**PEAK Technologies,
Pragma Systems & Stay-Linked™:**

A Best-Practices Approach to Getting
the Most Out of SAPConsole™

Introduction

If your organization has invested in SAPConsole™, you've taken big strides toward becoming more efficient and productive in today's competitive marketplace. One of the many reasons organizations deploy SAPConsole is the desire to manage and maintain an efficient, secure mobile computing environment – no easy task, given the current regulatory environment and constantly changing attempts to breach corporate data. But as your needs change, and as better and more efficient mobile devices come on line, it may be time to take a look at your SAPConsole configuration, making sure you're maximizing the value you get from your enterprise mobility environment, generally, and SAPConsole, specifically.

This best-practice primer for getting the most out of SAPConsole draws upon the institutional knowledge of three leading companies – Pragma Systems, Stay-Linked and PEAK Technologies. In this document, we provide a roadmap for supercharging your mobile data-collection solutions, starting by taking a detailed look at key SAPConsole features and optimal performance parameters. We then lay out the elements of an ideal RF solution design – a solution stack that meets every key practice element.

SAP & RF: Maximizing the Benefits

It's been nearly nine years since SAP Labs introduced SAP Console, the first native SAP Radio Frequency, or RF, solution – and, in a world seemingly dominated by web-based applications, SAPConsole continues to offer a solid platform for building robust data collection applications. Even the well-intentioned WebSAPConsole couldn't match the simplicity and success of the original, and was retired in early 2008.

While it remains popular, SAPConsole *does* present some challenges. There's no doubt SAPConsole-based approaches have improved over the years, offering a variety of enhancements that facilitate a better user experience. The critical question here: How do you make the most of the benefits it provides?

Getting Back to Basics: The ABCs of RF & SAP

Let's start with the basics: SAPConsole is a lightweight SAP application that allows specially designed SAP Enterprise Resource Planning, or ERP, screens to be accessed via well known and established terminal-emulation techniques. The SAPConsole application concerns itself only with connecting to SAP and translating screens, and offers no business functionality. (Although there are some key areas where SAPConsole capabilities or limitations come into play, these typically have no impact on what comprises an organization's data-collection solution.)

To create a functioning RF solution, you must establish a Terminal Emulation, or TE, Infrastructure, which serves as the link between SAPConsole and your company's mobile devices. There are several approaches for designing a TE environment for SAP Console – and this, typically, is where the most creativity occurs. A well-chosen TE infrastructure can increase performance and enhance data-layer security, touch-screen capabilities, voice-enabled processing and other advanced capabilities.

Crafting an Optimal SAPConsole Solution: Server Sizing

Moving beyond establishing a solid approach to TE infrastructure, most CIOs report that properly sizing their servers is one of the bigger challenges they face when dealing with SAPConsole. There's not much information readily available on this issue and, as a result, many organizations opt to overdesign, utilizing servers containing a good deal more RAM than is really needed. Given this trend, it's important that potential users understand the three tenets of sizing SAPConsole: initial sizing, scalability, and overload signals.

Initial sizing requires a working knowledge of the Microsoft® Windows® Operating System, the applications that will be used in the mobile-computing solution at hand and the potential number of concurrent (number of users using same resources at same time) – not total – users. In a SAPConsole environment, every active user connection requires the execution of several processes, including SAP Console, command-line shell, and one or more TE server processes, depending on the applications in use.

