Introduction to Moose

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Objectives

- What is Moose?
- Why should I use Moose?
- How can I use Moose?

Disclaimers

Old-style Perl OOP

```
package Circle;
use Math::Trig;

sub new {
  my $class = shift;
  my $self = { _radius => shift };
  bless $self, $class;
  return $self;
}

sub radius {
  my $self = shift;
  my $radius = shift;
  $self->{ _radius } = $radius if defined( $radius );
  return $self->{ _radius };
}

sub circumference {
  my $self = shift;
  return 2 * pi * $self->radius;
}

sub area {
  my $self = shift;
  return pi * $self->radius * $self->radius;
}
```

Testing our code

```
package main;

# Make circle
my $circle = Circle->new( 3 );

# Prints: 3 18.8495559215388 28.2743338823081
print $circle->radius . ' ' . $circle->circumference . ' ' . $circle->area . "\n";

# Change radius
$circle->radius( 4 );

# Prints: 4 25.1327412287183 50.2654824574367
print $circle->radius . ' ' . $circle->circumference . ' ' . $circle->area . "\n";
```

What is good about this code?
What would we like to improve?

What’s right with old-style OOP?

- Semantic
- Compact and encapsulated
- Idiomatic
- Flexibility

What would we like to improve?

- Remove implementation to focus on semantics
  - Semantics buried in implementation
  - Hash container visible in constructor and radius subroutine
  - Constructor parameters are ordered, not named
- Use type checking
- Reduce code (a circle is a very simple concept)

OOP with Moose

```
package Circle;
use Math::Trig;
use Moose;

has 'radius' => (
  is  => 'rw',
  isa => 'Num',
);

sub circumference {
  my $self = shift;
  return 2 * pi * $self->radius;
}

sub area {
  my $self = shift;
  return pi * $self->radius * $self->radius;
}
```

Testing our code

```
package main;

# Make circle
my $circle = Circle->new( radius => 3 );

# Prints: 3 18.8495559215388 28.2743338823081
print $circle->radius . ' ' . $circle->circumference . ' ' . $circle->area . "\n";

# Change radius
$circle->radius( 4 );

# Prints: 4 25.1327412287183 50.2654824574367
print $circle->radius . ' ' . $circle->circumference . ' ' . $circle->area . "\n";
```

What improvements did we make?

- **Remove implementation to focus on semantics**:
  - code describes circle, not how OOP is accomplished
  - Self documenting!
- **Use type checking:** `$circle->radius( 'two' );`

```
Attribute (radius) does not pass the type constraint because:
Validation failed for 'Num' with value two at ./circle2.plx
line 32
```

- **Reduce code**: 28 lines -> 18 lines

Introducing Moose

Moose is a complete object system for Perl 5... [W]ith Moose, you define your class declaratively, without needing to know about blessed hashrefs, accessor methods, and so on.

Source: [http://search.cpan.org/perldoc?Moose::Manual#WHAT_IS_MOOSE?]

Why object-oriented?

- Encourages orthogonality
- Easy to locate logic
- Focus on semantics, not implementation
- Object-oriented patterns
- Easy to unit test

Why Moose?

- Object-oriented syntax
- Compact
- Type constraints
- Hooks
- Lots of goodies
- Easy to use

Moose Fundamentals

1. Class
2. Attribute
3. Method
4. Role
5. Method modifiers
6. Type
7. Delegation

Class

```
package Circle;
use Moose; # Now we have a class

...

package main;
# Use the class
```

Attribute

```
package Circle;
use Moose;

has 'radius' => (
   is  => 'rw',
   isa => 'Num',
);
```

Method

- Same as old-style OOP
  - But without getter/setter

```
package Circle;
use Moose;
...

sub circumference {
  my $self = shift;
  return 2 * pi * $self->radius;
}
```

Role

- Adds functionality to class (like mixin)
- Used to include or require attributes or subroutines
- Can be used as type (i.e., interface)

```
package Displayable;
use Moose::Role;

requires 'html';

# - - - - - - - - - - - - - - - - - -
# Anything that accepts Displayable
# will also accept an Item.
# - - - - - - - - - - - - - - - - - -
package Item;
use Moose;

has 'html' => (
  is => 'rw',
  isa => 'Str',
);

with 'Displayable';
```

