Chado::AutoDBI

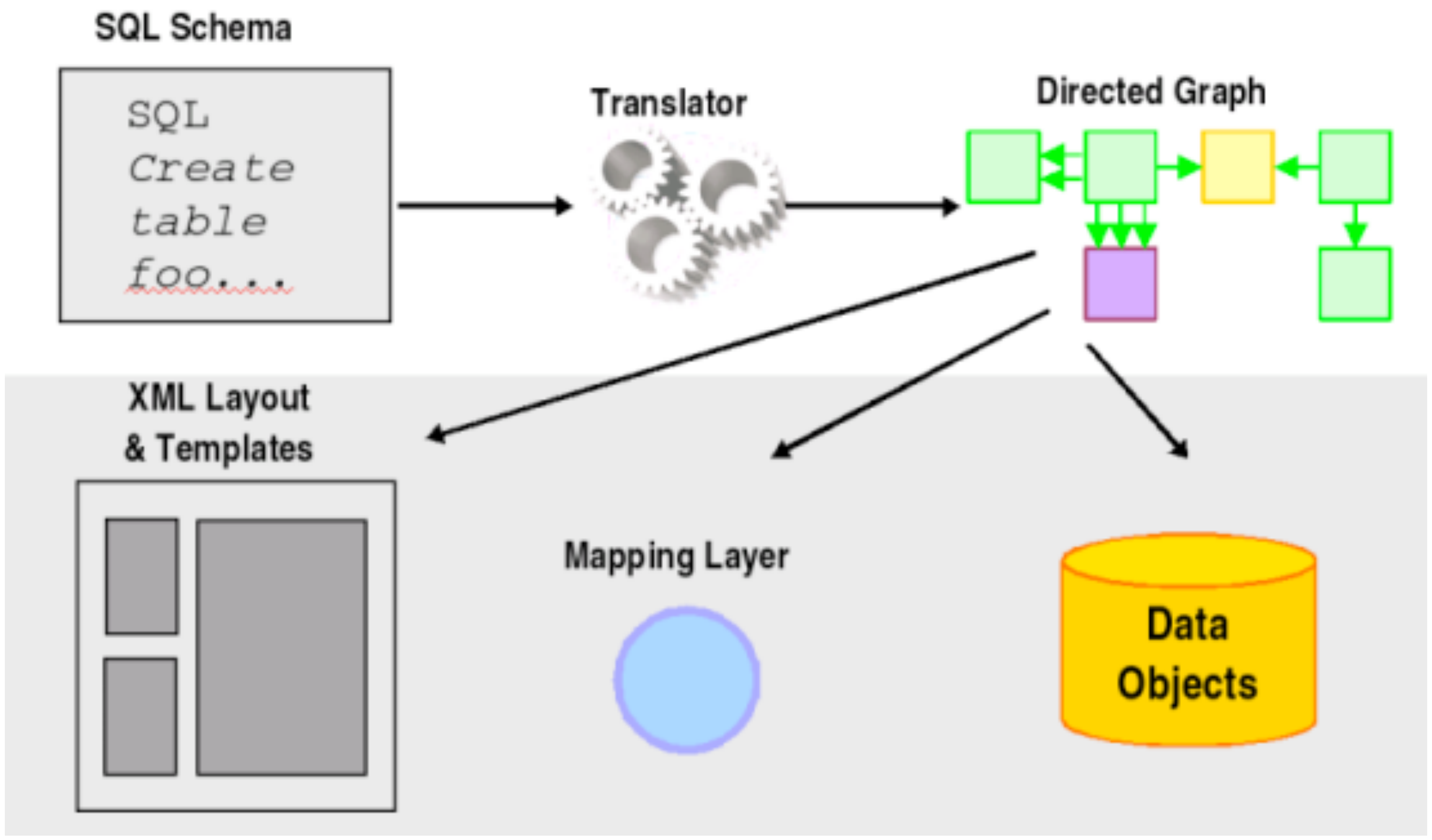
Middleware Demo
GMOD Meeting
Brian O'Connor
1/19/2007

Project Overview

- Who wrote/supports it?
  - Chado::AutoDBI: Allen Day, Scott Cain, Brian O'Connor, & others
  - Turnkey: Allen Day, Scott Cain, Brian O'Connor
- Third party code used?
  - Based on Class::DBI: Michael Schwern & Tony Bowden

