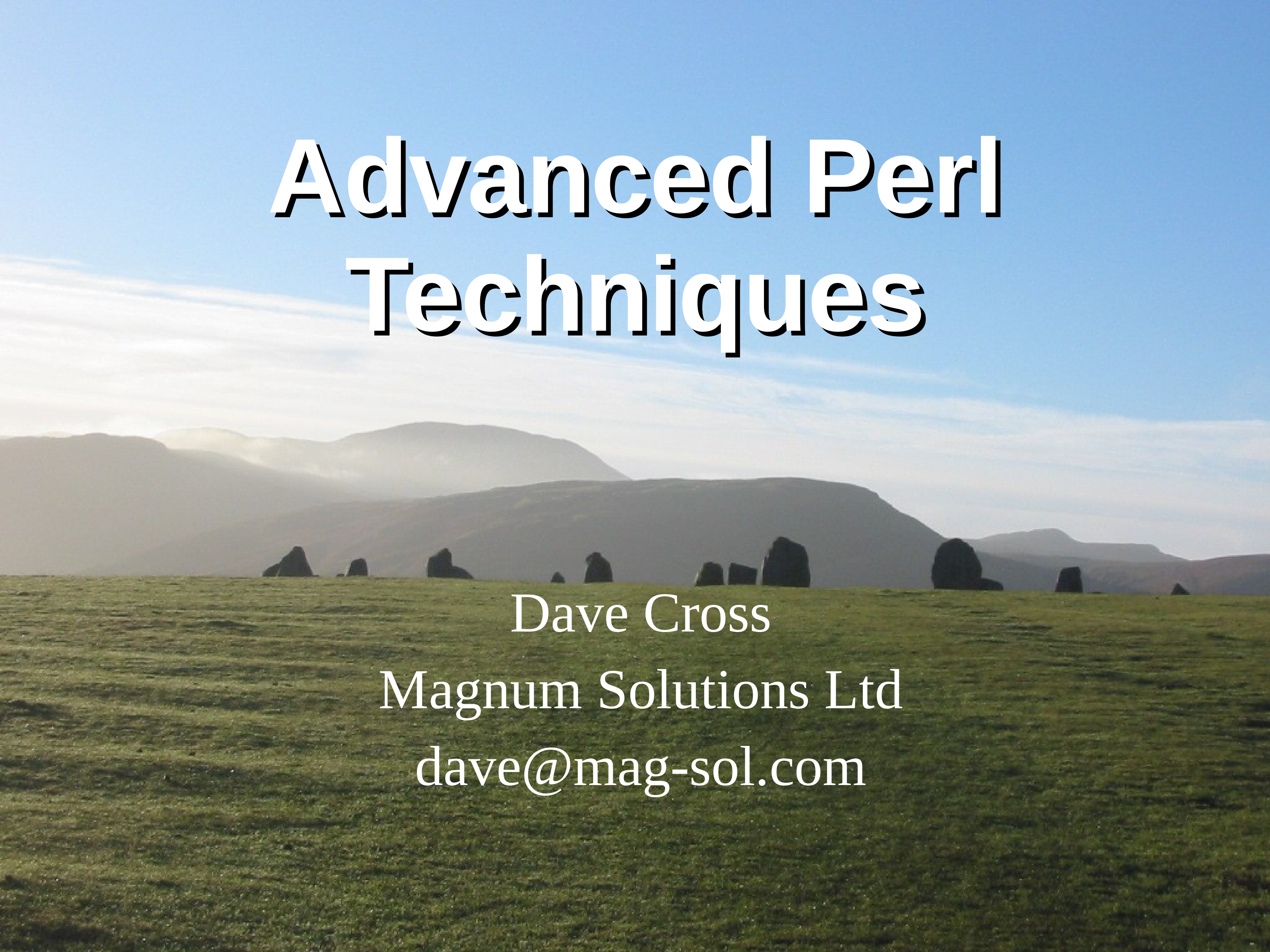

Advanced Perl Techniques

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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
- Templates
- 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/2010-04/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 $_ with EXPR
- Equivalent to `when ($_ ~~ 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

