

# Arm Holdings

## Q3 2017 Roadshow Slides

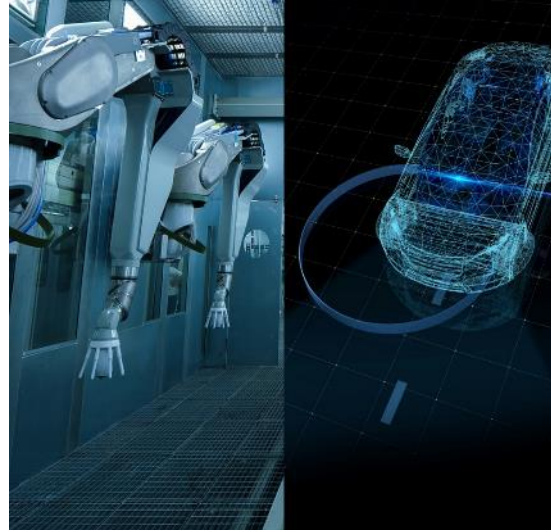


Arm Holdings is a subsidiary of  SoftBank

# Technology trends that will redefine all industries



Artificial Intelligence in every device



Autonomous machines



Augmented reality



Hyperscale cloud and connectivity



Security and Privacy

# Arm defines the technology that will redefine all industries



	Mobile and Consumer	Networking and Servers	Automotive and Robotics	Internet of Things
Artificial Intelligence in every device	✓	✓	✓	✓
Autonomous machines			✓	✓
Augmented reality	✓		✓	
Hyperscale cloud and connectivity		✓		✓
Security and Privacy	✓	✓	✓	✓



# Arm introduction

## Global leader in technology licensing

- R&D outsourcing for semiconductor companies

## Innovative business model

- Upfront licence fee – flexible licensing models
- Ongoing royalties on partner sales
- Technology reused across multiple applications

## Long-term, secular growth markets



**>1,550 licences**  
Growing by >100  
every year

**>500 potential  
royalty payers**

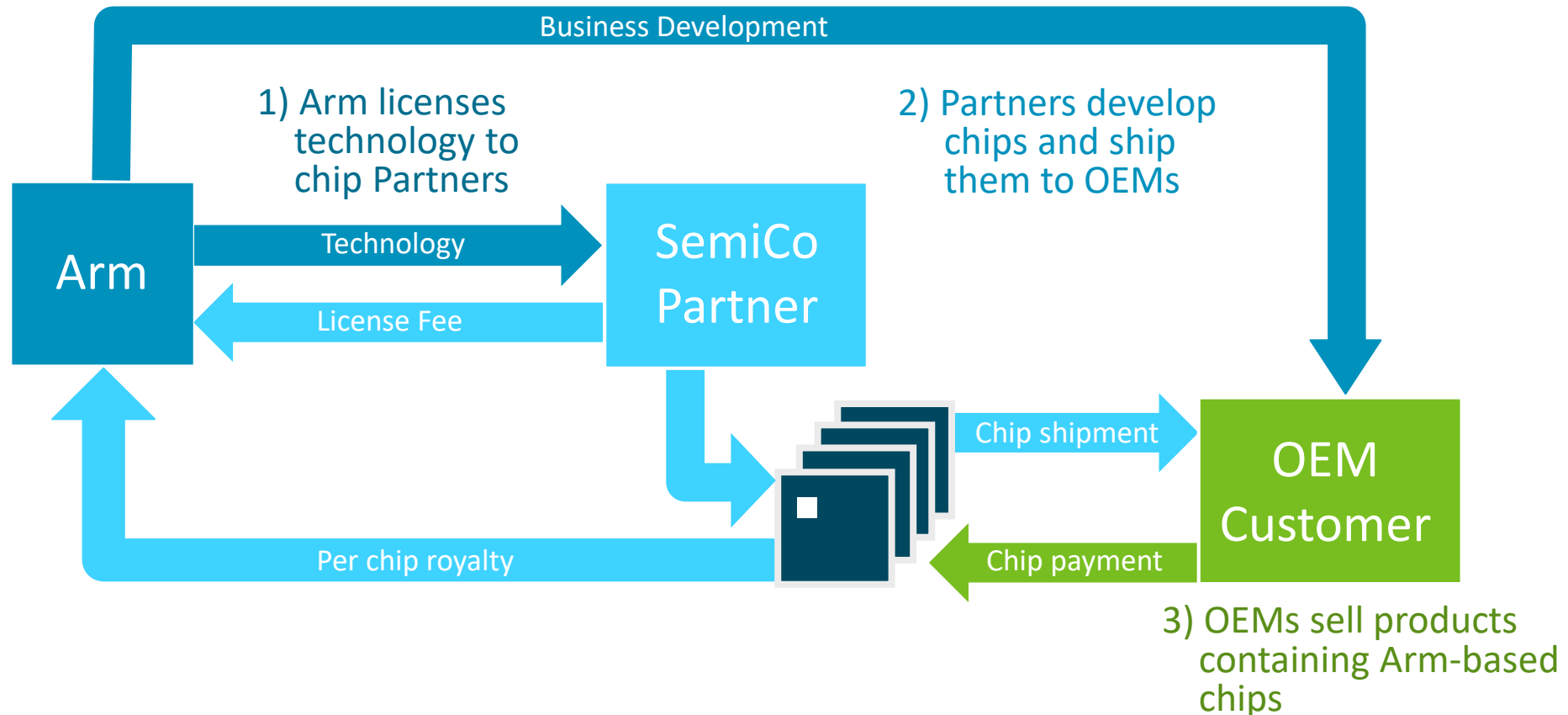
**>20 bn Arm-based chips  
shipped in past year**

**~15% CAGR over  
previous 5 years**

# Arm's business model

Arm develops technology that is licensed to semiconductor companies

Arm receives an upfront license fee and a royalty on every chip that contains its technology



# Arm's strategy

Maintain or gain share in long-term growth markets

- From mobile phones to networking infrastructure and servers to embedded smart devices and automotive

Increase value of Arm technology per smart device

- Invest in developing more advanced processors with higher royalty rates
- Physical IP and multimedia IP further increase Arm's value per chip

Explore and exploit new opportunities in emerging applications created by the Internet of Things

Invest to create a sustainable business, fit for the long term

- Create superior returns by developing new technology that will deliver increased profits and cash generation in the future



# Arm's main growth markets

## Application Processors



**\$55bn**  
TAM 2025

- Smartphones, tablets and laptops
- Apps processor, modem, connectivity, touchscreen and image sensors
- Growth coming from higher-value Arm technology such as Arm v8-A, octa core, multimedia

## Networking & Servers



**\$38bn**  
TAM 2025

- Base stations, routers, switches, and servers for cloud and data centres
- Networks evolve to cope with increased data at lower latency: virtualisation, integration and programmability
- Most major chip vendors have announced Arm-based products

## Embedded Markets



**\$85bn**  
TAM 2025

- Automotive, white-goods, wearables, smart devices in industrial and utilities
- Microcontrollers, smartcards, embedded connectivity chips
- 200 companies have licenced Arm processors for use in embedded intelligent devices

# History of Arm

Joint venture between  
Acorn Computers and Apple



1990

Designed into first mobile  
phones and then smartphones



1993 onwards

Now all electronic devices can  
use smart Arm technology



Today

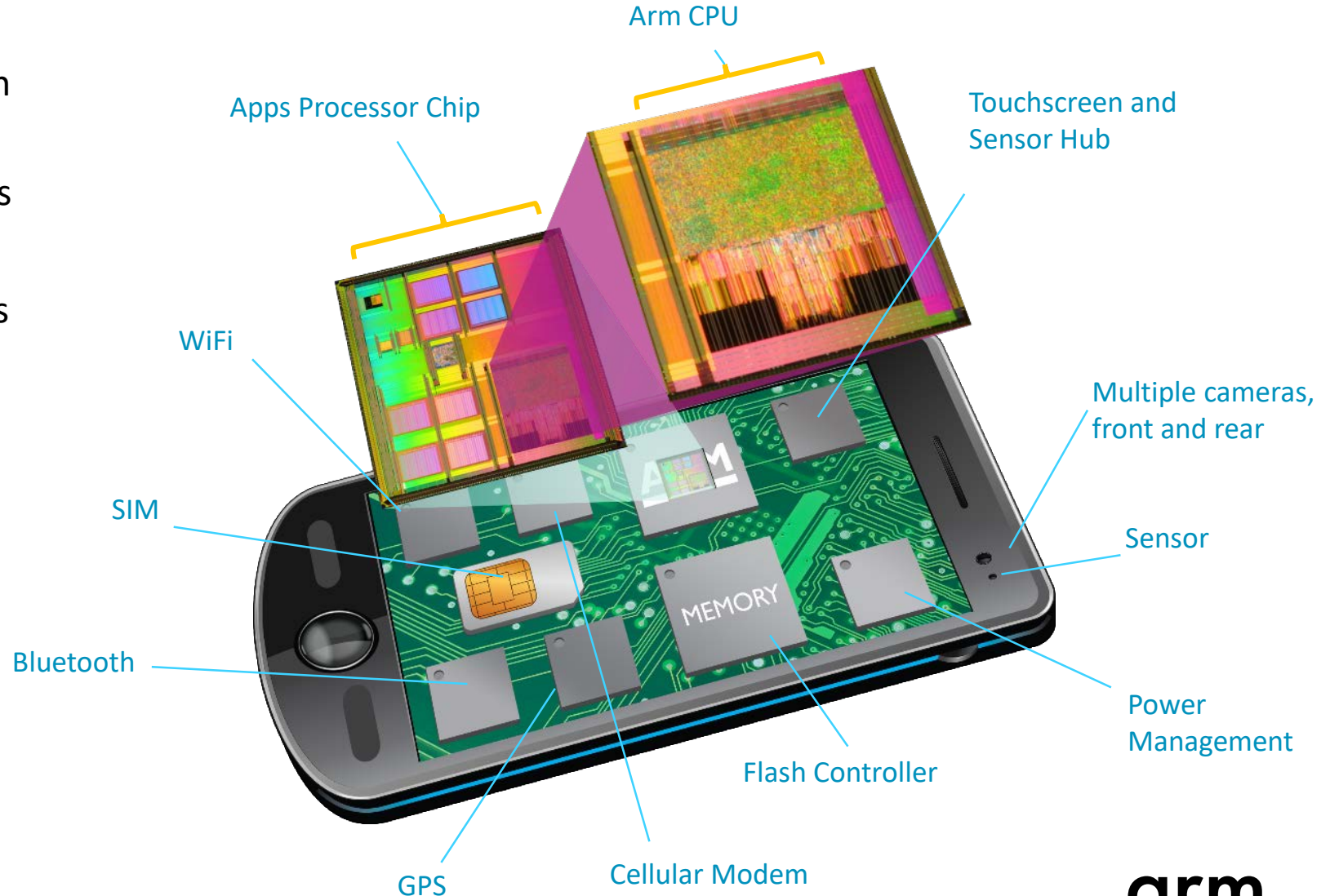


# Smart devices contain many Arm processors

**Applications Processor** chips can contain multiple Arm technologies

- Arm v8-A processor for OS and apps
- Cortex-R controller for modem
- Cortex-M controllers for peripherals
- Arm Mali multimedia processors: GPU, video, display, camera, etc.
- Arm physical IP

