Next-Gen Mobile Games

The arrival of cross-platform and evolution of high-fidelity mobile games

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High-Fidelity Games Continue to Find Their Place on Mobile

Foreword

In 2017, Newzoo and Arm jointly launched a market report on **high-fidelity mobile gaming**, in which we concluded that the high-fidelity mobile games market **showed massive growth potential, led by mobile-first markets like China**. Since then, the mobile games market has experienced tremendous growth across the globe. In fact, mobile gaming continues to outperform PC and console as the biggest gaming platform. In 2020, **nearly half ($86.9 billion) of global games market revenues came from mobile**.

With the rising trend of **cross-platform games** and **established PC/console franchises coming to mobile**, mobile gamers are increasingly looking for core gaming experiences on the touch screen. The growing appetite from consumers has pushed high-fidelity mobile games to the next level, thus demanding **powerful mobile devices to support premium gaming experiences**.

In this report, we look at how high-fidelity mobile gaming has evolved in the past four years worldwide, with a particular focus on North America, Europe and China. In addition to the growth analysis in key markets, we share insights from trend-making publishers in the mobile gaming space and deep-dive into how mobile devices have developed to meet mobile gamers' growing appetite for complex games.

Please note that in this report, we consider mobile games as high-fidelity if they feature advanced graphics and/or complex mechanics and gameplay, including *"lite"* versions of complex mobile games like PUBG Mobile Lite and Garena Free Fire. Typically, we classify the following types of games as high-fidelity: MMO, MOBA, 3D action RPG, 3D racing, 3D shooter/ battle royale, and 3D 4X strategy games. These games are also typically referred to as core games on mobile which require a certain level of skills, strategy and time to progress.

42.3%

of China's top-grossing mobile game revenues went to high-fidelity titles in 2016, vs. **6.0%** in North America and **6.6%** in Europe.

Note: In 2016, we tagged the top 200 grossing iOS and Android games separately, while in this report, we combined app revenues from the App Store and Google Play (excluding China). Therefore, the number of high-fidelity games was adjusted for 2016 accordingly from the previous report.

Tianyi Gu
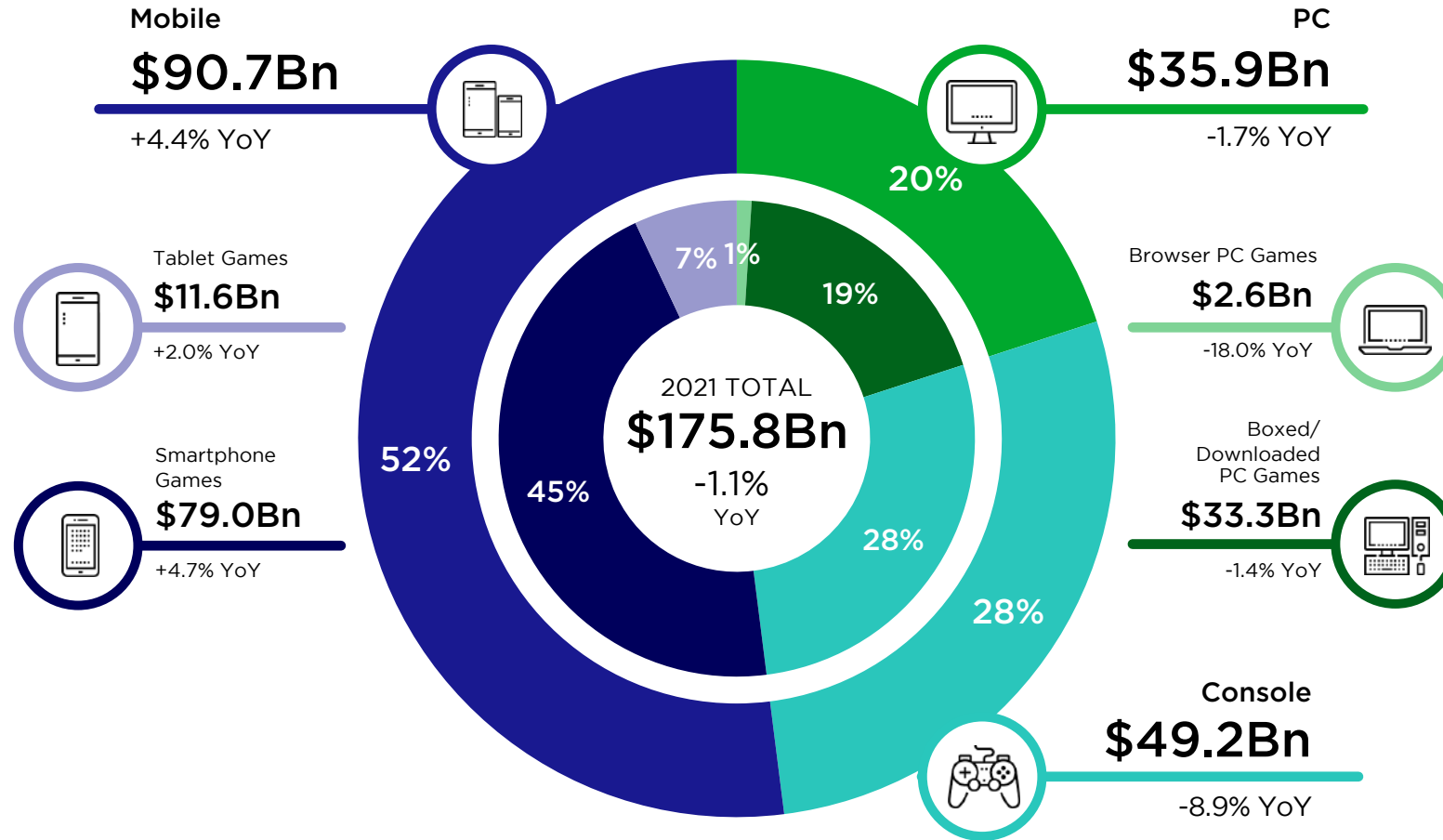Market Lead Telecom & Mobile Services

1. Mobile Games Market Overview

Revenues, players and developments

Mobile Is the Biggest Gaming Platform in the World

Global games market revenues | 2021 | Per device & segment with year-on-year growth rates
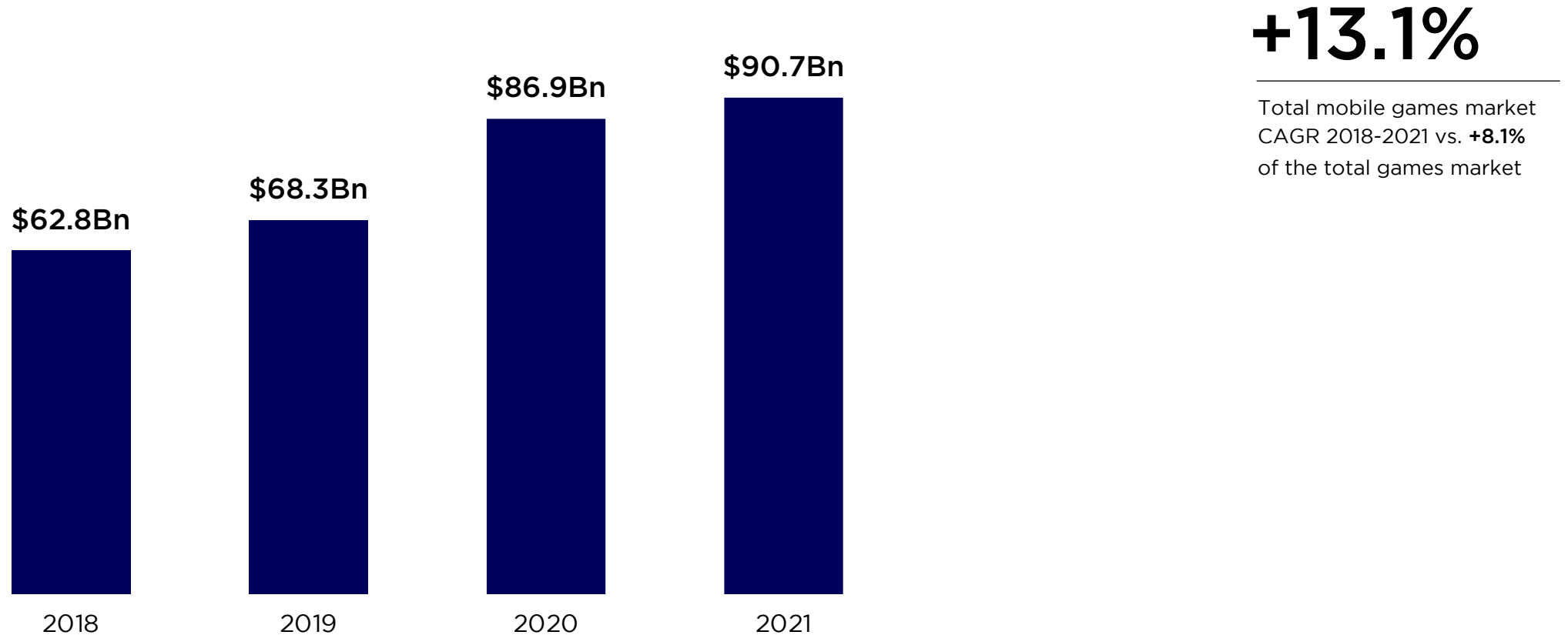
Mobile
$90.7Bn
+4.4% YoY

Tablet Games
$11.6Bn
+2.0% YoY

Smartphone Games
$79.0Bn
+4.7% YoY

PC
$35.9Bn
-1.7% YoY

Browser PC Games
$2.6Bn
-18.0% YoY

Boxed/ Downloaded PC Games
$33.3Bn
-1.4% YoY

Console
$49.2Bn
-8.9% YoY

2021 TOTAL
$175.8Bn
-1.1% YoY

52%
45%
7%
1%
19%
20%
28%
28%

$90.7Bn

Mobile game revenues in 2021 will account for 52% of the global market.
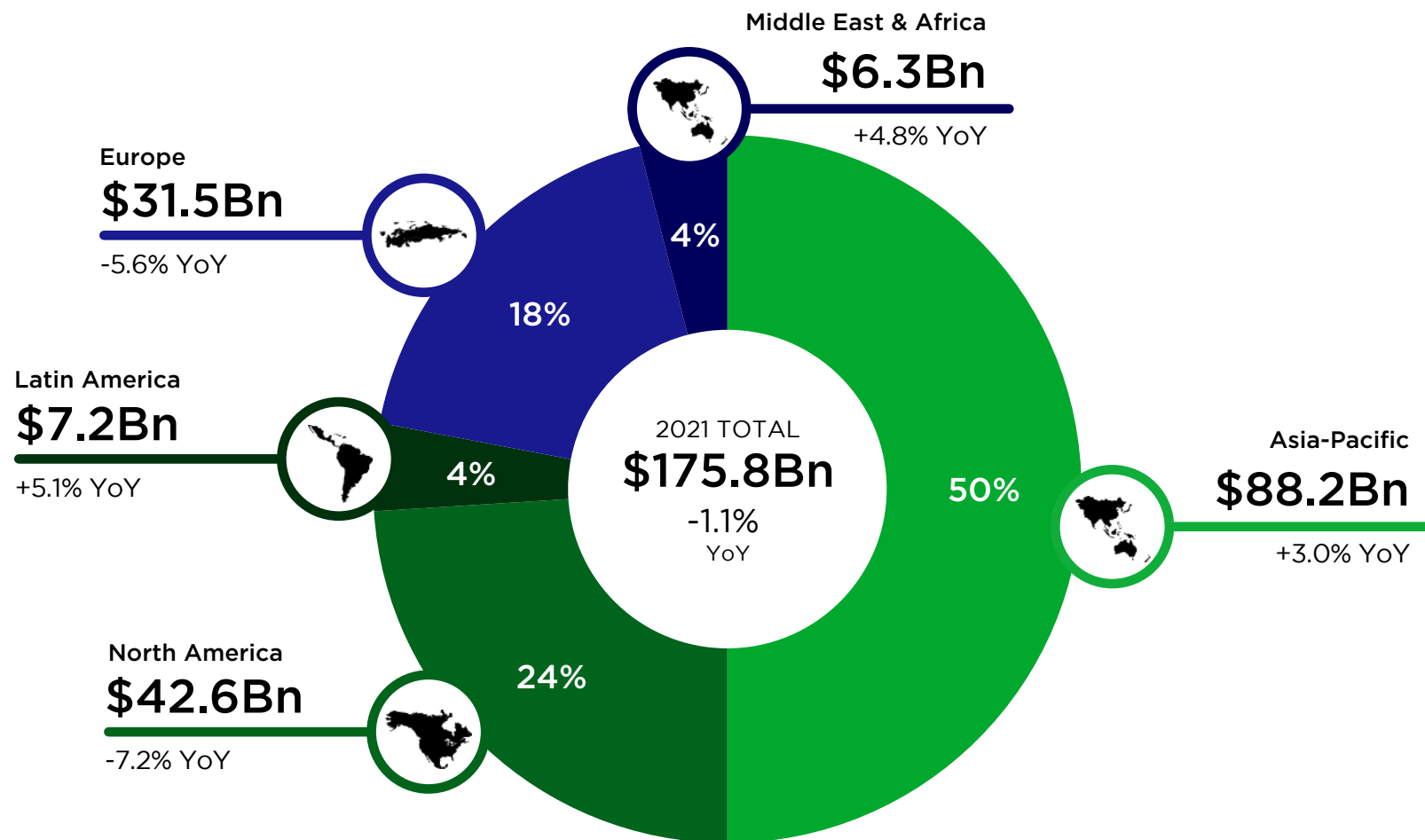
Source: © Newzoo | 2021 Global Games Market Report

