Appendix A Useful Queries Expressed in SPARQL Covering the Required Objectives and Criteria

Query A1: Retrieve the list of all Web resources

```
SELECT ?Res_id ?Res_title
WHERE {
        ?res rdf:type gradys:Resource; gradys:Id ?Res_id;
        gradys:Title ?Res_title; gradys:Exposed_by ?plat .
        ?plat rdf:type gradys:Platform
    }
```

Query A2: Retrieve the Web resources exposed by connected objects

```
SELECT ?Res_id ?Res_title
WHERE {
        ?res rdf:type gradys:Resource; gradys:Id ?Res_id ;
        gradys:Title ?Res_title; gradys:Exposed_by ?dev .
        ?dev rdf:type gradys:Device
    }
```

Query A3: Retrieve the Web resources exposed by connected objects

```
SELECT ?Res_id ?Res_title
WHERE {
        ?res rdf:type gradys:Resource; gradys:Id ?Res_id ;
        gradys:Title ?Res_title; gradys:Exposed_by ?plat .
        ?plat rdf:type gradys:Platform
        FILTER NOT EXISTS {
                            ?res gradys:Exposed_by ?dev .
                            ?dev rdf:type gradys:Device
                         }
    }
```

Query A4: Retrieve the list of elementary Web resources

```
SELECT ?Res_id ?Res_title
WHERE {
        ?res rdf:type gradys:ElementaryResource;
        gradys:Id ?Res_id; gradys:Title ?Res_title
        }
```

Query A5: Retrieve the composed Web resources exposed by platforms (which are not connected objects)

```
SELECT ?Res_id ?Res_title
WHERE {
        ?res rdf:type gradys:CompositeResource;
        gradys:Id ?Res_id; gradys:Title ?Res_title;
        gradys:Exposed_by ?plat .
        ?plat rdf:type gradys:Platform
        FILTER NOT EXISTS {
                            ?res gradys:Exposed_by ?dev .
                            ?dev rdf:type gradys:Device
                          }
        }
```

Query A6: Retrieve the Web resources belonging to a given category

```
SELECT ?Res_id ?Res_title
WHERE {
        ?res rdf:type gradys:Resource .
        ?res gradys:Has_MainCategory ?cat .
        ?cat gradys:Category_value "Data Collection"^^xsd:string .
        ?res gradys:Id ?Res_id . ?res gradys:Title ?Res_title
        }
```

Query A7: Retrieve the Web resources providing a given function

```
SELECT ?Res_id ?Res_title
WHERE {
        ?res rdf:type gradys:Resource;
        gradys:Provides ?Operation .
        ?Operation gradys:Function "Collect Temperature" .
        ?res gradys:Id ?Res_id; gradys:Title ?Res_title
        }
```

Query A8: Retrieve the list of all the functions provided by the Web environment

```
SELECT ?fun
WHERE {
        ?res rdf:type gradys:Resource.
        ?res gradys:Provides ?Operation .
        ?Operation gradys:Function ?fun
        }
```

Query A9: Retrieve the output parameters of a Web resource and the input parameters of another

```
SELECT ?res1id ?res2id ?Paramin_name ?Paramin_datatype
?Paramout_name ?Paramout_datatype
WHERE {
        {
            ?res1 rdf:type gradys:Resource . ?res1 gradys:Id "Res_4"
                ↪ ^^xsd:string .
            ?res1 gradys:Id ?res1id . ?res1 gradys:Provides ?op .
            ?op gradys:Expects ?Paramin .
            ?Paramin gradys:Param_name ?Paramin_name .
            ?Paramin gradys:Param_datatype ?Paramin_datatype
        }
        UNION
         {
            ?res2 rdf:type gradys:Resource .
            ?res2 gradys:Id "Res_2"^^xsd:string .
            ?res2 gradys:Id ?res2id . ?res2 gradys:Provides ?op .
            ?op gradys:Returns ?Paramout .
            ?Paramout gradys:Param_name ?Paramout_name .
            ?Paramout gradys:Param_datatype ?Paramout_datatype
         }
        }
```

