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# Mw Documentation

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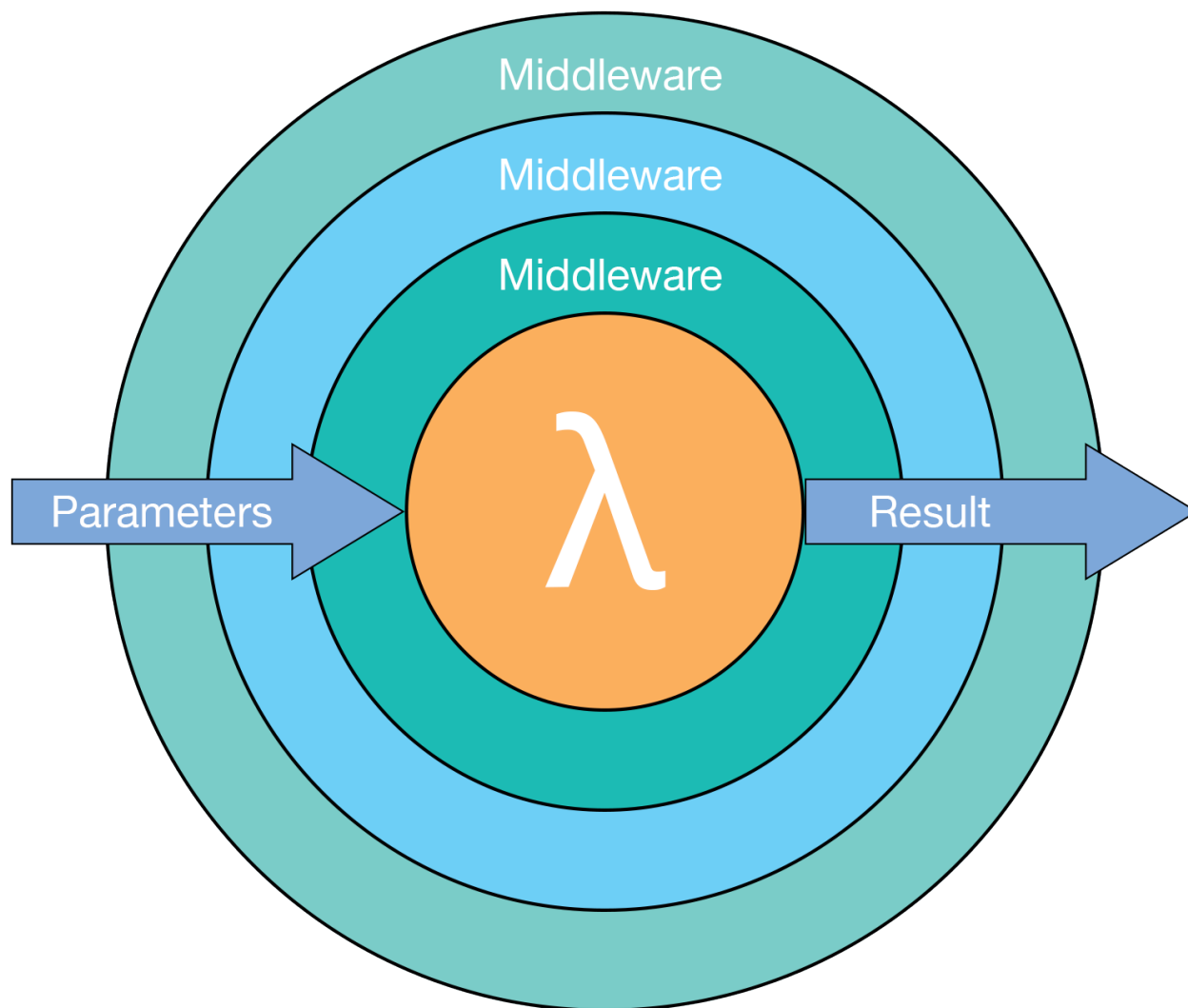
The Mw library is a very flexible framework for converting middleware into handlers. Middleware offer a clean syntax for implementing the [Decorator Pattern](#).

