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Workbooks Developer Training

March 2015

Agenda

- Introduction to Workbooks and its programming model
- What you can do with the API
- How to use the API
  - External access or the Process Engine?
  - PHP in 30 minutes
  - Security Model
  - Get, Create, Update and Delete with the API. Metadata
- The Process Engine, process types, how processes are run
- Special APIs, Reporting, Emailing
- Writing supportable scripts
- Getting support from Workbooks

Introduction: Why use the API?

Some examples:

- Email-to-Case: monitor a mailbox, create and update support cases with SLA
- MailChimp, Constant Contact, dotMailer, HubSpot , Google Sync…
- Sagelink, OneSaaS
- Outlook Connector
- Mobile Client
- Creating many order line items to reflect a delivery schedule
- Calculate field values
- Sales Lead categorisation, analysis and allocation

API not required:

- Simple lead or case capture (use web-to-case to get started)
- Generating a PDF (use PDF templates) or a templated email
- Simple workflow using custom page layouts and assignment
- Data Import
- Reporting

Introduction: What is the API?

- API – 'Application Programmatic Interface'
  - i.e. an interface enabling software to interact with Workbooks.
- A set of web services delivered over SSL (https)
- Stateless, client/server
- Almost RESTful – create, read, update, delete
- Batched
- JSON, UTF-8

How to call the API: Wire Protocol or Binding?

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- Wire Protocol = JSON-encoded HTTP requests
  - Can be complex
  - Documented at
    - http://www.workbooks.com/api-developer-guide
  - No restriction on which language is used.
- Bindings hide much of the complexity
  - Library and example code is on github (please feel free to contribute)
    - https://github.com/workbooks/client_lib
    - PHP used by the process engine
      - PHP is widely-understood and open-source.
      - Lots of systems have documented PHP APIs.
  - Currently: PHP, C#, Java, Ruby

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Wire Protocol versus Binding

e.g. Fetching a couple of fields from a record by ID.

```
/crm/people.api?_ff%5B%5D=id&_ft%5B%5D=eq&_fc%5B%5D=21458&&_start=0&_limit=1&_select_columns%5B%5D=id&_select_columns%5B%5D=main_location%5Bcountry%5D&_select_columns%5B%5D=main_location%5Bemail%5D
```

```
$response = $workbooks->assertGet('crm/people',
  array(
    '_filters[]' => array('id', 'eq', 21458),
    '_limit' => 1,
    '_start' => 0,
    '_select_columns[]' => array(
        'id', 'main_location[country]', 'main_location[email]'),
  )
);
```

Modifying records with the wire protocol is more complex: URL encoding, _authenticity_token etc.

In both cases, need to check the response. assertGet() includes error checking.

Exercise: Workbooks Desktop network traffic

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Login to a test account:

username:
api.training@workbooks.com
password:
crmsuccess

- Open your favourite web browser
- Reveal Developer Tools and show network traffic
- Login to the Workbooks Desktop
- Clear the the network traffic
- Open a landing page and an item
- Examine the .extjs and .wbjson traffic, especially the request and response headers

- This is **not** the Workbooks API. But it is close

- Note that it is https, compressed with gzip, JSON-based

How to call the API: Where to run your code?

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- Workbooks-hosted
  - The “Process Engine”.
  - Simpler, automates invocation, authentication and logging.
  - Not available if you are using a ‘Free’ licence.
- Externally
  - Host your code yourself.
  - Connect to Workbooks explicitly over HTTPS.
  - Authenticate using API Key or Username, password and database ID.
  - A little more flexible.
  - From an on-premises system, avoids most firewall issues.
  - The API is available to all Workbooks users.
- The Process Engine is used in this presentation for simplicity.

Workbooks Security Model: Authentication

- Username / password
  - not recommended for API clients unless a user is entering these in a UI
  - requires database selection
- API Keys
  - no password to expire
  - use a different API Key for each API client
  - easy to restrict by time or IP address, and to expose limited capabilities
  - specific to a database
  - recommended: use an API Key with /login.api to create a session
  - less good: pass an API Key with every request (slower and less efficient)
- Cookies
  - Authentication happens at /login.api which returns a Workbooks-Session cookie
  - Cookie value changes during session
  - Cookie just received should be sent with each request
- Required: _application_name during login, user-agent header, api_version=1

Using the Wire Protocol with curl

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- cURL is a command-line tool for requesting data with URLs
- Very flexible as a test/experimental tool
- Downloads for most platforms, from http://curl.haxx.se/
- Lots of examples in the Workbooks API Developers Guide, e.g.

```
curl -i -g -s --tlsv1 \
        -c '/tmp/cookiejar' \                          Store credentials for future calls
        -A 'XYZ plugin/1.2.3 (gzip)' \                 User-agent string
        --compressed \                                 Use gzip compression
        -X 'POST' \                                    HTTP POST (not GET)
        -d 'username=system_test@workbooks.com' \      A series of fields
        -d 'password=abc123' \
        -d 'client=api' \
        -d 'json=pretty' \
        https://secure.workbooks.com/login.api         The URL to send to
```

Exercise: Using curl

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- Download curl.
- Cut-and-paste to run a couple of the examples from the Workbooks API Developer Guide
  - Login
  - Retrieve
  - Create

- Note that parameters to create, update, delete are arrays! Append [] to the field names you are changing.
- Windows users: careful with quote characters!

Workbooks Security Model: Capabilities & Permissions

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- Licenses, Modules, Capabilities
  - Most ‘controller-actions’ require specific capabilities
    - crm/people, index (or create, edit, delete)
  - Capabilities are assigned through Group membership
  - API clients often require more capabilities than the users who use them
- Permissions - per-record
  - Read / Modify / Delete / Change ownership and permission
  - Again, API clients often require more visibility and access to records than the users who use them
  - Set upon record creation or ownership-change according to configured rules

Databases

- Workbooks customers normally have more than one database
- Databases can be used for
  - backup,
  - staging / testing / sandboxing,
  - segregation of data (but permissions are more flexible)
- Choose database at login time
- Copy a database
  - creates a completely separate copy of all data
  - users are shared (as are passwords)
  - capabilities, group membership, api keys, web2lead keys etc are per-database
- Can export to SQL. ODBC access is not permitted.

Introducing the Process Engine

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- Some glossary:
  - Script – a unit of PHP code.
  - Processes invoke Scripts.
  - Process types:
    - Scheduled Process
    - On-Change Process
    - Web Process
    - Process Button / on-Save Process
    - Report Process
    - Test Process
  - Processes run on behalf of a user, with the same constraints.
    - Capabilities matter.

Test Process

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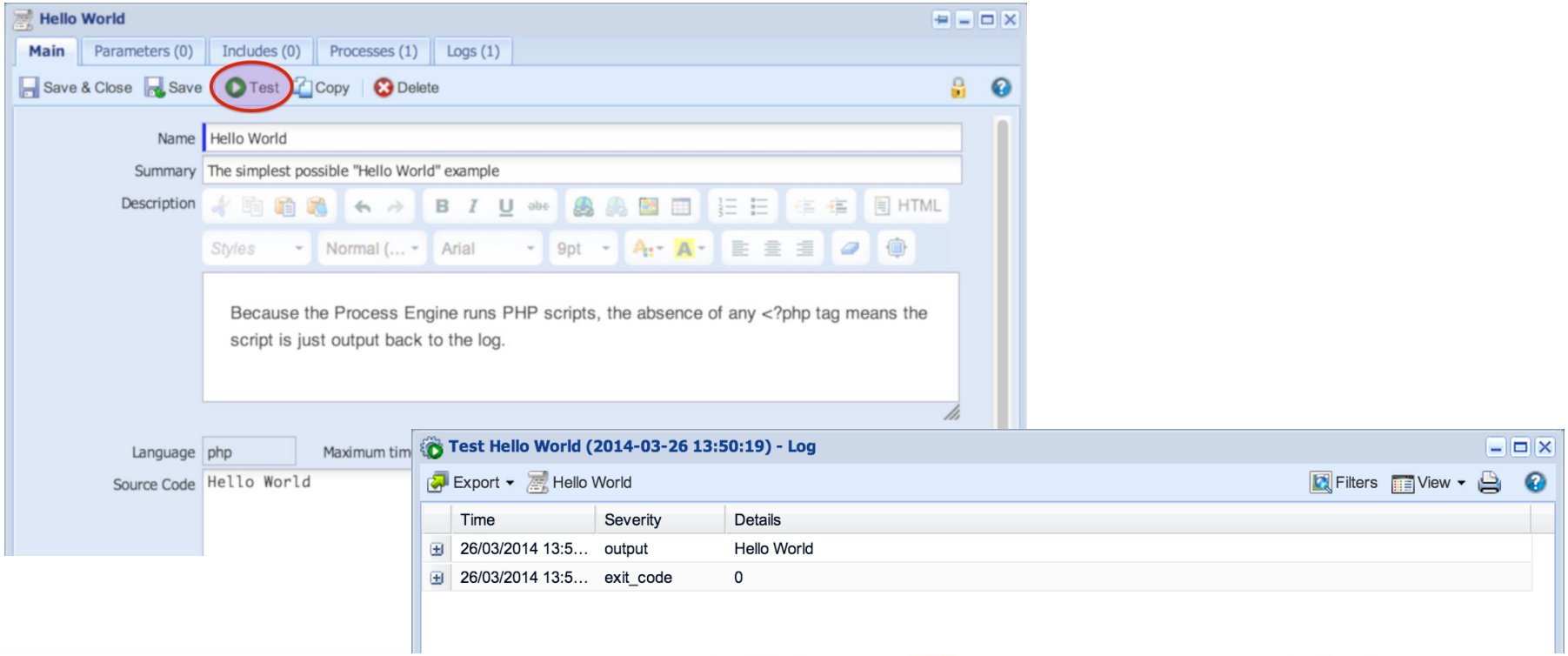
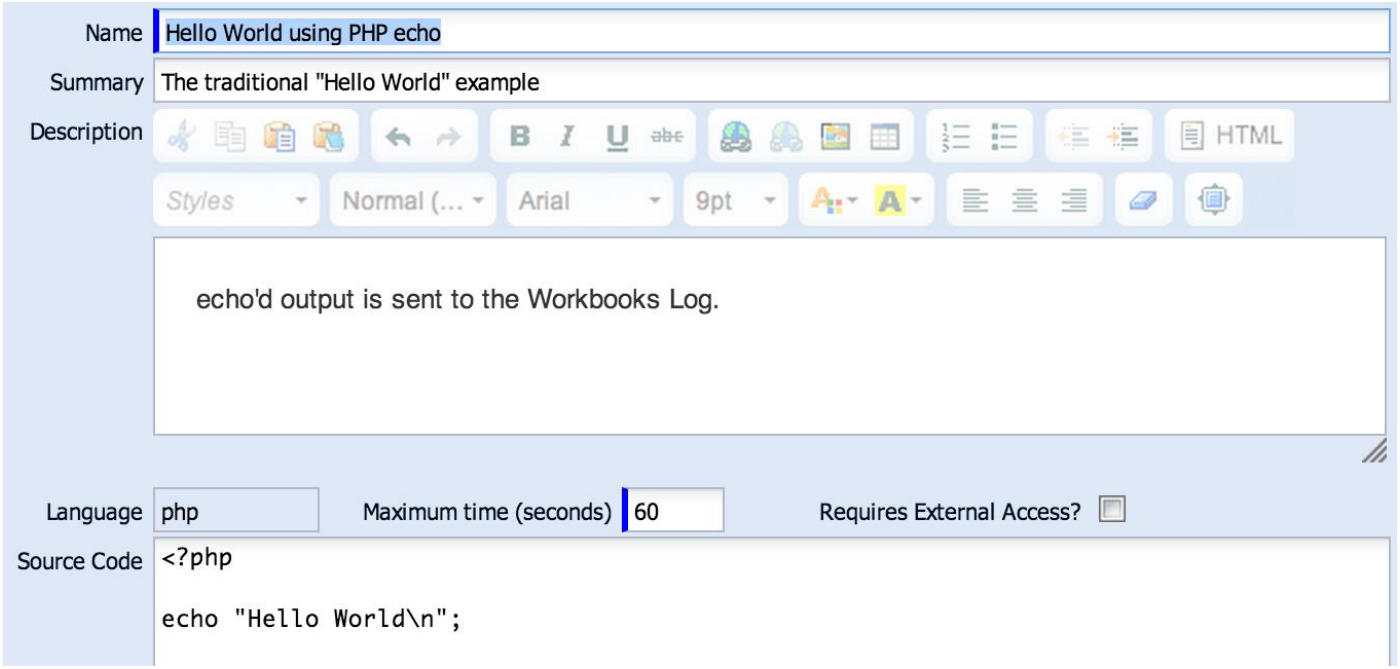
- Useful for debugging simple scripts
- Created when first used
- Prompts for parameters

