PEAK Technologies, Pragma Systems & Stay-Linked™:

Still the Best Way to Make the Most of SAPConsole™

Contents

If you're like most organizations, your enterprise mobility computing needs change over time. As 2009 draws to a close, and as better and more sophisticated mobile devices hit the market, it's a good time to take a look at your SAPConsole configuration and make sure that you're maximizing the value you're getting from your enterprise mobility infrastructure.

In October 2008, Pragma Systems, Stay-Linked and PEAK Technologies issued a best-practices primer for getting the most out of SAPConsole aimed at capturing the institutional knowledge of three of the industry's leading SAP companies. In that paper, we gave step-by-step instructions for supercharging your mobile data-collection solutions, laying out the elements of the *ideal* RF design that married mobile-computing technologies from both Pragma and Stay-Linked.

A year has passed – and we're back with *proof* that the Pragma/Stay-Linked solution stack offered by PEAK is the gold standard, state-of-the-industry choice for maximizing your investment in SAPConsole. In this document, we offer a refresher on the key elements of an ideal RF solution, we provide an overview of our solution stack, and we present real-time performance data that makes it clear that PEAK's Pragma/Stay-Linked is *the* way to go when you're putting in place a secure, easy-to-use, scalable and high-performance SAP mobile-computing environment.

An SAP "Cheat Sheet"

Before we lay out the proven, numbers-based case for our Pragma/Stay-Linked SAP solution, let's make sure we're on the same page when it comes to an ideal SAP set-up – and if we're starting at the beginning, we're starting with **the establishment of a Terminal Emulation or TE, Infrastucture, 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.

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**.

Once you've solved the problem of initial sizing**, it's time to lay the groundwork for ready – and affordable – scalability**. Then, as with all software applications, performance is relative – and the chief judge is your primary user base. 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.

Security will be your next area of concern – and **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 – **and a variety of new approaches – including the use of Secure Shell (SSH) instead of Telnet – remedies these security based issues.**

Once the security issues are addressed you then need to **weigh the types of screens/transactions utilized for simple scan/data collection purposes.** (For the record, there's no concrete need for sophisticated graphics and/or presentation capabilities when a visually appealing non-GUI interface would suffice.)

Finally, in any best-practices approach to crafting an ideal SAP/RF solution, you have to address failover up front**. Failover is the final and most challenging area of designing an optimal SAPConsole architecture – and failure is not an option.** The costs of *not* addressing the potential for failover up front are too significant to be left to chance.

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 PEAK's pairing of Pragma Systems and Stay-Linked – and as we indicated previously, the Pragma/Stay-Linked solution 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**.
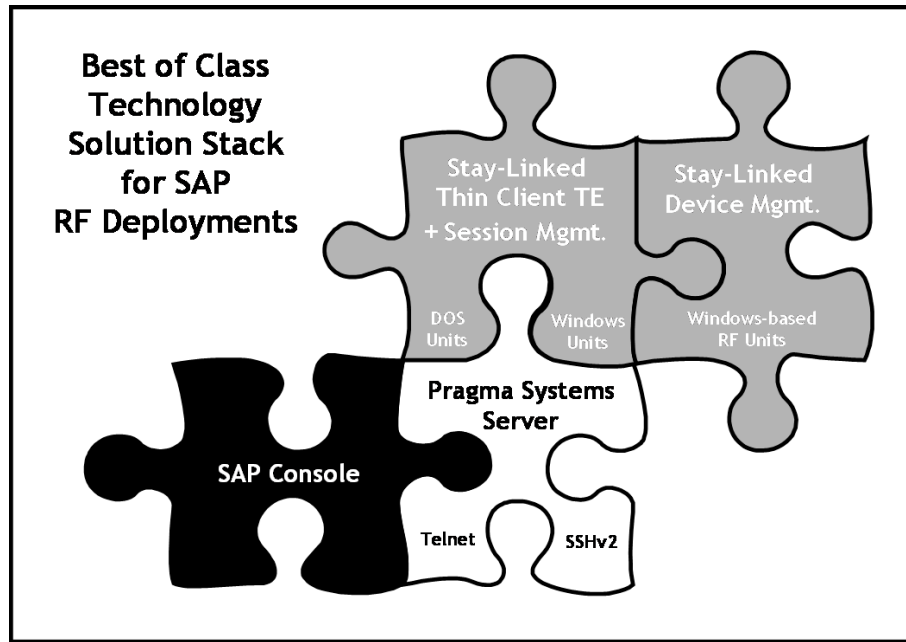
The Pragma/Stay-Linked Joint Solution Offered by PEAK Technologies

