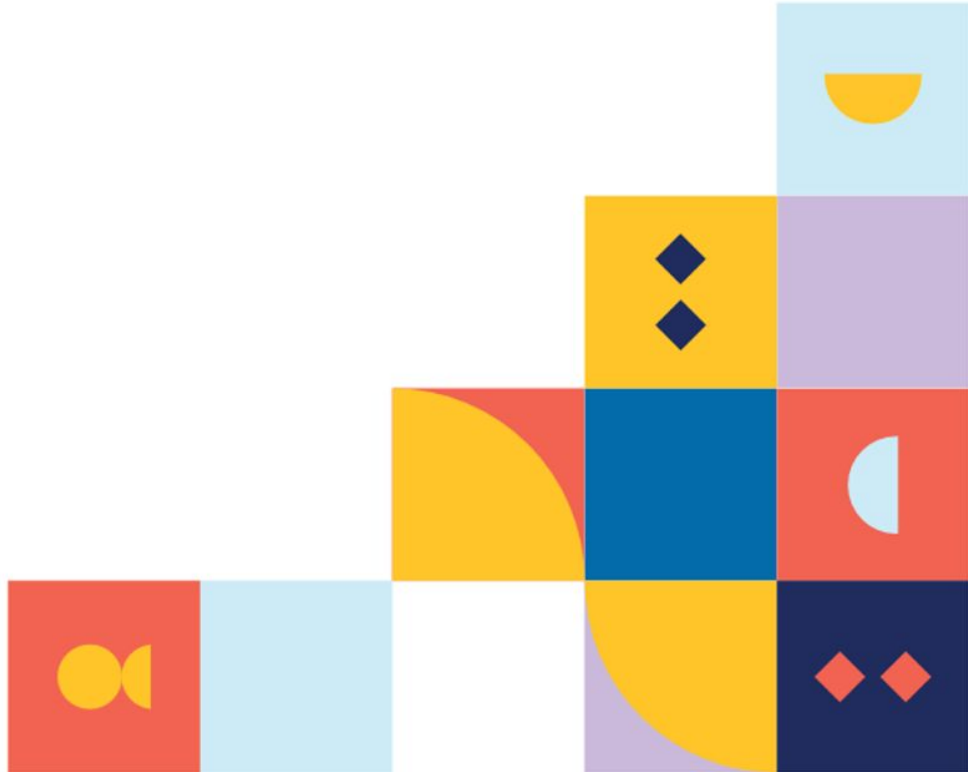
Scaling Drupal as a Headless Enterprise API

A High-Performance Case Study





DrupalCon
Vienna 2025
14 - 17 October



Vijaya Chandran Mani (vijaycs85)

DrupalCon Vienna 2025 14 - 17 October

- **19 years** working with Drupal (since Drupal 4)
- **Co-maintainer** of the *Configuration Translation* subsystem
- **Contributor** to Drupal Core & Contrib ecosystem
- **Provisional member** of Drupal Security team
- **Lead Drupal Developer** at *Reading Room (UK)*



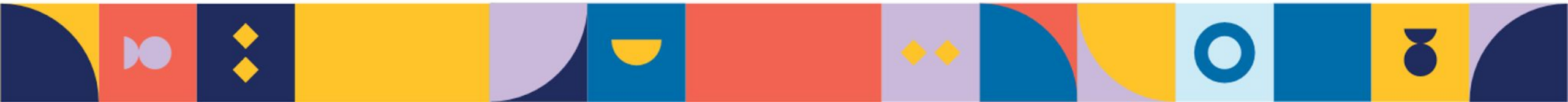
https://www.drupal.org/u/vijaycs85

Overview

- Architectural Overview
- High-level Design
- Implementation
- Performance Metrics
- Lessons learned
- Tools & Tips
- Contributed Modules

