PROJECT ARA

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Overview

INTRODUCTION

- Project ara is the codename for an initiative by Google that aims to develop a free, open hardware platform for creating highly modular platforms.

Figure: MODULAR PHONE

INTRODUCTION (Contd.)

- Ara is about opening hardware in the same way as Android has opened software
- Put it in the hands of as many as opposed to the grip of few
- The goal is to democratize the hardware ecosystem, break it wide open, basically disintermediate the OEMs

MODULARITY

- module is a collection of parts which are defined by some intent to be a distinct
- To make implementation easier
- To enable better services, better evolution and better upgrading of the product

STYLES OF MODULARITY

- Slot Modularity
- Sectional Modularity
- Bus Modularity

STYLES OF MODULARITY (Contd.)

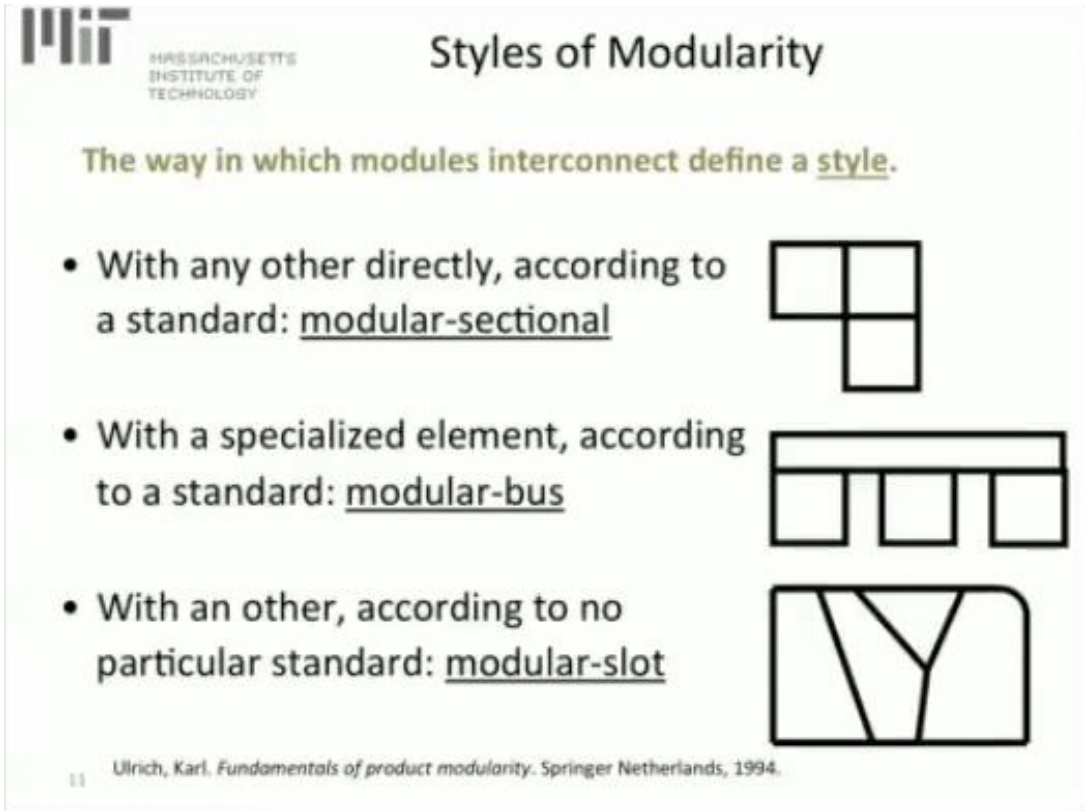

Figure: STYLES OF MODULARITY

CORE COMPONENTS

- Endoskeleton
- Module

ENDO

- Ara phones built using modules inserted into metal endoskeletal frames - "Endos"
- Acts as switch to on-device n/w linking all modules

ENDO (Contd.)

