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## **Traversal Using Relays around NAT (TURN) Uniform Resource Identifiers draft-petithuguenin-behave-turn-uris-05**

### Abstract

This document specifies the syntax of Uniform Resource Identifier (URI) schemes for the Traversal Using Relays around NAT (TURN) protocol. It defines two URI schemes to provision the TURN Resolution Mechanism [[RFC5928](#)].

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## [1.](#) Introduction

This document specifies the syntax and semantics of the Uniform Resource Identifier (URI) scheme for the Traversal Using Relays around NAT (TURN) protocol.

The TURN protocol is a specification allowing hosts behind NAT to control the operation of a relay server. The relay server allows hosts to exchange packets with its peers. The peers themselves may also be behind NATs. [RFC 5766](#) [[RFC5766](#)] defines the specifics of the TURN protocol.

The "turn" and "turns" URI schemes are used to designate a TURN server (also known as a relay) on Internet hosts accessible using the TURN protocol. With the advent of standards such as [[WEBRTC](#)], we anticipate a plethora of endpoints and web applications to be able to identify and communicate with such a TURN server to carry out the TURN protocol. This also implies those endpoints and/or applications to be provisioned with appropriate configuration required to identify



the TURN server. Having an inconsistent syntax has its drawbacks and can result in non-interoperable solutions. It can result in solutions that are ambiguous and have implementation limitations on the different aspects of the syntax and alike. The "turn/turns" URI scheme helps alleviate most of these issues by providing a consistent way to describe, configure and exchange the information identifying a TURN server. This would also prevent the shortcomings inherent with encoding similar information in non-uniform syntaxes such as the ones proposed in [[WEBRTC](#)], for example.

[RFC5928] defines a resolution mechanism to convert a secure flag, a host name or IP address, an eventually empty port, and an eventually empty transport to a list of IP address, port, and TURN transport tuples.

To simplify the provisioning of TURN clients, this document defines a TURN and a TURNS URI scheme that can carry the four components needed for the resolution mechanism.

## 2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [[RFC2119](#)] when they appear in ALL CAPS. When these words are not in ALL CAPS (such as "should" or "Should"), they have their usual english meanings, and are not to be interpreted as [RFC 2119](#) key words.

## 3. Definitions of the TURN and TURNS URI

### 3.1. URI Scheme Syntax

A TURN/TURNS URI has the following formal ABNF syntax [[RFC5234](#)]:

```

turnURI      = scheme ":" turn-host [ ":" turn-port ]
               [ "?transport=" transport ]
scheme       = "turn" / "turns"
transport    = "udp" / "tcp" / transport-ext
transport-ext = 1*unreserved
turn-host    = IP-literal / IPv4address / reg-name
turn-port    = *DIGIT
IP-literal   = "[" ( IPv6address / IPvFuture  ) "]"
IPvFuture    = "v" 1*HEXDIG "." 1*( unreserved / sub-delims / ":" )
IPv6address  =
    6( h16 ":" ) ls32
    /
    "::" 5( h16 ":" ) ls32
    / [
        h16 ] "::" 4( h16 ":" ) ls32
    / [ *1( h16 ":" ) h16 ] "::" 3( h16 ":" ) ls32
    / [ *2( h16 ":" ) h16 ] "::" 2( h16 ":" ) ls32
    / [ *3( h16 ":" ) h16 ] "::"   h16 ":"   ls32

```



```

        / [ *4( h16 ":" ) h16 ] ":@"          ls32
        / [ *5( h16 ":" ) h16 ] ":@"          h16
        / [ *6( h16 ":" ) h16 ] ":@"
h16      = 1*4HEXDIG
ls32     = ( h16 ":" h16 ) / IPv4address
IPv4address = dec-octet "." dec-octet "." dec-octet "." dec-octet
dec-octet  = DIGIT                ; 0-9
           / %x31-39 DIGIT        ; 10-99
           / "1" 2DIGIT           ; 100-199
           / "2" %x30-34 DIGIT    ; 200-249
           / "25" %x30-35         ; 250-255
reg-name  = *( unreserved / pct-encoded / sub-delims )

```

<unreserved>, <pct-encoded>, and <sub-delims> are specified in [\[RFC3986\]](#). The core rules <DIGIT> and <HEXDIGIT> are used as described in [Appendix B of RFC 5234 \[RFC5234\]](#).

The <host>, <port> and <transport> components are passed without modification to the [\[RFC5928\]](#) algorithm. <secure> is set to false if <scheme> is equal to "turn" and set to true if <scheme> is equal to "turns" and passed to the [\[RFC5928\]](#) algorithm with the other components.

### 3.2. URI Scheme Semantics

The TURN protocol supports sending messages over UDP, TCP or TLS-over-TCP. The "turns" URI scheme MUST be used when TURN is run over TLS-over-TCP (or in the future DTLS-over-UDP) and the "turn" scheme MUST be used otherwise.