Technical Overview

- Code Generation

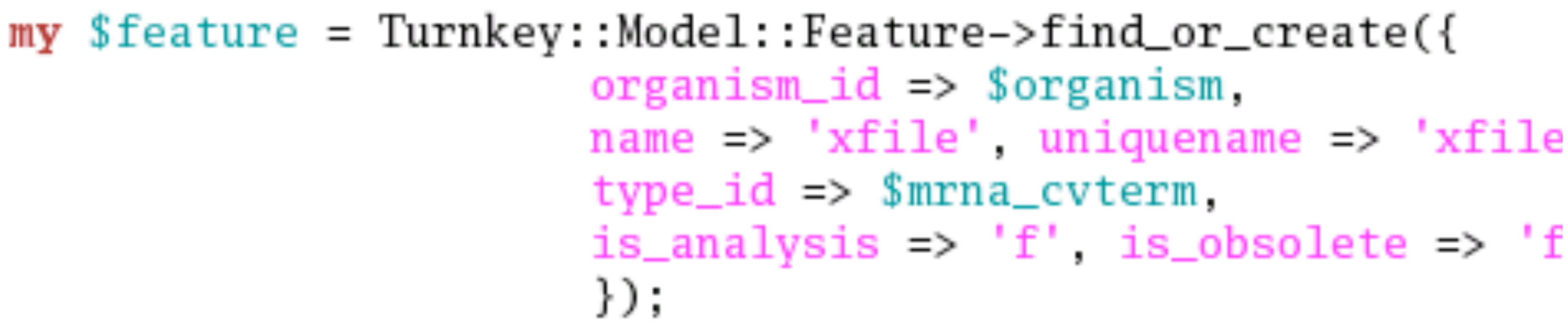


Project Overview

- Background
  - SQL Queries/Inserts/Deletes -> Object Calls

    INSERT INTO feature (organism_id, name)
                            VALUES (1, 'foo');

    to



```
my $feature = Turnkey::Model::Feature->find_or_create({
                              organism_id => $organism,
                              name => 'xfile', uniquename => 'xfile
                              type_id => $mrna_cvterm,
                              is_analysis => 'f', is_obsolete => 'f
                              });
```