Role (cont')

```
package Breakable;

use Moose::Role;

has 'is_broken' => (
      is  => 'rw',
      isa => 'Bool',
);

sub break {
  my $self = shift;

  print "I broke\n";

  $self->is_broken(1);
}
```

```
package Car;
use Moose;

with 'Breakable';

has 'engine' => (
  is  => 'ro',
  isa => 'Engine',
);

# - - - - - - - - -
package main;

my $car = Car->new( engine =>
Engine->new );

$car->break;

print $car->is_broken ? 'Busted' :
'Still working';
```

Source: http://search.cpan.org/perldoc?Moose::Manual::Roles#A_SIMPLE_ROLE

Method Modifiers

- Hooks
- Useful for logging, backups, tracers, processing

```
package StrongParagraph;
use Moose;

has 'value' => ( is => 'rw' );

sub to_html {
  my $self = shift;
  print $self->value;
}

before 'to_html' => sub { print
'<p>' };

after 'to_html'  => sub { print '</p>'
. "\n" };

around 'to_html' => sub {
  my $orig = shift;
  my $self = shift;

  print '<strong>';
  $self->$orig;
  print '</strong>';
};
```

```
package main;

my $p = StrongParagraph->new( value
=> 'Hello, World!' );

# Prints "<p><strong>Hello, World!
</strong></p>"
$p->to_html;
```

Type

- Str, Num, Int, *ClassName*, *RoleName*, Ref, ScalarRef, ArrayRef, HashRef, CodeRef, RegexpRef, GlobRef, FileHandle, Object
- Define subtypes

```
subtype 'PositiveInt'
  => as 'Int'
  => where { $_ > 0 }
  => message { "The number you provided, $_, was not a
positive number" }
```

Source: http://search.cpan.org/perldoc?Moose::Manual::Types

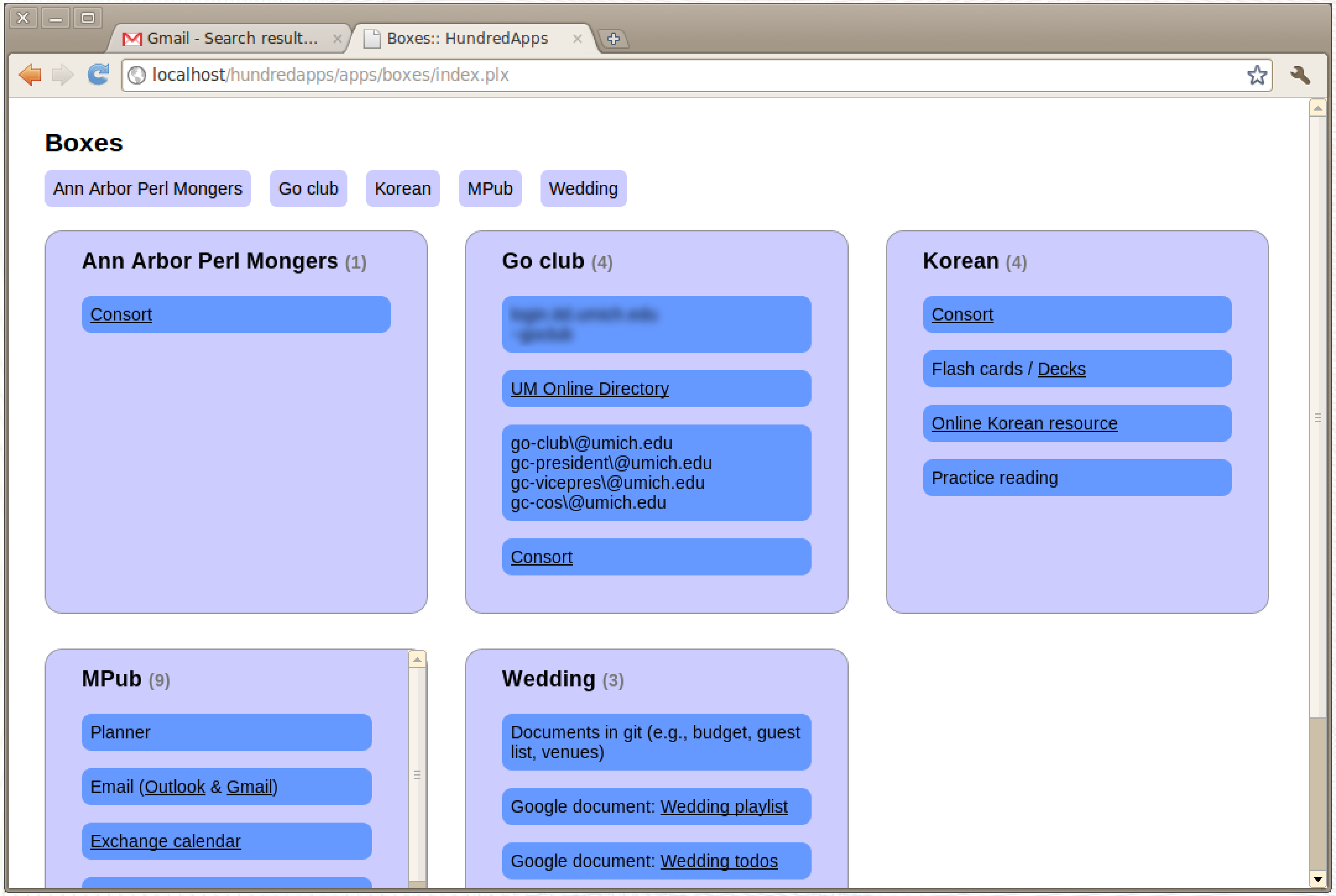
Type (cont')

```
package Organization;
use Moose;

has 'name' => (
  is => 'rw',
  isa => 'Str',
);

has 'members' => (
  is  => 'rw',
  isa => 'ArrayRef',
  default => sub { [] }, // Default value is empty array ref
);

# - - - - - - - - -
package main;

my $a2pm = Organization->new( name => 'Ann Arbor Perl Mongers' );

push @{ $a2pm->members }, Member->new( name => 'Bryan Smith' );
```

