

Clock System

- ▶ Xmega has many possible clock sources:
 - ▶ 32MHz runtime calibrated oscillator
 - ▶ 2MHz runtime calibrated oscillator
 - ▶ 32.768kHz runtime calibrated oscillator
 - ▶ 32kHz ultra low power oscillator
 - ▶ External clock source
 - ▶ External quartz crystal 0.4-16MHz
- ▶ Peripheral clocks can run at 2-4x CPU clock
- ▶ Directly after reset, CPU starts up with the internal 2MHz clock
- ▶ System clock can be changed on-the-fly safely.
- ▶ Each oscillator has a "ready" flag to indicate that its ready.

Clock System

► Setup for clocks:

```
void setUp32MhzInternalOsc() {  
    OSC_CTRL |= OSC_RC32MEN_bm; //Setup 32Mhz crystal  
    while(!(OSC_STATUS & OSC_RC32MRDY_bm));  
    CCP = CCP_IOREG_gc; //Trigger protection mechanism  
    CLK_CTRL = CLK_SCLKSEL_RC32M_gc; //Enable internal 32Mhz crystal  
}
```

```
void setUp16MhzExternalOsc() {  
    PORTD_DIR = 0x01;  
    //16MHz external crystal  
    OSC_XOSCCTRL = OSC_FRQRANGE_12TO16_gc | OSC_XOSCSEL_XTAL_16KCLK_gc;  
    //Enable external oscillator  
    OSC_CTRL |= OSC_XOSCEN_bm;  
    //Wait for clock stabilization  
    while(!(OSC_STATUS & OSC_XOSCRDY_bm));  
    // Selects clock system as external clock  
    // through change protection mechanism  
    CCP = CCP_IOREG_gc;  
    CLK_CTRL = CLK_SCLKSEL_XOSC_gc;  
}
```

Clock System

- ▶ Setup for clocks:
- ▶ Heres how to quickly and easily get your Atmel AVR XMEGA running at a very stable 32MHz without a crystal. This will enable both the 32Khz and 32MHz internal oscillators, using the 32KHz oscillator for DFLL calibration and switch the XMEGA to the 32MHz clock. Ive used the USART at 115,200 on a few projects with this configuration and its been very stable.

```
// Configure clock to 32MHz
OSC.CTRL |= OSC_RC32MEN_bm | OSC_RC32KEN_bm; /* Enable the internal
while(!(OSC.STATUS & OSC_RC32KRDY_bm)); /* Wait for 32Khz oscil
while(!(OSC.STATUS & OSC_RC32MRDY_bm)); /* Wait for 32MHz oscil
DFLLRC32M.CTRL = DFLL_ENABLE_bm ; /* Enable DFLL - default
CCP = CCP_IOREG_gc; /* Disable register sec
CLK.CTRL = CLK_SCLKSEL_RC32M_gc; /* Switch to 32MHz cloc
OSC.CTRL &= ~OSC_RC2MEN_bm; /* Disable 2Mhz oscilla
```

Clock System

- ▶ For further tutorials of XMEGA we will use PLL as system clock source and 2MHz internal oscillator as PLL clock source. The function for configuring system clock is as shown below.

```
void clock_init() {
    OSC_PLLCTRL=OSC_PLLFAC3_bm; //select internal 2MHz oscillator as PLL
    OSC_CTRL=OSC_PLEN_bm; //enable PLL
    while(!(OSC_STATUS & OSC_PLLRDY_bm)); //wait until PLL is locked to c
    CCP=0xd8; //write Configuration Change Protection register
    CLK_CTRL=CLK_SCLKSEL2_bm; //select PLL as system clock source
    CCP=0xd8; //write Configuration Change Protection register
    CLK_PSCTRL=CLK_PSADIVO_bm; //select Prescaler A as 2, Prescaler B and
    CLK_RTCCTRL=CLK_RTCEN_bm; //enable RTC clock source as 1KHz from 32KH
}
```