The example below offers a solid guideline for initial server sizing, based on the assumption of 100 concurrent RF users:

Scenario	Server Sizing for 100 Concurrent RF Users
Application Memory Footprint (Per active user)	SAP Console → 8 MB cmd.exe (Windows Command prompt) → 2 MB Pragma Telnet or SSH Server → 4 MB (5 MB for SSH) Stay-Linked Server → 1 MB + 25%
Base Memory Requirements for Microsoft® Windows® 2003	512 MB recommended
Server Memory Requirements Using Pragma Telnet Server or SSH Server	512 MB + 100 Users * (8 + 4 + 2) = 1212 MB → 2 GB Recommended for 100 Users

On a Scale of 1 to 10, Scalability Rates a 10

Once you've solved the problem of initial sizing, it's time to lay the groundwork for ready – and affordable – scalability. It can be tough to determine application sizing for a Windows environment, given that memory usage isn't linear (in other words, 200 users don't use twice as much memory as 100 users, particularly in an environment where all users are executing the same application set). The underlying reasons for this non-linear memory usage include the virtual memory management present in modern Windows operating systems, as well as the resource sharing between running applications.

So…is the information in our example misleading? In a word, yes. In reality, the recommended memory requirements from our example calculation can handle far more concurrent users.

Here's how:
The memory footprint for typical applications consists of shareable and non-shareable memory like executable code or dynamic link libraries, or DLLs – applications that utilize a high percentage of shareable memory, allowing for greater efficiency in situations where most users are executing the same set of programs. In addition, virtual memory management lets Windows trim down the memory footprint of applications, allowing rarely used components to be moved from physical memory into the swap file.

What does all that mean? A typical SAPConsole environment can operate at an acceptable performance level with about 6 MB of RAM per user, or a little higher for SSH. This depends on several factors – including, but not limited to – your network performance, the intensity of your operations and your authentication process. Given that 6 MB is not an exact figure but, rather, a mark observed through controlled tests, you need a method of determining the breaking point or identifying a "magic number" that signals an overburdened server.

There's no doubt about it: reading the tea leaves to determine when a system is overloaded is really more art than science. Finding the elusive "magic number" that determines when a server should be offloaded or split into multiple servers can represent a significant challenge – but there are three major signs that a server requires either more physical RAM or the diversion of some of your organization's workload to another server.

It's important to note that these conditions are valid only when your server has a reasonably high number of active users – and you've considered and dismissed other potential causes like authentication issues:

1. Your existing active user sessions disconnect
2. New user sessions begin to connect and immediately disconnect
3. Your system slows down dramatically

System administrators looking for more proactive methods of detecting overloads may find consulting Windows 2003 Server counters useful for detecting "thrashing," or the inability of the server to keep up with system demands for memory. These counters generally should be observed as a group, not in isolation, as one counter typically doesn't provide enough evidence of thrashing:

Windows® 2003 Counter	Your server may be overburdened if…
Available Bytes	Value consistently falls below 5-10% of total physical memory
Committed Bytes	If committed bytes > physical RAM consistently over time
Memory/Pages/Sec	If > 50 (some experts say if > 20) on a consistent basis

Parsing Performance Parameters

As with all software applications, performance is relative – and the chief judge is your primary user base. It's easier to understand your SAPConsole environment by separating the solution into the distinct performance areas indicated in the table below. Once you've broken performance measures down, you're in better shape to begin rectifying your system's bottlenecks:

Performance Area	Primary Constraints	Comments
SAP host connection to SAPConsole server	1. SAP host 2. Network	· Constant visibility of "processing" screen indicates performance issue
SAPConsole application to TE server application	1. TE server application 2. SAPConsole server memory 3. SAPConsole server CPU	· Using high-performance TE architecture/proper server sizing key · Not all TE servers can scale for high volume of users
TE server connection to TE client	1. Network 2. TE architecture	· TE utilizes small packets, with bursts in traffic · UDP protocol often best choice for high-latency networks · "Smart" TE client can increase performance

One critical caveat to achieving good performance: you can't use other targeted improvements to overcome a slow SAP host or program. Outside of a faster SAP host, an optimized network typically offers the most significant area for performance improvements. (Later in this paper, we'll take a look at the architecture for an ideal SAPConsole solution.)

As with many applications, a fast processor is desirable – but it doesn't always offer significant performance gains. Although many TE applications support multi-processing, SAPConsole doesn't – so having a server with multiple processors provides little benefit. As indicated earlier, sizing your server memory correctly is the best step you can take to ensure a peak-operating platform – but adding more memory than you need would have little or no impact on performance.

