



**SAP**

# Asset Management for Road Networks

April 2021

Jon Wilson  
Global Centre of Excellence, SAP

Marty Trembath  
Rizing – EAM Business Solutions

THE BEST RUN **SAP**

IMPLEMENTED BY **RIZING**



# Table of Contents

- 3** Introduction
- 5** Components of a Road Network Solution
- 7** Accurate and Thorough Asset Inventories
- 9** Asset Information and Referencing
- 11** A Geospatial View of Asset and Work Information
- 15** Supporting Business Capabilities
- 16** Real World Examples
- 17** Summary
- 18** Why SAP?
- 19** Why Rizing?

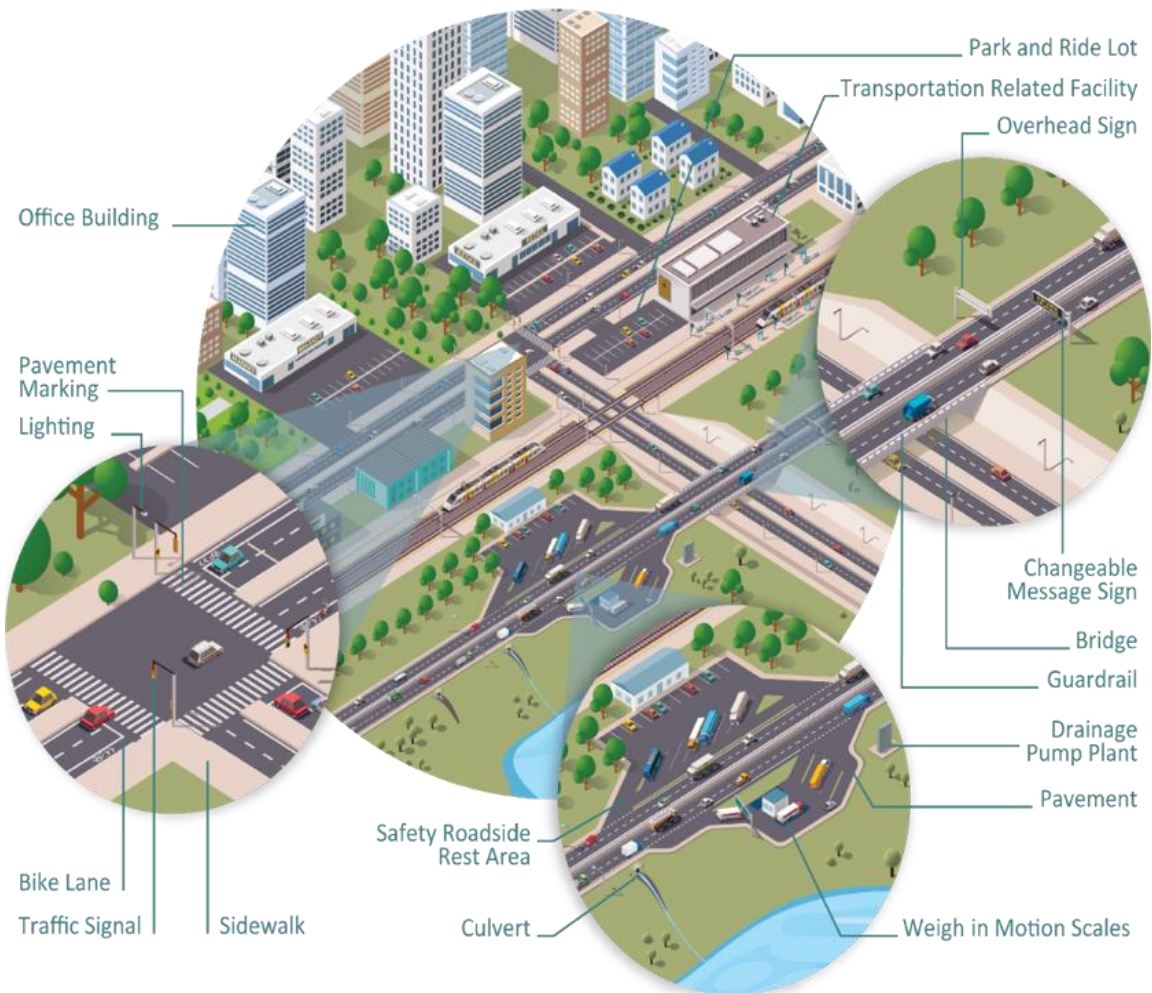


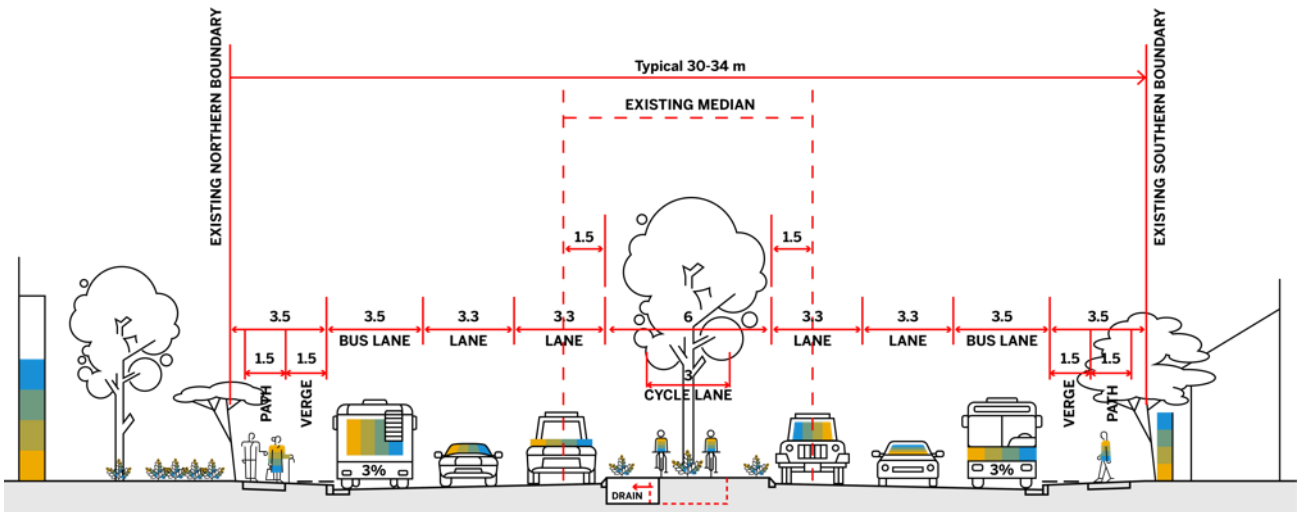
# Introduction



Road networks include an extensive set of physical assets, including pavement (e.g. roads, highways, streets, bike lanes), bridges, tunnels, structures, geotechnical assets, traffic signals, Intelligent Transportation System devices,

facilities, signs, and other traffic and safety features. The figure below, illustrates the diversity of assets that need to be considered.





There are many different groups that contribute to the management of road networks, which we collectively refer to in this document as Road Network Organisations. Road Network Organisations often include government agencies (local, state and federal), operators, maintainers, and service providers, but the term could apply to any organisation that has a role in the design, construction, operations, maintenance, refurbishment or decommissioning of road network assets.

Many Road Network Organisations are looking for innovative new ideas and approaches to replace aging and siloed systems, simplify complex business processes and support a comprehensive data-driven approach to asset management. They are looking for solutions that are easy to use; seamlessly integrate with their financial, work management, geospatial and life-cycle

analysis systems; provide comprehensive mobile capabilities; are based on modern technology platforms; address visualisation and reporting needs; and will remain viable and sustainable for years to come. We believe the combination of SAP, Rizing, and your organisations geospatial system can meet all of these demands.

