



**Q4 QUARTERLY
MOBILE INDEX**
2017 | & FULL YEAR LOOK BACK

PubMatic's Quarterly Mobile Index (QMI) report was created to provide both publishers and advertisers with key insights into the mobile advertising industry.

ABOUT PUBMATIC'S QUARTERLY MOBILE INDEX

By analyzing over ten trillion advertiser bids flowing each month through PubMatic's platform, we can observe real-time developments in the mobile space that may allude to broader digital industry trends. We can then compare this information to other published data to further understand changes in the mobile landscape. We are committed to providing best-in-class mobile tools and services, and we believe that information sharing is crucial in aligning the digital industry towards best practices and, ultimately, growth in mobile advertising.

In our Q4 2017 report, we have expanded our scope from quarterly analysis to a full year look back and have added several benchmarks for mobile advertising performance around pricing, volume and growth.

Note that directional data might not be comparable with prior reports.

IN FY 2017, THE FOLLOWING SIX KEY TRENDS EMERGED:

KEY TREND

01

As brands shifted more spend to automated channels in 2017, mobile PMPs earned a 150%+ eCPM premium over open exchanges, while overall mobile monetized impression volume grew over 50% from 2016.

KEY TREND

02

Mobile web header bidding approached maturity at the end of 2017 as monetized impression volume grew over 200% YOY, shifting focus toward the evolution and optimization of its capabilities.

KEY TREND

03

Apps drove mobile volume growth in 2017, while mobile web eCPMs rose more than 50% YOY globally to earn a sizeable premium.

KEY TREND

04

Android built a dominant OS lead to represent roughly eight-in-ten monetized mobile app impressions worldwide in 2017, while iOS delivered higher eCPMs.

KEY TREND

05

Mobile video remained a developing opportunity as its global footprint expanded with mobile video eCPMs catching up to desktop in 2017.

KEY TREND

06

Mobile monetization opportunities expanded globally in 2017, driven by strong volume rises in APAC and EMEA and eCPM growth in the Americas.

KEY TRENDS AFFECTING MOBILE MONETIZATION IN 2017:

1

UNMISTAKABLE SHIFT TOWARD QUALITY MARKED 2017

Leading brand advertisers established strict new frameworks for digital partners in 2017. Some drastically cut long tail advertising reach on the web, reporting significant savings and minimal impact—if any at all—on their brands in the early part of the year.¹ Then the YouTube adjacency scandal broke out in March, causing major advertisers to pull ads from the platform after appearing next to questionable and sometimes damaging content. The scandal reverberated throughout the ad tech ecosystem, effectively causing short-term retreats in volume and spending that impacted pricing. Advertisers' renewed calls for higher standards and bolder safeguards against fraudulent activity were met by premium ad tech vendors with additional quality levers, partnership reviews and expanded shielding against suspicious activity. As the year drew to a close, increased quality measures—i.e. widespread anti-fraud software adoption, increasing ads.txt adoption, fraud free guarantees and more—were in plain sight. As advertiser trust recovered, so did programmatic growth rates. The conversation about quality is not over. Expect industry standards to rise further in 2018 as brand advertising dollars continue to move into automated channels, demanding ever greater inventory quality and fraud protections and reshaping monetization profiles across formats, devices and geographies.

2

PRIVATE MARKETPLACES CAUGHT ADVERTISERS' ATTENTION

As fraud risks and price transparency came into focus, private marketplace (PMP) growth gained momentum in 2017. More than a quarter of programmatic decision-makers in North America stated their intention to shift resources from open exchanges to PMPs to ensure their ad purchases appear across higher-quality publisher sites.² Publishers are realizing that a direct sales force is not the antithesis of programmatic and have increasingly embraced PMP and PMP-Guaranteed to enhance price transparency and regain control over ad decisioning. This shift in turn increased the availability of premium inventory through private set ups. PMPs did not overtake the open exchanges in sheer volume in 2017 and are unlikely to do so any time soon as the latter offers far more reach. Nevertheless, expect PMPs to continue gaining ground, particularly in mobile, as brand advertisers wary of brand safety seek to secure ad space next to reputable content.

3

HEADER BIDDING RESHAPED PROGRAMMATIC ADVERTISING

Header bidding moved into the mainstream as nearly three-quarters of top 1000 US publishers deployed the technology in 2017.³ Throughout the year, publishers deepened their header bidding expertise and technology providers continued to innovate, evolving the tactic beyond the header. Header bidding wrapper solutions became common place, growing in sophistication from client-side to server-side implementations and the increasingly common hybrid solutions—the fastest growing header bidding implementation type in the second half of 2017.⁴ Header bidding improved digital advertising monetization with the benefits of the tactic spanning across verticals, devices and regions worldwide. Mobile-friendly publishers took the most advantage as analysis shows that the mobile share of header bidding impressions grew faster than desktop. Expect header bidding to remain a central part of programmatic strategies in 2018, expanding to video and in-app environments and continuing to lift eCPMs as publishers escape the waterfall to unify their demand sources and increase competition on an impression-by-impression basis.

