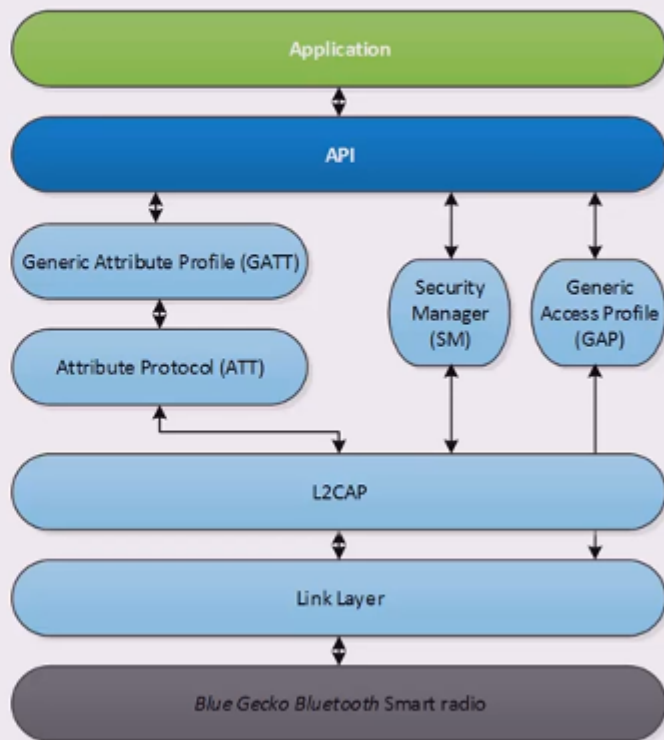


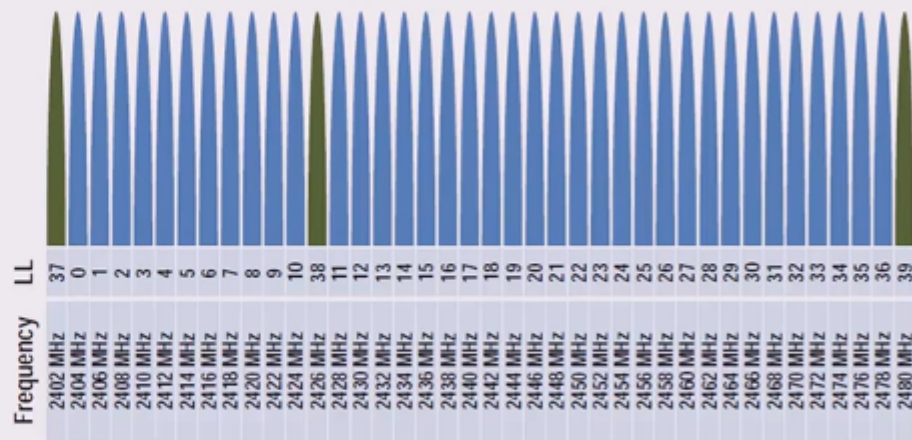
Bluetooth Smart Development

- An application communicates with 3 element of the stack
- GAP - Generic Access Profile
 - Handles everything above the connection
 - Advertisements, Connection parameters
- GATT - Generic Attribute Profile
 - Handles everything in the connection
 - Data transactions
- SM - Security Manager
 - Handles security
 - Encryption, authentication



