

# Internet Protocol Support Profile

*Bluetooth*<sup>®</sup> Specification



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## **Abstract:**

This Profile Specification proposes the support of exchanging IPv6 packets between devices over the Bluetooth Low Energy transport.

*Revision History*

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## Document Terminology

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The Bluetooth SIG has adopted portions of the IEEE Standards Style Manual, which dictates use of the words “shall”, “should”, “may”, and “can” in the development of documentation, as follows:

The word *shall* is used to indicate mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).

The use of the word *must* is deprecated and shall not be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

The use of the word *will* is deprecated and shall not be used when stating mandatory requirements; *will* is only used in statements of fact.

The word *should* is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain course of action is deprecated but not prohibited (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

The term *Reserved for Future Use (RFU)* is used to indicate Bluetooth SIG assigned values that are reserved by the Bluetooth SIG and are not otherwise available for use by implementations.

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V1.0.0

# 1 Introduction

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## 1.1 Scope

The Internet Protocol Support Profile (IPSP) allows devices to discover and communicate to other devices that support IPSP. The communication between the devices that support IPSP is done using IPv6 packets over the Bluetooth Low Energy transport. The transmission of IPv6 packets over Bluetooth Low Energy is not part of this specification, and is specified in the IETF RFC [3].

## 1.2 Conformance

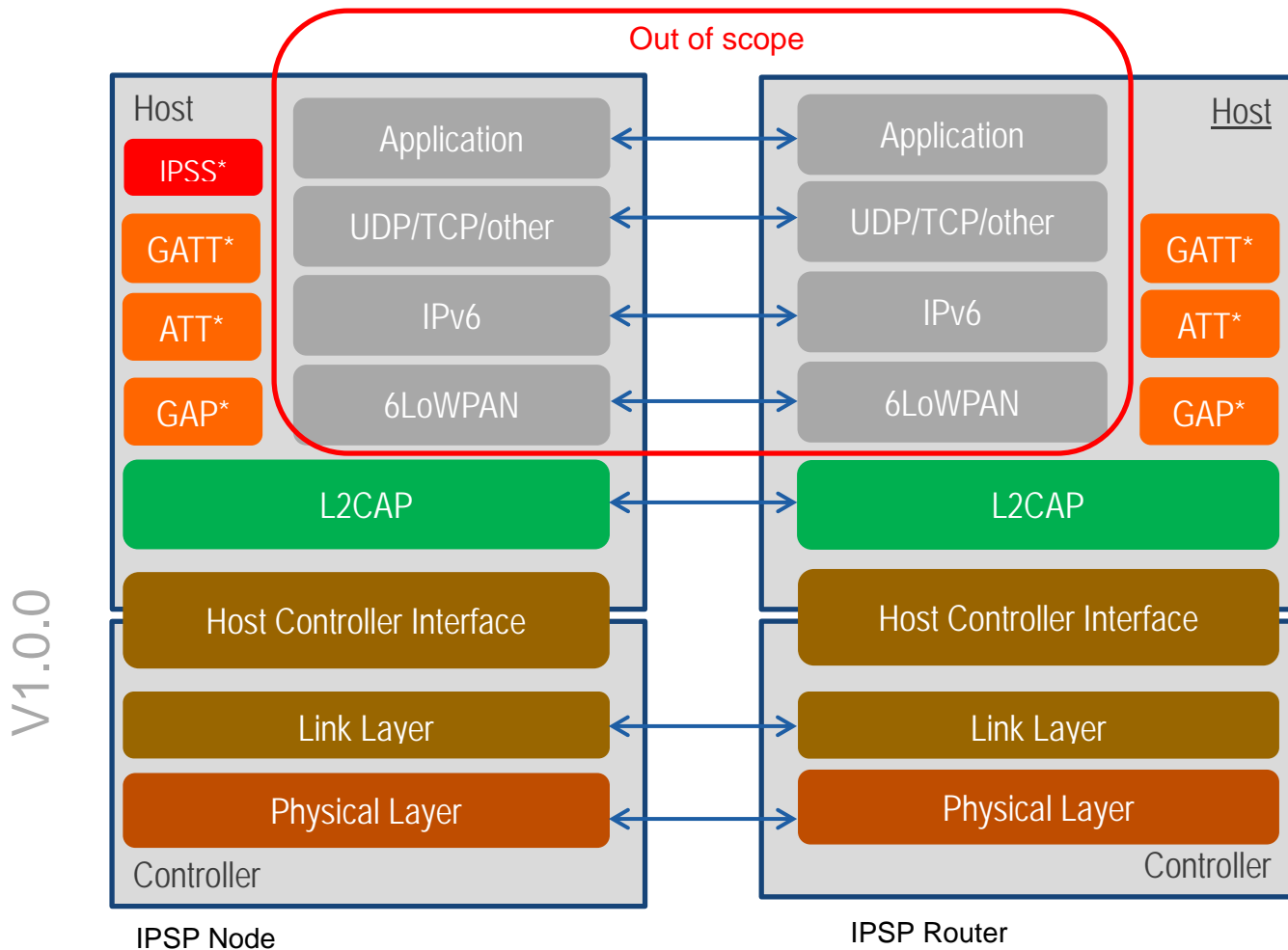
If conformance to this Profile is claimed, all capabilities indicated as mandatory for this Profile shall be supported in the specified manner (process-mandatory). This also applies for all optional and conditional capabilities for which support is indicated. All mandatory capabilities, and optional and conditional capabilities for which support is indicated, are subject to verification as part of the Bluetooth qualification program.

