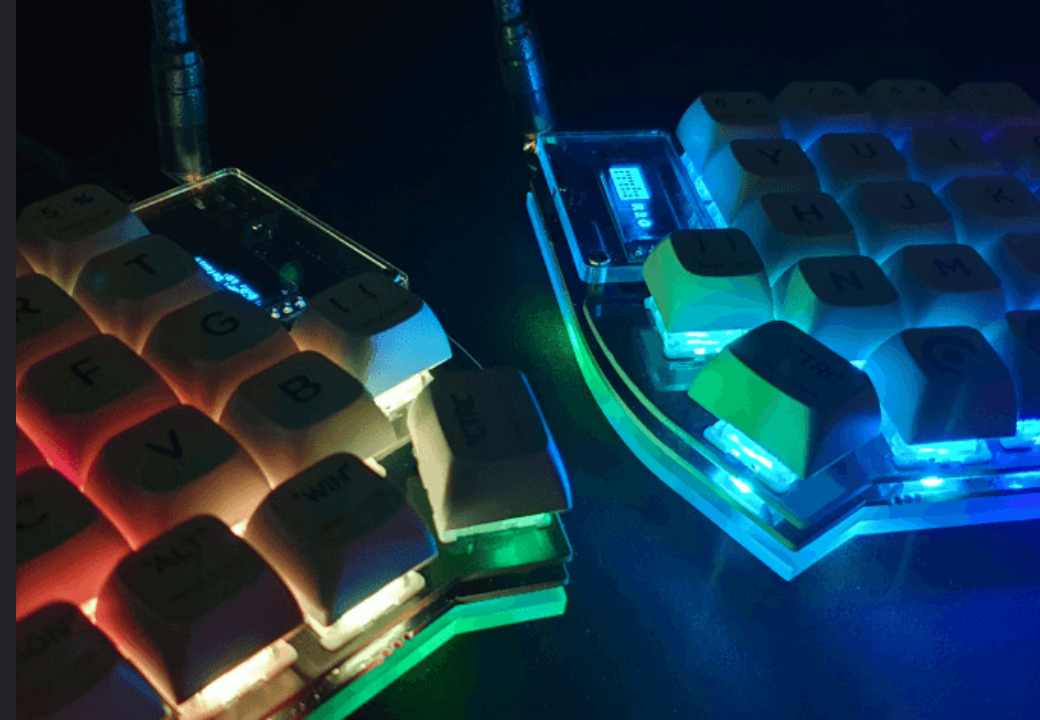


# The Drupal Batch API

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- Developer at Code Enigma
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# Source Code

- Talk is available at:  
<https://github.com/hashbangcode/drupal-batch-api-talk>
- All code seen can be found at:  
<https://bit.ly/3BQ4rsW>
- I have also written about the Batch API on  
[www.hashbangcode.com](http://www.hashbangcode.com)



# The Drupal Batch API

# The Batch API

Allows data to be processed in small chunks in order to prevent timeout errors or memory problems.

# What Problem Are We Solving?

# Bored Users

- Users get bored quickly.
- Studies show that a 5 second page load has a 0.6% conversion rate.
- Reducing this to 2 seconds doubles the conversion rate.
- This still means that after 2 seconds 98% of users will assume the page will not do anything.

# Server Timeouts

- Servers are designed to throw errors if something takes too long. Some defaults:
  - PHP ( `max_execution_time` ) - 30 seconds
  - PHP ( `memory_limit` ) - 256MB (recommended for Drupal)
  - Apache ( `TimeOut` ) - 60 seconds
  - Nginx ( `send_timeout` / `proxy_send_timeout` ) - 60 seconds



# The Problem

- Trying to do too much in one page request.
  - Downloading lots of data from an api.
  - Create/update/delete lots of entities.
- Users assume page is broken and click away.
- The page times out or runs out of memory.

# The Batch API

- Solves these problems by splitting long tasks into smaller chunks.
- Drupal then runs them through a special interface.

## Running batch process. ☆

Processing batch #5 batch size 100 for total 1,000 items.



Processing...

60%

# Using The Batch API

- Look at some code to run batches.
- Do some demos showing the code in action.

# The Batch API Stages

The Batch API can be thought of as the following stages:

- **Initialise** - Set up the batch run, define callbacks.
- **Process** - The batch process operations.
- **Finish** - A finish callback.