Middleware provide a great system for extendable features and the Krak\Mw library offers a simple yet powerful implementation to create middleware at ease.

```
<?php
use Krak\Mw;

$handler = mw\compose([
    function($s, $next) {
        return strtoupper($s);
    },
    function($s, $next) {
        return 'x' . $next($s . 'x');
    }
]);

$res = $handler('abc');
assert($res == 'xABCX');
```





# CHAPTER 1

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## Usage

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*Note:* each of these code samples can be seen in the `example` directory of the repo.

Here's an example of basic usage of the mw library

```
<?php

use Krak\Mw;

function rot13() {
    return function($s) {
        return str_rot13($s);
    };
}

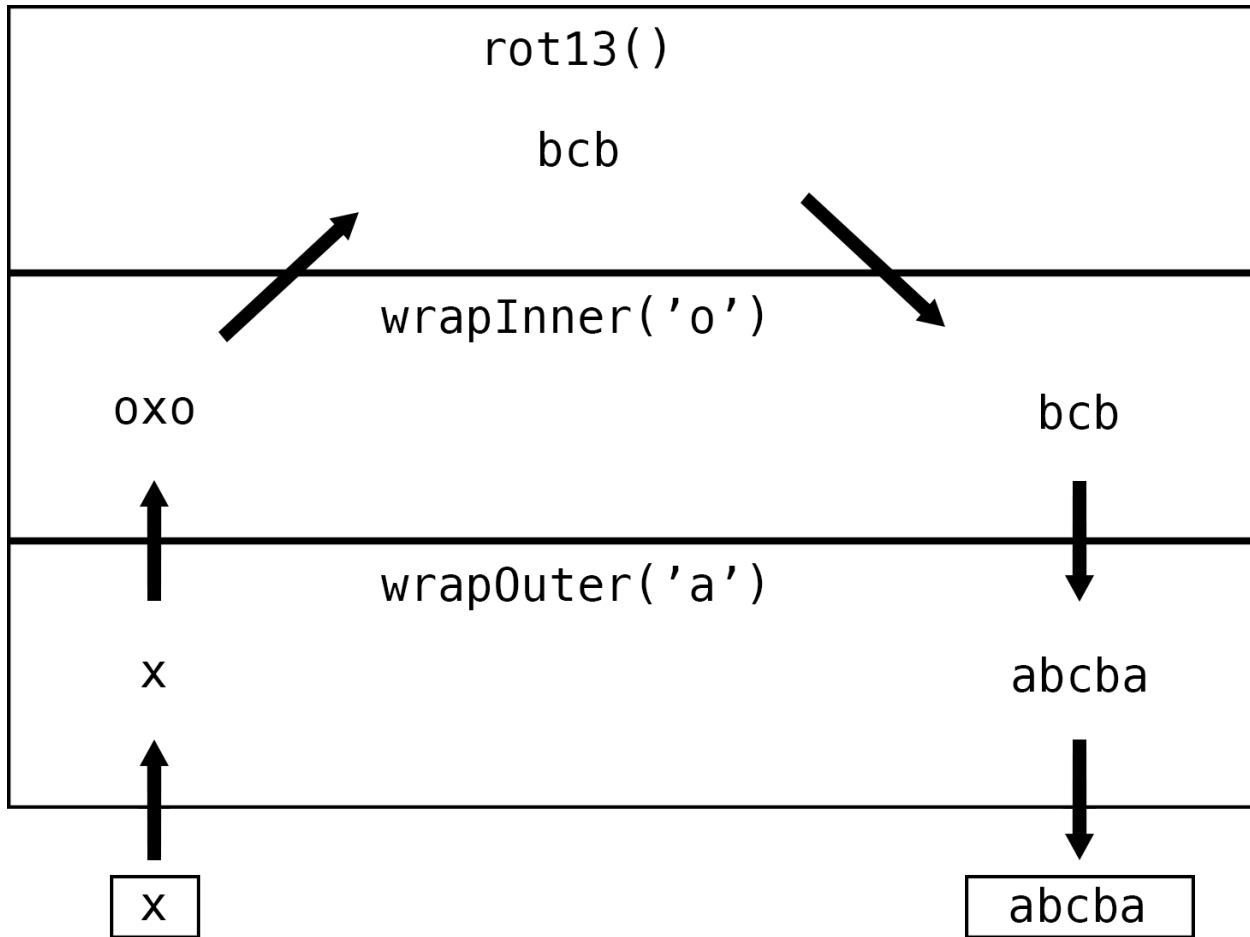
function wrapInner($v) {
    return function($s, $next) use ($v) {
        return $next($v . $s . $v);
    };
}

function wrapOuter($v) {
    return function($s, $next) use ($v) {
        return $v . $next($s) . $v;
    };
}

$handler = mw\compose([
    rot13(),
    wrapInner('o'),
    wrapOuter('a'),
]);

echo $handler('p') . PHP_EOL;
// abcba
```

