Semiconductor Technology at the Core of IoT Applications

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STMicroelectronics

for new smart connected Applications

Embedded Analytics
Embedded Memories
Ultra Low Power **RF Connectivity**
FD SOI
Sensor Fusion MEMS **Actuators**
Technology
System In Package **Sensors**
Image Processing
Wireless Charging **Processing**
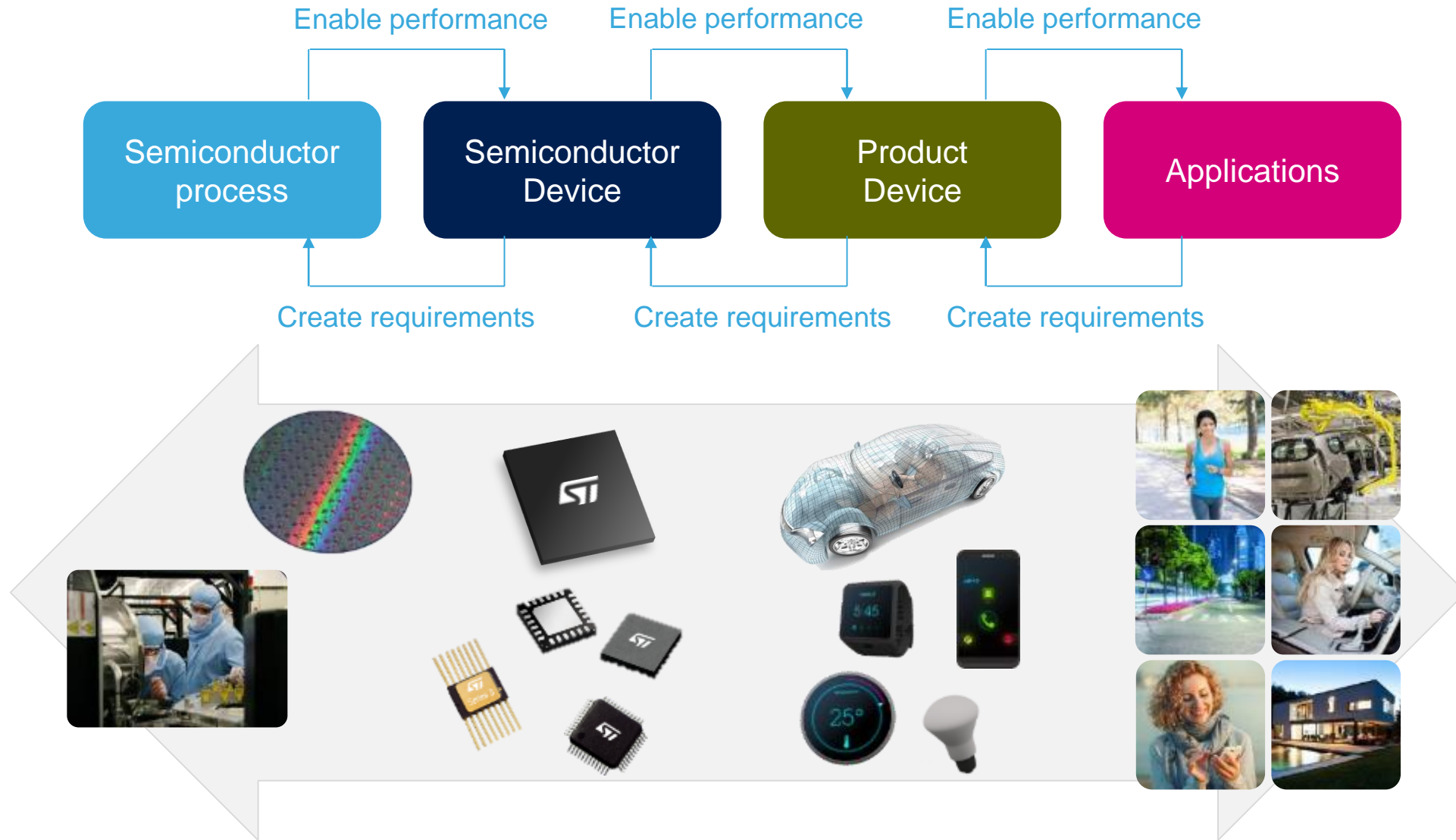Power Harvesting

Application Programming Interfaces
End to end architecture
Software
Privacy Interoperability
System
Security
Standardization

Business Model
Sales channel **Regulation**
Ethic
Market Adoption
Ecosystem Usage
Benefit
Society acceptance

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for new smart connected Applications

An open field for new ideas and innovation !!

