

LOD Touch Day

- 자료는 <http://family.rdf.kr> 홈페이지에 있습니다.

오 원 석

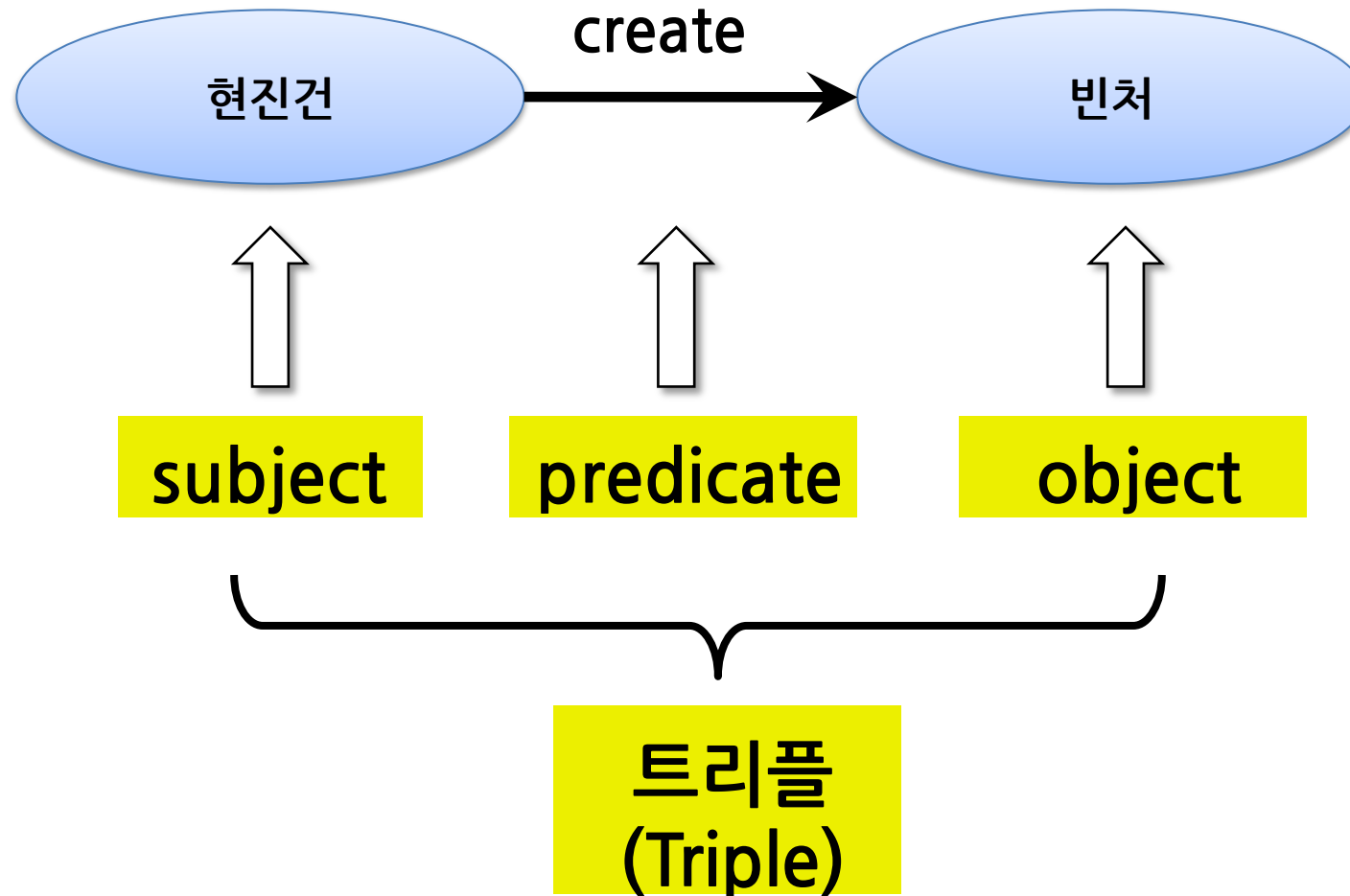
wonseok.oh@listinc.kr

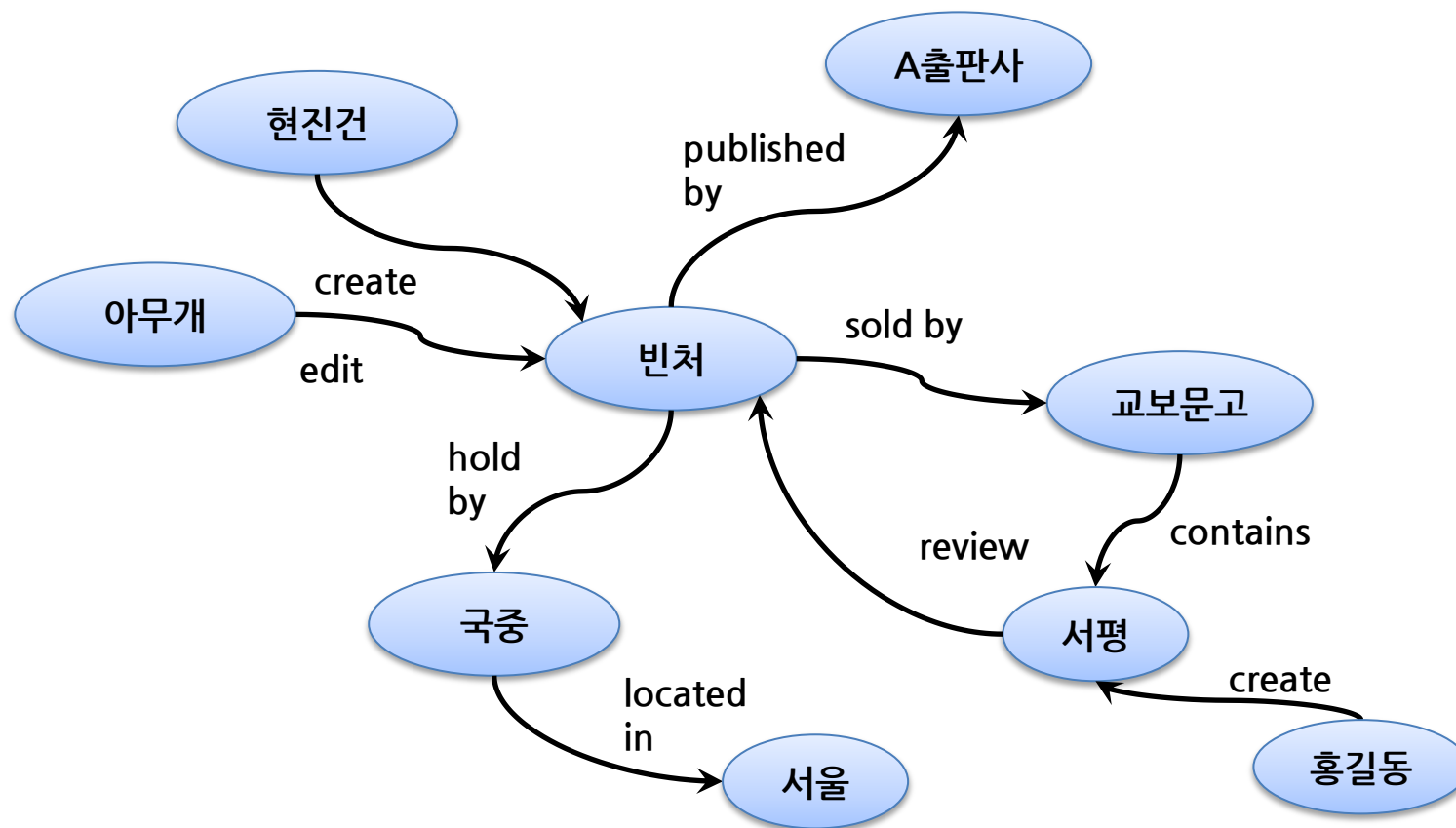
시간	내용	진행
09:30~10:00	등록	
10:00~10:30	LOD 소개	박진호
10:30~12:00	LOD 모델 설계 #1	오원석
12:00~13:00	점심	
13:00~13:30	LOD 모델 설계 #2	오원석
13:30~14:00	SPARQL 소개	허홍수
14:00~14:30	SPARQL 실습 - TBC	오원석
14:30~15:00	LOD 발행	오원석, 허홍수
15:00~15:30	SPARQL 실습 - WEB	오원석
15:30~16:30	LOD Application(Programming) 소개	허홍수
16:30~17:30	참가 소감 발표 및 발전방향 토론	김택훈(NIA)
17:30~18:00	마무리 및 경품 추첨	

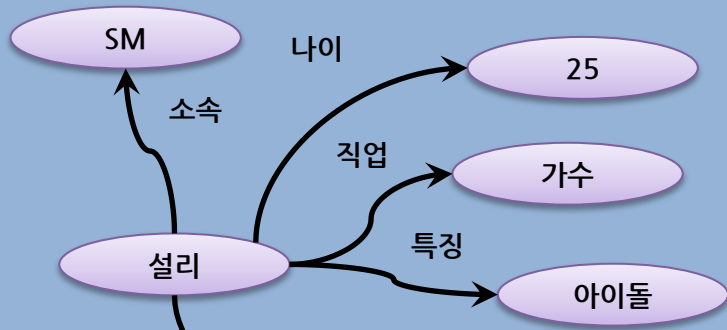
* 실습 진행에 따라 변경될 소지가 많습니다.