Here, too, is a feature-by-feature look at our SAP solution stack:

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

And, Now, the Main Event:
Performance Testing the Pragma/Stay-Linked Solution Set

For a year now, we've been telling you how terrific our SAP solution stack is – and while we were talking, we were busy proving our point. Over the last year, we've been formally examining the impact on our server and user performance when 500 simultaneous users execute a typical SAPConsole RF transaction within a SAPConsole/Pragma/Stay-Linked environment. This paper takes a look at those results – and clearly identifies any special settings that were required to achieve the optimal results we show here for accommodating a high volume of simultaneous connections.

To get us started, here's a look at the Test Environment we established for this study:

Our Test Environment

Component	Specification
Machine	HP ProLiant DL380 G4
Processor(s)	Quad (4) Intel Xeon 3.60 GHz
OS	Windows 2003 Server - Standard Edition SP1 Build 3970
RAM	2 GB
Network Card	Single NIC
Total Physical Memory	2,047.47 MB
Available Physical Memory	1,200.00 MB (with Baseline activity)
Total Virtual Memory	2.65 GB (Baseline activity)
Available Virtual Memory	2.08 GB (Baseline activity)
Page File Location	RAID 5 Smart Array
OS and Application Location	29 GB HD (non-RAID)
SAPConsole	Release 7.1 Patch Level 7
Stay-Linked	Release 9.1.0 Build 138
Pragma	Version 7.0 Build 7 Revision 152

A Look at Our Testing Protocol

As part of this process, we conducted several tests by simulating multiple users running a single SAP transaction (Material Inquiry), using the Stay-Linked client and associated automation script. A single inquiry transaction was selected to minimize any delay resulting from the SAP ERP system itself.

The simulation consisted of connecting up to 500 users to the test server, running the live connections for a period of 24 hours, and observing and evaluating specific server performance indicators during the testing period.

IMPORTANT NOTE: The actual test consists of using a Stay-Linked script to simulate user interaction -- and likely exceeds a realistic load created by actual RF users as it would not be typical for an RF user to maintain constant interaction over a long period of time. This test was created and executed, therefore, to prove that the Pragma/Stay-Linked solution set on offer through PEAK Technologies could support a high number of simultaneous connections, as well as to indicate what, if any, specific configuration settings might need to be made to accommodate such an environment.

In our test, each script simulates a single connection performing the following actions:

1. Invoke Stay-Linked client and connect to Stay-Linked Server (which is automatically configured to present an SAPConsole session via the Pragma Telnet Server)
2. Login into SAP
3. Select a material inquiry transaction from the RF menu
4. Simulate scanning a part number and displaying the first location containing the part
5. Scroll to the next location for the part
6. Scroll back to the first location
7. Exit the transaction and loop back to step 4 (this means the same steps are repeated over and over for the duration of the test period).

In our tests, the script operates on a timed basis, meaning it doesn't actually know which screen or prompt is currently active. As a result, specific (and random) pauses are introduced between certain events to allow a continuous flow through the transaction. This allows us to monitor each session, and provide a clear indication when our solution is being impacted by system performance issues not allowing it to function properly for maintaining session persistence and synchronization of user input.

In a perfect situation, all 500 sessions are still running with the correct screens after the testing period has ended. Since most Warehouse RF applications in reality have a constant flow of connecting and disconnecting of users through the day, 100 of the connections were programmed to disconnect and reconnect on a random basis, while the other 400 connections remained constant once they become connected.

