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Test vectors for STUN
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Abstract

The Session Traversal Utilities for NAT (STUN) protocol defines two STUN attributes -- FINGERPRINT and MESSAGE-INTEGRITY -- that may be included in STUN messages. This document provides test vectors for those two attributes.

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1. Introduction

The Session Traversal Utilities for NAT (STUN) [[I-D.ietf-behave-rfc3489bis](#)] protocol defines two different hashes that may be included in messages exchanged by peers implementing that protocol:

FINGERPRINT attribute: a 32-bits Circular Redundancy Check.

MESSAGE-INTEGRITY attribute: a HMAC-SHA1 authentication code.

This document provides samples of properly-formatted STUN messages including these hashes, for the sake of testing implementations of the STUN protocol.

2. Test vectors

All included vectors are represented as a series of hexadecimal values in network byte order. Each pair of hexadecimal digits represents one byte.

Messages follow the ICE Connectivity Checks use case of STUN, (see [[I-D.ietf-mmusic-ice](#)]). These messages include FINGERPRINT, MESSAGE-INTEGRITY and XOR-MAPPED-ADDRESS STUN attributes. These attributes are considered to be most prone to implementation errors. An additional message is provided to test STUN authentication with long-term credentials (which is not used by ICE).

In the following sample messages, two types of plain UTF-8 text attributes are included. The values of certain of these attributes were purposely sized to require padding.

In this document, ASCII white spaces (U+0020) are used for padding within the first three messages - this is arbitrary. Similarly, the last message uses nul bytes for padding. As per [[I-D.ietf-behave-rfc3489bis](#)], padding bytes can have any value.

[2.1.](#) Sample request

This request uses the following parameters:

Client (user-agent) name: "STUN test client" (without quotes)

Username: "evtj:h6vY" (without quotes)

Password: "V0kJxbRl1RmTxUk/WvJxBt" (without quotes)

```
00 01 00 58      Request type and message length
21 12 a4 42      Magic cookie
b7 e7 a7 01     }
bc 34 d6 86     } Transaction ID
fa 87 df ae     }
80 30 00 10     CLIENT attribute header
53 54 55 4e     }
20 74 65 73     } User-agent...
74 20 63 6c     } ...name
69 65 6e 74     }
00 24 00 04     PRIORITY attribute header
6e 00 01 ff     ICE priority value
80 29 00 08     ICE-CONTROLLED attribute header
93 2f f9 b1     } Pseudo-random tie breaker...
51 26 3b 36     } ...for ICE control
00 06 00 09     USERNAME attribute header
65 76 74 6a     }
3a 68 36 76     } Username (9 bytes) and padding (3 bytes)
59 20 20 20     }
00 08 00 14     MESSAGE-INTEGRITY attribute header
3e f9 bc 22     }
7b 2b 98 0f     }
4f 5f 90 9b     } HMAC-SHA1 fingerprint
60 00 3b 91     }
fa ba 42 6b     }
```

```
80 28 00 04    FINGERPRINT attribute header
ad 8a 85 ff    CRC32 fingerprint
```

[2.2.](#) Sample IPv4 response

This response used the following parameter:

Password: "V0kJxbRl1RmTxUk/WvJxBt" (without quotes)

Server name: "test vector" (without quotes)

Mapped address: 192.0.2.1 port 32853

```
01 01 00 3c    Response type and message length
21 12 a4 42    Magic cookie
b7 e7 a7 01    }
bc 34 d6 86    } Transaction ID
fa 87 df ae    }
80 22 00 0b    SERVER attribute header
74 65 73 74    }
20 76 65 63    } UTF-8 server name
74 6f 72 20    }
00 20 00 08    XOR-MAPPED-ADDRESS attribute header
00 01 a1 47    Address family (IPv4) and xor'd mapped port number
e1 12 a6 43    Xor'd mapped IPv4 address
00 08 00 14    MESSAGE-INTEGRITY attribute header
2b 91 f5 99    }
fd 9e 90 c3    }
8c 74 89 f9    } HMAC-SHA1 fingerprint
2a f9 ba 53    }
f0 6b e7 d7    }
80 28 00 04    FINGERPRINT attribute header
c0 7d 4c 96    CRC32 fingerprint
```