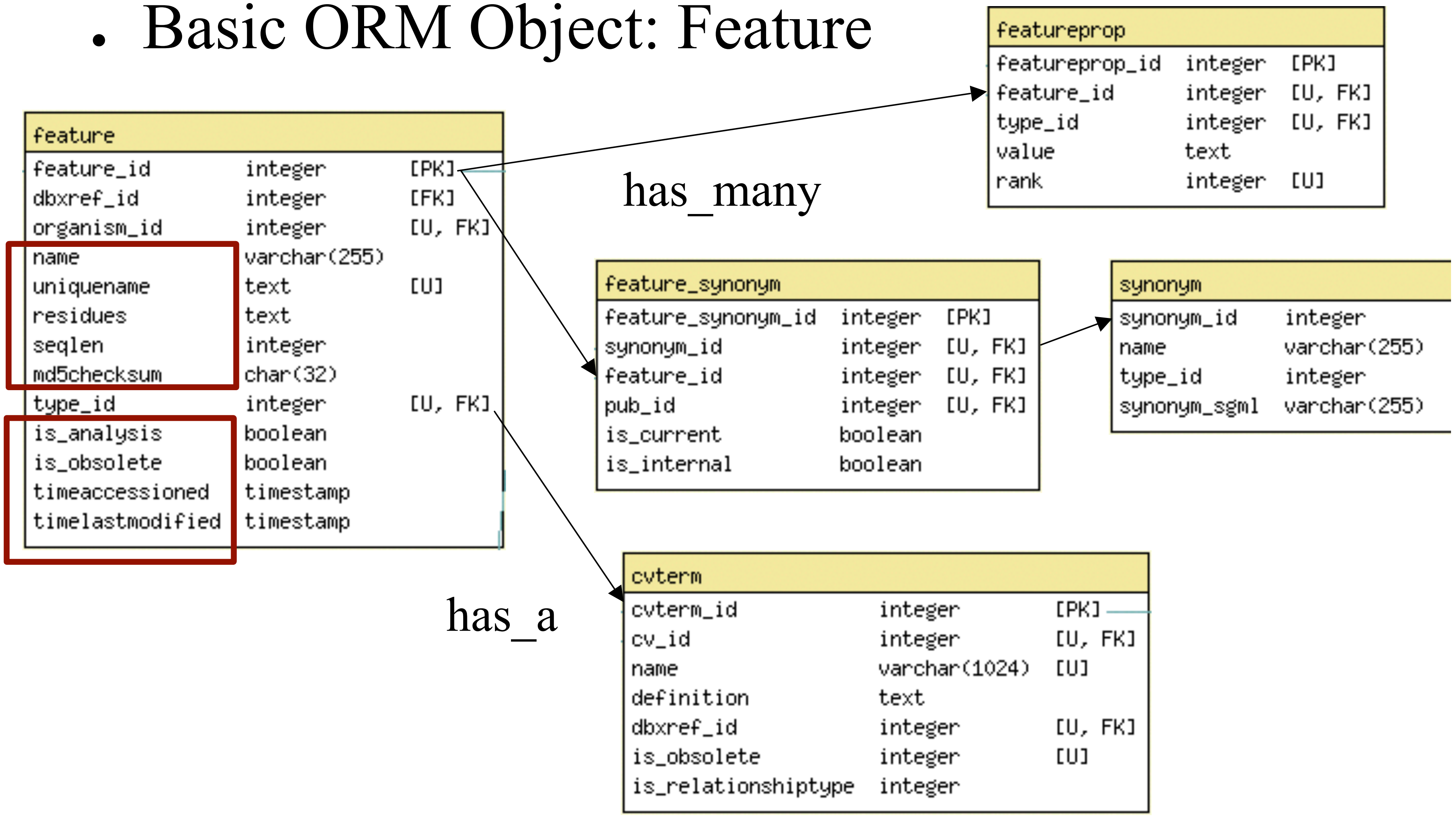
Technical Overview

- Database Connection: use a base class

```perl
use base qw(Class::DBI::Pg);

my ($dsn, $username, $password);
$dsn = "dbi:Pg:host=localhost;dbname=chado;port=5432";
$username = "postgres";
$password = "";

Turnkey::Model::DBI->set_db('Main', $dsn, $username, $password, {AutoCommit=>
```

Technical Overview

- Basic ORM Object: Feature



feature		
feature_id	integer	[PK]
dbxref_id	integer	[FK]
organism_id	integer	[U, FK]
name	varchar(255)	
uniquename	text	[U]
residues	text	
seqlen	integer	
md5checksum	char(32)	
type_id	integer	[U, FK]
is_analysis	boolean	
is_obsolete	boolean	
timeaccessioned	timestamp	
timelastmodified	timestamp	

featureprop		
featureprop_id	integer	[PK]
feature_id	integer	[U, FK]
type_id	integer	[U, FK]
value	text	
rank	integer	[U]

feature_synonym		
feature_synonym_id	integer	[PK]
synonym_id	integer	[U, FK]
feature_id	integer	[U, FK]
pub_id	integer	[U, FK]
is_current	boolean	
is_internal	boolean	

synonym	
synonym_id	integer
name	varchar(255)
type_id	integer
synonym_sgml	varchar(255)

cvterm		
cvterm_id	integer	[PK]
cv_id	integer	[U, FK]
name	varchar(1024)	[U]
definition	text	
dbxref_id	integer	[U, FK]
is_obsolete	integer	[U]
is_relationshiptype	integer	