4

APP ENVIRONMENTS PULLED AHEAD TO LEAD THE MOBILE ADVERTISING EXPANSION WORLDWIDE

Mobile remained the engine of advertising growth around the world in 2017. Within mobile, apps drove most of the volume expansion as publishers and advertisers sought to connect with consumers in the space where most of their online activity takes place. With apps building out a considerable volume lead, pricing and eCPMs across the mobile landscape were also rebalanced. Mobile web inventory remained relevant, benefiting from widespread header bidding adoption in the platform, a focus on higher quality inventory and relative scarcity to earn significantly higher average eCPMs. While the mobile volume split has stabilized in apps' favor at a level that mirrors consumer trends, expect the expansion of header bidding into app environments to spread the pricing benefits it has already brought to the mobile web.

KEY TREND

01

As brands shifted more spend to automated channels in 2017, mobile PMPs earned a 150%+ eCPM premium over open exchanges, while overall mobile monetized impression volume grew over 50% from 2016.

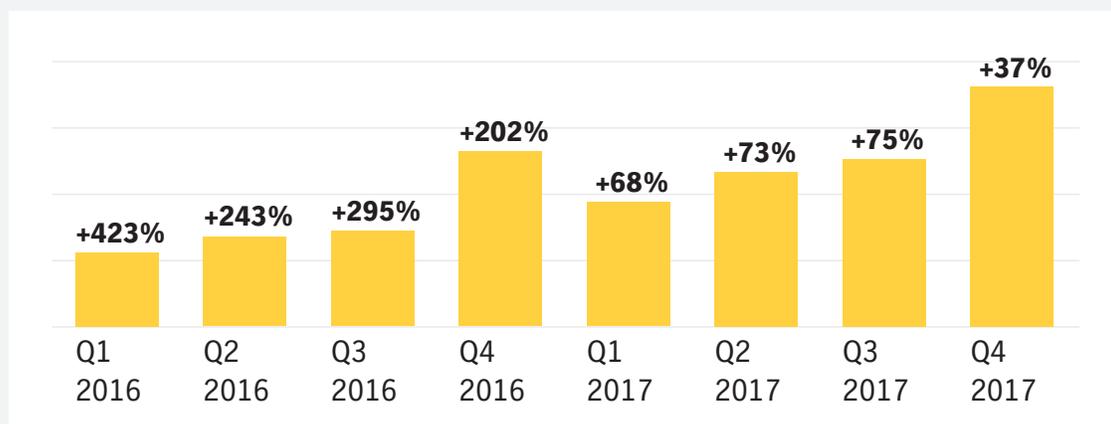
Growing brand safety, inventory quality, ad fraud and viewability concerns in 2017 fueled interest in PMP among advertisers seeking to gain access to safe and premium inventory. As digital media usage among consumers veered further into mobile—attracting brand advertising dollars along the way—mobile PMPs caught an upswing wave that lifted volume and earned significantly higher eCPMs than inventory sold via open exchanges in 2017.

Nearly three-quarters (72%) of CMOs polled worldwide said they were facing pressure from management to secure brand trust and gain tighter ad controls in 2017.⁵ Marketing executives have good reason to worry about brand safety⁶:

- 64% of consumers respond better to ads seen on trusted news channels
- 37% admit that ads on objectionable sites change their view of brands
- 66% of consumers will defect from a brand after a negative ad experience

Private marketplaces (PMP) offer one of the most robust options for advertisers to obtain early access to premium inventory as well as safeguards against ad fraud and brand risk. For publishers, PMP deals provide additional control over their inventory and partnership with advertisers. Combining these capabilities with the need to reach increasingly mobile-first

Monetized Mobile PMP Impression Volume & YOY Change



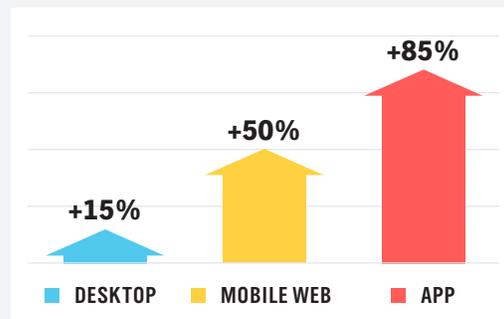
audiences, mobile PMP impression volume continued on its ascendance with a 37% YOY increase in Q4 2017, adding to a long growth streak now spanning eight consecutive quarters.

Full year mobile PMP impression growth surpassed 50% YOY in 2017, more than tripling the 15% YOY growth rate in desktop PMP impressions monetized through our platform. Within mobile, PMP volume experienced its greatest volume growth via apps, rising 85% YOY, while mobile web rose 50% YOY.

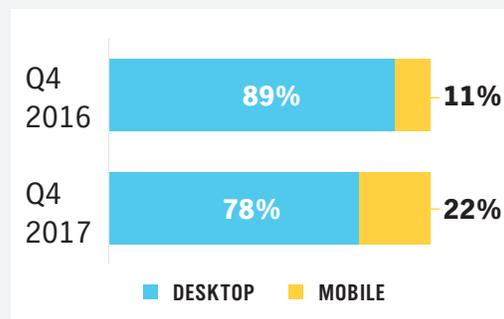
Mobile's faster growth rates brought its share of monetized PMP impressions up to 22% in Q4 2017, double its portion for the same period a year prior.

Publishers continued to bank on one of the most important benefits mobile PMPs have to offer: higher eCPMs. Mobile PMP eCPMs were priced at a 155% premium compared to those paid for the average mobile open exchange impression in 2017.

