

Streamline x Plains: PI Convergence and Digital Infrastructure Advancement

The Streamline Approach. At Streamline Control, our team of Operational Data Specialists have over 25 years of combined experience integrating PI Systems. Our goal is to work with systems and software applications that are the best fit for your organization.

Whether your organization is in the oil & gas sector, utilities, mining, pharmaceuticals, or manufacturing, Streamline Control has the PI System knowledge to help drive your business forward.

The PI System by AVEVA is a global leading industrial data management platform that organizations across the world trust to make well-informed critical operational decisions. A gold standard for operational data systems, the PI System enables organizations to digitally transform data into valuable real-time visualizations to gain meaningful insights and increase organizational efficiency.

Experts in All Aspects of the PI System. Streamline PI engineers are experienced in design, deployment and support of PI Systems and are accredited by AVEVA (PI System Infrastructure Specialist/PI System Installation Specialist).



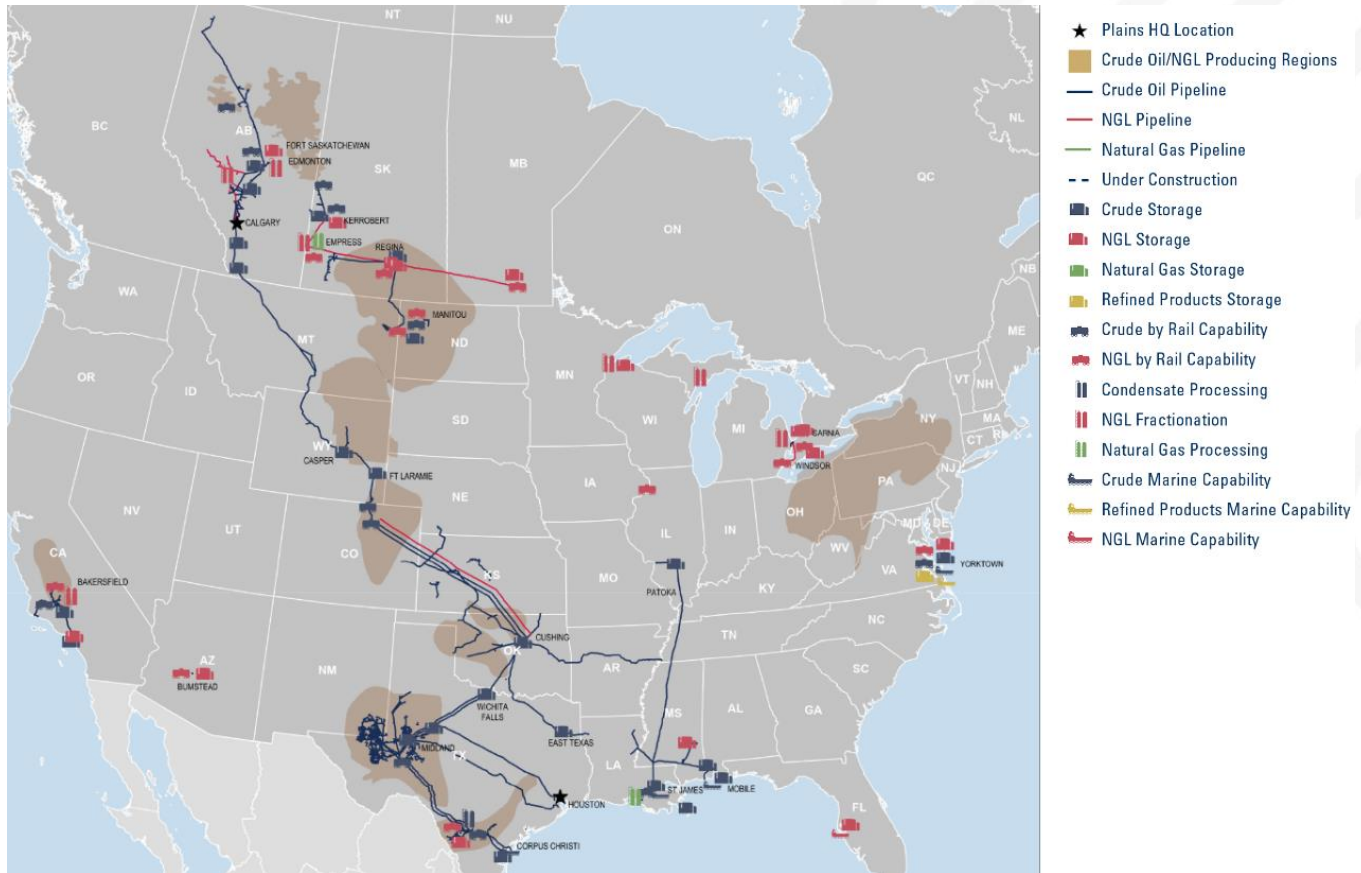
Introduction. Streamline Control (Streamline) is pleased to announce the successful completion of the PI Convergence project for Plains Midstream (Plains). The project's primary goal was to consolidate the existing PI Systems into a unified and centralized PI System serving the entire organization.