1. RDF, RDFS, OWL



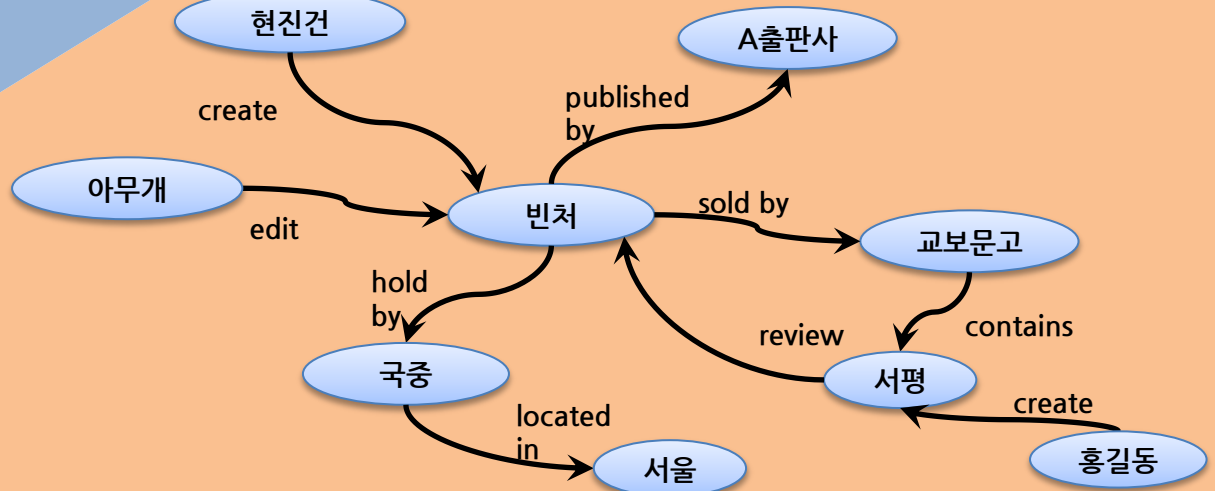




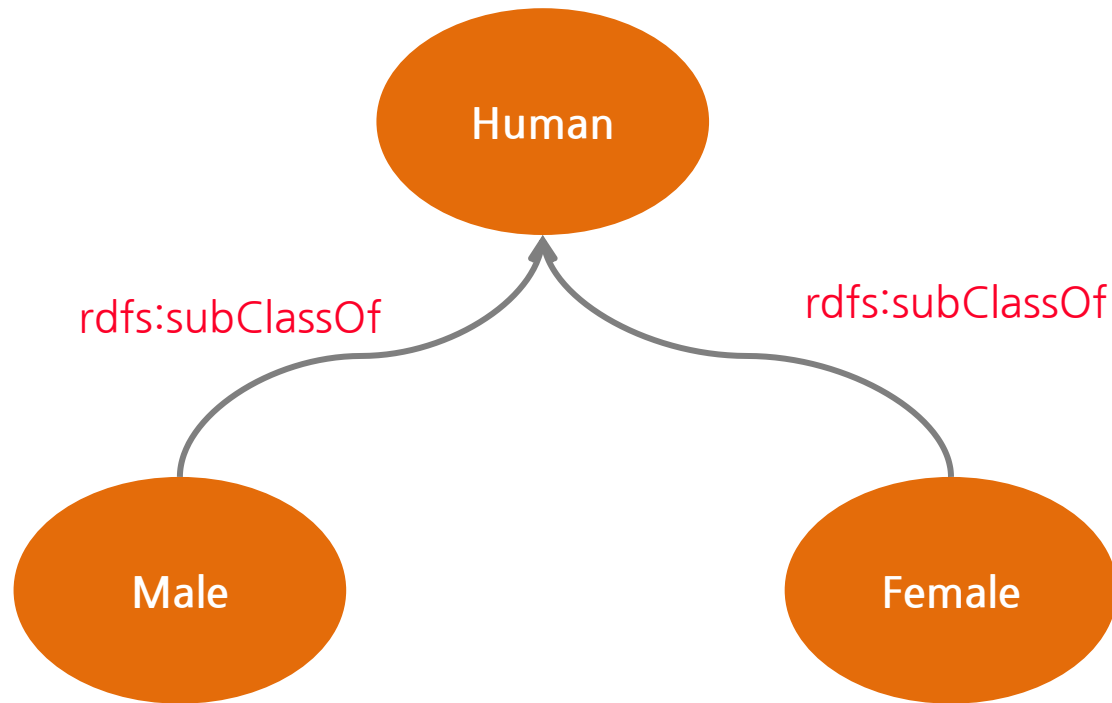
http://a.com

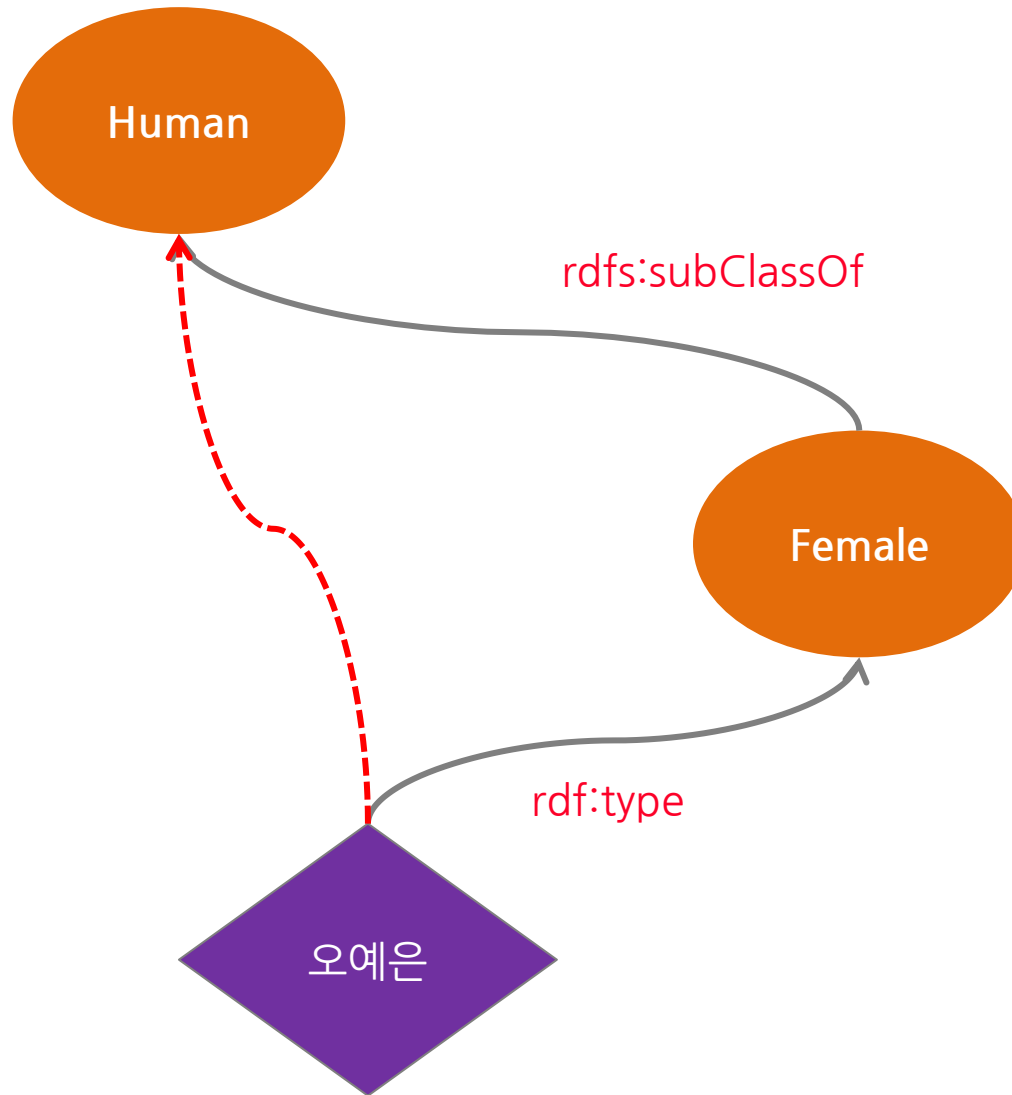
좋아하는 작가

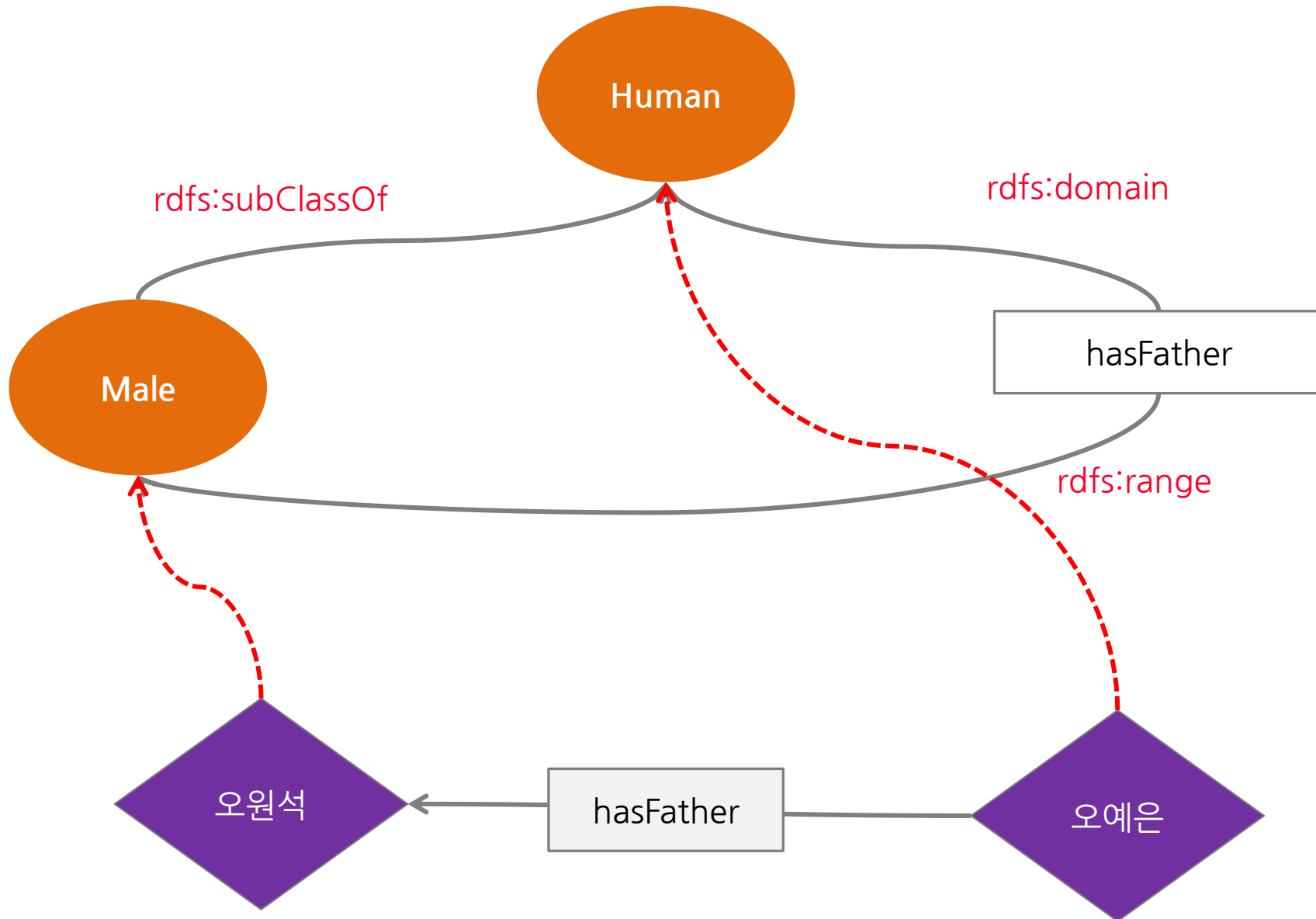
http://b.com

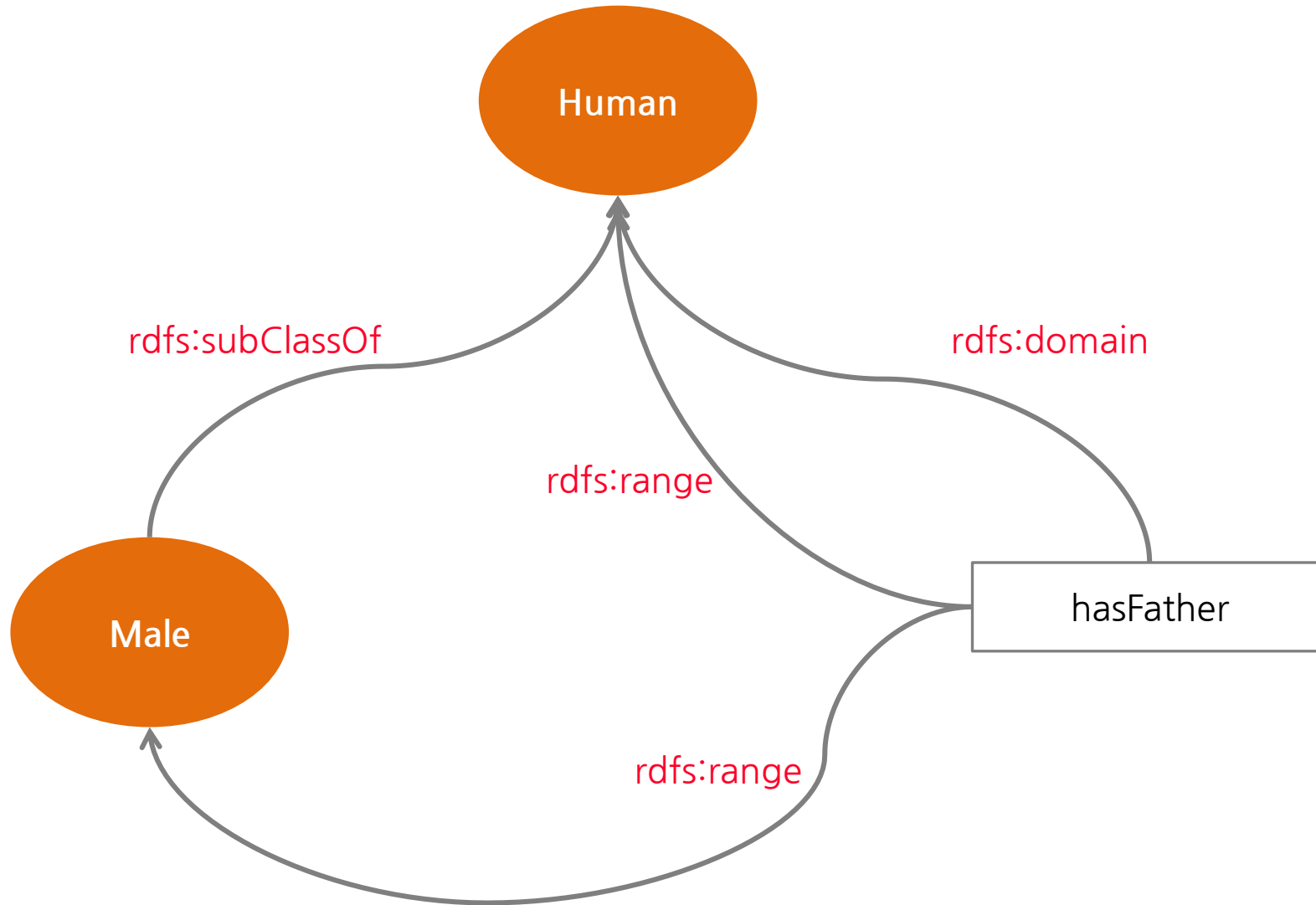


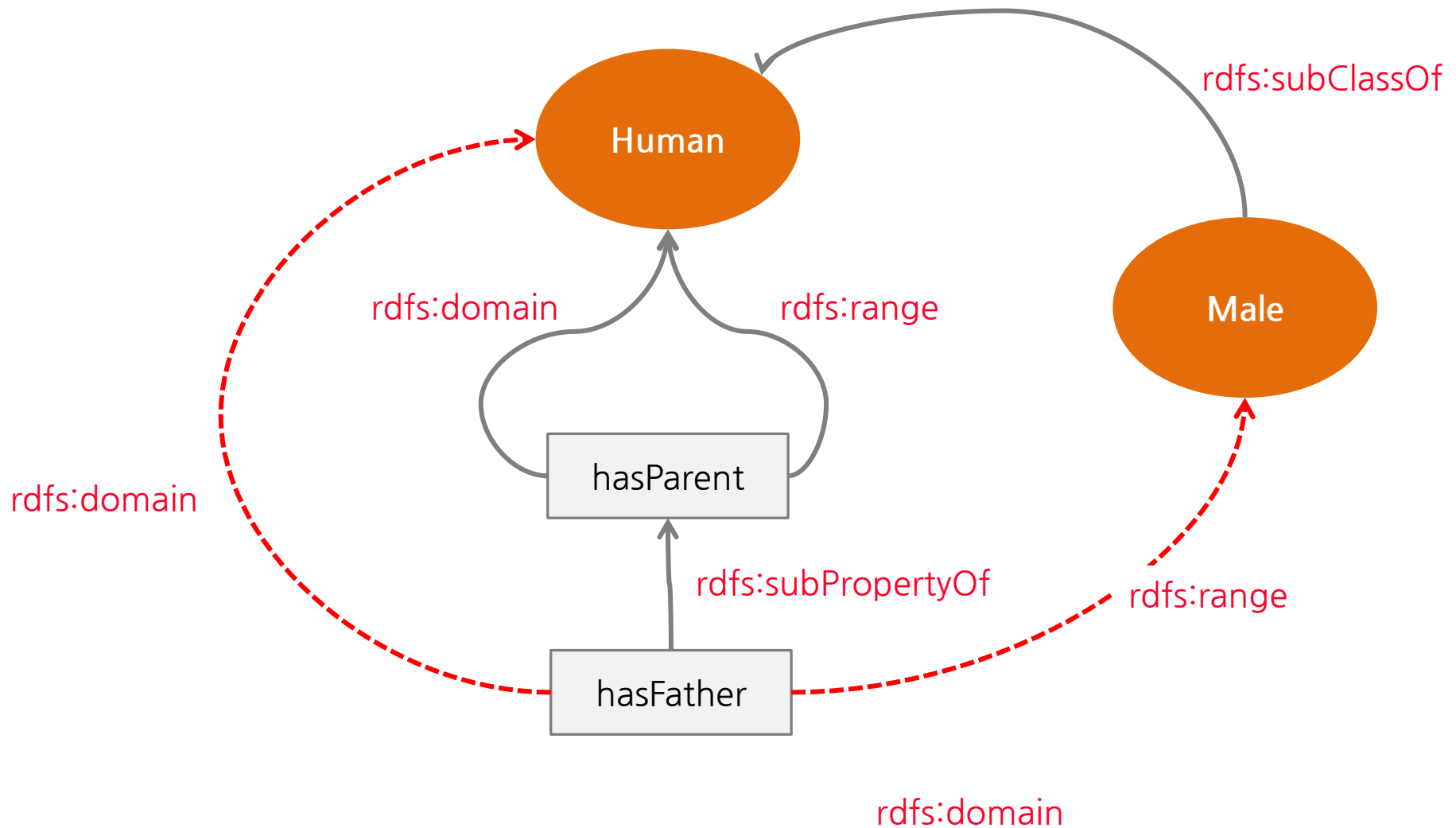
- 인스턴스를 멤버로 갖는 것
- subClassOf를 통해 계층화



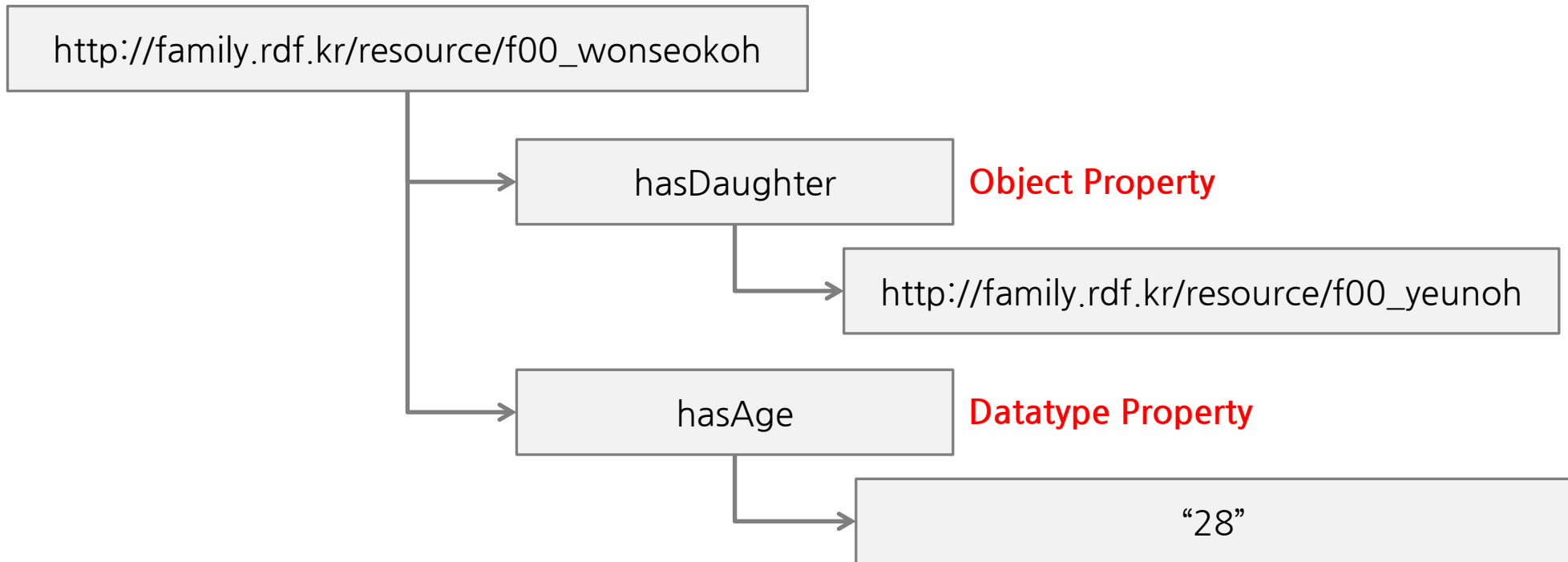




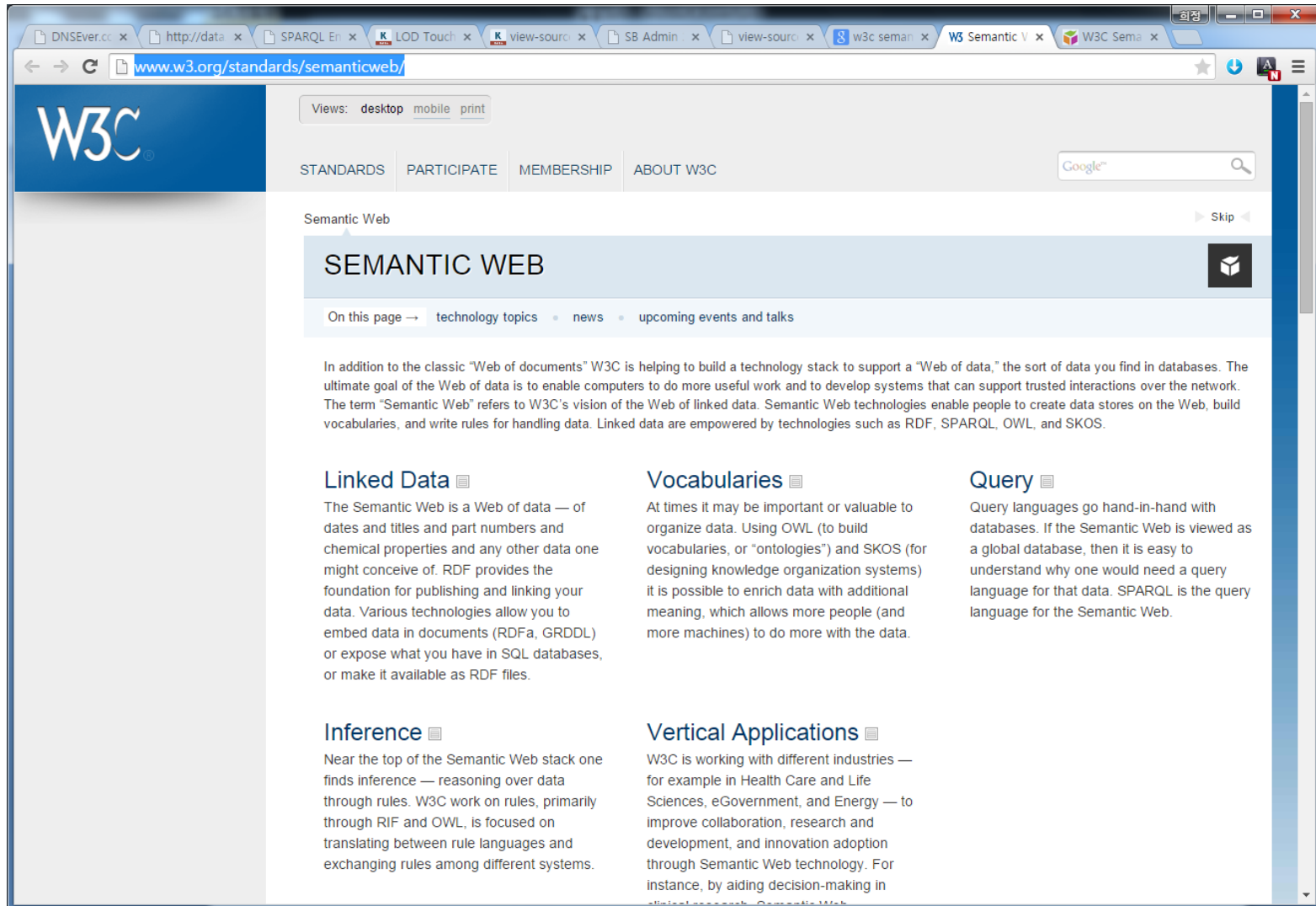




- ObjectProperty
 - Object(개체)를 Object(값)으로 갖는 Property
- DatatypeProperty
 - Data(String, Integer 등)을 Object(값)으로 갖는 Property



<http://www.w3.org/standards/semanticweb/>