The first value in the array is executed last; the last value is executed first.



Each middleware shares the same format:

```
function($arg1, $arg2, ..., $next);
```

A list of arguments, with a final argument `$next` which is the next middleware function to execute in the stack of middleware.

You can have 0 to n number of arguments. Every middleware needs to share the same signature. Composing a stack of middleware will return a handler which has the same signature as the middleware, but without the `$next` function.

**IMPORTANT:** At least one middleware **MUST** resolve a response else the handler will throw an error. So make sure that the last middleware executed (the first in the set) will return a response.

## Before/After Middleware

Middleware can either be a *before* or *after* or both middleware. A before middleware runs before delegating to the `$next` middleware. An after middleware will runs *after* delegating to the `$next` middleware.

Before Style

```
<?php
function($param, $next) {
    // code goes here
}
```



```

    // you can also modify the $param and pass the modified version to the next
    ↪middleware
    return $next($param);
}

```

After Style

```

<?php

function($param, $next) {
    $result = $next($param);

    // code goes here
    // you can also modify the $result and return the modified version to the
    ↪previous handler

    return $result;
}

```

## Stack

The library also comes with a MwStack that allows you to easily build a set of middleware.

```

<?php

use Krak\Mw;

$stack = mw\stack('Stack Name');
$stack->push(function($a, $next) {
    return $next($a . 'b');
})
->push(function($a, $next) {
    return $next($a) . 'z';
}, 0, 'c')
// replace the c middleware
->on('c', function($a, $next) {
    return $next($a) . 'c';
})
->before('c', function($a, $next) {
    return $next($a) . 'x';
})
->after('c', function($a, $next) {
    return $next($a) . 'y';
})
// this goes on first
->unshift(function($a, $next) {
    return $a;
});

$handler = $stack->compose();
$res = $handler('a');
assert($res == 'abxcy');

```



### Context

Each middleware is invoked with a `Mw\Context` instance. This is responsible for holding additional data to be used internally within the mw system *and* to provide additional features/usage for users. The context is available via the `Mw\Link` object of the middleware.

```
<?php
use Krak\Mw;

$handle = mw\compose([
    function($v, Mw\Link $next) {
        $ctx = $next->getContext();
        return 1;
    }
], new Krak\Mw\Context\StdContext());
```

You can configure or pass in any context as long as it implements the `Mw\Context` interface. Currently, the context provides an invoker via the `getInvoke` method. This allows custom invocation of the middleware as shown in the *Cookbook*.

### Custom Invocation

You can provide custom invocation of the middleware via the context. An invoker is any function that shares the signature of `call_user_func`. Its sole purpose is to invoke functions with their parameters. With custom invocation, you can do cool things like have middleware as pimple identifiers.

## Link

The final argument to each middleware is an instance of `Mw\Link`. The link represents the link/chain between middlewares. Technically speaking, it's a singly-linked list of middleware that once executed will invoke the entire chain of middleware.

