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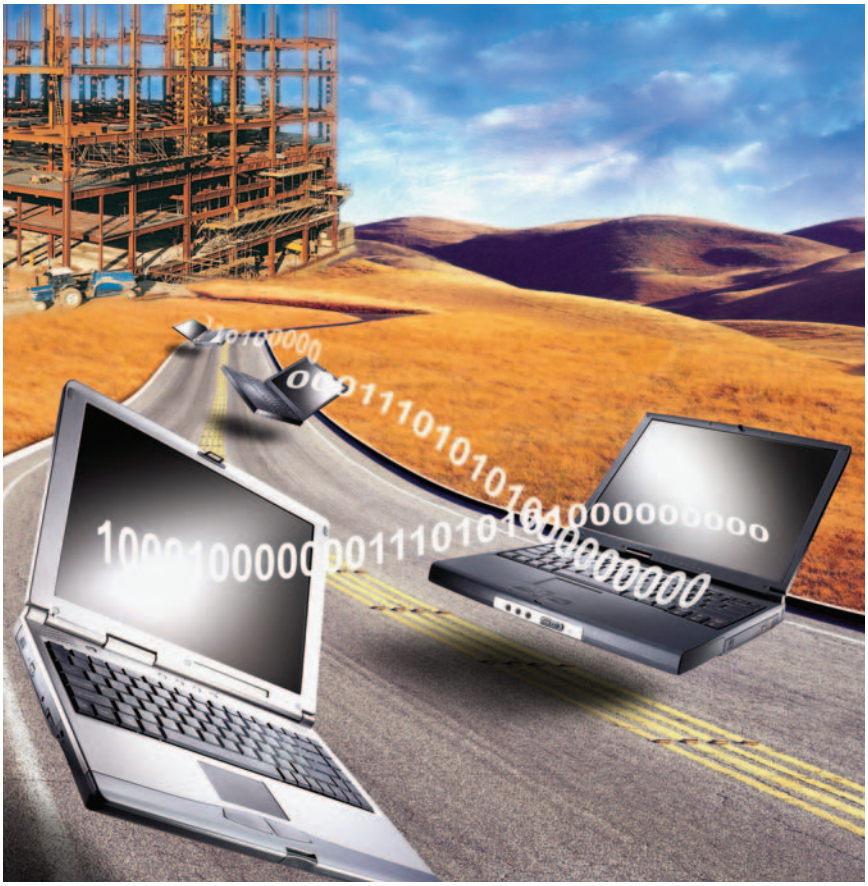
BUILDING THE VIRTUAL OFFICE – *In a Pick-Up Truck!*



While technology has flourished in the office during the past decade, use in the field has lagged behind for many reasons. Certainly, access to the home office from a construction trailer has been available – but productive, cost-effective jobsite solutions were seldom possible without access to electricity and phone lines.

Thanks to technology improvements and lower costs, this situation has changed. As a result, "the virtual office in a pick-up truck" is a reality.

At Schlouch Incorporated (a 365-person, full-service site contractor in eastern Pennsylvania), we've implemented an effective wireless remote access solution, or a "virtual office." In this article, we'll describe implementation challenges, the building blocks of an effective system, the incremental costs, and the benefits of wireless remote access. We'll also highlight the technology's current limitations.

The Technology Gap

Prior to the late 1990s, Schlouch's technology consisted of several legacy applications (accounting, estimating, design, and scheduling) operating in LANs or on stand-alone PCs.

In 1998, we implemented our first full network with e-mail, file-sharing, and print services. Very rapidly over a period of a few years, we moved our legacy applications to a network and added file servers as needed.

The technology users in the office embraced these changes. With some training, they were soon proficient with the new applications, e-mail, and broadband Internet access. In addition, with the advent of GPS technology and advances in design and survey technology, we soon needed to transmit large files from the office to the field and vice versa.

As our users became more proficient, they came to rely on technology for virtually every task and demanded new and even faster tools!

We provided laptops and training to the field coordinators, and gave them access to the network via dial-up lines and 56kbps modems. However, when you're responsible for multiple jobs in multiple locations, and you're the first contractor onsite (often without electricity or telephone lines), you cannot dial-in any time you like. As a result, our field PC users had to dial-in at the end of very long days or wait to access the network until they were in the office.

