

Specification Developer Guide for Transport Discovery Service

Bluetooth[®] White Paper



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Group Prepared By [Discovery of Things Working Group](#)

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Abstract:

The purpose of this white paper is to provide guidance for the development of profiles or higher level specifications which reference and make use of the Bluetooth Transport Discovery Service.

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Contents

1	Overview	5
2	Optional Connection Handover Mechanisms	6
3	Advertising Data Recommendations	7
3.1	Organization ID	7
3.2	Capabilities	7
3.3	Transport Data Incomplete	7
3.4	Transport State and Availability	7
3.5	Transport Data	7
3.6	GAP Recommendations	7
4	Recommendations when using GATT Database	9
4.1	GATT Database Example	9
4.2	Control Point Recommendations	9
4.2.1	Organization-specific Control Point Error Codes	9
5	Other Recommendations	10
5.1	Range Mismatch	10
6	Acronyms and Abbreviations	11
7	References	12

v1.0

1 Overview

The purpose of this white paper is to provide guidance for the development of profiles or higher level specifications which reference and make use of the Bluetooth Transport Discovery Service (TDS) [1].

TDS is a flexible service that enables advertising of capabilities that a device seeks, capabilities that a device provides, or a combination for use by different specifications enabling both connectionless and connection-oriented handover ‘trigger’ mechanisms. For example, TDS can accommodate up to 26 octets of organization-specific data in an advertising packet, and if the optional TDS Control Point is used, each organization can define up to 19 octets of payload in the Control Point and up to 19 octets of payload in the Response indication (which can be extended if a larger MTU is negotiated).

TDS also allows organization-specific GATT characteristics or descriptors to be defined to accommodate organization-specific needs while connected over Bluetooth low energy.

2 Optional Connection Handover Mechanisms

If a scanning device parses the Transport Discovery AD Type and determines that a compatible device is found, TDS provides two different mechanisms which may be used by the device to 'trigger' or request a connection handover to an Alternate Transport. The two mechanisms are as follows:

1. The scanning device advertises to provide a connectionless connection handover mechanism for the remote device to activate its Alternate Transport.
2. The scanning device forms a GATT connection to gather more information to decide whether or not to activate the Alternate Transport of the remote device via the use of the TDS Control Point.

Regardless of the type of connection handover mechanism used, the specification will need to define how and when to request a connection to the desired Alternate Transport along with the organization-specific protocol, additional behavior, error processing, and timeout requirements.

A device can attempt to connect using the Alternate Transport once it has enough information to do so.

3 Advertising Data Recommendations

3.1 Organization ID

An organization making use of TDS shall use a valid Organization ID value from the Bluetooth SIG Assigned Numbers [2] as appropriate to the organization. Organizations requiring the assignment of a value for this field should contact specification.manager@bluetooth.com for guidance on the process for requesting a new assignment.

3.2 Capabilities

Organizations making use of TDS may use the Transport Discovery AD Type to advertise the capabilities that a device seeks, the capabilities that a device provides, or a combination of the two. Specifications making use of TDS should define the appropriate settings of the Role bits, Transport Data Incomplete bit and the Transport State bits in the TDS Flags field and appropriate behavior. If the Role bits are not used, they should be set to a value of 0b00 (Unspecified).

3.3 Transport Data Incomplete

If an organization does not require the use of a GATT database, the Transport Data Incomplete bit shall be set to 0b00 (False).

3.4 Transport State and Availability

When the alternate transport of an advertising device is 'temporarily unavailable' (as indicated by the Transport State bits in the TDS Flags field being set to a value of 0b10), specifications may choose to include a 'hint' of the estimated time of availability as part of the Transport Data field, so this may be communicated to the user or for other purposes. If the Transport State bits are not used by the organization, they can be specified to be set to a default value. If they are used, the behavior related to these bits will need to be defined.

