Accelerated Application Delivery for SAP NetWeaver
Overview

SAP NetWeaver Solution Management

March 2010
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With an increasing grade of globalization, many companies are working on global markets and are thus becoming true global corporations. This means they usually operate multiple offices in different locations and there systems and applications are set up. This means that a group of duplicate, locally managed and dispersed systems exists. The main issue with this setup is first of all that this is pretty costly: operating servers in the different locations obviously leads to an enormous increase in Total Cost of Ownership for the overall IT environment. Moreover, for many systems like for example the SAP NetWeaver Portal there are no fully automated mechanisms available to really keep consistent data and configurations on the different instances worldwide. Thus the recommendation from SAP is not to run this kind of a setup.

In general the trend went and still goes into consolidating the IT infrastructure. Thus consolidated central applications are hosted once in data centers. This overcomes the typical distribution challenges and leads to consolidated and service-oriented IT environments overall. The remote offices that of course continue to exit now connect to central applications.

However this then leads to the next issue that the connection to the central systems becomes a bottleneck although end users would still expect a good performance as if the application is nearby.
Accelerated Application Delivery for SAP NetWeaver (AccAD) is a standalone product which is positioned as a complimentary offering to SAP NetWeaver. It can be leveraged as an enabler for SAP’s global central system strategy, e.g. when setting up one central portal which is the access point for all end users worldwide. Quite commonly due to bandwidth and latency restrictions, users in remote offices encounter performance issues like lengthy response times for logging in or navigating within web-based applications. This can cover applications like access to an SAP NetWeaver Portal, SAP BW reports, SAP CRM, web-based SAP Business Suite applications (e.g. Web Dynpro applications) or Non-SAP applications as long as you can access them via HTTP / HTTPS or TCP. Accelerated Application Delivery is a software appliance that can overcome those issues and thus deliver applications at near-LAN speed to global user groups. Accelerated Application Delivery can provide benefits for all web-based SAP applications. It overcomes bandwidth and latency issues with efficient generic optimizations, mainly caching and compression. Moreover, it provides stable connectivity in bad network conditions and is resistant to packet loss. It’s application aware optimization on top can be more efficient than generic WAN acceleration and application delivery technologies. It focuses on accelerating global access to SAP applications and thus it is not intended to be a full-fledged holistic application delivery tool for all kinds of traffic. It can support consolidation projects by helping to overcome network limitations.
To illustrate the full value proposition of the approach to integrate Accelerated Application Delivery into the landscape let’s have a look at an example. Our showcase is the opening of an SAP Business Warehouse report called „Overtime and Illness“. This is a standard report you can find in the portal Business Package Manager Self-Services. The graph compares direct access over LAN and wide area network with the access via AccAD application delivery. The scenario overall runs in a „Monday morning mode“, meaning that the browser cache is empty as if the user would call the portal the first time at the given day or week. What we can see is that AccAD access is significantly faster than the direct access over WAN and that we can reach response times that are close to the LAN baseline. This is true for both a limited bandwidth (in Mbit / s) and a longer distance which is the latency in ms.

In the following presentation you will then see how we can achieve this huge performance benefit at very low costs by implementing Accelerated Application Delivery, which can run on very standard hardware with low implementation effort.
This slide discusses the major benefits of Accelerated Application Delivery for SAP NetWeaver.

The generic optimization mechanisms within AccAD consist of several mechanisms:

- SAP patented compression mechanisms reduce the bandwidth consumption significantly
- Advanced caching concepts reduce the number and size of requests that need to be transferred through the wide area network. Within the cache settings you have the option to fine-tune them for individual applications.
- Overall optimization on a TCP layer reduces the effects of latency on response times.

With those mechanisms SAP offers means to improve web-based applications’ response times in Wide Area Network connections – with high physical distance (i.e. latency) and the limited capacity (i.e. bandwidth and congestions).

Moreover, there are application aware optimizations especially targeting SAP applications and scenarios – often referred to as “Layer-8 optimizations”. Currently, there are specific optimizations available for the SAP NetWeaver Portal, Knowledge Management (accessing and collaborating on documents) and the SAP Learning Solution. In addition within AccAD 2.2 we see additional predefined service types for common SAP applications such as SAP CRM, SAP Business Objects, Web Dynpro applications etc.

