ARtillry Intelligence Briefing
XR Global Revenue Forecast, 2017-2022
June 2018

TABLE OF CONTENTS

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EXECUTIVE SUMMARY

INTRODUCTION

Many AR and VR (a.k.a. XR) stakeholders claim that their market sizes will be massive. But how big are they, and how big will they realistically get? *ARtillry Intelligence* has quantified these sectors and all their moving parts in precise terms. The result is our latest XR revenue forecast.

Applying market sizing and forecast experience from 15 years of analyst work (see methodology section), *ARtillry Intelligence* has devised a disciplined and independent revenue forecast for AR & VR, segmented into their product areas. That includes sub-sectors like enterprise AR & VR.

The following pages provide market revenue projections, subdivisions of each product category, and bulleted insights all along the way. This is meant to qualify the revenue drivers and rationale behind the numbers. And we'll go deeper on specific data segments in future monthly reports.

Lastly, to characterize *ARtillry Intelligence's* overall position on XR revenue growth, we maintain a cautiously-optimistic view. Growth and scale will come but likely slower than some industry proponents believe, due partly to the pace of adoption and other signals *ARtillry* tracks.

ARtillry PRO subscribers are encouraged to spend time with the following pages, and to contact us with questions or requests for deeper analysis: **https://artillry.co/contact/**

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WHAT'S COVERED IN FORECAST

The market sizing figures in this report include consumer and enterprise AR and VR segments. These are each subdivided by several variables, such as hardware and software, as well as revenue categories like advertising (social AR lenses) and location-based VR (admissions).

VR hardware includes headsets and bundled input or tracking devices, but does *not* include gaming consoles, smartphones and PCs required to run some headsets. Similarly with AR, smart glasses are included in revenue projections, but mobile devices (such iPhone sales) are not.

INCLUDED

AR & VR Hardware: e.g. Headsets, smart glasses
Bundled Hardware: e.g. Input or tracking devices
AR & VR Software: e.g. Consumer (apps, in-app purchases), Enterprise (AR productivity software, retail installations)
AR & VR Advertising: e.g. Display (Snapchat Lenses), and Search (Google Lens) ad placements
Location Based VR: (e.g. Admissions revenue)

*We will expand category inclusions in future forecasts

NOT INCLUDED*

PC or Gaming Consoles: e.g. Playstation 4
Smartphones: e.g. iPhone to run ARkit apps
Network Data: e.g. Telco-delivered data usage for XR
Professional Services: e.g. Enterprise XR consulting
Game/app creation: e.g. Development costs, salaries
Advertising creation: Creative production costs
VR Cameras: e.g. 360 degree camera hardware
eCommerce: Value of goods bought through AR & VR interfaces (e.g. cost of a new couch bought or influenced through the IKEA Place app).

KEY TAKEAWAYS

KEY TAKEAWAYS

Takeaways and growth dynamics for XR and its sub-sectors.

Enterprise AR will grow from $671 million in 2017 to $29.6 billion in 2022, a 113 percent compound annual growth rate (CAGR). This makes it the largest XR sub-sector in 2022. Scale will result from wide applicability across enterprise verticals; and a form factor that supports all-day use and clear ROI (e.g. manufacturing efficiencies). Adoption is currently dampened by typical organizational inertia, enterprise risk aversion and sales cycles. ARtillry Intelligence believes these factors will continue to stunt enterprise AR growth but will be outweighed eventually by the momentum, support and ROI realizations that are currently building. A tipping point will come in 2020, after which adoption accelerates in a sort of enterprise herd mentality. This will follow a similar pattern, though on a smaller scale, as enterprise smartphone adoption over the past decade. Near-term Enterprise AR revenues will be hardware-dominant as it's the first step in enterprise tech adoption. Hardware growth creates an installed base for software, which will dominate enterprise AR in outer years. Enterprise hardware will also mature as it's established in the enterprise, with replacement cycles outpaced by software refresh rates, likely packaged and sold in a SaaS manner.

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KEY TAKEAWAYS

Takeaways and growth dynamics for XR and its sub-sectors.

Consumer AR will grow from $456 million in 2017 to $18.8 billion in 2022, a 110 percent compound annual growth rate (CAGR). Near term revenues will be dominated by the mobile form factor. Revenues will also be software-centric during that time (mobile device sales aren't counted in this forecast) and will include premium apps and in-app purchases. The latter will dominate software revenues in the near term, due to consumer hesitance to pay upfront for AR apps, as well as the in-app revenue model validated by Pokémon Go. Niantic will find success in its follow-up game to Pokémon Go, with architecture and game mechanics re-skinned to a Harry Potter theme. These and other developing AR experiences will be built around in-app purchase models. A mobile AR killer app won't arrive until 2019, likely built on social networking and native AR functionality. Consumer AR revenues will begin to shift towards hardware starting in 2021 as smart glasses (possibly from Apple) finally reach tenable specs and standards for consumer markets. Software at that time will begin to shift to premium purchases (as opposed to in-app purchases) as it's a model conducive to dedicated AR hardware (similar to how apps/games are purchased in VR). Meanwhile, the development work put into mobile AR apps will be a training ground for an eventual glasses-dominant era beyond 2022.

KEY TAKEAWAYS

Takeaways and growth dynamics for XR and its sub-sectors.

Enterprise VR will grow from $374 million in 2017 to $3.35 billion in 2022, a 55 percent compound annual growth rate (CAGR). Though strong in its own right, it will hold the smallest share of XR revenues among the sub-sectors measured in this forecast. VR will be stronger as a consumer play (see next slide), while AR is stronger in the enterprise. These VR shortcomings (relatively speaking) in the enterprise stem from the medium's inherent isolation, which inhibits some job functions and share of time per working day. This is especially true in industrial functions where "heads up" awareness is inherent, and where AR will conversely shine. However, VR will add value in corporate and finance settings, such as employee training and data visualization among others (vertical spending breakdown provided in this report). Like AR, VR's near term enterprise revenue will be hardware-dominant as it's the first step to tech adoption. That installed base will pave the way for enterprise VR software revenues to grow and overtake enterprise VR hardware revenues by 2022. Unlike AR, which will have specialized hardware that's optimized for enterprise functions, VR will utilize common hardware (the same hardware used in consumer contexts). The availability, evolution and economics of that increasingly penetrated hardware will be an adoption accelerant, and an advantage for enterprise VR.

KEY TAKEAWAYS

Takeaways and growth dynamics for XR and its sub-sectors.

Consumer VR will grow from $2.7 billion in 2017 to $9.4 billion in 2022, a 28 percent compound annual growth rate (CAGR). Like enterprise VR, it will be hardware-dominant in early years as its installed base is established. Over time, software (in this case, games and apps) will eclipse hardware revenues with a faster refresh cycle. A greater installed base of hardware will also incentivize VR content creators to invest in long-form content, resulting in more robust VR content libraries and greater software spending per user (ARPU). Premium apps will dominate software revenues but in-app purchases will also contribute, especially in gaming. Installed software and apps will also dominate, but slowly give way to web VR as its capability evolves. Price competition among VR headset manufacturers (e.g. Oculus, Sony, Samsung) will accelerate consumer adoption. Oculus Go, at a $199 price point, hits a sweet spot for quality and affordability, and we project it to reach unit sales of 1.3 million this year. Oculus – with the advantage of Facebook-backing – has the flexibility to apply loss-leader pricing in order to trade margins for market share. That will give it a strong competitive position versus players that are dependent on hardware revenue (i.e. HTC, Samsung). Given a gift-able price point, the 2018 holiday quarter will be a "moment of truth" for Oculus Go.

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GLOBAL XR REVENUES

GLOBAL XR REVENUES

🥽 **Global AR & VR product revenues will grow from U.S. $4.2 billion in 2017 to U.S. $61.2 billion in 2022, a 71% compound annual growth rate (CAGR).**

🥽 **The largest share of revenue in 2017 was held by VR (driven by consumer markets) which will shift over time as AR (driven by enterprise markets) gains momentum and revenue dominance through 2022.**

  🥽 VR comprises 74% of revenues in 2017 and 21% in 2022.

  🥽 AR comprises 26% of revenues in 2017 and 79% in 2022.

🥽 **Within VR, consumer revenue eclipses enterprise by a factor of 3-1 in 2022.**

  🥽 Standalone VR (e.g. Oculus Go) will accelerate consumer adoption.

  🥽 VR's form factor is aligned more with gaming and entertainment.

  🥽 VR's isolation inhibits industrial job functions, mobility and share of time per working day. It will however shine in corporate and finance contexts.*

See vertical spending analysis in this report's enterprise VR section.

GLOBAL XR REVENUES (CONT')

- Within AR, the opposite is true: enterprise revenue outweighs consumer revenue by as much as 60% over the next five years.
  - Head-worn AR's form factor is well-aligned with enterprise productivity such as manufacturing, assembly and medical procedures.
  - Head-worn AR will find a home with consumers, however its specs and stylistic realities inhibit several consumer use cases in the near term.

- Apple's potential 2020-2021 introduction of smart glasses will shift AR's momentum and revenue share towards consumer products.
  - By 2022, enterprise AR's revenue dominance over consumer AR will decelerate as smart glasses (led by Apple) penetrate consumer markets.
  - Until then, the mobile form factor will dominate consumer AR, with most revenue derived from software (mobile games, apps, in-app purchases) as opposed to hardware (smart glasses).

GLOBAL XR REVENUE OVERVIEW

(SIMPLIFIED VIEW)

AR = Smart glasses, software (games, apps, etc.), advertising
VR = Headsets, software, advertising, LBVR admissions

U.S. $Millions

2022: VR has a place in the enterprise but is a greater consumer play. Enterprise and consumer AR widen their lead in XR revenue share.

2020-2021: XR revenues hit an inflection point. Apple launches consumer smart glasses. Enterprise dominates AR, but its share will begin to diminishes as consumer AR glasses penetrate.

2018 – 2019: XR growth picks up, led by enterprise AR and consumer VR. Enterprise adoption approaches a tipping point in late 2019 due to measurable ROI gains. Consumers acclimate to VR, driven by price competition and standalone hardware like Oculus Go.

2017: Consumer adoption lags. VR leads in revenue share but ARCore and ARkit lay a foundation for AR growth, given massive installed hardware bases. In-app purchases show signs of being the predominant mobile AR pricing model, but still no killer apps.

U.S. $ Millions

$7 0,0 00
$6 0,0 00
$5 0,0 00
$4 0,0 00
$3 0,0 00
$2 0,0 00
$1 0,0 00
$0

$61,178

$4,246

20 17   20 18 (E)   20 19 (E)   20 20 (E)   20 21 (E)   20 22 (E)

■ Enterprise AR   ■ Consumer AR   ■ Enterprise VR   □ Consumer VR

[ARtillry]

GLOBAL XR REVENUE OVERVIEW

(DETAILED VIEW)

AR = Smart glasses, software (games, apps, etc.), advertising
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U.S. $Millions

