



## Digital twin architecture planning template

This template is designed to help you structure your thinking and document key decisions when planning your digital twin architecture. Answer each question in detail.

System and technology readiness	
What hardware is needed to capture and manage different types of data (e.g., visual, numeric)?	Example: "Drones with high-resolution cameras for photogrammetry, LiDAR scanners, environmental sensors for air quality and temperature, and occupancy trackers"
Do you have sufficient servers, networking infrastructure (e.g., LAN, WAN, wireless gateways), and peripheral devices (e.g., VR headsets, graphics cards)?	Example: "Campus has sufficient LAN/WAN coverage, but wireless gateways need upgrading to handle IoT devices. Graphics cards will need an upgrade for 3D visualization."
Is your current hardware scalable to support future needs?	Example: "Current server setup allows for modular expansion, and the network architecture is cloud-compatible, enabling future integration of additional IoT devices and buildings without major overhauls."
Are there specific requirements for drones, sensors, or reality capture devices?	Example: "A Mavic 3 drone and Leica LiDAR scanner have been identified as optimal tools for reality capture."
Do you have a disaster recovery plan in place?	Example: "Existing IT disaster recovery plan is being updated to include IoT and digital twin-specific data recovery protocols"
Software and compatibility	
What additional software is required beyond Bentley CAD or iTwin software?	Example: "ArcGIS for geospatial data analysis"

Are there compatibility issues with existing systems (e.g., operating systems, licenses, security)?	Example: "Current licenses for Bentley are valid, but ArcGIS licenses need to be procured. Systems are compatible with current OS."
Can the software integrate with university systems like CRMs, LMSs, or timetabling platforms?	Example: "Integration is planned for the facilities management system, energy monitoring dashboards, and the LMS for academic use cases."
Are APIs available for seamless integration with third-party tools?	Example: "Bentley APIs will integrate BIM and GIS data, while IoT device protocols (MQTT) will connect sensors."
<b>Data management</b>	
Where will your data be stored (on-premises, cloud, hybrid)?	Example: "A hybrid solution is planned: real-time IoT data in the cloud and BIM/GIS data on-premises"
What are the storage limitations regarding quantity, duration, or access control?	Example: "Current storage is sufficient for the pilot phase but will require a 50% increase in capacity within three years."
Do you need to extend administrative rights to access certain data sources or systems?	Example: "Yes, facilities management and IT teams will need expanded access to building management and IoT systems."
How will you handle real-time data collection and long-term historical storage?	Example: "IoT data will stream to a cloud platform for real-time analysis, while historical data will be archived annually on on-premises servers."
Are there existing datasets (e.g., BIM models, GIS layers) you can leverage?	Examples: "Existing BIM models for 40% of campus buildings and a GIS map of the entire campus will be integrated into the digital twin."
<b>Scalability and futureproofing</b>	
Is the system designed to scale with future needs, such as adding new buildings or use cases?	Example: "Yes, modular architecture will allow for additional buildings and sensors to be added incrementally."

Does the architecture allow for modular upgrades or replacements?	Example: “Hardware and software choices prioritize modularity to enable smooth upgrades.”
What are the long-term costs and ROI of scaling hardware and software?	Example: “Initial costs are high but expected to reduce maintenance costs by 20% annually and increase energy efficiency by 15%.”
What is your plan for ongoing maintenance, training, and updates?	Example: “Dedicated budget for staff training and software updates will be allocated annually.”
<b>Privacy, security, and compliance</b>	
How will you ensure compliance with regulations like GDPR?	Example: “All personal data will be anonymized, and access controls will restrict usage to authorized personnel.”
What security measures (e.g., encryption, role-based access controls) are in place?	Example: “IoT data will be encrypted, and role-based access controls will be implemented for BIM and GIS data.”
How will sensitive or personal data be safeguarded?	Example: “Security audits will be performed biannually, and sensitive data will be stored in secure, encrypted repositories.”
What protocols are in place for managing cyber threats or breaches?	Example: “An incident response plan includes real-time alerts for data breaches and immediate action protocols.”
<b>Functional and operational requirements</b>	
What prerequisites need to be addressed (e.g., software downloads, permissions)?	Example: “Bentley iTwin software and ArcGIS will be installed, with administrative permissions granted to the facilities team.”
How will the digital twin integrate with building management, energy monitoring, or academic systems?	Example: “APIs will connect the twin with the building management system and energy dashboards; LMS integration is planned for teaching modules.”

What training will be required for staff, and how will it be delivered?	Example: "Training for facilities and IT teams will include workshops and online modules. Faculty will receive a simplified user guide."
What key performance metrics or milestones will you use to evaluate success?	Example: "Metrics include reduced energy costs, improved space utilization, and integration with 80% of campus systems within two years."
<b>Budget and cost-effectiveness</b>	
What is the budget for hardware, software, and other resources?	Example: "£200,000 for hardware, £50,000 for software, and £20,000 for training and maintenance in the first year"
Is the return on investment (ROI) justified for new investments?	Example: "Yes, the digital twin is expected to save £40,000 annually through energy optimization and better facilities management."
Are there cost-saving or funding opportunities, such as using existing infrastructure or applying for grants?	Example: "Existing BIM models and GIS maps reduce initial data acquisition costs by 25%. Grants for smart campus initiatives are being explored."
How will you prioritize quick wins to demonstrate value early?	Example: "A pilot project on a single building will deliver early results, including energy savings and improved operational insights."