

Staying ahead of the game: A transformative, integrative approach to the Infrastructure value chain

WHITEPAPER

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Executive Summary

Challenges within infrastructure are numerous. While the problems faced within transportation, smart cities, data centers, and facility & fleet management differ in many aspects, each one faces increasing challenges of cost, centralised information management, and improved customer experience. Additionally, each one must maintain a holistic view of operations despite the many legacy, disparate applications and systems in use.

This whitepaper focuses on how a transformative "System of Systems" integration approach supports centralised control to increase visibility and improve decision-making across sites.



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INTRODUCTION

Infrastructure provides a critical connection to businesses, communities, people, and quality of life on a global scale. It drives economies across the world. In order to stay competitive, every nation must move people, goods and data efficiently while delivering energy and water resources in a safe, reliable and sustainable manner.

With increasing urbanisation, mounting cost pressures, and demand for improved quality of life, there is now a global move towards infrastructure consolidation, upgrade, and continuous improvement.

This, coupled with large greenfield capital projects funded by private and public entities, complex energy management, rising operating costs, and advancements in technology, there is now a greater need than ever for:

1. Seamless Integration between systems, sites, people and assets
2. Improved operational efficiency and reduced energy cost
3. Adherence to various security, cyber security, safety and regulatory compliance
4. Not just delivering on service level agreements, but exceeding expectations.

To accomplish this, enterprises must extend their sights beyond traditional KPIs and monitoring real-time operations. They must leverage the latest technological advancements in data, analytics, advanced visualisation and workflow management capabilities to ensure sustainable innovation through digitalisation.

Getting in the way of this vision are **several common infrastructure challenges**:

- Application silos – Enterprises often have multiple applications, but to remain competitive they need a holistic view of all end-to-end operations at any given point in time
- Information exchange – With multiple applications and systems, it can be difficult to have full visibility, which makes critical decision-making even more complicated
- Siloed IT/OT – Siloed applications means that the information technology layer does not interact with operational technology (OT) systems used to monitor events, processes and devices. This makes it challenging to make effective adjustments in enterprise and industrial operations.
- Availability and utilisation of assets – enterprises often have poor visibility into availability of assets and therefore how to utilise them optimally.

The subsequent sections of this whitepaper will look at how each infrastructure sub-segment (data centers, airports, cities, transportation, and other projects) could deal with these broad-level imperatives to stay ahead of the game.

