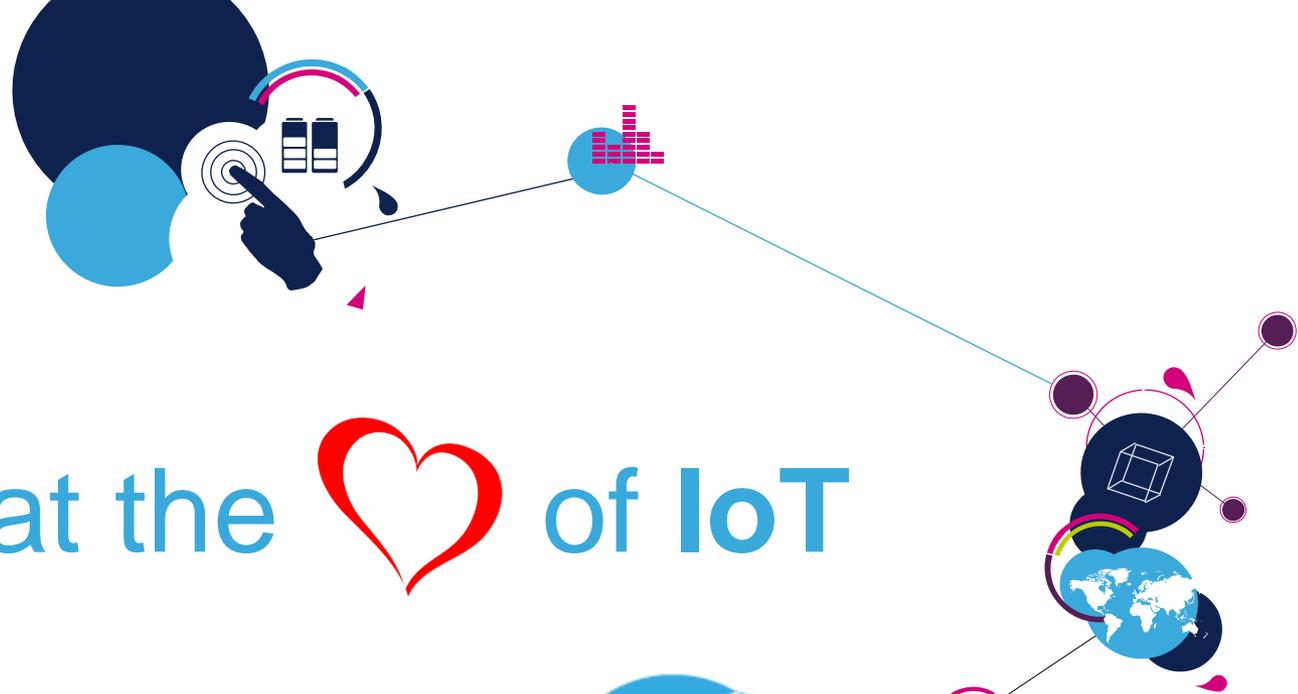
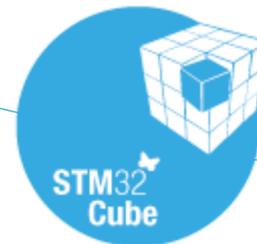