3.5 Transport Data

Each organization will likely include some sort of service identifier and other parameters within the Transport Data field of a Transport Frame which will need to be defined by the organization. Organizations are encouraged to reuse service identifiers from existing registries where possible for the sake of forward compatibility. For example, for a BR/EDR Connection Handover Profile, it is preferred to leverage the use of existing BR/EDR Service Class Identifiers rather than create and maintain a separate derivative registry.

An organization may benefit by including a device address within the Transport Data field for use cases that require the connection to a specific device.

3.6 GAP Recommendations

Specifications making use of TDS may also make GAP-related recommendations in order to have a good balance between user experience (i.e., connection establishment time) and device

power consumption. However, care should be taken to avoid recommendations (and requirements) that might conflict with the simultaneous use of TDS by other organizations on the same device in the future.

Specifications may provide recommendations for:

- Advertising type
- Advertising interval and advertising duration (min/max)
- Scan interval, scan window, and scan duration (min/max)

Recommendations may be case-specific depending upon the permitted use(s) of TDS. For example:

- Connectable devices where a device is connectable in order to provide further information stored in GATT
- Connectable devices where a device is connectable, as well as the case where the device is connectable only in order to provide access to the TDS Control Point
- Non-connectable devices

4 Recommendations when using GATT Database

4.1 GATT Database Example

If an organization requires the use of a GATT database, the organization may choose to organize or structure organization-specific data in different ways. Depending on the GATT database requirements of an organization, it is recommended that the database be structured by defining a generic top level and non-readable characteristic (e.g., Bluetooth SIG Data, or data from other organizations) and one or more descriptors beneath that characteristic. This allows a device looking for organization-specific data to more quickly sort through a GATT database within TDS. Below is an example structure of such a database for a device supporting the use of TDS by multiple organizations.

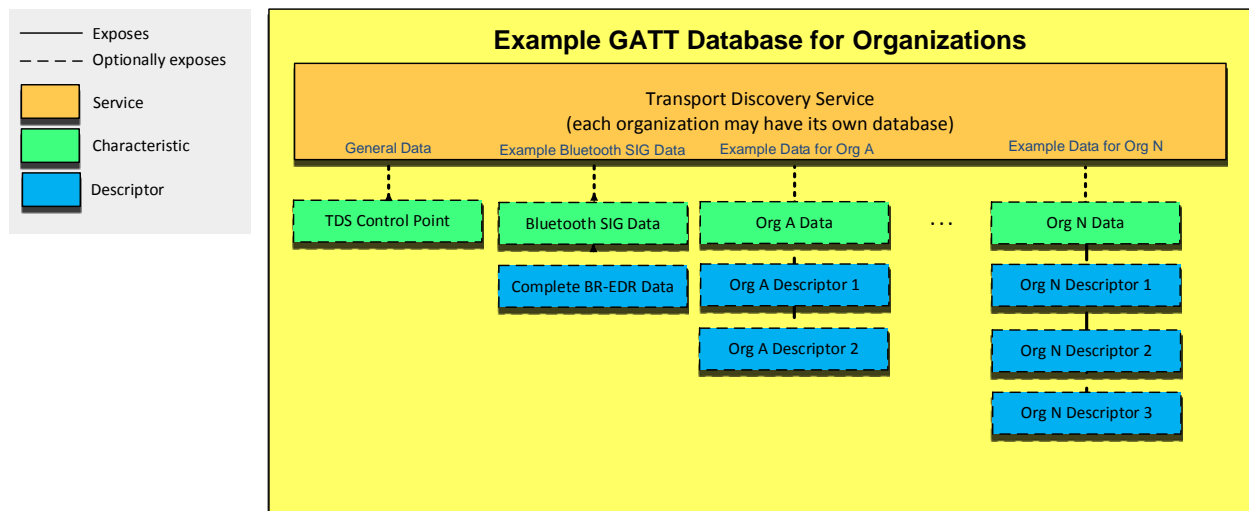


Figure 4.1: Example GATT Database for Organizations

If GATT characteristics and descriptors are used, the specification will need to define the number, type, and contents as well as the required behavior based on contents.