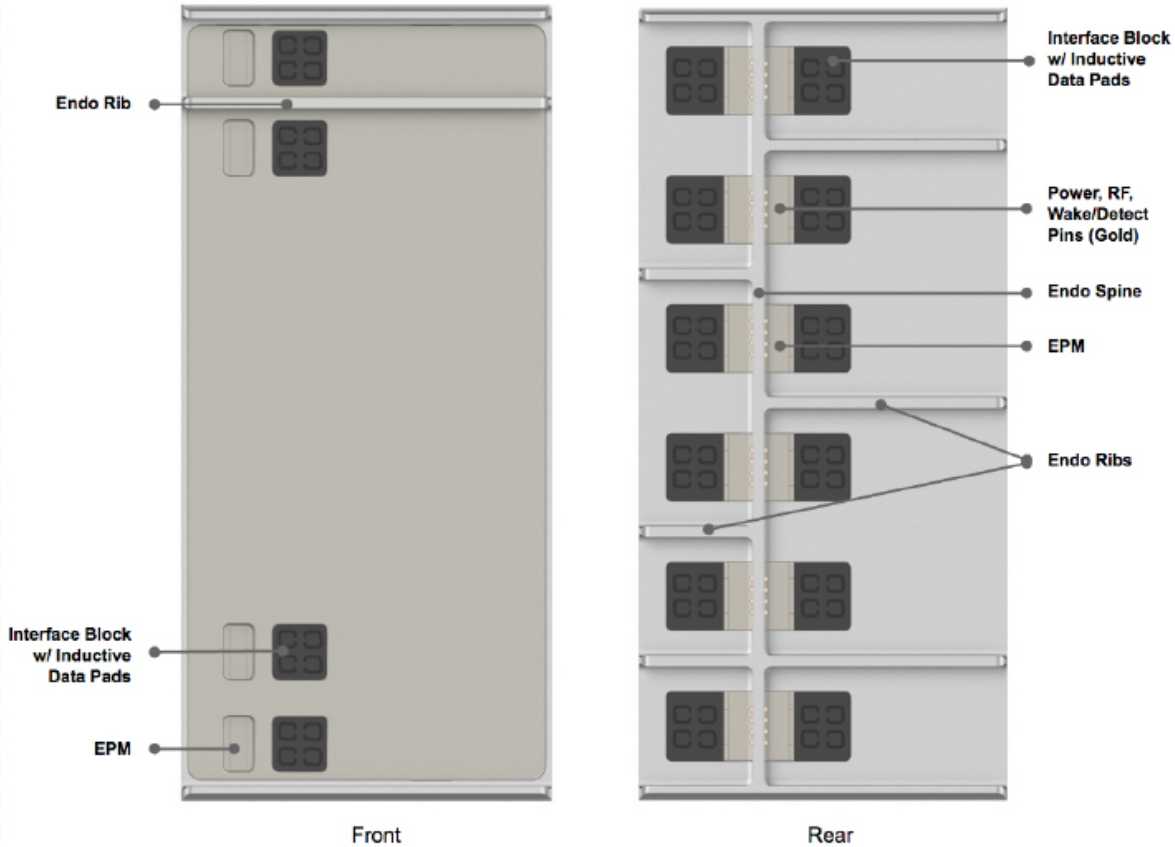

Figure: ENDO

MODULES

- Can be anything like display, camera, keyboard or battery
- Can be built using open source MDK
- The Modular Development Kits are already available

MODULES (Contd.)

Figure: Modules

MODULES (Contd.)