Example: Hello World!

- Is this cheating?



Exercise: Hello World and phpinfo() in PHP

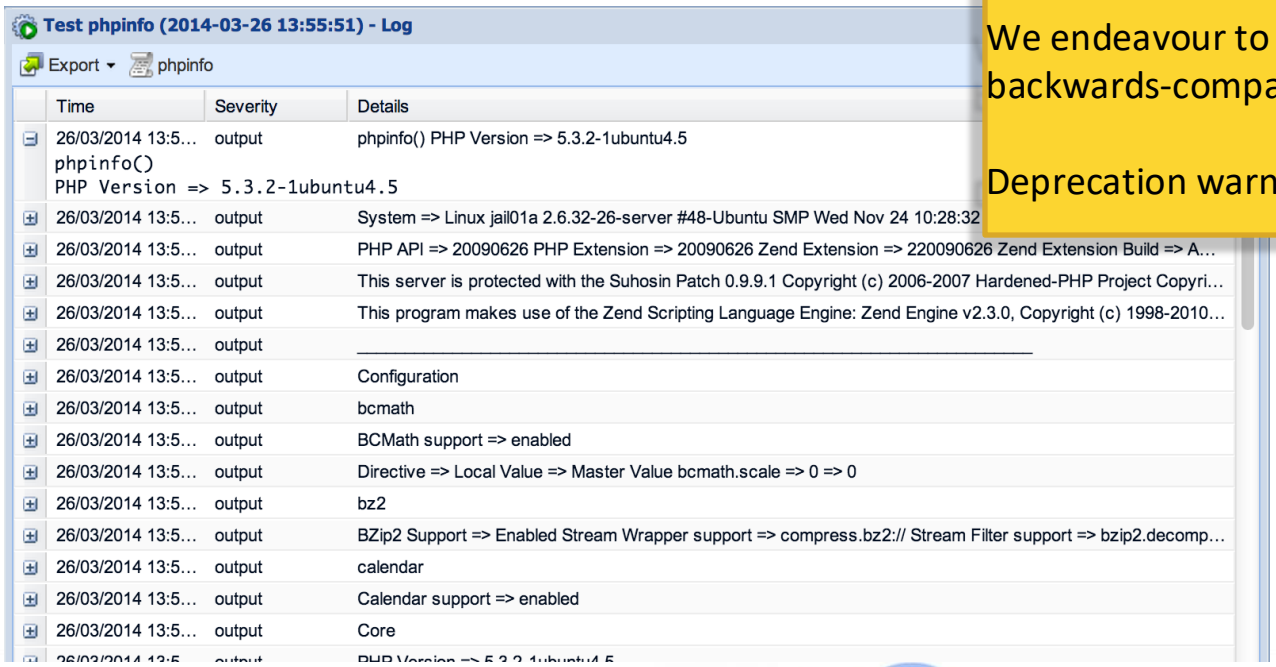


- Now try running the function **phpinfo();**

phpinfo()

```
<?php

phpinfo();
```



PHP versions and configuration will change from time to time.

We endeavour to keep things backwards-compatible.

Deprecation warnings are enabled.

Php in 30 minutes (ish)

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- For experienced programmers…

PHP Tags

- Your PHP code will be executed in Workbooks via a Web Server. Your code needs to differentiated from other elements that may occur within a Wen page.
- This is achieved by wrapping the PHP code within PHP tags, the most commonly used being:

  <?php...?>

Comments

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- Single Line Comments

```
# This is a comment
```

- Multi - Line comments (Like C/C++)

```
/* This is a
     Multi-line comment
  */
```

Notes

- PHP statements end with a semi-colon.
- PHP is case sensitive
- PHP is whitespace insensitive
- Blocks of code are delimited with braces { …. }
- PHP supports functional and Object Oriented programming

Variables

- Denoted with a leading dollar sign.

```
$varname = 123;
```

- Variables are not typed when declared
- They can be used before they are assigned and will take on default values
- They are converted between types as required

Types

- Integer

```
$counter = 0;
```

- Double

```
$amount = 2.85
```

- Boolean

```
$account_active = TRUE;
```

- NULL

```
$var1 = NULL;
IsSet( $var1 ) will return FALSE
```

Types

- Strings

```
$message = "Hello World";
```

  - Strings enclosed by double quotes support variable expansion. Single quotes do not.
  - PHP Supports Here Documents

- Arrays

```
$week_days = array( 'Mon', 'Tue', 'Wed','Thu', 'Fri' );
$days[0]  = 'Sun';
echo "The second working day is {$week_days[1]}";
```

  - Recent versions of PHP support a [] declaration syntax.

Types

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- Associative Arrays (Hashes)

```
   $classes = array(
    'Person' => 'Private::Crm::Person',
    'Lead' => 'Private::Crm::SalesLead',
);

echo 'Person class name is '.$classes['Person'];
```

  - Tip: You can leave trailing commas on the last array entry

Four Variable Scopes

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- Local - accessible within a function or module

```
$localVar = 'abc';
```

- Function Parameter - local within function

- Global - within or without any function

```
GLOBAL $varname;
```

- Static (like C/C++)
  - Will retain value over multiple functions calls

```
STATIC $call_count;
```

Constants

```
define( LINE_LENGTH, 255 );
echo LINE_LENGTH;  /* Note No leading $ */
```

- Magic Constants (See http://www.php.net/manual/en/language.constants.predefined.php)

```
__LINE__
__FILE__
__DIR__
__FUNCTION__
```

Conditionals

```
if ( $line_length < LINE_LIMIT )
{
    echo 'Line length is within limits';
}
else
{
    echo 'Line length exceeds limit: '.LIMIT;
}
```

Loops

```
while ( expression )
{
   /* block of code */
}


do
{
   /* block of code */
} while ( expression )


for ( expression1; expression2; expression3 )
{
   /* block of code */
}
```

Loops

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- foreach - iterates over an array

```
foreach ( $array as $value )
{
   /* Block of code */
}
```

- Or iterate over the members of a hash:

```
foreach ($hash as $key => $value)
{
 /* Block of code */
}
```

Functions

```
function myFunction( $param1 = "No Value", $param2  = "Value" )
{
    return "$param1 $param2";
}
```

- Parameters are passed by value. Prefix with & to pass by reference.

Classes

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```
class WorkBooksConnection extends Connections
{
   /* Variable Declarations */
   /* Function Declarations */
}
```

Use:

```
$wb = new WorkBooksConnection;
$wb->publicMethod1( $param1 );
```

Class Members

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```
# Constants are declared with the const keyword
const REQUEST_SIZE = 1024;
# A public attribute
var $var1 = 123;
# A private instance variable, only accessible by functions within this class.
private $var2 = 456;
# A private instance variable, accessible by any sub-class
protected $var3 = 789;
```

protected and **private** may also be used to set the scope for member functions too.

Constructors and Destuctors

- A constructor function may be declared:

```
function __contruct( $param1, $param2 ) { …. }
```

- A destructor may function may also be declared:

function __destruct() { …. }

Many Available Functions and Classes

- PHP has many many functions and classes available to the programmer.
  - String functions
  - Web Services
  - JSON parsing
  - Email handling
  - Exception handling
  - Many Many More.

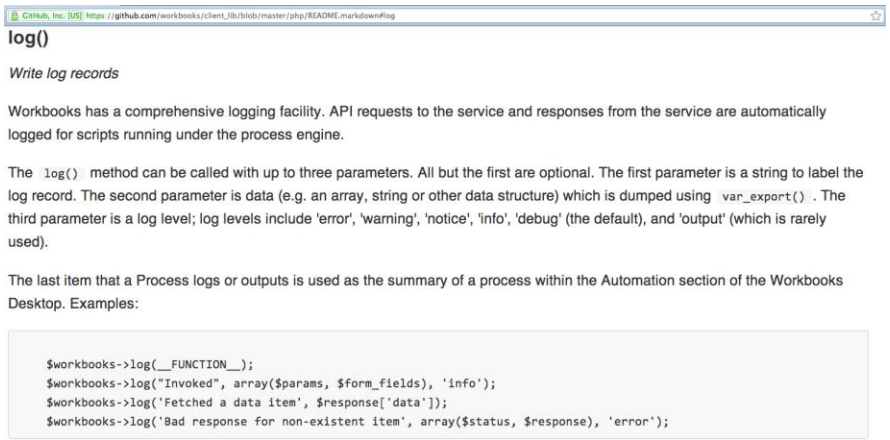
http://www.php.net/manual/en/funcref.php

More Information

- Google
- http://www.php.net/docs.php

Logging

- Log level set for each Process.
  - Debug level retains everything including API request/response.
  - Info level is the default.
    - Debug level logs retained on process failure.



