

**Applicability of the Tunnel Setup Protocol(TSP) as an IPv6 Transition  
Technique  
draft-blanchet-ngtrans-tsp-applicability-00**

Status of this Memo

This document is an Internet-Draft and is in full conformance with all provisions of [Section 10 of RFC2026](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at <http://www.ietf.org/ietf/1id-abstracts.txt>.

The list of Internet-Draft Shadow Directories can be accessed at <http://www.ietf.org/shadow.html>.

This Internet-Draft will expire on December 22, 2002.

Copyright Notice

Copyright (C) The Internet Society (2002). All Rights Reserved.

Abstract

There are multiple environments where IPv6 transition techniques can be used. There are multiple IPv6 transition techniques. This document describes the applicability of transition techniques based on the Tunnel Setup Protocol(TSP) used in different environments, such as: provider, enterprise, unmanaged networks, cable-dsl operators, wireless operators, mobile hosts and networks. TSP enables the automation of prefix assignment, DNS delegation and routing preferences. TSP supports IPv6 over IPv4 and IPv4 over IPv6 encapsulations, as well as UDP-IPv4 encapsulation for IPv4 NAT traversals, through automatic NAT discovery.

Table of Contents

<a href="#">1.</a>	Introduction . . . . .	<a href="#">3</a>
<a href="#">2.</a>	Description of the TSP framework . . . . .	<a href="#">3</a>
<a href="#">2.1</a>	NAT Discovery . . . . .	<a href="#">4</a>
<a href="#">2.2</a>	Any encapsulation . . . . .	<a href="#">4</a>
<a href="#">2.3</a>	Mobility . . . . .	<a href="#">4</a>
<a href="#">2.4</a>	Compression of TSP . . . . .	<a href="#">4</a>
<a href="#">2.5</a>	Advantages of TSP . . . . .	<a href="#">5</a>
<a href="#">3.</a>	Applicability of TSP in Different Environments . . . . .	<a href="#">5</a>
<a href="#">3.1</a>	Applicability of TSP in Provider Networks with Enterprise Customers . . . . .	<a href="#">5</a>
<a href="#">3.2</a>	Applicability of TSP in Provider Networks with Home/Small Office Customers . . . . .	<a href="#">5</a>
<a href="#">3.3</a>	Applicability of TSP in Enterprise Networks . . . . .	<a href="#">6</a>
<a href="#">3.4</a>	Applicability of TSP in Wireless Networks . . . . .	<a href="#">6</a>
<a href="#">3.5</a>	Applicability of TSP in Unmanaged networks . . . . .	<a href="#">6</a>
<a href="#">3.6</a>	Applicability of TSP in Exchange Points . . . . .	<a href="#">7</a>
<a href="#">3.7</a>	Applicability of TSP for Mobile Hosts . . . . .	<a href="#">7</a>
<a href="#">3.8</a>	Applicability of TSP for Mobile Networks . . . . .	<a href="#">7</a>
<a href="#">4.</a>	Security Considerations . . . . .	<a href="#">7</a>
<a href="#">5.</a>	Conclusion . . . . .	<a href="#">7</a>
	References . . . . .	<a href="#">8</a>
	Authors' Addresses . . . . .	<a href="#">8</a>
	Full Copyright Statement . . . . .	<a href="#">10</a>



## 1. Introduction

This document first describes the TSP framework as well as the different profiles used. It then describes the applicability of TSP in different environments.

## 2. Description of the TSP framework

The experience with the freenet6.net Tunnel Broker [6] gave a good input of what a real IPv6 deployment can be. A new generation of Tunnel Broker was designed [2][1] based user inputs, management of the service as well as requirements given by the community. This new generation is based on a signaling protocol, called Tunnel Setup Protocol (TSP).

Tunnel Setup Protocol (TSP) is a control/signaling protocol to setup tunnel parameters between two tunnel end-points. TSP is implemented as a tiny client code in the requesting tunnel end-point. The other end-point is the TSP server. TSP uses XML basic messaging over TCP or UDP. The use of XML gives extensibility and easy option processing.

Inside a session, TSP can negotiate between the two tunnel end-points:

- o authentication of the users, using any kind of authentication mechanism as well as anonymous
- o IPv6 over IPv4 tunnels
- o IPv4 over IPv6 tunnels
- o IPv6 over UDP-IPv4 tunnels, when IPv4 NAT are in the path between the two endpoints
- o IPv6 prefix assignment of any size
- o DNS delegation of the inverse tree, based on the ipv6 prefix assignment
- o Routing protocols
- o etc.

The TSP connexion can be established between two nodes, where each node can control a tunnel end-point. In this context, it is possible to have up to 4 parties involved: 1- the tsp client, 2- controlling the requesting tunnel end-point, 3- the tsp server, 4- controlling



the receiving tunnel end-point. 1,3 and 4 is the Tunnel Broker model. 1 and 2 can be on the same node, as well as 3 and 4 can be on the same node.

From the point of view of an operating system, TSP is implemented as a client application which is able to configure network parameters of the kernel and operating system.

