

# HOW TO JUMP START MIXED REALITY **AR**

Whitepaper

## 1.1 Introduction

In the context of this whitepaper, ‘mobile augmented reality’, or mobile AR, is information or digital goods, such as video and games, which are seen as an overlay to the view from the device’s camera. The download of this data to the device is triggered by real world data, such as physical location or a marketing poster, which is detected by the device.

Juniper Research defines augmented and mixed reality as:

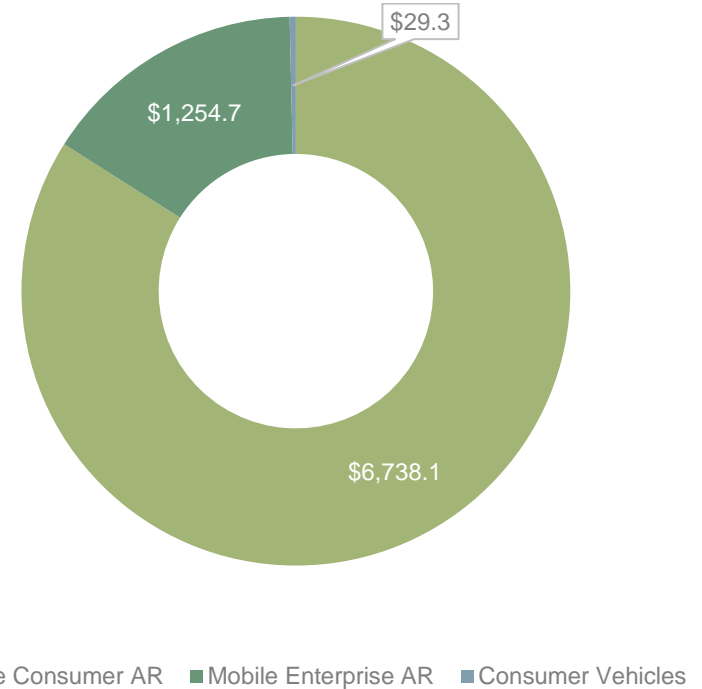
*‘A technology that overlays a computer-generated image on a user’s view of the real-world, through a mobile device such as smartphones, tablets and smart glasses, to provide a composite image of the real-world and overlapped digital images.’*

However, the market can be considered in two distinct areas; enterprise and consumer AR. These sectors have differing market drivers, constraints, and addressable user bases, and thus should be considered differing.

As shown in figure 1, Juniper Research believes that mobile consumer AR will account for 84.4% of all AR revenues this year. This is due to the large immediate addressable base of users in the form of smartphone and tablet users.