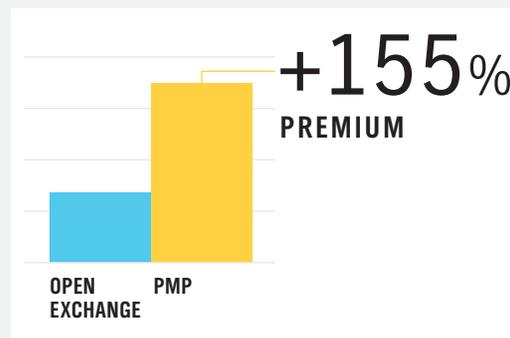
Mobile PMP Impression Volume YOY Growth Rate, by Platform, FY 2017



Share of Monetized PMP Impression Volume, by Platform



Average Mobile eCPMs, by Channel, FY 2017



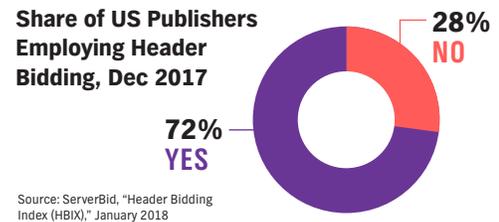
KEY TREND

02

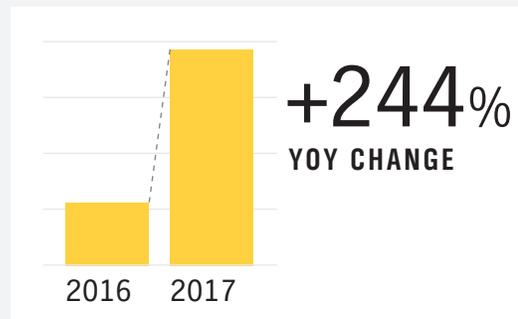
Mobile web header bidding approached maturity at the end of 2017 as monetized impression volume grew over 200% YOY, shifting focus toward the evolution and optimization of its capabilities.

Header bidding technology moved into the mainstream, reaching 72% penetration among the top 1000 US publishers that monetized inventory programmatically in December 2017. Client-side wrapper solutions remained the most common integration type with a 41.6% adoption rate the same month, trending lower towards the end of the year. As publishers deepened their header bidding expertise, hybrid solutions offering both client- and server-side integrations, such as PubMatic's OpenWrap, rose from 13.6% to 20.7% adoption rate between September and December 2017.⁷

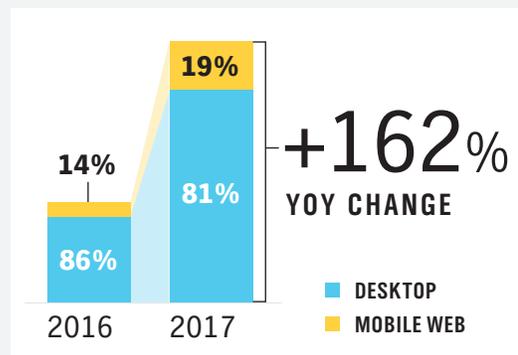
As publishers sought to regain control of ad decisioning with header bidding, the volume of impressions monetized by PubMatic through the technology rose 162% year-over-year worldwide in 2017, including annual volume expansions of 244% for mobile web and 148% for desktop. Header bidding maturity was evident as global volume growth rates slowed to 'merely' robust levels by Q4 2017.



Monetized Mobile Web Header Bidding Impression Volume



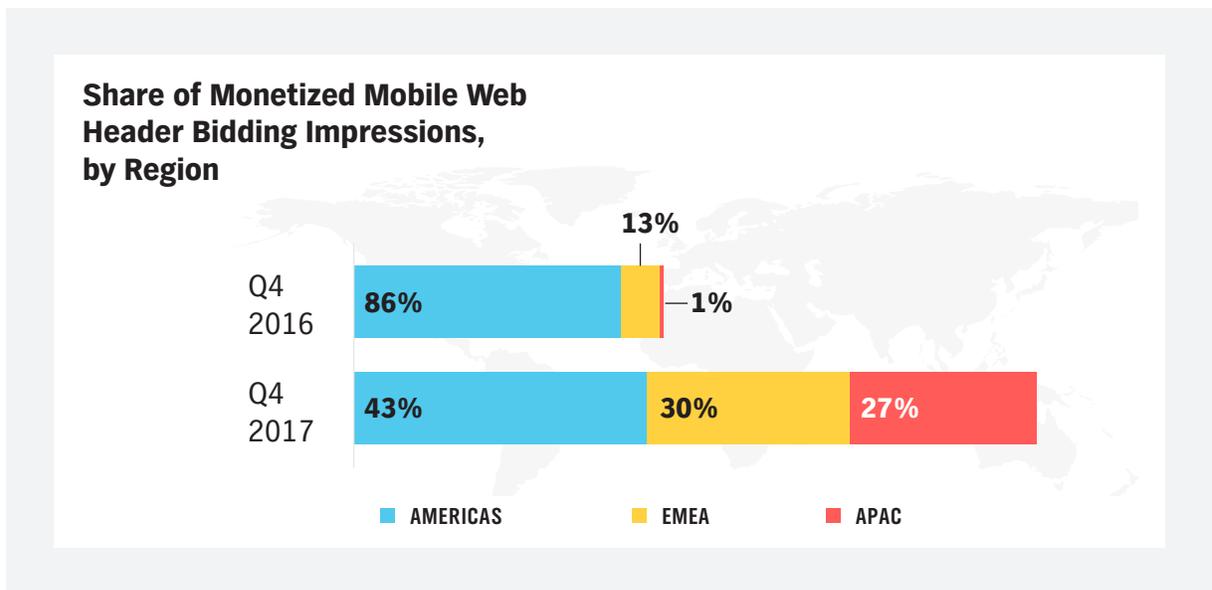
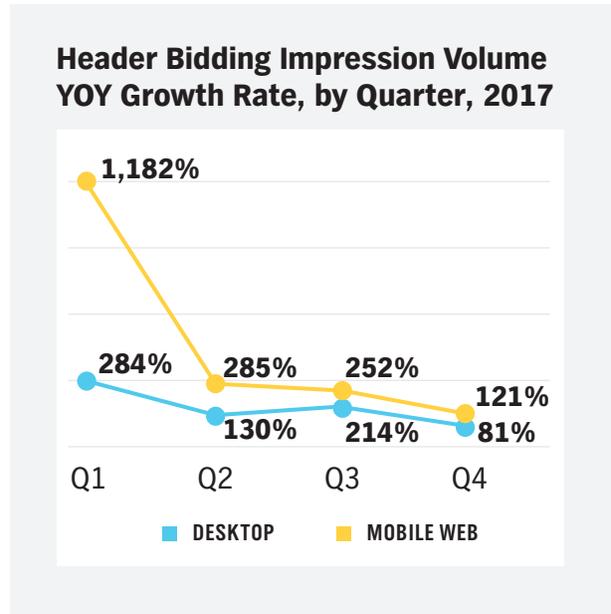
Monetized Header Bidding Impression Volume & Platform Share



