Troubleshooting Cisco Wide Area Application Services

BRKAPP-3006
Cisco Application Delivery Networks

Network Classification
- Quality of service
- Network-based app recognition
- Queuing, policing, shaping
- Visibility, monitoring, control

Application Scalability
- Server load-balancing
- Site selection
- SSL termination and offload
- Video delivery

Application Networking
- Message transformation
- Protocol transformation
- Message-based security
- Application visibility

Application Acceleration
- Latency mitigation
- Application data cache
- Meta data cache
- Local services

WAN Acceleration
- Data redundancy elimination
- Window scaling
- LZ compression
- Adaptive congestion avoidance

Application Optimization
- Delta encoding
- FlashForward optimization
- Application security
- Server offload

Application Networking
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- Protocol transformation
- Message-based security
- Application visibility

Application Scalability
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Application Classification
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Other Cisco Live Breakout Sessions that You May Want to Attend

<table>
<thead>
<tr>
<th>Session Code</th>
<th>Session Title</th>
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</thead>
<tbody>
<tr>
<td>BRKAPP-2002</td>
<td>Server Load Balancing Design</td>
</tr>
<tr>
<td>BRKAPP-3003</td>
<td>Troubleshooting ACE</td>
</tr>
<tr>
<td>BRKAPP-1004</td>
<td>Introduction WAAS</td>
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<tr>
<td>BRKAPP-2005</td>
<td>Deploying WAAS</td>
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<tr>
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<td>Troubleshooting WAAS</td>
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<tr>
<td>BRKAPP-1008</td>
<td>What can Cisco IOS do for my application?</td>
</tr>
<tr>
<td>BRKAPP-1009</td>
<td>Introduction to Web Application Security</td>
</tr>
<tr>
<td>BRKAPP-2010</td>
<td>How to build and deploy a scalable video communication solution for your organization</td>
</tr>
<tr>
<td>BRKAPP-2011</td>
<td>Scaling Applications in a Clustered Environment</td>
</tr>
<tr>
<td>BRKAPP-2013</td>
<td>Best Practices for Application Optimization illustrated with SAP, Siebel and Exchange</td>
</tr>
<tr>
<td>BRKAPP-2014</td>
<td>Deploying AXG</td>
</tr>
<tr>
<td>BRKAPP-1015</td>
<td>Web 2.0, AJAX, XML, Web Services for Network Engineers</td>
</tr>
<tr>
<td>BRKAPP-1016</td>
<td>Running Applications on the Branch Router</td>
</tr>
<tr>
<td>BRKAPP-2017</td>
<td>Optimizing Application Delivery</td>
</tr>
<tr>
<td>BRKAPP-2018</td>
<td>Optimizing Oracle Deployments in Distributed Data Centers</td>
</tr>
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Relevancy

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<tr>
<th>Session Code</th>
<th>GSS</th>
<th>ISR</th>
<th>WAAS</th>
<th>ACNS</th>
<th>ACE</th>
<th>AXG</th>
<th>Applications</th>
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</tbody>
</table>
Agenda

- Diagnostic Report
- Physical Components
- Platform
- Transport Optimizations
- Application Acceleration
- Virtual Blades
- Configuration Management System

Wide Area Application Engine (WAE)

Wide Area Application Services (WAAS) Version 4.1

<table>
<thead>
<tr>
<th>IOS Platform with Services and CLI</th>
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Cisco Linux Kernel

Policy Engine, Filter-Bypass, Egress Method, Directed Mode, Auto-Discovery

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<th>Flash</th>
<th>IOS Shell</th>
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</tbody>
</table>

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Presentation_ID.scr
Self Diagnostic Tool
A Good Place to Start…

- 4.0.15 release added support for self-diagnostic tool
- Executes series of tests to check correctness of configuration and device operation
- Test output saved in local diagnostic_report.txt file, which is included as part of sysreport

WAE7326-CC0# test self-diagnostic ?
all Run all self-diagnostic tests
basic Basic device configuration
connectivity Basic device connectivity
inline Inline groups and ports
interfaces Physical interfaces
system Device operation
tfo TFO/DRE configuration
wafs WAFS connectivity
wccp WCCP configuration and operation
WAE7326-CC0#
Sample Diagnostic Report

WAE7326-CCO# test self-diagnostic all
running test 'basic'
running test 'connectivity'
running test 'interfaces'
running test 'tfo'
running test 'wccp'
running test 'inline'
running test 'system'
running test 'wafs'

Diagnostic Report performed on 12/21/2007 11:22:59

Test NOTE [basic]
  NOTE NO_NTP_CFG       Device ntp time synchronization is not configured
  Action:
    Use 'ntp server' cli command to configure NTP server.

Test PASS [connectivity]

Test WARN [interfaces]
  WARN IFACE_HD         Interface GigabitEthernet 1/0 is in half-duplex mode.
    Please check the Switch/Router configuration.
  Action:
    Half-Duplex is configured in the interface. Use 'interface type slot/group full-duplex' cli command to configure Full-Duplex for better performance. If autosense is configured then change the duplex settings configured in the Switch/Router.

  NOTE IFACE_DOWN       Interface GigabitEthernet 2/0 is not up
  Action:
    Use 'interface type slot/group' cli command followed by 'no shutdown' to enable the interface.