Semiconductor Technology
fuels market Innovation

Enable performance   Enable performance   Enable performance

Semiconductor process	Semiconductor Device	Product Device	Applications

Create requirements   Create requirements   Create requirements
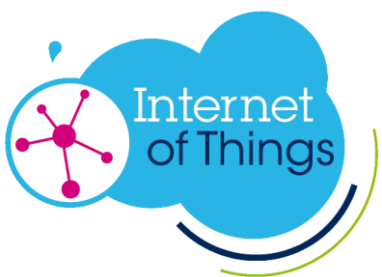
The unique IDM value proposition

Internet of Things

Specialized Imaging Sensors

Analog Mixed Signal Silicon Photonics

FD-SOI

Sensor | Analog | Sensor

FEM | PA | PMU | Power / Discrete

RF

CPU | Analytics /GPU | Storage | S/W

MEMS

Smart Power, Power MOSFET, IGBT, SiC, GaN

CMOS / eNVM

Embedded software

| Packaging technologies | Leadframe | Sensors |
| | Laminate | Wafer level |
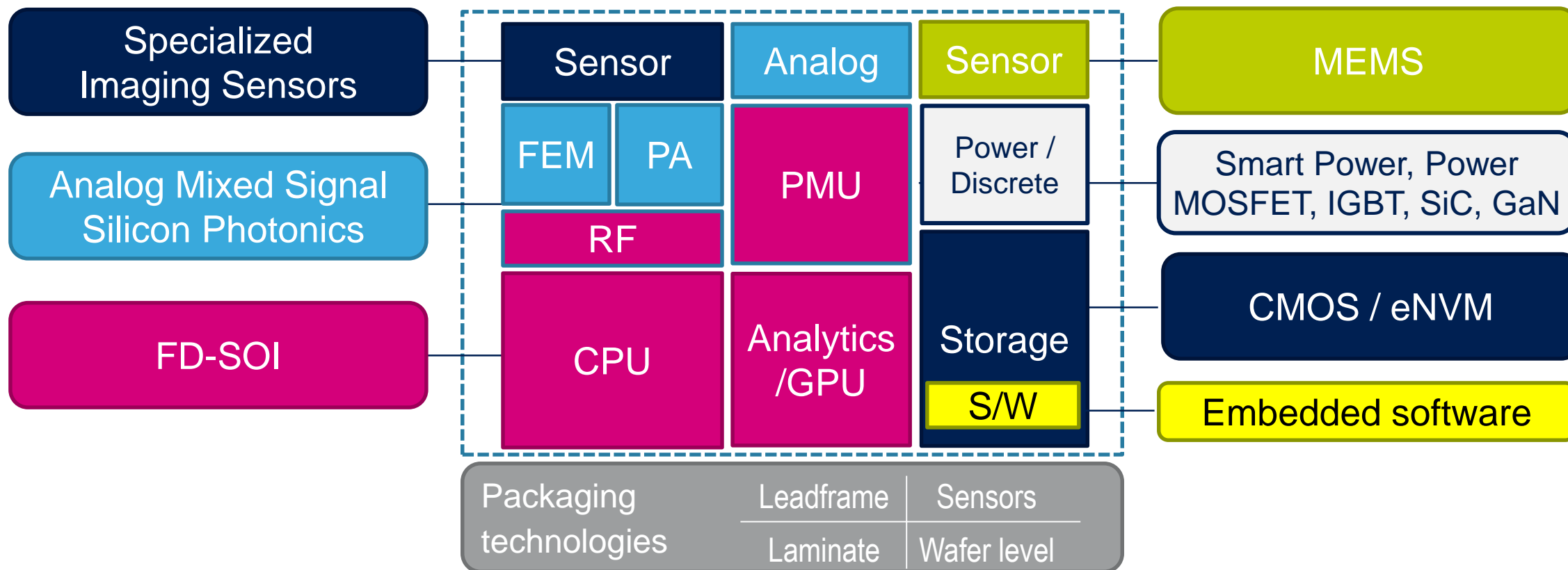
Unique **strategic advantage** of having in-house technologies for today's electronic systems

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IoT is a movement where any system is able to leverage the Internet and its eco-system

Nodes

Smart Things
(With intelligence)

Simple Things
(Send raw data)

Sense – Compute - Connect - Power - Secure

Gateways

Gateway

Process - Connect - Power - Secure

Cloud

Network infrastructure
(Switch / Router)