STM32 at the of IoT

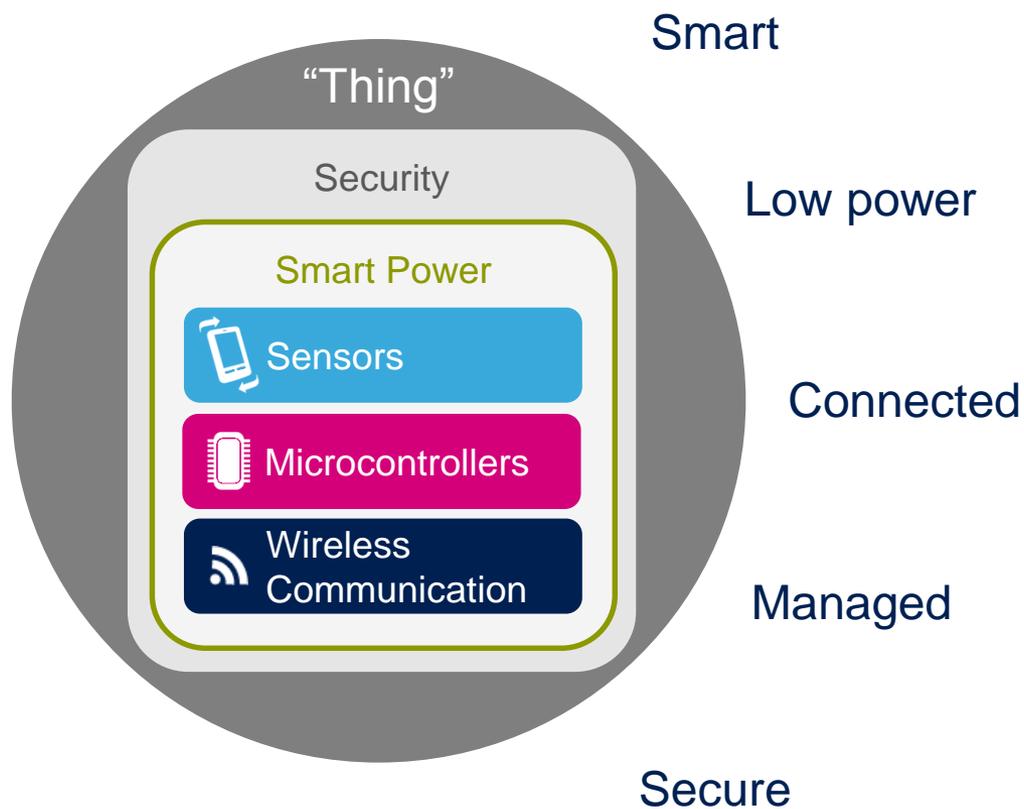
March 2016

Alexander KVASHIN
FAE – MCU's



Будьте онлайн с STM32

Микроконтроллер – ядро любой 'thing'....





5 причин выбрать STM32 для вашего приложения

- ARM Cortex-Mx это новый **ИНДУСТРИАЛЬНЫЙ СТАНДАРТ**
- **STM32 это #1** среди Cortex-Mx
- **>700 STM32 приборов** в одной философии
- Высококласная и развитая, доступная **Экосистема**
- Многоуровневая **Техическая Поддержка**

1.5 billion STM32
embedding
your
innovations



Thank
you!