Technical Overview

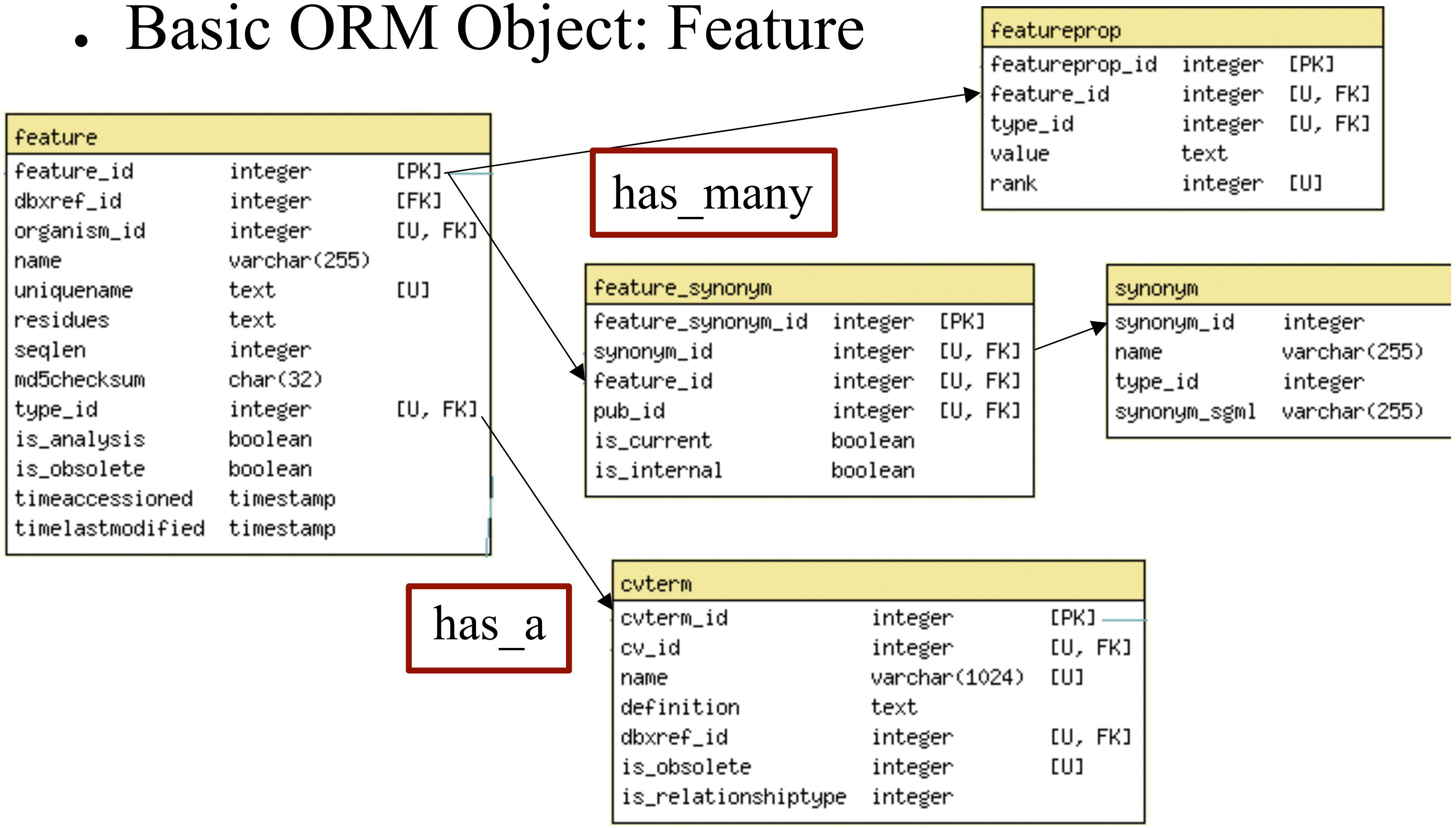
- Basic ORM Object: Feature

```
package Turnkey::Model::Feature;
use base 'Turnkey::Model::DBI';

Turnkey::Model::Feature->set_up_table('feature');

#
# Primary key accessors
#

sub id { shift->feature_id }
sub feature { shift->feature_id }
```

- data field accessors by Class::Accessor

Technical Overview

- Basic ORM Object: Feature



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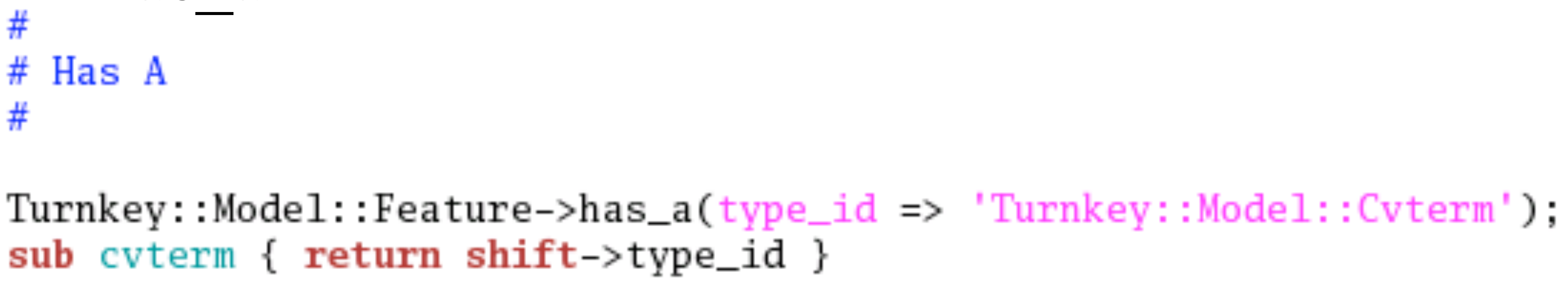
dbxref_id	integer	[U, FK]
is_obsolete	integer	[U]
is_relationshiptype	integer	