Quite important is the low total cost of ownership that this kind of setup involves. Especially compared to creating copies of web-based systems for different regions, utilizing an application delivery technology instead is inexpensive and easy-to-maintain. Accelerated Application Delivery can run on standard simple hardware because it requires only few hardware resources for it lean processing algorithms. In one central location you could administer the delivery policies for all remote locations and the data center. The technology itself is productive, simple and effective – the installation runs out-of-the-box and the configuration can be easily performed in an end-to-end manner. Moreover, there are flexible platform options suiting the needs of your individual setup: it can operate as a software appliance on Linux hosts or alternatively on Windows clients for small remote offices – for the future versions embedding into partner platforms is planned, i.e. integrating into generic application delivery tools offered by other vendors.
So now one of the immediate questions probably is: Well, is AccAD then the right solution for my use case? When does it make sense to evaluate AccAD more in detail and eventually implement it? Here you can see the most common customer profiles that can significantly benefit from AccADs optimization potential.

Customers upgrading from rather old versions of SAP ERP to the latest SAP Business Suite offering or additional SAP Business Objects solutions should think early of the performance impacts. The increasing number of web-based applications within those solutions certainly lead to an improved user experience overall. However, those applications behave differently over WAN than the traditional SAP GUI based UIs and suffer from effects like limited bandwidth and latency. In most intranet scenarios it is typical that you set up one central server (e.g. based on SAP NetWeaver Portal), but would like to roll this out to all corporate users worldwide. In order to ensure a successful rollout it is crucial to think in time about how to ensure stable connectivity and satisfying performance. With bad response times, corporate users might hesitate to really use the intranet offering eventually.

For extranet scenarios you have similar requirements as for intranet scenarios – however, the target group are remote customer or suppliers. They require stable connectivity and good response times as well to work successfully with your extranet offering.

Another aspect can be network savings: while in developed countries bandwidth became affordable over the last decade and can easily be extended, in many emerging countries additional bandwidth can become a significant investment effort. Instead of spending millions into bandwidth, you can go the alternative path of consuming less bandwidth for your web-based applications with AccAD – and thus realize significant savings.

Outsourcing companies are a special use case as well: BPOs connect its customers to business-critical hosted applications. In order to enable this connectivity at all and set up a successful on-demand business, AccAD can become an essential component in your landscape.

When you decide which enterprise software you would like to purchase, the availability of AccAD can be decision criteria in this context: For most Non-SAP enterprise offerings you have to purchase at the same time network optimization solutions that enable global rollout. SAP is the only vendor that has an offering like AccAD in its portfolio and thus provides a solution for global rollout included in the overall software licenses.
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The basic landscape without using Accelerated Application Delivery is centered around the data center where the applications are running on servers. Users in the local office connect to the applications via the LAN connection as well as users in remote offices via WAN connections.

As a prerequisite for any AccAD project the assumption is that the server-side performance is already optimized. Users in the local office are satisfied with the response times of the webbased application. However, users in remote offices are suffering from WAN effects, mainly limited bandwidth and high latency. Thus end user experience over a WAN connection is worse and the users are complaining about the long response times of the same application.
If this landscape is optimized with Accelerated Application Delivery for SAP NetWeaver, several components are added to this picture. Let’s start with a rather basic landscape layout to illustrate the major components.

First of all, the AccAD Repository is introduced to this landscape – this is the central component for AccAD and stores the overall landscape configuration settings, audit information and traffic history data. Onto the same box, we deploy a server front-end (SFE). The SFE improves the traffic from the application server by offloading tasks like encryption, data compression and handling slow WAN communication (TCP termination). Repository and SFE are the core of the application delivery software and are installed at the data center on a dedicated Linux host.

Secondly, the client front-end in each remote office is the counterpart to the SFE. The major tasks of a CFE are:
- emulate application services in the remote office
- take over LAN encoding and compression of messages for transmission to the SFE
- decode messages received from the SFE

Moreover, the CFE integrates a cache which can provide content that was already loaded beforehand. The CFE is as well part of the core application delivery software and is installed at each remote office on a dedicated Linux or Windows host.

Between CFE and SFE, there is a secured and optimized tunnel for optimizing the communication between remote office and data center. Messages are compressed and parallelized here. The tunnel can be secured by encoding the messages sent between CFE and SFE.

