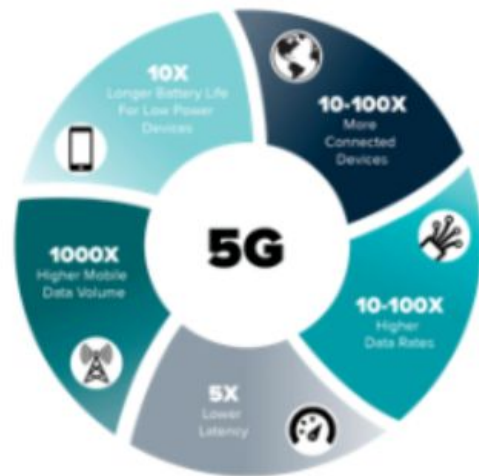


SensX

X-Senses over 5G



The reality of today... may “feel” different tomorrow



Mind



Touch



Taste



Sight



Sound



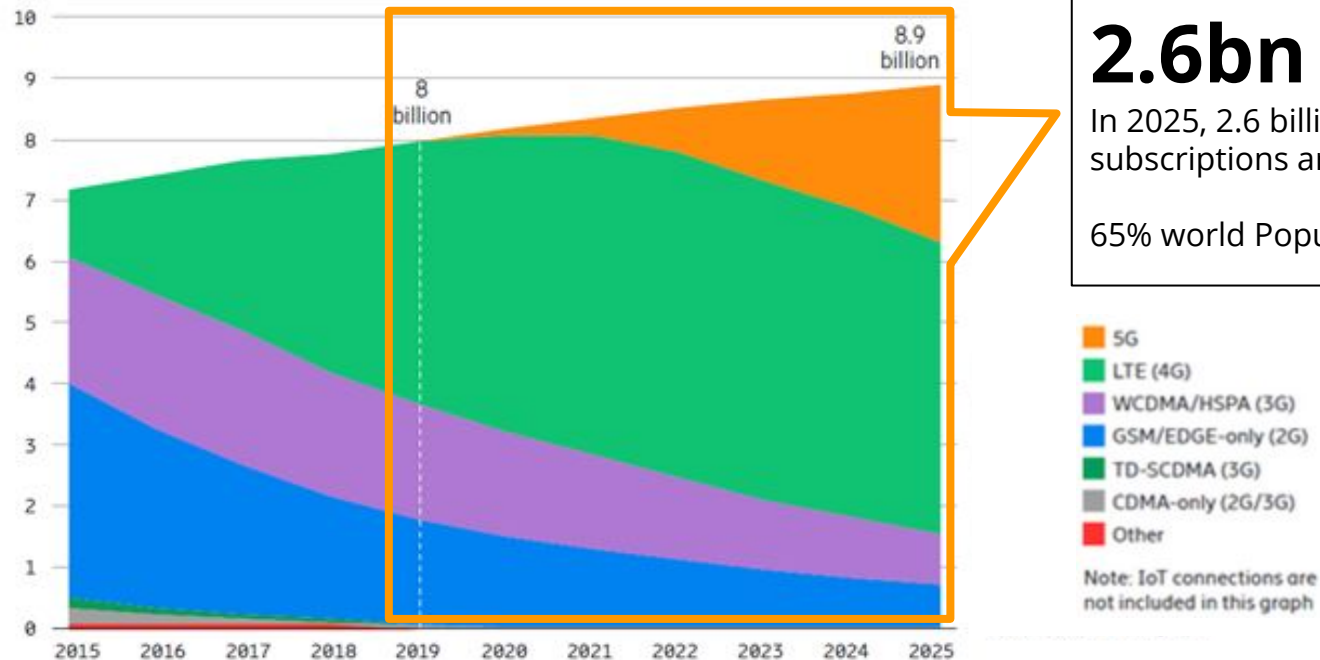
Smell

Internet of Senses through XR

5G is here to enable XR

Growing fast and strong!

Figure 4: Mobile subscriptions by technology (billion)



2.6bn

In 2025, 2.6 billion 5G subscriptions are forecast.