[2.3.](#) Sample IPv6 response

This response used the following parameter:

Password: "V0kJxbRl1RmTxUk/WvJxBt" (without quotes)

Server name: "test vector" (without quotes)

Mapped address: 2001:db8:1234:5678:11:2233:4455:6677 port 32853

| | |
|---------------|--|
| 01 01 00 48 | Response type and message length |
| 21 12 a4 42 | Magic cookie |
| b7 e7 a7 01 } | |
| bc 34 d6 86 } | Transaction ID |
| fa 87 df ae } | |
| 80 22 00 0b | SERVER attribute header |
| 74 65 73 74 } | |
| 20 76 65 63 } | UTF-8 server name |
| 74 6f 72 20 } | |
| 00 20 00 14 | XOR-MAPPED-ADDRESS attribute header |
| 00 02 a1 47 | Address family (IPv6) and xor'd mapped port number |
| 01 13 a9 fa } | |
| a5 d3 f1 79 } | Xor'd mapped IPv6 address |
| bc 25 f4 b5 } | |
| be d2 b9 d9 } | |

```

00 08 00 14    MESSAGE-INTEGRITY attribute header
a3 82 95 4e  }
4b e6 7b f1  }
17 84 c9 7c  } HMAC-SHA1 fingerprint
82 92 c2 75  }
bf e3 ed 41  }
80 28 00 04    FINGERPRINT attribute header
c8 fb 0b 4c    CRC32 fingerprint

```

[2.4.](#) Sample request with long-term authentication

This request uses the following parameters:

Username: "<U+30DE><U+30C8><U+30EA><U+30C3><U+30AF><U+30B9>"
(without quotes)

Password: "TheA<U+00AD>M<U+00AA>tr<U+2168>" (without quotes) before
SASLprep processing

Nonce: "f//499k954d60L34oL9FSTvy64sA" (without quotes)

Realm: "example.org" (without quotes)

```

00 01 00 60    Request type and message length
21 12 a4 42    Magic cookie
78 ad 34 33  }
c6 ad 72 c0  } Transaction ID
29 da 41 2e  }
00 06 00 12    USERNAME attribute header
e3 83 9e e3  }
83 88 e3 83  }

```

```

aa e3 83 83 } Username value (18 bytes) and padding (2 bytes)
e3 82 af e3 }
82 b9 00 00 }
00 15 00 1c   NONCE attribute header
66 2f 2f 34 }
39 39 6b 39 }
35 34 64 36 }
4f 4c 33 34 } Nonce value
6f 4c 39 46 }
53 54 76 79 }
36 34 73 41 }
00 14 00 0b   REALM attribute header
65 78 61 6d }
70 6c 65 2e } Realm value (11 bytes) and padding (1 byte)
6f 72 67 00 }
00 08 00 14   MESSAGE-INTEGRITY attribute header
f6 70 24 65 }
6d d6 4a 3e }
02 b8 e0 71 } HMAC-SHA1 fingerprint
2e 85 c9 a2 }
8c a8 96 66 }

```

[3.](#) Security Considerations

There are no security considerations.

[4.](#) IANA Considerations

This document raises no IANA considerations.

[5.](#) Acknowledgements

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[6.](#) Normative References

[I-D.ietf-behave-rfc3489bis] Rosenberg, J., Mahy, R., Matthews, P., and D. Wing, "Session Traversal

[draft-ietf-behave-rfc3489bis-16](#) (work in progress), July 2008.

[I-D.ietf-mmusic-ice]

Rosenberg, J., "Interactive Connectivity Establishment (ICE): A Protocol for Network Address Translator (NAT) Traversal for Offer/Answer Protocols",
[draft-ietf-mmusic-ice-19](#) (work in progress), October 2007.

