PRIVATE NETWORKS

5G-A enables immersive, backpack-free VR at Hubei Provincial Museum

湖北省博物館 HUBEI PROVINCIAL MUSEUM

Key partners
ZTE, China Unicom

ZTE and China Unicom deliver film-level VR experience through EasyOn·Meta architecture

Impact & statistics

The immersive installation delivered measurable commercial and social outcomes:

- **132,500 visitors** during the May Day holiday 2025 (+20.17% YoY)
- **>1,500 VR sessions per day**, each lasting about 10 minutes
- **USD 2.3 million** increase in museum revenue (Q2 2025) and **$13.7 million** boost to local economy through additional tourism revenue
- **12 provincial museums** scheduled to replicate the model by mid-2025, contributing to China's target of **35% museum digital transformation by 2026**

Challenge

Before 5G-A, most Location-Based Virtual Reality (LBVR) installations relied on heavy backpacks containing high-performance GPUs and batteries that were uncomfortable for extended use, especially for children and older visitors. Efforts to move to Wi-Fi-based or all-in-one headsets offered lighter form factors but degraded image quality, increased latency and support for only a handful of simultaneous users.

The museum needed a network that could deliver cinematic 4K visual quality, multi-user scalability and millisecond-level latency, all within a confined, architecturally sensitive space. The challenge was to design a self-contained, cost-efficient private network capable of supporting real-time collaborative VR at exhibition scale.

Solution

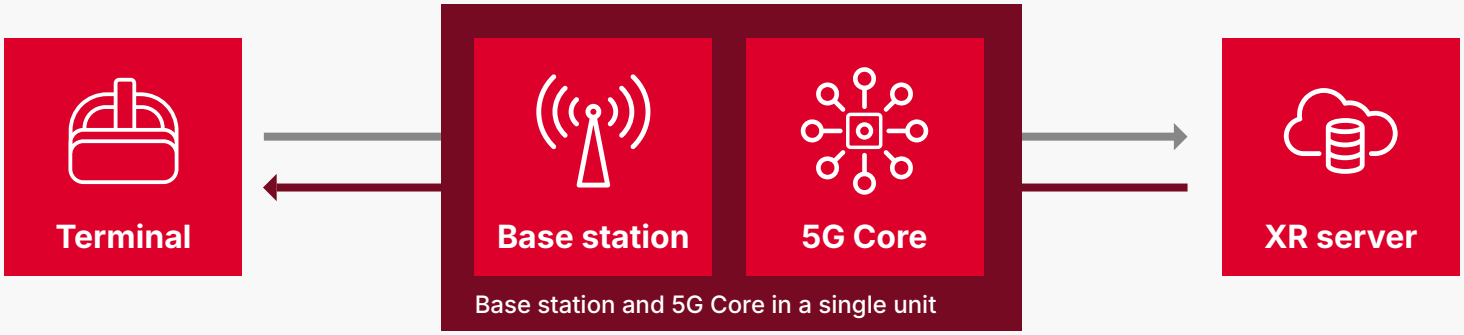
ZTE's EasyOn·Meta solution provided the technological foundation. Built on a 5G-A stand-alone private network architecture, it combined millimetre-wave (mmWave) radio, embedded edge rendering and a base station-integrated core, creating a self-sufficient communications environment inside the museum.

A stand-alone 5G-A private network, operated by China Unicom Hubei Branch, was deployed across a 600 m² active VR space using eight compact radio units. The solution's baseband unit (BBU) contained a simplified 5G core and edge-computing module, eliminating dependence on external data centres or the public internet and reduce costs. This local integration minimised latency and simplified deployment.

Figure 1

Architecture diagram

Source: ZTE



The cultural tourism industry has faced mounting pressure to remain relevant in the digital era. While more than 5,000 museums worldwide have digitised most of their collections, more than 70% of this content is not interactive. Visitors spend less than a third of the time at digital exhibits compared to traditional ones on average, limiting both engagement and revenue potential.

