USER ADOPTION GUIDE MAX32664C

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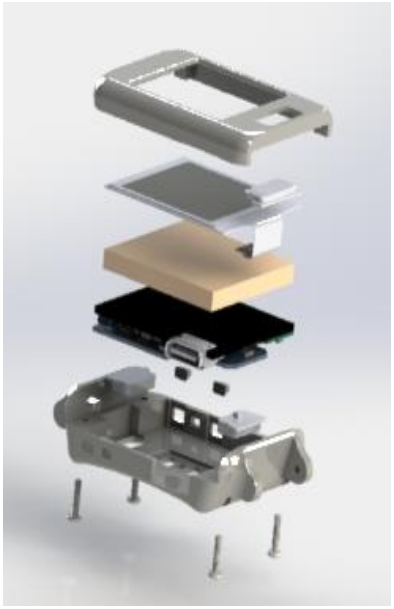
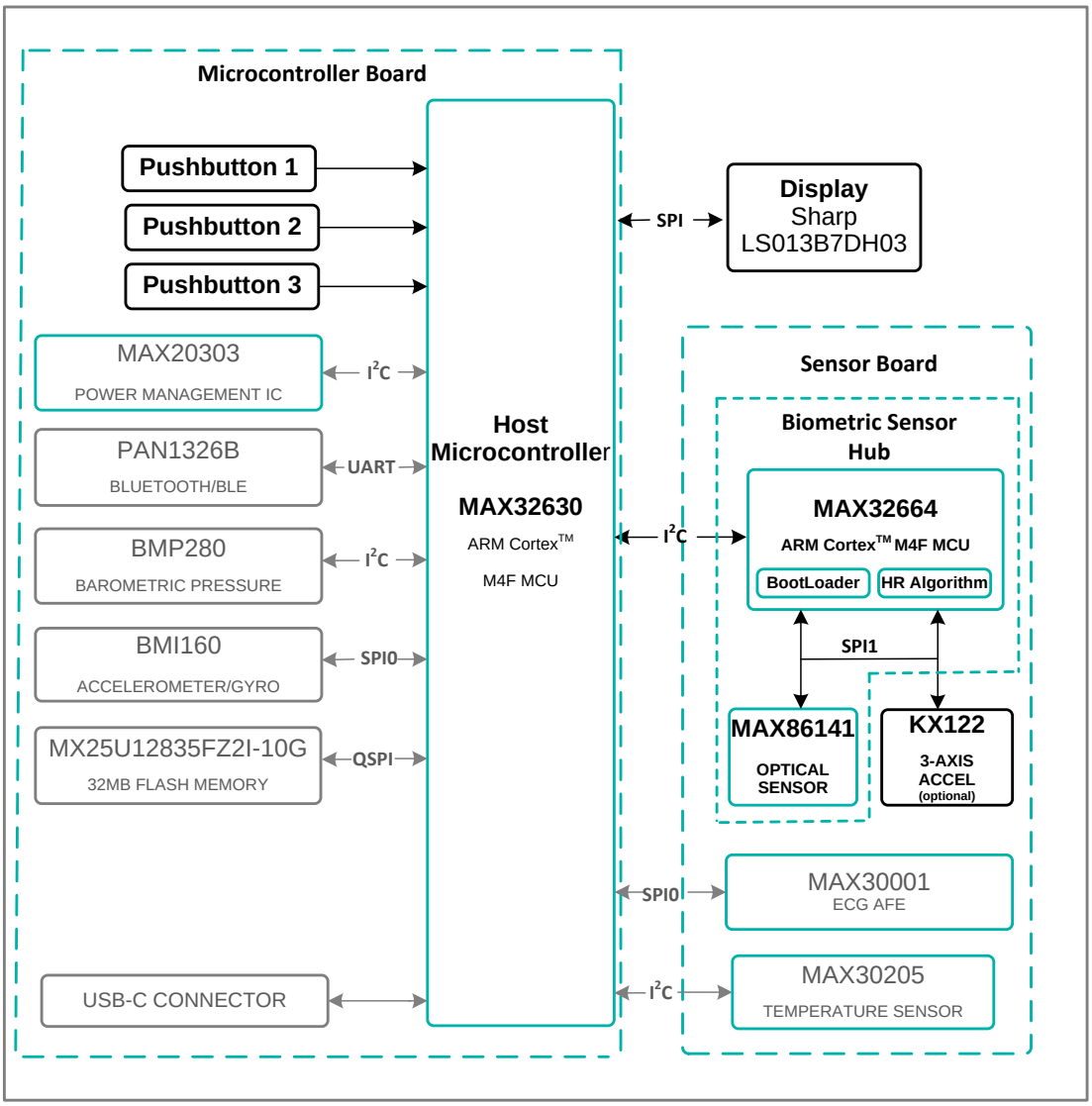
1. Introduction to MAXREFDES101