This case study provides an in-depth overview of the PI Convergence project, highlighting the collaborative efforts between Streamline and Plains that led to its successful implementation.

Client Profile. Plains is one of the largest midstream energy companies in North America. Plains is a publicly traded master limited partnership specializing in midstream energy infrastructure and logistics services for crude oil, natural gas liquids (NGL), and natural gas. Plains operates a broad network of pipeline transportation, terminals, storage, and gathering assets located in major crude oil and NGL production areas across the United States and Canada. Plains transportation manages over 8 million barrels of crude oil and NGL daily on average. Plains is headquartered in Houston, Texas, with Canadian operations based in Calgary, Alberta.

For more information on Plains, visit their website at <https://www.plains.com/>

Plains assets are seen below.

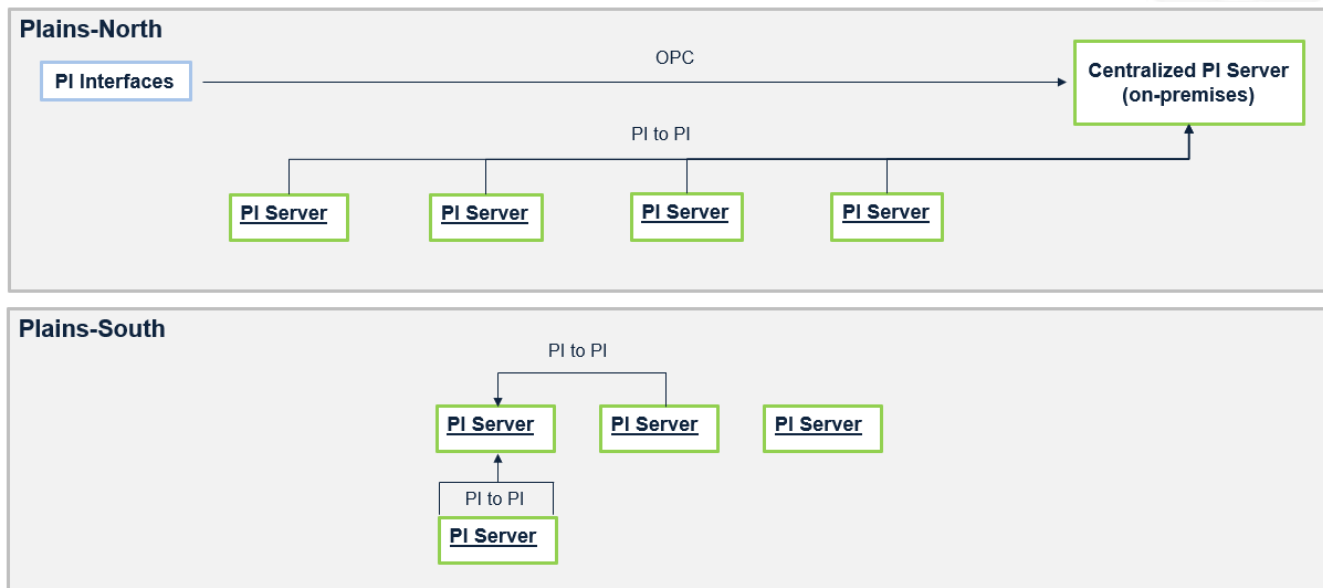


The Challenge. Plains was managing nine separate PI Systems across North America, each supporting different business requirements and end-user decision-making processes. These systems received data through approximately 30 PI Interfaces distributed across various business sites. The PI System architecture was a hybrid centralized system, comprising of eight individual systems located at various sites across North America and one centralized on-premises PI Server. Most of the PI System servers were operating on end-of-life operating systems, making their upgrade a key objective of the project. The PI System architecture at Plains lacked uniformity, with each system differing significantly in terms of licensing, hardware, software, system stability, cybersecurity and overall management practices.

