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A Model for Reputation Reporting draft-ietf-repute-model-01

Abstract

This document describes a general architecture for a reputation-based service and a model for the exchange of reputation information on the Internet. The document roughly follows the recommendations of [RFC4101](#) for describing a protocol model.

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1. Introduction

Traditionally Internet protocols have operated between unauthenticated entities. For example, an email message's author field (From) [[MAIL](#)] can contain any display name or address and is not verified by the recipient or other agents along the delivery path. Similarly, a sending email server using [[SMTP](#)] trusts that the [[DNS](#)] has led it to the intended receiving server. Both kinds of trust are easily betrayed, opening the door for spam, phishing, and a host of other ills.

In recent years, stronger identity mechanisms have begun to see wider deployment. For example, the [[DKIM](#)] protocol permits associating a validated identifier to a message. While this is a major step forward, it does not distinguish between identifiers owned by good actors versus bad. Even if it is possible to validate the domain name in an author field, such as "@trustworthy.example.com," there is no basis for knowing whether it is associated with a good actor worthy of trust. As a practical matter, both bad actors and good adopt basic authentication mechanisms, like DKIM. In fact, bad actors tend to adopt them even more rapidly than the good actors do assuming that some receivers will confuse identity authentication with identity assessment. The first merely means that the name is being used by its owner or their agent, while the latter makes a statement about the quality of the owner.

The added requirement -- which can usefully be undertaken only in the presence of such stronger identity validation -- is for a mechanism by which mutually trusted parties can exchange assessment information about other actors. A dictionary definition of "reputation" is "the estimation in which a person or thing is held, especially by the community or the public generally", this aggregation of individual assessments is called reputation information.

While the need for reputation information has been most clear in the email world, where abuses are commonplace, other Internet services are coming under attack, indicating a similar need. A reputation mechanism also could be useful in rating the security of web sites, the quality of service of an Internet Service Provider (ISP) or Application Service Provider (ASP), the customer satisfaction levels at e-commerce sites, and even things unrelated to Internet protocols, such as rating plumbers, hotels, or books. Just as human beings traditionally rely on the recommendations of trusted parties in the physical world, so too they can be expected to make use of such reputation information in a variety of applications on the Internet.

A full trust architecture encompasses a range of actors and activities, to enable an end-to-end service for creating and

consuming trust-related information. One component of that is a query mechanism, to permit retrieval of reputation information that facilitates a wide range of reputation applications. However, not all such reputation services will need to convey the same information. Some need only produce a basic rating, while others need to provide underlying detail. This is akin to the difference between check approval versus a credit report.

An overall reckoning of goodness versus badness can be defined generically, but specific applications are likely to want to describe reputations for multiple attributes; an e-commerce site might be rated on price, speed of delivery, customer service, etc., and might receive very different ratings on each. Therefore, work covered by the current effort defines a generic query mechanism and basic format for reputation information, while allowing extensions for each application.

Omitted from this effort is the means by which an reputation-reporting agent goes about collecting such data and the mechanism for creating an evaluation. The mechanism defined here merely enables asking a question and getting an answer; the remainder of an overall service provided by such a reputation agent is specific to the implementation of that service and is out of scope here.

2. High-Level Architecture

A reputation mechanism functions as a component of a service, such as depicted in Figure 1 of [[RFC5863](#)]:

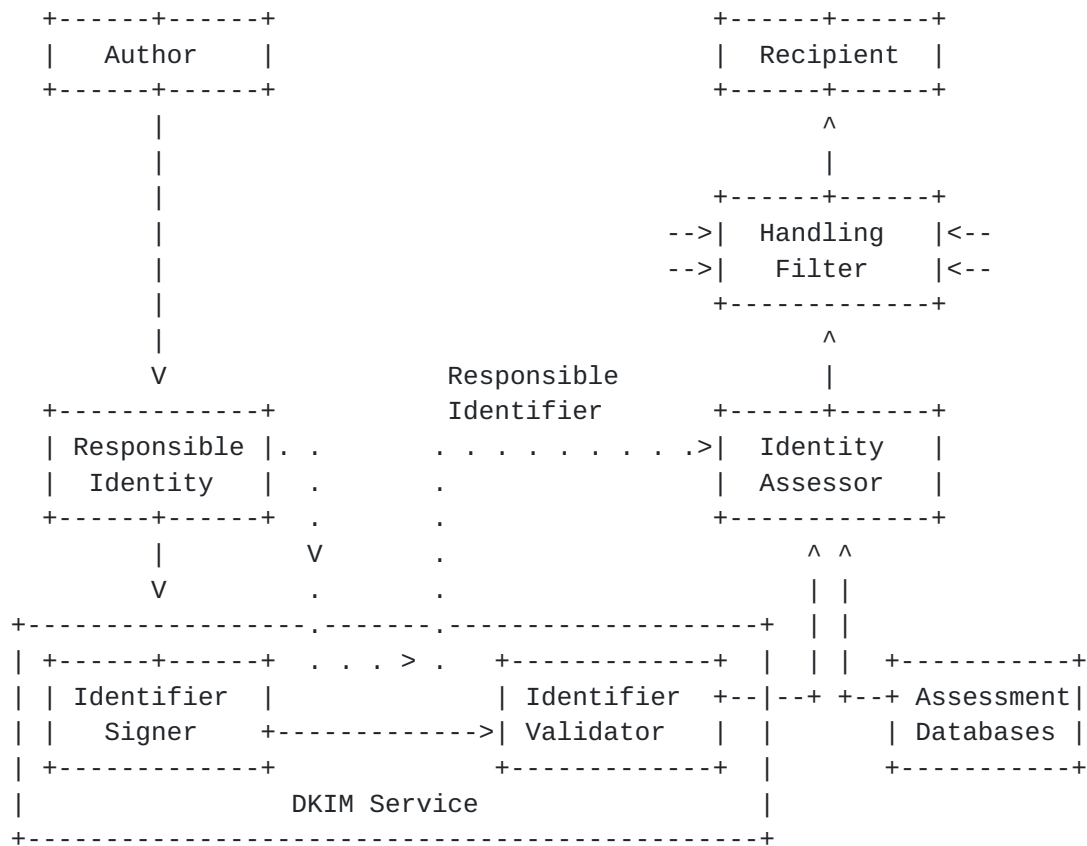


Figure 1: [RFC5683](#) 'Actors in a Trust Sequence Using DKIM'

Here, the reputation mechanism is shown only as a query by an Identity Assessor, made to Assessment Databases.

The current work attends specifically to the details of the query mechanism. It defines:

- o Vocabulary for the current work and work of this type
- o The types and content of queries that can be supported
- o The extensible range of response information that can be provided
- o A query/response protocol
- o Query/response transport conventions

The current work targets an extremely simple query/response model that can be carried over a variety of mechanisms, including the Domain Name System. (Although not typically thought of as a 'transport', the DNS provides generic capabilities and can be modeled as a mechanism for transporting queries and responses that have

nothing to do with addresses.) Each specification for Repute transport is independent of any other specification.