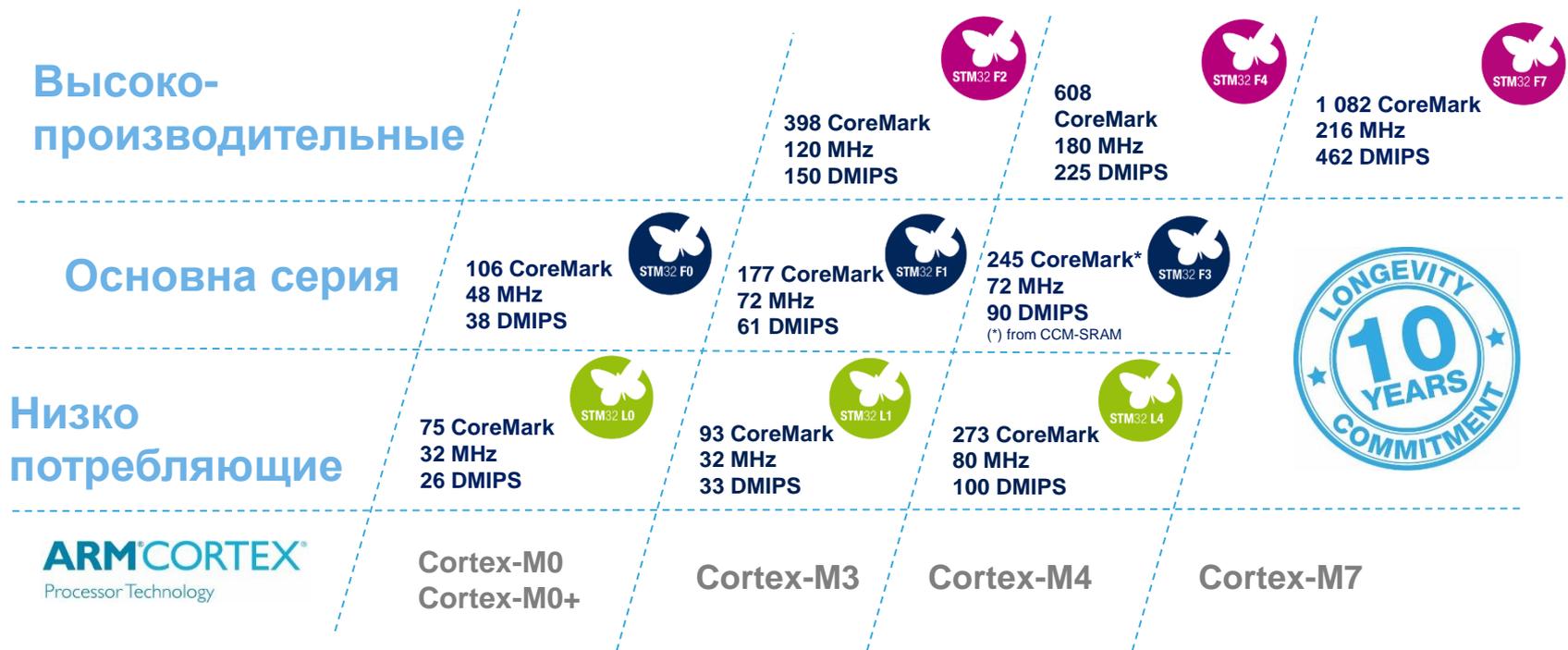


Releasing your **creativity**



Портфель STM32

9 продуктов / более 32 продуктовый линеек с >700 устройств





НОВОСТИ с планеты STM32

7

Ежемесячное обновление семейства STM32 и его Экосистемы

- **Завершено формирование серии STM32L0**
 - От 14pins 8kB flash до 100pins 192kB flash
- **Уменьшенные STM32L4**
 - Вниз до 32pins и 128kB flash
- **Новые STM32F4**
 - **STM32F410** с 128kB flash / 32kB SRAM –STM32F4 начально уровн
 - **STM32F446** с 512kB flash / 128kB SRAM – по цене STM32F2xx
 - **STM32F469** с 2MB flash / **384kB SRAM + DSI**
- **Большой брат в семье STM32F7**
 - **STM32F7xx** с 2MB flash / **512kB SRAM** с JPEG HW ускор.





НОВОСТИ с планеты STM32

8

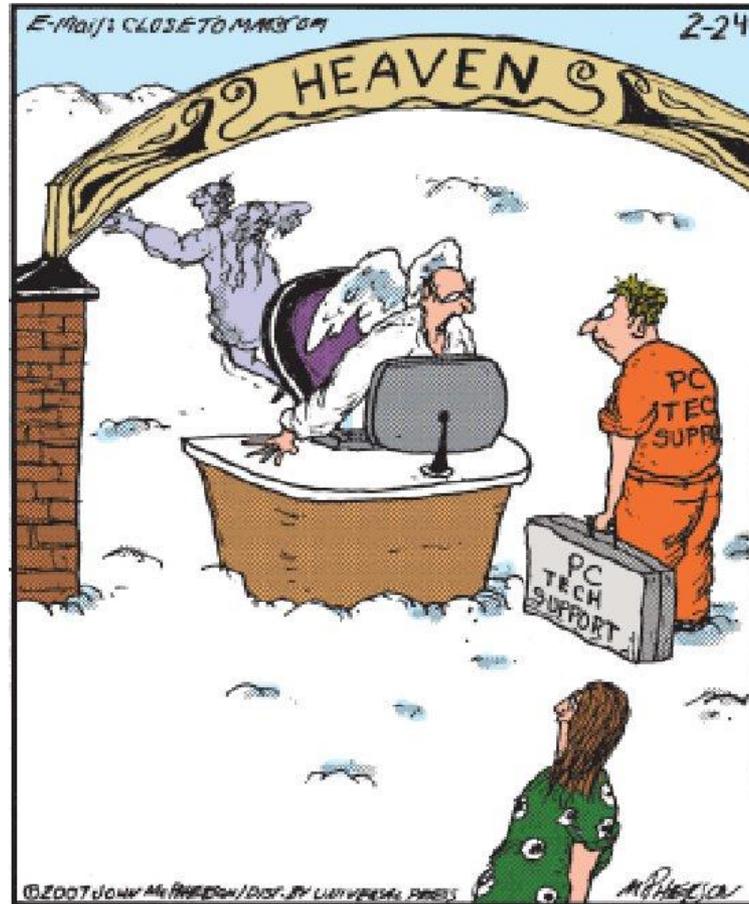
Ежемесячное обновление семейства STM32 и его Экосистемы