As you might expect, a rather large technology gap developed between our power users in the office and our field users (who had the same needs as our office users, but in a more challenging environment). More importantly, this group was responsible for making daily decisions regarding their projects, and they needed access to job cost information, the schedule, and other key information during the workday.

The potential for further widening the gap took place in 2002 when we implemented document imaging and A/P invoice routing/invoice approval to further improve access to information and the efficiency of our accounting closing process. In fact, the success of the system itself, on a long-term basis, was dependent upon the participation of the field coordinators. Somehow, we had to close the gap and provide the field coordinators with the access they needed and deserved.

Challenges with Available Technology

Due to the mobility of our field coordinators and lack of electricity and telephone lines onsite, we needed a wireless solution. The available choices were (and still are): satellite, cellular, or wireless Internet access.

Satellite Internet access was an expensive option, and also impractical due to the location of our jobs and movement of our field coordinators within a 50-mile radius of our office. (Satellite Internet access is primarily geared to receive data, while dial-up typically transmits data.)

From the late 1990s into the early 2000s, we consolidated our cell phone, two-way radio, and pager providers, and settled on one provider. Our provider used phones (via data cables) to connect laptops to networks. However, the provider used outdated utility/maintenance channels for this access and the connection speed was less than dial-up speed. In addition, while the data cable was in use, we couldn't make phone calls.

By default, we chose wireless Internet cards, even though the coverages varied widely based on geographic location. (Consider your company fortunate if you find reasonably-priced coverage with fairly robust bandwidth available.)

In our case, we researched all available providers (including our cell phone provider) and found one viable option with:

- Good availability/coverage within most of our working area.

The "VIRTUAL OFFICE in a PICK-UP TRUCK" is indeed a reality. It increases efficiency, shortens time frames, and reduces costs.

- Workable, to reasonable, bandwidth (varying from 56kbps to 250kbps and often 150kbps to 200kbps).
- Fair price ($80/month for unlimited data transmission and $55/month for 50 MB per month).

While wireless cards were certainly a key component to our remote access solution, the other important building blocks included:

- laptops
- remote access capability
- hardware for company pick-up trucks
- high-speed Internet connections to the main network
- security
- document imaging

The Building Blocks

Laptops

Currently, most laptops are sufficient to run the majority of applications required in the field (such as Word, Excel, Projects, etc.). If users need more powerful applications, evaluate and size the laptop accordingly. For example, we

outfitted our surveyors with fairly powerful laptops because they also generate CAD drawings.

We also considered hardened laptops for our personnel who work in hostile environments with moisture, dirt, vibration, or the increased risk of laptop breakage. But, a hardened laptop will generally cost twice as much as a standard laptop, and have less processing power. As a result, we purchased business-class laptops, which typically last 3-4 years in the field.

In addition, we developed a schedule of preventative maintenance for all laptops. We clean the units, check and update software as necessary, and run diagnostics to ensure they are running at top efficiency.

Because of our progressive implementation of technology, all of our field coordinators and most of our foremen already had laptops; so, our incremental costs were drastically reduced.

Remote Access Capability

We were already using a terminal server solution to provide network access for users out of the office. So, field employees could access terminal services once they established an Internet connection via their wireless cards. So, once again, our incremental costs were zero.

With the wireless card, laptops, and Web access, we had all the basic requirements for the solution to work. But, what about lack of power, inefficiency, and inconvenience? In order to address these concerns, we purchased new hardware for each field coordinator's vehicle.

Pick-Up Truck Hardware

We installed power inverters to provide a power supply. The power inverter converts the 12-volt DC from the vehicle's electrical system to 115 volts AC for use by your typical electrical appliances. (It's very important to correctly size the inverter for the equipment you intend to use.) We selected 700-watt inverters because they provide ample power to run the laptops and printers, and to charge phones and batteries for miscellaneous equipment.

The inverters allowed our coordinators to power their laptops at the beginning of the day and not lose power; nor did they need an endless supply of batteries on hand. (However, inverters should not be used with the vehicle shut off for extended periods of time because this drains the car battery.)

We also installed laptop stands in each cab. The laptops were then placed on the stands and secured with straps. We addressed safety concerns, within our resourceful group, by requiring that laptops not be used while the vehicle is moving. (These stands can be easily removed because the bracket is equipped with a quick disconnect clamped to the floor.)