Test WARN [tfo]
  WARN PE_OTHER         Un-classified traffic is configured for by-pass and is not optimized
  Action:
    Use policy engine 'policy-engine application map other' cli command to enable optimization of un-classified traffic.

Test PASS [wccp]

Test PASS [inline]
  NONE - Skipping test because inline card(s) is not present

Test WARN [system]
  WARN HAS_ALARM        1 Major Alarms are raised in the device. Please find the list below.
  1. The interface GigabitEthernet 1/0 is not in full-duplex mode.
  Action:
    Critical/major alarms are raised. Check device alarms using 'show alarms detail' cli command for details.

Test PASS [wafs]
### Physical Components

#### Wide Area Application Engine (WAE)

**Wide Area Application Services (WAAS) Version 4.1**

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<tr>
<td>CIFS AO, MAPI AO, HTTP AO, SSL AO, RTSP AO, NFS AO, EPM AO, WoW, Virtual Blade # 2, Virtual Blade # 3</td>
<td></td>
</tr>
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<td>TCP Proxy with Scheduler Optimizer (SO) DRE, LZ, TFO</td>
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</tr>
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<td></td>
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#### Cisco Linux Kernel

- **Policy Engine, Filter-Bypass, Egress Method, Directed Mode, Auto-Discovery**
  - Flash IOS Shell Linux
  - Application Storage
  - Object Storage
  - DRE Storage
  - Virtual Blade Storage /vbspace
  - Ethernet Network I/O
Network Interface Errors

WAE7341# show int gi 1/0
Type: Ethernet
Ethernet address: 00:14:5E:AC:2D:79
Internet address: 10.88.80.135
Broadcast address: 10.88.80.255
Netmask: 255.255.255.128
Maximum Transfer Unit Size: 1500
Metric: 1
Packets Received: 14298
Input Errors: 0
Input Packets Dropped: 0
Input Packets Overruns: 0
Input Packets Frames: 0
Packet Sent: 12946
Output Errors: 0
Output Packets Dropped: 0
Output Packets Overruns: 0
Output Packets Carrier: 0
Output Queue Length: 1000
Collisions: 64
Interrupts: 16
Flags: UP BROADCAST RUNNING MULTICAST
Mode: autoselect, half-duplex, 100baseTX
WAE7341#

Verify Interface Statistics for Errors

Network Interface Status

WAE7341# show int gi 1/0
Type: Ethernet
Ethernet address: 00:14:5E:AC:2D:79
Internet address: 10.88.80.135
Broadcast address: 10.88.80.255
Netmask: 255.255.255.128
Maximum Transfer Unit Size: 1500
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Collisions: 64
Interrupts: 16
Flags: UP BROADCAST RUNNING MULTICAST
Mode: autoselect, half-duplex, 100baseTX
WAE7341#

Verify Interface State, Speed and Duplex
**CPU Utilization**

- WAE CPU utilization is available in three (3) places:
  - Central Manager GUI, WAE Manager GUI, CLI
- Use CLI for real-time CPU utilization monitoring:

```
WAE612# show processes system count 10 delay 5
< .. >
procs -----------memory---------- ---swap-- -----io---- --system-- ----cpu----
 r b  swpd free  buff  cache  si so  bi  bo  in  cs  us  sy  id  wa
 0  0   772548 151944 161944  0  0   2  7  227  185  1  1  98  0
 1  0   772628 151948 161940  0  0   0 15  1010  1518  1  1  98  0
 0  0   772438 151956 161932  0  0   0 18  1006  1401  0  0  99  0
 0  0   772150 151956 161932  0  0   0  8  1010  1400  1  0  98  0
 1  0   772204 151956 161932  0  0   0  6  1009  1421  1  0  98  0
 0  0   772652 151960 161996  0  0   0  6  1005  1422  0  0  99  0
 1  0   772492 151964 161992  0  0   0  8  1007  1508  0  0  99  0
WAE612#
```

Subtract 'id' Column from 100 to Get Current CPU Utilization

**Verify Disk Health and Status**

- Check disk drive status through CLI

```
WAE7341# show disk det
RAID Physical disk information:
  disk00: Online  3QD107QJ  715404 MB
  disk01: Online  3QD10X88  715404 MB
  disk02: Online  3QD10C9P  715404 MB
  disk03: Online  3QD11BZE  715404 MB
RAID Logical drive information:
  raid-disk: RAID-5 Okay
  Enabled (read-cache) Enabled (write-back)
Mounted file systems:
  MOUNT POINT       TYPE       DEVICE                SIZE     INUSE      FREE USE%
  /sw internal      /dev/sda1            991MB     822MB   169MB  82%
  /swstore internal /dev/sda2            991MB     371MB     620MB  37%
  /state internal  /dev/sda3           7933MB     185MB    7750MB   2%
  /vspace internal  /dev/data/vbsp 392123MB 245841MB 389698MB 0%
  /local/local sysfs /dev/sda8            83322MB 27477MB 80575MB 3%
  /disk00-05 CONTENT /dev/data/waas 1568509MB 1289MB 1568381MB 0%
  /local/spool PRINTSPool /dev/sda9         991MB     18MB     973MB  1%
Disk encryption feature is disabled.
WAE7341#
```
Important Directories and Log Files

- The following directories are used by Cisco WAAS for log files:
  
  `/local1`—Root directory for all log files
  `/local1/logs`—Service log files (aka "admin" logs)
  `/local1/errorlog`—Service log files (aka "debug" logs)
  `/local1/core_dir`—Process core dump files

- File system navigation commands;
  
  `cd`  
  `pwd`  
  `dir`  
  `type-tail <filename> <lines> [ | | follow]`
  `find-pattern`

WAAS System Report

Help Us Help You

- The WAAS system report (sysreport) contains a compressed archive containing all relevant support and system health information

- The sysreport includes the following:
  
  CLI command output, platform configuration and logs, platform state information, print services configuration and logs, authentication configuration and logs, logs for internal services and acceleration, CMS configuration and logs, system logs, etc.