In China, this "digital survival crisis" prompted the Hubei Provincial Museum to seek an immersive, interactive solution that could attract new demographics while respecting the constraints of public heritage institutions. In partnership with **ZTE**, **China Unicom Hubei Branch** and **2:10 AM Cultural Communication**, the museum launched Traversing the Bronze Age, the world's first film-level 5G-Advanced (5G-A) digital cultural relics location-based virtual reality (LBVR) experience.

Visitors wear lightweight VR headsets connected by a short USB-C cable to a palm-sized mmWave CPE (customer premises equipment) worn on the arm or in a pocket. This provides backpack-free mobility while maintaining 4K@90 fps ultra-high definition rendering. The EasyOn·Meta platform dynamically allocates rendering workloads between terminals and XR servers through intelligent time slot scheduling and joint beam management, sustaining consistent frame rates even with more than 100 concurrent users.

The collaboration extended beyond technology. China Unicom provided spectrum resources and operational support while ZTE delivered the 5G-A hardware, software and network integration and 2:10 AM Cultural Communication designed the cinematic VR content. Together, they achieved film-level realism in a multi-user environment where visitors could freely explore a reconstructed Bronze Age world, interact with artefacts and experience history as an unfolding narrative.

This private network model ensures that all data, including 3D artefact scans and visitor interaction metrics, remains within the museum, addressing concerns over intellectual property protection and cultural data sovereignty. The success of Traversing the Bronze Age has made the 5G-A LBVR architecture a reference design for future immersive cultural projects across China.

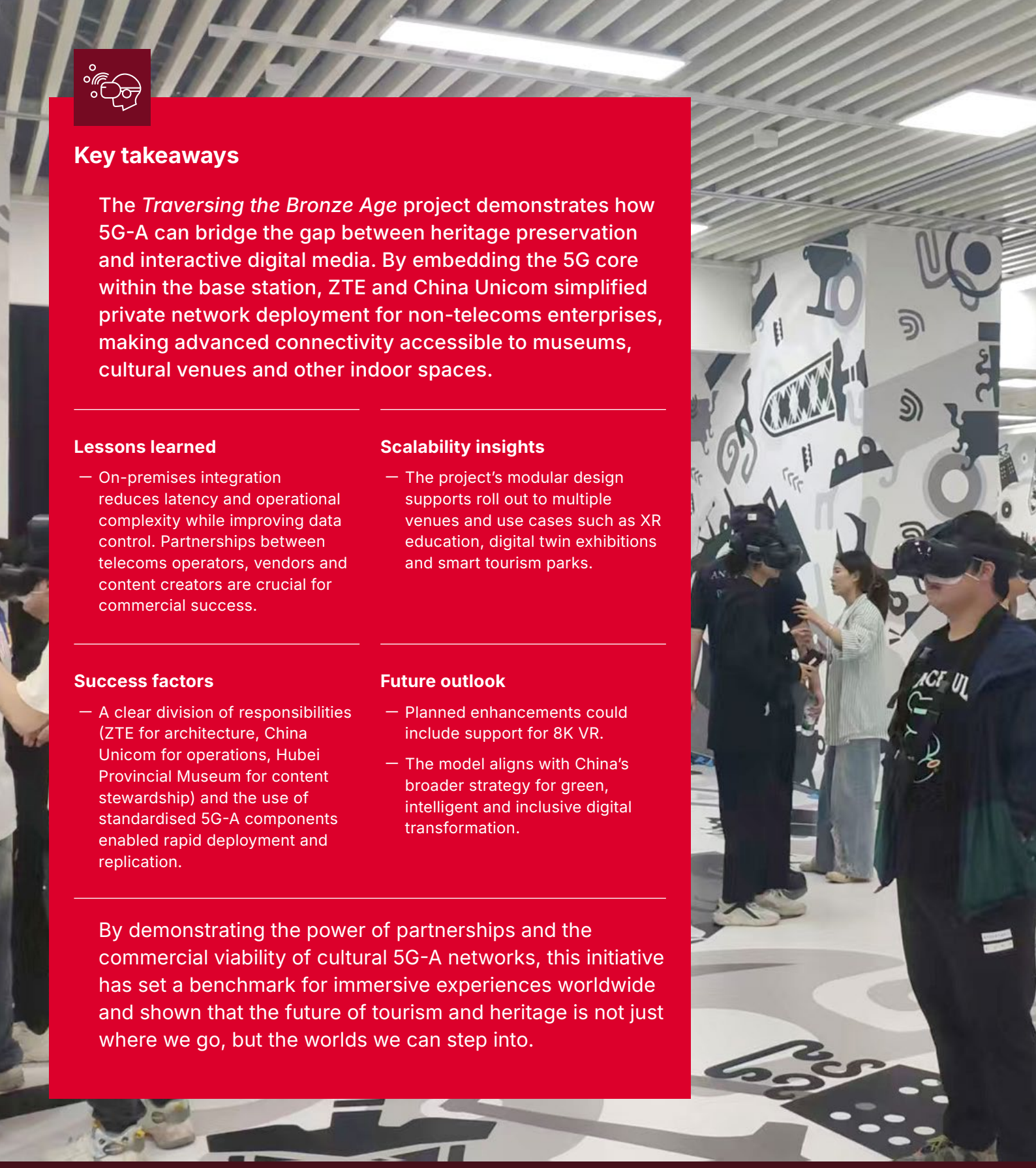
> **This isn't a gimmick. It's a genuine transformation of user experience that sets a new standard for how institutions engage with digital audiences.**
>
> **Chen Ming**
> Director of Cultural Experience Innovation, ZTE