DrupalCon
Vienna 2025
14 - 17 October

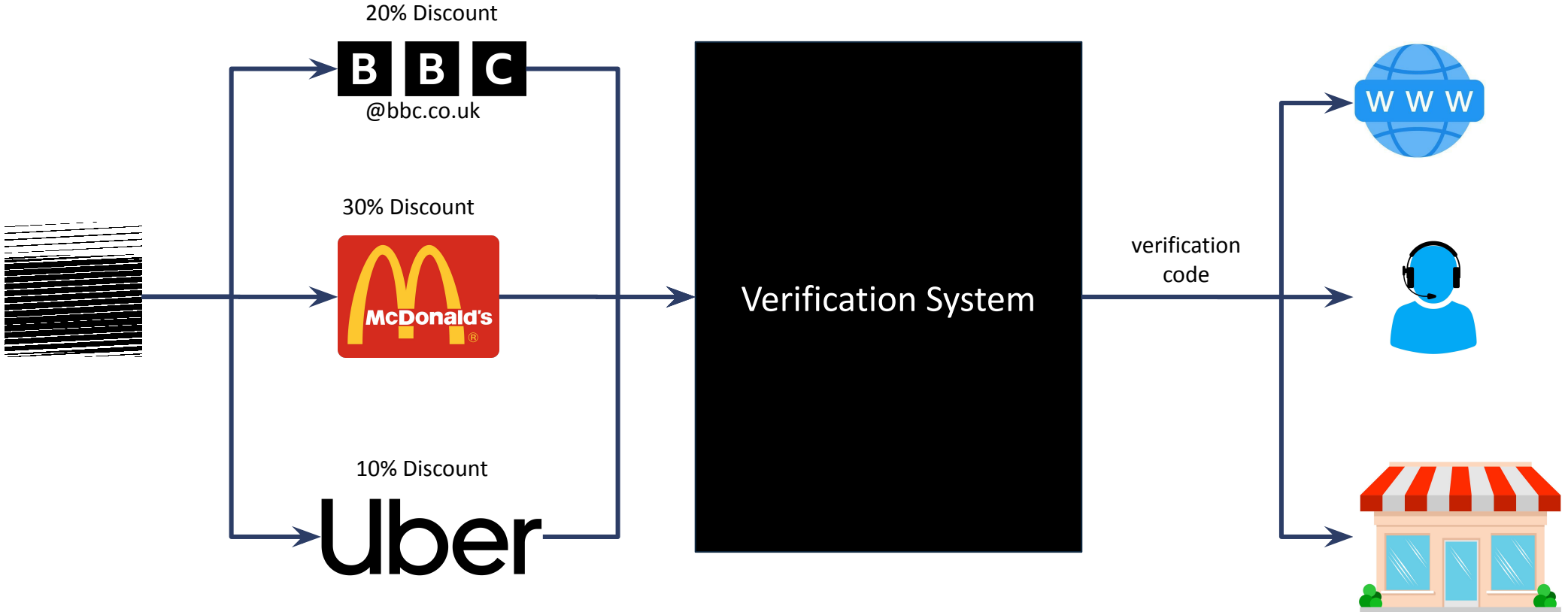
Architectural Overview



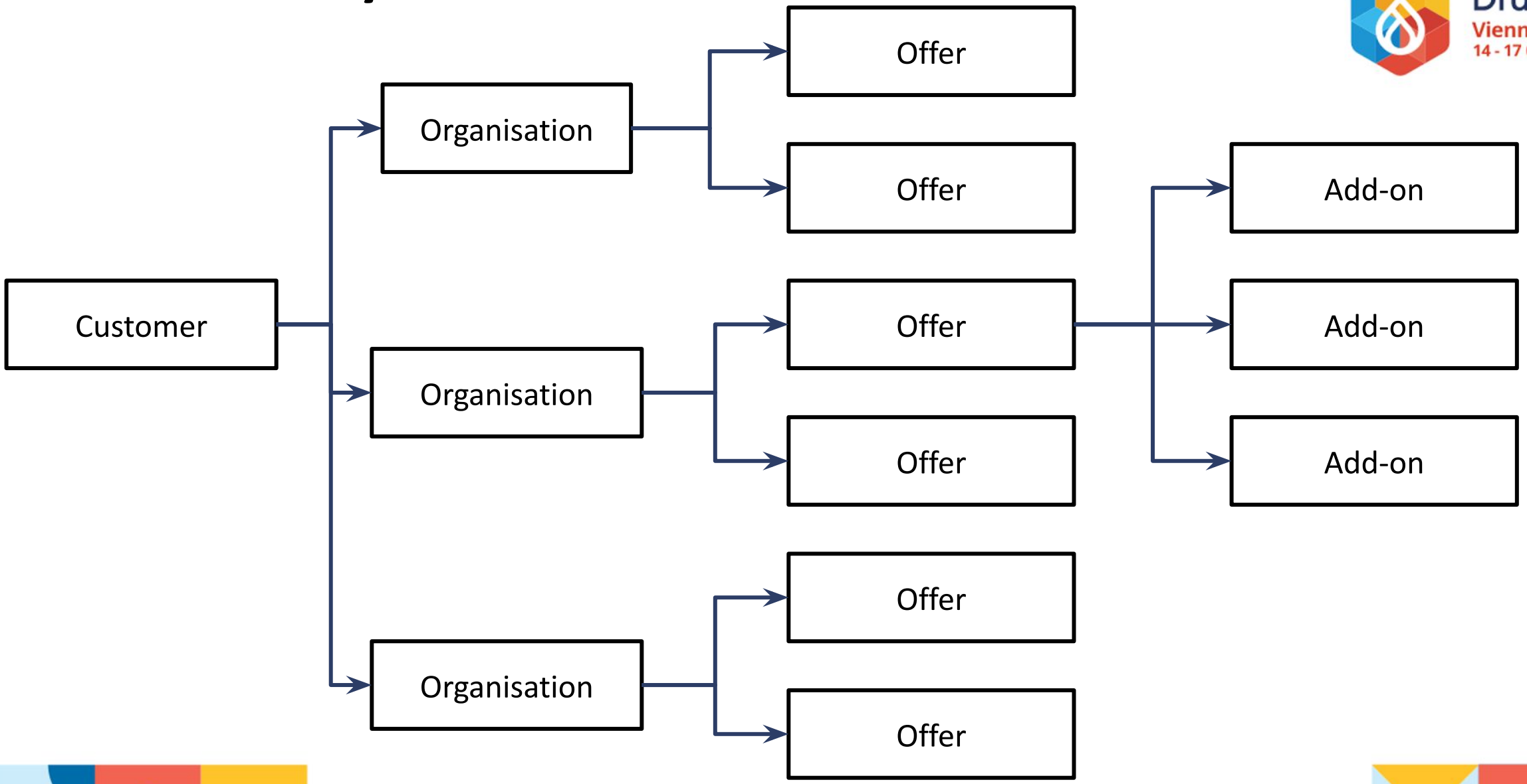
Project Overview

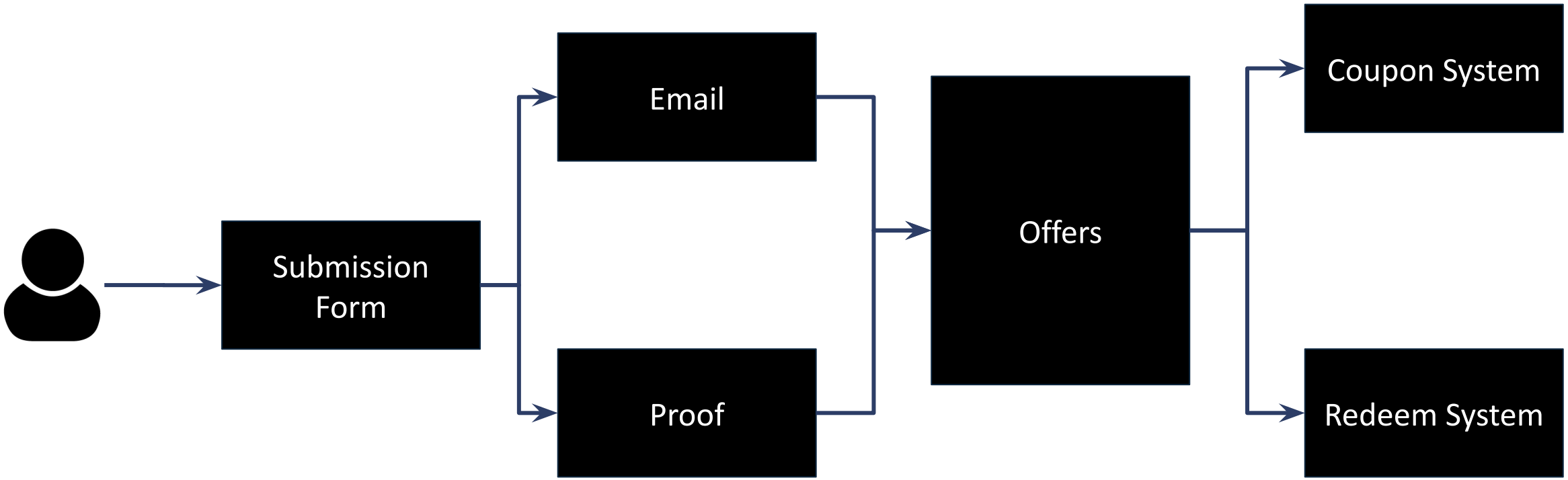
- e-Verification System (B2B)
- One of the large telecom company in North America
- Headless Drupal
- Performance
- Large volume of data
- Complex data structure

DrupalCon
Vienna 2025
14 - 17 October

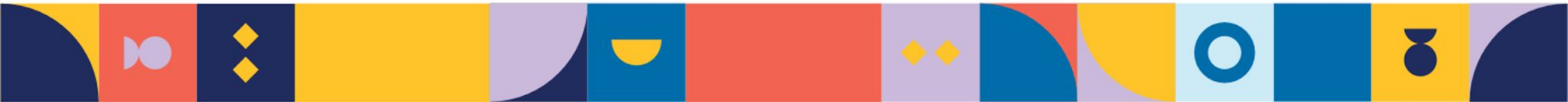

20% Discount
BBC
@bbc.co.uk
30% Discount
McDonald's
10% Discount
Uber
Verification System
verification
code
WWW

