

OpenStrom - Microcontroller Considerations

Microcontroller's selection

The microcontroller selection is very important in order the for smart meter to be able to satisfy the developer's and client's requirements connected with its performance and, memories and peripheral resources, communications and network capabilities.

The choice of 32-bit microcontroller implemented Arm Cortex M3-M7 architecture with performance of 100 MIPS and 80 Mhz rate can be made between many manufacturer such a Texas Instrument, Microchip, Atmel and etc.

From the other hand should be answered to the question if it is necessary to apply a sensor dedicated microcontroller or general-purpose one.

At the current stage of SM development we will limit our considerations on the following:

General purpose microcontrollers as far as possible to determine by this way can be:

- TI cc3200 Simple Link Wi-Fi and IoT solution;
- TI cc2530F32 for 2.4Ghz IEEE 802.15.4(ZigBee applications);
- PIC 32MX795F512H from the Microchip;

Sensor dedicated microcontroller:

- 78M6618 with PDU I80515;

Parameters

CPU	Performance	MCLK	Flash	RAM	Peripherals	Network
CC3200	100 MIPS	80Mhz	64K	256K bootloader	GPIOs,SPI,IIC,UA RT,DMA	Wifi
CC2530	High performance 8-bits 80515 CPU	32 Mhz	256 K	8 K	GPIOs,SPI,IIC,UA RT,DMA	ZigBee
PIC 32MX795F51 2H	105 DMIPS	80Mhz	512 K	128 K	GPIOs,SPI,IIC,UA RT, 10-bit ADC 1Msps, 16 channels	Ethernet
78M6618 with PDU I80515	High performance 8-bits 80515 CPU	40Mhz	128 K	4 K	GPIOs,UART, SPI, LCD driver	

TI CC3200 vs Microchip pic32MX795F512H

Performance

The performance of both microcontrollers is in the rate of 100 MIPS and MCLK 80 Mhz.

The research¹ shows that the high operation performance of this microcontroller has a capability to increase Disaggregation rate.

For CC3200 this type of test is still not available, but may be its performance is very close to 32MX795HF512H one.

Cost estimation

In the pictures below are shown the network interfaces realized with CC3200 and PIC 32MX795HF512H.

These network interfaces are: WiFi, Ethernet and ZigBee.

MCU	Wifi	Ethernet	ZigBee	Total Cost
TI CC3200	SoC	ENC28J60 LAN8720	AT86RF233	\$16.55 ²
32MX795HF512 H	EPS8266	LAN8720	AT86RF233	\$14.20 ³