GitHub, Inc. [US] https://github.com/workbooks/client_lib/blob/master/php/README.markdown#log

log()

Write log records

Workbooks has a comprehensive logging facility. API requests to the service and responses from the service are automatically logged for scripts running under the process engine.

The `log()` method can be called with up to three parameters. All but the first are optional. The first parameter is a string to label the log record. The second parameter is data (e.g. an array, string or other data structure) which is dumped using `var_export()`. The third parameter is a log level; log levels include 'error', 'warning', 'notice', 'info', 'debug' (the default), and 'output' (which is rarely used).

The last item that a Process logs or outputs is used as the summary of a process within the Automation section of the Workbooks Desktop. Examples:

```
$workbooks->log(__FUNCTION__);
$workbooks->log("Invoked", array($params, $form_fields), 'info');
$workbooks->log('Fetched a data item', $response['data']);
$workbooks->log('Bad response for non-existent item', array($status, $response), 'error');
```

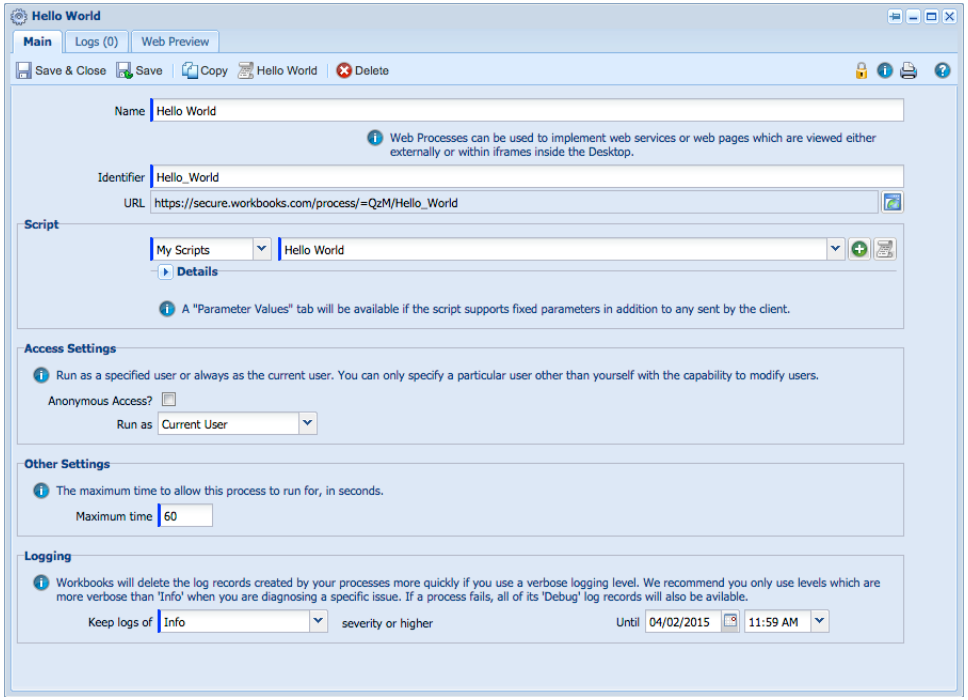
```php
<?php
$workbooks->log("Hello World");

// $workbooks->log() takes one or more parameters.
$workbooks->log('Process inputs',
  array( // The second parameter, if present, is passed through var_export()
    '$_POST' => $_POST,
    '$_GET' => $_GET,
    '$_SERVER' => $_SERVER,
    '$form_fields' => $form_fields,
    '$params' => $params,
  )
);

$workbooks->log('Process inputs',
  array(
    '$_POST' => $_POST,
    '$_GET' => $_GET,
    '$_SERVER' => $_SERVER,
    '$form_fields' => $form_fields,
    '$params' => $params,
  ),
  'info', // Log level (default: 'debug')
  1000000 // Maximum log length (default: 4096 bytes)
);
```

Web Processes

- Process output shown in preview ‘iframe’ in tab on form, logs also in tab
  - Or click on button by URL to open in another window and capture URL
  - URL identifies database
- Access Settings
  - Can be used to permit anonymous access
- Headers
  - Set headers prior to any output
  - Use $workbooks->header()

    e.g. to set cookies

    header() will not work!
- Output streamed to client as it is sent by the script
- Output UTF-8, be sure to escape it: use ***htmlentities()***



Exercise: Hello “name”

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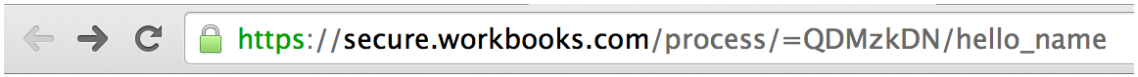
- The challenge: show an HTML form asking for a name using a script hosted within the Process Engine.
- Use the ‘Web Process’ facility.
- Echo that name back.
- Hint: URL parameters are put in **$_GET[]** and **$_POST[].**

Example: Hello “name”



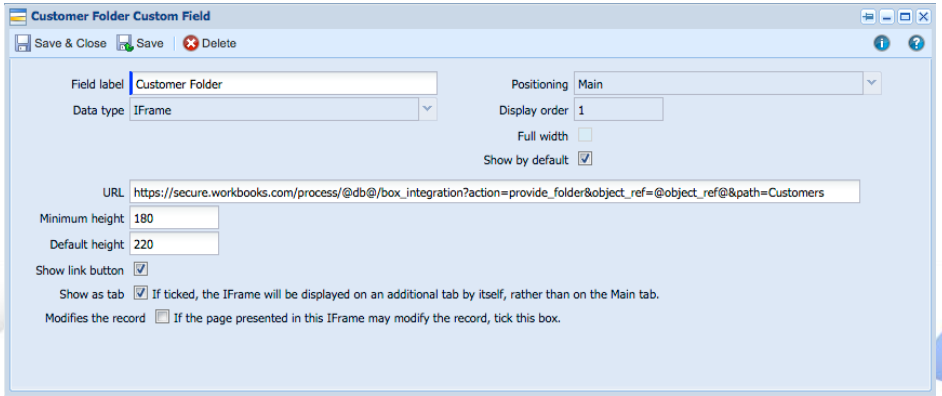

```
<?php
if (empty($_POST)) {
  echo <<<EOF
    <form method="post">
      <label for="name">Name</label>
      <input name="name"/>
      <input type="submit" value="Submit"/>
    </form>
EOF;
}
else {
  $encoded_name = htmlentities($_POST['name']);
  echo "<p>Hello {$encoded_name}</p>";
}
```

Web Process Uses

- Extremely useful:
  - Web Services
    - Wrap up business logic in a larger system
  - Portals
    - e.g. Case Portal
  - Populate iframes within Workbooks
    - Order configurators
    - Views onto other web-based systems

Web Process within iframe

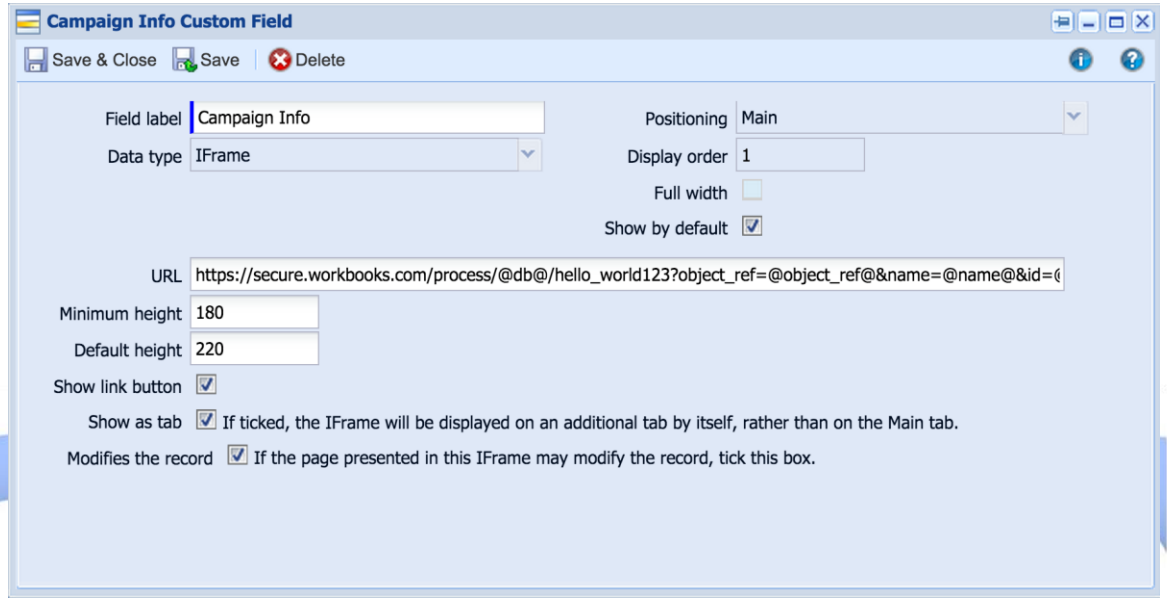
- Create a custom IFRAME field
  - Option to “show as tab”.
    - If process modifies the main record tick ‘Modifies the record’ to force change before redisplay.
- URL should contain local DB as @db@
  - … so when the DB is copied it still works
- URL can include field values wrapped in @-signs.



Web Process iframe example

- Iframe tab containing a form to change the campaign name.

