

# Configurable CDS Hooks (order-select and order-sign)

# Goal

Demonstrate a method so that the CDS Service:

- ~ Allows for some level configuration to be passed in CDS Hooks requests
  - Enables more flexibility for the client systems
- ~ Maintain some concept of state
  - Enables coordination between order-select and order-sign as a strategy to avoid apparently duplicate alerts

# Configuration Solution

A new structure definition for configuration options (pddi-cds-configuration-options)

- ~ Follows the ideas of the DaVinci Coverage Requirements Discovery (CRD)
  - <http://hl7.org/fhir/us/davinci-crd/2018Sep/hooks.html#configuration-options>

~ Example:

<https://dikb.org/baseDstu3/StructureDefinition/pddi-cds-configuration-options>

# Configuration Structure Definition

“It will be a Configuration object that will contain an array of available options. Each option will include four mandatory elements:

- ~ A code that will be used when setting configuration during hook invocation
- ~ A data type for the parameter. At present, allowed values are “boolean” and “integer”
- ~ A display name for the configuration option to appear in the client’s user interface when performing configuration
- ~ A description providing a 1-2 sentence description of the effect of the configuration option”
- ~ *<http://hl7.org/fhir/us/davinci-crd/2018Sep/hooks.html#configuration-options0>*

# Configuration Options in PDDI CDS PlanDefinitions

**order-select:**

<https://dikb.org/baseDstu3/PlanDefinition/warfarin-nsaids-cds-select>

**order-sign:**

<https://dikb.org/baseDstu3/PlanDefinition/warfarin-nsaids-cds-sign>

# How Configuration Looks in CDS Hooks

GET <http://dikb.org/cds-services>

RESPONSE (order-select service):

```
{
  "services": [
    {
      "hook": "order-select",
      "name": "PlanDefinition - Warfarin NSAIDs Recommendation Workflow",
      "title": "Warfarin NSAIDs Recommendation",
      "extension": {
        "pddi-configuration-items": [
          {
            "code": "cache-for-order-sign-filtering",
            "type": "boolean",
            "name": "Cache Info for Order Sign Filtering",
            "description": "Cache information about this CDS call so that additional filtering of card responses can be done when the service is called using an order-sign CDS Hook request. Currently, this only supports filtering out cards that were triggered by the same knowledge artifact when the physician and patient identifiers match between the order-select and order-sign requests. Filtering will happen if both this configuration option is set to 'true' and order-sign requests set filter-out-repeated-alerts to 'true'."
          },
          {
            "code": "alert-non-serious",
            "type": "boolean",
            "name": "Alert for non-serious potential drug-drug interactions",
            "description": "Serious potential drug-drug interactions could result in death; requires hospitalization or extension of hospital stay; results in persistent or significant disability or incapacity; is life-threatening (see https://www.w3.org/2019/05/pddi/index.html). If set to True, this configuration option tells the CDS service to alerts for potential drug-drug interactions that do not meet this criterion."
          },
          {
            "code": "show-evidence-support",
            "type": "boolean",
            "name": "Show evidence support",
            "description": "If this options is set to True, CDS response cards will provide more complete information about the evidence that supports the potential drug-drug interaction alert."
          }
        ]
      }
    }
  ]
}
```

# How Configuration Looks in CDS Hooks Continued

GET <http://dikb.org/cds-services>

RESPONSE CONTINUED (order-sign service):

```
{
  "hook": "order-sign",
  "name": "PlanDefinition - Warfarin NSAIDs Recommendation Workflow",
  "title": "Warfarin NSAIDs Recommendation",
  "extension": {
    "pddi-configuration-items": [
      {
        "code": "filter-out-repeated-alerts",
        "type": "boolean",
        "name": "Filter out repeated alerts",
        "description": "Only works if both this configuration option is set to 'true' and cache-for-order-sign-filtering was set to 'true' in an order-select request. Uses information about this CDS call to filter apparently repetitious card. Currently, this only supports filtering out cards that were triggered by the same knowledge artifact when the physician and patient identifiers match between the order-select and order-sign requests."
      },
      {
        "code": "alert-non-serious",
        "type": "boolean",
        "name": "Alert for non-serious potential drug-drug interactions",
        "description": "Serious potential drug-drug interactions could result in death; requires hospitalization or extension of hospital stay; results in persistent or significant disability or incapacity; is life-threatening (see https://www.w3.org/2019/05/pddi/index.html). If set to True, this configuration option tells the CDS service to alerts for potential drug-drug interactions that do not meet this criterion."
      },
      {
        "code": "show-evidence-support",
        "type": "boolean",
        "name": "Show evidence support",
        "description": "If this options is set to True, CDS response cards will provide more complete information about the evidence that supports the potential drug-drug interaction alert."
      }
    ]
  },
  "id": "warfarin-nsaids-cds-sign"
```