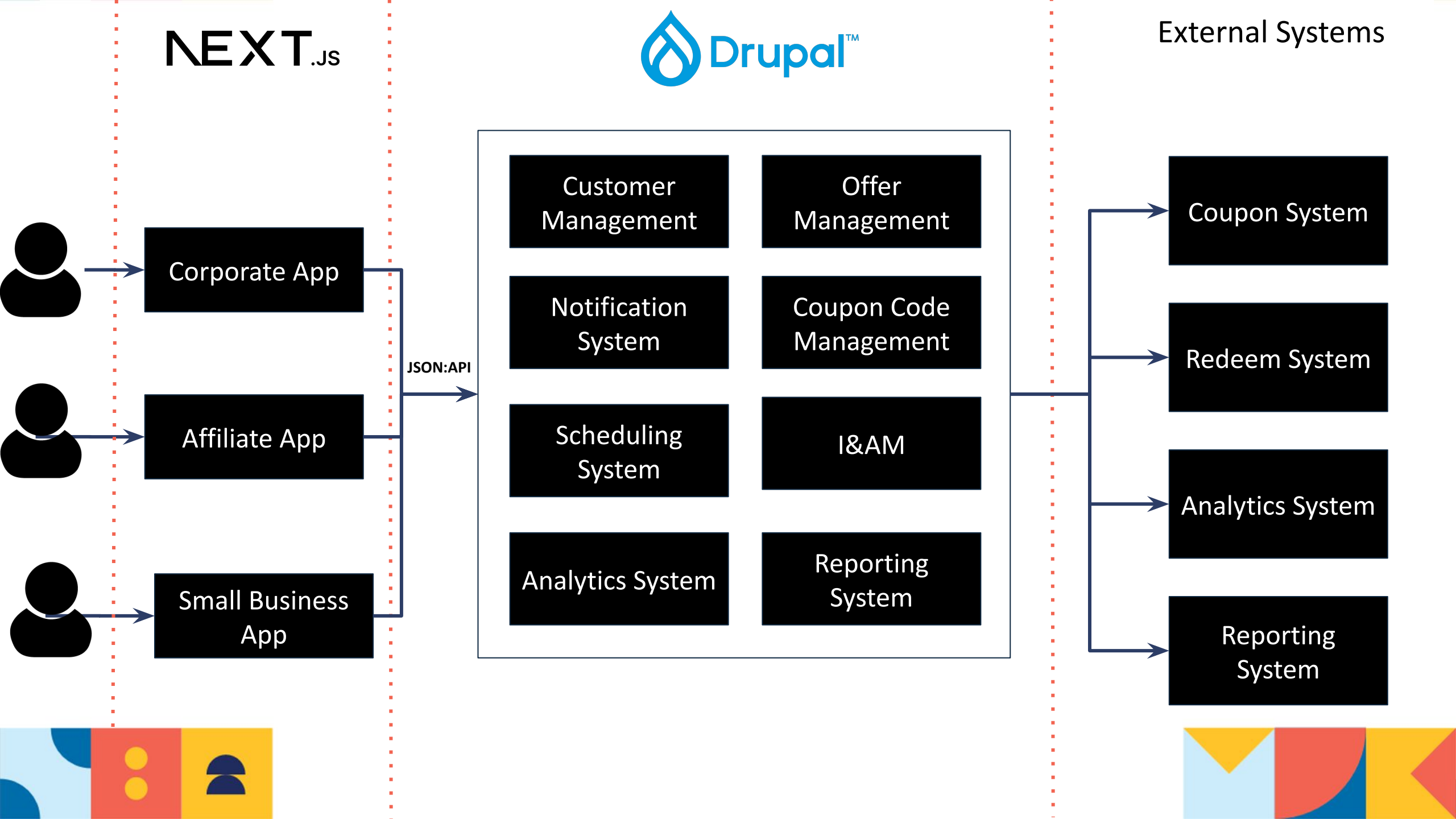
Verification System



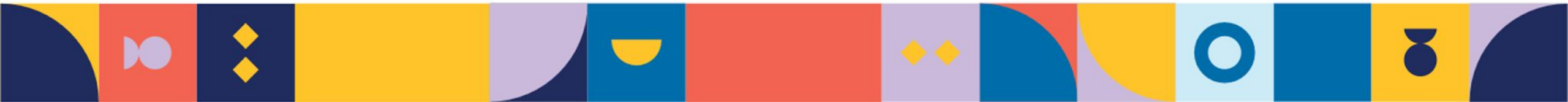

Email
Submission Form
Proof
Offers
Coupon System
Redeem System

High-level Design




NEXT.JS
Drupal™
External Systems
Corporate App
Affiliate App
Small Business App
JSON:API
Customer Management
Offer Management
Notification System
Coupon Code Management
Scheduling System
I&AM
Analytics System
Reporting System
Coupon System
Redeem System
Analytics System
Reporting System

Implementation



Main Components

- Custom Entities (Entity API)
- Custom Fields (Field API)
- JSON:API Resources
- Custom API Authentication





Custom Entity

```
* @ContentEntityType(
*   id = "playground_organization",
*   label = @Translation("Organization"),
*   label_collection = @Translation("Organization"),
*   handlers = {
*     "view_builder" = "Drupal\Core\Entity\EntityViewBuilder",
*     "list_builder" = "Drupal\playground_organization\Entity\Organization\ListBui
*     "views_data" = "Drupal\playground_organization\Entity\Organization\ViewsData
*     "permission_provider" = "Drupal\entity\EntityPermissionProvider",
*     "access" = "Drupal\playground_organization\Entity\Organization\AccessControl
*     "form" = {
*       "add" = "Drupal\playground_organization\Entity\Organization\Form",
*       "edit" = "Drupal\playground_organization\Entity\Organization\Form",
*       "delete" = "Drupal\Core\Entity\ContentEntityDeleteForm",
*     },
*     "route_provider" = {
*       "default" = "Drupal\entity\Routing\AdminHtmlRouteProvider"
*     },
*     "storage_schema" = "Drupal\playground_organization\Entity\Organization\Stora
*   },
*   base_table = "playground_organization",
*   translatable = FALSE,
*   admin_permission = "administer organizations",
*   entity_keys = {
*     "id" = "id",
*     "uuid" = "uuid",
*   },
*   links = {
*     "add-form" = "/admin/organization/add",
```

```
$submission = Submission::load(123);
$add_ons = $submission
  ->organization()
  ->Offer()
  ->addOns();
```

