

WAN Optimization – Changes to more than just a box

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Order of appearance

- Speaker introduction
- Background on WAN optimization
- Impacts on the network and monitoring
- Integration with software and services
- Failures and troubleshooting
- Know your networks!
- Questions and answers*

* Or when they come up.

Speaker information

Edwin Groothuis

- Dutch origins, pardon the accent. Just ask me to repeat it.

Past work-experience

- Philips Electronics – Communication and Processing Services - WAN group (network hardware, network management, DNS group) later known as Atos Origin; from 1995.
- BarNet – ISP (systems management, network management); from 2001.

Current work

- Riverbed Technology – TAC Support group Sydney; since 2008.

Hobbies

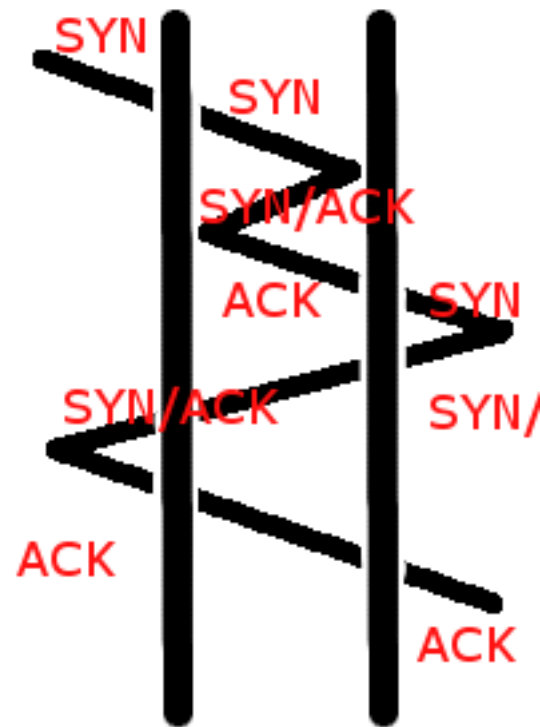
- Involved in the FreeBSD Operating System.
- Two child processes competing for CPU time.

Background on WAN optimization - Setup

What happens by the setup of the TCP session?

- Client sends TCP SYN packet.
- Client-side WAN optimizer intercepts the TCP SYN packet, sets up a session with the server-side WAN optimizer.
- Server-side WAN optimizer sets up TCP session with server.
- Client-side WAN optimizer sends TCP SYN-ACK packet to the client and client sends TCP ACK packet.

As a result, two outer TCP sessions (client <-> client-side WAN optimizer, server-side WAN optimizer <-> server) are setup, plus some form of connectivity (inner channel) between the two WAN optimizers. Note that the characteristics on the two outer TCP sessions are different: TCP Window size and usage, TCP Sequence numbers. The IP addresses and TCP ports should be the same.



Background on WAN optimization – The magic

TCP Optimization – make the client look smarter

- Adjust TCP Window Size and allow TCP Window Scaling
- Add TCP Selective ACKnowledgement
- Allow for Highspeed TCP and packet-loss compensation

Data reduction – reduce the WAN utilization

- Referencing of known data
- Compression of data

Latency Optimization – reduce the WAN latency

- On remote filesystems: Directory metadata caching
- On file operations: Read-ahead and write-behind
- Prefetching of data: CIFS, HTTP, MAPI and Lotus Notes.

Impact on the network and monitoring - 1

Obvious: Less traffic going over the WAN.

Not so obvious: More traffic going over the LAN.

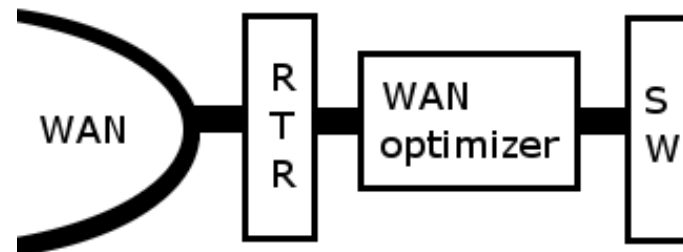
Not all traffic can or should be optimized:

- Encrypted traffic (SSH, SSL transport layer)
- Compressed streams (note: not compressed data)
- Interactive and realtime traffic (remote desktop, Citrix, telephony session handling)
- Help the WAN optimizer by properly configuring your webproxy configuration

State-full firewalls might not like the auto-discovery behaviour seen.