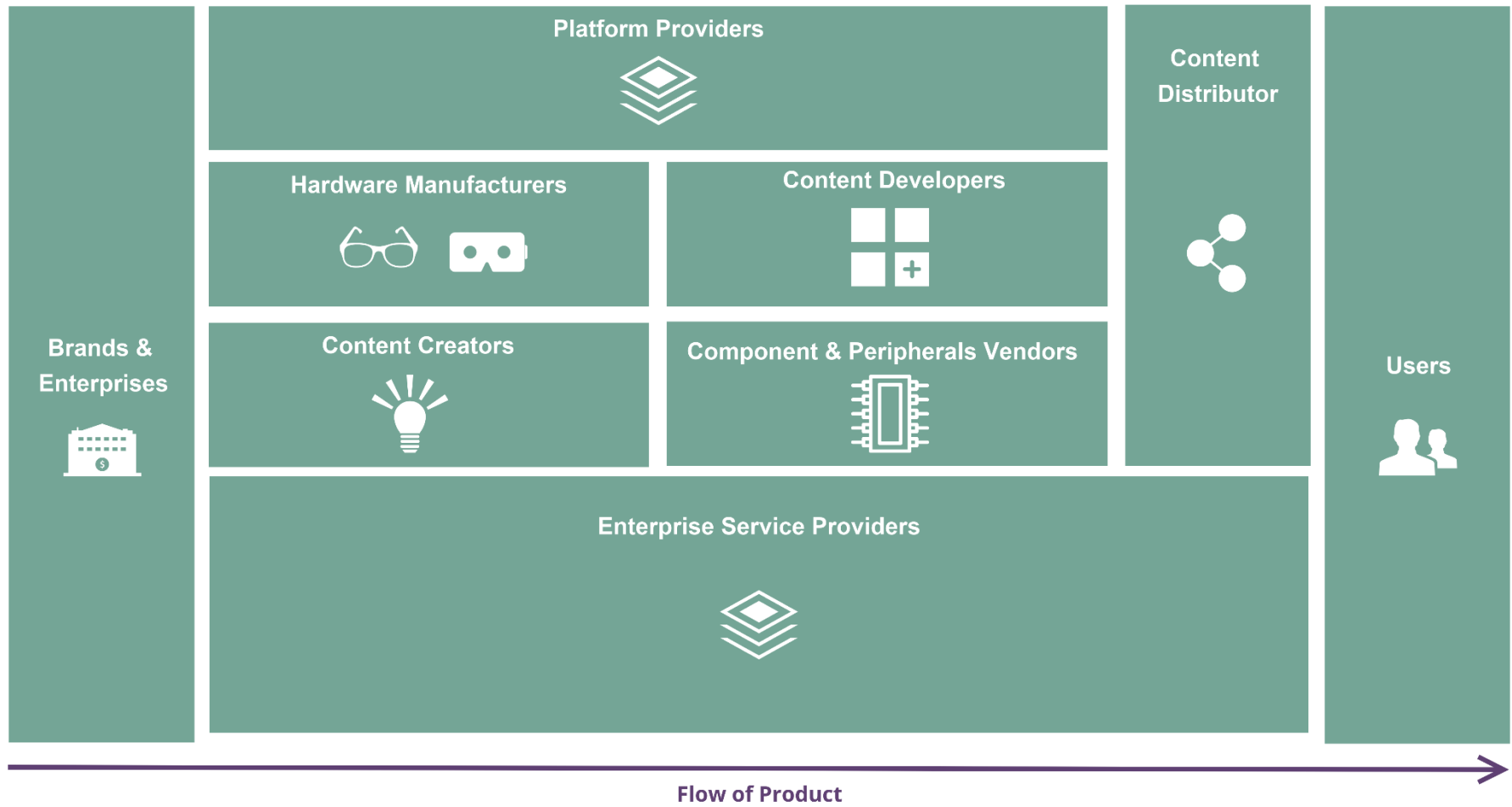
Conversely, Juniper Research anticipates that the enterprise market will only account for 15.3% of global AR revenue in 2019. This is due to the sector reliance on dedicated AR hardware, such as smart glasses.