Security Concerns?

No news here. The most prominent security concern when using SAPConsole has always been entering the SAP username and password, which is then transmitted wirelessly over the network in clear text. In truth, this has nothing to do with SAPConsole but, instead, results from the Telnet protocol used in the majority of SAPConsole implementations. The good news? A variety of new approaches – including the use of Secure Shell (SSH) instead of Telnet as well as next-generation thin client terminal emulation technology – can help you make this a thing of the past.

Mission-Critical RF: The GUI Interface v. TE Character Interface

Until very recently, hardware and software technology deployed to capture data by scanning a printed bar code with a wireless terminal device – and then posting that data to a host-based screen application like SAP in real time – has been in a holding pattern. The emergence over the last few years of next-generation wireless devices from the big device manufacturers that support GUI applications is driving end-users to investigate the value of shifting character-based, TE-driven, real-time RF screen applications to GUI based applications.
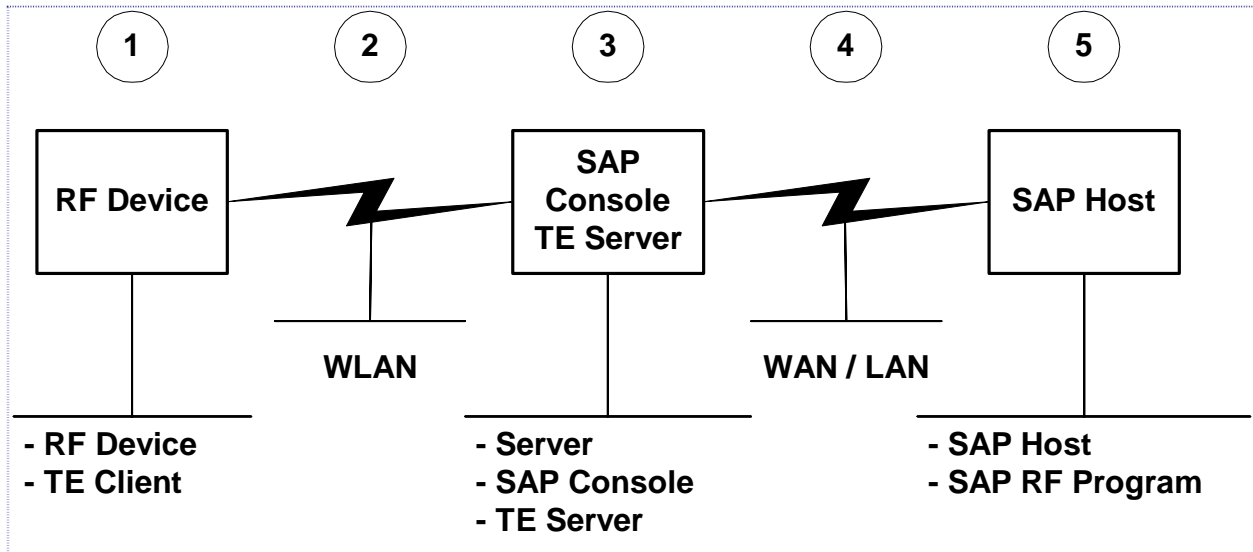
Application providers like SAP have fueled this trend, offering new Web browser or Windows GUI-based versions of screen applications used for mission-critical, RF data-acquisition transactions. The speed, reliability, efficiency and simplicity offered by character-based TE screen applications is proving very hard to duplicate with newer Web browser or Windows GUI based versions, especially when communicating over a wireless medium in harsh environments where steady, high-bandwidth connectivity isn't a given. In fact, we're seeing a trend within the SAP community to recommit to character-based TE screen applications until such time as Web browser or Windows GUI-based versions achieve the same level of performance.