Delegation

- Proxy methods
- More info: http://search.cpan.org/perldoc?Moose::Manual::Delegation

Example: Boxes



Boxes

Ann Arbor Perl Mongers | Go club | Korean | MPub | Wedding

Ann Arbor Perl Mongers (1)

- Consort

Go club (4)

- [redacted]
- UM Online Directory
- go-club\@umich.edu
  gc-president\@umich.edu
  gc-vicepres\@umich.edu
  gc-cos\@umich.edu
- Consort

Korean (4)

- Consort
- Flash cards / Decks
- Online Korean resource
- Practice reading

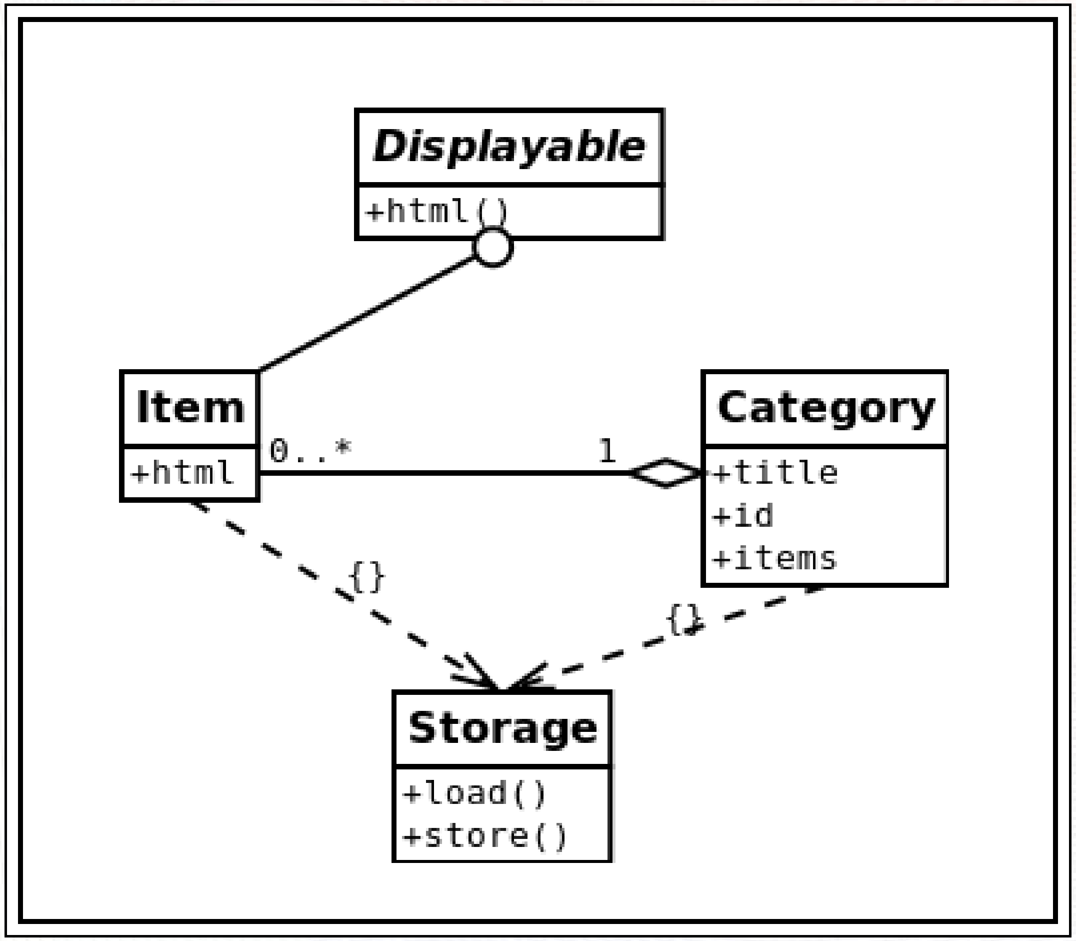
MPub (9)

