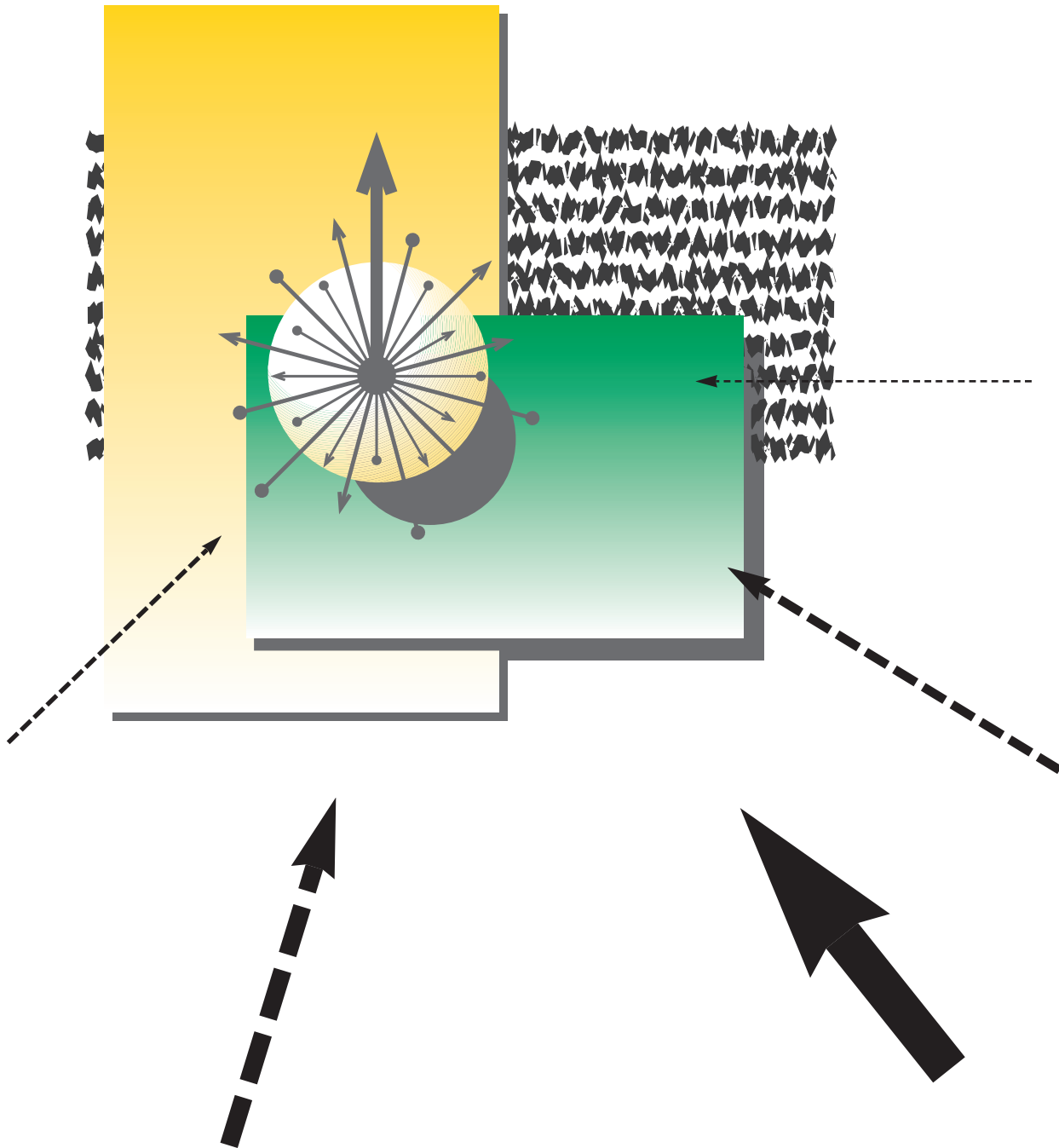


# Lotus Notes Management: Optimizing Notes Replication Performance

Through Effective Measurement and Monitoring

*The Lotus IS Experience — A Case Study*



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## Abstract

Lotus® Development's internal global Notes™ network is central to the company's success. It not only enables the distribution of critical information throughout the worldwide organization but also acts as both an example of the power of Notes in a major corporate setting and as a production test lab for each Notes advance as it comes along. When Lotus workers in 1996 started complaining about the performance of the company's Notes network and, particularly, the replication of information, top management grew concerned and made resolution of replication problems a top priority.