Mobile Is Also the Fastest-Growing Gaming Platform Since 2018

Global mobile game revenue forecast | 2018-2021

+13.1%

Total mobile games market
CAGR 2018-2021 vs. **+8.1%**
of the total games market

$62.8Bn
$68.3Bn
$86.9Bn
$90.7Bn

2018   2019   2020   2021

Nearly Half of Global Game Revenues Come from APAC

Global games market revenues | 2021 | Per region with year-on-year growth rates

Middle East & Africa
$6.3Bn
+4.8% YoY

Europe
$31.5Bn
-5.6% YoY

Latin America
$7.2Bn
+5.1% YoY

2021 TOTAL
$175.8Bn
-1.1% YoY

North America
$42.6Bn
-7.2% YoY

4%

18%

4%

50%

24%

Asia-Pacific
$88.2Bn
+3.0% YoY

48%
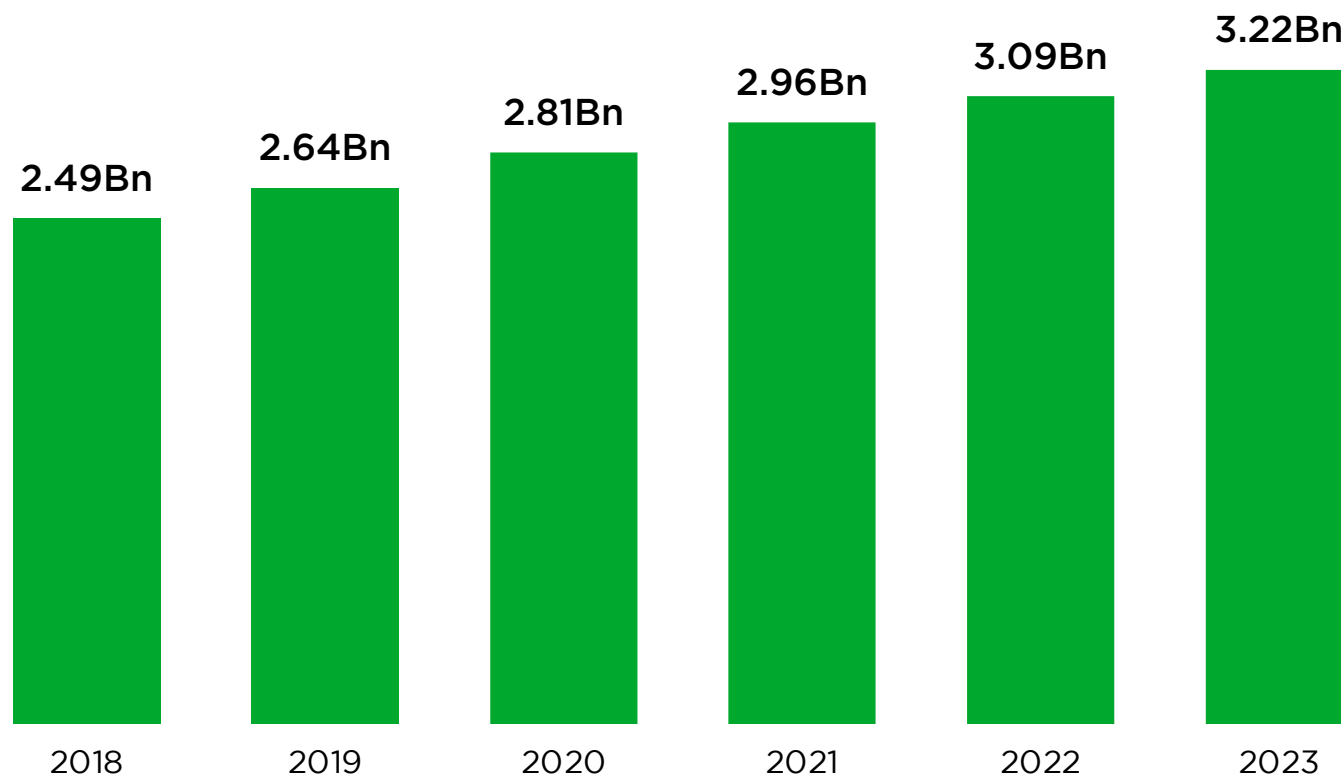of all consumer spending on games in 2021 will come from the U.S. and China

China Total
$45.6Bn

U.S. Total
$39.1Bn

Globally, 94% of Gamers Play on Mobile

Global number of players across PC, console, and mobile | 2018-2023

+5.3%

Total players CAGR
2018-2023

2.49Bn · 2018
2.64Bn · 2019
2.81Bn · 2020
2.96Bn · 2021
3.09Bn · 2022
3.22Bn · 2023

Mobile Players in 2021

2.8Bn

Console Players in 2021

0.9Bn

PC Players in 2021

1.4Bn

Source: © Newzoo | 2021 Global Games Market Report
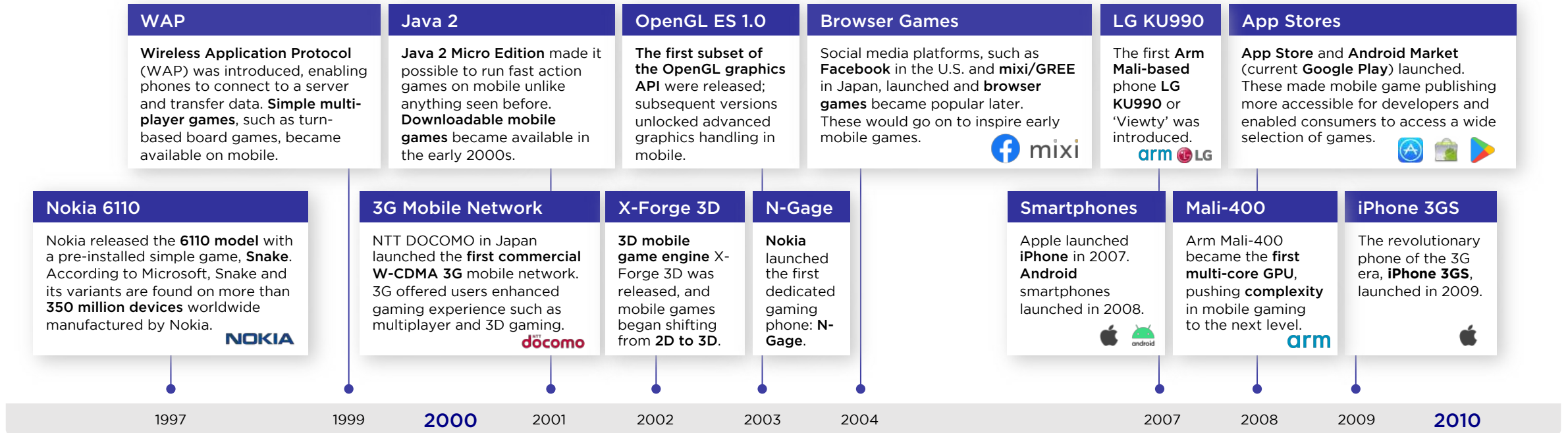
History of Mobile Games and Their Evolution from 2000-2010

How new technologies enabled new features in mobile games

WAP
Wireless Application Protocol (WAP) was introduced, enabling phones to connect to a server and transfer data. **Simple multi-player games**, such as turn-based board games, became available on mobile.

Java 2
Java 2 Micro Edition made it possible to run fast action games on mobile unlike anything seen before. **Downloadable mobile games** became available in the early 2000s.

OpenGL ES 1.0
The first subset of the OpenGL graphics API were released; subsequent versions unlocked advanced graphics handling in mobile.

Browser Games
Social media platforms, such as **Facebook** in the U.S. and **mixi/GREE** in Japan, launched and **browser games** became popular later. These would go on to inspire early mobile games.

LG KU990
The first **Arm Mali-based** phone **LG KU990** or 'Viewty' was introduced.

App Stores
App Store and **Android Market** (current **Google Play**) launched. These made mobile game publishing more accessible for developers and enabled consumers to access a wide selection of games.

Nokia 6110
Nokia released the **6110 model** with a pre-installed simple game, **Snake**. According to Microsoft, Snake and its variants are found on more than **350 million devices** worldwide manufactured by Nokia.

3G Mobile Network
NTT DOCOMO in Japan launched the **first commercial W-CDMA 3G** mobile network. 3G offered users enhanced gaming experience such as multiplayer and 3D gaming.

X-Forge 3D
3D mobile game engine X-Forge 3D was released, and mobile games began shifting from **2D to 3D**.

N-Gage
Nokia launched the first dedicated gaming phone: **N-Gage**.

Smartphones
Apple launched **iPhone** in 2007. **Android** smartphones launched in 2008.

Mali-400
Arm Mali-400 became the **first multi-core GPU**, pushing **complexity** in mobile gaming to the next level.

iPhone 3GS
The revolutionary phone of the 3G era, **iPhone 3GS**, launched in 2009.

| 1997 | 1999 | **2000** | 2001 | 2002 | 2003 | 2004 | 2007 | 2008 | 2009 | **2010** |

Innovations that revolutionized mobile gaming in the 2000s

1. Commercially available **3G mobile network**.
2. **Fast-action**, **downloadable** and **3D** mobile games.
3. Introduction of **smartphones** with **large screens**.
4. Launch of the **App Store** and **Android Market**.
5. Release of **Arm Mali-400**, the first multi-core GPU.

Breakthrough in mobile device development

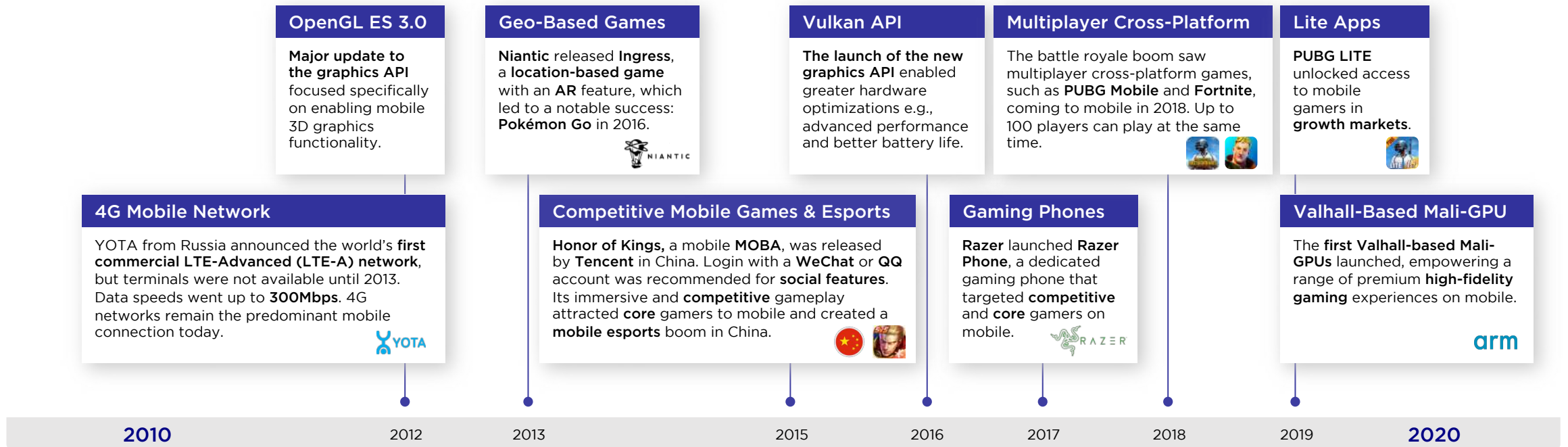**Nokia 6110** with a pre-installed game Snake, launched in 1997.