When new functions are added to smartphones it creates opportunity for new Arm IP



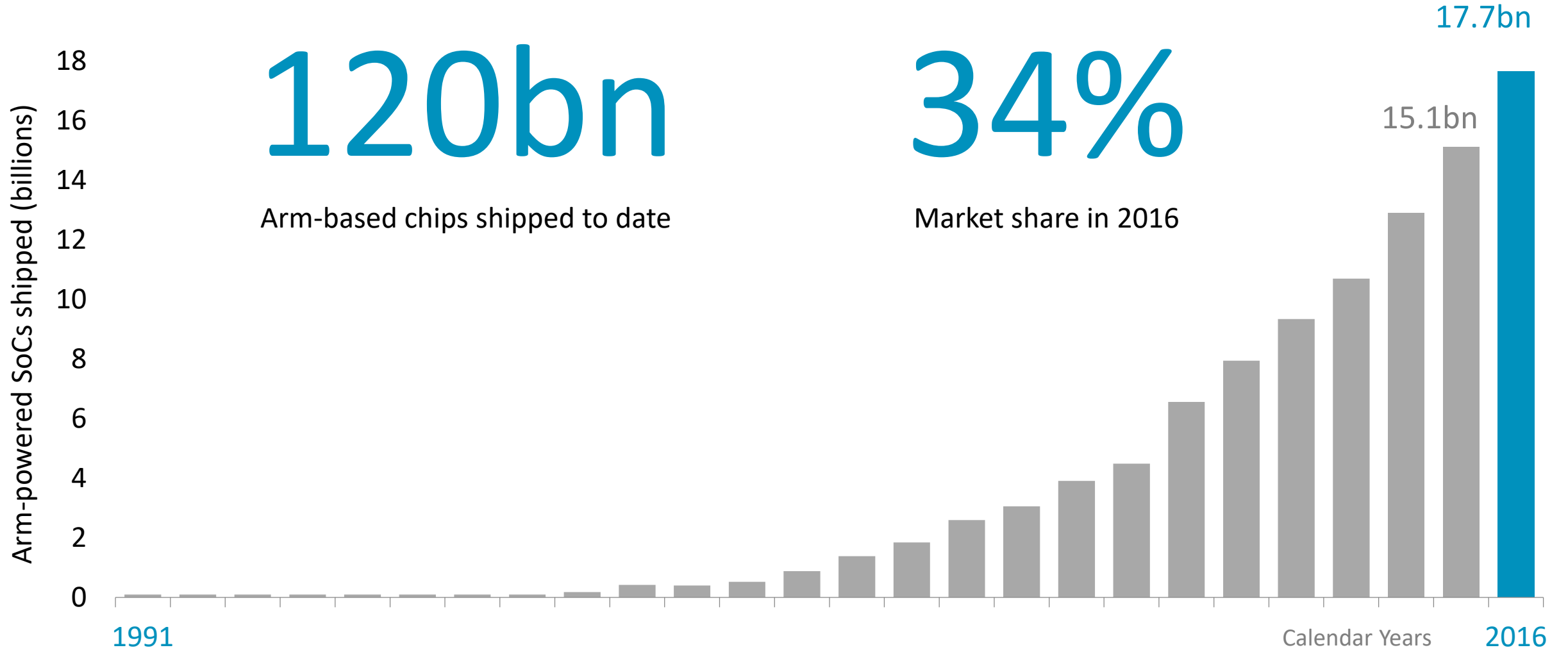
# Arm-based chip shipments

120bn

Arm-based chips shipped to date

34%

Market share in 2016

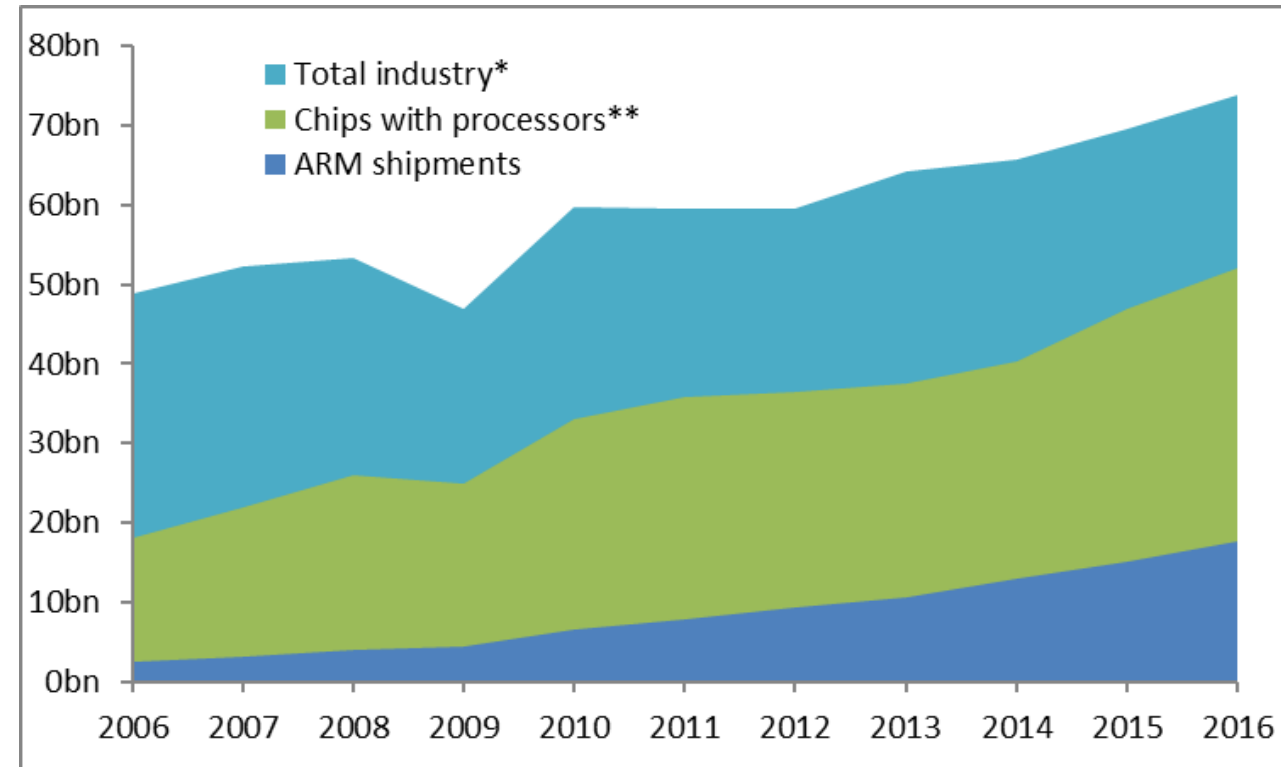


# Arm's opportunity continues to broaden

Semiconductor industry continues to grow:  
4% by volume, 1% by value over past five years

Proportion of chips with processors is increasing:  
70% in 2016

Arm is gaining share within the “chips with processors” segment of the industry:  
34% in 2016



\* Data source: WSTS, March 2017 and Arm,  
Industry volume excluding analog and memory

\*\* Arm estimates

Calendar years

# From revenue to profits

FY 2016 Revenues	\$m	£m	%revs	
Licensing	601	437	34%	←
Royalty	974	751	59%	←
Software and Services	114	83	7%	
<b>Total</b>	<b>1,689</b>	<b>1,271</b>	<b>100%</b>	
Costs (£m)		667		←
<b>Adjusted EBITDA (£m)</b>		<b>604</b>		←
Operating Margin		48%		←
Other expenses (£m)		292		←
IFRS EBIT (£m)		<b>312</b>		

Over 95% of revenues earned in US dollars

Royalties are a growing proportion of revenues

Cost increase as Arm accelerates investment in R&D for future product developments

10% move in \$/£ impacts profits by ~15% (forex impacts £ revenues *and* costs)

Operating margins are lower than in recent periods as investments grow faster than revenues

Excludes amortisation of intangibles related to the acquisition of Arm by SoftBank



# Qtr. ending December 2017 – Financial summary

Revenues (\$m)	Q3 2016	Q3 2017	Growth
Licensing	229	190	-17%
Royalty	248	297	20%
Software and Services	31	33	6%
Total (\$m)	508	520	2%
<hr/>			
Revenues (£m)	Q3 2016	Q3 2017	Growth
COGS (£m)	12	21	75%
R&D (£m)	92	154	67%
SG&A (£m)	72	122	69%
Costs (£m)	176	297	69%
Adjusted EBITDA (£m)	216	93	-57%
<hr/>			
Depreciation & amortisation	13	17	31%
Other operating expenses (£m)	-11	34	-
IFRS EBIT (£m)	214	42	-80%

Licensing can fluctuate quarter to quarter  
Q1 up 22%; Q2 down 17%; Q3 up 54% seq.

Royalty revenue growth driven by market share gains and increasing royalty per chip

Nearly 100% of Arm's revenues are in USD  
40% of costs are in USD and 40% in GBP

25% increase in total headcount  
New remuneration schemes post acquisition

Currency fluctuations lead to mark-to-market revaluation of long-term contracts

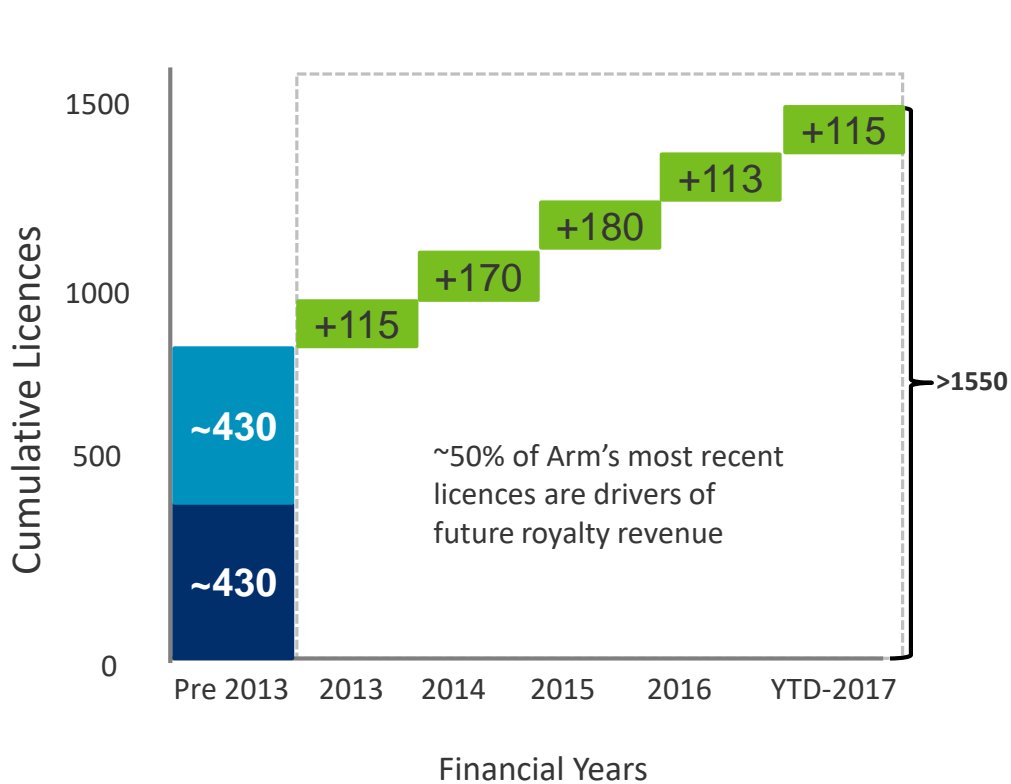
YTD IFRS EBIT margin 16% excluding impact of exchange rate fluctuations