2022: VR has a place in the enterprise but is a greater consumer play. Enterprise and consumer AR widen their lead in XR revenue share.
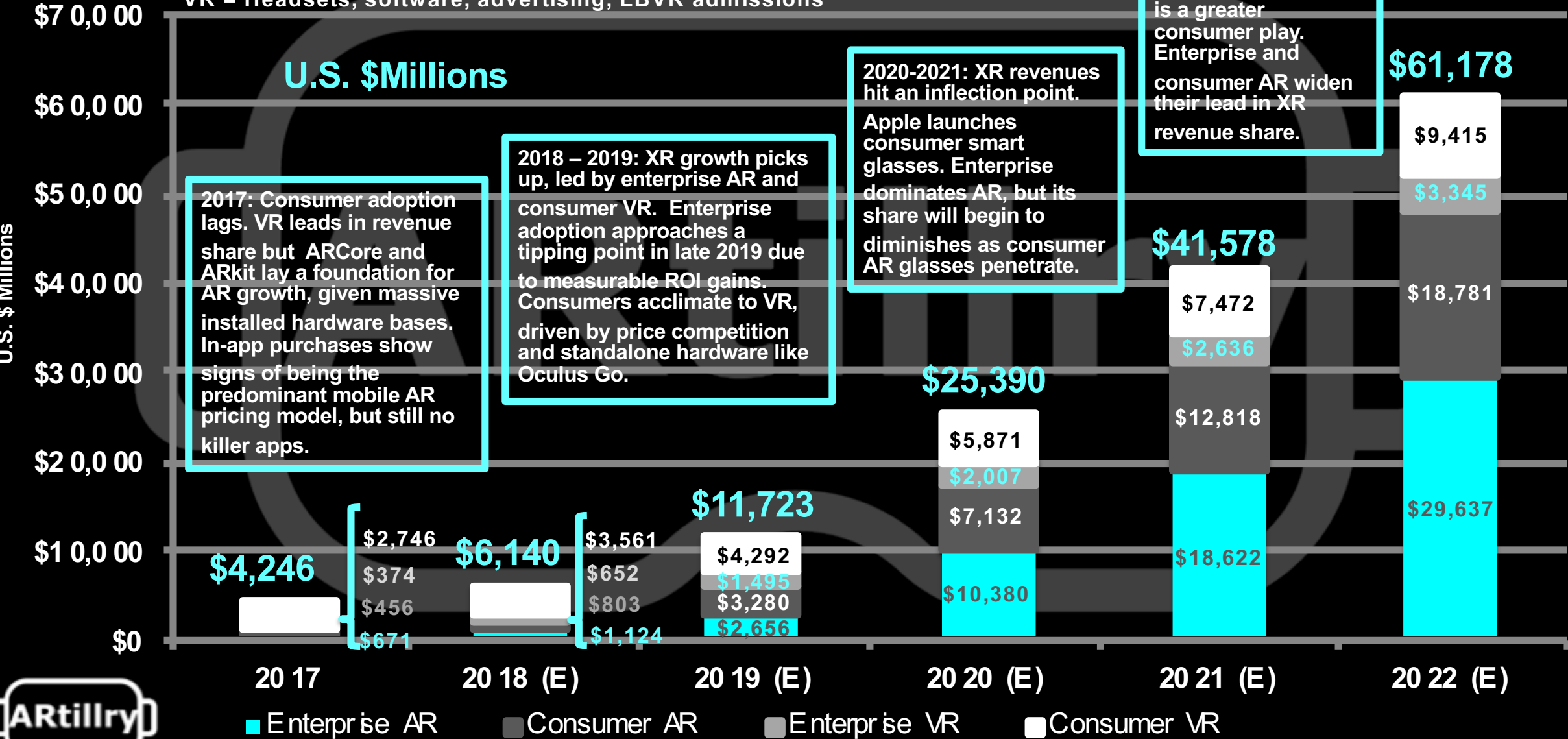
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U.S. $ Millions

$70,000					
$60,000					$61,178
$50,000				$41,578	$9,415
$40,000					$3,345
$30,000			$25,390	$7,472	$18,781
$20,000				$2,636	
$10,000	$4,246	$6,140	$11,723	$12,818	$29,637
$0				$18,622	

2017: $4,246 — $2,746 / $374 / $456 / $671

2018 (E): $6,140 — $3,561 / $652 / $803 / $1,124

2019 (E): $11,723 — $4,292 / $1,495 / $3,280 / $2,656

2020 (E): $25,390 — $5,871 / $2,007 / $7,132 / $10,380

2021 (E): $41,578 — $7,472 / $2,636 / $12,818 / $18,622

2022 (E): $61,178 — $9,415 / $3,345 / $18,781 / $29,637

Legend: ■ Enterprise AR ■ Consumer AR ■ Enterprise VR □ Consumer VR

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DRILLING DOWN ON AR

GLOBAL AR REVENUES

- Global AR product revenues will grow from U.S. $1.1 billion in 2017 to U.S. $48.4 billion in 2022, a 112% compound annual growth rate (CAGR).

- Enterprise holds the largest share of AR revenue throughout the forecast period, culminating in a 61% share in 2022.
  - Enterprise comprises 59% of AR revenues in 2017 and 61% in 2022.
  - Consumer comprises 41% of AR revenues in 2017 and 39% in 2022.

- Consumer AR took an early lead in 2016 due to an anomaly: Pokémon Go. Revenue dipped in 2017 but will rebound in 2018 then inflect in 2020.
  - Near term consumer AR growth is in software (e.g. in-app purchases), as mobile AR apps have a massive installed base of hardware to grow into.*
  - Longer term, Apple's 2020 smart glasses will accelerate consumer AR and shift its composition – erstwhile software-dominant – to hardware.

See mobile AR hardware analysis and unit forecast in this report's AR hardware section.

GLOBAL AR REVENUE OVERVIEW

(SIMPLIFIED VIEW)

AR Hardware, Software & Advertising Revenues

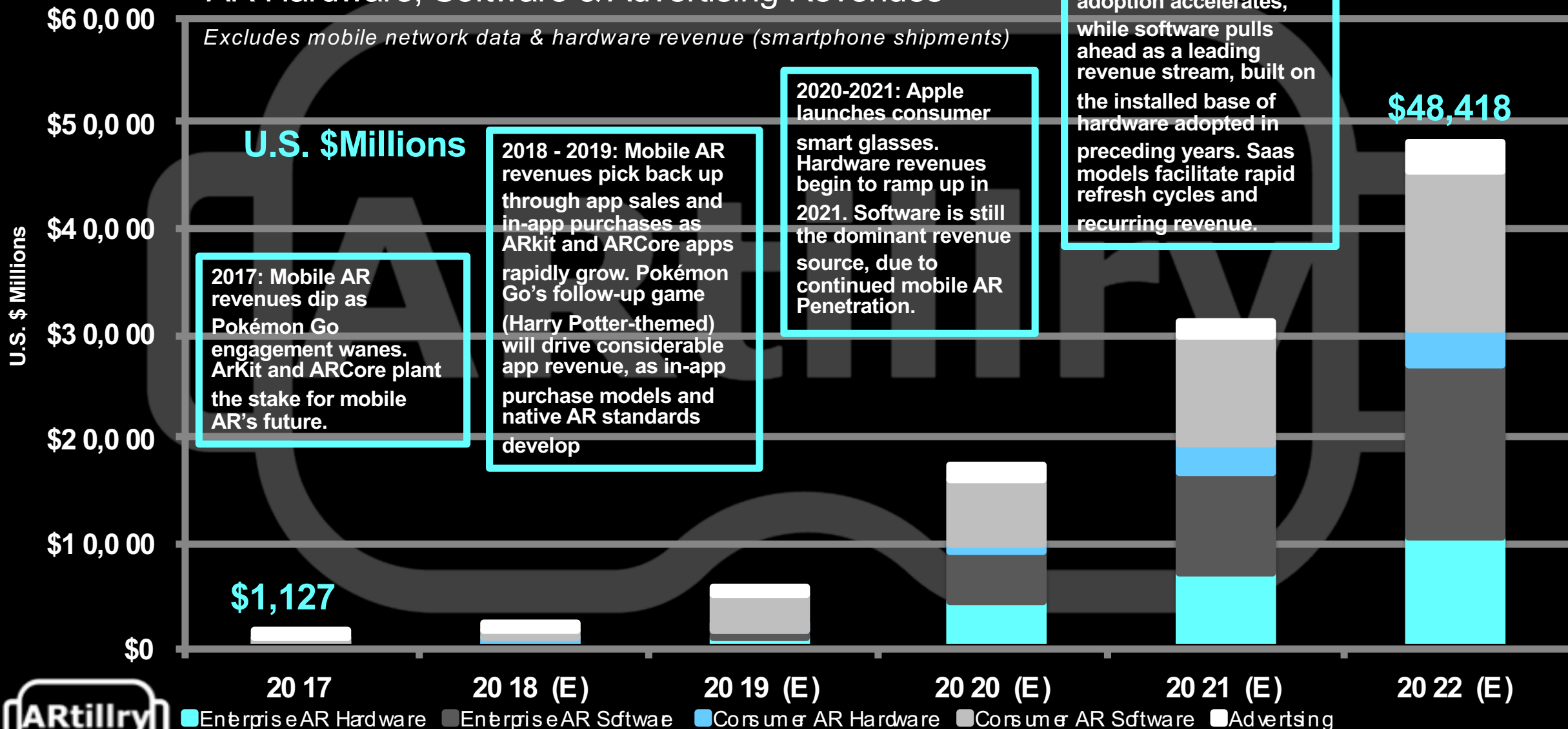*Excludes mobile network data & hardware revenue (smartphone shipments)*

U.S. $Millions

2017: Mobile AR revenues dip as Pokémon Go engagement wanes. ArKit and ARCore plant the stake for mobile AR's future.

2018 - 2019: Mobile AR revenues pick back up through app sales and in-app purchases as ARkit and ARCore apps rapidly grow. Pokémon Go's follow-up game (Harry Potter-themed) will drive considerable app revenue, as in-app purchase models and native AR standards develop

2020-2021: Apple launches consumer smart glasses. Hardware revenues begin to ramp up in 2021. Software is still the dominant revenue source, due to continued mobile AR Penetration.

2022: Enterprise AR adoption accelerates, while software pulls ahead as a leading revenue stream, built on the installed base of hardware adopted in preceding years. Saas models facilitate rapid refresh cycles and recurring revenue.

$48,418

$1,127

U.S. $ Millions

| $6 0,0 00 |
| $5 0,0 00 |
| $4 0,0 00 |
| $3 0,0 00 |
| $2 0,0 00 |
| $1 0,0 00 |
| $0 |

20 17 | 20 18 (E) | 20 19 (E) | 20 20 (E) | 20 21 (E) | 20 22 (E)

■Enterprise AR Hardware ■Enterprise AR Software ■Consumer AR Hardware ■Consumer AR Software □Advertising

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GLOBAL AR REVENUE OVERVIEW

(DETAILED VIEW)

AR Hardware, Software & Advertising Revenues

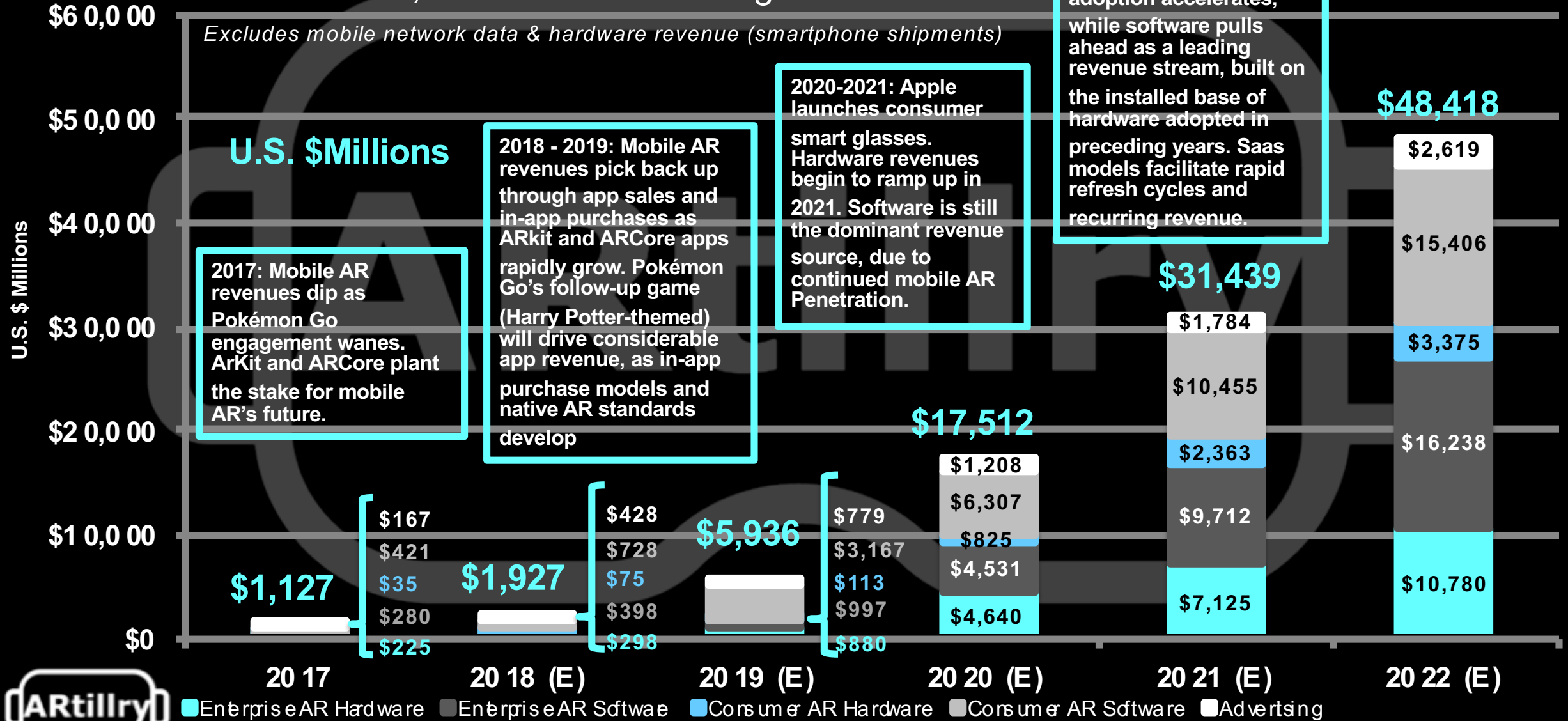*Excludes mobile network data & hardware revenue (smartphone shipments)*

U.S. $Millions

U.S. $ Millions

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Year	Total
2017	$1,127
2018 (E)	$1,927
2019 (E)	$5,936
2020 (E)	$17,512
2021 (E)	$31,439
2022 (E)	$48,418

Axis labels: $0, $10,000, $20,000, $30,000, $40,000, $50,000, $60,000

	2017	2018 (E)	2019 (E)	2020 (E)	2021 (E)	2022 (E)
Advertising	$167	$428	$779	$1,208	$1,784	$2,619
Consumer AR Software	$421	$728	$3,167	$6,307	$10,455	$15,406
Consumer AR Hardware	$35	$75	$113	$825	$2,363	$3,375
Enterprise AR Software	$280	$398	$997	$4,531	$9,712	$16,238
Enterprise AR Hardware	$225	$298	$880	$4,640	$7,125	$10,780

Legend: ■ Enterprise AR Hardware ■ Enterprise AR Software ■ Consumer AR Hardware ■ Consumer AR Software ■ Advertising

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COUNSUMER AR DRILL DOWN

CONSUMER AR REVENUES

- Near term consumer AR revenues will be ruled by the mobile form factor.
- Mobile AR revenues are in turn dominated by software.
  - Mobile AR hardware (smartphone sales) aren't counted in this forecast, as it's a ubiquitous consumer device on which AR's function is secondary.
  - Mobile AR software revenue includes premium app and in-app purchases.

