An open format for reputation exchange

Here is a sketch of a model of reputation scoring which could be the basis for an open XML/RDF exchange format. There is also some example XML syntax. Any comments welcome.
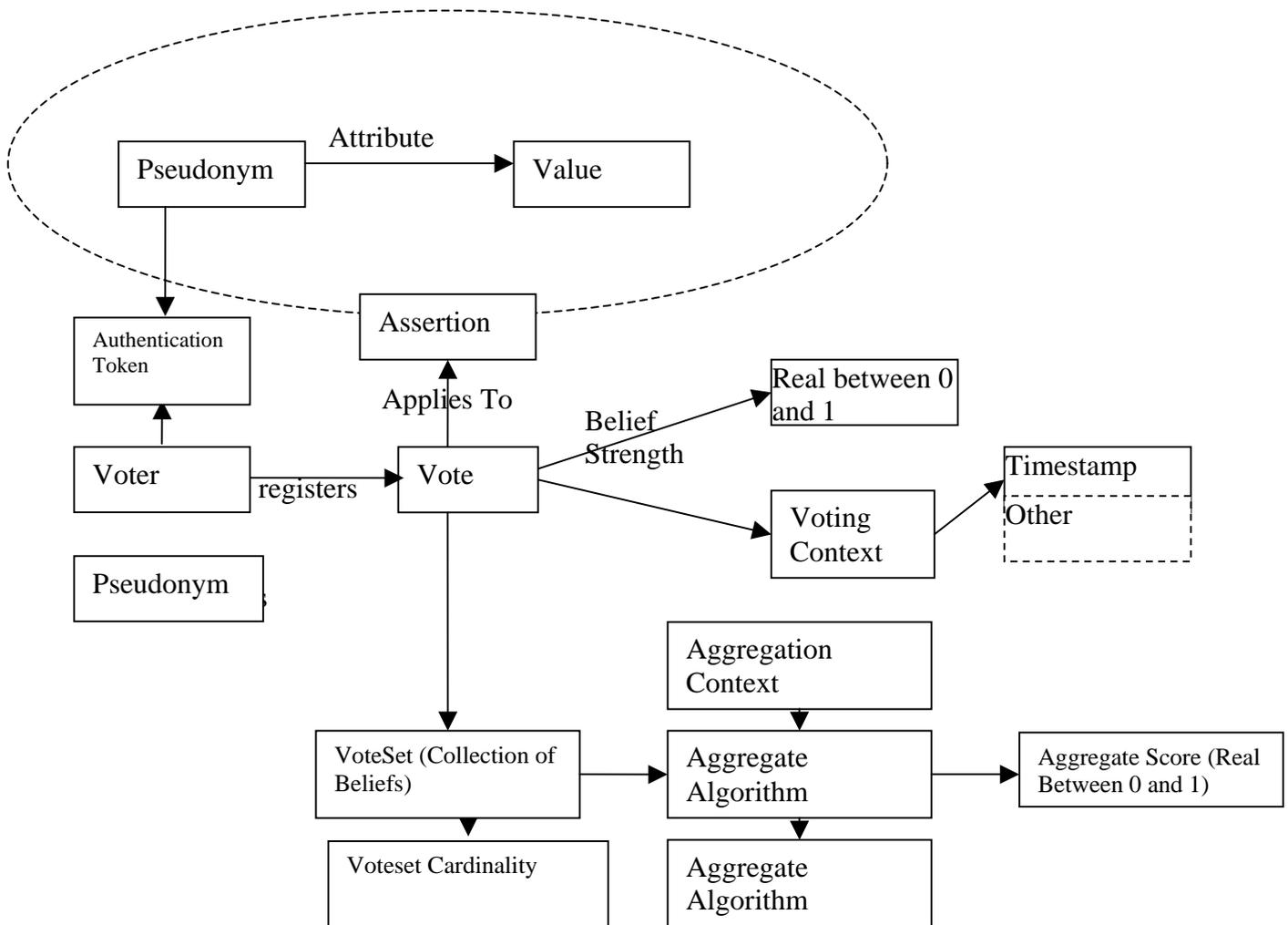
Model description

Assertions

Assertions are the basic units of reputation. An assertion is an attribute, value pair applied to a pseudonym. For example Vlad [pseudonym] isA [attribute] TrustedSeller [value].

Voters

Voters assert the degree of belief in a specific assertion. A voter is defined by a pseudonym and authenticated by mechanisms as defined by the authentication data attached. Note that a

pseudonym can also be a URL or an OpenID. This allows me to identify the target of my vote by their web page e.g. a hotel's home page etc…

Authentication Data

Placeholder for Authentication data/tokens. e.g. SAML Authentication Token representing results of UN/PWD, etc… or PGP/X.509 Certificate.

Votes

Votes are applied to assertions and express how much a voter believes a particular assertion is true. The time of the expression of the belief may be recorded.
E.g. Y believes {X delivered the goods on time} with strength 0,99

Voting Context

Contextual information about how the vote was registered, which may affect a trust decision (e.g. a timestamp for the vote, was the vote encrypted, was any additional information given to the voter at the time of voting)

Strength of Belief

A value between 0 and 1 expressing the strength of a belief in an assertion.
E.g. {X delivered the goods on time} belief strength .99

Vote Set

A set of votes used as input to an aggregation algorithm
E.g.
{W believes {X delivered the goods on time} with strength 0,99
Y believes {X delivered the goods on time} with strength 0,11
Z believes {X delivered the goods on time} with strength 0 }

Cardinality

The number of votes.