# Licensing enables future royalties

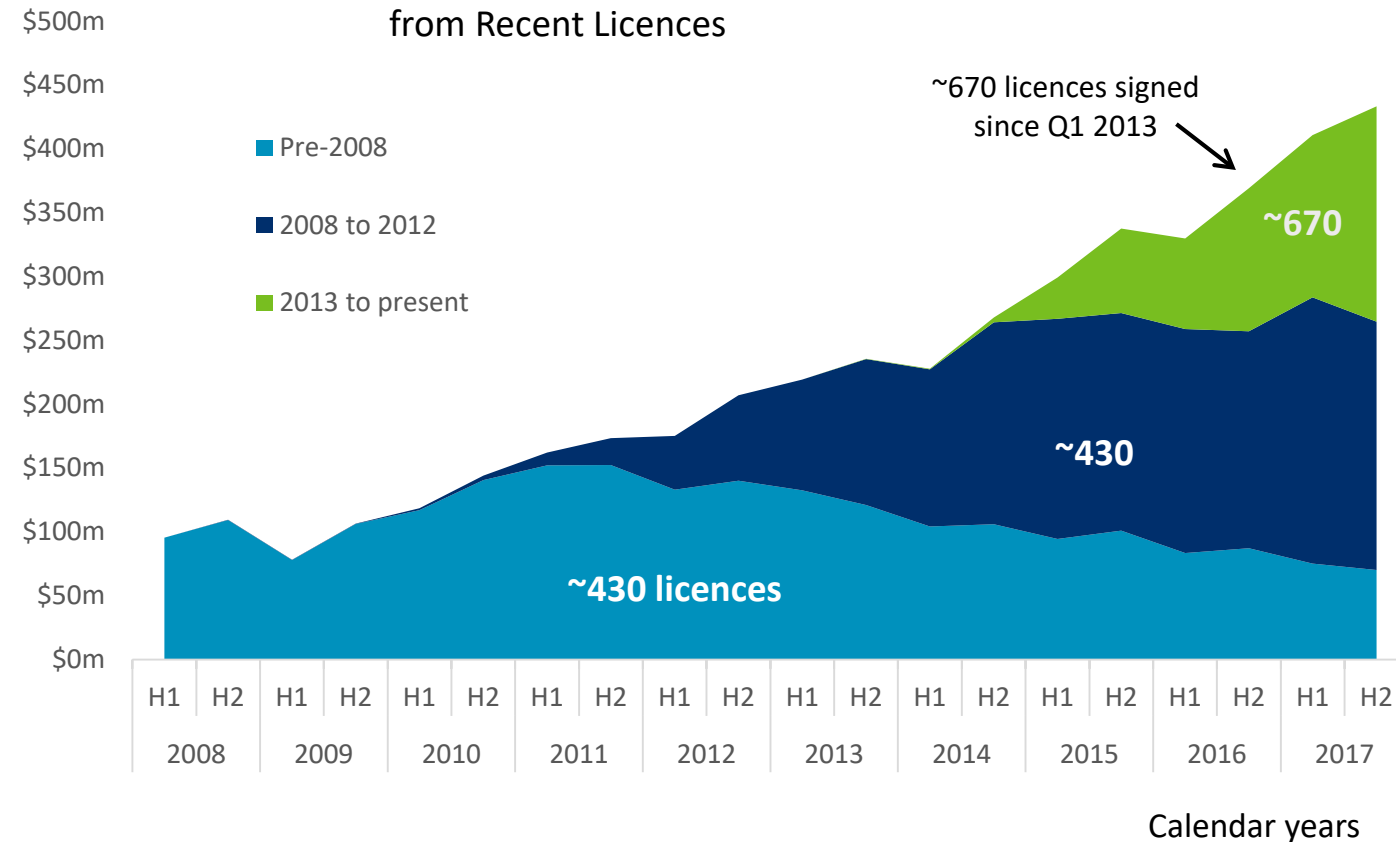
Arm signed 115 licences YTD 2017

Arm's current royalty revenues are derived from licences signed many years ago

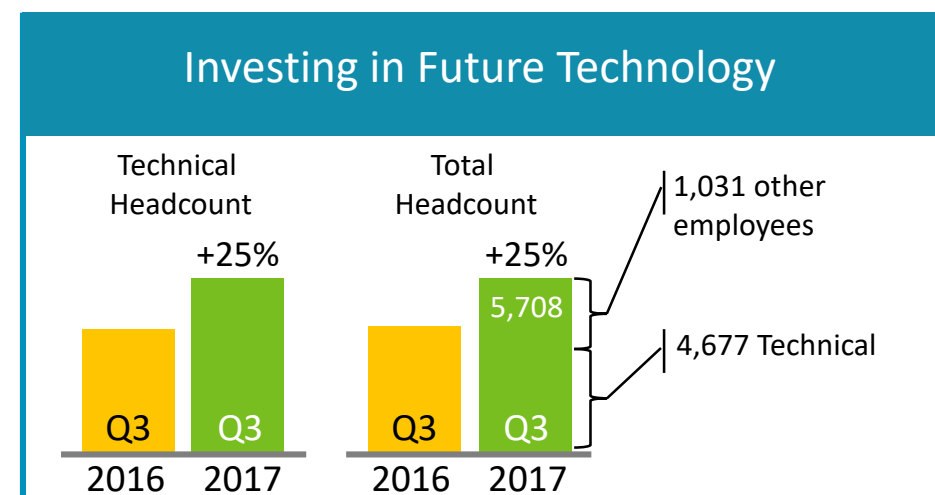
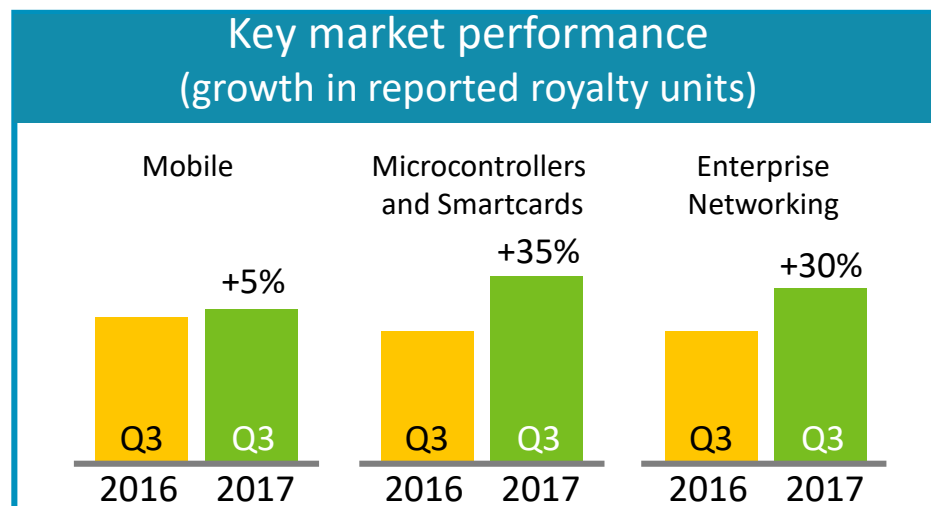
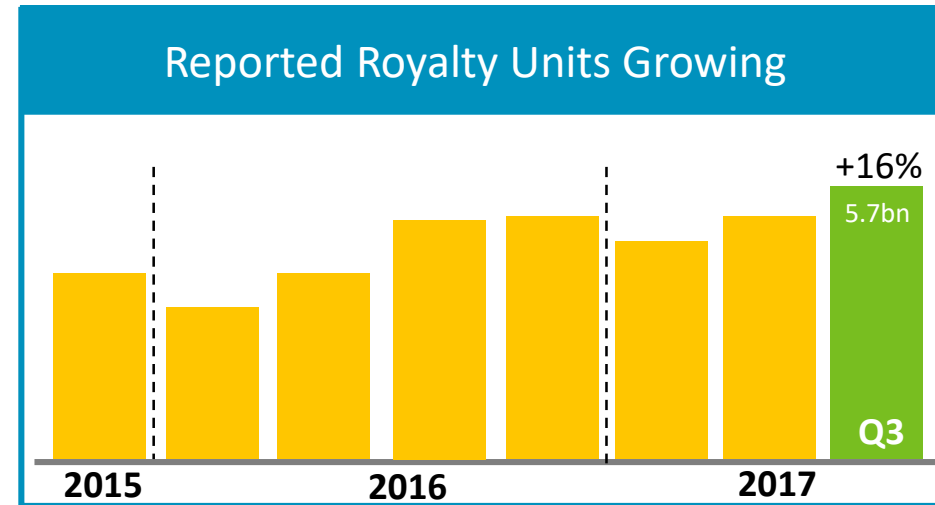
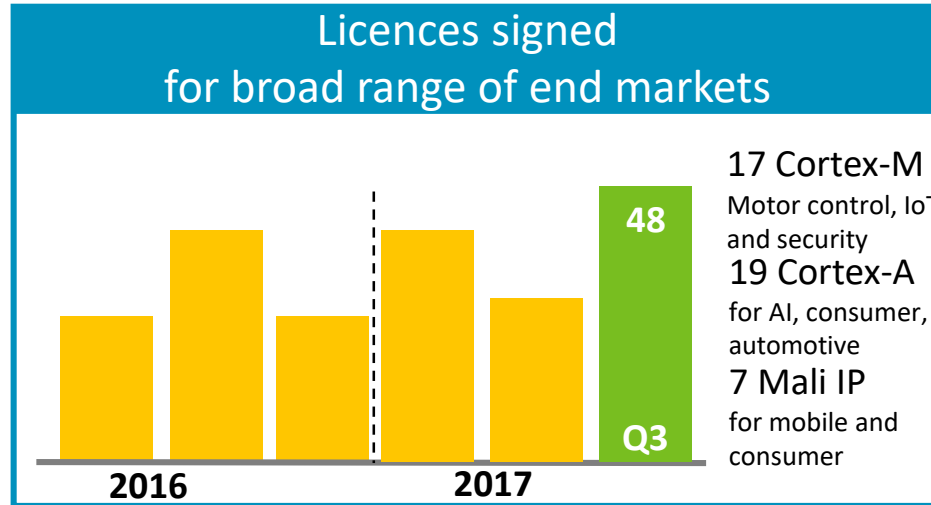
Growing base yields royalty revenues over long period