2. 온톨로지 설계도구

■ 온톨로지 설계 도구

- ◆ 온톨로지 설계를 위한 도구
- ◆ W3C 시맨틱웹 표준 언어인 RDF, RDFS, OWL 등을 이용
- ◆ 온톨로지 추론 및 규칙 추론을 지원
- ◆ SPARQL 질의 지원
- ◆ 각종 편리 기능 지원

■ Protégé

- ◆ 스탠포드 대학의 온톨로지 설계 도구

■ TopBraid Composer

- ◆ 탑쿼드란트(TopQuadrant)의 온톨로지 설계 도구

■ 온톨로지 설계 도구 선정

- ◆ 사용 편의성
- ◆ 설치 편의성

■ TopBraid Composer 설치

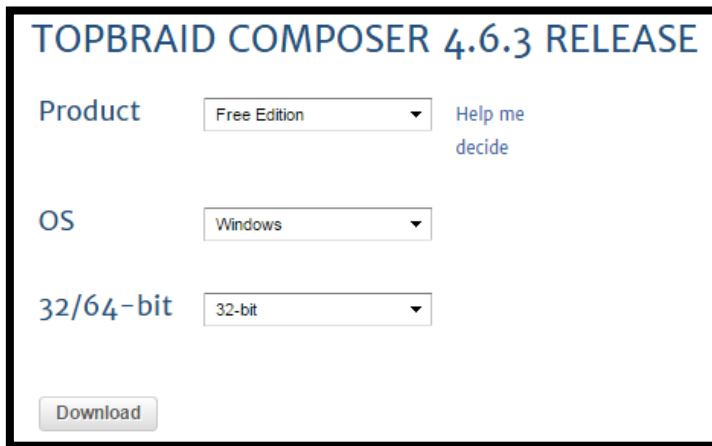
- ◆ TopBraid Composer Free Edition 다운로드 및 설치
 - <http://www.topquadrant.com/downloads/topbraid-composer-install/>

■ TopBraid Composer Free Edition 다운로드

◆ tbcfree-4.6.3v20150326-1917-win32.win32.x86.zip

■ 파일 선택

■ 압축 해제



TOPBRAID COMPOSER 4.6.3 RELEASE

Product [Help me decide](#)