highly mobile work force via pagers, phone, PDAs, and fax. The Lotus IS organization is organized into three main focus areas: 1) solutions, 2) customer service, and 3) new product testing, deployment, and showcasing. Lotus's Notes network is critical both as a strategic tool for use by the company's workers and as a showcase for Notes products.

The IS senior management team is headed by Chris Cournoyer, Vice President/CIO. Reporting to her are Hassen Baghai, Senior

- Groups within Lotus had freely added Notes servers to the network and specified replication requirements without carefully coordinating their efforts.
- Groups had removed Notes servers from the network without concern for registering those changes network-wide.

During the summer of 1996, the level of complaints had reached a point that attracted the attention of senior Lotus management. At

Lotus' International Notes Network					
SERVERS*	DOMAINS (2)	EMPLOYEES SUPPORTED	WORLDWIDE LOCATIONS	REPLICATIONS PER DAY*	NETWORK TOPOLOGY
600	International Americas and Japan	10,000	80	10,000	Hub and Spoke
FACT: 90 servers reside in company headquarters in Cambridge, MA					*approximately

Director of Worldwide Engineering and Regional Information Services; Cindy Pratt, Director of Customer and Computing Support Services; David Brown, Director of Advanced Technology, Architecture, and Development; Lisa Pyle, Manager of Worldwide IS Practices; and a Senior Director of Worldwide Business Solutions.

The company's Notes network is administered from the Cambridge headquarters by a small staff of seven administrators led by James Jaillet. Regional IS teams are in place around the globe supporting local Notes administration in close partnership with the headquarters team. Lotus has a major server consolidation initiative underway, which has reduced the number of servers in Cambridge from 256 to the current level of 90. The company recently dedicated one person to managing replication.

**Lotus' Replication Challenge**

Replication problems at Lotus developed gradually; administrators hardly noticed at first. The problems appeared first as a few sporadic complaints about out-of-date information. The administrators followed up the complaints but couldn't detect a pattern. More complaints about outdated or missing information followed. Lotus administrators attacked the problem on a reactive basis, responding to each individual complaint by tracking down replication logs for each server involved and trying to pinpoint what actually had occurred. It was an ineffective, laborious, time-consuming task.

By 1996, Lotus' worldwide engineering and information systems group responsible for the overall architecture, design, and operation of the Lotus communications infrastructure became aware of problems with its Notes replication. With hindsight, the signs of potential problems were already evident:

- The replication strategy had not been reviewed since it had been initially implemented years before although the network had experienced rapid, uncoordinated growth.

the same time, the Notes administrators, frustrated and weary over chasing each individual complaint, recognized they faced an underlying systemic replication problem although they did not yet realize the full extent of the problem. "At that time, we did not believe replication overall was that bad," recalls Hassen Baghai, Senior Director for Worldwide Engineering and Regional Information Systems.

The problems could not have come at a worse time. The IS organization's declared mission is, in part, to support high-quality business and technology solutions for Lotus business units worldwide. The IS group had been trying to focus on serving its internal customers and deliver the high quality solutions they wanted. Now users—the Notes Administration's internal customers—were increasingly vocal about their unhappiness and senior management was beginning to ask pointed questions about the rising tide of complaints.

A Replication Re-Engineering group was formed, led by James Jaillet. It spent countless hours troubleshooting the problem but was frustrated in its efforts by the lack of accurate information concerning replication. Administrators tried to gather the necessary information manually from each server, but the volume of information and the widespread nature of the complaints presented nearly insurmountable obstacles. It was a slow, painstaking process. "We needed to know not only if an event occurred or a database was replicated but the relative path on all the servers," recalls James Jaillet, the Principal Administrator of Lotus' Notes network, on whose desk the complaints were piling up.