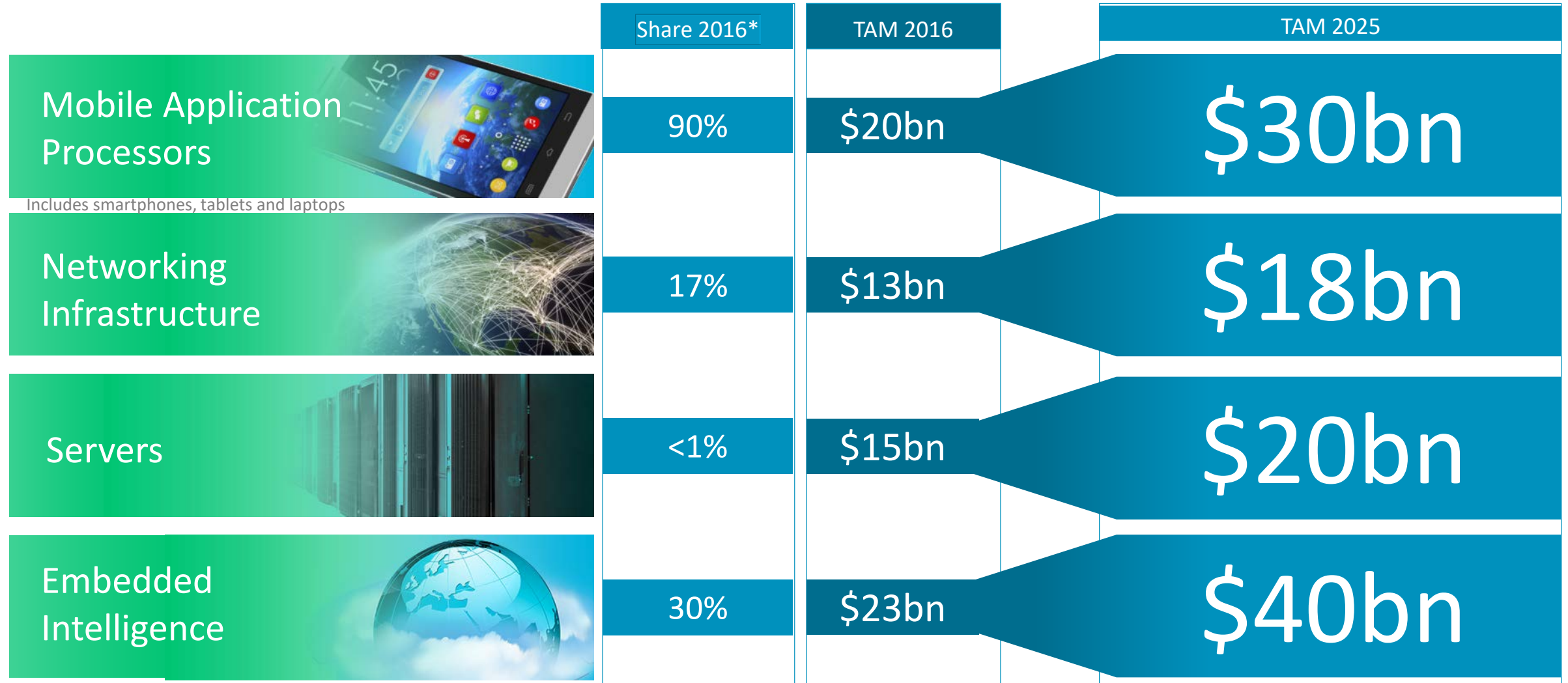
### Significant Royalty Potential from Recent Licences



# Qtr. ending December 2017\* – Progress against strategy



# Arm's expanding opportunity



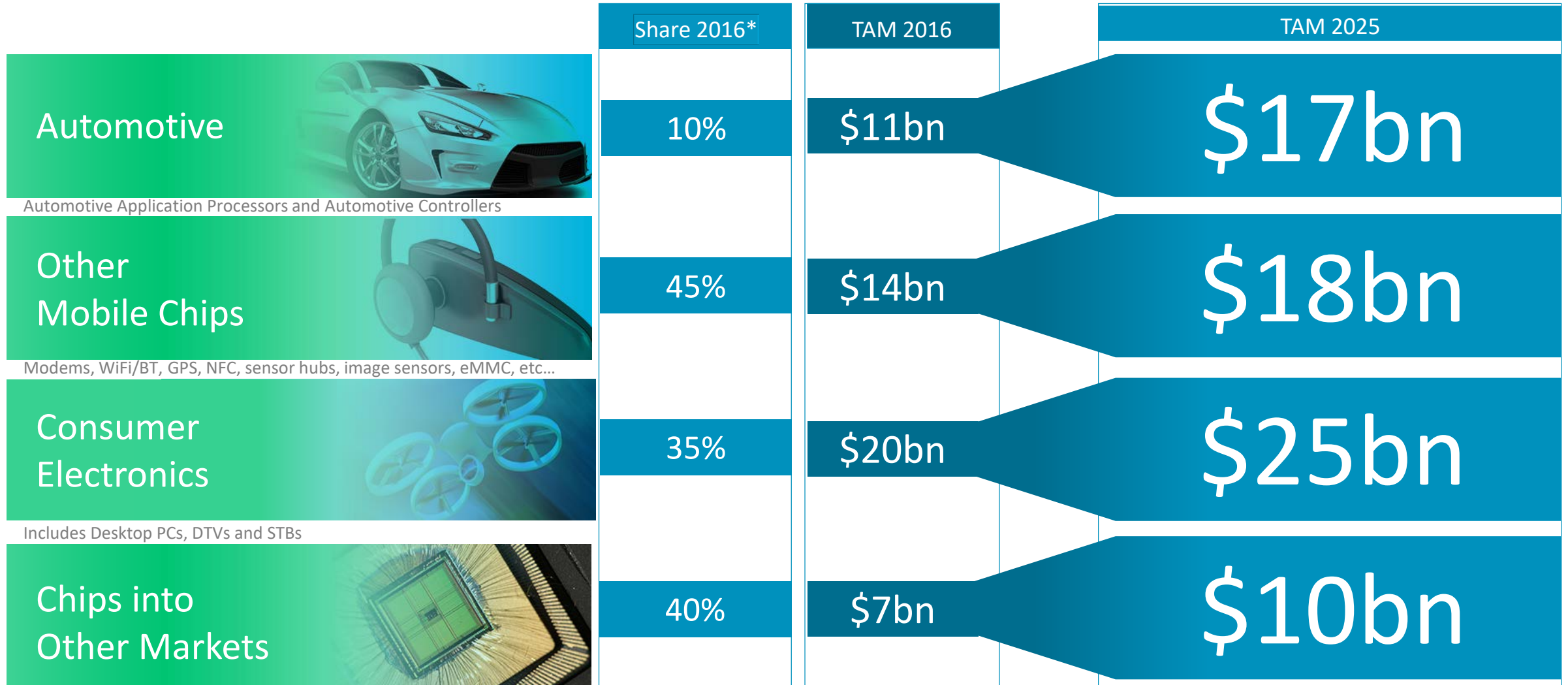
Includes microcontrollers, smartcards and non-mobile connectivity. Excludes automotive

\* 2016 Arm Market Share by Volume

† Total Available Market (TAM)



# Arm's expanding opportunity

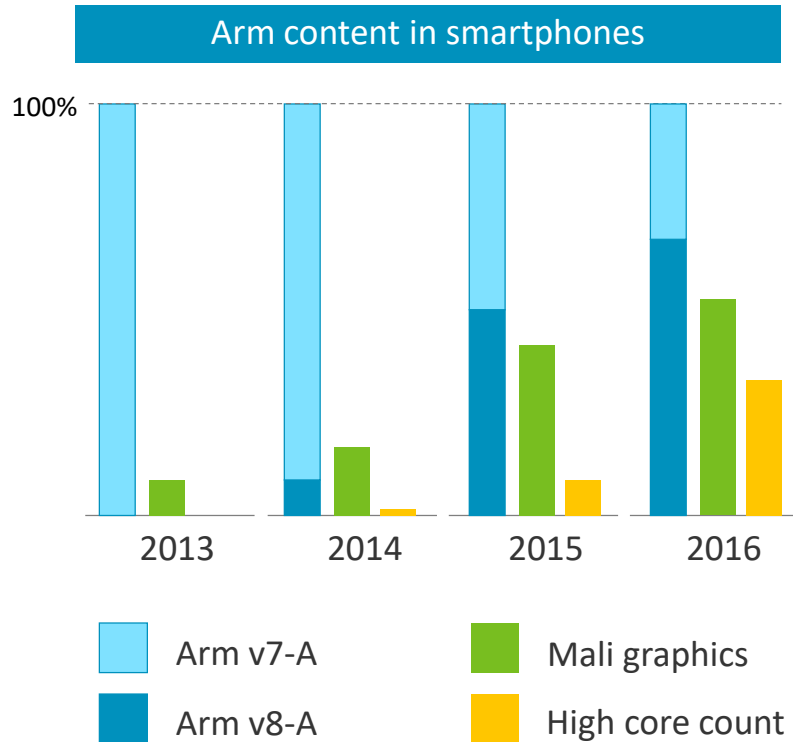


\* 2016 Arm Market Share by Volume  
 † Total Available Market (TAM)

# Arm's opportunity in mobile and consumer

Continued growth from advanced technology and new form factors

## Growth has been driven by advanced Arm technologies

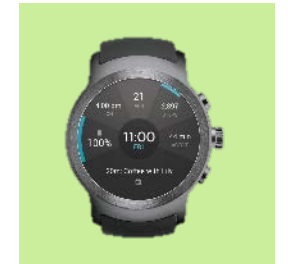


## Consumers pay a premium for performance and features



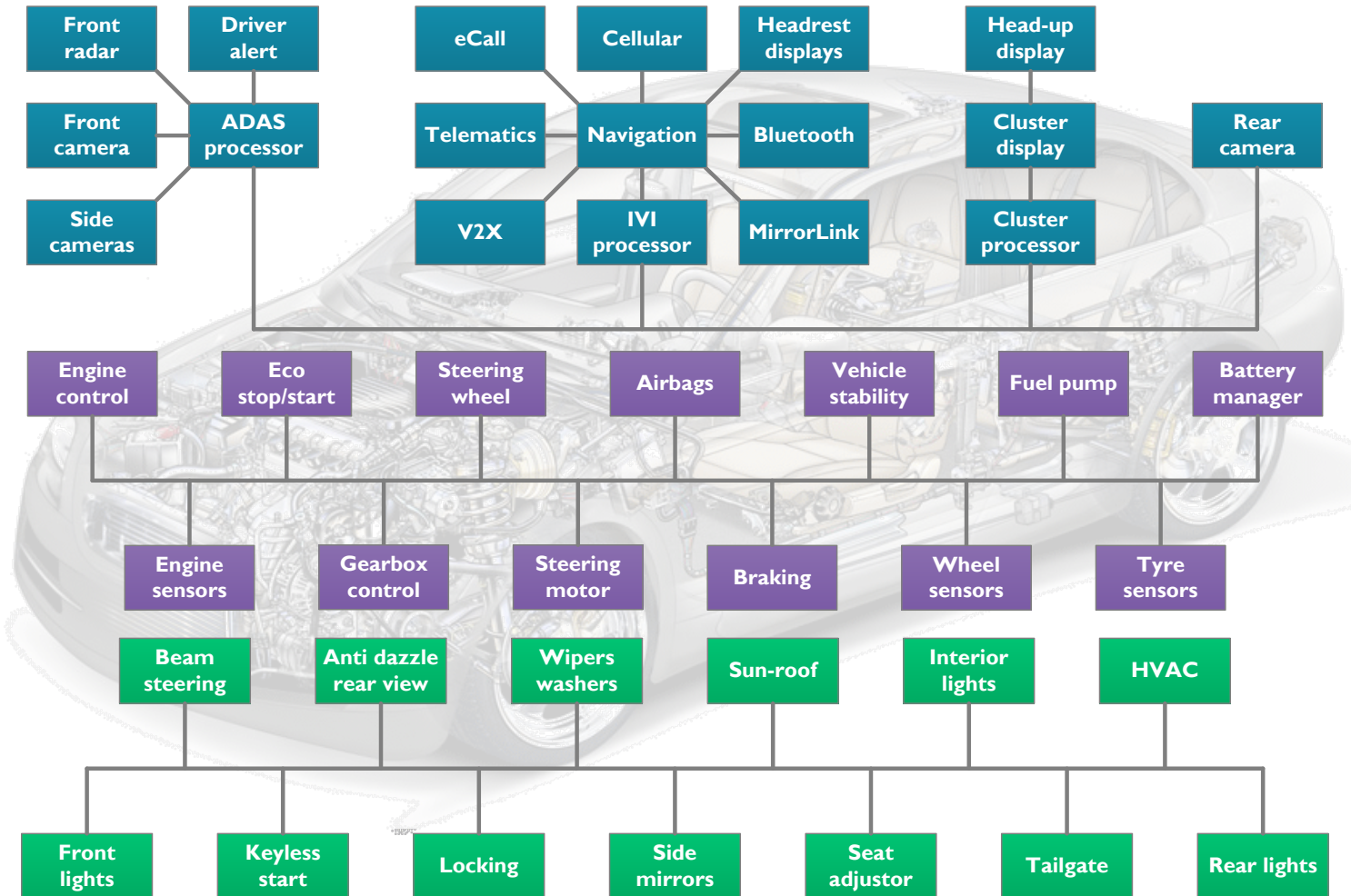
\$60 of Arm-addressable chips in the latest high-end smartphones