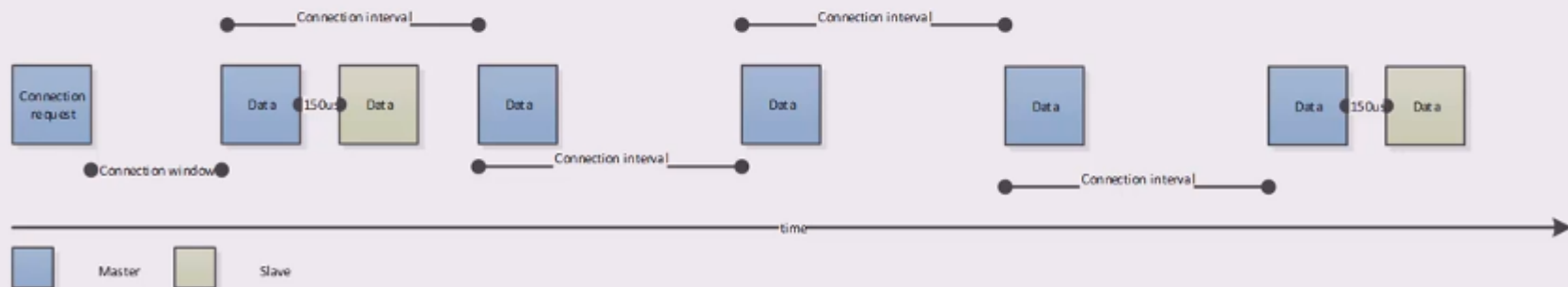
GAP - Advertisements

- 3 channels dedicated for advertisements
- Advertisement packet has user data
- Can be used as a broadcasting service: iBeacon
- Advertisement on all 3 channels takes 1.3ms
- Delay between advertisements can be 20ms-10240ms



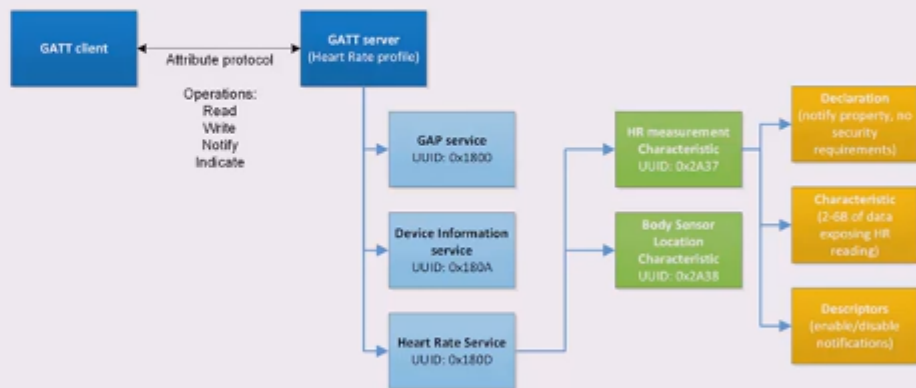
GAP - Connection interval

- Communication handled in intervals
- Interval can be from 7.5ms to 4000ms
- Slave latency: Slave skips N interval
- At most one message per interval
 - Exception: bulk transmission of data (no ACK)
- One packet has 20/22B payload



GATT - Basic principles

- Typically peripheral has a GATT table (GATT server)
- Typically central manipulates this table (GATT client)
- Transactions, Server -> Client
 - Indication
 - Notification (no application level ACK, but much faster)
- Transactions, Client -> Server
 - Read
 - Write
 - Enable notifications/indications
 - Write without response (no application level ACK, but much faster)



GATT - Database

- Profile is definition of possible applications and specify general behavior of that particular Bluetooth enabled device
 - Bluetooth Smart profiles are based on top of GATT
 - Adopted profiles are specified by the Bluetooth SIG
 - Vendor specific profiles are possible
- Service - Group of related characteristics
 - E.g. measurement of health thermometer, location of health thermometer
- Characteristic - One user data
 - Declaration attribute - What is the data, how it can be manipulated
 - Value attribute - The data itself
 - Client characteristic configuration descriptor (CCCD) - Notification/Indication control
- Attribute - One record of the database
 - Handle - Address
 - UUID - Determines the type of the attribute
 - Permission - Read/Write, Require encryption/authentication
 - Value

GATT - Service example

- Service 0x180F (Battery service)
 - Characteristic 0x2A19 (Battery level characteristic)
 - With read and notify capabilities
 - With the value of 73%

		Handle	UUID	UUID meaning	Permission	Value	Value meaning
Service	Characteristic	0x001A	0x2800	Service declaration	Read	0x180F	Battery Service
		0x001B	0x2803	Characteristic Declaration	Read	0x12 0x001C 0x2A19	Read & Notify Value at 0x001C Characteristic UUID
		0x001C	0x2A19	Battery Level	Read	73	73 percent
		0x001D	0x2902	CCCD	Read/Write	0x01	Notifications Enabled