- **STM32 и технология LoRa®**
 - Коопирация с Semtech
- **Новые отладочные платы STM32 NUCLEO**
 - Nucleo-32 и Nucleo-144
- **Инструментарий STM32 теперь и под Linux**
 - ST-Link, STM32CubeMx и SW4STM32



Linux

Мы рядом, всегда на связи



"Sorry we had to kill you, but it was the only way we could get some computer tech support up here."

Releasing your creativity



 /STM32

 @ST_World

 st.com/e2e



www.st.com/stm32



STM32L ultra-low-power

Ultra-low-power, market-proven solutions
Best in class with up to 100 DMIPS performance

STM32L DNA	Product Series	System	Advanced Periph.	USB 2.0	LCD	Security
<ul style="list-style-type: none"> Ultra-low leakage technology Flexible LP⁴ Modes Optimized design for ULP⁴ Operating from 1.65 to 3.6 V From - 40 to 125 °C Reset circuitry Rich peripheral set Advanced analog features 16-bit, 32-bit timers Low power Batch acquisition mode (BAM) 2 watchdogs Temperature sensor Unique ID Cap. touch-sensing Single wire protocol 	STM32L4	ART Accelerator™ Vbat New LP ⁴ Modes SDIO/FSMC ¹	SAI CAN Quad-SPI DFSDM ² LP UART LP Timers	FS OTG + Xtal less	Seg. up to 8x40 + TFT	256-bit AES + TRNG
	STM32L1	True EEPROM with RWW ³ + SDIO/FSMC ¹		FS	Seg. up to 8x40	256-bit AES
	STM32L0	True EEPROM with RWW ³	LP UART LP Timer	FS + Xtal less	Seg. up to 8x48	256-bit AES + TRNG



- ▶ ARM Cortex-M4 + FPU at 80 MHz – 100 DMIPS
- ▶ From 128 Kbytes to 1 Mbyte of Flash memory
- ▶ Lowest power mode + RAM + RTC: 0.6 µA

153 **273**
An EEMBC Benchmark



- ▶ ARM Cortex-M3 at 32 MHz – 33 DMIPS
- ▶ From 32 to 512 Kbytes of Flash memory
- ▶ Lowest power mode + RAM + RTC: 1.2 µA

