bridge between relational objects and program objects
- Avoid writing SQL in common cases
- DBIx::Class is the currently fashionable module
- Lots of plugins
- Caveat: ORM may be overkill for simple programs

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More Information

- Manual pages (on CPAN)
- DBIx::Class
- DBIx::Class::Manual::*
- DBIx::Class::Schema::Loader
- Mailing list (Google for it)

Moose



Moose

- *A complete modern object system for Perl 5*
- Based on experiments with Perl 6 object model
- Built on top of Class::MOP
 - MOP - Meta Object Protocol
 - Set of abstractions for components of an object system
 - Classes, Objects, Methods, Attributes
- An example might help

Moose Example

- ```
package Point;
use Moose;

has 'x' => (isa => 'Int',
 is => 'ro');
has 'y' => (isa => 'Int',
 is => 'rw');

sub clear {
 my $self = shift;
 $self->{x} = 0;
 $self->y(0);
}
```

# Understanding Moose

- There's a lot going on here
- use Moose
  - Loads Moose environment
  - Makes our class a subclass of Moose::Object
  - Turns on strict and warnings

# Creating Attributes

- `has 'x' => (isa => 'Int',  
              is   => 'ro')`
  - Creates an attribute called 'x'
  - Constrained to be an integer
  - Read-only accessor
- `has 'y' => (isa => 'Int',  
              is   => 'rw')`

# Defining Methods

- ```
sub clear {  
    my $self = shift;  
    $self->{x} = 0;  
    $self->y(0);  
}
```
- Standard method syntax
- Uses generated method to set y
- Direct hash access for x

Subclassing

- ```
package Point3D;
use Moose;

extends 'Point';

has 'z' => (isa => 'Int');

after 'clear' => sub {
 my $self = shift;
 $self->{z} = 0;
};
```

# Subclasses

- extends 'Point'
  - Similar to use base
  - Overwrites @ISA instead of appending
- has 'z' => (isa = 'Int')
  - Adds new attribute 'z'
  - No accessor function - private attribute



# Extending Methods

- ```
after 'clear' => sub {  
    my $self = shift;  
    $self->{z} = 0;  
};
```
- New clear method for subclass
- Called after method for superclass
- Cleaner than `$self->SUPER::clear()`

Creating Objects

- Moose classes are used just like any other Perl class
- `$point = Point->new(x => 1, y => 2);`
- `$p3d = Point3D->new(x => 1,
y => 2,
z => 3);`

More About Attributes

- Use the has keyword to define your class's attributes
- `has 'first_name' => (is => 'rw');`
- Use `is` to define `rw` or `ro`
- Omitting `is` gives an attribute with no accessors

Getting & Setting

- By default each attribute creates a method of the same name.
- Used for both getting and setting the attribute
- `$dave->first_name('Dave');`
- `say $dave->first_name;`

Change Accessor Name

- Change accessor names using reader and writer
- ```
has 'name' => (
 is => 'rw',
 reader => 'get_name',
 writer => 'set_name',
);
```
- See also MooseX::FollowPBP

# Required Attributes

- By default Moose class attributes are optional
- Change this with `required`
- ```
has 'name' => (  
    is          => 'ro',  
    required => 1,  
);
```
- Forces constructor to expect a name
- Although that name could be undef

Attribute Defaults

- Set a default value for an attribute with default
- ```
has 'size' => (
 is => 'rw',
 default => 'medium',
);
```
- Can use a subroutine reference
- ```
has 'size' => (  
  is          => 'rw',  
  default     => \&rand_size,
```

);

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The logo for Magnum Solutions Limited is positioned in the bottom right corner. It features the word "Magnum" in a large, bold, serif font, with "Solutions Limited" in a smaller, sans-serif font directly beneath it. The background of the logo is a landscape photograph showing rolling green hills under a hazy, overcast sky.

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More Attribute Properties

- `lazy`
 - Only populate attribute when queried
- `trigger`
 - Subroutine called after the attribute is set
- `isa`
 - Set the type of an attribute
- Many more

More Moose

- Many more options
- Support for concepts like delegation and roles
- Powerful plugin support
 - MooseX::*
- Lots of work going on in this area

Catalyst



MVC Frameworks

- MVC frameworks are a popular way to write applications
 - Particularly web applications

M, V and C

- Model
 - Data storage & data access
- View
 - Data presentation layer
- Controller
 - Business logic to glue it all together

MVC Examples

- Ruby on Rails
- Django (Python)
- Struts (Java)
- CakePHP
- Many examples in most languages
- Perl has many options

MVC in Perl

- Maypole
 - The original Perl MVC framework
- CGI::Application
 - Simple MVC for CGI programming
- Jifty
 - Developed and used by Best Practical
- Catalyst
 - Currently the popular choice