[Appendix A.](#) Source code for test vectors

```
const unsigned char req[] =
  "\x00\x01\x00\x58"
  "\x21\x12\xa4\x42"
  "\xb7\xe7\xa7\x01\xbc\x34\xd6\x86\xfa\x87\xdf\xae"
  "\x80\x30\x00\x10"
  "STUN test client"
  "\x00\x24\x00\x04"
  "\x6e\x00\x01\xff"
  "\x80\x29\x00\x08"
  "\x93\x2f\xf9\xb1\x51\x26\x3b\x36"
  "\x00\x06\x00\x09"
  "\x65\x76\x74\x6a\x3a\x68\x36\x76\x59\x20\x20\x20"
  "\x00\x08\x00\x14"
  "\x3e\xf9\xbc\x22\x7b\x2b\x98\x0f\x4f\x5f\x90\x9b"
  "\x60\x00\x3b\x91\xfa\xba\x42\x6b"
  "\x80\x28\x00\x04"
  "\x8c\xdd\x72\x38";
```

Request message

```
const unsigned char respv4[] =
  "\x01\x01\x00\x3c"
  "\x21\x12\xa4\x42"
  "\xb7\xe7\xa7\x01\xbc\x34\xd6\x86\xfa\x87\xdf\xae"
  "\x80\x22\x00\x0b"
  "\x74\x65\x73\x74\x20\x76\x65\x63\x74\x6f\x72\x20"
  "\x00\x20\x00\x08"
  "\x00\x01\xa1\x47\xe1\x12\xa6\x43"
  "\x00\x08\x00\x14"
  "\x2b\x91\xf5\x99\xfd\x9e\x90\xc3\x8c\x74\x89\xf9"
  "\x2a\xf9\xba\x53\xf0\x6b\xe7\xd7"
  "\x80\x28\x00\x04"
```

```
"\xc0\x7d\x4c\x96";
```

IPv4 response message

```
const unsigned char respv6[] =
  "\x01\x01\x00\x48"
  "\x21\x12\xa4\x42"
  "\xb7\xe7\xa7\x01\xbc\x34\xd6\x86\xfa\x87\xdf\xae"
  "\x80\x22\x00\x0b"
  "\x74\x65\x73\x74\x20\x76\x65\x63\x74\x6f\x72\x20"
  "\x00\x20\x00\x14"
  "\x00\x02\xa1\x47"
  "\x01\x13\xa9\xfa\xa5\xd3\xf1\x79"
  "\xbc\x25\xf4\xb5\xbe\xd2\xb9\xd9"
  "\x00\x08\x00\x14"
  "\xa3\x82\x95\x4e\x4b\xe6\x7b\xf1\x17\x84\xc9\x7c"
  "\x82\x92\xc2\x75\xbf\xe3\xed\x41"
  "\x80\x28\x00\x04"
  "\xc8\xfb\x0b\x4c";
```

IPv6 response message

```
const unsigned char reqlrc[] =
  "\x00\x01\x00\x60"
  "\x21\x12\xa4\x42"
  "\x78\xad\x34\x33\xc6\xad\x72\xc0\x29\xda\x41\x2e"
  "\x00\x06\x00\x12"
  "\xe3\x83\x9e\xe3\x83\x88\xe3\x83\xaa\xe3\x83\x83"
  "\xe3\x82\xaf\xe3\x82\xb9\x00\x00"
  "\x00\x15\x00\x1c"
  "\x66\x2f\x2f\x34\x39\x39\x6b\x39\x35\x34\x64\x36"
  "\x4f\x4c\x33\x34\x6f\x4c\x39\x46\x53\x54\x76\x79"
  "\x36\x34\x73\x41"
  "\x00\x14\x00\x0b"
  "\x65\x78\x61\x6d\x70\x6c\x65\x2e\x6f\x72\x67\x00"
  "\x00\x08\x00\x14"
  "\xf6\x70\x24\x65\x6d\xd6\x4a\x3e\x02\xb8\xe0\x71"
  "\x2e\x85\xc9\xa2\x8c\xa8\x96\x66";
```

Request with long-term credentials

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