JPL WWW Redesign

Going Headless with Wagtail, Nuxt.js and GraphQL

183x | DesignLab

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This document has been reviewed and determined not to contain export controlled technical data.

About the Project

- Small team of on-site developers working with Torchbox to develop the redesigned JPL website
- High-profile, High-traffic
- Wide range of visitors and entry points
- Internal workflows lead to published content
- Thousands of pages

Note: This presentation is NOT a design preview. It is an abstract of our development strategy.

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Key Decision: Why Headless?

- Modern approach
- Flexibility for the future: Decoupling the backend from the frontend allows us to change and adapt
- Performance: snappy and reactive front-end (if done right) can improve overall user experience

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Backend

For required markings, please visit https://mh.jpl.nasa.gov

Backend Setup

- CMS: Wagtail
- API Framework: GraphQL (via Graphene)
    - Modern approach
    - Better developer experience, and can query for the exact content needed
    - Reduces over-fetching
    - Issues with monitoring and caching, but not as much an issue with SSG (more on this later)
- Headless Preview: allows us to expose the preview data to the frontend. See: https://github.com/torchbox/wagtail-headless-preview

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Example data model: Mission Page

```python
class Mission(Page):
    """ Detail page for Missions """

    # Database fields
    thumbnail_image = models.ForeignKey(
        'backend.CustomImage',
        null=True,
        blank=False,
        on_delete=models.SET_NULL,
        help_text='Please provide a thumbnail image',
        related_name="+",
    )

    summary = models.TextField(
        help_text='A description of the page',
        blank=True,
    )
    body = StreamField(
        JStreamExtraBlock(required=False),
        verbose_name="Page body",
        blank=True,
        null=True,
    )

    file = models.FileField(
        upload_to='data-models/',
        blank=True,
        null=True,
        validators=[FileExtensionValidator(['glb'])],
        help_text=mark_safe("Select the <strong>.glb</strong> file type for the model"),
    )
    auto_rotate = models.BooleanField(
        default=False,
        help_text="Select checkbox to enable auto rotation of the model",
    )
```

```python
    # Editor panels configuration
    content_panels = Page.content_panels + [
        ImageChooserPanel('thumbnail_image'),
        FieldPanel('summary'),
        StreamFieldPanel('body'),
        MultiFieldPanel([
            FieldPanel('file'),
            FieldPanel('auto_rotate'),
        ], heading="3D Model Settings"),
    ]

    # Search Fields
    search_fields = Page.search_fields + [
        index.SearchField('summary'),
        index.SearchField('body'),
    ]

    class Meta:
        verbose_name = "Mission"
        verbose_name_plural = "Missions"
```