# Initialise

The BatchBuilder class is used to setup the batch.

```
use Drupal\Core\Batch\BatchBuilder;  
$batch = new BatchBuilder();
```

# Initialise

A number of methods set up different parameters.

```
$batch = new BatchBuilder();  
$batch->setTitle('Running batch process.')  
->setFinishCallback([self::class, 'batchFinished'])  
->setInitMessage('Commencing')  
->setProgressMessage('Processing...')  
->setErrorMessage('An error occurred during processing.');
```

# Initialise - Adding Operations

Populate the operations we want to perform.

```
// Create 10 chunks of 100 items.
$chunks = array_chunk(range(1, 1000), 100);

// Process each chunk in the array.
foreach ($chunks as $id => $chunk) {
    $args = [
        $id,
        $chunk,
    ];
    $batch->addOperation([BatchClass::class, 'batchProcess'], $args);
}
```

# Initialise - Start Batch Run

- Set the batch running by calling `toArray()` and passing the array to `batch_set()`.

```
batch_set($batch->toArray());
```

- The whole purpose of `BatchBuilder` is to generate that array.
- This will trigger and start up the batch process.



# Process

- The callbacks defined in the `addOperation()` method are executed.
- Parameters are the array of arguments you set.
- `$context` is passed as the last parameter is used to track progress.

```
public static function batchProcess(int $batchId, array $chunk, array &$context): void {  
}
```

# Process - Tracking Progress

- The `$context` parameter is an array that is maintained between different batch calls.
- The `"sandbox"` element is used inside the batch process and is deleted at the end of the batch run.
- The `"results"` element will be passed to the finished callback and is often used to track progress for reporting.

```
public static function batchProcess(int $batchId, array $chunk, array &$amp;context): void {  
    if (!isset($context['sandbox']['progress'])) { }  
    if (!isset($context['results']['updated'])) { }  
}
```

# Process - Tracking Progress

- Some sensible defaults.

```
public static function batchProcess(int $batchId, array $chunk, array &$amp;context): void {  
    if (!isset($context['sandbox']['progress'])) {  
        $context['sandbox']['progress'] = 0;  
        $context['sandbox']['max'] = 1000;  
    }  
    if (!isset($context['results']['updated'])) {  
        $context['results']['updated'] = 0;  
        $context['results']['skipped'] = 0;  
        $context['results']['failed'] = 0;  
        $context['results']['progress'] = 0;  
        $context['results']['process'] = 'Form batch completed';  
    }  
}
```

# Process - Messages

- As the batch runs you can set a "message" property to print messages to the user.
- This will appear above the batch progress bar as the batch progresses.

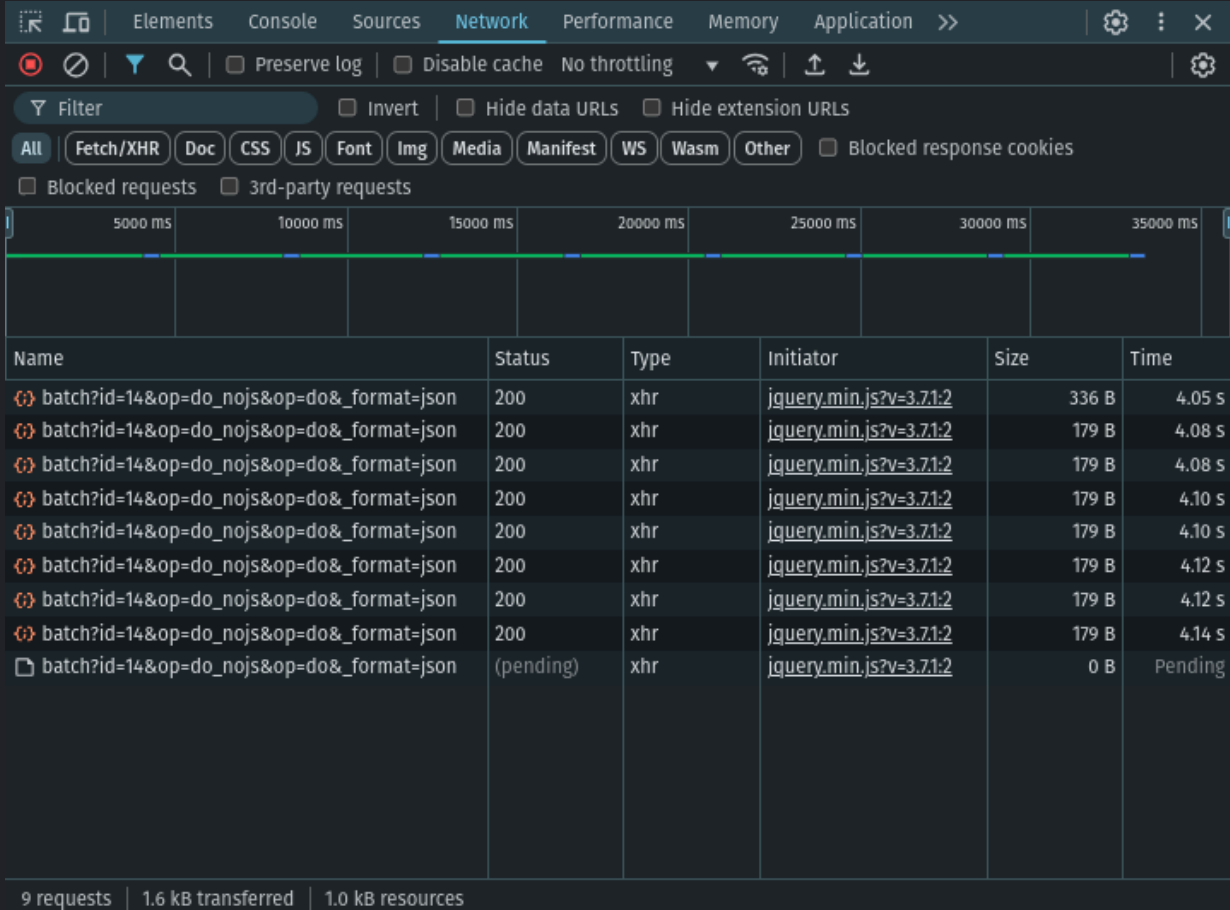
```
// Message above progress bar.  
$context['message'] = t('Processing batch #@batch_id batch size @batch_size for total @count items.', [  
    '@batch_id' => number_format($batchId),  
    '@batch_size' => number_format(count($chunk)),  
    '@count' => number_format($context['sandbox']['max']),  
]);
```