Some of the complaints about long delays were clearly exaggerated, but others were undeniably legitimate. Without timely, accurate information, however, the Replication Re-Engineering group could not respond to user complaints about delayed replication. "Without the facts, it came down to claims and counter-claims, and we didn't want to get into emotional arguments with our users," says Baghai.

Despite its best efforts and high level of expertise, the lack of information kept the Replication Re-Engineering group from getting at the source of the problems. In addition, the task force faced some organizational issues that interfered with the pursuit of a solution, specifically:

- The lack of dedicated resources to devote to the problem.
- Other priorities competing for the same technical resources.

As summer of 1996 rolled into the fall, the complaints mounted.

### Senior Executive Mandate

As the year end approached, Lotus executives, led by Stu Kazin, Senior Vice President of Worldwide Operations and Administration, had grown increasingly frustrated with the complaints about the timely and accurate distribution of information throughout its own Notes network. The Notes network was critical to the company's global operations. Sales, consulting, services, and support groups relied extensively on

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the Notes network.

The problems also raised questions about the effectiveness of Notes when deployed on a large scale and about the competency of Lotus itself. If Lotus couldn't make replication work correctly, who could?

Over the course of that year, senior management called for the engineering and operations group to measure Notes replication as a necessary condition to being able to effectively manage it. Faced with having to manually sift through hundreds of server replication logs, the group lacked the manpower and resources to gather the kind of information all agreed was needed. **Senior management decided to act and gave the Replication Re-engineering group a mandate: fix the replication problem in 1997.** Now, it had become a corporate priority.

The group responded by forming a task force led by Jaillet to solve the replication problem. They were to correct the situation by whatever means it took. The company was prepared to spend millions of dollars if necessary.

### Replication Task Force Strategy

The replication task force found itself facing a daunting situation. Lotus's Notes network was initially set up in the late 1980s during release 1.0 of Notes. The company didn't have an extensive wide area network (WAN) at the time so replication was handled via dial-up links. In the intervening years, the company established its global WAN and continually upgraded to the latest version of Notes. By now, it was a very advanced network, with some servers performing multi-threaded replication, where multiple servers are replicated simultaneously.

However, the task force also had to deal with remaining legacy technology. Users had been generally free to set up and take down Notes servers at will, using whatever systems were available. Some legacy servers were nothing more than retired desktop systems.

Without the information required to tune the existing Notes network replication, the task force turned to the idea of completely re-engineering the Notes network from the ground up. It began to draw up a strategy to re-architect the network. This would involve a major investment in hardware and time, at a cost of millions of dollars.

Although Lotus was willing to make whatever investment was necessary, the task force hesitated. “We still didn't have all the facts,” Baghai explains. How could the task force improve the replication process if it couldn't effectively monitor and measure the existing process?

What was needed was a tool that would measure and track replication across the network. Such tools existed for network management, allowing managers to measure packet traffic over the wire and through the various devices. Lotus, however, had no such tool for Notes replication.

### The DYS CONTROL! Solution

At this point, early in 1997, the task force was tipped off to a possible replication management tool from a young company, DYS Analytics™, a new Lotus business partner. The tool, DYS CONTROL!™, reportedly tracked and measured replication performance for all the servers in the network—exactly what the task force needed.

The task force was interested but wary. “I was very skeptical of their claims. My attitude was: prove it to me,” recalls Jaillet.

DYS Analytics accepted the challenge. DYS CONTROL! was installed on a single dedicated server. Because of the hub and spoke design, DYS CONTROL! was able to quickly collect replication information from about 20 hubs, representing replication among hundreds of servers. Within a day, the tool began generating useful replication measurements.

The early results were disconcerting:

- Three or four main replication hubs were achieving only 45 percent replication success.
- One server alone commonly took 10 hours to replicate with one of the hubs.

“We were surprised. We knew we had a replication problem, but this was worse than we thought,” concedes Baghai.

But there was good news amidst the bad. Now that the task force

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had accurate, timely information, it could analyze the problems. “We realized that the basic replication strategy was not bad. We just had a lot of garbage,” notes Jaillet. By garbage, Jaillet was referring to superfluous replication

events, ghost Notes servers, and such. The task force immediately shifted focus. It shelved the costly plans to rebuild the entire network and concentrated on cleaning out the garbage that was interfering with replication.