Servers
(Big data & cloud)
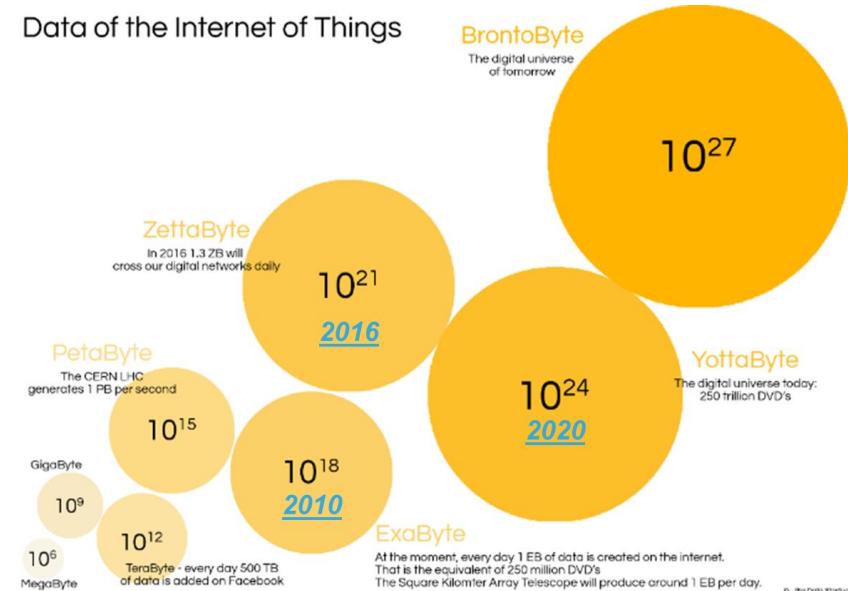
Process/Compute – Connect - Power - Secure
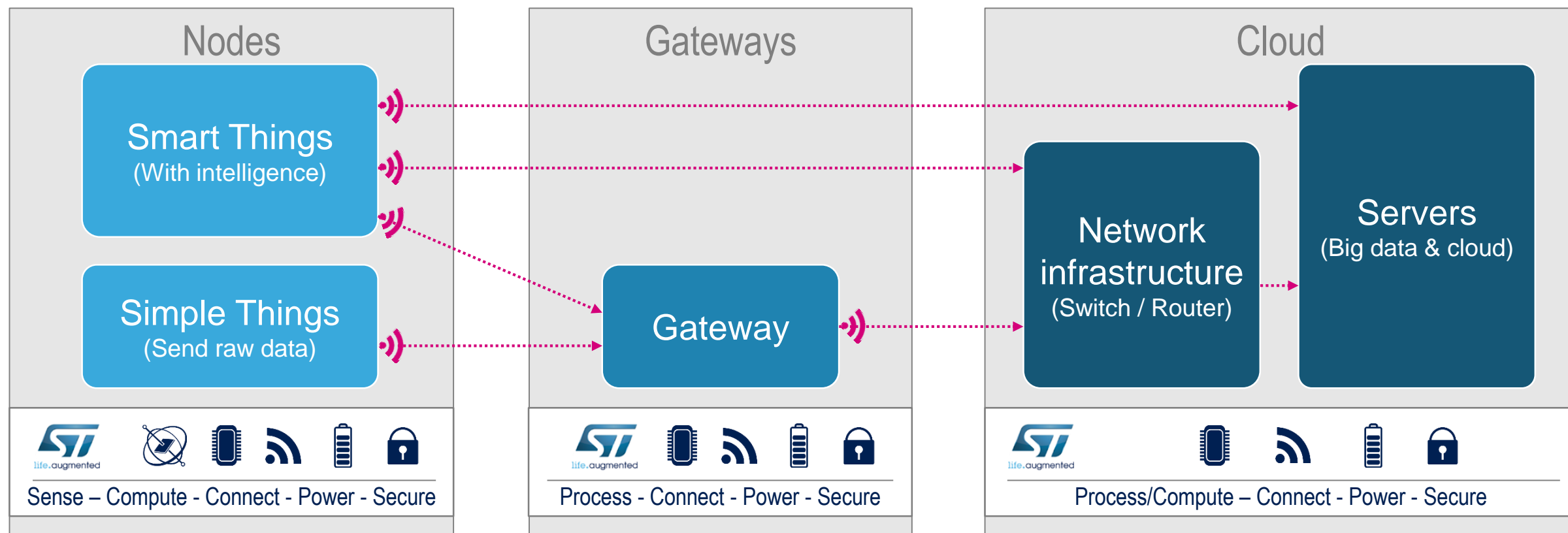
Connected Objects to generate a Data Deluge

- **1250 Billion Giga Bytes** of data generated
  - more bits than stars in the universe