# Process

- Perform the task you want in the batch.

```
public static function batchProcess(int $batchId, array $chunk, array &$amp;context): void {  
    // --- Set up and messages goes here...  
    $random = new Random();  
    foreach ($chunk as $number) {  
        $context['results']['progress']++;  
        $context['sandbox']['progress']++;  
        $node = Node::create([  
            'type' => 'article',  
            'title' => $random->name(15),  
            'body' => [  
                'value' => '<p>' . $random->sentences(2) . '</p>', 'format' => filter_default_format(),  
            ],  
            'uid' => 1,  
            'status' => 1,  
        ]);  
        $node->save();  
    }  
}
```

# The Running Batch



The screenshot shows the Chrome DevTools Network tab. The top toolbar includes buttons for 'Filter', 'Invert', 'Hide data URLs', 'Hide extension URLs', and a list of request types: 'All', 'Fetch/XHR', 'Doc', 'CSS', 'JS', 'Font', 'Img', 'Media', 'Manifest', 'WS', 'Wasm', and 'Other'. There are also checkboxes for 'Blocked response cookies', 'Blocked requests', and '3rd-party requests'. The main area displays a list of requests. The first eight requests are 'batch?id=14&op=do\_nojs&op=do&\_format=json' with status 200, type xhr, and initiator 'jquery.min.js?v=3.7.1:2'. The ninth request is the same but with status '(pending)' and type 'xhr'. The bottom status bar shows '9 requests | 1.6 kB transferred | 1.0 kB resources'.

Name	Status	Type	Initiator	Size	Time
batch?id=14&op=do_nojs&op=do&_format=json	200	xhr	jquery.min.js?v=3.7.1:2	336 B	4.05 s
batch?id=14&op=do_nojs&op=do&_format=json	200	xhr	jquery.min.js?v=3.7.1:2	179 B	4.08 s
batch?id=14&op=do_nojs&op=do&_format=json	200	xhr	jquery.min.js?v=3.7.1:2	179 B	4.08 s
batch?id=14&op=do_nojs&op=do&_format=json	200	xhr	jquery.min.js?v=3.7.1:2	179 B	4.10 s
batch?id=14&op=do_nojs&op=do&_format=json	200	xhr	jquery.min.js?v=3.7.1:2	179 B	4.10 s
batch?id=14&op=do_nojs&op=do&_format=json	200	xhr	jquery.min.js?v=3.7.1:2	179 B	4.12 s
batch?id=14&op=do_nojs&op=do&_format=json	200	xhr	jquery.min.js?v=3.7.1:2	179 B	4.12 s
batch?id=14&op=do_nojs&op=do&_format=json	200	xhr	jquery.min.js?v=3.7.1:2	179 B	4.14 s
batch?id=14&op=do_nojs&op=do&_format=json	(pending)	xhr	jquery.min.js?v=3.7.1:2	0 B	Pending

9 requests | 1.6 kB transferred | 1.0 kB resources

## Running batch process.

Processing batch #8 batch size 100 for total 1,000 items.