- Create a script containing our form.
- Create a web process referring to that script.
- Create an iframe custom field referring to the URL of the web process.
  - Show in tab
  - Modifies record



Code for Web Process example

```
<?php

$workbooks->log('Process inputs',
  array(
    '$_POST' => $_POST,
    '$_GET' => $_GET,
    '$_SERVER' => $_SERVER,
    '$form_fields' => $form_fields,
    '$params' => $params,
  ),
  'info', // Log level (default: 'debug')
  1000000 // Maximum log length (default: 4096 bytes)
);

if (empty($_POST)) {
  $escaped_name = htmlentities($_GET['name']);
  $html = <<<EOD
  <html>
    <body>
      <p>
        Modify {$_GET['object_ref']}
      </p>
      <form method="POST">
        <input type="text" name="campaign_name" value="{$escaped_name}"/>
        <input type="submit" name="change" value="Change"/>
      </form>
    </body>
  </html>
EOD;

  $workbooks->output($html);
} else {

  // Do the change
  $change_campaign_name = [
      'id'             => $_GET['id'],
      'lock_version'   => $_GET['lock_version'],
      'name'           => $_POST['campaign_name'],
  ];
  $response = $workbooks->assertUpdate('crm/campaigns',
$change_campaign_name);

  $workbooks->log('Campaign name change response', $response, 'info');

  $html = <<<EOD
  <html>
    <body>
      Record changed
    </body>
  </html>
EOD;

  $workbooks->output($html);
}
```

Header Example

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Reminder: header() does not work.

```
<?php

# Replace this with something more interesting...
$target = 'https://www.workbooks.com';

$workbooks->header('Status: 302 Found');
$workbooks->header('Location: ' . $target);
$workbooks->output('<html><body><p>Redirect to ' . $target . ' did not
work!</p></body></html>');
```

Parameters

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As per ‘standard’ PHP norms, the Process Engine sets these up:

- **URL** parameters are put in **$_GET[]** and **$_POST[]**
- **Environment** parameters are in **$_SERVER[]**
- Uploaded **File** parameters are in **$_FILE[]**

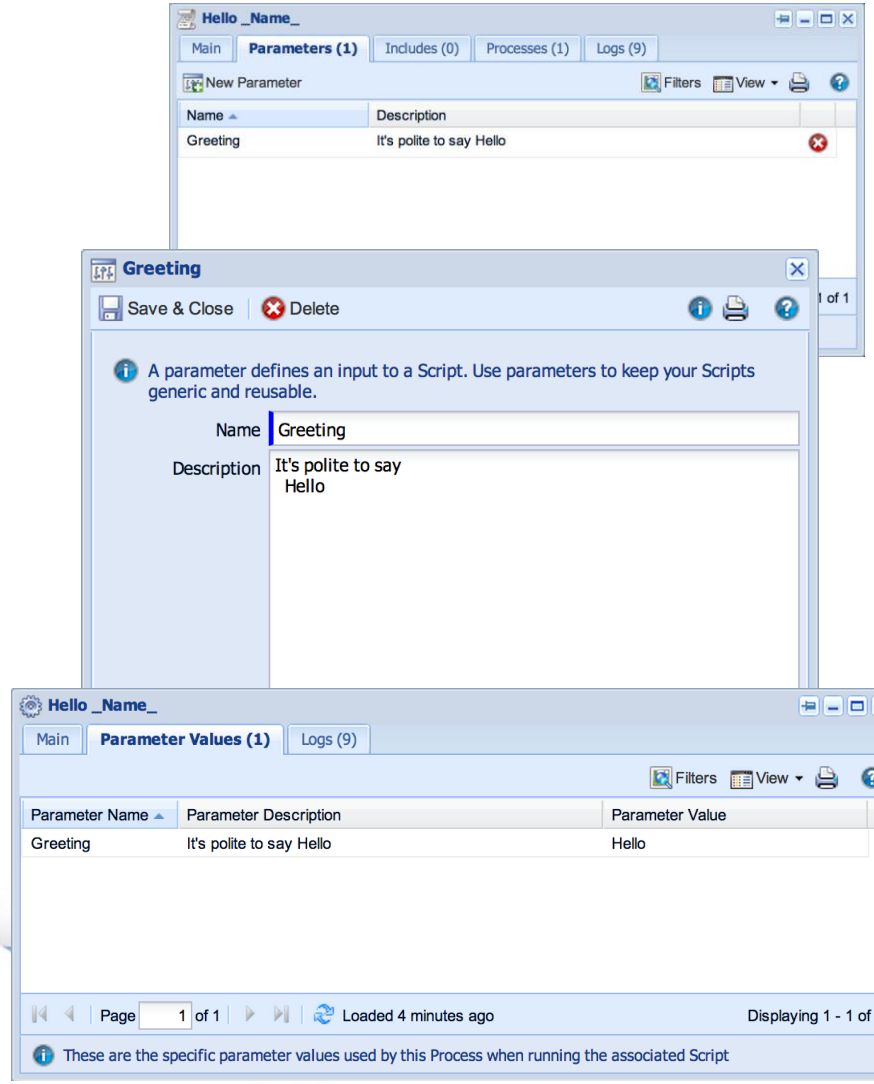
In addition these are also set up:

- **‘Script’** parameters are in **$params[]**
- **‘Form field’** parameters are in **$form_fields[]**
- **$workbooks**

Using Script Parameters

- On your Script go to the Parameters tab, give it a name and description.
- Open a Process which calls the Script, define a value.
- That value will be passed to the script within the **$params[]** array.
- Common pattern: several processes invoke a script with differing parameters
- In the previous example…

```
echo "<p>{$params['Greeting']}
{$encoded_name}</p>";
```



Exercise: Add script parameters to ‘Hello Name’

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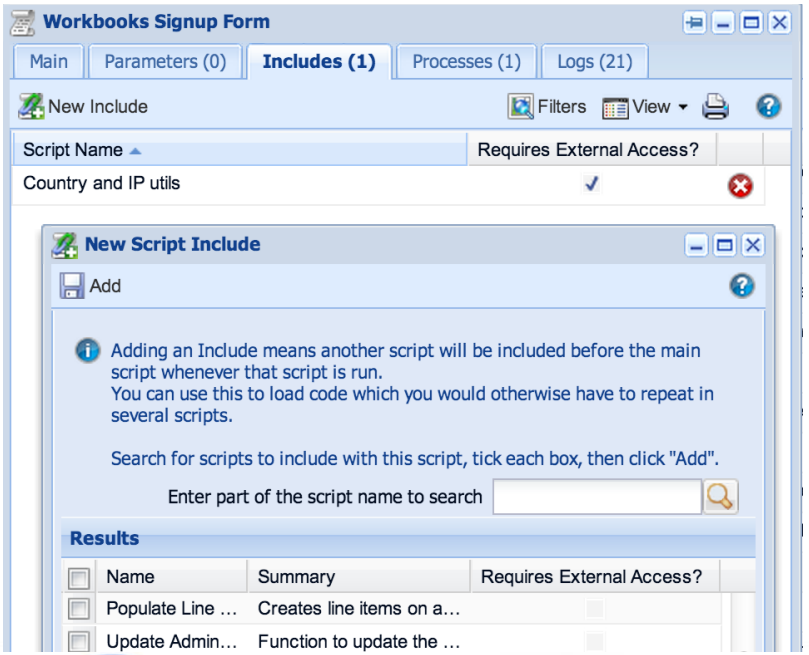
- Adapt your previous code to use Script Parameters

Including shared code

- A simple mechanism to share code between scripts
- Usual model: common functions and constants
- Can include code from the Library



How the Jail runs processes

- Processes are run within a sandbox, away from the main Workbooks service.
- Passed to the process each time it's run:
  - Scripts, included scripts, parameters, HTTP parameters, environment variables
  - One special script: workbooks_api.php
  - Each included script is run in turn, with the main script run last.
- Processes only have write access to their TMPDIR.
- Processes authenticate automatically back to Workbooks using credentials passed when they are invoked.

Jail Resource Constraints

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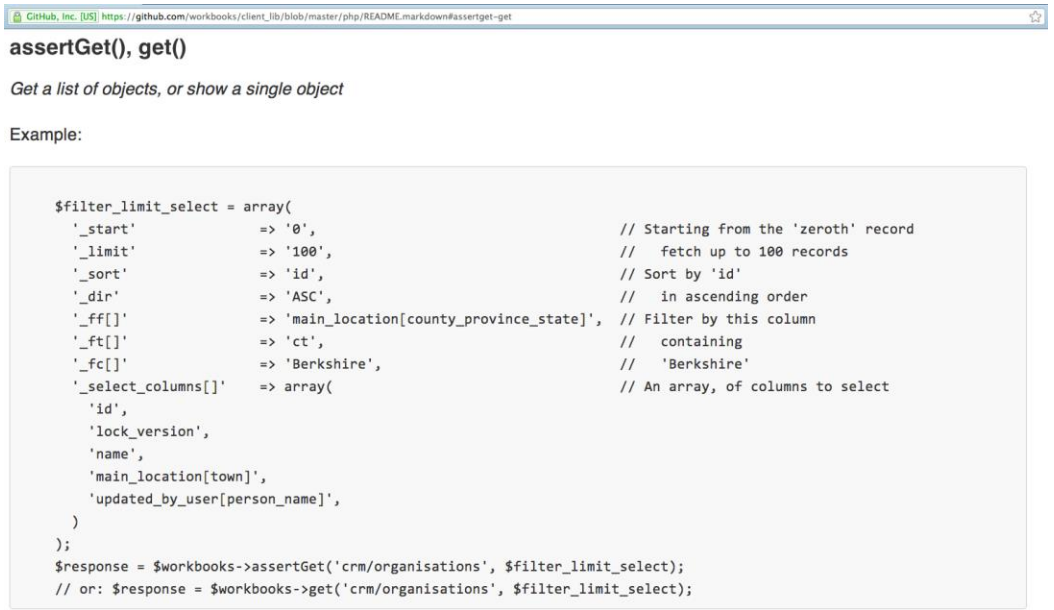
- An alarm timer limits the process to its allocated maximum time.
  - Discover the maximum time in seconds using **getenv('TIMEOUT')**
- If 'Requires External Access' is set, firewall ruleset is more open:
  - ICMP
  - DNS
  - HTTP, HTTPS
  - IMAP, IMAPS, POP3, POP3S
  - Database (MySQL, MSSQL default ports)
- Specifically not SMTP: use Workbooks' email API instead.
- Memory, disk usage, process limits all enforced
  - Receive a SIGTERM if memory limit exceeded.
- Workbooks recommends that processes do their work in small batches and checkpoint as required.