**Figure 1: Total AR Market Value in 2019, (\$m) Split by Industry**



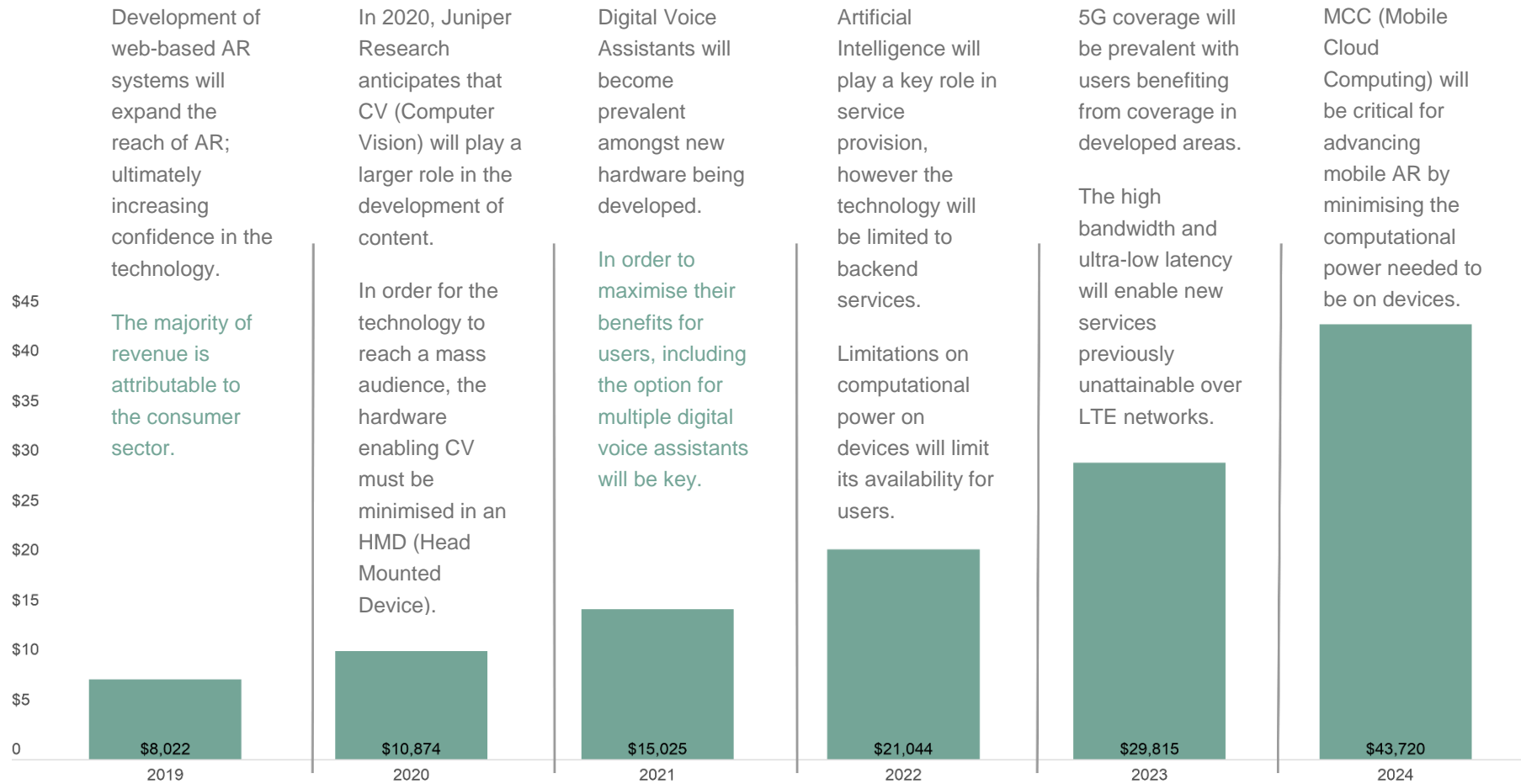
Source: Juniper Research

Figure 2: The Augmented & Mixed Reality Ecosystem



Source: Juniper Research

**Figure 3: The AR 5 Year Roadmap & Total AR Market Value (\$m) 2019-2024**



Source: Juniper Research

## 1.2 Emerging Technologies in Consumer AR

Juniper Research expects 5G networks to greatly accelerate both AR and VR technologies, principally in the mobile space. At present most HMDs need wired connections to process the information. Juniper Research anticipates, that for a fully immersive experience, AR will require speeds of 5.2Gbps and VR speeds of over 8Gbps.

### 1.2.1 5G Networks

With the low cost of mobile VR holder headsets, it costs relatively little for consumers with a sufficiently advanced smartphone to try out VR experiences. This enlarges the potential market for VR, increasing the chances that more consumers will begin to adopt the technology on a more serious basis.

This has, to date, been primarily achieved by Google Cardboard, with headsets at minimal prices and the possibility of self-assembly instructions as well. This has catapulted VR forward in a variety of markets, particularly those where smartphones are the primary form of computing.

### 1.2.2 Digital Voice Assistants

Juniper Research considers a digital voice assistant to be a software program designed to fill some or all of the role of a personal assistant, which is given its instructions by the user through the medium of voice interactions.

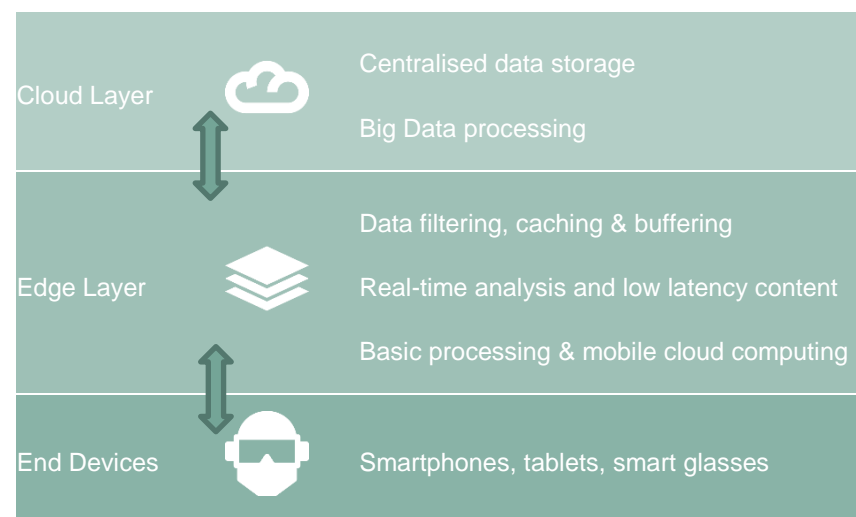
Note that voice is not the only method of interaction with the software, merely the primary or advised method. For example, Google’s Assistant,

which comes under this definition, also supports text-based interaction. However in the context of AR HMDs, digital voice assistants will act as the primary, if not the sole, means of user control.

