Wearable Devices

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October-2013
Wearable Market Opportunity

15 Million wearable devices expected to be sold in 2013
Rising to 70 million by 2017

Areas of biggest growth by 2016:

- Infotainment
  - Smart watches
  - Smart glasses

- Activity Monitors
  - ~65% of Fitness and Wellness market

- Healthcare
  - Continuous Glucose Monitoring (CGM)

Source: IMS Research
Juniper Research

The Architecture for the Digital World®
End To End: Linking Devices to Cloud

Wearable Devices

Smartphone ‘My Personal Hub’

Access Network

Cloud Services

Access Network: e.g. 3G, LTE, WiFi

Device Provisioning and Diagnostics

Management Platform

‘Big Data’ Storage

Cloud Hosting

Apps

Low Energy e.g. BT Smart, 6lowpan, Ant+ etc

Wi-Fi, 3G, LTE

The Architecture for the Digital World® ARM
Use Case - Quantified Self

- Memoto Lifelogging
- Nike Smart Shoes
- Fitbit
- Fuelband
- Jawbone
- Shine

Key Features:
- MEMS Sensors
- Sensor Fusion
- Infrequent Charging
- Simple OS
- Low Energy RF
- Smartphone Tether
Use Case - Watch

- Pebble
- Sony
- I'm Watch
- MotoActiv

- Sensor Fusion
- Security
- Simple OS
- Rich OS
- MEMS Sensors
- Infrequent Charging
- Low Energy RF
- Cellular Wi-Fi
- Smartphone Tether
- The Architecture for the Digital World®
Use Case - Glasses / Augmented Reality

- Graphics
- MEMS Sensors
- GPS
- Sensor Fusion
- Audio
- Rich OS
- HD Camera
- Daily Charging
- Low Energy RF
- Smartphone Tether

Golden-i

Oakley Airwave

Google Glass

The Architecture for the Digital World
Crowd Funding – Launching Innovation

Pebble: E-Paper Watch for iPhone and Android
by Pebble Technology

Funded! This project successfully raised its funding goal on May 19, 2012

68,929 backers
$10,266,845 pledged of $100,000 goal
0 seconds to go

Thank you!
Now accepting orders at Memoto.com

Misfit Shine: an elegant, wireless activity tracker

Funded! This project successfully raised its funding goal on Jun 16

501 backers
$194,444 pledged of $100,000 goal
0 seconds to go
Building the ecosystem on mbed

Connectivity

SIPs

Peripherals/Rapid Proto.

Middleware

Software Libraries

On Line Tools
ARM In Wearable Technology Today

Wrist Devices

- Bluetooth Smart
  - Cortex™-M0

- Apps Processor
  - Cortex™-A5
  - Cortex™-A7
  - Mali™-400 Graphics

- MEMS Sensors
  - Cortex-M0+

- MCU
  - Cortex™-M3

Glasses

- Bluetooth Smart
  - Cortex™-M0

- MEMS Sensors
  - Cortex-M0+
Wearable Device Categorisation

Basic Wearable
- Simple OS
- No Display
- BT Tether

Smart Wearable
- Simple OS
- E-Ink Display
- BT Tether

Advanced Wearable
- Rich OS
- Colour Display
- Graphics
- Touch Screen
- BT/Wi-Fi
- Audio
- GPS
- Camera

Device power/complexity/Form factor

ARM Cortex-A
- ARM Cortex-A
- Simple OS
- No Display
- BT Tether

ARM Cortex-M
- ARM Cortex-M
- Simple OS
- E-Ink Display
- BT Tether
- Rich OS
- Colour Display
- Graphics
- Touch Screen
- BT/Wi-Fi
- Audio
- GPS
- Camera

Basic Wearable

Smart Wearable

Advanced Wearable
Wearable Device Categorisation

- **ARM Cortex-A**
  - Device power/complexity/Form factor
  - Simple OS
  - No Display
  - BT Tether
  - E-ink Display
  - BT Tether
  - Simple OS
  - Colour Display
  - Touch Screen
  - BT/Wi-Fi
  - Audio
  - GPS

- **ARM Cortex-M**
  - Basic Wearable
  - Smart Wearable
  - Advanced Wearable
  - Fitbit
  - Fuelband
  - etc
  - Pebble
  - Sony Smartwatch

- **Advanced Wearable**
  - Google Glass
  - Oakley Airwave
  - Golden-i
  - MotoActv

- **Basic Wearable**
  - Fitbit
  - Fuelband
  - etc
  - Pebble
  - Sony Smartwatch

- **Advanced Wearable**
  - Google Glass
  - Oakley Airwave
  - Golden-i
  - MotoActv
Is there anything New about IOT or has it Just Become Fashionable?
Big Data begins with Little Data
The Long Tail Drives Big Data Value

Number of IOT Applications

Value per Application

Value of Big Data

Smart meters, Wellness …

Turn on my lights when I arrive home

When did I buy it?

Where did I buy it?

When do I use it?

Where do I use it?

What do I do with it?

Who do I use it with?

Who did I tell about it?
Scale Needs Standards and Automation
Universal Standards for IOT

- ARM is dedicated to a standards-based IOT with billions of IP and Web based devices

- To accelerate the Internet of Things, ARM has acquired Sensinode to complement mbed
  - Sensinode was a pioneer in creating and deploying these key IoT open standards
  - Sensinode software enables efficient and secure communication from device to cloud
    - 6LoWPAN Stack and end-to-end CoAP and Lightweight M2M Platform
From Web Applications to IoT Nodes

1000s of bytes

Web Object

HTTP

TLS / TCP

IP

Web Application

~100 bytes

Binary Web Object

CoAP

DTLS / UDP

IP

IoT over Backhaul

Proxy

Sensinode NanoService Platform

10s of bytes

Binary Web Object

CoAP

DTLS / UDP

IP

Sensinode NanoRouter

IoT Node Network

6LoWPAN

The Architecture for the Digital World®
Summary

- Wearable technology market is establishing already
  - Fitness
  - Smartwatch
  - Glasses/Goggles

- Disruptive and highly innovative
  - Many small players
  - Kickstarter fuelling innovation
  - Multiple form factors and power/performance/size trade offs

- Device requirements
  - Ultra low power
  - SW eco system enablement
  - Right size compute depending upon use case
  - Bringing ultra efficient GPU to wearables

- Performance point is critical
  - Power, package, performance and memory are critical in this market
  - Very constrained battery (max 260mAh)
  - Very constrained PCB area (typically 30mm2)