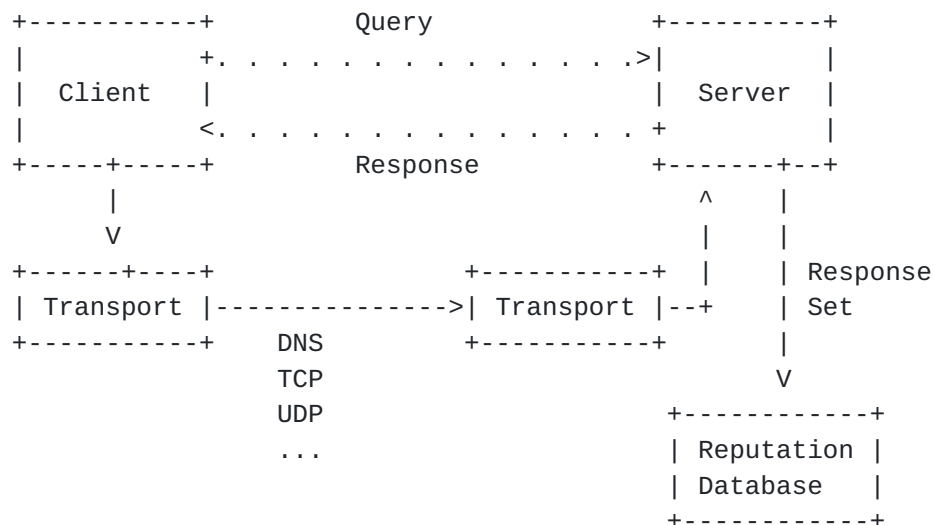


Figure 2: Basic Reputation Query Service

3. Terminology and Definitions

This section defines terms used in the rest of the document.

3.1. Response Set

A "Response Set" comprises those data that are returned in response to a reputation query about a particular entity. The types of data are specific to an application; the data returned in the evaluation of email senders would be different than the reputation data returned about a movie or a baseball player.

Response Sets have symbolic names, and these have to be registered with IANA to prevent name collisions. The IANA registries are created in a separate memo.

4. Information Represented in a Response Set

The basic information to be represented in the protocol is fairly simple, and includes:

- o the identity of the entity providing the reputation information;
- o the identity of the entity being rated;

- o the overall rating score for that entity;
- o the level of confidence in the accuracy of that rating; and
- o the number of data points underlying that score.

Beyond this, arbitrary amounts of additional information might be provided for specific uses of the service. The entire collection of such information is called the "Response Set" for that application. The query/response protocol defines a syntax for representing such Response Sets, but each application defines its own Set. Thus, the basic information also includes:

- o the name of the application for which the reputation data is being expressed.

For example, a separate specification is needed for a reputation Response Set for an "email-sending-domain" to be used to combat spam and other abuses of email. Additional documents define a [\[MIME\]](#) type for reputation data, and protocols for exchanging such data.

5. Information Flow in the Protocol

The basic Response Set could be wrapped into a new MIME media type [\[MIME\]](#) or a DNS RR, and transported accordingly. It also can be the integral payload of a purpose-built protocol. For basic request/response scenario, one entity (the Client) will ask a second entity (the Server) for reputation data about a third entity (the Target), and the second entity will respond with that data.

An applications might benefit from an extremely lightweight mechanism, supporting constrained queries and responses, while others might need to support larger and more complex responses.

6. IANA Considerations

This memo presents no actions for IANA, though later memos in this series are likely to do so.

7. Security Considerations

This memo introduces an overall protocol model, but no implementation details. As such, the security considerations presented here are very high-level. The detailed analyses of the various specific components of the protocol can be found the documents that

instantiate this model.

7.1. Biased Reputation Agents

As with [\[VBR\]](#), an agent seeking to make use of a reputation reporting service is placing some trust that the service presents an unbiased "opinion" of the object about which reputation is being returned. The result of trusting the data is, presumably, to guide action taken by the reputation client. It follows, then, that bias in the reputation service can adversely affect the client. Clients, therefore, need to be aware of this possibility and the impact it might have. For example, a biased system returning reputation information about a DNS domain found in email messages could result in the admission of spam, phishing or malware through a mail gateway.

Clients might also seek to interact only with reputation services that offer some level of transparency into the computation of the results they return. How this might be evaluated, however, is not specified here.

Similarly, a client placing trust in the results returned by such a service might suffer if the service itself is compromised, returning biased results under the control of an attacker without the knowledge of the agency providing reputation service. This might result from an attack on the data being returned at the source, or from a man-in-the-middle attack. Protocols, therefore, need to be designed so as to be as resilient against such attacks as possible.

7.2. Malformed Messages

Both clients and servers of reputation systems need to be resistant to attacks that involve malformed messages, deliberate or otherwise. Failure to do so creates an opportunity for a denial-of-service.

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[Appendix A](#). Public Discussion

Public discussion of this suite of memos takes place on the domainrep@ietf.org mailing list. See <https://www.ietf.org/mailman/listinfo/domainrep>.

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