## 1.3 Bluetooth Specification Release Compatibility

This specification is compatible with v4.1 or higher Bluetooth Core Specification [1].

## 2 Profile Dependencies

The IP Support Profile enables devices to use the IP protocol with the IP stack as shown below.



**Figure 2.1:** IP Support Profile stack and IP stack

\* Note that the IPSS, GATT and ATT are used only for service discovery. GAP is used for device discovery and connection setup.

## 3 Configuration

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### 3.1 Roles

The IPSP defines two roles – Node role and Router role.

The Router role is used for devices that can route IPv6 packets.

The Node role is used for devices that can only originate or consume IPv6 application packets. Additionally, the Node role has a special function in Bluetooth service discovery; an instance of the IPSS (Internet Protocol Support Service) that allows router devices to discover it (over GATT).

Devices with IPv6 routing capabilities and with a need to connect to Routers implement both the Router and the Node roles of this profile.

### 3.2 Concurrency Limitations and Restrictions

A device may implement the Node role and/or the Router role together with other profiles at the same time.

### 3.3 Topology Limitations and Restrictions

A device supporting the Node role is likely to be a sensor or actuator. A Node device shall support the GAP Peripheral role, and may additionally support the GAP Central role.

A device supporting the Router role is likely to be an Access Point (such as home router, mobile phone, or similar). A Router device shall support the GAP Central role, and may additionally support the GAP Peripheral role.

A device may support both Node role and Router role.



## 4 Node Role Requirements

A device supporting the Node role shall implement the GATT server role and instantiate one and only one IP Support Service (IPSS).

The IP Support Service shall be instantiated as a «Primary Service».

Service	Node role
IP Support Service	M

### 4.1 IP Support Service

The IP support service is used during service discovery to determine support for the IP Support Profile's Node role.

#### 4.1.1 Service Declaration

The service UUID shall be set to « Internet Protocol Support Service» defined in [2].

#### 4.1.2 Service Characteristics

This service does not define any characteristics.

#### 4.1.3 Service UUID AD Type

When in a GAP Discoverable Mode for an initial connection to a Router, the Node shall include the IP Support Service UUID defined in [2] in the Service UUIDs AD type field of the advertising data. This enhances the user experience as a Node may be identified by the Router before initiating a connection.

### 4.2 L2CAP Requirements

#### 4.2.1 Channel Type

In this profile, only the LE Connection Oriented Channels feature with the LE Credit Based Flow Control Mode shall be used.

The node shall respond to an LE Credit Based Connection Request packet which has the LE\_PSM field set to the value for IPSP defined in the Bluetooth Assigned Numbers [2] (LE\_PSM\_IPSP). The LE Credit Based Connection Response packet shall use any valid result code, excluding "Connection Refused – PSM not supported".

#### 4.2.2 Configuration

##### 4.2.2.1 Maximum Transmission Unit (MTU)

MTU size shall be 1280 octets or higher.

## 5 Router Role Requirements

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A device supporting the Router role shall implement the GATT client role. A device supporting the Router role shall use a GATT procedure for primary service discovery to discover IPSS.