- `\g{N}`
- More powerful version of `\1`, `\2`, etc
- `\g{1}` is the same as `\1`
- `\g{-1}` is the last capture buffer
- `\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
  ```

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');
  ```

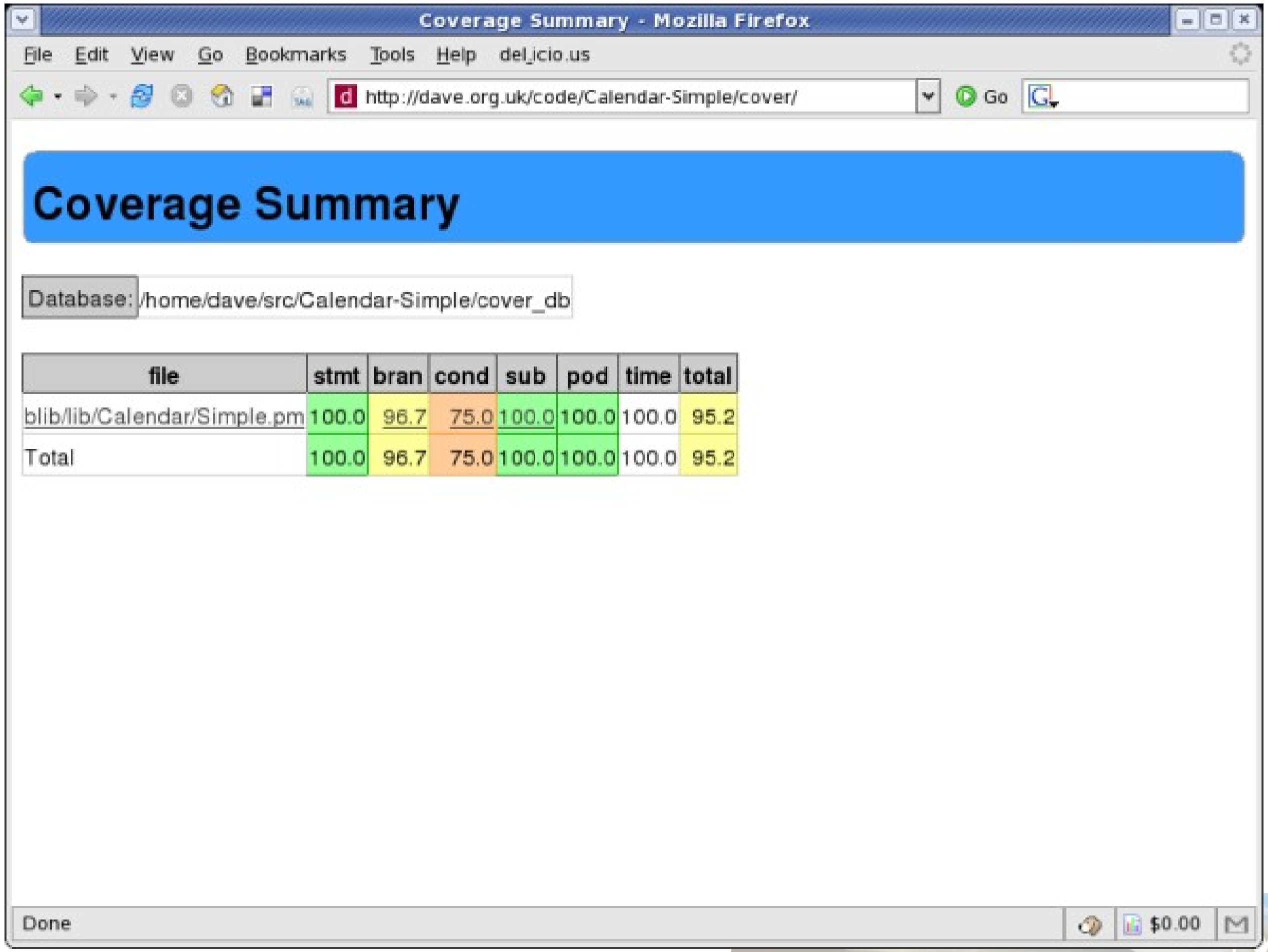
monitor.t

-
  ```
  # 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

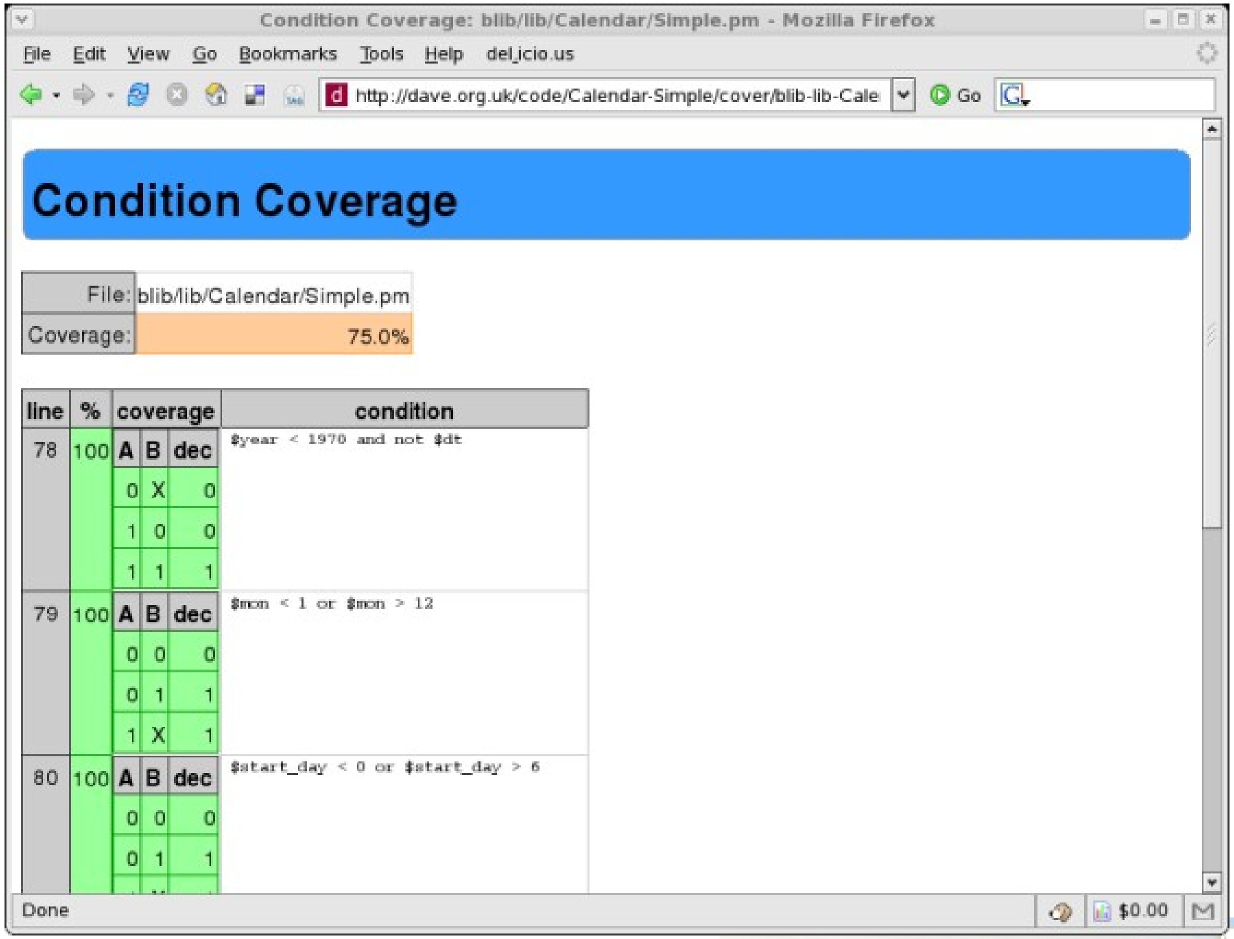

Coverage Summary - Mozilla Firefox
File Edit View Go Bookmarks Tools Help del.icio.us