# Finish - The Finished Callback

- When the batch finishes, the finished callback is triggered.
- This has a set of parameters that detail how the batch performed.

```
public static function batchFinished(  
    bool $success,  
    array $results,  
    array $operations,  
    string $elapsed): void {  
}
```

# Finished - The Finished Callback

For example, you might want to report the results of the batch run to your user.

```
public static function batchFinished(bool $success, array $results, array $operations, string $elapsed): void {  
    $messenger = \Drupal::messenger();  
    if ($success) {  
        $messenger->addMessage(t('@process processed @count, skipped @skipped, updated @updated, failed @failed in @elapsed.', [  
            '@process' => $results['process'],  
            '@count' => $results['progress'],  
            '@skipped' => $results['skipped'],  
            '@updated' => $results['updated'],  
            '@failed' => $results['failed'],  
            '@elapsed' => $elapsed,  
        ]));  
    }  
}
```



# Batch Internal Workings

- The Batch API is really an extension of the Queue system.
- When you add operations to the batch you are adding items to the queue.
- The Drupal batch runner then pulls items out of the queue and feeds them to the process.

# The Batch "finished" State

# The Batch "finished" State

- So far, we have looked at pre-configured batch runs.
- A better approach is to use the `finished` property of the batch `$context` array.
- If we set this value to  $\geq 1$  then the batch process callback is considered finished.

```
if (done) {  
    $context['finished'] = 1;  
}
```

# The Batch "finished" State

The setup is slightly different as we only create a single operation.

```
$array = range(1, 1000);  
$batch->addOperation([BatchClass::class, 'batchProcess'], [$array]);
```

This is run over and over until we issue the finished state.

# The Batch "finished" State

It is common to divide the progress by the maximum number of items.

```
$context['finished'] = $context['sandbox']['progress'] / $context['sandbox']['max'];
```

# The Batch "finished" State

This also means that we can just launch the batch with no arguments.

```
$batch->addOperation([BatchProcessNodes::class, 'batchProcess']);
```

The `max` property is discovered in the `batchProcess()` method the first time it is run.

```
public static function batchProcess(array &$context): void {  
    if (!isset($context['sandbox']['progress'])) {  
        $query = \Drupal::entityQuery('node');  
        $query->accessCheck(FALSE);  
        $context['sandbox']['progress'] = 0;  
        $context['sandbox']['max'] = $query->count()->execute();  
    }  
}
```

# The Batch "finished" State

- Use the `finished` state over the pre-loaded batch operations where possible.

# Running Batch With Drush



# Drush

Call batch set as normal.

```
batch_set($batch->toArray());
```

Then call the Drush function.

```
drush_backend_batch_process();
```

This will run the batch on the command line.

```
philipnorton42@pop-os:~/Development/drupal_batch

→ drupal_batch ddev drush batch_class_example:run
> [notice] Processing batch #0 batch size 100 for total 1,000 items.
> [notice] Processing batch #1 batch size 100 for total 1,000 items.
> [notice] Processing batch #2 batch size 100 for total 1,000 items.
> [notice] Processing batch #3 batch size 100 for total 1,000 items.
> [notice] Processing batch #4 batch size 100 for total 1,000 items.
> [notice] Processing batch #5 batch size 100 for total 1,000 items.
> [notice] Processing batch #6 batch size 100 for total 1,000 items.
> [notice] Processing batch #7 batch size 100 for total 1,000 items.
> [notice] Processing batch #8 batch size 100 for total 1,000 items.
> [notice] Processing batch #9 batch size 100 for total 1,000 items.
> [notice] Message: Class batch completed processed 1000, skipped 263, updated 508, failed 229 in
> 0 sec.
>
[notice] Batch operations end.
→ drupal_batch
```

# Drush

- Be careful! Drush will process the batch operations in the same memory space.
- As you are on the command line you won't time out, but you can run out of memory.

# Examples Of Batch API In Action

Some live demos!

# Batch Using A Form

- A look at the Batch API shown above.
- Batch process goes through 1,000 items and randomly determines outcome.

# Batch Using Drush

- Batch process goes through 1,000 items and randomly determines outcome.
- This time, in Drush!

# Process a CSV file

- Import 1,000 nodes using a batch process.
- This uses the `finished` property to track progress of the CSV and stop the batch when needed.