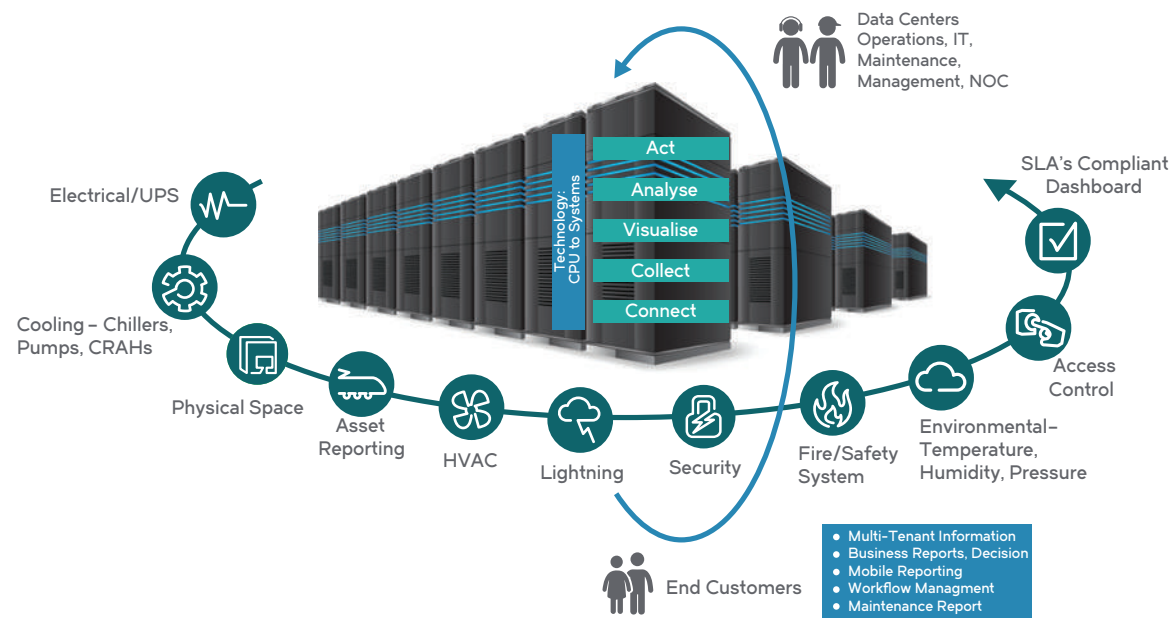


Infrastructure for Data Centers

A cutting edge Data Center needs to manage diverse systems. Hardware, software, emerging trends and technologies of varying ages, from numerous vendors, all have widely divergent levels of connectedness and interoperability.

Data Center transformation, therefore, is not an overnight process, but a journey that requires optimisation of various individual functions, resulting in:

- Data resiliency and high availability, to ensure business continuity regardless of external or internal factors
- Standardisation of all systems for increased scalability
- Remote monitoring and controlling
- Multi-system and multi-site integration
- Asset management with predictive and condition-based maintenance to ensure maximum utilisation and operational efficiency
- Situational awareness, to ensure the right information is delivered with the right context at the right time
- Energy and service costs controlled and reduced
- Moving from CAPEX to OpEx lease
- Workflow management to automate procedures and tasks, with advanced reporting and analytics for deeper insights.



A digital transformation journey consists of moving away from decision-making as a result of disparate systems, and towards a strategic vision where various systems and applications are integrated and communicating effectively. This is known as a “System of Systems” approach.

A System of Systems wrapper brings a scalable, interoperable, and secure platform that provides analytics, workflows, and effective asset management. It enables operational efficiency with enterprise-level monitoring and control across multiple sites to manage electro-mechanical, environmental, and physical security systems.

The combination and optimisation of resources, tools, best practices, and intelligence ensures the lowest total cost of ownership, and the best ROI a Data Center can anticipate.

Business KPIs to improve overall efficiency, increase speed-to-market and hit sustainability goals across multiple sites are therefore more attainable.

Infrastructure for Airports

Airports are continually being challenged to grow by attracting and retaining major airline services, managing government agency interaction, and providing very high levels of customer service and satisfaction. They must also supplement these aeronautical revenues with non-aeronautical revenue sources such as retail, restaurants, bars, parking, and conference centers.

Airport management have to manage and optimise the entire passenger experience, which is a people-intensive undertaking. Airport personnel are a key part of the entire airport machinery, and they need to be trained, informed, productive, efficient, available and responsive. Such an enormous people challenge requires that every part of the airport is now digitally aware and connected, and that information is readily available for whoever needs it, wherever they need it, and whenever they need it.

Other imperatives for airports include:

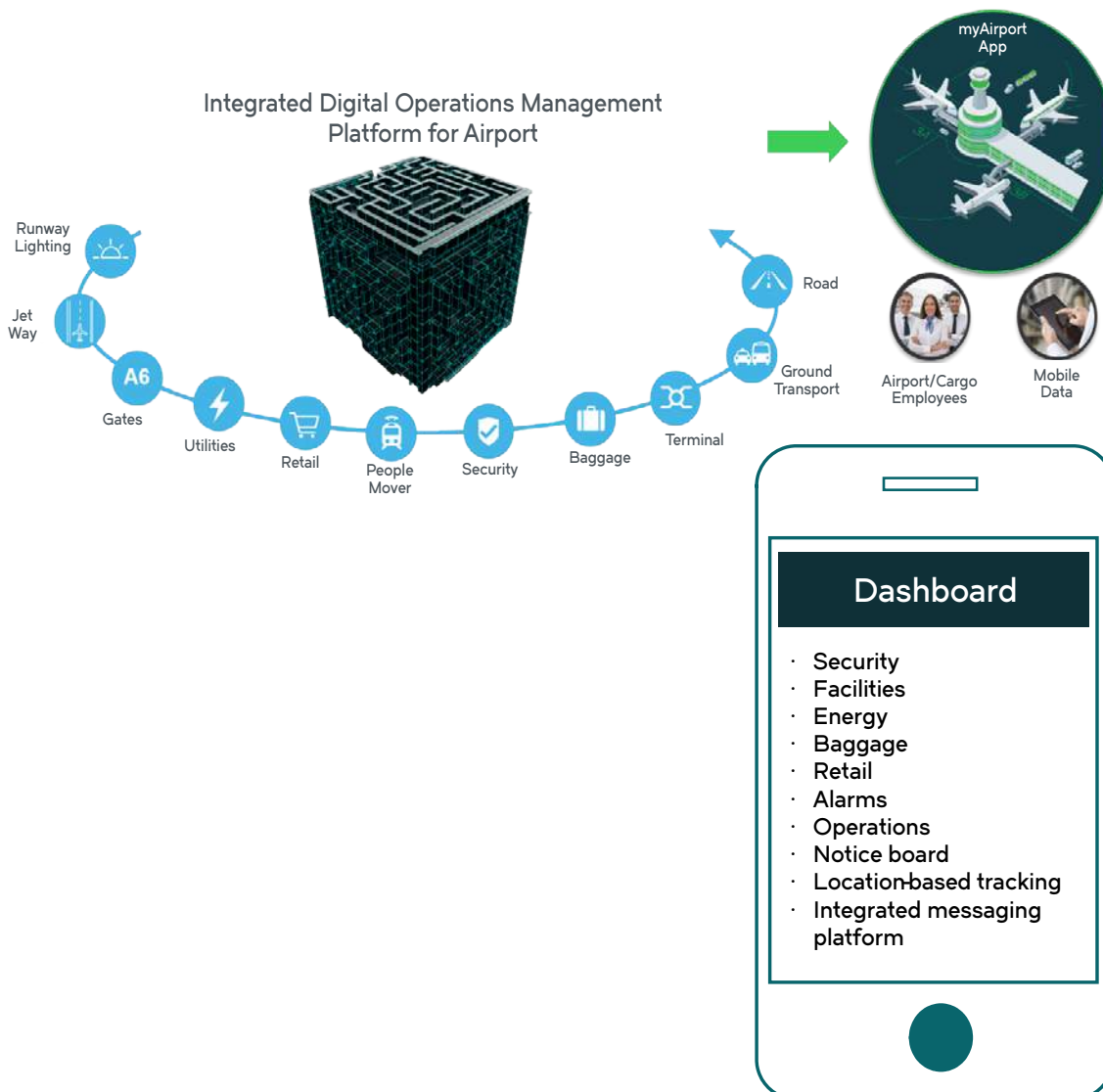
- Ready access to metrics and KPIs that cross both organisational and system boundaries
- Integrated operational systems. This is especially critical for emergency response situations, where the technology must support, not impede, emergency response
- Ability to drill-down into details, possibly as far as device-level information
- Effective personnel training, including reducing the number of complex systems that have various standards and user interfaces
- Visibility of critical operational parameters, which may involve consolidating numerous systems into powerful operational dashboards
- Capturing, managing, and analysing high volumes of data from a vast and growing number of diverse sources
- Be capable of providing appropriate closed-loop operational functionality, with intelligent decision support to all operations personnel, regardless of role.

Transformation for this infrastructure segment means pulling all the pieces together into a unified system that can handle connectivity, data marshaling and contextualisation. It should provide a secure platform for real-time control, and extend comprehensive access to all types of devices for managers, staff and passengers.

An integrated, "System of Systems" approach helps modern airports lead the way through continuous, data-driven innovation that augments customer experience while also complying with new regulations and eco-friendly mandates. When disparate systems are working together, airports are able to:

1. Leverage big data and analytics, with advanced visualisation and workflow management
2. Enable real-time visibility and awareness to optimise the response of all airport operations
3. Initiate improved processes that sustain ongoing innovation through digitalisation

This approach provides context and clarity in what is otherwise an extremely complex multi-vendor landscape.