This trend was even more apparent for mobile web, which saw header bidding impression volume growth drop from 1,182% in Q1 2017 to more stable levels of 121% YOY in Q4 2017, more closely aligning with desktop inventory, which experienced 81% growth in impression volume YOY over the same period.

Header bidding impression volumes monetized via mobile web expanded fastest in APAC where they rose 43X YOY, followed by 4X YOY expansion in EMEA in 2017. In the Americas, mobile web header bidding volumes rose 1.5X YOY.

Reflecting the faster growth rates outside the Americas, quarterly shares of monetized header bidding impressions turned increasingly global. APAC and EMEA increased their respective shares to represent a combined 57% of mobile web header bidding impressions by Q4 2017, up from 14% during the same quarter in 2016.



KEY TREND

03

Apps drove mobile volume growth in 2017, while mobile web eCPMs rose more than 50% YOY globally to earn a sizeable premium.

Mobile programmatic volume continued to climb in 2017 as brand advertisers increased automated ad buying investments in the channel most used by consumers to go online, while the app-to-mobile web impression split stabilized soon after apps took the lead in Q2 2017.

Total monetized mobile impressions—including app and mobile web—rose 26% YOY in 2017, driven primarily by a 121% YOY increase in mobile app impression volume. Mobile’s volume rise aligned with the near 30% YOY growth estimate for US mobile programmatic display ad spending in 2017.⁸

Consumer trends, particularly the amount of time devoted to different devices, are likely affecting the balance between in-app and

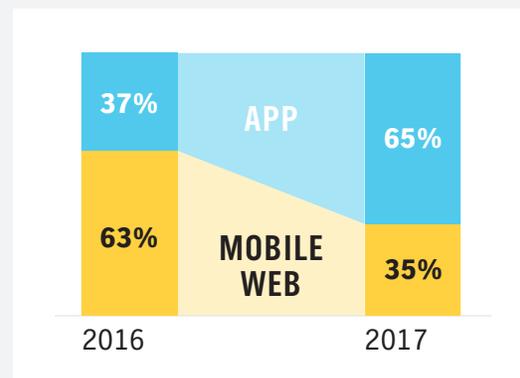
mobile web ad volume and spending. Globally, mobile users spent nearly 3 hours on average using apps each day in 2017. On average, US consumers spent nearly 150 minutes using apps each day, or about 88% of total time spent with mobile.⁹

Acknowledging the distinct strengths of each of the in-app and mobile web environments, mobile advertisers said in-app inventory outperforms the mobile web in providing lower bot fraud (45% vs 22% of respondents), greater user data accuracy (54% vs 30%) and better user experience for consumers (53% vs 34%). On the other hand, a majority of that group said the mobile web offers more compelling formats (47% vs 39%) and far greater reach (62% vs 23%) than apps.¹⁰

Monetized Mobile Impression Volume



Share of Monetized Mobile Impressions, by Platform



Greater focus on quality and fraud prevention drove advertisers to app environments, which represented nearly two-thirds (65%) of monetized mobile impressions across the PubMatic platform in 2017, up from 37% the previous year. Impression volume monetized via apps had been growing steadily since 2016 and gained momentum in Q2 2017 to flip the balance in their favor. Since then, the app-to-mobile web volume split stabilized around the annual average.

Although mobile web's share declined, going from 63% of monetized impressions in 2016 to 35% in 2017, the transition brought about an optimized offer focused on premium partnerships that elevated the quality of the inventory available through the PubMatic platform.

Combined, the focus on high quality publishers and a relative inventory scarcity propelled mobile web eCPMs up 54% YOY in 2017 to earn eCPMs 30% higher than those paid for app impressions.



KEY TREND

04

Android built a dominant OS lead to represent roughly eight-in-ten monetized mobile app impressions worldwide in 2017, while iOS delivered higher eCPMs.