Nokia N-Gage was the first dedicated gaming phone launched in 2003.

The revolutionary phone of the 3G era: **iPhone 3GS**, launched in 2009.

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History of Mobile Games and Their Evolution from 2010-2020

How new technologies enabled new features in mobile games

OpenGL ES 3.0

Major update to the graphics API focused specifically on enabling mobile 3D graphics functionality.

Geo-Based Games

Niantic released **Ingress**, a **location-based game** with an **AR** feature, which led to a notable success: **Pokémon Go** in 2016.

Vulkan API

The launch of the new graphics API enabled greater hardware optimizations e.g., advanced performance and better battery life.

Multiplayer Cross-Platform

The battle royale boom saw multiplayer cross-platform games, such as **PUBG Mobile** and **Fortnite**, coming to mobile in 2018. Up to 100 players can play at the same time.

Lite Apps

PUBG LITE unlocked access to mobile gamers in **growth markets**.

4G Mobile Network

YOTA from Russia announced the world's **first commercial LTE-Advanced (LTE-A) network**, but terminals were not available until 2013. Data speeds went up to **300Mbps**. 4G networks remain the predominant mobile connection today.

Competitive Mobile Games & Esports

Honor of Kings, a mobile **MOBA**, was released by **Tencent** in China. Login with a **WeChat** or **QQ** account was recommended for **social features**. Its immersive and **competitive** gameplay attracted **core** gamers to mobile and created a **mobile esports** boom in China.

Gaming Phones

Razer launched **Razer Phone**, a dedicated gaming phone that targeted **competitive** and **core** gamers on mobile.

Valhall-Based Mali-GPU

The **first Valhall-based Mali-GPUs** launched, empowering a range of premium **high-fidelity gaming** experiences on mobile.

2010 2012 2013 2015 2016 2017 2018 2019 **2020**

Innovations that revolutionized mobile gaming in the 2010s

1. Evolution of on-device sensors, including the 3-axis **gyroscope**.
2. Broadly available **4G mobile network**.
3. **Vulkan and OpenGL ES 3.0+ graphics API** technologies.
4. Rise of **online multiplayer** and **multiplayer cross-platform**.
5. Introduction of **augmented reality** and **location-based games**.

Breakthrough in mobile device development

HTC Evo 4G, the first 4G-enabled phone, launched in 2010.

Razer Phone, a dedicated gaming smartphone boasting a 120HZ display, dual front-facing stereo speaks, launched in 2017.

2. Latest Trends in Mobile Gaming

How they impact the mobile hardware market

More and More PC/Console Publishers Are Investing in Mobile

Bringing complex game genres to the mobile platform

The trend is clear: PC and console publishers can no longer ignore mobile.

Riot Games, after being a PC developer for a decade, now supports three titles on mobile. **Blizzard Entertainment** is releasing a mobile-first title, **Diablo Immortal**, after 30 years of only PC/console releases. **Electronic Arts** recently purchased **Glu Mobile**, indicating a big investment into its mobile future, and plans to launch **Apex Legends** on mobile next year. **Path of Exile** will also soon get a mobile version, as will console classics **Devil May Cry**, **The Witcher** and **H1Z1**. **Final Fantasy VII** will get two new mobile games. Meanwhile, **Microsoft** brought its exclusive console franchise **Forza** to mobile in 2020 with **Forza Street**.

The rise of **cross-platform** play (or crossplay) is also playing a big part in removing barriers between devices, and it's worth noting that big franchises often need to be accessible on mobile to truly become global successes. **Fortnite** made headlines with its crossplay support for all platforms, with tailored elements for mobile. As another example, **PUBG** reached its peak global success not on PC/console but through the popularity of its mobile iteration. Today, being a globally successful franchise is much harder to achieve if the experience is limited to devices that don't have widespread accessibility. This is especially true for growth markets, where the cost of next-gen consoles and premium PC hardware continues to put next-gen gaming out of reach for many would-be core gamers.

What's more, the concept of **live games** is becoming increasingly important to today's PC/console publishers as the market embraces a game-as-a-service future initiated by mobile gaming's free-to-play business model.

At the same time, mobile developers are learning from PC/console by **introducing complex and immersive game genres to the touch screen**, such as MOBA, strategy, racing, shooter and battle royale. In fact, with mobile gaming's impressive growth in the past decade, a variety of **genres have become more widespread on mobile than on PC/console**. Among the top 1,000 games tagged in Newzoo's Platform by number of monthly active users per platform (PC/console/mobile), only mobile games cover all genres, while both PC and console lack one or more genres among the platform's top 1,000 games.

Games Are More Complex, Advancing in Mechanics and Graphics

Mobile games are more core and complex than 10 years ago, though there are also shifts to casual gaming

Casual .... **Core**

Disney Tsum Tsum 2014 → Tsum Tsum Stadium 2020
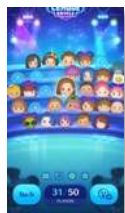
PVP (Player vs. Player) mode was introduced. Up to 50 players can compete in a single game.

Angry Birds 2009 ↓ Angry Birds AR 2019

Increased complexity and upgraded graphics from 2D to 3D and AR-powered.

Fantasy Westward Journey 2015 ↓ Fantasy Westward Journey 3D 2019

Graphics were upgraded from 2D to 3D and real-time battles were introduced in the new version.

AFK Arena 2019 ← Xiaobingbing Arena [Lilith Games] 2014

AFK Arena moved Xiaobingbing concept toward mid-core by including idle and simplified mechanics.

Mobile Gamers Become More Gender Balanced Across Key Markets

Gamers aged 21-35 have the highest share: about one-third to over half of mobile gamers across key markets

United States

52%
- 12%
- 18%
- 15%
- 7%

48%
- 10%
- 14%
- 15%
- 9%

2016
Average age: **34.4**

51%
- 14%
- 17%
- 14%
- 6%

49%
- 11%
- 15%
- 13%
- 10%

2020
Average age: **33.5**

United Kingdom

55%
- 13%
- 22%
- 14%
- 6%

45%
- 10%
- 15%
- 14%
- 6%

2016
Average age: **32.7**

51%
- 12%
- 19%
- 13%
- 7%

49%
- 11%
- 17%
- 14%
- 7%

2020
Average age: **32.9**

China

59%
- 17%
- 30%
- 12%

41%
- 11%
- 20%
- 10%

2016
Average age: **27.4**

53%
- 9%
- 26%
- 18%

47%
- 10%
- 25%
- 12%

2020
Average age: **29.8**

India

54%
- 15%
- 24%
- 15%

46%
- 12%
- 21%
- 13%

2020
Average age: **28.5**

Saudi Arabia

59%
- 14%
- 24%
- 21%

41%
- 12%
- 17%
- 12%

2020
Average age: **29.4**

Legend

Male
- 10-20
- 21-35
- 36-50
- 51-65

Female
- 10-20
- 21-35
- 36-50
- 51-65

Note: India and Saudi Arabia were not covered in Newzoo's Consumer Insights – Games & Esports in 2016

Competitive Genres Are More Popular in Mobile-First Markets

Some of today's most popular genres didn't exist on mobile four years ago

Favorite Genres on Mobile

	U.S.	U.K.	CN	IN	SA
#1	Puzzle	Puzzle	MOBA	Racing	Puzzle
#2	Match	Match	Match	Puzzle	Sports
#3	Traditional Card Games	Arcade	Shooter	Sports	Racing
#4	Arcade	Traditional Card Games	Battle Royale	Shooter	Adventure
#5	Strategy	Simulation	Role-Playing	Battle Royale	Shooter

Complex and competitive genres, such as MOBA, shooter, battle royale and racing, are much more popular in mobile-first countries (e.g., China, India and Saudi Arabia) than in the U.S. and the U.K., where mobile gamers tend to enjoy more casual genres like puzzle, match and arcade. Strategy is the #5 most popular mobile genre in the U.S., where Supercell's Clash of Clans and Clash Royale and a few 4X strategy games developed by Chinese companies have been leading the top-grossing chart. Interestingly, popular genres in mobile-first markets like battle royale didn't exist on mobile back in 2016, proving how fast the market has evolved in recent years.

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Introducing Newzoo's Gamer Personas

Globally, Time Fillers and Subscribers are the most common, accounting for almost half of all mobile gamers

16%

The Ultimate Gamer

"Gaming is in my DNA! There are few things I love more. I spend my free time and money on games."

11%

The All-Round Enthusiast

"I am interested in all forms of gaming, from playing to watching and everything in between."

23%

The Subscriber

10%

"I enjoy playing high-quality games, preferably free-to-play or discounted titles. I will only spend on hardware when necessary."

3%

The Conventional Player

"I do not watch other people play games much. I own plenty of hardware, so I would rather be playing myself."

9%

The Hardware Enthusiast

"I am always following the latest hardware news and trends. Whether it's for work or play, I want an optimized experience."

14%

The Popcorn Gamer

"Playing video games may not be my favorite hobby, but I definitely enjoy watching others play."

24%

The Time Filler

"I only game when I have time to spare or at social events. Mobile games are my go-to."

On a global level, the Subscriber and the Time Filler are the most popular personas among mobile gamers. Time fillers are those who play games, typically on mobile, to pass time.

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China Has the Most Ultimate Gamers and "Core" Preferences

The top persona varies per market; overall, the Subscriber is in the top 2, characterized by lower hardware engagement but high software engagement

	U.S.	U.K.	CN	IN	SA
The Ultimate Gamer	14%	10%	**27%**	24%	20%
The All-Round Enthusiast	10%	11%	13%	11%	12%
The Conventional Player	5%	7%	4%	1%	2%
The Subscriber	**28%**	23%	18%	**37%**	**29%**
The Popcorn Gamer	8%	10%	15%	15%	18%
The Hardware Enthusiast	8%	7%	10%	7%	10%
The Time Filler	27%	**32%**	13%	5%	9%

Game Enthusiasts

Game Players

Game Viewers

Casual Gamers

The top persona among mobile gamers in China is the Ultimate Gamer—they score the highest on all dimensions in terms of playing, viewing and owning. Linked to this, competitive and immersive genres on mobile, as opposed to more casual game genres, are more popular in China.

The Subscriber enjoys playing games, especially F2P, and only spends on hardware when necessary. This persona ranks #1 in India, Saudi Arabia and the U.S. In the U.S., they are marginally more common than Time Fillers.

Source: © Newzoo | Consumer Insights – Games & Esports | April 2020

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How China Has Grown as the #1 Market for Core Mobile Gaming

Key milestones in core mobile gaming development in China

PC Dominance

The Chinese games market was dominated by PC games before the 2010s. The market was led by **competitive PC titles** like **Counter-Strike** and **IP-based MMORPGs** such as **World of Warcraft** and **Fantasy Westward Journey**. MMORPG has strong roots in China since the launch of **Legend of Mir2** in 2001, developed by Korean-based WeMade Entertainment.

Domestic Smartphone Manufacturers

Since 2011, domestic brands like **Xiaomi**, **OPPO**, **Huawei** and **Vivo**, targeting the mid- and low-end market, have gradually taken an increasing market share. With pre-installed Android app stores on these devices, domestic OEMs still play an important role in distributing mobile games in China.

I AM MT

I AM MT was introduced by Locojoy, integrating successful PC game mechanics to mobile.

Core Mobile Gaming Boom

2015 marked the start of core mobile gaming experiences in China, with high-quality games such as MOBA **Honor of Kings** and strategy RPG **Onmyoji** (2016) launching on mobile. Moreover, multiple PC franchises were migrated to mobile, including MMORPG **Fantasy Westward Journey** and shooter game **CrossFire Mobile**. These games remain China's top-grossing games today.