### 1.2.3 MCC & Edge Processing for Mobile AR

Edge computing in IoT has the role of forming, collating and analysing data and information at the site/source where it is generated (eg an airplane turbine engine), and not necessarily in a centralised computing set up, such as a data centre.

Figure 4: Edge Computing Architecture in AR



Source: Juniper Research

### 1.3 Augmented & Mixed Reality: Movers & Shakers



David Xing  
LetsPlott  
Founder & CEO

David Xing is the cofounder and CEO of LetsPlott. As part of his duties, Xing is responsible for the overall direction of the company. He has had this position since September 2016.

Prior to founding LetsPlott, Xing was CEO of NWI from 2011 onwards.

Xing has a BSc/BA in Finance from the University of Pittsburgh and an MBA from the University of Cambridge.

Xing's novel approach to the AR market has led to LetsPlott winning multiple awards around innovation. Over the next five years, Juniper Research believes that Xing will be responsible for attracting investment to accelerate growth.



Alex Kipman  
Microsoft  
HoloLens creator and Technical Fellow of the OS Group

Alex Kipman graduated from Rochester Institute of Technology in 2001 and immediately joined Microsoft. In 2008, he created the Kinect motion camera that was compatible with Microsoft's Xbox gaming console. He also created the subsequent motion controller. Kipman is also the creator of Microsoft's AR HMD, HoloLens, having personally demonstrated the unit for the first time in 2015.

He is currently Technical Fellow at Microsoft.

Kipman was an early pioneer in AR technology. Juniper Research believes his efforts in developing HoloLens has been instrumental in giving Microsoft an early mover advantage in the AR space, as it was one of the first companies to develop AR content.



Michael Hoffman  
Object Theory  
Lead Architect and Technical Visioneer

Michael Hoffman leads technical strategy and engineering for Object Theory, and is its lead architect and technical visionary. Prior to Object Theory, Hoffman led the creation of content for Microsoft HoloLens as a Principal Engineering Lead. Hoffman's HoloLens work includes demos created for Autodesk Fusion 360, Trimble, the JPL/NASA Curiosity Mars Rover.

Hoffman also had positions at Google and Nike Digital Sport.

Hoffman's experience in working at multiple levels of the AR journey will prove crucial for Object Theory and its future in the AR market. His experience in the development of HoloLens will continue to position Object Theory well over the next five years.



Wolfgang Stelze  
Re'fлект  
CEO & Founder

Wolfgang Stelze is currently CEO of Re'fлект, and is responsible for the strategy and direction of the company. This includes the development of products and formation of industry partnerships. Re'fлект's current list of partnership signed include Bertelsmann, Bosch and BASF.

Stelze is also Chairman of a Federal Working group for start-ups.

With his responsibility being the direction of the company, Juniper Research believes that Stelze will become increasingly important to Re'fлект as AR moves to mass adoption.



Scott Montgomerie  
ScopeAR  
CEO & Co-Founder

Scott Montgomerie has over 15 years of consumer software and AR experience that he brings to his roles of co-founder, CEO and CTO at Scope AR. In addition to managing day-to-day company operations, Montgomerie is a full-stack developer, including consumer and enterprise content.

He graduated from the University of Alberta with a BSc degree in Computing Science and is a published researcher in the field of bioinformatics.

Montgomerie has gained experience in a wide variety of AR use cases, notably both consumer and enterprise. Juniper Research believes that this will become increasingly important to the company as it look to maximise its footprint in the AR market.



Martin Herdina  
Wikitude  
CEO & Founder

Martin Herdina is a successful Internet and telecom entrepreneur. Prior to joining Wikitude, Martin has successfully built-up and sold fatfoogoo, a leading provider of payment systems for online games, to Digital River.

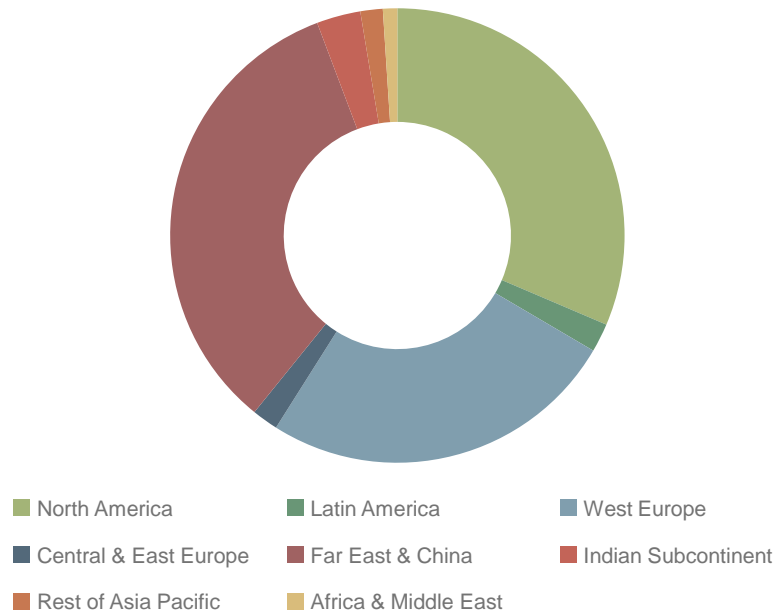
Previously, Herdina had strategic management positions in Europe and the US with Qpass, UCP and T-Mobile.