WAN side traffic is not “plain text” anymore:

- QoS classification needs to be done before or on the WAN optimizer.
- IPS/IDS needs to be done before the WAN optimizer.
- Packet-shaping needs to be done before the WAN optimizer.



Impact on the network and monitoring - 2

Network monitoring:

- Obvious: Network traffic monitoring will report different amounts of traffic on the LAN and on the WAN side.
- The inner channel between the WAN optimizers does not need to have the same IP addresses and TCP ports as the outer TCP sessions.
- How can it be matched now? Listen to the WAN optimizer instead of the WAN router.

Systems and services monitoring

- Has to happen twice, once for an optimized TCP session and once for an un-optimized TCP session.

Know what has to be optimized and monitor it!

Integration with servers and services - 1

Latency optimization can only be done if the protocols spoken and the behaviour of the clients are known.

Integration with the Windows Active Directory Domain services:

- When a WAN optimizer is joined to an AD Domain, it is able to
 - » ... decrypt, optimize, re-encrypt MAPI sessions.
 - » ... re-sign CIFS sessions.
- Some features are transparent on some versions of Windows, some features need further integration.

SSL optimization:

- Being able to decrypt, optimize and re-encrypt SSL encrypted TCP sessions, the WAN optimizer needs to know the SSL server private key, public certificate and CA public certificate.

Integration with servers and services - 2

Protocol changes for Latency Optimization

- SMBv2 – Negotiation can be used to fallback to SMBv1.
- NFS v3 and v4
- Exchange 2000, 2003, 2007, 2010 – Negotiation can be used to fallback to the protocol of a previous version.
- Exchange to Exchange is not standard MAPI.
- Citrix ICA – protocol and behaviour depending on client and servers.
- Windows client authentication – NTLM vs Kerberos

Upgrades of clients and servers

- You want to know about them in advance to prepare yourself.
- You want to know about them in hindsight in case things broke.

WAN optimizer failures and troubleshooting - 1

BEEP BEEP “Nagios alert”

Network layer failures:

- Two ways of integration: Inline and out-of-path.

IP and TCP layer failures:

- Instead of one TCP session you end up with two outer TCP sessions and an inner channel between the WAN optimizers.
- Some devices take shortcuts on in TCP protocols.
- Some devices use specific TCP header information to indicate to their clients or servers.
- Most of the time, it is related to basic IP routing.

WAN optimizer failures and troubleshooting - 2

TRING TRING “The network is sloooooooooooooow....”

Network related:

- What has changed in the last couple of days?
- Speed or duplex issues.
- LAN flooding with excess traffic due to WAN optimization.
- LAN switch and WAN router cannot cope with the increase of packets.

Client or server related:

- What has changed in the last couple of days?
- Fileservers are busier because of read-ahead and “increased” bandwidth of the WAN links.
- Dumb programs thinking that everything is zero ms latency.
- Undocumented protocol extensions.
- Faked clients.

WAN optimizer failures and troubleshooting - 3

TRING TRING “Riverbed Support, how can I help you?”

Appliance issues:

- What has been changed in the last couple of days?
- Hardware health: Harddisk health, NICs.
- Operating System health: CPU load, disk I/O, memory usage, network usage.
- Optimization health: Amount of optimization, latency optimization failures, licensing issues.

Network issues:

- What has been changed in the last couple of days?
- Check what happens with the setup of the optimized TCP sessions.
- Check what happens once the TCP sessions are setup.
- Check what happens with latency optimization.

Just being a rubber duck often helps already.

Know your IP network - 1

Firewalls, IDS, IPS – They don't always like the way WAN optimizers work. Know all the links coming out of remote sites and cover them with WAN optimizers.

Know the path the traffic takes:

- client to server and back.
- client-side WAN optimizer to server-side WAN optimizer and back.

Test your backup links and make sure the traffic stays optimized or gets optimized again.

Know your services network – 2

- Run services which can be optimized.
- Configure these services so that the WAN optimizers can do their job.
- Configure your WAN optimizers so they can optimize the services.
- Be informed about network changes and upgrades.

Know your social network - 3

Know your colleagues in the networking department, the LAN services group, the firewall team, the email group, the Exchange team, the Lotus Notes managers, the webserver people, the database administrators, the file-server department, the SAN team, third party network providers.

Let them know...

- What the WAN optimizers do.
- How they improve the service experience for their users.
- That they need to work together to keep this experience up.
- That it will break if they don't work together.

Finished!

Questions and answers