Cross-Platform Games

More games such as **Genshin Impact** and MMORPG **Revelation** (2021) became available cross-platform on Android/iOS and PC.

Smartphone Games

Popular smartphone games, such as **Angry Birds** and **Fruit Ninja**, were introduced to China, opening the door to mobile games for Chinese consumers.

Shenxiandao Mobile

Shenxiandao Mobile, a MMORPG adapted from the browser game Shenxiandao, launched. The game inspired domestic developers to bring **established PC/browser games to mobile**.

Mobile Battle Royale

Following the success of PUBG on PC, battle royale caught the attention of big Chinese mobile game developers. **Knives Out** was released in 2017 by NetEase and **PUBG Mobile** by Tencent in 2018 (later re-launched as **Peacekeeper Elite** in China in 2019).

Esports

In 2019, **QQ Speed** and **Honor of Kings** held their first **international tournaments**.

Before 2010	**2010**	2011	2012	2013	2015	2017	2019	**2020**

Key drivers of China's mobile games market development in the 2010s

1. Introduction of **budget smartphones** by domestic OEMs.
2. **PC/browser franchises and mechanics** adapted to mobile.
3. **Leading game companies** joining the fray of core mobile game development and publishing.
4. **Fully established ecosystem** in China, integrating streaming, esports, publishing, and more.

Core Genres Take Mobile by Storm in China

Mobile adaptation of core PC titles take the lead in development priorities

Complex and competitive IP-based games dominate the mobile games market in China, demanding smartphones with better gaming performance.

- Most top mobile games in China are (mid)core and inspired by popular PC franchises. For example, mobile MOBA **Honor of Kings** (2015) was inspired by the PC version of **League of Legends**. In 2018, Tencent released **PUBG Mobile** (later re-launched as **Peacekeeper Elite** in China) following the rising popularity of **PUBG** on PC. With competitive mechanics, both franchises successfully developed esports ecosystems in China.

- Besides the top two competitive mobile games, multiple IP-based games have migrated from PC to mobile, such as **Fantasy Westward Journey** (2015) and **Moonlight Blade** (2020). Compared to the first generation of mobile MMORPGs, new MMORPGs feature better 3D graphics. Other IP-based games, like Alibaba's 4X strategy game **Three Kingdoms Tactics** (2019), are loaded with a more realistic geographical simulation.

- Since NetEase released the cross-platform version of **Fantasy Westward Journey** in 2016, an increasing number of cross-platform games have become available across Android, iOS and PC in China. The biggest breakthrough in China's cross-platform game development was undoubtedly miHoYo's open-world RPG **Genshin Impact** (2020), available on Android/iOS, PC, PS4 and Nintendo Switch, bringing an AAA gaming experience to the touch screen. Cross-platform games are pushing demand for powerful mobile hardware to the next level.

MOBA: Honor of Kings

Battle Royale: Peacekeeper Elite

Strategy: Three Kingdoms Tactics

MMORPG: Moonlight Blade

How have high-fidelity games developed in the past four years to meet the growing appetite for complex gaming?

China Leads the Way for High-Fidelity Mobile Games

In 2020, nine out of the top 20 Android games (by MAU) and eight out of the top 10 grossing iOS games were high-fidelity

Revenue Share of High-Fidelity Mobile Games in China

Top 200 grossing iOS games | 2016 & 2020

2016: 42% / 58%

vs.

2020: 70% / 30%

● High-Fidelity Games
● Other
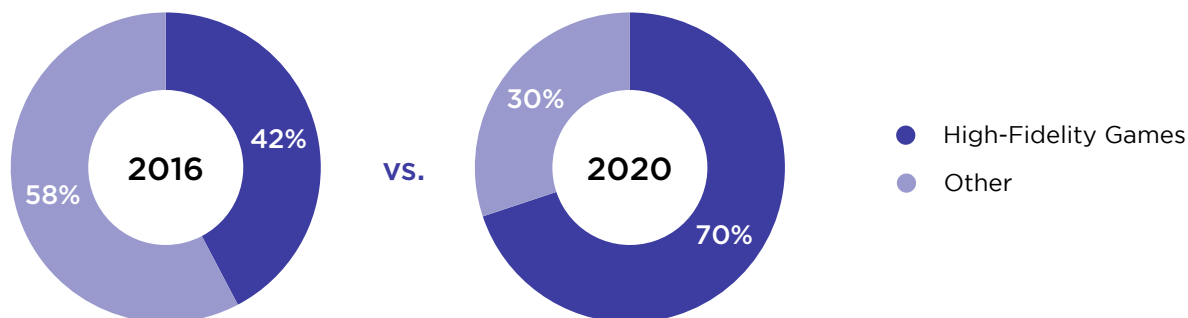
Among China's top 200 grossing iOS games in 2020, we identified 88 games as high-fidelity, vs. 73 in 2016. These 88 games contributed to 69.9% of the top 200's total revenues in 2020. In 2016, the revenue share of high-fidelity games was 42.3%.

As the world's largest mobile games market (for both revenues and number of players), China is still leading the way for high-fidelity mobile games. Chinese developers have long been devoted to complex, competitive and multiplayer mobile titles. Many of the leading high-fidelity games were launched before 2016. In recent years, Chinese game companies are bringing this trend to overseas markets as the domestic market gets increasingly saturated.

Top High-Fidelity Games by MAU

Android | December 2020

1 **Honor of Kings**
Publisher: Tencent
Launch Year: 2015
Genre: MOBA

2 **Peacekeeper Elite**
Publisher: Tencent
Launch Year: 2019
Genre: Battle Royale

3 **CrossFire Mobile**
Publisher: Tencent
Launch Year: 2015
Genre: Shooter

4 **QQ Speed Mobile**
Publisher: Tencent
Launch Year: 2017
Genre: Racing

5 **LifeAfter**
Publisher: NetEase
Launch Year: 2018
Genre: Adventure

North America Embraces Many Newcomers to High-Fidelity Gaming

Three out of the top 10 grossing mobile games in North America in 2020 were high-fidelity

Revenue Share of High-Fidelity Mobile Games in North America
Top 200 grossing games on iOS & Google Play combined | 2016 & 2020

2016
- 6%
- 94%

vs.

2020
- 33%
- 67%

● High-Fidelity Games
● Other
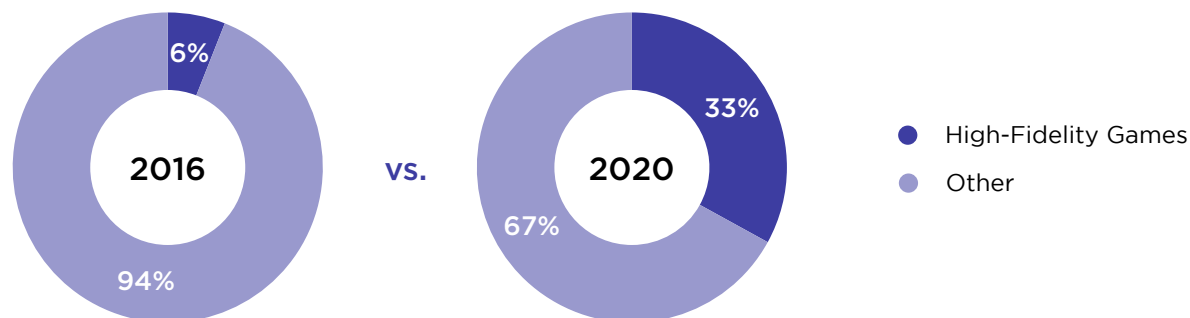
In North America, 48 out of the top 200 grossing mobile games were high-fidelity in 2020, compared to 23 in 2016. Revenue contribution from high-fidelity games jumped from 6.0% to 32.9% among the top 200, showing the increasing demand for complex gaming experience from mobile players in the region.

Much of the revenue growth in North America was driven by newcomers to the leading chart of high-fidelity games (by revenues). Among the top five in 2020 (see on the right), four were launched in 2016 or later. (Mid)core genres, such as strategy (especially 4X games), shooter, battle royale and RPG, continue to find their place among mobile gamers in North America.

Top-Grossing High-Fidelity Games
iOS & Google Play | 2020

1 **ROBLOX**
Publisher: Roblox Corporate
Launch Year: 2011
Genre: Adventure

2 **Pokémon Go**
Publisher: Niantic
Launch Year: 2016
Genre: AR/Location-Based

3 **PUBG Mobile**
Publisher: Tencent
Launch Year: 2018
Genre: Battle Royale

4 **Call of Duty: Mobile**
Publisher: Activision Blizzard
Launch Year: 2019
Genre: Shooter

5 **Rise of Kingdoms**
Publisher: Lilith Games
Launch Year: 2018
Genre: Strategy

Europe Sees Similar Market Dynamics as North America

Four out of the top 10 grossing mobile games in Europe in 2020 were high-fidelity

Revenue Share of High-Fidelity Mobile Games in Europe

Top 200 grossing games on iOS & Google Play combined | 2016 & 2020

2016
- 7%
- 93%

vs.

2020
- 37%
- 63%

● High-Fidelity Games
● Other
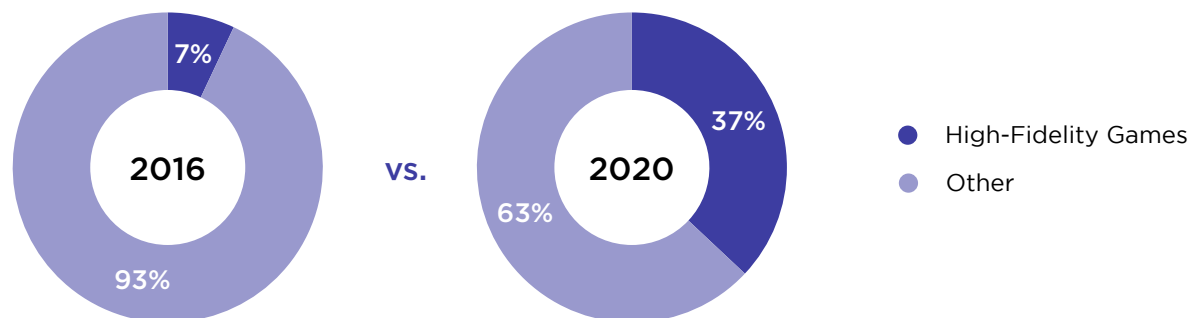
There were 61 high-fidelity mobile games identified among Europe's top 200 grossing chart in 2020, compared to 30 in 2016. Revenues from these 61 games accounted for 37.3% of the top 200, increasing significantly from 6.6% in 2016.

The high-fidelity mobile games market in Europe has seen similar developments in the past four years as those of North America. The number of high-fidelity mobile games among the top 200 doubled in four years, and these games now contribute to a much larger share of revenues. Nevertheless, complex mobile games tend to appeal more to European mobile gamers than North American players.

Top-Grossing High-Fidelity Games

iOS & Google Play | 2020

1 **Pokémon Go**
Publisher: Niantic
Launch Year: 2016
Genre: AR/Location-Based

2 **Brawl Stars**
Publisher: Supercell
Launch Year: 2018
Genre: Shooter

3 **ROBLOX**
Publisher: Roblox Corporate
Launch Year: 2011
Genre: Adventure

4 **State of Survival**
Publisher: FunPlus
Launch Year: 2020
Genre: Strategy

5 **PUBG Mobile**
Publisher: Tencent
Launch Year: 2018
Genre: Battle Royale

How are mobile devices catching up with the rising trend of high-fidelity mobile games in the market?