ARCHITECTURE AT A GLANCE

ZTE EasyOn·Meta 5G-A LBVR

- **Private 5G-A stand-alone network** operated by China Unicom Hubei Branch (Service Model)
- **mmWave spectrum (26.75 GHz)** providing download speeds of >6 Gbps
- **Base station-embedded core** with local offloading and control plane on premises
- **8 compact radio units** (A5 book-sized) covered the entire exhibition space
- **Terminal-edge collaboration** for real-time rendering and interaction control
- **Intelligent joint beamforming and time slot scheduling** for mobility optimisation
- **4K@90 fps** UHD streaming with millisecond-level latency
- **Support for 100+ concurrent users** within >600 m² active VR area
- **Portable mmWave CPE + USB-C tethered headset** enabling backpack-free operation

5G-A enables backpack free, film-quality VR experience in a multi-user environment



Key takeaways

The *Traversing the Bronze Age* project demonstrates how 5G-A can bridge the gap between heritage preservation and interactive digital media. By embedding the 5G core within the base station, ZTE and China Unicom simplified private network deployment for non-telecoms enterprises, making advanced connectivity accessible to museums, cultural venues and other indoor spaces.

Lessons learned

— On-premises integration reduces latency and operational complexity while improving data control. Partnerships between telecoms operators, vendors and content creators are crucial for commercial success.

Scalability insights

— The project's modular design supports roll out to multiple venues and use cases such as XR education, digital twin exhibitions and smart tourism parks.

Success factors

— A clear division of responsibilities (ZTE for architecture, China Unicom for operations, Hubei Provincial Museum for content stewardship) and the use of standardised 5G-A components enabled rapid deployment and replication.

Future outlook

— Planned enhancements could include support for 8K VR.

— The model aligns with China's broader strategy for green, intelligent and inclusive digital transformation.

By demonstrating the power of partnerships and the commercial viability of cultural 5G-A networks, this initiative has set a benchmark for immersive experiences worldwide and shown that the future of tourism and heritage is not just where we go, but the worlds we can step into.