FHIR IG dev. + CI/CD

Litt om meg

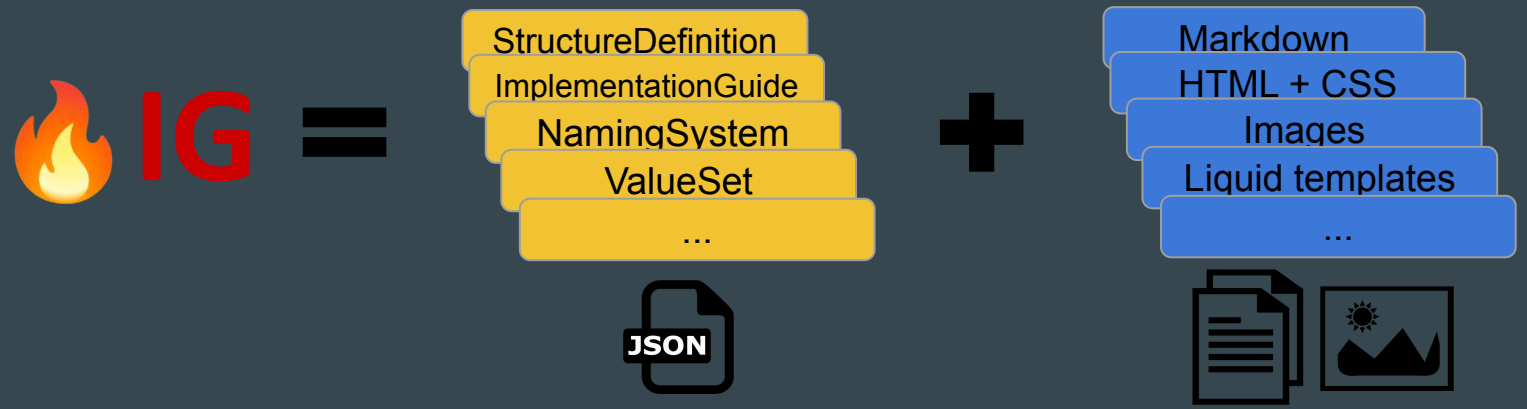
- Eirik Myklebost
- Konsulent fra Aboveit
- 👨‍💻 Utvikler og arkitekt
- 🔥 2+ år erfaring med FHIR implementering og profilering
  - Felles Kontaktregister (FKR), Helsedirektoratet
  - Team Helseopplysninger, NAV

Agenda

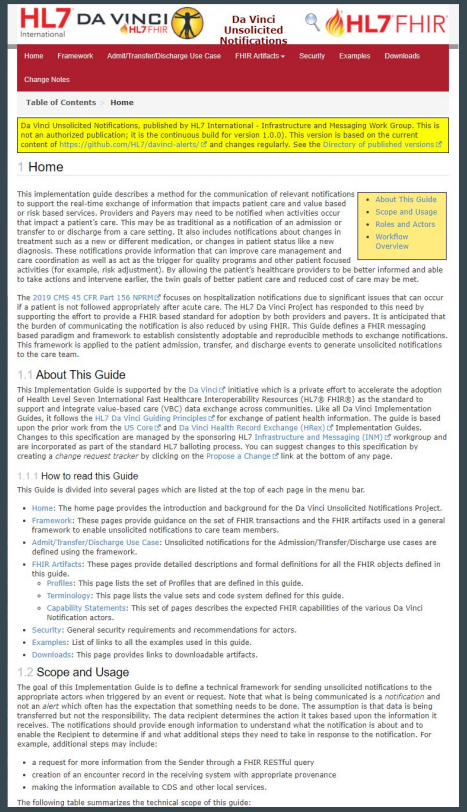
1. Hva er FHIR Implementation Guide (IG)?
2. Hva er CI/CD pipeline?
3. NAV sin IG dev. Pipeline
    a. FHIR Shorthand (FSH)
    b. GitHub (actions, pages, releases)
    c. Testing & validation
    d. IG Publisher
    e. FHIR Package registry

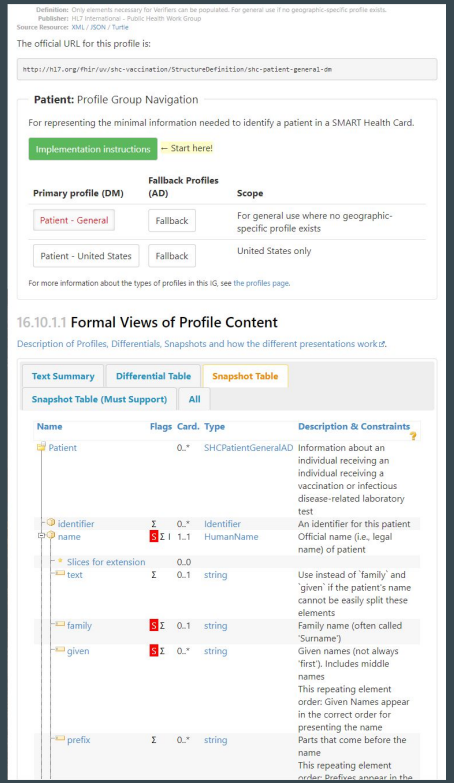
Hva er FHIR Implementation Guide (IG)?

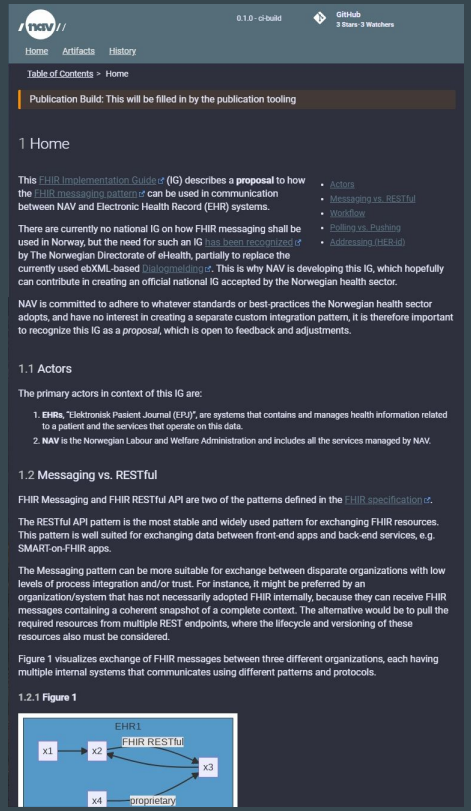
- En **IG** er **kontrakter** + **dokumentasjon**
- Kontrakter implementeres som Conformance Resources
- Profilering er å lage Conformance Resources

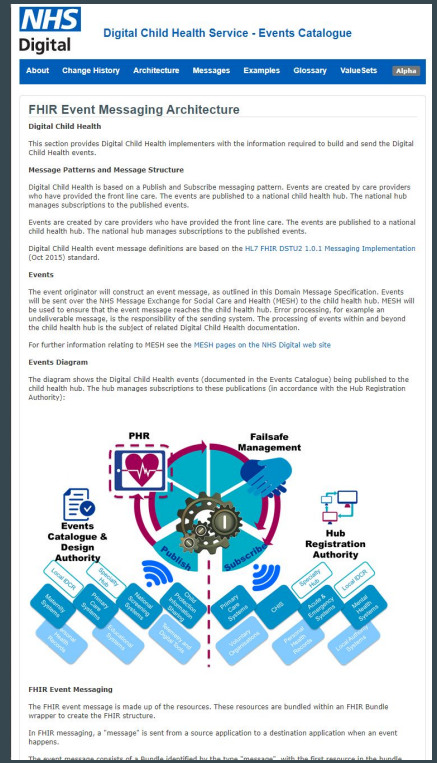


IG eksempler



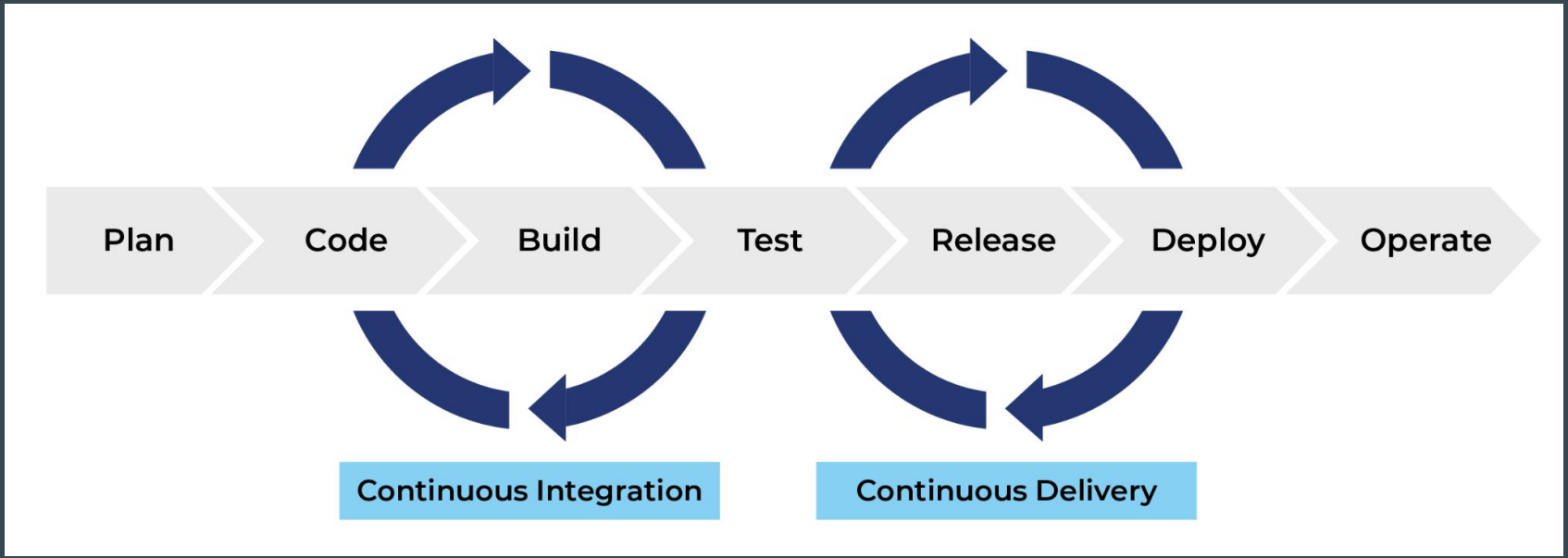




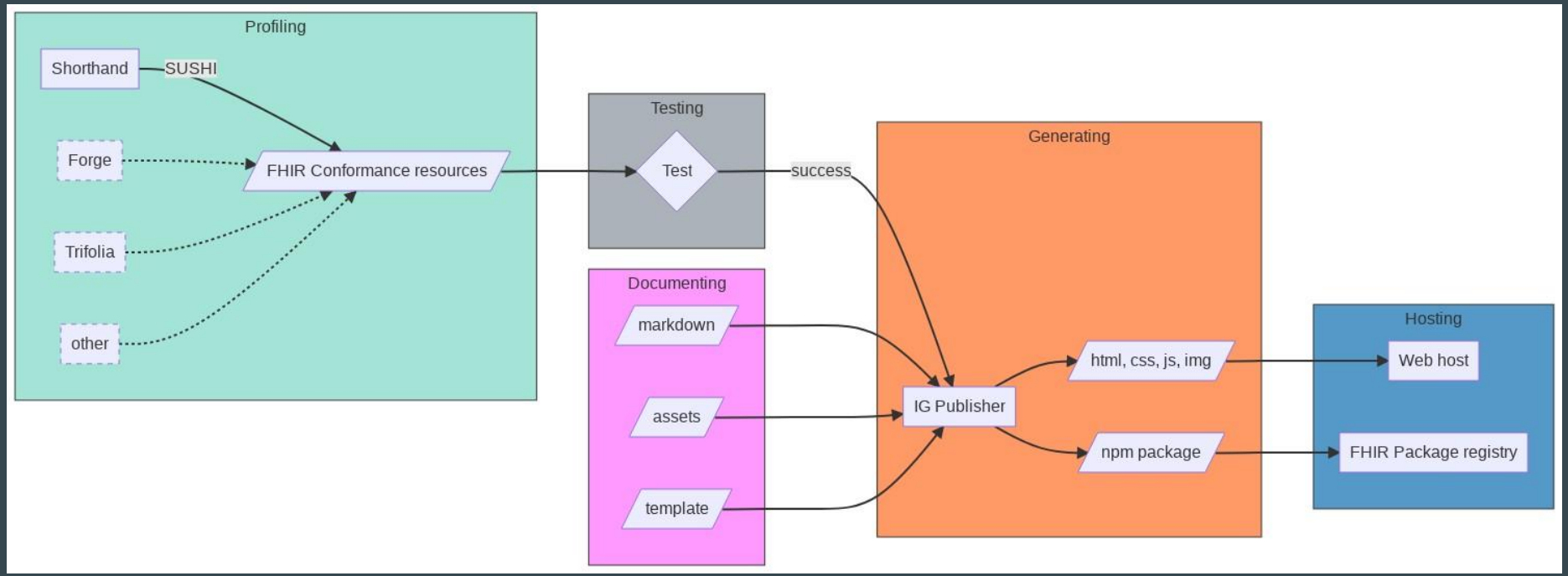


Hva er CI/CD pipeline?