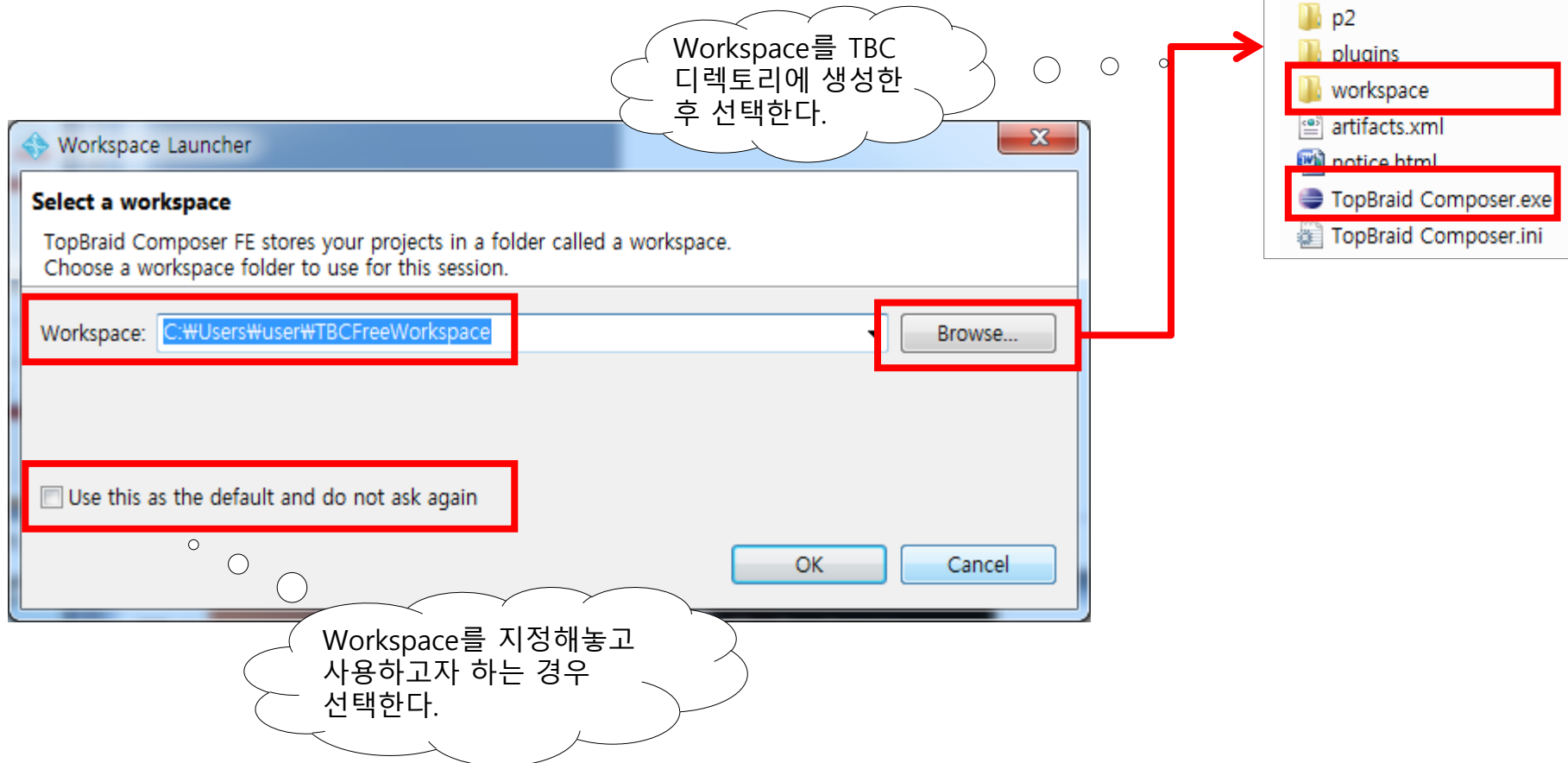
OS

32/64-bit

이름	수정한 날짜	유형
configuration	2015-04-17 오후...	파일 폴더
dropins	2015-03-26 오후...	파일 폴더
features	2015-04-17 오후...	파일 폴더
jre7	2015-04-17 오후...	파일 폴더
p2	2015-04-17 오후...	파일 폴더
plugins	2015-04-17 오후...	파일 폴더
workspace	2015-04-21 오후...	파일 폴더
artifacts.xml	2015-03-26 오후...	XML 문서
id.txt	2015-03-26 오후...	텍스트 문서
notice.html	2015-01-16 오후...	HTML 문서
TopBraid Composer.exe	2015-03-26 오후...	응용 프로그램
TopBraid Composer.ini	2015-04-21 오후...	구성 설정
TopBraid Composer.ini.bak	2015-04-17 오후...	BAK 파일
TopBraid Composer.ini.orig	2015-03-26 오후...	ORIG 파일

■ TopBraid Composer Workspace 설정

- ◆ Workspace 디렉토리 생성 (또는 기본 디렉토리 사용)
- ◆ "Use this as the default and do not ask" 설정



Classes

Main Panel

Instances

Properties

Navigator

더블 클릭하여 실행

Classes

- owl:Thing (227)
 - food:BlandFishCourse
 - food:CheeseNutsDessertCourse
 - food:ConsumableThing (53)
 - food:DarkMeatFowlCourse
 - food:DessertCourse
 - food:FishCourse
 - food:Fruit
 - food:FruitCourse
 - food:LightMeatFowlCourse
 - food:NonBlandFishCourse
 - food:NonConsumableThing

Main Panel

Ontology Overview

Base URI (Location): <http://www.w3.org/TR/2003/PR-owl-guide-20031209/food>

Default Namespace:

Namespace Prefixes

Specify the prefixes to abbreviate the URIs of the namespaces that are used in this model.

Prefix	Namespace URI
food	http://www.w3.org/TR/2003/PR-owl-guide-20031209/food
owl	http://www.w3.org/2002/07/owl#
rdf	http://www.w3.org/1999/02/22-rdf-syntax-ns#
rdfs	http://www.w3.org/2000/01/rdf-schema#
vin	http://www.w3.org/TR/2003/PR-owl-guide-20031209/vin

Properties

- food:course
- food:hasDrink
- food:hasFood
- food:madeFromFruit
- vin:adjacentRegion
- vin:hasMaker
- vin:hasVintageYear
- vin:hasWineDescriptor
- vin:locatedIn
- vin:madeIntoWine
- vin:producesWine
- vin:yearValue
- owl:versionInfo
- rdfs:comment
- rdfs:label
- rdfs:seeAlso

Instances

[Resource]	rdf:type	rdfs:label	rdfs:comment
food:Bananas	food:SweetFruit		
food:BeefCu...	food:SpicyRed...		
food:Cake	food:SweetDes...		
food:Cheese	food:CheeseN...		
food:Chicken	food:LightMea		

Properties

food:course
food:hasDrink
food:hasFood
food:madeFromFruit
vin:adjacentRegion
vin:hasMaker
vin:hasVintageYear
vin:hasWineDescriptor
vin:locatedIn
vin:madeIntoWine
vin:producesWine
vin:yearValue
owl:versionInfo
rdfs:comment
rdfs:label
rdfs:seeAlso

Navigator

- TopBraid
 - Common
 - Examples
 - countries.ttl [http://topbr...]
 - CreateReportSpreadsheets.ttl [http://topbr...]
 - du-constraints.ttl [http://topbr...]
 - food.ttl [http://www.w3.org/TR/2003/PR-owl-guide-20031209/food]
 - geotriple.ttl [http://topbr...]
 - kennedys.ttl [http://topbr...]

선택 방법

1. 리소스 (Resource) 더블 클릭
2. 아이콘 싱글 클릭

Class Form

Name: kennedys:College

Annotations

rdfs:label

College

Class Axioms

rdfs:subClassOf

owl:Thing

owl:equivalentClass

owl:disjointWith

owl:hasKey

Other Properties

Properties

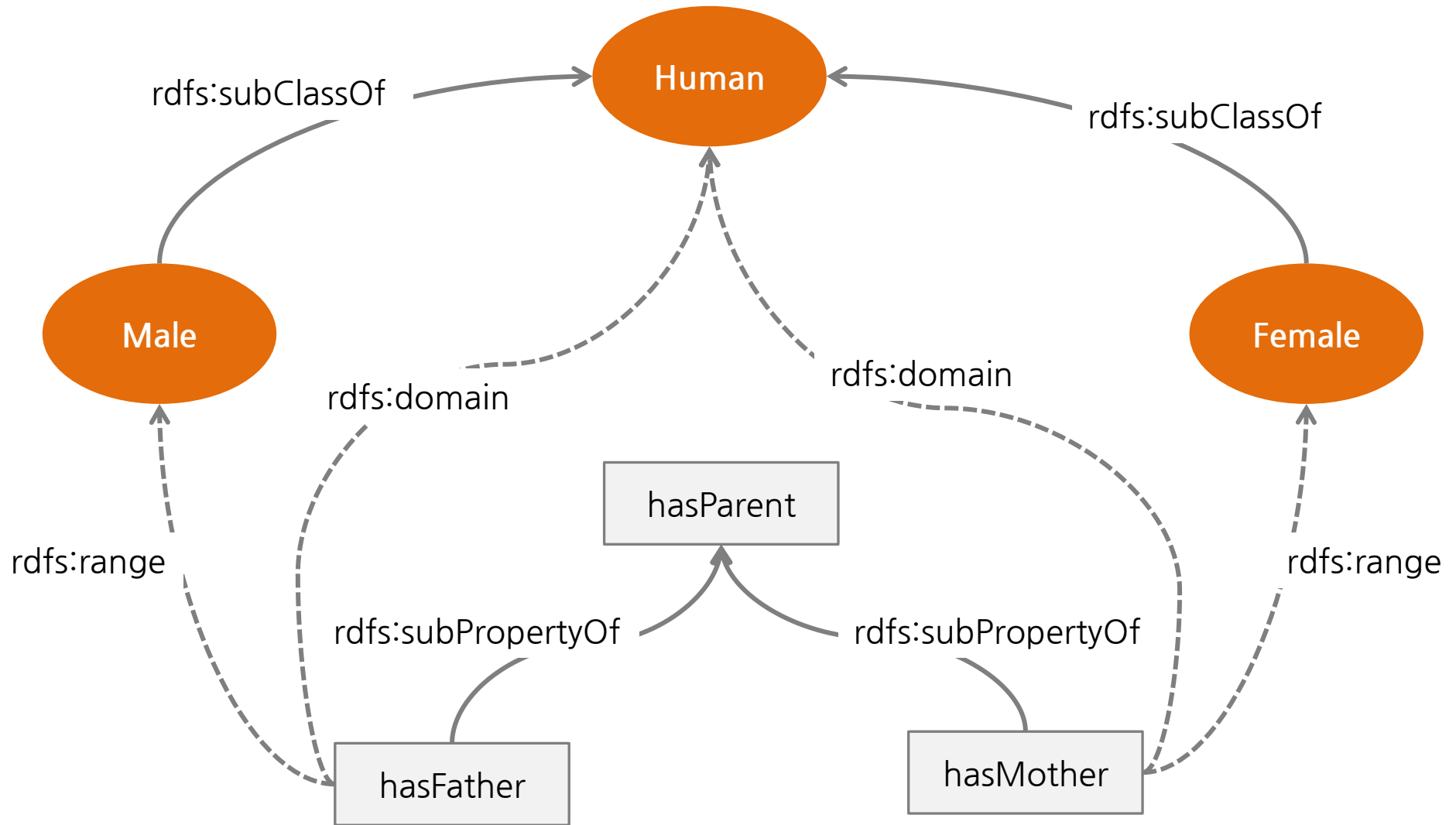
- kennedys:almaMater
- kennedys:child
- kennedys:gender
- kennedys:parent
- kennedys:photo
- kennedys:profession
- kennedys:spouse
- kennedys:birthYear
- kennedys:deathYear
- kennedys:firstName
- kennedys:ivyLeague
- kennedys:lastName
- kennedys:middleInitial
- kennedys:middleName
- kennedys:suffix
- owl:versionInfo
- rdfs:comment
- rdfs:label
- rdfs:seeAlso