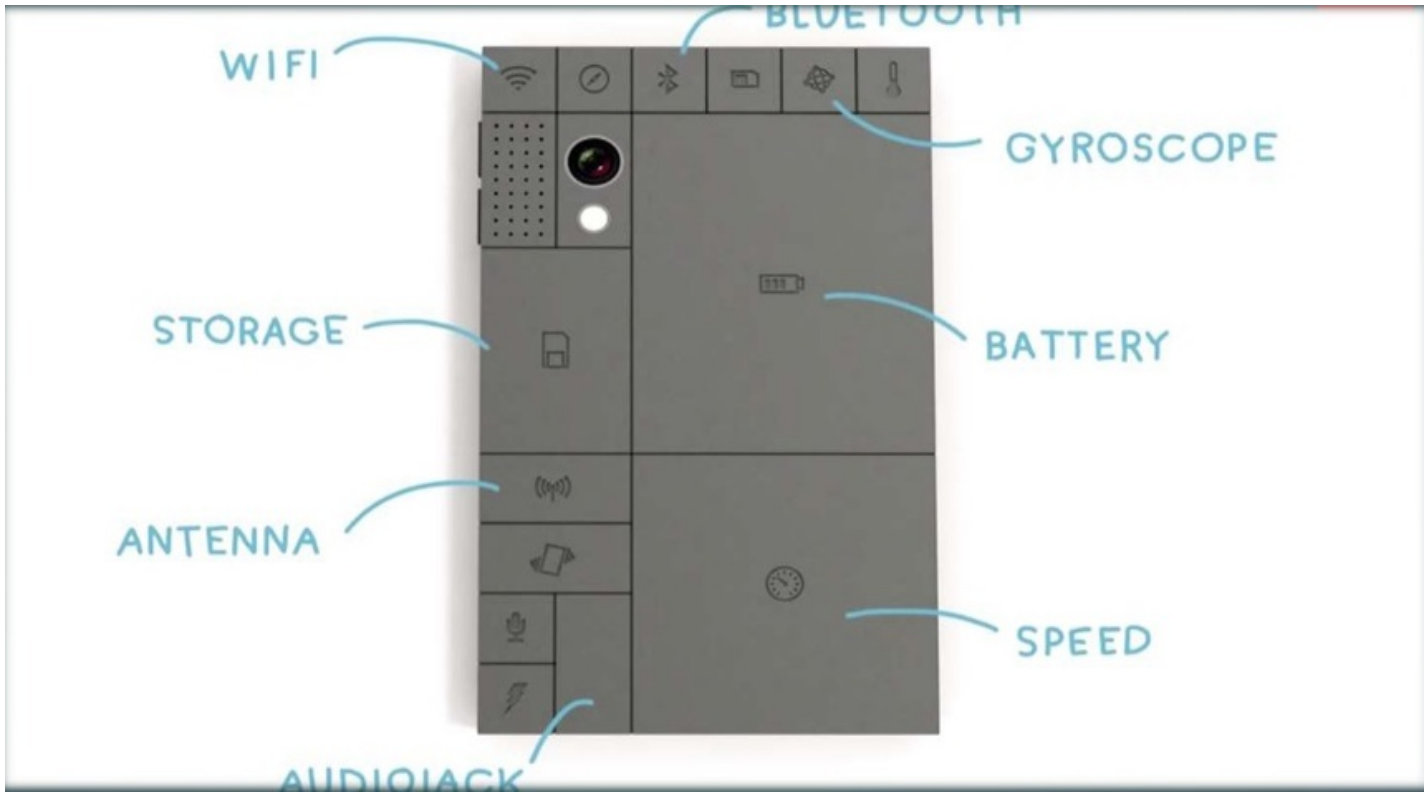

Figure: Modules Explained

TECHNOLOGIES USED

- UniPro
- Capacitive M-PHY
- ElectroPermanent Magnets

UniPro

- A high speed internet protocol
- Used to allow Ara modules to speak each other
- Share common low level language for communication & building a network
- Project ARA is tapping into latest UniPro 1.6 SPEC
- It offers higher bandwidth, low power connections between modules
- Greybus - An application layer of Unipro

UniPro (Contd.)

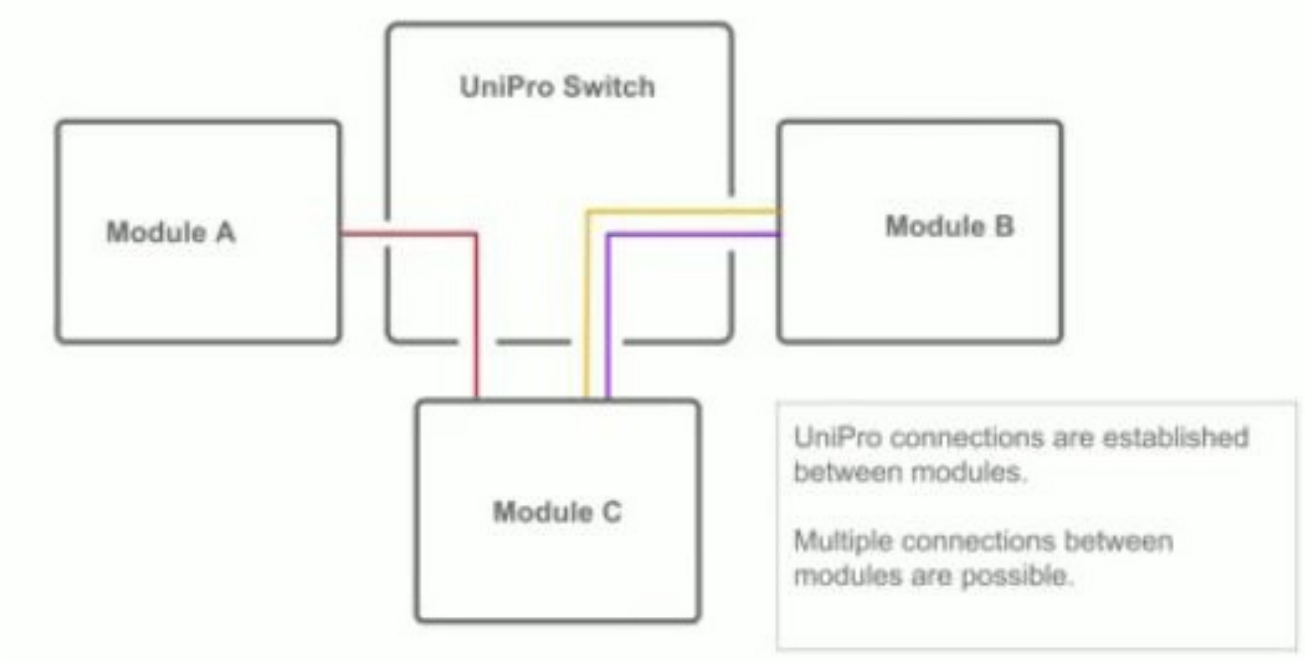

Figure: UniPro- Bidirectional Connection

Features of UniPro

- Error Handling.
- Reliable.
- Highspeed bidirectional data transmission.

Capacitive M-PHY

- A physical layer spec
- Developed by MIPI alliance and made to work with ARA
- It is a capactive interface- points won't be worn down over time in swapping modules in and out
- Requires less pins
- Provides more bandwidth per pin with improved power efficiency

Capacitive M-PHY (Contd.)