Android and iOS remained the only viable mobile operating system contenders, powering 99.7% of smartphones sold worldwide in Q1 2017 (Windows Phone came in third with a 0.1% share).¹¹ Android held the undisputed market leader position with 85.0% of the global total, compared with a 14.7% slice for iOS. A later report showed Apple with a lower 12.5% portion of global smartphone sales in Q3 2017 but did not disclose an aggregated share for Android.¹²

Down to the country level, iOS clawed back some market share in late 2017 after its latest iPhone release to take a 55.2% share of smartphone sales in Japan—its most competitive market worldwide—and 46.0% in Australia in December 2017. Android led in France, Germany, Italy and Spain with 75%+ smartphone sales shares. The UK and the US were

more evenly matched, with Android taking a 55.3% share in the last month of 2017.¹³

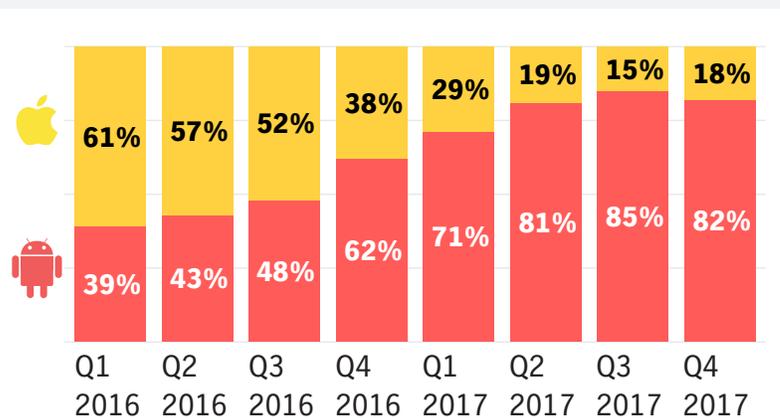
Consumer preference has inevitably skewed impression volume in the mobile advertising market in Android's favor, consolidating its position as the driver of mobile volume growth in 2017.

Having captured a majority share (62%) of monetized mobile app impressions transacted across the PubMatic platform for the first time in Q4 2016, Android volume continued to expand globally at a triple-digit rate in 2017 to build a dominant market share lead. Monetized Android impression volume expanded 266% YOY throughout 2017, reaching an 82% share of mobile app impressions in Q4 2017. In full year terms, Android took an 81% slice of the category in 2017.

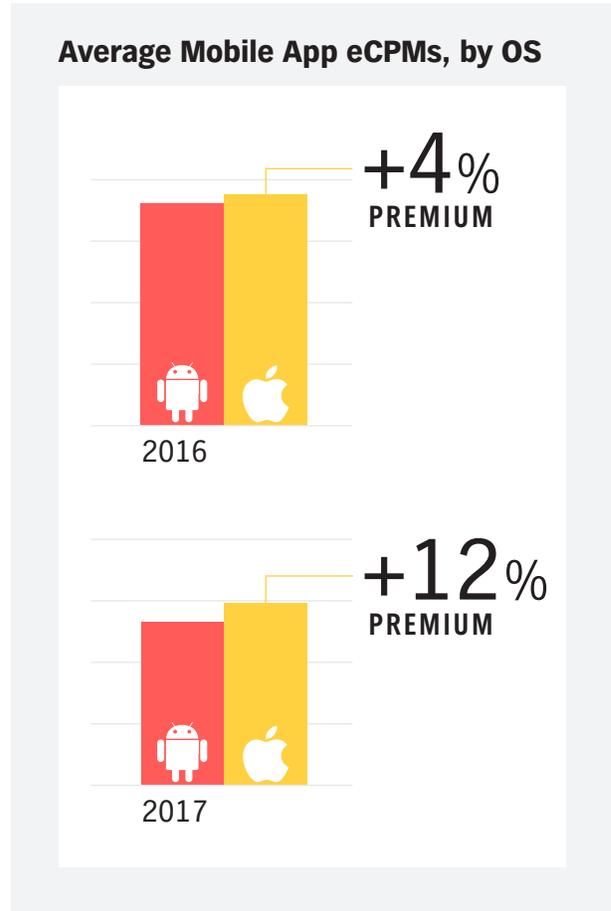
Monetized Android Impression Volume



Share of Monetized Mobile App Impressions, by OS



Android eCPMs also earned a 1% premium over iOS in Q4 2017—down from 17% the same quarter a year prior—likely fueled by advertisers seeking the greatest reach possible for mobile campaigns running during the holiday shopping season. But when the full year was accounted for, iOS had the edge with a 12% eCPM premium over Android in 2017, up from 4% the prior year.



KEY TREND

05

Mobile video remained a developing opportunity as its global footprint expanded with mobile video eCPMs catching up to desktop in 2017.