Finally, we purchased inkjet printers to complete the virtual office. While there are printers specifically built to be portable, we found that standard, small desktop inkjet printers easily fit into the cabs and were quite inexpensive. This provided the final tool and eliminated the inefficiency of not being able to print documents in the field.

To access the Internet, users boot up their laptops and click on an icon on their desktop. This launches the wireless provider's software, which automatically logs the users into their network. Once connected to the Internet, the users can either **1)** use a Web browser to access Web sites or check e-mail or **2)** launch the terminal services application to connect and log into the corporate network to access all applications and data available in the office.

High-Speed Internet Connection

Depending on the files you plan to send and receive, it's important to have the right connection from your network to the Internet. A dial-up, or a slow link like a 128k Fractional T1, can't handle network traffic and will only frustrate your users. A satellite Internet connection is reasonably fast when downloading information, but uses a modem to send information to the Internet. This type of connection is less desirable for remote access to the network, as traffic needs to flow as quickly as possible in both directions.

Reliability and repair time after a circuit goes down are also critically important. Traditionally, circuits like T1s are considered business-critical, and the providers are fairly quick to resolve any issues or problems with those lines. Cable and DSL solutions may not carry the same level of urgency. Outages or other issues generally take longer to resolve. (As these connections become more common in business, the repair time should improve.) Review your provider's Service Level Agreement (SLA) to determine your service and repair guarantee.

As a result of these factors, we initially deployed a 384k fractional T1 and then upgraded to a full T1 as the number of users increased.

Security

Passwords

When allowing your network to be accessed from the Internet, user passwords become even more important. "Good"

passwords are often the only protection against unauthorized access.

What is a good password? A good password should be a random string of numbers, letters, and special characters of reasonable length. It should not be anything obvious (e.g., the name of your spouse, child or pet; sports teams; the word *password*; your own name, phone number, birthday, etc.).

An easy way to create a good password is to think of a phrase and then take the first letters or parts of each word in the phrase as the password. An example of this translates the phrase – "I Like to Pound Dirt and Excavate All Day!" – to "1l2#d&Ecav8ad!"

User passwords should be changed every 45 to 90 days. We took a practical approach with users and their passwords by educating them about the importance of good passwords, recommending that they use them, and requiring passwords to change every 90 days.

Firewall & Intrusion Detection/Prevention

It is critically important to have a properly configured firewall deployed once you offer services from your network to the Internet. Even a basic firewall, like the one we deployed, provides a good level of protection from much of the unwanted or malicious traffic coming from the Internet.

While a firewall does a pretty good job of keeping unwanted visitors from your network, an Intrusion Detection System notifies you of attempts at unauthorized access, and its logs can be used to prosecute offenders. Also, some systems actively block offenders by blocking the IP addresses they use to get to your network. As a result, we also deployed this type of system.

We periodically check and actively monitor both our firewall and intrusion detection system to ensure our network is protected.

Local Security

Because field laptops access the Internet directly, they all need firewalls and anti-virus software. We implemented anti-virus software that automatically updates when connected to the Internet so that our users don't need to remember to perform the updates. We also employ a good anti-spyware program, which is available as a free download from the Internet.

By dealing with the hardware and security issues upfront and selecting computer savvy users to lead us, we tried to position ourselves and the users for success. We further supported this by providing adequate training and support from our IT department.

Document Imaging

We would be remiss if we did not mention how our document imaging system impacted our wireless remote access plans. We implemented this system with our accounting vendor in 2001 and went live with A/P invoice routing in 2002.

While we immediately recognized savings in accounting (decreased handling/filing, streamlined internal processes, more efficient research, paper savings, etc.), we did not fully recognize the benefits in the field because many of our invoice approvers were field coordinators outside the office. So unless they had a high-speed Internet connection at home, they either had to come into the office or suffer with slow performance as images loaded through a dial-up connection.

The implementation of the wireless solution allowed for better speed than dial-up and also provided the flexibility for our field coordinators to approve invoices when and where they wanted to. The benefits have been significant because our field coordinators have saved travel time into the office and invoice approvals are getting completed sooner.

Return on Investment

As discussed earlier, we had already invested in the infrastructure to provide remote (but not wireless) access to our users. As a result, the incremental costs were less significant than if we had needed to purchase network hardware and software from scratch, in addition to laptops, for our users. (However, the benefits and cost savings would also be greater in this scenario.) As a result, we will focus on the incremental costs and benefits gained by implementing the wireless/virtual office portion of the solution at Schlouch Incorporated.

