



# Imagination

**MIPS IoT Solutions**

December 2016

[www.imgtec.com](http://www.imgtec.com)

# Imagination: A global technology leader

*A technology powerhouse for multimedia, processors, and communications IP*

## Developing innovative IP

- Leader in graphics, GPU compute and video IP
- The leading alternative mainstream CPU IP
- Leader in RPU communications IP

## Delivering exceptional service

- Enabling very fast time to market
- Enabling customers to leverage IP to maximise differentiation

## Driving major markets

- Helping our partners to create successful solutions
- Influencing new and emerging opportunities
- Showcasing and proving our technology with real products

### Revenues

**FY16: £120m (US\$ 158m)**

### Products

**More than 10bn units shipped**

- Over 3m per day
- Around 1.2bn in past year

### People

**>1,400 people world-wide**

- 20+ offices; HQ in UK
- >80% of staff are engineers

# Imagination's IP powers everything, everywhere

Mobile



Automotive



IoT



Consumer



Networking



AR / VR

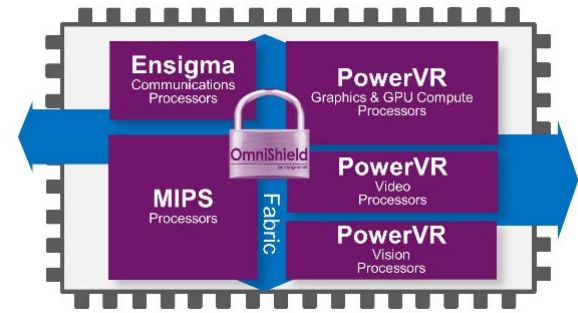


- We have extensive knowledge of market segments
- We work with partners who have specialist market knowledge
- Our core IP lets us target a wide range of segments

# Our core

- **MIPS: The CPU/MCU processor for differentiation**
  - True RISC, long heritage and comprehensive roadmap
  - Unique Multi-Threading and Virtualization features – even in M-class
- **PowerVR: The ultimate range of multimedia IP cores**
  - Tile Based Deferred Rendering, proven history of leadership in graphics & video, innovative vision developments
  - PowerVR Series 7/8XE: double digit licensee growth; strong pipeline
- **Enigma: The comprehensive choice for connectivity**
  - Widest range of standards, far lower power, value making flexibility
  - Licensing has never been stronger

*On top of this Imagination has the tools, partnerships, design and support to help our customers succeed*



# Examples: New MIPS-based chips entering market

*From entry-level to high-end*

## Leveraging MIPS efficiency for IoT



**MICROCHIP**

PIC32MZ EF  
Warrior M5150  
CPU

**SAMSUNG**

ARTIK 1  
2 M-class CPUs



FourGee LTE  
chips  
M5150 CPU



Colibri & Calliope  
LTE platforms  
Multi-thread CPU



Sensor hubs  
Warrior M-class  
CPU



QCA4531 for  
IoT nodes  
Classic CPU

## Differentiating through MIPS performance



OCTEON III  
processors  
64-bit CPUs with VZ

**LOONGSON**

3A2000 & 3B2000  
64-bit CPUs



T1 Processor  
Warrior P5600 CPU



EyeQ4 ADAS chip



HYDRA gigabit  
modem SoC  
Multiple CPUs

# Advantages of MIPS architecture

*Clear differentiation*



## Multi-threading

### Hardware multi-threading offering

- Increases amount of work CPU can be achieved in given time
- Unique in licensable CPU IP
- More efficient & lower cost alternative to adding extra CPU cores



## Virtualisation

### Hardware virtualisation available across entire performance range

- Available across the entire performance range
- Competitors only high end → unsuitable for power & cost requirements of IoT