- Already dominated **by data coming from sensors**

- Storage (disk, ram, …) capacity growing slower than generated data

  source IDC - 2010

Data of the Internet of Things

BrontoByte
The digital universe of tomorrow

10^{27}

ZettaByte
In 2016 1.3 ZB will cross our digital networks daily

10^{21}
2016

PetaByte
The CERN LHC generates 1 PB per second

YottaByte
The digital universe today: 250 trillion DVD's

10^{24}
2020

10^{15}

10^{18}
2010

GigaByte

10^9

10^{12}

10^6

MegaByte

TeraByte - every day 500 TB of data is added on Facebook

ExaByte
At the moment, every day 1 EB of data is created on the internet.
That is the equivalent of 250 million DVD's
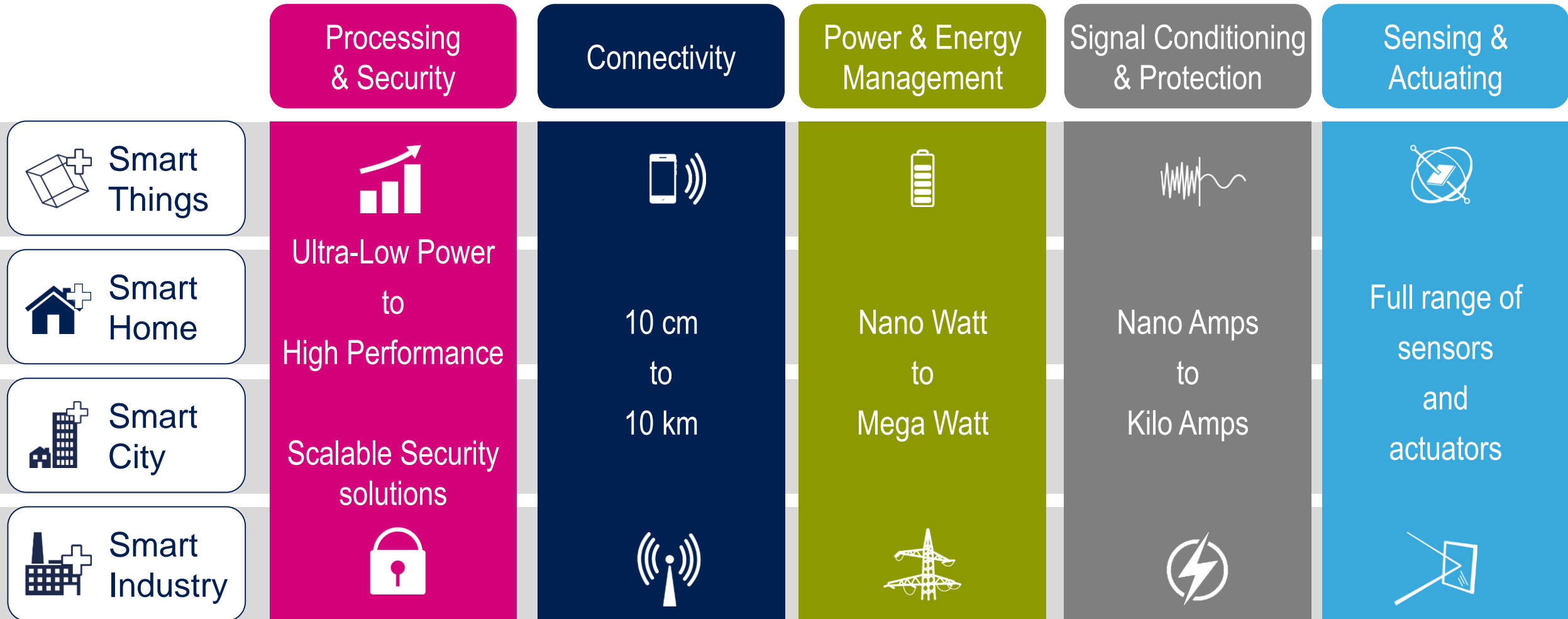The Square Kilomter Array Telescope will produce around 1 EB per day.

Even with a solid improvement of tansmission efficiency, the trend is not sustainable in energy & power