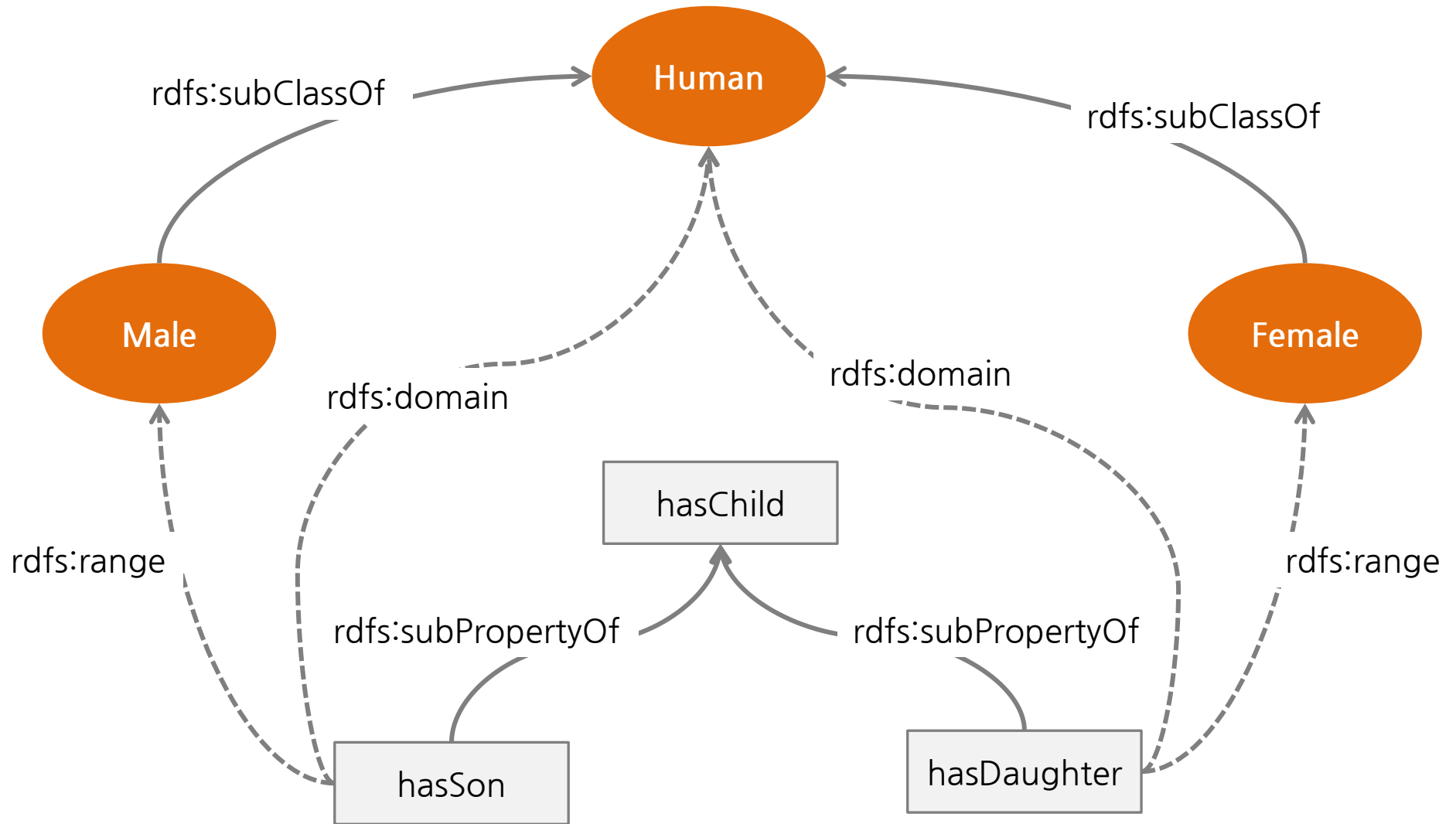
Instances

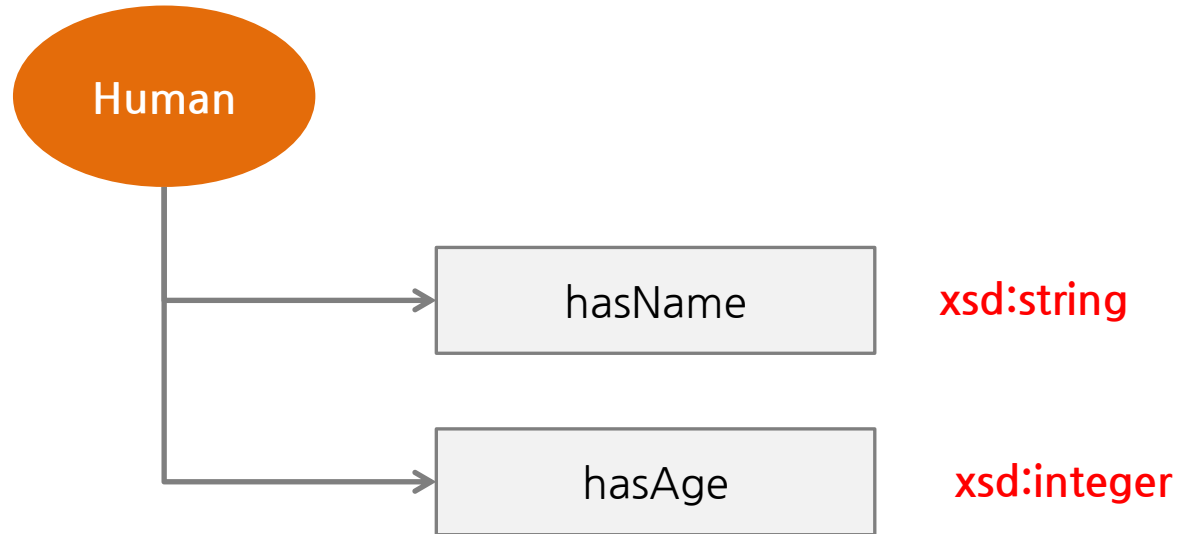
[Resource]	rdf:type	rdfs:label	rdfs:comment
kennedys:Boston...	kennedys:College	Boston University	
kennedys:Brown...	kennedys:College	Brown University	
kennedys:Catholi...	kennedys:College	Catholic University	
kennedys:Columbia...	kennedys:College	Columbia University	
kennedys:George...	kennedys:College	George Washington...	
kennedys:Georget...	kennedys:College	Georgetown Univers...	
kennedys:Harvard...	kennedys:College	Harvard University	
kennedys:Manhat...	kennedys:College	Manhattanville Coll...	



3. 온톨로지 설계 모델 - Family Ontology

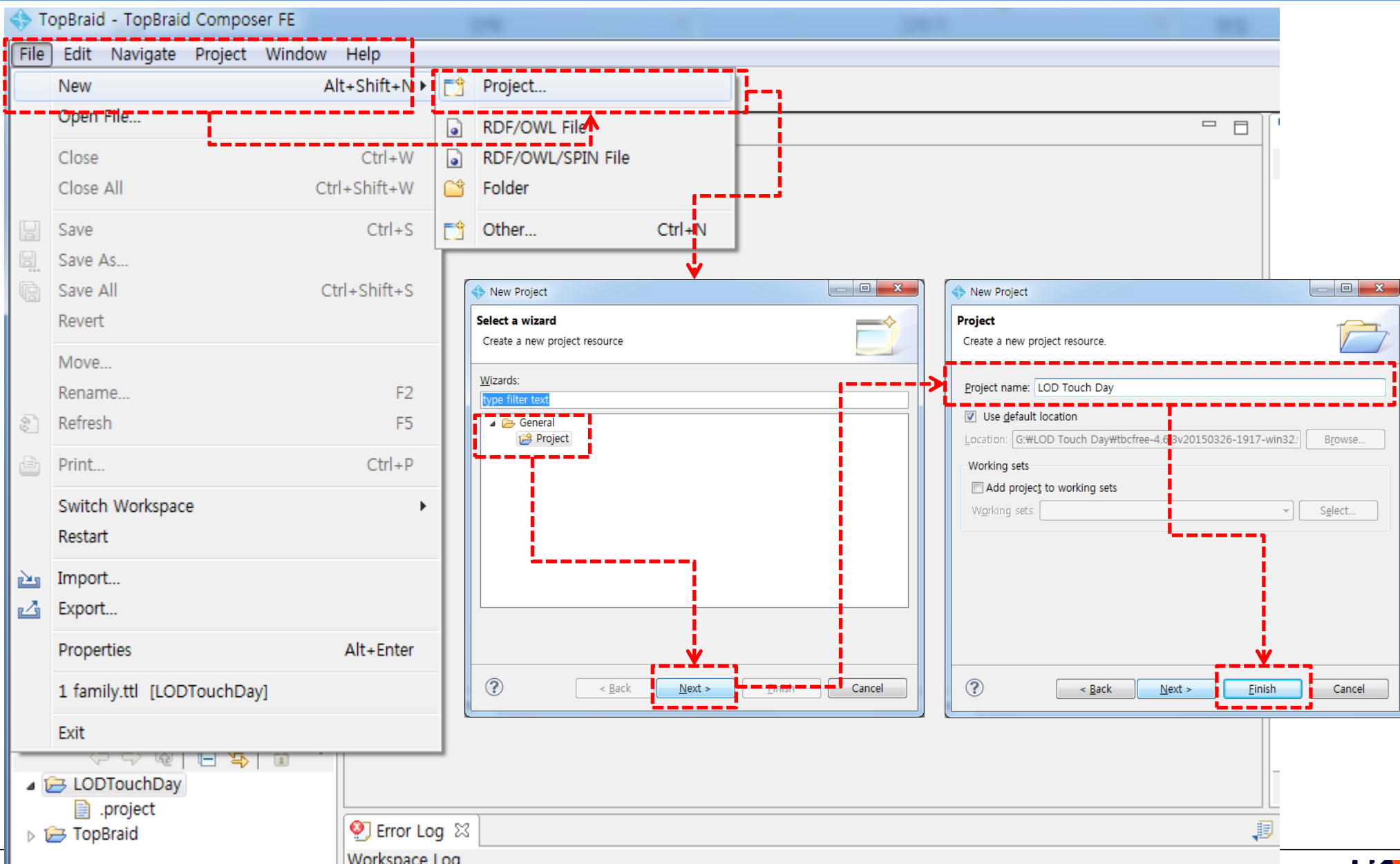


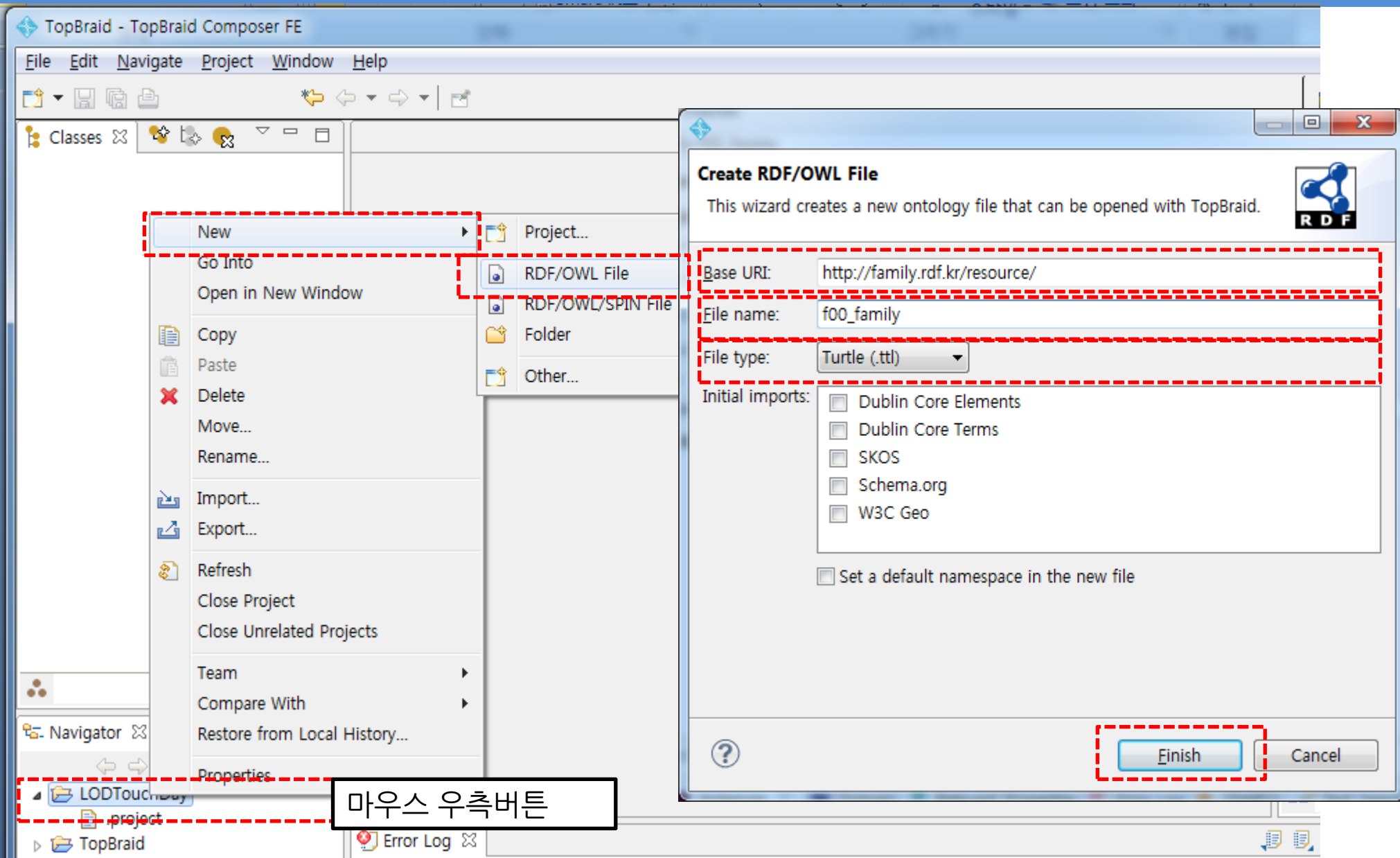






4. 온톨로지 설계 실습





TopBraid - LODTouchDay/00_family.ttl - TopBraid Composer FE

File Edit Navigate Project Model System Inference Resource Window Help

Classes 00_family.ttl

- rdfs:Resource (176)
 - owl:Thing
 - rdf:Property (90)
 - rdf:Statement
 - rdfs:Class (83)

Create subclass of selected classes
 Create sibling of selected classes
 Delete selected classes
Start hierarchy with owl:Thing
 Preferences...

Specify the prefixes to abbreviate the URIs of the namespaces that are used in this model.

Prefix	Namespace URI	
owl	http://www.w3.org/2002/07/owl#	Add...
rdf	http://www.w3.org/1999/02/22-rdf-syntax-ns#	Delete
rdfs	http://www.w3.org/2000/01/rdf-schema#	Clone
resource	http://family.rdf.kr/resource/	Goto
xsd	http://www.w3.org/2001/XMLSchema#	

[View/Edit ontology annotations](#) [View/Edit imported ontologies](#)
[Check for namespace conflicts...](#)

Navigator

- LODTouchDay
 - .project
 - 00_family.ttl [http://family.rdf.kr/resource/]
 - TopBraid

Overview Profile Statistics Form Source Code

Imports Instances Domain Relevant Pro... Error Log SPARQL Text Search

00_family.ttl

Ontology Overview

Base URI (Location):

Default Namespace:

▼ Namespace Prefixes

Specify the prefixes to abbreviate the URIs of the namespaces that are used in this model.