65% world Population

So how fast is 5G really?

It's out of the ballpark!!

- 10-100x more connected devices
- 10x-100x data rate
- 1000x bandwidth (High Density Graphics))
- 10x more battery life
- 5x low latency (1 ms)

Latency: Human reaction time is 250 ms
Combined with Edge → Real Time

Edge: Remote data processing → Thin and cheaper devices



Truly Immersive Experiences (XR)

Sight - capture the monsters on the go



500 Million Downloads

\$3 Billion Spending

Value proposition



Mobile device



Connect to childhood

Monetization

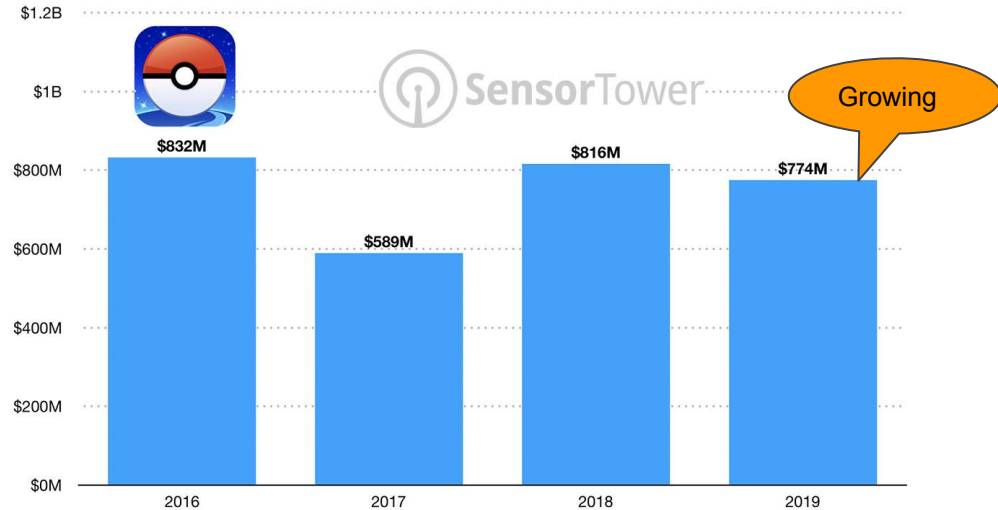


Gamer



Local stores

Pokémon GO Worldwide User Spending by Year



<https://sensortower.com/blog/pokemon-go-catches-3-billion-usd-in-lifetime-revenue>

Touch the world as you imagine it

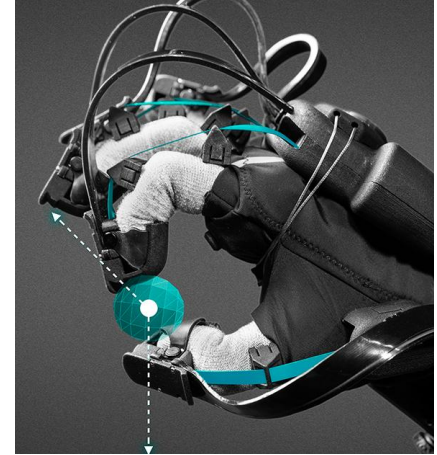


Companies

- [TeslaSuit](#) by VR Electronics Ltd, UK
- [HaptX \(Gloves\)](#) by HaptX, Seattle, WA

Business Model

- Sell products / devices
- Sell software & services
- Revenue share model



Suit / Glove: Stretchable, breathable; technology with sensor inputs and outputs, biometry



Software: Powerful analytics & program control



Microfluidic skin flexible, smart textile, pneumatic actuators, microfluidic channels



