The DDI4 Collections Pattern

DDI4 has a pattern used to describe collections of a variety of, possibly heterogeneous, objects. These collections may be described as a simple “bag” having no structure or even order, or as an ordered list. Collections may also be assigned multiple more complex structures, including hierarchies and cyclical networks.

## Examples of Collections

#### A Simple CodeList

A common example of a collection is a code list. The DDI CodeList class realizes the collection archetype (has all of its properties and relationships). A simple code list might be, for example:

a, n = never

b = some of the time

c = always

This list is ordered. The collection is modeled as a list of CodeItems (e.g. 1 = never), having a Code (the string “1” denotes the concept described as “never”). The DDI4 expressed as YAML might look like:

CodeList:

agency: example.org

id: CodeListSimple1

version: 1

hasMember:

- "URN:DDI:example.org:IDCodeItem1:1"

- "URN:DDI:example.org:IDCodeItem2:1"

- "URN:DDI:example.org:IDCodeItem3:1"

hasMemberIsList: true

CodeItem:

agency: example.org

id: IDCodeItem1

version: 1

contains:

- "URN:DDI:example.org:IDCodea:1

- "URN:DDI:example.org:IDCoden:1

takesMeaningFrom: "URN:DDI:example.org:IDCategory1:1"

CodeItem:

agency: example.org

id: IDCodeItem2

version: 1

contains:

- "URN:DDI:example.org:IDCodeb:1

takesMeaningFrom: "URN:DDI:example.org:IDCategory2:1"

CodeItem:

agency: example.org

id: IDCodeItem3

version: 1

contains:

- "URN:DDI:example.org:IDCodec:1

takesMeaningFrom: "URN:DDI:example.org:IDCategory3:1"

Code:

agency: example.org

id: IDCodea

version: 1

token: a

denotes: "URN:DDI:example.org:IDCategory1:1"

Code:

agency: example.org

id: IDCoden

version: 1

token: n

denotes: "URN:DDI:example.org:IDCategory1:1"

Code:

agency: example.org

id: IDCodeb

version: 1

token: b

denotes: "URN:DDI:example.org:IDCategory2:1"

Code:

agency: example.org

id: IDCodec

version: 1

token: c

denotes: "URN:DDI:example.org:IDCategory3:1"

Category:

agency: example.org

id: IDCategory1

isUniversallyUnique: False

version: 1

displayLabel:

languageSpecificStructuredString:

-

content:

- never

isPlainText: True

language:

Category:

agency: example.org

id: IDCategory2

isUniversallyUnique: False

version: 1

displayLabel:

languageSpecificStructuredString:

-

content:

- some of the time

isPlainText: True

language:

Category:

agency: example.org

id: IDCategory3

isUniversallyUnique: False

version: 1

displayLabel:

languageSpecificStructuredString:

-

content:

- always

isPlainText: True

language:

#### A More Complex CodeList

CodeLists may be structured as a hierarchy. In the example below the second category can be subdivided. Changes from the simple case are shown in bold below

a, n = never

b = some of the time

b.L = less than half of the time

b.H = half of the time or more, but less than always

c = always

CodeList:

agency: example.org

id: **CodeListComplex1**

version: 1

hasMember:

- "URN:DDI:example.org:IDCodeItem1:1"

- "URN:DDI:example.org:IDCodeItem2:1"

**- "URN:DDI:example.org:IDCodeItem2L:1"**

**- "URN:DDI:example.org:IDCodeItemI2H:1"**

- "URN:DDI:example.org:IDCodeItem3:1"

**hasMemberIsList: false**

CodeItem:

agency: example.org

id: IDCodeItem1

version: 1

contains:

- "URN:DDI:example.org:IDCodea:1

- "URN:DDI:example.org:IDCoden:1

takesMeaningFrom: "URN:DDI:example.org:IDCategory1:1"

CodeItem:

agency: example.org

id: IDCodeItem2

version: 1

contains:

- "URN:DDI:example.org:IDCodeb:1

takesMeaningFrom: "URN:DDI:example.org:IDCategory2:1"

CodeItem:

agency: example.org

id: IDCodeItem3

version: 1

contains:

- "URN:DDI:example.org:IDCodec:1

takesMeaningFrom: "URN:DDI:example.org:IDCategory3:1"

**CodeItem:**

**agency: example.org**

**id: IDCodeItem2L**

**version: 1**

**contains:**

**- "URN:DDI:example.org:IDCodebL:1**

**takesMeaningFrom: "URN:DDI:example.org:IDCategory2L:1"**

**CodeItem:**

**agency: example.org**

**id: IDCodeItem2H**

**version: 1**

**contains:**

**- "URN:DDI:example.org:IDCodebH:1**

**takesMeaningFrom: "URN:DDI:example.org:IDCategory2H:1"**

Code:

agency: example.org

id: IDCodea

version: 1

token: a

denotes: "URN:DDI:example.org:IDCategory1:1"