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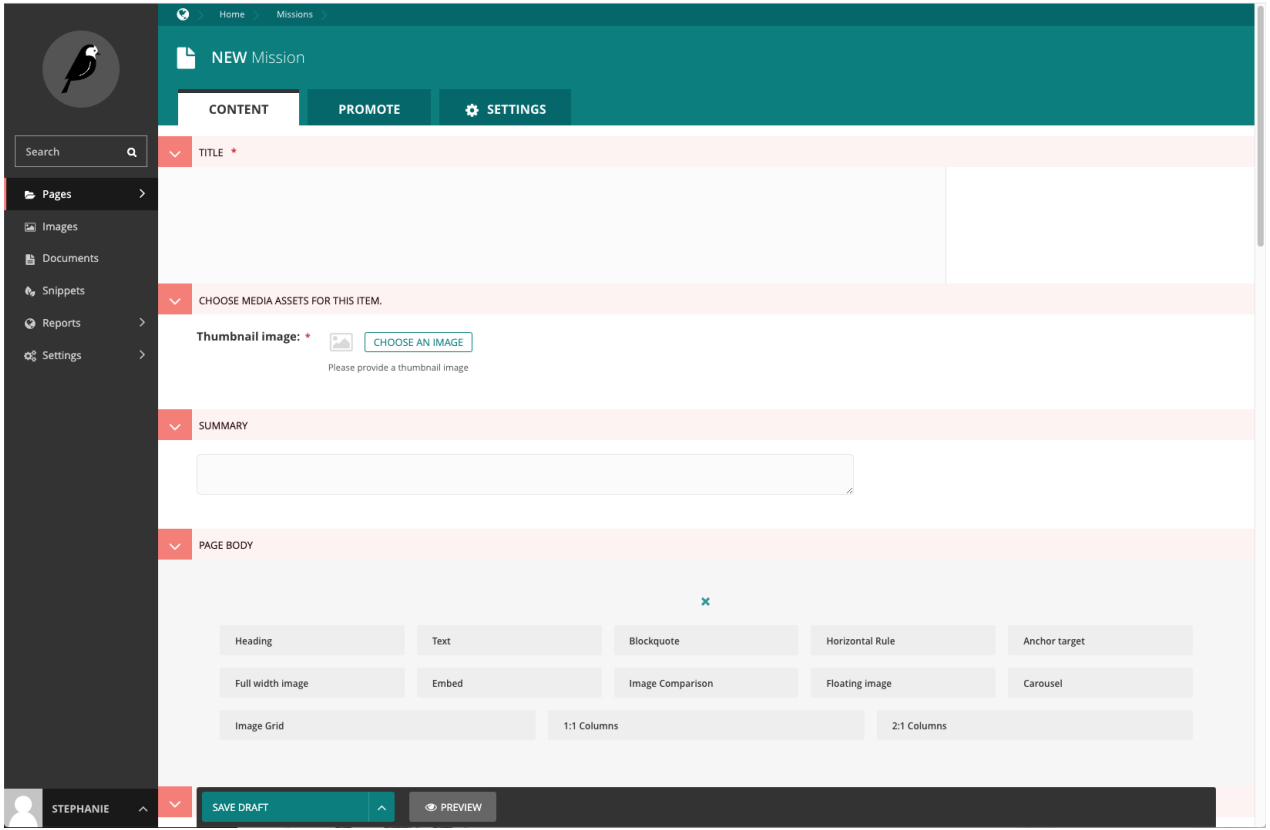
Example data model: Mission Page Admin View



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API: Create GraphQL nodes using Graphene

```python
# schema.py
import graphene
from django.conf import settings
from missions.models import Mission
from graphene_django import DjangoObjectType
from . import graphene_wagtail

class MissionNode(DjangoObjectType):
    thumbnail_image = graphene.String(width=graphene.Int())

    def resolve_thumbnail_image(self, info, width=860):
        if not self.thumbnail_image:
            return ""

        return self.thumbnail_image.get_rendition('width-%s' % width).url

    class Meta:
        model = Mission

class Query(graphene.ObjectType):
    mission = graphene.Field(MissionNode, slug=graphene.String())
    missions = graphene.List(MissionNode)

    def resolve_mission(self, info, slug):
        return Mission.objects.live().get(slug=slug)

    def resolve_missions(self, info):
        return Mission.objects.live().all()

schema = graphene.Schema(query=Query)
```


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API: What about Streamfield?

```python
# graphene_wagtail.py
from wagtail.core.fields import StreamField
from graphene.types import Scalar
from graphene_django.converter import convert_django_field


class GenericStreamFieldType(Scalar):
    @staticmethod
    def serialize(stream_value):
        return stream_value.stream_data

@convert_django_field.register(StreamField)
def convert_stream_field(field, registry=None):
    return GenericStreamFieldType(
        description=field.help_text, required=not field.null
    )
```


