Case Study

Utilicast/MISO: Realistic Power Grid Operator Training with Historic Events

Time Machine® Enables Replaying AVEVA's PI Systems Real-Time Operational Data for Simulation & Testing

Quote

"Solution-Soft's Time Machine capabilities enabled a first-of-its-kind fully synchronized operator training and simulation environment that truly recreates what an operator will encounter in a real-life setting."
— Josh Binstead
Utilicast Technical Architect

About Utilicast

Utilicast is a premier consulting firm dedicated to the energy and utilities industry. With a team of seasoned industry experts, Utilicast helps organizations navigate the complex challenges of the modern energy grid, from digital transformation and system operations to regulatory compliance. They specialize in delivering tailored, high-impact solutions for power grid operators and utilities across North America.

About MISO Energy

The Midcontinent Independent System Operator (MISO) is a not-for-profit organization responsible for managing the high-voltage electricity grid across 15 U.S. states and Manitoba, Canada. Acting as the "air traffic controller" for the grid, MISO ensures reliable and cost-effective electricity delivery for 45 million people. They manage one of the world's largest energy markets and monitor the power system 24/7/365 to keep the lights on for the communities they serve.

Project

To maintain a safe and reliable grid, MISO uses a highly sophisticated simulation environment to train its power system operators. This system acts as a flight simulator for the electric grid, allowing operators to practice their response to real-world conditions without risk. The system features two vital training modes:

- **Playback:** Replaying actual historical events to review past performance.
- **Simulate:** Creating "what-if" scenarios such as extreme weather or sudden equipment failures to help operators build the muscle memory needed to handle emergencies with confidence.

Challenge – Time Traveling the PI System

A significant challenge in making this training environment realistic was the management of "time." The simulation relies on a massive historical database to drive the screens that operators see.

About Solution-Soft

Solution-Soft has been at the forefront of virtual clock software and time travel testing solutions since 1997 to empower companies in the ever-evolving digital world. Our flagship product, Time Machine®, has revolutionized application testing, enabling companies, including many of Fortune 100, to reduce costs and accelerate project delivery by an average of 3 – 10 times across enterprise and containerized systems to run critical software and application testing.

The Time Machine Product Suite extends these capabilities, optimizing cloud migration, test automation, Agile/DevOps, and containerization testing. Time Machine for Containers supports standalone Docker containers, and large-scale Kubernetes and OpenShift clusters (including the world's largest 16,000+ CPU core cluster, 1,300+ namespace deployments with CI/CD test automation.)

Trusted by over thousands of installed base worldwide across diverse industries, including AIG, Australian Tax Office, Atruvia, AMEX, BBC, Boeing, CVS, Discover, Lloyds Bank, National Grid, SNCF, State of CA, ID, HI, MO, OH, NC, and more. We partner with industry leaders like Accenture, Deloitte, DXC, IBM, Microsoft, and Oracle providing cutting-edge solutions for all time travel testing and simulator training needs.

Solution-Soft was founded in 1993 and is headquartered in Santa Clara, CA.

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The training simulator relies on the AVEVA's PI System, a massive time-series archive to drive the displays that operators see. However, the PI System is designed for real-time production and inherently lacks the ability to "rewind" or "replay" specific historical periods for training.

If trainers wanted to simulate a specific storm from the past (e.g., August 14, 2023), the PI System servers needed to "believe" it was that specific day. However, strict IT security policies prohibited changing the actual clocks on the servers, as doing so would break security logs and disrupt other critical background processes. Furthermore, the environment consisted of multiple independent servers (PI Data Archive, PI Asset Framework, and PI Displays) that all had to be perfectly synchronized to the same millisecond.

The team needed a way to make the simulation software "believe" it was in the past without actually changing the time on the hardware.

The Technical Environment

The environment was a complex network of multiple Windows servers, including data archives and display systems. For the simulation to be effective, every single server had to be perfectly synchronized. If one server thought it was 10:00 AM and another thought it was 10:05 AM, the data on the operators' screens would become garbled and unusable.

The Time Machine® Solution

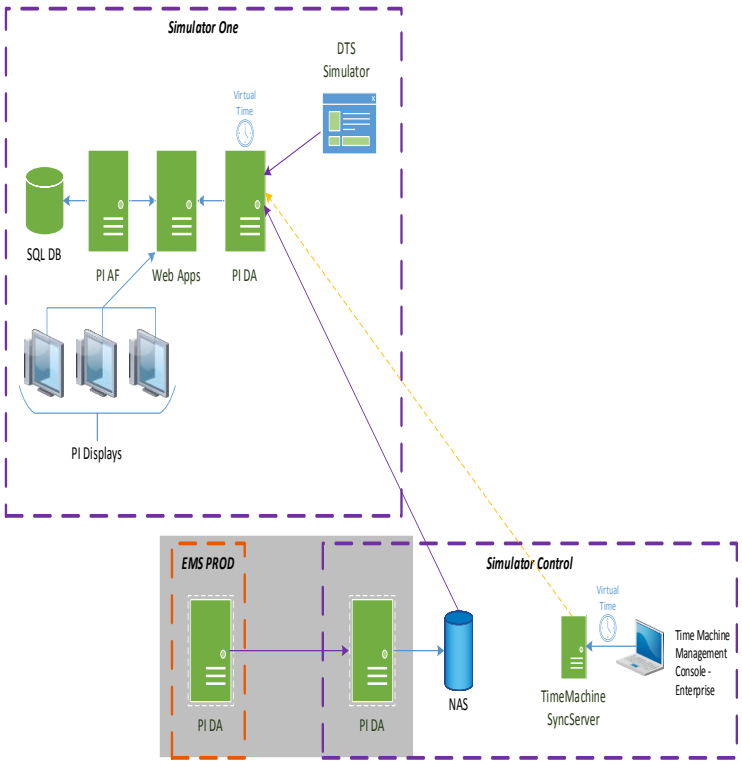
Utilicast implemented Solution-Soft's Time Machine to solve this "time travel" dilemma.

- **Virtual Clocks:** Time Machine provided the PI System with "virtual clocks". The underlying Windows servers stayed on the correct current time for security, while the PI applications "saw" the historical time required for the exercise.

- **Customer-Driven Innovation (Pause & Resume):** To support interactive learning, MISO required the ability to pause simulations instantly when a student asked a question. Solution-Soft responded to this request by implementing a specialized Pause/Resume API and Console enhancement. Now, an instructor can freeze the entire simulation with one click to answer a question, then resume with one click without any timeline drift.

- **Seamless Integration:** A major win for the project was that Time Machine worked "out of the box." The team did not have to rewrite any complex code or modify the existing simulator software, which saved significant time and cost.

- **Automated Training:** By using Time Machine's automation features, trainers can now launch a complex scenario with a single click, with all virtual clocks setting themselves automatically.



POC Diagram: Time Machine Sync Server synchronizes virtual time across distributed servers without altering system clocks.

The Result

The result is a first-of-its-kind, fully synchronized training environment. By leveraging Time Machine, MISO Energy can now provide its operators with the most realistic training experience possible, ensuring they are prepared to keep the grid stable and reliable regardless of the challenges they face.