This combined and comprehensive design provides a business process and solution framework within which to significantly improve the information collection, maintenance, and management of road network assets, accelerate decision making processes on asset management programs, improve project execution, and deliver more actionable reporting. An asset-centric system establishes a more sustainable architecture to manage current challenges and build for the future.



# Components of a Road Network Solution

Organisations responsible for the design, construction, operation and maintenance of road networks, both public and private, have well defined and specific methodologies and processes for managing their assets. As the original form of government owned civil infrastructure, there are often historical and unique requirements that must be carefully considered when designing a roads asset management solution. The use, and integration, of both asset management and geographic information systems (GIS) is fundamental to this design.

In modern day road asset management there are many different stakeholders and tools used, from design and construction through to decommission and disposal, and they have an increasing level of interdependency. It is critical that systems specific to a users requirements are seamlessly integrated to other corporate systems to ensure accurate and real time information can be obtained for decision making and facilitating maintenance.

The use of an organisations GIS provides a framework for gathering, managing, and

analysing data in its geospatial context. It facilitates asset search and identification, asset data maintenance, work planning, change management, reactive maintenance, location and condition correlation, forecasting and analysis, and map visualisation. GIS systems can integrate many types of data, not just specific to the assets owned by the organisation, but also other relevant available spatial data that can be rendered across the network in the form of business and environment map layers. It analyses spatial location and organises layers of information into visualisations using maps and 3D scenes. With this important capability, geospatial views reveal deeper insights into data, such as patterns, relationships, and situations – helping users make smarter decisions.

