AI Smartphone White Paper
01 Drivers of the AI smartphone era

- Opportunities to the mobile device industry
- Device users expect more
- Technology will bring new features and form factors
- What makes AI smartphone?

02 Characteristics of AI smartphones

- Open ecosystem of user-generated service
- Context-aware, personalized AI OS
- Device hardware supporting generative AI

03 AI smartphone industry outlook

- IDC forecast of next-gen AI smartphone shipments
- Changes brought by next-gen AI smartphone to the global phone industry
- AI smartphone ecosystem
AI has empowered many industries, but the user experience on mobile devices remains complicated.

**AI has empowered many industries:**

<table>
<thead>
<tr>
<th>Industry</th>
<th>Use Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>Smart production management, automated defect detection</td>
</tr>
<tr>
<td></td>
<td>Internet</td>
</tr>
<tr>
<td></td>
<td>Intelligent coding assistance, data analysis, root cause analysis, IT operations</td>
</tr>
<tr>
<td>Finance</td>
<td>Financial market forecasting, smart customer service, risk control</td>
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<tr>
<td></td>
<td>Transport/Healthcare</td>
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<tr>
<td></td>
<td>Intelligent vehicle and crew scheduling, AI-assisted imaging &amp; diagnosis</td>
</tr>
<tr>
<td>Marketing</td>
<td>Image generation, web design, copy creation, user growth strategies, etc. for growth engineering</td>
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</tbody>
</table>

**The mobile device industry:**

- **Large user base**: 54% of the global population (roughly 4.3bn people) owns a smartphone.
- **Close interaction**: The phone has evolved from making calls to a wallet, music player, computer, key, and more, integrated into every aspect of lives.
- **Long screen time**: OPPO phone users spend 6 hours per day on average; phones are our constant companions.

*Source: GSMA report 2023*  
*Source: OPPO statistics on phone users*

**How can AI empower users to focus on more meaningful tasks and live a more interesting life?**
Fast-paced lives, fragmented time... Users want technology that frees up their energy and creativity

Phone use needs to be more efficient

Taking a photo should be completed in one click
- rather than switching between photo editing apps

Online media should be inclusive
- rather than streamed with time-wasting ads and scams that discriminate less internet-savvy users

Language & culture should not be barriers
- rather than sap our time and energy on translation and understanding culture differences

Time should not be wasted on admin
- We still waste time and energy such as noting information and juggling schedules

Mission of AI smartphones: Solve the problems of fragmentation and admin tasks, so that users can focus on themselves and their value
Technology drives the evolution of mobile phones, enabling more productivity and creativity.

Feature phones

2008
OPPO A103
First mobile phone: Smiley Face

Music phone
Defines a new industry form

Smartphones

2013
ColorOS
Integrates hardware, software, and services

2013
OPPO N1
Camera phone

Capacitive touchscreens revolutionized the form factor and the user interface

Next-gen AI smartphones

2023
OPPO Find X6
First phone with main cameras

2024
OPPO Find X7
Leading the industry toward next-gen AI smartphones

Large models are transforming the way we use devices again

AI opens up endless possibilities in the user experience; OPPO and our industry peers have the opportunity to define what the AI phone will be.
What makes AI smartphone?

- Efficient computing
- Perception of the real world
- Ability of self-learning
- Content generation
Full-stack transformation and ecosystem restructuring of AI smartphones

Next-gen AI smartphone

- **AI OS**
  - Multimodal UIs
    - Natural semantics | Intuitive
  - OS AI agents
    - Native capability to learn and evolve

- **Ecosystems**
  - Native services ecosystem
  - AI agents ecosystem
  - Large models ecosystem
  - Computing power supply ecosystem

- **Large models**
  - LLMs and MLLMs that simulate the real world

- **Hardware**
  - High bandwidth memory, near-memory, and in-memory computing

- **Content generation**

- **Ability of self-learning**

- **Perception of the real world**

- **Efficient computing**
Characteristics of AI smartphones

- Open ecosystem of user-generate service

- Context-aware, personalized AI OS
  - All-new multimodal UIs
  - Native AI agents

- Device hardware supporting generative AI
The open ecosystem of services built on LLMs for AI smartphones will include native service components provided by vendors and AI agents customized by users. For example, AndesGPT as a large model and Breeno as a customized agent.

Smart device manufacturers should build platforms for maximum openness in the AI services ecosystem.

