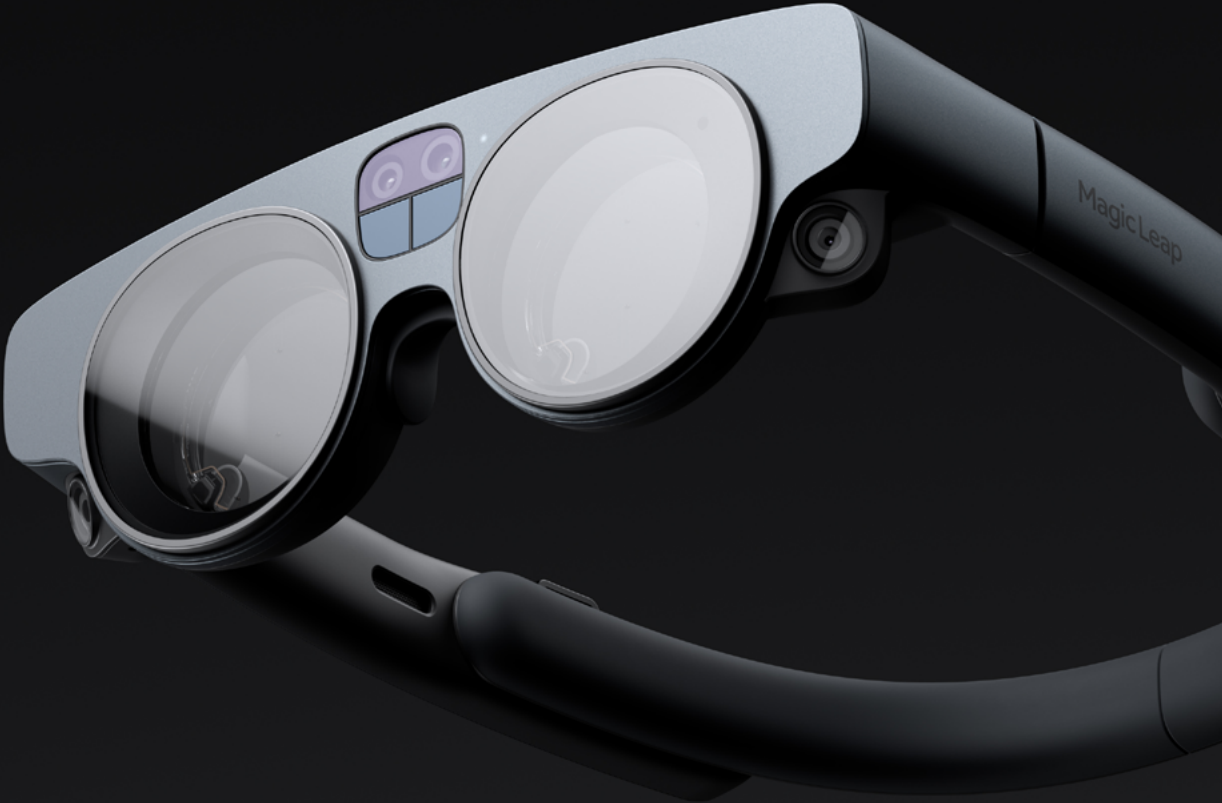# Magic Leap 2

Product Specification

v1.2

Product Highlights

Best-in-Class AR Device

- Proprietary optics breakthroughs double the Field of View, offer industry-leading image performance, and introduce dynamic dimming technology.

- The lightweight device enables extended, everyday use by all types of workers, with a 50% smaller, 20% lighter headset and a precise controller.

- 2-3x computing performance, leadership spatial audio, and advanced biometric capabilities power a visual workstation with environmental awareness.

Transforming the Enterprise

- Enterprises have privacy and control with support for private cloud, on-prem, or major cloud providers, and ownership of all data.

- Magic Leap 2 is easy to set up, scale, and manage with existing enterprise IT and device systems.

- Enterprises can tailor UX, apps, and options to their business and the needs of each worker.

Empowering the Developer Ecosystem

- Magic Leap 2's AOSP-based OS interface standard offers an open platform for developers and enterprises.

- A dynamic set of SDKs, APIs, and support tools empower developers to tap into Magic Leap 2's advanced capabilities and create leading-edge enterprise solutions.

- Magic Leap 2's flexibility makes it easy to develop and ship new solutions, faster, across multiple channels.