http://dave.org.uk/code/Calendar-Simple/cover/
Go
Done
$0.00

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

Devel::Cover Output

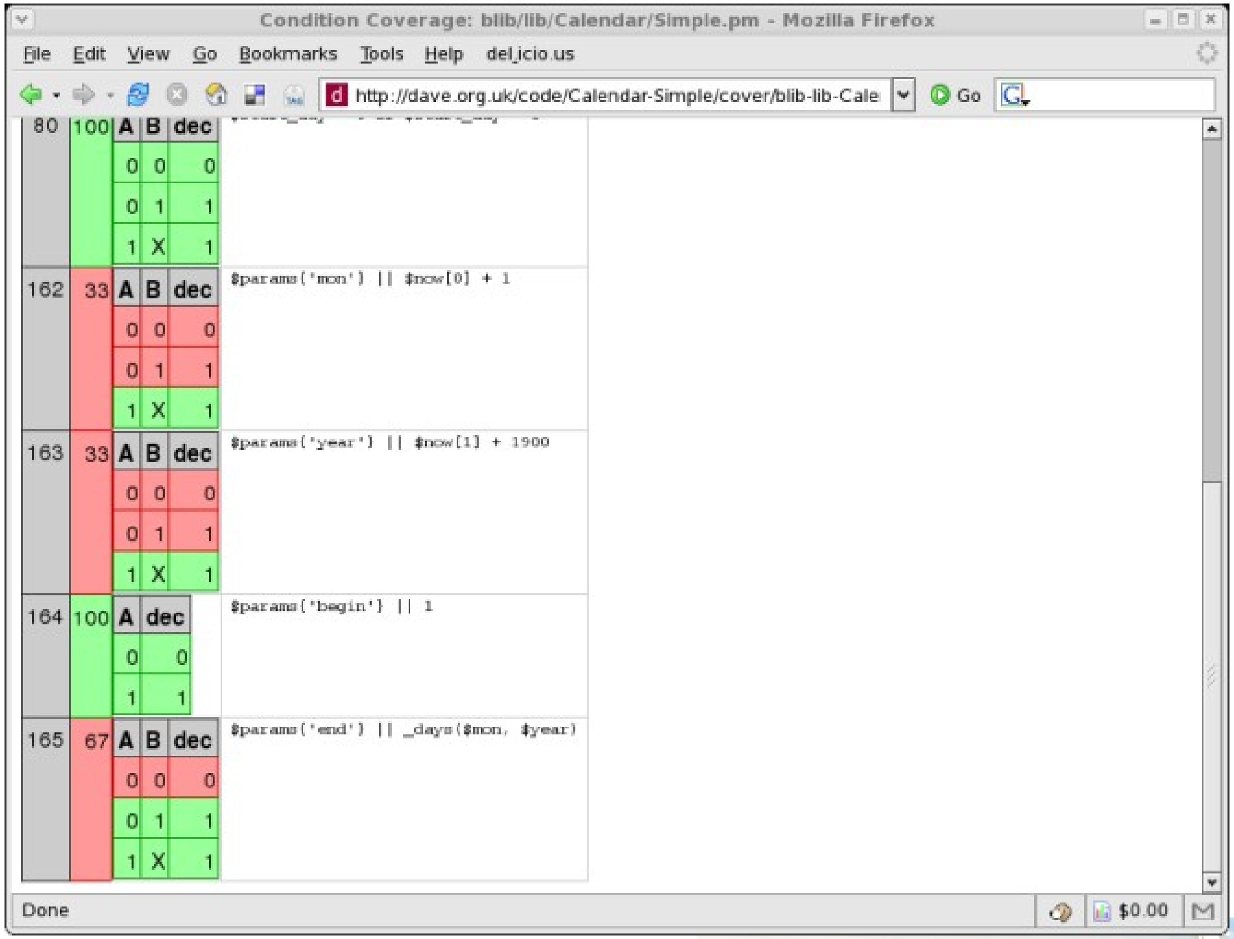

Condition Coverage: blib/lib/Calendar/Simple.pm - Mozilla Firefox
File Edit View Go Bookmarks Tools Help del.icio.us
http://dave.org.uk/code/Calendar-Simple/cover/blib-lib-Cale
Go
Done
$0.00

Condition Coverage

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	

Devel::Cover Output



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