Premium Smartphones Are Attracting More and More Consumers

Leading OEMs continue to strive for flagship models in their product portfolios

Market Share of High-End Smartphones

Global | January 2019 – December 2020

35.3%

7.6%

Jan
2019 Mar
2019 Jun
2019 Sep
2019 Dec
2019 Mar
2020 Jun
2020 Sep
2020 Dec
2020
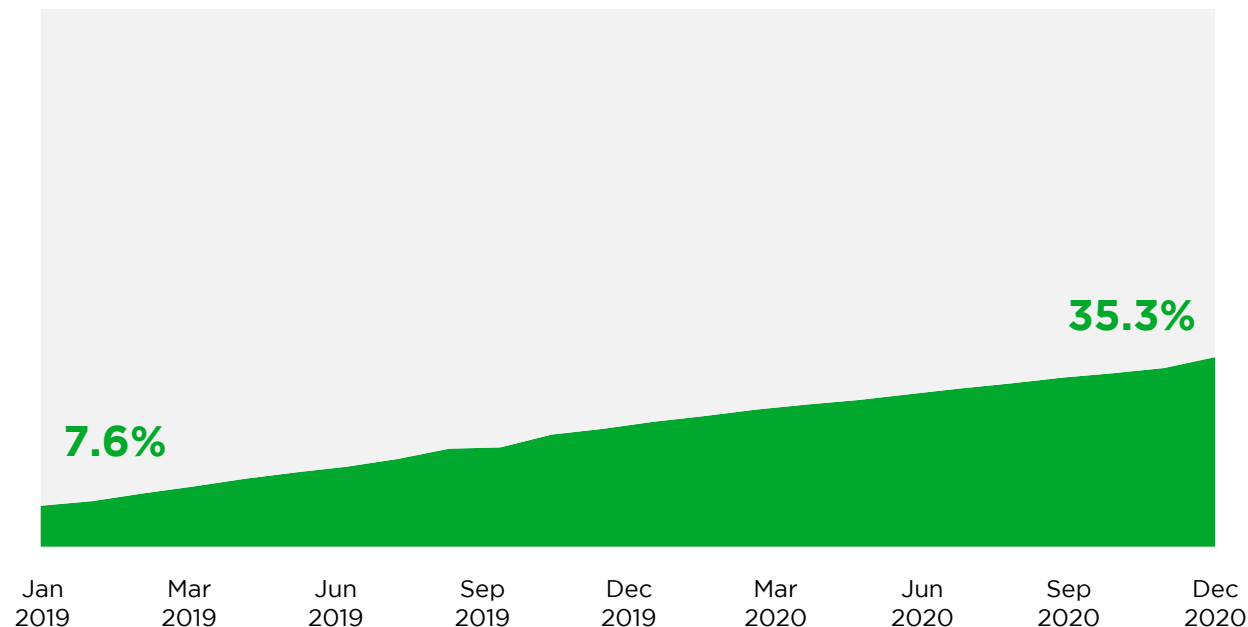
Note: High-end smartphones have at least 4GB of RAM, four CPU cores, and a launch date of 2018 or later.

Flagship Models Released/Announced for 2021

Samsung Galaxy S21 Ultra 5G
6.8-inch with 1440 x 3200 pixels
Exynos 2100 based on 1x Arm Cortex-X1 core, 3x Cortex-A78 cores, and 4x Cortex-A55 cores and Arm Mali-G78 MP14/ Qualcomm SM8350 Snapdragon 888 5G based on Arm Cortex-X1, Cortex-A78 and Cortex-A55 with 12/16GB RAM
5000 mAh battery

Xiaomi Mi 11 Ultra 5G
6.81-inch with 1440 x 3200 pixels
Qualcomm SM8350 Snapdragon 888 5G based on Arm Cortex-X1, Cortex-A78 and Cortex-A55
with 8/12GB RAM
5000 mAh battery

OPPO Find X3 Pro 5G
6.7-inch with 1440 x 3216 pixels
Qualcomm SM8350 Snapdragon 888 5G based on Arm Cortex-X1, Cortex-A78 and Cortex-A55
with 8/12GB RAM
4500 mAh battery

Source: © Newzoo | Monthly Active Device Data

Gaming Phones Are Entering the Market from Major Brands

Following in the footsteps of Razer, dedicated gaming smartphones are finding unique selling points

Razer: A Gaming Phone Trail-Blazer

A company known for its peripherals and now hardware in the PC space, Razer was among the first companies to launch a gaming smartphone.

The original Razer Phone (launched in 2017) boasted a 120HZ display, dual front-facing stereo speakers and a variety of other features that targeted competitive gamers and core gamer personas—Razer's target audience in general.

Established Phone Manufacturers Join the Trend with Different Strategies

Following in Razer's footsteps, established phone and hardware manufacturers have entered the market, too. Xiaomi and ZTE bring their popularity in mobile-first markets and expertise in phone manufacturing, while Asus and Lenovo leverage their own gaming brands. Each phone has a slightly different selling point—the Asus is modular, the Lenovo has a liquid cooling system, and the latest ZTE Nubia Red Magic model boasts a 165Hz frame rate.

newzoo

Black Shark Is the Most Widely-Adopted Gaming Phone Brand

China is by far the biggest market for gaming smartphones

Monthly Active Users of Key Gaming Smartphone Brands
Global | January 2018 – December 2020

Xiaomi Black Shark
1.43M

Asus ROG
0.85M

Nubia
0.41M

Razer
0.16M
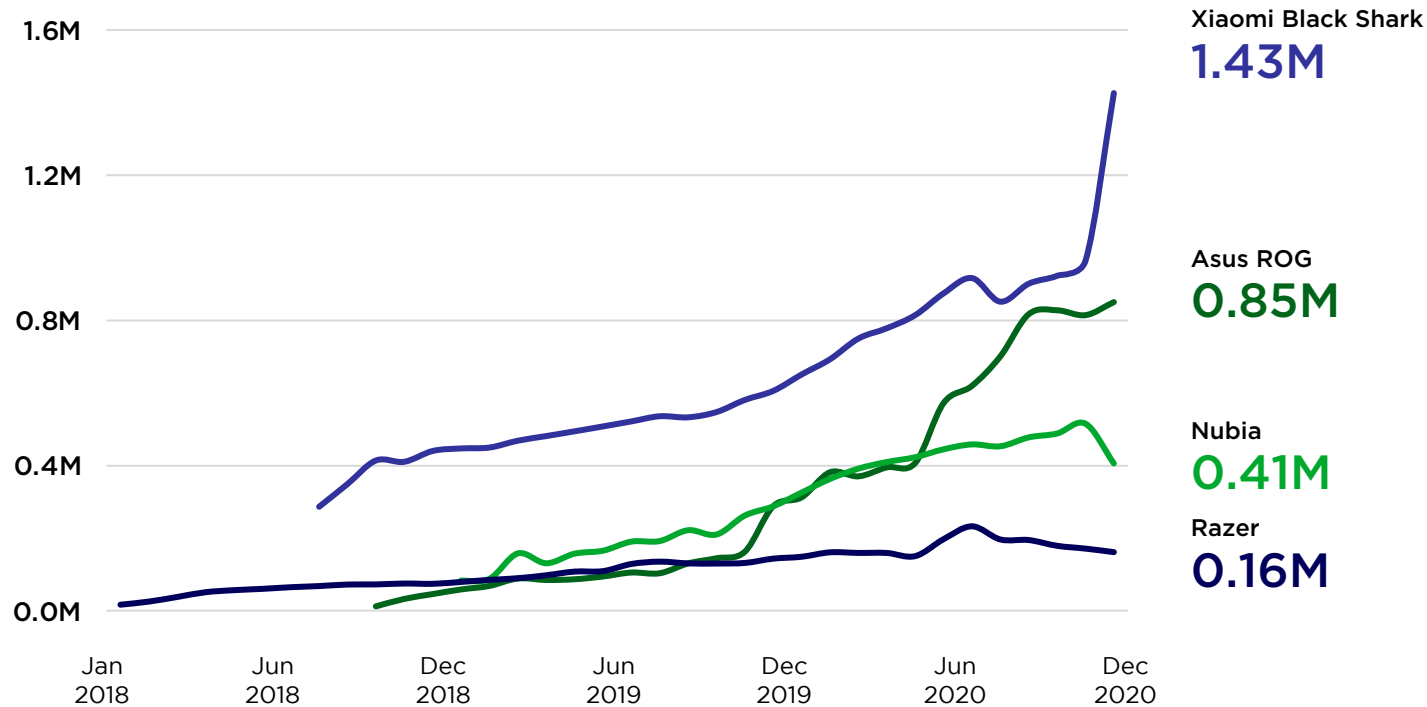
62.6%

of all active gaming smartphones across the globe were from China by December 2020.

Dedicated Gaming Smartphones Still Need to Find What Works

Content partnerships may be key in helping these brands to find their audience

A Challenging Future for Gaming Smartphones

After nearly four years on the market, gaming smartphones still have a hard time finding their audience. The years ahead will continue to present this sector with additional challenges:

- Non-gaming phone brands are adding similar premium features, such as OLED screens, better cooling and higher frame rates.
- Cloud gaming will remove hardware barriers, making performance gaming accessible on any phone.

Are Content Partnerships the Key to Extending Greater Reach?

Content is Queen—major smartphone brands are recognizing this reality and partnering with leading game publishers to push their devices. We're seeing typical branded devices and more innovative pushes, for example, OnePlus offering PUBG Mobile at 90 FPS as a one-month exclusive for gamers outside of China, Japan and South Korea.

In China, Tencent is partnering with several leading gaming smartphone brands, such as Asus ROG, ZTE Nubia and Xiaomi's Black Shark, to optimize Tencent games on their gaming devices. On the software front, Chinese mobile game developers have enabled multiple modes on many high-fidelity games like Honor of Kings, Peacekeeper Elite, QQ Speed and Sky: Children of the Light to support different frame rates, aiming to target low-, mid- and high-end smartphone users alike.

On the computing side, Qualcomm announced Snapdragon Elite Gaming in 2019 to boost immersive gaming on mobile by supporting *"cinema-quality graphics, powerful audio, smooth play, and near-instant responses."* In February 2020, Qualcomm introduced its Snapdragon 865 5G Mobile Platform, powered by Snapdragon Elite Gaming. Qualcomm's latest flagship 8 series 5G platform, Snapdragon 888 5G Mobile Platform, based on Arm Cortex CPU technology, was introduced in December 2020. At ChinaJoy 2020, Tencent and Qualcomm announced a partnership to launch high frame rate modes of Tencent's games in China on mobile devices powered by the Snapdragon 865 (Plus) Mobile Platform.

Tencent 腾讯   **Qualcomm**   **arm**

Publishers Don't Want to Miss Out on a Global Audience

How the tech requirements of games impact the addressable market and potential engagement

Android only	OS (Android only)	RAM (Android only)	Install (Initial download can be smaller)	Addressable Market (# active smartphones by December 2020)	Downloads & Top Markets (As of December 2020 since launch; Google Play only)
PUBG MOBILE	5.1.1 or later	2GB (min)*	2.3GB (full)	90.7% (2,928M) DEFINING METRIC: RAM	>335M (Google Play excl. China) 1. India (18%) 2. Indonesia (10%) 3. Turkey (9%)
CALL OF DUTY MOBILE	5.1 or later	2GB (min)	1.8GB (full)	90.7% (2,928M) DEFINING METRIC: RAM	>132M (Google Play excl. China) 1. U.S. (16%) 2. Brazil (11%) 3. Indonesia (9%)
FREE FIRE	4.0.3 or later	1GB (min)	~680MB (full)	97.4% (3,144M) DEFINING METRIC: RAM	>666M (Google Play excl. China) 1. Brazil (20%) 2. India (17%) 3. Indonesia (13%)
PLAYERUNKNOWN'S BATTLEGROUNDS MOBILE LITE	4.1 or later	1GB (min)	~500MB (full)	97.4% (3,144M) DEFINING METRIC: RAM	>124M (Google Play excl. China) 1. India (55%) 2. Turkey (12%) 3. Brazil (8%)

*All RAM limitation is according to public information.