## Investment in smartphones has led to new form factors



# Arm's opportunity in automotive

Functional safety, consolidation, partitioning, performance, power, cost



Autonomous driving, ADAS, Cluster, Connectivity

Powertrain, chassis

Body electronics, sensors, actuators, communications

# Arm's opportunity in servers

Targeting 25% share (~1% share today)

## Arm processors are suitable for >50% of data centre workloads

Microsoft has ported the core components of Windows Server onto Arm



- Search and Indexing
- High-performance storage
- Machine learning and big data
- Web servers, database servers
- Email, PaaS services

## Arm v8-A selected for High Performance Computing

Barcelona Supercomputer Centre selects Arm v8-A for Mare Nostrum 4



Fujitsu and RIKEN select Arm v8-A for the Post-K supercomputer



## Now shipping into enterprise applications

Arm v8-A server chips are shipping in volume into storage appliances.

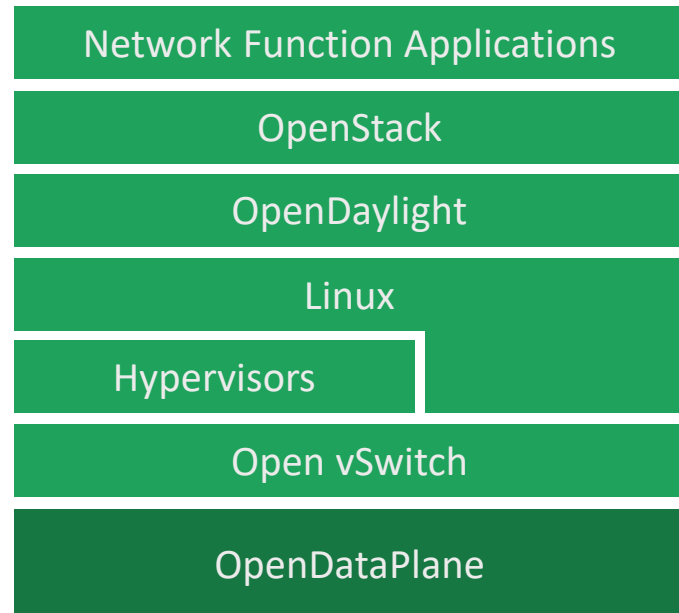




# Arm's opportunity in networking

Targeting >50% share of chips in next-generation networks

Future networks will be based on open source collaboration



Networking software is being optimised for Arm-based chips

OpenDataPlane project members



Accelerating data comms from server to server



*“When you offload to hardware, you run roughly a tenth the latency, a tenth the power, a tenth the cost. Here’s some great news: we’re in the semiconductor business!”*

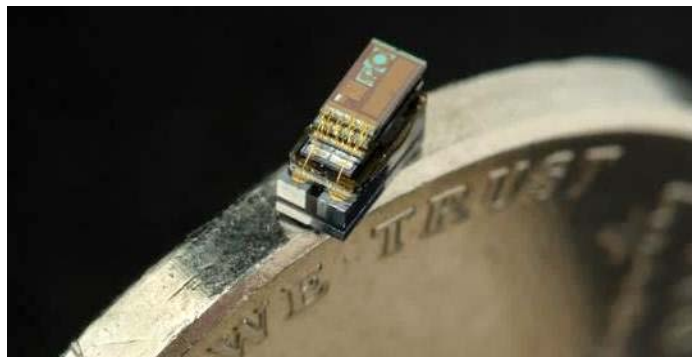
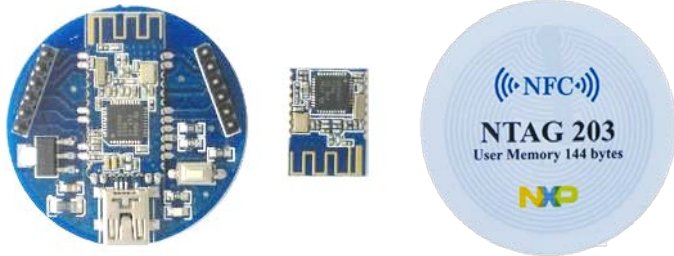
James Hamilton, VP and Distinguished Engineer, AWS



# Arm's opportunity in IoT – silicon IP

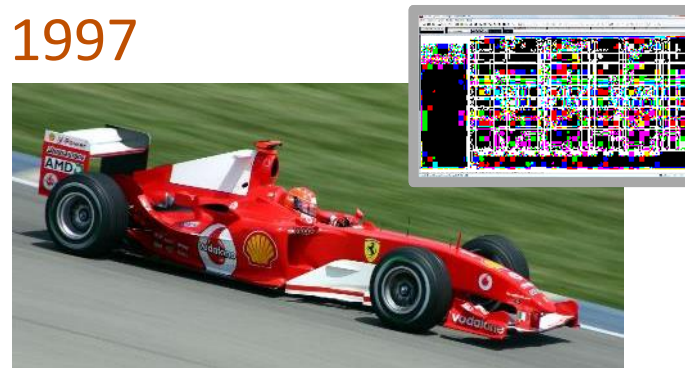
The architecture of choice for IoT developers