http://dave.org.uk/code/Calendar-Simple/cover/blib-lib-Cale

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

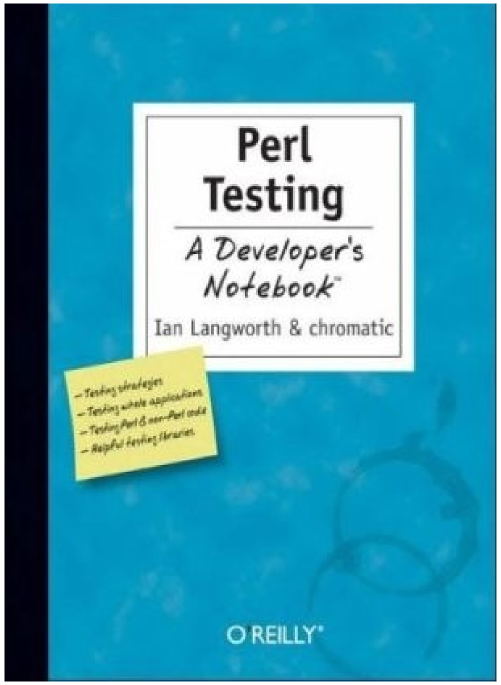
Done

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
- Devel::Cover
- etc...


Perl
Testing
A Developer's Notebook
Ian Langworth & chromatic
—Testing strategies
—Testing whole applications
—Testing Perl & non-Perl code
—Helpful testing libraries
O'REILLY

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