- In-app purchases (IAP) will dominate near-term mobile AR revenue – a vestige of the existing mobile app economy and its consumer acclimation.
  - IAP has been further validated through its revenue generation for Pokémon Go, which will be replicated in several AR games and use cases.
  - At mobile AR's early stages of consumer adoption, users aren't ready to commit to upfront (premium) app purchases, but are comfortable with IAP.*
  - Premium app revenues will grow as a corollary to smart glasses, circa 2021, as that's how software will be bought for AR headsets (similar to VR).

Validated in ARtillry original survey research. See ARtillry Intelligence Briefing: Mobile AR Usage & Consumer Attitudes

CONSUMER AR DRILL DOWN

(SIMPLIFIED VIEW)

Consumer AR Hardware & Software Revenues

Excludes mobile network data & hardware revenue (smartphone shipments)

U.S. $Millions

U.S. $ Millions

Y-axis:
- $20,000
- $18,000
- $16,000
- $14,000
- $12,000
- $10,000
- $8,000
- $6,000
- $4,000
- $2,000
- $0

X-axis: 2017, 2018 (E), 2019 (E), 2020 (E), 2021 (E), 2022 (E)

$456

$18,781

2017: Pokémon Go-style In-app purchases (IAP) still rule consumer AR revenues, as AR is still too early to get most users to pay upfront for premium apps.

2018 - 2019: Mobile AR revenues begin to accelerate and reach a tipping point in 2019 when the first few killer apps start to emerge. In-app payments remain predominant model, applied in Niantic's Harry Potter game, among other apps and use cases.

2020 - 2021: Apple launches AR glasses, which start slow but warm consumers to AR via halo effect. Mobile continues to be the dominant AR format, and a handful of killer apps begin to penetrate deeper. The first major social AR killer app arrives.

2022: Revenues continue to be dominated by IAP, but premium software revenue starts to grow in share as smart glasses penetrate further. Glasses (like VR) will be more conducive to premium software pricing.

Legend: ■ Hardware (Glasses) ■ Premium Apps (Mobile & Glasses) ■ In-App Purchases (Mobile & Glasses)

[ARtillry]

CONSUMER AR DRILL DOWN

(DETAILED VIEW)

Consumer AR Hardware & Software Revenues

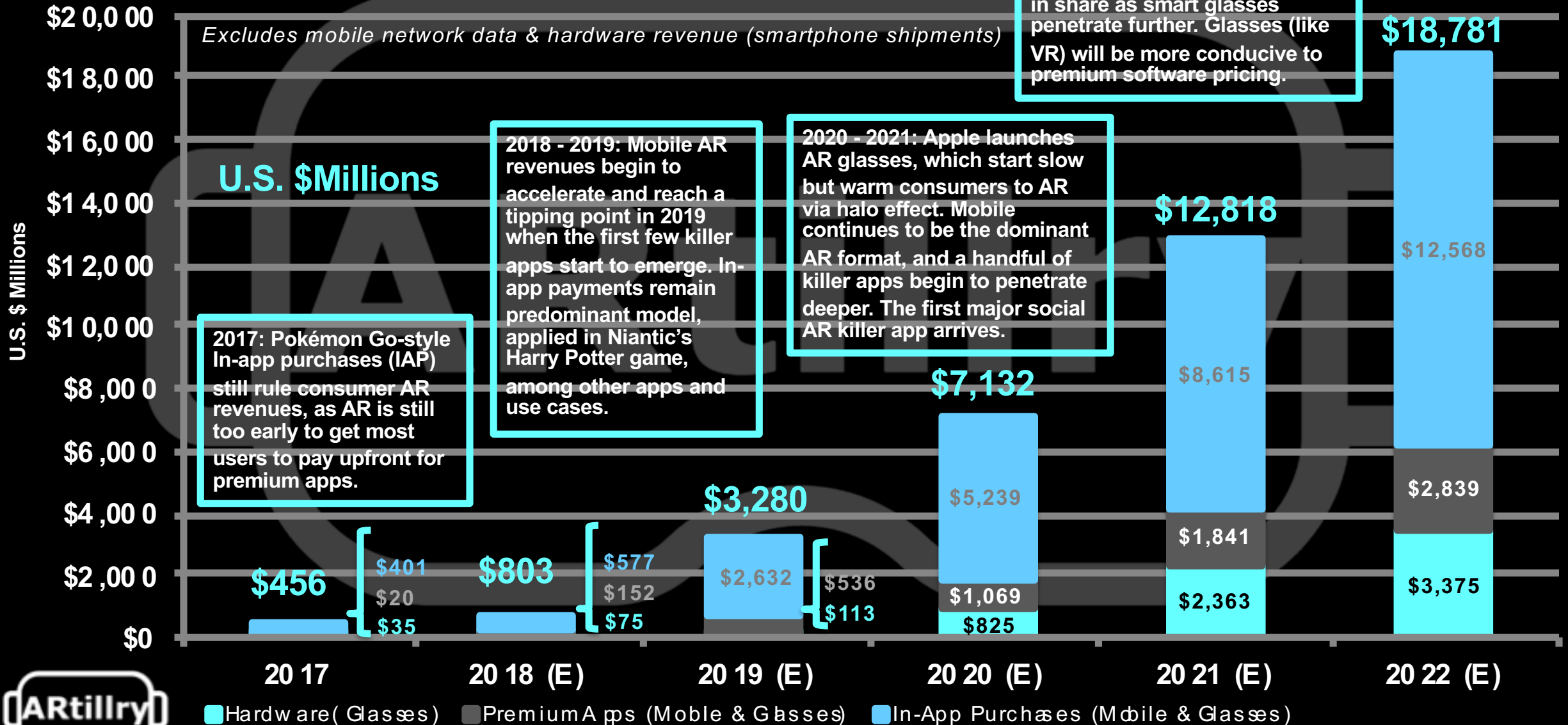*Excludes mobile network data & hardware revenue (smartphone shipments)*

U.S. $Millions

U.S. $ Millions

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2017: Pokémon Go-style In-app purchases (IAP) still rule consumer AR revenues, as AR is still too early to get most users to pay upfront for premium apps.

Year	Total	In-App Purchases	Premium Apps	Hardware
2017	$456	$401	$20	$35
2018 (E)	$803	$577	$152	$75
2019 (E)	$3,280	$2,632	$536	$113
2020 (E)	$7,132	$5,239	$1,069	$825
2021 (E)	$12,818	$8,615	$1,841	$2,363
2022 (E)	$18,781	$12,568	$2,839	$3,375

Hardware (Glasses)   Premium Apps (Mobile & Glasses)   In-App Purchases (Mobile & Glasses)

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ENTERPRISE AR DRILL DOWN

ENTERPRISE AR REVENUES

- Unlike Consumer AR, Enterprise AR revenues will be hardware-dominant in the near term (smart glasses).

- As is often the case with enterprise technologies, hardware comes first and establishes an installed base that paves the way for software revenue.
  - Over time, software revenue share grows through recurring purchases (i.e. SaaS enterprise software) that outpace hardware replacement cycles.

- Unlike VR, which comprises the same headsets for consumer and enterprise buyers (e.g. HTC Vive), AR hardware is mostly designed for one or the other.
  - This is due to stylistic nuances required in consumer markets.
  - Apple's 2020 smart glasses will be consumer-targeted (size, weight, style, etc.) but could be optimized in some ways for enterprise contexts.
  - Enterprise and consumer AR glasses design could eventually converge.

ENTERPRISE AR REVENUES (cont'd)

- **AR advertising spend is included in our enterprise AR revenue figures, and today primarily consists of brand marketing with social AR lenses.**
  - Snapchat has sold the most sponsored lenses, but Facebook's camera effects platform will quickly gain share with ad inventory on the News Feed, Instagram, Messenger and other Facebook properties.
  - Though it won't materialize into significant ad dollars for a few years, search-based advertising through Google visual search (e.g. Google Lens) could become a valuable "high consumer intent" form of AR ads.*
  - Overall we're bearish on AR advertising as a considerable revenue source for the near term, given that it's inventory constrained due to low consumer usage (in advertising terms), and AR's short session lengths.
  - VR suffers from similar ad inventory constraints, due to its low usage levels (covered separately in VR section), and brand advertisers' need for greater reach.

See ARtillry Intelligence Briefing: AR Cloud & the Internet of Places

ENTERPRISE AR DRILL DOWN

(SIMPLIFIED VIEW)

Enterprise AR Hardware, Software & Advertising Spend

Excludes mobile network data & hardware revenue (smartphone shipments)

2022: XR starts a path to ubiquity in some enterprise fields. Software gains ground as it has faster refresh cycles through SaaS delivery, and as hardware becomes more embedded and mature in the enterprise.

U.S. $Millions

2018-2019: Adoption lags as enterprise red tape and cultural resistance challenge AR deployments. Things begin to pick up in 2019 due to ROI realization and a softening of organizational resistance.

2020-2021: Enterprise AR hits a tipping point and accelerates as ROI is demonstrated and organizational resistance breaks down through acclimation and education.

$29,637

2017: Adoption is challenged by organizational inertia, but measurable ROI gains are a bright spot for the industry. Hardware dominates in early years, as it's the first step to new tech adoption, paving the way for software growth.

U.S. $ Millions

$3 5,0 00
$3 0,0 00
$2 5,0 00
$2 0,0 00
$1 5,0 00
$1 0,0 00
$5 ,00 0
$0

$671

| 20 17 | 20 18 (E) | 20 19 (E) | 20 20 (E) | 20 21 (E) | 20 22 (E) |

Hardware (Head Worn)   Software (Head Worn)   Software (Smartphone & Tablet)   Advertising Spend

ARtillry

ENTERPRISE AR DRILL DOWN

(SIMPLIFIED VIEW)

AR Hardware, Software & Advertising Spend by Vertical

2022: XR starts a path to ubiquity in some enterprise fields. Software gains ground as it has faster refresh cycles through SaaS delivery, and as hardware becomes more embedded and mature in the enterprise.