DrupalCon
Vienna 2025
14 - 17 October

Custom Field



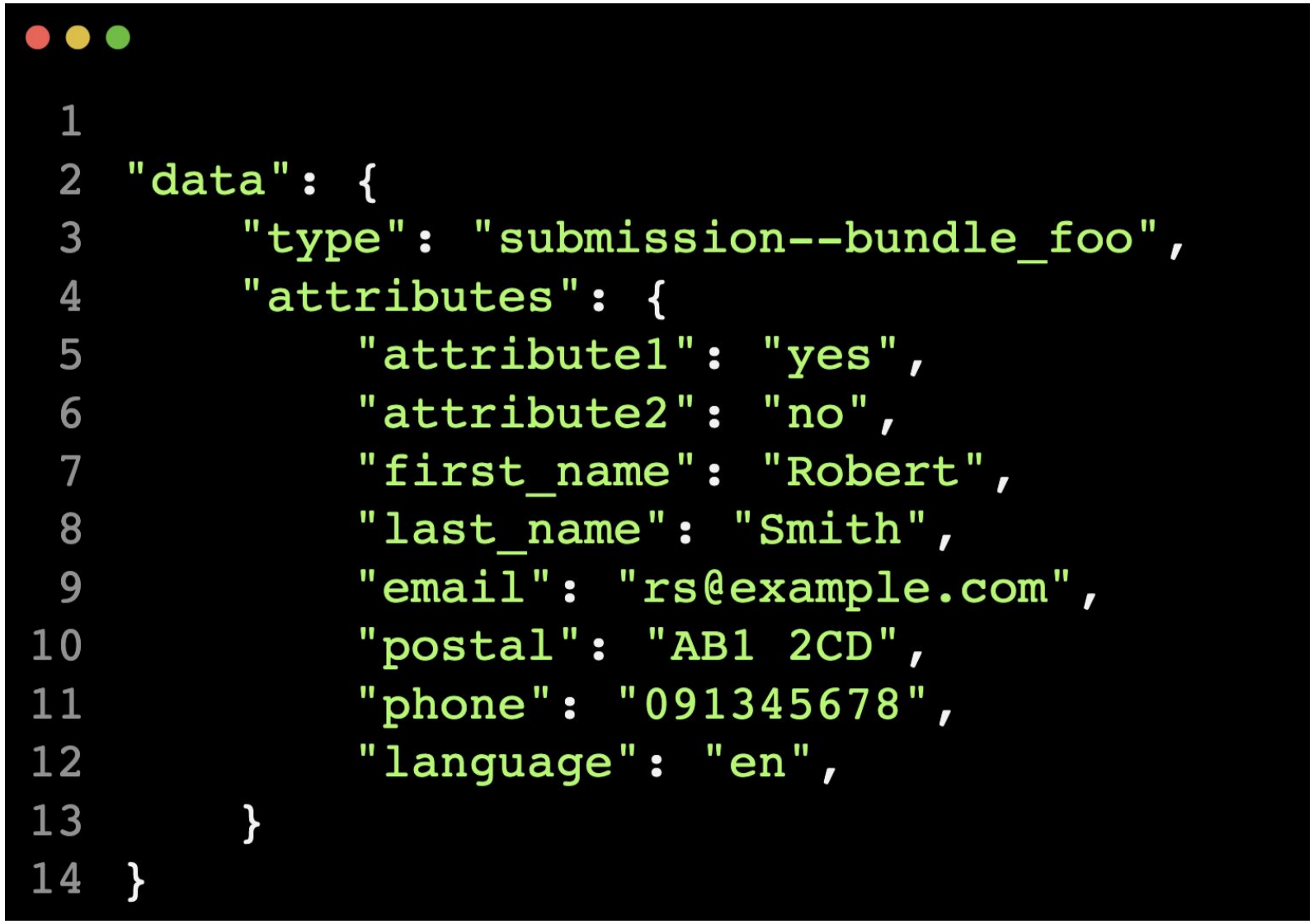
DrupalCon
Vienna 2025
14 - 17 October

```php
public static function propertyDefinitions(FieldStorageDefi
  $properties['notes'] = DataDefinition::create('string')
    ->setLabel(new TranslatableMarkup('notes'))
    ->setSetting('case_sensitive', $field_definition->getSet
    ->setDescription(t('Notes to add.'));

  $properties['timestamp'] = DataDefinition::create('intege
    ->setLabel(new TranslatableMarkup('Created timestamp'))
    ->setDescription(t('The time that the note was created.'

  $properties['author'] = DataDefinition::create('integer')
    ->setLabel(new TranslatableMarkup('Author of notes'))
    ->setDescription(t('The user ID of the notes.'));

  return $properties;
}
```





JSON:API Resources



```
{
  "data": {
      "type": "submission--bundle_foo",
      "attributes": {
          "attribute1": "yes",
          "attribute2": "no",
          "first_name": "Robert",
          "last_name": "Smith",
          "email": "rs@example.com",
          "postal": "AB1 2CD",
          "phone": "091345678",
          "language": "en",
      }
}
```

DrupalCon
Vienna 2025
14 - 17 October

Custom Authentication



- Use Drupal\Core\Authentication\AuthenticationProviderInterface
- Anonymous Role vs API user (with specific roles)
- Token based verification





Token Generation vs Verification



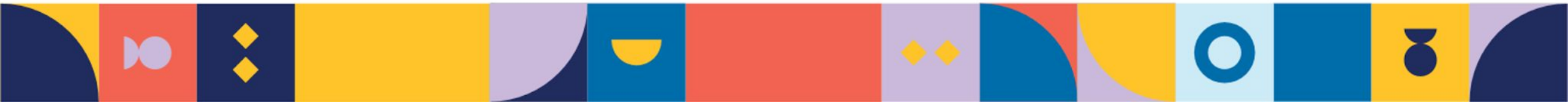
DrupalCon
Vienna 2025
14 - 17 October

```php
public function validate($token, $value = '') {
    $seed = $this->sessionMetadata->getCsrfTokenSeed();
    if (empty($seed)) {
      return FALSE;
    }
    $value = $this->computeToken($seed, $value);
    // PHP 8.0 strictly typehints for hash_equals. Maintain BC until we can
    // enforce scalar typehints on this method.
    if (!is_string($token)) {
      return FALSE;
    }

    return hash_equals($value, $token);
  }

protected function computeToken($seed, $value = '') {
  return Crypt::hmacBase64($value, $seed . $this->privateKey->get() . Settings::getHashSalt
}
```