Test Observations

Our test was quite successful after some initial tweaking to the environment, with our solution stack allowing 500 simultaneous (and active) user connections to run successfully for several hours. As expected, the tested server experienced periods of spikes in CPU and memory/paging usage, but it never reached a point of constant stress where the server became overburdened.

More detailed observations are presented below:

Figure 1 - Stay-Linked Administrator - Monitoring 501 Connections

1. Only a single setting change for both Pragma (InetD) and Stay-Linked (Heap size) was required in order to accommodate 500 concurrent users. These settings are identified later in this document, in the section titled *Recommended Stay-Linked and Pragma Settings for use in a SAPConsole Environment*.

2. The most compelling observation made is that the operating system was able to trim the working memory of each user's connection to such a small level that the first indication that server performance was slipping was actually client responsiveness rather than a server failure.

Putting it simply, the first sign of trouble came from users, not from automatic detection of server performance, which would have created meaningful alerts. In these instances, users would begin to note missing keystrokes or delays in screen updates; during this period, the Windows Server showed spikes in page file reads, indicating more and more memory was being read from the paging file, causing the delays observed by the user connections.
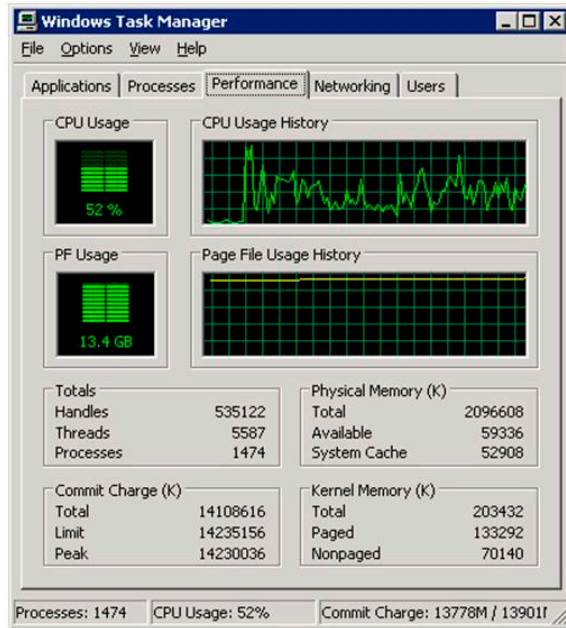
Figure 2 - Task Manager during 500 Simultaneous Users

3. The application suite of SAPConsole, Pragma Telnet and Stay-Linked is mostly memory and processor dependant, so increasing one or both will yield the greatest performance improvement, given that the specific area is struggling under the typical load. In this test, adding more memory would have resolved the user performance issues observed. Having a faster processor, however, wouldn't have much impact as CPU utilization was rarely more than 70% under the maximum load.

4. During the testing period, several Windows 2003 performance counters were monitored to observe the server's overall health and attempt to identify if the server was overburdened.

Counter	Description	Considerations	Test Observations
Memory \ Pages /sec	Pages/sec is the rate at which pages are read from or written to disk to resolve hard page faults. This counter is a primary indicator of the kinds of faults that cause system-wide delays.	If paging to disk is > 70% of your total disk activity on a consistent basis, there may be an issue	Page File reads accounted for most of this activity as memory became scarce.
Memory \ Available Bytes	Available Bytes is the amount of physical memory, in bytes, immediately available for allocation to a process or for system use.	If this value falls below 5% of installed RAM on a consistent basis, you should investigate. If the value drops below 1% of installed RAM on a consistent basis, there is a definite problem!	Available memory was the most visible indicator that the server was becoming overburdened. When this value fell to within 4-5%, the operating system would trim more memory from the applications. However, this event did not always coincide with user performance issues.
System\ Processor Queue Length	The number of threads queued and waiting for time on the CPU.	Divide this by the number of CPUs in the system. If the answer is less than 10, the system is most likely running well.	Throughout the testing, this value would spike and then drop back to almost zero -- but never stayed consistently high enough to be a concern.

