

Technology Brief

Executive Summary

Achieving corporate performance by growing both the top and bottom lines is a universal goal for all companies. For manufacturers, this requires a deep understanding of the underlying cost make-up of the materials and supply chain, and the revenue composition of the product and customer mix. Disparate systems and silos of communications obscure the pre-requisite data that decision makers need to act on the levers that influence company performance. Manufacturers are faced with these challenges to achieve cost and contribution margin transparency at a detailed level so that customers and products can be properly segmented, leading to actionable decisions. To deliver meaningful margin calculations down to the order level, pvelocity has created technologies that knock down these barriers.

At the core of these technologies is our pvelocity Application Server (or simply, the *Engine*). The Engine is designed to connect to the separate data sources of the enterprise and unveil the top and bottom line impact of individual orders and customers. Our tight integration with the ERP data model ensures a rapid deployment, while our unique algorithms correctly match and assign relevant cost allocations to their associated revenue for calculating meaningful margins.

Our Engine also has interactive workflow processing capabilities, so that insights discovered from the decision support capabilities can be seamlessly transitioned into action items and to do lists. These action items can be assigned, tracked and monitored, allowing manufacturers to forecast and quantify margin and pricing improvements, at the customer and product level where it is actionable. Participants of these workflows can analyze, decide, act, measure and monitor improvements in a continuous fashion. This closed loop process break down communication silos by providing well-informed collaborations, improving company forecasts and meeting corporate management and commercial objectives.

Our User Interface Server (the *HTML5 Presentation Server*), using modern web based technologies, delivers the Engine's capabilities in an intuitive and consistent manner through rich graphical components stitched logically together in navigable workflows consumed on mobile devices and desktops.

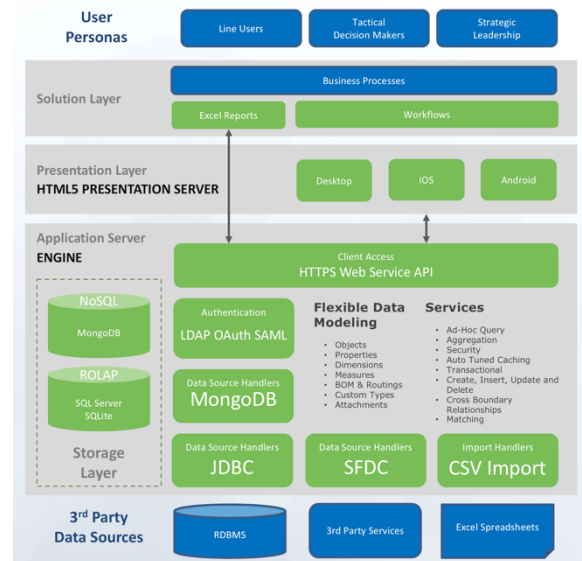


Figure 1: Architecture Landscape

The user interface retains the same look and feel whether the user is using it on a phone, tablet or on a desktop computer.

Our proven Engine and HTML5 Server together provide tailored corporate performance solutions that have been deployed by multinational manufacturers used by their employees across the globe.

Engine

The pvelocity Engine is built with the mature server side Java technology platform. With the embedded Apache Tomcat web application server, the Engine is fast, secure, and extensible. Natively, the Engine communicates with traditional SQL based RDBMS, such as MS SQL Server and MySQL. The Engine also understands NoSQL based document system using the popular MongoDB as its storage system. Remote services such as Salesforce.com are also integrated. Regardless of how and where the data is stored, the Engine has a common query and data manipulation service to address them, hiding the complexity of communication and protocols from other systems using the Engine's services.

Fast Deployment

Unlike traditional OLAP solutions, where a decision support project must go through a lengthy period of discovery and design of a data warehouse, the

pvelocity Engine automatically creates the required data model, rapidly delivering results and value to key decision makers. Upon integrating with ERP systems like Oracle and SAP, users can immediately perform ad-hoc queries for meeting the demands of performance management in the areas of pricing, sales, purchasing, and margin improvements.

Broad Integration with Other Data Sources

The Engine is architected with different data source handlers as optional plugins to handle different types of data. One popular augmentation to the ERP data are Excel spreadsheet. Other data source handlers are used to seamlessly communicate with other SaaS offerings such as Salesforce.com and NetSuite.

Analytical (OLAP) and Transactional (OLTP)

The Engine supports both analytical and transactional processing.

Analytical processing (OLAP) for segmentations and quick discoveries of customers and products by margin, service levels, and pricing. Corporate risks are made apparent by understanding the usage and costs of materials, equipment, supply chain sources and routings.

The OLAP processing also has specific algorithms for matching business transactions such as invoices and receivables to purchases and costs, such that an accurate account of margin can be calculated from the order line level and aggregated to customer accounts, product categories, and beyond. These capabilities are purpose built for the manufacturing environment and it is what differentiates pvelocity from other generic OLAP vendors that require significant data warehouse design and customization to deliver even a basic margin analysis solution.

Transactional processing (OLTP) is used to manage custom business documents that are created and updated to track and monitor business progresses. Action items or sales opportunities are good examples of such documents.