Automatisering av steg



IG Pipeline


Profiling
Shorthand
SUSHI
Forge
FHIR Conformance resources
Trifolia
other
Testing
Test
success
Documenting
markdown
assets
template
Generating
IG Publisher
html, css, js, img
npm package
Hosting
Web host
FHIR Package registry

CI/CD Pipeline

Code - FHIR Shorthand (FSH)

- Utviklervennlig språk for å lage Conformance ressurser
- Kompileres til FHIR JSON vha. SUSHI 🍣
- Eksempel: https://fshschool.org/FSHOnline/#/share/3ADW6SE

Code

- Utv
- Kon
- Eks

0W6SE

FSH ONLINE
Powered by SUSHI v2.1.1 and GoFSH v1.3.2

Back to School

FSH Examples | Convert to JSON ▶ | ◀ Convert to FSH | Save All | Configuration

FSH

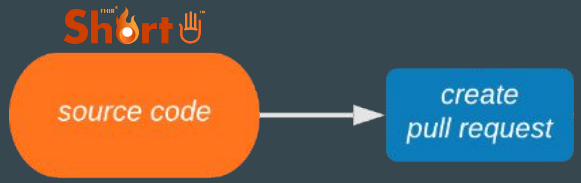
```
Profile: MyExample
Parent: Bundle
* id obeys valid-uuid
* meta
  * id 0..0
  * profile 1..1
  * security 0..0
  * tag 0..0
* implicitRules 0..0
* language 0..0
* identifier 0..0
* type = #message (exactly)
* timestamp 1..1
* total 0..0
* link 0..0
* entry 2..
  * ^slicing.discriminator.type = #type
  * ^slicing.discriminator.path = "resource"
  * ^slicing.rules = #open
  * id 0..0
  * extension 0..0
  * modifierExtension 0..0
  * link 0..0
  * fullUrl 1..1
  * resource 1..1
  * search 0..0
  * request 0..0
  * response 0..0
* entry contains messageheader 1..1
* entry[messageheader].resource only MessageHeader
* signature 0..0

Invariant: valid-uuid
Description: "Must be a valid uuid"
Expression: "$this.matches('^[0-9a-f]{8}-[0-9a-f]{4}-[0-9a-f]{
Severity: #error
```

FHIR JSON: MyExample

```
{
  "resourceType": "StructureDefinition",
  "id": "MyExample",
  "extension": [
    {
      "url": "http://hl7.org/fhir/StructureDefinition/structuredefinition-category",
      "valueString": "Foundation.Other"
    },
    {
      "url": "http://hl7.org/fhir/StructureDefinition/structuredefinition-security-categ
      "valueCode": "not-classified"
    }
  ],
  "url": "http://example.org/StructureDefinition/MyExample",
  "version": "1.0.0",
  "name": "MyExample",
  "status": "active",
  "fhirVersion": "4.0.1",
  "mapping": [
    {
      "identity": "v2",
      "uri": "http://hl7.org/v2",
      "name": "HL7 v2 Mapping"
    },
    {
      "identity": "rim",
      "uri": "http://hl7.org/v3",
      "name": "RIM Mapping"
    },
    {
      "identity": "cda",
      "uri": "http://hl7.org/v3/cda",
      "name": "CDA (R2)"
    },
    {
      "identity": "w5",
      "uri": "http://hl7.org/fhir/fivews",
      "name": "FiveWs Pattern Mapping"
    }
  ],
  "kind": "resource",
  "abstract": false,
  "type": "Bundle",
  "baseDefinition": "http://hl7.org/fhir/StructureDefinition/Bundle",
  "derivation": "constraint",
  "differential": {
    "element": [
      {
        "id": "Bundle.id",
        "path": "Bundle.id",
        "constraint": [
```

CI/CD Pipeline

CI/CD Pipeline



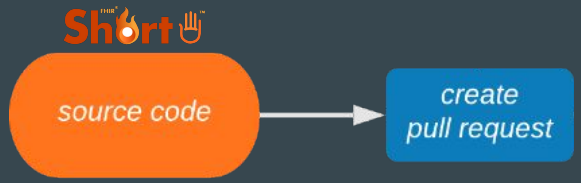
Automation - GitHub actions

- Automatiserte arbeidsflyter
- Kjøres ved events i repo

on-pull_request 👉 run tests

```yaml
on:
  push:
    branches: [main]
    paths:
      - ig-template/**
      - igs/MessagingCore/input/**
      - igs/MessagingCore/ig.ini
      - igs/MessagingCore/sushi-config.yaml
  workflow_dispatch:

env:
  IG: MessagingCore

# The following jobs are equal for all IGs and can be moved to a common composite-action if 'uses'-support is a
# https://github.com/actions/runner/blob/main/docs/adrs/1144-composite-actions.md
jobs:
  publish:
    runs-on: ubuntu-latest
    steps:
      - uses: actions/checkout@v2

      # Persist the FHIR Package Cache between runners.
      # Doc: https://confluence.hl7.org/display/FHIR/FHIR+Package+Cache
      - name: 📁 Cache FHIR Packages
        uses: actions/cache@v2
        with:
          path: |
            ~/.fhir/packages
          key: fhir-packages

      # Persist the IG Publisher input-cache between runners.
      # Doc: https://build.fhir.org/ig/FHIR/ig-guidance/using-templates.html#igroot-input-cache
      - name: 📁 Cache IG Publisher input-cache
        uses: actions/cache@v2
        with:
          path: |
            igs/${{ env.IG }}/input-cache
          key: ig-publisher-input-cache

      # Downloads the newest version of the IG Publisher, this could probable be cached.
      - name: 🚤 Download IG Publisher
        run: wget -q https://github.com/HL7/fhir-ig-publisher/releases/latest/download/publisher.jar

      # Builds the HTML page for the IG.
      - name: 🏃 Run IG Publisher
        uses: docker://hl7fhir/ig-publisher-base:latest
        with:
          args: java -jar publisher.jar publisher -ig igs/${{ env.IG }}/ig.ini -publish https://navikt.github.i

      # Publishes the HTML page to a seperate branch in order to host it using GitHub-Pages.
      # This will overwrite the currently published HTML page.
      - name: 🚀 Deploy to GitHub-Pages
        uses: peaceiris/actions-gh-pages@v3
        with:
          github_token: ${{ secrets.GITHUB_TOKEN }}
          publish_dir: igs/${{ env.IG }}/output
          destination_dir: igs/${{ env.IG }}
          exclude_assets: '**.zip,**.tgz,**.pack'
          commit_message: '${{ env.IG }}: ${{ github.event.head_commit.message }}'
```

CI/CD Pipeline



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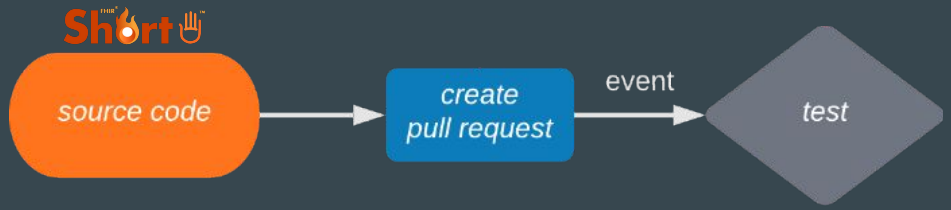

Test - FHIR Validator & JUnit5

- FHIR Validator validerer ressurser med hensyn til Conformance ressurser 👉 Info, Warning, Error
- Test at eksempel ressurser gir forventet valideringsutfall
- fhir-validator-junit-engine
  tar inn tester i YAML og output som JUnit test report

Test - FHIR Validator & JUnit5

en eller flere YAML filer med tester

```yaml
---
validator:
  version: "4.0"
  ig:
    - "../fsh-generated/resources"
tests:
  - title: Validate conformance resources
    fileMatch:
      - ../fsh-generated/resources/**
      - "!../fsh-generated/resources/ImplementationGuide-*"
  - fileMatch: instances/message-with-invalid-her-id.json
    profile: http://fhir.nav.no/StructureDefinition/HopsMessage
    expectedIssues:
      - severity: ERROR
        message: valid-her-id
```

Test - FHIR Validator & JUnit5

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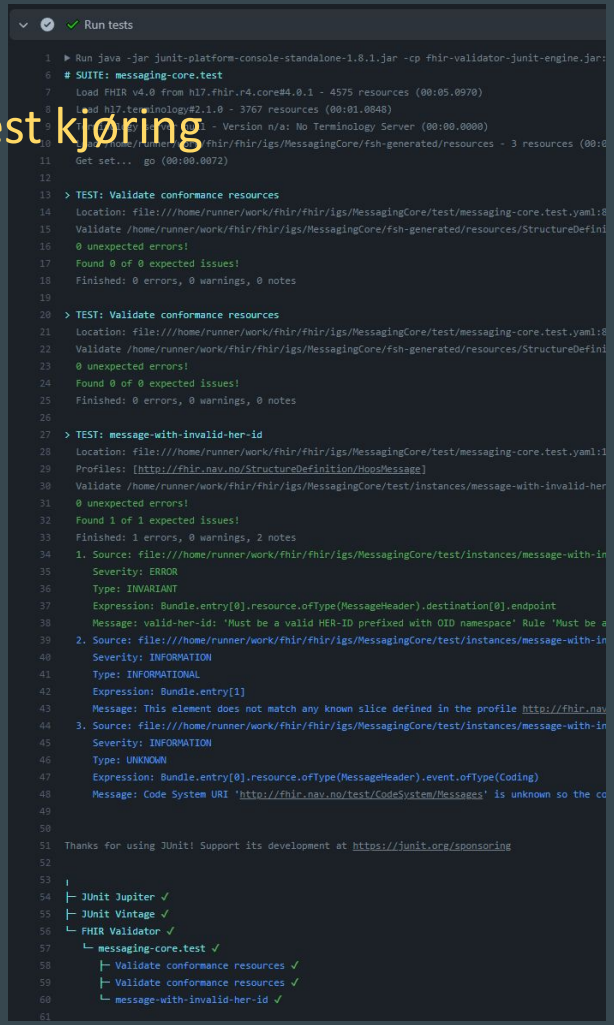
test kjøring