- The sysreport can be generated from the WAE Manager GUI or CLI:

  `WAE612# copy sysreport <disk | ftp | tftp> ...`
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</table>
WCCP Platform Recommendations

<table>
<thead>
<tr>
<th>Function</th>
<th>Support / Recommend</th>
<th>Software</th>
<th>ASR 1000</th>
<th>Cat 6500</th>
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<th>Cat 4500</th>
<th>Cat 3750</th>
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<td></td>
</tr>
<tr>
<td></td>
<td>Hash Only</td>
<td>Mask Only</td>
<td>Mask or Hash</td>
<td>Mask or Hash</td>
<td>Mask only</td>
<td>Mask only</td>
<td></td>
</tr>
<tr>
<td>Forwarding</td>
<td>GRE Only</td>
<td>L2 or GRE/ L2 or GRE</td>
<td>L2 or GRE / L2 or GRE</td>
<td>L2 or GRE / L2</td>
<td>L2 only</td>
<td>L2 only</td>
<td></td>
</tr>
<tr>
<td>Forwarding Redirect List</td>
<td>Full extended ACL</td>
<td>Full extended ACL</td>
<td>Full extended ACL</td>
<td>Full extended ACL</td>
<td>No Redirect List Support</td>
<td>Extended ACL no deny support</td>
<td></td>
</tr>
<tr>
<td>Direction</td>
<td>In or Out / In</td>
<td>In only</td>
<td>In or Out / In</td>
<td>In only</td>
<td>In only</td>
<td>In only</td>
<td></td>
</tr>
<tr>
<td>Return</td>
<td>IP Forward or GRE</td>
<td>IP Forward, L2, or GRE / GRE, nGRE, IP Forward or No GRE</td>
<td>IP Forward or L2 / IP Forward</td>
<td>IP Forward or L2 / IP Forward</td>
<td>IP Forward or L2 / IP Forward</td>
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<td></td>
</tr>
<tr>
<td>IOS</td>
<td>12.1(14); 12.2(26); 12.3(13); 12.4(10); 12.1(3)T; 12.2(14)T; 12.3(14)T5; 12.4(8)T1</td>
<td>Planned</td>
<td>12.2(18)SXF13 12.2(18)SRB3 12.2(33)SXH</td>
<td>12.1(27)E 12.2(18)SXF13</td>
<td>12.2(40)SG</td>
<td>12.2(44)SE</td>
<td></td>
</tr>
</tbody>
</table>

WCCPv2 Interception Verification (Router)

Router# show ip wccp
Global WCCP information:
    Router information:
        Router Identifier: 10.88.81.242
        Protocol Version: 2.0
    Service Identifier: 61
        Number of Service Group Clients: 1
        Number of Service Group Routers: 1
        Total Packets s/w Redirected: 68755
            Process: 2
            Fast: 0
            CEF: 68753
        Service mode: Open
        Service access-list: -none-
        Total Packets Dropped Closed: 0
        Redirect access-list: -none-
        Total Packets Denied Redirect: 0
        Total Packets Unassigned: 0
        Group access-list: -none-
        Total Messages Denied to Group: 0
        Total Authentication failures: 0
        Total Bypassed Packets Received: 0

Client = WAE
WCCPv2 Interception Verification (Router)

Router# show ip wccp
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Verify That Counters Are Incrementing on Software-Based Platforms

Counter Will Increment for Packets That Match Service Group but Do Not Match Redirect-List
WCCPv2 Interception Verification (Router)

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   Group access-list: -none-
   Total Messages Denied to Group: 0
   Total Authentication failures: 0
   Total Bypassed Packets Received: 0

--More--

Increments for Every Packet Received with Incorrect Service Group Password

Interception Verification (Router) (Cont.)

Router# show ip wccp 61 detail
WCCP Client information:
   WCCP Client ID: 10.88.81.4
   Protocol Version: 2.0
   State: Usable
   Initial Hash Info: 00000000000000000000000000000000 00000000000000000000000000000000
   Assigned Hash Info: FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
                         FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
   Hash Allotment: 256 (100.00%)
   Packets s/w Redirected: 2452
   Connect Time: 01:19:46
   Bypassed Packets:
      Process: 0
      Fast: 0
      CEF: 0