The chart on the following page outlines our initial incremental investment, which totaled $575 per user. (Please note that even though the majority of the wireless card costs were credited back to us with each new activation, we left the full cost in the analysis.)

On a monthly basis, we invest $80 per user for unlimited data transmission, or $55 per user for up to 50MB per month. (In many areas of the country, this monthly cost would be much lower, but we used the $80 per user in the ROI analysis.)

We estimated our quantifiable savings at four trips to the office per month at 1.5 hours per trip at a fully loaded rate of $60 per hour for each field coordinator and his truck. Trips to the office were saved because the field coordinators no longer needed to come to the office to:

- access the schedule;
- pick up standard forms and reports;
- access files and information during the day;
- access the accounting system including job cost, contracts, subcontracts, purchase orders, the original estimate, current budget, etc.;
- approve invoices; and
- access the Internet or call the office to monitor weather.

If you subtract the monthly cost of the wireless access from the quantified savings, you generate a net monthly savings of $280. By dividing the incremental investment of $575 by $280 in monthly savings, you calculate a payback period of 2.05 months. This does not include any quantified savings from:

- better decisions due to access to information when needed;
- improved communications;
- more timely and updated job cost data due to quicker approvals; and
- efficiency in completing "office work" when convenient.

Overall, this solution has fulfilled the challenge to provide effective access to the network for our field coordinators. And, it has helped overcome the challenges of mobility and lack of electricity and telephone lines on many of our sites. The coordinators are satisfied with the solution, and it has become one of the tools they use on a daily basis to perform effectively. We have seen communication improve, and the technology gap is narrowing.

Current Limitations & Future Plans

Our current users desire more bandwidth from the wireless providers – it's their top complaint since imaging, CAD, and GPS files can be quite large. At times, the speed required to transmit or view these files leaves much to be desired. In addition, there are some "dead spots" within the network in our work area.

At this time, many providers are expanding and implementing high-speed wireless networks with connection speeds ranging from 400kbs to 1 gbs. (Many of you may be fortunate enough to be in an area where a high-speed network has already been implemented.)

Further, as a result of limited high-speed competition in our area, the monthly cost for unlimited access is still relatively high. As the technology matures and additional vendors develop higher speed networks, this cost should decrease, allowing for even wider deployment among other field team members.

As we continue to expand our document imaging and management capacity, remote users will have access to additional information.

Security is (and will continue to be) an issue with remote technology. To mitigate our risk, we plan to enhance our security

Virtual Office Breakeven Analysis

Below is a summary of our breakeven analysis for each virtual office. This does not include the cost of remote access, laptops, or additional security – which were already budgeted in our case.

Monthly Savings	
Travel: (4 trips a month x 1.5 hrs x $60 an hr.)	$360
Monthly Costs	
Data Transmission	(80)
Net Monthly Savings	**$280**
Incremental Investment	
Wireless Card	$150
Laptop Stand	300
Printer	50
Inverter	75
Total Incremental Investment	**$575**

BREAKEVEN = 2.05 MONTHS
(Total Incremental Investment/Net Monthly Savings)

by deploying our terminal server into a "DMZ," which is a portion of the network isolated by a firewall from the rest of the network. This will allow us to further secure the network by controlling network traffic to/from the terminal server and the Internet, as well as controlling the traffic to/from the terminal server and local network. We also plan to deploy a Virtual Private Network (VPN). This will further secure the Internet-to-network connection by creating isolated and secure connections between laptops and the corporate network.

Conclusion

The "virtual office in a pick-up truck" is indeed a reality. It increases efficiency, shortens time frames, and reduces costs. The technology and communication options available today will continue to improve, increasing the speed and availability of remote access. But, possibly one of the most important benefits of the virtual office is that it makes your field coordinators more effective, lowers their stress, and unifies your entire team's access to the information essential to an effective, successful business. BP

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Rich earned a BS in Business Administration from Bloomsburg University of Pennsylvania. He has 10 years' experience in public accounting working with construction, real estate, and manufacturing clients and previous experience as an Assistant Controller with Toll Brothers. Rich has spoken before CFMA chapters and conferences, and other trade associations. In addition, he is an instructor for several of CFMA's educational programs.

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