Data Generated by Connected objects have to be shrunk
by several orders of magnitude before on-the-air transmission
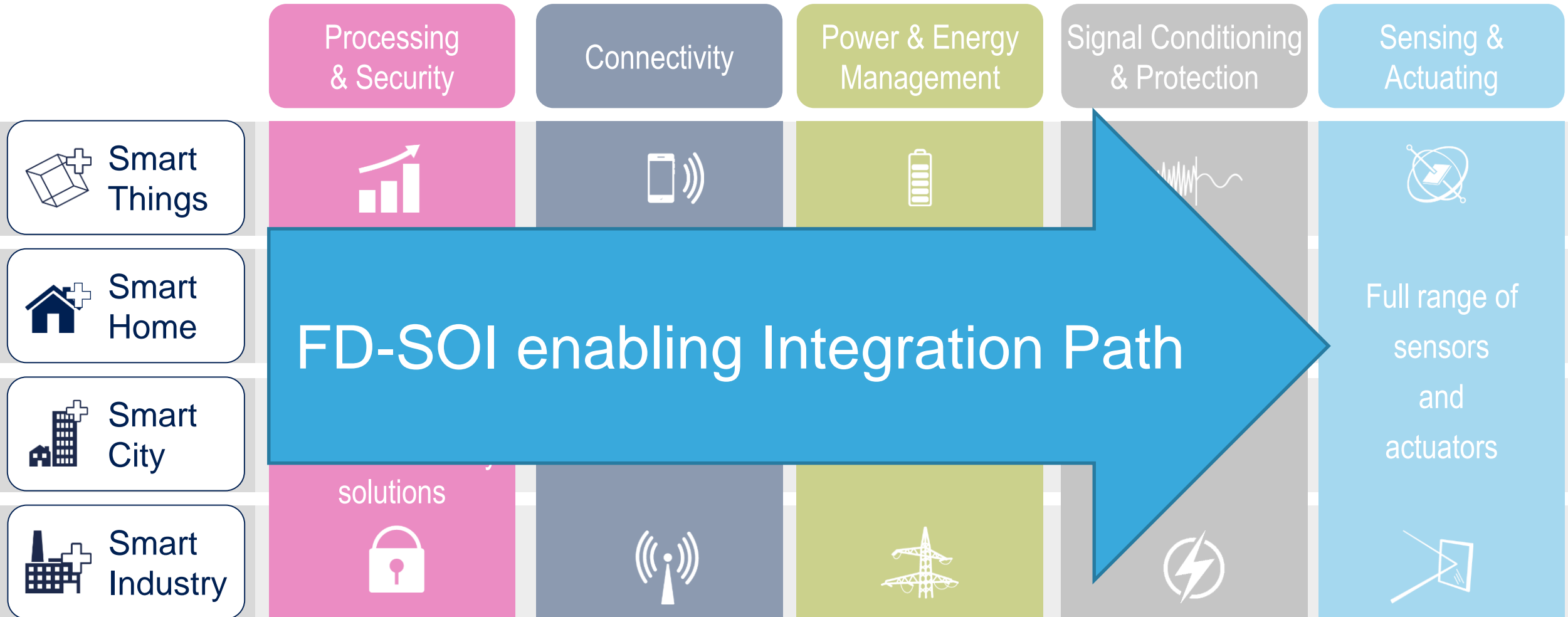**From Data Quantity to Qualitative Data**

IoT Needs are the Same

	Processing & Security	Connectivity	Power & Energy Management	Signal Conditioning & Protection	Sensing & Actuating
Smart Things	Ultra-Low Power to High Performance	10 cm to 10 km	Nano Watt to Mega Watt	Nano Amps to Kilo Amps	Full range of sensors and actuators
Smart Home					
Smart City	Scalable Security solutions				
Smart Industry					

Processing & Security	Connectivity	Power & Energy Management	Signal Conditioning & Protection	Sensing & Actuating

Smart Things

Smart Home

Smart City

Smart Industry

solutions

FD-SOI enabling Integration Path

Full range of sensors and actuators

FD-SOI Enables the Ultimate Integration for Tomorrow's Connected World

5G

Internet of Things

Ultra low voltage operations with high performance.

Easy and efficient analog integration (ADC/DACs, RF, LDOs, …)

