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Kerberos Cryptosystem Negotiation Extension

Status of This Memo

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Abstract

This document specifies an extension to the Kerberos protocol as defined in RFC 4120, in which the client can send a list of supported encryption types in decreasing preference order, and the server then selects an encryption type that is supported by both the client and the server.

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1. Introduction

Under the current mechanism [RFC4120], the Kerberos Distribution Center (KDC) must limit the ticket session key encryption type (enctype) chosen for a given server to one it believes is supported by both the client and the server. If both the client and server understand a stronger enctype than the one selected by the KDC, they cannot negotiate it. As the result, the protection of application traffic is often weaker than necessary when the server can support different sets of enctypes depending on the server application software being used.

This document specifies an extension to the Kerberos protocol to allow clients and servers to negotiate use of a different and possibly stronger cryptosystem in subsequent communication.

This extension utilizes an authorization data element in the authenticator of the AP-REQ message [RFC4120]. The client sends the list of enctypes that it supports to the server; the server then informs the client of its choice. The negotiated subkey is sent in the AP-REP message [RFC4120].

2. Conventions Used in This Document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

3. Negotiation Extension

If the client prefers an enctype over that of the service ticket session key, then it SHOULD send a list of enctypes in decreasing preference order to the server. Based on local policy, the client selects enctypes out of all the enctypes available locally to be included in this list, and it SHOULD NOT include enctypes that are less preferable than that of the ticket session key in the service ticket. In addition, the client SHOULD NOT include negative (local-use) enctype numbers unless it knows a priori that the server has been configured to use the same negative enctype numbers for the same enctypes.

The client sends the enctype list via the authorization-data of the authenticator in the AP-REQ [RFC4120]. A new authorization data element type AD-ETYPE-NEGOTIATION is defined.

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This authorization data element itself is enclosed in the AD-IF-RELEVANT container; thus, a correctly implemented server that does not understand this element should ignore it [RFC4120]. The value of this authorization element contains the DER [X680] [X690] encoding of the following ASN.1 type:

```
EtypeList ::= SEQUENCE OF Int32
   -- Specifies the enctypes supported by the client.
   -- This enctype list is in decreasing preference order
   -- (favorite choice first).
   -- Int32 is defined in [RFC4120].
```

If the EtypeList is present and the server prefers an enctype from the client's enctype list over that of the AP-REQ authenticator subkey (if that is present) or the service ticket session key, the server MUST create a subkey using that enctype. This negotiated subkey is sent in the subkey field of AP-REP message, and it is then used as the protocol key or base key [RFC3961] for subsequent communication.

If the enctype of the ticket session key is included in the enctype list sent by the client, it SHOULD be the last on the list; otherwise, this enctype MUST NOT be negotiated if it was not included in the list.

This negotiation extension SHOULD NOT be used when the client does not expect the subkey in the AP-REP message from the server.

A note on key generation: The KDC has a strong Pseudo-Random Number Generator (PRNG); as such, the client can take advantage of the randomness provided by the KDC by reusing the KDC key data when generating keys. Implementations SHOULD use the service ticket session key value as a source of additional entropy when generating the negotiated subkey. If the AP-REQ authenticator subkey is present, it MAY also be used as a source of entropy.

The server MAY ignore the preference order indicated by the client. The policy by which the client or the server chooses an enctype (i.e., how the preference order for the supported enctypes is selected) is a local matter.

4. Security Considerations

The client's enctype list and the server's reply enctype are part of encrypted data; thus, the security considerations are the same as those of the Kerberos encrypted data.

Both the EtypeList and the server's sub-session key are protected by the session key or sub-session key used for the AP-REQ, and as a result, if a key for a stronger enctype is negotiated underneath a key for a weaker enctype, an attacker capable of breaking the weaker enctype can also discover the key for the stronger enctype. The advantage of this extension is to minimize the amount of cipher text encrypted under a weak enctype to which an attacker has access.

5. Acknowledgements

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6. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC3961] Raeburn, K., "Encryption and Checksum Specifications for Kerberos 5", RFC 3961, February 2005.

[RFC4120] Neuman, C., Yu, T., Hartman, S., and K. Raeburn, "The Kerberos Network Authentication Service (V5)", RFC 4120, July 2005.

[X680] ITU-T Recommendation X.680 (2002) | ISO/IEC 8824-1:2002, Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation.

[X690] ITU-T Recommendation X.690 (2002) | ISO/IEC 8825-1:2002, Information technology - ASN.1 encoding Rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER).

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