Recommended Stay-Linked and Pragma Settings for use in a SAPConsole Environment

Based on the test results outlined above, then, we recommend that users of our Pragma/Stay-Linked solution sets adopt the settings outlined below to get the most out of our solutions stack:

Pragma Telnet Server Settings

Note: These recommendations are for environments using both Pragma Telnet and Stay-Linked. If Stay-Linked is not being used, the recommendations will likely change.

- General Settings
  - Monitor Sessions – Disable (Use Stay-Linked to monitor sessions)
  - Server to Client Heartbeat in seconds – set to 0 if using Stay-Linked, because Stay-Linked manages the opening and closing of telnet connections
- User General Settings
  - Default Screen Mode – Advanced Console
  - Idle Session Time Out – set to 0 to disable when using Stay-Linked
  - Home Directory - C:\Program Files\SAP\Console
  - Allow System Beep to Pass Through – Yes
  - Default Terminal Type – vtxxx
  - Reconnect Sessions – No
- Console Settings
  - Use optimized screen scraper – Enabled
  - Slow Network Connection – depends on infrastructure. If Pragma and Stay-Linked are on same machine or both within a high speed LAN, disable this setting.
  - Largest Packet Size – Leave unchecked
  - Startup Program - "C:\Program Files\SAP\Console\sapcnsl.exe"
    - *Note: Must be enclosed in double quotes due to the spaces in the path*
  - Default Screen
    - Rows – 16
    - Columns – 40 (to account for both 16x20 and 8x40 RF screen sizes)
  - Default Character Map – [VT220]
  - Screen Update Timers
    - Initial - 100
    - Increment - 200
    - Maximum – 3000
    - InetD

o   Desktop Count – When using over 120 simultaneous sessions, increase the Desktop Count (default is 2). To accommodate 500 users this value was increased to 12. Since there is a fixed amount of memory that the Operating System allows for services, this value should be incrementally increased when it cannot accommodate all the desired sessions (e.g. there is no exact formula to determine a value).

Stay-Linked Settings

To accommodate 500 or more simultaneous connections, Stay-Linked must be allowed to allocate more heap space. This is accomplished by editing the installstaylinked.bat file that is used to install the Stay-linked server service on a Windows-based server.

This example below is a typical installstaylinked.bat file. The critical value that needs to be changed is highlighted in blue (-**Xmx128m**)**.** To allocate more heap space, increase the 128 to 256 in the parameter so the value becomes: -**Xmx256m**, then Uninstall and reinstall the service using the updated batch file.

```
"C:\Program Files\Stay-Linked\StayLinkedService.exe" -install "Stay-Linked Server" "C:\Program Files\Stay-Linked\jre\bin\server\jvm.dll" "-Xms64m" "-Xmx128m" -
Djava.class.path=lib/staylinked.jar;lib/sla.jar;lib/slb.jar;lib/slc.jar;lib/sld.jar;lib/sle.jar;lib/slf.jar;lib/slg.jar;lib/slh.jar;lib/sli.jar;lib/slj.jar;lib/slk.jar;lib/sll.jar;lib/slm.jar;lib/sln.jar;lib/slo.jar;lib/slp.jar;lib/slq.jar;lib/slr.jar;lib/sls.jar;lib/slt.jar;lib/slu.jar;lib/slv.jar;lib/slw.jar;lib/slx.jar;lib/sly.jar;lib/slz.jar -start
"com.esp400.StayLinked" -stop "com.esp400.StayLinked" -method "shutDown" -err "C:\Program Files\Stay-Linked\starterr.txt" -current "C:\Program Files\Stay-Linked"
```

Note: For this specific test, we didn't need to increase the heap space until about 420 simultaneous connections were reached – so don't automatically increase this value unless your Stay-Linked server can't accommodate any more connections. Otherwise, you're wasting memory.

The Bottom Line?

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.

PEAK Technologies – with its pairing of Pragma Systems and Stay-Linked – offers the best SAPConsole solution on the market today, and the performance numbers we outline in this document prove it. Even better, a Pragma Systems and Stay-Linked solution stack is efficient, scalable and easily deployed.

Yes, SAPConsole has some inherent limitations – 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 3,500 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:

1-888-ASK-PEAK (275-7325), or via email: info@peaktech.com.