

**WHITEPAPER**

# PIVOTAL CRM ARCHITECTURE

Built for Enterprise Performance and Scalability



## **ABOUT**

Performance and scalability are important considerations in any CRM selection and implementation process. Pivotal CRM's web platform is architected from the ground up for optimal performance over local and wide area networks. This white paper examines the factors that impact CRM performance and scalability and looks at how Pivotal CRM's flexible architecture addresses these issues.

## INTRODUCTION

Performance and scalability are important considerations in any CRM selection and implementation process. These issues can be quite complex, and a proper investigation of

performance and scalability should extend beyond simple questions regarding how long it takes to open a form or what kind of hardware is required for a given number of users.

Pivotal CRM's web platform is architected from the ground up for optimal performance over local and wide area networks (LANs and

WANs). This white paper examines the factors that impact CRM performance and scalability and looks at how Pivotal CRM's flexible architecture addresses these issues.

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## KEY APPLICATION PERFORMANCE FACTORS

Application performance is typically—and most practically—determined by measuring how quickly a user can complete an end-to-end business task. This measurement depends on two factors:

1. **Application Speed:** How quickly the user can retrieve data and access functionality over a local or wide area network (for example, how long it takes to open a form)
2. **Business Productivity:** How quickly the user can complete a business task once they are in the application and the information has been retrieved.

Factors that affect application speed include bandwidth, latency, server round trips, hardware, compression, and performance optimization. Factors that affect business productivity are screen design, navigation design in relation to the business context, number of clicks required to complete the task, ability to multi-task, availability and presentation of information, number of applications the user has to access to complete the task, and so on.

## PIVOTAL CRM: DESIGNED FOR PERFORMANCE AND SCALABILITY

A high-performing enterprise application must adhere to all aspects of the performance measurement factors described above. Pivotal CRM's architecture was designed to take into account the various factors that ultimately lead to performance and scalability. The sections that follow outline the best practices in design and architecture that have gone into Pivotal CRM to produce a world-class enterprise application with unmatched performance and scalability.

## APPLICATION SPEED

The first key performance measurement factor is the speed at which an application can retrieve data and access functionality over a local or wide area network. The following Pivotal CRM design attributes address this challenge.

### Minimization of Server Round Trips

**Description:** Pivotal CRM is based on a three-tier architecture that offers clear separation of its foundation (database layer) from the middle tier (application server) and the presentation tier (user access tier). Pivotal CRM can enforce business logic, data integrity, rules, and workflow both at the middle tier and at the presentation tier.

**Benefits:** The ability to delegate enforcement of some of the business logic and workflow to the presentation tier allows for some client-side processing, offloading certain tasks from the Pivotal application server. This benefits the user by minimizing server round-trips, which results in a faster, more responsive application for the end user. For example, validating certain tasks or enforcing some rules on the client device—before a request is sent to the middle tier—can avoid extra round trips between the application server tier and the presentation tier, thereby improving performance.

## Middle-Tier Caching

**Description:** The Pivotal Business Server, upon start, reads and caches the metadata definition and all components in the middle tier.

**Benefits:** As more users use the CRM system, the metadata, procedures, and execution methods get cached in the middle tier and the system becomes more responsive.

## Deployment of the Pivotal Application Server in Server Farms

**Description:** The Pivotal Business Server can be load-balanced across multiple servers in a farm.

**Benefits:** If a Pivotal Business Server is busy processing a request or is unavailable, the request is automatically routed to the next available server in the farm. By load balancing

the Pivotal Business Server across multiple servers, Pivotal CRM is able to support thousands of concurrent users, as well as provide failover redundancy.

Upon the first version release of the Pivotal CRM web architecture, Aptean and Microsoft jointly put the Pivotal CRM system under a massive stress and scalability test, pushing the application to 20,000 concurrent users. The results were response times of under one second. In subsequent releases, many additional

performance enhancements have been made to Pivotal CRM, further improving its performance and scalability.

## Satellite Servers in an N-tier Deployment

**Description:** Pivotal CRM's HTTP synchronization technology enables deployment of satellite servers for Pivotal CRM across departments or geographies. This "n-tier" deployment allows

bi-directional synchronization of both enterprise data and metadata (customizations) between master and satellite servers at set intervals of as low as one second.