81 **93**
An EEMBC Benchmark



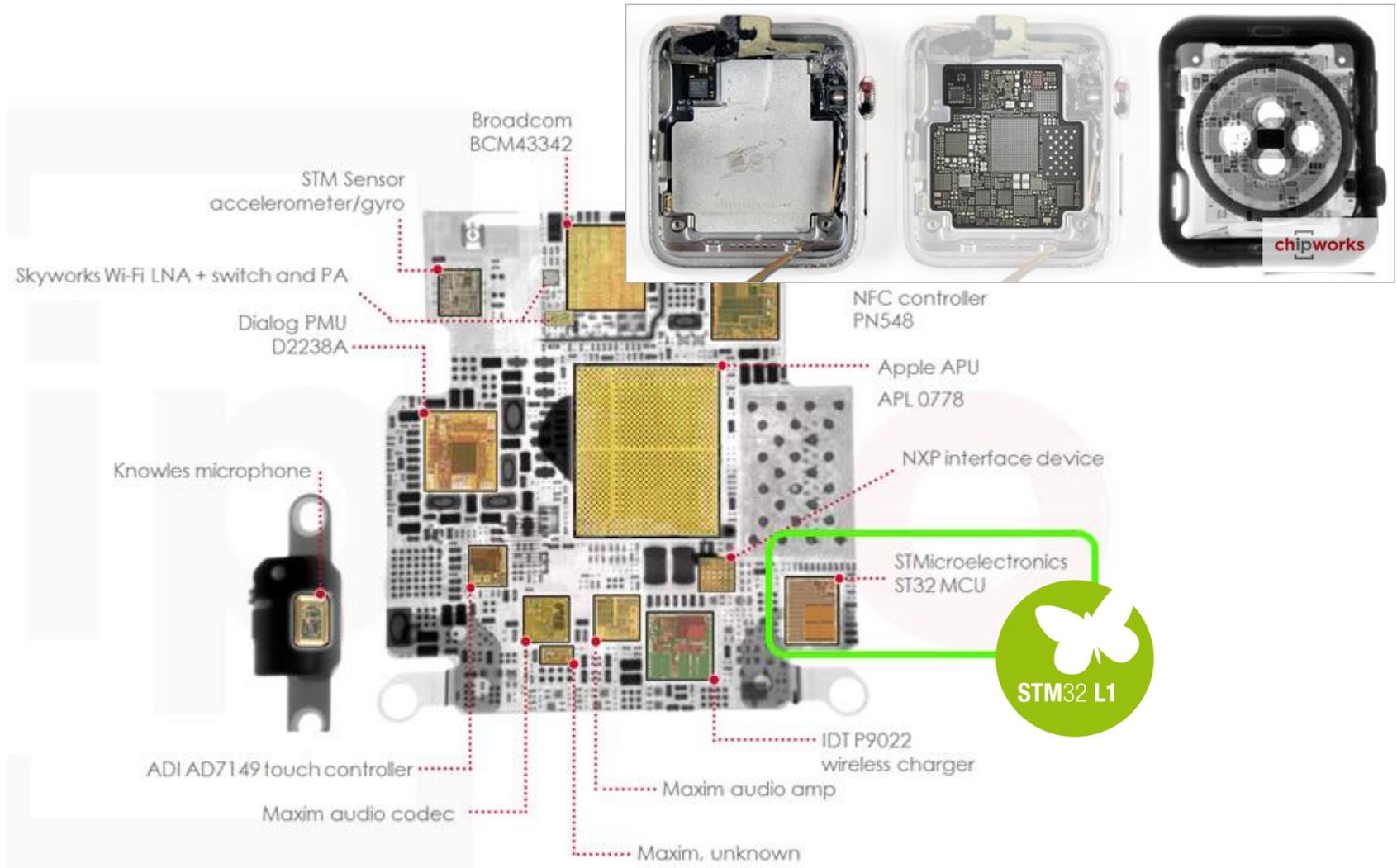
- ▶ ARM Cortex-M0+ at 32 MHz – 26 DMIPS
- ▶ From 8 to 192 Kbytes of Flash memory
- ▶ Lowest power mode + RAM + RTC: 0.8 µA

153 **75**
An EEMBC Benchmark

¹ FSMC : Flexible Static Memory Controller
² DFSDM : Digital Filters for Sigma Delta Modulation. Accepts digital microphones pdm input signal
³ RWW : Read While Right (Dual Bank Flash and Dual Bank EEPROM)
⁴ ULP / LP : Ultra-low-power / Low power



Meet the STM32 – Apple Watch





STM32F mainstream MCUs

Линейка контроллеров общего назначения - для решения множества задач от промышленного применения до потребительской электроники