Verify WAE State in Service Group

% of Hash Buckets Assigned

Current Time in the Service Group
WCCPv2 Interception Verification (WAE)

```
show wccp services
Services configured on this File Engine
TCP Promiscuous 61
TCP Promiscuous 62

show wccp status
WCCP version 2 is enabled and currently active

show wccp routers
Router Information for Service: TCP Promiscuous 61
Routing Configured and Seeing this File Engine:
<table>
<thead>
<tr>
<th>Router Id</th>
<th>Sent To</th>
<th>Recv ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.88.81.242</td>
<td>10.88.81.1</td>
<td>0000A631</td>
</tr>
</tbody>
</table>

WAE-612# show wccp gre
Transparent GRE packets received: 55311
Transparent non-GRE packets received: 0
Total packets accepted: 55311
Invalid packets received: 0
Packets received on a disabled service: 0
Packets dropped due to zero TTL: 0
Packets dropped due to bad buckets: 0
Packets dropped due to no redirect address: 0
Packets dropped due to loopback redirect: 0
Connections bypassed due to load: 0
Packets sent back to router: 0
GRE packets sent to router (not bypass): 0
Packets sent to another WAE: 0
GRE fragments redirected: 0
GRE encapsulated fragments received: 0
Packets failed encapsulated reassembly: 0
Packets failed GRE encapsulation: 0
```

Verify WCCP Is Configured and Enabled
Verify Bi-Directional Communication with WCCP-Enabled Routers
Either of These Counters Should Be Incrementing If WCCP Redirection Is Working
show wccp gre

WAE-612# show wccp gre
Transparent GRE packets received: 55311
Transparent non-GRE packets received: 0
Transparent non-GRE non-WCCP packets received: 0
Total packets accepted: 5051
Invalid packets received: 0
Packets received with invalid service: 0
Packets received on a disabled service: 0
Packets received too small: 0
Packets dropped due to zero TTL: 0
Packets dropped due to bad buckets: 0
Packets dropped due to no redirect address: 0
Packets dropped due to loopback redirect: 0
Pass-through pkts dropped on assignment update: 0
Connections bypassed due to load: 0
Packets sent back to router: 0
GRE packets sent to router (not bypass): 0
GRE packets sent to another WAE: 0
GRE fragments redirected: 0
GRE encapsulated fragments received: 0
Packets failed encapsulated reassembly: 0
Packets failed GRE encapsulation: 0
--More--

For Packets Redirected Using WCCP L2-Redirect Forwarding Method

For Packets L2 Redirected Using Non-WCCP (L4, PBR, Etc.) Interception Method
show wccp gre

WAE-612# show wccp gre
Transparent GRE packets received: 55311
Transparent non-GRE packets received: 0
Transparent non-GRE non-WCCP packets received: 0
Total packets accepted: 5051
Invalid packets received: 0
Packets received with invalid service: 0
Packets received on a disabled service: 0
Packets received too small: 0
Packets dropped due to zero TTL: 0
Packets dropped due to bad buckets: 0
Packets dropped due to no redirect address: 0
Packets dropped due to loopback redirect: 0
Pass-through pkts dropped on assignment update: 0
Connections bypassed due to load: 0
Packets sent back to router: 0
GRE packets sent to router (not bypass): 0
Packets sent to another WAE: 0
GRE fragments redirected: 0
GRE encapsulated fragments received: 0
Packets failed encapsulated reassembly: 0
Packets failed GRE encapsulation: 0

--More--

WAE-612# show wccp gre
Transparent GRE packets received: 55311
Transparent non-GRE packets received: 0
Transparent non-GRE non-WCCP packets received: 0
Total packets accepted: 5051
Invalid packets received: 0
Packets received with invalid service: 0
Packets received on a disabled service: 0
Packets received too small: 0
Packets dropped due to zero TTL: 0
Packets dropped due to bad buckets: 0
Packets dropped due to no redirect address: 0
Packets dropped due to loopback redirect: 0
Pass-through pkts dropped on assignment update: 0
Connections bypassed due to load: 0
Packets sent back to router: 0
GRE packets sent to router (not bypass): 0
Packets sent to another WAE: 0
GRE fragments redirected: 0
GRE encapsulated fragments received: 0
Packets failed encapsulated reassembly: 0
Packets failed GRE encapsulation: 0

--More--
Egress Methods Mismatch

- Only WCCP GRE Return is supported as a ‘negotiated-return’ egress method
  
  WAE raises minor alarm if negotiated return method is L2

- Generic GRE egress method only supported WCCP GRE as the intercept-method

  WAE raises minor alarm if negotiated intercept method is L2

- Alarm cleared when mismatch is resolved by altering the egress method and/or WCCP configuration

- Verify configured and used egress method with `sh tfo egress-method` CLI command
Egress Methods Mismatch

WAE612# sh egress-methods
Intercept method : WCCP
TCP Promiscuous 61 :
  WCCP negotiated return method : WCCP GRE

<table>
<thead>
<tr>
<th>Destination</th>
<th>Egress Method Configured</th>
<th>Egress Method Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>any</td>
<td>Generic GRE</td>
<td>IP Forwarding</td>
</tr>
</tbody>
</table>

WARNING: WCCP has negotiated WCCP L2 as the intercept method for which generic GRE is not supported as an egress method in this release. This device uses IP forwarding as the egress method instead of the configured generic GRE egress method.