Technical Overview

- Basic ORM Object: Feature

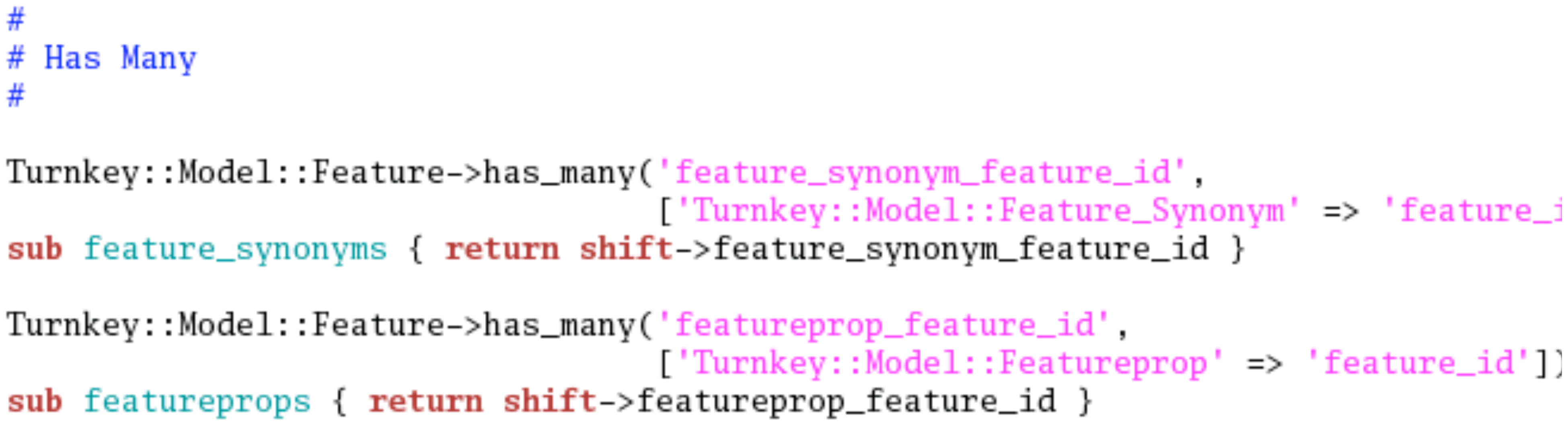
  has_a



```
#
# Has A
#

Turnkey::Model::Feature->has_a(type_id => 'Turnkey::Model::Cvterm');
sub cvterm { return shift->type_id }
```