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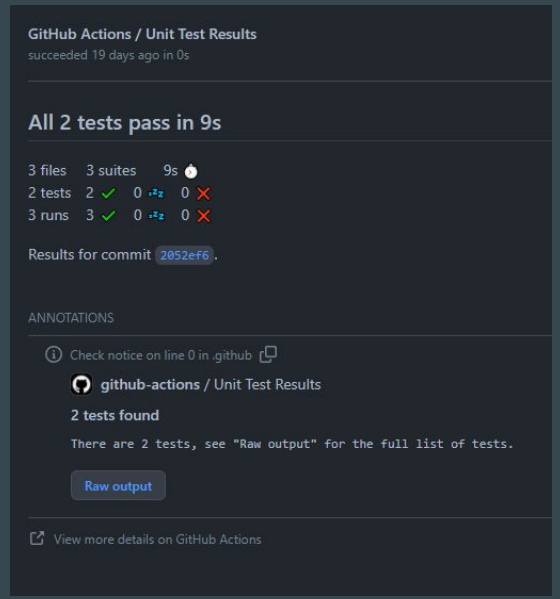
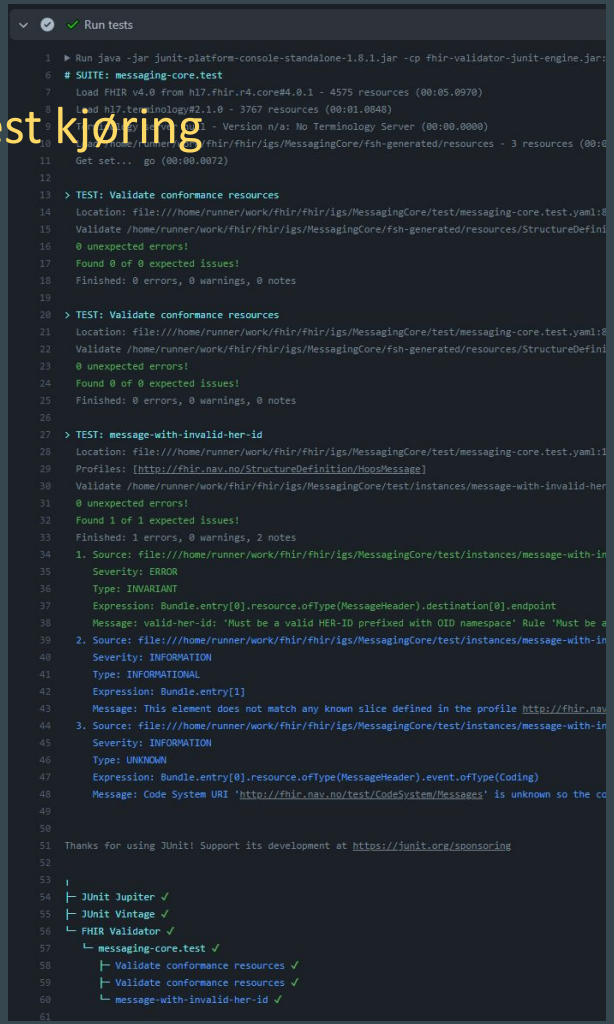
test rapport



test kjøring



CI/CD Pipeline

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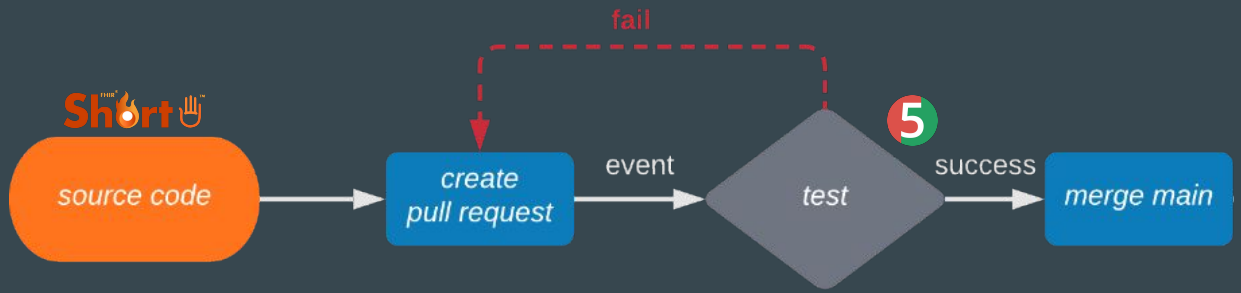

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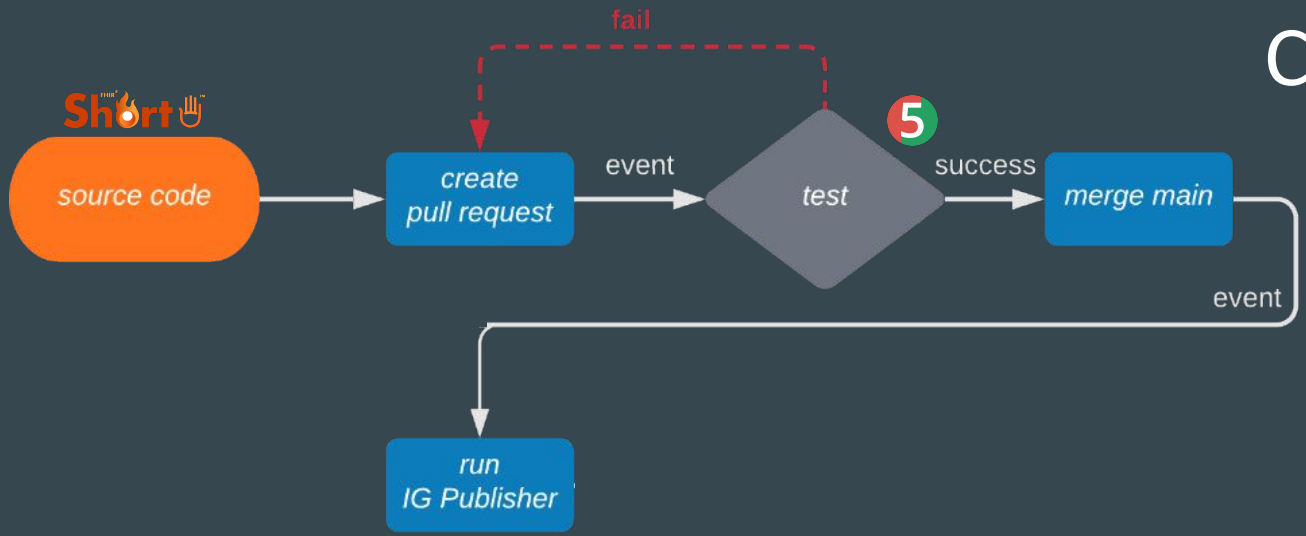
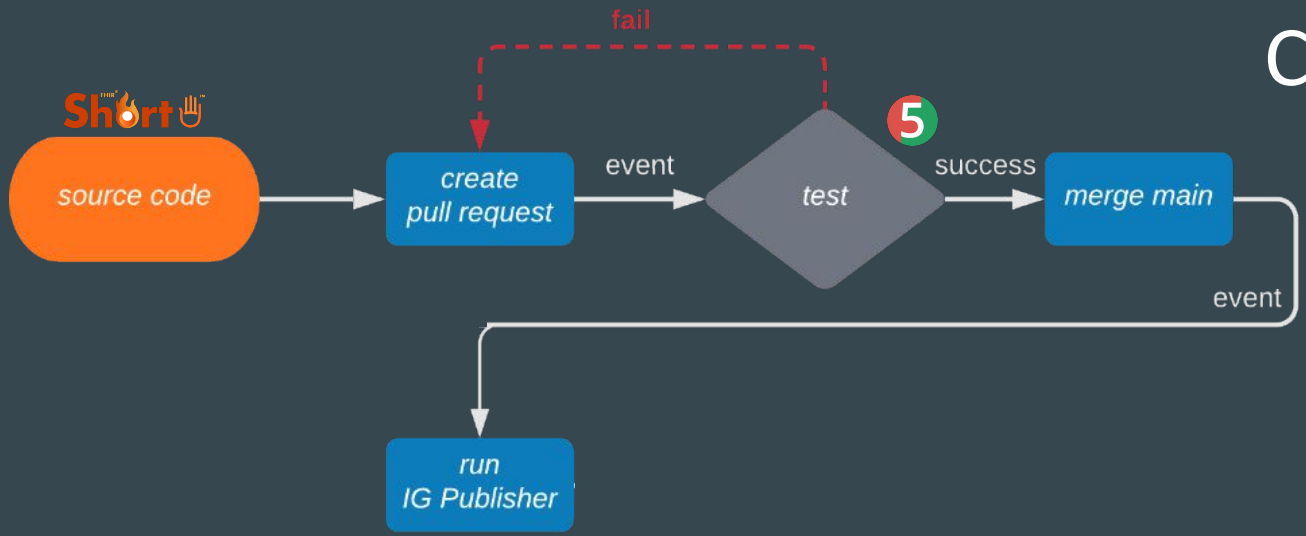


Build - IG Publisher

- Java CLI app + Jekyll (static site generator)
- **Input**: conformance-resources, markdown, assets og template
  Output: web-side og NPM-pakke
- Kan brukes med SUSHI

CI/CD Pipeline



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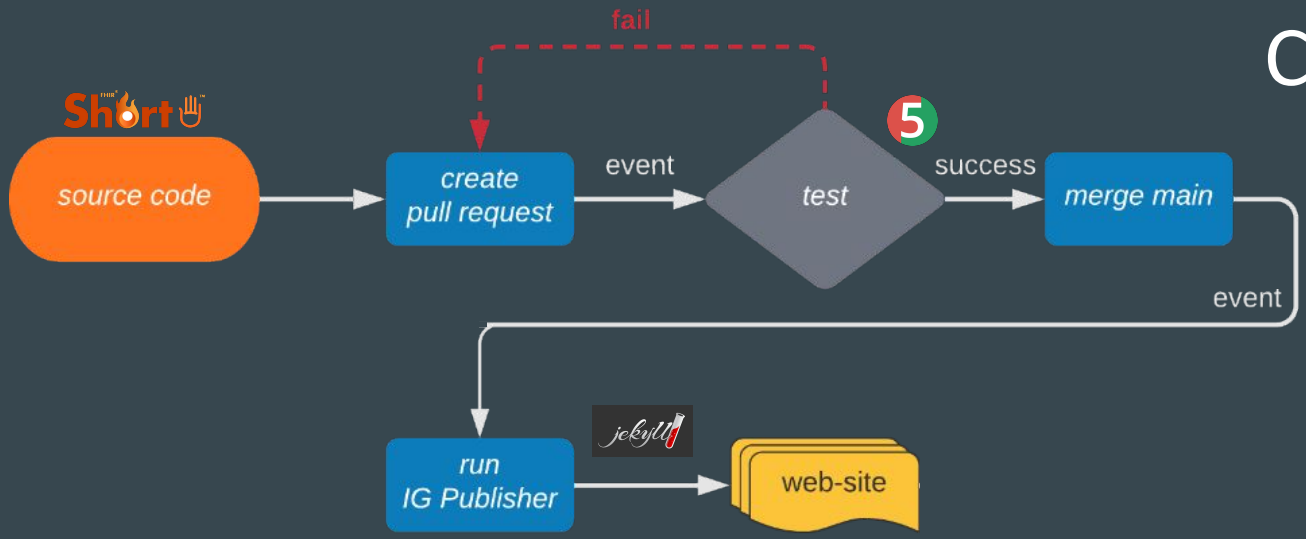
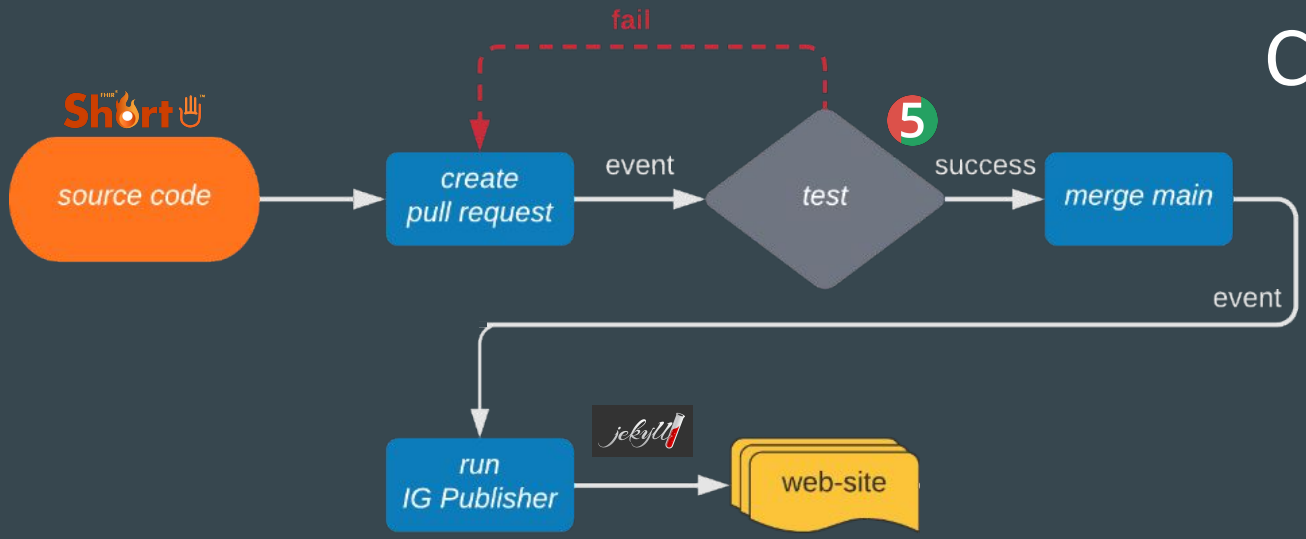