Infrastructure for Smart Cities

Due to rapid urbanisation, many cities have old and aging infrastructure with high replacement costs. Converting existing infrastructure to Smart Infrastructure is the key to improving cities, and it is directly correlated to quality of life improvements.

Some of the drivers for Smart Cities include:

- Cities have many IT/OT systems supplied by various vendors. The ability to connect and exchange information is critical to making more informed decisions
- Increased use of public transit
- The need for increased visibility of building plans, for example to help fire fighters mitigate losses
- Smart buildings reduce energy consumption
- The need for better traffic management to reduce congestion and improve emergency response
- Land usage decisions need to be made, for example to help locate schools and community facilities
- Water and waste water management must be constantly innovated and maintained for public health
- High citizen experience to help adhere to most-livable city index

For Smart Cities to be efficient, they must be able to connect, collect, analyse and act from disparate data sources.

There are three main parts to that job: collecting, communicating and “crunching.”

First, a smart city connects and collects information about itself through sensors, other devices and existing systems. Next, it communicates that data using wired or wireless networks. Third, it “crunches” (analyses) that data to understand what is happening now, what is likely to happen next, and finally it must act based on this intelligence.

A transformative approach here spans across various applications, including facilities management, utilities, telecommunication, transportation, health and e-Governance. The most effective approach, then, is to not just connect all these disparate functions, but to collect, analyse and then act with a unified and holistic intelligence with the help of real-time data.

With Smart Cities, the objective is to enable city leaders to better serve citizens and businesses. A command and control center based on an integrative, “System of Systems” approach can be used to leverage information from various data sources to anticipate and resolve problems even before they are presented, coordinate various resources and processes to operate seamlessly, and generally make more strategic decisions.

Smart City Applications



Facilities Management



Utilities



Telecommunications



Transportation



Health



e-Governance

Smart City Functions

Administration | Infrastructure | Operations

Command & Control Center System of Systems



Connect

- Citizen connectivity
- Sensor and device connectivity
- Control systems
- Alarms, events management
- Enterprise asset performance management
- Supervisory control and data acquisition



Collect

- Enterprise data historisation
- Data aggregation and contextualisation
- Utility, facility and agency data collection
- Big data support
- Event streaming



Analyse

- Business intelligence
- Rules engine
- Asset and information models
- Situational awareness
- Pattern recognition
- Decision support KPIs
- Predictive analytics



Act

- Workflow management
- Task scheduling and notifications
- Closed loop actions
- Continuous process improvement