# The Batch API Inside Drupal



# Batch API In Drupal

- Drupal makes use of the Batch API in lots of different situations. For example:
  - Installing Drupal.
  - Installing modules.
  - Importing translations.
  - Importing configuration.
  - Deleting users.
  - Bulk content updates.
  - And much more!

# The Update Hook

- Update hooks get a `$sandbox` variable. This is actually a batch `$context` array.
- Update hooks are `hook_update_N()` and `hook_post_update_NAME()`.
- You can set the `#finished` property in the `$sandbox` array to stop the batch.

# The Update Hook

An example of a batched update hook.

```
function batch_update_example_update_10001(&$sandbox) {  
  if (!isset($sandbox['progress'])) {  
    $sandbox['progress'] = 0;  
    $sandbox['max'] = 1000;  
  }  
  $batchSize = 100;  
  $batchUpperRange = $sandbox['progress'] + $batchSize;  
  
  for ($i = $sandbox['progress']; $i < $batchUpperRange; $i++) {  
    // Keep track of progress.  
    $sandbox['progress']++;  
    // Do some actions...  
  }  
  \Drupal::messenger()->addMessage($sandbox['progress'] . ' items processed.');
```

```
$sandbox['#finished'] = $sandbox['progress'] / $sandbox['max'];  
}
```

# Some Tips On Batch API Usage

# Top Tips

- If the data needs to be processed in real time then use a batch; otherwise use a standard queue.
- Kick off your batches in a form or controller, but process the batch in a separate class. This allows easy Drush integration.
- Use the `finished` property to make dynamic batches; rather than preloaded.

# Top Tips

- Keep your batch operations simple. Break them apart into separate operations if needed.
- Think about the footprint of your batch operations. Keep them small. You can still cause timeouts during the batch if you aren't careful.
- Try to allow batch operations to pick up where they left off. If any errors occur you can re-run to complete the task.

# When To Use The Batch API

- If the request processes multiple items then move it into a batch.
- Users will more readily wait for a batch to finish than a spinning page.
- Use the batch system early to save having to rework things later.

# Modules That Use Batch



# Queue UI

- View current queues and process them with a batch.

[https://www.drupal.org/project/queue\\_ui](https://www.drupal.org/project/queue_ui)

### Queue manager

Action

Batch process ▾

Apply to selected items

<input type="checkbox"/>	Title	Machine name	Number of items	Class	Cron time limit	Operations
<input type="checkbox"/>	Thumbnail downloader	media_entity_thumbnail	0	DatabaseQueue	60 seconds	<div>Inspect ▾</div>
<input type="checkbox"/>	Node revision delete	node_revision_delete	0	DatabaseQueue	300 seconds	<div>Inspect ▾</div>
<input type="checkbox"/>	Sitemap search engine submission	simple_sitemap_engine_submit	0	DatabaseQueue	30 seconds	<div>Inspect ▾</div>
<input type="checkbox"/>	Cache warmer	warmer	0	DatabaseQueue	60 seconds	<div>Inspect ▾</div>

# View Batch Operations

- Batch process items in a view.

[https://www.drupal.org/project/views\\_bulk\\_operations](https://www.drupal.org/project/views_bulk_operations)

10 items selected

Action: 

Delete selected entities / translations ▾

▾ Selected 1000 items

☒ Select / deselect all results (all pages, 1000 total):

Apply to selected items

# Views Data Export

- A Views plugin that exports data in a number of different formats.

[https://www.drupal.org/project/views\\_data\\_export](https://www.drupal.org/project/views_data_export)



Export complete. Download the file [here](#).



# Batch Plugin

- Wraps the Batch API in a plugin to make your batch operations pluggable.

[https://www.drupal.org/project/batch\\_plugin](https://www.drupal.org/project/batch_plugin)

Batch plugin configuration ☆						
<a href="#">+ Add batch plugin</a>						
Label	Machine name	Plugin ID	Provider	Processor	Status	Operations
Batch Plugin Example	batch_plugin_example	example_batch_plugin	batch_plugin_example	drush	Enabled	<a href="#">Edit</a> ▼

# Resources

- Batch on `#! code`

<https://www.hashbangcode.com/tag/batch-api>

- All code seen is code available at

[https://github.com/hashbangcode/drupal\\_batch\\_examples/](https://github.com/hashbangcode/drupal_batch_examples/)

- Batch Processing and the Drupal Queue System -

<https://www.drupalatyourfingertips.com/bq>

# Questions?

- Slides:

<https://github.com/hashbangcodebatch-api-talk>



# Thanks!

- Slides:

<https://github.com/hashbangcodebatch-api-talk>