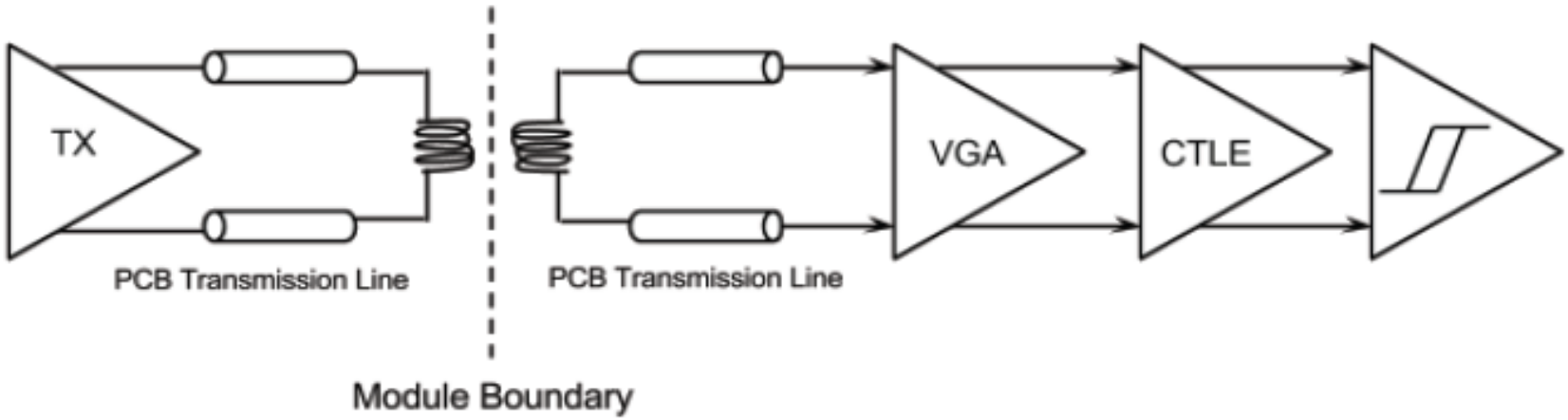

Figure: Contactless media converter for M-PHY

ElectroPermanent Magnets

- Used for affixing the modules in place in the 'ENDO'
- Normal electro magnets magnetize depending on whether current flow through them or not
- That can cause battery drain
- EPM only use current to flip magnetization on and off
- Able to retain magnetized state without draining additional power

ElectroPermanent Magnets (Contd.)

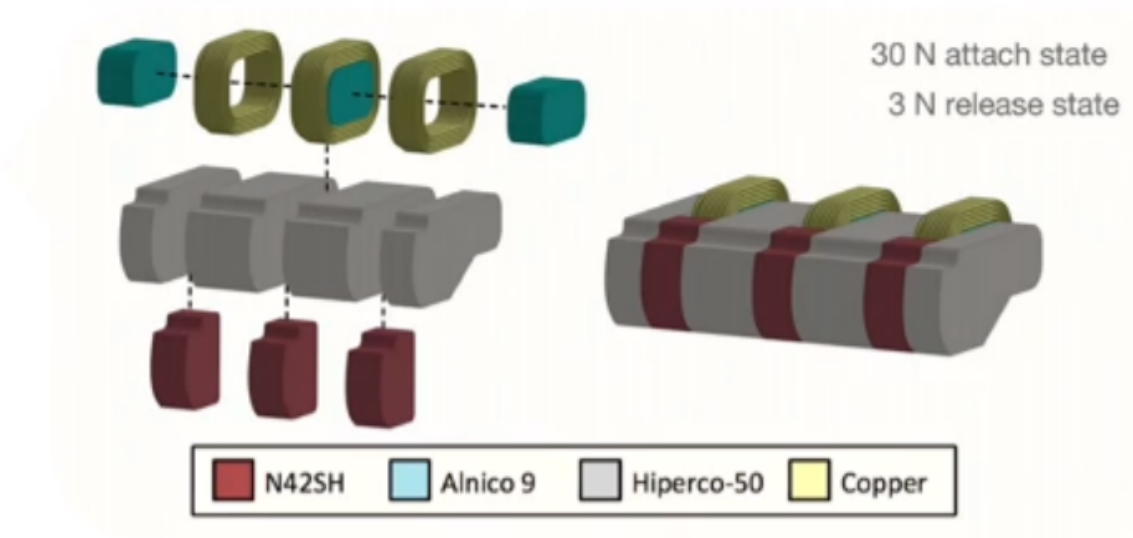

Figure: ElectroPermanent Magnets

ElectroPermanent Magnets (Contd.)