Integrated system

Better decision making
with real-time data

Proactive issue resolution

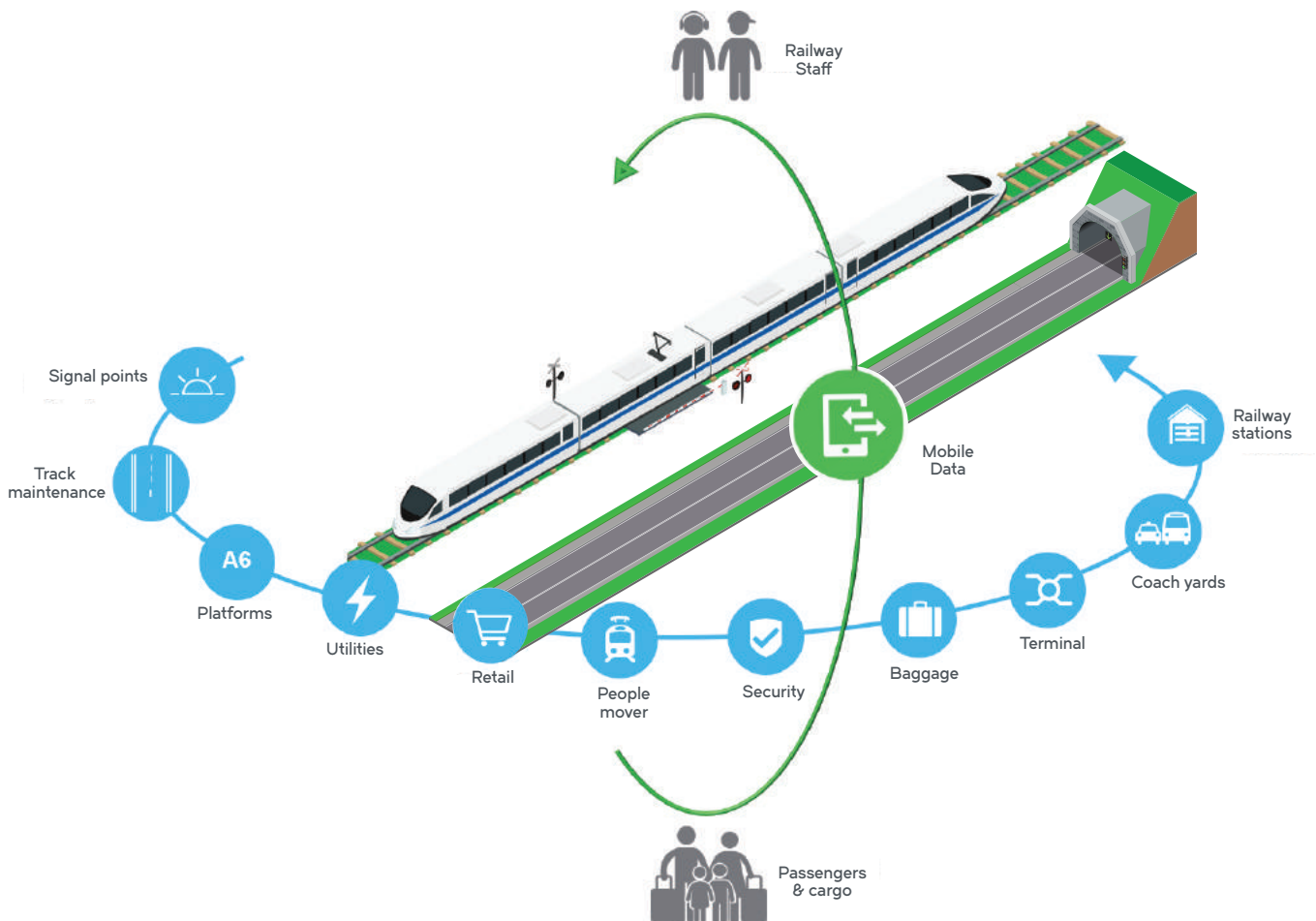
Efficient resources &
effective operations

Infrastructure for Transportation (Rail, Tunnels, Ports)

Regulatory changes, safety requirements, alternate modes of transportation with both higher labor costs and demand for high customer satisfaction are driving the push towards automation, advanced analytics and digitalisation in the transportation sector.

Other drivers include:

- The need for rapid deployment and connection of multiple IO devices
- The ability to scale up even faster
- Compliancy with regulatory bodies
- A vast network of connection points
- Real-time data processing required to improve customer satisfaction
- Remote monitoring of operations and bringing people together in cross functional processes
- Advanced and predictive alarm management capabilities



Infrastructure for Campus Management

Another type of specialised infrastructure projects supports the management of buildings and facilities that cater to large groups of people including sports stadiums, malls, hospitals, universities, hotels and other large campuses.

State-of-the-art services, energy management, security, and a rich customer experience are all drivers for a transformative, digital approach.

As in all other sectors already discussed, gaining a single view of all operations is imperative to effective collaboration and more strategic decision-making. To attain this holistic view, these infrastructure projects must also integrate their existing systems to create a "system of systems".