When you're considering the types of screens/transactions you need to use for simple scan/data collection purposes, it's easy to see that there's no concrete need to have sophisticated graphics and presentation capabilities where a visually appealing GUI interface would suffice. Because these transactions occur literally thousands of times a day – by a large and often distributed set of users – your system's logic and interface need to be as streamlined and concise as possible to guarantee maximum efficiency.

If all a user does with a wireless device is scan a bar code into a host-screen data-entry field, it can be tough to justify a change in the application interface if it doesn't offer the same productivity attributes – for example, speed, reliability, efficiency, etc. – as does the legacy character-based TE interface. In short, this is still a simple case of "less is more" until the paradigm can fully shift to an equivalent or better offering.

Fail-Over Failure Is Not an Option

Failover. It's the final and most challenging area of designing an optimal SAPConsole architecture – and failure is not an option. The costs of *not* addressing failover could be significant if left to chance. Every RF system on the market has multiple points of failure, and SAPConsole solutions are no different. Every point of failure can mean lost work and reduced efficiency, frustrating both workers and management. We've created the figure and table below to help you identify the most prominent points of failure and potential solutions:

PoF	Comments and Potential Approaches
1	▪ Best approach is using TE with connectionless protocol (UDP), allowing sessions to be resumed instantly after device failure or network drop ▪ Next best approach: Telnet server with session-saver capabilities, allowing limited ability to resume sessions (limited by TCP protocol behavior)
2	▪ Best addressed by redundant wireless coverage and approaches identified for #1 ▪ Redundant coverage shouldn't be confused with "more access points," which typically lead to a high volume of dropped connections
3	▪ Best addressed by having redundant servers or hot backup ▪ Using an IP load balancer with redundant servers minimizes user downtime, recovery time ▪ Experience proves applications themselves are rarely cause of failures
4	▪ Best addressed by having reliable connection and a backup connection. SAP load balancing can be used but isn't common, as many administrators prefer to direct RF users to specific application servers
5	▪ A crash* in this area is nonrecoverable, regardless of planning in other areas. Smart process design, saving small units of work and a workable backup plan are best approaches for addressing this area – in practice the least common point of failure *"*Crash" refers to ABAP program short dump or SAP application shutdown*

A Certified Solution Stack

End-user organizations deploying SAP applications are faced with the constant challenge of selecting the right technologies and solution providers that can add real value to their environments from the many that are available today. The advantage of the solution stack we're about to present here is that its separate technology components have been cross-validated and certified for reliable interoperability between the best-of-class Independent Software Vendors (ISV) that develop and support them.

PEAK, Pragma and Stay-Linked: SAPConsole Set-Up Made Simple

Now that you know what makes for optimal SAPConsole configuration, it's time to take a look at your own organization's RF technology set-up – and, identify ways to improve the efficiency of your application. When it comes to making the most of RF and SAPConsole, PEAK's pairing of Pragma Systems and Stay-Linked stacks up taller than the rest. Simply put, the combination of Pragma Systems and Stay-Linked – as illustrated in the box, below – is the market's only proven, effective, end-to-end SAPConsole solution.
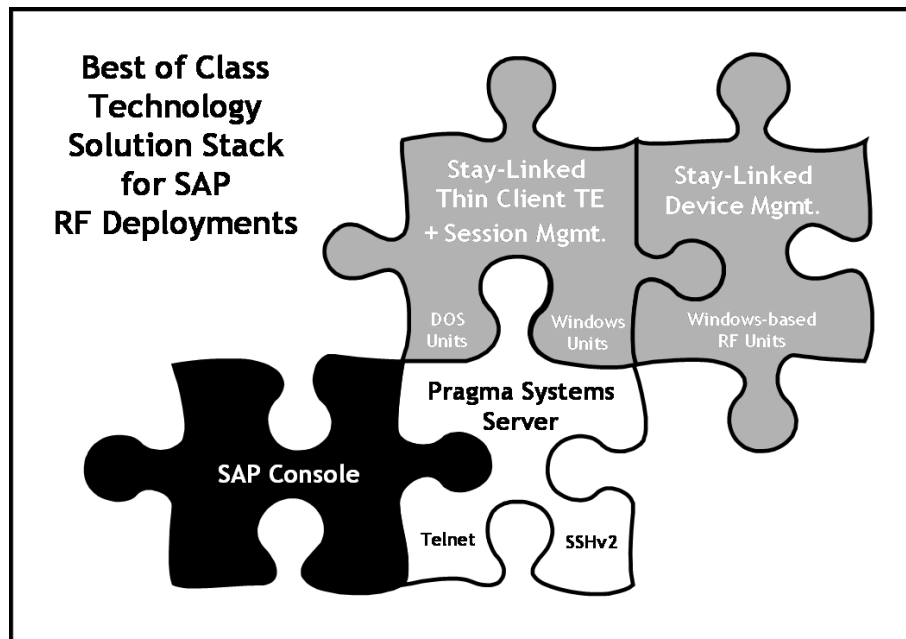
Key Differentiating Functionality:
The Pragma/Stay-Linked Joint Solution Stack
Offered by PEAK Technologies

