Bluetooth® Device Addresses for the LMX9830

TEXAS INSTRUMENTS

1.0 Scope

This application note is intended for designers using the LMX9830 Bluetooth module. It explains why a unique Bluetooth Device Address (BD_ADDR) is required for each device, the structure of the BD_ADDR, and how to request a range of addresses from the IEEE.

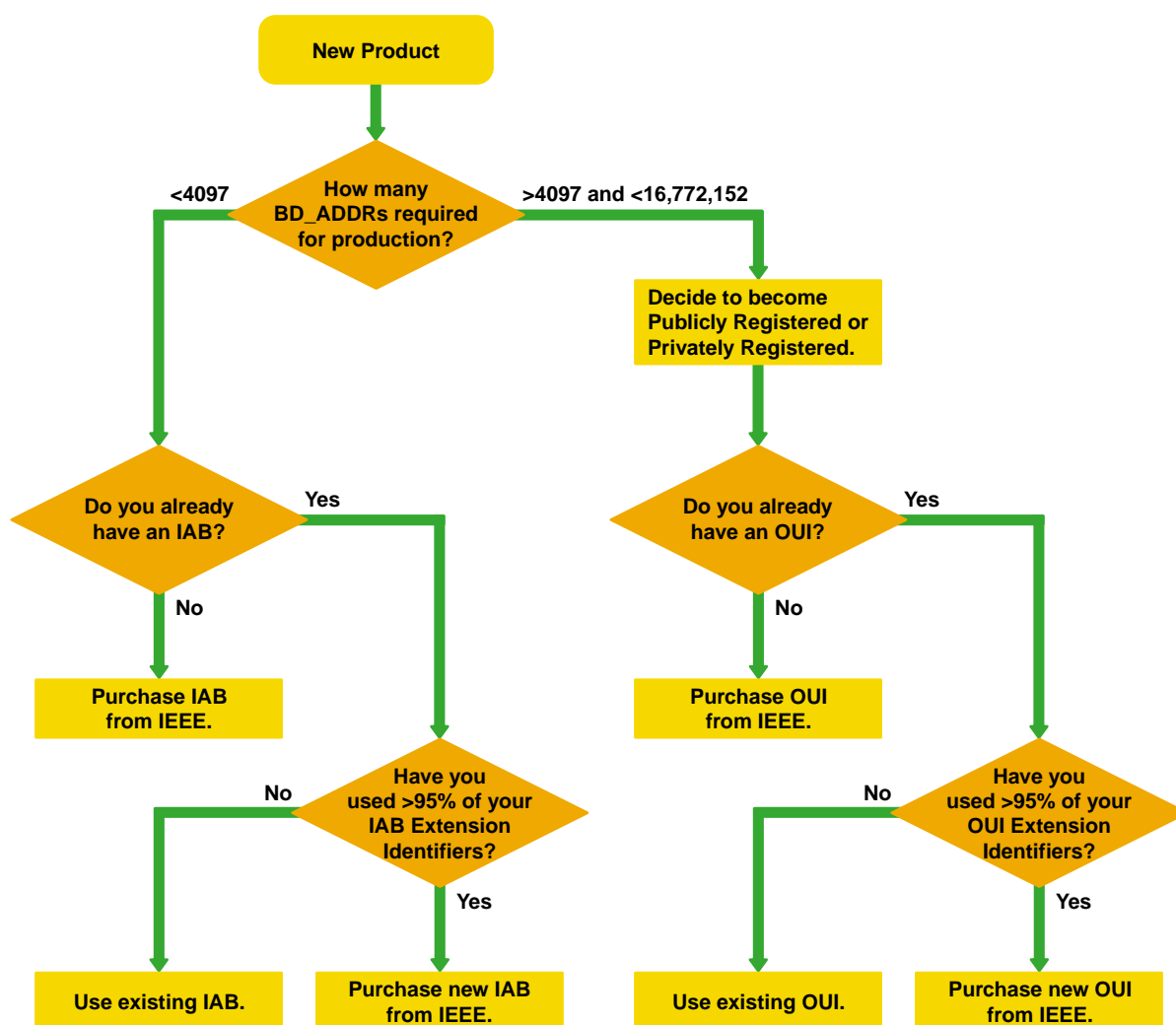A summary of the decision process when purchasing Bluetooth Device Addresses is shown in Figure 1.

Figure 1. Decision Process for Purchasing Bluetooth Device Addresses

2.0 Why Are BD_ADDRs Needed?

Each Bluetooth device requires a unique 48-bit address known as the Bluetooth Device Address or BD_ADDR.

The device-specific BD_ADDR plays a central role in the Bluetooth system, such as seeding algorithms required to implement the core functionality. It is used during physical connection establishment (paging) and discovery (inquiry). It is also used by the Bluetooth communication protocol stack to maintain link layer security.

3.0 BD_ADDR Structure

The BD_ADDR consists of a 24-bit Organizationally Unique Identifier (OUI) assigned by the IEEE Registration Authority (IEEE/RAC) to a particular organization. This is a globally unique assigned number. The OUI is concatenated with a 24-bit extension identifier assigned by IEEE/RAC to create a 48-bit Extended Unique Identifier (EUI-48) that is unique to a specific device.

Because the OUI is 24 bits long, approximately 16 million OUI blocks can be issued to manufacturers. The 24-bit extension identifier gives each manufacturer approximately 16 million BD_ADDRs per OUI block.