In the Box

- Headset, Compute Pack, Controller

- Enterprise Charger - 2 x 45W USB-C charger and cables for Compute Pack and Controller

- Fit Kit for Headset. A set of nose pads and forehead pads to customize the fit for your Magic Leap 2

- Optional Overhead Strap to support in-motion use and slippage

- Frame with eye cups to reduce rainbow effects if working under bright lights

- Shoulder strap for crossbody wearing

- Controller lanyard to attach to users wrist

- Carry Case and Cleaning Cloth, robust case to carry Headset, Compute Pack and Controller

- Quick Start and Safety Guide are accessed via QR code

Accessories

- Prescription insert that can be magnetically attached to your Magic Leap device for optimized visual experience

  - Custom prescription inserts;

  - Support for +3 to -9.5 D prescription (ML1 covers +2 to -7.5)

  - Full virtual and real world FOV available, with surface reflection management

  - Orders are managed and fulfilled by a third party vendor

- Rx Insert lens kits available to purchase on-line for short term use, supports 8 prescriptions

- Additional Enterprise charger available to purchase on-line

- External Battery, plugs into USB-C charging port to extend device hours of use (available 3Q 2022)

- Enterprise Carry Solution - Belt that can be cleaned and carries Compute Pack, Controller and Extended Battery (available 3Q 2022)

- Overhead strap to support in-motion use and slippage

Regulatory/Operating Environments

Regulatory Standard	Description
Regional Regulatory Compliance	Including the United States, Canada, United Kingdom, Germany, Italy, Spain, France, Japan, Saudi Arabia and Singapore. Contact Magic Leap for updates on additional countries.
FCC (US), ISED (Canada), CE (EU), JTBL.JRL (Japan) certification	Federal Communications Commision (FCC-US), Innovation, Science and Economic Development (ISED-Canada), Standards for health, safety, and environmental protection (CE-EU) Japan Telecommunications Business Law (JTBL), Japan Radio Law (JRL)
ISO 12312-1	Eye and face protection — Sunglasses and related eyewear
ANSI Z87.1	American standard for eye safety glasses
EN 62368	Safety standard for Audio/video, information and communication technology equipment
IEC 62471	Addresses potential photobiological safety concerns from LEDs by categorizing the potential risk to the eyes and skin
IEC 60825	Safety of laser products
RoHS/REACH	Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH-EU) assess the hazards of new and existing chemicals. Restriction of Hazardous Substances (RoHS-EU) applies to Electronics and Electrical Equipment (EEE).
Bluetooth® Sig Certification	Bluetooth® SIG Qualification Program
ISO 10993	Standards for evaluating the biocompatibility of medical devices to manage biological risk.

Environment	Specification
Operating environment	10 to 30 C / 5 to 95% RH / 2000m equivalent
Non-operating storage	-20 C to 45 C, 5 - 95% RH

Headset

- Includes optical and display components for generating lightfield, soundfield capability and a suite of computer vision sensors.

- Split architecture enables the lightest Headset for this class of Augmented Reality product

- Stable on-head wearable as light as a pair of headphones

- Weight - 260g

- ISO 12312-1 / 21 CFR 801.4 - impact testing of lens

- ANSI Z87.1 eye safety testing ongoing

Fit and Comfort

- Designed to be physiologically correct, significantly reducing the risk of dizziness or nausea

- Optimized for multi-hour comfort through thermal and weight distribution

- Best-in-class visual comfort due to eyeball center tracking and operating range for virtual content

- Single size fits all with flexible torsion band system

- 4mm diameter cable with high flexibility and durability

Lightfield/Display

- Largest digital content overlay in the market with a 66° diagonal field of view (44.6° W x 53.6° H), enables visualization of: a full person, CAD models at full scale, room scale data visualization for command and control.

- 1440 x 1760 @ 24 bits per pixel per eye, angular resolution = 1.875 arcmin/pixel

- 120 Hz refresh rate, sRGB Color

- Content range - 0.37m to infinity enables greater depth and placement of digital content

- Opacity control - global dimming from 5% to 20% transmission to enable brighter digital content in a broad range of ambient light conditions. Localized dimming of <5% available for specific use cases

- Online, real-time display calibration

Spatial Audio

- Dedicated HiFi3z 1GHz DSP core with VFPU, 128kB SRAM I-Cache, 128kB SRAM D-Cache, 1152kB of local SRAM