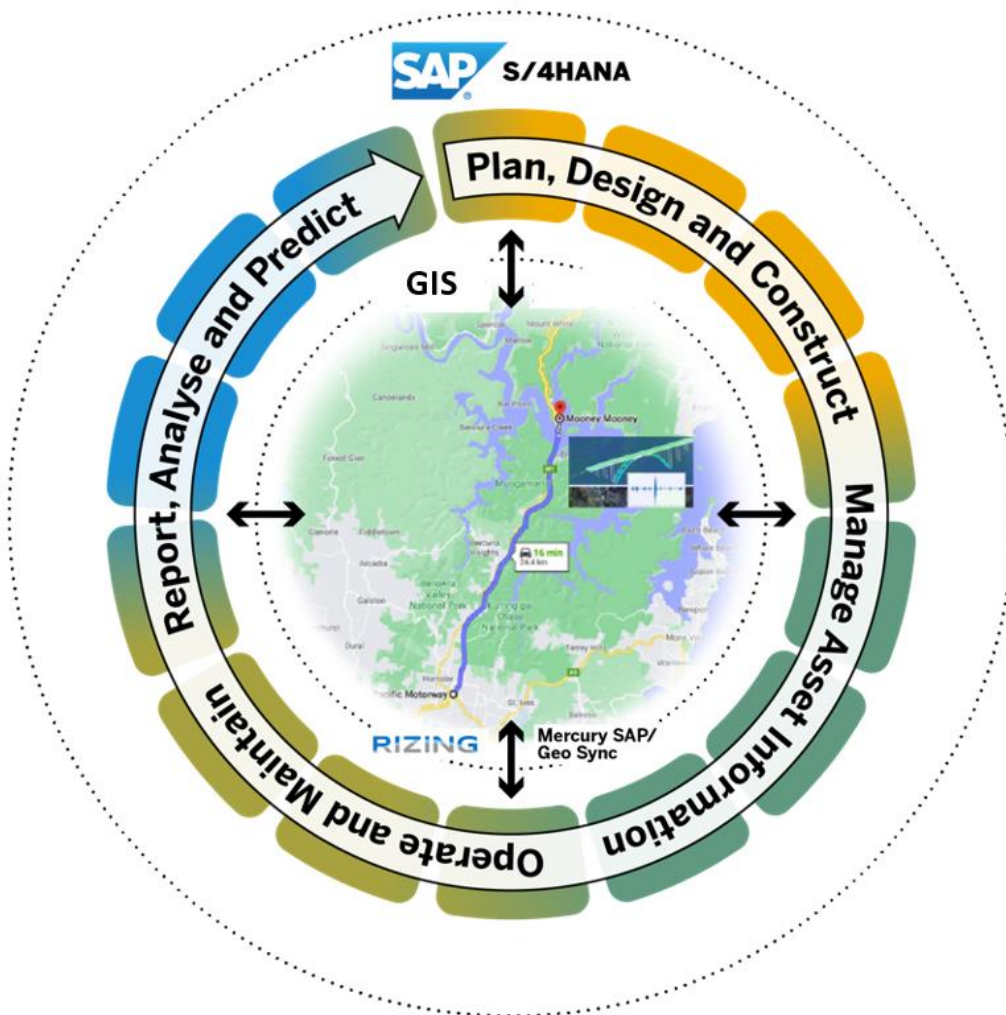




The **SAP S/4HANA Asset Management solution** is used to manage the entire road asset lifecycle. With real-time visibility into asset performance and powerful analytics, it is easier to optimise asset usage, decrease costs, better manage capital expenditures, and ultimately maximize your return on assets (ROA).

Planning and Integrated Cost Tracking strengths provided within the SAP S/4HANA Asset Management solution, seamlessly integrated with the asset identification and visualisation ability of a GIS solution. Real-time and bi-directional data flows between these solutions provides the flexibility for Road Network Organisations to more easily manage complex asset management use cases.

The unique solution designed by SAP and Rizing combines the Work Management,





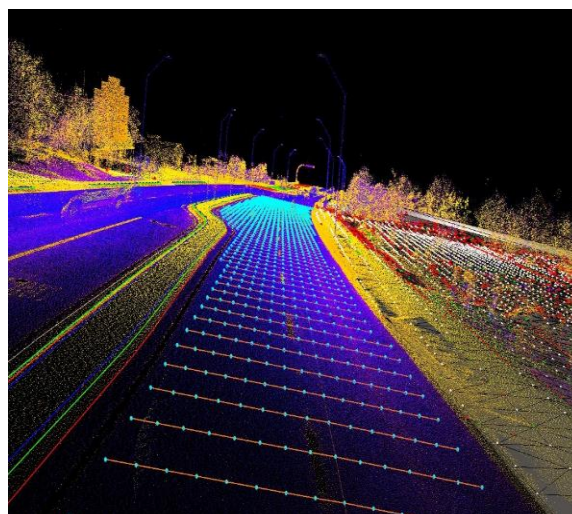
## Accurate and Thorough Asset Inventories

Before any organisation can successfully implement and utilise an enterprise asset management system, it must first establish an accurate and thorough asset inventory. Often organisations are dissatisfied with the analysis and reporting from their asset systems because they have failed to take this first critical step.

There are many ways to create and maintain an asset and road network inventory including using commercially-available field data collection applications, buying inventory data

from content providers, or using mobile and/or drone LiDAR/imagery technology.

Rizing owns and operates a Leica Pegasus:Two Ultimate mobile mapping system that collects highly accurate point cloud and associated 360-degree imagery. The data collected is then used as the foundation for extracting asset locations and associated attribution. This is an excellent way for organisations to create an initial inventory as well as to confirm and validate asset data changes on a periodic basis.



In between these wider-scale data collection routines, road networks are continually being modified. These modifications may include smaller changes such as sign replacements or the addition of rumble strips to larger changes such

as new road construction, additional lanes, or bridge replacements. A mobile field data collection application is therefore a vital tool in Road Network Organisations toolbox.

Rizing’s OmniSpatial product is an innovative progressive web application for field and office data collection and maintenance workflows. The application provides the ability to work seamlessly with many published geospatial web services, including map and feature services.

OmniSpatial provides asset locations for not only traditional map points, lines, and polygon modelled assets, but also allows data to be collected on linearly referenced data using traditional linear referencing and geospatial web services.



The key features and functionalities of OmniSpatial include:



Map (coordinate) and roadway (linear) data collection modes



Device agnostic solution that runs on any modern web browser



Integration of data from many published web services and data file formats



"Broom sweep" collection for obtaining multiple linear and point features in a single pass



Data preparation tools to guide users through downloading data for offline use



Photos, audio, note, and video collection capabilities to augment attribute data





# Asset Information and Referencing

Road networks are in a constant state of flux and most Road Network Organisations utilise linear referencing as the means for identifying locations and correlating the measurements of assets, road characteristics, and planned, current and historical work to those locations. Most GIS solutions allow an organisations to manage the geometry and measures associated with their road network and then to keep this

business data synchronised as the network changes in the GIS environment. Permanent referencing locations (or markers) along a route plus offsets, route and XY coordinates, or route and jurisdiction plus measures are examples of linear referencing methods (LRMs) used to describe the position along the linear asset. This is a critical component to any road asset management solution.