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Result: Parse-able mission object

```
query getMission {
  mission(slug: "mars-2020") {
    id
    title
    slug
    summary
    thumbnailImage
    body
  }
}
```


```
{
  "data": {
    "mission": {
      "body": [
        {
          "id": "ce09ceac-17d0-489b-b16d-4d13cbd54146",
          "type": "text",
          "value": "<p>Lorem ipsum page body</p>"
        },
        {
          "id": "36a9e4a1-2535-4315-b262-08bfffd13c80",
          "type": "heading",
          "value": {
            "heading_text": "A heading!",
            "size": "h2"
          }
        },
        {
          "id": "72b3d404-4a1f-4baf-b943-5274812f9e58",
          "type": "text",
          "value": "<p>More text</p>"
        }
      ],
      "id": "5",
      "slug": "mars-2020",
      "summary": "Lorem ipsum summary info",
      "thumbnailImage": "http://127.0.0.1:9000/media/images/mars2020-PIA23719-1920x1200.width-860.jpg",
      "title": "Mars 2020"
    }
  }
}
```


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Querying for all missions returns an array

```
query getMissions {
  missions {
    id
    title
    slug
    summary
  }
}
```


```
{
  "data": {
    "missions": [
      {
        "id": "5",
        "slug": "mars-2020",
        "summary": "Lorem ipsum summary info",
        "title": "Mars 2020"
      },
      {
        "id": "6",
        "slug": "example-mission",
        "summary": "Nunc augue est, porta sed nisl ac, dictum dignissim tellus.",
        "title": "Example Mission"
      }
    ]
  }
}
```


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Frontend

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Frontend Stack

- Vue.js – great developer experience, solid user-base
- Nuxt.js to leverage its features (there are many!)
- Apollo Client to manage data with GraphQL

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Using GraphQL queries in Nuxt.js:

Mission landing page

```
<template>
  <div class="lg:container mx-auto my-5">
    <h1 class="text-4xl">{{ missionIndexPage.title }}</h1>
    <p class="lead">
      {{ missionIndexPage.summary }}
    </p>
    <Cards :data="missions" path="missions" />
  </div>
</template>

<script lang="ts">
import Vue from 'vue'
import gql from 'graphql-tag'

export default Vue.extend({
  async asyncData({ app }) {
    const client = app.apolloProvider.defaultClient
    const missionIndexPageResponse = await client.query({
      query: gql`
        query getMissionIndexPage {
          missionIndexPage {
            title
            summary
          }
          missions {
            id
            title
            slug
            thumbnailImage
            summary
          }
        }
      `,
    })
    const missionIndexPageData = await missionIndexPageResponse.data
    return { ...missionIndexPageData }
  },
  head() {
    return {
      title: 'Missions',
    }
  },
})
</script>
```


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Cards Component

```
<template>
  <div class="cards">
    <nuxt-link :to="'/' + path + '/' + item.slug"  v-for="item in data" :key="item.id">
      <img :src="item.thumbnailImage" class="w-full" :alt="item.title">
      <div>
        <h3 v-html="item.title"></h3>
        <p v-html="item.summary"></p>
      </div>
      <button>
        Learn more
      </button>
    </nuxt-link>
  </div>
</template>

<script>
export default {
  name: 'Cards',
  props: {
    data: {
      type: Array,
      default: () => [],
    },
    path: {
      type: String,
      default: '',
    },
  },
}
</script>
```


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Detail page using Nuxt.js' dynamic routes based on slug

```
<template>
  <main role="main" class="position-relative">
    <div>
      <div class="mission-header flex items-center justify-center">
        <div class="w-full md:w-2/5 lg:w-1/5">
          <h1 class="text-4xl">{{ mission.title }}</h1>
          <div class="lead" v-html="mission.summary"></div>
        </div>
        <div class="w-full md:w-3/5 lg:4/5">
          <img class="w-full my-5" :src="mission.thumbnailImage">
        </div>
      </div>
    </div>
    <div class="lg:container mx-auto">
      <Streamfield :data="mission.body" />
    </div>
  </main>
</template>
<script>
import gql from 'graphql-tag'

export default {
  async asyncData({ params, app }) {
    const client = app.apolloProvider.defaultClient
    const response = await client.query({
      query: gql`
        query getMission {
          mission(slug: "${params.slug}") {
            slug
            title
            thumbnailImage
            summary
            body
          }
        }
      `,
    })
    const data = await response.data
    return {
      ...data,
    }
  },
}
</script>
```