4.2 Control Point Recommendations

If using the TDS Control Point, the organization making use of this will need to define associated behavioral requirements including any organization-specific payload in the request, response, as well as security and authentication requirements.

4.2.1 Organization-specific Control Point Error Codes

The design of the TDS Control Point permits organization-specific data to be included within the optional Response Parameter field of the TDS Control Point indication. For example, if the Result Code is 'Operation Failed' (0x04), then the Response Parameter field, if present, must include the 1-octet Organization ID and may include organization-specific error code and/or other information.

5 Other Recommendations

5.1 Range Mismatch

When an Alternate Transport is detected that has a shorter range compared to the range of LE (e.g., WiGig), a specification may recommend techniques such as the use of RSSI and Tx Power to avoid situations where the user attempts to connect to the short-range transport when out of range. By making use of this information, the application can provide notification to the user that the Alternate Transport is out of range, thus avoiding a bad user experience for cases where a user attempts to unsuccessfully connect to the remote device.

v1.0

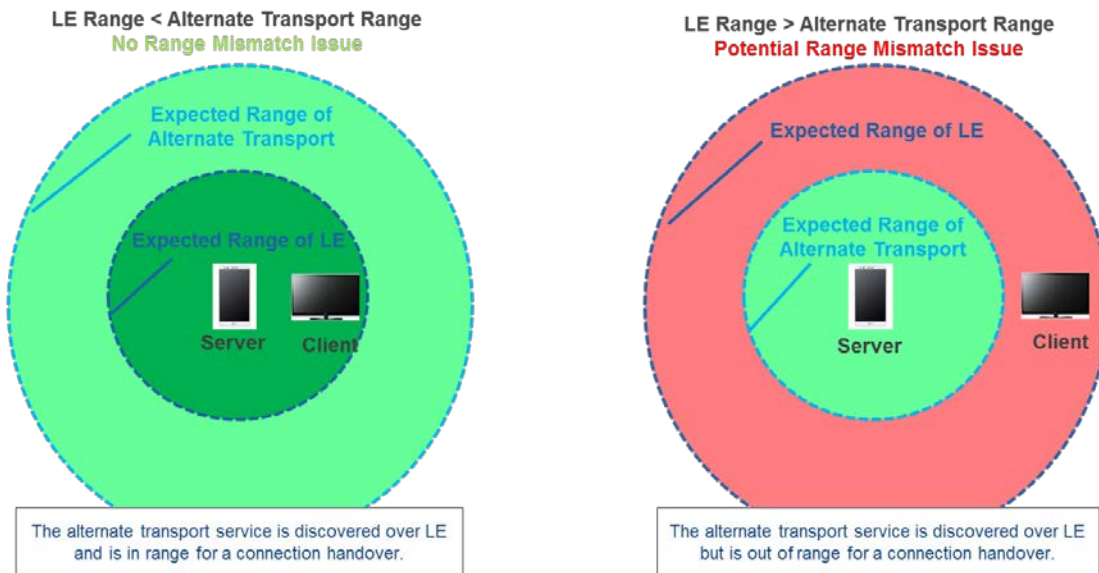


Figure 5.1: Range Mismatch Example

6 Acronyms and Abbreviations

Abbreviation or Acronym	Meaning
AD	Advertising Data
BR/EDR	Basic Rate / Extended Data Rate
GAP	Generic Access Profile
GATT	Generic Attribute Profile
MTU	Maximum Transmission Unit
SIG	Special Interest Group
TDS	Transport Discovery Service

Table 6.1: *Acronyms and Abbreviations*

7 References

- [1] Transport Discovery Service v1.0
- [2] Characteristic and Descriptor descriptions are accessible via the [Bluetooth SIG Assigned Numbers](#)
- [3] Core Specification Addendum v6 or later