There were several challenges in supporting the architecture:

- Application life cycle management issues related to software versions
- Duplicated data existing at multiple sites
- Differing security models from site to site
- Problems enforcing standardization
- High licensing costs
- High support costs
- High infrastructure costs
- High data management costs

PI System architecture before the PI Convergence project:

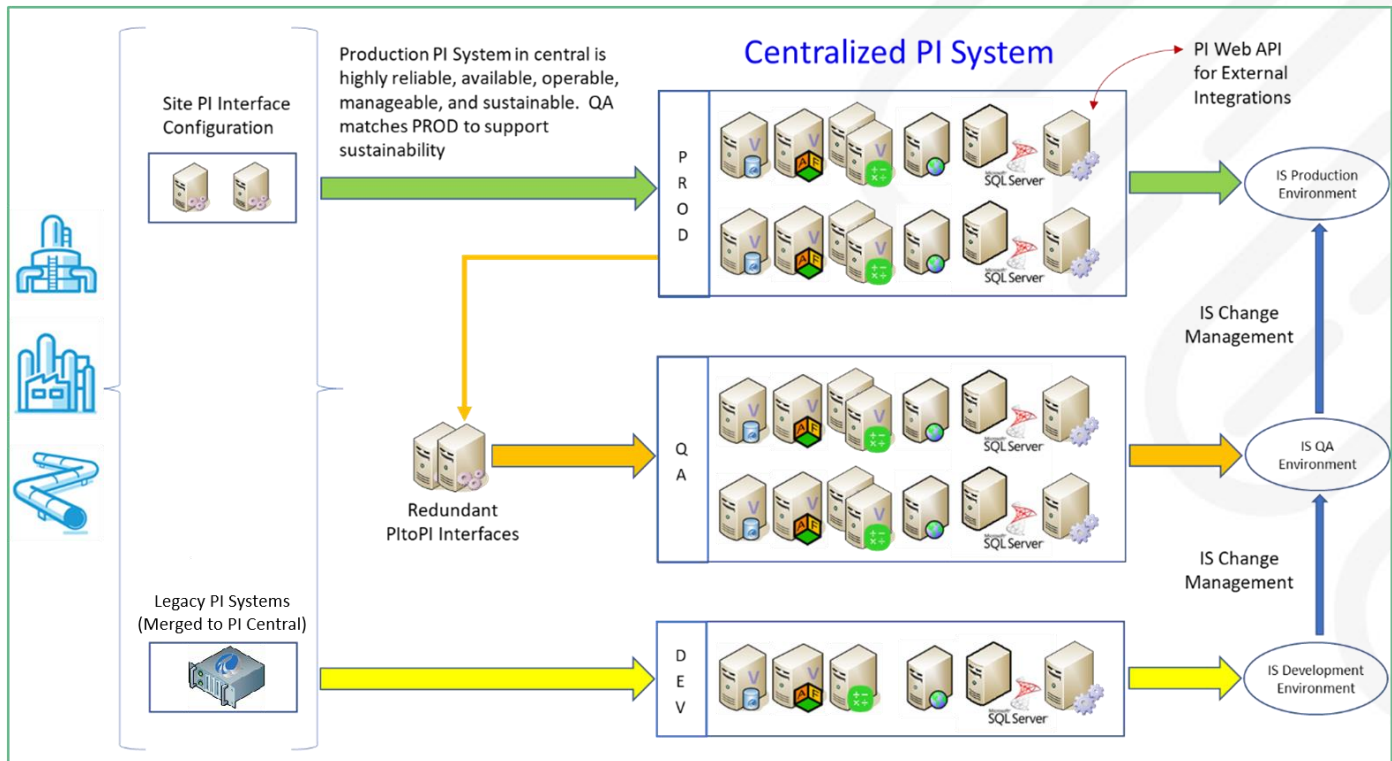


The Solution. Streamline's PI Team brought expertise to the design, configuration, and implementation of the project. Streamline conducted a comprehensive assessment of Plains existing PI Systems and proposed a solution based on the assessment findings and Streamline's extensive experience in the PI industry.

The architecture designed and implemented by Streamline is a true centralized PI System. Hosted on Microsoft Azure, the system is redundant for all the required PI System components – PI Data Archive, PI AF Server, PI Analysis/Notifications, PI Vision, PI Web API and Microsoft SQL Server.

Each site contains a pair of PI Interfaces located in the appropriate network security zone, interfacing into a Central PI System. This central system is built with best practices in mind, such as ISA-95, and includes full development (DEV) and test environments (QA). The development environment was used to stage individual PI Systems and then merge them with the existing centralized architecture. The architecture supports the change management requirements for QA and production. The QA environment has its data sourced from the production environment to ensure testing can be completed between QA and production.

PI Central – Centralized PI System architecture.