Hosting - GitHub pages

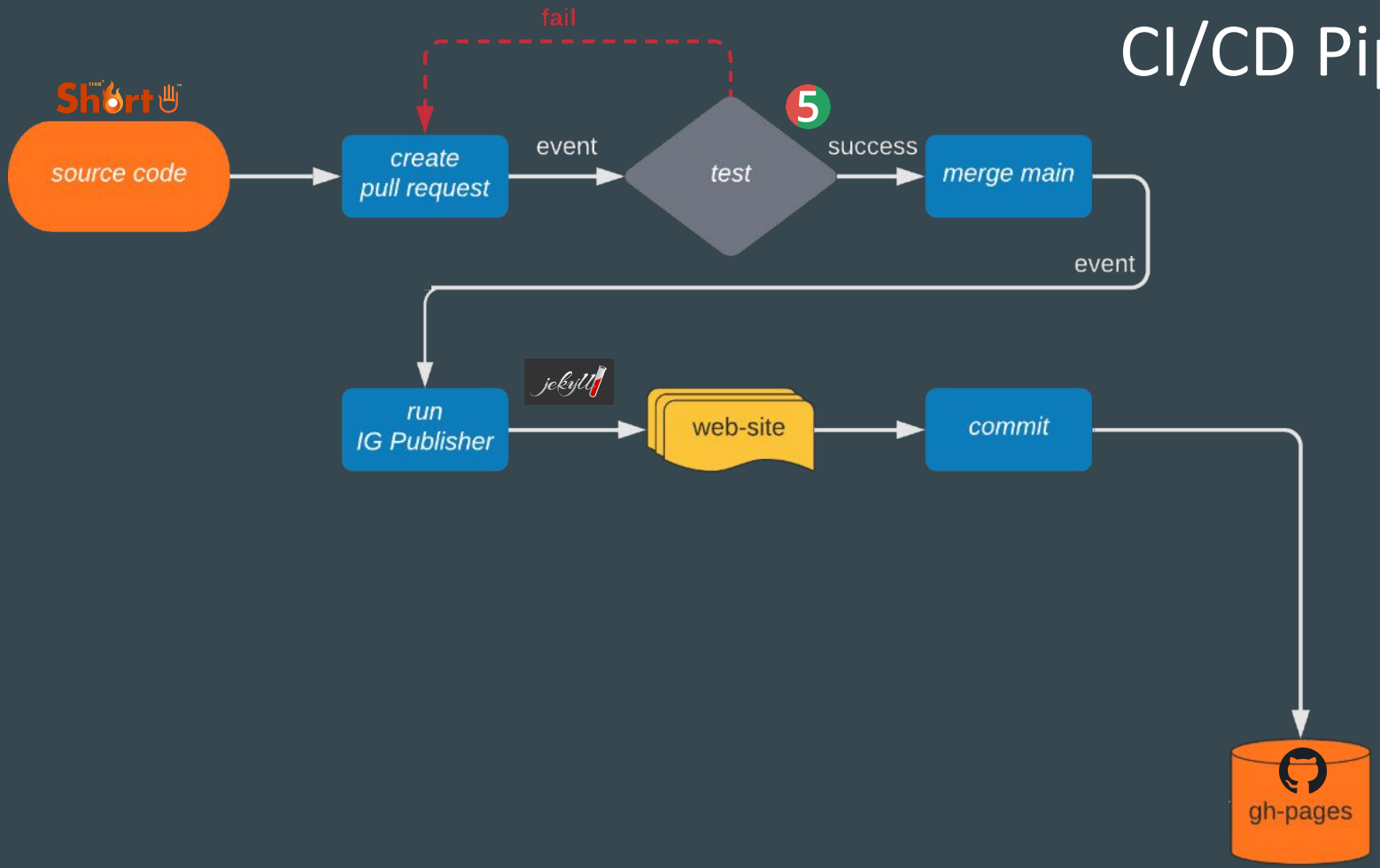
- Web host for statiske nettsider lagret i GitHub repo
- Enkelt alternativ til egen web-server

https://{org}.github.io/{repo}

CI/CD Pipeline



CI/CD Pipeline



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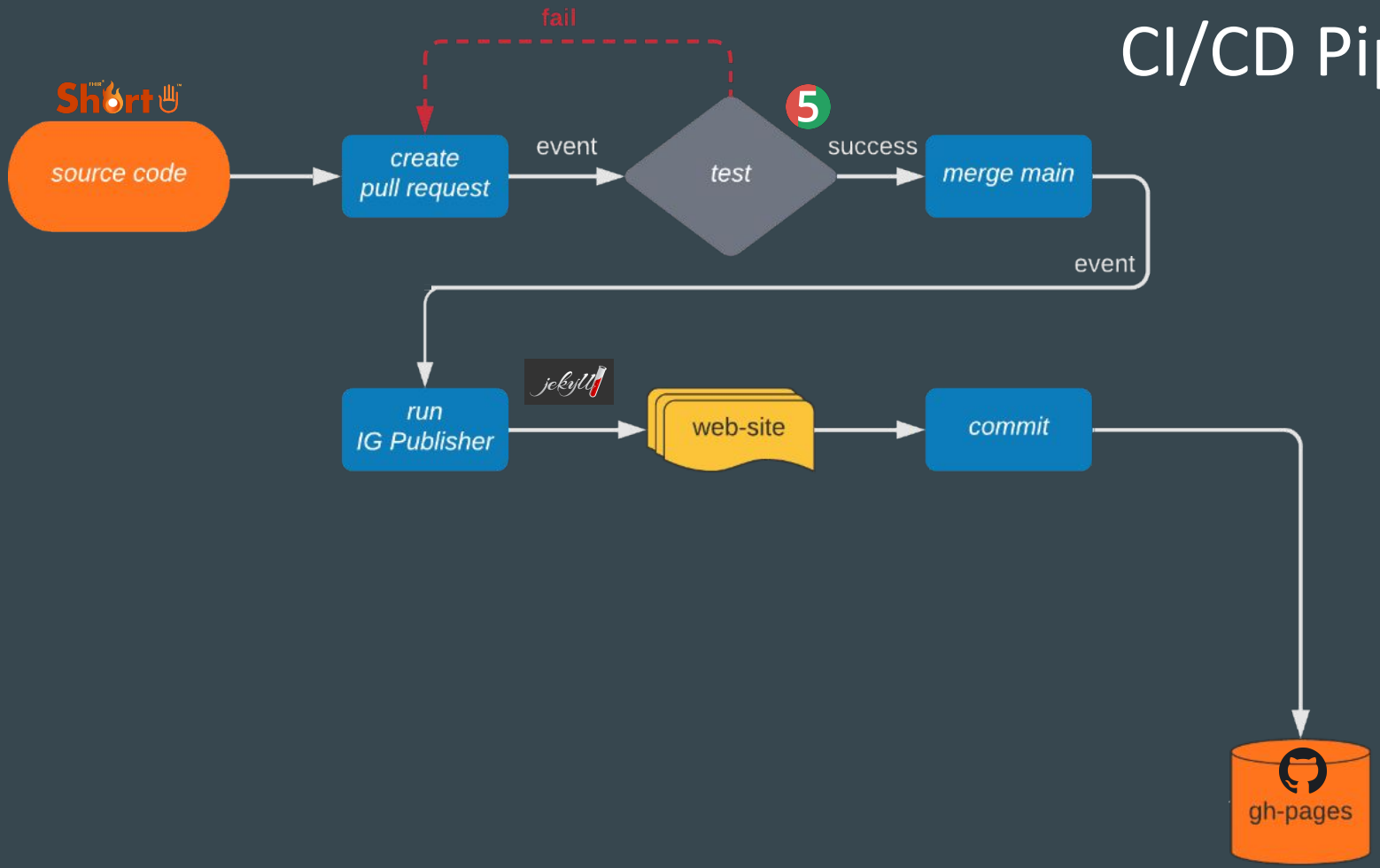