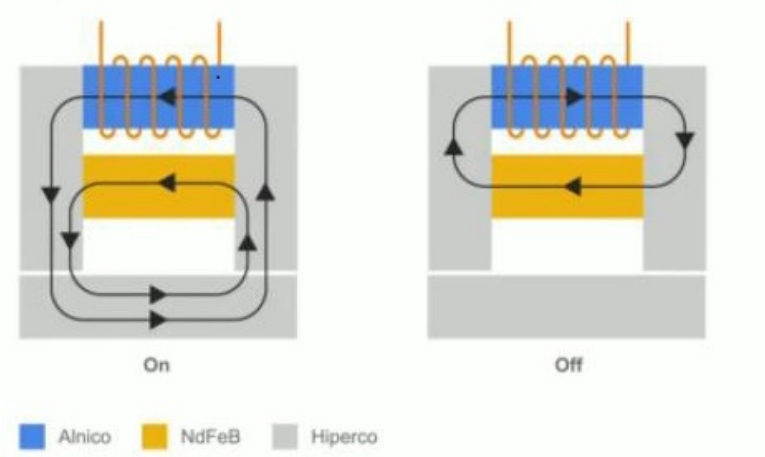

Figure: Spiral 1 EPM

ElectroPermanent Magnets (Contd.)

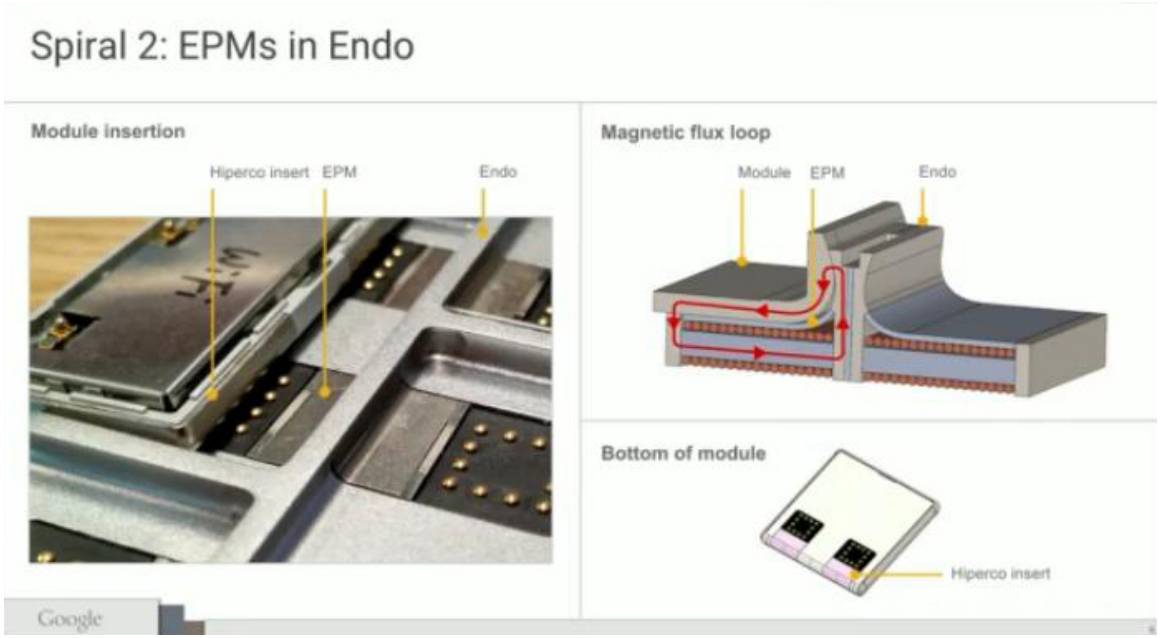

Figure: Spiral 2 EPM

ElectroPermanent Magnets (Contd.)

Figure: Interface Block

PARCELING SCHEME

- Rules that determine how and where modules can be placed in the endoframe
- Two types of Parceling Schemes:
- Rear Parceling Scheme
- Front Parceling Scheme

Rear Parceling Scheme

- Endos must have exactly one vertical spine.
- For the horizontal ribs, there must be at least 1 rib per 2 units (since modules cannot be larger than 2x2)
- Only a single cross is allowed in an endo

Rear Parceling Scheme (Contd.)