Prefix	Namespace URI
fclass	http://family.rdf.kr/class/
fproperty	http://family.rdf.kr/property/
rdf	http://www.w3.org/1999/02/22-rdf-syntax-ns#
rdfs	http://www.w3.org/2000/01/rdf-schema#
family	http://family.rdf.kr/resource/
xsd	http://www.w3.org/2001/XMLSchema#

[View/Edit ontology annotations](#) [View/Edit imported ontologies](#)
[Check for namespace conflicts...](#)

Overview Profile Statistics Form Source Code

참고 : <http://family.rdf.kr/>

TopBraid - LODTouchDay/00_family.ttl - TopBraid Composer FE

File Edit Navigate Project Model System Inference Resource Window Help

resource:

Classes

owl:Thing에서 마우스 우측 버튼

- Create subclass
- Create sibling class
- Create clone
- Create instance...
- Change metaclass (including subclasses)...
- Rename...
- Delete

Create Classes

Please enter class name(s)

- owl:Thing
 - fclass:Human
 - fclass:Male
 - fclass:Female

Annotations Template

Property	Initial Value
<input type="checkbox"/> rdfs:label	{name}
<input type="checkbox"/>	
<input type="checkbox"/>	

OK Cancel

Navigator

- LODTouchDay
 - .project
 - 00_family.ttl [http://family.rdf]
 - TopBraid

Overview Profile Statistics Form

Imports Instances

Bas

System Inference Resource Window Help

Create property...

Available types:

- rdf:Property
 - owl:AnnotationProperty
 - owl:DatatypeProperty
 - owl:DeprecatedProperty
 - owl:FunctionalProperty
 - owl:ObjectProperty

Name of new resource: fproperty:hasParent

Range: rdf:Resource

Annotations Template

Property	Initial Value
<input type="checkbox"/> rdfs:label	{name}

OK Cancel

Property Form

URL: http://www.w3.org/2001/XMLSchema#

Annotations

rdfs:comment

The annotation property is

rdfs:isDefinedBy

owl:

rdfs:label

versionInfo

Property Axioms

rdfs:domain

rdfs:Resource

rdfs:range

rdfs:subPropertyOf

Other Properties

rdf:type

owl:AnnotationProperty

Form Source Code

Imports Instances

Properties

owl:versionInfo

rdfs:comment

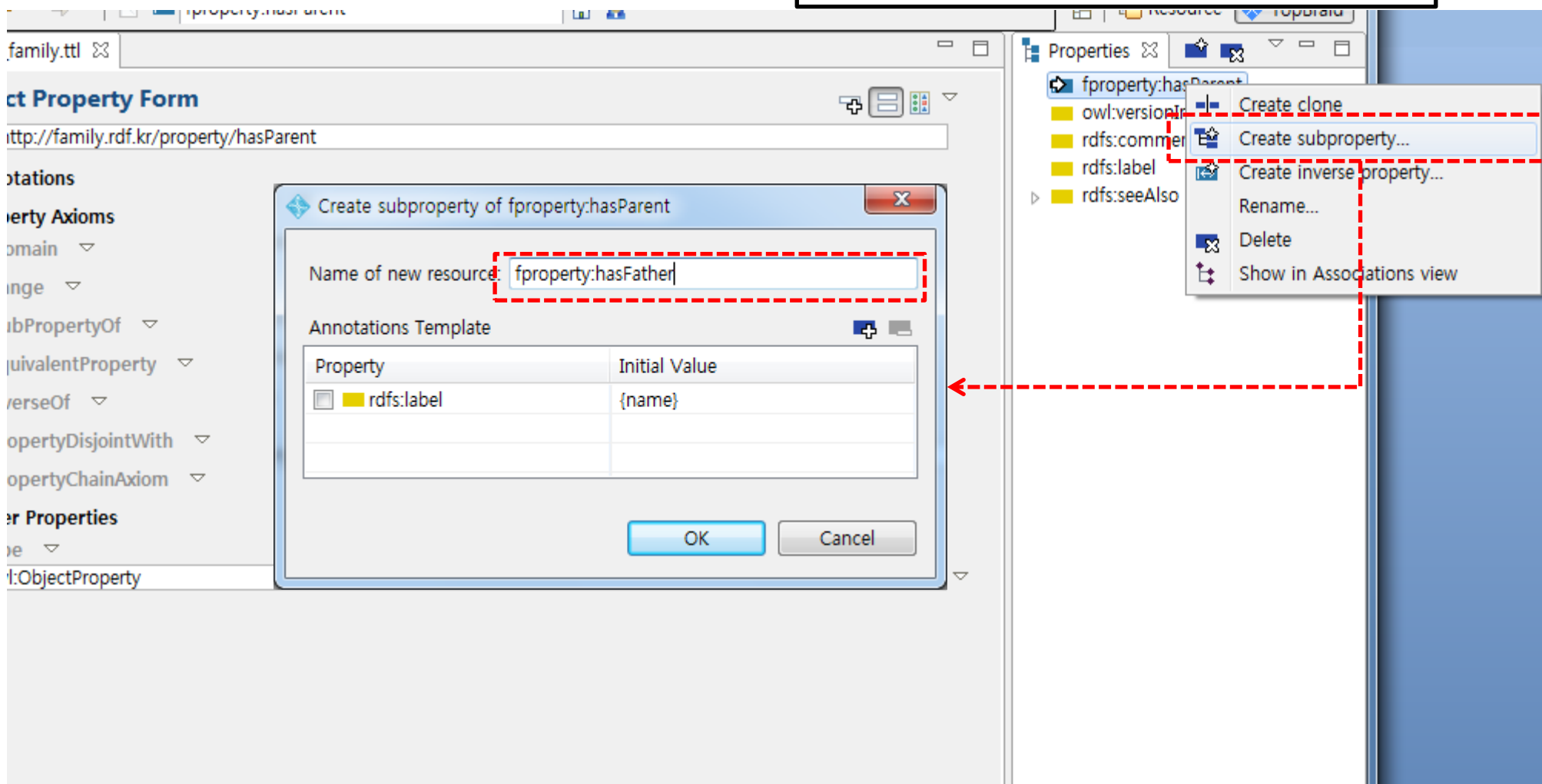
rdfs:label

rdfs:seeAlso

Resource TopBraid

Basket

fproperty:hasParent에서 마우스 우측 버튼



메인 패널에 fproperty:hasFather가 나오게 → fproperty:hasFather 더블 클릭

The screenshot shows the 'Object Property Form' for the property `fproperty:hasFather` (URI: `http://family.rdf.kr/property/hasFather`). The 'rdfs:domain' dropdown is open, and the 'Add existing...' option is selected. A dialog box titled 'Add existing...' is open, showing a hierarchy of classes: `owl:Thing`, `fclass:Human`, `fclass:Female`, and `fclass:Male`. The `fclass:Human` class is selected. The 'OK' button in the dialog is highlighted.

Classes

- owl:Thing
 - fclass:Human
 - fclass:Female
 - fclass:Male

Drag & Drop

Object Property Form

URI: <http://family.rdf.kr/property/hasFather>

Annotations

Property Axioms

rdfs:domain

rdfs:range

rdfs:subPropertyOf

owl:equivalentProperty

owl:inverseOf

owl:propertyDisjointWith

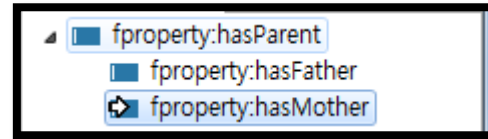
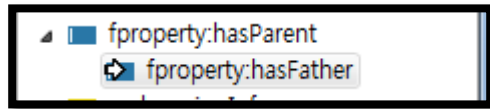
owl:propertyChainAxiom

Property Axioms

rdfs:domain

rdfs:range

rdfs:subPropertyOf



Object Property Form

URI:

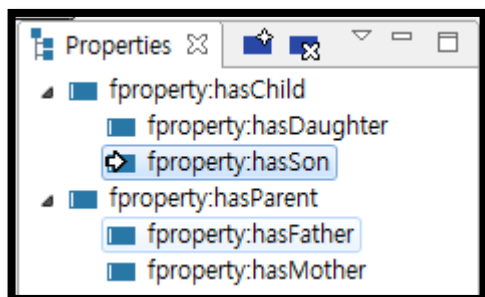
▼ Annotations

▼ Property Axioms

rdfs:domain ▼

rdfs:range ▼

rdfs:subPropertyOf ▼



Object Property Form

URI:

Annotations

Property Axioms

rdfs:domain

rdfs:range

rdfs:subPropertyOf

Object Property Form

URI:

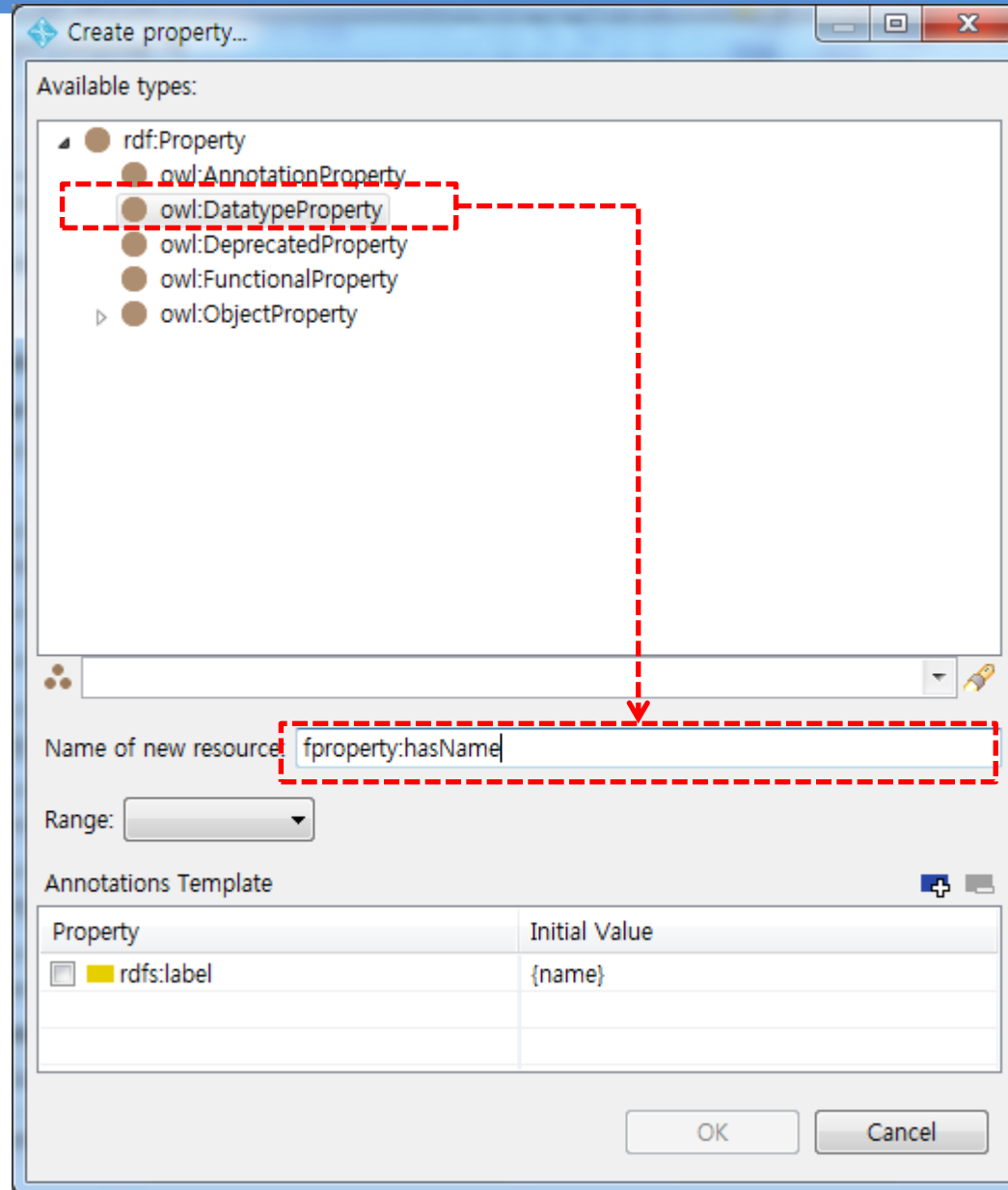
Annotations

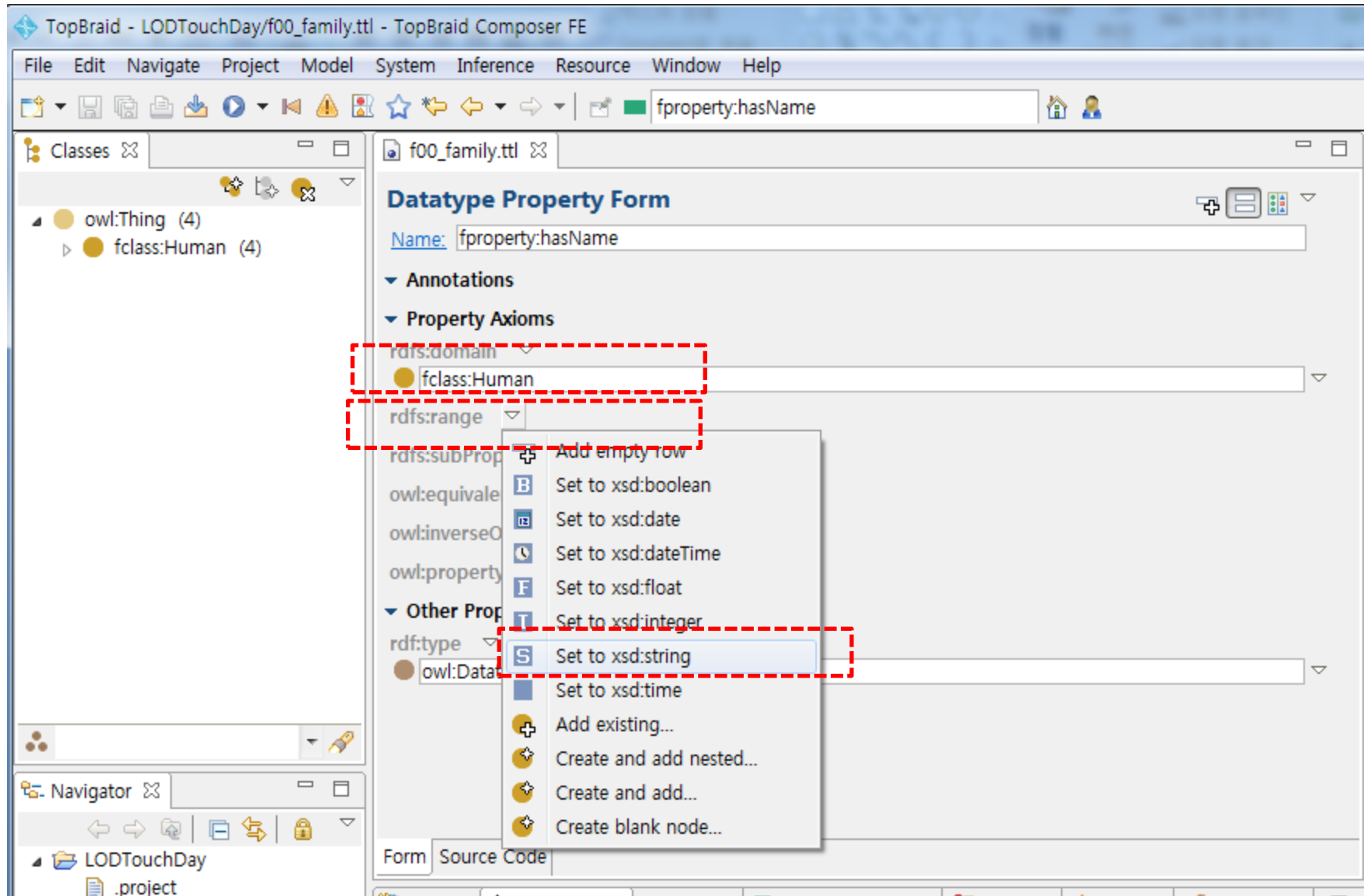
Property Axioms

rdfs:domain

rdfs:range

rdfs:subPropertyOf





Datatype Property Form

Name:

▼ Annotations

▼ Property Axioms

rdfs:domain ▼

rdfs:range ▼

- 인스턴스 생성 시 각자에게 부여 받은 번호를 꼭 사용하세요.
 - 동명이인이 있기 때문에 식별을 위해서입니다.
- 인스턴스 생성 법칙
 - family:[부여번호]_xxxxxx
 - family:f00_wonseokoh
 - http://family.rdf.kr/resource/f00_wonseokoh

TopBraid - LODTouchDay/00_family.ttl - TopBraid Composer FE

File Edit Navigate Project Model System Inference Resource Window Help

Male 또는 Female 에서 마우스 우측 버튼

Classes

- owl:Thing
 - fclass:Human
 - fclass:Female
 - fclass:Male

Class Form

URI: <http://family.rdf.kr/class/Male>

Create subclass
Create sibling class
Create clone
Create instance...
Change metaclass (including subclasses)...
Rename...
Delete

Create fclass:Male

Name of new resource: ☐ Anonymous

Annotations Template

Property	Initial Value
<input type="checkbox"/> rdfs:label	{name}

OK Cancel

TopBraid - LODTouchDay/00_family.ttl - TopBraid Composer FE

File Edit Navigate Project Model System Inference Resource Window Help

family:f00_wonseokoh

Classes

- owl:Thing (1)
 - fclass:Human (1)
 - fclass:Female
 - fclass:Male (1)

활성화

Resource Form

Name: family:f00_wonseokoh

Annotations

Other Properties

- fproperty:hasDaughter
- fproperty:hasFather
- fproperty:hasMother
- fproperty:hasSon
- rdf:type
 - fclass:Male

Incoming References

Create fclass:Male

Name of new resource: family:f00_hoony ☐ Anonymous

Annotations Template

Property	Initial Value
<input type="checkbox"/> rdfs:label	{name}

OK Cancel

Navigator

- LODTouchDay
 - .project
 - 00_family.ttl [http://family.rdf.k
 - TopBraid

Form Source Code

Imports Instances Domain Relevant Properties Error Log SPARQL Text Search

[Resource]	rdf:type	rdfs:label	rdfs:comment
family:f00_wonseokoh	fclass:Male		

Create instance

Classes

- owl:Thing (4)
 - fclass:Human (4)
 - fclass:Female (2)
 - fclass:Male (2)**

Class Form

Name: fclass:Male

Annotations

Class Axioms

rdfs:subClassOf

- fclass:Human

owl:equivalentClass

owl:disjointWith

owl:hasKey

Other Properties

Instances

[Resource]	rdf:type
family:f00_hoony	fclass:Male
family:f00_wonseokoh	fclass:Male

Classes

- owl:Thing (4)
 - fclass:Human (4)
 - fclass:Female (2)
 - fclass:Male (2)

Resource Form

Name: family:f00_yeunoh

Annotations

Other Properties

fproperty:hasDaughter

fproperty:hasFather

fproperty:hasMother

fproperty:hasSon

rdf:type

- fclass:Female

Incoming References

Instances

[Resource]	rdf:type
family:f00_heejungiang	fclass:Female
family:f00_yeunoh	fclass:Female

*f00_family.ttl

Resource Form

Name: family:f00_wonseokoh

Annotations

Other Properties

fproperty:hasDaughter

fproperty:hasFather

fproperty:hasMother

fproperty:hasSon

family:hasAge

family:hasName

rdf:type

fclass:Male

Incoming References

fproperty:hasDaughter

family:f00_yeunoh

Add existing...

fclass:Female (2)

family:f00_neejeungjang

family:f00_yeunoh

OK

Cancel

Form

Source Code

Imports

Instances

Domain

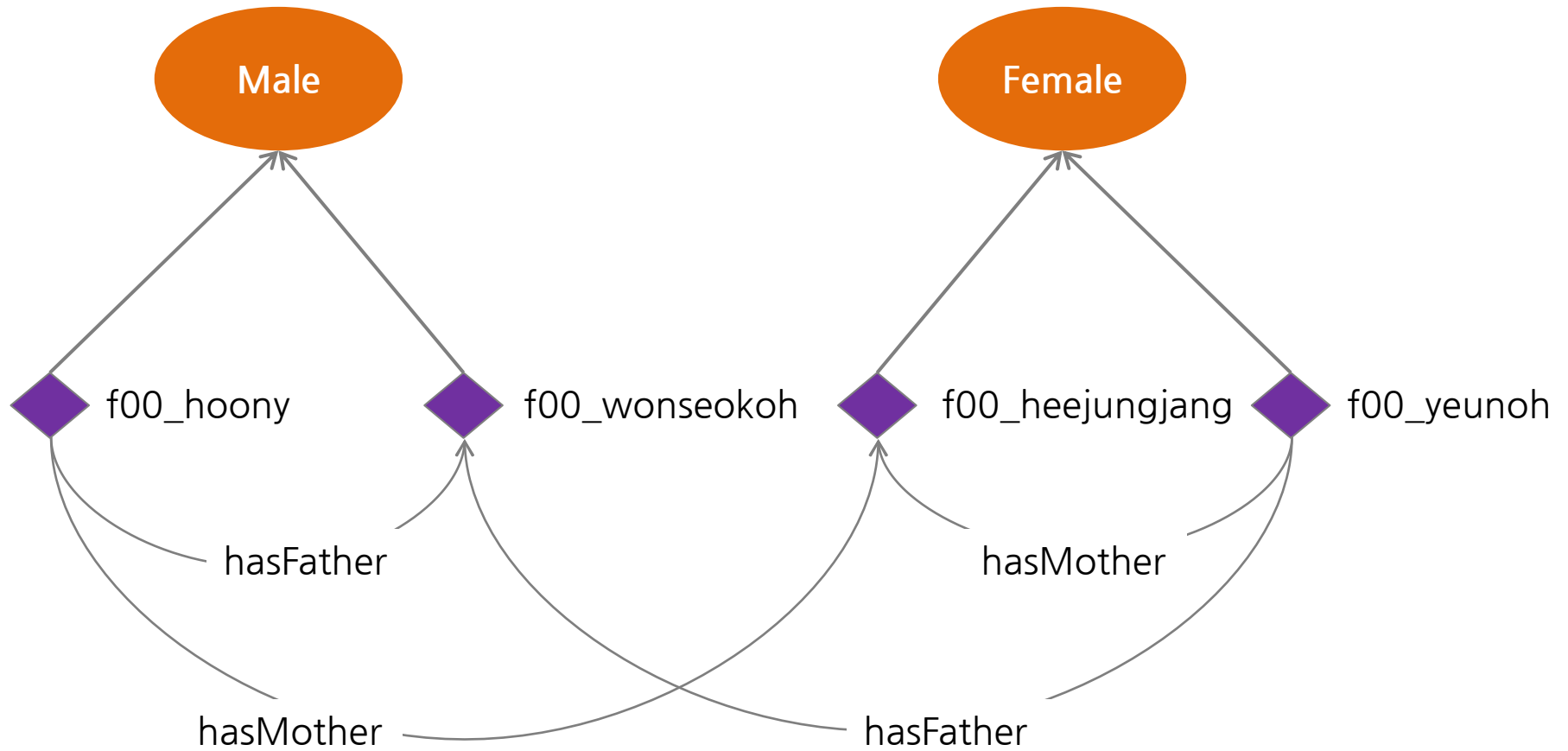
Relevant...

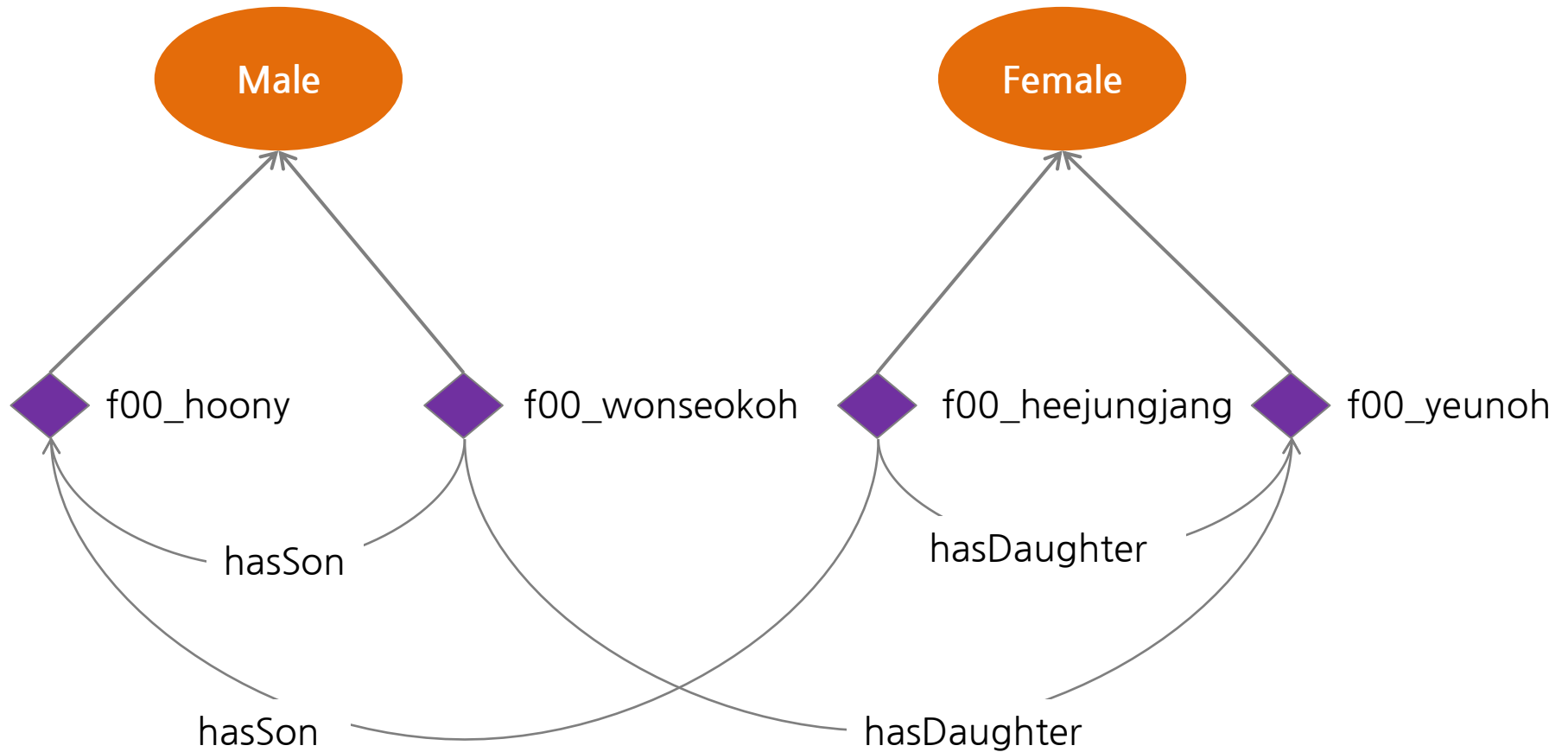
Error Log

SPARQL

Text Sea...