MAXREFDES101 is a unique evaluation and development platform in a wrist-worn wearable form factor that demonstrates the functions of a wide range of Maxim's products for health-sensing applications. It integrates a PPG analog-front-end (AFE) sensor (MAX86141), a biopotential AFE (MAX30001), a human body temperature sensor (MAX30205), a host microcontroller (MAX32630), a power-management IC (MAX20303), along with a sensor hub (MAX32664). MAX32664 is a sensor hub family with embedded firmware and algorithms for wearables. It seamlessly enables customer desired sensor functionality, including communication with Maxim's optical sensor solutions and delivering raw or calculated data to the outside world. This is achieved while keeping overall system power consumption in check.



MAXREFDES101 system diagram is shown below:

Figure 1: MAXREDES101 System Diagram



In this design, MAX32630 is used as the host controller. A display and three pushbuttons are connected to the microcontroller. The sensor hub microcontroller is the MAX32664 which has the pre-programmed wearable heart rate and SpO2 algorithms[1]. The MAX86141 optical AFE sensor and the KX-122 accelerometer are connected to the sensor hub.

MAXREFDES101 hardware and software reference designs are available for Maxim customers on Maxim's product webpage and on the respective mbed OS webpages.

To support the HR and SpO2 features of the MAX32664C, it is necessary to replace the LED board of the MAXREFDES101 with an SpO2 capable board.

[1] MAX32664 has several variants. Please contact Maxim sales to find the part that best suits your algorithm needs.

The protocol for communicating with the MAX32664 sensor hub is defined in the MAX32664 User Guide.

2. MAXREFDES101-based watch reference design

MAXREFDES101 EV-Kit software comes complete with the following:

- MAX32664 firmware with embedded health sensing WHRM+SpO2 algorithm (Wrist Heart Rate Monitor)
- MAX32630 host firmware, which provides communication between MAX32664 and the Windows or Android visualization/debugging application
- A Windows or Android GUI application for evaluation and debugging

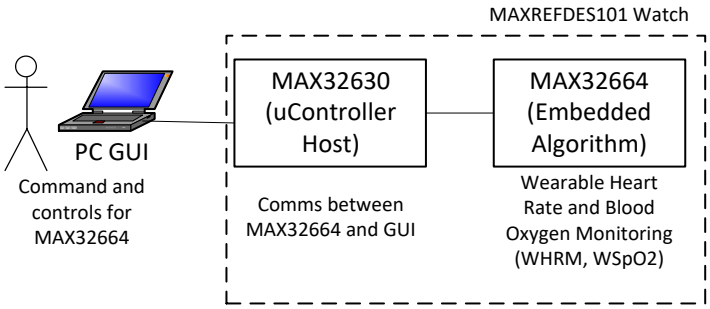


Figure 2: MAXREFDES101 software components

MAXREFDES101 reference design can also be used by our customers to design their own system, which may require a different set of software. An example design can be as follows:

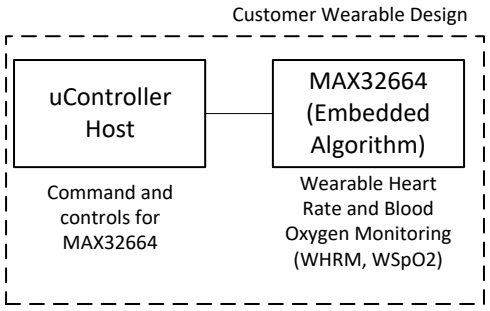


Figure 3:Customer's wearable design software components

In this case, MAX32664 is now fully controlled by the embedded microcontroller. A typical system diagram for a MAXREFDES101-based watch design will then look like the following:

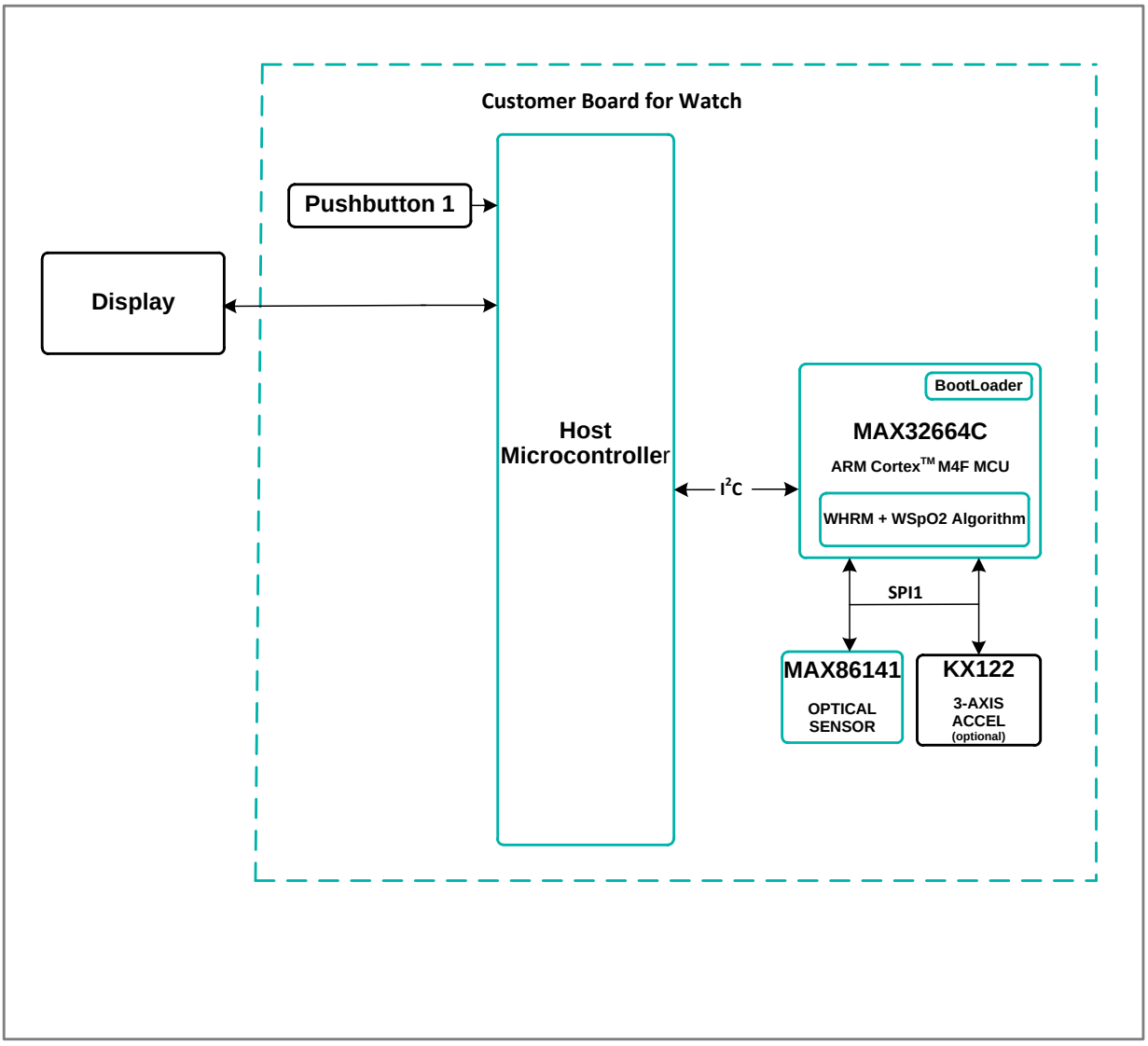


Figure 4: Typical customer watch design based on MAXREFDES101

3. Sample host (microcontroller) software

The sample host software consists of three modules:

- Watch GUI & controls
- SH Communications
- Algorithm Report using SH configured with MAX8614X

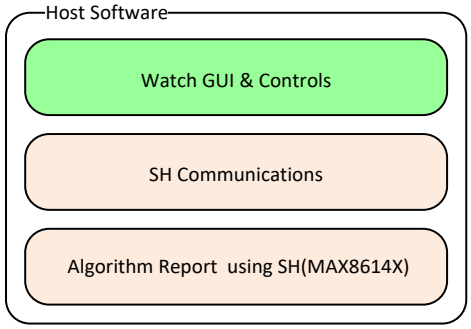


Figure 5: Sample host software modules

3.1. **Hardware abstraction in sample host software**

The sample host controller software is layered to provide hardware abstraction. This layered approach will allow most of the software modules to be cut and pasted into our customer's target platform. Hardware dependent modules may require modifications to match your target microcontroller.

The sample host controller software is divided up into three layers:

1) The hardware libraries, which are the microcontroller specific code to support the hardware devices such as interrupts, I2C, and GPIOs.
2) The sensor hub communications layer, which include procedures to read/write data from/to the sensor hub, change the sensor hub mode to either application mode or bootloader mode, and to initialize the MAX32664 sensor hub.
3) The application layer, which has procedures for the user interface interactions to the display and pushbutton and procedures to stream processed data from the sensor hub.