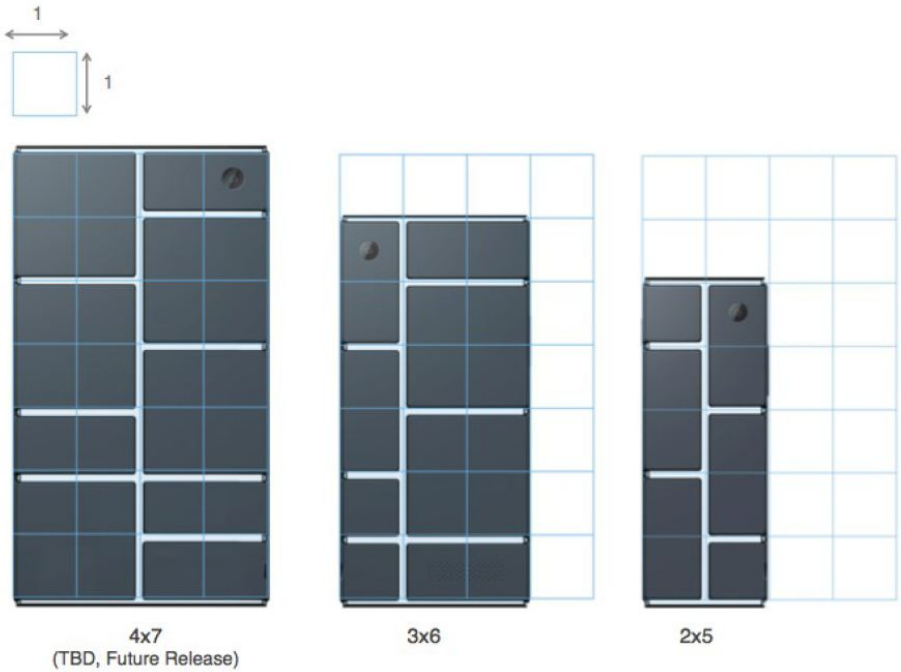

Figure: Rear Parceling Scheme

Front Parceling Scheme

- Vertical spines are not allowed - all modules must fll the complete horizontal width
- A maximum of 2 ribs are allowed
- Only a single rib is allowed in each of the upper or lower halves

Front Parceling Scheme (Contd.)

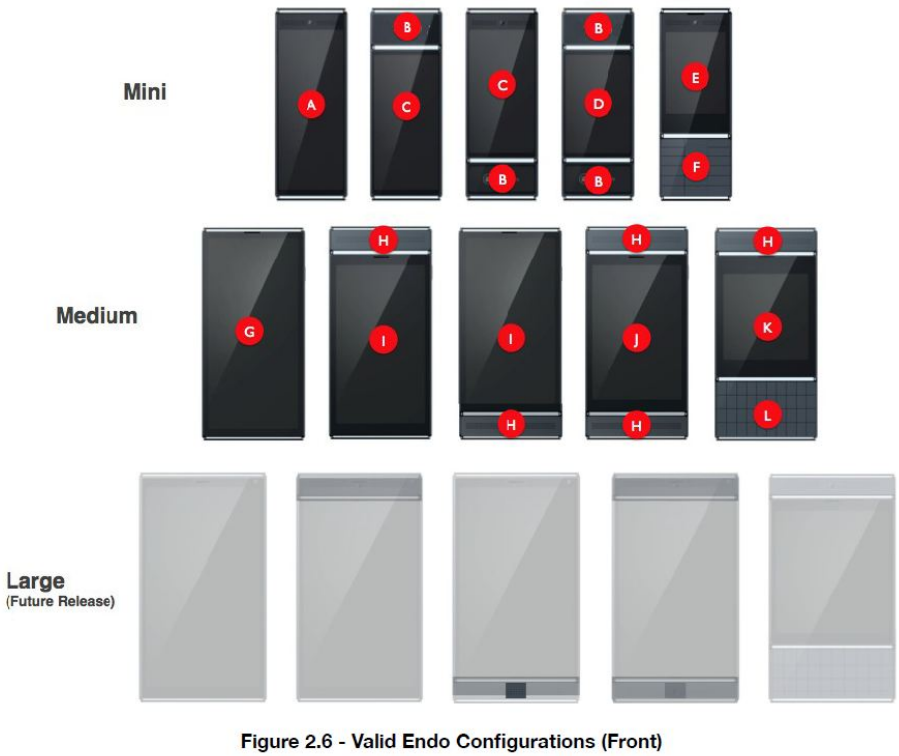

Figure 2.6 - Valid Endo Configurations (Front)

Figure: Front Parceling Scheme

3D PRINTING

- Project ARA is working with 3D systems to develop new kind of 3D printer.
- Capable of mass producing custom shells (the plastic pieces on back of each module)
- Can print efficiently at volume, something that existing printers are not very good at
- Will allow to choose the cover that users want
- Printing system is based on an innovative process that reduces printing time

3D PRINTING (Contd.)

Figure: 3D Cover

SOFTWARE STACK

- single Application Processor (AP) Module running Android
- Ara Manager Application

SOFTWARE STACK (Contd.)