For example, in many cases, servers were wasting time trying to replicate with servers that no longer existed. In the freewheeling Lotus environment, groups had put up servers and later removed them but never deleted the replication record.

Senior management, too, was relieved. Top managers firmly believed in the business axiom that an organization can’t effectively manage what it can’t measure. Top executives had long been bothered by the fact that the IS group could not provide effective measurements; that the operators of the company’s critical Notes network were, in effect, flying blind.

***Now that the Replication Re-engineering group had effective measurements, it realized it had the means to attack and solve the company’s replication woes, and senior management could follow the progress. Everyone was relieved that the company could avoid the cost and disruption of a complete network rebuild.***

The company quickly moved from the test of the product, called DYS CONTROL!, to a rollout. The company established just three DYS CONTROL! servers:

- Cambridge, MA—master server; also responsible for North America. The other servers roll up their information to this server.
- Atlanta, GA—responsible for all of Latin America and South America.
- Staines, England—responsible for UK and Europe.

In addition, Jaillet organized his staff into three DYS CONTROL! groups. One group responds to CONTROL! proactive alerts that warn of potential replication problems as they develop. A second group does thorough analysis of the CONTROL! information. A third group, an engineering team, uses CONTROL! data to plan current and future improvements to the network.

Following the initial deployment, Lotus implemented two DYS enhancements:

- I). **Individual database replication management**—allows administrators to monitor and measure the replication of individual Notes databases and applications rather than just servers. Initially, Lotus targeted the most critical databases.

- II). **Direct user access to DYS information**—enable business users and owners of monitored databases to have direct access to DYS information. This allows them to check the status of the database at their own convenience.

Among the key database applications designated for tracking was Lotus’ sales database, which is replicated between 65 servers. This critical database provides the latest information on Lotus prospects and crucial sales initiatives. Lotus now individually tracks about 500 databases with DYS CONTROL!.

### **DYS CONTROL! Payback**

The payback came swiftly. “We were prepared to invest millions of dollars, burn a lot of staff time, and throw new hardware into rebuilding the network to solve the replication problem. We avoided all of that,” Baghai reports. Specifically, Lotus achieved the following results:

- **Performance**—Replication improved from less than 50 percent success to 85 percent success.
- **Speed**—Replication speed improved. (For example, the 10-hour server-hub replication was reduced to less than one hour.)
- **Hardware reduction**—The company has been able to dramatically consolidate servers (reducing the number of servers in Cambridge alone from over 256 to 90).
- **Increased customer satisfaction**—User complaints about not receiving information in a timely manner stopped completely. Users are using their Notes information with the assurance that it is accurate and up to date. Lotus representatives, for example, can make commitments to project staffing or service delivery with confidence that the Notes-based information they rely on is timely and accurate.
- **Improved planning**—Lotus administrators and managers can predict and measure the results of connection record changes.
- **Cost avoidance**—Without DYS CONTROL! the IS group would have had to hire several additional Notes administrators just to monitor replication. In addition, it freed administrators from continuously responding to user complaints and reporting the status of database updates. Administrators and engineers can now concentrate on enhancing the performance of Lotus’ Notes network.

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The best evidence of the success of the replication task force’s efforts with DYS CONTROL! can be seen in the reaction by Lotus senior management. “The replication initiative has been declared a success. Management removed replication from the list of priority concerns,” reports Baghai. By 1998, replication had ceased to be a problem.

The replication task force attributes its success in large part to DYS CONTROL!, which enables Lotus' Notes operations group to proactively track and respond to potential problems early, support service level commitments, track critical applications, perform informed capacity planning and trend analysis, pursue data-driven design improvements, and focus staff and system resources.

### Future Lotus Directions

While replication is no longer a priority concern, management of replication through the on-going use of DYS CONTROL! is a central part of Lotus' Notes administration process. Lotus intends to continue to expand and enhance its replication management as follows:

- Extend DYS CONTROL! measurements to all servers worldwide (Asia).
- Add more databases to the DYS CONTROL! application tracking process.
- Make more replication information available directly to more users and more widely distribute DYS CONTROL! reports.
- Continue to consolidate servers.
- Continue to improve overall user satisfaction with the Notes

network worldwide through the use of TQM and continuous improvement teams.

