# The Drupal Batch API

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DrupalCamp Scotland 2024

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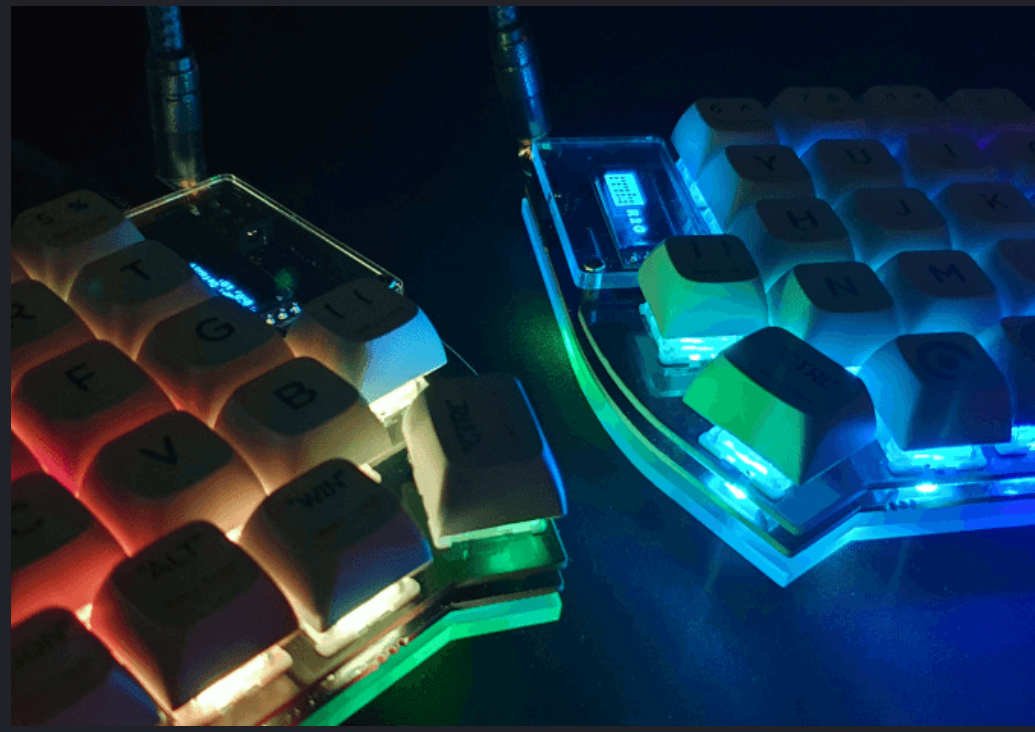


# Source Code

- This presentation: https://github.com/hashbangcode/drupal-batch-api-talk
- All code seen here is available: https://github.com/hashbangcode/drupal_batch_examples
- I have also written extensively about the Batch API on https://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 doubes 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 is 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

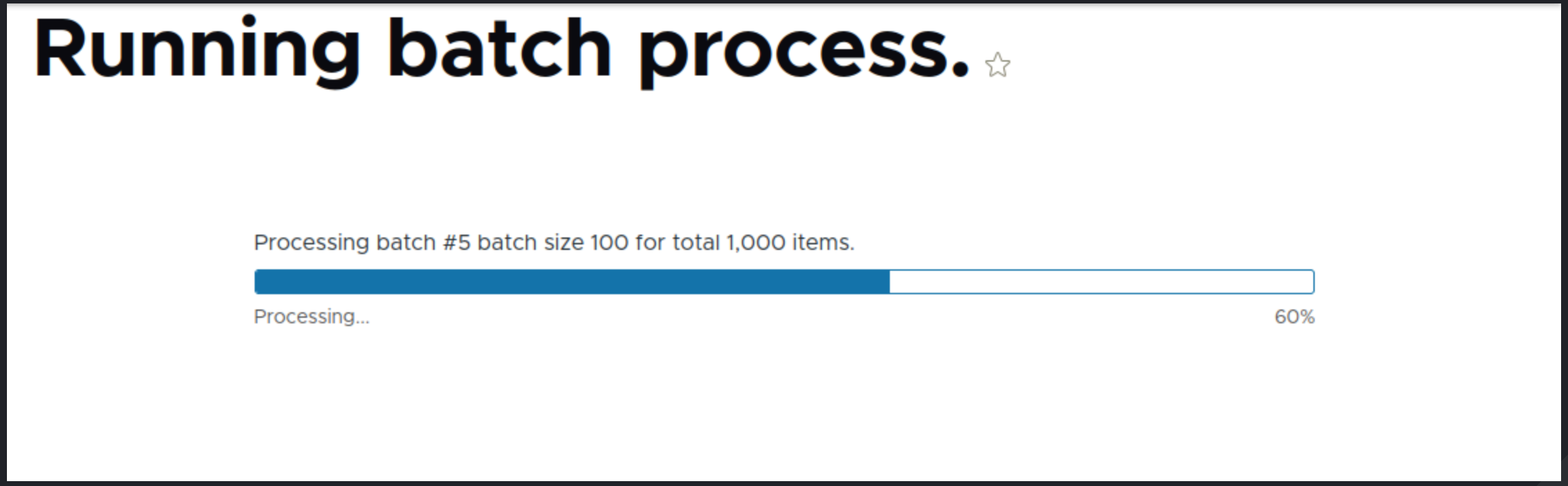
# The Problem

- 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.