Code:

agency: example.org

id: IDCoden

version: 1

token: n

denotes: "URN:DDI:example.org:IDCategory1:1"

Code:

agency: example.org

id: IDCodeb

version: 1

token: b

denotes: "URN:DDI:example.org:IDCategory2:1"

Code:

agency: example.org

id: IDCodec

version: 1

token: c

denotes: "URN:DDI:example.org:IDCategory3:1"

**Code:**

**agency: example.org**

**id: IDCodeb**

**version: 1**

**token: b,L**

**denotes: "URN:DDI:example.org:IDCategory2L:1"**

**Code:**

**agency: example.org**

**id: IDCodeb**

**version: 1**

**token: b.HH**

**denotes: "URN:DDI:example.org:IDCategory2:1"**

Category:

agency: example.org

id: IDCategory1

isUniversallyUnique: False

version: 1

displayLabel:

languageSpecificStructuredString:

-

content:

- never

isPlainText: True

language:

Category:

agency: example.org

id: IDCategory2

isUniversallyUnique: False

version: 1

displayLabel:

languageSpecificStructuredString:

-

content:

- some of the time

isPlainText: True

language:

Category:

agency: example.org

id: IDCategory3

isUniversallyUnique: False

version: 1

displayLabel:

languageSpecificStructuredString:

-

content:

- always

isPlainText: True

language:

**Category:**

**agency: example.org**

**id: IDCategory2L**

**isUniversallyUnique: False**

**version: 1**

**displayLabel:**

**languageSpecificStructuredString:**

**-**

**content:**

**- less than half of the time**

**isPlainText: True**

**language:**

**Category:**

**agency: example.org**

**id: IDCategory2**

**isUniversallyUnique: False**

**version: 1**

**displayLabel:**

**languageSpecificStructuredString:**

**-**

**content:**

**- half of the time or more, but less than always**

**isPlainText: True**

**language:**

**RelationshipStructure:**

**structures: "URN:DDI:example.org: CodeListComplex1:1"**

**hasRelationsSpecification: List**

**semantics: Hierarchy**

**totality: Total**

**hasMemberRelationships:**

**- "URN:DDI:example.org: MemberRelationshipsCodeListComplexA:1"**

**- "URN:DDI:example.org: MemberRelationshipsCodeListComplexB:1"**

**- "URN:DDI:example.org: MemberRelationshipsCodeListComplexC:1"**

**- "URN:DDI:example.org: MemberRelationshipsCodeListComplexD:1"**

**MemberRelationships: # b follows a,n**

**agency: example.org**

**id: MemberRelationshipsCodeListComplexA**

**version: 1**

**hasRelationsSpecification: List**

**semantic:**

**associationType:**

**atLevel: "URN:DDI:example.org:Level1:1"**

**sourceMamber: "URN:DDI:example.org:CodeItem1:1"**

**targetMembers: "URN:DDI:example.org:TargetMemberA:1"**

**TargetMembers:**

**agency: example.org**

**id: TargetMemberA**

**version: 1**

**atLevel: "URN:DDI:example.org:Level1:1"**

**hasMember: "URN:DDI:example.org:CodeItem2:1"**

**MemberRelationships: # c follows b**

**agency: example.org**

**id: MemberRelationshipsCodeListComplexB**

**version: 1**

**hasRelationsSpecification: List**

**semantic:**

**associationType:**

**sourceMamber: "URN:DDI:example.org:CodeItem2:1"**

**targetMembers: "URN:DDI:example.org:TargetMemberB:1"**

**TargetMembers:**

**agency: example.org**

**id: TargetMemberB**

**version: 1**

**atLevel: "URN:DDI:example.org:Level1:1"**

**hasMember: "URN:DDI:example.org:CodeItem3:1"**

**MemberRelationships: # b is Parent of b.L and b.H**

**agency: example.org**

**id: MemberRelationshipsCodeListComplexB**

**version: 1**

**hasRelationsSpecification: ParentChild**

**semantic:**

**associationType:**

**hasMembersIsList" true**

**sourceMamber: "URN:DDI:example.org:CodeItem2:1"**

**targetMembers: "URN:DDI:example.org:TargetMemberBLH:1"**

**TargetMembers:**

**agency: example.org**

**id: TargetMemberBLH**

**version: 1**

**atLevel: "URN:DDI:example.org:Level2:1"**

**hasMember:**

**- "URN:DDI:example.org:CodeItem2.L:1"**

**- "URN:DDI:example.org:CodeItem2.H:1"**

**Level: # Level 1 is a,n b c**

**agency: example.org**

**id: Level1**

**version: 1**

**depth: 1**

**ContainsList: true**

**hasMember:**

**- "URN:DDI:example.org:CodeItem1:1"**

**- "URN:DDI:example.org:CodeItem1:2"**

**- "URN:DDI:example.org:CodeItem1:3"**

**Level: # Level 2 is 2.L 2.H**

**agency: example.org**

**id: Level2**

**version: 1**

**depth: 2**

**ContainsList: true**

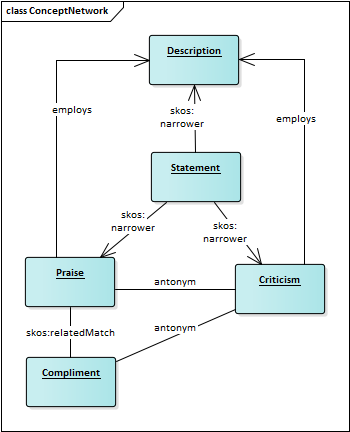
**hasMember:**

**- "URN:DDI:example.org:CodeItem1:2.L"**

**- "URN:DDI:example.org:CodeItem1:2.H"**

#### A Network Structure

Relationships among concepts may be described in a hierarchy as with SKOS or XKOS, or in a more general graph. Developing the latter is one of the activities supported in qualitative data analysis packages. In the example below segments of an interview might be marked up with a set of seven codes ("Praise" etc.). Relationships among the codes might be described in a network combining directed and undirected elements.



The YAML below describes the relationships in the figure above.

ConceptSystem:

agency: example.org

id: ConSys1

isUniversallyUnique: False

hasMembersList: False # has a complex strucure, the order

version: 1

concept:

- "URN:DDI:example.org:1Desc:1"

- "URN:DDI:example.org:2Stmt:1"

- "URN:DDI:example.org:3Pra:1"

- "URN:DDI:example.org:4Comp:1"

- "URN:DDI:example.org:5Crit:1"

Concept:

agency: example.org

id: 1Desc

isUniversallyUnique: False

version: 1

name:

content:Description

Concept:

agency: example.org

id: 2Stmt

isUniversallyUnique: False

version: 1

name:

content:Statement

Concept:

agency: example.org

id: 3PRA

isUniversallyUnique: False

version: 1

name:

content:Praise

Concept:

agency: example.org

id: 4Comp

isUniversallyUnique: False

version: 1

name:

content:Compliment

Concept:

agency: example.org

id: 5Crit

isUniversallyUnique: False

version: 1

name:

content:Criticism

RelationshipStructure:

structures: "URN:DDI:example.org:ConSys1:1"

semantics: mixed relationships

hasMemberRelationships:

- "URN:DDI:example.org:MemberRelationships1:1"

- "URN:DDI:example.org:MemberRelationships2:1"

- "URN:DDI:example.org:MemberRelationships3:1"

- "URN:DDI:example.org:MemberRelationships4:1"

- "URN:DDI:example.org:MemberRelationships5:1"

MemberRelationships: # Description, Praise, Criticism narrower than Statment

agency: example.org

id: MemberRelationships1

version: 1

hasRelationsSpecification: ParentChild

semantic: skos:narrower

associationType: directed

sourceMamber: "URN:DDI:example.org:2Stmt:1"

targetMembers: "URN:DDI:example.org:TargetMember1:1"

TargetMembers:

agency: example.org

id: TargetMember1

version: 1

hasMember:

- "URN:DDI:example.org:1Desc:1"

- "URN:DDI:example.org:3PRA:1"

- "URN:DDI:example.org:5Crit:1"

MemberRelationships: # Criticism employs Description

agency: example.org

id: MemberRelationships2

version: 1

hasRelationsSpecification: ParentChild

semantic: employs

associationType: directed

sourceMamber: "URN:DDI:example.org:5Crit:1"

targetMembers: "URN:DDI:example.org:TargetMember2:1"

TargetMembers:

agency: example.org

id: TargetMember2

version: 1

hasMember:

- "URN:DDI:example.org:1Desc:1"

MemberRelationships: # Praise employs Description

agency: example.org

id: MemberRelationships3

version: 1

hasRelationsSpecification: ParentChild

semantic: employs

associationType: directed

sourceMamber: "URN:DDI:example.org:3PRA:1"

targetMembers: "URN:DDI:example.org:TargetMember2:1" # reuse of TargetMembers

MemberRelationships: # Praise and Compliment are antonyms to Criticism

agency: example.org

id: MemberRelationships4

version: 1

hasRelationsSpecification: Unordered

semantic: antonym

associationType: undirected

sourceMamber: "URN:DDI:example.org:5Crit:1"

targetMembers: "URN:DDI:example.org:TargetMember4:1"

TargetMembers:

agency: example.org

id: TargetMember4

version: 1

hasMember:

- "URN:DDI:example.org:3PRA:1"

- "URN:DDI:example.org:4Comp:1"

MemberRelationships: # Praise and Compliment are related as a match

agency: example.org

id: MemberRelationships5

version: 1

hasRelationsSpecification: Equivalence

semantic: skos:relatedMatch

associationType: undirected

sourceMamber: "URN:DDI:example.org:3PRA:1"

targetMembers: "URN:DDI:example.org:TargetMember5:1"

TargetMembers:

agency: example.org

id: TargetMember5

version: 1

hasMember:

- "URN:DDI:example.org:4Comp:1"