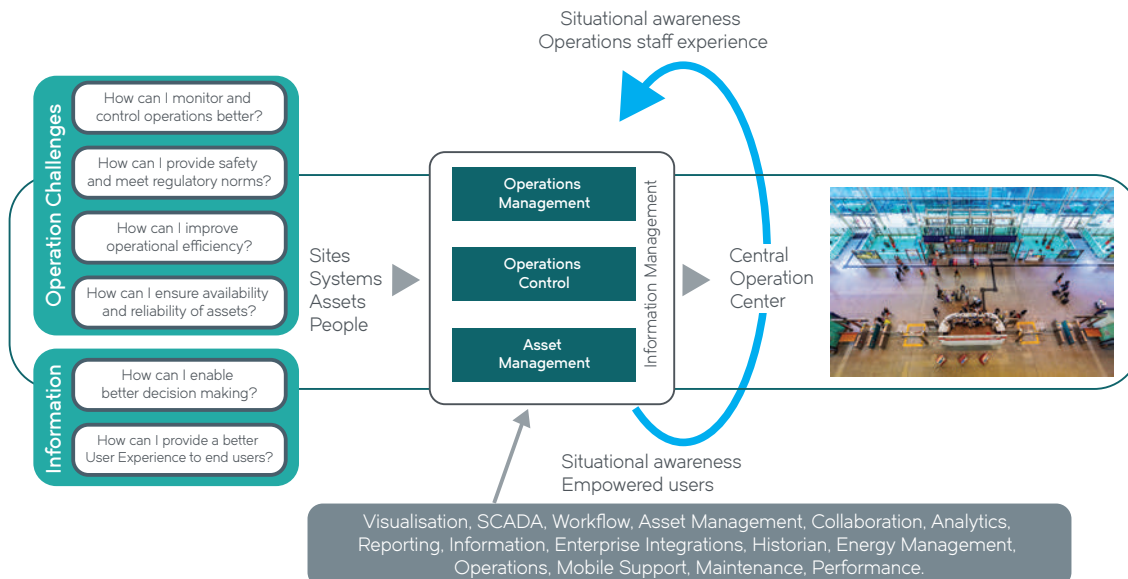
Final Thoughts

In the increasingly complex world of Infrastructure, technology is the powerful unifying asset.

The integrated, "System of Systems" approach presented here aims to provide a truly holistic approach to unify disparate and complex system and data challenges.

Doing so provides a centralised infrastructure that supports operations and customer information systems across the entire value chain. Combining information technology and operational technology, and having a system that communicates effectively means:

- Reduced total cost of ownership through better system integration and by leveraging investments already made in systems and applications
- Improved asset utilisation and availability of assets with minimal downtime
- Improved predictability of asset maintenance
- Improved customer experience through digitalisation of processes, information and communication
- Lower implementation costs with a hardware-agnostic, unified platform



AVEVA offers a robust platform that integrates enterprise and control applications with advanced real-time monitoring. We believe in integrating your existing systems through a "System of Systems" approach with:

- A hardware-agnostic platform for centralised control and device system connectivity
- Asset performance monitoring, predictive maintenance capabilities, and asset life maximisation
- Enhanced workforce collaboration with real-time control and monitoring.

Why AVEVA ?

Our strength is in our installation base, our global reach, and wide eco-system partner network. We work with 19 of the top 20 petroleum companies, 22 of the top 40 chemical companies, 10 of the top 15 mining and minerals companies, 25 of the top 50 food and beverage companies backed by 4000 System Integrators and 160 technology partners. Our software powers applications in over 100,000 sites with over 2 million licenses, monitors 20 billion operating parameters, and process over 12,000 terabytes of operating data.

Our project approach begins with a comprehensive requirements assessment focused on meeting the overall objectives of your business, while minimising execution risk.

AVEVA is proud of:

- Our ability to bring tremendous depth and breadth of prior global experience on complex projects
- Our ability to provide a highly experienced and completely integrated execution team with strong leadership and proven standard practices
- A global team of experts and an extensive network of partners who are familiar with our tools, technology and implementation methodology
- A core execution team who will provide design guidance to ensure compliance and consistency across all elements and phases of the project from pre-award to handover
- Knowledge transfer and local support – resources from the local operation interface with the global AVEVA teams to facilitate knowledge transfer and long term site support.



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About the Author

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About AVEVA

AVEVA is a global leader in engineering and industrial software driving digital transformation across the entire asset and operational lifecycle of capital-intensive industries.

The company's engineering, planning and operations, asset performance, and monitoring and control solutions deliver proven results to over 16,000 customers across the globe. Its customers are supported by the largest industrial software ecosystem, including 4,200 partners and 5,700 certified developers. AVEVA is headquartered in Cambridge, UK, with over 4,400 employees at 80 locations in over 40 countries.

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