Cloud Gaming Is Bound to Bring Premium Experiences to Mobile

Global cloud gaming market cap forecast | Revenue estimates for 2020-2023 (base scenario)
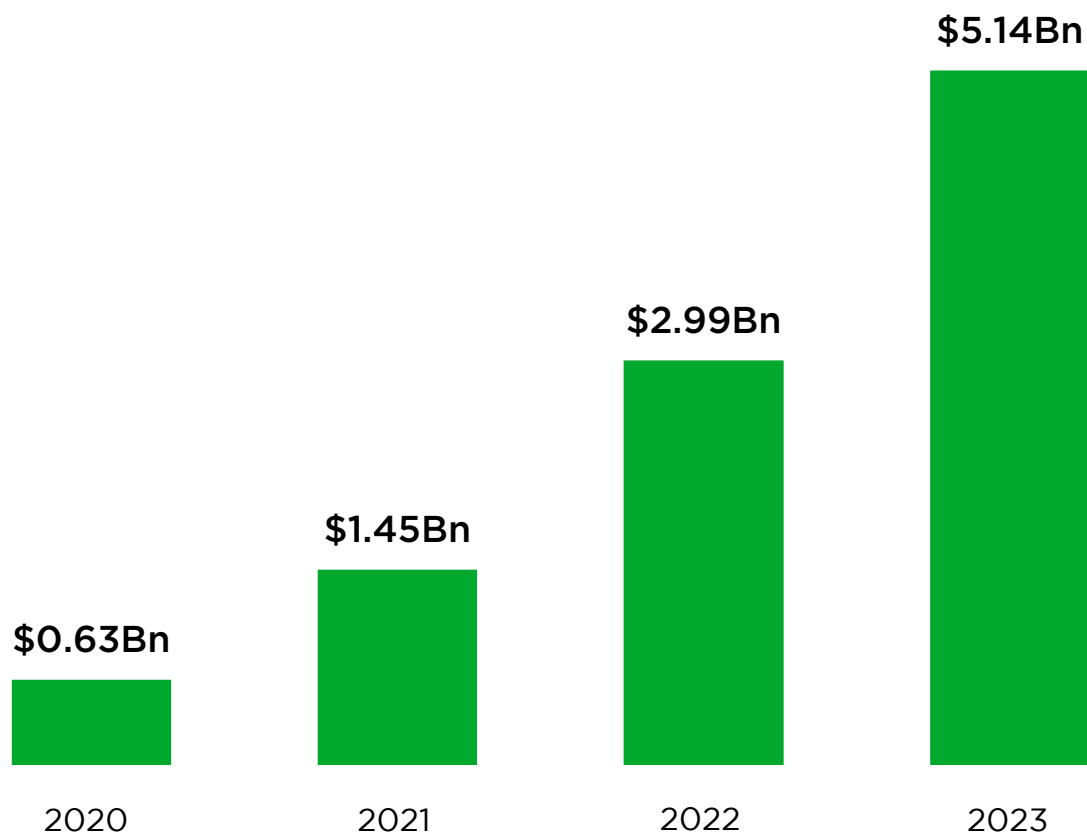
196.5M

The Global Serviceable Obtainable Market* for Cloud Gaming in 2021

$0.63Bn — 2020
$1.45Bn — 2021
$2.99Bn — 2022
$5.14Bn — 2023

We define cloud gaming revenues as the amount the market generates in consumer spending on cloud gaming services: digital full-game purchases, in-game spending and monthly fees to use the services themselves, as well as spending on game subscriptions that operate with cloud gaming services.

* **The serviceable obtainable market does not correspond to users.** It should be interpreted as the total number of people that **could realistically be interested** in using and paying for a cloud gaming service past any trial period.

As a Key Enabler of Cloud Gaming on Mobile, 5G Attracts the Attention of Smartphone Manufacturers Across the Globe

Global 5G-Ready Smartphone Forecast
Forecast toward 2023
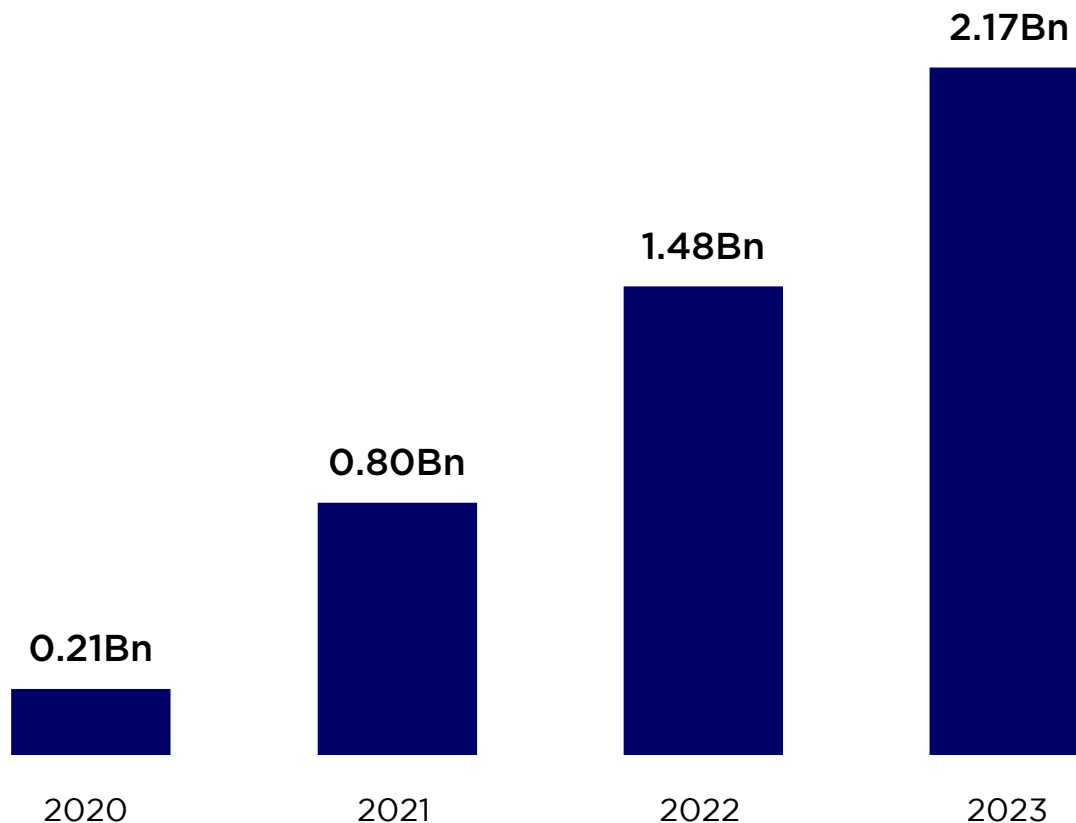
798.7M

or **17.5%** of all active smartphones will be 5G-ready by the end of 2021. By 2023, the global share will grow to **43.1%**.

0.21Bn	0.80Bn	1.48Bn	2.17Bn
2020	2021	2022	2023

For more insights on 5G, cloud gaming, and how these technologies may potentially impact the mobile hardware market, see here.

3. Interview Spotlights

Stakeholder Spotlight

In this report, we've covered how publishers are continuing to focus on creating complex franchise experiences on mobile, and the rise of cross-platform support.

We had the chance to sit down with a few key players who are instrumental in bringing these games to life.

Introducing: Insights from the Trend-Makers

We spoke to leaders from Arm, King, Unity, Riot Games and Wargaming about the growing high-fidelity mobile space

To learn more about the continued growth of high-fidelity gaming experiences, we interviewed key stakeholders about their latest experiences in mobile and their role in breaking down platform barriers.

King, famous for its massively popular **Candy Crush** franchise, went in a new direction with their recently released title **Crash Bandicoot: On the Run!**™. The game brings an iconic console favorite, **Crash Bandicoot**, back to life in a high-fidelity 3D format, which marks a departure from the art style King is traditionally known for.

The **MS-1** studio at **Wargaming** was one of the first AAA developers to innovate what a full-sized experience for mobile could be with **World of Tanks Blitz** in 2013. That experience not only showed the demand for such games, but also brought powerful insights on how to optimize gameplay and design for a mobile audience that was largely non-overlapping

with its PC/console base. Today, **MS-1** is expanding, having recently opened a new studio in Vilnius, Lithuania, dedicated to bringing mid-core games to mobile and portable devices.

As the company behind the world's leading PC game League of Legends, **Riot Games** is eager to expand the reach of the 12-year-old franchise to mobile by introducing **TeamFight Tactics**, **Legends of Runeterra** and **Wild Rift** to the touch screen, and potentially more deep mobile games to come in the pipeline.

Meanwhile, **Unity** recognizes the growing needs of developers to create and scale games, spurred on by technology trends, such as cross-platform/crossplay and cloud gaming. Its innovations, such as **DOTS** (Data-Oriented Technology Stack) and **Universal Render Pipeline**, aim to help developers tackle the increasing complexity requirements of designing and operating games.

Arm, a leading technology provider of processor IP, is dedicated to supporting game developers and game engines in transitioning to the mobile platform amid the rising trends of high-fidelity mobile gaming and crossplay. For example, **Arm Mobile Studio** enables fast and intuitive graphics optimizations for developers who are targeting Mali-based mobile devices.

In the interviews, we also learned what new mobile technologies each leader is most looking forward to in the coming years, and how it could shake up mobile gaming's landscape.

Interview with Aaron Allport, VP Art at King, on Crash Bandicoot: On The Run™

King brought the beloved console franchise **Crash Bandicoot** to mobile, marking a move away from its classics and into uncharted territory

Aaron Allport
VP Art, King

What makes "now" the right time for this title, and what was some of the decision making behind it?

We had been looking for opportunities to bring the mayhem and madness of *Crash Bandicoot* to mobile. *Crash Bandicoot* is an iconic franchise and when we began exploring the runner genre, we felt that he was a perfect fit. Crash is also celebrating his 25th anniversary this year, so now is as good a time as any!

Crash Bandicoot is a nostalgic franchise for many gamers. What were some of the biggest challenges faced with translating a classic franchise onto mobile?

When you are bringing a predominantly console franchise to mobile, you need to make sure that you consider how playing a game on your phone is different to using a controller on a console, and that the gameplay is complimentary to this. At King, we make games that are perfect for bite-sized moments of entertainment and *Crash Bandicoot: On the Run!* is a great example of this. Players can pick up the game, play a level or two, and still feel immersed in the world and excited by the story.

Which types of gaming personas are you primarily targeting with On the Run? Did you expect a strong overlap with Candy Crush gamers?

As with most of our games at King, this is a mobile game that will attract a broad audience. We think kids of the 90s and Crash fans will love it as it features some of the best characters, bosses and lands from the last 25 years. That being said, we truly believe it will appeal to anyone who loves to play games and seeks snackable entertainment that they can play on the go.

What mobile features and technology are you most excited about in the next few years that you think will have the biggest impact on mobile gaming?

Perhaps still a few years out, but I'm very excited about the more substantial rollout of 5G across the various global networks. The opportunity this brings from a low latency standpoint will greatly enhance the ways that our players interact with mobile games. The idea of having huge multiplayer events with no noticeable lag is going to open opportunities

for us as game makers to create even more immersive experiences.

Building on that point is the opportunity to change the way we process, render and stream our games to players over a 5G network. The ability to do more of the processing of our games in the cloud and send them to our players' devices without latency unlocks the ability to deliver gaming experiences at a level of depth and fidelity like we've never seen before.

Of course, it's not all about high fidelity rendering, it's also about being able to stream these experiences to a wider range of devices that are on that network. Better games that are more accessible.

This places the task in our hands, as game makers, to respond with innovative interactive experiences that utilize this technology to the fullest extent. I find this really exciting.

What other trends do you predict for the future of mobile gaming?

I think it is clear to see that the future of mobile gaming is incredibly bright. We have already

Aaron Allport
VP Art, King

seen the positive influence that handheld, easily accessible entertainment can bring to many millions of people around the world.

With this in mind, I see a continued trend in social activity inside our games. At King, we endeavor to bring that design mindset into the experiences that we craft. How we bring people into our games, to play together, is a big part of the conversation. This can include innovative types of in-game social gatherings or events as well as new opportunities for user generated content.

We notice that *Crash Bandicoot: On the Run* is an evolution of what King may have been traditionally known for in the past. Is there anything in particular that you would like to point out there?

One of the things I'm very proud of is the visual quality that the team has been able to deliver for ***Crash Bandicoot: On the Run***. This is King's first time bringing an Activision-owned IP to mobile so it's really important to us that the game feels like an authentic and exciting experience for new and existing Crash fans. The team is working incredibly hard to honor that promise, from all the super fun characters and bosses that we meet, to the wonderfully varied environments that players get to run through.

We have endeavored to deliver a considerable step up in terms of the fidelity and graphics in this game, with the many challenges of delivering it to a wide array of device specifications.

To do this well, you have to make smart choices and not throw the whole kitchen sink at it. We have avoided detail just for the sake of detail, utilizing the right techniques and focusing on the right key areas for a high-quality visual experience that can be enjoyed by the largest number of players as possible.