Query A10: Retrieve the Web resources exposed in a given location

```
SELECT ?Res_id ?Res_title
WHERE {
        ?res rdf:type gradys:Resource .
        ?res gradys:Id ?Res_id .
        ?res gradys:Title ?Res_title .
        ?dev rdf:type hssn:Device .
        ?dev gradys:Exposes ?res .
        ?loc rdf:type hssn:Location .
        ?dev hssn:currentlyLocatedAt ?loc .
        ?loc gradys:Location_id "Zone 1"^^xsd:string
      }
```

Query A11: Retrieve the Web resources that are the same (same-as) as a Web resource

```
SELECT ?res_id
WHERE {
        ?res rdf:type gradys:Resource .
        ?res gradys:Id "Res_5"^^xsd:string .
        ?res gradys:Same_As ?otheres .
        ?otheres gradys:Id ?res_id
      }
```

Query A12: Retrieve the Web resources that are complementary (follows) to a Web resource

```
SELECT ?res_id
WHERE {
        ?res rdf:type gradys:Resource .
        ?res gradys:Id "Res_3"^^xsd:string .
        ?res gradys:Follows ?otheres .
        ?otheres gradys:Id ?res_id
      }
```

Query A13: Retrieve the workflow of a composed Web resource

```
SELECT ?list_res_id
WHERE {
        ?res rdf:type gradys:CompositeResource .
        ?res gradys:Id "Res_co_1"^^xsd:string .
        ?res gradys:Has_Workflow ?wf .
        ?wf gradys:Has_Component ?comp .
        ?comp gradys:Represents ?list_res .
        ?list_res gradys:Id ?list_res_id
        }
```

Query A14: Retrieve the sequential order of the workflow components of a composed Web resource

```
SELECT ?list_res1_id ?list_res2_id
WHERE {
        ?res1 rdf:type gradys:CompositeResource .
        ?res1 gradys:Id "Res_co_1"^^xsd:string .
        ?res1 gradys:Has_Workflow ?wf .
        ?wf gradys:Has_Component ?comp .
        ?comp gradys:Represents ?list_res1 .
        ?list_res1 gradys:Id ?list_res1_id .
        ?comp gradys:Precedes ?othercomp .
        ?othercomp gradys:Represents ?list_res2 .
        ?list_res2 gradys:Id ?list_res2_id
        }
```

Query A15: Retrieve the functions provided by the virtual Web resources

```
SELECT ?fun
WHERE {
        ?res rdf:type gradys:VirtualResource.
        ?res gradys:Provides ?Operation .
        ?Operation gradys:Function ?fun
        }
```

Query A16: Retrieve a Web resource providing a given function with a quality criterion (e.g. Accuracy > %80)

```
SELECT ?Res_id ?Res_title
WHERE {
        ?res rdf:type gradys:Resource.
        ?res gradys:Provides ?Operation .
        ?Operation gradys:Function "Temperature Prediction" .
        ?res gradys:Id ?Res_id .
        ?res gradys:Title ?Res_title .
        ?res gradys:Has_QoR ?qor .
        ?qor gradys:QoR_name "Accuracy"^^xsd:string .
        ?qor gradys:QoR_value ?val .
        FILTER (?val > 80)
      }
```

Query A17: Retrieve a Web resource collecting data within a location with a quality criterion (e.g. Bandwidth> 400 Mbits/sec)

```
SELECT ?Res_id ?Res_title
WHERE {
        ?res rdf:type gradys:Resource.
        ?res gradys:Has_MainCategory ?cat .
        ?cat gradys:Category_value "Data Collection"^^xsd:string .
        ?res gradys:Id ?Res_id .
        ?res gradys:Title ?Res_title .
        ?dev rdf:type hssn:Device .
        ?dev gradys:Exposes ?res .
        ?loc rdf:type hssn:Location .
        ?dev hssn:currentlyLocatedAt ?loc .
        ?loc gradys:Location_id "Zone 1"^^xsd:string .
        ?res gradys:Has_QoR ?qor .
        ?qor gradys:QoR_name "Bandwidth"^^xsd:string .
        ?qor gradys:QoR_value ?val .
        FILTER (?val > 400)
     }
```