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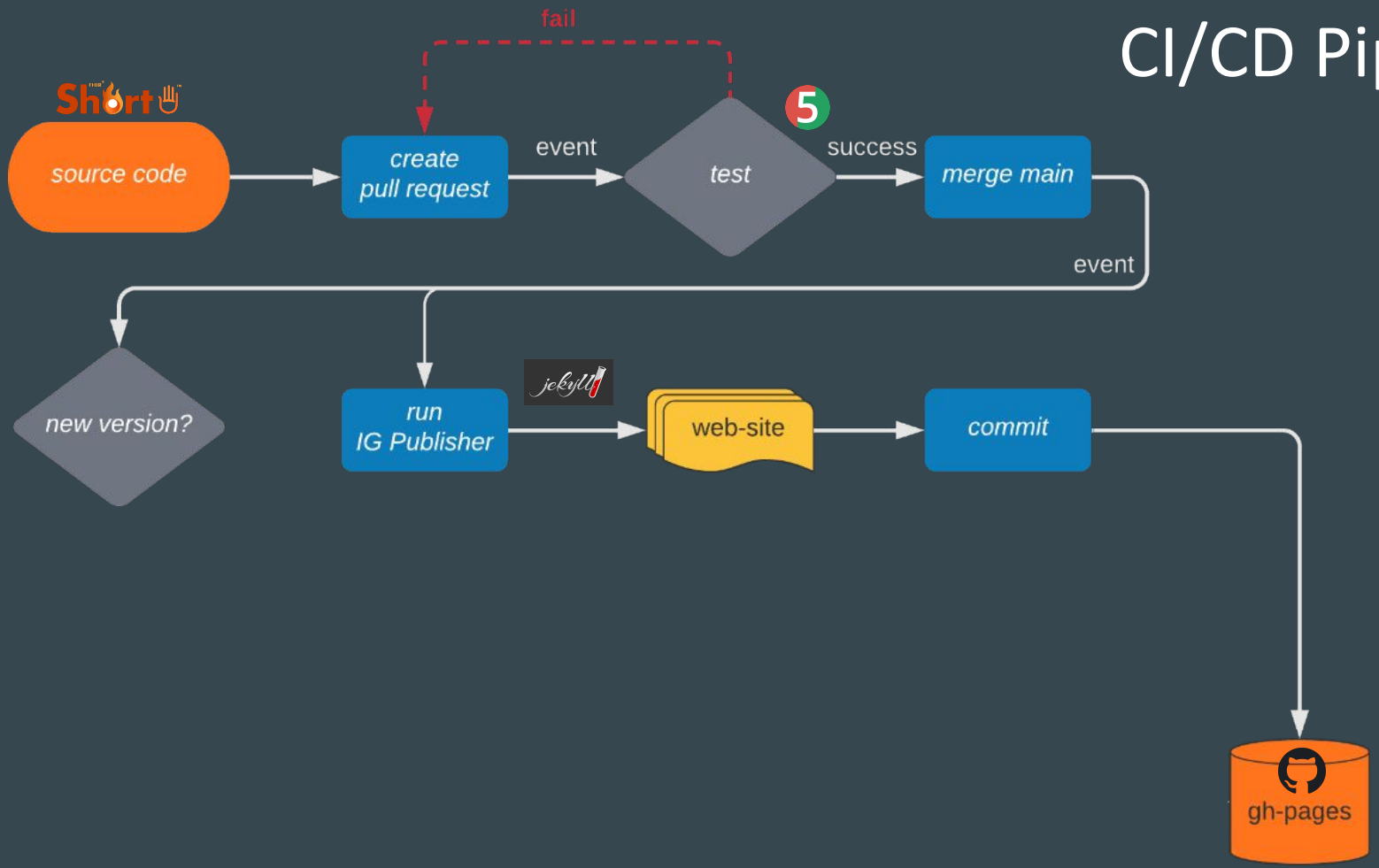
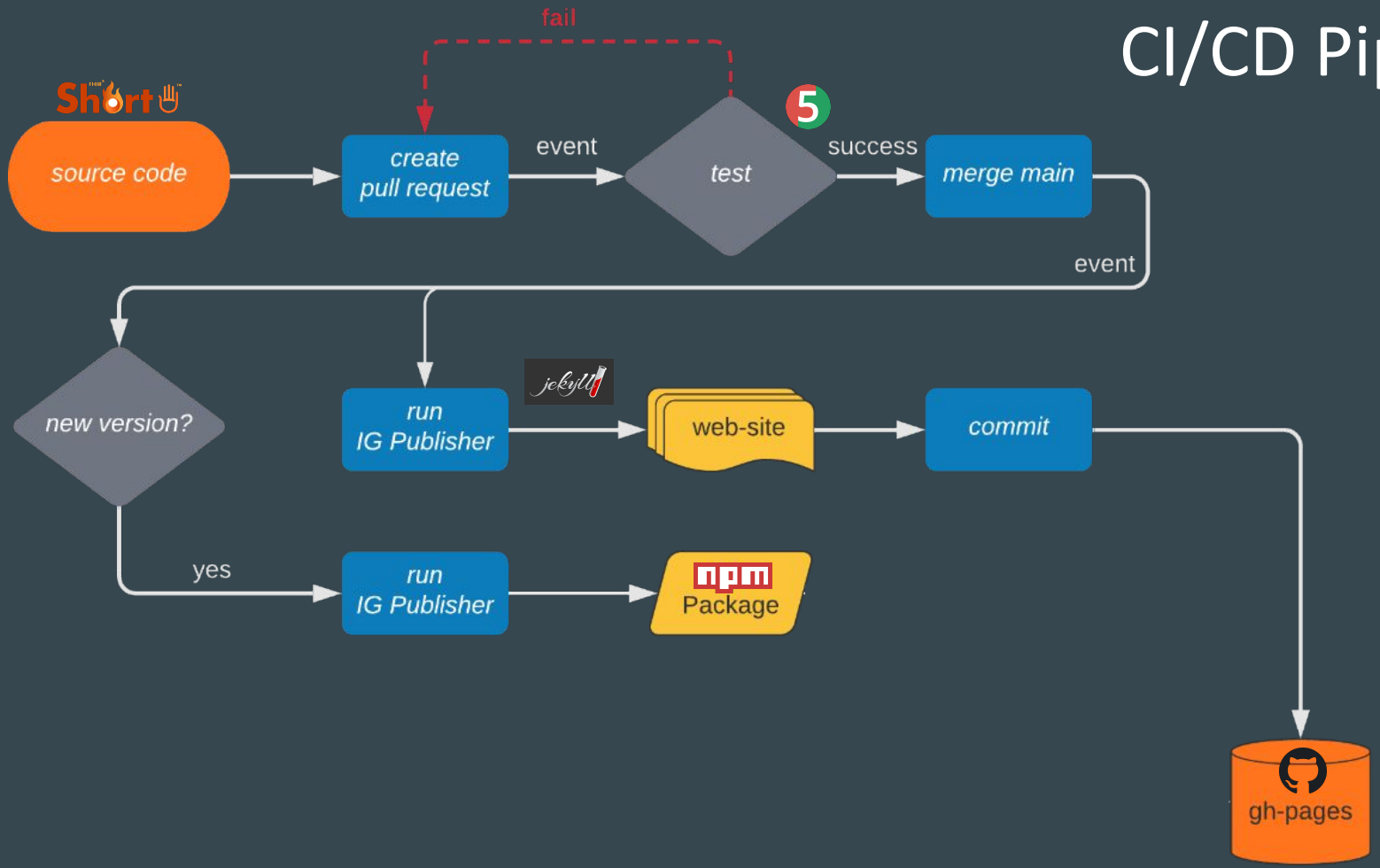


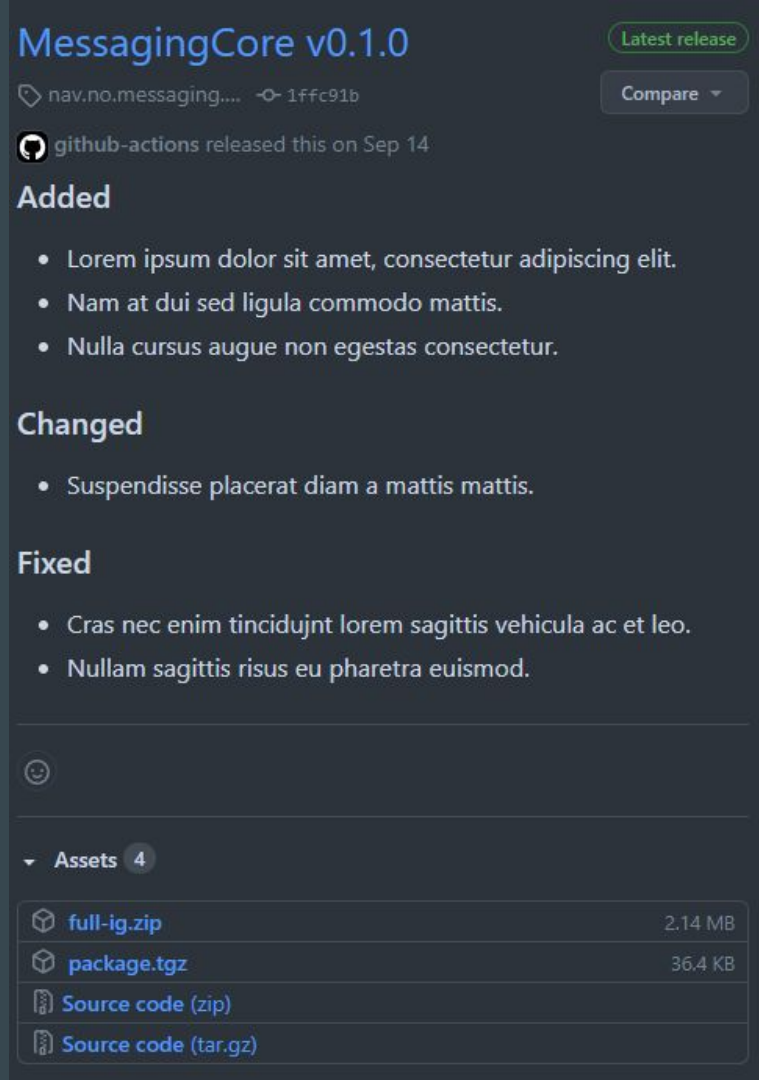
CI/CD Pipeline



Release - GitHub releases

- Versionert snapshot
- Dokumenter endringer
- Bundled assets
- Fåes også som maskinlesbar Json:

https://api.github.com/repos/{owner}/{repo}/releases



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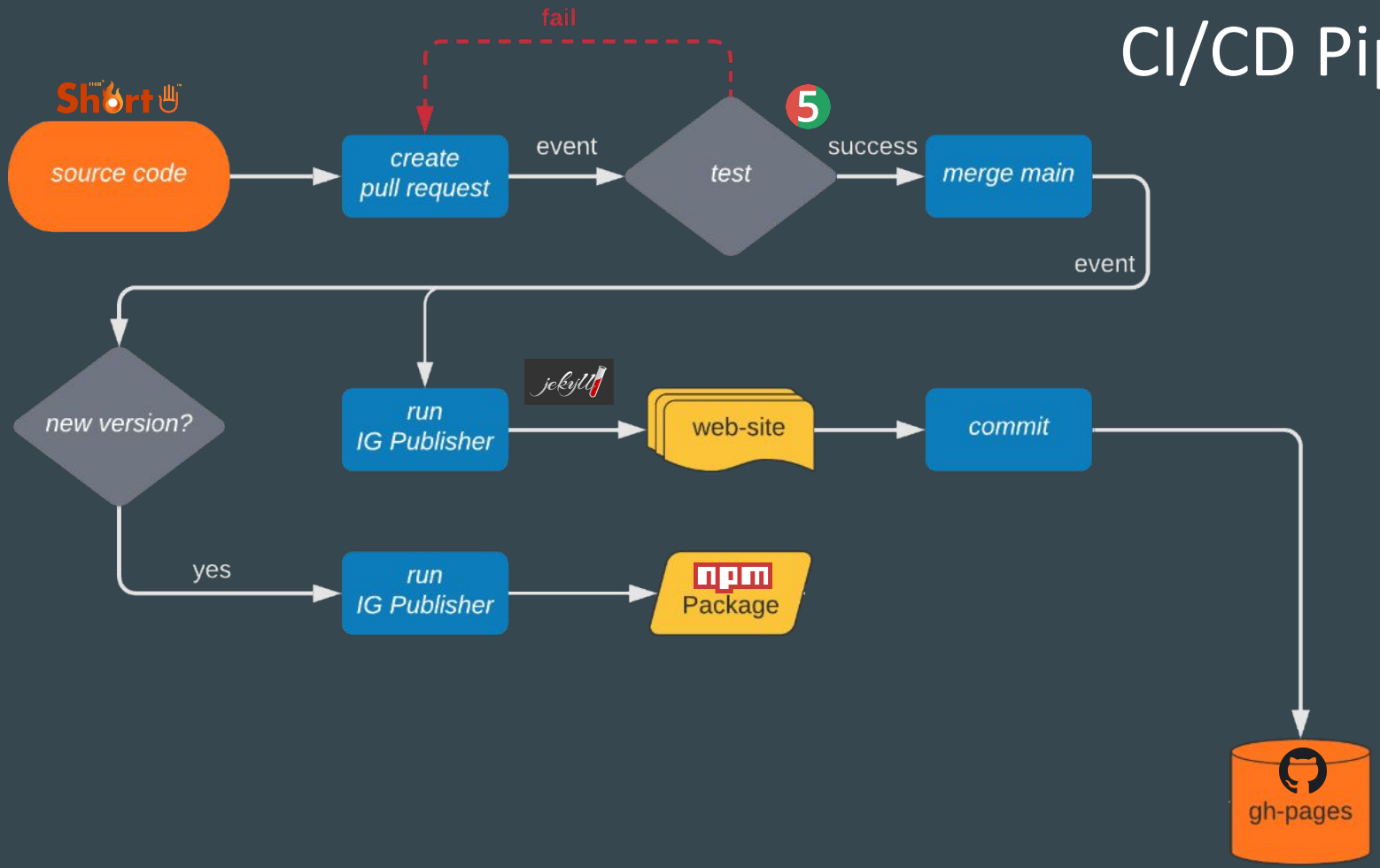