We're incredibly proud of the team for the level of care and craft they've put into this game with many fun nuances that we hope Crash fans will love. I'm also personally excited to show our industry a little bit more of what King has been up to and our continued commitment to

bringing great mobile experiences to our players.

Interview with Thaine Lyman, General Manager at MS-1 (Wargaming), on bringing AAA titles to mobile

Wargaming was an early leader in bringing **World of Tanks** to mobile with **Blitz**, and it continues to create full-sized experiences for the platform

Thaine Lyman
General
Manager,
Wargaming

Wargaming is a publisher known for having a dedicated PC and console fanbase. However, it was actually one of the earliest AAA publishers to bring its main franchise to mobile with World of Tanks Blitz in 2013. How has your strategy for mobile gaming changed from 2013 to now?

When the team started developing *World of Tanks Blitz* for mobile devices, it was certain to be a challenge; it wasn't just about bringing the franchise to mobile, but more importantly, a style of gameplay. At the time, there were only really certain types of games available on mobile: mostly farming, meta clickers, puzzle and click-and-wait style games - "alarm clock simulators." *World of Tanks Blitz* was one of the first games to show that mobile could be a great place to play the kind of action games you'd usually only had been able to find on PC or consoles.

Eight years later, the situation is completely different. We see so many AAA games coming to mobile, but back in 2013 it really was a rarity. As for bringing *World of Tanks* to mobile, a lot of work went into how to translate the super-

hardcore action of *World of Tanks* on PC to be a fit for mobile. Of course, that meant making a lot of changes to the experience, but this also helped give the game its own character.

Our goal at the studio is pretty straightforward: we want to make games which are fun for people to pick up and play anywhere they are and are available anytime. And any of the lessons learned in developing *World of Tanks Blitz* were taken onboard and they continue to help us when developing the new games we are working on at MS-1.

What were some of the biggest challenges faced with translating World of Tanks to a mobile format? What sort of mechanics or features were made possible, or required changing?

From an industry perspective, it was a challenge to bring a game like *World of Tanks*, which has a certain level of complexity, to mobile devices, as well as making sure the game was optimized in terms of both size and graphics. Both due to technical limitations of mobile devices in 2013 and due to a desire to

make individual battles shorter and faster because of the nature of mobile users' available play time. This meant fine-tuning the core gameplay that *World of Tanks* on PC was known for, with battles becoming 7v7 and creating maps smaller than their PC counterparts.

This allows players to get into the action much quicker and leads to battle durations best suited to mobile gaming. The scaled down number of team members means your impact on the battle is that much more effective.

We also realized that the market is different and adjusted the game as such from PC. For example, where *World of Tanks* on PC likes to be as historically accurate as possible, *World of Tanks Blitz* takes more liberties with the setting, allowing us to introduce more fantastical elements. We still use historical vehicles as our core base, but we also have added several vehicles which come from our own imagination, like our post-apocalyptic or "gothic"/Halloween tanks. All our tanks (irrespective of how fantastical they are) still use realistic physics and feel realistic in how

Thaine Lyman
General
Manager,
Wargaming

they play, so the realistic/historical and fantastic vehicles still blend and play well together—though of course different players will have different opinions about the balance of any one tank or another!

Additionally, we had to adjust the controls from keyboard and mouse to make sure they felt natural and intuitive on glass. Shooters just weren't on mobile all those years ago and the team faced a big challenge making sure the controls worked well. I think the end result was very successful, but it took a lot of trial and error in the early development stages.

Throughout the eight years since development of *World of Tanks Blitz* began, mobile devices have also improved massively, meaning we always have to make sure that we can take advantage of all these technical improvements. Nowadays, we are developing a game which is available on millions of mobile devices, so we have continued to make significant improvements to the core technology to keep it looking and playing fresh and sharp despite

its age. We have a good-sized team focused on these core technology improvements, both user-facing and tool/pipeline improvements that players don't see. That allows us to deliver better stuff to players faster and more easily.

Do you find that there are many core PC/console fans who are resistant to certain IP appearing in a mobile game, or are your platform users largely overlapping? What is your experience with differences in community management?

I think many PC and console gamers are naturally suspicious of mobile gaming because of its old roots in what can sometimes feel like predatory free-to-play (F2P) monetization techniques, and these games were originally built on lower budgets (in case they flopped) so they were very much "minimum viable products". As with anything, it takes time (and great examples) for people to change their mind. But with **World of Tanks Blitz**, we always want to make sure that there's no unfair advantage; whether you spend money or you

don't, your skill will still be the driving force behind your success in battle. We sell our Premium account and ways for players to progress faster up the tank tree or unlock new things faster, and we sell Premium tanks that players can enjoy for collection purposes and/or to enjoy different playstyles or that just look cool and unusual. But as players progress up the tree, they still face off against higher tier enemies as well—we want to make sure it is not a "pay-to-win" experience.

Additionally, we don't want people to ever have a feeling of buyer's remorse. We think we are in a good position now, and it seems that the industry overall has been figuring out how to make it work in a way consumers can feel good about (though of course exceptions in the market still exist).

F2P gaming isn't just something that has been adopted by a few regions or on specific platforms anymore, it's a global industry movement now. As far as our audience on the different platforms goes, the majority of our *Blitz* players (around 70%) use mobile

Thaine Lyman
General Manager, Wargaming

devices exclusively to play their games, so the overlap between PC and mobile is pretty small. *World of Tanks PC* and *World of Tanks Blitz* players have different interests, and their behaviour differs too, so we do obviously have different ways of approaching our respective communities.

For example, we spend a lot of our time interacting with our players on social media as our players don't tend to use the forums nearly as much, whereas *World of Tanks PC* players are very active there. Of course, we also have *World of Tanks Blitz* available on Steam PC, and now recently on handheld gaming devices as well, so we're interacting with those players in new and different ways from our mobile players, too.

What mobile features and technology are you most excited about in the next few years that you think will have the biggest impact to mobile gaming?

I'd say there are three big things to be excited about. First, better quality internet and the ubiquity of it: with internet technology constantly evolving, we're now better connected than ever and it means mobile gamers now can have a better experience. With any shooter, whether it's on mobile, console or PC, latency and packet drops are a big worry, but now more and more of us have faster and more stable/constant high-quality internet connections, this becomes less and less of a concern. Hopefully in a few years, the idea of "Oh no, my signal is about to drop" is a thing of the past.

Secondly, mobile tech advances: the technology in our phones and other mobile devices is improving at such a great rate, and this really allows us to push past the limits of what we can do with games.

Years ago, people might have thought you were crazy if you stated AAA games would soon be playable on mobile, but that's where we are right now. The great thing is that anyone can realize how far we've come, even the less technically savvy, if they just think about how camera quality has improved over the years. The guts of these devices are undergoing revolutions that are equally or more significant to how cameras are evolving.

And finally, generations of kids are being born into a world where mobile gaming and access to a phone or other mobile device is common and ubiquitous.

These kids will have been experiencing games on mobile their entire lives. So, playing games on these devices will come as naturally to them as playing on a PC or on a console controller. In fact, the previously mentioned interfaces may eventually be related only to gamers from earlier generations.

Then we'll explore shaping gaming experiences for the way this new generation lives and plays their games. This is part of what I really enjoy about working on mobile—it's going to be a primary driver of innovation in gaming over the next decade, and the massive changes we have seen in recent years are just the beginning.

Thaine Lyman
General
Manager,
Wargaming

What other trends do you predict for the future of mobile gaming?

There are some obvious trends we can all predict, such as everyone will be gaming on mobile in the future and that more and more AAA games will make their way to the platform.

However, there's a lot that could happen with mobile gaming as we are at the beginning of a new world: mobile gaming has arrived and we're at the very foundation of it. The future of mobile gaming also depends on how mobile tech evolves and working closely with those mobile industry leaders driving that evolution to better our games.

It will become the standard that mobile game developers, mobile device manufacturers, silicon vendors and IP providers work together to benefit all sides. As an example, last year we've been closely collaborating with Arm to optimize *World of Tanks Blitz* performance on Android devices. Arm, in return, will get insights on developers' pain points to further improve tooling and IP features.

This, in turn, means that content is optimized to fully utilize the performance and energy efficiency of the underlying hardware—bringing the best gaming experiences to millions of players worldwide.

Interview with Jim McArdle, Head of Strategic Advisory for New Game Development at Riot Games

Riot, once a PC-only publisher, now has three titles on mobile and sees the platform as a key part of the company's future

Jim McArdle
Head of Strategic Advisory for New Game Development, Riot

Can you shed some light on how Riot's approach to mobile and cross-platform development could evolve in the next five years?

Like most major studios, we're aware of the global growth in mobile as well as increasing audience expectations for cross-platform play. Our intention is "go where the players are" with regards to these platforms. At Riot, we're trying to make deep games that players can pursue as meaningful life pursuits, so you can expect us to bring this same intention to the mobile space as we continue to expand our offerings there beyond *TeamFight Tactics*, *Legends of Runeterra* and *Wild Rift*.

What mobile features and technology are you most excited about in the next few years that you think will have the biggest impact on mobile gaming?

Broadly speaking, we're seeing mobile become capable of supporting higher fidelity, more technologically demanding gaming experiences over time. Some of the recent flagship models have more power than handheld gaming consoles and there are some games on mobile with beautiful graphical fidelity.

I'm most interested in whether various I/O expansions take off. ROG has a potentially compelling set of offerings here between the external battery and fan + controller attachments and the TV docks and I'm very curious to see if products like those gain traction, especially in Asia.

Looking at a slightly longer timeframe, I think it's possible high bandwidth, low latency mobile internet (aka 5G) and edge computing infrastructure may allow developers to move much of the compute work for games off of the phone. That could theoretically be quite disruptive in the number of new experiences it empowers, as well as its implications for the future of console and PC.

What other trends do you predict for the future of mobile gaming?

One of the most interesting questions in the next 3-5 years in gaming is whether the mobile market in Western countries will trend toward more long-form, high-focus (aka "deeper") experiences. On the one hand, we're seeing a lot of classically PC/console AAA developers start to embrace mobile, and the deeper experiences they deploy to the platform might meaningfully outcompete existing mobile games. On the other hand, I think a lot of the success of mobile gaming in China could have to do with the differences in play session context and device preference there.

A possible explanation for the success of deeper mobile games in places like China is that living room / TV ownership is much lower (preventing console ownership) and so a lot of the demand satisfied by console in the West is served on the phone in Asia instead. If that were true (and the console experience was a better place to deliver those experiences), the Western market might not take to longer-session deep gaming on the phone at all—and mobile gaming there will continue to be shorter session, lower attention experiences that best conform to an "on-the-go" use case. Either way, I'm excited to find out!

Interview with Scott Flynn, VP Platforms at Unity Technologies, on the rise of cross-platform

Unity continues to push boundaries to help developers build and scale uncompromised experiences on mobile

Scott Flynn
VP Platforms,
Unity
Technologies

What trends are you seeing among developers in terms of cross-platform development, and how has that changed from five years ago? What are the key drivers behind the shift? How are these trends impacting how mobile is viewed as a platform in the community?

Gamers today increasingly ask for cross-platform play. There's an expectation that players can join friends, regardless of device or platform. Whereas five years ago, we'd often see companion mobile games, which would act as a complement to the 'larger' console/PC versions.

Now, it's access to the same experience regardless of platforms. Creativity and polish in execution are always at the core of great games, with games like *Among Us* showing us that the connected experience can trump over graphics. A strong community is a commonality in successful titles—gamers want more than just gameplay, they are looking to socialize, to connect around what they are playing. A key driver of this change is what is possible today on a mobile/handheld device compared to five years ago. Mobile phones (and handheld

devices) have undergone a significant performance change and thus are suitable for a wide range of gaming experiences. Mobile has become a first-class citizen and customers expect games to have high-fidelity content, cross-platform play, multiplayer support and options to personalize their game experience.

What do you see as the cloud's impact on platforms? Will the distinction between mobile and PC/console eventually disappear?

The distinction between PC and mobile is here to stay for many game titles. Mobile games today are less defined by the limited resources a phone may have versus a PC but rather the form factor (e.g., touch input, smaller displays, sensors), device portability and the shorter, targeted experiences customers expect when on the go. Unity (and our developer community) continue to push the limits to create uncompromised experiences running on mobile hardware.