Accessing the Service

- Within the Process Engine:
  - Use $workbooks->assertGet(), assertCreate(), assertUpdate(), assertDelete()
  - Authentication and logout is automatic
- Using the wire protocol:
  - HTTP POST or GET, be careful with URL encoding especially with sparse arrays
  - Explicitly authenticate before you start
  - https://secure.workbooks.com/…
  - Do not turn off certificate checks.
  - Test using ‘curl’, as per examples in API Developer Guide

Using the API: Get records

- Retrieve Parameters: all optional:
  - start, limit (default: 100)
  - sort, direction
  - filter
  - column selection (speed)
- Response:
  - an array of hashes
- Errors:
  - **assert**Get - raise exception



GitHub, Inc. [US] https://github.com/workbooks/client_lib/blob/master/php/README.markdown#assertget-get

assertGet(), get()

Get a list of objects, or show a single object

Example:

```
$filter_limit_select = array(
  '_start'              => '0',                                    // Starting from the 'zeroth' record
  '_limit'              => '100',                                  //   fetch up to 100 records
  '_sort'               => 'id',                                   // Sort by 'id'
  '_dir'                => 'ASC',                                  //   in ascending order
  '_ff[]'               => 'main_location[county_province_state]', // Filter by this column
  '_ft[]'               => 'ct',                                   //   containing
  '_fc[]'               => 'Berkshire',                            //   'Berkshire'
  '_select_columns[]'   => array(                                  // An array, of columns to select
    'id',
    'lock_version',
    'name',
    'main_location[town]',
    'updated_by_user[person_name]',
  )
);
$response = $workbooks->assertGet('crm/organisations', $filter_limit_select);
// or: $response = $workbooks->get('crm/organisations', $filter_limit_select);
```

More about fetching data

- 'total' element: the total number of matching rows
  - Fetch with _limit set to 0 to discover this without retrieving the rows (remember to set _start as well)
  - Set **_skip_total_rows=1** (or true) to speed things up
- Most records have common fields such as id, lock_version, object_ref, name.
  - Tip: object_ref is convenient in your logging since you can paste it into the search bar
- PDF, and '.print' versions. 'csv' version.
- Report
  - A good way to wrap up a lot of complexity, away from code
- Metadata API
  - Discover the set of fields, including custom fields
- Do not assume field order or record order without sort
  - **id** is assigned in ascending order
- Field sizes are important

Filters

- In general: sets of {field, comparison operator, value}
- Combine with boolean logic (defaults to just ‘AND’)
- OR can be slow: avoid this when many records queried

- Several syntaxes - see https://github.com/workbooks/client_lib/blob/master/php/filter_example.php

- Choose whichever suits your needs

Filter syntax 1: arrays of fields, comparators, contents

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```
// First filter structure: specify arrays for Fields ('_ff[]'), comparaTors ('_ft[]'), Contents ('_fc[]').
// Note that 'ct' (contains) is MUCH slower than equals. 'not_blank' requires Contents to compare with, but this is ignored.
$filter1 = array_merge($limit_select, array(
  '_ff[]' => array('main_location[county_province_state]', 'main_location[county_province_state]', 'main_location[street_address]'),
  '_ft[]' => array('eq',                                   'ct',                                   'not_blank'),
  '_fc[]' => array('Berkshire',                            'Yorkshire',                            ''),
  '_fm' => '(1 OR 2) AND 3',                           // How to combine the above clauses, without this: 'AND'.
));
$response1 = $workbooks->assertGet('crm/organisations', $filter1);
$workbooks->log('Fetched objects using filter1', array($filter1, $response1['data']));
```

Filter syntax 2: JSON-formatted

```
// The equivalent using a second filter structure: a JSON-formatted string  array of arrays containg 'field, comparator, contents'
$filter2 = array_merge($limit_select, array(
  '_filter_json' => '['.
    '["main_location[county_province_state]", "eq", "Berkshire"],' .
    '["main_location[county_province_state]", "ct", "Yorkshire"],' .
    '["main_location[street_address]", "not_blank", ""]' .
    ']',
  '_fm' => '(1 OR 2) AND 3',                          // How to combine the above clauses, without this: 'AND'.
));
$response2 = $workbooks->assertGet('crm/organisations', $filter2);
$workbooks->log('Fetched objects using filter2', array($filter2, $response2['data']));
```

Filter syntax 3: array of filters

```
// The equivalent using a third filter structure: an array of filters, each containg 'field, comparator, contents'.
$filter3 = array_merge($limit_select, array(
  '_filters[]'     => array(
     array('main_location[county_province_state]', 'eq', 'Berkshire'),
     array('main_location[county_province_state]', 'ct', 'Yorkshire'),
     array('main_location[street_address]', 'not_blank', ''),
  ),
  '_fm' => '(1 OR 2) AND 3',                          // How to combine the above clauses, without this: 'AND'.
));
$response3 = $workbooks->assertGet('crm/organisations', $filter3);
$workbooks->log('Fetched objects using filter3', array($filter3, $response3['data']));
```

Filter comparison operators

- Many, see the API Developers Guide for a full list
- **eq** - equality, **ne** - not equals
- **bg** - begins with, **nbg** - does not begin with
- **ct** - contains, **nct** - does not contain
- Some do not require a value - specify ‘’:
  - **false**, **true**, **blank**, **not_blank**, **today**
- **eq** and **bg** much faster than **ct** etc.

Using a report with filters

- Benefit: combine data from several related records
- Apply filters to select specific record(s)
- Report definition encapsulates complex rules
  - Don’t try to be too complex (performance)
  - Consider indexes
- Fetch report metadata to discover columns etc
- See report_examples.php

```
$view_name='Inventory:By Competition';
$escaped_data_view_name = rawurlencode($view_name);
$response = $workbooks->assertGet("data_view/{$escaped_data_view_name}", $filter);
```

Exercise: Fetch people records

- Write a script to fetch all People whose county is ‘Berkshire’.

Fetch people records: example

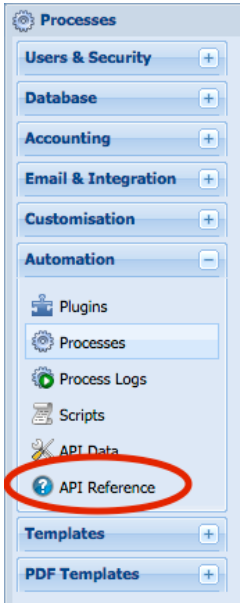
```
<?php

$filter = [
   '_filters[]' => [
     ['main_location[county_province_state]', 'eq', 'Berkshire'],
   ],
];

$people_response = $workbooks->assertGet('crm/people',$filter);
$workbooks->log('response', $people_response, 'info');
```

Metadata

- Calls retrieve this for you - see metadata_example.php
- The documentation in the API Reference Guide is invaluable



Api Data

Class Private::Automation::ApiData

A persistent key-value store for Workbooks API clients - see the help for more details.

URL

Requests for this model should be directed to `automation/api_data.api`

Fields:

Field name	Label	Description	Null?	Filter?	Sort?	Create?	Update?	Required?	Visibility	Default value	Type (bytes)	Picklist/Linked item
_can_chaccess	_can_chaccess	Boolean specifying whether you can change the permissions on this object.	false	false	false	false	false	false	invisible	true	boolean (1)	N/A
_can_chown	_can_chown	Boolean specifying whether you can change the owner of this object.	false	false	false	false	false	false	invisible	true	boolean (1)	N/A
_can_delete	_can_delete	Boolean specifying whether you can delete this object.	false	false	false	false	false	false	invisible	true	boolean (1)	N/A
_can_modify	_can_modify	Boolean specifying whether you can modify this object.	false	false	false	false	false	false	invisible	true	boolean (1)	N/A
_can_read	_can_read	Boolean specifying whether you can read this object.	false	false	false	false	false	false	invisible	true	boolean (1)	N/A
created_at	Created at	When this object was created.	true	true	true	false	false	false	visible	nil	datetime	N/A
created_by	Created by	The id of the creator of this object.	true	true	true	false	false	false	invisible	nil	integer (4)	N/A
created_by_user[login_name]	Created by login	The login name of the User that created this object.	true	true	true	false	false	false	visible	nil	string (255)	N/A
created_by_user[person_name]	Created by name	The name of the User that created this object.	false	true	true	false	false	false	visible	nil	string (255)	N/A
created_through	Created through	A keyword describing the creating application of this record.	false	true	true	false	false	false	hidden	nil	string (255)	N/A
Field name	**Label**	**Description**	**Null?**	**Filter?**	**Sort?**	**Create?**	**Update?**	**Required?**	**Visibility**	**Default value**	**Type (bytes)**	**Picklist/Linked item**
created_through_reference	External Reference	A value defined by the creating application - normally a reference to an external equivalent record that is the source of this record.	false	true	true	true	true	false	hidden	""	string (255)	N/A
id	Id	The id of this object.	false	true	true	false	false	false	hidden	nil	integer (4)	N/A
key	Key	A key to identify this API Data item	false	true	true	true	true	true	visible	nil	string (255)	N/A
lock_version	Lock version	Modification count - incremented each time this object is changed. You cannot modify this object without submitting a matching value for lock_version.	false	true	true	false	false	false	invisible	0	integer (4)	N/A
owner[login_name]	Owner login	The login name of the User that owns this object.	true	true	true	false	false	false	visible	nil	string (255)	N/A
owner[person_name]	Owner name	The name of the User that owns this object.	false	true	true	false	false	false	visible	nil	string (255)	N/A
owner_id	Owner	The id of the owner of this object.	true	true	true	false	false	false	invisible	nil	integer (4)	N/A
type	STI type	Type column that specifies the class of each row.	false	true	true	false	false	true	invisible	nil	string (255)	N/A
updated_at	Updated at	When this object was last updated.	true	true	true	false	false	false	visible	nil	datetime	N/A
updated_by	Updated by	The id of the last updater of this object.	true	true	true	false	false	false	invisible	nil	integer (4)	N/A
Field name	**Label**	**Description**	**Null?**	**Filter?**	**Sort?**	**Create?**	**Update?**	**Required?**	**Visibility**	**Default value**	**Type (bytes)**	**Picklist/Linked item**
updated_by_user[login_name]	Updated by login	The login name of the User that updated this object.	true	true	true	false	false	false	visible	nil	string (255)	N/A
updated_by_user[person_name]	Updated by name	The name of the User that last updated this object.	false	true	true	false	false	false	visible	nil	string (255)	N/A
value	Value	The value which is stored for this API Data item	true	true	true	true	true	false	visible	nil	text (65535)	N/A

Related models:

Association name	Label	Description	Target Models	Type	Polymorphic?	Foreign key	Through	Min. items	Max. items
created_by_user	Created by	The creator of this object.	Global::UnrestrictedUser	belongs_to	false	created_by		0	1
owner	Owner	The owner of this object.	Global::UnrestrictedUser	belongs_to	false	owner_id		0	1
updated_by_user	Updated by	The last updater of this object.	Global::UnrestrictedUser	belongs_to	false	updated_by		0	1

Workbooks Data Model

- Main Objects
  - People/Organisations/Parties
  - Leads
  - Opportunities/Quotations/Orders/Invoices/Credit Notes
    - Line Items
  - Marketing Campaigns, Members, Statuses
  - Cases
  - API Data
- Custom Fields
- Queues
- Relationships
- Users, Groups, ACLs
- Search

Create

- Batch
  - up to 100 objects in a single request (which can become slow: consider smaller batches, maybe 10 or 20)
- Wire proto: id=0, lock_version=0
- Response: an array of
  - ‘affected objects’ - id, lock_version, …
- Create:
  - main objects
  - picklists and associations
  - dynamic linked items
  - relationships

Create a record

Simple create…