# The Batch API

# 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.

```php
// 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 called.
- 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 is will be passed to the finished callback and is often used to track progres for reporting.

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

# Process - Messages

- As the batch runs you can set a `"message"` element to print messages to the user.
- This will appaer 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 $chunk, array &$context): void {
  // --- Set up and messages goes here...
  $random = new Random();
  foreach ($chunk as $number) {
    $context['results']['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();
  }
}
```

# 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.

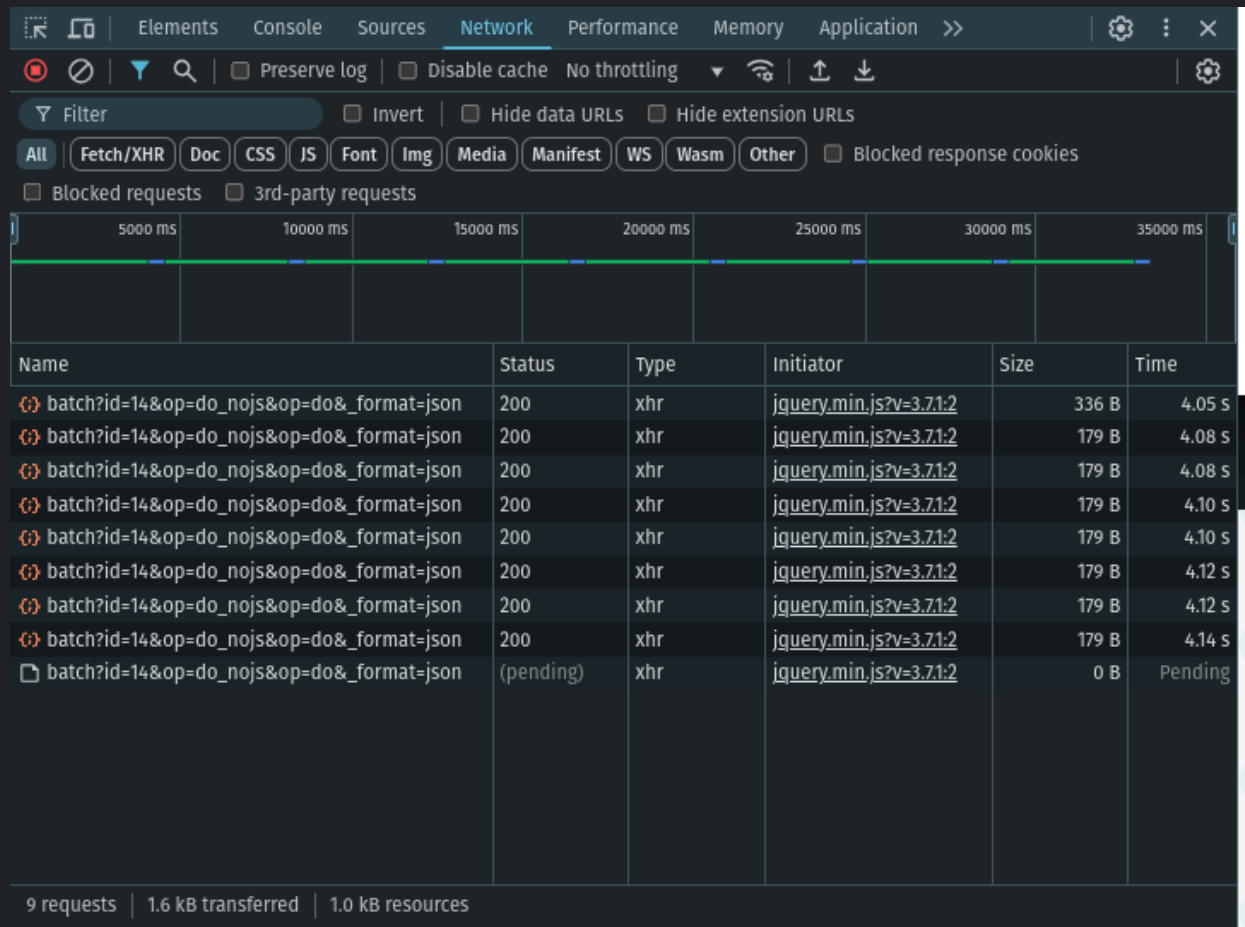
```
public static function batchFinished(
  bool $success,
  array $results,
  array $operations,
  string $elapsed): void {
}
```

