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# Traversal Using Relays around NAT (TURN) Uniform Resource Identifiers draft-petithuguenin-behave-turn-uris-02

## 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 that can be used to provision the configuration values needed by the resolution mechanism defined in [RFC5928] .

Table of Contents

## 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/turns" URI scheme is 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.

A reference implementation [REF-IMPL] is available.

## 2. Terminology

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] .

"SHOULD", "SHOULD NOT", "RECOMMENDED", and "NOT RECOMMENDED" are

appropriate when valid exceptions to a general requirement are known to exist or appear to exist, and it is infeasible or impractical to enumerate all of them. However, they should not be interpreted as permitting implementors to fail to implement the general requirement when such failure would result in interoperability failure.

## 3. Syntax of a TURN or TURNS URI

### 3.1. URI Scheme Syntax

The "turn" URI takes the following form (the syntax below is non-normative):

```
turn:<host>:<port>
turns:<host>:<port>
```

Note that the <port> part and the preceding ":" (colon) character, is OPTIONAL.

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>, <sub-delims>, and <pct-encoded> 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 SHALL be used when TURN is run over TLS-over-TCP (or in the future DTLS-over-UDP) and the "turn" scheme SHALL 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 SHALL be 3478 for both UDP and TCP. The default port for TURN over TLS SHALL be 5349.

## 4. 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] .

## 5. IANA Considerations

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

### 5.1. TURN URI Registration

URI scheme name: turn

Status: permanent

URI scheme syntax: See Section 3 .

URI scheme semantics: See [RFC5928] .

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 4 .

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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.]]

### 5.2. TURNS URI Registration

URI scheme name: turns

Status: permanent

URI scheme syntax: See Section 3 .

URI scheme semantics: See [RFC5928] .

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 4 .

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References: RFCXXXX

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

## 6. Acknowledgements

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

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

## 7. References

### 7.1. 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.

### 7.2. 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>.

[REF-IMPL] Petit-Huguenin, MPH., "Reference Implementation of TURN resolver and TURN URI parser".

<http://debian.implementers.org/stable/source/turnuri.tar.gz> .

## 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. Release notes

This section must be removed before publication as an RFC.

### B.1. Design Notes

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>

- 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.
- <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.
- As discussed in Dublin, there is no generic parameters in the URI to prevent compatibity issues.

### B.2. Modifications between petithuguenin-behave-turn-uris-02 and petithuguenin-behave-turn-uris-01

- Added design note about choice for turn/turns syntax.

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