# How Configuration Looks in CDS Hooks Continued

POST <http://localhost:2020/cds-services/warfarin-nsaids-cds-select>

REQUEST (Warfarin-NSAIDS order-select service):

```
{
  "hookInstance": "f24dfe5e-9480-429f-9b27-2af9c6512345",
  "hook": "order-select",
  "fhirServer": "http://localhost:2020/baseDstu3",
  "user": "Practitioner/COREPRACTITIONER1",
  "patient": "f101",
  "extension": {
    "pddi-configuration-items": {
      "cache-for-order-sign-filtering": false,
      "show-evidence-support": true,
      "alert-non-serious": true
    }
  },
  "context": {
    "patientId": "f101",
    "encounterId": "e101",
    "selections": ["MedicationRequest/ketorolac-draft-order-test"],
    "draftOrders": {
      "resourceType": "Bundle",
      "entry": [
        {
          "resource": {
            "resourceType": "MedicationRequest",
            "id": "ketorolac-draft-order-test",
            "authoredOn": "2019-12-07",
            "status": "draft",
            "subject": {
              "reference": "Patient/f101"
            }
          },
          "dosageInstruction": [
            {
              "doseQuantity": {
                "value": 1,
                "system": "http://unitsofmeasure.org",
                "code": "{pill}"
              },
              "timing": {
                "repeat": {
```



# How Configuration Looks in CDS Hooks Continued

POST <http://localhost:2020/cds-services/warfarin-nsaids-cds-sign>

REQUEST (Warfarin-NSAIDS order-sign service):

```
{
  "hookInstance": "f24dfe5e-9480-429f-9b27-2af9c123456",
  "hook": "order-sign",
  "fhirServer": "http://localhost:2020/baseDstu3",
  "user": "Practitioner/COREPRACTITIONER1",
  "patient": "f101",
  "extension": {
    "pddi-configuration-items": {
      "filter-out-repeated-alerts": false,
      "show-evidence-support": true,
      "alert-non-serious": true
    }
  },
  "context": {
    "patientId": "f101",
    "encounterId": "e101",
    "draftOrders": {
      "resourceType": "Bundle",
      "entry": [
        {
          "resource": {
            "resourceType": "MedicationRequest",
            "authoredOn": "2020-02-05",
            "status": "draft",
            "subject": {
              "reference": "Patient/f101"
            },
            "dosageInstruction": [
              {
                "doseQuantity": {
                  "value": 1,
                  "system": "http://unitsofmeasure.org",
                  "code": "{pill}"
                },
                "timing": {
                  "repeat": {
                    "frequency": 1,
```

# Demonstration

1. GET services

2. order-select with no coordination to order-sign

- using:

cache-for-order-sign-filtering=**false**

filter-out-repeated-alerts=**false**

3. order-select coordinated to order-sign

- using:

cache-for-order-sign-filtering=**true**

filter-out-repeated-alerts=**true**

# New Requirements to Support Configuration

If the CDS service supports configuration:

1. The service needs to be able to respond with available options from the configuration extension (in our case 'pddi-configuration-items') at the time of service registration (GET)
2. The client CDS Hooks POST requests need to include configuration object in the 'extension' attribute (in our case, named 'pddi-configuration-items') with only those configuration options reported by the service
3. The service needs to validate the configuration items submitted and have a graceful way to return an error (e.g., an information card)

# New Requirements to Support Coordination between order-select and order-sign

1. The service must have mechanism to cache information from order-select requests for use by the service when processing order-sign requests
  - For our use case, we are currently caching [1]:
    - Ordering physician (user)
    - patient id
    - encounter id
    - the URL of the the relatedArtifact (PlanDefinition)
    - medication id constructed from system + code from the Medication Codeable Concept
    - Base64 encoded Medication object
3. (order-select) The client needs to set cache-for-order-sign-filtering to true for POST
4. (order-sign) The client needs to set filter-out-repeated-alerts to true for POST

[1] <http://localhost/~rdb20/PDDI-CDS/output/cds-service-spec.html#-360--cds-message-filtering>

# Discussion

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