Pneumatic Control Mini-compressor, pneumatic



AR/VR: Utilizes system with or without VR and AR



Development kit: a library of haptic feedback and programming options



Force feedback exoskeleton



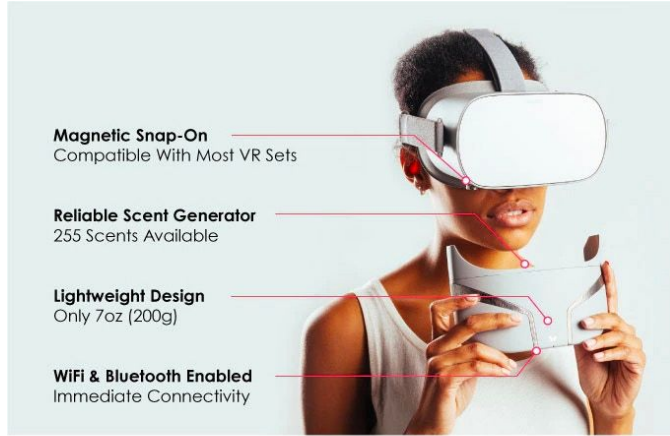
Magnetic motion tracking

Making the world a safer place, one person at a time



from training grounds... to real time assist and monitoring

The world comes together in what you smell



Company

- Multisensory Mask by [Feelreal](#)

Business Model

- Sell products / devices
- Sell software & services
- Entertainment, gaming, meditation, aromatherapy



Smell:
Scent-generator



Rain Water:
Ultrasonic ionizing
system



Wind:
Micro-cooler



Vibration:
Haptic feedback

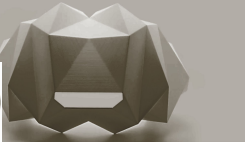
Eat Anything, Anywhere - Guilt Free!!



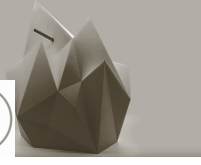
Eat Anything, Anywhere - Guilt Free!!



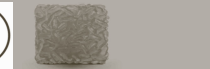
VIRTUAL REALITY HEADSET
SIMULATES THE 3-D ENVIRONMENT



AROMATIC DIFFUSER
PRODUCES THE SENSE OF SMELL



3D PRINTED FOOD
MADE OF ALGAE FOR ADDED TASTE AND TEXTURE



GYROSCOPIC UTENSIL
MANIPULATES VIRTUAL AND PHYSICAL FOOD



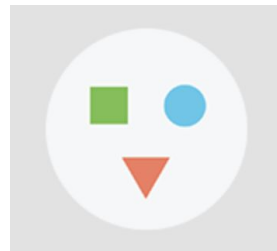
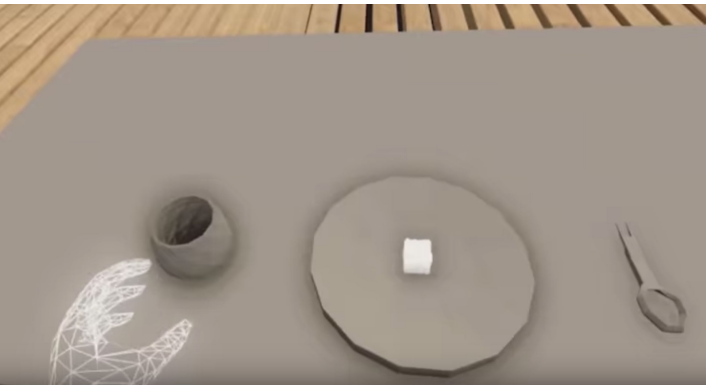
VIRTUAL COCKTAIL GLASS
MIMICS INTOXICATION WITHOUT THE USE OF ALCOHOL



BONE CONDUCTION TRANSDUCER
CREATES CHEWING SOUNDS AND VIBRATIONS ON YOUR JAW AND INNER EAR



- Early stage startup - Kokiri Lab, LA ([Project Nourished](#))
- Motivation
 - Eat guilt free (sustainability)
 - Time together virtually
- Business Model
 - Sell unique dining experience
 - Provide toolkit for others
- Ecosystem
 - Royal Caribbean Cruise Ships offering similar experiences



Immersive experience → stress less, get motivated



- ✗ Crowded screens → visual fatigue
- ✗ Simultaneous speakers → hard to see
- ✗ Emotional cues → challenging to pick up
- ✗ Single display → insufficient while presenting



✓ Sense of depth and variety makes it engaging



✓ Positional audio can be tracked by turning head



✓ Holograms with body language means better EQ



✓ Haptic, and Digital Skin enables handshakes, hi-fives.