The link is responsible for building a set of middleware via the `chain`.

```
<?php

use Krak\Mw;

$link = new Mw\Link(function($i) {
    return $i * 2;
}, new Mw\Context\StdContext());
$link = $link->chain(function($i, $next) {
    return $next($i) + 1;
});
assert($link(2) == 5);
```

`chain` takes a middleware and produces a new link that is appened to the head of the linked list of mw links. As you can see, the middleware on the second link is executed first.

## Meta Middleware

Custom Context and invocation is a very useful feature; however, it requires special consideration if you are creating your own Meta Middleware. Meta middleware are middleware that accept other middleware and inject middleware into the chain of middleware.

```
mw\group
mw\lazy
mw\filter
```

These are all meta middleware. To allow *all* middleware to be properly linked and have access to the context, these meta middleware need to learn how to properly inject middleware into the mw link.

Here's an example:

```
<?php

use Krak\Mw;

// maybe middleware will only invoke the middleware if the parameter is < 10
function maybe($mw) {
    return function($i, $next) use ($mw) {
        if ($i < 10) {
            /** NOTE - this is the crucial part where we prepend the `$mw` onto the_
            ↪link. Now, when we execute `$next`,
                the `$mw` func will be first to be executed */
            $next = $next->chain($mw);
        }

        return $next($i);
    };
}
```

```

function loggingInvoke() {
    return function($func, ...$params) {
        echo "Invoking Middleware with Param: $params[0]\n";
        return call_user_func($func, ...$params);
    };
}

$handler = mw\compose([
    function() { return 1; },
    maybe(function($i, $next) {
        return $next($i) + 100;
    })
], new Mw\Context\StdContext(loggingInvoke()));

echo $handler(1) . PHP_EOL;
echo $handler(10) . PHP_EOL;

/*
Outputs:

Invoking Middleware with Param: 1
Invoking Middleware with Param: 1
Invoking Middleware with Param: 1
101
Invoking Middleware with Param: 10
Invoking Middleware with Param: 10
1
*/

```



## CHAPTER 3

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### Cookbook

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The cookbook provides documentation on how to extend or utilize the mw system in advanced ways.

- [cookbook/custom-link-class](#)
- [cookbook/custom-method-middleware](#)
- [cookbook/pimple-middleware](#)





The api documentation is broken up into 2 parts: Middleware documentation and Middleware Stack documentation.

## Middleware Functions

**Closure `compose(array $mws, Context $ctx = null, callable $last = null, $link_class = Link::class)`** Composes a set of middleware into a handler.

```
<?php
$handler = mw\compose([
    function($a, $b, $next) {
        return $a . $b;
    },
    function($a, $b, $next) {
        return $next($a . 'b', $b . 'd');
    }
]);

$res = $handler('a', 'c');
assert($res === 'abcd');
```

The middleware stack passed in is executed in LIFO order. So the last middleware will be executed first, and the first middleware will be executed last.

After composing the stack of middleware, the resulting handler will share the same signature as the middleware except that it **won't** have the `$next`.

`$ctx` will default to `Context\StdContext` if none is supplied, and it will be the context that is passed to the start link (see: [Advanced Usage](#) for more details).

`$last` represents the last middleware to be executed if no other middleware handle the parameters. This typically will throw an exception in that case, but it might be advantageous to set this to something else for your needs.

`$link_class` is the class that will be constructed for the middleware link. It must be or extend `Krak\Mw\Link` (see: [Advanced Usage](#) for more details).

**Closure group(array \$mws)** Creates a new *middleware* composed as one from a middleware stack.

Internally, this calls the `compose` function, so the same behaviors will apply to this function.

```
<?php

/** some middleware that will append values to the parameter */
function appendMw($c) {
    return function($s, $next) use ($c) {
        return $next($s . $c);
    };
}

$handler = mw\compose([
    function($s) { return $s; },
    append('d'),
    mw\group([
        append('c'),
        append('b'),
    ]),
    append('a'),
]);

$res = $handler('');
assert($res === 'abcd');
```

On the surface, this doesn't seem very useful, but the ability group middleware into one allows you to then apply other middleware onto a group.