Mobile devices gained relevance among video producers as viewers flocked to handheld devices to consume video content. Nearly half of the average 77 minutes per day that US adults devoted to watch video content online was spent on mobile devices in 2017.¹⁴

Attempting to capitalize on the growing viewership levels, traditional publishers and branded content producers pivoted toward digital video with various levels of success in 2017.¹⁵ Complicating matters for video content producers, Digiday reported in November 2017 that some publishers have experienced up to 20 percent programmatic video impression waste, an issue partially driven by video ad networks winning auctions, failing to resell the ad space and ultimately abandoning the purchase.¹⁶

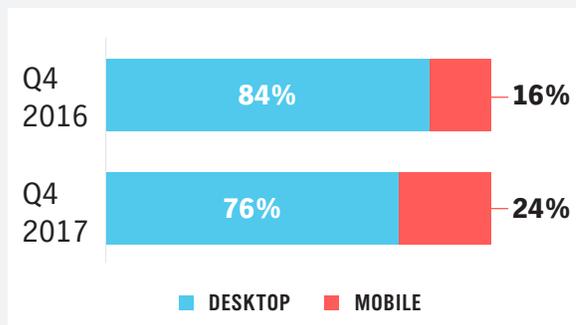
In this environment, we observed the programmatic video opportunity grow as publishers sought reliable monetization partners, particularly in

the mobile space. Mobile programmatic video impression volume trended upward to reach its highest point of the year during the holiday shopping season in Q4 2017, after taking a blow when the YouTube scandal broke out in March, eroding advertiser trust and resulting in significant pullback in Q2.

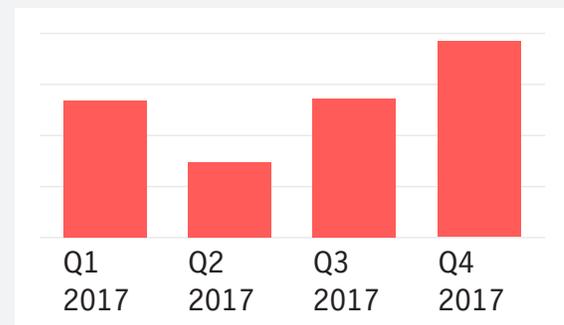
Increasing mobile video consumption pushed publishers into the channel and attracted advertisers. Research shows that 83% of advertisers planned to increase their video ad spend in 2017. Fully 72% of that group planned to shift spend away from broadcast/cable TV and into digital video with 71% shifting that budget to mobile video.¹⁷

Nearly a quarter (24%) of video ad impressions in the PubMatic platform were monetized through mobile devices in Q4 2017, up from 16% the same period a year prior. From a global standpoint,

Share of Monetized Video Ad Impressions, by Device



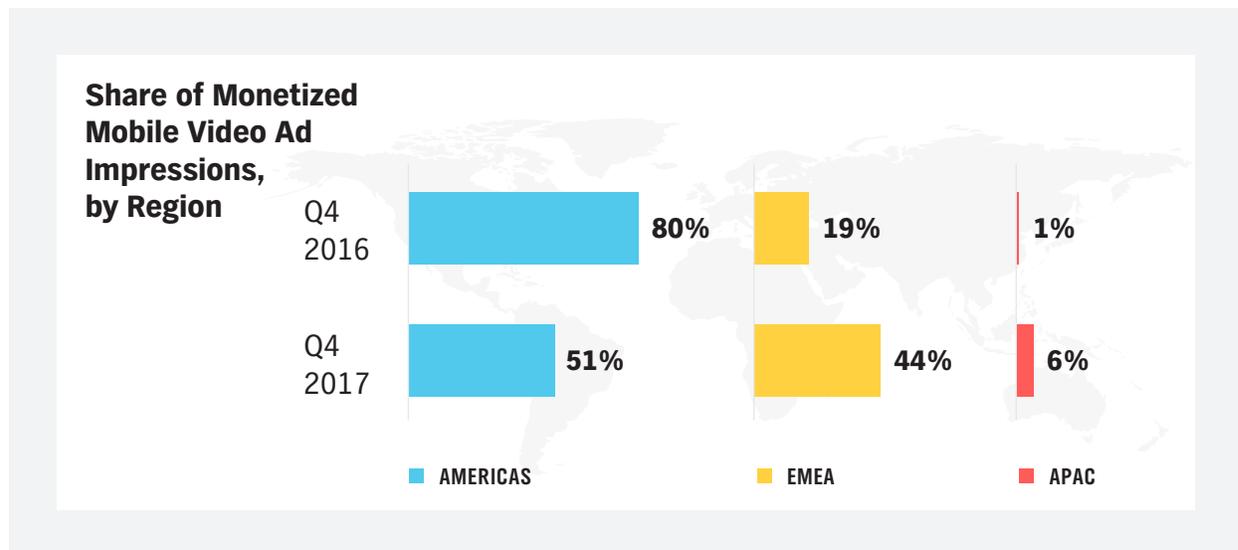
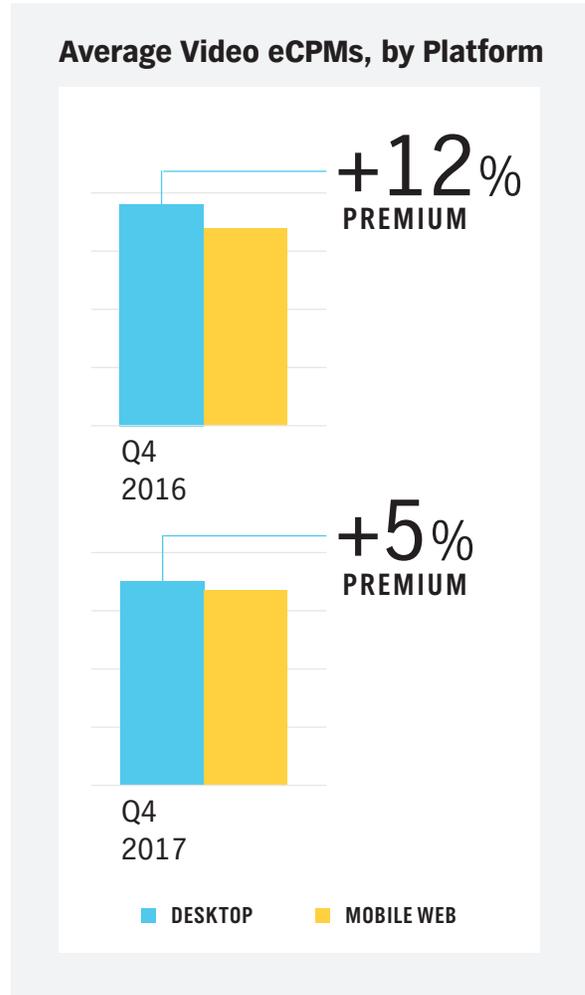
Monetized Video Ad Impression Volume