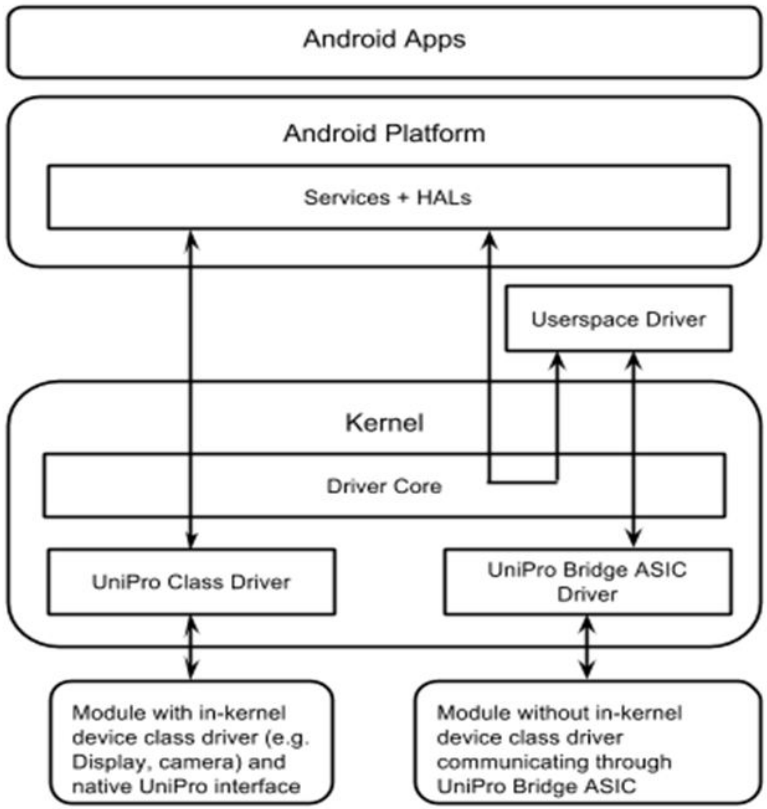

Figure: SOFTWARE ARCHITECTURE

SOFTWARE STACK (Contd.)

Figure: ARA MANAGER APPLICATION

ADVANTAGES OF ARA PHONES

- Phone is very cheap
- Users only buy the features they need
- Phone could last indefinitely
- Repairs are easier and cheaper
- Users could have 2 version of their phone

DISADVANTAGES OF ARA PHONES

- Will be bigger and heavier than a normal smart phone
- Security Issues
- The connections are bound to cause problems
- Certain combinations won't work
- It won't be optimized