The screenshot shows the Event Editor software interface. The main map area displays a road network with linear referencing data overlaid. The data is represented by colored lines (red, blue, green) along the road. The interface includes a toolbar with various tools like 'Reconcile & Post', 'Select', 'Rectangle', 'Point Events', 'Line Events', and 'Attribute Set'. The 'Layers' panel on the left shows 'Add Linear Events' and 'New Edit' buttons. The 'Event Editor' title bar indicates version v10.5.1.1353. The data table below the map shows the following information:

Object ID	Condition	From Measure	To Measure	Post	Rail	Guardrail ID	Supp Description	ID: Guardrail	F Key	Element ID	Route ID	County Code	Route	Sub-Route
10743	GOOD	6.864	7.15	METAL	CABLE	5806	Not Applicable	0	1511	CABE-IS-064-00-00NA	06100640000EB	CABE	064	00
10801	GOOD	7.131	7.174	METAL	W BEAM	5900	Not Applicable	0	1384	CABE-IS-064-00-00NA	06100640000EB	CABE	064	00
10802	GOOD	7.153	7.173	METAL	W BEAM	5902	Not Applicable	0	1385	CABE-IS-064-00-00NA	06100640000EB	CABE	064	00

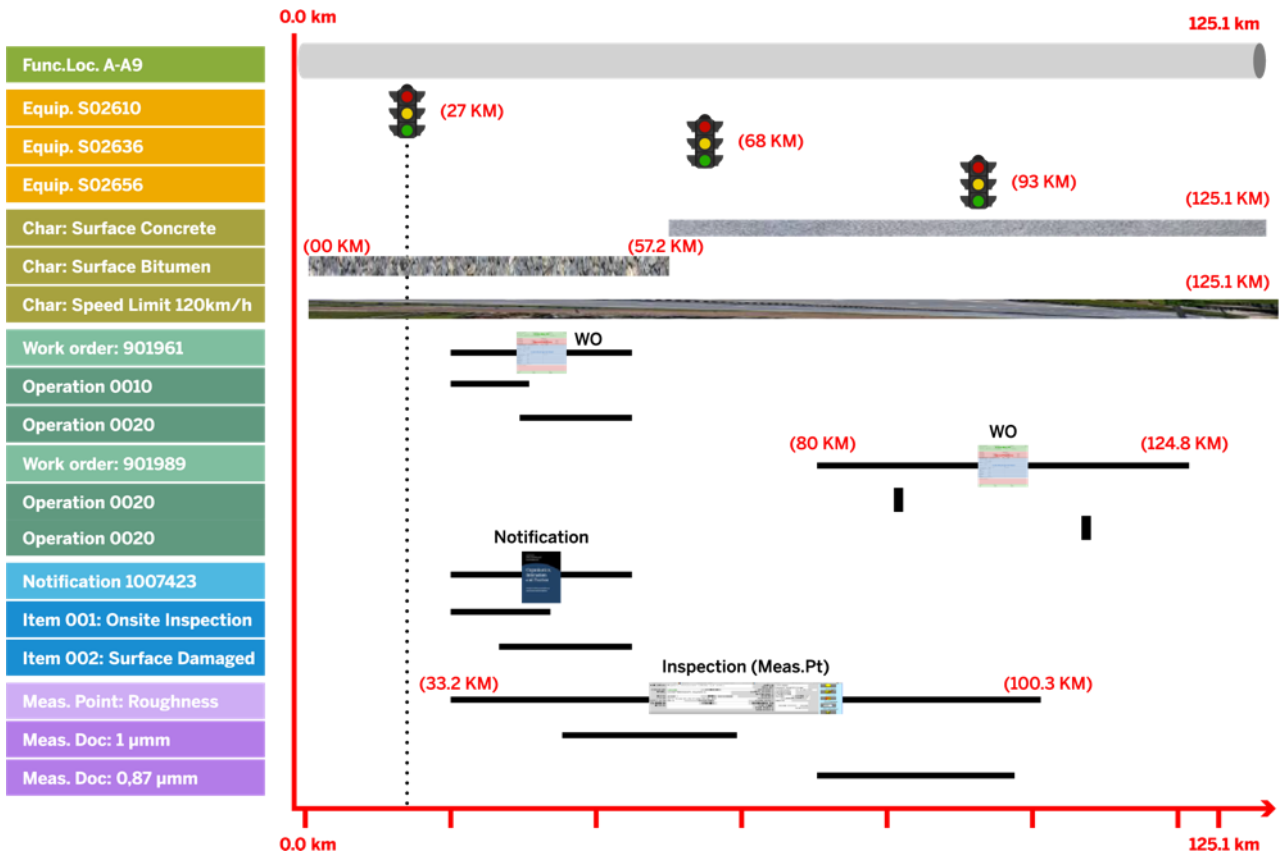
*Roadway linear information depicted in a GIS system*

The use of linearly referenced data also provides users with a data integration technique known as dynamic segmentation. Dynamic segmentation combines multiple sets of linear extent attributes along any portion of an existing linear feature,

independently of where it begins or ends. This creates a new segmented dataset that breaks at each attribute change to create uniquely attributed linear segments. These segments can then be used for data analysis.

The linear data within a GIS solution can be tied in to support and validate SAP's Linear Asset Management (LAM) tool. As organisations use LAM to assign linear attributes, work orders, or notifications to discreet sections of a functional location, the measures associated with these items can be updated by using the geospatial system data as the authoritative source for location information.

The use of LAM significantly reduces the complexity of asset data maintenance and work location identification. The use of distance references allows condition or characteristics of a linear asset to change without splitting existing asset records or creating a new asset each time an attribute changes somewhere along its length.



The diagram above shows how the linear relationship is established amongst assets, attributes and work orders along a specific road.

Repair and maintenance work is identified and planned based on specific linear sections of the network allowing for more precise location definition, which aids planning and specific maintenance site identification.