✓ Choice of avatars for privacy



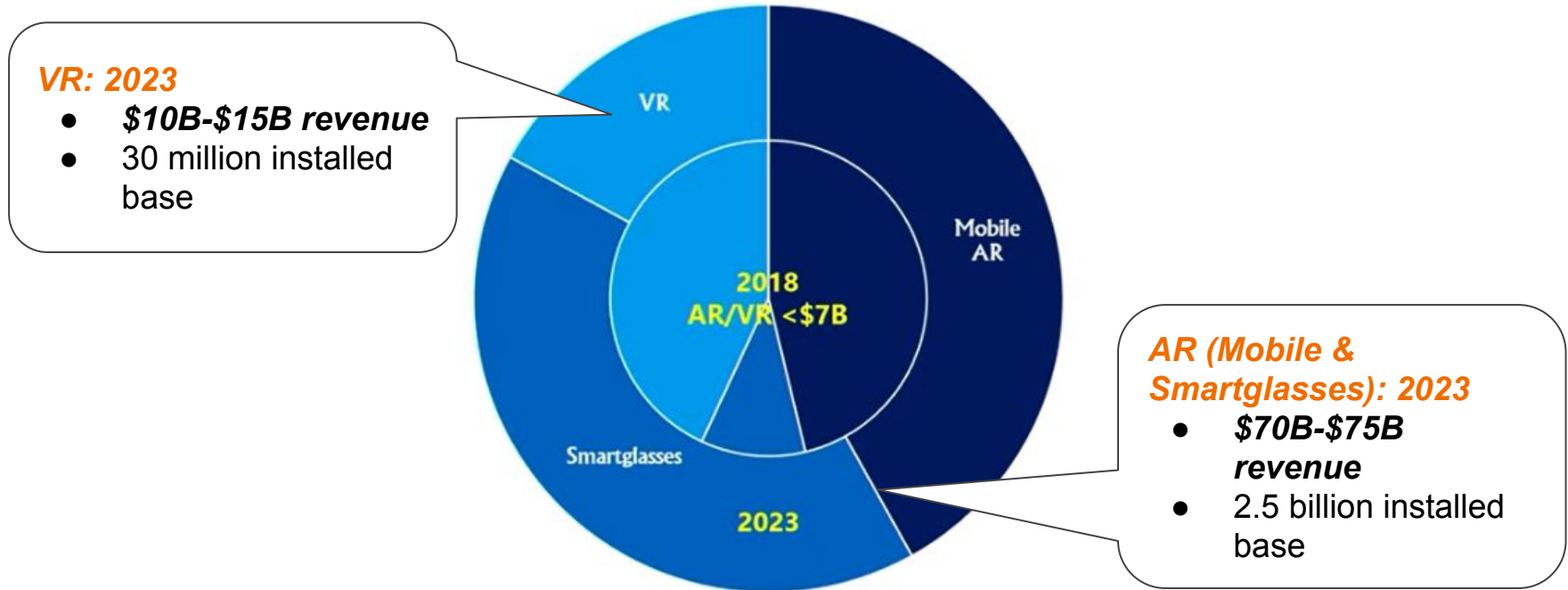
✓ Team lunches with virtual food and drinks