Aggregate Score

A score (Real between 0 and 1) expressing a reputation based on a vote set as input
E.g. . X's reputation for the attribute { delivered the goods on time} is 0,37

Aggregate Algorithm

A class of algorithms describing how an aggregate score is calculated from a belief set. This may for example include second order reputations (beliefs of voters about other voters), weightings based on time of vote and other elements of the aggregation context.
E.g. . X's reputation for the attribute { delivered the goods on time} is 0,37 according to algorithm A.

Aggregate Algorithm Description

Describes how the score is calculated from the belief set. This may be a factor in making a trust decision on a reputation.
E.g. Algorithm A is the mean of the input values for a given assertion.

Aggregation Context

Gives context information which might be relevant to a trust decision such as security certifications on vote set storage, encryption procedures for vote transmission, protection against Sybil attacks etc…
[This part of the model should be expanded]

Use-case

I had a bad experience with a builderX, which I want to publish on my blog. I want to allow this to be aggregated with other opinions about this builder.
A reputation service. Reputation.com wants to collect opinions published at arbitrary web urls and aggregate them into a single score on builderX

Abstract Syntax Solution

I browse a set of standard assertions published on reputation.com and find one which I find appropriate.
I publish a vote:
MyPGPKey authenticated by MyPGPCertificate
      votes {builderX serviceLevel Good} Value 0
at 12:00 31/08/2007

Someone else publishes

MyPGPKey authenticated by MyPGPCertificate
      votes {builderX serviceLevel Good} Value 1
at 13:00 31/08/2007

Reputation.com spiders for these and aggregates them using a meanScore aggregation algo to {builderX serviceLevel Good} Value 0.5 with the vote set cardinality 2. meanScore does not use the authentication information to weight the scores. The aggregation context states that voting forms were sent in plaintext (therefore subject to replay attacks).

Example XML Syntax

Of course this could also be done as RDF but most adopters prefer XML (I will do an alternative RDF version).

Bob publishes:

```
<vote>
    <assertion>
        <pseudonym identifier="http://www.exampleBuilderX.com">
            <token>X.509 DATA</token>
        </pseudonym>
        <Attribute name="http://www.reputation.com/ontologies/serviceLevel"
        value= " http://www.reputation.com/ontologies/good"/>
        <voter>
            <pseudonym identifier="http://www.bob.com">
                <token>X.509 DATA</token>
            </pseudonym>
        </voter>
```

```
                    <voteContext><timestamp value="08/31/07 12:00:00"/></voteContext>
                    <beliefStrength value="0"/>
            </assertion>
        </vote>
```

Alice publishes:

```
<vote>
            <assertion>
                    <pseudonym identifier=" http://www.exampleBuilderX.com">
                            <token>X.509 DATA</token>
                    </pseudonym>
                    <Attribute name="http://www.reputation.com/ontologies/serviceLevel"
                    value= " http://www.reputation.com/ontologies/good"/>
                    <voter>
                            <pseudonym identifier="http://www.alice.com">
                                    <token>X.509 DATA</token>
                            </pseudonym>
                    </voter>
                    <voteContext><timestamp value="08/31/07 13:00:00"/></voteContext>
                    <beliefStrength value="1"/>
            </assertion>
</vote>
```

Reputation.com aggregates these and publishes (the voteset is optional):
```
<reputation>
<aggregateScore value="0,5"/>
<algorithm name=http://www.reputation.com/meanScore/>
<aggregationContext>
        <encryptedForms value="false"/>
</aggregationContext>
 <voteSet url=http://www.reputation.com/votes/no1.xml/>
</reputation>
```

At the url the following may be published

```
<voteSet>
        <vote>
                <assertion>
                        <pseudonym identifier="http://www.exampleBuilderX.com">
                                <token>X.509 DATA</token>
                        </pseudonym>
                        <Attribute name="http://www.reputation.com/ontologies/serviceLevel"
                        value= " http://www.reputation.com/ontologies/good"/>
                        <voter>
                                <pseudonym identifier="http://www.bob.com">
                                        <token>X.509 DATA</token>
                                </pseudonym>
                        </voter>
```

```xml
                        <voteContext><timestamp value="08/31/07 12:00:00"/></voteContext>
                        <beliefStrength value="0"/>
                </assertion>
        </vote>
        <vote>
                <assertion>
                        <pseudonym identifier="http://www.exampleBuilderX.com">
                                <token>X.509 DATA</token>
                        </pseudonym>
                        <Attribute name="http://www.reputation.com/ontologies/serviceLevel"
                        value=" http://www.reputation.com/ontologies/good"/>
                        <voter>
                                <pseudonym identifier=" http://www.alice.com">
                                        <token>X.509 DATA</token>
                                </pseudonym>
                        </voter>
                        <voteContext><timestamp value="08/31/07 13:00:00"/></voteContext>
                        <beliefStrength value="1"/>
                </assertion>
        </vote>
</voteSet>
```