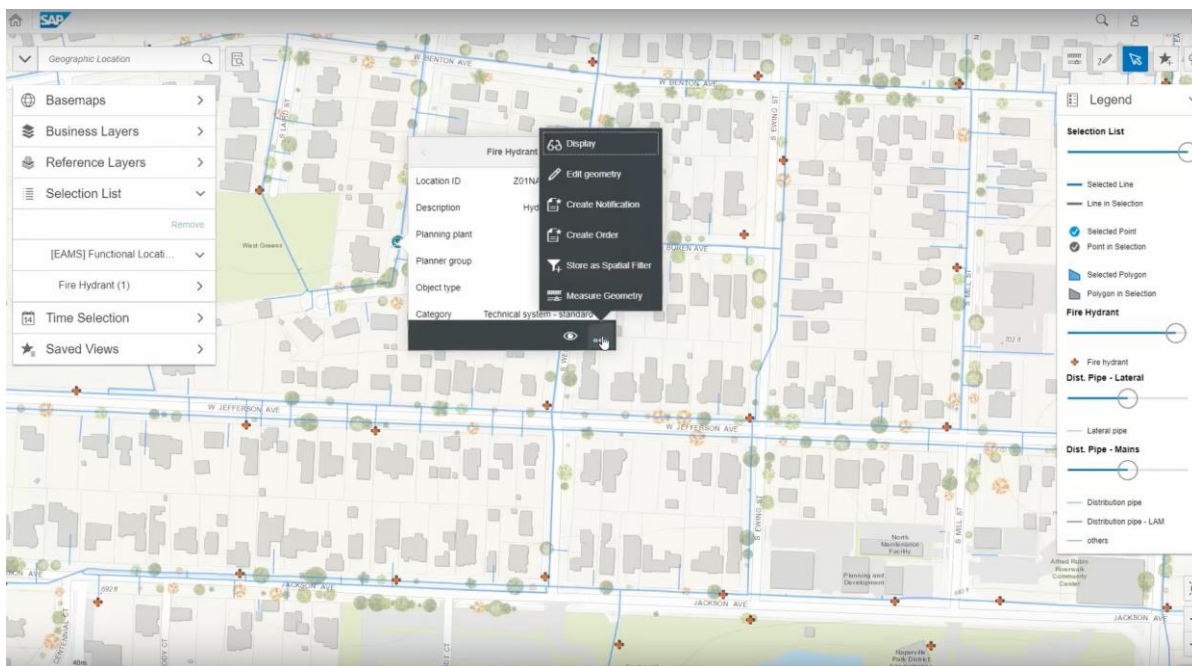


# A Geospatial View of Asset and Work Information

While analysing road asset data and planning maintenance activities for specific assets, it is often required to view a geospatial representation of the roadway and its surroundings. The SAP Geographical Enablement Framework (GEF) provides the ability to embed a map view of an asset, based upon data fed from a GIS, right into the SAP asset overview or work order screens. From a single system, a maintenance planner or field technician is able to have all the information

they require to perform their work.

To provide reliable information and ensure user confidence, it is critical that the accurate geospatial asset data is in sync with the organisation's GIS database. Rizing's Mercury integration software provides real-time, seamless and bi-directional integration between an organisations SAP system containing GEF and the organisation's GIS system.



Road Network Organisations maintain a great deal of data for their networks, and the key tool for road analysis, structuring and planning is the organisation's GIS system and the integration of the Linear Referencing system in SAP to the

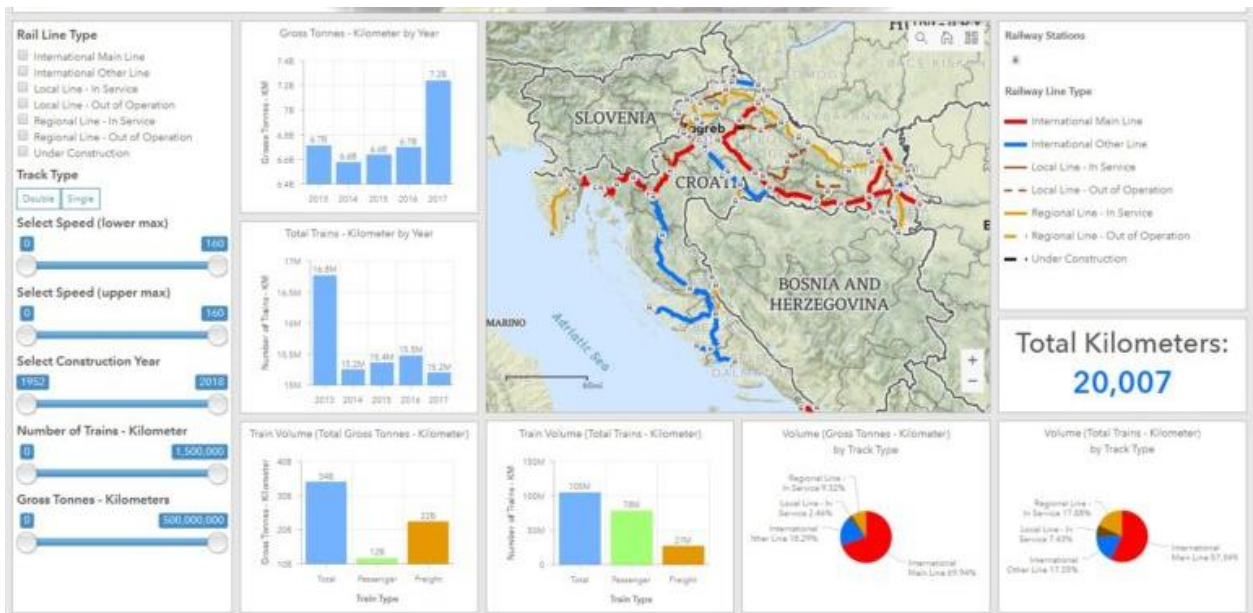
geographical locations depicted in the GIS solution.