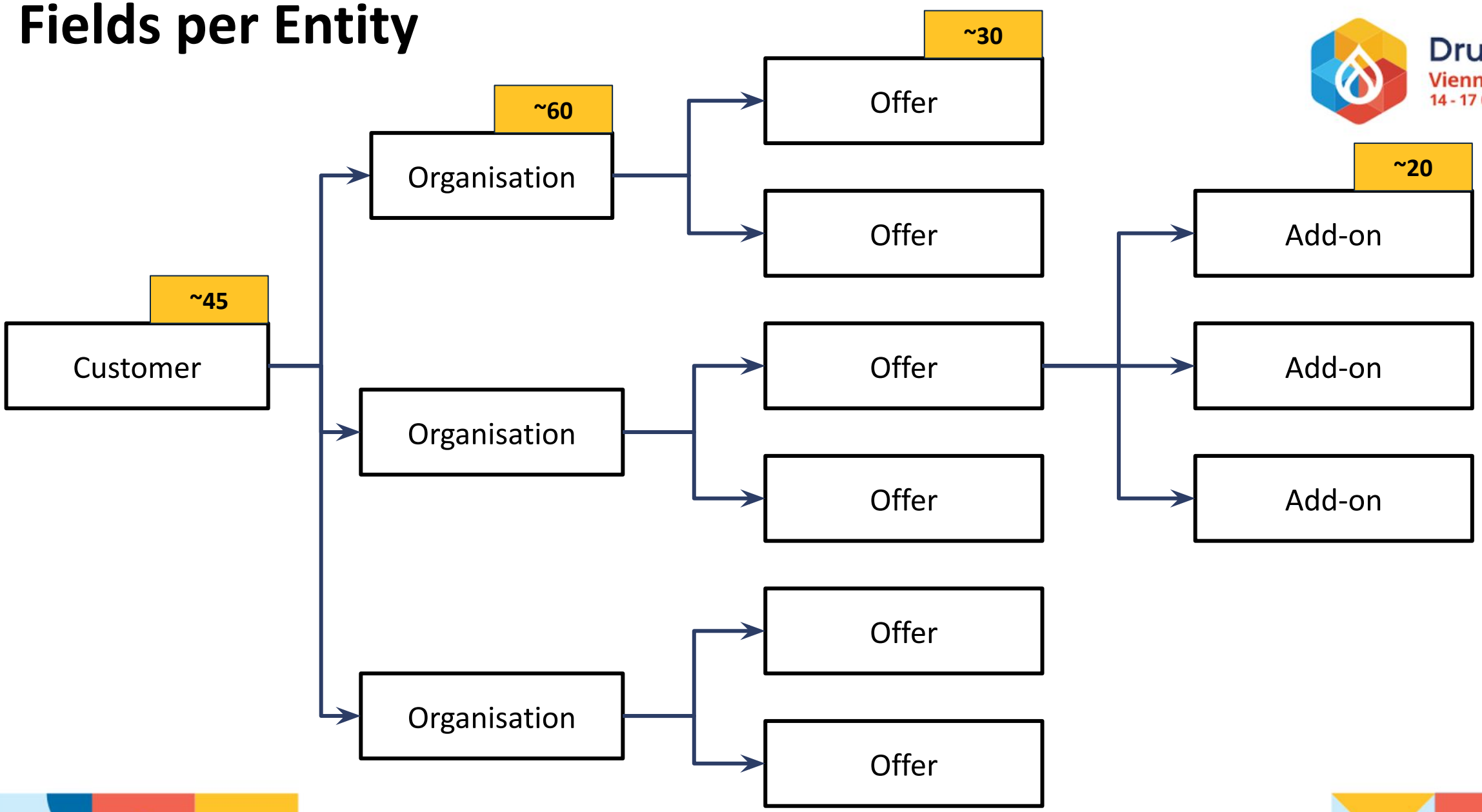




Performance Metrics

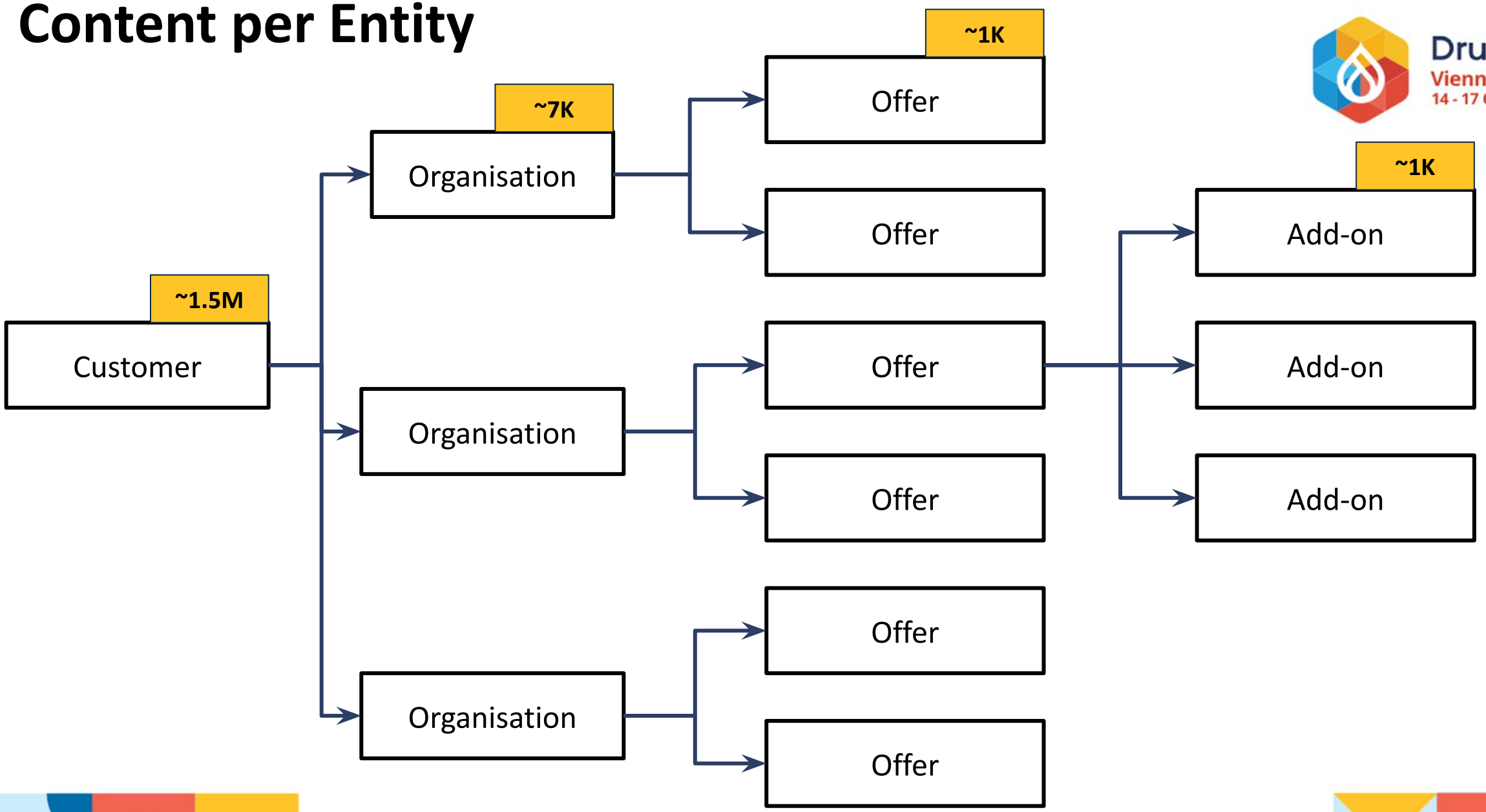


Fields per Entity



DrupalCon
Vienna 2025
14 - 17 October

Content per Entity



DrupalCon
Vienna 2025
14 - 17 October

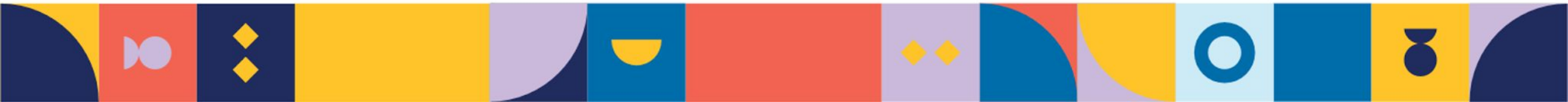
Load Test (Jmeter/k6)

