

NETWORK WORKING GROUP  
Internet-Draft  
Expires: December 30, 2004

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Sun  
July 2004

A PRF for the Kerberos V GSS-API Mechanism  
draft-ietf-kitten-krb5-gssapi-prf-01.txt

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#### Abstract

This document defines the Pseudo-Random Function (PRF) for the Kerberos V mechanism for the Generic Security Service Application Programming Interface (GSS-API), based on the PRF defined for the Kerberos V cryptographic framework, for keying application protocols given an established Kerberos V GSS-API security context.

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## 1. 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](#)].

## [2.](#) Kerberos V GSS Mechanism PRF

The GSS-API PRF [[GSS-PRF](#)] function for the Kerberos V mechanism [[CFX](#)] shall be the output of a PRF+ function based on the enctype's PRF function keyed with the negotiated session key of the security context and key usage X (TBD).

The security context MUST be fully established, else the mechanism MUST fail with GSS\_S\_FAILURE as the major status code and GSS\_KRB5\_S\_KG\_CTX\_INCOMPLETE as the minor status code.

This PRF+ MUST be keyed with a key derived, with key usage (TBD), from the session used by the initiator and acceptor, after the security context is fully established, to derive keys for per-message tokens. For the current Kerberos V mechanism [[CFX](#)] this means that the PRF+ MUST be keyed with the acceptor-asserted subkey, if it did assert such a key, or the initiator's sub-session key otherwise.

The PRF+ function is a simple counter-based extension of the Kerberos V pseudo-random function [[KRB5-CRYPTO](#)] for the enctype of the security context's keys:

$$\text{PRF+}(K, L, S) = \text{truncate}(L, T1 \parallel T2 \parallel \dots \parallel Tn)$$
$$Tn = \text{pseudo-random-function}(K, n \parallel S)$$

where '||' is the concatenation operator, 'n' is encoded as a network byte order 32-bit unsigned binary number, and where

`truncate(L, S)` truncates the input octet string `S` to length `L`.

The maximum output size of the Kerberos V mechanism's GSS-API PRF then is, necessarily,  $2^{32}$  octets.

Implementations MUST support output size of up to  $2^{14}$  octets at least.

If the implementation cannot produce the desired output then it MUST output what it can.

The minimum input octet string length that implementations MUST support is also  $2^{14}$  octets. If the input octet string is longer than the maximum that an implementation can process then the implementation MUST fail with `GSS_S_FAILURE` as the major status code and `GSS_KRB5_S_KG_INPUT_TOO_LONG` as the minor status code.

### [3.](#) Security Considerations

Kerberos V enctype's PRF functions use a key derived from contexts' session keys and should preserve the forward security properties of the mechanisms' key exchanges.

Legacy Kerberos V enctype's may be weak, particularly the single-DES enctype's.

See also [\[GSS-PRF\]](#) for generic security considerations of `GSS_Pseudo_random()`.

The computational cost of computing this PRF+ may vary depending on the Kerberos V enctype's being used, but generally the computation of this PRF+ gets more expensive as the input and output octet string lengths grow (note that the use of a counter in the PRF+ construction allows for parallelization). This means that if an application can be tricked into providing very large input octet strings and requesting very long output octet strings then that may constitute a denial of service attack on the application; therefore applications SHOULD place appropriate limits on the size of any input octet

strings received from their peers without integrity protection.

#### 4 Normative References

- [CFX] Zhu, L., Jaganathan, K. and S. Hartman, "The Kerberos Version 5 GSS-API Mechanism: Version 2".
- [GSS-PRF] Williams, N., "A PRF API extension for the GSS-API".
- [KRB5-CRYPTO]  
Raeburn, K., "Encryption and Checksum Specifications for Kerberos 5".
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC2743] Linn, J., "Generic Security Service Application Program Interface Version 2, Update 1", [RFC 2743](#), January 2000.
- [RFC2744] Wray, J., "Generic Security Service API Version 2 : C-bindings", [RFC 2744](#), January 2000.

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#### Acknowledgment

Funding for the RFC Editor function is currently provided by the Internet Society.