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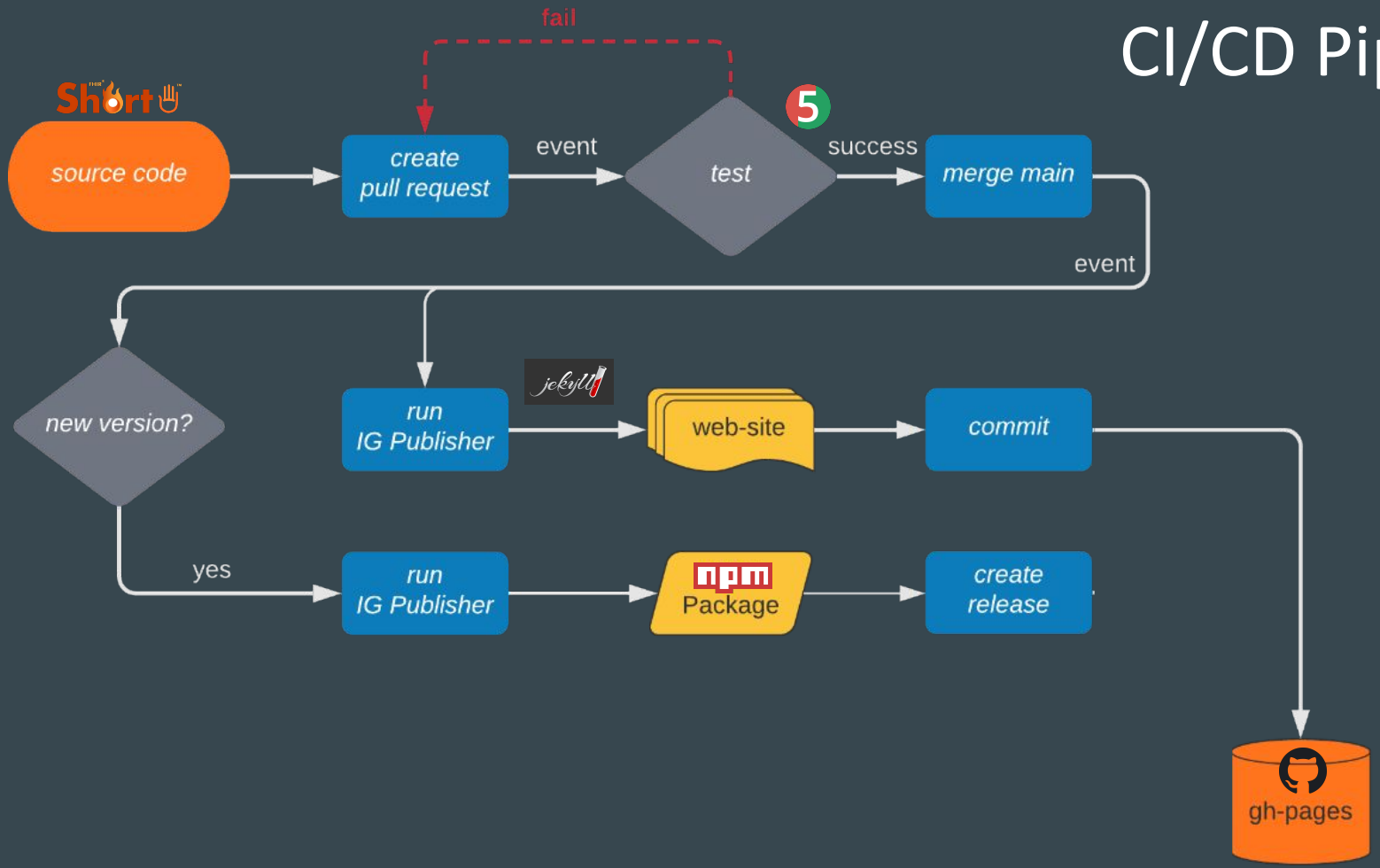
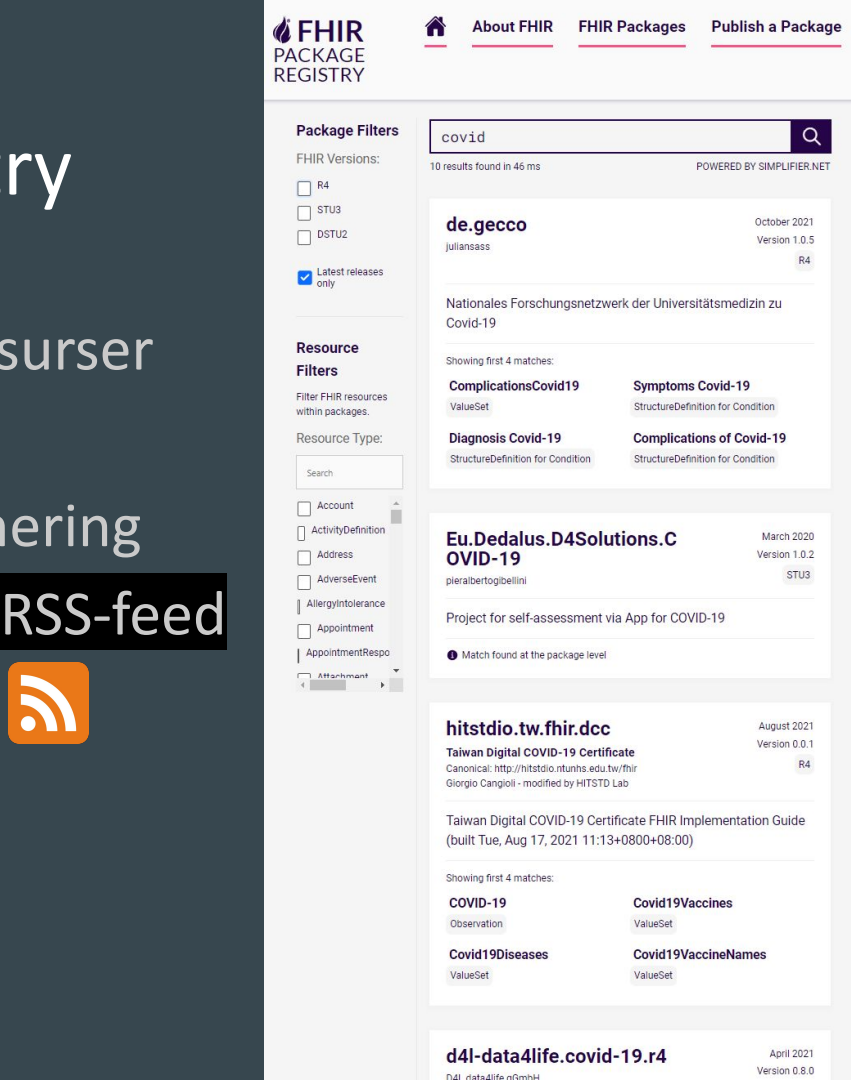


Deploy - FHIR Package registry

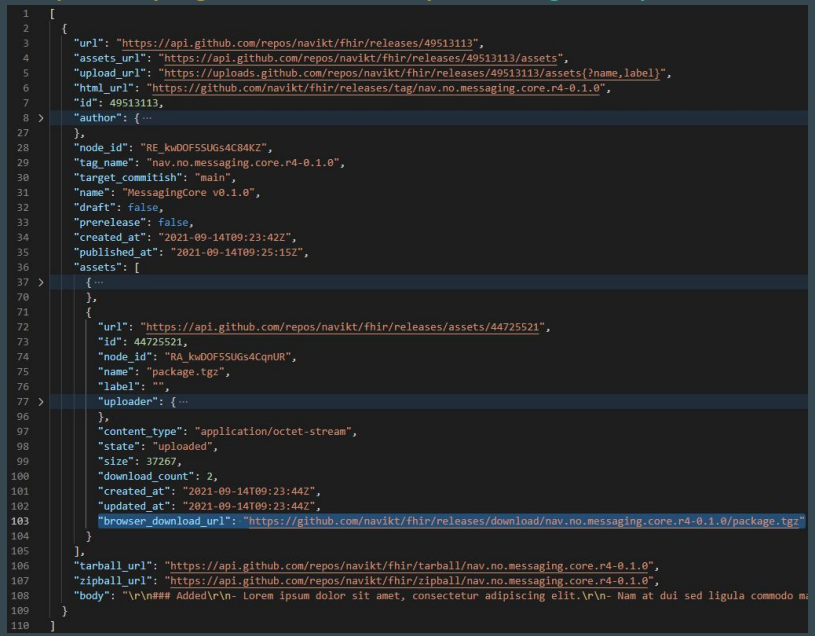
- npm pakke med Conformance ressurser
- Egen NPM-feed bare for FHIR
- Orden på dependencies og versionering
- Publisering krever at du hoster en RSS-feed



Deploy - FHIR Package registry

- DIY: Create your own package feed and add it to the list of package feeds:
    - Create an RSS feed (template at http://hl7.org/fhir/package-feed.xml)
    - Register the package feed in https://github.com/FHIR/ig-registry/blob/master/fhir-ig-list.json (by making a GitHub Pull-Request).
      The package server will regularly check the RSS feed for new packages.

https://api.github.com/repos/{org}/{repo}/releases




```
[
  {
    "url": "https://api.github.com/repos/navikt/fhir/releases/49513113",
    "assets_url": "https://api.github.com/repos/navikt/fhir/releases/49513113/assets",
    "upload_url": "https://uploads.github.com/repos/navikt/fhir/releases/49513113/assets{?name,label}",
    "html_url": "https://github.com/navikt/fhir/releases/tag/nav.no.messaging.core.r4-0.1.0",
    "id": 49513113,
    "author": {…
    },
    "node_id": "RE_kwDOF5SUGs4C84KZ",
    "tag_name": "nav.no.messaging.core.r4-0.1.0",
    "target_commitish": "main",
    "name": "MessagingCore v0.1.0",
    "draft": false,
    "prerelease": false,
    "created_at": "2021-09-14T09:23:42Z",
    "published_at": "2021-09-14T09:25:15Z",
    "assets": [
      {…
      },
      {
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        "id": 44725521,
        "node_id": "RA_kwDOF5SUGs4CqnUR",
        "name": "package.tgz",
        "label": "",
        "uploader": {…
        },
        "content_type": "application/octet-stream",
        "state": "uploaded",
        "size": 37267,
        "download_count": 2,
        "created_at": "2021-09-14T09:23:44Z",
        "updated_at": "2021-09-14T09:23:44Z",
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      }
    ],
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    "zipball_url": "https://api.github.com/repos/navikt/fhir/zipball/nav.no.messaging.core.r4-0.1.0",
    "body": "\r\n### Added\r\n- Lorem ipsum dolor sit amet, consectetur adipiscing elit.\r\n- Nam at dui sed ligula commodo ma
  }
]
```
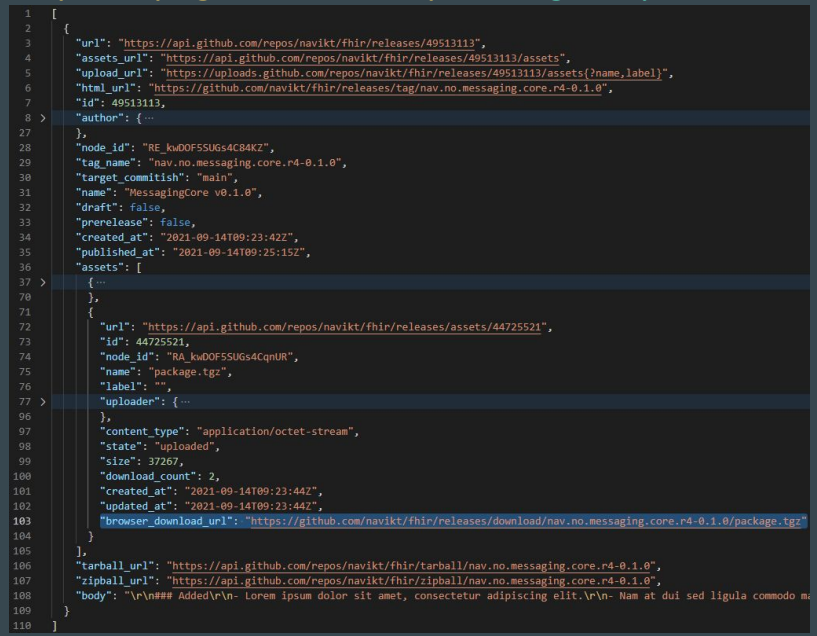

