ACCELERATE SAP® APPLICATIONS WITH CDNETWORKS

Improve internet performance and reliability, resulting in faster application response times
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Introduction

SAP customers can innovate on top and around their investments in on-premise SAP® application landscapes for core enterprise business functions by adding new capabilities delivered by SAP (see Figure 1). Their IT teams can add value to their business units through the introduction of cloud, mobile, new analytics, and data and platform technologies without disrupting their ongoing business operations.

Figure 1: SAP Product Strategy

SAP cloud solutions can be ramped up without lead time on a subscription basis, and increasingly, SAP offers integration of cloud or “on-demand” applications with existing on-premise applications for overarching hybrid application and business scenarios. All types of end users – employees, business partners, and customers – might be offered mobile applications, which can be developed at a rapid pace and integrate with on-premise back-end systems running SAP software. The in-memory processing of the SAP HANA® platform can offer users insights for making business decisions in real time as never before thought possible by bringing transactional and analytics processing capabilities together.

Long-time SAP customers have already seen the reach of their SAP applications being extended to new user groups working in remote branch locations, from home, or while traveling through the Web-enabling of their applications. This is now followed by use of distributed on-premise–on-demand applications and mobile apps over the Internet. Both trends have in common the fact that increased attention needs to be paid to the reliability, security, and performance qualities of long-distance wide area network (WAN) connections. Wide area networks are very different from data center networks, and new network technologies are offered to mitigate those differences and to enable distributed application integration and use. Network technologies are delivered in the form of hardware, virtual appliances, or agents deployed as proxies in front of data center applications or at network entry points in branch offices or on mobile devices, respectively. As on the application side, a more cloud-like network service delivery model exists as well in the form of so-called content delivery networks (CDN). Such “network as a service” offerings do not need appliances or software deployments, and can be added quickly on a subscription basis.

In this paper, CDNetworks and SAP present the results of a proof of concept project we jointly conducted in SAP Co-Innovation Lab. We will describe how simply CDNetworks’ service can be applied to a test landscape running in SAP Co-Innovation Lab, what challenges an end user might see when accessing such an on-premise landscape, and how these challenges are mitigated by CDNetworks cloud technology.
Strength of CDNetworks’ Dynamic Web Acceleration

The very nature of cloud-based CDN offers tremendous advantages to organizations running SAP applications accessed by distributed employees, customers, partners, and suppliers. The CDNetworks Dynamic Web Acceleration (DWA) architecture seamlessly combines network technologies necessary to make the Internet more efficient and increase application performance across the globe. By increasing the efficiency of network protocols, CDNetworks enhances the public network’s performance for SAP applications and related content, media, and dynamic Web pages. CDNetworks provides acceleration for ERP applications via an all-in-one network architecture that includes cloud-based static and dynamic content acceleration, Domain Name Service (DNS), load balancing, and cloud storage. The services are integrated to facilitate the fastest possible application performance.

Rapid Deployment

The CDNetworks network is always on and provisioned with so much capacity that new customers simply configure their DNS to point to our cloud-based infrastructure, and global application acceleration is instantaneously turned on. This rapid-deployment capability transforms an IT organization’s ability to deliver high-performing business applications over otherwise low-quality Internet connections, versus struggling with time- and resource-intensive on-premise network hardware deployment and setup.

OpEx and CapEx Efficiencies and Savings

The in-house expense and expertise required to reliably deliver business applications, with good network performance to end users around the globe, can be cost-prohibitive and slow to implement. Often, organizations must over-provision hardware, software, and bandwidth to prepare for spikes in user demand, leading to very expensive business-application delivery. Moreover, integrating multiple vendors’ services and products for critical infrastructure components ─ content delivery, DNS optimization, load balancing, and storage ─ increases overall complexity, which is another cost driver. By contrast, CDNetworks combines the necessary network delivery and acceleration components in a cloud solution and architecture. SAP customers achieve optimal performance, resilience, and scalability at the lowest OpEx and CapEx possible through the completely integrated cloud technology architecture.

Emerging Market Penetration

CDNetworks stands alone as the only global CDN provider with a presence in all the world’s emerging market regions, including infrastructure, operations, and staff in mainland China. This is particularly important for organizations sharing SAP applications and on-demand service offerings with supply chain partners in supplier-heavy countries such as Brazil, Russia, India, and China (BRIC). Simultaneously, several BRIC countries have become important customer markets, and CDNetworks seamlessly streamlines SAP application delivery to employees, partners, and customers in these markets.