  has_many



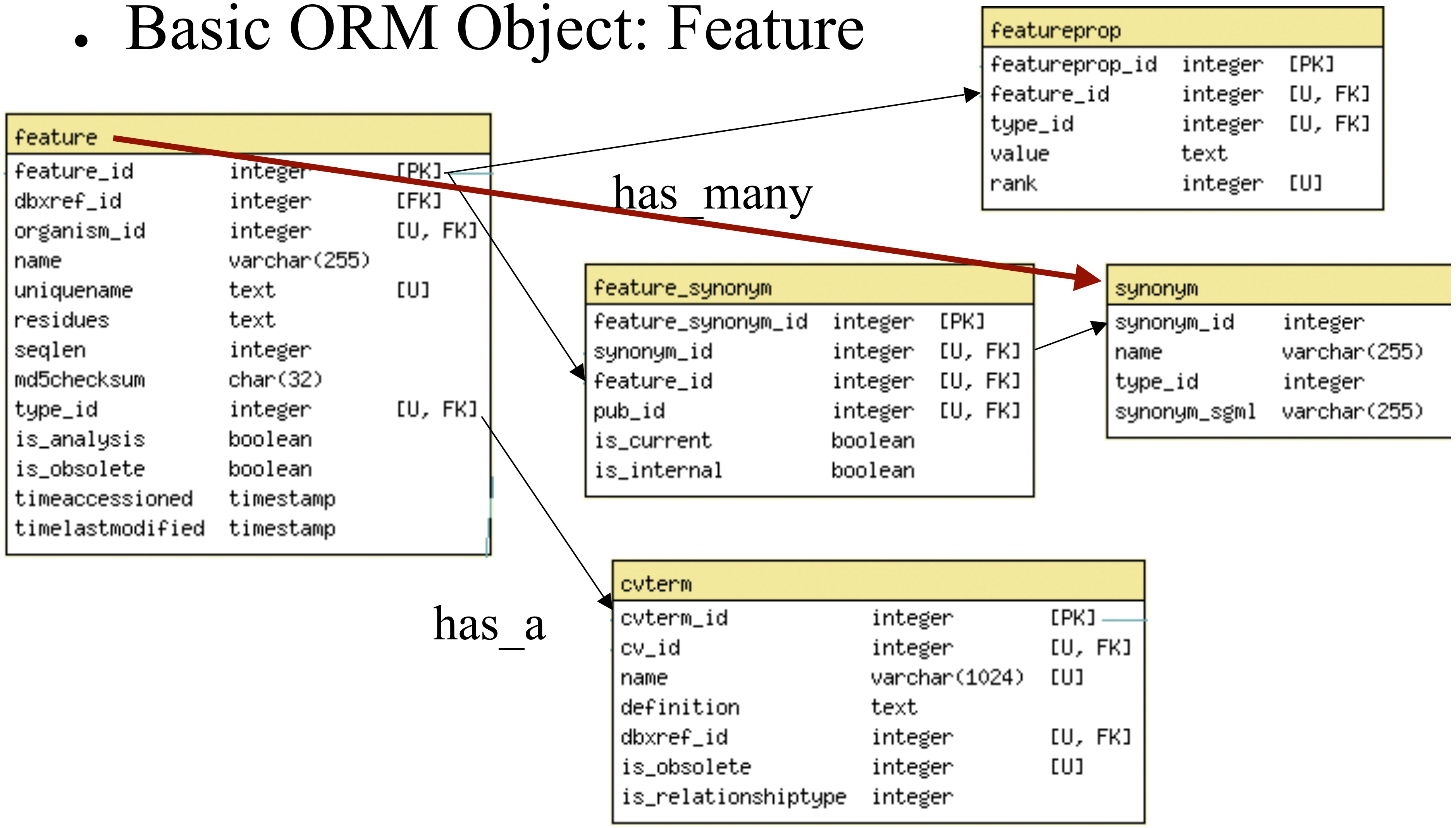
```
#
# Has Many
#

Turnkey::Model::Feature->has_many('feature_synonym_feature_id',
                                  ['Turnkey::Model::Feature_Synonym' => 'feature_i
sub feature_synonyms { return shift->feature_synonym_feature_id }

Turnkey::Model::Feature->has_many('featureprop_feature_id',
                                  ['Turnkey::Model::Featureprop' => 'feature_id']]
sub featureprops { return shift->featureprop_feature_id }
```

Technical Overview

- Basic ORM Object: Feature



feature

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md5checksum	char(32)	
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is_analysis	boolean	
is_obsolete	boolean	
timeaccessioned	timestamp	
timelastmodified	timestamp	

featureprop

featureprop_id	integer	[PK]
feature_id	integer	[U, FK]
type_id	integer	[U, FK]
value	text	
rank	integer	[U]

feature_synonym

feature_synonym_id	integer	[PK]
synonym_id	integer	[U, FK]
feature_id	integer	[U, FK]
pub_id	integer	[U, FK]
is_current	boolean	
is_internal	boolean	