mobile video became most widely available beyond the Americas. While still taking the lion's share of video impressions, the Americas saw its worldwide share drop from 80% to 51% between Q4 2016 and Q4 2017. During the same period, EMEA experienced a 25 percentage-point improvement to reach 44% market share in Q4 2017, followed by a more subdued improvement from 1% to 6% for APAC during the same period.

Video eCPMs are still higher for desktop impressions, especially during the holiday shopping season when retailers invest heavily in the larger screen as the likelihood of ecommerce sales closing remains higher on computers than mobile phones. Still, the video eCPM gap between desktop and mobile impressions stood at 5% in Q4 2017, less than half the premium for desktop video a year earlier.

It is worth noting that PubMatic platform figures reflect premium publisher trends, among which demand for quality programmatic video is often met with limited availability as direct deals often sell out the still scarce video inventory. Broader video market trends may differ as they are likely dominated by the more widely available user generated content (UGC).



KEY TREND

06

Mobile monetization opportunities expanded globally in 2017, driven by strong volume rises in APAC and EMEA and eCPM growth in the Americas.

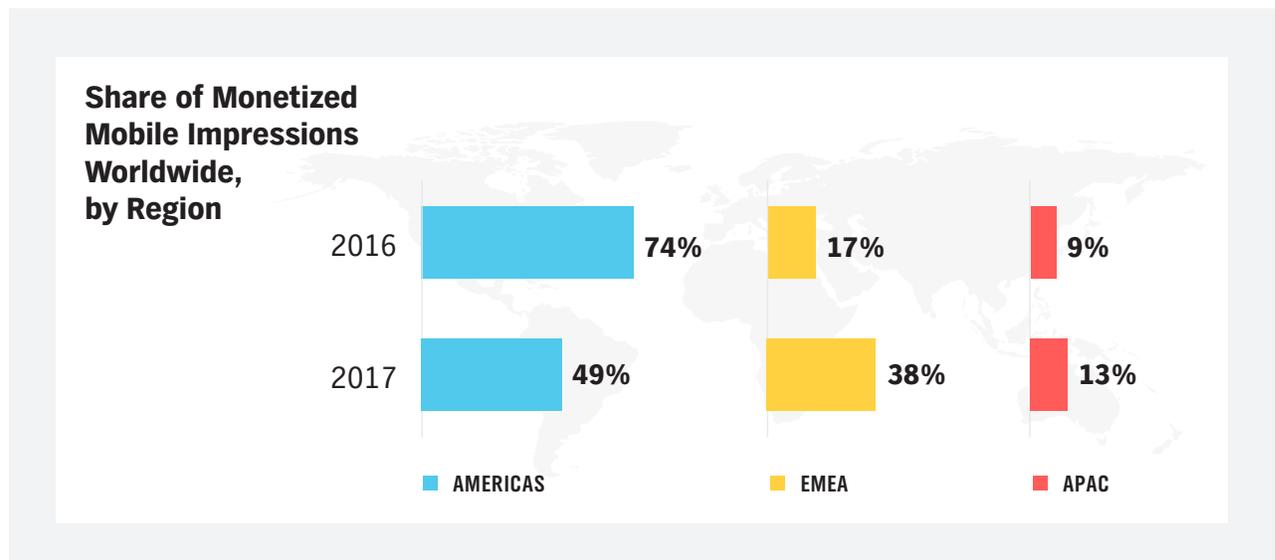
Mobile volume reached a significant milestone in 2017 as all regions represented minority portions of monetized mobile impressions worldwide for the first time. Put another way, the profile of programmatic mobile monetization was the most global yet.

Monetized mobile impression volume rose 26% YOY worldwide in 2017 (see Key Trend #3). Global expansion in the category was driven by EMEA and APAC with respective YOY growth rates of 191% and 95%, compensating for a 13% YOY reduction in the Americas, where increased focus on premium publisher partnerships has resulted in lower impression volume levels but higher eCPMs.