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Streamfield block component

```
<template>
  <div class="block-streamfield">
    <div v-for="block in data">
      <div v-if="block.type == 'heading'">
        <Heading :data="block.value" />
      </div>
      <div v-else-if="block.type == 'text'">
        <div class="block-text" v-html="block.value"></div>
      </div>
      <div v-else>
        <pre>{{ block }}</pre>
      </div>
    </div>
  </div>
</template>
<script>
import Heading from '@/components/Blocks/Heading/Heading.vue'
export default {
  name: 'WagtailStreamfield',
  components: {
    Heading,
  },
  props: {
    data: {
      type: Array,
      required: true,
    },
  },
}
</script>
```


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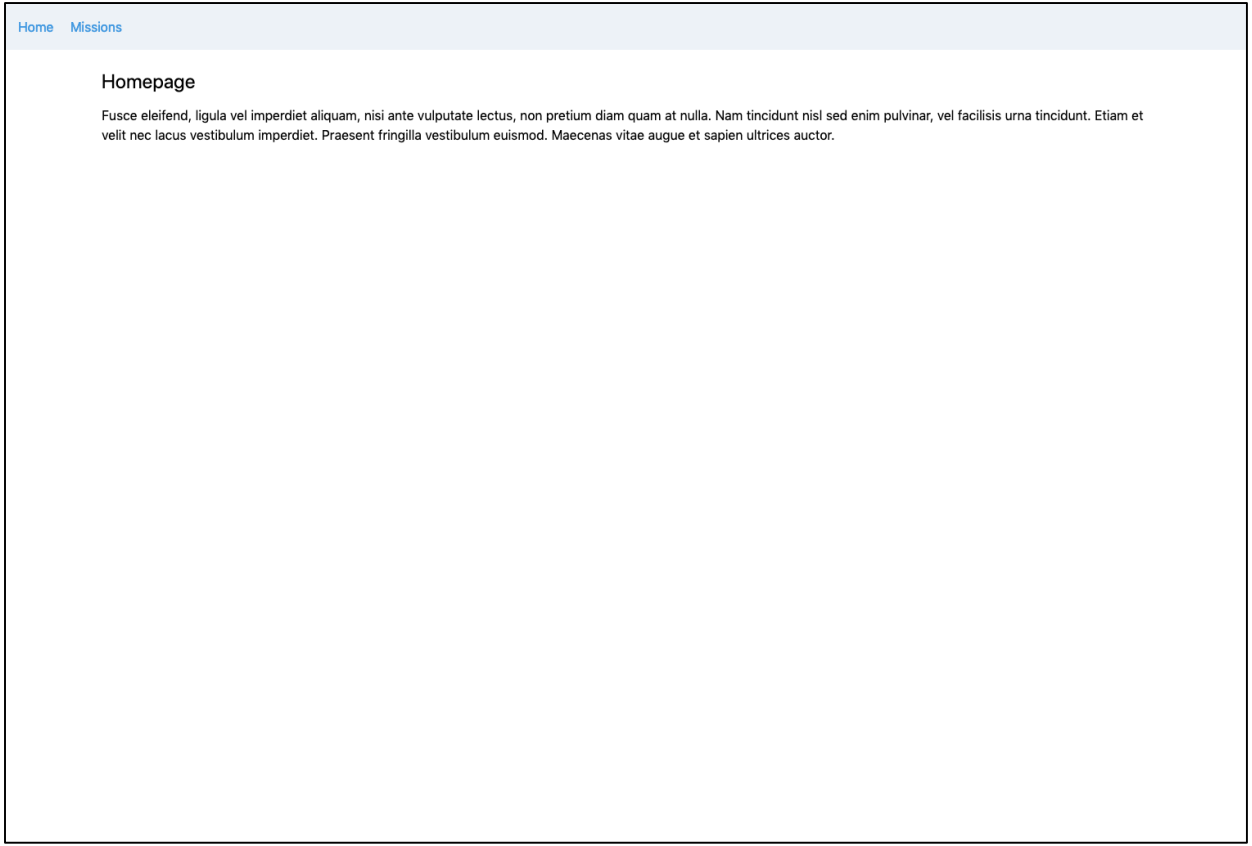
Rendered: Homepage