In order to monitor Accelerated Application Delivery, the AD Monitor collects real-time delivery statistics. It can be installed on any host in the data center network, e.g. on the administrator’s host.
Let's look at a more advanced landscape. Here we look at the option to deploy the repository separate from the Engine and to use multiple data centers. This would make the definition of Server Front-End and Client Front-End more difficult – because each engine takes over both roles to a certain extend.

Our major data center is in Germany / Walldorf where the central AccAD repository is deployed as well. This repository holds the overall configuration and traffic history information of the whole AccAD landscape. We have separate engine available as well that connects to this repository – the SFE. In Walldorf we see various applications that we would like to deliver to the remote locations worldwide, such as SAP CRM, SAP ERP and an SAP NetWeaver Portal. One of the remote offices is Palo Alto (USA). Here we build up another engine (CFE because it doesn't need to connect to any repository directly). Thus the users in Palo Alto can consumer the services from Walldorf with significantly improved response times over WAN. In Palo Alto we have some SAP Business Objects applications that should be provided to the rest of the company. The same engine in Palo Alto can provide services to Germany – and here the users can consume those with optimized performance as well.

If you set up your landscape in a high-availability manner, then the landscape could change slightly, e.g. by multiplying the SFE in the data center and the CFEs in remote offices and by providing a fall-back mechanism to access the data center directly in case of non-availability of Accelerated Application Delivery.
Here you can see the general communication flow from end user via CFE – WAN – SFE to the application server and back to the end user. The overall transaction time thus consists of different steps (terminology based on SAP Solution Manager terms):

- **Client wait / Pre-processing time**: indicates the time spent in the browser before the request leaves it
- **Network Time**: time for transmitting the request over WAN
- **Server Time**: the processing at the application server itself
- **Network Time**: time for transmitting the reply over WAN
- **Client wait / Rendering time**: time spent for rendering and/or waiting for sub-requests

The optimization effects and key capabilities of Accelerated Application Delivery are especially efficient due to the application awareness in all of those areas:

- **Integrated cache with caching patterns**: this saves unnecessary roundtrips to the application server if the content was already requested by other users before (e.g. a huge document was already downloaded)
- **Efficient compression mechanisms**: you could also label this capability as adaptive traffic flow minimization. Here AccAD achieves 1/10-1/20 more compression than standard http compression. It identifies redundancies in the transaction messages (based on SAP Patent algorithms) and thus the traffic over the WAN for web enabled enterprise applications is reduced. For the future, there would be even a potential to integrate service prioritization.
- **On the application server, commodity tasks and processes can be offloaded**: this comprehends for example compression, encryption and handling communication over slow WAN. Those tasks don’t create load on the application server anymore, but are rather moved to the dedicated Accelerated Application Delivery hosts.
- **TCP traffic optimization**: TCP roundtrips are minimized by using local TCP termination – this reduces the overall number of roundtrips and parallel transmission can increase the efficiency further. Usually, without AccAD, 1 roundtrip is necessary in order to open the TCP connection before transferring the request. Since CFE and SFE keep connections open, those connections can be reused and at least 1 roundtrip per request is saved. Between CFE and SFE multiple connections are opened, thus the traffic can potentially be transmitted in parallel.
- **End-to-end security**: All communication between user and CFE, CFE and SFE, SFE and Application Server can be secured.
- **Software appliance**: Accelerated Application Delivery follows a software appliance approach, thus it is preconfigured and contains a straight-forward installation with kickstart files. The common baseline is that it takes at max. 60 min to set up a client front-end.
In this slide I would like to illustrate which optimization methods of AccAD really help to improve applications’ response times under the different network issues that typically occur in WAN scenarios.

**Bandwidth** is also referred to as data transfer rate. Here we talk about a limited amount of data that can be carried from one point to another in a given time period – usually measured in Mbit / s. AccAD helps to keep good response times even with low bandwidth connections because efficient compression mechanisms reduce the amount of data that has to be carried from the remote office to the data center.