STM32F DNA	Product series	System	Comm. Periph.	Analog & timers
<ul style="list-style-type: none"> • 1.8V ± 8% and 2.0 to 3.6 V operation • Up to 105 °C • Calendar RTC • Multiple DMAs • USARTs, SPIs, I²Cs, • 16-bit, 32-bit timers • Motor Control timer • 2 independent watchdogs • Temperature sensor • CRC • Unique ID 	STM32F3	80-Kbyte RAM CCM-SRAM FSMC DSP and FPU	CAN 2.0B HDMI-CEC USB 2.0 FS	217 ps HR 3 x 16-bit (144 MHz) 2 x 5 MSPS ADC 4 x 12-bit DAC 7 x comparators 4 x PGA 3 x 16-bit Σ/Δ ADC 24 x Cap sense
	STM32F1	96-kbyte RAM FSMC	2 x CAN 2.0B SDIO USB 2.0 FS OTG FS Ethernet MAC	14 x 16-bit 2 x 16-bit MC 3 x 1 MSPS ADC 2 x 1 MSPS DAC
	STM32F0	32-kbyte RAM DMA Multiply	1 x CAN 2.0B HDMI-CEC USB 2.0 FS (Xtal-less)	1 MSPS 12-bit ADC 2 x comparators 1 MSPS 12-bit DAC 24 x Cap. Sense



- ▶ ARM Cortex-M4 + FPU at 72 MHz – 90 DMIPS*
- ▶ From 16 to 512 Kbytes of Flash memory
- ▶ Mixed-signals: CCM-SRAM, 16-bit ADC $\Sigma \Delta$, HR-timer...

COREMARK
An EEMBC Benchmark **245***



- ▶ ARM Cortex-M3 at 72 MHz – 61 DMIPS
- ▶ From 16 Kbytes to 1 Mbyte of Flash memory
- ▶ STM32 foundation: USB, Ethernet, CEC...

COREMARK
An EEMBC Benchmark **177**



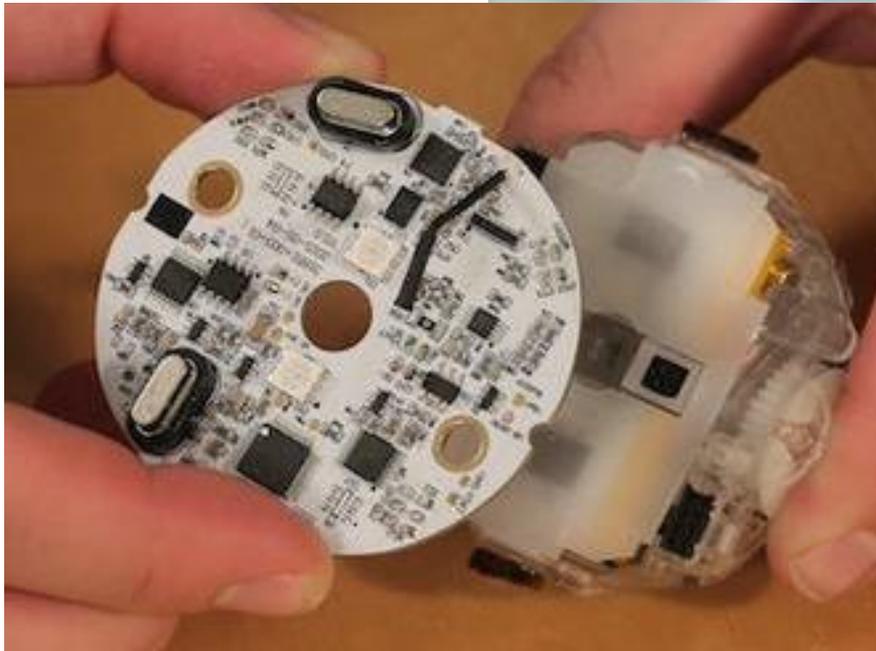
- ▶ ARM Cortex-M0 at 48 MHz – 38 DMIPS
- ▶ From 16 to 256 Kbytes of Flash memory
- ▶ Entry-level, cost-sensitive: 1st 32-bit MCU at 32 cents, USB, CAN...

