RDF

RDF stands for "Resource Description Framework." RDF is a specification that defines how metadata, or descriptive information, should be formatted. In other words RDF in general is a method of conceptual data modelling. RDF is a data model for objects (resources) and relations between them, provides a simple semantics for this data model, and these data models can be represented in an XML syntax. The RDF standard helps ensure each description contains the triples which includes subject, predicate and object necessary to describe the page's content and also represent links in a graph.It has come to be used as a general method for conceptual description or modeling of information that is implemented in web resources, using a variety of syntax notations and data serialization formats. It is also used in knowledge management applications.The Resource Description Framework is a graph data model that formally describes the semantics, or meaning of information. It also represents metadata, that is, data about data.

Advantages:

1) The RDF model is made up of triples: as such, it can be efficiently implemented and stored; other models requiring variable-length fields would require a more cumbersome implementation.
2) The basic RDF model can be processed even in absence of more detailed information (an "RDF schema") on the semantics.
3) Domain Independent.
4) Extensible and easily processed with XML.
5) Clear Semantics.

Disadvantages:

1) Verbose
2) Reconstructing RDF graph non-trivial

RDFS

RDFS is a general-purpose language for representing simple RDF vocabularies on the Web. RDFSchema is a vocabulary for describing properties and classes of RDF resources, with a semantics for generalization-hierarchies of such properties and

classes. RDF Schema (RDFS) is extending RDF vocabulary to allow describing taxonomies of classes and properties. It also extends definitions for some of the elements of RDF, for example it sets the domain and range of properties and relates the RDF classes and properties into taxonomies using the RDFS vocabulary. The RDF Vocabulary Description Language 1.0 (or RDF Schema or RDFS) is a language that can be used to define the vocabulary (i.e., the terms) to be used in an RDF graph. The RDFS is used to indicate that we are describing specific kinds or classes of resources, and will use specific properties in describing those resources. Vocabulary descriptions (schemas, ontologies) written in the RDF Schema language are legal RDF graphs. In other words, we use RDF to represent RDFS information. RDFS provides vocabulary for describing how properties and classes are intended to be used together in RDF data. The *rdfs:domain* predicate can be used to indicate that a particular property applies to instances of a designated class (i.e., it defines the domain of the property). The *rdfs:range* predicate is used to indicate that the values of a particular property are instances of a designated class (i.e., it defines the range of the property).

Advantages:
1) A primitive ontology language.
2) Offers certain modeling primitives with fixed meaning.
3) Key concepts of RDF Schema
- subclass relations, property, subproperty relations, domain and range restrictions
4) There exist query languages for RDF and RDFS.
5) Allows metamodeling

Disadvantages:
1) Many desirable modeling primitives are missing
- An ontology layer on top of RDF/RDFS is needed
2) RDF Schema can be used as a lightweight language for defining a vocabulary (also called ontology) used in RDF graphs.

Web Ontology Language (OWL)

Web Ontology Language (OWL) is a Semantic Web language designed to represent rich and complex knowledge about things, groups of things, and relations between things. OWL is a computational logic-based language such that knowledge expressed in OWL can be exploited by computer programs. The OWL Web Ontology Language is designed for use by applications that need to process the content of information instead of just presenting information to humans. OWL facilitates greater machine interpretability of Web content than that supported by XML, RDF, and RDF Schema (RDF-S) by providing additional vocabulary along with a formal semantics. The Semantic Web is a vision for the future of the Web in which information is given explicit meaning, making it easier for machines to automatically process and integrate information available on the Web. The purpose of OWL is identical to RDF Schemas -to provide an XML vocabulary to define classes, properties and their relationships.

OWL is actually a family of three language variants (often called species) of increasing expressive power: **OWL Lite, OWL DL, and OWL Full.**

OWL 2 extends the W3C OWL Web Ontology Language with a small but useful set of features that have been requested by users, for which effective reasoning algorithms are now available, and those OWL tool developers are willing to support.

An **OWL 2** ontology is a formal description of a domain of interest. OWL 2 ontologies consist of the following three different syntactic categories:

Entities, such as classes, properties, and individuals, are identified by IRIs. They form the primitive terms of an ontology and constitute the basic elements of an ontology. For example, a **class** a:Person can be used to represent the set of all people. Similarly, the object property a:parentOf can be used to represent the parent-child relationship. Finally, the individual

a:Peter can be used to represent a particular person called "Peter".

Expressions represent complex notions in the domain being described. For example, a class expression describes a set of individuals in terms of the restrictions on the individuals' characteristics.

Axioms are statements that are asserted to be true in the domain being described. For example, using a subclass axiom, one can state that the class a:Student is a subclass of the class a:Person.

OWL 1.0 is based on SHOIN(D) which includes Axioms, Class constructors whereas **OWL 2.0** is based on SROIQ(D) which includes Class expressions, Properties, Class Axioms (Tbox), Properties Axioms (Rbox) and Facts(Abox).