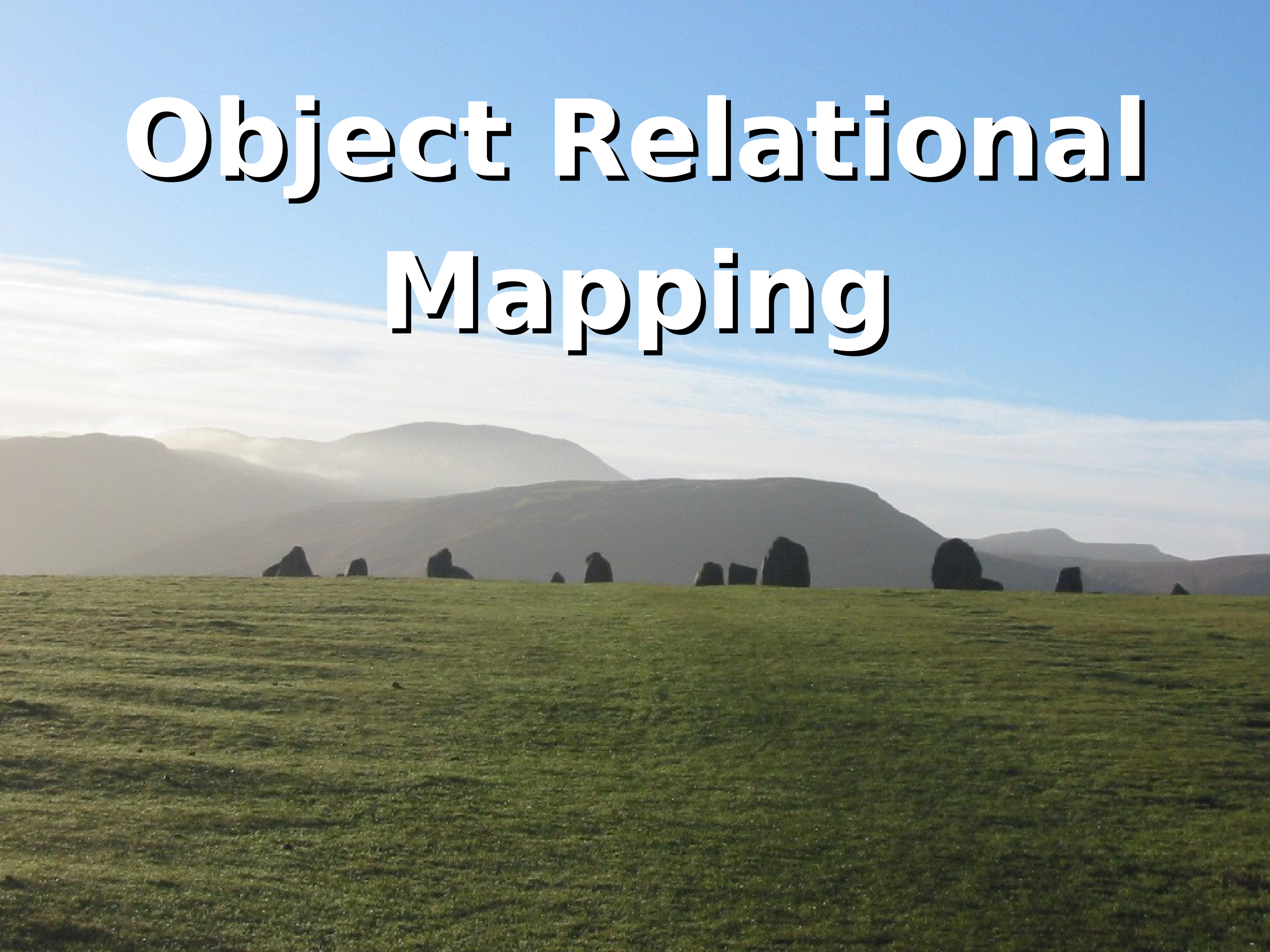
- Similar to Devel::DProf
- `$ perl -d:NYTProf ./invoice.pl 244`
- Writes nytprof.out
- `$ nytprofhtml`
- Or
- `$ nytprofcsv`

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"
- Nonsense
- 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"
- Nonsense
- 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

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'
  - Constrainted 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,
  );
  ```