```
$create_one_organisation = array(
  'name'                                  => 'Birkbeck Burgers',
  'industry'                              => 'Food',
  'main_location[country]'                => 'United Kingdom',
  'main_location[county_province_state]' => 'Oxfordshire',
  'main_location[town]'                   => 'Oxford',
);
$response = $workbooks->assertCreate(
  'crm/organisations', $create_one_organisation);
$created_id_lock_versions = $workbooks->idVersions($response);
```

$response contains ‘affected_objects’ hash (id, lock_version, …)

Picklists

- Workbooks picklists are simple lists of string values
  - Some picklists have ‘open/closed’ state
  - ‘Resricted’ or ‘Unrestricted’
- Two endpoints:
  - admin/picklists: picklists
    (id, name)
  - admin/picklists: picklist_entries
    (picklist_id, value, display_order)

Fetch picklist entries

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```
/**
* Fetch the contents of a picklist, caching the response
*/
private function fetch_picklist_entries_and_cache($picklist_id) {
  static $result_cache = array();

  if (!isset($result_cache[$picklist_id])) {
    $picklist_api = 'picklist_data/Private_PicklistEntry/id/value';
    $response = $this->workbooks->assertGet($picklist_api,
       array('picklist_id' => $picklist_id));
    $result_cache[$picklist_id] = @$response;
  }
  return $result_cache[$picklist_id];
} // fetch_picklist_entries_and_cache()
```

Associations

- Associated records are linked by ID.
- Entries on a queue
- e.g. relationship to ‘parent’
  - Campaign member: marketing_campaign_id
  - Specify IDs when modifying
- relationships between records
- Separately: relationship APIs for many:many

Relationship APIs

- API endpoint depends on the record type
  - They differ due to additional fields such as relationship statuses

- **accounting/document_header_relationships**
  - between ‘transaction documents’
- **accounting/document_header_contacts**
  - between ‘transaction documents’ and ‘parties’
- **activity/activity_links**
  - between ‘activities’ and other items
- **related_items**
  - everything else

Create relationships

```
$create_relationships = array(
        'source_id' => $form_fields['id'],
        'source_type' => $form_fields['type'],
        'related_item_id' => $line_item[$all_fields_field],
        'related_item_type' => 'Private::Crm::MarketingCampaign',
);
$workbooks->assertCreate('related_items', $create_relationships);
```

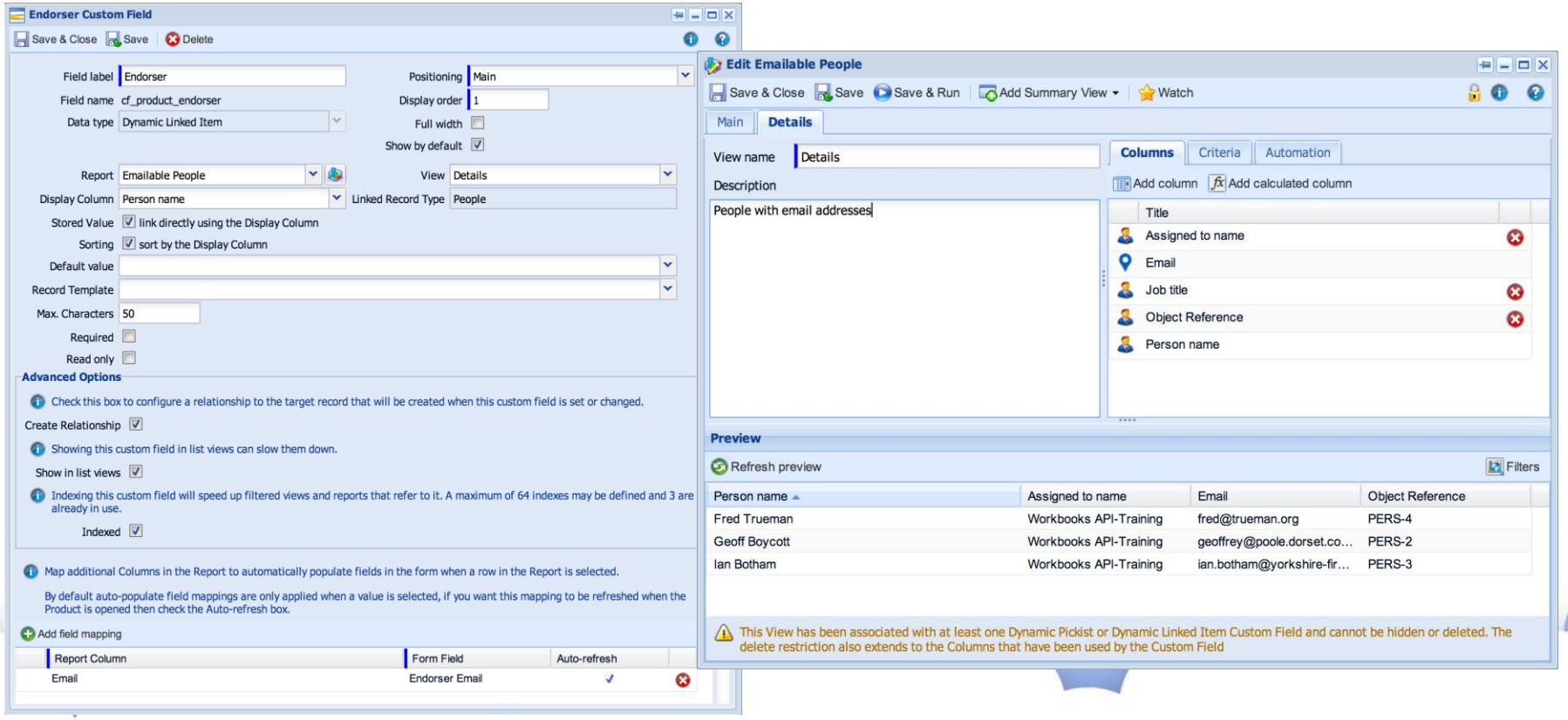
Relationships are normally bi-directional.

Dynamic Linked Items

- Dynamic Linked Items (DLIs)
- DLIs are custom associations between records
  - Populated through a report
  - Assign an ID to the field
  - The report used in a DLI must yield an ID field and typically has a Name field for display purposes
  - Operate on IDs, e.g. **cf_task_campaign** - contains an ID and a separate field, e.g. **cf_task_campaign__name** contains the name of the record
    - Note the double underscore before ‘name’.

DLI Configuration example

- Field: cf_product_endorser
- In this case, would be the ID of a Person



Queues

- Queues are collections of records
  - Simple workflow through assignment
- Records are assigned to Queues
- Users subscribe to Queues
- Each Queue **has separate IDs**

e.g. The assigned_to value for a person record is not compatible with that for an task

Queue Query - by ID

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```
/**
* Returns a queue name for a given queue ID and object type (specify the API), caching the result for efficiency.
*/
private function get_queue_name($queue_id, $api) {
  static $result_cache = array();

  if (empty($queue_id)) { return NULL; }
  $cache_key = "{$api}:{$queue_id}";
  if (!isset($result_cache[$cache_key])) {
    $get_queue = array(
      '_ff[]' => array('id'),
      '_ft[]' => array('eq'),
      '_fc[]' => array($queue_id),
      '_select_columns[]' => array('name'),
    );
    $response = $this->workbooks->assertGet($api, $get_queue);
    $result_cache[$cache_key] = @$response['data'][0]['name'];
  }
  return $result_cache[$cache_key];
} // get_queue_name()
private function get_person_queue_name($queue_id){ return $this->get_queue_name($queue_id, 'crm/person_queues'); }
private function get_sales_lead_queue_name($queue_id){ return $this->get_queue_name($queue_id, 'crm/sales_lead_queues'); }
```

Queue Query - by Name

```
/**
* Returns a queue ID for a given queue name and object type (specify the API), caching the result for efficiency.
*/
private function get_queue_id($queue_name, $api) {
  static $result_cache = array();

  if (empty($queue_name)) { return NULL; }
  $cache_key = "{$api}:{$queue_name}";
  if (!isset($result_cache[$cache_key])) {
    $get_queue = array(
      '_ff[]' => array('name'),
      '_ft[]' => array('eq'),
      '_fc[]' => array($queue_name),
      '_select_columns[]' => array('id'),
    );
    $response = $this->workbooks->assertGet($api, $get_queue);
    $result_cache[$cache_key] = @$response['data'][0]['id'];
  }
  return $result_cache[$cache_key];
} // get_queue_id()
private function get_activity_queue_id($queue_name){ return $this->get_queue_id($queue_name, 'activity/activity_queues'); }
private function get_person_queue_id($queue_name){ return $this->get_queue_id($queue_name, 'crm/person_queues'); }
private function get_sales_lead_queue_id($queue_name){ return $this->get_queue_id($queue_name, 'crm/sales_lead_queues'); }
```

Queue Query - by Name

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So to access the queue to which a record is assigned…

```
  /**
  *  Returns the queue name which the given record is assigned to
  */
  private function get_assigned_queue_name($record){
    switch($record['type']) {
      case 'Private::Crm::Person': return $this->get_person_queue_name($record['assigned_to']);
      case 'Private::Crm::SalesLead': return $this->get_sales_lead_queue_name($record['assigned_to']);
//// etc
      return NULL;
    }
  } // get_assigned_queue_name()
```

Data types

- Currency values:
  - *code amount fix* e.g. GBP 123.45 0
  - code: 3-character ISO-4217 code (GBP USD EUR JPY CHF)
  - fix: ignore this, set to zero (both currency and code can change)
- Dates, DateTimes - use the ‘C’ locale
  - "due_date" : "22 May 2009”
    - output format: %e %b %Y
  - "updated_at" : "Fri May 15 14:36:54 UTC 2009”
    - output format: %a %b %d %H:%M:%S %Z %Y
  - internally stored as seconds since the epoch
  - input formats are a little more flexible than this

Another ‘create’ example: Quote

```
$today = date('Y-m-d');
$create_quote = array(
  'party_id'      => $party_id, //Set the party ID (Customer)
  'description'   => 'New quotation',
  'document_date'   => $today,
  'document_currency' => 'GBP',
);

