Assignment

You need to develop a project supporting the following features in 3 to 4 weeks. After it's done, submit it to me with your whole project source code.

1. Get started with nrf\samples\bluetooth\peripheral_uart. Follow the Readme to run and test this sample. Here you would know Nordic UART Service(NUS).
2. Add BT smp/DFU service (refer to zephyr\samples\subsys\mgmt\mcumgr\smp_svr). Put the secondary slot on external Flash. After it's done, test it by nRF Connect for Android/iOS/Desktop separately.
3. Add BT Device Information Service.
4. Add BAS service. Report VDD value to BAS characteristic. You need to use ADC to sample VDD
5. Change advertising mode. First do 5s fast advertising with 40ms interval. 10s slow advertising with 500ms interval. Turn off advertising for 5s. Repeat the 3 stages again and again. When doing fast advertising, blink LED2 every 0.5s. When doing slow advertising, blink LED2 every 1 second. Turn off LED2 when advertising is off. You shall use PPI and GPIOTE to control the blinking of LED2.
6. Use mobile phone to send BLE commands to the device by NUS RX characteristic. BLE commands format is cmd + len + data (len<=18). By BLE commands, you can operate Flash area, SPI and TWI. See below Item7, 8 and 9
7. User Flash data manipulation. You can persistent user data by NVS API(refer to: zephyr\samples\subsys\nvs) or Settings API(refer to: zephyr\samples\subsys\settings). I recommend you implement both API series. You need to implement following commands:

   ➢ Format: cmd + len + data (len<=18)

   ➢ cmd: 01-> write, 02->read

   ➢ 010411223344, write 0x11223344 to Flash

   ➢ 0204, read the previous value(return 0000 if it's not set) and show it in NUS TX characteristic

8. SPI master manipulation. Your device is a SPI master device. Refer to: zephyr\samples\drivers\spi_fujitsu_fram. It supports the following commands:

   ➢ Format: cmd + len + data (len<=18)

   ➢ cmd: 04-> write SPI slave, 05->read SPI slave

   ➢ 040411223344, write 0x11223344 to SPI slave

   ➢ 0504, read the previous value(return 0000 if it's not set) and show it in NUS TX characteristic

   ➢ Note: the SPI slave code is written by you as well, refer to: nRF5_SDK_17.1.0_ddde560\examples\peripheral\spis

9. TWI master manipulation. Your device is a TWI master device. Refer to: zephyr\samples\drivers\i2c_fujitsu_fram. It supports the following commands:

   ➢ Format: cmd + len + data (len<=18)

   ➢ cmd: 07-> write TWI slave, 08->read TWI slave

   ➢ 070411223344, write 0x11223344 to TWI slave

   ➢ 0804, read the previous value(return 0000 if it's not set) and show it in NUS TX characteristic

   ➢ Note: the I2C slave code is written by you as well, refer to: nRF5_SDK_17.1.0_ddde560\examples\peripheral\twi_master_with_twis_slave

10. Disable or enable the paring feature of your project. Test NUS and OTA. See if there are any differences between paring mode and normal mode.

11. Change your advertising name to "培训"

12. Change UART baud rate to 1Mbps. Test it to see if your example works as intended.

13. Make Button4 work in network core. After pressing Button4, network core would print a message "Button4 is pressed". By default, Button4 only works in application core. You need to do pin forward to achieve it. Refer to: nrf\samples\bluetooth\direction_finding_peripheral\boards\nrf5340dk_nrf5340_cpuapp.overlay

14. Optimize power consumption when advertising is turned off. Make sure you get the least desired power consumption.