**Latency** can be translated into delay as well. This is the time that it takes for a packet of data to travel from one point to another. Influencing factor is mainly the speed of light - the highest speed a which data could travel. Moreover, those factors might introduce a delay as well: the transmission medium itself, routers or other gateway nodes that need some time to examine or change the packet header, and other intermediate network devices such as switches or bridges (e.g. storage or hard disk delays). The latency is measured in ms, and you can obtain the data with a ping or ni-ping to the application server. AccAD addresses this factor by reducing the number of roundtrips: the TCP traffic optimization keeps tcp connections open, with caching you can avoid unnecessary roundtrips by serving the data from the local web cache instead of the data center.

**Network congestion** is the overall information overflow. A large amount of redundant data and huge packets might exceed the available network capacity. Since http traffic is often low prioritized in corporate networks, this traffic might suffer especially from the bottleneck. AccAD helps to reduce the overall network usage by caching redundant traffic and then serving it locally and by compressing the traffic to reduce the packets size. On the future roadmap an internal service priorization is planned which might help to deliver critical traffic faster than uncritical traffic (such as documents) if a bottleneck remains to exist.

**Packet loss** is the failure of certain packets to arrive at their destination. You measure this is % or ‰ . This usually occurs due to a tcp slow start effect where you start to transfer small packets, increase gradually the payload size until you loose something, then reduce the size of the packet again – this process then continues in order to find the optimal size for transferring packets. Since AccAD keeps 16 tcp connections open by default and this static connection stays optimal, the traffic is a lot less fragile for packet loss.

Thus all typical network issues are addressed by AccAD optimizations for web-based traffic.
Here the application aware caching mechanism for Knowledge Management within Accelerated Application Delivery is illustrated. Knowledge Management documents are bound to permissions, which means that a generic web caching of KM documents is not possible. This would otherwise open a security hole if users can access the document in a cache without a permission check.

Whenever a user requests a KM document as the first user, the cache is checked but still empty and thus the file is requested from the SFE of the data center. The file is then transmitted to the Client Front-End, located into the cache and delivered to the end user. This flow is already optimized in comparison to setups without AccAD due to TCP and HTTP compression and parallelizing mechanisms. If the second user wants to access the document, then this is already located in cache. Since KM documents hold permissions, a small request is sent to the SFE in order to request the permissions for this document as well as to ask whether the document is still up-to-date. The according flags will be transmitted from the data center, via the SFE back to the CFE. If these flags say „authorized“ and „up-to-date“ then the user receives the file from the CFE. In case he is not authorized to access the content, he will receive a permission error. In case the document in the cache is not the same as the latest version in the application server, then this document is re-transmitted.

This KM caching mechanisms is beneficial as well for any application that uses Knowledge Management as a document store: for example BI Java Broadcasting, various Business Packages and Collaboration Rooms.
The SAP Learning Solution contains several specialities in execution due to a complex system of object versioning. Training courses can change over time and the user has to be assigned to a specific version of the course that he took. Thus several versions of the same object are valid for different user groups. There is a mapping file existing within the SAP Learning Solution in the „Content Player“ that transfers the logical path (the URL) to a physical path where the documents are located in a content management system.

For the SAP Learning Solution an application aware on-demand caching is provided as well. Here the first end user launches a course and since no information is yet cached on the CFE, he requests the information from the SFE and thus the data center. This request is split into 2 different roundtrips: request the mapping file from the SAP Learning Solution Content Player and transmitting this file. Then requesting the course content itself which can be found via the content player on a Content Management System like for example the Knowledge Management of the SAP NetWeaver Portal. This content file then is transmitted back to the CFE – both the content file as well as the XML based mapping file are placed into the CFE’s cache and the content is sent back to the end user who requested it. The next user, who is launching the same course but with a slightly different URL can use the mapping file available on the CFE to find the physical path of this course and thus receive the cached course details from the CFE. Thus 2 effects are addressed: the Learning Solution content can be cached efficiently in the remote locations and secondly load is taken from the Content Player of the LSO, since the mapping file and resolution then happens for many users directly on the CFE instead of the application server.
The communication in all subareas can be secured: between user and CFE, CFE and SFE, SFE and data center. However, one should always outweigh security versus performance gains, since securing the communication will have a negative impact on performance.

Between the User and the CFE, TLS / SSL communication can take place and different certificates for different services can be used.

The communication between CFE and SFE can be secured using AccAD certificates – the Server Front-End contains an integrated CA (certificate authority, which issues digital certificates).