Catalyst

- MVC framework in Perl
- Building on other heavily-used tools
- Model uses DBIx::Class
- View uses Template Toolkit
- These are just defaults
- Can use anything you want

Simple Catalyst App

- Assume we already have model
 - CD database from DBIx::Class section
- Use `catalyst.pl` to create project
- ```
$ catalyst.pl CD
created "CD"
created "CD/script"
created "CD/lib"
created "CD/root"
... many more ...
```



# What Just Happened?

- Catalyst just generated a lot of useful stuff for us
- Test web servers
  - Standalone and FastCGI
- Configuration files
- Test stubs
- Helpers for creating models, views and controllers

# A Working Application

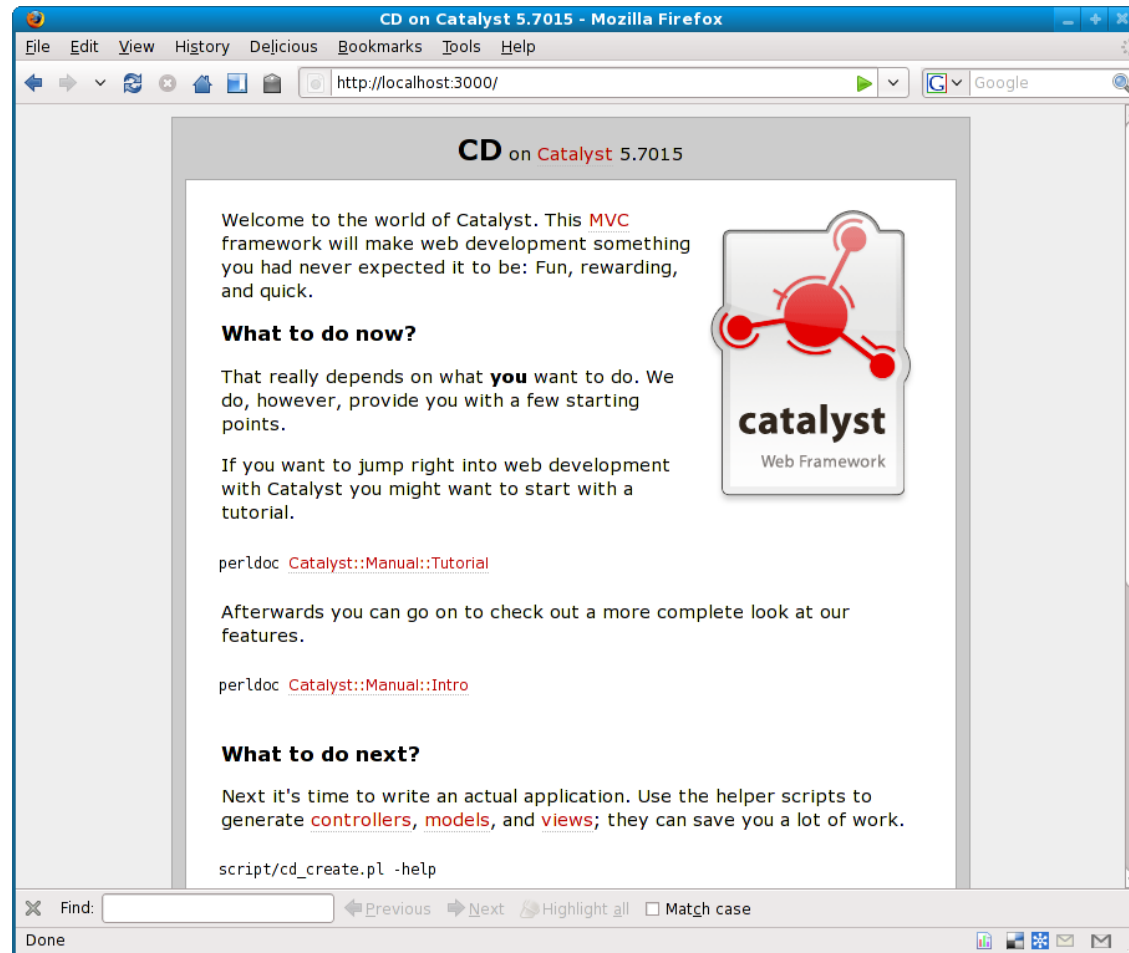
- We already have a working application
- `$ CD/script/cd_server.pl`

`... lots of output`

```
[info] CD powered by Catalyst 5.7015
You can connect to your server at
http://localhost:3000
```

- Of course, it doesn't do much yet

# Simple Catalyst App



# Next Steps

- Use various helper programs to create models and views for your application
- Write controller code to tie it all together
- Many plugins to handle various parts of the process
  - Authentication
  - URL resolution
  - Session handling
  - etc...