COREMARK
An EEMBC Benchmark **106**

* From CCC-SRAM



Meet the STM32 – Sphero BB-8 droid





STM32F high performance MCUs

Высокопроизводительные STM32 предоставляют производительность до 1082 CoreMark и богатейшую периферию, чтобы убрать максимум внешних элементов

Performance DNA	Product Series	System	HW acceleration	Advanced Comm. Periph. Graphic and Audio
<ul style="list-style-type: none"> Smart architecture for fast data transfers: DMAs, Bus Matrix Operating from 1.7 to 3.6V From - 40 up to 105 °C Rich peripheral set including: CAN, Ethernet, Camera interface, SDMMC, USB OTG Advanced analog features 16-bit, 32-bit timers Low power Batch Acquisition Mode (BAM) 2 watchdogs Temperature sensor Unique ID CRC 	STM32F7	FPU, DSP instructions MPU	Execution: ART Accelerator™ Graphics: Chrom-ART Accelerator™ Crypto-Hash: coprocessor	SDRAM I/F, Dual Quad-SPI I/F SPDIF, HDMI-CEC 2xSAI TFT LCD
	STM32F4	FPU, DSP instructions MPU	Execution: ART Accelerator™ Graphics: Chrom-ART Accelerator™ Crypto-Hash: coprocessor	SDRAM I/F, Dual Quad-SPI I/F SPDIF, HDMI-CEC up to 2xSAI TFT LCD I/F MIPI DSI I/F
	STM32F2	MPU	Execution: ART Accelerator™ Crypto-Hash: coprocessor	



- ▶ ARM Cortex-M7 + FPU up to 216 MHz – 462 DMIPS
- ▶ From 512 KB to 2 MB Flash, 512 KB RAM
- ▶ Very High performance from Flash and external memories (including dual Quad-SPI)



- ▶ ARM Cortex-M4 + FPU up to 180 MHz – 225 DMIPS
- ▶ From 64 KB to 2 MB Flash, up to 384 KB RAM
- ▶ Select the right F4 for your needs: from the F401/F411 Access lines to the most Advanced Lines



- ▶ ARM Cortex-M3 at 120 MHz – 150 DMIPS
- ▶ From 128 KB to 1 MB Flash, up to 128 KB RAM
- ▶ Foundation for performance and connectivity



- Sub-GHz – это фрагментированный сегмент с множеством собственных протоколов и решений под различные сферы применения.
- Инициатива стандартизации приходит с LTE, LoRa®, Sigfox ...
- А Стандартизация станет ключом для входа в рынок промышленных приложений (счетчики), Умные Города...
- Сегодня 2 главных решения выходят в свет: (LTE is targeted for 2020)



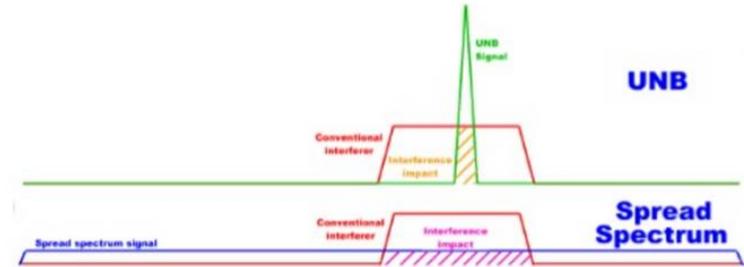
SIGFOX
One network A billion dreams

Sigfox and LoRa® - обзор

- Различный подход:

- Ultra Narrow Band (UNB) → 

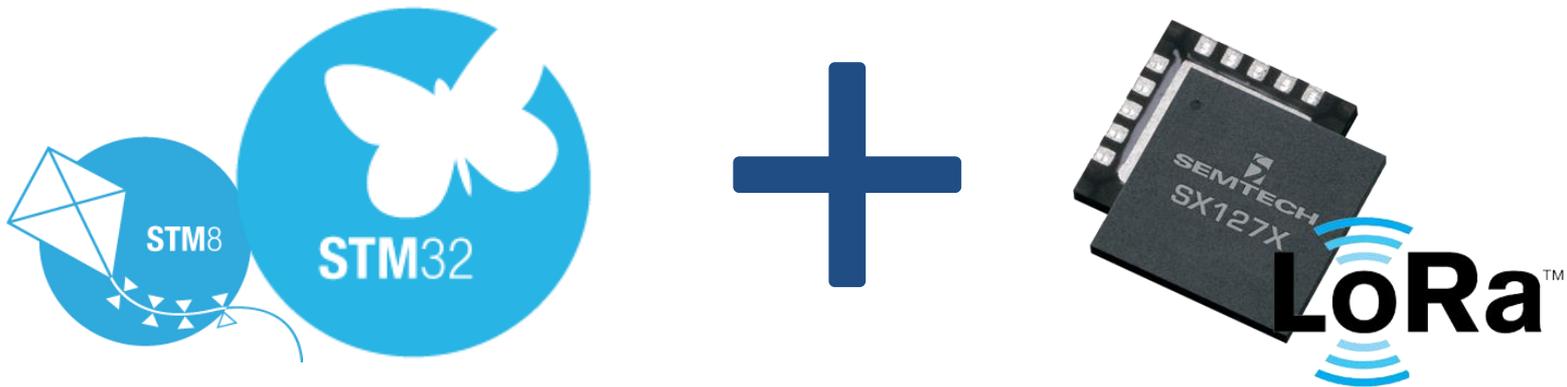
- Spread Spectrum (SS) → 



	Sigfox	LoRa®
Modulation	UNB	DSS-like
Throughput	100bps	300bps to 50Kbps
Payload	12bytes	64bytes
Link Adaptation	No (BPSK)	VSF (SF7-Sf12)
BW	100Hz	125KHz
DutyCycle Limited	Yes	Yes
Channel Hopping	Yes	Yes
Best Sensitivity (dBm)	-142	-142
Bi-Directional	No (1)	Yes
Battery Life	10years	10Years
Localization	No	Yes (30m)
Encryption	AES-128	AES-128
SDR	Yes	N/A
Benefits	Robustness to RF coexistence Multi Radio vendor \$1 module cost Network deployed in EU	2 to 3x longer Range Less sensitive to noise and environment Birectional Orange + Bouygues-Tel selected LoRa Identified big customer going with LoRa
Drawbacks	Limited baud rate (->limited application) Limitation in the USA Note (1): Not available in 2015. Sigfox working on it to add the bidirectional	Single radio provider High module cost \$3+ Network needs to be deployed

Решение найдено: STM32/8 + LoRa®

18



Портфель STM32 это **700+** партномеров, от ARM Cortex-**M0+** core до **M7** available From **8KB up to 2MB** of Flash, коммуникационные интерфейсы, **сильны в Аналоге**, **широкий выбор корпусов**

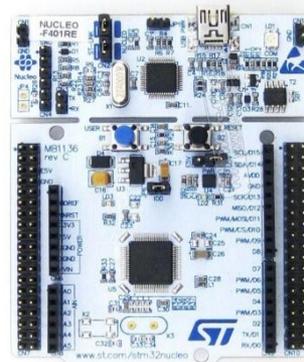
Портфель STM8 это 350+ устройств **ебезоговорочно уникального 8-bit** решения

LoRa® Long Range wireless solution предлагает **4 различных** линейки в QFN

С чего начать?!

- Аппаратные средства

Уже доступны!



STM32 Nucleo



Semtech LoRa® Shield

- Попробуйте **plug'n play пример** (point-to-point demo) on ARM mbed

SX1276MB1xAS

The SX1276MB1MAS and SX1276LB1LAS are both fitted with the SX1276 transceiver which, added to a high-performance FSK / OOK RF transceiver modem, features the LoRa™ long range modem.

Hello World



С чего начать?!

- Библиотеки и стеки **уже доступны**
 - GitHub: Lora-net / LoRaMac/WAN-node [here](#)
 - IBM: LoRaWAN in C by IBM [here](#)
 - ARM mbed: LoRaWAN-mic-app [here](#)
 - STM32Cube: LoRaWAN (coming soon)

GitHub



ARM[®]mbed[™]



Select the best partner

STMicroelectronics is leading the market



Pioneer in introducing a full range of ARM® Cortex®-M cores

Market-share leader in ARM® Cortex®-M

Owner of the largest Cortex®-M portfolio

Reliable industrial partner able to guarantee 10 years lifetime

Expert in ultra-low-power, performance and cost-efficiency