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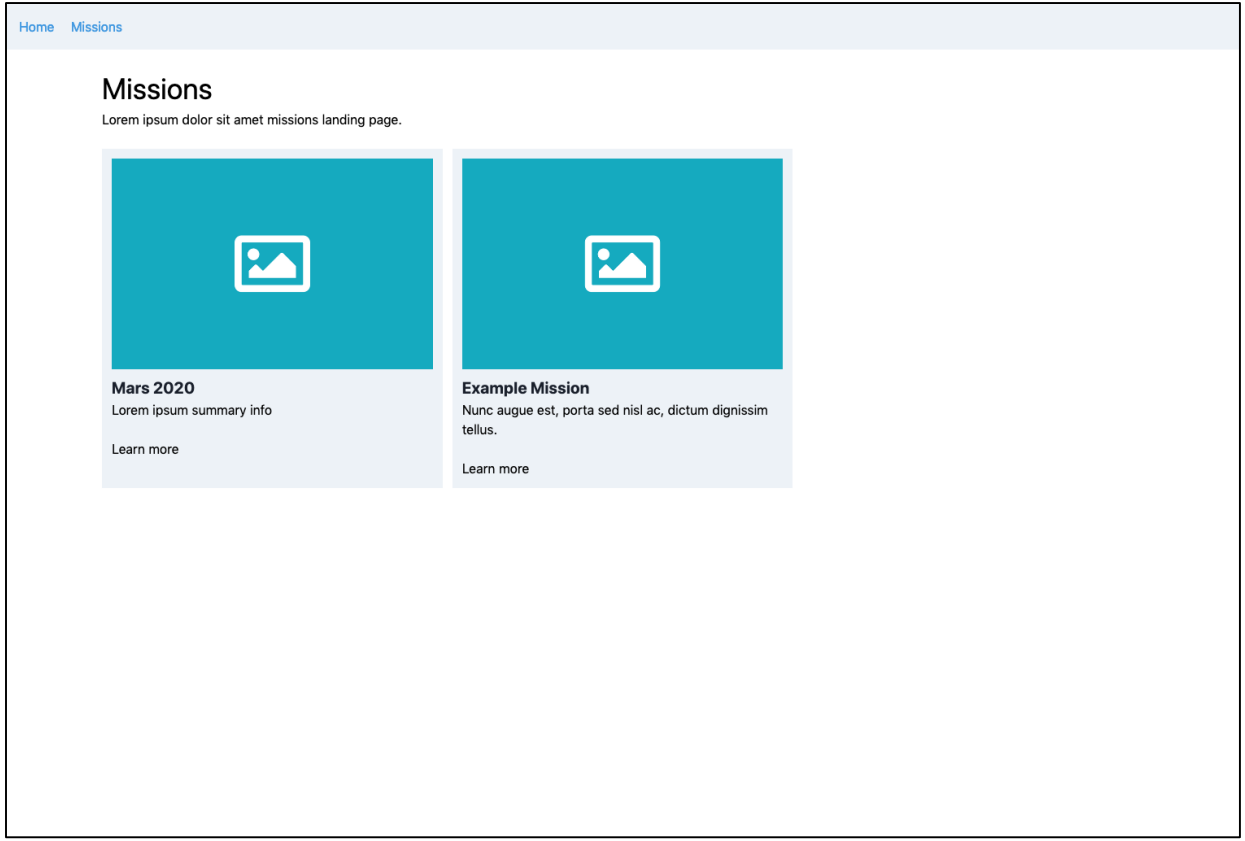
Rendered: Landing page