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

Newer MVC in Perl

- Dancer
- Squatting
- Mojolicious

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?

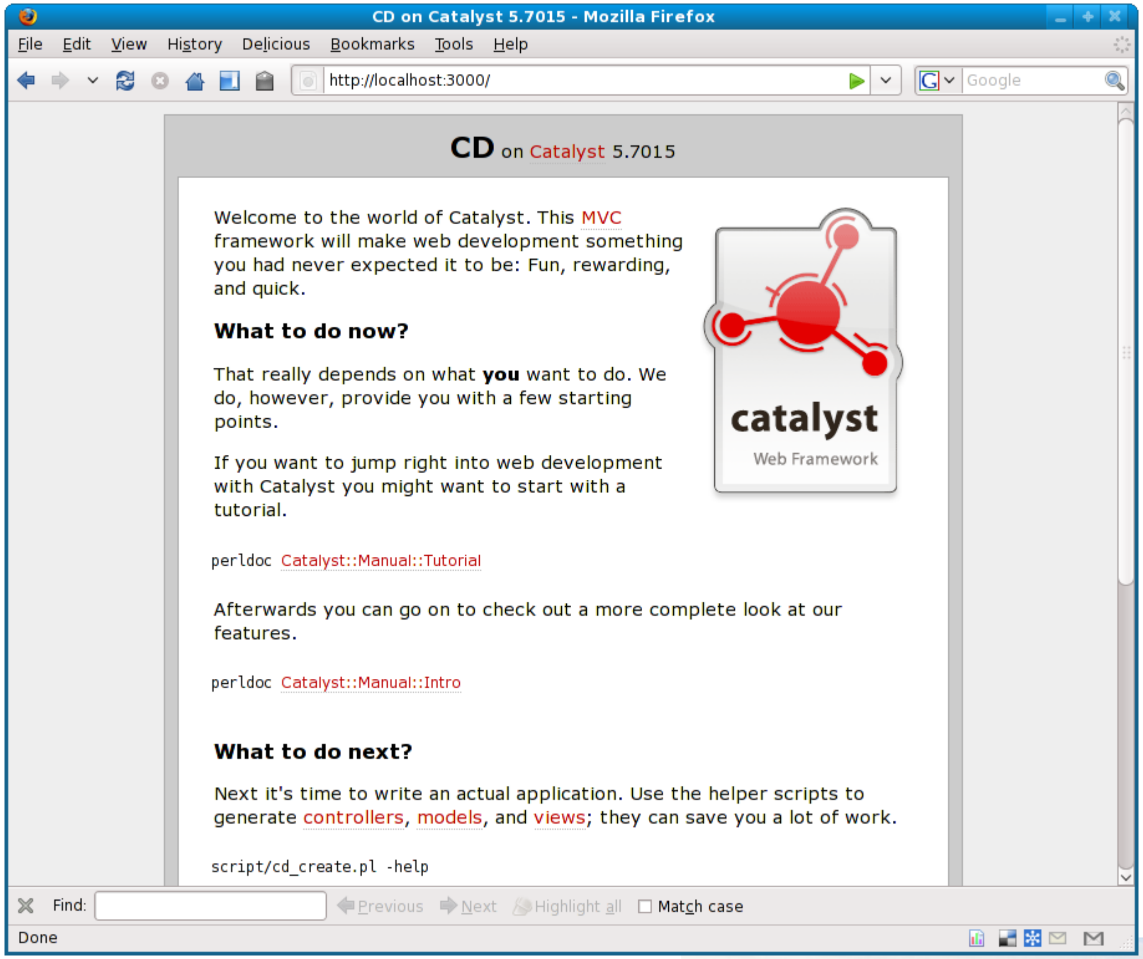
- Catalyst just generated a lot of useful stuff for us
- Test web servers
  - Standalone and FastCGI
- Configuration files
- Test stubs
- Helpers for creating models, views and controllers