https://api.github.com/repos/{org}/{repo}/releases



```
[
  {
    "url": "https://api.github.com/repos/navikt/fhir/releases/49513113",
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    "author": {…
    },
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    "tag_name": "nav.no.messaging.core.r4-0.1.0",
    "target_commitish": "main",
    "name": "MessagingCore v0.1.0",
    "draft": false,
    "prerelease": false,
    "created_at": "2021-09-14T09:23:42Z",
    "published_at": "2021-09-14T09:25:15Z",
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      {
        "url": "https://api.github.com/repos/navikt/fhir/releases/assets/44725521",
        "id": 44725521,
        "node_id": "RA_kwDOF5SUGs4CqnUR",
        "name": "package.tgz",
        "label": "",
        "uploader": {…
        },
        "content_type": "application/octet-stream",
        "state": "uploaded",
        "size": 37267,
        "download_count": 2,
        "created_at": "2021-09-14T09:23:44Z",
        "updated_at": "2021-09-14T09:23:44Z",
        "browser_download_url": "https://github.com/navikt/fhir/releases/download/nav.no.messaging.core.r4-0.1.0/package.tgz"
      }
    ],
    "tarball_url": "https://api.github.com/repos/navikt/fhir/tarball/nav.no.messaging.core.r4-0.1.0",
    "zipball_url": "https://api.github.com/repos/navikt/fhir/zipball/nav.no.messaging.core.r4-0.1.0",
    "body": "\r\n### Added\r\n- Lorem ipsum dolor sit amet, consectetur adipiscing elit.\r\n- Nam at dui sed ligula commodo m
  }
]
```
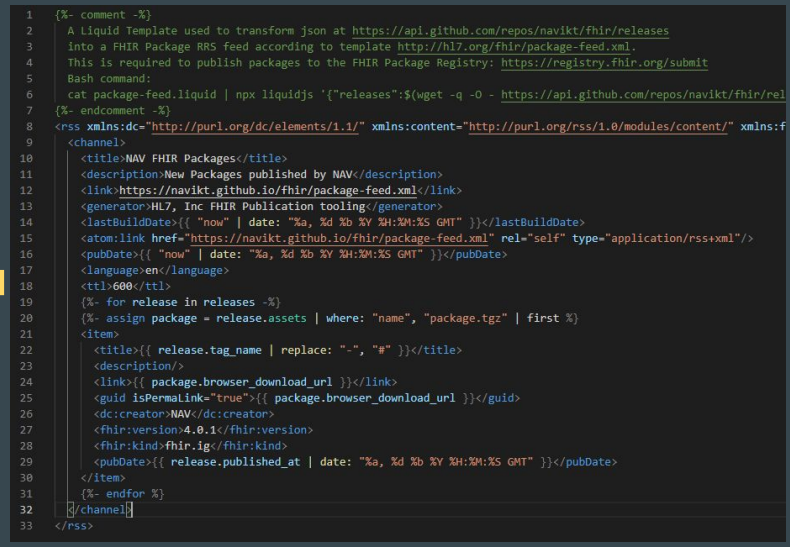

Liquid template



```
{%- comment -%}
  A Liquid Template used to transform json at https://api.github.com/repos/navikt/fhir/releases
  into a FHIR Package RRS feed according to template http://hl7.org/fhir/package-feed.xml.
  This is required to publish packages to the FHIR Package Registry: https://registry.fhir.org/submit
  Bash command:
  cat package-feed.liquid | npx liquidjs '{"releases":$(wget -q -O - https://api.github.com/repos/navikt/fhir/rel
{%- endcomment -%}
<rss xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:content="http://purl.org/rss/1.0/modules/content/" xmlns:f
  <channel>
    <title>NAV FHIR Packages</title>
    <description>New Packages published by NAV</description>
    <link>https://navikt.github.io/fhir/package-feed.xml</link>
    <generator>HL7, Inc FHIR Publication tooling</generator>
    <lastBuildDate>{{ "now" | date: "%a, %d %b %Y %H:%M:%S GMT" }}</lastBuildDate>
    <atom:link href="https://navikt.github.io/fhir/package-feed.xml" rel="self" type="application/rss+xml"/>
    <pubDate>{{ "now" | date: "%a, %d %b %Y %H:%M:%S GMT" }}</pubDate>
    <language>en</language>
    <ttl>600</ttl>
    {%- for release in releases -%}
    {%- assign package = release.assets | where: "name", "package.tgz" | first %}
    <item>
      <title>{{ release.tag_name | replace: "-", "#" }}</title>
      <description/>
      <link>{{ package.browser_download_url }}</link>
      <guid isPermaLink="true">{{ package.browser_download_url }}</guid>
      <dc:creator>NAV</dc:creator>
      <fhir:version>4.0.1</fhir:version>
      <fhir:kind>fhir.ig</fhir:kind>
      <pubDate>{{ release.published_at | date: "%a, %d %b %Y %H:%M:%S GMT" }}</pubDate>
    </item>
    {%- endfor %}
  </channel>
</rss>
```

https://api.github.com/repos/{org}/{repo}/releases


```
[
  {
    "url": "https://api.github.com/repos/navikt/fhir/releases/49513113",
    "assets_url": "https://api.github.com/repos/navikt/fhir/releases/49513113/assets",
    "upload_url": "https://uploads.github.com/repos/navikt/fhir/releases/49513113/assets{?name,label}",
    "html_url": "https://github.com/navikt/fhir/releases/tag/nav.no.messaging.core.r4-0.1.0",
    "id": 49513113,
    "author": {…
    },
    "node_id": "RE_kwDOF5SUGs4C84KZ",
    "tag_name": "nav.no.messaging.core.r4-0.1.0",
    "target_commitish": "main",
    "name": "MessagingCore v0.1.0",
    "draft": false,
    "prerelease": false,
    "created_at": "2021-09-14T09:23:42Z",
    "published_at": "2021-09-14T09:25:15Z",
    "assets": [
      {…
      },
      {
        "url": "https://api.github.com/repos/navikt/fhir/releases/assets/44725521",
        "id": 44725521,
        "node_id": "RA_kwDOF5SUGs4CqnUR",
        "name": "package.tgz",
        "label": "",
        "uploader": {…
        },
        "content_type": "application/octet-stream",
        "state": "uploaded",
        "size": 37267,
        "download_count": 2,
        "created_at": "2021-09-14T09:23:44Z",
        "updated_at": "2021-09-14T09:23:44Z",
        "browser_download_url": "https://github.com/navikt/fhir/releases/download/nav.no.messaging.core.r4-0.1.0/package.tgz"
      }
    ],
    "tarball_url": "https://api.github.com/repos/navikt/fhir/tarball/nav.no.messaging.core.r4-0.1.0",
    "zipball_url": "https://api.github.com/repos/navikt/fhir/zipball/nav.no.messaging.core.r4-0.1.0",
    "body": "\r\n### Added\r\n- Lorem ipsum dolor sit amet, consectetur adipiscing elit.\r\n- Nam at dui sed ligula commodo m
  }
]
```

