Connecting XR to the Enterprise Stack – Integration Patterns for PLM, CAD, IT Systems and Shared Data Models

Category:
Interoperability Issues or Standards Requirements

Problems this Research Would Address

1. No widely adopted standards or proven integration patterns exist for connecting AR applications to enterprise systems — PLM platforms, CAD models, ERP, and IoT sensors.

2. Organizations attempting integration today are **building custom connectors**, tolerating **data latency**, and managing **fragile CAD-to-AR model conversion workflows** that slow deployment and increase cost.

3. **AR cannot scale in the enterprise** without **reliable, secure, repeatable access to live operational data** — yet the tools and specifications needed to achieve this are *absent or inconsistent*.

    a) Development teams spend significant time on one-off integrations that cannot be reused across projects or hardware platforms.
    b) IT and security teams lack a reference architecture to evaluate XR integration proposals against enterprise data governance requirements.
    c) Standards bodies lack input from practitioners on where formal specifications would have the highest impact.

How would this research be conducted?

1. **Map enterprise process (or system) and data integration requirements** — conduct structured interviews with at least 15 enterprise AR practitioners and IT architects across 5 industry verticals to document which enterprise systems most commonly require AR integration and what is failing today.

2. **Document real-world integration architectures** — collect and analyse at least 10 anonymised real-world XR-to-enterprise integration designs, capturing tools, data flows, latency profiles, and known failure modes.

3. **Review available tools and middleware** — assess the current commercial and open-source landscape of integration tools, middleware, and connectors (including OpenXR-adjacent tooling and EDMA-related work) against practitioner requirements.

4. **Identify and classify integration gaps** — rank the top gaps where no adequate commercial solution or standard currently exists, supported by practitioner data and cross-referenced with active standards initiatives

Project Deliverables

- Report of research findings describing **enterprise XR integration requirements, patterns, risks, and gaps**
- **Enterprise XR Integration Reference Architecture** with visual and written guidance for common integration scenarios
- **Enterprise XR integration assessment tool** for members to evaluate requirements, risks, dependencies, and suitable architecture options
- **Practitioner decision guide** covering tool selection, security, governance, testing, and implementation considerations
- **Standards recommendations** identifying where new or updated specifications would most reduce integration friction
- Executive summary of findings for **public release** and **member exclusive webinar**

How would this research be conducted

1. **Synthesise interview and architecture findings** — cross-reference practitioner interview data with documented real-world integrations to identify recurring patterns and failure modes, producing a validated findings report
2. **Develop the reference architecture** — working with a technical working group drawn from AREA members, draft the Enterprise XR Integration Reference Architecture covering at minimum 5 integration scenario types.
3. **Validate with the Research Committee** — present draft findings, the reference architecture, and gap analysis to the AREA Research Committee for review and revision before final publication.
4. **Engage standards bodies** — briefs to all (at least four) working groups in relevant standards organisations on findings and submit formal recommendations identifying the specifications gaps that would most benefit the enterprise AR ecosystem.

Why This Research Matters

- Enterprise AR adoption is **blocked by integration complexity** — without clear patterns and standards, every deployment *reinvents the wheel*, creating cost, delay, and technical debt.

- The enterprise XR ecosystem needs a **shared reference architecture** that IT, AR developers, and security teams can all work from — reducing friction and enabling faster, more secure deployments.

- **AREA is uniquely positioned to lead** this research, bringing together enterprise practitioners, technology providers, and standards bodies to produce guidance that no single organisation could create alone.

- Outcomes will feed directly into **standards processes at EDMA** and other relevant bodies, ensuring that practitioner needs are reflected in formal specifications.