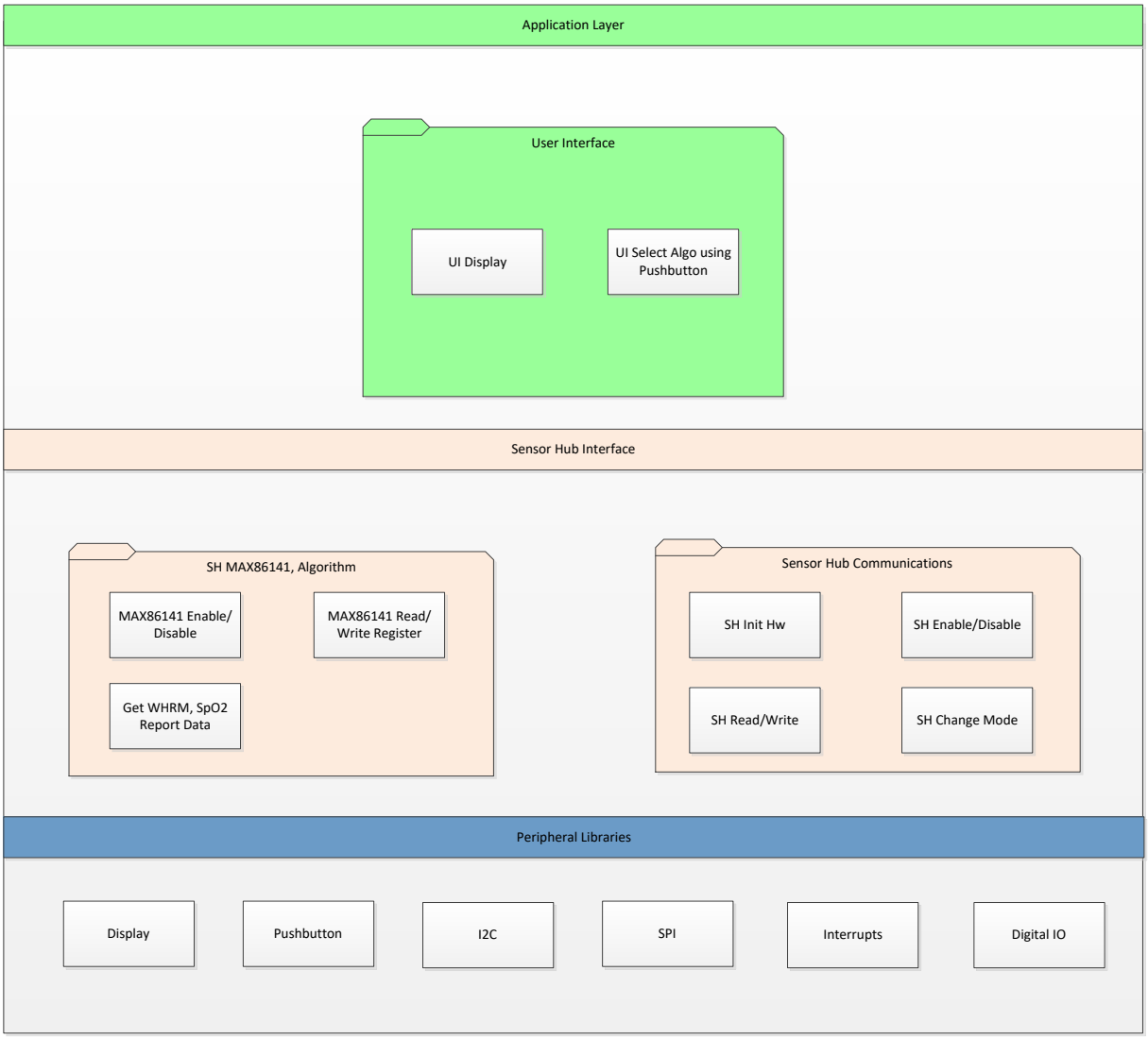


Figure 6: Sample host software layered design

3.2. **Sample host software flowchart**

We utilize MAXREFDES101 hardware (watch form factor) to demonstrate our sample software. Below is the flowchart:

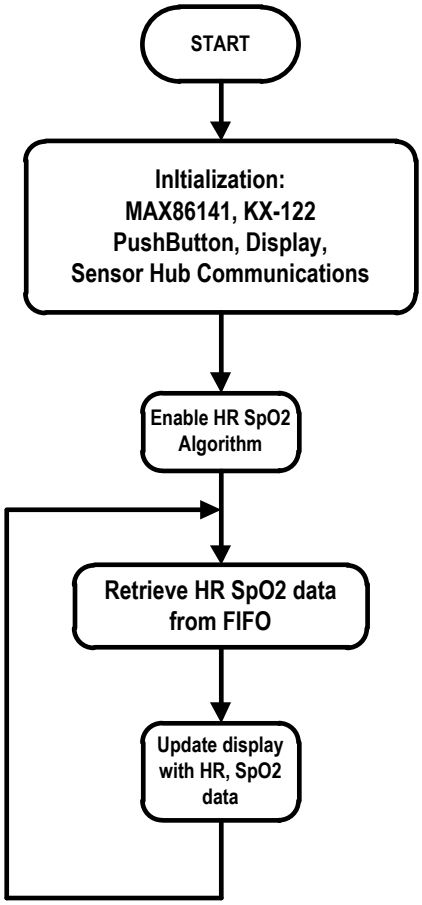


Figure 7: Sample host software flowchart

4. Data Flow Diagram

The drawing below is the Data Flow Diagram for the displaying of the data for the host software.