- Planner
- Email (Outlook & Gmail)
- Exchange calendar

Wedding (3)

- Documents in git (e.g., budget, guest list, venues)
- Google document: Wedding playlist
- Google document: Wedding todos

Boxes UML


Displayable
+html()
Item
+html
0..*
1
Category
+title
+id
+items
{}
{}
Storage
+load()
+store()

Displayable (role)

```
package Displayable;
use Moose::Role;

requires 'html';

no Moose;

1;
```

Item (class)

```
package Item;
use Moose;
use MooseX::Storage;

with Storage('format' => 'YAML', 'io' => 'File');

require 'lib/displayable.pl';

has 'html' => (
  is => 'rw',
  isa => 'Str',
);

with 'Displayable';

no Moose;
__PACKAGE__->meta->make_immutable;
```

Category (class)

```
package Category;

use Moose;
use MooseX::Storage;

with Storage('format' => 'YAML', 'io' => 'File');

require 'lib/displayable.pl';

has 'title' => (
  is => 'rw',
  isa => 'Str',
);

has 'id' => (
  is => 'rw',
  isa => 'Str',
);

has 'items' => (
  is  => 'rw',
  isa => 'ArrayRef',
  default => sub { [] },
);

no Moose;
__PACKAGE__->meta->make_immutable;
```

Loading and storing boxes

```perl
sub saveCategories {
  my @categories = getCategories();

  for $category ( @categories ) {
    my $filename = 'db/' . $category->id . '.yaml';

    $category->store( $filename );
  }
}

sub getCategories {
  my @categories = ();

  for my $filename ( glob( 'db/*.yaml' ) ) {

    my $category = Category->load($filename);

    push( @categories, $category );
  }

  return @categories;
}
```

Using boxes

```
sub printSectionLinks {

  my @categories = getCategories();

  for my $category ( @categories ) {

    my $anchor = wrap( $category->title, 'a', [[ 'href', '#' . $category-
>id ]]);

    println( wrap( $anchor, 'li' ) );
  }
}

sub printSections {

  my @categories = getCategories();

  for my $nextCat ( @categories ) {
    printBox( $nextCat );
  }
}
```

Using boxes (cont')

```
sub printBox {
  my $category = shift;

  my $items = $category->items;
  my $itemCount = '(' . scalar( @{ $items } ) . ')';
  my $title = $category->title . ' ' . wrap( $itemCount, 'span' );

  my $header = wrap( $title, 'a', [[ 'name', $category->id ]]);
  $header = wrap( wrap( $header, 'h2' ), 'header' );

  my $section;
  my $items = $category->items;

  for my $item ( @$items ) {
    $section .= wrap( $item->html, 'div', [[ 'class', 'item' ]] );
  }

  println wrap( $header . $section, 'section' );
}
```

Overkill?

- Easy to maintain
- Composite pattern available

Conclusion

- **What is Moose?**: Object-oriented system for Perl
- **Why should I use Moose?**: Object-oriented for easier maintenance, Moose for easier object-oriented programming in Perl
- **How can I use Moose?**: http://search.cpan.org/perldoc?Moose::Manual

Notes

- Any original content released under CC0 (no rights reserved)

  [http://creativecommons.org/choose/zero/]
- “Yellow Red Blending” OpenOffice.org theme

  [http://templates.services.openoffice.org/en/node/184]