TCP Promiscuous 62 :
WCCP negotiated return method : WCCP GRE

<table>
<thead>
<tr>
<th>Destination</th>
<th>Egress Method Configured</th>
<th>Egress Method Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>any</td>
<td>Generic GRE</td>
<td>IP Forwarding</td>
</tr>
</tbody>
</table>

WARNING: WCCP has negotiated WCCP L2 as the intercept method for which generic GRE is not supported as an egress method in this release. This device uses IP forwarding as the egress method instead of the configured generic GRE egress method.

show interface inlineGroup

WAE-612# show interface inlineGroup 1/0

Interface is in intercept operating mode.
Standard NIC mode is off.
Disable bypass mode is off.
VLAN IDs configured for inline interception: All
Watchdog timer is enabled.
Timer frequency: 1600 ms.
Autoreset frequency 500 ms.
The watchdog timer will expire in 1452 ms.

Intercept Operating Mode or Bypass Operating Mode

- **Intercept operating mode**—Packet are passed to WAAS for (potential) optimization
- **Bypass operating mode**—Mechanical bypass between ports in InlineGroup
show interface inlinePort

```
WAE-612# show interface inlinePort 1/0/wan
  Packets Received : 54231
  Packets Intercepted: 0
  Packets Bridged : 54231
  Packets Forwarded : 0
  Packets Dropped : 0
  Packets Received on native : 0
  Active flows for this interface : 0
...
WAE-612# show interface inlinePort 1/0/lan
  Device name : eth5. Bypass slave interface.
  Packets Received : 334602
  Packets Intercepted: 0
  Packets Bridged : 334599
  Packets Forwarded : 0
  Packets Dropped : 3
  Packets Received on native : 0
  Active flows for this interface : 0
...
WAE-612#
```

Use `sh int inlinep` to determine Device Name for any inlineport.
The Device Name is needed for packet captures.

Packets from L3 and above layers that were sent out from an inline port.
Packets that the bridging layer decided to pass-through.
Connection Admission

- WAAS accepts new connections into the system if:
  - WAE maximum connection limit has not been exceeded
  - Enough memory exists to handle the connection
  - License(s) have been installed and are valid
  - Connection rate limit hasn’t been exceeded
  - Necessary components (TFO/DRE/AO) aren’t overloaded

- Connection admission is enforced by the ATP

- Alarms will be raised if any of the above exception are true, and the connection will be handled as pass-through

```
debug tfo conn policy-engine

May 4 07:52:17 CE-115-07 kernel: %WAAS-SYS-7-900000: 2.43.139.130:40095 - 2.43.139.2:139 - Policy Engine: (pe_get_filtr_policy) orig p:ph: 0xc0669ca0, term p:ph: 0xc0669c98, filt flags: IN-Hook = T, conn type = Accelerator Non-Optimized (11), state: Need Update (2), IBM: 0, app index: 26, ep/tmp index: 2, flags: s>d=Y, action: cfgd-Optimize Full/drvd-Optimize Full, accel: cfgd-CIFS/drvd-CIFS, peer accl rqrd: Y, SSL accl: N, drvq op: FDPAIR, svc cls: Default, dscp op: C, dscp Val: 0, dm cookie: 0x00000000, app pcy key: 0x0000080A, accl rsrvd: 3:0:0:0, ao rsrvd: 2:0:0:0, Reject(T:A:S): None:None:None, policy_figs: 0x00A0

- cfgd and drvd actions should match in most cases
- cfgd and drvd accelerators should match
- peer accl required—Set when AO requires a counterpart AO on peer WAE
- Everything looks fine here?

Enable auto discovery debugs with debug tfo connection auto-discovery and inspection negotiation results
```
debug tfo conn auto-discovery

- **AO field** set to true (1) indicates that an AO has been considered for this connection
- **AO discovery** set to true (1) indicates that a counterpart AO was discovered on the peer WAE
- If the negotiation is successful, the flow is handed over to the AO and TFO accelerators

**Auto-Discovery States**

- Orig-St: Sr, Term-St: SsO
- Orig-St: SrO, Term-St: SsO
- Orig-St: SAs, Term-St: SArO
- Orig-St: SAsO, Term-St: SAr
- Orig-St: EO, Term-St: As
  - F,F,F,F

```
May 4 15:06:12 CE-115-07 kernel: %WAAS-SYS-7-900000: 2.43.139.130:40099 - 2.43.139.2:139 - Our policy: 0x7, Peer policy: 0x7, Neg policy: 0x7, Directed: 0, AO: 1, AO discovery: 1, SSL: 0, AOM sync: 0

May 4 15:06:12 CE-115-07 kernel: %WAAS-SYS-7-900000: 2.43.139.130:40099 - 2.43.139.2:139 - Queueing fd pair to CIFS (aosh id: 2)
```

```
May 4 15:06:12 CE-115-07 kernel: %WAAS-SYS-7-900000: 2.43.139.130:40099 - 2.43.139.2:139 - Queueing fd pair to TFO (aosh id: 13)
```
### Auto-Discovery Statistics

```plaintext
WAE612# show stat conn auto-discovery
...  
Auto discovery failure:

<table>
<thead>
<tr>
<th>Reason</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>No peer or asymmetric route</td>
<td>631</td>
</tr>
<tr>
<td>Insufficient option space</td>
<td>0</td>
</tr>
<tr>
<td>Invalid connection state</td>
<td>0</td>
</tr>
<tr>
<td>Missing Ack conf</td>
<td>0</td>
</tr>
<tr>
<td>Intermediate device</td>
<td>0</td>
</tr>
<tr>
<td>Version mismatch</td>
<td>0</td>
</tr>
</tbody>
</table>

Auto discovery success TO:

<table>
<thead>
<tr>
<th>Source</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal server</td>
<td>40</td>
</tr>
<tr>
<td>External server</td>
<td>0</td>
</tr>
</tbody>
</table>

Auto discovery success FOR:

<table>
<thead>
<tr>
<th>Source</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal client</td>
<td>2902</td>
</tr>
<tr>
<td>External client</td>
<td>0</td>
</tr>
</tbody>
</table>

Auto discovery success SYN retransmission:

<table>
<thead>
<tr>
<th>Type</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero retransmit</td>
<td>2902</td>
</tr>
<tr>
<td>One retransmit</td>
<td>0</td>
</tr>
<tr>
<td>Two+ retransmit</td>
<td>0</td>
</tr>
</tbody>
</table>

Auto discovery Miscellaneous:

<table>
<thead>
<tr>
<th>Reason</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermediate device</td>
<td>0</td>
</tr>
<tr>
<td>RST received</td>
<td>0</td>
</tr>
<tr>
<td>SYNs found with our device id</td>
<td>0</td>
</tr>
<tr>
<td>SYNs retransmit count resets</td>
<td>0</td>
</tr>
</tbody>
</table>
```