# Create a View

- ```
$ script/cd_create.pl view Default TT  
exists  
"/home/dave/training/cdlib/CD/script/../../lib/CD/V  
iew"  
exists  
"/home/dave/training/cdlib/CD/script/../../t"  
created  
"/home/dave/training/cdlib/CD/script/../../lib/CD/V  
iew/Default.pm"  
created  
"/home/dave/training/cdlib/CD/script/../../t/view_D  
efault.t"
```

Remove Default Message

- In lib/CD/Controller/Root.pm
- ```
sub index :Path :Args(0) {
 my ($self, $c) = @_;

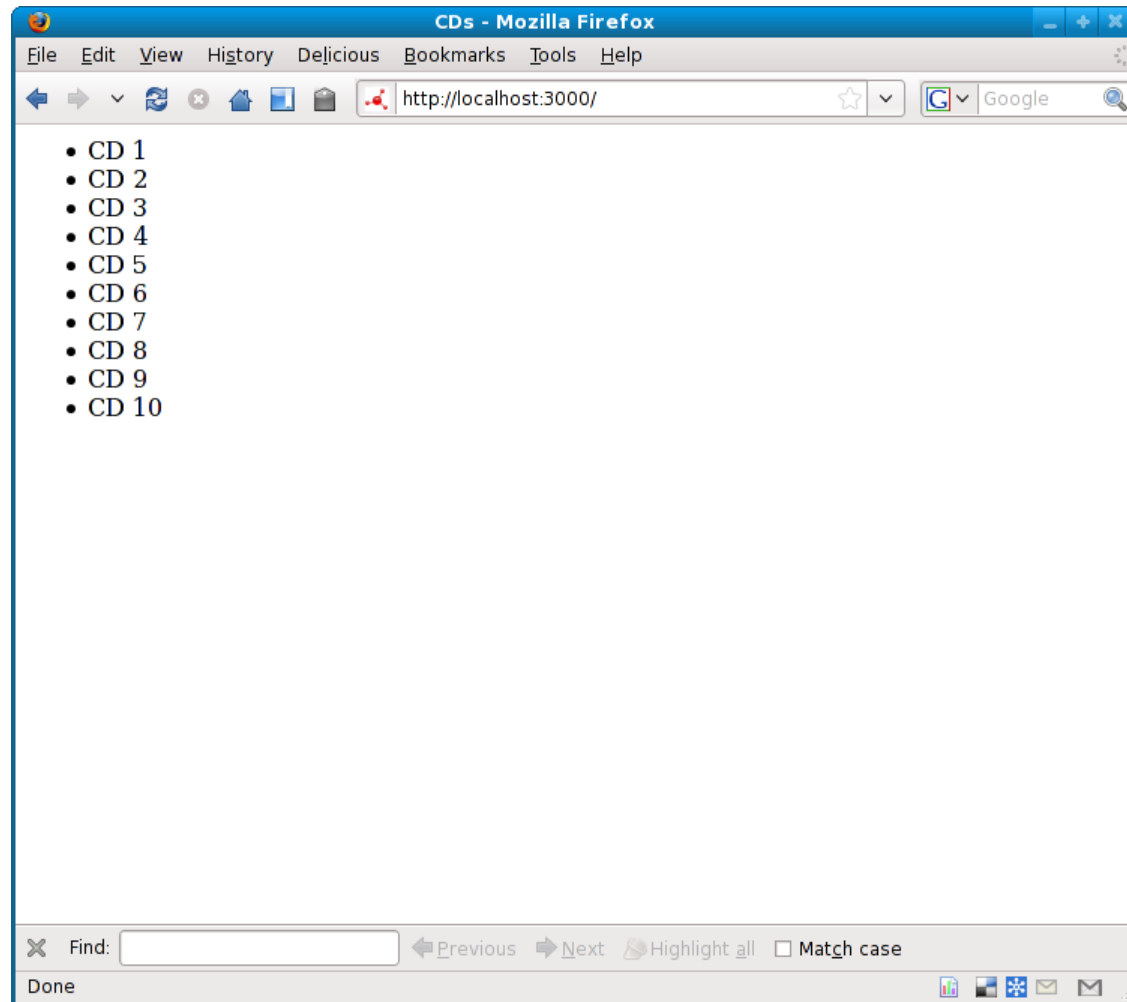
 # Hello World
 $c->response_body($c->welcome_message);
}
```
- Remove response\_body line
- Default behaviour is to render index.tt
- Need to create that