Herdina has been instrumental in Wikitude's previous success. As CEO, Juniper Research believes that its 'on-stop' solution for AR must continue to focus on providing AR for all sectors, rather than a specific sector.

### 1.4 Market Forecast Summary: Total Augmented & Mixed Reality Market Value

Juniper Research found that the global value of the mobile mixed reality market will exceed \$43 billion by 2024, rising from \$8 billion in 2019. Mixed reality overlays interactive digital images and videos onto the real world through a smartphone, tablet or smart glasses.

**Figure 5: Total AR Market Value in 2024: \$43.8 billion**



Source: Juniper Research

- Juniper Research has identified 5G networks and edge computing as two key emerging technologies that will accelerate the development of mixed reality services in 2020.
- Smart glasses vendors must incorporate hardware to enable 5G and edge computing capabilities. Enhanced content and services enabled by these technologies will usher in the second wave of smart glasses adoption by increasing the end users' capabilities.
- Leveraging cloud computing capabilities to deliver high-value mixed reality content is crucial to future success. Migrating processing power to the cloud would enable device vendors to reduce device sizes and minimise the social cost of public device use. Mobile games and multimedia apps categories will benefit most over the next 5 years, accounting for 67% of all smart glasses apps by 2024.
- 75% of consumer mixed reality will be attributable to smartphone apps by 2024. The immediate base of nearly 6 billion smartphone users combined with established content distribution, in the form of app stores, will drive content development towards smartphone devices.



## Order the Full Research

**Augmented & Mixed Reality** research provides an in-depth examination of the mobile augmented reality market, covering both the consumer and enterprise spaces. With a clear analysis of eight key vertical markets, this latest research provides an extensive forecast suite and comprehensive analysis of pivotal use cases and significant market players. Through extensive forecasts, the consumer and enterprise market analysis is presented for three key hardware platforms: Smartphones, Tablets and Smart Glasses.

### Key Features

- **Augmented & Mixed Reality Sector Analysis:** Analysis of future market prospects across eight key vertical markets including: Education, Healthcare, Multimedia and Social Media.
- **Technology Impact Assessment:** An evaluation of the development of enabling technologies and their impact on the future of the Augmented & Mixed Reality market, including: 5G Networks, Artificial Intelligence and Web-based Augmented Reality.
- **Consumer & Enterprise Market Analysis and Impact Assessment:** Separate analyses for the impact of Augmented & Mixed Reality technologies in the consumer and enterprise markets, aligned with insights and strategic recommendations for key stakeholders.
- **Juniper Research Leaderboard:** Offers a comparative assessment of the products and services from 16 leading Augmented & Mixed Reality platform and framework providers, categorised in terms of the depth of

<http://www.juniperresearch.com>

their solutions and software offerings. Vendors in the Leaderboard include Apple, Facebook, Microsoft and Wikitude.

### What's in this Research?

1. **Executive Summary & Core Findings** – Top-level report summarising key takeaways and market forecasts, allied to a series of strategic recommendations for players across the value chain (PDF).
2. **Deep Dive Strategy & Competition** – Strategic analysis of industry pain points, player market share, market trends and competitive analysis of Augmented & Mixed Reality solutions providers (PDF).
3. **Deep Dive Data & Forecasting:** Analysis by region and sector, together with 5 year forecasts for Augmented & Mixed Reality markets (PDF).
4. **Interactive Forecast Excel:** Highly granular dataset comprising more than 11,000 datapoints, allied to an Interactive Scenario tool giving users the ability to manipulate Juniper's data (Interactive XL).

### Publication Details

Publication date: October 2019

Author: Sam Barker

Contact: For more information contact [info@juniperresearch.com](mailto:info@juniperresearch.com)

Juniper Research Ltd, 9 Cedarwood, Chineham Business Park, Crockford Lane, Basingstoke, Hampshire, RG24 8WD UK

Tel: UK: +44 (0)1256 830002/475656 USA: +1 408 716 5483  
(International answering service)