In the GIS environment, the available products allow for querying, filtering, mapping, analysing and reporting on the assets and work information managed by SAP along with other geospatial data such as functional classifications, speed limits, traffic counts, or

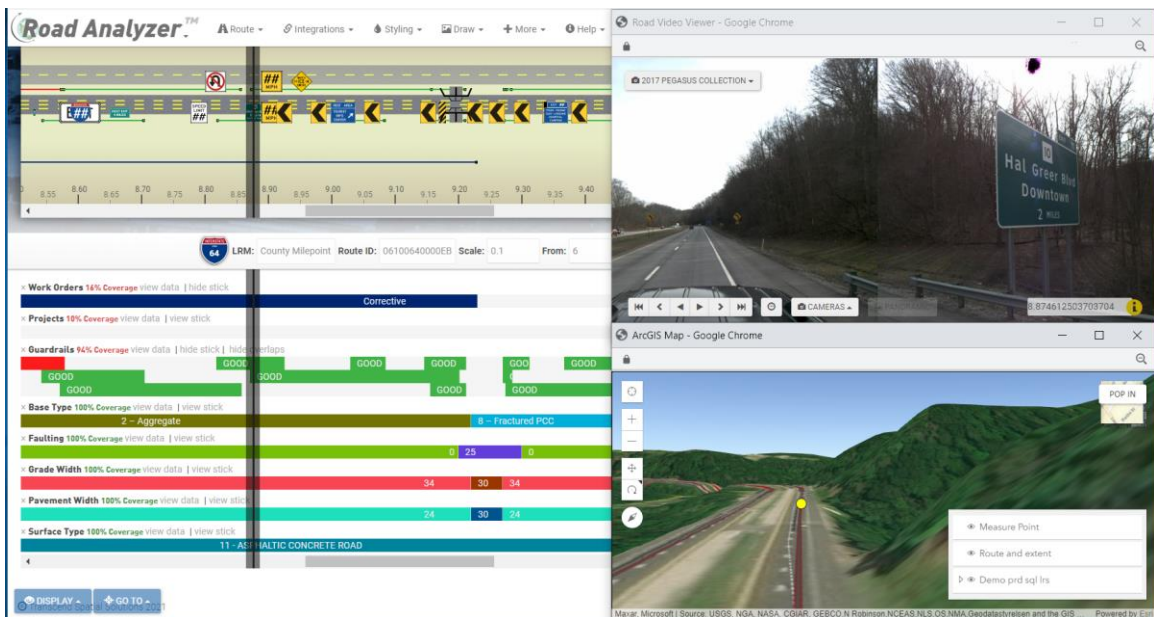
intersection areas of influence. In addition to traditional mapping tools, it is possible to setup tools like an Operations Dashboard that can consolidate information pulled from SAP by Mercury with other statistical data to facilitate decision-making and data awareness.





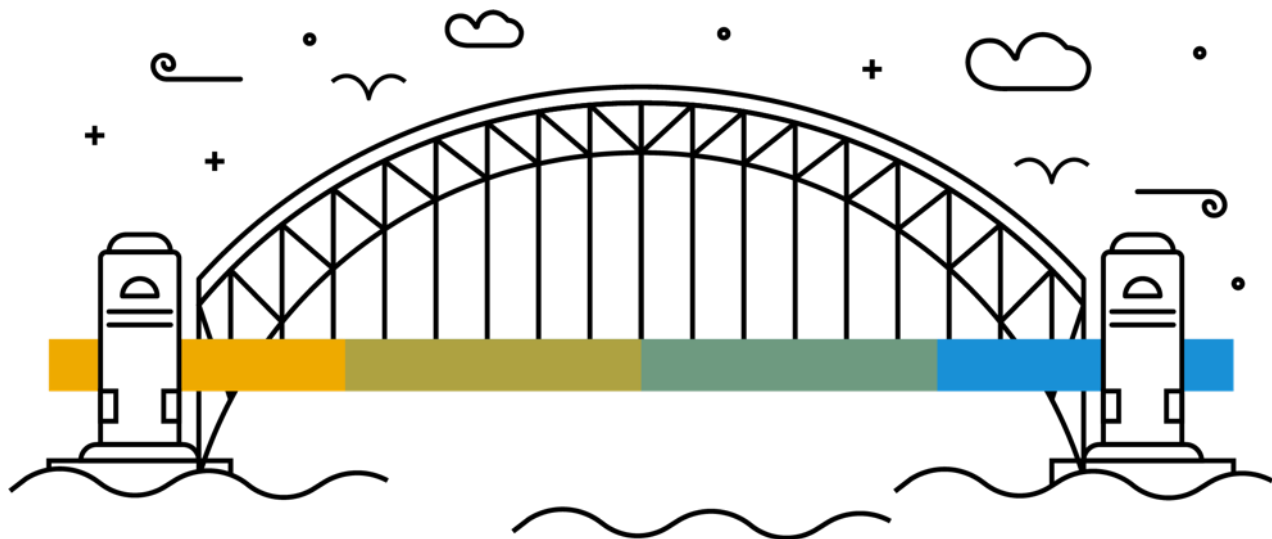
Along with the basic functions expected from a GIS solution in visualisation and maintenance of road networks and associated data from a map, the solution built by SAP and Rizing allows for in depth visualisation and analysis of pavement cross-section – via the Rizing Road Analyzer tool. Road Analyzer allows transportation users to view multiple layers of information in a straight-line diagram format. Viewing this information in a traditional mapping interface

would result in cluttered information that is difficult to see and understand. In addition to being an excellent visualisation tool, Road Analyzer provides a wealth of integration capabilities and the integrated applications stay in sync with Road Analyzer as a user moves along a selected route segment. Those integrations may include maps, Google Street View, video logs, and LiDAR point cloud viewers.



With a core asset and work information foundation in place, some of the bespoke road asset requirements can be addressed using GIS and SAP built-in intelligent technologies such as:

- The creation of a digital twin of required road assets including pavement surface segments, layer materials, lane and road usage data, streetlights, traffic signage and road operational technology.
- The integration of linear data in real time between SAP and GIS allows for the automated creation and update of data during construction, modification or road realignment scenarios.
- The modelling and maintenance of corridor assets such as property boundaries, footpaths and cycleways, rest areas, vegetation, safety barriers and culverts.
- The criticality of highly engineered assets such as bridge and tunnels leads to the suitability of Industry 4.0 concepts such as interconnected sensors, IoT data and real time insights. SAP Predictive Asset Insights can be used for condition monitoring, predictive analysis and asset behaviour modelling.
- The assessment of high-risk assets and associated mitigation plans (i.e. slopes, bridges) by performing failure mode and effect analysis and risk assessments using SAP Asset Strategy and Performance management tool.
- The mapping in GIS of detailed inspection routes used during assisted and optimised work planning and scheduling.