# index.tt

- root/index.tt
- ```
<html>
  <head>
    <title>CDs</title>
  </head>
  <body>
    <ul>
[% FOREACH cd IN [ 1 .. 10 ] %]
      <li>CD [% cd %]</li>
[% END %]
    </ul>
  </body>
</html>
```



New Front Page



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Adding Data

- Of course that's hard-coded data
- Need to add a model class
- And then more views
- And some controllers
- There's a lot to do
- I recommend working through a tutorial

Easier Catalyst

- A lot of web applications do similar things
- Given a database
- Produce screens to edit the data
- Surely most of this can be automated
- It's called Catalyst::Plugin::AutoCRUD
- (Demo)

Cat::Plugin::AutoCRUD

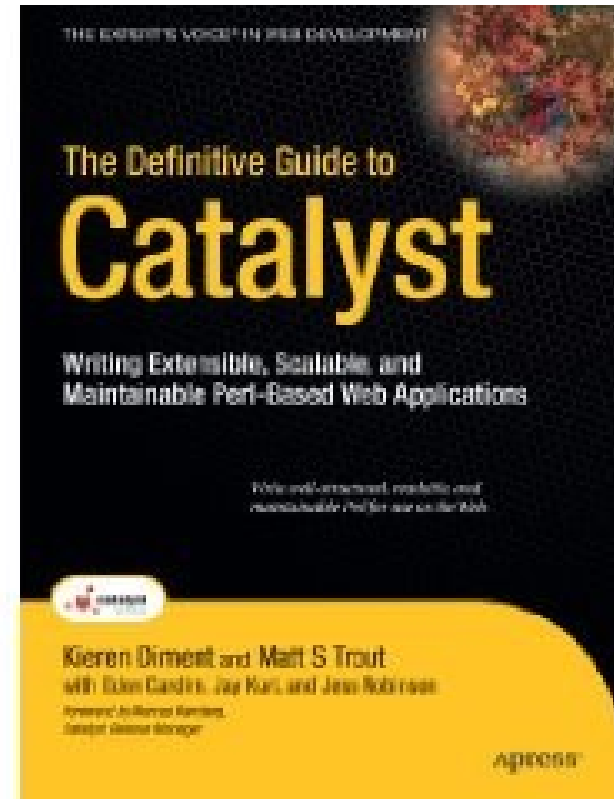
- Does a lot of work
- On the fly
- For every request
- No security on table updates
- So it's not right for every project
- Very impressive though

Conclusions

- There's a lot to bear in mind when writing a web app
- Using the right framework can help
- Catalyst is the most popular Perl framework
- As powerful as any other framework
 - In any language
- Lots of work still going on
- Large team, active development

Recommended Book

- The Definitive Guide to Catalyst
 - Kieren Diment
 - Matt S Trout



Further Information



Further Information

- Some suggestions for places to go for further information
- Web sites
- Books
- Magazines
- Mailing lists
- Conferences

London Perl Mongers

- <http://london.pm.org/>
- Mailing list
- Regular meetings
 - Both social and technical
- London Perl Workshop
 - 5th December 2009
- Many other local Perl Monger groups
 - <http://pm.org/>

Web Sites

- The Perl directory
 - <http://perl.org/>
 - Lists of many Perl-related sites
- use Perl;
 - Perl news site
 - Also journals

Web Sites

- Perl Monks
 - Best web site for Perl questions
 - Many Perl experts

Perl Blogs

- Perl Iron Man
 - <http://ironman.enlightenedperl.org/>
- Planet Perl
 - <http://planet.perl.org/>
- Perlsphere
 - <http://perlsphere.net/>
- blogs.perl.org
 - <http://blogs.perl.org/>

Books

- Some recent Perl books
- *Perl Best Practices* - Damian Conway
- *Advanced Perl Programming* - Simon Cozens
- *Perl Hacks* - chromatic, Conway & Poe
- *Intermediate Perl* - Schwartz, foy & Phoenix
- *Mastering Perl* - brian d foy

More Books

- *Higher Order Perl* - Mark-Jason Dominus
- *Minimal Perl* - Tim Maher
- *Pro Perl Debugging* - Richard Foley & Joe McMahon
- *Perl & LWP* - Sean M Burke
 - Updated online edition
 - <http://lwp.interglacial.com/>
- See <http://books.perl.org/>

Mailing Lists

- Many mailing lists devoted to Perl topics
- See <http://lists.cpan.org/>

Conferences

- The Open Source Convention
 - Portland, Oregon 19-23 July 2010
- YAPC
 - Columbus, Ohio 2010
 - Pisa, Italy 2010
 - Brazil, Asia, Israel, Australia
- One-Day Perl Workshops
- See <http://yapc.org/>



That's all folks

- Any questions?