- 2 on-device speakers

- 4 on-device microphones

World/Environment Sensing

- ToF depth sensor

  - FOV: 75°H x 70°V

  - Resolution: 544 x 480 (px)

- 3x 1MP world sensing cameras

  - Resolution: 1016 x 1016

  - FOV [deg : res arcmin/px]: 100°H x 100°V : 5.9 x 5.9

  - Nominal Framerate: 30 FPS, 60 FPS for dual exposure mode to improve fiducial tracking performance

  - Shutter: Global

  - Focus: Fixed, Hyperfocal @ ~0.3m

  - Lens Type: Equidistant

  - Exposure Control: Min = 7µs; Step size = 7µs

- 1x 12.6 MP auto-focus near and far mode RGB camera for see-what-I see and bar code scanning

  - Resolution: 4206 x 3120

  - FOV: 65°H x 51°V

  - Nominal Framerate: 30 FPS

  - Max Framerate: 60 FPS (2x2bin, 3.3MP)

  - Shutter: Rolling

  - Focus: Variable, Near/Far

  - Focus Distance: 2m & infinity

  - Lens Type: Rectilinear

- Ambient light sensor

- 3 Inertial Measurement Units, two in Headset and one in Compute Pack

- Enterprise-quality tracking performance

- Supports broad range of ambient lighting, 5 lux (low) to 1,000 lux

- Supports object recognition and tracking, including barcodes and QR codes

- Supports multi-user and multi-session sharing with high accuracy over large areas

Human Sensing/Input Modalities

- Headpose

- Hand tracking (capable of 60 Hz) - skeleton with 25 key points, hand mesh, plus managed poses

- Eye tracking (capable of 90 Hz) - 4 eye cameras

- Iris authentication

- Voice and speech control

- Dictation, speech to text and text to speech (roadmap item)

- 6 DoF computer vision-based controller (delivered in the box)

- Bluetooth keyboard and virtual keyboard support for rapid text entry

Research Mode (planned '23)

- Additional access to sensors and camera images for approved research partners

Compute Pack

- Permanently attached to the back of the Headset via the cable to transfer data and supply electrical power

- Easily clips onto pockets or the accessory straps

- 106 mm diameter

- Active cooling solution for peak SoC usage, enables CPU/GPU boost for extreme apps

- Battery Life

    - 3.5 hours (2 hours in heaviest-compute scenarios) with onboard battery

    - 110 minute charge time to 90%, 180 minute to 100%

    - HW capable of supporting IEC 60601-1 compliant external battery via USB-C

Compute/Processors

- Distributed compute architecture with custom, low power silicon to provide class leading compute with best battery life

- AMD 7nm, quad-core Zen2 custom SoC

    - (8 Threads) 512 kB L2 per core & 4MB L3

- Custom computer vision (CVIP) block

    - Dedicated 1700 GOP/s Fixed Point HW

    - 6 Vector Computer Vision / Machine Learning Cores with 4MB SRAM

    - 2 Dedicated Machine Learning Cores

    - 6 ARM A55 Cores 1.28MB SRAM

    - HW Decompression and Corner detection blocks

    - Global 2MB cache and LP5 DRAM access

- Custom display driver

    - Improved and class leading GPU performance and low motion to photon latency

    - Localized dimmer support

Memory/Storage

- 128-bit 16GB LPDDR5 5500 (88GBps peak, 1.7x bandwidth of competitive systems)

- 256GB 2-lane NVMe

Graphics

- GFX10.2 1SE, 1SA, 4WGP (8 CU), 2RB+, 1MB L2 Cache

  - >2x performance per watt vs ML1

  - View Instancing, Flexible Screen Rasterization, ray tracing, ultra-sharp upscaling

OS Features

- Multiple user accounts per device

- Web Browser

- Photo and video capture, including "see-what-I-see" streaming of composite digital and physical content

- Android "locked task mode" support allows for Kiosk style operation restricting access to private applications and device settings

- File Management via Android Media Transfer Protocol (supported on Windows, macOS, and Linux)

- Easily sync user settings between devices (planned 2H '22)

- Languages supported: U.S. English, U.K. English, French, German, Italian, Japanese, Spanish

Connectivity

- WiFi 802.11 a/b/g/n/ac/ax + 6e (6e SW support planned 1H '23)

