API Design Notes

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This describes the design of the api for the FRDM k64F

Introduction

The layer model for the API places Port and Bit access at the bottom.

Memory model and C

The Bit-Band alias region allows direct access to bits, each word is mapped to a bit in the peripheral region.

	start address	end address
Peripheral memory region	40000000	400FFFFF
Bit band	42000000	43FFFFFF

Table 1: Peripheral Memory

```
typedef uint32_t portregisters[16];/* works but clunky */
typedef uint32_t registerbits[32];
typedef registerbits portbits[16];
portregisters *ports = (portregisters*)(0x400FF000);
portbits *bits = (portbits*)(0x49FE0000);

ports[PortB][Clear];
bits[PortB][Clear][22];
```

Port

The MCU has 5 ports: A, B, C, D, and E. Their default state is inactive. To enable a Port the5 clock signal has to be distributed to the Port, via the System Clock Gating Control Register 5 (SIM_SCGC5).

SIM_SCGC5 address		40048038
Port A	9	42900724
Port B	10	42900728
Port C	11	4290072C
Port D	12	42900730
Port E	13	42900734

Table 2: System Clock Gating Control Register 5 (SIM_SCGC5)

Bits

The port control registers control the behaviour of each bit. The `MUX` field (bits 8–10) controls the function, for GPIO pins the MUX value is 1 (3 bits 001)

Device	port	bit	PCR	Output	Set
Red LED	B	22	`4004A058`	`43FE0858`	`42FE08D8`
Blue LED	B	21	`4004A054`	`43FE0584`	`42FE08D4`

Table 3: Device Bit addresses

Sequence of events

1. open LED — maps from LED to bit, including logic levels
2. opens Bit for writing — collates bit alias addresses
3. opens Port — ensures clock signal is gated to enable port

Some semantics

I want to have a common API,

```
result = open(MajorNo, MinorNo, params, params);
```

Where the Major device number is used to select the driver from a lookup table. The device gets opened as.

```
result = dev_open(MinorNo, params, params);
```

The Minor number is used to identify the particular device.

LED the parameters have no effect here, an LED can only be opened for writing.

BIT we need to know the port and bit numbers, bits can be opened for reading or writing. They can be GPIO or special purpose.

Port As a minimum the port needs to have the clock signal gated to enable the port. Do reading and writing have meaning?