SUPPORTING BUSINESS CAPABILITIES	SOLUTION
<ul style="list-style-type: none"> <li>Managing assets from design, commissioning, operation and maintenance, through to decommissioning.</li> <li>Work identification, planning, scheduling, execution, completion and analysis</li> </ul>	<ul style="list-style-type: none"> <li>SAP S/4HANA Asset Management</li> </ul>
<ul style="list-style-type: none"> <li>Extended modelling based on linear referencing of assets and attributes</li> <li>Dynamic segmentation to support capture of different attributes along the length of an asset</li> <li>Work planning and history capture down exact linear locations along a road segment.</li> </ul>	<ul style="list-style-type: none"> <li>SAP Linear Asset Management</li> </ul>
<ul style="list-style-type: none"> <li>Visualise and maintain road networks and associated data</li> <li>Establish the authoritative location of assets using organisation-wide linear referencing systems (LRS)</li> <li>Synchronize business data changes with changes to network geometries</li> <li>Create as build road data following construction and road re-alignment projects.</li> <li>Connect GIS data with asset management systems for unified data maintenance workflows</li> </ul>	<ul style="list-style-type: none"> <li>GIS Solutions</li> </ul>
<ul style="list-style-type: none"> <li>Ability to view asset data and work requirements on a map from within the SAP system.</li> <li>Embed geospatial capabilities into asset management processes.</li> <li>Consume SAP business data from GIS applications</li> </ul>	<ul style="list-style-type: none"> <li>SAP Geographic Enablement Framework</li> </ul>
<ul style="list-style-type: none"> <li>Sync of SAP Geographic Enablement Framework and GIS Solutions</li> <li>Leverage spatial data in GIS to populate asset geometry in the SAP Geo-Enablement Framework</li> <li>Seamless and Bi-directional synchronization of Linear, Point and Polygon Geometry</li> </ul>	<ul style="list-style-type: none"> <li>Rizing Mercury</li> </ul>
<ul style="list-style-type: none"> <li>Straight line diagramming, pavement cross-section visualization and analysis</li> <li>Integration with viewing tools such as maps, Google Street View, video logs, LiDAR point cloud viewers, document management systems, and operational asset management systems</li> </ul>	<ul style="list-style-type: none"> <li>Rizing Road Analyzer</li> </ul>
<ul style="list-style-type: none"> <li>Real time roadway inventory field data collection and verification (using LIDAR).</li> <li>Office-based data collection based on video log data, LiDAR, and / or aerial photography</li> </ul>	<ul style="list-style-type: none"> <li>Rizing mobile mapping services and OmniSpatial</li> </ul>
<ul style="list-style-type: none"> <li>Asset Performance Management</li> <li>Conduct risk and criticality analysis – i.e. slope risks</li> <li>Perform Failure Mode &amp; Effects Analysis (FMEA) and Reliability Centered Maintenance (RCM) reviews</li> </ul>	<ul style="list-style-type: none"> <li>SAP Asset Strategy &amp; Performance Management</li> </ul>
<ul style="list-style-type: none"> <li>Condition monitoring and predictive analysis</li> <li>Analyse IoT-enabled predictive maintenance data</li> <li>Monitor and simulate equipment behaviour remotely</li> </ul>	<ul style="list-style-type: none"> <li>SAP Predictive Asset Insights</li> </ul>

# Real World Examples



	<p>The City of San Diego</p>	<p>Integration of GIS solution to SAP S/4HANA, creating a smart city with apps used by the public for requesting road network maintenance tasks.</p>
	<p>Norway Public Roads / Bridges</p>	<p>The use of SAP Predictive Engineering Insights (PEI) for real-time monitoring and analysis for more effective maintenance and safe operation.</p>
	<p>Colorado Department of Transportation</p>	<p>Implemented Esri ArcGIS Roads and Highways and Rizing's geospatial productivity and analysis tools to facilitate a new road inventory data model and process design. Are using SAP Asset Management solutions for roads asset management delivered by Rizing.</p>
	<p>US Department of Transport (State DOTs)</p>	<p>Within the USA, approximately 80% of the 50 Departments of Transportation have implemented Esri Roads and Highways. Many are also using Rizing's road analysis and visualisation tools.</p>
	<p>Australian Road Network Condition Proof of Concept</p>	<p>Consolidation of data from 40+ systems to create virtual data model. Utilised in-memory computing and data science to generate real-time insights and close gap between Engineering and Finance.</p>



## Summary

We believe that Road Network Organisations require an integrated asset register that is able to tie all of their processes and interactions (e.g. human, sensors, financial, estimating, spatial) together. If this integrated asset register exists, then current and future integrations and the inevitable ex post facto consolidation of information is achievable. Pre-integrated solutions from SAP, GIS systems and Rizing provide such an asset register.

Based on best in class software from SAP combined with modelling, design and enhancements provided by Rizing, our fully integrated asset management solution allows Roads Network Organisations to access and

process both asset and geospatial data using their preferred application toolset, including SAP and Rizing applications.

Bi-directional synchronisation exposes the core strengths of both asset management and geospatial platforms to be utilised and provides a powerful and complete asset management solution for Road Network Organisations.





# Why SAP?



SAP's industry-leading portfolio of solutions is uniquely positioned to enable digital transformation across all key aspects of their business value chain, supporting end to end asset management processes. The value of SAP is in the seamless integration we deliver across every part of the digital business framework. As we strive to embrace emerging technologies, our customers can look forward to continued simplicity and efficiencies across the asset management landscape.