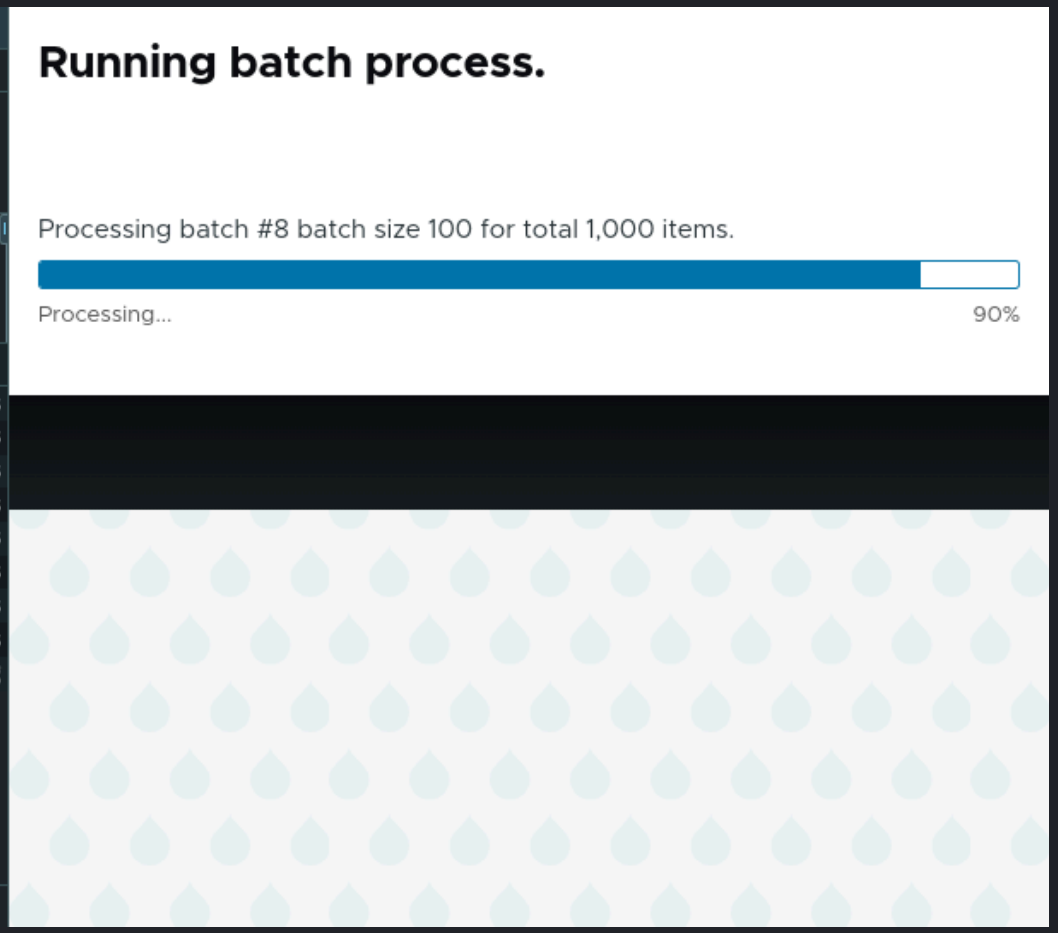
# Finished - The Finished Callback

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,
      ]));
    }
}
```

# The Running Batch



# 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 method.

# The Batch "finished" State

# The Batch "finished" State

- So far, we have looked at pre-confgured batch runs.
- A better approach is to use the `finished` property of the batch `$context` array.
- If we set this value to >= 1 then the batch process 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();
  }
```

# 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.

# 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

- Look at 1,000 items and roll a dice.

# Batch Using Drush

- Look at 1,000 items and roll a dice.

# Process a CSV file

- Import 1,000 nodes using a batch process.

# The Batch API Inside Drupal

# The Update Hook

- Update hooks get a `$sandbox` variable. This is actually a batch `$context` array.
- 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;
  }

  for ($i = 0; $i < 100; $i++) {
    // Keep track of progress.
    $sandbox['progress']++;
    // Do some actions...
  }
  \Drupal::messenger()->addMessage($sandbox['progress'] . ' items processed.');

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

# General Batch Uses

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

# Some Tips On Batch API Usage

# When To Use The Batch API

- If the request processes items them 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.

# 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.

# Modules That Use Batch

# View Batch Operation

- Batch process items in a view.

https://www.drupal.org/project/views_bulk_operations

# Advanced Queue

- Shows a breakdown of the current queues in your system.
- Gives the option to process queues as a batch run.

https://www.drupal.org/project/advancedqueue

# Views Data Export

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

https://www.drupal.org/project/views_data_export

# Batch Plugin

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

https://www.drupal.org/project/batch_plugin

# Resources

- Drupal 11: An Introduction To Batch Processing With The Batch API
- Drupal 11: Batch Processing Using Drush
- Drupal 11: Using The Finished State In Batch Processing
- Drupal 11: Using The Batch API To Process CSV Files
- Drupal Batch Examples source code

# Questions?

- Slides: https://github.com/hashbangcode/batch-api-talk

# Thanks!

- Slides: https://github.com/hashbangcode/batch-api-talk