Pragma Telnet and SSH Server Software

- Telnet Server for Windows
- SSH Server for Windows
- Microsoft Windows Certified
- Tested as Best in Class by Independent Labs (PCWeek, NSTL)
- Microsoft Telnet NTLM authentication
- Full SAPConsole Support
- Logs to home directory
- Configuration programs for ease of use, management
- Full Session Reconnect
- Converged stream and console modes
- Avoids screen scraping
- Cost effective pricing - $599 - $799 per server

Stay-Linked Thin Client TE/Session Management/Device Management Software

- Ability to monitor TE session, regardless of device or connection status
- Ability to transfer control of TE session to different device
- Ability to share data entry and control of TE session with user from console
- Utilizes quiet UDP-based protocol for device-to-host communication (no TCP heartbeat)
- Utilizes network/NAT/firewall-friendly protocol for device-to-host communication
- Highly secure, PCI-compliant encryption option for data communication; centralized console-management features
- Centralized TE configuration, settings – no need to push configuration files to devices
- Usage-based, concurrent user-licensing scheme applied on host, not on device
- Fully integrated mobile device management option within same solution (utilizes same console, same thin-client connection)
- Fully integrated, voice-driven TE option (Stay-Linked VoiceWedge™)
- Powerful set of host-programming API's for dynamic control of device functionality
- Supports dynamic, programmable "tap spot" data entry for use with touch-capable devices
- Solution performs equally well over wide-area wireless (wi-fi hot spot, cellular, etc.) networks
- Cost effective pricing – full TE/Session Management Telnet and SSH support - $225 per client

Scalability: Managing Growth

If you're already administering an SAPConsole set-up, managing growth is one of the biggest challenges you're likely to face – and when it comes to scalability, Pragma offers the market's only complete, end-to-end solutions for both Telnet and SSH remote and secure access.

Pragma servers work across all Windows environment – from NT, 2000, XP, Vista, 2003 and 2008 systems – and are the only servers currently available for both 32 and 64 bit use, as well as the state of the art Itanium systems. Coupled with extremely user-friendly, intuitive installation, configuration, and ongoing management, Pragma Telnet and SSH servers represent best-in-class remote and secure connectivity solutions.

Even better, while many Telnet servers offer only 96-120 simultaneous connections, Pragma scales easily to more than 1,000 connections – and, once a Pragma system is installed, you can upgrade the license simply by entering a new registration key, so there's no need for an upgrade or reinstallation. In fact, your Pragma servers can accommodate additional connections simply by making some basic changes in the OS configuration.

Data Security? We're the Fort Knox of SAP.

When it comes to RF security, it's tough to beat the combination of Pragma Systems and Stay-Linked. For starters, Pragma's SSH server technology utilizes government-certified, best in class Advanced Encryption Standard (AES) standards across all key components.