## MARKET LEADER

- 40+ years of experience in supporting mission critical processes across 25 industries
- #1 Leader in many categories (ERP, business networks, total workforce management, B2B e-commerce, marketing, supply chain, analytics and many more)
- Largest and fastest growing cloud application portfolio with more than 30 solutions for all lines-of-business (LoB) as well as business suites
- Positioned as a Leader in IDC MarketScape: Worldwide SaaS and Cloud-Enabled Asset-Intensive EAM Applications
- Integrated end-to-end solutions with flexibility to deploy on-premise/on-cloud/hybrid
- 17K+ strong partner ecosystem (including major SIs, Esri, Google, Apple, Siemens) to drive innovations and deliver solutions
- SAP portfolio includes innovative and cost effective solutions for the SME segment



## DRIVING INNOVATION

- With SAP S/4 HANA companies can finally operate in real-time and drive step change in productivity
- Market leading open business technology platform with new generation technology stack to drive digital transformation
- One of the first technology companies to embrace design thinking and help customers to drive innovation
- Well positioned to bring newer technologies (like machine learning/ blockchain) into enterprise applications with minimal disruption.
- Through the integration of our industry solutions and new technologies such as IoT and ML we are delivering on a true SENSE/ANALYZE/RESPOND solutions that redefine how companies operate.
- Packaged solutions and services to kick-start innovation and scale quickly

# Why Rizing?



Rizing helps organisations implement market leading SAP solutions in the areas of Enterprise Asset Management, Human Capital Management and Consumer Products. With deep industry experience, Rizing fully understand business problems and how to solve them. They have planned, designed, configured, and implemented SAP solutions to meet the asset management needs of hundreds of clients around the world.

Rizing are at the forefront of SAP's intelligent technologies and innovation and are a trusted partner with the SAP global ecosystem.



## MARKET LEADER

- Global client base, including large network-based enterprises across a range of industries
- Travel & Transportation – Sydney Trains, Norfolk Southern, Colorado DOT
- Utilities – Pacific Gas & Electric
- Oil & Gas – Marathon Petroleum
- Rizing's experience with SAP Geospatial integration and Esri ArcGIS Roads and Highways is unparalleled across the globe.



## DRIVING INNOVATION

- Rizing have been working with SAP for many years and are a global vendor of the software. Rizing continuously works to co-develop the geospatial integration SAP solution.
- Focused on specific industries, have augmented SAP's solutions with Rizing EAM's products
- Provide specific innovations in the areas of asset management, GIS integration, mobility, condition monitoring and linear asset inheritance transformation
- Frequently called upon as the experts of the IAM suite of products to present at conferences and at potential SAP customers. Rizing is a participant in the Influence Council for another of the IAM suite of applications, Predictive Asset Insights (PAI).





[www.sap.com/contactsap](http://www.sap.com/contactsap)

SAP Statement of Confidentiality and Exceptions

---

The information in this presentation is confidential and proprietary to SAP and may not be disclosed without the permission of SAP. This presentation is not subject to your license agreement or any other service or subscription agreement with SAP. SAP has no obligation to pursue any course of business outlined in this document or any related presentation, or to develop or release any functionality mentioned therein. This document, or any related presentation and SAP's strategy and possible future developments, products and or platforms directions and functionality are all subject to change and may be changed by SAP at any time for any reason without notice. The information in this document is not a commitment, promise or legal obligation to deliver any material, code or functionality. This document is provided without a warranty of any kind, either express or implied, including but not limited to, the implied warranties of merchantability, fitness for a particular purpose, or non-infringement. This document is for informational purposes and may not be incorporated into a contract. SAP provides this information as guidance only to illustrate estimated costs and benefits of the predicted delivery project. These materials may be based upon information provided by you, information provided by other companies and assumptions that are subject to change. These materials present illustrations of potential performance and cost savings, and do not guaranty future results, performance or cost savings. SAP assumes no responsibility for errors or omissions in this document, except if such damages were caused by SAP's willful misconduct or gross negligence.

All forward-looking statements are subject to various risks and uncertainties that could cause actual results to differ materially from expectations. Readers are cautioned not to place undue reliance on these forward-looking statements, which speak only as of their dates, and they should not be relied upon in making purchasing decisions.

© 2021 SAP SE or an SAP affiliate company. All rights reserved (10/17).

No part of this publication may be reproduced or transmitted in any form or for any purpose without the express permission of SAP SE or an SAP affiliate company.

SAP and other SAP products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of SAP SE (or an SAP affiliate company) in Germany and other countries. Please see <http://www.sap.com/corporate-en/legal/copyright/index.epx#trademark> for additional trademark information and notices. Some software products marketed by SAP SE and its distributors contain proprietary software components of other software vendors.

National product specifications may vary.

These materials are provided by SAP SE or an SAP affiliate company for informational purposes only, without representation or warranty of any kind, and SAP SE or its affiliated companies shall not be liable for errors or omissions with respect to the materials. The only warranties for SAP SE or SAP affiliate company products and services are those that are set forth in the express warranty statements accompanying such products and services, if any. Nothing herein should be construed as constituting an additional warranty.

In particular, SAP SE or its affiliated companies have no obligation to pursue any course of business outlined in this document or any related presentation, or to develop or release any functionality mentioned therein. This document, or any related presentation, and SAP SE's or its affiliated companies' strategy and possible future developments, products, and/or platform directions and functionality are all subject to change and may be changed by SAP SE or its affiliated companies at any time for any reason without notice. The information in this document is not a commitment, promise, or legal obligation to deliver any material, code, or functionality. All forward-looking statements are subject to various risks and uncertainties that could cause actual results to differ materially from expectations. Readers are cautioned not to place undue reliance on these forward-looking statements, which speak only as of their dates, and they should not be relied upon in making purchasing decisions.