Item	Data
Concurrent Threads	~100
Duration	10 minutes
Throughput	~7500 rpm
Avg. Response time	~500 ms
Total Requests	~22,000

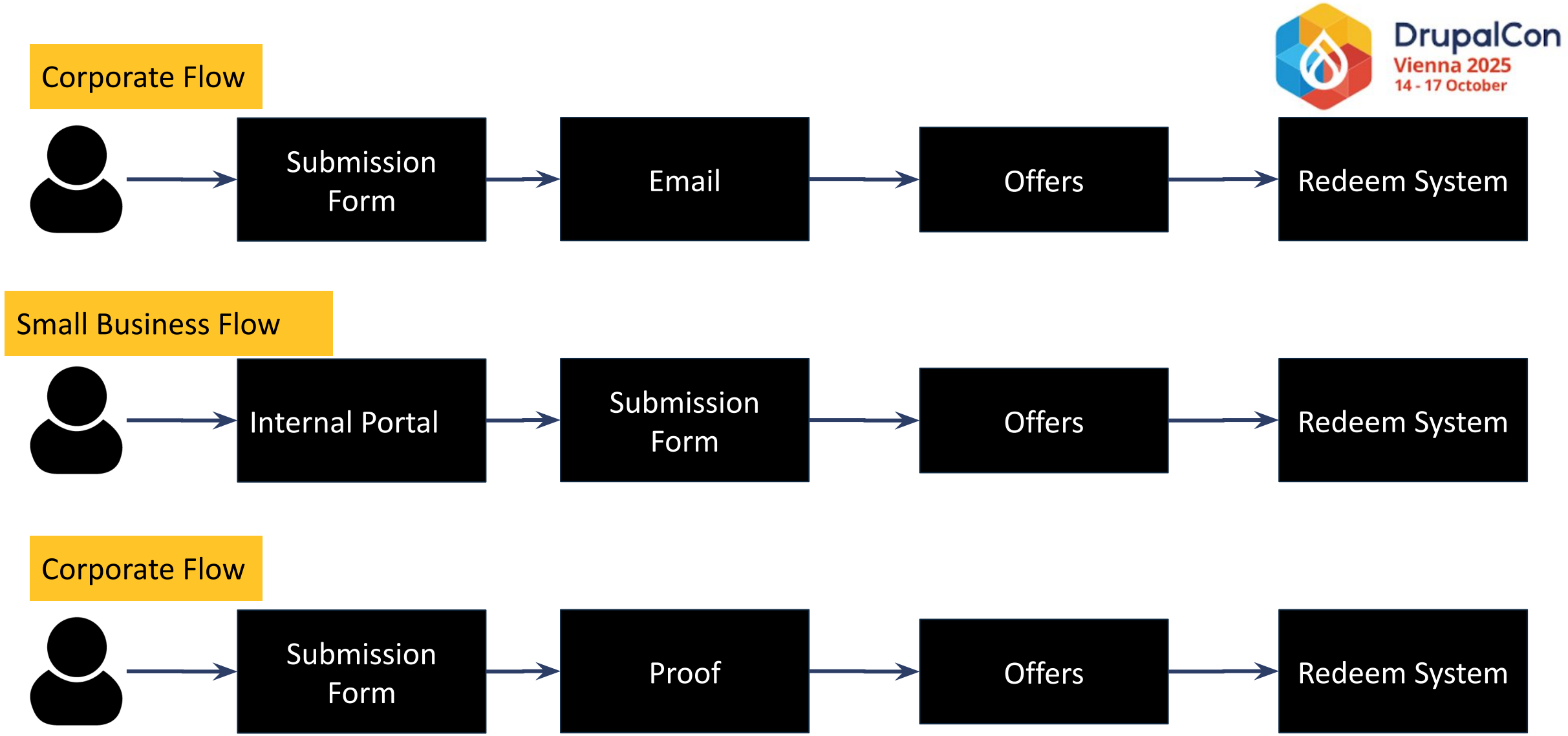




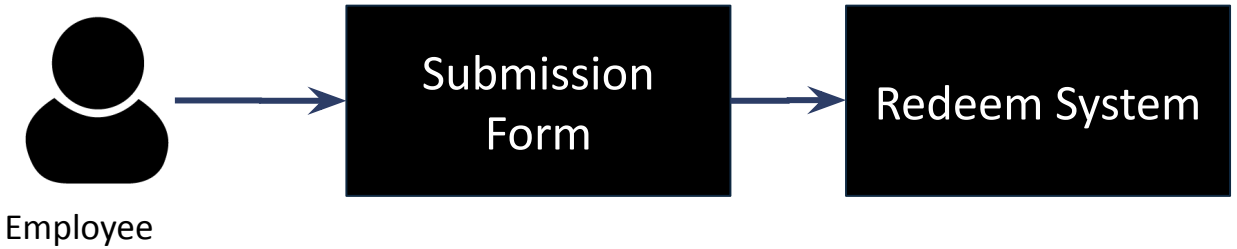
Lessons Learned



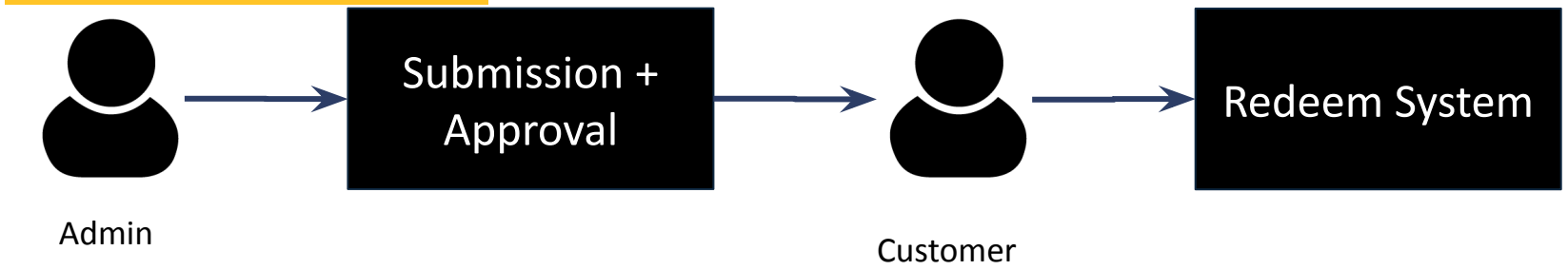
- Product vs Service (single entity, multi-bundle approach)
- Clean admin UI (per role)
- Installation profiles ❤️


Corporate Flow
Submission Form
Email
Offers
Redeem System
Small Business Flow
Internal Portal
Submission Form
Offers
Redeem System
Corporate Flow
Submission Form
Proof
Offers
Redeem System