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


CD on Catalyst 5.7015 - Mozilla Firefox
File Edit View History Delicious Bookmarks Tools Help
http://localhost:3000/
Google
Find:
Previous
Next
Highlight all
Match case
Done

CD on Catalyst 5.7015

Welcome to the world of Catalyst. This MVC framework will make web development something you had never expected it to be: Fun, rewarding, and quick.

What to do now?

That really depends on what **you** want to do. We do, however, provide you with a few starting points.

If you want to jump right into web development with Catalyst you might want to start with a tutorial.

```
perldoc Catalyst::Manual::Tutorial
```

Afterwards you can go on to check out a more complete look at our features.

```
perldoc Catalyst::Manual::Intro
```

What to do next?

Next it's time to write an actual application. Use the helper scripts to generate controllers, models, and views; they can save you a lot of work.

```
script/cd_create.pl -help
```

UKUUG
15th April 2010

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/View"
   exists
  "/home/dave/training/cdlib/CD/script/../t"
  created
  "/home/dave/training/cdlib/CD/script/../lib/CD/View/Default.pm"
  created
  "/home/dave/training/cdlib/CD/script/../t/view_Default.t"
  ```

Remove Default Message

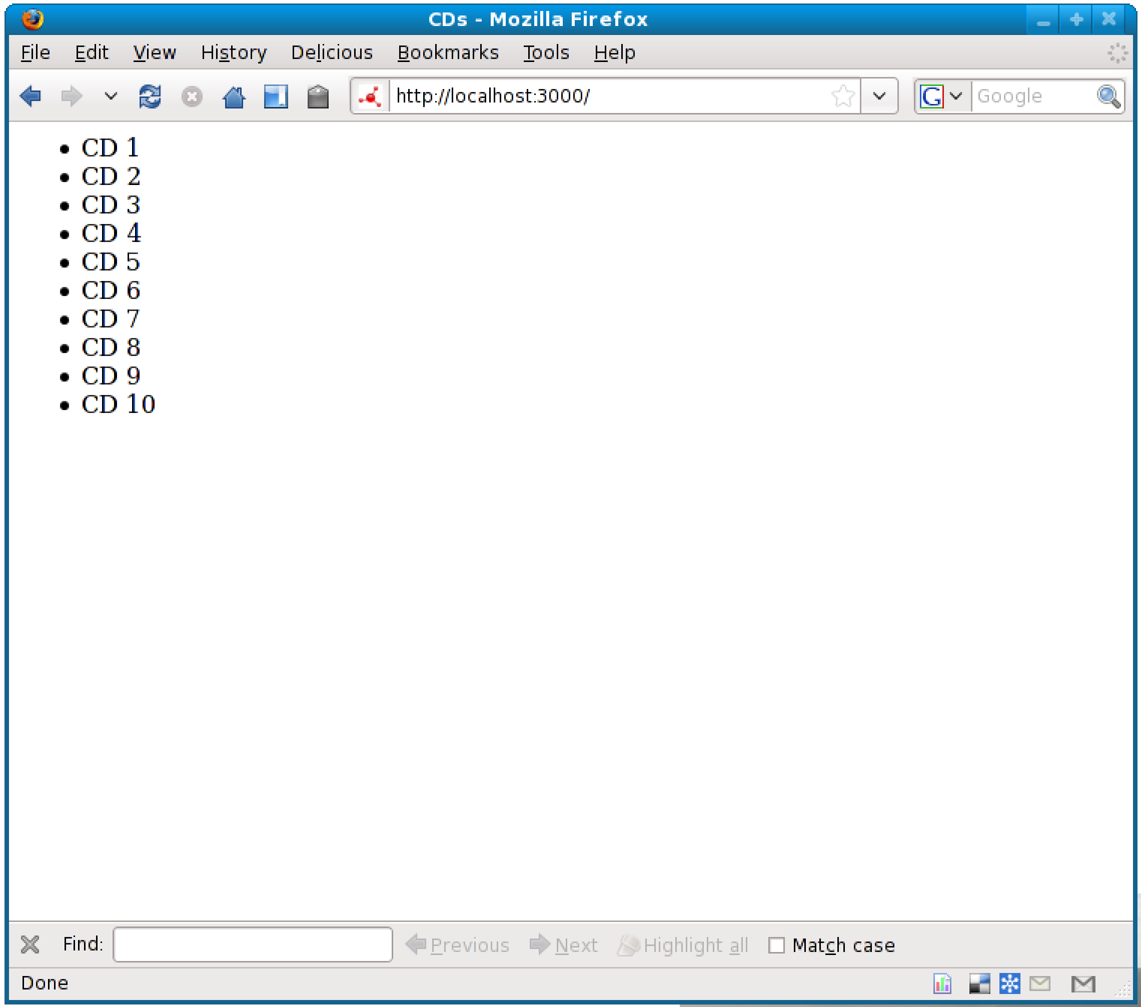
- In lib/CD/Controller/Root.pm