## Cortex-M processors enable secure, low-cost IoT devices



## High-value tech is now available at consumer price points

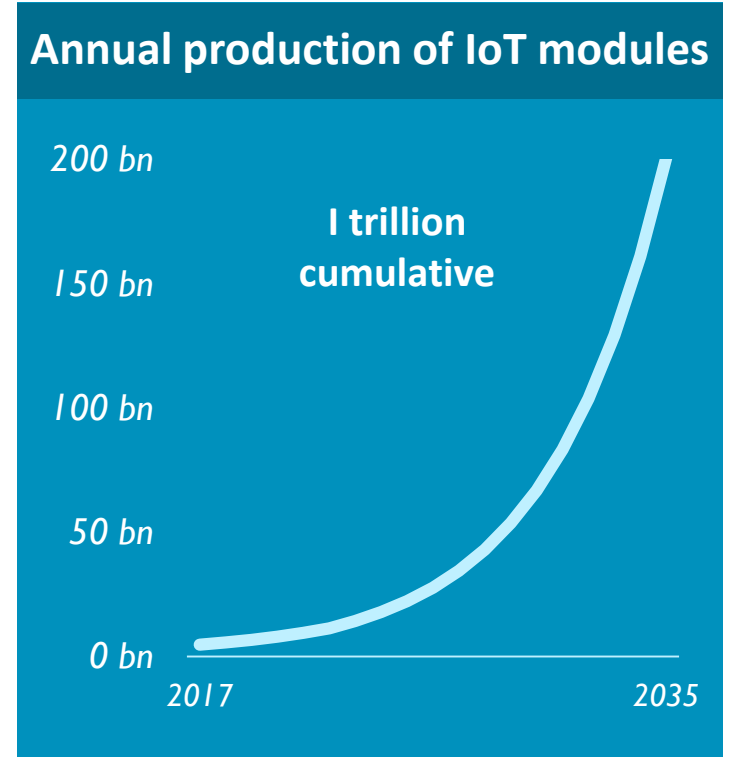
1997



2017



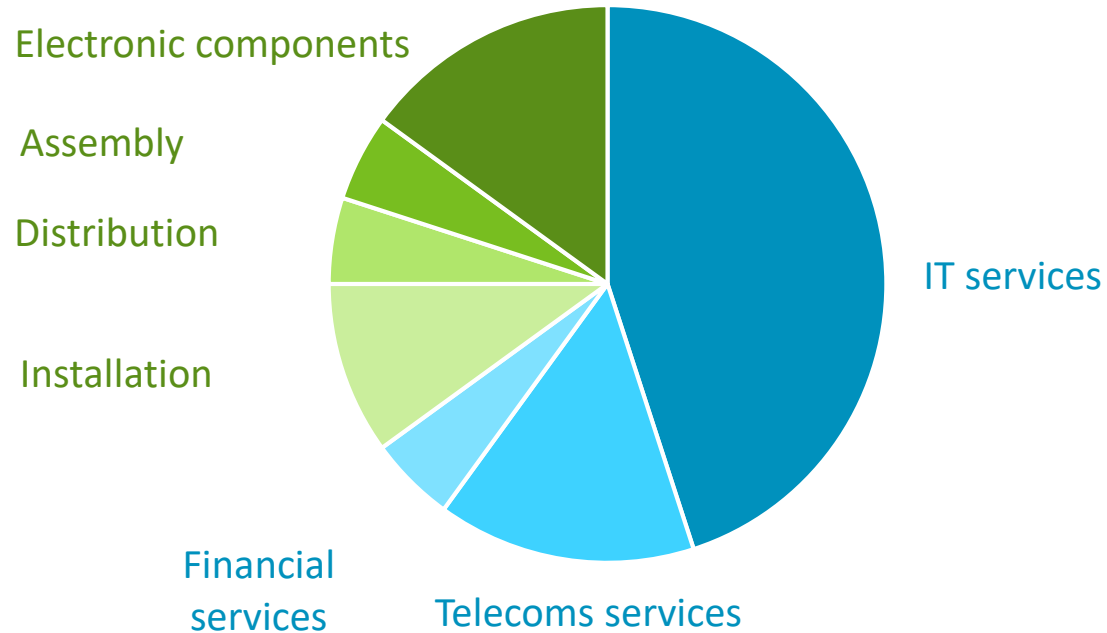
## Every thing will be connected



# Arm's opportunity in IoT – software and services

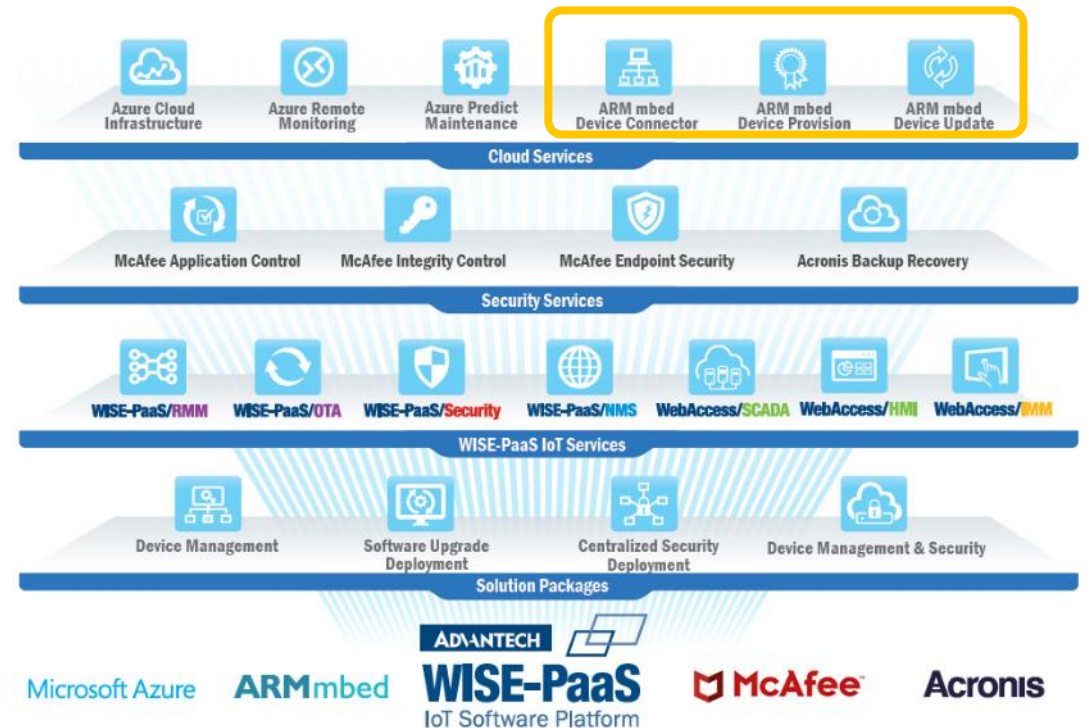
Investing to create new revenue streams

Arm forecasts a \$1 trillion TAM for IoT technology in 2035



*The TAM refers to IoT technology (electronics, software, services) only, it excludes the value of the 'things' that contain the IoT modules*

Arm's IoT platform is being integrated into OEM lifetime management services





# Artificial intelligence in every device

Learning in the cloud, inference at the edge

## Mobile



## Automotive



## Robotics



## Drones



## IoT



## Home, surveillance & analytics



## VR/MR



## Shipping & logistics





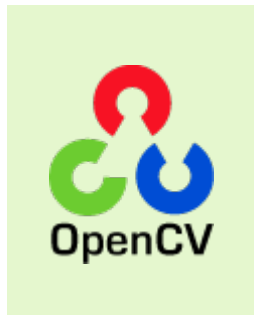
# Machine learning and computer vision

The key workloads for intelligent computers

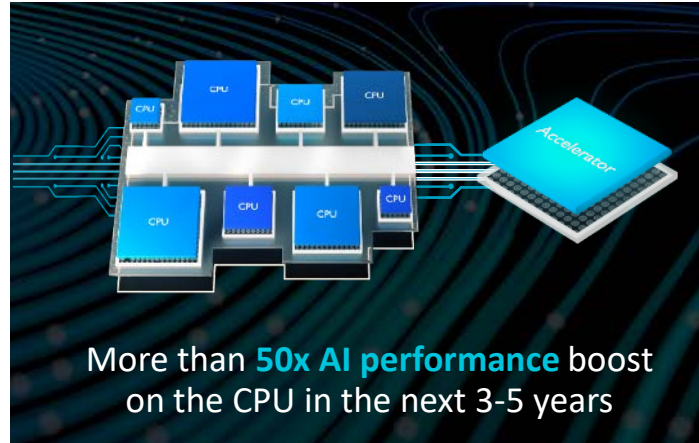
Widely-available software tools give developers access to ML



arm COMPUTE LIBRARY



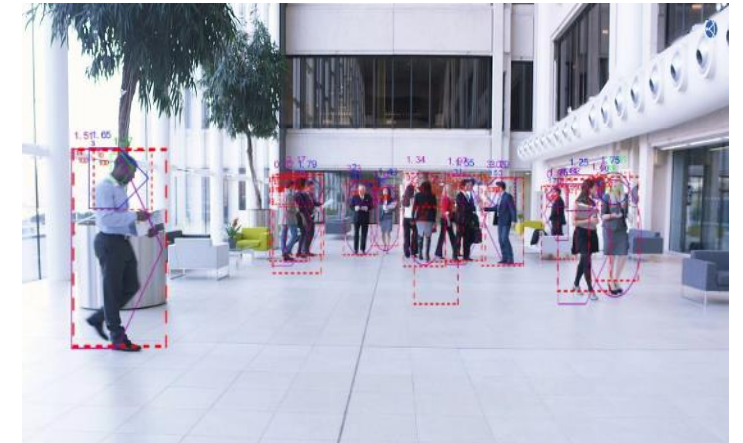
Optimise for performance, cost and programmability



arm DynamIQ

The latest Arm v8-A CPUs implement new instructions for ML calculations, and increase the memory bandwidth between CPUs and accelerators.

Stable algorithms can be hardwired into accelerators



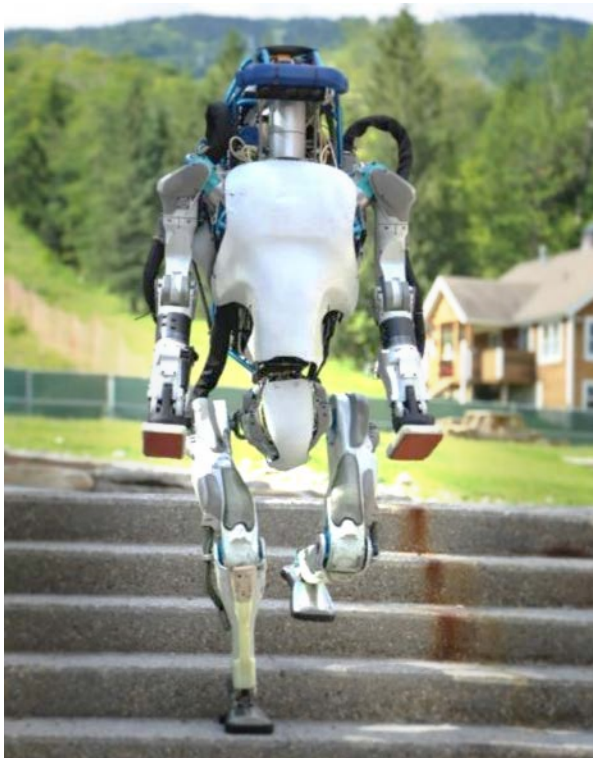
arm COMPUTER VISION

Arm's silicon IP for computer vision identifies objects in moving images. It is smaller and more power efficient than equivalent software implementations.

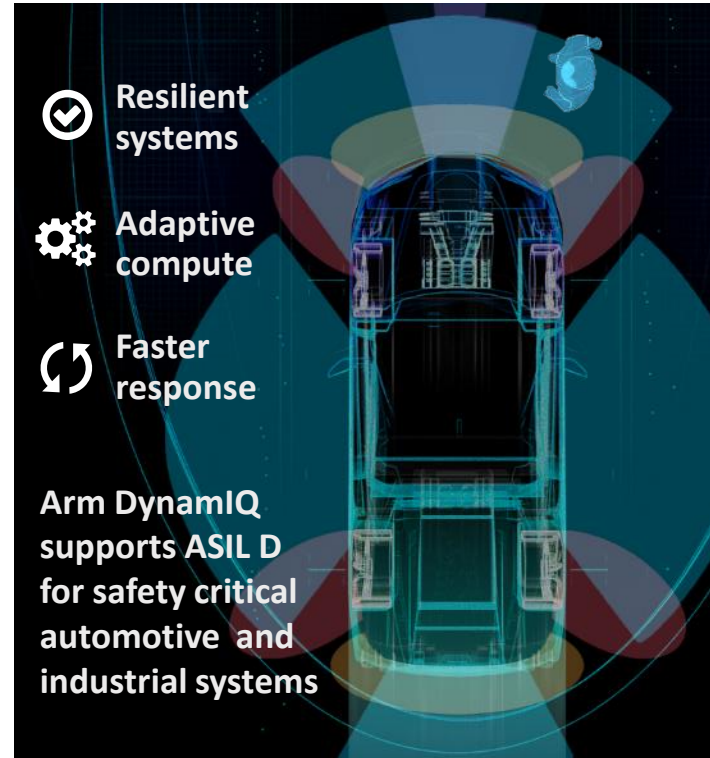
# Autonomous machines

Advanced compute is moving to the physical domain

Robots and autonomous cars will operate alongside people



The physical domain requires stringent safety standards



Vehicle electrification will force the pace of change



- All future models from Volvo will have electric or hybrid engines
- UK and France have announced plans to phase out petrol vehicles by 2040

# Augmented reality

New experiences and new user interfaces

## Seamless interactions between humans, machines and data



Augmented reality (AR) overlays digital information onto the user's view of their immediate surroundings.

AR relies on advanced display technologies and new techniques for reading user input, such as 3D sensors.