### Verify Interception at Peer Location

### Transport Optimizations
### Wide Area Application Engine (WAE)

**Wide Area Application Services (WAAS) Version 4.1**

#### IOS Platform with Services and CLI

<table>
<thead>
<tr>
<th>CIFS AO</th>
<th>MAPI AO</th>
<th>HTTP AO</th>
<th>SSL AO</th>
<th>RTSP AO</th>
<th>NFS AO</th>
<th>EPM AO</th>
<th>WoW</th>
<th>Virtual Blade # 2</th>
<th>Virtual Blade # 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TCP Proxy with Scheduler Optimizer (SO)**
- DRE, LZ, TFO

**Cisco Linux Kernel**
- Policy Engine, Filter-Bypass, Egress Method, Directed Mode, Auto-Discovery
- Flash
- IOS Shell Linux
- Application Storage
- Object Storage
- DRE Storage
- Virtual Blade Storage/vbspace
- Ethernet Network I/O

#### Global TCP Statistics

```
WAE-612# show statistics accelerator tfo
   Total number of connections : 9115
   No. of active connections : 9
   No. of bypass connections : 0
   No. of normal closed conns : 12
   No. of reset connections : 9094
   Socket write failure : 0
   Socket read failure : 0
   WAN socket close while waiting to write : 0
   AO socket close while waiting to write : 0
   WAN socket error close while waiting to read : 0
   AO socket error close while waiting to read : 0
   DRE decode failure : 0
   DRE encode failure : 0
   Connection init failure : 0
   WAN socket unexpected close while waiting to read : 0
   Exceeded maximum number of supported connections : 0
   Peer received reset from end host : 0
   DRE connection state out of sync : 0
   Memory allocation failed for buffer heads : 0
   SSL replumbing failed : 0
   (null): 0
   Overload: max-conn: state : no
   Total number of occurrences : 0

Data buffer usages:
- Used size: 0 B, B-size: 0 B, B-num: 0
- Closed size: 32605 B, B-size: 32605 B, B-num: 37

Scheduler:
- Queue Size: IO: 0, Semi-IO: 0, Non-IO: 0
- Total Jobs: IO: 45910, Semi-IO: 18567, Non-IO: 9237
- Class: 0 weight = 10 bytes = 11090668
- DSCP : 0 weight = 10 bytes = 11090668
```

---

**Aggregate Connection Open/Close Statistics**

---

© 2006, Cisco Systems, Inc. All rights reserved.
Presentation_ID.scr
Global TCP Statistics

```plaintext
WAE-612# show statistics accelerator tfo
Total number of connections : 9115
No. of active connections : 9
No. of bypass connections : 0
No. of normal closed conns : 12
No. of reset connections : 9094
Socket write failure
Socket read failure
WAN socket close while waiting to write
AO socket close while waiting to write
WAN socket error close while waiting to write
DRE decode failure
DRE encode failure
Connection init failure
WAN socket unexpected close while waiting to read : 0
Exceeded maximum number of supported connections : 0
Buffer allocation or manipulation failed : 0
Peer received reset from end host : 0
DRE connection state out of sync : 0
Memory allocation failed for buffer heads : 0
SSL replumbing failed : 0
Overload: max-conn: state : no
Total number of occurences : 0
Data buffer usages:
Used size: 0 B, B-size: 0 B, B-num: 0
Closed size: 32605 B, B-size: 32605 B, B-num: 37
Scheduler:
Queue Size: IO: 0, Semi-IO: 0, Non-IO: 0
Total Jobs: IO: 45910, Semi-IO: 18567, Non-IO: 9237
Class: 0 weight = 10 bytes = 11090668
DSCP : 0 weight = 10 bytes = 11090668
```

Current Overload State and Number of Times the Maximum Number of Supported (Optimized) Connections Has Been Exceeded