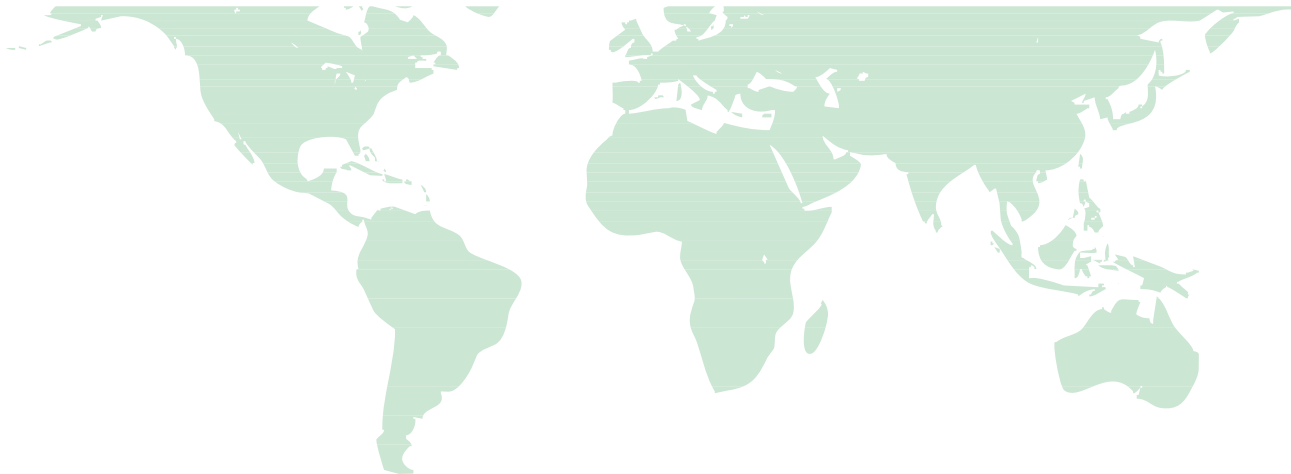
Today DYS CONTROL! is a fundamental component of Lotus' Notes network system management structure. As DYS enhances DYS CONTROL! Lotus expects to implement each upgrade.

### Lessons Learned

Looking back, Baghai realizes that the solution to the replication problem could have been much more difficult and expensive. He was prepared, if necessary, to recommend a complete rebuilding of the Notes network (something that is happening gradually through server consolidation). This would have been a costly and risky undertaking and would not have delivered the kind of pay-back Lotus received, as fast as it did, with the DYS CONTROL! solution.

From the experience, the Notes operations group learned key lessons:

- Accurate information is essential to good planning, troubleshooting, and operations management. Notes is too important to operate it flying blind.



- Automation of management information pays off. Large Notes networks and global Notes networks are too unwieldy, too complex to manage manually.