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U.S. $Millions

U.S. $ Millions

$29,637

$671

| | $3 5,0 00 | $3 0,0 00 | $2 5,0 00 | $2 0,0 00 | $1 5,0 00 | $1 0,0 00 | $5 ,00 0 | $0 |

20 17   20 18 (E)   20 19 (E)   20 20 (E)   20 21 (E)   20 22 (E)

■ Industrial   ■ Retail & Commerce   ■ Corporate & Finance   ■ Healthcare   ■ Education

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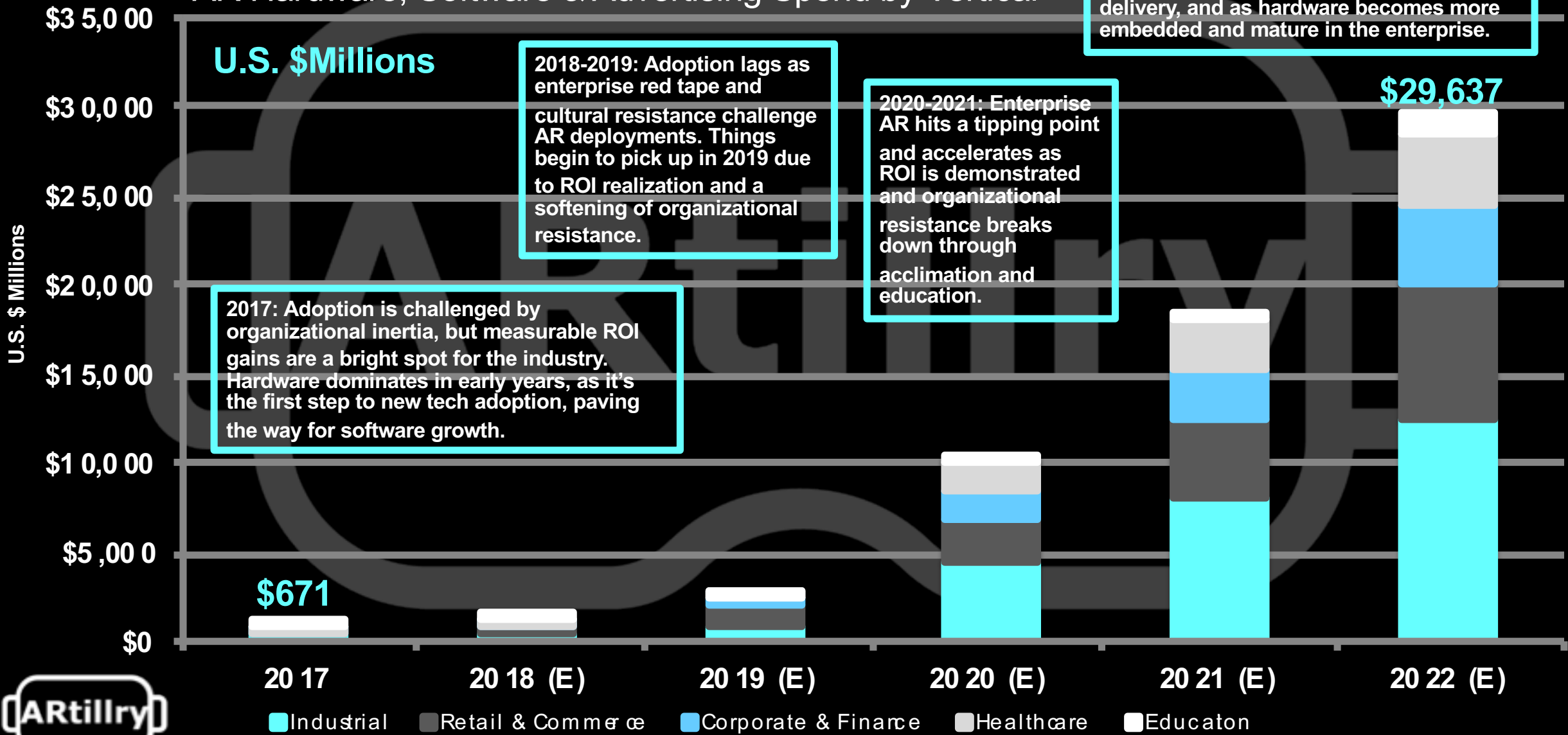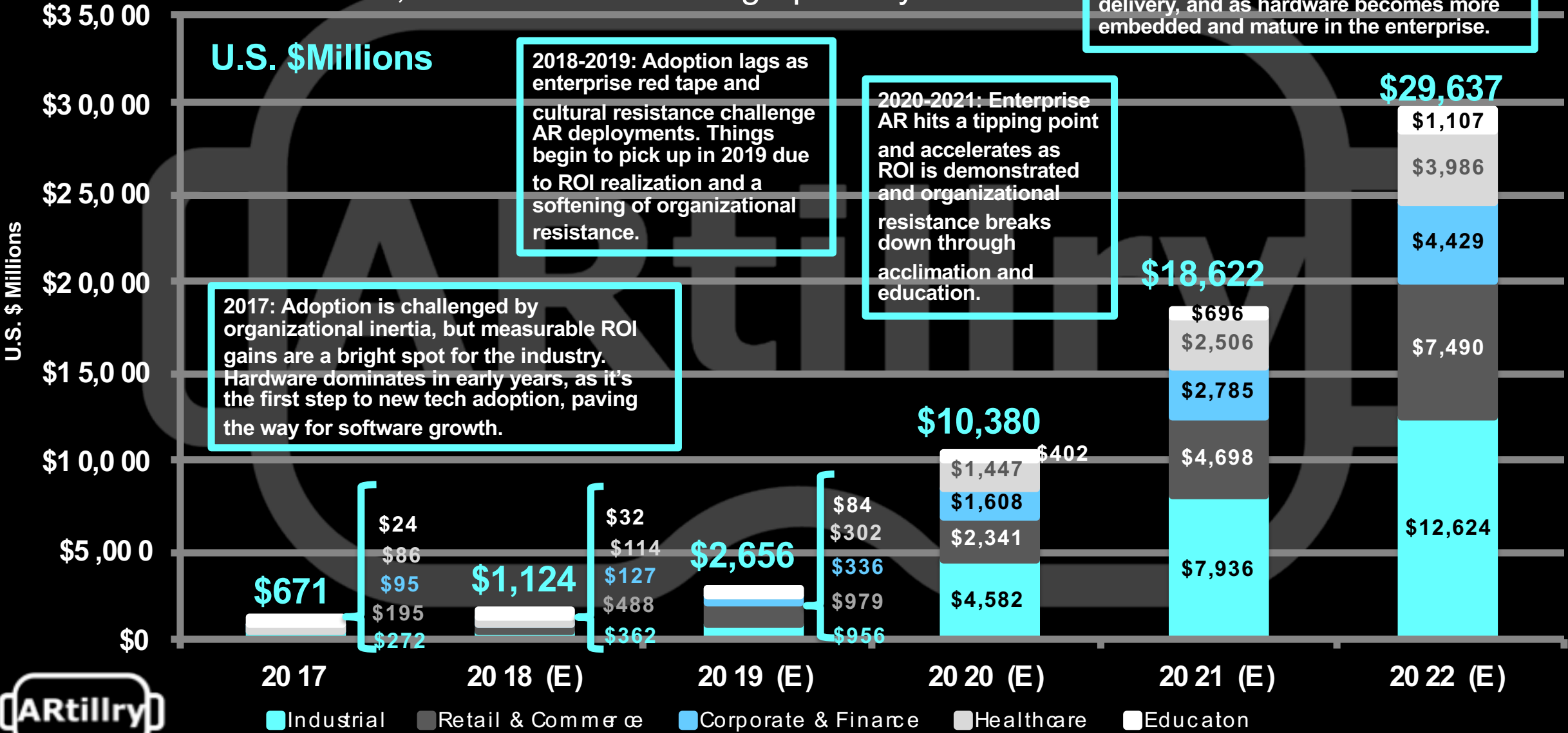
AR DEVICE FORECAST

MOBLE AR: UNIT FORECAST

As mentioned, AR devices in the near term will mostly be smartphones, whose sales are not included in AR & VR revenue projections.

- Mobile AR hardware (smartphones) isn't counted as AR revenue, because it's a ubiquitous consumer device on which AR's function is secondary.
- However, quantifying smartphones' AR compatibility on a *unit penetration basis*, can be a leading indicator for mobile AR software revenue.

There are 2.6 billion smartphones globally, growing to 3.7 billion by 2022.

Of those, 477 million are AR compatible in 2017, growing to 3.4 billion (92 percent compatibility) by 2022.

- This steep growth is driven by smartphone replacement cycles (2.5 years), which represent a phasing-in period for mobile AR.
- The pace of this phasing-in process will differ between ARkit and ARCore.

MOBLE AR: UNIT FORECAST (CONT')

- Apple's ARkit will grow from 433 million compatible iPhones in 2017 to 701 million in 2022.
  - ARkit has the nearer-term advantage, due to Apple's ability to mandate software updates across a more unified hardware base.

- Google's ARCore will grow from 44 million compatible phones in 2017 to 2.7 billion in 2022.
  - ARCore is disadvantaged in the near-term, due to Android's fragmented hardware base that inhibits comprehensive software updates.
  - However it has a longer-term advantage in scale: The Android universe (2 billion devices) is much larger than iOS (600 million devices).

- Collectively, mobile AR's massive installed base will incentivize developers to build content and apps. This will be a driving force for mobile AR revenues.*
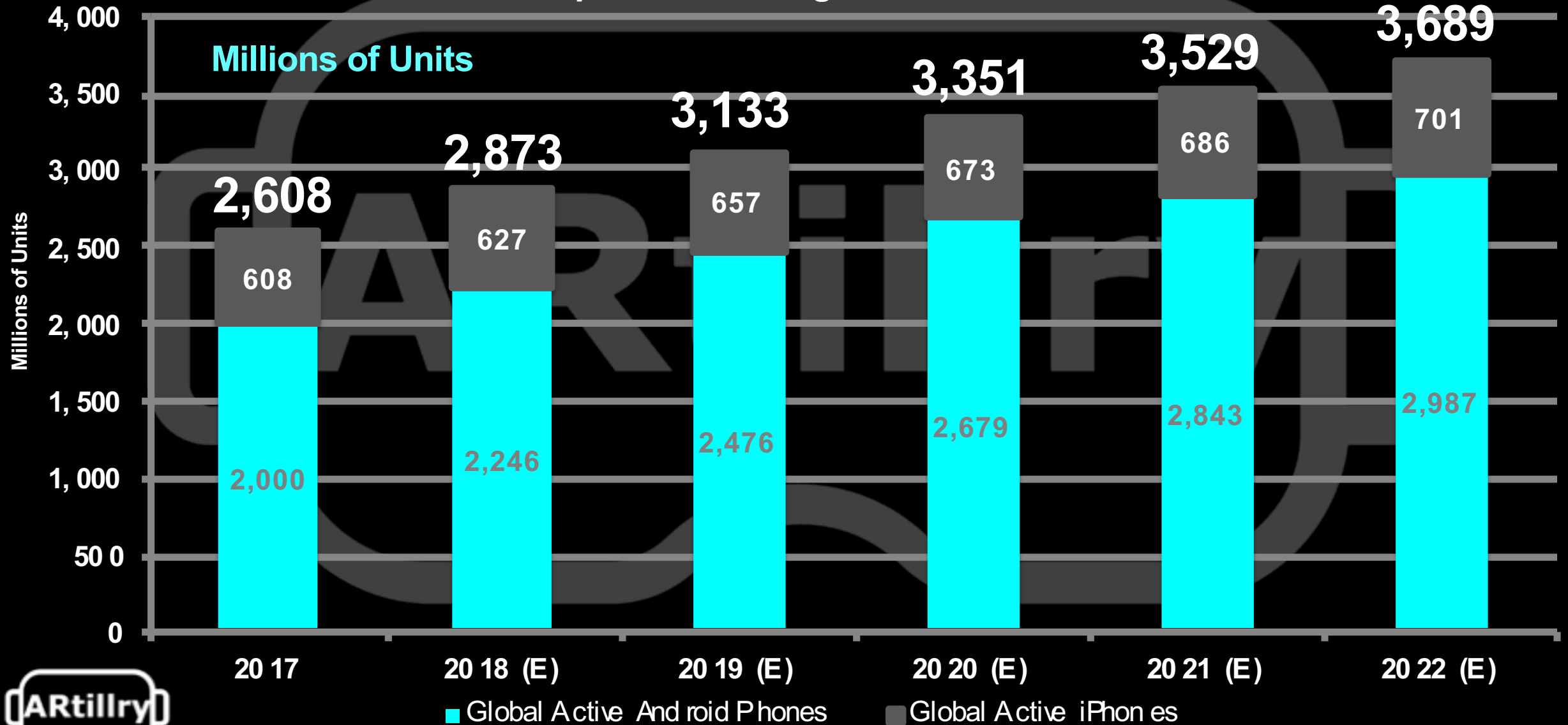
ARKIT INSTALLED BASE

Active iPhones with A9 chip or greater (iPhone 6s or greater)

Millions of Units

Millions of Units

	2017	2018 (E)	2019 (E)	2020 (E)	2021 (E)	2022 (E)
Non-ARKit-Compatible iPhones	175.7	41.6	3.9	0.0	0.0	0.0
ARKit-Compatible iPhones	432.7	585.3	652.8	672.6	686.3	701.3