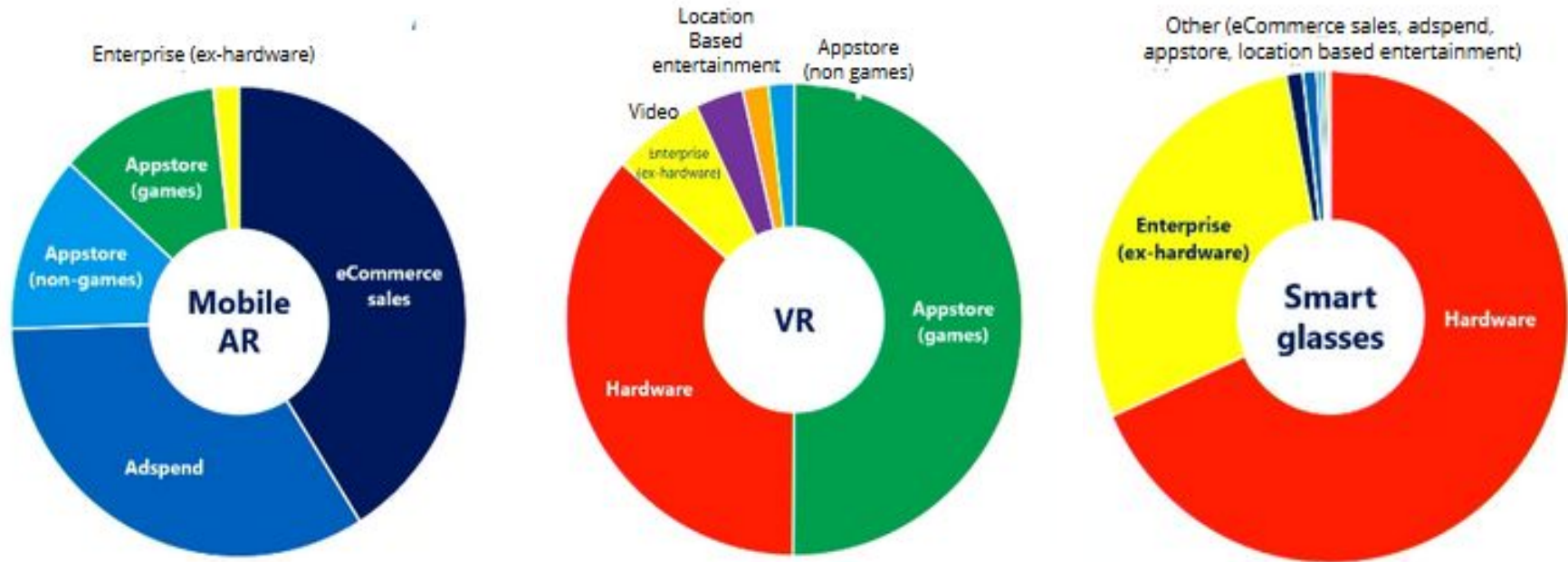
✓ 5G → realtime, higher bandwidth, lighter devices



How much is AR/VR worth ?

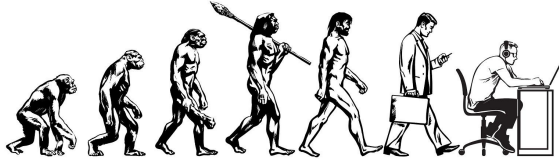


Show me the money !