- Latest WiFi standard with 2.4GHz, 5GHz and 6GHz support

- Up to 2.4Gbps PHY Bandwidth at short range

- Latency <10ms capable on 6e in lightly loaded systems

- Dense user scenarios

- Range and capacity extensions

- Enhanced Open, WPA/WPA2/WPA3 Personal & Enterprise, WPA3-Enterprise 192bit, EAP-TLS, EAP-TTLS WiFi security

- Compatible with 5G mobile hotspot

- Bluetooth 5.0, multipoint-to-multipoint Bluetooth such as sharing and broadcast

- USB-C for charging and loading data and applications via USB-C

Controller

- Optical hand-held controller that is wirelessly connected to the Headset and Compute Pack enabling the user to navigate, maneuver, and interact with content

- 127x62x61 mm, 140g, 157 cc

- Proprietary computer vision based 6-DoF Controller tracking

- Tracks outside the FOV of the display, even behind the user

- Optical to improve performance in magnetic environments

- Paired with Compute Pack and ready for use out of the box

- Touch, Trigger, Bumper, Back and Home button inputs

- 2X World Cameras, 1X IMU

- 6 hour battery life

Enterprise Platform

Manageability & Enterprise Readiness

- Supports 3rd party MDM/UEM agents (Workspace ONE and others)

- Zero-touch enrollment and provisioning (planned 2H '22)

- Supports application & system-wide VPN (planned 1H '22)

- Supports select 3rd party Zero Trust network configurations (planned 2H '22)

- Application management via MDM, or direct install via The Lab

- Manage or disable device settings:

  - WiFi (WPA2, WPA3, WPA Enterprise, EAP-TLS, EAP-TTLS)

  - Bluetooth

  - Microphone

  - Iris / PIN

- Remote lock / remote wipe

- Integrate with customer-managed observability / monitoring tools via OpenTelemetry

- Device gateway can be deployed inside corporate perimeter / firewall

Deployments (Customer Managed)

- Self-contained customer deployments for all customer data (maps, anchors, user info)

- Elastic compute/network for maximum scalability and cost containment

- Private deployments via Google Cloud or AWS

- Private deployments via Azure or other regional hyperscalers (planned 2H '22)

- On-premise deployments via Google Anthos or AWS Outputs (planned 2H '22)

- On-premise deployments via OpenShift, OpenStack, or vSphere (planned 2H '22)

- Supports Zero Trust network configurations (zScaler, Cloudflare) (planned 2H '22)

Stand Alone / Offline / Secure Environment Capabilities

- Device can be provisioned as an Offline / Secure device

  - Disable WiFi

  - Disable Bluetooth

  - Disable Microphones

  - Disable access to device gateway and shared maps

- Scan and map spaces up to 100 m2 each

- Fast localization without GPS via localization hinting (QR Code, ArUco)

- Load data and applications via USB-C mass storage or device bridge (The Lab)

- Local user accounts (no network directory or cloud connection required)

- Lock via Administrator PIN

AR Cloud (planned 1H'22)

- Scan and map locations up to 10,000 m2 using ML2 devices

- Securely store and manage mapped spaces in a self-contained deployment

- Fast localization via localization hinting (QR Code, ArUco, Assisted GPS)

- Scan locations up to 100,000 m2 with other 3D mapping systems (planned 2H'22)

- Persistent content placement using Spatial Anchors

- XR cross-platform support [iOS, Android, Web] (planned 2H'22)

Object Tracking & Recognition (planned 2H'22)

- Compatible with 3rd party object recognition solutions

Remote Rendering (planned 2H'22)

- Compatible with 3rd party application streaming and remote rendering solutions

SDK/Developer Tools

- Multi-engine support, including C API, Unity and web - support for third-party engines

- Robust tools, including enhancements to Zero Iteration, device bridge, device stream, debugging tools and system icons

- The Magic Leap Lab is a tool to accelerate workflows by consolidating several tools and utilities in one place. Magic Leap Lab tools and resources include: Quick SDK access, Software package management, Access to external tools, manage apps and files, and view information about your Magic Leap devices

- MRTK Supported - Easily develop Unity AR interactions

- Access to select device capabilities APIs (head tracking, eye tracking, meshing, gestures, object recognition, dynamic dimming, battery level, voice) or use via MRTK

- Developer portal, including learning resources, forums, snippets and samples

- Cross-platform AR Cloud SDK (planned 2H'22)

- WebRTC support for data and content transfer, voice and RGB video streaming

- Sample code to support building applications that takes advantage of Magic Leap 2's ability to deliver true business augmented reality solutions for physical places, communication and collaboration scenarios