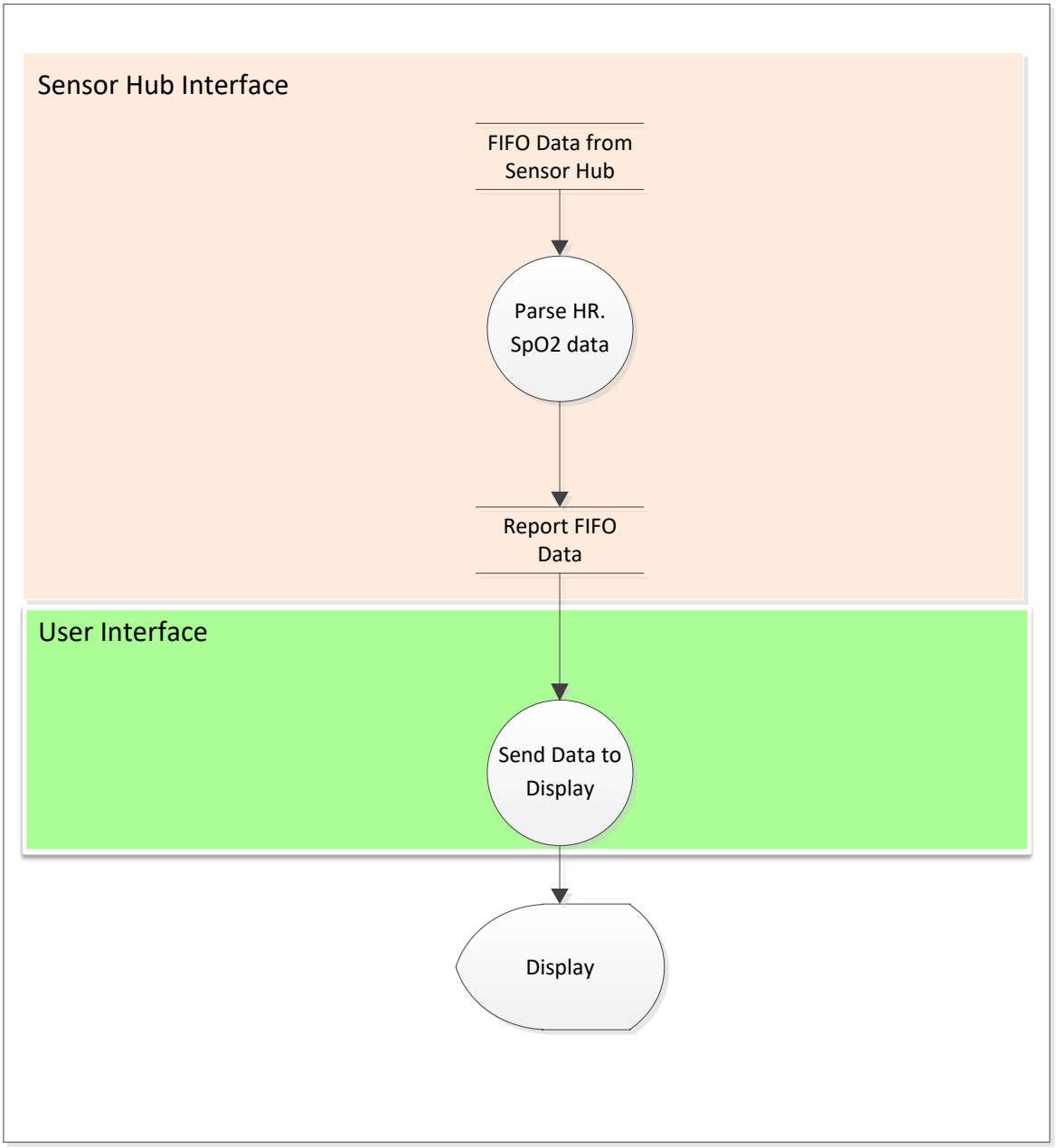


Figure 8: Sample host software layered design