POWER-TRAK.COM
LOGISTICS INTEGRATION PLATFORM

Power-Trak.com Infrastructure Overview

Power-Trak.com is a highly customizable and versatile enterprise logistics solution that supports multiple simultaneous users who access the core functionality through the internet. The Power-Trak.com infrastructure consists of multiple independent clients connected to a common application group and data set. The system design is modular in nature with many functionally unique components contributing to the overall feature set of the solution. The system has been designed with a few key factors in mind: usability, scalability, availability, manageability, and security.

Power-Trak.com uses a three-tier architecture that is separated logically and physically into the client tier, application tier, and the data tier. We will explore the functionality of the three tiers and the benefits of this architecture.

Client Tier

The client tier interacts with the user via a modular and highly customizable user interface and communicates with the application tier over a network connection. Power-Trak's client tier is accessed universally through a web browser such as Internet Explorer, Firefox, or Netscape. For example, as basic functions clients can view their fleet, submit requests for vehicle tracking, and control certain features on their vehicles. Added functionality would allow the client to access vehicle statistics and reporting as well as internal and external collaboration tools.

Application Tier

The application tier gathers requests from the client tier and executes transactions against the data tier. Requests between the two tiers is employed using HTML and XML over SSL encrypted connection. The application tier is composed of two closely integrated but functionally different components; the data exchange component and data processing component..

The data exchange component acts as a communication layer between the client tier and the data processing layer. It is primarily responsible for insuring reliable and secure communication over common protocols.

The data processing component manages access to stored data between the client tier and data tier. It also contains other data mining and analysis processes needed to deliver advanced features and business intelligence tools. This layer is responsible for processing large volumes of raw statistical and live data into usable and meaningful information.

Data Tier

The data tier physically stores and manipulates the information received from the application queries as well as the response to those queries. The data tier is implemented as a distributed database using Microsoft SQL Servers. The data tier stores and manages information over relational data sets including customer data, tracking data, and mapping data.

The Technology Behind Power-Trak

Power-Trak's client tier is built using the latest Web 2.0 technology. A combination of AJAX (Asynchronous Java and XML) and .Net Server Side technology delivers state-of-the-art thick client interactivity to a web-based solution. The use of this technology allows us to deliver drastically increased performance and robust security by distributing the workload between the client machine and Power-Trak servers.

Common web-based logistics solutions are designed on a model storing and executing all of the business logic on the application servers and utilizing the client tier for visual delivery of pre-assembled and static web pages. Power-Trak's model distributes the business logic into two components (still stored on the application tier); one part executes on the applications servers, processing complex data using various data sources and components, the second part is loaded and executed on client machines assembling and delivering refined data to the user's screen. Processed data is exchanged between the application servers and client rather than pre-assembled web pages. This allows the user to interact with the data using the client business logic without continuously accessing the internet. The application server returns to working with other clients or processing complex data using the server-side business logic.

Power-Trak.com is one of the first few organizations to pioneer this technology including Google, Yahoo, and Microsoft.

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Below we examine key aspects of the Power-Trak.com design including scalability, availability, manageability, and security of our architecture from a cost and management benefits standpoint:

Scalability

The Power-Trak system is designed to be highly scalable, able to readjust to increasing load and customer demand without having to rewrite components. We achieve this by distributing work load across several machines as well as distributing part of the processing to client machines. The load balanced and clustered application tier is also designed to be modular and expandable. The application tier is separated into functional modules each operating independent, but interacting with each other for specific data and tasks. If a new user group demands more load and better performance from our Real-Time Tracking Engine, new servers are added to only the server cluster responsible for Real-Time processing. Any changes to the physical structure of the application tier or data tier are transparent to the user. The data tier implements a similar strategy to storing different types of data using groups of load balanced and clustered servers. Our cost and management benefits are realized from only investing in components that are heavily used.

Availability

Power-Trak is a highly available system that has the ability to be operational a large percentage of the time. Our systems can survive the failure of individual hardware components through load balancing and clustering. Our modular application tier is strategically integrated to allow any module to detect and report failures of other software components it depends on. All failures and recovery from failures are transparent to the user. Our cost and management benefits are realized from reduced and often eliminated down-time, reduced need for customer support and rapid identification and repair of failed components.

Manageability

The key to cost-effective manageability is minimizing detection and response times for systems failures. Power-Trak was designed around modular components whose independent failure is easy to identify and repair, with minimum loss of usability during down-time.

Our system detects faults (or the absence of faults) and automatically reacts to them. These functions originate from instrumentation and enterprise monitoring, respectively. Instrumentation is the feature in Power-Trak that lets us determine the health of the system components at any given time. This includes faulty communications, notification of proper behavior, and “heartbeat” capability to determine that a component is functioning but idle. Features are built into the software modules to allow each module to detect and report failures of components it depends on. This feature prevents “daisy-chain” effect failure of components

Enterprise monitoring tools informs us when a failure occurs. These tools automate the task of watching systems for health and fault tolerance. The enterprise monitoring tool directly integrates with Power-Trak’s instrumentation device allowing for maximum flexibility and speed in responding to faulty events.

The Benefits of Our Architecture

The Power-Trak.com three-tier architecture includes many benefits:

- A simpler and more functional experience is delivered to users with the use of Web 2.0 technology at the client tier.
- A broader reach for application is allowed when the client tier is a browser because an independent platform is used to deliver solutions to the user.
- Less dependency on server processes allowing for increased performance and security by distributing the processing of business logic between the client tier and application tier. It also results in more productive application servers and less demand on bandwidth from both the user and Power-Trak.com.
- It allows for centralized management of business logic for ease of maintenance. The architecture separates user interface logic (client tier) from data access and processing logic (application-tier and data tier), storing both on the application tier, but executing the processes using the distributed model.
- Load balancing and clustering allows for increased reliability and work to be spread over several machines and data to be transmitted to multiple clients efficiently.

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Security

Power-Trak's enterprise security is built around isolating critical information from vulnerability and encrypting data exchanged over public networks. Access to our system is limited to users authenticated by .Net framework security protocols over secure communication channels. Users have access privileges as configured by our systems administrators allowing for organization structure and roles to be setup within our system.

Highly sensitive and critical business processes are isolated from user and network access by splitting the application tier into data access and data processing layers. The data access layer controls and monitors all activity before passing requests down to the data processing layer. All activity performed by the application tier as well as actions performed on the data tier are monitored and logged for anomalous behavior.

Our administrators and support staff have the ability to take appropriate measures when an attack is detected by limiting or blocking access to specific resources or even the entire system.

Conclusion

Implementing a large scale system to execute correctly and consistently while delivering next generation functionality and usability in a distributed environment where millions of requests need to be serviced is the biggest challenge a logistics service provider faces. The Power-Trak.com three tier structure provides the appropriate architecture that is necessary to carry out the many functions that serve our clients, ranging from vehicle tracking and monitoring to user collaboration and advanced reporting. Power-Trak.com offers a comprehensive, cost-effective, and versatile enterprise solution, positioning itself as a leading provider of fleet logistics solutions.

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