## **2.1 NAT Discovery**

TSP is also used to discover if a NAT is in the path. In this discovery mode, the client sends a TSP message, containing its source tunnel information and the request for the tunnel over UDP-IPv4 to the TSP server. The TSP server verifies if the inner information was not changed by an IPv4 NAT in the path.

If an IPv4 NAT is discovered, then UDP-IPv4 encapsulation of the IPv6 tunnel is used[4]. If there is no IPv4 NAT in the path, then usual IPv6 in IPv4 encapsulation is used[1]. When the TSP client moves to another network, the same discovery process is done. This IPv4 NAT discovery builds the most effective tunnel for all cases, and in a dynamic situation where the client moves.

Considering the current dominant IPv4 networks and the current use of mobile devices, this NAT discovery is very useful, given that with TSP, the client always keeps the same IPv6 addresses, prefixes, dns delegation, routing, etc..

## **2.2 Any encapsulation**

TSP is used to negotiate IPv6 over IPv4 tunnels[1], IPv6 over UDP-IPv4 tunnels [4] and IPv4 over IPv6 tunnels [3]. IPv4 in IPv6 tunnels are used in the Dual Stack Transition Mechanism (DSTM) together with TSP [3].

## **2.3 Mobility**

When a tunnel endpoint changes its underlying IP address (i.e. change of its IPv4 address when doing IPv6 in IPv4 encapsulation), the TEP operating system restart the TSP client to refresh the new information to the TSP server. With the response of the TSP server, the tunnel is re-established using the new information. This enables mobility of the tunnel end-point.

## **2.4 Compression of TSP**

In bandwidth-limited environments, TSP can be compressed [5].



## **2.5 Advantages of TSP**

- o A signaling protocol to establish the tunnel: no need to change kernels, routing...
- o A signaling protocol flexible and extensible
- o one solution to many encapsulation techniques: v6 in v4, v4 in v6, v6 over udp over v4, ...
- o prefix assignment
- o dns delegation
- o routing negociation
- o discovery of IPv4 NAT in the path, establishing the most optimized tunnelling technique depending on the discovery.
- o mobility of the underlying IP node.
- o two to four tier tunnel broker model
- o signaling protocol can be compressed in bandwidth-limited environments

## **3. Applicability of TSP in Different Environments**

This section describes the applicability of TSP in different environments.

### **3.1 Applicability of TSP in Provider Networks with Enterprise Customers**

In a provider network where IPv4 is dominant, a tunnelled infrastructure can be used to provider IPv6 services to the enterprise customers, before a full IPv6 native infrastructure is built. In order to start deploying in a controlled manner and to give enterprise customers a prefix, the TSP framework is used. The TSP server can be put in the core, in the aggregation points or in the pops to offer the service to the customers. IPv6 over IPv4 encapsulation[1] can be used. If the customers are behind an IPv4 NAT, then IPV6 over UDP-IPv4 encapsulation [4] can be used.

### **3.2 Applicability of TSP in Provider Networks with Home/Small Office Customers**

In a provider network where IPv4 is dominant, a tunnelled





infrastructure can be used to provider IPv6 services to the home/  
small office customers, before a full IPv6 native infrastructure is  
built. In order to start deploying in a controlled manner and to  
give customers a prefix, the TSP framework is used. The TSP server  
can be put in the core, in the aggregation points or in the pops to  
offer the service to the customers. IPv6 over IPv4 encapsulation[1]  
can be used. If the customers are behind an IPv4 NAT, then IPv6 over  
UDP-IPv4 encapsulation [4] can be used.

Automation of the prefix assignment and DNS delegation, done by TSP,  
is a very important feature for a provider in order to substantially  
decrease support costs. The provider can use the same authentication  
database that is used to authenticate the IPv4 users. Customers can  
deploy home IPv6 networks without any intervention of the provider  
support people.

With the NAT discovery function of TSP, providers can use the same  
TSP infrastructure for both NAT and not-NAT parts of the network.

### **3.3 Applicability of TSP in Enterprise Networks**

In an enterprise network where IPv4 is dominant, a tunnelled  
infrastructure can be used to provider IPv6 services to the IPv6  
islands (hosts or networks) inside the enterprise, before a full IPv6  
native infrastructure is built. TSP can be used to give IPv6  
connectivity, prefix and routing for the islands. This gives to the  
enterprise a full control deployment of IPv6 while maintaining  
automation and permanence of the IPv6 assignments to the islands.

### **3.4 Applicability of TSP in Wireless Networks**

In a wireless network where IPv4 is dominant, hosts and networks move  
and change IPv4 address. TSP enables the automatic re-establishment  
of the tunnel when the IPv4 address change.

In a wireless network where IPv6 is dominant, hosts and networks  
move. TSP enables the automatic re-establishment of the tunnel  
together with the DSTM mechasnism [3].

TSP can be compressed [5] for bandwidth-limited networks.