FBB for dynamic power/ leakage/ frequency tuning

Excellent reliability and soft-error performances

Smart City

Smart Home
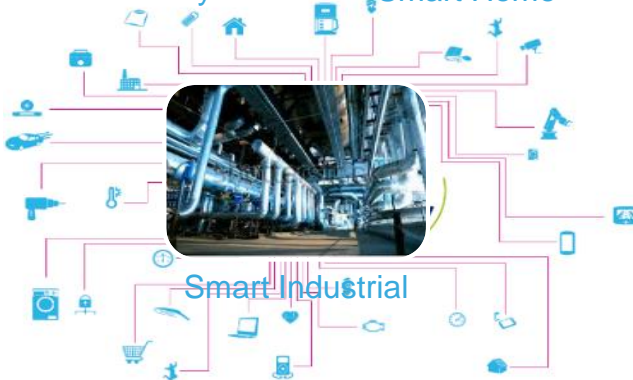
Smart Industrial

Smart Car

Healthcare

The Internet of Things

FD-SOI
Enterprise & Cloud Datacenter

FD-SOI
Core Network

FD-SOI
Backhaul Mobile Network

FD-SOI
Access Network

FD-SOI
Radio Access Network

Network infrastructure

Performant Ft / Fmax, Performant passive devices

Improved noise, Lower parasitic capacitances

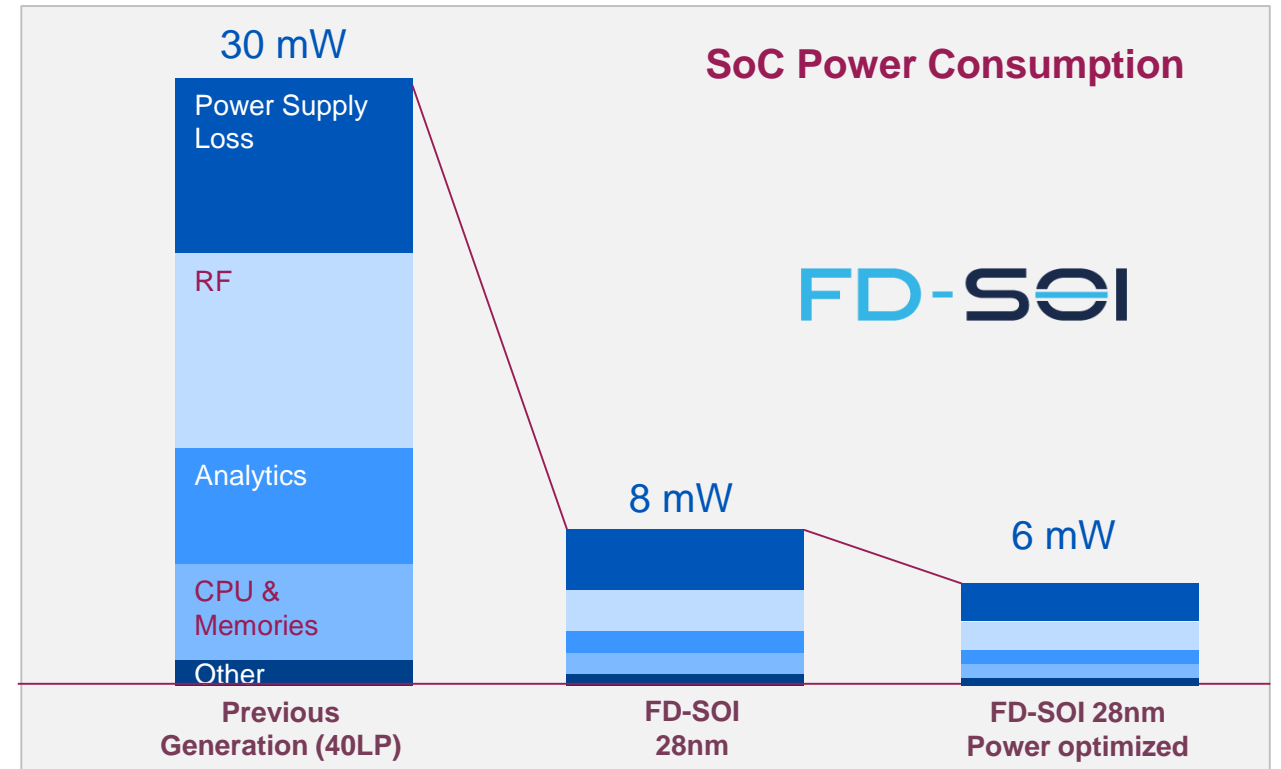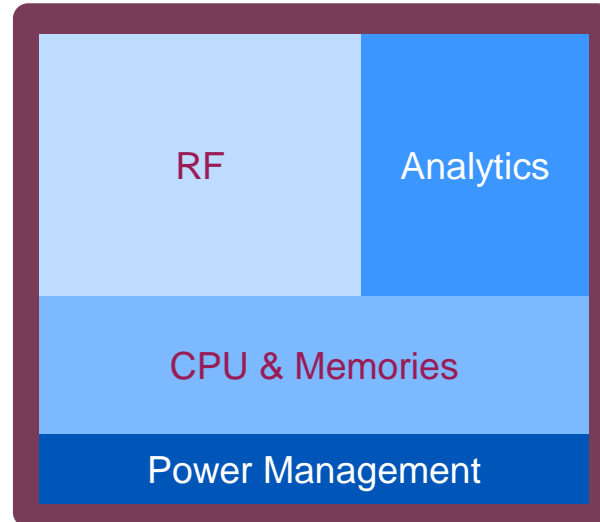**Adapt power consumption to load**

Performance and power efficiency

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The FD-SOI Advantage for Internet of Things

SoC Architecture

RF	Analytics
CPU & Memories	
Power Management	

SoC Power Consumption

FD-SOI

30 mW
- Power Supply Loss
- RF
- Analytics
- CPU & Memories
- Other

Previous Generation (40LP)

8 mW

FD-SOI 28nm

6 mW

FD-SOI 28nm Power optimized
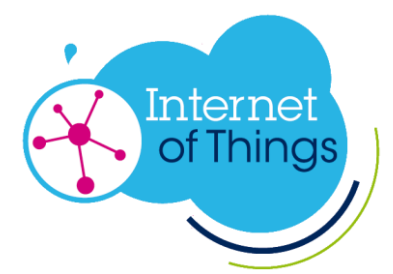
Up to X5 Power Consumption Improvement with FD-SOI.