Stay-Linked thin-client architecture then provides an added layer of security to your existing wireless networks. Finally, all TE application-screen and captured data is encrypted. That means there's no "clear-text" Telnet or SSH communication in the device-to-host system data stream at all, even when supplying initial authentication values to log on.

There's no Telnet or SSH client on the user's device, only the Stay-Linked thin client. With Stay-Linked, all Telnet or SSH communication takes places internally within the host system, where it's most secure.

With our recommended configuration, NAT, network firewalls and port restrictions don't present a problem for Stay-Linked communication. What's more, you don't need Web services or the configuration of additional ports to implement Stay-Linked device-management features. Making things easier, the Stay-Linked Administrator GUI console for interactive mobile-device-management functions uses this same secure connection method and protocol.

Legacy Solutions? Maybe it's Time to Thin Down…

Unlike typical legacy terminal emulation products, Stay-Linked's host-based, thin-client approach to TE features running and managing the Telnet or SSH client component on the same host system where the Telnet or SSH server is running. Only a thin client resides on the user's device to provide the connectivity to the user's host-based TE session.

The Stay-Linked server software that launches and manages Telnet or SSH client sessions on the host is a Java-based software application that has been optimized and tuned to provide maximum scalability while utilizing the absolute minimum of host-system resources.

The Stay-Linked user base features installations of multiple thousand simultaneous users connected to a single-host instance of the Stay-Linked Server process without any scalability issues. In fact, we've documented that the Stay-Linked server process will actually become more efficient from a system resources (memory, processor, etc.) required per session standpoint as the number of simultaneous connected users increases. You should note, though, that because Stay-Linked is a host-based, thin-client solution that can be implemented easily in load-balancing, multiple-host environments, it naturally takes advantage of the inherent scalability benefits provided by load-balancing schemes.

Reliability and Persistence You Can Count On

Pragma's Telnet and SSH server work seamlessly with Stay-Linked's architecture to provide reliable and secure session persistence, including the capability to provide customer-specific customizations, dependent upon specific applications or connectivity requirements. Pragma servers are well-known for quick installation and configuration, without further required maintenance. The default installation values are designed for minor customer customization – including, for example, home directory and launching a custom application – and the session is ready for production.

With Stay-Linked's thin-client approach to TE, Telnet and/or SSH client sessions run on the host system and *not* on the device in the user's hand, making it as reliable and highly available as the host system it's running on. Telnet and/or SSH Client/Server sessions aren't affected by disruptions in host-network access, loss of wireless signal or any common device-related issues like dead batteries and re-boots.

Unparalleled Session Performance

Pragma's Telnet and SSH servers offer best-in-class speed and reliability across multiple environments and across any applications, including many popularly used tools such as vi, ingres db, and other command line tools. Pragma offers multiple features to improve performance if necessary, such as monochrome, slow network connection, and packet-size configuration. Our servers are installed by default with optimized features enabled.

Stay-Linked thin-client TE is noticeably faster than traditional "device-side" Telnet or SSH Client products. End-users consistently describe Stay-Linked's scan-to-scan readiness and overall screen responsiveness as "snappy," offering peak user productivity. Like you, we know that wireless devices are expensive – and Stay-Linked software maximizes hardware investments by helping them perform optimally.

Communication between devices running the Stay-Linked thin client and the host system where the Stay-Linked server is running is handled by Stay-Linked's proprietary UDP/IP-based protocol, *not* a typical TCP/IP based protocol. There's no need for constant TCP/IP device-to-host communication needed between scans or key presses with Stay-Linked's quiet UDP/IP-based protocol. As a result, our stack greatly reduces network traffic and bandwidth consumption.

Centralized Management: The Core of an Ideal SAP Solution

One key benefit to our best-of-industry SAPConsole solution approach is Pragma's centralized configuration. Pragma functions consistently between Telnet and SSH servers, with both operating on a single machine and configurable from a single application. Pragma also offers a centralized program for large deployments, allowing administrators to set up a central configuration that is then pushed to all Pragma Servers on the network.