As an example of a device EUI-48, assume that a manufacturer's IEEE-assigned OUI value is 00-00-91 (hexadecimal, little endian), and the manufacturer-selected extension identifier for a given component is E0-82-25 (hexadecimal, little endian). The EUI-48 value generated from these two numbers is 00-00-91-E0-82-25.

Figure 2. BD_ADDR Captured by an Anritsu MT8852A Bluetooth Test Set

4.0 BD_ADDR Interpretation

The BD_ADDR is divided into three fields:

- Lower Address Part (LAP) consisting of 24 bits.
- Upper Address Part (UAP) consisting of 8 bits.
- Non-significant Address Part (NAP) consisting of 16 bits.

The LAP and UAP form the "significant" part of the BD_ADDR, because they are used for seeding many algorithms, such as those which create Channel Code Values and determine the Frequency Hopping Sequence.

The NAP is "non-significant" because it has a low degree of device-to-device randomness, and therefore it has limited utility for seeding Bluetooth algorithms.

Figure 3 shows an example of a BD_ADDR.

LSB											MSB
company_assigned						company_id					
LAP						UAP		NAP			
0000	0001	0000	0000	0000	0000	0001	0010	0111	1011	0011	0101

Figure 3. BD_ADDR Format

The BD_ADDR may have any values except those containing a LAP address in the block from 0x9E8B00-0x9E8B3F, which is reserved for Bluetooth inquiry operations.

5.0 BD_ADDR Administration

The IEEE assigns the 24-bit OUI values. These assignments are public, so that an EUI-48 value identifies the organization that provided the address. The IEEE/RAC has no control over the assignments of the extension identifiers and assumes no liability for assignments of duplicate EUI-48 identifiers within a manufacturer's range. [1]

The terms EUI-48 and EUI-64 are trademarked by the IEEE. Companies are allowed to use these terms for commercial purposes, but only if their use has been reviewed by the IEEE/RAC and the proposed products using the EUI-48 or EUI-64 conform to their specifications. [1]

6.0 Extension Identifier

Each OUI allows the assignee to generate approximately 16 million unique EUI-48 values that differ only in the extension identifiers. It is the responsibility of the assignee to create unique extension identifiers for each device.

The Registration Authority requires that 95% of the existing values in the assignee's address space have been allocated before a second OUI number can be issued. [1]

If this requirement cannot be met, the IEEE can issue an additional OUI to your company provided that you send a letter on company letterhead stating that you will not ship product on the new assigned OUI until 95% of the existing numbers based on that OUI are used. Your company must ensure that large blocks of the 48-bit numbers are not left unused. Exceptions to this policy are rarely granted. [1]

7.0 Individual Address Block (IAB)

An Individual Address Block (IAB) is for companies who need less than 4097 unique 48-bit numbers (EUI-48) and therefore find it hard to justify buying their own OUI block. An IAB uses a special OUI belonging to the IEEE/RAC, concatenated with 12 additional IEEE-provided bits, leaving only 12 bits for allocating up to 4096 devices.

8.0 LMX9830 Bluetooth Module

The LMX9830 is ROM-based, therefore cannot be preprogrammed with a BD_ADDR. The BD_ADDR is preloaded in an EEPROM or downloaded by the host application

9.0 How to Obtain an OUI

To obtain an OUI, complete the listed steps:

1. Visit http://standards.ieee.org/regauth/oui/index.shtml

2. Search the OUI and IAB public listings to determine whether your company or any parent/subsidiary companies already own an assignment.

3. Complete and submit the OUI application (https://standards.ieee.org/regauth/oui/forms/OUI-form.shtml).

Once the OUI application is successfully submitted, a confirmation e-mail with a tracking number and additional information will be sent to the Requestor. *All applications are processed within seven (7) working days from receipt of application and payment.* If there are any problems with the application (incomplete information, lack of usage percentage letter for existing assignment), or payment (declined, not received), the application will be placed on hold until the issue is rectified. All applications expire after 30 days. The Requestor will receive an e-mail with the assignment information after the application is processed. [1]

If the company already has an assignment, send an e-mail to the IEEE Registration Authority requesting the contact information for the company, and then make arrangements within your company to use your existing OUI or IAB. [1]

Figure 4. Application Form

10.0 Costs

The following pricing information is accurate as of February 2006. The IAB and IOU have no annual fees. The OUI can also be registered as a confidential number. This incurs extra up-front fees and a yearly fee, see Table 1.

Table 1. Fees for BD_ADDR Allocation

Service Type	Number of Unique Identifiers Required	
	<4097	**>4097 and <16,777,152**
Publicly Registered IAB (Company name and address on the public listing)	US$550	
Publicly Registered OUI (Company name and address on the public listing)		US$1,650
Privately Registered OUI (Company name and address not on the public listing)		US$1,650 + US$2,000 (privacy fee) = US$3,650
Yearly Confidentiality Renewal Fee (for privately registered assignments only)		US$2000

11.0 References

[1] IEEE web site (ieee.org).

[2] Specification of the Bluetooth System (Core 1.2).

Information included in this document was obtained from the IEEE web site and could change at any time. It is recommended that the user read the FAQ's at the IEEE site for additional details. Texas Instruments cannot accept liability for damages resulting from the information given in this document.

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