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Embedded Memories

Ultra Low Power **RF Connectivity**

FD SOI

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Facilitate DEPLOYMENT of new ideas and innovation !

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Versatile Embedded Processing Platform

	Ultra-Low-Power	Mainstream	High Performance

450 DMIPS
425
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25

10 Series
More than 700 part numbers
>2.5 Billion Parts Shipped

STM32 L0 — 26 — 32 MHz
STM32 L1 — 33 — 32 MHz
STM32 L4 — 100 DMIPS — 273 CoreMark — 80 MHz
STM32 F0 — 38 — 48 MHz
STM32 F1 — 61 — 72 MHz
STM32 F3 — 90 — 72 MHz
STM32 F2 — 150 DMIPS — 398 CoreMark — 120 MHz
STM32 F4 — 225 DMIPS — 608 CoreMark — 180 MHz
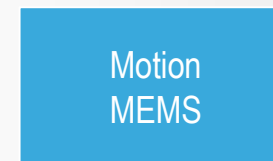STM32 F7 — 428 DMIPS — 1000 CoreMark — 200 MHz

Market's smallest wrist heart monitor

STM32 L1

STM32 L0

STM32 F2

Analog & Sensors for Smart Things

Power Conversion

Sensors & Actuators

Connectivity & Communication

Motor Control & Actuation

Analog & Signal Conditioning
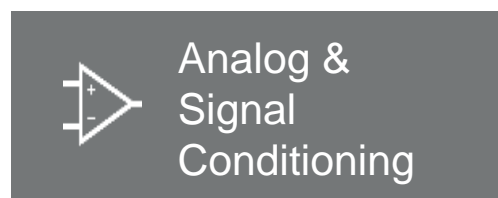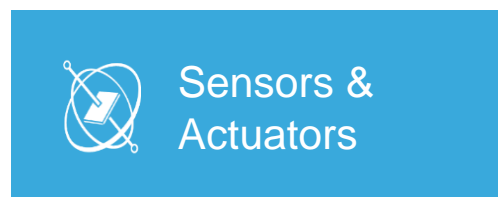
Sensors & Actuators
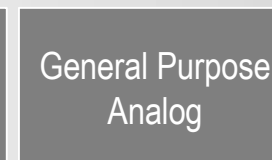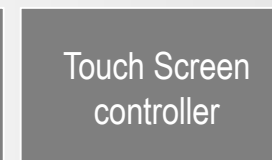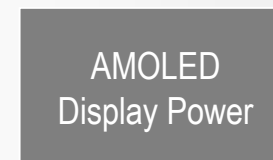
Analog

Motion MEMS	MEMS Actuators	Environmental Sensors
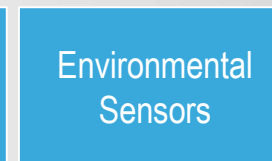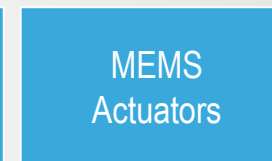
- Industry Leading range of of MEMS Motion Sensors from 3 to 9-axis solution including OIS
- Portfolio of actuation technologies powering innovative partner solutions
- Best-in-class pressure sensors