For example, you can do something like:

```
$grouped = mw\group([
    // ...
]);
mw\filter($grouped, $predicate);
```

In this example, we just filtered an entire group of middleware

**Closure lazy(callable \$mw\_gen)** Lazily creates and executes middleware when it's executed. Useful if the middleware needs to be generated from a container or if it has expensive dependencies that you only want initialized if the middleware is going to be executed.

```
<?php

$mw = lazy(function() {
    return expensiveMw($expensive_service_that_was_just_created);
});
```

The expensive service won't be created until the `$mw` is actually executed

**Closure filter(callable \$mw, callable \$predicate)** Either applies the middleware or skips it depending on the result of the predicate. This is very useful for building conditional middleware.

```
<?php

$mw = function() { return 2; };
$handler = mw\compose([
```

```
function() { return 1; },
mw\filter($mw, function($v) {
    return $v == 4;
})
]);
assert($handler(5) == 1 && $handler(4) == 2);
```

In this example, the stack of middleware always returns 1, however, the filtered middleware gets executed if the value is 4, and in that case, it returns 2 instead.

## Invoke Functions

**Closure `pimpleAwareInvoke(Pimple\Container $c, $invoke = 'call_user_func')`** invokes middleware while checking if the mw is a service defined in the pimple container

**Closure `methodInvoke(string $method_name, $allow_callable = true, $invoke = 'call_user_func')`** This will convert the middleware into a callable array like [`$obj`, `$method_name`] and invoke it. The `$allow_callable` parameter will allow the stack to either invoke objects with the given method or invoke callables. If you want to only allow objects with that method to be invocable, then set `$allow_callable` to false.

## Stack Functions

**MwStack `stack($name, array $entries = [], Context $ctx = null, $link_class = Link::class)`** Creates a MwStack instance. Every stack must have a name which is just a personal identifier for the stack. It's primary use is for errors/exceptions that help the user track down which stack has an issue. `$ctx` and `$link_class` are forwarded to the MwStack constructor.

```
<?php

$stack = mw\stack('demo stack');
$stack->push($mw)
    ->unshift($mw1);

// compose into handler
$handler = $stack->compose();
// or, use as a grouped middleware
$handler = mw\compose([
    $mw2,
    $stack
]);
```

**array `stackEntry(callable $mw, $sort = 0, $name = null)`** Creates an entry for the MwStack. This is only used if you want to initialize a stack with entries, else, you'll just be using the stack methods to create stack entries.

```
<?php

$stack = mw\stack('demo stack', [
    stackEntry($mw1, 0, 'mw1'),
    stackEntry($mw2),
    stackEntry($mw3, 5, 'mw3'),
]);
// equivalent to
```

```
$stack = mw\stack('demo stack')
->push($mw1, 0, 'mw1')
->push($mw2)
->push($mw3, 5, 'mw3');
```

**MwStack stackMerge(...\$stacks)** Merges stacks into one another. The resulting stack has the same name as the first stack in the set. The values from the later stacks will override the values from the earlier stacks.

```
<?php

$a = mw\stack('stack', [
    mw\stackEntry($mw1),
    mw\stackEntry($mw2),
    mw\stackEntry($mw3, 0, 'mw')
]);
$b = mw\stack('stack', [
    mw\stackEntry($mw4, 0, 'mw'),
]);
$c = mw\stackMerge($a, $b);
// stack $c is equivalent to
$c = mw\stack('stack')
->push($mw1)
->push($mw2)
->push($mw4, 0, 'mw')
```

## Utility Functions

**array splitArgs(array \$args)** Splits arguments between the parameters and middleware.

```
<?php

use Krak\Mw

function middleware() {
    return function(...$args) {
        list($args, $next) = Mw\splitArgs($args);
        return $next(...$args);
    };
}
```

## class MwStack implements Countable

The stack presents a mutable interface into a stack of middleware. Middleware can be added with a name and priority. Only one middleware with a given name may exist. Middleware that are last in the stack will be executed first once the stack is composed.

**\_\_construct(\$name, Context \$ctx = null, \$link\_class = Link::class)** Creates the mw stack with a name. The `$ctx` and `$link_class` are forwarded to `mw\compose` once the stack is composed.