The required <host> part of the "turn" URI denotes the TURN server host.

The <port> part, if present, denotes the port on which the TURN server is awaiting connection requests. If it is absent, the default port is 3478 for both UDP and TCP. The default port for TURN over TLS is 5349.

## 4. Implementation Status

Note to RFC Editor: Please remove this section before publication.

This section records the status of known implementations of the protocol defined by this specification at the time of posting of this Internet-Draft, and is based on a proposal described in [\[RUNNING-CODE\]](#). According to [\[RUNNING-CODE\]](#), "this will allow reviewers and working groups to assign due consideration to documents



that have the benefit of running code, by considering the running code as evidence of valuable experimentation and feedback that has made the implemented protocols more mature. It is up to the individual working groups to use this information as they see fit".

#### **4.1. turnuri**

Organization: Impedance Mismatch

Name: turnuri 0.3.4

Description: A reference implementation of this document and of [RFC 5928](#) [[RFC5928](#)].

Level of maturity: Beta.

Coverage: Fully implements this specification and [RFC 5928](#).

Licensing: AGPL3

Contact: Marc Petit-Huguenin <[marc@petit-huguenin.org](mailto:marc@petit-huguenin.org)>. <http://debian.implemeters.org/stable/source/turnuri.tar.gz>

#### **4.2. libjingle**

Organization: Google Inc.

Name: libjingle 0.7.1

Description: Libjingle is a set of components provided by Google to implement Jingle protocols XEP-166 (<http://xmpp.org/extensions/xep-0166.html>) and XEP-167 (<http://xmpp.org/extensions/xep-0167.html>).

Level of maturity: Beta.

Coverage: Implements [draft-petithuguenin-behave-turn-uris-01](#) without IPv6.

Licensing: BSD 3-clauses license.

Contact: <https://code.google.com/p/chromium/> [https://code.google.com/p/chromium/codesearch#chromium/src/third\\_party/libjingle/source/talk/app/webrtc/peerconnection.cc](https://code.google.com/p/chromium/codesearch#chromium/src/third_party/libjingle/source/talk/app/webrtc/peerconnection.cc)

#### **4.3. Firefox**

Organization: Mozilla





Name: Firefox Aurora 21

Description: Mozilla Firefox is a free and open source web browser.

Level of maturity: Beta.

Coverage: Implements [draft-petithuguenin-behave-turn-uri-03](#) without [RFC 5928](#).

Licensing: Mozilla Public License, v2.0.

Contact: <http://www.mozilla.org/en-US/firefox/channel/> <http://hg.mozilla.org/mozilla-central/rev/6b5016ab9ebb>

## **5. Security Considerations**

Security considerations for the resolution mechanism are discussed in [\[RFC5928\]](#).

The "turn" and "turns" URI schemes do not introduce any specific security issues beyond the security considerations discussed in [\[RFC3986\]](#).

## **6. IANA Considerations**

This section contains the registration information for the "turn" and "turns" URI Schemes (in accordance with [\[RFC4395\]](#)).

### **6.1. TURN URI Registration**

URI scheme name: turn

Status: permanent

URI scheme syntax: See [Section 3.1](#).

URI scheme semantics: See [Section 3.2](#).

Encoding considerations: There are no encoding considerations beyond those in [\[RFC3986\]](#).

Applications/protocols that use this URI scheme name:

The "turn" URI scheme is intended to be used by applications that might need access to a TURN server.

Interoperability considerations: N/A



Security considerations: See [Section 5](#).

Contact: Marc Petit-Huguenin <petithug@acm.org>

Author/Change controller: The IESG

References: RFCXXXX

[[NOTE TO RFC EDITOR: Please change XXXX to the number assigned to this specification, and remove this paragraph on publication.]]

## **6.2. TURNS URI Registration**

URI scheme name: turns

Status: permanent

URI scheme syntax: See [Section 3.1](#).

URI scheme semantics: See [Section 3.2](#).

Encoding considerations: There are no encoding considerations beyond those in [\[RFC3986\]](#).

Applications/protocols that use this URI scheme name:

The "turns" URI scheme is intended to be used by applications that might need access to a TURN server over a secure connection.

Interoperability considerations: N/A

Security considerations: See [Section 5](#).

Contact: Marc Petit-Huguenin <petithug@acm.org>

Author/Change controller: The IESG

References: RFCXXXX

[[NOTE TO RFC EDITOR: Please change XXXX to the number assigned to this specification, and remove this paragraph on publication.]]