$creation_response = $workbooks->assertCreate('accounting/quotations', $create_quote);
// $creation_response['affected_objects'] is an array of hashes, each containing
// a number of fields including 'id' and 'lock_version':
//
//    @$creation_response['affected_objects'][0]['id']
//    @$creation_response['affected_objects'][0]['lock_version']
```

Line Items

- Creating Line Items, you must specify the ID of the item that they are linked to (document_header_id)
- e.g. for a Contract:

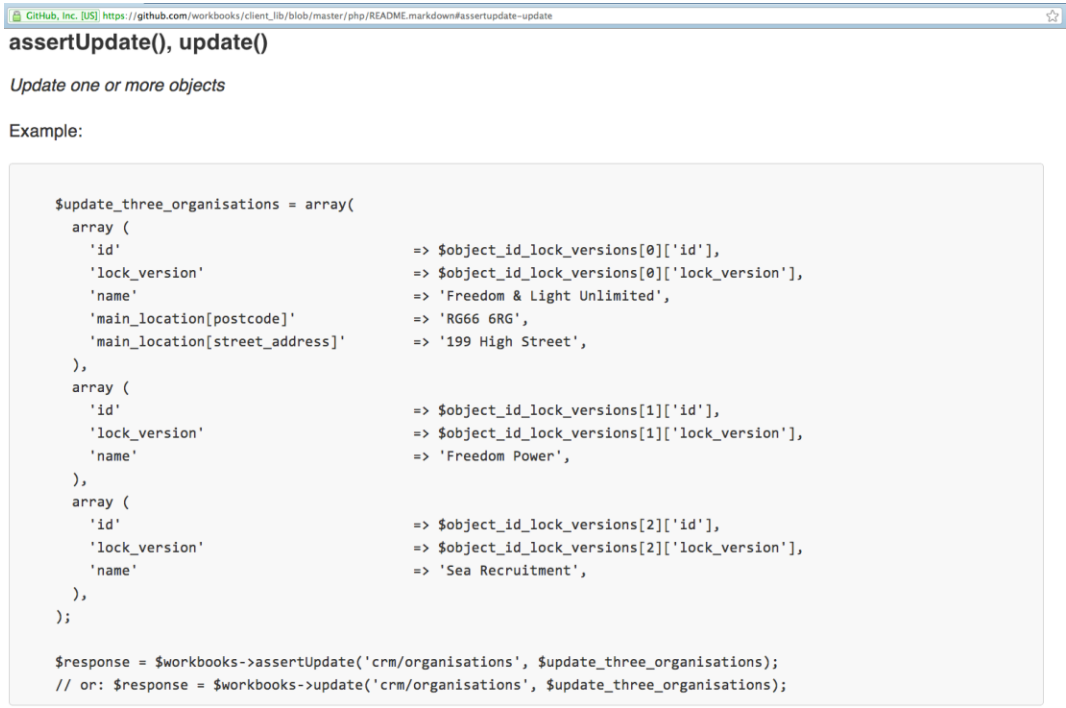
```
function add_interval_to_date($date_str, $interval='P1Y', $format='Y-m-d') { // Add interval to
date_str, returning date in format. Date must be in parseable format.
  $d = new DateTime($date_str);
  $d->add(new DateInterval($interval));
  return $d->format($format);
} // add_interval_to_date()

$create_contract_line_item = array(
    'document_header_id' => $last_contract_line_item['document_header_id'],
    'end_date' => add_interval_to_date($last_contract_line_item['end_date'], $extend_by),
    'start_date' => add_interval_to_date($last_contract_line_item['end_date'], 'P1D'),
    'description' => $last_contract_line_item['description'],
    'product_id' => $last_contract_line_item['product_id'],
    'unit_quantity' => $last_contract_line_item['unit_quantity'],
    'document_currency_unit_price_value' =>
$last_contract_line_item['document_currency_unit_price_value'],
  );
  $workbooks->log('About to create a new contract line item', $create_contract_li
  $workbooks->assertCreate('accounting/contract_line_items', $create_contract_line_item);
```

PHP's DateInterval class is useful for adding and subtracting time periods.

Logging the parameters to your assertCreate() results in better log information than relying on automatic logging.

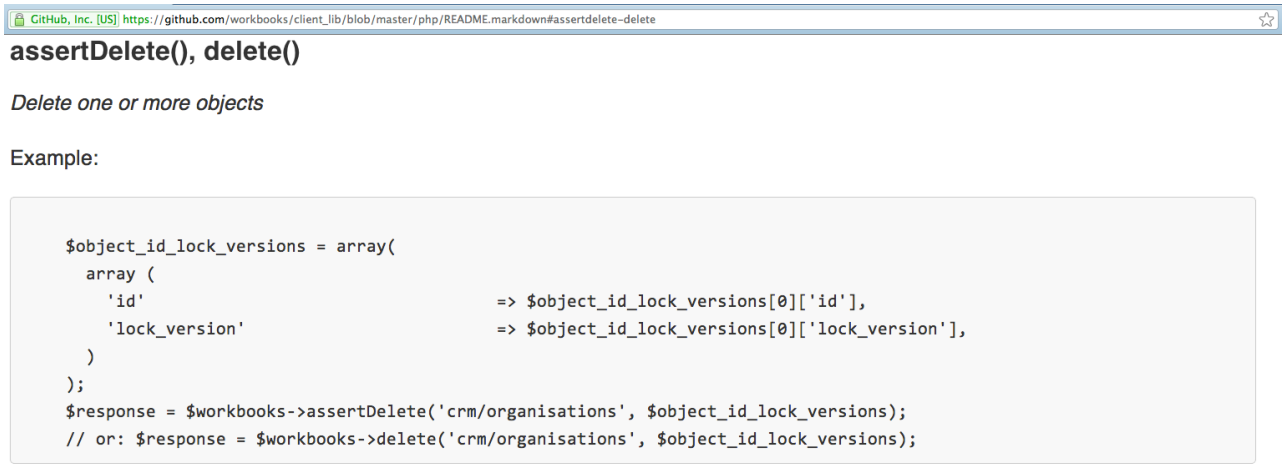
Update

- Required:
  - id
  - lock_version
  - _can_modify capability
  - fields to change
- Returns
  - An array of affected objects/errors
- Stale object error:
  - lock_version out of date



Delete

- Required:
  - id
  - lock_version
  - _can_delete capability



Example: delete all order line items process button

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```
/*
 * Clear out any old line items. Raise an exception on failure.
 */
function delete_all_line_items() {
  global $workbooks, $form_fields;

  $select_order_line_items = array(
    '_ff[]'                                => 'document_header_id',
    '_ft[]'                                => 'eq',
    '_fc[]'                                => $form_fields['id'],
    '_select_columns[]'                    => array(
      'id',
      'lock_version',
    )
  );
  $workbooks->log('$select_order_line_items', $select_order_line_items);
  $response = $workbooks->assertGet('accounting/sales_order_line_items', $select_order_line_items);
  $delete_order_line_items = $response['data'];
  if (!empty($delete_order_line_items)) {
    $response = $workbooks->assertDelete('accounting/sales_order_line_items', $delete_order_line_items);
    $workbooks->log(count($delete_order_line_items) == 1 ? 'One order line item removed.' : count($delete_order_line_items) . " order line items removed.");
  }
  else {
    $workbooks->log('No order line items present.');
  }
} // delete_all_line_items()
```

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Modifying data with the Wire Protocol

- You must supply an _authenticity_token (retrieved during login)
- For ‘create’ (for historic reasons) always specify a filter which selects no records (‘id=0’)
- Every array of parameters must be the same size
- Content-type:
  - Normally use application/x-www-form-urlencoded
  - Use multipart/form-data if you are uploading files

API Behaviour flags

- Pass these at login or per-request:
  - **_strict_attribute_checking** - set to true to reject requests to modify fields which do not exist (recommended)
  - **_time_zone** - override user-configured timezone

- Pass at login:
  - **json=pretty** (slows things down a little)
  - **_application_name**
  - **api_version=1**

Sending Email

- Sending email
  - e.g. send a report.
  - Uses the user's email settings as configured in Workbooks to deliver.
  - API allows creation of drafts, or send immediately
  - API allows the use of email templates …. from email_send_example.php:

```
/*
 * Choose a template and a Case then use it to Send an email about the Case.
 */
$send_templated_email = array(
  'render_with_template_name' => 'Autotest Template',
  'render_with_resource_type' => 'Private::Crm::Case',
  'render_with_resource_id' => 2,
  'from_address' => 'from_address@workbooks.com',
  'to_addresses' => 'to.address1@workbooks.com, to.address2@workbooks.com',
  'cc_addresses' => 'cc.address1@workbooks.com, cc.address2@workbooks.com',
  'bcc_addresses' => 'bcc.address@workbooks.com',
  'status' => 'SEND',
);
$workbooks->assertCreate('email/emails', $send_templated_email);
```

Other Useful APIs

- Sending email
  - e.g. send a report.
  - Uses the user's email settings as configured in Workbooks to deliver.
  - API allows creation of drafts, or send immediately
  - API allows the use of email templates

- Copy transaction document
  - Use the **create_from_id** parameter and specify the source document

- During login, specify **with_dropbox_email=true**
  - a dropbox will be created for the current user
  - bcc: it to send a copy into Workbooks and relate to items (e.g. by object_ref) automatically

- API Data
  - Useful to hold process 'state' between invocations.
  - Do work in small batches.