**string getName()** returns the name of the middleware

**MwStack push(\$mw, \$sort = 0, \$name = null)** Pushes a new middleware on the stack. The sort determines the priority of the middleware. Middleware pushed at the same priority will be pushed on like a stack.

**MwStack unshift(\$mw, \$sort = 0, \$name = null)** Similar to push except it prepends the stack at the beginning.

**MwStack on(\$name, \$mw, \$sort = 0)** Simply an alias of `push`; however, the argument order lends it nicer for adding/replacing named middleware.

**MwStack before(\$name, \$mw, \$mw\_name = null)** Inserts a middleware right before the given middleware.

**MwStack after(\$name, \$mw, \$mw\_name = null)** Inserts a middleware right after the given middleware.

**array shift(\$sort = 0)** Shifts the stack at the priority given by taking an element from the front/bottom of the stack. The shifted stack entry is returned as a tuple.

**array pop(\$sort = 0)** Pops the stack at the priority given by taking an element from the back/top of the stack. The popped stack entry is returned as a tuple.

**array remove(\$name)** Removes a named middleware. The removed middleware is returned as a tuple.

**array normalize()** Normalizes the stack into an array of middleware that can be used with `mw\compose`

**mixed \_\_invoke(...\$params)** Allows the middleware stack to be used as middleware itself.

**Closure compose(callable \$last = null)** Composes the stack into a handler.

**Generator getEntries()** Yields the raw stack entries in the order they were added.

**MwStack withName(\$name)** Creates a clone of the current stack with an updated name.

**MwStack withContext(Context \$ctx)** Creates a clone of the current stack with an updated context

**MwStack withLinkClass(\$class)** Creates a clone of the current stack with an updated link class

**MwStack withEntries(\$entries)** Creates a clone of the current stack with updated entries.

**MwStack static createFromEntries(\$name, \$entries)** Creates a stack with a set of entries. `mw\stack` internally calls this.

## class Link

Represents a link in the middleware chain. A link instance is passed to every middleware as the last parameter which allows the next middleware to be called. See *Advanced Usage* for more details.

**\_\_construct(\$mw, Context \$ctx, Link \$next = null)** Creates a link. If `$next` is provided, then the created link will be the new head of that linked list.

**\_\_invoke(...\$params)** Invokes the middleware. It forwards the params to the middleware and additionally adds the next link to the end of argument list for the middleware.

**chain(\$mw)** Creates a new link to be the head of the current list of links. The context is copied from the current link.

**getContext()** returns the context instance apart of the link.

## interface Context

Represents the middleware context utilized by the internal system.

**getInvoker()** Returns the invoker configured for this context.

## class Context\StdContext implements Context

The default context for the mw system. It simply holds the a value to the invoker for custom invocation.

```
__construct($invoke = 'call_user_func')
```

## class Context\PimpleContext implements Context

Provides nice pimple integration by allowing the context to act like a pimple container and it provides pimple invocation by default.

View the [cookbook/pimple-middleware](#) for example on this.

```
__construct(Container $container, $invoke = null) The pimple container and an optional invoker if you don't want to use the pimpleAwareInvoke
```

Here are few common errors and how to resolve them

#### **“No middleware returned a response” Error**

When you get this error or something similar, this means that no middleware in the set of middleware returned a response.

You can get this error if you:

- Forget to put a return statement in your middleware so the chain breaks and no response is returned.
- Have a logic error where no middleware actually accepts the response

If you are having trouble finding which handler is causing the issue, you can use a `MwStack` instead. These provide better error messages because each middleware stack has a name which can help track down which middleware stack is causing the problem.

#### **“Middleware cannot be invoked because it does not contain the “method”**

This exception is thrown when using the `methodInvoke` for composing your middleware. This means that one of the middleware on your stack doesn't have the proper method to be called.

To fix this, you should check your middleware stack and verify that every middleware has the proper method. The stack trace should also show you which class instance caused the problem to help you track down the problem.