-
  ```
  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



- CD 1
- CD 2
- CD 3
- CD 4
- CD 5
- CD 6
- CD 7
- CD 8
- CD 9
- CD 10

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

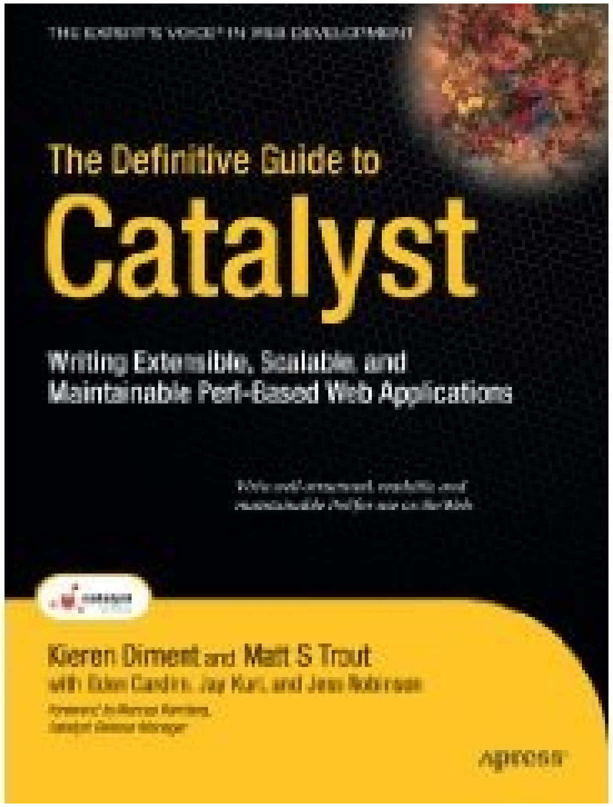
- Does a lot of work
- On the fly
- For every request
- No security on table updates
- So it's not right for every project
- Very impressive though

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


THE EXPERT'S VOICE® IN WEB DEVELOPMENT
The Definitive Guide to
Catalyst
Writing Extensible, Scalable, and Maintainable Perl-Based Web Applications
Kieren Diment and Matt S Trout
Apress®

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
- 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 21 – 23 June 2010
  - Pisa, Italy 2010 4 – 6 August 2010
  - Brazil, Asia, Israel, Australia
- One-Day Perl Workshops
- See http://yapc.org/

That's all folks

- Any questions?