### **3.5 Applicability of TSP in Unmanaged networks**

An unmanaged network is where no network manager or staff is  
available to configure network devices. TSP is particularly powerful  
in this context where automation of all necessary information for the  
IPv6 connectivity is handled by TSP: tunnel end-points parameters,  
prefix assignment, dns delegation, routing.



An unmanaged network may be behind a NAT, maybe not. With the NAT discovery function, TSP works automatically in both cases.

### **3.6 Applicability of TSP in Exchange Points**

TSP can be used to connect the providers that have only IPv4 connectivity to the exchange point. This gives to the exchange point a tool to reach customers who are not ready for native IPv6 connectivity.

### **3.7 Applicability of TSP for Mobile Hosts**

Mobile hosts are common and used. Laptops moving from wireless, wired in office, home, ... are examples. They often have IPv4 connectivity, but not necessarily IPv6. TSP framework enables the mobile hosts to have IPv6 connectivity wherever they are, by having the TSP client sends updated information of the new environment to the TSP server, when a change occur. Together with NAT discovery, the mobile host can be always IPv6 connected wherever it is.

Mobile here means only the change of IPv4 address. MobileIP mechanisms and fast handoff take care of additional constraints in mobile environments.

### **3.8 Applicability of TSP for Mobile Networks**

Mobile networks share the applicability of the mobile hosts. Moreover, in the TSP framework, they also keep their prefix assignment and can control the routing. NAT discovery can also be used.

## **4. Security Considerations**

This document does not specify any protocol. It describes the applicability of a protocol and a set of profiles. Security considerations are described in each document describing the protocol or a profile.

It should be noted however that this signaling protocol together with authentication makes the tunnel server a more robust server than other transition techniques that have the server as an open relay.

## **5. Conclusion**

The Tunnel Setup Protocol (TSP) is applicable in many environments, such as: providers, enterprises, wireless, unmanaged networks, mobile hosts and networks. TSP gives the two tunnel end-points the ability to negotiate tunnel parameters, as well as prefix assignment, dns



Internet-Draft    Applicability of the Tunnel Setup Protocol(TSP) as an IPv6  
Transition  
Technique  
June 2002

delegation and routing in an authenticated session. It also provides IPv4 NAT discovery function by using the most effective encapsulation. It also supports the IPv4 mobility of the nodes.

#### References

- [1] Blanchet, M., "IPv6 over IPv4 profile for Tunnel Setup Protocol (TSP)", [draft-vg-ngtrans-tsp-v6v4profile-00](#) (work in progress), July 2001.
- [2] Blanchet, M., "Tunnel Setup Protocol (TSP)", [draft-vg-ngtrans-tsp-00](#) (work in progress), July 2001.
- [3] Blanchet, M., "DSTM IPv4 over IPv6 tunnel profile for Tunnel Setup Protocol(TSP)", [draft-blanchet-ngtrans-tsp-dstm-profile-00](#) (work in progress), February 2002.
- [4] Blanchet, M. and F. Parent, "TSP-TEREDO: Stateful IPv6 over IPv4 Tunnels with NAT using TSP and TEREDO", [draft-vg-ngtrans-tsp-teredo-00](#) (work in progress), June 2002.
- [5] Blanchet, M., "Compression of the Tunnel Setup Protocol(TSP)", [draft-blanchet-ngtrans-tsp-compressed-00](#) (work in progress), June 2002.
- [6] Durand, A., Fasano, P., Guardini, I. and D. Lento, "IPv6 Tunnel Broker", [RFC 3053](#), January 2001.

#### Authors' Addresses

Marc Blanchet  
Viagenie inc.  
2875 boul. Laurier, bureau 300  
Sainte-Foy, QC G1V 2M2  
Canada

Phone: +1 418 656 9254  
EMail: [Marc.Blanchet@viagenie.qc.ca](mailto:Marc.Blanchet@viagenie.qc.ca)  
URI: <http://www.viagenie.qc.ca/>



Internet-Draft      Applicability of the Tunnel Setup Protocol(TSP) as an IPv6  
Transition  
Technique  
June 2002

Florent Parent  
Viagenie inc.  
2875 boul. Laurier, bureau 300  
Sainte-Foy, QC G1V 2M2  
Canada

Phone: +1 418 656 9254  
EMail: Florent.Parent@viagenie.qc.ca  
URI: <http://www.viagenie.qc.ca/>





Internet-Draft      Applicability of the Tunnel Setup Protocol(TSP) as an IPv6  
Transition  
Technique  
June 2002

#### Full Copyright Statement

Copyright (C) The Internet Society (2002). All Rights Reserved.

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and this paragraph are included on all such copies and derivative works. However, this document itself may not be modified in any way, such as by removing the copyright notice or references to the Internet Society or other Internet organizations, except as needed for the purpose of developing Internet standards in which case the procedures for copyrights defined in the Internet Standards process must be followed, or as required to translate it into languages other than English.

The limited permissions granted above are perpetual and will not be revoked by the Internet Society or its successors or assigns.

This document and the information contained herein is provided on an "AS IS" basis and THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

#### Acknowledgement

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