**Benefits:** Deployment of Pivotal CRM satellite servers allows for a hybrid of centralized and distributed architecture, where remote locations can access a Pivotal CRM satellite server locally over a LAN instead of going across the WAN. This deployment overcomes infrastructural limitations between offices and/or in remote offices with poor connections to the master servers. In addition, it can provide redundancy: if one server fails, the rest will continue to operate, queuing changes until the failed server is repaired or backed up. There are no limits to the number of satellite servers you can deploy.

## Pivotal CRM's Stateless Web Application

**Description:** The Pivotal CRM client is a stateless web application: it only uses network resources when a request is made.

**Benefits:** This architecture eliminates wasted hardware resources, since the hardware/network resources are only used when a request is made, which frees up resources to process other requests faster. In addition, it reduces your hardware costs since hardware sizing is done based on the number of actual concurrent users, not the total number of users.

## Client-Side Caching

**Description:** As users navigate through the Pivotal CRM system, forms are cached on their computers.

**Benefits:** After forms are cached, only net data changes are sent back and forth between the tiers, which reduces unnecessary activity and improves performance. In addition, Pivotal CRM forms only need to be loaded once; they do not require the screen to be refreshed as users tab through the different components of the forms.

“The Pivotal Smart Client can provide a single coherent interface not only to data and functionality within the Pivotal application, but also to third-party applications or web pages.”

## Ability to Leverage Local Workstation Resources

**Description:** As a Smart Client application, Pivotal CRM can take advantage of local resources (CPU, hard disk, peripherals, etc.) to do work at the local level—on the user's computer.

**Benefits:** The power of workstation and notebook hardware has increased in recent years. Because Smart Client applications take advantage of these local resources, users typically experience greater responsiveness and performance from a Smart Client application such as Pivotal CRM. In contrast, thin clients generally do not access local resources, and if they do, it is through an extra layer, such as a COM layer, which requires information to be passed back and forth to the central server.

As a Smart Client application, not only can Pivotal CRM take advantage of the local CPU, but it also has the advantage of permitting multi-threading, which dramatically increases performance by allowing different tasks to occur simultaneously.

## Indexing and Full-Text Search

**Description:** Pivotal CRM supports full-text searching and indexing directly in the Pivotal Toolkit.

**Benefits:** This improves performance by enabling faster data access, searches, and querying.

# BUSINESS PRODUCTIVITY

The section that follows discusses how Pivotal CRM addresses factors that affect the second performance measurement criteria: productivity, that is, how long it takes to complete an end-to-end business task.

## Navigation Structure

**Description:** Unlike most enterprise applications, Pivotal CRM's navigation is modeled around the business structure, rather than the database model. The navigation is based on a three-level structure that is not limited by the data model,

which means that it is highly adaptable to different company requirements. It is designed to segment and provide access to data and functionality in a manner that best represents specific end users' roles within the company.

**Benefits:** This navigation structure enables users to navigate the system more easily, with far fewer clicks to access data. Users are provided with important information and functionality through context-driven Task Pads and portals that provide real-time reports, KPIs, alerts, queries, and so on. In other words, as a user navigates through the system, the portals and Task Pad contents change to reflect the most commonly needed tasks and data for this contextual area of the application.

In addition, Pivotal CRM is built for multi-tasking in a non-linear fashion. Users can easily interact with multiple forms at the same time, peel forms off and save them for later use, create shortcuts to their most frequently used functions or records, easily access their navigation history, etc., all of which greatly enhances productivity and reduces the time required to complete a business task.

Furthermore, the Pivotal Smart Client can provide a single coherent interface not only to data and functionality within the Pivotal application,

but also to third-party applications or web pages.

This provides a one-stop resource through which end users can complete an end-to-end business task that requires access to more than one application. It therefore increases

productivity by reducing the need to switch back and forth

between multiple applications and to enter redundant data.

## Configuration of Smart Client Forms

**Description:** Smart Client forms in Pivotal CRM provide a customized view of CRM data to end users. Each form

“Pivotal CRM's security filters improve performance by limiting the data accessed based on individual needs.”



provides 1) the end-user view (form); 2) links to the underlying data structure; and 3) logic, workflow, and customized functionality.

In addition, the Pivotal CRM Task Pad provides a set of shortcuts that offer one-click launch of commonly used activities associated with the type of record the user has on screen. This Task Pad can be personalized and sorted into custom categories, and its contents change dynamically as the user navigates the application to display information and tasks that fit the area of the application and page type the user is viewing.