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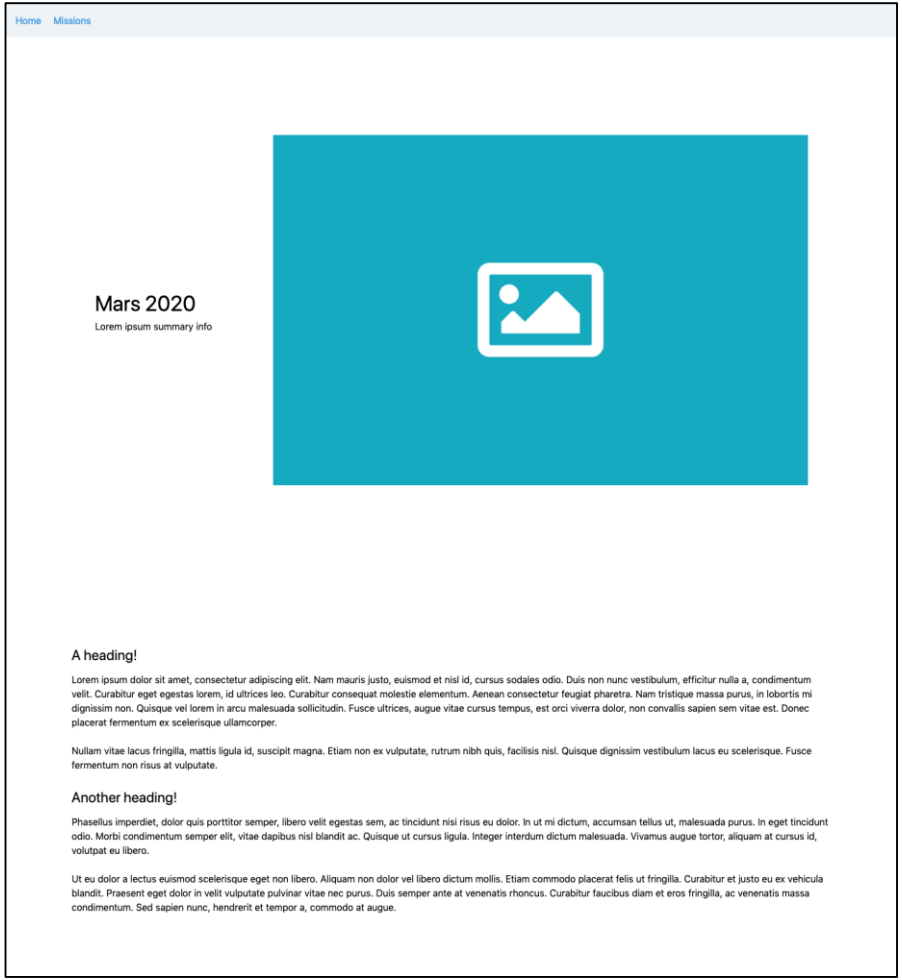
Rendered:
A mission page



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Leveraging Static Site Generation

- Nuxt.js has this option built in
- Super-fast page loading
- The API is required only during site generation. It is never accessed client-side.

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Bigger questions

- Optimizing static site generation
  - Selectively rebuild only changed pages rather than the entire site
- Site search
  - How to leverage Wagtail's built-in capability?
  - 3rd party services may be the answer (AWS Elasticsearch)

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Always a work in progress

- Web development is a rapidly evolving field
- Even as we're working on initial proof-of-concepts, new technologies are available every day, continuously shaping our approach
- Watch for the open-source release!

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