## A demanding roadmap for mobile GPU performance



**Latency: <16ms**  
to avoid motion sickness

**Frame-rate: >60 Hz**  
for a smooth viewing experience

**Resolution: 2K minimum**  
for realistic images

## Driving innovation in displays, 3D sensors and computer vision



Source: Sony



# Hyperscale cloud and connectivity

Infrastructure for the information revolution

## Enterprise compute is moving to the cloud

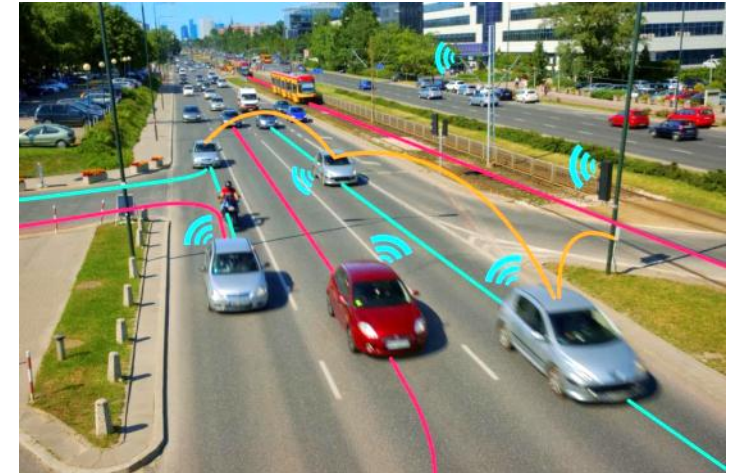


## Insatiable demand for data is driving new standards

### Performance targets for 5G networks

- **1000x** data volume per km<sup>2</sup>
- **1000x** connections per km<sup>2</sup>
- **100x** user data rate
- **80%** reduction in latency
- **80%** reduction in opex
- **90%** reduction in energy

## Workloads will be shared across devices, base stations and servers

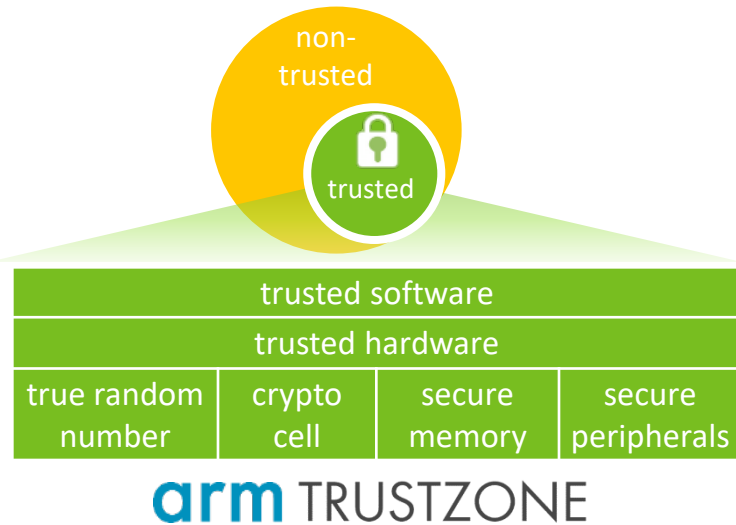


Autonomous vehicles will be controlled by computers in the car, in neighbouring cars, in nearby base stations and in remote datacentres

# Information security

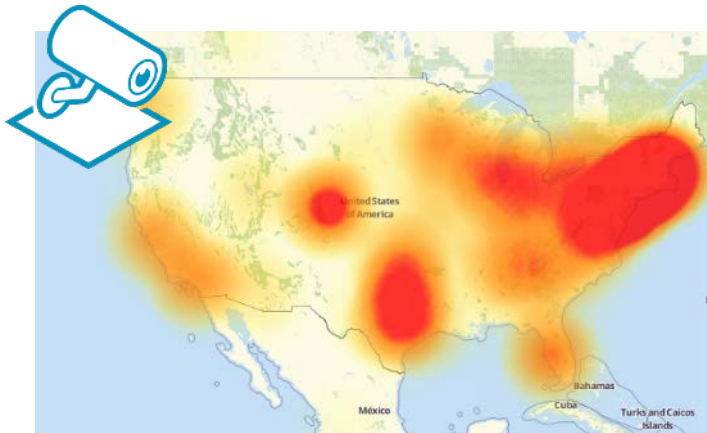
The fundamental component of all connected systems

## Secure systems are built on a hardware root of trust



- Secure Identity – Software Identity –
- Secure Boot – Isolation – Authentication –
- Encryption – Tamper Detection –
- Trusted Execution Environment –

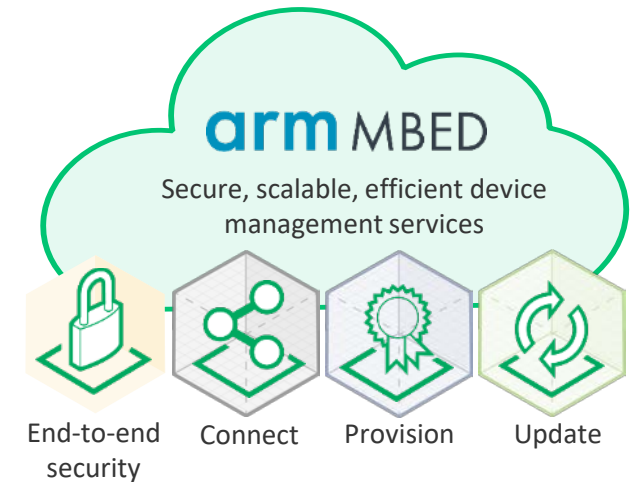
## Devices must be kept secure with regular software updates



### Chinese OEM to recall up to 10,000 webcams after hack

Mirai Botnet attack, October 2016

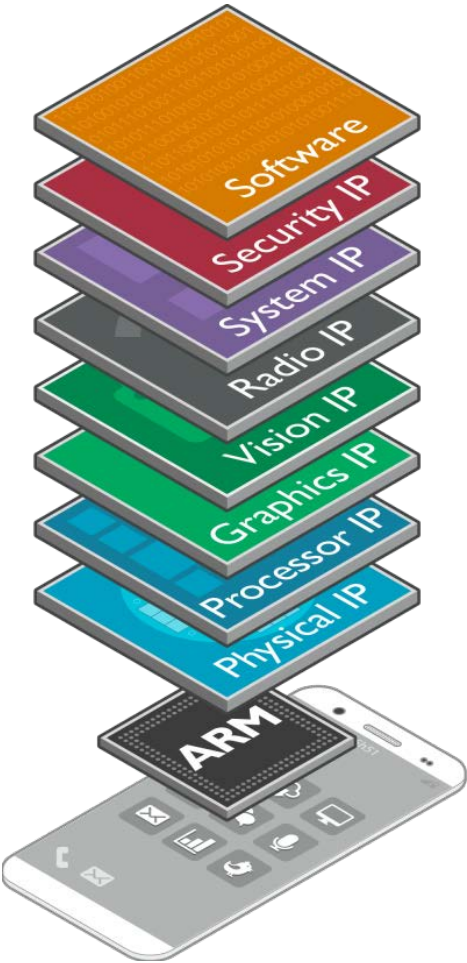
## Good security is inexpensive to implement and costly to crack



Arm mbed Cloud takes care of complex security tasks in large-scale IoT networks. This allows Arm's OEM customers to concentrate their development on features that differentiate their product offering.



# Arm's current business



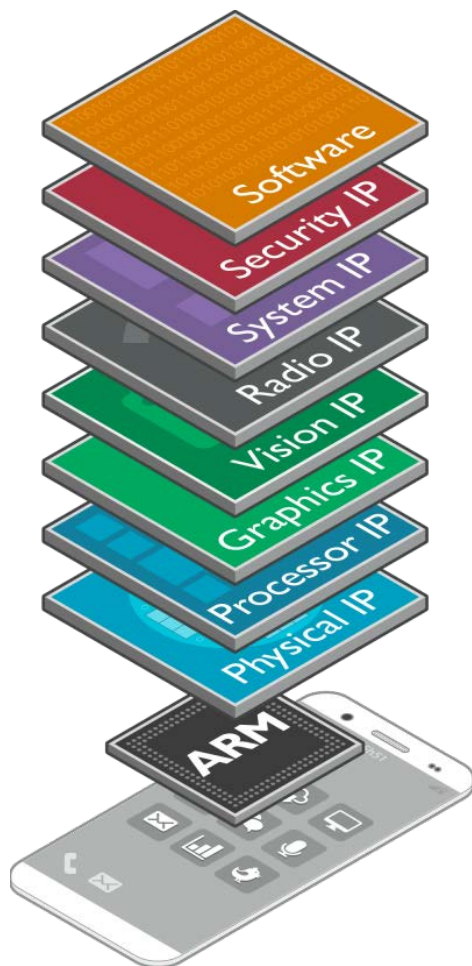
Arm develops **intellectual property** (IP) blocks which are used in silicon chips

Our partners combine Arm IP with their own IP to create complete chip designs

We earn **license fees** when we deliver Arm IP to our partners and **royalties** when our partners ship chips that contain Arm IP

Highly **profitable and cash generative**

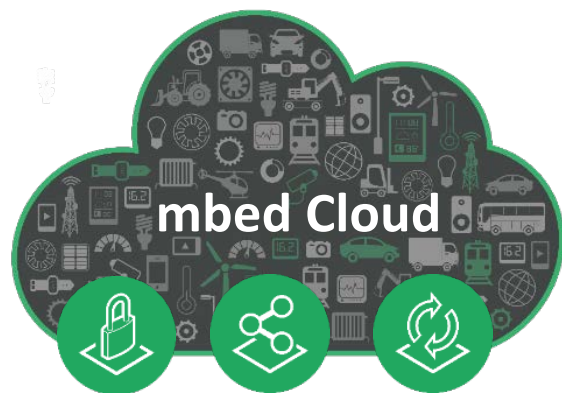
## Accelerating investment to increase share gains



Generating  
**\$600m**  
annualised  
free cash flow

## Investing to create new revenue streams

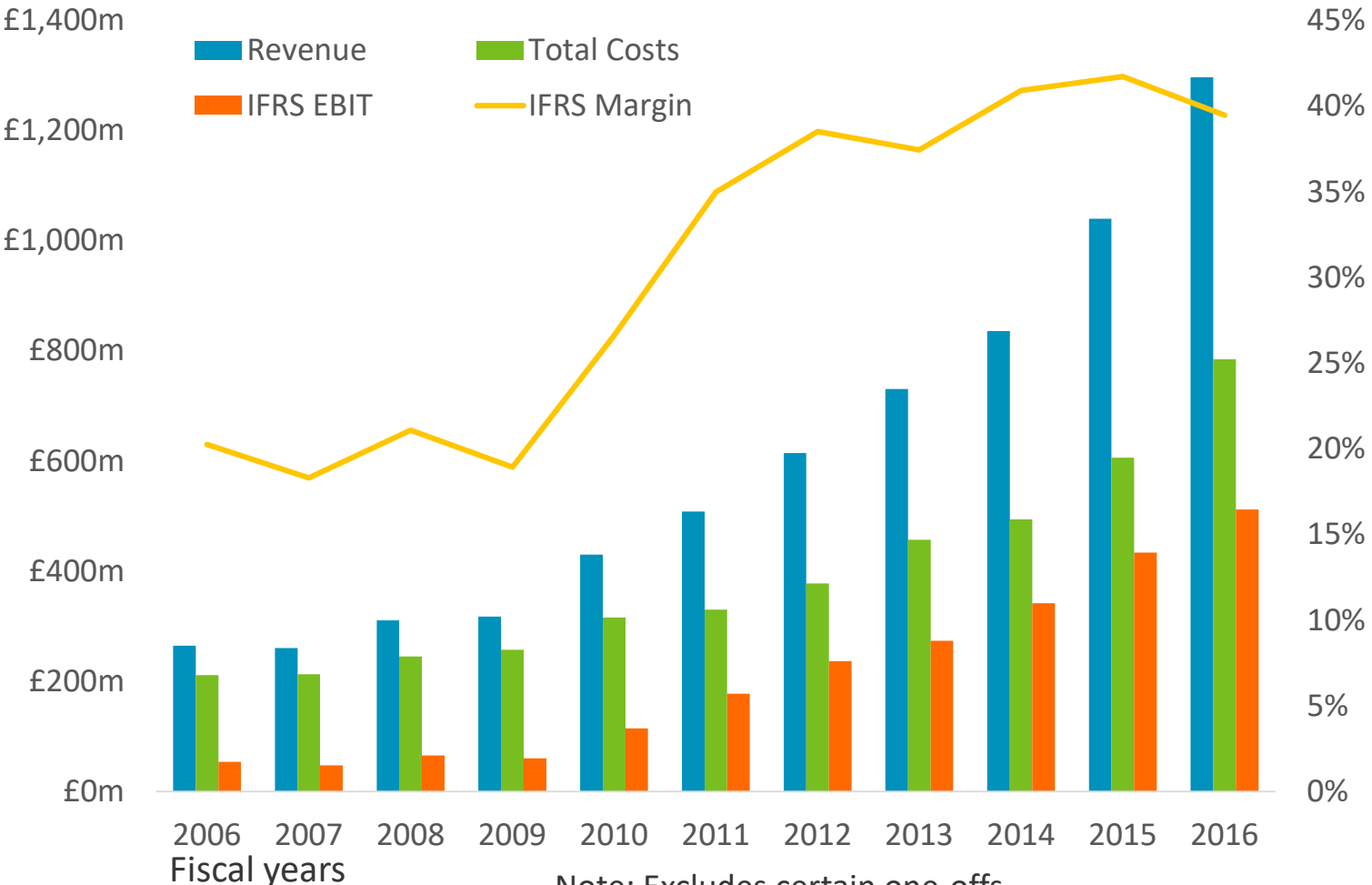
- mbed Cloud SaaS business
- Early-stage investment but many years in research
- Securely connect any device into your network, using any communications technology, supporting any cloud platform
  - Cloud provision: secure device identification, on-boarding and configuring
  - Cloud connect: manage your IoT networking using standard-based comms
  - Cloud update: remotely update firmware across all your devices



mbed Cloud Partners



# Revenues, profits and profitability



Note: Excludes certain one-offs  
- 2013: Write down of MIPS patents (£100m)  
- 2016: Execution costs associated with SoftBank acquisition