Between SFE and Data Center the communication might be secured as well by re-encrypting the information to HTTPS by leveraging client certificates.

The overall configuration options are available in the AccAD Administrator.

In addition, you have the option to encrypt the cache on the engines - and thus increase the physical security for potentially sensitive content such as KM documents.
For setting up the appliance landscape and configuring it, 2 different environments are now available.

The web-based UI for administration of the overall landscape including monitoring and audit tasks is called “AccAD Administrator”. This environment typically suits especially application administrators that are used to graphical UIs. You can simply call the UI via the IP address of the according engine / repository and port 7443. Compared to previous releases, this environment has no dependency anymore to an SAP NetWeaver Portal and thus replaces the portal admin plug-in.

In addition there is a command line interface offered as an alternative environment suiting typically the network administrator. This environment is a secure shell connection to a network-device like CLI. The CLI contains advanced characteristics – it’s auto-comprehensive and provides auto-completion for commands and content. Within a command line you have the option to work with scripts for automation purposes – this can be especially useful in large and dynamic landscapes.

Both environments offer the same configuration options and are exchangably usable (apart from the slight differences named before).
Here you can see the latest Product Availability

<table>
<thead>
<tr>
<th>Application Delivery Engine: Repository + SFE + CFE</th>
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<tbody>
<tr>
<td>- Linux RedHat Enterprise 4 (updates higher than U4), 32Bit + 64 Bit</td>
</tr>
<tr>
<td>- Linux RedHat Enterprise 5 (updates higher than U3), 32Bit + 64Bit</td>
</tr>
<tr>
<td>- SuSe Linux SLES 10, 32Bit + 64 Bit</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Windows Client: CFE</th>
</tr>
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<tbody>
<tr>
<td>(remote office, for single stations &amp; small offices, up to 100 users)</td>
</tr>
<tr>
<td>- Windows XP 2002, 32Bit</td>
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<tr>
<td>- Windows 2003, 32Bit</td>
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<tr>
<td>- Planned: Windows Vista, 32Bit</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>AccAD Administrator (Web Browsers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Internet Explorer 6.0, Internet Explorer 7.0, Internet Explorer 8.0</td>
</tr>
<tr>
<td>- Firefox 3.0, Firefox 3.5</td>
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</tbody>
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<table>
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<tr>
<th>Application Delivery Monitor</th>
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</thead>
<tbody>
<tr>
<td>- SUN JSE 1.4.2, 32Bit</td>
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<tr>
<td>- SUN JSE 1.4.2, 64Bit</td>
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<tr>
<td>- SUN JSE 5.0, 32Bit</td>
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<td>- SUN JSE 6.0, 32Bit</td>
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The vision of Accelerated Application Delivery continues as is: AccAD addresses performance painpoints of global SAP scenarios. It improves response times of Wide Area Network (WAN) connections, which typically have characteristics such as high latency, low bandwidth and overall network congestion. AccAD overcomes the restrictions and improves response times with efficient generic compression and caching mechanisms as well as SAP application-aware optimizations („Layer-8-optimizations“).

Key elements are: maintaining a low TCO, reliability and security.
Here you can see the timeline of already available and planned AccAD releases. AccAD 2.1 is available in unrestricted shipments since end of 2008 – although already earlier we have improved the product during early pilot, beta and Ramp-Up phases.

End of March 2010 the Ramp-Up for AccAD 2.2 starts – of course as usual, during the Ramp-Up timeline SAP aims to provide Support Package Stacks that fix potential issues. In Q3 unrestricted shipment is planned to start and approximately one year later the next release AccAD 2.3.
As a summary of this overview presentation on Accelerated Application Delivery, the key takeaways are that it enables users to access applications with optimized performance over Wide Area Networks. It overcomes bandwidth and latency restrictions and thus provides access at near-LAN speed. Moreover, it is centrally managed and provides several means of security. Accelerated Application Delivery helps to provide optimal end user experience in terms of performance e.g. for global portal implementations – such as the SAP Corporate Portal, which uses AccAD since 2006 to deliver portal content to its worldwide employees.
More Information

SAP Public Web:
SAP Developer Network (SDN)
http://www.sdnn.sap.com/irj/sdn/nw-accad
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