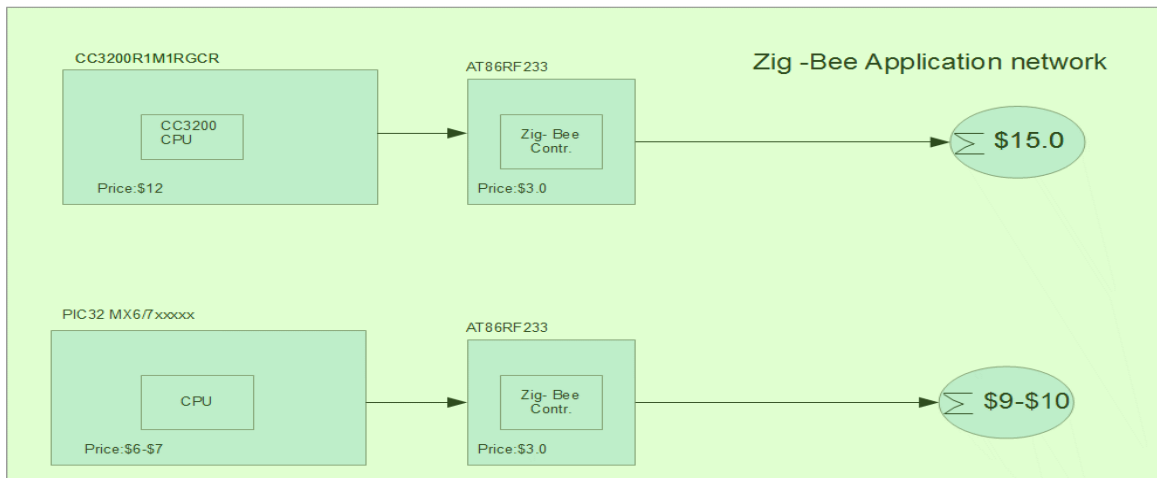
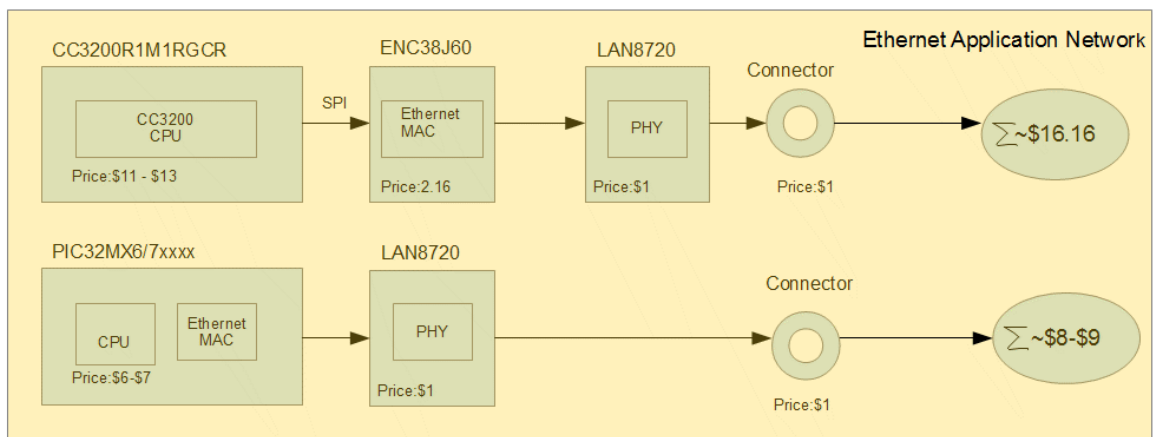
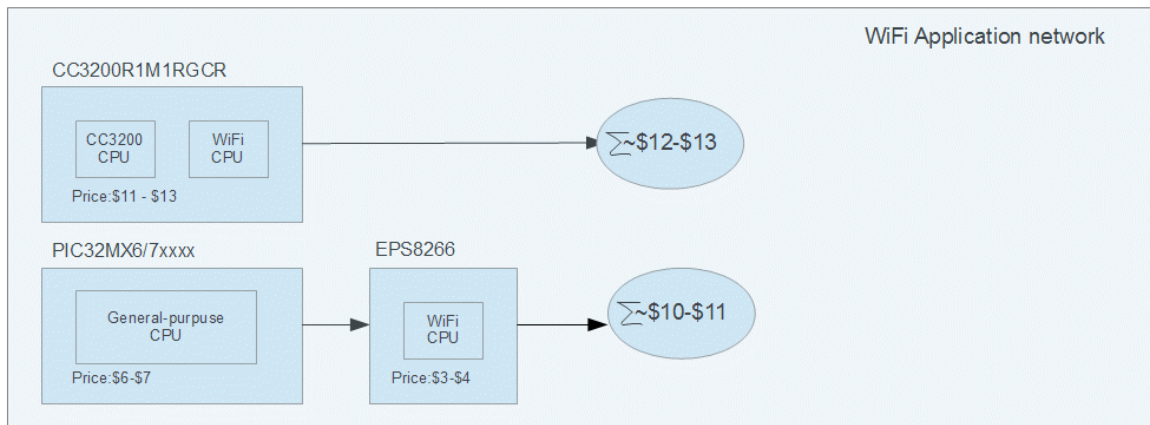
In the all applications is obviously that pic32MX795F512H is most effective choice in the ratio cost/performance.

¹ For the CPU PIC 32MX795F512 H see

http://hades.mech.northwestern.edu/index.php/PIC32MX:_Benchmarking_Mathematical_Operations#Multipli
cation_.28Test_4.29 can be make real estimation about micros performance and to see time execution for mathematical operations necessary for energy parameters computations

² 10+0+2.35+1.20+3

³ 7+3+1.20+3



Development tools and software support

For both microcontrollers exists a wide spectrum of hardware and software development tools, software libraries, APIs, IDEs.

Selection

Based on the technical parameters and the price point of the different options we have decided to use the PIC32MX795HF512H