Synchronisation Hints and Tips

- Consider where it should run: on-premises or in Process Engine
- Typically run as a user with visibility of ALL records so ‘delta’ synchronisation can be reliable (examining and updating only recently-changed records)
  - Without visibility of everything, consider what happens if the set of visible records changes
- For efficiency, store external IDs in the ‘External Reference’ field (created_through_reference) rather than in a custom field. And set ‘Created Through’ field to your application name.
- Look for records where updated_at is on or after the latest updated_at previously considered
- Include the is_deleted field in your filter to see deleted records alongside undeleted records
- Make sure you trim() fields to fit
- Consider conflicting edits on each system
- Don’t stall the entire sync just because a single record cannot be synced
- Sync in batches, saving state/progress frequently
- Log object_ref whenever possible
- Email addresses do not have to be unique in Workbooks, they do in some other systems

Inward Synchronisation: Automated Import

- Avoid a lot of complexity: use Workbooks Import
- Scheduled Process fetches data
  - FTP / SFTP (FTP-over-SSH)
  - HTTP(S) API
  - SQL Database
- Create an Import job based on previous job plus received data
  - Import defines field mappings, error handling etc
- Multiple jobs, based on different template jobs, can run in a defined order
- Imports can be auto-approved/rolled back
- Easy to see data history

```
<?php

$configuration = array(
  'ftp' => array(
    'server' => '*************',
    'username' => '************',
    'password' => '*****************',
    'mode' => 'active', # ... or 'passive' (controls the way FTP transfers files)
    'directory' => '/',
  ),
  'imports' => array(
    array(
      'name' => 'Customers',
      'file_name' => 'Customers.csv',
      'template_import_job_name' => 'Organisations - Mon 22 Sep 2014 12:54:33',
    ),
    array(
      'name' => 'BackOrders',
      'file_name' => 'Backorders.csv',
      'template_import_job_name' => 'Opportunities - Fri 12 Sep 2014 10:06:07',
    ),
  ),
);

$ftp_import = new AutomaticFtpImport($workbooks, $configuration);
$good_run = $ftp_import->run();

exit($good_run ? 0 : 1);
```

Outward Synchronisation: Workbooks Reports

- Combine related records into a report and constrain
- Select columns
- External system
  - fetches using report API secured with API Key
  - can retrieve metadata through API

workbooks_api.php

Workbooks.com

github.com/workbooks, choose client_lib/php

- This is a worthwhile piece of code to review to understand how it uses the wire protocol.
  - Key functions:
    - assertCreate(), assertGet(), …
    - which call: create(), get(), …
    - which call: api_call()
    - which calls: make_request()

github
SOCIAL CODING

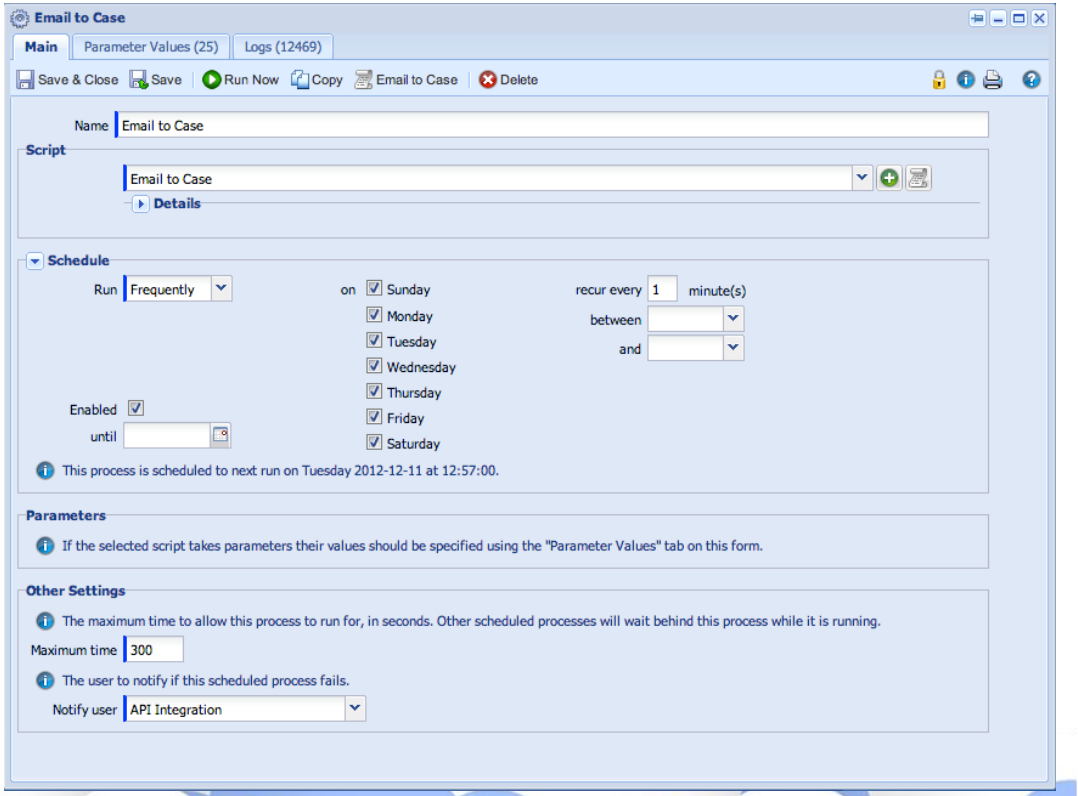
Files

- If a field is a file then use multipart/form-data content type for the transfer.
- Create attachments using the ‘resource_upload_files’ endpoint.
- Often fetch back using ‘upload_files’ endpoint.
- See the ‘Case Portal’ (in the script library) for an example in PHP. Or upload_file_example.php
- workbooks_api.php will give you a hint.
- Attaching files to email not currently possible through the API. Instead you must build your email the hard way using ‘rfc822’ format.

Scheduled Process

- Restriction: only one per database can run at a time
  - Duration should be small
- Exit Code matters
  - 0 => OK
  - 1 => Retry later
  - 2 => Failure
- Upon failure:
  - Process disabled
  - User notified

- On-Change Process
  - Almost the same, triggers on record change…

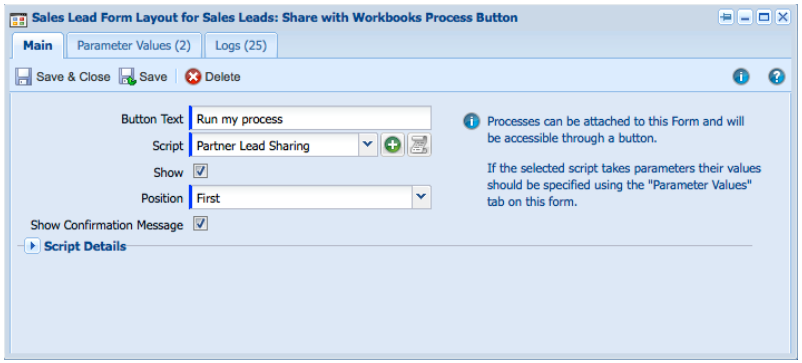


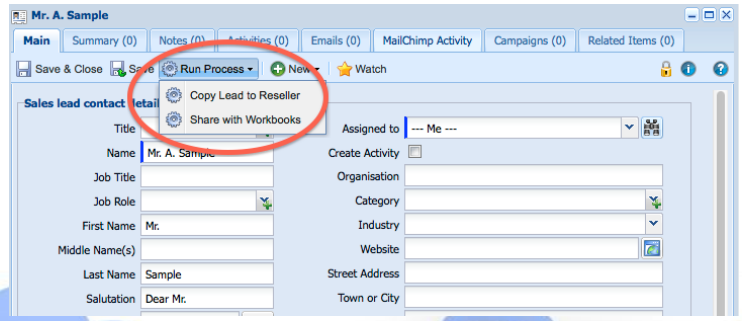
Exercise: Case Follow-up email

- Create a custom field which records if a follow-up email was sent
- Find all cases in ‘Awaiting customer response’ state which have not had a follow-up email and send a reminder to the primary contact of each.
- As each email is sent, record that the email was sent

Process Button

- Added via Custom Form Layout.
  - Automation tab
- Buttons appear on record toolbar.
- Process invoked after successful validation and save of the record.
- Process completes before form reloads.
- Form fields passed to the process in $form_fields array.
- Summary shown as an alert message unless turned off.
- Button processes can be attached to the record save action to run every time.





Exercise: Process Button Case Reminder

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- Take the code you wrote to send a reminder about a Case and make it run for the current Case using a Process Button.

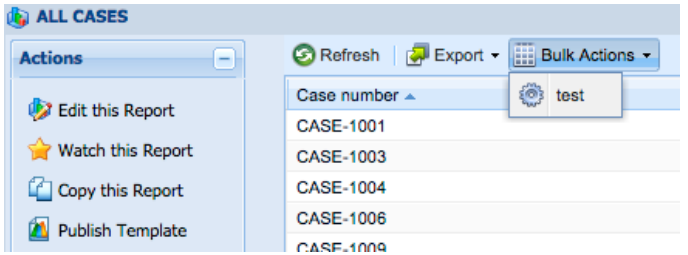
Exercise: Order Configurator

- Create the following custom fields in a section for Orders:

- Create a simple Order Configurator:
  - A process button should interpret those fields and create a set of line items.
  - e.g. for a 6-month subscription create 6 line items, at monthly intervals.

Report Process

- Process added as a ‘Bulk Action’ to reports when viewed.
- User prompted to confirm the operation.



- Script passed the ID of the report being viewed.

```
'$form_fields' =>
 array (
   'data_view_id' => '2058',
 ),
```

- Script can then use reporting API to fetch records and operate on them, in the background, usually changing the records so they no longer meet the report’s criteria.

Some Examples

- Order Configurator
- HubSpot Synchronisation
- Case Portal - portals in general
- Box Integration
- MailChimp Synchronisation - checkpointing
- Email to Case

API Gotchas

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- **Don't…**
  - Cache cookie values between multiple requests
    - Always send back the value of the cookie just received
  - Do your own JSON parsing!
  - Assume ordering of response fields - they are unordered
  - Implement your own HTTP stack. Use the one from your framework
  - Forget to escape HTML entities
  - Forget to consider locale: character sets, timezone
  - Leave performance as an afterthought; test with realistic data volumes

Ensuring UI responsiveness

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- Do not do very much at all in process buttons
  - Do the heavy lifting in scheduled processes - consider a implementing a queue of work in API Data
- Checkpoint frequently to break up long-running processes

In general

- Filters: filter on indexed fields, ideally on the main table and use ‘eq’ or ‘starts with’
- Do not run repetitive processes any more frequently than necessary
- Don’t update and refetch the same record multiple times: collect your changes together and apply in a small number of API calls

Error handling

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- If you are using a binding, use the assert…() method
- What happens if your script fails halfway through?
  - Catch exceptions where necessary and clean-up to leave a consistent state and/or log
- Expect errors
  - Timeouts and system errors will happen from time to time
- Stale object errors
  - Consider retrying the update or delete
- Consider using per_object_transactions
  - On failure, the whole request will roll back

Support

- The API changes from time to time
  - Features are added, e.g. the proportion of Workbooks which is accessible via the API increases.
  - All changes are backwards-compatible.
    - Any exceptions would be widely announced before reaching.
  - All published examples are auto tested
- Look at examples - on github.com/workbooks and in the Script Library
- Contact us via support@workbooks.com
  - Please include your code, the intention of the script, and as much information about the problem.
  - Make sure you've read your logs carefully first. Make sure you log well.
  - We really like tidy code which is easy to read and well formatted.
  - We are happy to write scripts for our customers if you purchase Admin Credits from us: contact sales@workbooks.com