[Resource]	rdf:type	rdfs:label	rdfs:comment
family:f00_hoony	fclass:Male		
family:f00_wonseokoh	fclass:Male		





나머지 다른 가족들의 관계도 생성 해 보세요.

TopBraid - LODTouchDay/f00_family.ttl - TopBraid Composer FE

File Edit Navigate Project Model System Inference Resource Window Help

family:f00_wonseokoh

Classes

- owl:Thing (4)
 - fclass:Human (4)
 - fclass:Female (2)
 - fclass:Male (2)

Resource Form

Name: family:f00_wonseokoh

Annotations

Other Properties

fproperty:hasDaughter
family:f00_yeunoh

fproperty:hasFather

fproperty:hasMother

fproperty:hasSon
family:f00_hoony

family:hasAge
family:hasName

rdf:type
fclass:Male

Incoming References

family:hasAge
family:hasName

Form Source Code

44

오원석

Add empty row

나머지 다른 가족들의 이름과 나이도 입력 해 보세요.

1. 형제 관계 hasSibling
2. 부부 관계 hasWife, hasHusband
3. 할머니, 할아버지 hasGrandFather

1. 태어난 곳 : place ➔ <http://dbpeida.org/Seoul>
➔ 예시 : http://family.rdf.kr/resource/f00_wonseokoh
1. 좋아하는 뮤지션
2. 좋아하는 생물
3. 좋아하는 역사 인물



5. SPARQL

```
SELECT *  
WHERE {  
    ?child fproperty:hasMother ?mother  
}
```

The screenshot shows a SPARQL query editor interface. The top toolbar includes buttons for Imports, Instances, Domain, Relevant Properties, Error Log, SPARQL, and Text Search. The main area is divided into a Query Editor and a Query Library. The Query Editor contains the following SPARQL query:

```
SELECT *  
WHERE {  
    ?child fproperty:hasMother ?mother  
}
```

Below the query editor, a table displays the results of the query. The table has two columns: [child] and mother. The results are as follows:

[child]	mother
family:f00_hoony	family:f00_heejungjang
family:f00_yeunoh	family:f00_heejungjang

SELECT ?name ?age

WHERE {

?man fproperty:hasDaughter ?daughter .

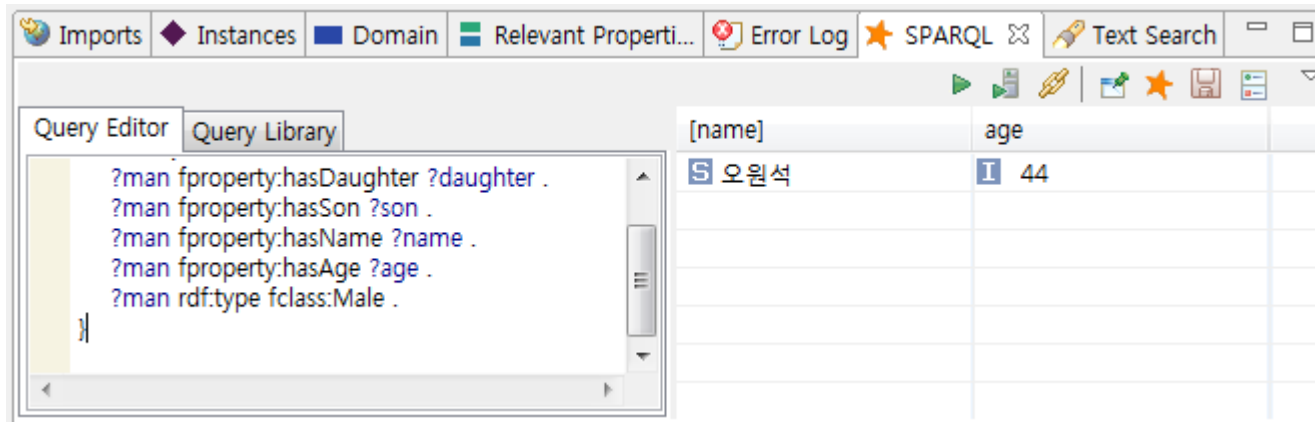
?man fproperty:hasSon ?son .

?man fproperty:hasName ?name .

?man fproperty:hasAge ?age .

?man rdf:type fclass:Male .

}



The screenshot shows a SPARQL query editor interface. The 'Query Editor' tab is active, displaying the following query:

```
?man fproperty:hasDaughter ?daughter .  
?man fproperty:hasSon ?son .  
?man fproperty:hasName ?name .  
?man fproperty:hasAge ?age .  
?man rdf:type fclass:Male .
```

The 'Query Library' tab is also visible. To the right of the editor, a table displays the results of the query. The table has two columns: '[name]' and 'age'. The first row shows the name '오원석' (Oh Won-seok) and the age '44'.

[name]	age
오원석	44

```

SELECT *
WHERE {
    ?uri rdf:type fclass:Male .
    ?uri fproperty:hasName ?name .
}

```

[uri]	name
◆ family:f00_wonseokoh	S 오원석

```

SELECT *
WHERE {
    ?uri rdf:type fclass:Male .
    optional {?uri fproperty:hasName ?name .}
}

```

[uri]	name
◆ family:f00_hoony	
◆ family:f00_wonseokoh	S 오원석


```
SELECT *  
WHERE {  
  {  
    ?uri rdf:type fclass:Male .  
    optional { ?uri fproperty:hasName ?name . }  
  }  
  union  
  {  
    ?uri rdf:type fclass:Female .  
    optional { ?uri fproperty:hasName ?name . }  
  }  
}
```

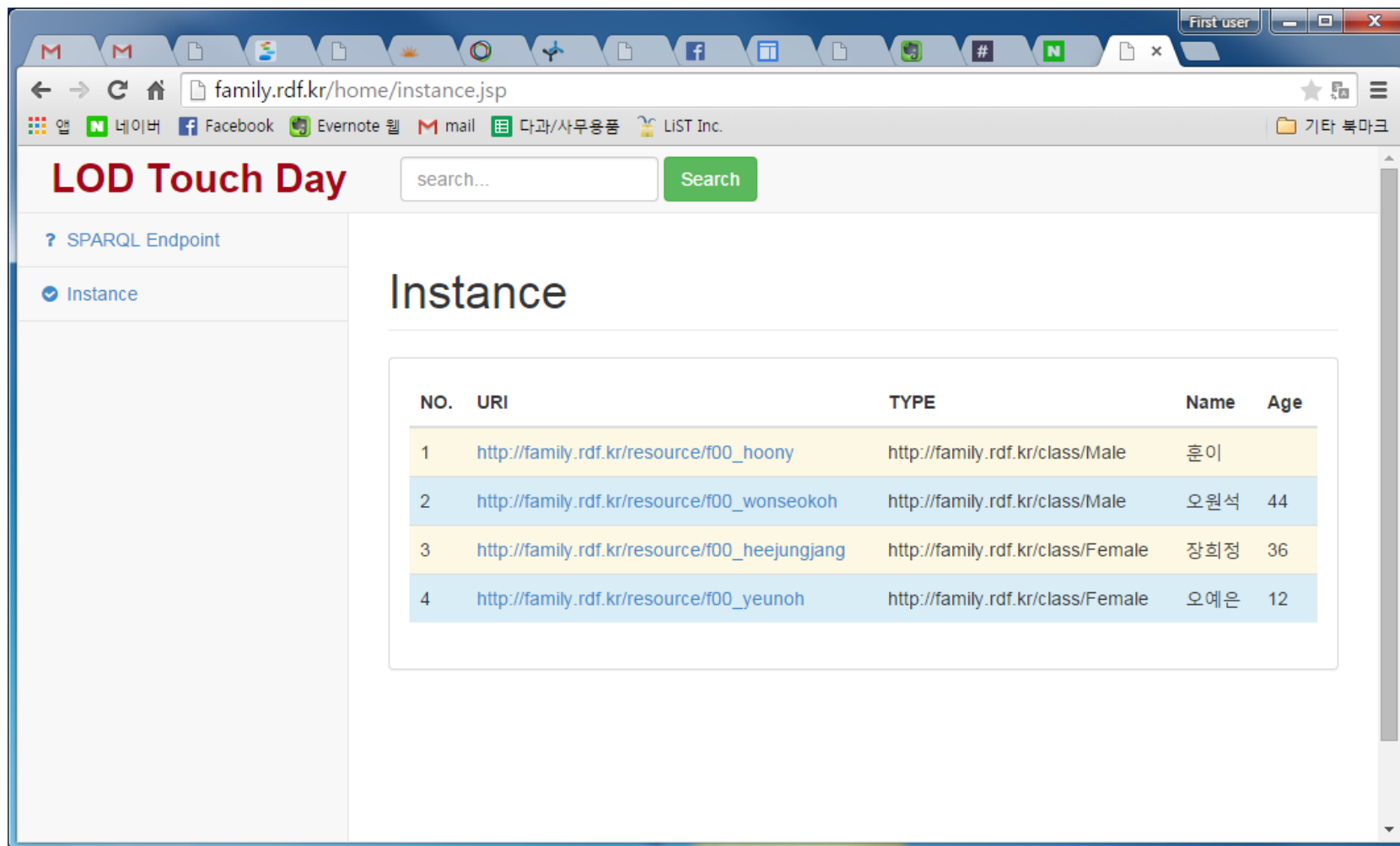
Optional : hasName이 없
는 것도 갖고 오기

[uri]	name
◆ family:f00_heejungjang	S 장희정
◆ family:f00_hoony	
◆ family:f00_wonseokoh	S 오원석
◆ family:f00_yeunoh	S 오예은

지금까지 실습한 파일을 허홍수 부장에게 보내 주세요.

joyhong@li-st.com

여기에 발행됩니다.



LOD Touch Day

search... Search

? SPARQL Endpoint

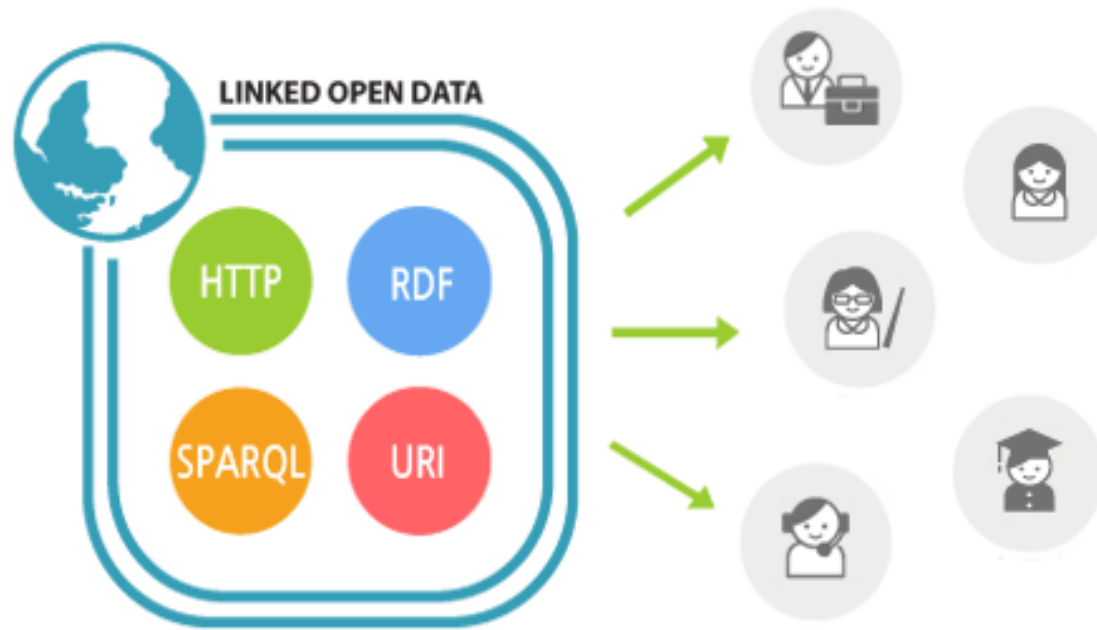
✓ Instance

Instance

NO.	URI	TYPE	Name	Age
1	http://family.rdf.kr/resource/f00_hoony	http://family.rdf.kr/class/Male	훈이	
2	http://family.rdf.kr/resource/f00_wonseokoh	http://family.rdf.kr/class/Male	오원석	44
3	http://family.rdf.kr/resource/f00_heejungjang	http://family.rdf.kr/class/Female	장희정	36
4	http://family.rdf.kr/resource/f00_yeunoh	http://family.rdf.kr/class/Female	오예은	12

SPARQL Endpoint 에서 다른 참여자 분들의 트리플도 질의해 보겠습니다.

The screenshot shows a web browser window with the address bar set to `family.rdf.kr/sparql`. The page title is "SPARQL Endpoint for LOD Touch Day". Below the title, there are two dropdown menus: "-- Template --" and "-- Prefixes --". A large text area contains a SPARQL query: `select ?s ?p ?o where {
?s ?p ?o .
} limit 50`. At the bottom, there are two dropdown menus: "Result Type : html" and "Request Method : Get", followed by an unchecked checkbox labeled "inline". A blue "Submit" button is located at the bottom left.



감사합니다.

주식회사 리스트 대표이사 : <http://li-st.com>
대한민국 대표 LOD - KDATA : <http://kdata.kr>
새주소 기반 Linked Open Data - 주소데이터 : <http://jusodata.kr>

codalida@gmail.com , ceo@li-st.com