### 5.1 L2CAP Requirements

#### 5.1.1 Channel Type

In this profile, only the LE Connection Oriented Channels feature with the LE Credit Based Flow Control Mode shall be used.

The LE\_PSM field in the LE Credit Based Connection Request packet shall be set to LE\_PSM\_IPSP.

#### 5.1.2 Configuration

##### 5.1.2.1 Maximum Transmission Unit (MTU)

MTU size shall be 1280 octets or higher.

## 6 Connection Establishment Procedure

After a Router and a Node have established a link layer connection, the Router shall initiate an L2CAP connection to the Node with the parameters specified in Section 5.1.

In order to avoid the establishment of two simultaneous L2CAP channels between two devices, where both support Router and Node roles, the Router acting as the link layer Master on the given link shall refuse an LE Credit Based Connection Request packet which has the LE\_PSM field set to the value for IPSP defined in the Bluetooth Assigned Numbers [2].

### 6.1 Multi Profile Considerations

Several devices implementing the IPSP Router role will most likely have an autonomous connection behavior and be “always on”. Devices implementing the IPSP Router role will also initiate an L2CAP connection immediately after a link layer connection is established. For peer devices that only implement the IPSP Node role, these behaviors are desirable. However, when a device combines the IPSP Node role with other Bluetooth profiles, implementations must consider these Router role behaviors to achieve a good user experience for the other Bluetooth profiles.

#### 6.1.1 Link Layer Connection Establishment

When a device implementing the IPSP Node role wants to establish a link layer connection for the purpose of another profile, the device should use the GAP Directed connectable mode.

If a device implementing the IPSP Node role needs to use the GAP Undirected connectable mode to establish a link layer connection for the purpose of another profile, the device should support multiple connections.

#### 6.1.2 L2CAP Channel Establishment

When a device implementing the IPSP Node role creates a link layer connection to a device implementing the Router role for the purpose of another Bluetooth profile (and not for IPSP), the device can respond to the LE Credit Based Connection Request packet with Initial Credits set to 0.

If a device implementing the IPSP Node role has responded to the LE Credit Based Connection Request packet with Initial Credits set to 0 and that device later, while link layer connection is still available, decides that it needs to exchange data for IPSP too, the device can initiate IPSP data flow by sending an LE Flow Control Credit with Credits set to a value greater than 0.

### 6.2 Router Discovery Behavior

A Router that discover node devices autonomously (no user intervention required to start a time limited discovery) should not connect to undirected advertising unless the advertising device has included a Service UUIDs AD type field with the value of the IP Support Service UUID defined in [2] in its advertising data.

## 7 Security Considerations

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This section describes the security considerations for a Node and a Router.

### 7.1 Node Security Considerations

This section describes the security requirements for the Node.

The Node may use the SM Slave Security Request procedure to request an LE Security Mode other than LE Security Mode 1 Level 1 if required by the use case.

### 7.2 Router Security Considerations

This section describes the security requirements for the Router.

The Router should accept any request by the Node for LE Security Mode 1 Level 2.

The Router should accept a request by the Node for LE Security Mode 1 Level 3, if the Router's IO capabilities are sufficient to support Level 3.

## 8 Acronyms and Abbreviations

Any abbreviation or acronym used in the document, but not defined in the common specification sections (e.g., Volume 1 Part B), is defined here. The list is alphabetized.

Abbreviation or Acronym	Meaning
ATT	Attribute Protocol
GAP	Generic Access Profile
GATT	Generic Attribute Profile
IP	Internet Protocol
IPSP	Internet Protocol Support Profile
IPSS	Internet Protocol Support Service
L2CAP	Logical Link Control and Adaptation Protocol
LE	Low Energy
LE_PSM	LE Protocol Service Multiplexer
LE_PSM_IPSP	LE_PSM used by IPSP
SM	Security Manager

**Table 8.1:** Abbreviations and Acronyms

## 9 References

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- [1] Bluetooth Core Specification, Version 4.1 or later
- [2] [Bluetooth SIG Assigned Numbers](#)
- [3] IETF RFC, Transmission of IPv6 packets over Bluetooth Low Energy (informative)  
<https://datatracker.ietf.org/doc/draft-ietf-6lo-btle/>