Greater volume growth rates increased the market shares from EMEA and APAC by 21 and

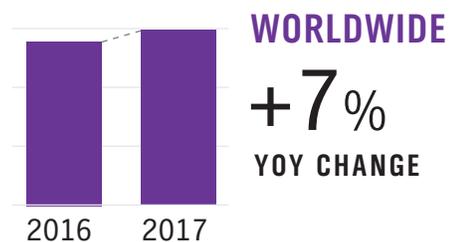
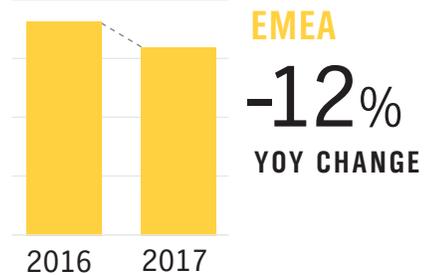
4 percentage points, respectively, to reach a combined 51% of monetized mobile ad impressions in 2017, up from 26% the year prior. Conversely, the portion corresponding to the Americas moved from 74% to 49% during the same period.

Average mobile eCPMs were more of a mixed bag. Globally, mobile eCPMs improved 7% YOY in 2017, driven by a 16% YOY increase in the Americas. APAC was essentially flat with a 1% YOY upward change in eCPMs. EMEA experienced a 12% YOY eCPM reduction largely due to downward pressure on app eCPMs as app impression volume increased by a factor of 4X YOY in 2017. Nonetheless, average mobile eCPMs remained highest in EMEA, followed closely by the Americas, both of which stood above the global average for the year.



Faster programmatic ad spending growth rates beyond North America were likely at play in the increasingly globalized mobile monetization opportunity within the PubMatic platform in 2017. Programmatic market growth rates in countries such as Germany (21% YOY), Italy (20% YOY), France (25% YOY) and Japan (27% YOY) surpassed the 19% YOY growth estimate for the US in 2017, according to MAGNA Global's forecasts including non-social banner display and video ad spend transacted through a technology platform rather than a traditional I/O process and excluding search and social media. Mobile represented an average 43% of programmatic ad spending worldwide in 2017, while the same metric stood at 53% in APAC, 29% in EMEA and 43% in North America.¹⁸

Average Mobile eCPMs Worldwide, by Region





QMI Methodology

PubMatic's yield and data analytics team analyzes over ten trillion advertiser bids on a monthly basis, utilizing the company's best-in-class analytics capabilities. The Q4 2017 QMI incorporates impressions, revenue and eCPM data from these reports to provide a high-level analysis of key trends within the mobile advertising industry. Data is from the fourth quarter of 2017 (i.e., October 1, 2017 to December 31, 2017) and calendar year 2017, as well as the corresponding prior year periods. "Monetized impressions" or "paid impressions" are defined as impressions that were sold through the PubMatic platform, and "eCPM" is defined as the effective cost per one thousand impressions.

Disclaimer: This QMI may include inaccuracies or typographical errors, and is based on operational data that has not been audited or reviewed by a third-party. It may contain forward-looking statements about future results and other events that have not yet occurred. Actual results may differ materially from PubMatic's expressed expectations due to future risks and uncertainties, and past performance or trends are no guarantee of future results. PubMatic does not intend to update the information contained in this QMI if any information or statement contained herein later turns out to be inaccurate.

¹ "Why Did Sales Not Decline After P&G's Digital Cuts?" Nigel Hollis, Kantar Millward Brown, July 2017

² "Advertisers Want Programmatic Tech Players to Fight Fake News," Maria Minsker, eMarketer, August 2017

^{3, 4, 7} "Header Bidding Industry Index," ServerBid, January 2018

^{5, 6} "Brand Protection From Digital Content Infection – Safeguarding Brand Reputation Through Diligent Ad Channel Selection," CMO Council and Dow Jones, September 2017

⁸ "US Programmatic Ad Spending Forecast – The Duopoly Drives Dollars Through 2019," Lauren Fisher, eMarketer, October 2017

⁹ "2017 Retrospective," Lexy Sydow and Sam Cheney, App Annie, January 2018

¹⁰ "The State of Mobile Advertising: Context and Measurement Wanted," Samantha Merlivat, Forrester, December 2017

¹¹ "Quarterly Mobile Phone Tracker – Smartphone OS Market Share, 2017 Q1," International Data Corporation (IDC), May 2017

¹² "Quarterly Mobile Phone Tracker," International Data Corporation (IDC) as cited by Venture Beat, November 2017

¹³ "iPhone X Boosts Apple OS Share in Key Markets," Kantar Worldpanel, December 2017

¹⁴ "US Time Spent With Media: eMarketer's Updated Estimates for 2017," Corey McNair, eMarketer, October 2017

¹⁵ "As Branded Content Pivots to Video, Publishers Face New Challenges," Lucia Moses, Digiday, November 2017

¹⁶ "Publishers Waste Video Ad Impressions Thanks to a Programmatic Flaw," Ross Benes, Digiday, November 2017

¹⁷ "Digital Video Insights," AOL Advertising now an Oath subsidiary, April 2017

¹⁸ "Programmatic 2017 – Programmatic Supremacy," Luke Stillman, MAGNA Global, October 2017



About PubMatic

PubMatic is a publisher-focused sell-side platform for an open digital media future. Featuring leading omni-channel revenue automation technology for publishers and enterprise-grade programmatic tools for media buyers, PubMatic's publisher-first approach enables advertisers to access premium inventory at scale. Processing over ten trillion advertiser bids per month, PubMatic has created a global infrastructure to drive publisher monetization and control over their ad inventory. Since 2006, PubMatic's focus on data and technology innovation has fueled the rise of the programmatic industry as a whole. Headquartered in Redwood City, California, PubMatic operates 13 offices and six data centers worldwide.

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