**Benefits:** The Pivotal Toolkit embeds Microsoft Visual Studio form designer, which allows each form to be fully configured based on the specific needs of each user. The Pivotal CRM form designer can also be used to configure each form to ensure optimal performance in low-bandwidth environments. This can include full control over the number of fields on each page/tab, number of records pulled from secondary tables, paging, layout of each form, and so on. In addition, certain user interface behavior can be set using the Pivotal CRM and Visual Studio form and field properties to prevent round trips to the application server.

Pivotal CRM's Smart Client architecture allows you to present data in a manner that makes sense for your business and takes best advantage of the screen real estate. The screens are designed to make it easier for users to retrieve information and make decisions quickly.

Pivotal CRM loads the appropriate net data when it loads a form, which means users don't have to wait to retrieve data each time they navigate from one tab to another tab within the same form. In addition, Pivotal CRM has the ability to divide the search results of a query or secondary table data into pages to ensure that the database server is not overloaded.

The Pivotal CRM Task Pad feature increases efficiency by allowing users to complete their business tasks in far fewer clicks—common activities are a single click away. In addition, every button and every form that is provided to the end user

is specifically designed for that user and his or her role within the organization.

## Multiple Views and Access Types

**Description:** The Pivotal Toolkit enables administrators to control security and authorization access for all Pivotal CRM end users. Security rights can be set up for individual users, groups, or access types (WAN, mobile, handheld, etc). In addition, Pivotal CRM's security features allow multiple views of each object. For example, the contact table may be associated with 10 different contact forms, each assigned to different security groups, allowing users to see only the information for which they have security clearance and in the format that makes the most sense for their role. This means that within the same Pivotal CRM system, some users can have a completely different look, feel, and workflow/business processes than other users of the same system.

**Benefits:** Combined with the benefits of the Visual Studio Form Designer, Pivotal CRM can

further personalize user access based on individual needs and/or access types. For example, if a group of users is accessing the system from a remote location where WAN bandwidth is poor, and another group of users is accessing the system through wireless devices, Pivotal CRM can ensure that each of these user groups is set up for optimal performance under their unique access conditions. In addition, Pivotal CRM's security filters improve performance by limiting the data accessed based on individual needs, reducing the amount of data that is retrieved to that which is user-appropriate and thus accelerating response times.

“Ultimately, user productivity is the true performance concern.”

## History, Shortcuts, and Portals

**Description:** Pivotal CRM maintains a history of users' activities. This includes both the last few items accessed, as well as a history of the last records loaded. These can be organized in a number of different ways (e.g., by date or type), according to what makes the most sense for the end user.

Pivotal CRM also enables end users to create personal shortcuts to records and areas within the system and similarly organize them in a manner that makes sense to them for fast retrieval of records in the future. For example, users can create shortcuts to their top contacts, reports, and forms.

Pivotal CRM also offers personalized portals, which give quick one-stop access to features and data that each user requires to do their job effectively, all in a single page.

**Benefits:** All of the features above reduce the number of clicks and amount of typing end users have to do to access their most commonly used items. In addition, these features reduce the load on the database server, since users don't have to go through extra steps and queries to retrieve the info they most commonly use.

### Pivotal Diagnostics

**Description:** Pivotal Diagnostics is a web-based utility that provides system administrators with a detailed breakdown and performance measurement of the Pivotal CRM system.

**Benefits:** This tool shows a detailed and graphical breakdown of each transition point at each layer of the three tier architecture, from the time a user makes a request at the presentation tier to the time that the request is fulfilled. Administrators can use this tool to get greater insight into potential network and/or system issues, so they are able to isolate and address each issue accordingly.

## CONCLUSION

As this paper suggests, scalability and performance considerations go much deeper than a simple question of how many users an application can handle. There are many factors that combine to impact performance and scalability for any size of CRM deployment. Ultimately, user productivity is the true performance concern. Each task the user performs in the system—whether viewing a record, retrieving search results, processing a lead, running a pipeline report, or converting a quote to an order and submitting it to the back-end ERP system—must be as fast, efficient, and easy to perform as possible. Each second wasted performing any of these tasks (or the multitude of other daily activities users perform in the CRM system) can quickly add up and result in a loss of efficiency and productivity.

For this reason, Pivotal CRM has been carefully architected to take all these factors into consideration, leveraging best practices in design, technology, and architecture in all of the ways described above to create a world-class enterprise application with unmatched performance and scalability.



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