■ ARkit-Compatible iPhones　■ Non-ARkt-Compatible iPhones

[ARtillry]
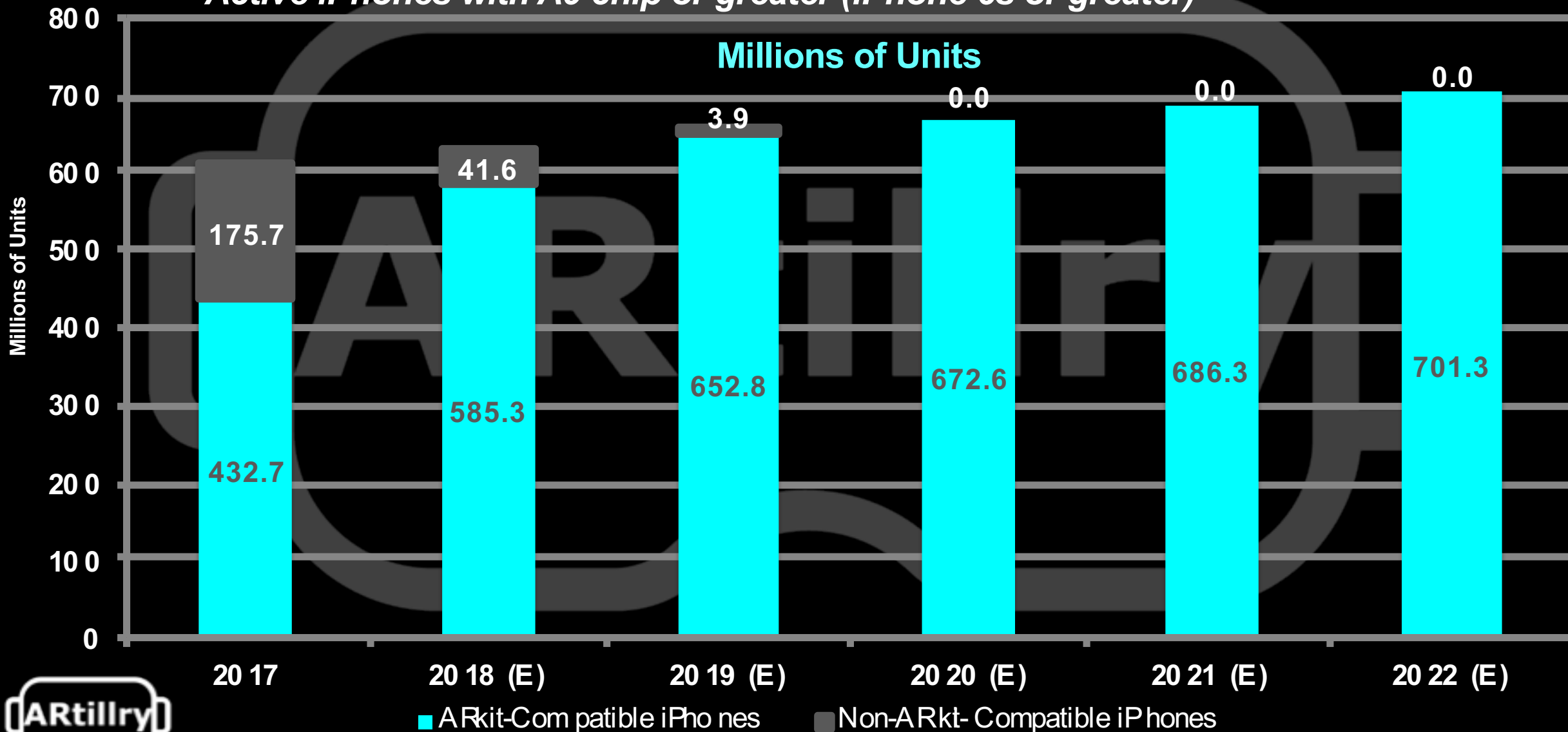
ARCORE INSTALLED BASE

Phones with Android 7.0 (Nougat) or greater, and deliberate sensor calibration for ARCore

Millions of Units

Year	Non-ARCore-Compatible Phones	ARCore-Compatible Phones
2017	1,956	43.9
2018 (E)	1,613	633.4
2019 (E)	936	1,540
2020 (E)	557	2,122
2021 (E)	338	2,504
2022 (E)	269	2,718

Millions of Units (y-axis): 0, 500, 1,000, 1,500, 2,000, 2,500, 3,000, 3,500

■ ARCore-Compatible Phones   ■ Non-ARCore-Compatible Phones
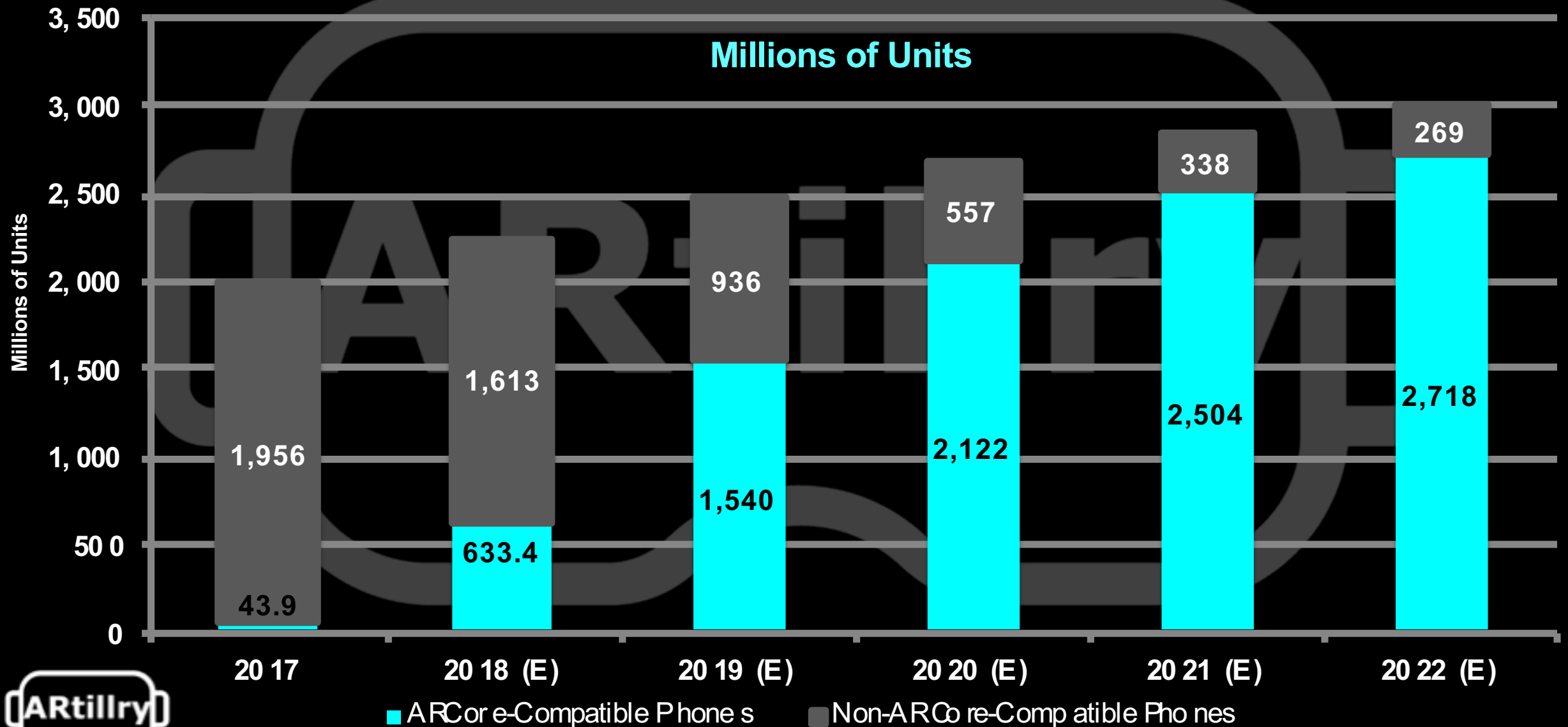
ARCORE + ARKIT INSTALLED BASE

Global Handsets Compatible with ARCore or ARkit

Millions of Units

Millions of Units

- 4,000
- 3,500
- 3,000
- 2,500
- 2,000
- 1,500
- 1,000
- 500
- 0

2017
477
433
43.9

2018 (E)
1,219
585
633

2019 (E)
2,193
653
1,540

2020 (E)
2,794
673
2,122

2021 (E)
3,191
686
2,504

2022 (E)
3,420
701
2,718

■ ARCore-Compatible Phones   ■ ARkit-Compatible iPhones

[ARtillry]

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AR HEADSET ANNUAL SALES

(not installed base… see separate slide)

Millions of Units (y-axis)

Legend: ■ Enterprise AR Headsets   ■ Consumer AR Headsets

Millions of Units

- 2017: .19
- 2022 (E): 14.30

X-axis: 20 17 | 20 18 (E) | 20 19 (E) | 20 20 (E) | 20 21 (E) | 20 22 (E)

(SIMPLIFIED VIEW)

AR HEADSET ANNUAL SALES

(not installed base… see separate slide)

Millions of Units

■ Enterprise AR Headsets ■ ConsumerARHeadsets

Millions of Units

Year	Total	Consumer	Enterprise
2017	.19	0.07	0.12
2018 (E)	.27	0.10	0.17
2019 (E)	.70	0.15	0.55
2020 (E)	4.30	1.10	3.20
2021 (E)	8.85	3.15	5.70
2022 (E)	14.30	4.50	9.80

(DETAILED VIEW)

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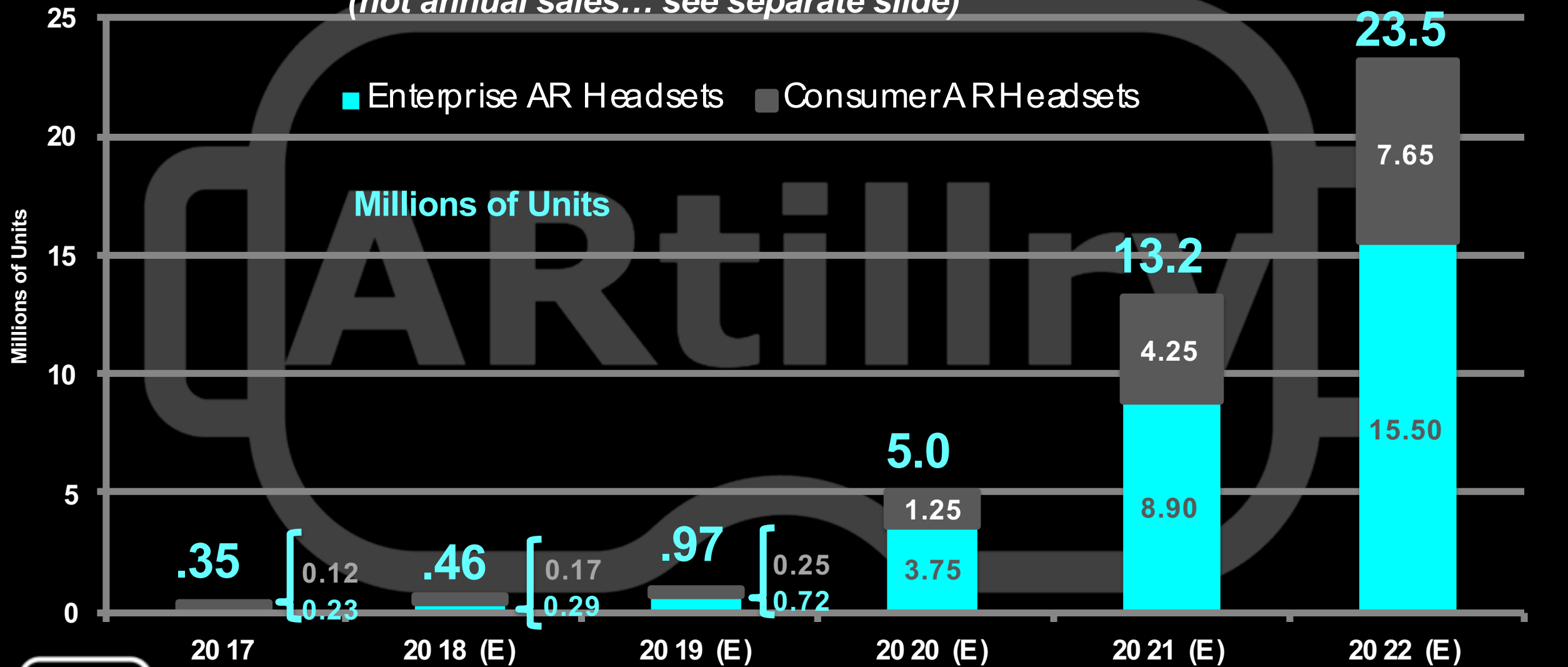
DRILLING DOWN ON VR

GLOBAL VR REVENUES

⬡ Global VR product revenues will grow from U.S. $3.1 billion in 2017 to U.S. $12.8 billion in 2022, a 32.6% compound annual growth rate (CAGR).