Implementation. To establish a clear direction for the PI Convergence project, the following activities were undertaken:

- **Discovery Phase.** Conducted a comprehensive assessment of the PI System architecture across various sites, including a thorough review of existing documentation. Assessment of third-party applications which integrate with the PI System.
- **Centralized Architecture Design.** Developed a centralized architecture based on the assessment findings and close collaboration with Plains Operations. Determined all PI Server and Azure environment specifications.
- **PI System Security.** Collaborated with Plains Operations to establish PI System security, including Active Directory groups and display management, following AVEVA's best practices. Windows' single sign-on (SSO) was incorporated into the design.
- **As-Built Documentation and Procedures.** Created As-Built Documentation along with procedures to detail the construction of the centralized system.
- **Project Execution Plan and Schedule.** Created a detailed execution plan outlining the architecture build steps, implementation process, timelines, cutovers, deliverables, and milestones. Identified key project stakeholders and subject matter experts. Incorporated key performance indicators (KPIs) and metrics to monitor progress, with regular reviews to ensure alignment with goals and milestones.
- **PI System Community of Practice.** Established a PI System community of practice by engaging Plains Operations, the PI Support team and the project team. Scrum meetings followed an agile methodology, enabling parallel progress on multiple project action items.

- **PI System Cutover Planning.** Coordinated with Plains Operations to ensure a seamless transition for end users as individual sites were integrated into the centralized architecture.
- **PI System Integration Cutover Planning.** Collaborated with Plains Operations and subject matter experts to plan seamless cutovers for third-party applications integrating with the centralized PI System. Integration action items were managed in parallel with other project activities to optimize efficiency.
- **Development Environment.** The project team leveraged the development environment to stage and merge all individual PI Systems to the centralized architecture. This approach greatly reduced risks while ensuring no disruptions for end users using the PI System.
- **Standardization.** With the centralized PI System in place, the project team established standards and documentation aligned with AVEVA best practices. These standards included PI tag descriptions, units of measure, digital states, and PI Asset Framework templates
- **Training.** The project team developed training material and quick reference guides for end user reference.

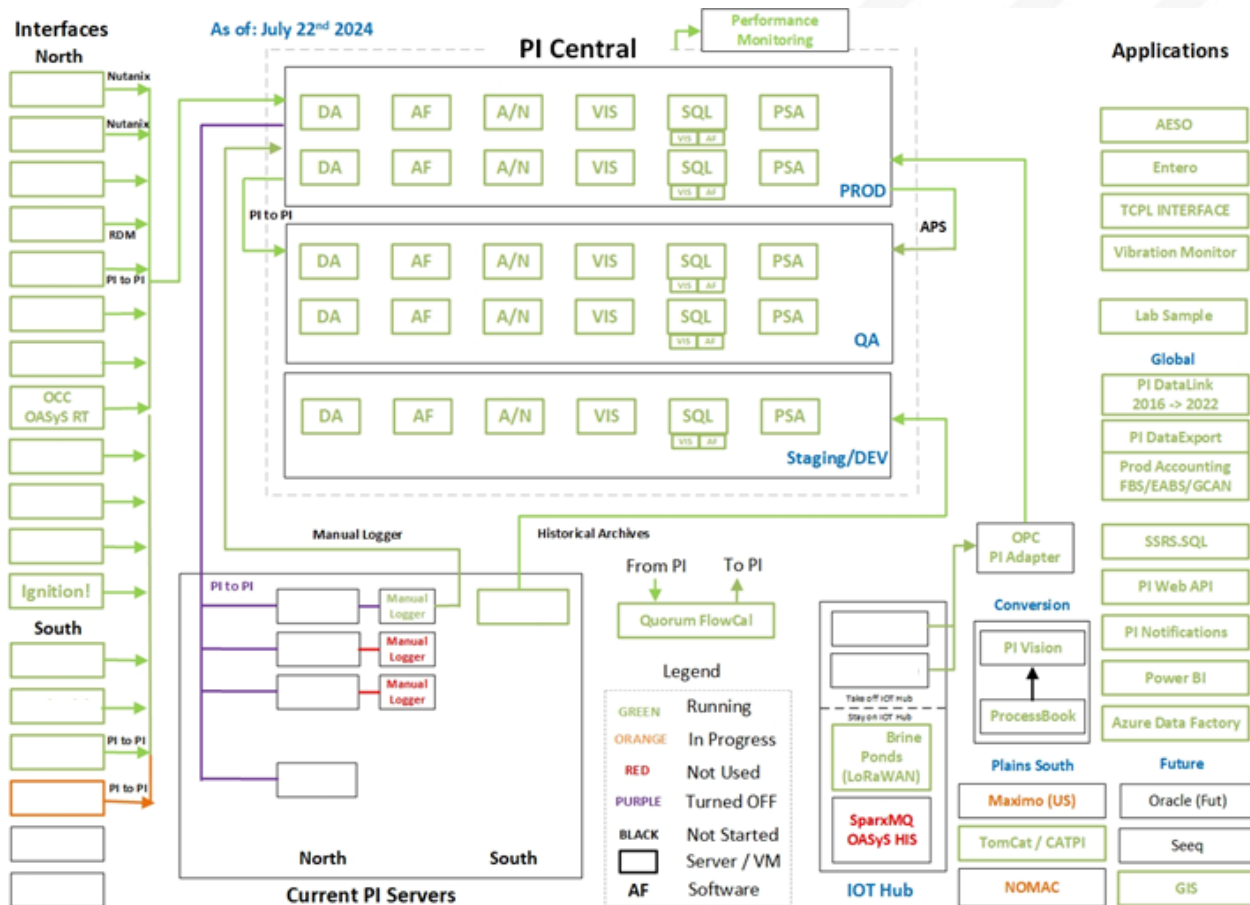
The Plains PI System integrated with numerous third-party applications, with a total of approximately twenty-one application integrations migrated to the centralized PI System.