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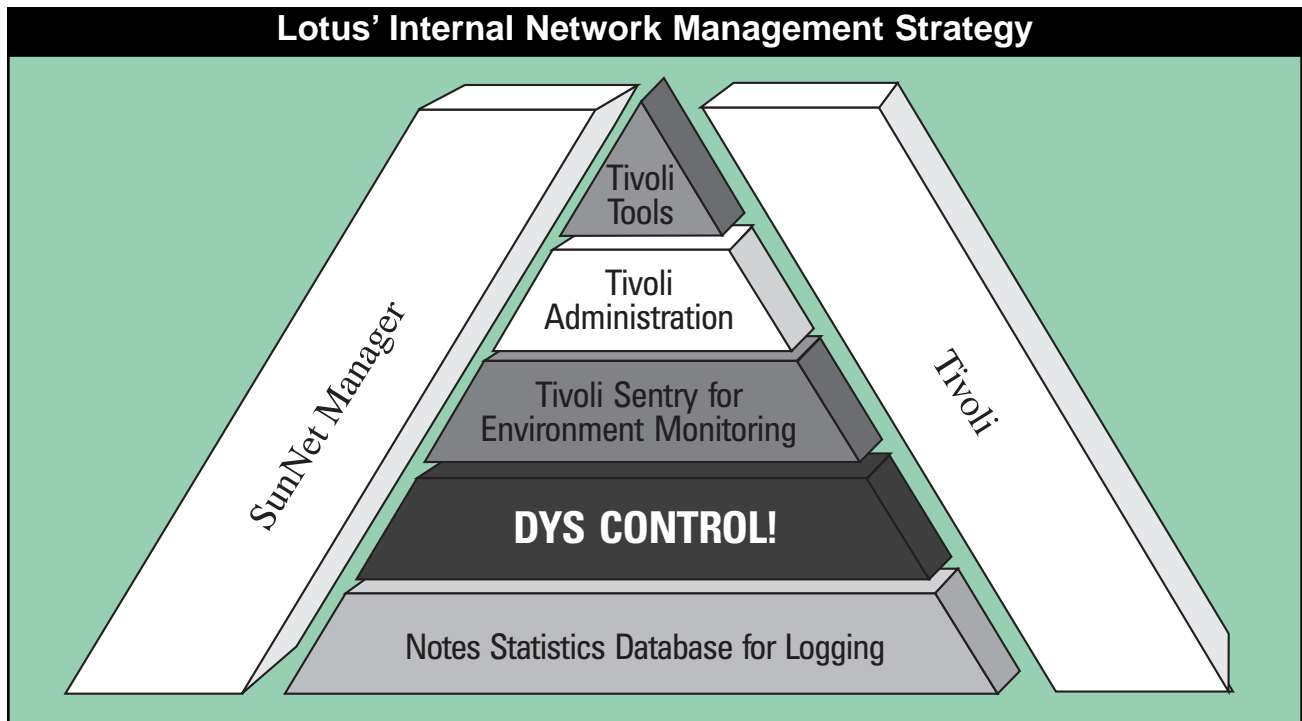
- Early access to information enables proactive management. Administrators can nip potential problems before they impact users and trigger complaints by reviewing data early and often and following through on automated alerts.
- Data should be applied to all aspects of Notes network operation; including planning and design, performance tuning, replication management, troubleshooting, and network enhancements.
- Information on Notes network performance and specific Notes databases should be distributed to appropriate users and managers and placed where they can access the informa-

**Conclusion: the Right Information Makes All the Difference**

Lotus senior managers, following the business adage about managing what you can measure, were correct to call for measurements of Notes replication. Without the help of automated tools, however, replication measurement in a large, global Notes network is a formidable task.

Fortunately, the replication task force came across DYS CONTROL, which enabled it to gather the information it needed to solve the replication problem. And the solution, surprisingly turned out to be simpler, easier, faster, and far less costly than anyone imagined. This was a clear case of how having the right information makes all the difference.

The Lotus experience is typical of that faced by most large Notes deployments. They grow gradually over time, becoming more complex in the process. Replication is set up once and seldom revisited. Over time the performance of the network degrades but few notice the gradual decline until users start complaining about missing or out-of-date information—information that can cause multi-million dollar deals or initiatives to be lost.



tion on their own. This will free the operations staff from having to continually respond to requests for status updates.

- Administrators must monitor the addition and deletion of Notes servers from the network. Processes must be put in place to ensure all replication records are updated for changes in servers.

The lessons Lotus learned from its replication experience—the need for accurate information, the value of automated information collection, and the distribution and application of information—can benefit every organization with a large Notes deployment. You can't manage what you can't measure: it is as true for Notes replication as for management anywhere.



## About DYS Analytics

DYS Analytics, Wellesley, MA, was founded in 1993 as a consulting company specializing in the diagnostics and tuning of replication for large Notes implementations. During its early years, DYS Analytics developed Notes replication expertise and software tools, becoming an authority on Notes replication.

In 1996, the company introduced DYS Analyzer, which later evolved into DYS CONTROL, a suite of tools to assist in replication monitoring, proactive alerts, diagnostics, analysis, trending, capacity planning, and strategic reporting. DYS Analytics tools serve the needs of both Notes operations groups and Notes network engineering teams. The company is introducing a new tool to provide similar capabilities for email traffic management.

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