- Open computing platforms and technology
- Collaborative business models
- Ecosystem governance systems & industry alliances

The industry should set standards and ensure zero barriers to entry for developers, so that users can shape the ecosystem they want.
Zero-code development | Everyone can define their own agents

Streamlined app development process with easy prompt definition, data import, and selection of plug-ins

Quick connection with data lakehouses, databases, and local files to enlarge the knowledge base for models

A wide range of plug-ins such as Q&A, online search, lakehouse query, database query, document analysis

Supports JavaScript embedding and API calls to models
The AI OS breaks out of the rigid vertical silo for everyone to have their own customized AI assistant, delivering the benefits of AI to all.
The new user interface on an AI smartphone makes it a personal assistant at hand, more than just a consumer electronic device.
Embedded personalized agents

- Proactive
- Efficient

- Creative
- Revolutionary

- Adaptive
- Personalized

Efficient
Automating complex and repetitive tasks

Creative
Inspiring creativity

Personalized
Learning through use to become a personal assistant

Native AI agents learn and adapt to user preferences to deliver an intuitive user experience

Components (image analysis, image generation, text analysis, information analysis and structuring...)

Cloud-device fusion

Memory enhancement

Task planning

Use of other tools

User profiles
Example | Personal assistant: From standardized to personalized, from single-modal to multi-modal

An AI-powered personal assistant can understand complex needs and provide smarter, better, personalized services

Example: OPPO Find X7

Content generation
Speeches | Social media texts | Resumes | Slides outlining

Call with Breeno
Identify calls | Answer calls | Generate records

Chat with Breeno
Chat-chat | Open up | Brainstorm

Education
Role play | Tutoring | History Q&A

Multimodal conversation
Natural conversation | Multimodality integrated to OS | Understanding voice, text, imagery, files, and video | Control with voice and gestures

Trustworthy, useful, personalized
Guardrails for content | Hallucination eliminated | Complex reasoning | Task scheduling | Services ecosystem | Customization | Personalized answers & recommendations | User-specific memory

Content generation
AI text | AI voice | AI images | AI video | Creativity tools | Productivity tools | Fun personalized skills

The era of AI smartphones has arrived, and will transform the speed and ease of content creation
Multimodal AI built into the OS simplifies the process of using the phone

Example: OPPO Find X7

Step 1: Add-on AI features (single-mode, single data source)
AI given discretion over interfaces and controls: power button, voice, Aqua Dynamics, ubiquitous service cards, image settings, text, video, and audio can be accessed by single-modal AI.

Step 2: AI embedded into OS (multimodal, single data owner/multiple data sources)
Images, text, video, and audio are combined to generate something new. For example, text and audio can be used to generate call summaries. The AI assistant understands and generates data and invokes personal services.

Step 3: Cross-device AI (multi-dimensional data, multiple data owners/multiple data sources)
Accurately identifies user’s intentions using data from multiple sensors on multiple devices; makes intelligent decisions on service orchestration using data provided by different suppliers.

Cross-device AI experience enables seamless transitions between the digital and real worlds
Device hardware supporting generative AI

Accurate understanding of user intentions

Efficient computing for low power consumption, long battery life

Context-aware understanding of the user

<table>
<thead>
<tr>
<th>OS capabilities + AI</th>
<th>Adaptive to environment</th>
<th>Adaptive to context</th>
<th>Adaptive to user</th>
<th>Virtualized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart components</td>
<td>Storage</td>
<td>Visual</td>
<td>Audio</td>
<td>Haptics</td>
</tr>
<tr>
<td>On-device heterogeneous computing resources</td>
<td>On-device personalized training</td>
<td>On-device &amp; in-cloud inference</td>
<td></td>
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</tbody>
</table>

Current hardware does not yet support the new model; new SoCs and in-memory computing architectures will emerge.
Benefits of AI smartphones: A personal assistant that provides intuitive interaction, context-aware intelligence, personal companionship, and reliable security

Intuitive interaction: Multi-modal capabilities and cross-domain knowledge

- Smartphone: Supplies information
- AI smartphone: Supplies knowledge and skills
- User value: Access to the latest and most correct answers in a more natural and direct way

Reliable security: Guardrails on content, privacy protection

- Smartphone: Privacy focused
- AI smartphone: Privacy focused, also ethical and free of hallucinations
- User value: Protection for personal data and reliable answers

Intuitive interaction

- Smartphone: Able to chat
- AI smartphone: Able to provide services

Context-aware intelligence: Instantly understands user intention and delivers suitable services

- Smartphone: Information platform powered by search AI
- AI smartphone: Develops with personal knowledge

User value: Access to service at one click/command

Personal companionship: Personalization through model tuning and knowledge enhancement

- Smartphone: Information platform powered by search AI
- AI smartphone: Develops with personal knowledge

User value: AI smartphone grows with users by learning user preferences
Reliable security | Innovate to secure data, algorithms, and content; alignment with our values

Security compliance and ethical risks related to AI technology

**Impact on user privacy**
Privacy disclosure

**Impact on country governance**
Sensitive information compromises national security
Misinformation stirs up the public sentiment
Infringements during AI training
Challenges in delivering AI benefits to all and bridging knowledge gaps