synonym

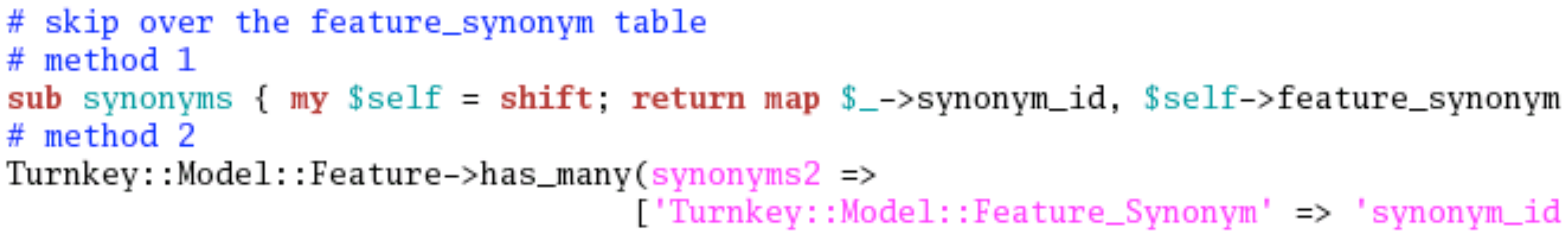
synonym_id	integer
name	varchar(255)
type_id	integer
synonym_sgml	varchar(255)

cvterm

cvterm_id	integer	[PK]
cv_id	integer	[U, FK]
name	varchar(1024)	[U]
definition	text	
dbxref_id	integer	[U, FK]
is_obsolete	integer	[U]
is_relationshiptype	integer	

Technical Overview

- Basic ORM Object: Feature
  skipping linker tables for has_many



```
# skip over the feature_synonym table
# method 1
sub synonyms { my $self = shift; return map $_->synonym_id, $self->feature_synonym
# method 2
Turnkey::Model::Feature->has_many(synonyms2 =>
                                  ['Turnkey::Model::Feature_Synonym' => 'synonym_id
```

Technical Overview

- Transactions

```
sub do_transaction {
  my $class = shift;
  my ( $code ) = @_;
  # Turn off AutoCommit for this scope.
  # A commit will occur at the exit of this block automatically,
  # when the local AutoCommit goes out of scope.
  local $class->db_Main->{ AutoCommit };

  # Execute the required code inside the transaction.
  eval { $code->() };
  if ( $@ ) {
    my $commit_error = $@;
    eval { $class->dbi_rollback }; # might also die!
    die $commit_error;
  }
}
```

```
# wrap in transaction
Turnkey::Model::DBI->do_transaction( sub {
   my $feature = create_new_feature();
});
```

Technical Overview

- Lazy Loading

```
Turnkey::Model::Feature->columns(Primary   => qw/feature_id/);
Turnkey::Model::Feature->columns(Essential => qw/name organism_id type_
Turnkey::Model::Feature->columns(Others    => qw/residues .../);
```

typically

```
Turnkey::Model::Feature->set_up_table('feature');
```

Demo

- Show solution for sample problems
  - Create
  - Retrieve
  - Update
  - Delete

Demo

- Create Feature & Add Description

```
# now create mRNA feature

 my $feature = Turnkey::Model::Feature->find_or_create({
                    organism_id => $organism,
                    name => 'xfile', uniquename => 'xfile',
                    type_id => $mrna_cvterm,
                    is_analysis => 'f', is_obsolete => 'f'
                    });

# create description

my $featureprop = Turnkey::Model::Featureprop->find_or_create({
                        value => 'A test gene for GMOD meeting',
                        feature_id => $feature,
                        type_id => $note_cvterm,
                        });
```

Demo

- Retrieve a Feature via Searching

```
# objects for global use

# the organism for our new feature
my $organism = Turnkey::Model::Organism->search(abbreviation => "S.cerevisiae")->

# the cvterm for a "Note"
my $note_cvterm = Turnkey::Model::Cvterm->retrieve(2);


# searching name by wildcard

my @results = Turnkey::Model::Feature->search_like(name => 'x-%');
```

Demo

- Update a Feature

```
# update the xfile gene name

$feature->name("x-file");
$feature->update();
```

- Delete a Feature

```
# now delete the x-file feature

$feature->delete();
```

Special Topics

- Things Chado::AutoDBI does well:
  - easy to use
  - easy to port
    - other DBs
    - other platforms
  - autogenerated via Turnkey
  - find_or_create

Limitations

- performance
- joins & complex queries

```
# Add the add_constructor for looking for name lengths

__PACKAGE__->add_constructor(long_names => qq{ length(name) > 15
```

```
# Custom SQL

__PACKAGE__->set_sql(xfiles => qq {
        SELECT feature_id
        FROM feature
        where name = 'xfiles'});
```

For More Information

- Class::DBI
  http://www.class-dbi.com
  http://search.cpan.org
- Turnkey
  http://turnkey.sf.net
- Biopackages
  http://biopackages.net