Connection Level Statistics

```plaintext
show statistics connection
```

```plaintext
WAE-612# sh stat conn
D:DRE,T:TCP Optimization,
C:CIFS,E:EPM,H:HTTP,M:MAPI,N:NFS,S:SSL,V:VIDEO,
ConnID Local IP:Port Remote IP:Port PeerID Accelerator
1719 10.88.81.10:35021 10.88.80.53:389 0:14:5e:ac:2d:79 D
9994 10.88.81.10:405033 10.88.80.53:389 0:14:5e:ac:2d:79 D
10791 10.88.81.10:45830 10.88.80.51:80 0:14:5e:ac:2d:79 D
10792 10.88.81.10:45831 10.88.80.51:80 0:14:5e:ac:2d:79 D
10793 10.88.81.10:45832 10.88.80.51:80 0:14:5e:ac:2d:79 D
10794 10.88.81.10:45833 10.88.80.51:80 0:14:5e:ac:2d:79 D
10795 10.88.81.10:45834 10.88.80.51:80 0:14:5e:ac:2d:79 D
WAE-612#
```
Detailed Connection Statistics (1 of 4)
show statistics connection optimized ... detail

```
WAE-612# sh stat conn opt client-port 59341 detail

Connection Id: 10900
Start Time                                                  : 0
Connection Id                                               : 10900
Connection type                                             :
Client IP Address                                           : 10.88.81.10
Server IP Address                                           : 10.88.80.53
Client Port Number                                          : 59341
Server Port Number                                          : 389
Peer Identifier                                             :
AO Identifier                                               : 13 0
The policy configured on this waes : 0 0
The policy configured on the peer waes : 7 7
Negotiated Policy between this and the peer waes : 7 7
The policy applied                                          :
```

Detailed Connection Statistics (2 of 4)
show statistics connection optimized ... detail

```
----------------- Flow 10900 dre stats -----------------
Conn-ID: 10900 10.88.81.10:59341 -- 10.88.80.53:389  Peer No: 0 Status: Active
------------------------------------------------------------------------------
Open at 05/13/2008 02:49:12, Still active
Encode:
  Overall: msg: 0, in: 11647 B, out: 11647 B, ratio: 0.00%
  DRE: msg: 0, in: 0 B, out: 0 B, ratio: 0.00%
  DRE Bypass: msg: 0, in: 0 B
  LZ: msg: 0, in: 0 B, out: 0 B, ratio: 0.00%
  LZ Bypass: msg: 0, in: 0 B
  Avg latency: 0.000 ms  Delayed msg: 0
  Encode th-put: 0 B/s
Message size distribution:
  0-1K=0%  1K-5K=0%  5K-15K=0%  15K-25K=0%  25K-40K=0%  >40K=0%
Decode:
  Overall: msg: 0, in: 0 B, out: 0 B, ratio: 0.00%
  DRE: msg: 0, in: 0 B, out: 0 B, ratio: 0.00%
  DRE Bypass: msg: 0, in: 0 B
  LZ: msg: 0, in: 0 B, out: 0 B, ratio: 0.00%
  LZ Bypass: msg: 0, in: 0 B
  Avg latency: 0.000 ms
  Decode th-put: 0 B/s
Message size distribution:
  0-1K=0%  1K-5K=0%  5K-15K=0%  15K-25K=0%  25K-40K=0%  >40K=0%
```
Detailed Connection Statistics (3 of 4)
show statistics connection optimized … detail

----------------- Flow 10900 tfo stats -----------------
Conn-ID: 10900 10.88.81.10:59341 -- 10.88.80.53:389  Peer No:10900 Status: Active
Open at 05/13/2008 02:49:12, Still active

Conn-Type: EXTCLIENT       Policy: DRE+LZ
EDT state:
  Write: req: N, ack: N, Read: req: N, ack: N
Socket states
DRE hints:
  local : latency: 0 plz-off: 0, lz-off: 0, dre-off: 0
  remote : latency: 0 plz-off: 0, lz-off: 0, dre-off: 0
  active : latency: 0 plz-off: 0, lz-off: 0, dre-off: 0
Scheduler: class_id: 0     dscp: 0

TFO Connection States

Detailed Connection Statistics (4 of 4)
show statistics connection optimized … detail

<table>
<thead>
<tr>
<th></th>
<th>Encode-Flow</th>
<th>Decode-Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Read</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total bytes</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total number</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Average size</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Schd latency(ms)</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Stop latency(ms)</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Read latency(ms)</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Flow-ctrl stop</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Peer-choke</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Processed ack frames</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Decoder pending queue:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum size</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Current size</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Average size</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Flow-ctrl stop</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Encode/Decode:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of calls</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Latency(ms)</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Send data/ack frames</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Writer pending queue:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum size</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Current size</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Average size</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Flow-ctrl stop</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Write</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total bytes</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total number</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Average size</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Latency(ms)</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

TFO Connections Statistics
Advanced Connection Tracing

- debug accelerator <ao> connection
- debug tfo connection {policy-engine | auto-discovery | filter | etc}
- Debug commands can be ACL limited with: debug connection <acl>
- Using the combination of above, it is possible to trace the activities on a connection through out the system
Monitoring

show accelerator

- Displays the current status of each accelerator

```
WAE-612# sh ac a
"video accelerator"
Configured status : Enabled
Operational status : Running Normally(Normal Load)

<snip>

"http accelerator"
Configured status : Enabled
Operational status : Running Normally(Normal Load)

"cifs accelerator"
Configured status : Enabled
Operational status : Running Normally(Normal Load)

"nfs accelerator"
Configured status : Enabled
Operational status : Running Normally(Normal Load)

WAE-612#
```
Accelerator Level Statistics