MODULAR SMART PHONES BY OTHER OEM'S

- LG G5

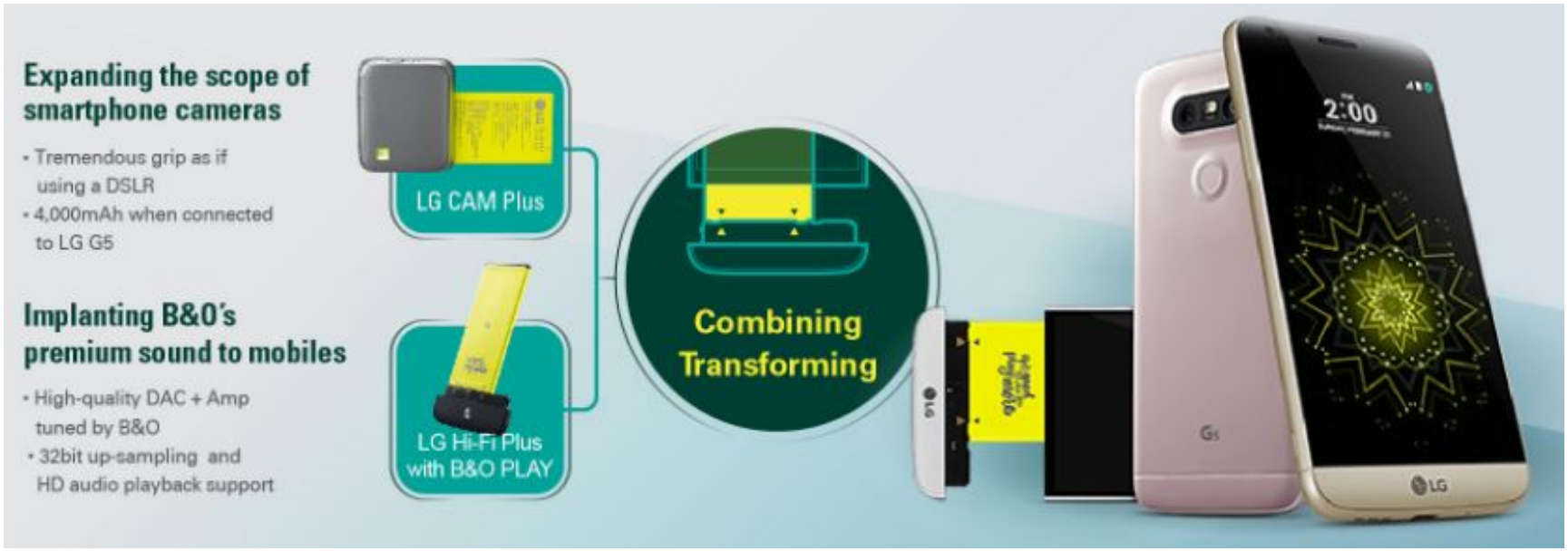

Figure: LG G5

MODULAR SMART PHONES BY OTHER OEM'S

- MOTO Z

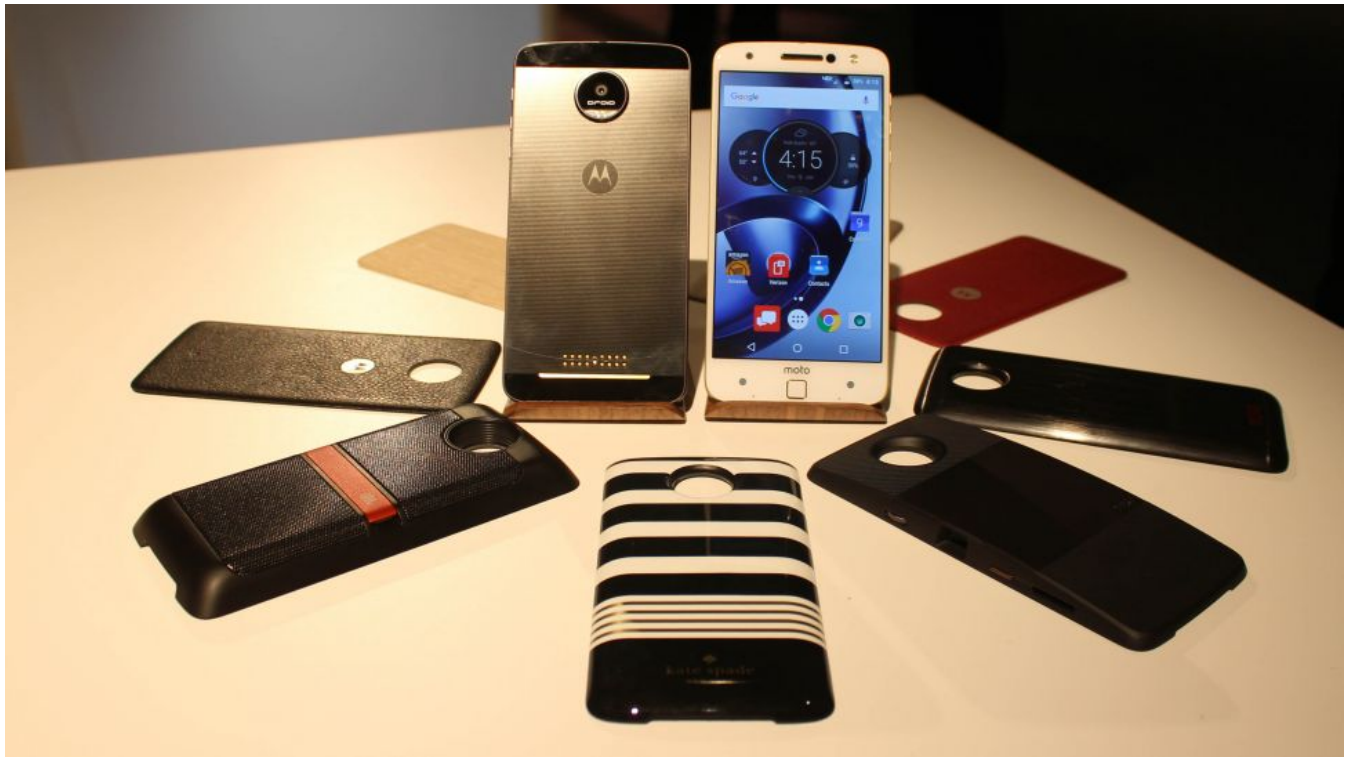

Figure: MOTO Z

CONCLUSION

- Project Ara will be the future of smart phones
- Platform will include a endoskeletal frame with modules of the owners choice, such as a display, camera or an extra battery.
- Phone itself can be swapped from malfunctioning modules or upgrades as innovations emerge, providing longer handset cycle lifetime, and potentially reducing electronic waste

CONCLUSION (Contd.)

- Estimated that the device is designed to be utilized by 6 billion people
- Technologies such as M-PHY, UniPro and electromagnets added a great deal to the Project Ara
- 3D printing will going to have a great impact on the future

REFERENCES

1. PHONEBLOKS Phonebloks, a phone worth keeping.2014. https://phonebloks.com/en
2. http://wwwen.zte.com.cn/endata/magazine/mobileworld/2013/5/articles/201310/t20131029.html
3. https://en.wikipedia.org/wiki/Phonebloks
4. https://www.engadget.com/2016/06/09/blocks-modular-smartwatch-final-prototype/
5. http://www.modularmania.com/wordpress/?page_id=217
6. http://www.modularphonesforum.com/news/project-ara-15-questions-and-answers-2214/
7. http://www.modularphonesforum.com/developers/faq/how-project-ara-modular-phone-works/
8. http://www.modularphonesforum.com/news/module-test-and-certification-1068/
9. http://www.modularphonesforum.com/news/about-unipro-protocol-interface-blocks-cports-unipro-layers-vs-osi-layers-440/
10. http://www.modularphonesforum.com/developers/faq/ara-network-stack-layer-1-contactless-media-converter-and-m-phy/

THANK YOU....