Employee discount Flow



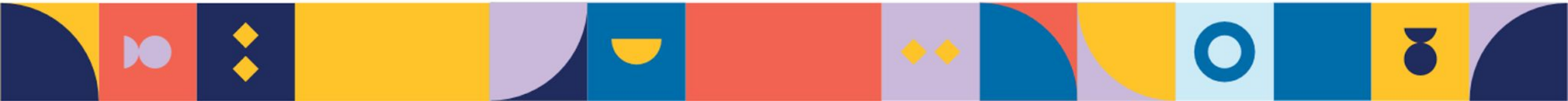
Admin Flow



Clean Admin UI



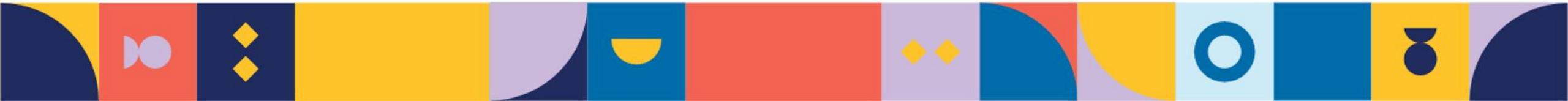
- Use custom landing page (e.g. /admin/mycompany)
- Use alias pattern to generate per flow admin pages (e.g. /admin/mycompany/corporate)
- Use views to create all entity listing and reporting per role



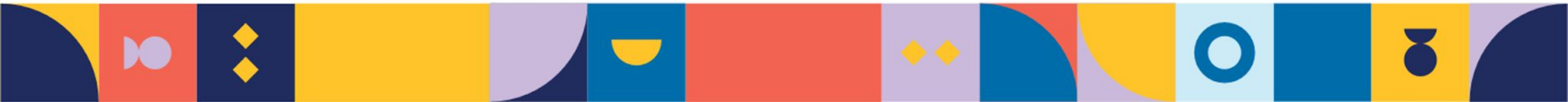
Install Profile

DrupalCon
Vienna 2025
14 - 17 October

- Ships with default config, content & translation
- No need of DB dump for local setup
- Use default content module for content
- Common place for hook_update_N



Tips & Tools



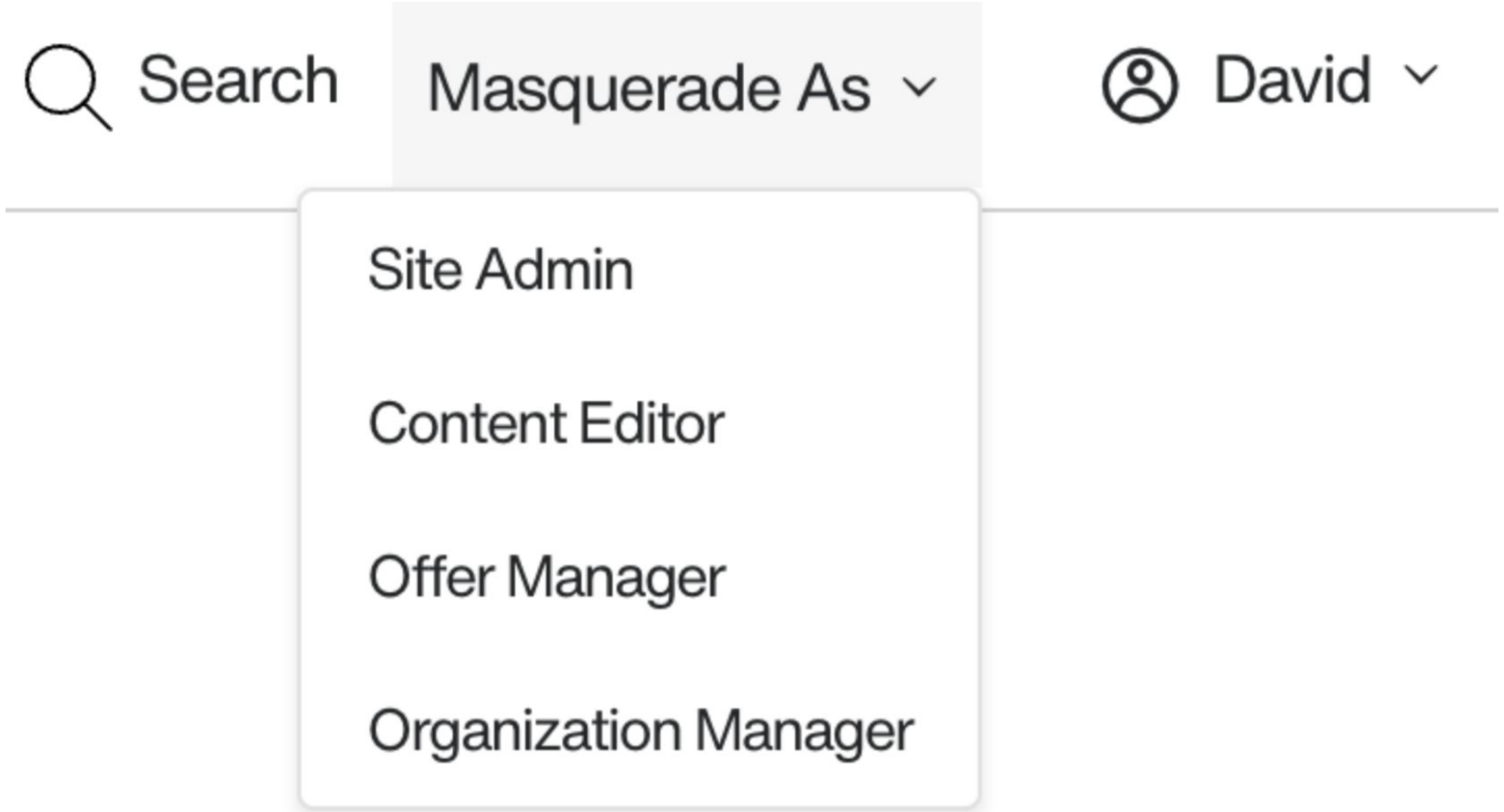
Node as Configuration Form




```yaml
playground_organization.form_settings.form:
  _title: 'Playground Settings'
  path: /admin/config/playground/settings/{node}
  defaults:
    _entity_form: node.edit
    node: d5564b7f-9101-46dc-b892-2285ed3d85c1
  requirements:
    _entity_access: node.update
  options:
    _admin_route: true
    _node_operation_route: true
    parameters:
      node:
        type: 'entity:node'
        converter: paramconverter.jsonapi.entity_uuid
```