**Impact on user experiences**
Generation of offensive information
Generation of outdated or inaccurate information

Build secure, friendly AI with technology

**Data security**
Focusing on security, compliance, and objectivity of source data used in training

- Security of source data
- Compliance of source data
- Objectivity of source data

**Algorithm security**
Developing attack/defense and model calibration schemes

- AI firewalls
- Attack/defense and evaluation system
- Enhancement with knowledge graphs

**Content security**
Ensuring that compliant and satisfactory content is generated

- Traceability of generated info
- Labeling of generated content
- Evaluation criteria for generated info

**Values alignment**
Building a complete calibration system to ensure consistency with human values

- Reinforcement learning from human feedback (RLHF)
- Constitutional AI for smart scenarios
Shipments of next-gen AI smartphones forecasted by IDC (global market)

IDC forecasts 170 million next-gen AI smartphones to be shipped in 2024, representing almost 15% of the total smartphone market.

IDC forecast of the next-gen AI smartphone market worldwide

<table>
<thead>
<tr>
<th>Year</th>
<th>Units (100m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2023</td>
<td>0.51</td>
</tr>
<tr>
<td>2024 (forecast)</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Next-gen AI smartphones to be shipped worldwide in 2024

- **170 million units**
- **15%** of total smartphone market worldwide

*Next-gen AI smartphones use SoCs capable of running on-device GenAI models more quickly and efficiently and have an NPU with at least 30 TOPS performance. Examples of on-device GenAI include Stable Diffusion and various large language models (LLMs). Read more on IDC AI Smartphone Definition.*
Shipments of next-gen AI smartphones forecasted by IDC (Chinese market)

IDC’s forecast suggests that the share of next-gen AI smartphones in the Chinese market will surge after 2024 to over 50% in 2027, amounting to 150 million units, as chipsets and user scenarios will iterate swiftly.

IDC forecast of the next-gen AI smartphone market in China

- **2023**: 0.1\% (5.5m units)
- **2024**: 0.4\% (13.2m units)
- **2025**: 0.8\% (29.6m units)
- **2026**: 1.3\% (45.3m units)
- **2027**: 1.5\% (51.9m units)

- **Next-gen AI smartphones to be shipped in China in 2027**: 150 million units

- **51.9\%** of Chinese smartphone market

*Next-gen AI smartphones use SoCs capable of running on-device GenAI models more quickly and efficiently and have an NPU with at least 30 TOPS performance. Examples of on-device GenAI include Stable Diffusion and various large language models (LLMs).*
Next-gen AI smartphones will transform the global smartphone industry

- 2024 onward, next-gen AI smartphone sales will explode, creating a wave of phone sales.

- Flagship phones will be an important driver of next-gen AI smartphones in the early stages.

- 16 GB RAM will be the minimum spec for next-gen AI smartphones. SoCs and other hardware also need to be upgraded.

- Upgraded storage, displays, and cameras on next-gen AI smartphones will lead to changes in hardware and higher costs. Manufacturers may increase the ASP by leveraging technological innovations and AI-related selling points.

- Generative AI will spark a burst of new apps, which will in turn bolster AI smartphone sales. AI apps deployed on smartphones will offer more utility compared to existing apps.

- Chip makers, OEMs, and industry players will accelerate the transformation of user scenarios, advancing the development of next-gen AI smartphones.
Next-gen AI smartphones will transform content creation

AI interactivity integrating hardware, software, and services

**Personal assistant**
- Customized agents
  - "AI smartphone that grows with you"
- Planning and recommendation
- Inquiries and chats

**Productivity tool**
- Efficiency at work and play
- File browsing
- File editing
- Audio/video summarization

**Easy creation**
- Create with ease, anytime, anywhere
- Photo touch-up
- Image generation
- Video editing

**Fun personalization**
- Personalized expression with images, text, and video
- Copywriting assistant
- Personalized images
- Personalized videos

Personal creativity will become a habit, anytime, anywhere
### AI smartphone ecosystem outlook

#### Existing ecosystem

- **In-house apps**
  - OS
- **App ecosystem**
  - SoC

#### Next-gen AI smartphone ecosystem

1. **Hybrid computing power supply ecosystem**
   - Long-term mismatch between supply of computing power and demand for computing from AI products
   - Call for concerted efforts with chipset makers to find satisfactory solutions

2. **Large models ecosystem**
   - Persistent competition among large models
   - Large model capabilities channeled by smart device makers to address user needs using hybrid expert models and other solutions

3. **AI agents ecosystem**
   - Lower barriers to entry for agent development compared to app development, which will mean more customization
   - Smart device makers with app ecosystem experience can duplicate their existing practices to deliver a richer agent ecosystem

4. **Native service components ecosystem**
   - Large model plug-ins and native OS services will be the most common early applications
   - Native services accessible to AI agents will support the growth of the AI ecosystem

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**OPPO will be an open, collaborative contributor as we kickstart the era of AI smartphone**
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