⬡ The largest share of VR revenue in 2017 was consumer VR (88%), which continues to dominate through 2022, but lose some share to enterprise VR.

   ⬡ Enterprise comprises 12% of VR revenues in 2017 and 26% in 2022.*

   ⬡ Consumer comprises 88% of VR revenues in 2017 and 74% in 2022.

⬡ Consumer VR's dominance results from the form factor's alignment with consumer-geared use cases, such as gaming and entertainment.

   ⬡ Consumer VR has taken an early lead, due mostly to gaming but enterprise VR adoption will accelerate as ROI is demonstrated.

   ⬡ The HTC Vive Pro will benefit most from enterprise adoption, and its higher price tag will shift overall revenue share towards enterprise VR.

*This includes VR hardware and software sales only. It does not include professional services such as enterprise consulting. See slide 5.

GLOBAL VR REVENUE OVERVIEW

(DETAILED VIEW)

VR Hardware, Software & LBVR Revenues

Headsets, Games, Apps, Enterprise Software, Ads, LBVR Admissions

U.S. $Millions

U.S. $ Millions

2017: Hardware dominates enterprise and consumer VR in early years, as it's the first step to new tech adoption, paving the way for software growth.

2018-2019: Consumer VR purchases accelerate as prices drop and standalone VR (i.e. Oculus Go) provide a compelling and affordable entry point for mainstream adoption.

2020-2021: Enterprise VR accelerates as ROI is demonstrated, and as organizational resistance breaks down due to acclimation and education.

2022: Software gains ground as VR's hardware base builds, and spending share shifts to software.

Year	Total	Consumer VR Hardware	Consumer VR Software	Enterprise VR Hardware	Enterprise VR Software	LBVR
2017	$3,119	$1,787	$761	$277	$198	$96
2018 (E)	$4,213	$2,247	$1,015	$451	$299	$201
2019 (E)	$5,787	$2,672	$1,215	$961	$534	$405
2020 (E)	$7,878	$3,351	$2,004	$1,177	$831	$515
2021 (E)	$10,108	$3,743	$3,088	$1,301	$1,334	$641
2022 (E)	$12,760	$4,063	$4,563	$1,447	$1,899	$789

Legend: ■ Consumer VR Hardware ■ Consumer VR Software ■ Enterprise VR Hardware ■ Enterprise VR Software ■ LBVR

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CONSUMER VR DRILL DOWN

CONSUMER VR REVENUES

- **One of consumer VR hardware's greatest adoption drivers will be price competition among headset manufacturers (e.g. Oculus, Sony, Samsung).**
  - **Oculus Go, at a $199 price point, will hit a sweet spot for quality, affordability, and an established content library from Gear VR's tenure.**
  - **Holidays 2018 will be a "moment of truth" for Oculus Go, as the above advantages plus a gift-able price point could jumpstart VR adoption.**

- **Consumer VR revenues will be led by hardware in the near term, shifting over time to software.**
  - **VR software will overtake hardware in 2022 as headset revenue growth matures, and as software refresh rates outpace hardware replacement cycles. Greater content libraries will also boost consumer spending.**
  - **Within VR software, premium app revenue rules, but web VR will gain share over time as evolving capability and lack of friction attracts users.**

*See the next section for a breakdown of headset pricing and unit sales trending

CONSUMER VR DRILLDOWN

(SIMPLIFIED VIEW)

VR Hardware, Software & LBVR Revenues

Headsets, Games, Apps, LBVR Admissions

U.S. $Millions

U.S. $ Millions

2017: Hardware dominates VR in early years, as it's the first step to new tech adoption, incentivizing content creation with a greater installed base.

2018-2019: Consumer VR purchases accelerate as prices drop and standalone VR (i.e. Oculus Go) provide a compelling and affordable entry point for mainstream adoption.

2020-2021: Software gains ground as VR's hardware base becomes more established and consumer spending shifts more to content, apps and games.

2022: Software gains ground as VR's hardware base builds, and compels game and app development.

$10,000
$9,000
$8,000
$7,000
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0

$2,746

$9,415

| 2017 | 2018 (E) | 2019 (E) | 2020 (E) | 2021 (E) | 2022 (E) |

■ Consumer VR Hardware   ■ Premium Apps/Games   ■ In-App/Game Purchases   ■ LBVR

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CONSUMER VR DRILLDOWN

VR Hardware, Software & LBVR Revenues

Headsets, Games, Apps, LBVR Admissions

U.S. $Millions

U.S. $ Millions

2017: Hardware dominates VR in early years, as it's the first step to new tech adoption, incentivizing content creation with a greater installed base.

2018-2019: Consumer VR purchases accelerate as prices drop and standalone VR (i.e. Oculus Go) provide a compelling and affordable entry point for mainstream adoption.

2020-2021: Software gains ground as VR's hardware base becomes more established and consumer spending shifts more to content, apps and games.

2022: Software gains ground as VR's hardware base builds, and compels game and app development.

Scale	
$10,000	
$9,000	
$8,000	
$7,000	
$6,000	
$5,000	
$4,000	
$3,000	
$2,000	
$1,000	
$0	

$2,746
- $198
- $75
- $686
- $1,787

$3,561
- $299
- $172
- $842
- $2,247

$4,292
- $405
- $230
- $985
- $2,672

$5,871
- $515
- $402
- $1,602
- $3,351

$7,472
- $641
- $730
- $2,358
- $3,743

$9,415
- $789
- $1,149
- $3,414
- $4,063

2017	2018 (E)	2019 (E)	2020 (E)	2021 (E)	2022 (E)

Legend: ▆ Consumer VR Hardware ▆ Premium Apps/Games ▆ In-App/Game Purchases ▆ LBVR

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CONSUMER VR SOFTWARE DRILL DOWN

(SIMPLIFIED VIEW)

Consumer VR Software: Apps vs. Web VR

U.S. $Millions

$761

$4,563

U.S. $ Millions

| 20 17 | 20 18 (E) | 20 19 (E) | 20 20 (E) | 20 21 (E) | 20 22 (E) |

■ Premium Software & Apps   ■ Web VR

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CONSUMER VR SOFTWARE DRILL DOWN

Consumer VR Software: Apps vs. Web VR

U.S. $Millions

U.S. $ Millions

	2017	2018 (E)	2019 (E)	2020 (E)	2021 (E)	2022 (E)
Total	$761	$1,015	$1,215	$2,004	$3,008	$4,563
Web VR	$8	$30	$61	$200	$618	$1,141
Premium Software & Apps	$754	$984	$1,154	$1,804	$2,471	$3,422

■ Premium Software & Apps ■ Web VR

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ENTERPRISE VR DRILL DOWN

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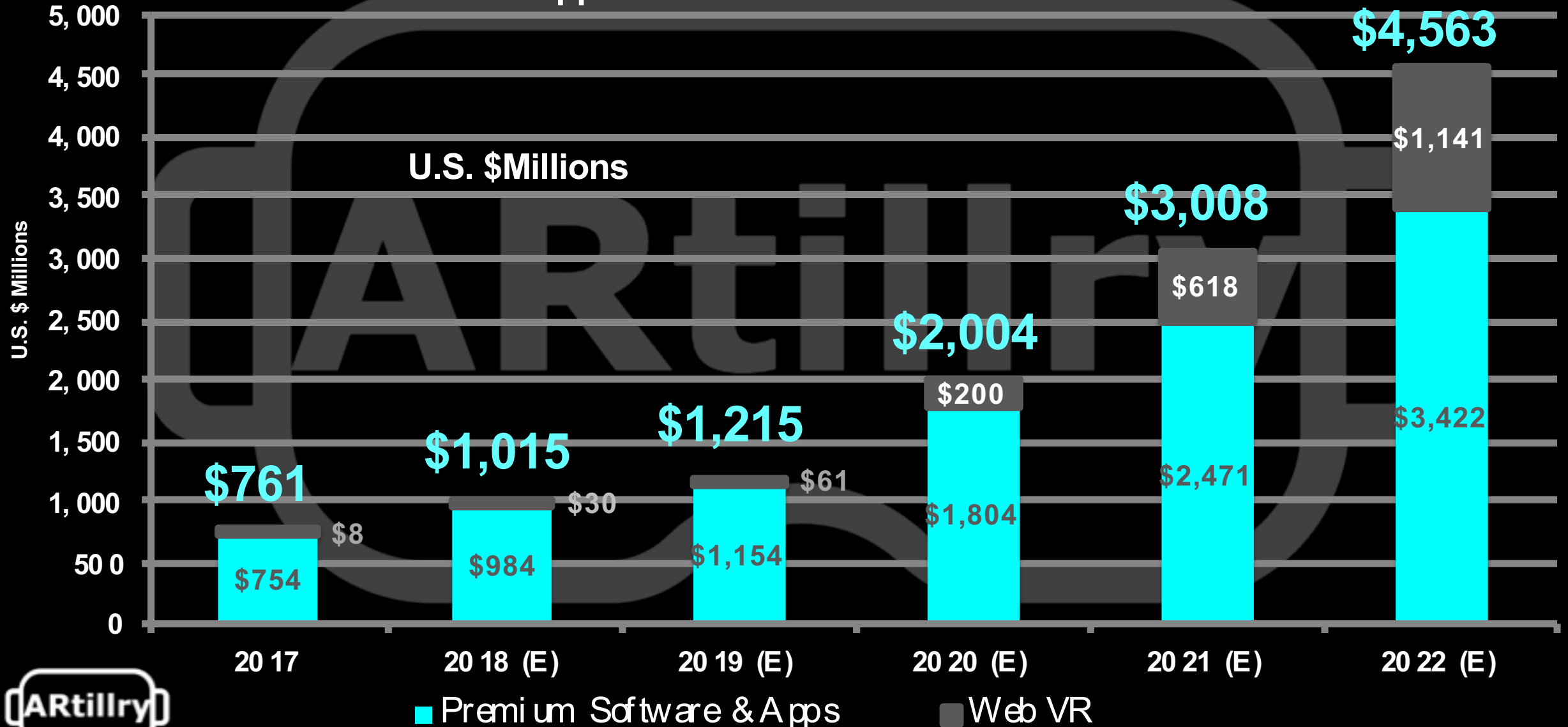
ENTERPRISE VR REVENUES

- Enterprise VR revenue trails consumer VR and other XR sub-sectors, due to limited hours of eligible use per working day.
    - VR's isolation inhibits industrial job functions and hand work.
    - VR's will excel in corporate, finance (data visualization) and training.

- Like Consumer VR, Enterprise VR revenues will be led by hardware in the near term, shifting over time to software.
    - Hardware often dominates early stages of enterprise technology adoption, creating an installed base for software growth.
    - VR software will overtake hardware in 2022 as software refresh rates (likely sold in a SaaS format) outpace hardware replacement cycles.

- Near-term advertising spend is relatively low in VR, due to usage levels.
    - Ad inventory is constrained, as is advertiser reach, interest and fill rates.*

ENETERPRISE VR DRILL DOWN

(SIMPLIFIED VIEW)

VR Hardware, Software & Ad Revenues

Headsets, Software, Advertising spend

U.S. $Millions

2022: Software gains ground as it has faster refresh cycles through SaaS delivery, and as hardware becomes more embedded and mature in the enterprise.

2020-2021: Enterprise VR accelerates as ROI is demonstrated, and as organizational resistance breaks down due to acclimation and education.

2018-2019: Adoption lags as enterprise red tape and cultural resistance challenge VR deployments. Things begin to pick up in 2019 due to ROI realization and a softening of organizational resistance.

2017: Hardware dominates enterprise VR in early years, as it's the first step to new tech adoption, paving the way for software growth.

$3,345

$374

U.S. $ Millions

$4,000					
$3,500					
$3,000					
$2,500					
$2,000					
$1,500					
$1,000					
$500					
$0					

20 17 **20 18 (E)** **20 19 (E)** **20 20 (E)** **20 21 (E)** **20 22 (E)**

■ Enterprise VR Hardware   ■ Premium Software/Apps   ■ VR Advertising Spend

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ENETERPRISE VR DRILL DOWN

(DETAILED VIEW)

VR Hardware, Software & Ad Revenues

Headsets, Software, Advertising spend

U.S. $Millions

2022: Software gains ground as it has faster refresh cycles through SaaS delivery, and as hardware becomes more embedded and mature in the enterprise.

2020-2021: Enterprise VR accelerates as ROI is demonstrated, and as organizational resistance breaks down due to acclimation and education.

2018-2019: Adoption lags as enterprise red tape and cultural resistance challenge VR deployments. Things begin to pick up in 2019 due to ROI realization and a softening of organizational resistance.