Reference: https://drupal.stackexchange.com/a/300313/10157

Masquerade Block

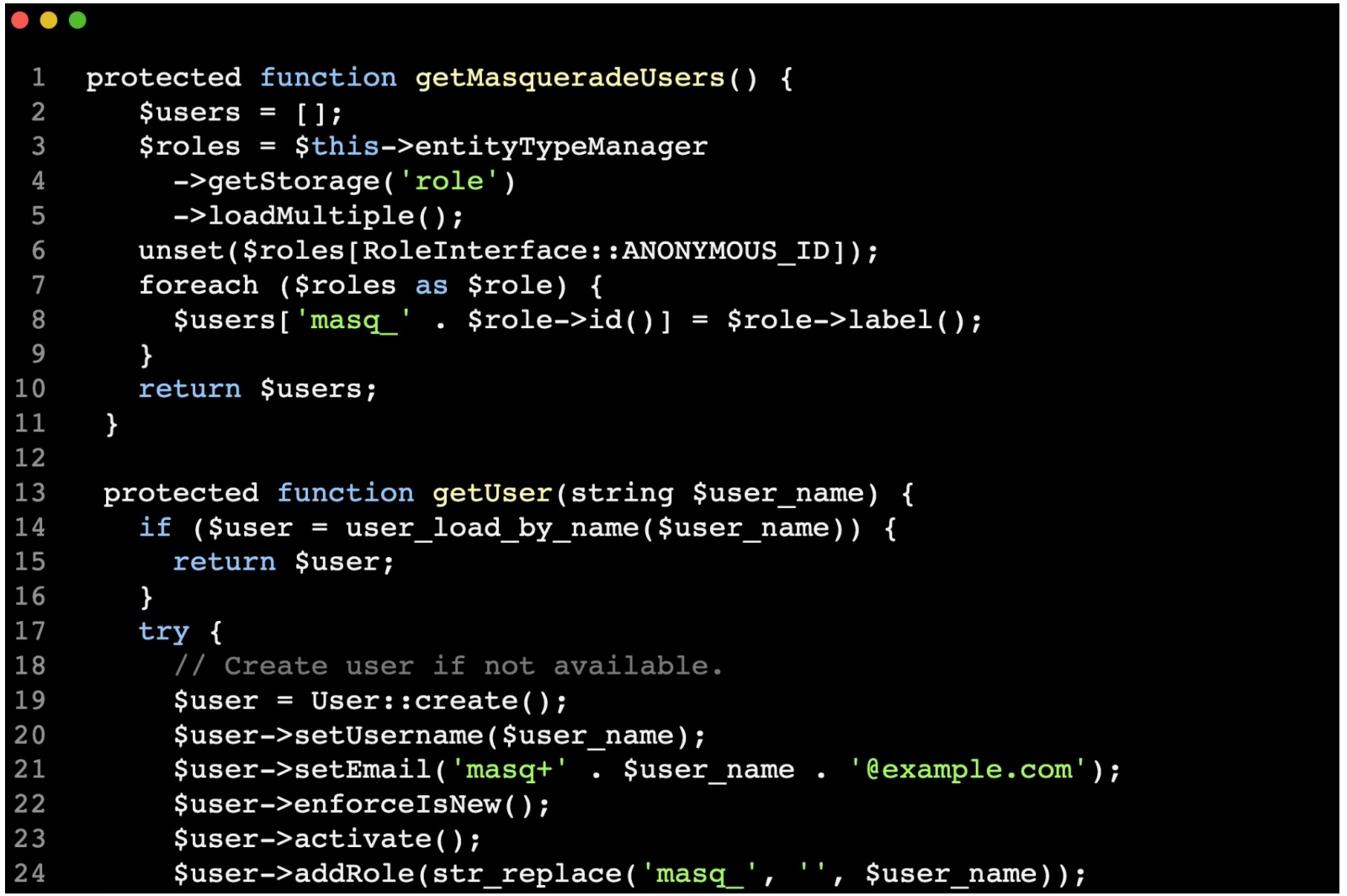


Masquerade Block



```php
$masquerade_as_users = $this->getMasqueradeUsers();
  foreach ($masquerade_as_users as $user_name => $role_name) {
    $masquerade_user = $this->getUser($user_name);
    if (!$masquerade_user) {
      continue;
    }
    if (!masquerade_masquerade_access($this->getCurrentUser(), $masquerac
      continue;
    }

    $url = Url::fromRoute('entity.user.masquerade', ['user' => $masquerac
    $links[] = [
      'type' => 'link',
      'title' => $role_name,
      'url' => $url,
    ];
  }

  $block = [
    '#theme' => 'links__toolbar_masqueradeblock',
    '#links' => $links,
    '#attributes' => [
      'class' => ['toolbar-menu'],
    ],
```

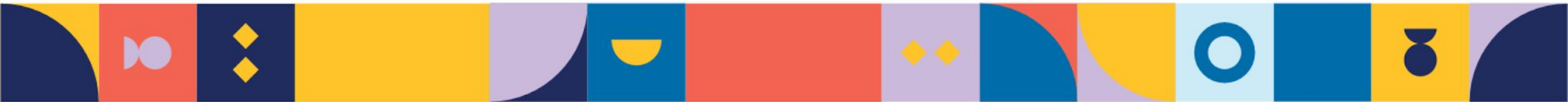
Masquerade Block



```php
protected function getMasqueradeUsers() {
   $users = [];
   $roles = $this->entityTypeManager
     ->getStorage('role')
     ->loadMultiple();
   unset($roles[RoleInterface::ANONYMOUS_ID]);
   foreach ($roles as $role) {
     $users['masq_' . $role->id()] = $role->label();
   }
   return $users;
 }

 protected function getUser(string $user_name) {
   if ($user = user_load_by_name($user_name)) {
     return $user;
   }
   try {
     // Create user if not available.
     $user = User::create();
     $user->setUsername($user_name);
     $user->setEmail('masq+' . $user_name . '@example.com');
     $user->enforceIsNew();
     $user->activate();
     $user->addRole(str_replace('masq_', '', $user_name));
```

DrupalCon
Vienna 2025
14 - 17 October

Contributed Modules



Key Contributed Modules Used

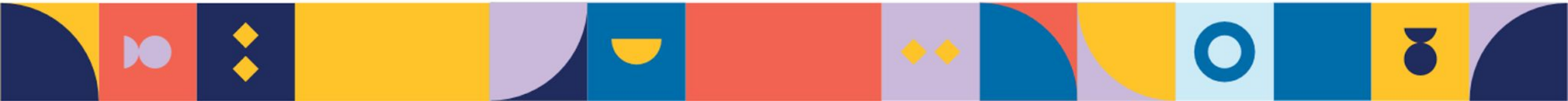
- JSON:API Resources
- Easy Breadcrumb
- Easy Email
- HTTP Client Manager
- Views Data Export

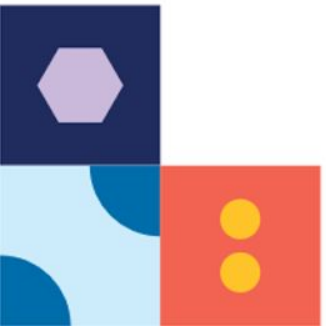
Modules Contributed Back

- Entity Reference View
- Codes pool
- Inline Translation
- Permission Group



Thank You!







DrupalCon
Vienna 2025
14 - 17 October





DrupalCon
Vienna 2025
14 - 17 October





DrupalCon
Vienna 2025
14 - 17 October




DrupalCon
Vienna 2025
14 - 17 October