Over the past 10 years Arm's revenues grew faster than costs

Profits grew and profitability edged over 40%

At the start of the next phase of investment Arm expects costs to grow faster than revenues

This should yield even greater profits in the future

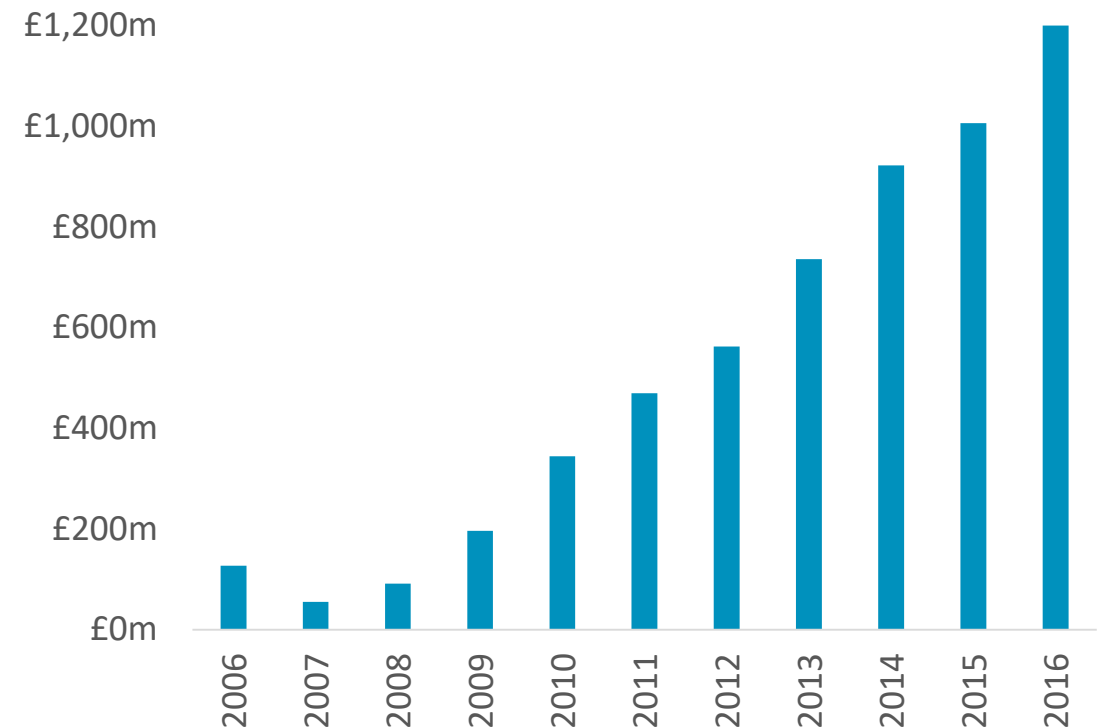


# Investment philosophy

## “Now is the time to be sowing, not harvesting”

- Rate of investment is discretionary and under Arm's control
- SoftBank has asked Arm to accelerate investments and to increase risk appetite
- All costs are expected to be financed from IP business' revenue streams
- During this accelerated investment phase, costs are expected to grow faster than revenues

## Arm has over £1.2bn of net cash and no debt



# Return on Investments – Arm v8-A case study

Arm incurs R&D costs many years before revenue starts

Research into 64-bit computing started in 2000

Arm v8-A Development starts

Architecture development and processor design

First generation of processors

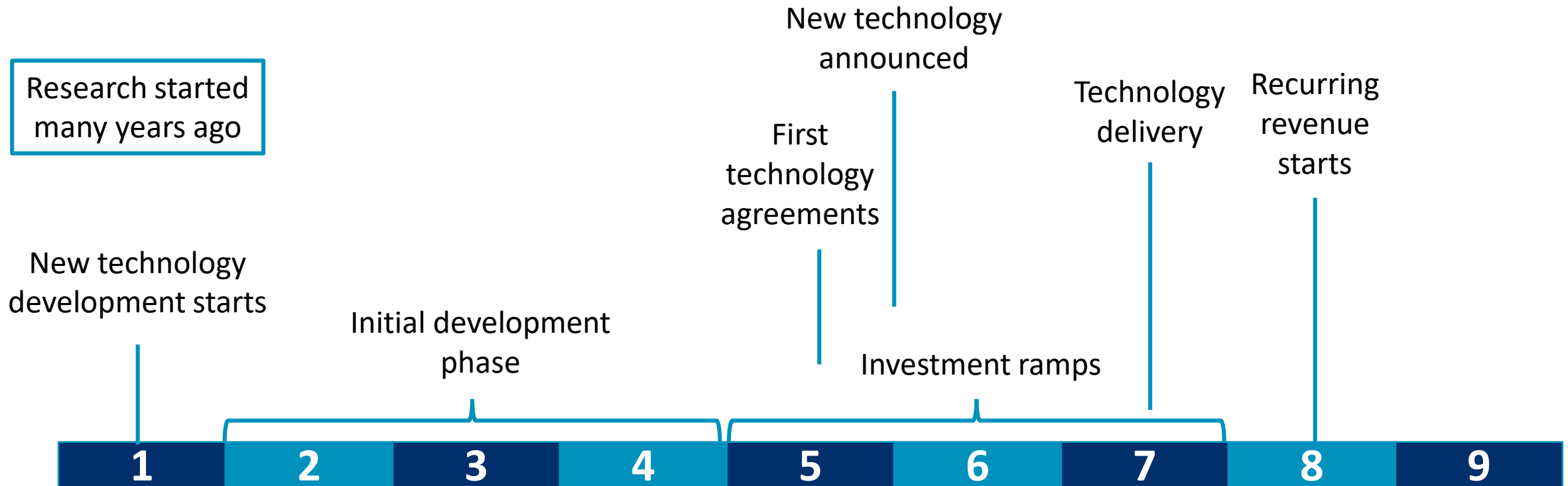
Multiple processors in development





# Return on Investments – General case

Arm incurs R&D costs many years before revenue starts

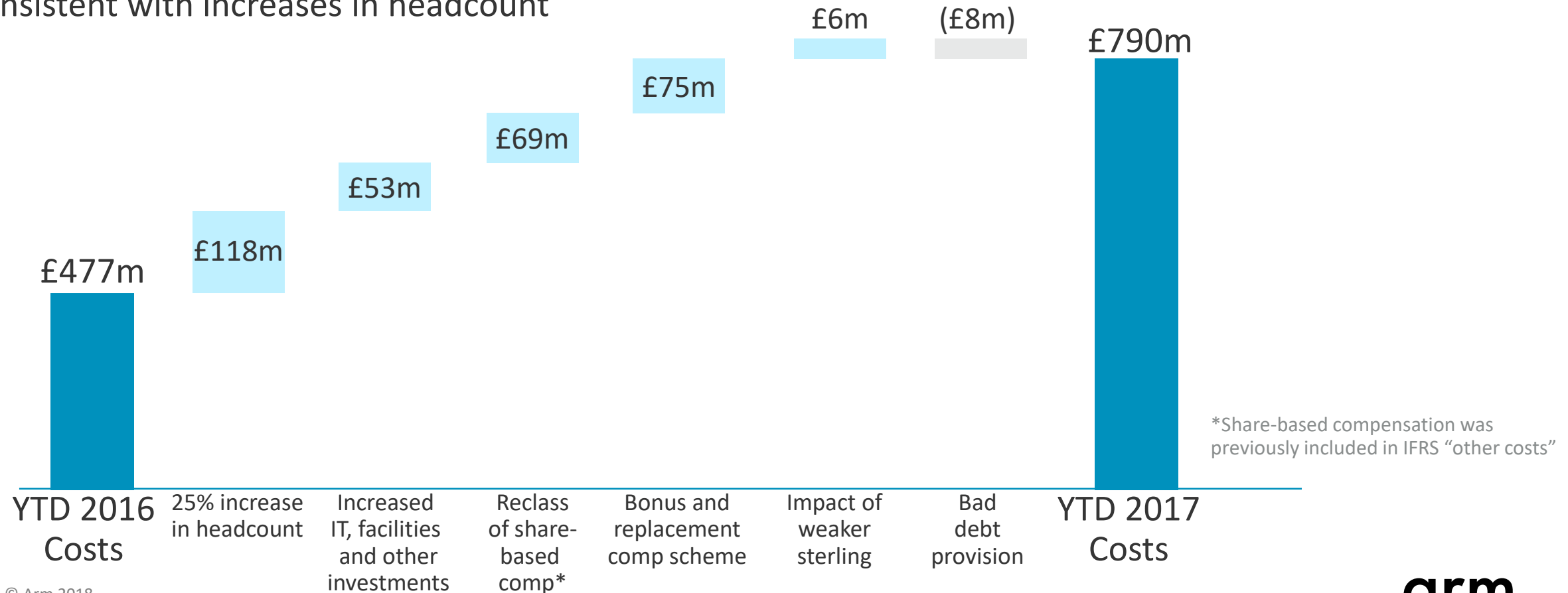


Revenue continues for many years after the investment phase, yielding high profits over time

# Investing in people, infrastructure to create new products

Costs are higher in 2017 as Arm expands R&D capability

Future cost increases are expected to be consistent with increases in headcount



# Contact information

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Recent investor webinars and papers:

- **The route to a trillion devices** white paper and a series of three webinars on the economics of IoT. Featuring Diya Soubra, Product Manager, IoT and Michael Horne, Deputy GM, IoT
- **Accelerating artificial intelligence** with Nandan Nayampally, General Manager of Arm's Compute Products Group
- **The route to 10nm** by Ron Moore, VP Marketing for Arm's Physical IP Group
- **Machine learning in client devices** by Jem Davies, General Manager of Arm's Media Products Group
- **Intelligent buildings** white paper by Ani Deodhar, Segment marketing manager for IoT Solutions

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