2017: Hardware dominates enterprise VR in early years, as it's the first step to new tech adoption, paving the way for software growth.

U.S. $ Millions

Year	Total	VR Advertising Spend	Premium Software/Apps	Enterprise VR Hardware
2017	$374	$4	$92	$277
2018 (E)	$652	$7	$193	$451
2019 (E)	$1,495	$17	$517	$961
2020 (E)	$2,007	$47	$784	$1,177
2021 (E)	$2,636	$84	$1,250	$1,301
2022 (E)	$3,345	$131	$1,768	$1,447

Legend: ■ Enterprise VR Hardware ■ Premium Software/Apps ■ VR Advertising Spend

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ENTERPRISE VR DRILL DOWN

VR Hardware, Software & Advertising Spend by Vertical

2022: Software gains ground as it has faster refresh cycles through SaaS delivery, and as hardware becomes more embedded and mature in the enterprise.

U.S. $Millions

2020-2021: Enterprise VR accelerates as ROI is demonstrated, and as organizational resistance breaks down due to acclimation and education.

$3,345

2018-2019: Adoption lags as enterprise red tape and cultural resistance challenge VR deployments. Things begin to pick up in 2019 due to ROI realization and a softening of organizational resistance.

U.S. $ Millions

2017: Hardware dominates enterprise VR in early years, as it's the first step to new tech adoption, paving the way for software growth.

$374

2017	2018 (E)	2019 (E)	2020 (E)	2021 (E)	2022 (E)

■ Corporate & Finance ■ Industrial ■ Healthcare ■ Education ■ Retail & Commerce

ARtillry
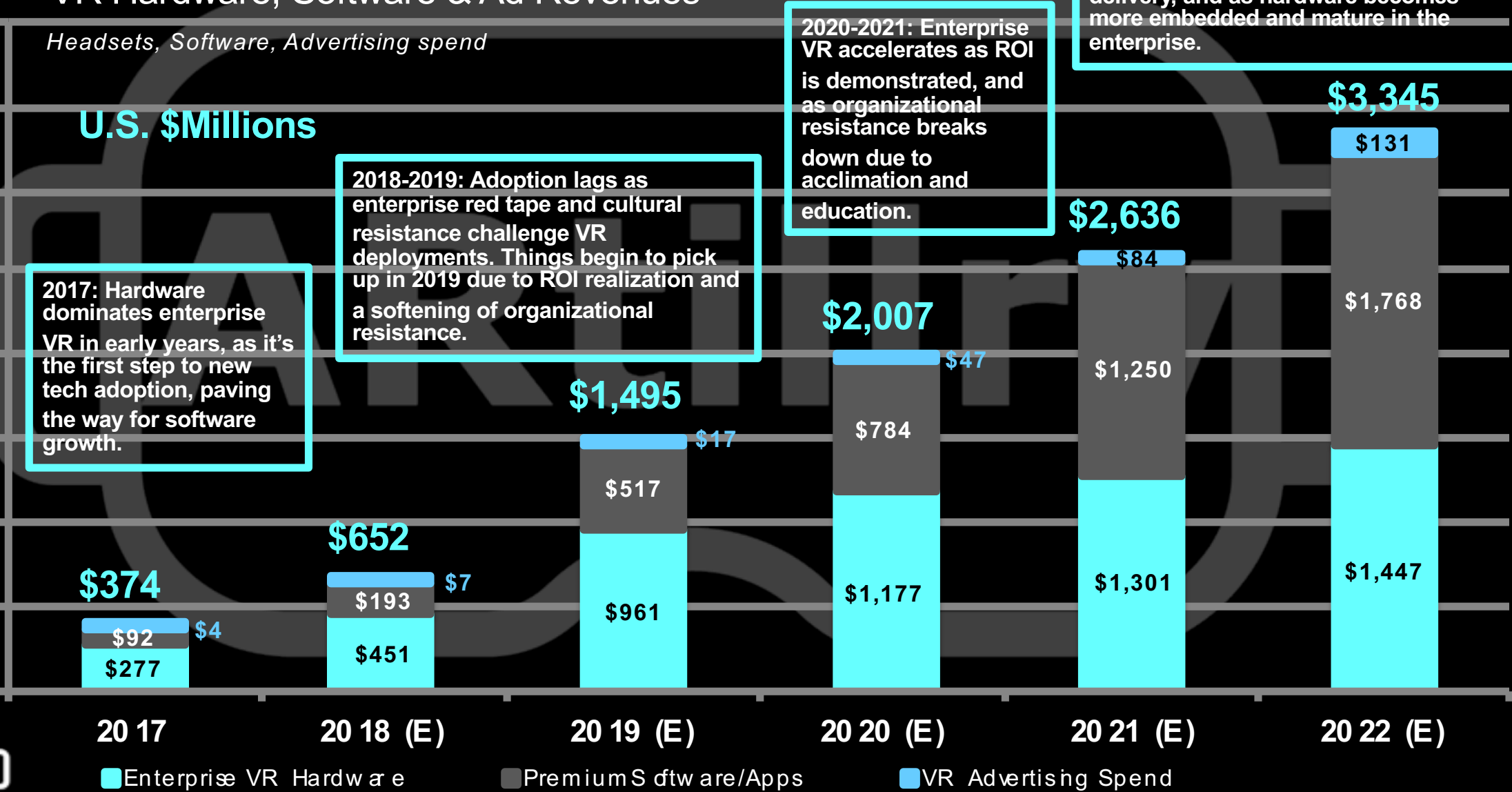
ENTERPRISE VR DRILL DOWN

(DETAILED VIEW)

VR Hardware, Software & Advertising Spend by Vertical
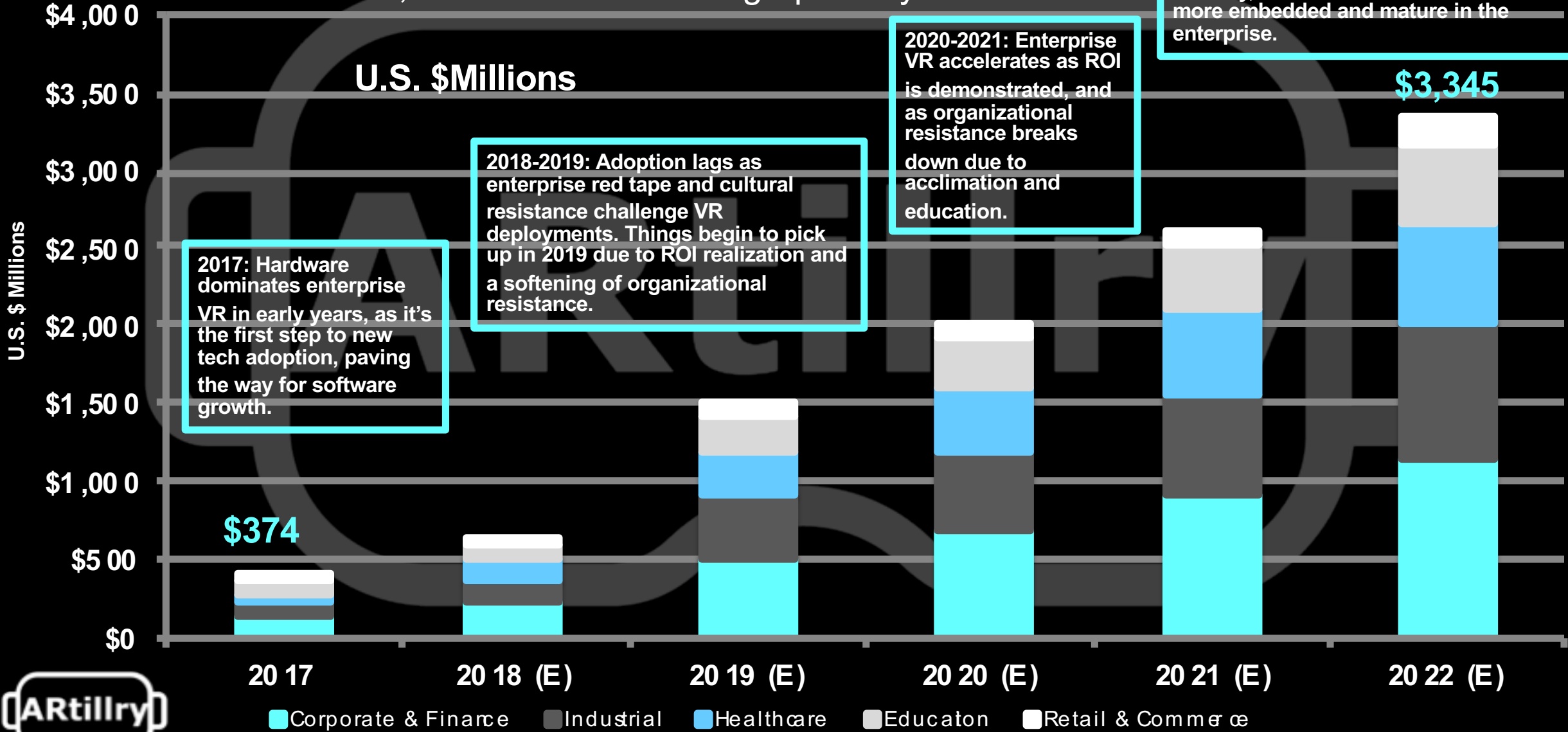
U.S. $Millions

2022: Software gains ground as it has faster refresh cycles through SaaS delivery, and as hardware becomes more embedded and mature in the enterprise.

2020-2021: Enterprise VR accelerates as ROI is demonstrated, and as organizational resistance breaks down due to acclimation and education.

2018-2019: Adoption lags as enterprise red tape and cultural resistance challenge VR deployments. Things begin to pick up in 2019 due to ROI realization and a softening of organizational resistance.

2017: Hardware dominates enterprise VR in early years, as it's the first step to new tech adoption, paving the way for software growth.

Year		
2017	**$374**	$19 / $56 / $75 / $93 / $131
2018 (E)	**$652**	$33 / $98 / $130 / $163 / $228
2019 (E)	**$1,495**	$75 / $224 / $299 / $374 / $523
2020 (E)	**$2,007**	$100 / $301 / $401 / $502 / $703
2021 (E)	**$2,636**	$132 / $395 / $527 / $659 / $923
2022 (E)	**$3,345**	$167 / $502 / $669 / $836 / $1,171

Legend:
- ■ Corporate & Finance
- ■ Industrial
- ■ Healthcare
- ■ Education
- ■ Retail & Commerce

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VR DEVICE FORECAST

VR HEADSET REVENUE

Global VR headset revenues will grow from U.S. $2.1 billion in 2017 to U.S. $5.5 billion in 2022, a 21.7% compound annual growth rate (CAGR).

PSVR is the market share leader for headset revenue, due to the Playstation 4 installed base, though its share will recede over time.

Oculus Go will grow at a fast pace and lead *unit share* by 2022, but its smaller price tag ($199) inhibits its *revenue share* of VR headsets.

Having the opposite effect, Vive Pro will have a low unit share but a high revenue share by 2022, given its high price tag and enterprise adoption.

HTC Vive and Samsung Gear VR will perform relatively poorly versus competitors that have more flexibility to subsidize hardware (i.e. Oculus).

Oculus – with the advantage of Facebook-backing and a revenue model detached from hardware sales – has this flexibility to apply loss-leader pricing in order to trade margins for market share.*

VR HEADSET REVENUE

- In units, the global VR headset market will grow from 9 million in 2017 annual sales to 29 million in 2022.
  - This correlates to a cumulative installed base of 26 million active VR headsets to 63 million units during the same period.

- VR headset pricing will trend downward over the forecast period, from an average of $468.50 in 2017 to $281.63 in 2022.
  - Price competition will be a key adoption driver, bringing VR's entry point down to levels that are in the range of higher consumer demand.*
  - Standalone headsets represent an effective "all-in" price for consumers, given that they don't require dedicated PCs, consoles or mobile devices.
  - Cardboard and other tier-4 devices are removed from average pricing calculations, as they're an outlier (as low as $10 per unit).

GLOBAL VR HEADSET INSTALLED BASE

Millions of Headsets

Figures are rounded.