Along the same lines, our solution's Stay-Linked Administrator Windows GUI Console application lets Help Desk staff centrally manage all Stay-Linked thin-client connected devices; host-based TE sessions and settings; and licensing, too. The Help Desk can also manage TE user sessions interactively, allowing administrators to monitor them, take them over, share them, or transfer them to the control of a new device – even when the user's device can't communicate with the host or if it becomes completely disabled.

Further simplifying your operations, mobile device-management functions such as "remote-control"; install/remove applications; start/stop applications; access/change file system and/or folder structure; as well as check processor, memory and battery utilization are all performed using the same Stay-Linked administrator-console application and thin-client connection.

Cost-Effective Telnet/SSH Client Licensing: We're All About Your ROI

By now you're probably thinking, "Sure, sure. It sounds great, but how much is this going to set us back?" Relax. Pragma Systems has two of the market's most compelling, price-effective server-side solutions, each based upon the number of CPUs and number of connections. Pragma also works with your organization to provide regular support and upgrades, ensuring consistent and complete reliability, state-of-the-industry functionality and cutting-edge user improvements.

Unlike other TE and device-management products, Stay-Linked licensing is based on usage, and isn't tied to individual/specific devices. When older units are replaced in favor of newer ones, there is no cost. With Stay-Linked in place, you can order replacement devices without the cost of a TE or device management software product; the Stay-Linked license on the system is all you need.

The Bottom Line?

Look, we all know the limitations of SAPConsole – but for better or worse, it's going to dominate the RF scene for a while. Now that you've invested in a SAPConsole environment, it's time to take a look at the ways you can make your mobile-computing environment reach its PEAK performance.

The problem? Employing the best practices – and the best technology – to get the most out of SAP. The solution? PEAK Technologies – with its pairing of Pragma Systems and Stay-Linked – offers the best SAPConsole solution on the market today. A Pragma Systems and Stay-Linked solution stack is efficient, scalable and easily deployed.

Yes, SAPConsole has some inherent limits – but you don't have to be saddled with the way it performs. Put PEAK, Pragma Systems and Stay-Linked to work for your company today, and you can create an optimal, next-gen solution that effectively, affordably meets your RF computing needs.

About PEAK Technologies

A systems integrator of supply chain automation and inventory management solutions and services, PEAK Technologies delivers a tangible return on investment to some of the world's largest corporations. Taking a consultative approach to projects allows PEAK to propose a SAP solution that addresses the entire supply chain versus just addressing single initiatives. As one of the nation's leading SAP integrators of wireless solutions, PEAK Technologies gives you:

- Two decades of experience in RF technology
- SAP Systems integration, software design, wireless networking, and host interfacing expertise
- Efficient and cost-effective solutions tailored to meet your wireless networking and data collection objectives

About Pragma Systems

Pragma Systems is the only company in the world that offers end-to-end secure shell (SSH) and telnet solutions for Windows servers, desktops and handheld devices.
Our solutions deliver fast, comprehensive connectivity for IT administrators and users who need reliable and secure access to corporate data and networks.
More than 2,700 customers around the world use Pragma's secure file transfer (SFTP), remote systems management, Telnet, and SSH products, which offer unparalleled performance and quality for secure remote access requirements.

About Stay-Linked

Stay-Linked, with its thin-client Client2Host™ architecture, overcomes all of the typical challenges associated with deploying enterprise wireless terminals by providing:

- Reliable host-based preservation of wireless user application screens/sessions
- Centralized management of wireless TE sessions and mobile devices
- Secure, end-to-end data transmission between wireless users and host-resident applications

Stay-Linked supports all Motorola/Symbol, Intermec, Psion Teklogix, LXE, and other popular devices. Flawlessly.

Contact PEAK Technologies:

For more information on PEAK Technologies' data-collection solutions for industrial SAP data collection, contact us at:

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