- Some of the integrated applications included:
- Production Accounting
- Plant Balancing
- Measurement Software
- Vibration Monitoring
- IIoT Devices
- Data exchange between pipeline companies
- Production Reporting using SSRS
- SCADA Systems
- Sampling and Analysis
- Pipeline Leak Detection
- Power BI reporting
- GIS
- Mobile Applications

An effective approach for the project involved conducting interviews with subject matter experts for each of the integration applications and site personnel. The information gathered from these interviews was documented in an “Integration Catalog.” The migration of third-party integrations was managed within parallel project scrums and documented in the project’s As-Built Documentation.

Illustrations were used during weekly meetings to track the progress of each cutover integration. These visuals simplified the complexity of managing multiple integrations, allowing project stakeholders to easily identify which integrations had been successfully cut over to the centralized architecture.

The drawing below is an example of the illustrations used to track progress, with green indicating completion.



Results. Migrating to a true centralized architecture has many benefits. From the successful completion of the PI Convergence project, Plains was able to achieve the following goals:

- **Optimize Total Cost of Ownership.** By minimizing the number of PI System servers and eliminating site-based systems, Plains reduced server, storage, and licensing costs. A centralized license scheme lowers the overall cost per tag, while centralized data handling eliminates duplication and synchronization issues. Standardized training, system management, and maintenance further reduce costs.
- **Enhanced Cybersecurity Posture.** Shifting system access to the secured corporate network minimizes the cyber attack surface. The centralized system enables consistent updates across the operating systems and PI applications, Windows single sign-on (SSO), and a standardized security model.
- **Improved System Access and Functionality.** Centralized architecture facilitates proper development, testing and management of change strategies. End users gain access to the latest PI System tools, self-service operational intelligence data, and streamlined third-party integrations. Configuration consistency across the QA and Production environments streamlines operations, with security managed through standardized Windows Active Directory groups.

- **Reliable, Sustainable and Standardized Environment.** The centralized PI System architecture ensures reliability, scalability, and standardization. Redundant components provide seamless load balancing for core system elements, enhancing stability and minimizing disruptions for users and applications. The system is designed to support future upgrades for both the central PI System and site interfaces, ensuring long-term adaptability.
- **Redundancy, Failover and Backup.** The architecture incorporates redundancy, failover mechanisms and backup strategies to enhance system reliability and data protection.
- **Change Management and Software Development Lifecycle.** Change Management processes are taken into consideration with the architecture. The QA environment enables thorough testing of upgrades, including network, OS and application software changes, before deployment to production. The system enforces clear segregation of user roles to maintain security and operational integrity. Separate roles are established for the QA and PROD environments including PI Admin, PI Tag/AF Editors and Read-Only Access. Additional roles for external applications were also created to support required data access.

The completion of the PI Convergence project marks a significant milestone in the decade-long partnership between Streamline and Plains, which has strengthened through numerous SCADA system upgrades. The centralized PI System integrates Operational Technology (OT) data into corporate applications, consolidating all of Plains PI Systems into a unified architecture. This centralized system delivers substantial benefits to Plains, enhancing efficiency, productivity, and overall effectiveness. The successful execution of the PI Convergence project not only highlights the strength of the Plains-Streamline partnership but also highlights the shared commitment to continuous innovation and collaboration.