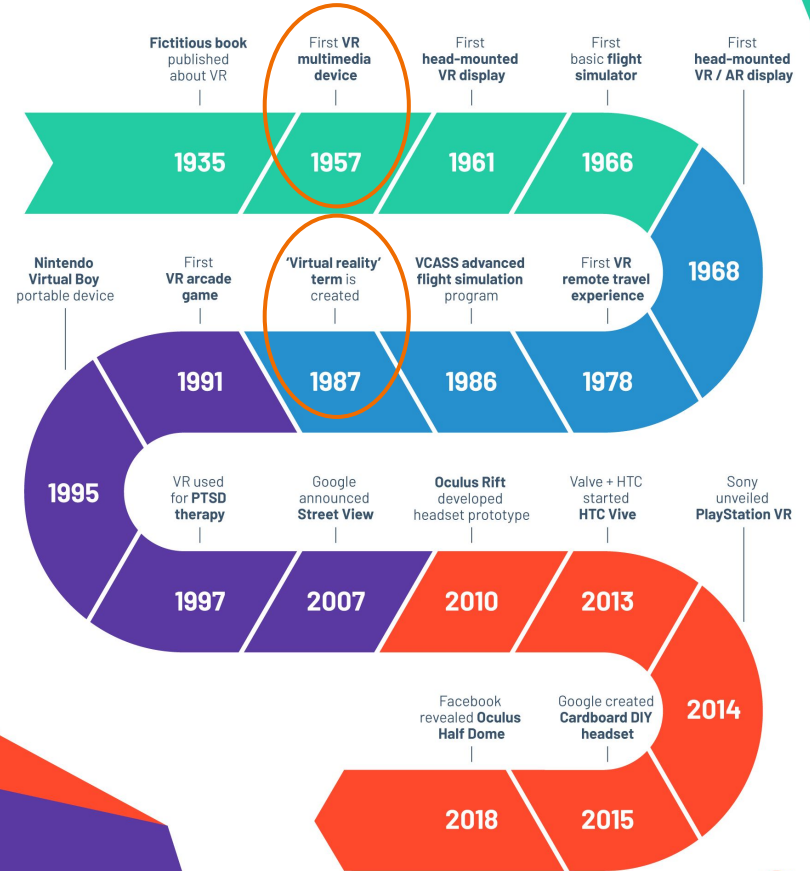


Ref: <https://www.youtube.com/watch?v=0y31TFNPRIk&feature=youtu.be>

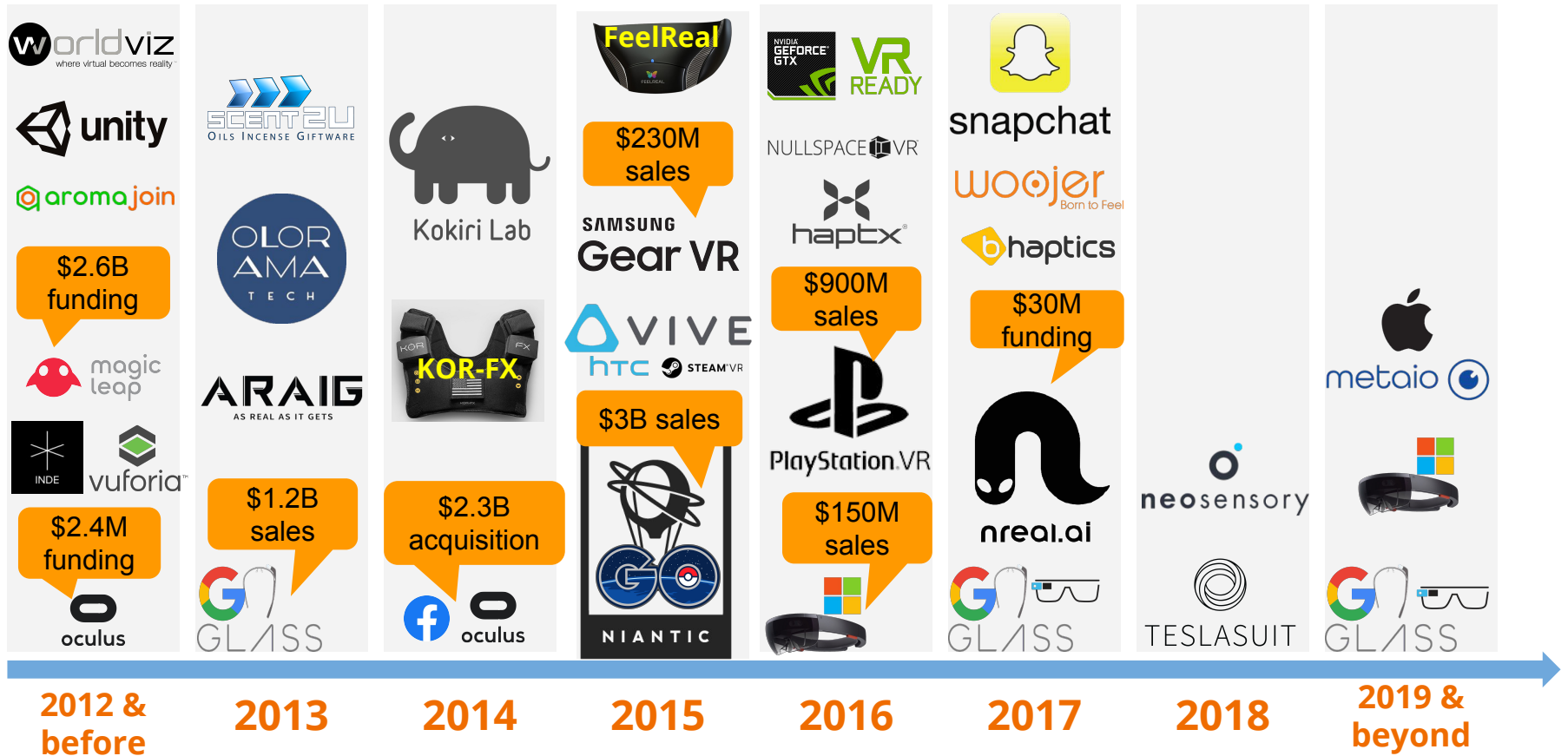
Evolution of 60+ years...