## Security

### Multi-zone security

- Available now → essential for multi-domain security for IoT

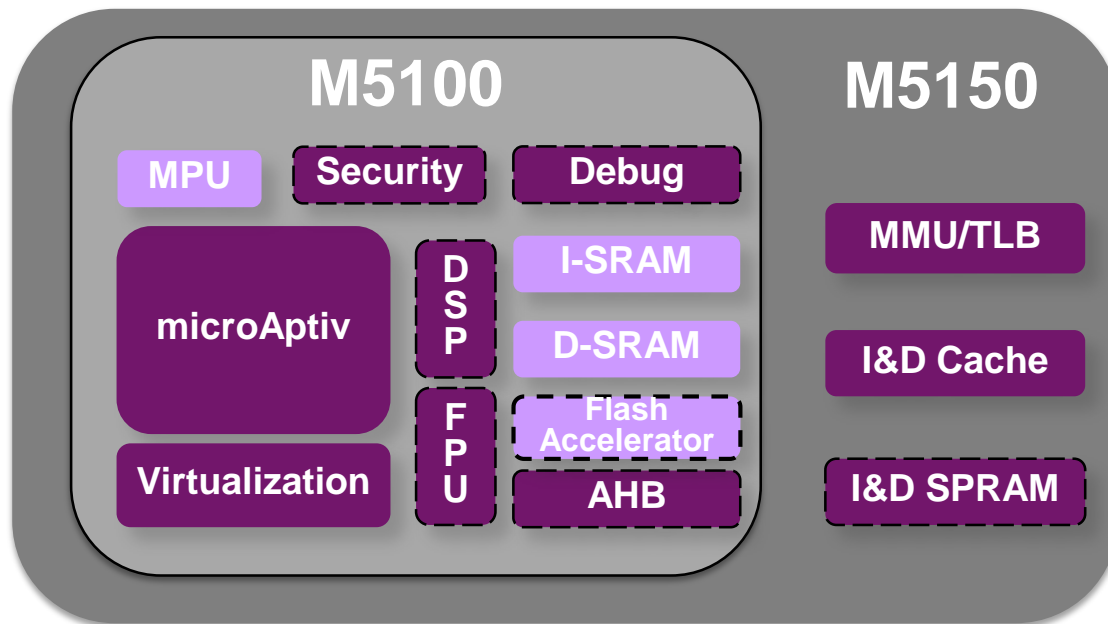
# MIPS IoT-Engine Specification

Device	Microchip Technology PIC32MZ PIC32MZ0512EFE100
CPU	MIPS M5150 CPU core Single/Double precision Floating Point Unit DSP Instruction microMIPS Instruction Hardware Virtualization
Frequency	200MHz/330DMIPS
ROM	512KB Flash memory (plus an additional 160 KB of Boot Flash)
RAM	128KB SRAM memory
Temperature Range	-40-125 (C)
Supply Voltage	2.2V-3.6V
DMA Channels	8
SPI	6
I <sup>2</sup> C™ Compatible	5
USB	HS2.0 Device/Host/OTG
ADC	12bit 18Msps
16-bit Digital Timers	9
Comparators	2
Internal Oscillator	8 MHz, 32 kHz
RTCC	Yes
Debug IF	EJTAG ICSP



# M5100/5150 Key Features

Optimized solutions for embedded MCU or microprocessor applications



## 5 stage pipeline

### M5100 - microcontroller core

- I&D SRAM
- Memory Protection Unit (MPU)
- Flash Accelerator (option)

### M5150 - microprocessor core

- MMU/TLB
- I&D Cache

 M5100 specific

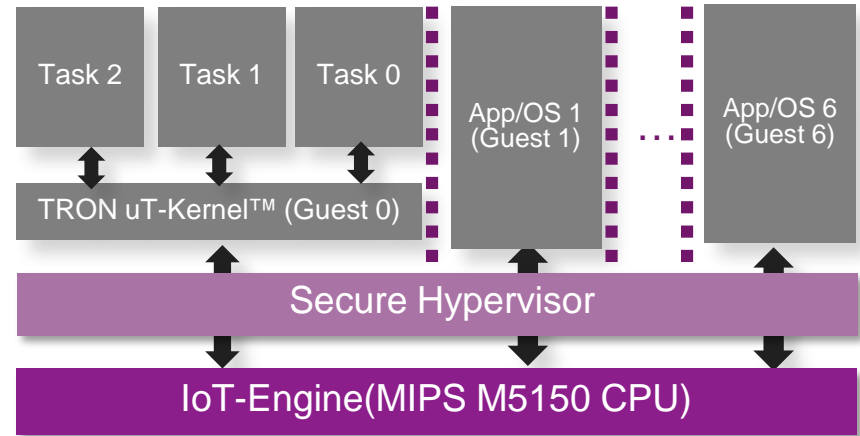
 optional



# Security & Reliability

## *HW Virtualization as the foundation*

- Security
  - Root is the secure hypervisor
  - Guest access rights controlled by Root
- Reliability
  - Corrupted/crashed OS1 cannot affect OS2
  - Supports multiple Guest domains ‘Secure Containers’ (up to 7 in M51xx)
  - Shadow Register Sets can be used for each guest – no context switching overhead
  - Interrupts and most exceptions can be dealt with entirely in the Guest
  - No modification of Guest OS required
  - Same Virtualization scheme used in I- and P-Class cores



# What makes Imagination the choice of leaders



- We have leading technologies in each of our three key IP pillars
- We have innovative and flexible approach centred on helping customers to differentiate
- We actively invest in our Ecosystem along with our partners
- Our royalty based business model means we only succeed if our customers succeed

**We do everything we can to ensure our partners' success**



# Imagination

**Thank you!**

Questions?

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