Global Reach

Of course, many organizations utilizing SAP business applications also need to accelerate their application connectivity in both the Western and Eastern hemispheres. The global reach of the CDNetworks cloud architecture enables thousands of customers to optimize network reliability, security, and performance for business applications anywhere in the world.
The world map (Figure 2) demonstrates the reach of the CDNetworks architecture and the focus placed on optimizing performance in the world's most challenging markets, while Figure 3 shows CDNetworks’ Dynamic Web Acceleration process flow.
**Pervasive Security**

Business application communications send confidential business data; therefore network traffic should be encrypted. CDNetworks can enhance the security of public networks for unencrypted and encrypted, secured network traffic. Through a process of security key exchanges, data encryption, and message authentication between an organization's servers and stakeholders outside the firewall, the PCI-certified CDNetworks services ensures that data moves quickly and securely across the Internet.

**Test Environment**

CDNetworks and SAP worked jointly in SAP Co-Innovation Lab to accurately test the acceleration of SAP applications to global end-user traffic to applications. The lab’s application test landscape is located in Palo Alto, California.

Testing was done on CDNetworks global network and DWA solution. CDNetworks DWA optimizes the Internet “middle mile” by reducing the number of data round trips necessary to complete a Web request – even for dynamic content. DWA accelerates application performance and improves the end-user experience. The middle mile refers to the long-haul network connection between the CDN end-point locations, which are closest to your application data center and the application clients.

![Figure 4: Architecture of the SAP Co-Innovation Lab Test Bed](image)

The test landscape resembled an on-premise data center setup, with an SAP NetWeaver® Portal component exposing business data from an SAP ERP Central Component (SAP ECC) 6.0 back-end system via an SAP NetWeaver Composite Environment application to the Internet. (See Figure 4.) To protect the inner data-center network from unauthorized access from the Internet, a firewall and reverse proxy were placed between SAP NetWeaver Portal and the Internet. Any business data is confidential, and is therefore encrypted as HTTPS traffic to the outside of the data center. The reserve proxy terminated the HTTP-SSL session and sent a request to SAP NetWeaver Portal via plain HTTP protocol within the protected data-center network. The NetWeaver Portal made subsequent request via an SAP NetWeaver Composite Environment component to an SAP ECC 6.0 system for retrieving business data.

Traffic from productively used applications could be sent from employees' mobile devices, from employees working in a branch office, or originating from business partners and customers, depending on the purpose of applications run in the data center. For our joint project, the end-user traffic was emulated with the cloud-based testing service Compuware Gomez.
CDNetworks Test Environment:

CDNetworks used Compuware’s Gomez testing service to test global end-user performance. Gomez has more than 150,000 backbone and last-mile testing locations in nearly 170 countries, and more than 2,500 ISPs.

- Testing was done between February 9, 2013 and February 13, 2013.
- Test collection was done hourly.

One of the goals of the testing was to validate functional correctness by running the test with and without CDNetworks service to verify that both tests produced the same functional results. In addition, we verified that the CDN could process secured traffic over HTTPS with expected results. On the performance side, the goal was to measure the performance benefits of using the CDN as well as test for any reliability improvements.

Two main scenarios were tested:

1. User login to SAP NetWeaver Portal: after login, a content rich welcome page is displayed:
   a) Request login screen
   b) Submit user credentials and receive the welcome page
   c) Log out again

2. Download large, 5 MB-size PowerPoint presentation file from the Knowledge Management component inside SAP NetWeaver Portal:
   a) Complete steps a+b of scenario 1
   b) Download PowerPoint document (5 MB, non-cacheable)
   c) Log out

The scenarios were executed with many iterations. In between scenario steps and scenario executions, a four-second user think time was used. We also used encrypted HTTPS-based communications between end-user locations and the SAP Co-Innovation Lab data center. The CDN can be configured with the certificate to optimize performance caching or without the certificate to limit caching. In this scenario, a certificate was used to optimize the performance caching.

We also verified that business scenarios, which involved access to back-end application data via SAP NetWeaver Portal, were functionally correct when routed through the CDNetworks service.
Results

In this section, we present some of our performance and reliability improvement results when comparing SAP application access via plain Internet with access via the CDNetworks service. In the following charts and text, “origin” refers to the plain Internet case, and “CDNW” refers to results gained with CDNetworks’ service.

