

NAME

Switch - A switch statement for Perl

SYNOPSIS

```
use Switch;

switch ($val) {
  case 1 { print "number 1" }
  case "a" { print "string a" }
  case [1..10,42] { print "number in list" }
  case (@array) { print "number in list" }
  case /\w+/ { print "pattern" }
  case qr/\w+/ { print "pattern" }
  case (%hash) { print "entry in hash" }
  case (&sub) { print "arg to subroutine" }
  else { print "previous case not true" }
}
```

BACKGROUND

[Skip ahead to *DESCRIPTION* if you don't care about the whys and wherefores of this control structure]

In seeking to devise a "Swiss Army" case mechanism suitable for Perl, it is useful to generalize this notion of distributed conditional testing as far as possible. Specifically, the concept of "matching" between the switch value and the various case values need not be restricted to numeric (or string or referential) equality, as it is in other languages. Indeed, as Table 1 illustrates, Perl offers at least eighteen different ways in which two values could generate a match.

Table 1: Matching a switch value (\$s) with a case value (\$c)

Switch Value	Case Value	Type of Match Implied	Matching Code
=====	=====	=====	=====
number or ref	same	numeric or referential equality	match if \$s == \$c;
object ref or ref	method name	result of method call match if defined	match if \$s->\$c(); \$s->\$c();
other non-ref scalar	other non-ref scalar	string equality	match if \$s eq \$c;
string	regexp	pattern match	match if \$s =~ /\$c/;
array ref	scalar	array entry existence array entry definition array entry truth	match if 0<=\$c && \$c<@\$s; match if defined \$s->[\$c]; match if \$s->[\$c];
@\$s	array	array intersection	match if intersects(@\$s, @\$c);

	ref	ref	(apply this table to all pairs of elements \$s->[\$i] and \$c->[\$j])	
	array ref	regex	array grep	match if grep /\$c/, @\$s;
	hash ref	scalar	hash entry existence hash entry definition hash entry truth	match if exists \$s->{\$c}; match if defined \$s->{\$c}; match if \$s->{\$c};
%\$s;	hash ref	regex	hash grep	match if grep /\$c/, keys
	sub ref	scalar	return value defn return value truth	match if defined \$s->{\$c}; match if \$s->{\$c};
	sub ref	array ref	return value defn return value truth	match if defined \$s->{@\$c}; match if \$s->{@\$c};

In reality, Table 1 covers 31 alternatives, because only the equality and intersection tests are commutative; in all other cases, the roles of the `$s` and `$c` variables could be reversed to produce a different test. For example, instead of testing a single hash for the existence of a series of keys (match if exists `$s->{$c}`), one could test for the existence of a single key in a series of hashes (match if exists `$c->{$s}`).

DESCRIPTION

The `Switch.pm` module implements a generalized case mechanism that covers most (but not all) of the numerous possible combinations of switch and case values described above.

The module augments the standard Perl syntax with two new control statements: `switch` and `case`. The `switch` statement takes a single scalar argument of any type, specified in parentheses. `switch` stores this value as the current switch value in a (localized) control variable. The value is followed by a block which may contain one or more Perl statements (including the `case` statement described below). The block is unconditionally executed once the switch value has been cached.

A `case` statement takes a single scalar argument (in mandatory parentheses if it's a variable; otherwise the parens are optional) and selects the appropriate type of matching between that argument and the current switch value. The type of matching used is determined by the respective types of the switch value and the `case` argument, as specified in Table 1. If the match is successful, the mandatory block associated with the `case` statement is executed.

In most other respects, the `case` statement is semantically identical to an `if` statement. For example, it can be followed by an `else` clause, and can be used as a postfix statement qualifier.

However, when a `case` block has been executed control is automatically transferred to the statement after the immediately enclosing `switch` block, rather than to the next statement within the block. In other words, the success of any `case` statement prevents other cases in the same scope from executing. But see *Allowing fall-through* below.

Together these two new statements provide a fully generalized case mechanism:

```
use Switch;
```

```
# AND LATER...

%special = ( woohoo => 1, d'oh => 1 );

while (<>) {
chomp;
  switch ($_) {
    case (%special) { print "homer\n"; }      # if $special{$_}
    case /[a-z]/i   { print "alpha\n"; }     # if $_ =~ /a-z/i
    case [1..9]     { print "small num\n"; } # if $_ in [1..9]
    case { $_[0] >= 10 } { print "big num\n"; } # if $_ >= 10
    print "must be punctuation\n" case /\W/; # if $_ =~ /\W/
  }
}
```

Note that `switches` can be nested within `case` (or any other) blocks, and a series of `case` statements can try different types of matches -- hash membership, pattern match, array intersection, simple equality, etc. -- against the same switch value.

The use of intersection tests against an array reference is particularly useful for aggregating integral cases:

```
sub classify_digit
{
    switch ($_[0]) { case 0           { return 'zero' }
                   case [2,4,6,8]  { return 'even' }
                   case [1,3,5,7,9] { return 'odd' }
                   case /[A-F]/i   { return 'hex' }
                   }
}
```

Allowing fall-through

Fall-through (trying another case after one has already succeeded) is usually a Bad Idea in a switch statement. However, this is Perl, not a police state, so there *is* a way to do it, if you must.

If a `case` block executes an untargeted `next`, control is immediately transferred to the statement *after* the `case` statement (i.e. usually another case), rather than out of the surrounding `switch` block.