## **7. Acknowledgements**



Thanks to Margaret Wasserman, Magnus Westerlund, Juergen Schoenwaelder, Sean Turner, Ted Hardie, Dave Thaler, Alfred E. Heggstad, Eilon Yardeni, Dan Wing, Alfred Hoenes, and Jim Kleck for the comments, suggestions and questions that helped improve the [draft-petithuguenin-behave-turn-uri-bis](#) document.

Many thanks to Cullen Jennings for his detailed review and thoughtful comments on the [draft-nandakumar-rtcweb-turn-uri](#) document.

Thanks to Bjoern Hoehrmann and Dan Wing for the comments, suggestions and questions that helped improve this document.

The <turn-port> and <turn-host> ABNF productions have been copied from the <port> and <host> ABNF productions from [[RFC3986](#)].

## **8. References**

### **8.1. Normative References**

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC3986] Berners-Lee, T., Fielding, R., and L. Masinter, "Uniform Resource Identifier (URI): Generic Syntax", STD 66, [RFC 3986](#), January 2005.
- [RFC5234] Crocker, D. and P. Overell, "Augmented BNF for Syntax Specifications: ABNF", STD 68, [RFC 5234](#), January 2008.
- [RFC5766] Mahy, R., Matthews, P., and J. Rosenberg, "Traversal Using Relays around NAT (TURN): Relay Extensions to Session Traversal Utilities for NAT (STUN)", [RFC 5766](#), April 2010.
- [RFC5928] Petit-Huguenin, M., "Traversal Using Relays around NAT (TURN) Resolution Mechanism", [RFC 5928](#), August 2010.

### **8.2. Informative References**

- [RFC4395] Hansen, T., Hardie, T., and L. Masinter, "Guidelines and Registration Procedures for New URI Schemes", [BCP 35](#), [RFC 4395](#), February 2006.
- [WEBRTC] Bergkvist, A., Burnett, D., Jennings, C., and A. Narayanan, "WebRTC 1.0: Real-time Communication Between Browsers", World Wide Web Consortium WD WD-webrtc-20120821, August 2012, <<http://www.w3.org/TR/2012/WD-webrtc-20120821>>.



## [RUNNING-CODE]

Sheffer, Y. and A. Farrel, "Improving Awareness of Running Code: the Implementation Status Section", [draft-sheffer-running-code-06](#) (work in progress), June 2013.

**Appendix A. Examples**

Table 1 shows how the <secure>, <port> and <transport> components are populated from various URIs. For all these examples, the <host> component is populated with "example.org".

URI	<secure>	<port>	<transport>
turn:example.org	false		
turns:example.org	true		
turn:example.org:8000	false	8000	
turn:example.org?transport=udp	false		UDP
turn:example.org?transport=tcp	false		TCP
turns:example.org?transport=tcp	true		TLS

Table 1

**Appendix B. Design Notes**

- o The ABNF duplicates some definitions from [RFC3986] instead of referencing them. This was done because the definitions in RFC 3986 are for hierarchical URIs, so using these references in an opaque URI proved confusing.
- o One recurring comment was to stop using the suffix "s" on URI scheme, and to move the secure option to a parameter (e.g. ";proto=tls"). We decided against this idea because the STUN URI does not have a ";proto=" parameter and we would have lost the symmetry between the TURN and STUN URIs. A more detailed account of the reasoning behind this is available at <<http://blog.marc.petit-huguenin.org/2012/09/on-design-of-stun-and-turn-uri-formats.html>>
- o Following the advice of RFC 4395 section 2.2., and because the TURN URI does not describe a hierarchical structure, the TURN URIs are opaque URIs.
- o <password> is not used in the URIs because it is deprecated. <username> is not used in the URIs because it is not used to guide the resolution mechanism.





- o As discussed at IETF 72 in Dublin, there is no generic parameters in the URI to prevent compatibility issues.

## **Appendix C. Release notes**

This section must be removed before publication as an RFC.

### **C.1. Modifications between petithuguenin-behave-turn-uris-05 and petithuguenin-behave-turn-uris-04**

- o Simplify the abstract.
- o Change boilerplate from noModificationTrust200902 to trust200902.
- o Update [RFC 2119](http://trac.tools.ietf.org/group/iesg/trac/wiki/Draft2119BoilerplateSuggestions) boilerplate to <http://trac.tools.ietf.org/group/iesg/trac/wiki/Draft2119BoilerplateSuggestions>
- o Remove non-normative text in "Definitions of the TURN and TURNS URI" section.
- o Reorder ABNF production references in the text to match the ABNF definition order.
- o Add a design note explaining the reason for duplicating the ABNF productions from [RFC 3986](http://tools.ietf.org/rfc/rfc3986).
- o Move the Design Notes section from the Release Notes appendix to its own appendix to keep them in the RFC-to-be.
- o s/in Dublin/at IETF 72 in Dublin/
- o Updated acknowledgment section.
- o Updated Implementation Status section with new template.

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