Content-rich welcome page

The “welcome” page end users see after login to SAP NetWeaver Portal is their first impression of this application. Therefore it is particularly important that the performance end users perceive is very good. When testing the performance of the welcome page, SAP Co-Innovation Lab, origin delivered an across-the-world-average end-user response of 4.7 seconds, while the CDNetworks’ accelerated solution delivered response times of 2.3 seconds. This represents a 52% improvement and a 2.1x increase in speed.

Please note that the CDNetworks accelerated response times become quite consistent around the globe with only small variances between locations. In contrast, pure Internet-delivered application services can vary by as much as 500% for our use case between different locations.

The same results as above are shown further averaged and grouped by major regions of the world in the chart below.
Figures 6 and 7: Consistent Response Times Around the World

Download large 5 MB document file
Transferring large files to remote locations is always a WAN performance challenge compared to inner-office or inner-campus networks. What takes seconds in a local environment extends to the minute range when connecting from remote locations. Download times are proportional to distance, file size, and fluctuating Internet quality.

During our testing, we found the results charted above. The SAP origin delivered a global average end-user response time of 21.9 seconds, while the CDNetworks’ accelerated solution delivered response times of 7.5 seconds. This resulted in a 66% improvement and a 2.9x increase in speed. Below we show again the condensed and averaged region results of the same test by region.

![Response Times by Region](image)

<table>
<thead>
<tr>
<th>HTTPS</th>
<th>Origin response (sec)</th>
<th>CDNETWORKS DWA response (sec)</th>
<th>Percentage Improvement</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Performance</td>
<td>18.5s</td>
<td>6.2s</td>
<td>66%</td>
<td>2.9x</td>
</tr>
</tbody>
</table>

Figure 8: Response Times by Region
Reliability Stress-Test Setup and Results

Performance is not the only metric related to network quality. Maybe even more important for the business of SAP customers is the reliability of WAN connections. If such connections are broken, a lot of activities based on business applications cannot happen, and might result in loss of revenue – and customers.

Therefore we scaled our SAP NetWeaver Portal welcome page scenario so as to achieve 10,000 SAP user transactions in a 6-hour period, working with 4 seconds of think time between scenario steps. The end users were emulated with the Gomez service again, which runs those users at a number of different locations around the world.

![Number Transactions per Minute](image)

**Figure 9: Comparison in the Number of Transactions per Minute**

On the stress portion of the test, the SAP origin delivered 250-300 transactions per minute, while the CDNetworks accelerated service delivered 400-450 transactions per minute.

![Login Response Time / seconds](image)

**Figure 10: Comparison of Login Response Time**

On the stress portion of the test, the SAP origin delivered the login response in 7-8 seconds, while the CDNetworks' accelerated service delivered the login response in 1 second, which is approximately 650% faster.
In the following graphs, full test times including load ramp-up and -down are shown too.

![Graph 1: Total Transactions per Minute](image1.png)

![Graph 2: Total Transactions per Minute](image2.png)

**Figure 11: Error Rates When Using CDNetworks**

As the red-framed numbers show, we saw about a 4% failure rate on executing our 3-page scenario over the Internet. One could expect that scenario failure rates would increase proportional to the numbers of pages/steps in a business scenario. On larger 10-step or more scenarios, end users might be quite bothered with frequent interruptions of their activities. In contrast, no error was found when using CDNetworks. The reliability of application access is significantly enhanced.
Other Capabilities Offered by CDNetworks

Security

CDNetworks blends the latest in CDN security with the performance of a distributed cloud-based infrastructure to keep customers' sites both high-performing and secure. CDNetworks incorporates security into everything we do, making the cloud faster and safer for our customers as they innovate and penetrate the world's emerging markets.