For example:

```
switch ($val) {
  case 1      { handle_num_1(); next } # and try next
case...
  case "1"   { handle_str_1(); next } # and try next
case...
  case [0..9] { handle_num_any(); }   # and we're done
  case /\d/   { handle_dig_any(); next } # and try next
case...
  case /.*/   { handle_str_any(); next } # and try next
case...
}
```

If `$val` held the number 1, the above `switch` block would call the first three `handle_...` subroutines, jumping to the next case test each time it encountered a `next`. After the third `case` block was executed, control would jump to the end of the enclosing `switch` block.

On the other hand, if `$val` held 10, then only the last two `handle_...` subroutines would be called.

Note that this mechanism allows the notion of *conditional fall-through*. For example:

```
switch ($val) {
    case [0..9] { handle_num_any(); next if $val < 7; }
    case /\d/   { handle_dig_any(); }
}
```

If an untargeted `last` statement is executed in a case block, this immediately transfers control out of the enclosing `switch` block (in other words, there is an implicit `last` at the end of each normal case block). Thus the previous example could also have been written:

```
switch ($val) {
    case [0..9] { handle_num_any(); last if $val >= 7; next; }
    case /\d/   { handle_dig_any(); }
}
```

Automating fall-through

In situations where case fall-through should be the norm, rather than an exception, an endless succession of terminal `nexts` is tedious and ugly. Hence, it is possible to reverse the default behaviour by specifying the string "fallthrough" when importing the module. For example, the following code is equivalent to the first example in *Allowing fall-through*:

```
use Switch 'fallthrough';

switch ($val) {
    case 1      { handle_num_1(); }
    case "1"   { handle_str_1(); }
    case [0..9] { handle_num_any(); last }
    case /\d/   { handle_dig_any(); }
    case /.*/   { handle_str_any(); }
}
```

Note the explicit use of a `last` to preserve the non-fall-through behaviour of the third case.

Alternative syntax

Perl 6 will provide a built-in switch statement with essentially the same semantics as those offered by `Switch.pm`, but with a different pair of keywords. In Perl 6 `switch` will be spelled `given`, and `case` will be pronounced `when`. In addition, the `when` statement will not require `switch` or `case` values to be parenthesized.

This future syntax is also (largely) available via the `Switch.pm` module, by importing it with the argument "Perl6". For example:

```
use Switch 'Perl6';

given ($val) {
    when 1      { handle_num_1(); }
    when ($str1) { handle_str_1(); }
    when [0..9] { handle_num_any(); last }
    when /\d/   { handle_dig_any(); }
    when /.*/   { handle_str_any(); }
    default     { handle anything else; }
}
```

Note that scalars still need to be parenthesized, since they would be ambiguous in Perl 5.

Note too that you can mix and match both syntaxes by importing the module with:

```
use Switch 'Perl5', 'Perl6';
```

Higher-order Operations

One situation in which `switch` and `case` do not provide a good substitute for a cascaded `if`, is where a switch value needs to be tested against a series of conditions. For example:

```
sub beverage {
    switch (shift) {
        case { $_[0] < 10 } { return 'milk' }
        case { $_[0] < 20 } { return 'coke' }
        case { $_[0] < 30 } { return 'beer' }
        case { $_[0] < 40 } { return 'wine' }
        case { $_[0] < 50 } { return 'malt' }
        case { $_[0] < 60 } { return 'Moet' }
        else                 { return 'milk' }
    }
}
```

(This is equivalent to writing `case (sub { $_[0] < 10 })`, etc.; `$_[0]` is the argument to the anonymous subroutine.)

The need to specify each condition as a subroutine block is tiresome. To overcome this, when importing `Switch.pm`, a special "placeholder" subroutine named `__` [sic] may also be imported. This subroutine converts (almost) any expression in which it appears to a reference to a higher-order function. That is, the expression:

```
use Switch '__';

__ < 2
```

is equivalent to:

```
sub { $_[0] < 2 }
```

With `__`, the previous ugly case statements can be rewritten:

```
case __ < 10 { return 'milk' }
case __ < 20 { return 'coke' }
case __ < 30 { return 'beer' }
case __ < 40 { return 'wine' }
case __ < 50 { return 'malt' }
case __ < 60 { return 'Moet' }
else       { return 'milk' }
```

The `__` subroutine makes extensive use of operator overloading to perform its magic. All operations involving `__` are overloaded to produce an anonymous subroutine that implements a lazy version of the original operation.

The only problem is that operator overloading does not allow the boolean operators `&&` and `||` to be overloaded. So a case statement like this:

```
case 0 <= __ && __ < 10 { return 'digit' }
```

doesn't act as expected, because when it is executed, it constructs two higher order subroutines and then treats the two resulting references as arguments to `&&`:

```
sub { 0 <= $_[0] } && sub { $_[0] < 10 }
```

This boolean expression is inevitably true, since both references are non-false. Fortunately, the overloaded `'bool'` operator catches this situation and flags it as an error.

DEPENDENCIES

The module is implemented using `Filter::Util::Call` and `Text::Balanced` and requires both these modules to be installed.

AUTHOR

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BUGS

There are undoubtedly serious bugs lurking somewhere in code this funky :-). Bug reports and other feedback are most welcome.

LIMITATIONS

Due to the heuristic nature of `Switch.pm`'s source parsing, the presence of regexes with embedded newlines that are specified with `raw /.../` delimiters and don't have a modifier `//x` are indistinguishable from code chunks beginning with the division operator `/`. As a workaround you must use `m/.../` or `m?...?` for such patterns. Also, the presence of regexes specified with `raw ?...?` delimiters may cause mysterious errors. The workaround is to use `m?...?` instead.

Due to the way source filters work in Perl, you can't use `Switch` inside an string `eval`.

If your source file is longer than 1 million characters and you have a `switch` statement that crosses the 1 million (or 2 million, etc.) character boundary you will get mysterious errors. The workaround is to use smaller source files.

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