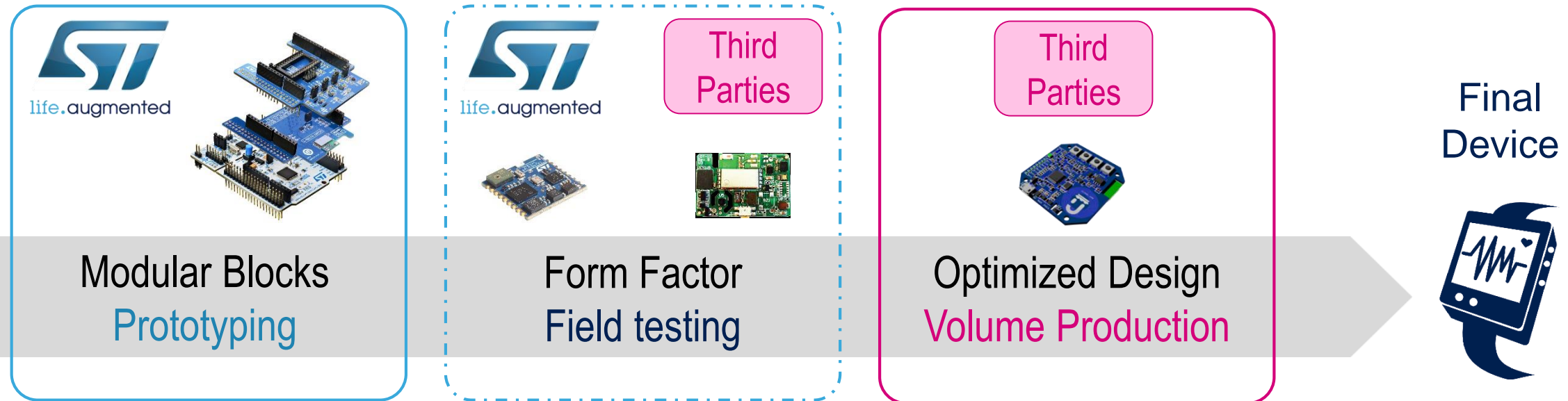| AMOLED Display Power	Touch Screen controller	General Purpose Analog
Wireless Charging	Fast Charging Solutions	Specialized Analog
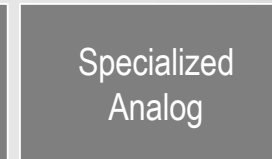
- Solutions for smartphone touch screen control and power supply
- Charging solutions for wireless charging and fast charging
- Broad range of general purpose and specialized analog solutions

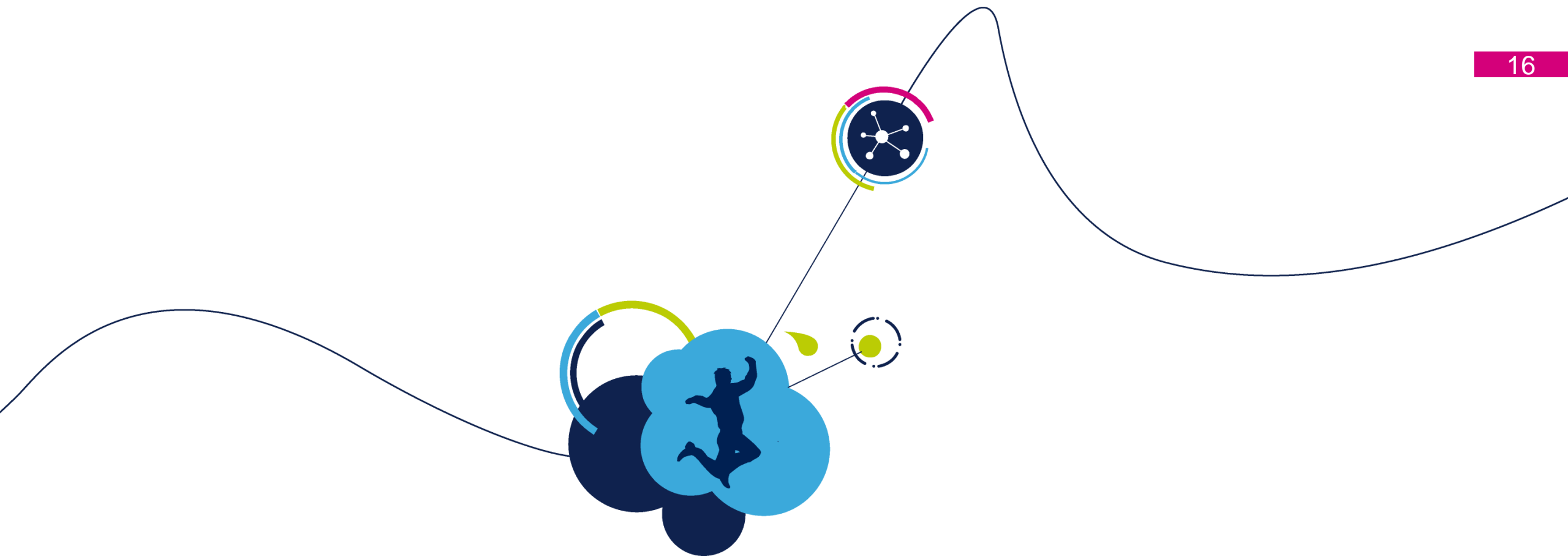# Lowering the Barriers for IoT "MVP" Developers

To accelerate Time To Market

Partnership with third parties - Form factor devices and customization

Third Parties

Third Parties

Final Device

Modular Blocks
Prototyping

Form Factor
Field testing

Optimized Design
Volume Production

Easy porting of developed software to final Product

HW/SW optimization and support for production

Thank You