The use of both types of processing within a single common user interface, empowers companies using pvelocity to truly close the loop on continuous improvement process and corporate performance objectives.

Accessible Through Web Services

No matter how many different data sources and third party applications that are being integrated into the pvelocity solution, all capabilities are accessible through a unified and common web service based API. The Engine abstracts and hides the complexity of the different communication schemes and the data models, creating a single and consistent querying and analytical interface that can be consumed from any platforms that use a web based API through HTTP. The API is secure with the application of TLS. The engine can scale horizontally and vertically depending on deployment requirements.

Secure

To gain access to Engine services, an authenticated session with the Engine is required. The Engine supports multiple authentication modes:

- Native authentication using ID and password
- Delegation to an LDAP server
- Using OAuth to integrate with a third party
- Integrate with an identity provider via SAML

The Engine is designed to provide single sign on convenience without sacrificing critical security.

Extensible

The capability of the Engine can be extended with our Javascript framework built on the Node.js platform. Implementers can create onsite application specific logic to address unique business process requirements. These extensions are made available through web services as well as through the user interface.

HTML5 Server

The HTML5 Server is implemented with the Node.js platform and the Express module. This server coordinates with user interactions on the browser and determines how to render data results and navigation items, such as menus and buttons.

A hybrid Model-View-Controller (MVC) framework is created by pvelocity to increase the performance and the fluidity of the user interface, so that users do not experience unwanted stuttering and other halting distractions. Web sockets are used between the code

running on the browser, and the core user interface logic, running on the HTML5 Server. The sockets provide both push and pull communication between the browser and the server. The MVC framework allows for dynamic deployment of Javascript code ensuring a minimum set of code and DOM elements present on the browser at any given time. This optimization makes the pvelocity user interface scalable on a wide variety of operating platforms, from resource challenging mobile devices to super powerful desktops.

The HTML5 Server communicates with the Engine using its web service API. Both the HTML5 Server and the Engine typically reside on the same server.

Highly Configurable

The user interface architecture is component based. A component represents a rectangular graphical container displaying data to a user. Below is a partial list of component examples:

- Bar / Line Chart
- Scatter Plot
- Bubble Chart
- Pie Chart
- Funnel Chart
- Table Selector
- Multi-Field Selector
- Waterfall Diagram
- P & L Table
- Funnel / Pipeline Diagram
- Detail Form
- Browser

Each component can further be configured to show appropriate fields or properties of the data being queried. Components are laid out and connected to constitute a workflow. Therefore, a workflow is a collection of components in sequence. User interaction on a single component causes a data propagation to ripple through the downstream components. The interconnected components within the workflow provides a rich interactive environment for the user.

Workflows can also be connected in a hierarchical manner so that the user can drill down from a workflow to another workflow.

Workflows are totally customizable and can be constructed by any user with appropriate privileges. Users simply select the components that they want to add, and then drag and resize the component to the desirable position on the screen.

Visually Scalable with Consistency and Familiarity

The workflow concept is visually scalable and pvelocity HTML5 Server will adjust its layout accordingly based on the size of the display area, presenting the most

usable format for the user, whether it is in portrait mode on the phone, or in landscape mode on a high resolution desktop.

The workflow layout and navigation items are tuned for both touch and click interfaces, allowing users to participate either on the go, or sitting down at the office with a keyboard and mouse.

Consistent navigation concepts and layouts makes it easy to learn with instantaneous adoption. No matter how small or large the display, the user only needs to understand a limited number of gestures to use the pvelocity solution.

Adaptable

Every business process is different, each incorporating the unique philosophy and running of a business. Our workflow architecture allows pvelocity to quickly configure, adapt and deploy a solution that matches the native processes without needing to modify or adjust the process. It can literally mirror your existing processes.

Secure

Our hybrid MVC framework positions sensitive business logic on the HTML5 Server that is inaccessible from prying eyes. Those who may be curious to view the HTML page or source code will only see a minimal set of HTML elements required for the display. Unlike other single page HTML5 applications, our user interface framework renders in a Just-In-Time (JIT) manner only the minimal DOM elements required with a small layer of Javascript bootstrap code. Logic on the browser is installed and removed dynamically as they are needed. Business and navigation flow logic are fully protected and are never loaded in the browser, because they reside on the HTML5 Server.

Extensible

The component and workflow paradigm allows pvelocity to configure or build specialized visual components depending on the requirements. These may include tailored monitoring visuals, custom charts, or alert views with special indicators and layouts.

Proven

The combination of the Engine and HTML5 Server's capabilities means users can navigate from leads and pipeline data in one system, such as Salesforce.com, to ordering and fulfillment data from the ERP system, and further to dependent materials and suppliers from perhaps a different procurement system, all within a single, consistent and friendly user interface, whether on mobile or on desktop.

The pvelocity technology suite has been deployed to numerous multinational manufacturers with hundreds of different geographical sites spanning the globe. Users from around the world securely access our corporate performance enhancing solutions deployed with the pvelocity software stack without issue or downtime.