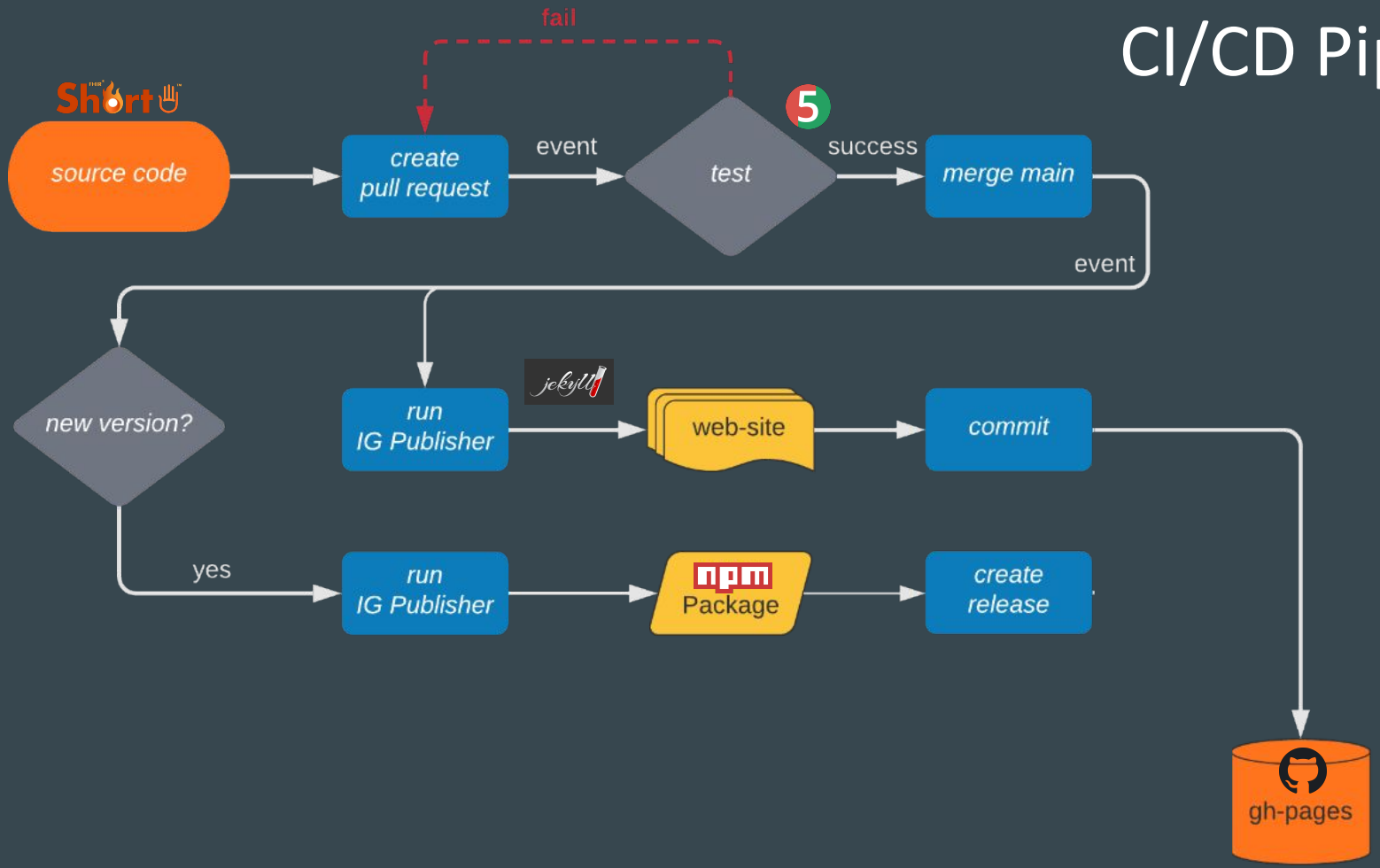

Liquid template


```
{%- comment -%}
  A Liquid Template used to transform json at https://api.github.com/repos/navikt/fhir/releases
  into a FHIR Package RRS feed according to template http://hl7.org/fhir/package-feed.xml.
  This is required to publish packages to the FHIR Package Registry: https://registry.fhir.org/submit
  Bash command:
  cat package-feed.liquid | npx liquidjs '{"releases":$(wget -q -O - https://api.github.com/repos/navikt/fhir/rel
{%- endcomment -%}
<rss xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:content="http://purl.org/rss/1.0/modules/content/" xmlns:f
  <channel>
    <title>NAV FHIR Packages</title>
    <description>New Packages published by NAV</description>
    <link>https://navikt.github.io/fhir/package-feed.xml</link>
    <generator>HL7, Inc FHIR Publication tooling</generator>
    <lastBuildDate>{{ "now" | date: "%a, %d %b %Y %H:%M:%S GMT" }}</lastBuildDate>
    <atom:link href="https://navikt.github.io/fhir/package-feed.xml" rel="self" type="application/rss+xml"/>
    <pubDate>{{ "now" | date: "%a, %d %b %Y %H:%M:%S GMT" }}</pubDate>
    <language>en</language>
    <ttl>600</ttl>
    {%- for release in releases -%}
    {%- assign package = release.assets | where: "name", "package.tgz" | first %}
    <item>
      <title>{{ release.tag_name | replace: "-", "#" }}</title>
      <description/>
      <link>{{ package.browser_download_url }}</link>
      <guid isPermaLink="true">{{ package.browser_download_url }}</guid>
      <dc:creator>NAV</dc:creator>
      <fhir:version>4.0.1</fhir:version>
      <fhir:kind>fhir.ig</fhir:kind>
      <pubDate>{{ release.published_at | date: "%a, %d %b %Y %H:%M:%S GMT" }}</pubDate>
    </item>
    {%- endfor %}
  </channel>
</rss>
```

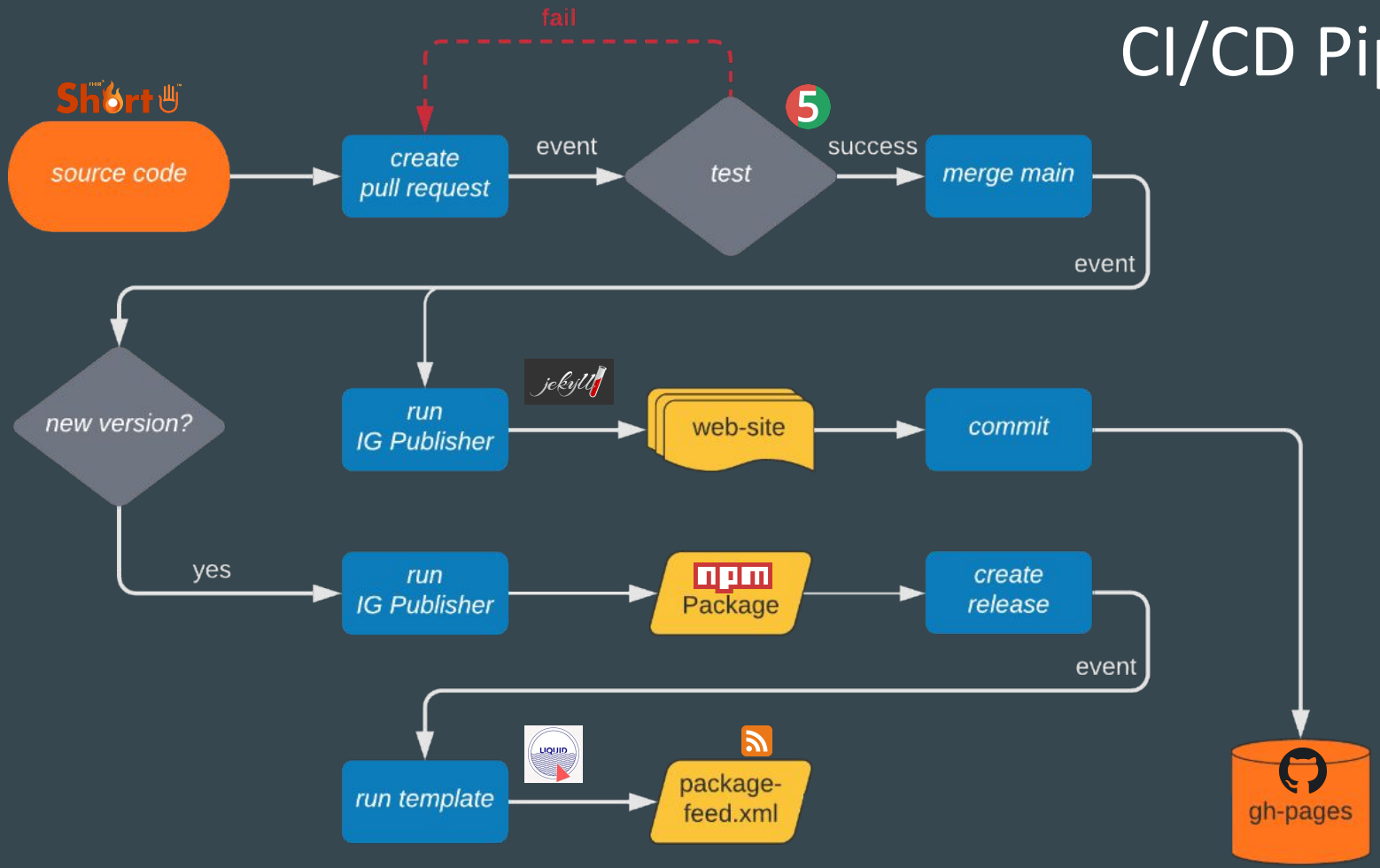
```
<rss xmlns:dc="http://purl.org/dc/elements/1.1/" xmlns:content="http://purl.org/rss/1.0/modules/content/" xmlns:fhir="http://hl7.
  <channel>
    <title>NAV FHIR Packages</title>
    <description>New Packages published by NAV</description>
    <link>https://navikt.github.io/fhir/package-feed.xml</link>
    <generator>HL7, Inc FHIR Publication tooling</generator>
    <lastBuildDate>Sun, 17 Oct 2021 13:05:52 GMT</lastBuildDate>
    <atom:link href="https://navikt.github.io/fhir/package-feed.xml" rel="self" type="application/rss+xml"/>
    <pubDate>Sun, 17 Oct 2021 13:05:52 GMT</pubDate>
    <language>en</language>
    <ttl>600</ttl>
    <item>
      <title>nav.no.messaging.core.r4#0.1.0</title>
      <description/>
      <link>https://github.com/navikt/fhir/releases/download/nav.no.messaging.core.r4-0.1.0/package.tgz</link>
      <guid isPermaLink="true">https://github.com/navikt/fhir/releases/download/nav.no.messaging.core.r4-0.1.0/package.tgz</guid>
      <dc:creator>NAV</dc:creator>
      <fhir:version>4.0.1</fhir:version>
      <fhir:kind>fhir.ig</fhir:kind>
      <pubDate>Tue, 14 Sep 2021 11:25:15 GMT</pubDate>
    </item>
  </channel>
</rss>
```

package-feed.xml

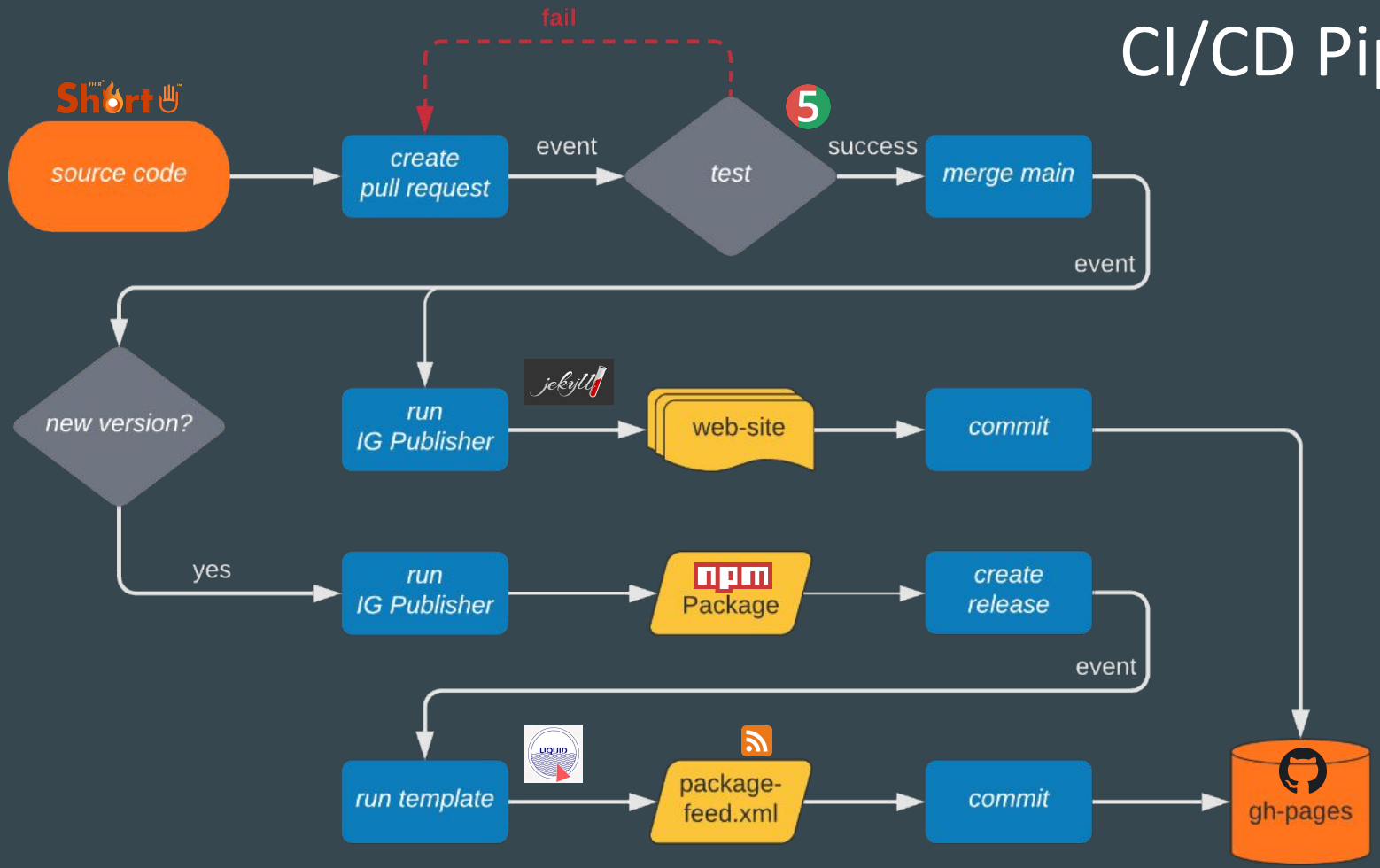
CI/CD Pipeline



CI/CD Pipeline



CI/CD Pipeline



Spørsmål?

https://github.com/navikt/fhir