That being said, we're starting to see the rise of cloud gaming, which is further unlocking cross-platform play. Cloud gaming will blur the line for many users, where hardware recedes as

a determining factor in where and what games you can play. Cloud gaming abstracts devices and any screen with a sufficient internet connection can join in on the fun.

Games don't just launch; they live in the cloud. Cloud games can more easily allow for feature drops, the rise of gaming 'seasons' and live experiences because content can be pushed, and users can jump in without having to update their game on device.

What mobile features and technology are you most excited about in the next few years that you think will have the biggest impact on mobile gaming?

Mobile computing capabilities will continue to grow and alone offer an exciting future for gaming content, but some of the most exciting technology beginning to be adopted is specialized chips (e.g., machine learning, NPU), sensors (e.g., LiDAR) and wearable hardware (e.g., Watch, HMD).

Combined, these advancements will introduce a new level of contextual based gaming and non-gaming experiences that will be unmatched by conventional platforms like

Scott Flynn
VP Platforms,
Unity
Technologies

PC and consoles. 5G alone will enable more connected, continuously updated content providing longer, more immersive and evolving games.

What other trends do you predict for the future of mobile gaming?

Mobile gaming will continue to grow as a key segment in the entire gaming industry. Younger generations will continue to gravitate more heavily to mobile gaming, and as they grow older, so will the demand for more mature and complex games. We'll continue to see growth in titles that prioritize connected gaming which delivers a dynamic experience. I also expect to see an increased presence of games and experiences that enable users to express themselves through user generated content.

How can developers be more ambitious when creating mobile games?

Developers need to take a 360˚ approach to game creation. It's not enough to simply build a game; there needs to be a considerable amount of thought put into how the game runs, how the game evolves, how the game can connect

players together, and of course, how the game works on long-tail replayability. We know mobile game players are sophisticated, and game developers should rise to the challenge through better graphics, complex characters, and engaging story lines.

What Unity technology is moving the game industry forward?

Through innovative technologies such as DOTS (Data-Oriented Technology Stack) and Universal Render Pipeline, we are building the future of Unity's platform to focus on the demanding needs of next-generation games.

We're focused on more than building games. Our operational solutions include tools that let developers add interactivity, better allow them to scale their games, and monetize their games through our suite of monetization tools.

Developers need more than a game engine to build a successful title, which is why we're working on giving them a complete solution. Together with top developers, publishers and strategic game platform

partners, Unity is building a platform that's optimized for game creation and successfully scaling and running gaming titles.

Interview with Steve Winburn, Senior Gaming Ecosystem Manager at Arm, on high-fidelity mobile gaming

Steve Winburn
Head of Developer Relations, Advocacy and Graphics Engineering, Arm

What trends are you seeing in high-fidelity mobile gaming across the globe? What do you think are the key drivers for such trends?

The high performance of the current generation of premium smartphones is lowering the barrier of entry when getting high-fidelity gaming experiences to mobile. In the past, mobile game assets had to be made special for mobile. Now it is far more common to see high-fidelity assets from PC and console gaming titles being created for mobile gaming titles in the same IP with minimal effort.

Large game studios and developers are also recognizing the value of high-fidelity mobile games. Not only because of the technology, but also through the experiences they can bring to bigger audiences. More and more mobile game studios and developers are now investing in quality graphics. This compares to the early days of mobile where games started out cut-rate and of poor quality compared to console graphics at the time.

To meet this demand for high-fidelity gaming and high-quality graphics, we believe that there are key gaming content trends that will define

mobile gaming moving forward. These are better lighting, more complex geometry shading, textures and particle effects, advanced post-processing effects, and higher refresh rates. These gaming content trends are front of mind when Arm designs its premium Mali GPUs.

How are Arm IP and supporting software and tools helping to enable these amazing gaming experiences, now and in the future?

We aim to deliver a 'Total Gaming' experience by working with leading game engines, studios and developers to optimize the performance on Mali-based mobile devices through new graphics technologies, tools and developer education resources.

Arm Mobile Studio enables fast and intuitive graphics optimizations for game developers that are targeting Mali-based mobile devices with their games. Already, Arm Mobile Studio is being utilized by leading games studios like Wargaming and King to help optimize their gaming content for mobile.

For Wargaming, we integrated Arm Mobile Studio Professional into its CI workflow,

bringing great cost savings and performance benefits when it targeted *World of Tanks* for mobile. King also used Arm Mobile Studio in the development of *Crash Bandicoot: On the Run!* for mobile, which led to significant performance improvements for the game.

On top of this, we are continuing our work with Unity to provide graphics improvements and resources to developers and their game applications. Bringing smoother, more efficient gaming experiences to the billions of consumers who play Unity-generated content on Mali-based mobile devices. This is alongside supporting leading games companies through multiple deep-dive training sets on how to use Arm's software and tools.

All of this behind-the-scene work is vital in enabling amazing mobile gaming experiences now and in the future!

Steve Winburn
Head of
Developer
Relations,
Advocacy and
Graphics
Engineering,
Arm

What mobile features and technology are you most excited about in the next few years that you think will have the biggest impact to mobile gaming?

One stat that always amazes me is that mobile gaming revenues is now worth more than global Box Office and record music revenues combined! In the future, I expect the Box Office to come to mobile, with CG-type quality animation that you see in films on mobile. Ray tracing will be important to open mobile gaming up to these advanced, more realistic graphics.

AI advancements will be highly influential in mobile gaming in the future. Developers will be able to leverage these advanced AI capabilities in their games in more innovative ways. Rather than having a set programmed game, AI will allow the user to develop their own adventure based on how they want to play the game. Gaming interactions will also be more exciting and convincing with NPCs. Moving away from set-scripts and choices and instead having more natural, flowing conversations with NPCs that aren't programmed into the game. This essentially means more immersive, interactive

and personal mobile gaming experiences.

Making all of these high-quality gaming experiences will be possible thanks to advances in cloud and 5G connectivity. The cloud will provide a "gateway" to more performance away on top of high-performance smartphones, while 5G will give the connectivity, latency and bandwidth boost to allow people to enjoy these complex and uninterrupted gaming experiences for longer.

What other trends do you predict for future of mobile gaming?

Despite the outstanding growth of mobile gaming in the past few years, I believe that we are still just at the beginning of what can be achieved! Top gaming titles are slowly shifting to mobile devices. In the next five to ten years, I believe that the smartphone will have performance that is on par with—or will even blow away—high-end gaming and graphics cards that are available today! Combining this level of performance with 5G for ultimate connectivity, CG-level graphics and plug-in controllers, users will be getting a high-end gaming machine that will rival the PC and

console experience.

Additionally, I believe that the next ten years will see the emergence of true cross-platform gaming, largely thanks to 5G and cloud technologies. This means users will experience similar gaming quality regardless of whatever device they choose! Arm is making this future possible, powering the devices and services that provide the conditions for true cross-platform pay to exist!

This commitment to gaming is part of Arm's wider drive to spark the world's potential, enabling the end user and our partners to achieve remarkable digital experiences on mobile.

What's Next for High-Fidelity Mobile Gaming?

Growing consumer demand is accelerating market growth, enabled by mobile technological advancements

With **5G** around the corner, the possibilities for mobile games will again evolve, driven by technological advancements. As the games market embraces a **platform-agnostic** future, enabled by **cross-play** and **cloud gaming**, consumers are increasingly looking for immersive and mid-core gaming experiences on the go.

The continued **proliferation of smartphones** and **internet access in growth markets** will bring more players to the fold as well, leading to **3.2 billion mobile gamers by 2023** based on Newzoo's forecast. And often, these mobile-first gamers are eager to enjoy competitive and complex games on their mobile devices.

All in all, we still hold our prediction on high-fidelity mobile gaming from 2017, that the market is seeing great growth potential.

In mature mobile games markets like China, high-fidelity mobile games have already hit the mainstream. We believe that in the next couple of years, **emerging markets and Western countries will play an increasingly important role in driving the growth of high-fidelity or next-gen mobile games**. In particular, the West is likely to follow China in shifting tastes more toward mid-core and core games as the young mobile-first generation matures.

For mobile hardware, **powerful computing capabilities** will stay in demand to support premium gaming experiences. Some of the most exciting technologies, such as sensors and wearables, will also find their way to facilitate high-fidelity gaming experiences on mobile.
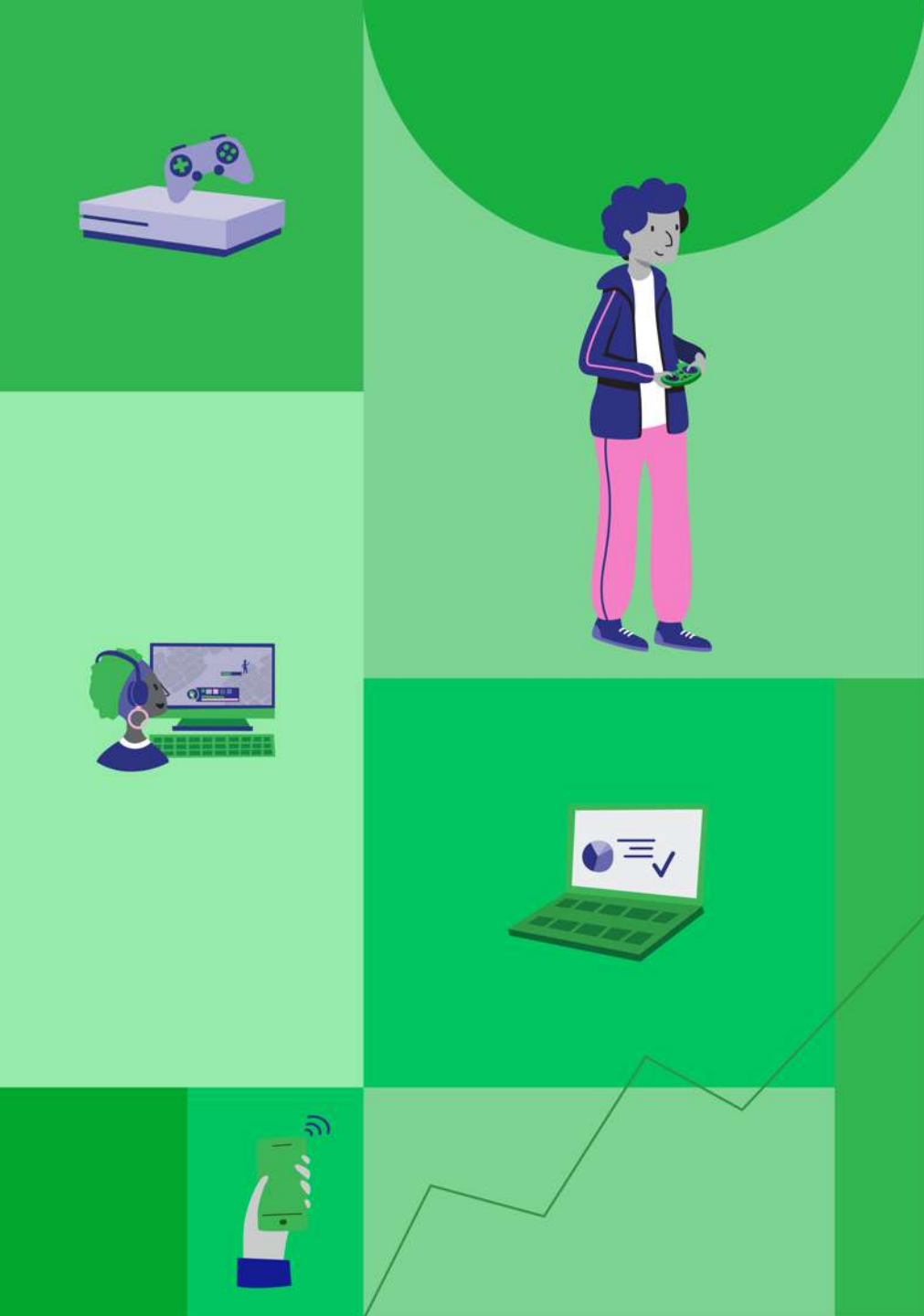
69.9%

Of China's top grossing mobile game revenues were contributed by high-fidelity games in 2020, vs. **32.9%** in North America and **37.3%** in Europe.

Tianyi Gu
Market Lead Telecom & Mobile Services

Next-Gen Mobile Games

The arrival of cross-platform and evolution of high-fidelity mobile games