History of Virtual Reality



Accelerated in last decade...



Google goes after enterprise market



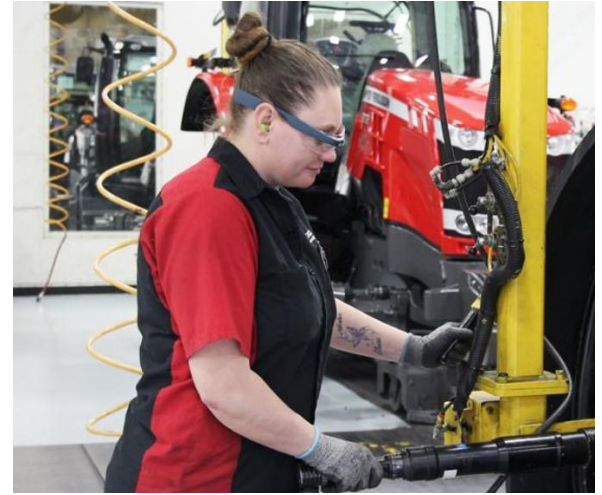
Consumer Edition

\$1500



Enterprise Edition 1

\$1500



Enterprise Edition 2

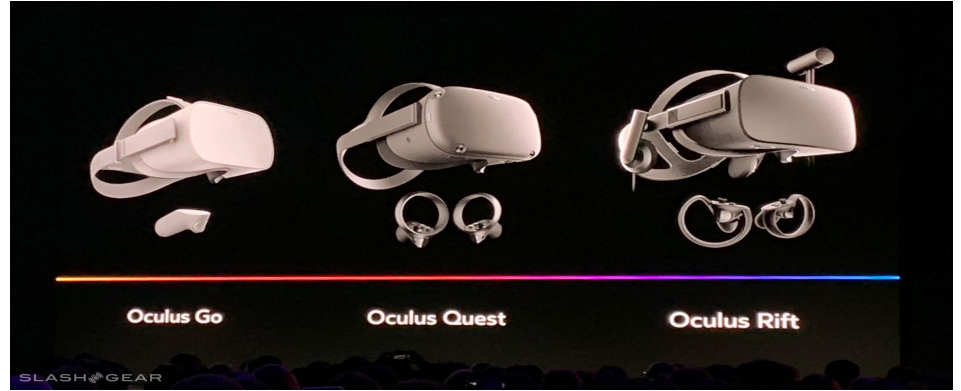
\$999

March 2013

March 2017

May 2019

Facebook goes after consumer market



Oculus Acquisition
\$2.3 Billion

Oculus Rift
20 countries
\$599

Oculus Go
1 million units
\$199

Oculus Quest
0.5 million units
\$399+

Oculus Rift S
\$100M revenue
\$399

March 2014

March 2016

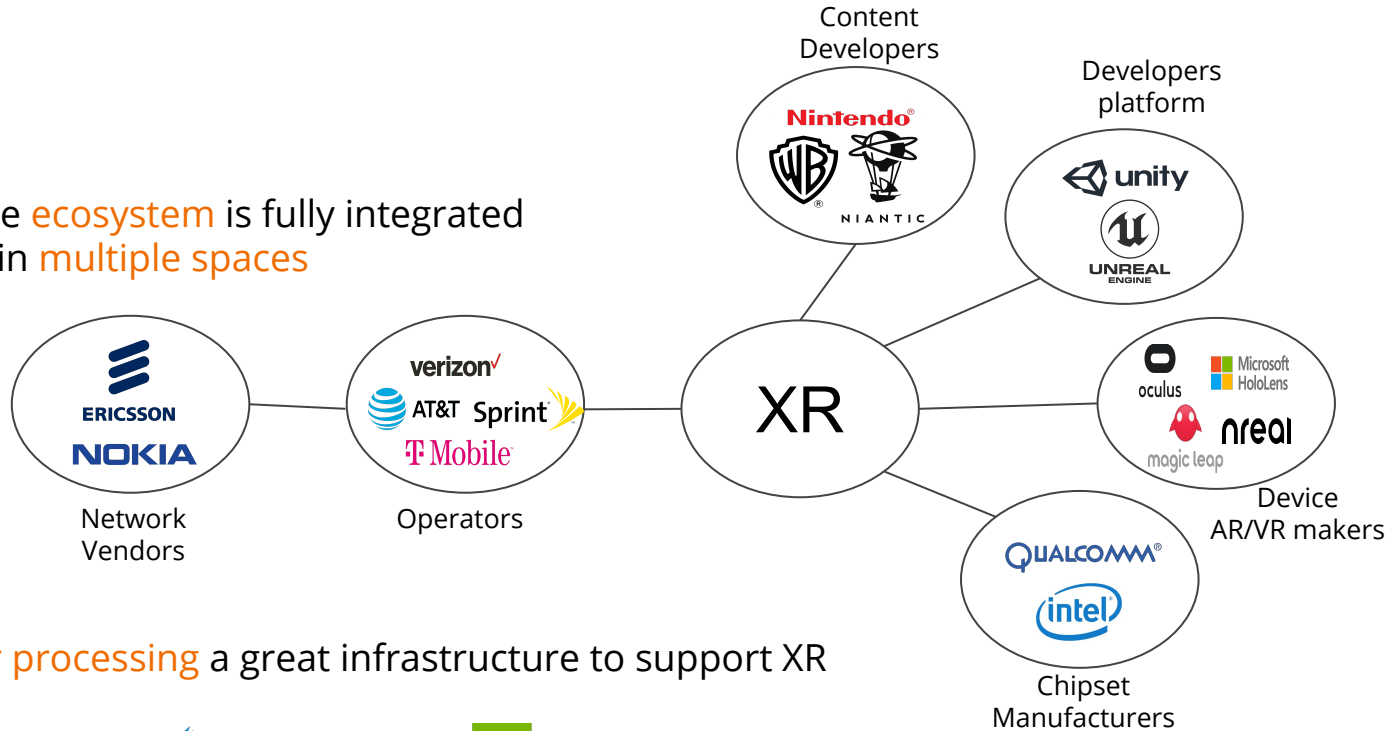
Oct 2017

Sept 2018

March 2019

XR is real

XR is picking up and the ecosystem is fully integrated
Some players present in multiple spaces



Cloudification & Faster processing a great infrastructure to support XR



Key Takeaways

With **5G** the technology for **XR** has arrived

Ecosystem players are partnering to accelerate **XR**

Adoption accelerating because of **compelling applications**

Our prediction for the future...

Your brain is the user interface

2030



Fifty-nine percent of consumers believe that we will be able to see map routes on VR glasses by simply thinking of a destination.



The possibilities of a new tomorrow



Mind



Touch



Taste



Sight



Sound



Smell

Internet of Senses, XR

Thank You



Diala Abi-Rached



Kallol Bera



ShanShan Song



Joy Ghosh



Pantas and Ting

Sutardja Center
for Entrepreneurship & Technology

Berkeley Engineering