Millions

70

63

60

54

50

46

40

38

31

30

29

26

24

20

20

16

12

10

9

0

20 17   20 18 (E)   20 19 (E)   20 20 (E)   20 21 (E)   20 22 (E)

■ AN NU AL SALES   ■ INS TALL ED BA SE

[ARtillry]

GLOBAL VR HEADSET REVENUES

U.S. $Millions

U.S. $ Millions

	2017	2018 (E)	2019 (E)	2020 (E)	2021 (E)	2022 (E)
Total	$2,064	$2,699	$3,633	$4,528	$5,045	$5,510
CARDBOARD & OTHER TIER 4	$35	$38	$42	$30	$22	$20
GEAR VR & OTHER TIER 3	$200	$216	$194	$193	$170	$174
OTHER STANDALONE	$175	$239	$391	$538	$657	$693
OCULUS GO		$263	$358	$571	$689	$687
WINDOWS MR & OTHER		$144	$279	$359	$418	$462
RIFT	$248	$287	$391	$478	$538	$577
VIVEPRO		$264	$639	$949	$1,079	$1,477
VIVE	$491	$431	$439	$499	$539	$463
PSVR	$804	$816	$900	$910	$933	$957
(extra)	$112					

Legend:
- PSVR
- VIVE
- VIVEPRO
- RIFT
- WINDOWS MR & OTHER
- OCULUS GO
- OTHER STANDALONE
- GEAR VR & OTHER TIER 3
- CARDBOARD & OTHER TIER 4

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GLOBAL VR HEADSET UNIT SALES

(SIMPLIFIED VIEW)

Millions of Headsets Sold

Figures are rounded.

Millions of Units

	PSVR		VIVE		VIVEPRO
	RIFT		WINDOWS MR & OTHER		OCULUS GO
	OTHER STANDALONE		GEAR VR & OTHER TIER 3		CARDBOARD & OTHER TIER 4

GLOBAL VR HEADSET UNIT SALES

Millions of Headsets Sold

Figures are rounded.

Millions of Units

	2017	2018 (E)	2019 (E)	2020 (E)	2021 (E)	2022 (E)
Total	9	12	16	20	24	29
CARDBOARD & OTHER TIER 4	3.51	3.84	4.16	3.00	2.16	2.03
GEAR VR & OTHER TIER 3	2.07	2.28	2.56	2.80	2.88	3.19
OTHER STANDALONE	0.35	0.60	1.12	1.80	2.64	
OCULUS GO	0.23	1.32	2.40	4.80	6.96	8.70
WINDOWS MR & OTHER		0.36	0.80	1.20	1.68	2.32
VIVEPRO	0.45	0.72	1.12	1.60	2.16	2.90
VIVE		0.24	0.64	1.00	1.20	1.74
RIFT	0.70	0.72		1.00	1.20	1.16
PSVR	1.69	1.92	2.40	2.80	3.12	3.48

Legend:
- PSVR
- VIVE
- VIVEPRO
- RIFT
- WINDOWS MR & OTHER
- OCULUS GO
- OTHER STANDALONE
- GEAR VR & OTHER TIER 3
- CARDBOARD & OTHER TIER 4

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GLOBAL VR HEADSET PRICING TREND

(DETAILED VIEW)

Headset prices are averaged within any given year, due to fluctuations throughout the year. Pricing on bundled VR hardware is included (inputs and tracking equipment). Cost of PCs, consoles or mobile devices are not included. Cardboard pricing is eliminated from the mean, as an outlier.

2017 — AVG: $468.50
- $89
- $499
- $499
- $550
- $699
- $475

2017 bar appears shorter due to less headset models in the market (sans Oculus Go and Vive Pro.)

2018 (E) — AVG: $451.00
- $89
- $399
- $199
- $399
- $399
- $1,099
- $599
- $425

2019 (E) — AVG: $399.13
- $74
- $349
- $149
- $349
- $349
- $999
- $549
- $375

2020 (E) — AVG: $357.25
- $69
- $299
- $119
- $299
- $299
- $949
- $499
- $325

2021 (E) — AVG: $319.00
- $59
- $249
- $99
- $249
- $249
- $899
- $449
- $299

2022 (E) — AVG: $281.63
- $54
- $199
- $79
- $199
- $199
- $849
- $399
- $275

Millions of Units

Legend:
- PSVR
- VIVE
- VIVEPRO
- RIFT
- WINDOWS MR & OTHER
- OCULUS GO
- OTHER STANDALONE
- GEAR VR & OTHER TIER 3
- CARDBOARD & OTHER TIER 4

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KEY
TAKEAWAYS
(REDUX)

KEY TAKEAWAYS

Takeaways and growth dynamics for XR and its sub-sectors.

Enterprise AR will grow from $671 million in 2017 to $29.6 billion in 2022, a 113 percent compound annual growth rate (CAGR). This makes it the largest XR sub-sector in 2022. Scale will result from wide applicability across enterprise verticals; and a form factor that supports all-day use and clear ROI (e.g. manufacturing efficiencies). Adoption is currently dampened by typical organizational inertia, enterprise risk aversion and sales cycles. ARtillry Intelligence believes these factors will continue to stunt enterprise AR growth but will be outweighed eventually by the momentum, support and ROI realizations that are currently building. A tipping point will come in 2020, after which adoption accelerates in a sort of enterprise herd mentality. This will follow a similar pattern, though on a smaller scale, as enterprise smartphone adoption over the past decade. Near-term Enterprise AR revenues will be hardware-dominant as it's the first step in enterprise tech adoption. Hardware growth creates an installed base for software, which will dominate enterprise AR in outer years. Enterprise hardware will also mature as it's established in the enterprise, with replacement cycles outpaced by software refresh rates, likely packaged and sold in a SaaS manner.

KEY TAKEAWAYS

Takeaways and growth dynamics for XR and its sub-sectors.

Consumer AR will grow from $456 million in 2017 to $18.8 billion in 2022, a 110 percent compound annual growth rate (CAGR). Near term revenues will be dominated by the mobile form factor. Revenues will also be software-centric during that time (mobile device sales aren't counted in this forecast) and will include premium apps and in-app purchases. The latter will dominate software revenues in the near term, due to consumer hesitance to pay upfront for AR apps, as well as the in-app revenue model validated by Pokémon Go. Niantic will find success in its follow-up game to Pokémon Go, with architecture and game mechanics re-skinned to a Harry Potter theme. These and other developing AR experiences will be built around in-app purchase models. A mobile AR killer app won't arrive until 2019, likely built on social networking and native AR functionality. Consumer AR revenues will begin to shift towards hardware starting in 2021 as smart glasses (possibly from Apple) finally reach tenable specs and standards for consumer markets. Software at that time will begin to shift to premium purchases (as opposed to in-app purchases) as it's a model conducive to dedicated AR hardware (similar to how apps/games are purchased in VR). Meanwhile, the development work put into mobile AR apps will be a training ground for an eventual glasses-dominant era beyond 2022.

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KEY TAKEAWAYS

Takeaways and growth dynamics for XR and its sub-sectors.

Enterprise VR will grow from $374 million in 2017 to $3.35 billion in 2022, a 55 percent compound annual growth rate (CAGR). Though strong in its own right, it will hold the smallest share of XR revenues among the sub-sectors measured in this forecast. VR will be stronger as a consumer play (see next slide), while AR is stronger in the enterprise. These VR shortcomings (relatively speaking) in the enterprise stem from the medium's inherent isolation, which inhibits some job functions and share of time per working day. This is especially true in industrial functions where "heads up" awareness is inherent, and where AR will conversely shine. However, VR will add value in corporate and finance settings, such as employee training and data visualization among others (vertical spending breakdown provided in this report). Like AR, VR's near term enterprise revenue will be hardware-dominant as it's the first step to tech adoption. That installed base will pave the way for enterprise VR software revenues to grow and overtake enterprise VR hardware revenues by 2022. Unlike AR, which will have specialized hardware that's optimized for enterprise functions, VR will utilize common hardware (the same hardware used in consumer contexts). The availability, evolution and economics of that increasingly penetrated hardware will be an adoption accelerant, and an advantage for enterprise VR.

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KEY TAKEAWAYS

Takeaways and growth dynamics for XR and its sub-sectors.

Consumer VR will grow from $2.7 billion in 2017 to $9.4 billion in 2022, a 28 percent compound annual growth rate (CAGR). Like enterprise VR, it will be hardware-dominant in early years as its installed base is established. Over time, software (in this case, games and apps) will eclipse hardware revenues with a faster refresh cycle. A greater installed base of hardware will also incentivize VR content creators to invest in long-form content, resulting in more robust VR content libraries and greater software spending per user (ARPU). Premium apps will dominate software revenues but in-app purchases will also contribute, especially in gaming. Installed software and apps will also dominate, but slowly give way to web VR as its capability evolves. Price competition among VR headset manufacturers (e.g. Oculus, Sony, Samsung) will accelerate consumer adoption. Oculus Go, at a $199 price point, hits a sweet spot for quality and affordability, and we project it to reach unit sales of 1.3 million this year. Oculus – with the advantage of Facebook-backing – has the flexibility to apply loss-leader pricing in order to trade margins for market share. That will give it a strong competitive position versus players that are dependent on hardware revenue (i.e. HTC, Samsung). Given a gift-able price point, the 2018 holiday quarter will be a "moment of truth" for Oculus Go.

VIDEO COMPANION

(CLICK LINK TO PLAY VIDEO)

https://youtu.be/On6GStY430s

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THE XR TRANSFORMATION
BE EMPOWERED THROUGH KNOWLEDGE

NEXT STEPS, REFERENCE & METHODOLOGY

NEXT STEPS

In addition to standalone status, this forecast lays the groundwork for *ARtillry Intelligence* future deliverables.

With the foundation of this data set, several subsequent narratives will be developed in the coming months that each drill down into XR sub-sectors, rationale, revenue-drivers and strategic implications.

We will also update this data set bi-annually, projecting a five year time horizon with each forecast. We will expand the scope of this forecast over time as well, to include more categories of AR & VR spending (see slide 5 for inclusions).

We encourage questions and coverage suggestions at **https://artillry.co/contact/**

ARtillry

ABOUT ARTILLRY INTELLIGENCE

ARtillry is a publication and intelligence firm that examines augmented reality (AR) and virtual reality (VR). Through writings, data and multimedia, it provides deep and analytical views into the industry's biggest players and opportunities. It's about insights, not cheerleading.

Run by career analyst and journalist Mike Boland, coverage is grounded in a disciplined and journalistic approach. It also maintains a business angle: Though fun and games permeate VR and AR (especially the former) long-term cultural, technological and financial implications are primary.

Learn more at **https://artillry.co/about/**

2017   2007

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ABOUT INTELLIGENCE BRIEFINGS

ARtillry Intelligence Briefings are monthly installments of VR/AR data and analysis. They synthesize original and third-party data to reveal the dynamics of VR and AR sectors, and their opportunities.

In addition to data, a layer of insights is applied to translate market events and raw figures into prescriptive advice. This takes form in a narrative story arc, grounded in market figures.

Questions and requests for deeper analysis can be submitted at: **https://artillry.co/contact/**

ABOUT THE AUTHOR

Mike Boland was one of Silicon Valley's first tech reporters of the Internet age, as a staff reporter for *Forbes* (print) starting in 2000. He has been an industry analyst covering mobile and social media since 2005, and is now Chief Analyst of *ARtillry Intelligence*, covering emerging tech.

Mike is a frequent speaker at industry conferences such as VRLA, ad:tech and LeadsCon. He has authored in-depth reports and market-sizing forecasts on the changing tech & media landscape. He contributes regularly to highly read online news sources such as *TechCrunch*, *Business Insider* and the *Huffington Post*.

A trusted source for tech journalists, his comments have appeared in A-list publications, including *The New Yorker*, *The Wall Street Journal* and *The New York Times*.

Further background, history and credentials can be found at **http://www.mikebo.land/**

METHODOLOGY

ARtillry Intelligence follows disciplined best practices in market sizing and forecasting, developed and reinforced through its principles' 15 years in research and intelligence in the tech sector. This includes the past 2.5 years covering AR & VR as a main focus.

This report focuses on AR and VR revenue projections in various sub-sectors and product areas. *ARtillry Intelligence* has built financial models that are customized to the specific dynamics and unit economics of each. These include variables like unit sales, company revenues, pricing trends, market trajectory and several other micro and macro factors that *ARtillry Intelligence* tracks.

This approach primarily applies a *bottom-up* forecasting methodology, which is secondarily vetted against a top-down analysis. Together, confidence is achieved through triangulating revenues and projections in a disciplined way. For more information on what's included and not included in the forecast (a key consideration when evaluating the figures) see slide 5.

More about ARtillry Intelligence's market-sizing credentials can be found at **http://www.mikebo.land/forecasting**

DISCLOSURE AND ETHICS POLICY

ARtillry has no financial stake in the companies mentioned in this report, nor received payment for its production. With respect to market sizing, ARtillry remains independent of players and practitioners in the sectors it covers. It doesn't perform paid services or consulting for such companies, thus mitigating bias — real or perceived — in market sizing and industry revenue projections. ARtillry's disclosure and ethics policy can be seen in full at **https://artillry.co/about/disclosure-and-ethics-policy/**

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