There are numerous aspects to the security measures employed on behalf of our customer sites and our own CDN infrastructure. These can be segmented into four categories that correspond to the needs of our application and Web site customers, as follows:

- **High availability:** Cloud-based delivery of robust Web site and application functionality in a high-performance manner
- **Distributed denial of service (DDoS)/attack defense:** Protection of Web sites via DDoS mitigation
- **CDNetworks service can stop such attacks at their perimeter before they even hit a customer's Internet connection and data center.**
- **Data security:** Protection of an organization's data, and that of its customers, by applying and supporting leading security methods and standards, such as PCI compliance, TLS/SSL, and digital rights management
- **Regulatory compliance:** Enhancement of CDN infrastructure and services to support industry and governmental standards for managing and protecting consumers' personal and financial data

Note: Not all functionality was exercised during testing with SAP.
Other Features CDNetworks Has that Were Not Tested

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content acceleration through content caching</td>
<td>A network of widely deployed caches that work in conjunction with intelligent caching software and cloud-based storage to optimize website content delivery to end users around the globe</td>
<td>Ensures that all static content from websites is delivered optimally around the world via HTTP or HTTPS</td>
</tr>
<tr>
<td>Dynamic network acceleration (DNA)</td>
<td>An on-demand network acceleration service for enterprise (behind the firewall) applications</td>
<td>Quickly and reliably scales and accelerates both browser- and non-browser-based applications</td>
</tr>
<tr>
<td>China acceleration</td>
<td>The unique capabilities of having both licensed business operations and CDN POPs within mainland China for the purpose of extending businesses’ content and applications into China much faster than they could on their own</td>
<td>Opens up the massive Internet market in China to businesses’ applications and content for both operational efficiencies and revenue generation</td>
</tr>
<tr>
<td>Media acceleration</td>
<td>Capabilities for speeding the delivery of bandwidth-intensive content, such as streaming media and high-definition content</td>
<td>Enables businesses to deliver media via the HTTP protocol globally to support Web-based initiatives</td>
</tr>
<tr>
<td>Cloud storage</td>
<td>Networked online storage in which data is in multiple data centers rather than on individual dedicated servers</td>
<td>Provides unlimited growth capability in storage at reasonable cost for ultimate flexibility and resiliency</td>
</tr>
<tr>
<td>Cloud DNS</td>
<td>Cloud-based global delivery of the Distributed Name System (DNS) service</td>
<td>Accelerates global performance of applications and websites, as DNS is the first step that occurs in every Web action/transaction</td>
</tr>
<tr>
<td>Cloud load balancer</td>
<td>Policy-based load balancing that allows for both geography-based and rules-based load balancing to deliver content based on cost and/or performance</td>
<td>Gives customers control over their priorities and costs by enabling them to implement policy-based load balancing between CDNs, clouds, and data centers using their own rules</td>
</tr>
</tbody>
</table>
Summary

The reliability and scalability of the CDNetworks global network overrides the typical Internet performance degradations to deliver high-performance SAP applications anywhere in the world. As demonstrated by the third-party testing service Gomez, CDNetworks improves the performance of Internet application delivery around the globe by more than 50% on average, delivering content- and application-rich pages about 210% faster.

Performance gains are even higher when accessing SAP applications from emerging market regions via CDNetworks. In BRIC countries, for example, average gains in performance and speed testing resulted in approximately 75% and 300%, respectively, when using CDNetworks.

The robust nature of the CDNetworks architecture is proven through stress tests in which CDNetworks consistently outperformed Internet delivery: 650% faster system login times and 33%-80% increases in transaction volume managed. While the stress tests showed performance improvements, the elimination of network response failures is also important for achieving uninterrupted business operations.

CDNetworks’ performance and reliability make an easy business case for accelerating networks for SAP applications. Add to that the far lower requirements in network CapEx and OpEx, and the business case becomes imperative for IT departments working with limited budget.

References

CDNetworks: http://www.cdnetworks.com

SAP Co-innovation Lab: http://coil.sap.com
About CDNetworks

CDNetworks enables Global Cloud Acceleration. Our mission is to transform the Internet into a secure, reliable, scalable and high performing Application Delivery Network. CDNetworks’ unique position as the only multinational CDN with expertise and infrastructure in China, Russia and other emerging markets, enables us to be trusted partners in local markets, while serving as foremost experts on extending into global markets. Accelerating more than 40,000 global websites and cloud services over our 160 PoPs, CDNetworks serves its e-business customers across industries like finance, travel, ecommerce, learning management, high tech, manufacturing and media. CDNetworks has been serving its enterprise customers for more than 13 years, and has offices in the U.S., Korea, China, Japan, Singapore, and the UK. For more information, please visit: [http://www.cdnetworks.com](http://www.cdnetworks.com)