- Displays global statistics for an accelerator

```
WAE612# sh stat acc h
HTTP:

  Time AO was started          : Mon May 12 21.
  Time global statistics were last reset/cleared : Mon May 12 21.
  Connections handled since the AO was started      : 0
  Connections optimized by the AO from start to finish : 0
  Connections received and pushed down by AO     : 0
  Connections dropped by the AO due to unknown reasons : 0
  Connections currently being handled by the AO : 0
  The maximum count of active connections          : 0
  A count of time reduction done by the AO measured in milliseconds : 0
  Number of active connections free for fast connection use : 0
  Total number of connection handoffs             : 0
  Number of connection handoffs to SSL Accelerator : 0
  Number of fast connections                      : 0
  Maximum number of fast connections on a single connection : 0
  Percentage of connection time saved             : 0
  Total round trip time for all connections in milliseconds : 0
```

AO Discovery

- Most AOs require a counterpart AO on the peer WAE to be able to optimize a flow
- Negotiations performed at the auto discovery time
- Usually edge requests an AO and core responds back
- With SSL, core requests and edge responds back
- Flow will be handed off to AO, only if AO discovery succeeds
Accelerator Discovery

- Most accelerators require a counterpart accelerator on the peer WAE to accelerate a connection
- Accelerator discovery occurs during TCP auto-discovery
- Usually the client-side WAE requests an accelerator and the server-side WAE responds back
  - With the SSL Accelerator, the server-side WAE requests and the client-side responds back
- Connections are only handed off to the accelerator if accelerator auto-discovery succeeds

Auto-Discovery Statistics

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto discovery failure:</td>
<td></td>
</tr>
<tr>
<td>No peer or asymmetric route:</td>
<td>631</td>
</tr>
<tr>
<td>Insufficient option space:</td>
<td>0</td>
</tr>
<tr>
<td>Invalid option content:</td>
<td>0</td>
</tr>
<tr>
<td>Invalid connection state:</td>
<td>0</td>
</tr>
<tr>
<td>Missing Ack conf:</td>
<td>0</td>
</tr>
<tr>
<td>Intermediate device:</td>
<td>0</td>
</tr>
<tr>
<td>Version mismatch:</td>
<td>0</td>
</tr>
<tr>
<td>Auto discovery success TO:</td>
<td></td>
</tr>
<tr>
<td>Internal server:</td>
<td>0</td>
</tr>
<tr>
<td>External server:</td>
<td>0</td>
</tr>
<tr>
<td>Auto discovery success FOR:</td>
<td></td>
</tr>
<tr>
<td>Internal client:</td>
<td>0</td>
</tr>
<tr>
<td>External client:</td>
<td>126213</td>
</tr>
<tr>
<td>Auto discovery success SYN retransmission:</td>
<td></td>
</tr>
<tr>
<td>Zero retransmit:</td>
<td>126062</td>
</tr>
<tr>
<td>One retransmit:</td>
<td>151</td>
</tr>
<tr>
<td>Two+ retransmit:</td>
<td>0</td>
</tr>
<tr>
<td>AO discovery:</td>
<td></td>
</tr>
<tr>
<td>AO discovery successful:</td>
<td>0</td>
</tr>
<tr>
<td>AO discovery failure:</td>
<td>121165</td>
</tr>
<tr>
<td>AO discovery Auto-discovery:</td>
<td></td>
</tr>
<tr>
<td>RST received:</td>
<td>43</td>
</tr>
<tr>
<td>SYNs found with our device id:</td>
<td>0</td>
</tr>
<tr>
<td>SYN retransmit count resets:</td>
<td>0</td>
</tr>
</tbody>
</table>

Peer WAE Found, but Peer Accelerator Not Available
### Accelerator Connection Statistics

**show statistics connection <ao> detail**

- Displays accelerator-specific statistics for a connection

```bash
WAE-612# sh stat conn opt h det
Connection Id: 52
Start Time: Fri May 2 21:40:02 2008
(...standard TCP tuple information omitted, same for all AO's...)
HTTP : 52
Time statistics were last reset/cleared: Fri May 2 21:40:02 2008
Count of bytes read by the AO: 7502 1537346
Count of bytes written by the AO: 8486 1534330
Count of bytes buffered: 0 3016
Bit flags for I/O state: 1040
Internal object pointer: 134708704
Number of fast connections on this connection: 61
WAE-612#
```

### Accelerator Debug Logging

- **debug accelerator <ao> <option>**
- Accelerator generated debug logs go to:
  ```
  /local1/errorlog/<ao>-errorlog.X files
  ```
- Debug messages from kernel modules go to:
  ```
  /local1/syslog.txt
  ```
## Wide Area Application Engine (WAE)

Wide Area Application Services (WAAS) Version 4.1

<table>
<thead>
<tr>
<th>IOS Platform with Services and CLI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIFS AO</td>
</tr>
<tr>
<td>MAPI AO</td>
</tr>
<tr>
<td>HTTP AO</td>
</tr>
<tr>
<td>SSL AO</td>
</tr>
<tr>
<td>RTSP AO</td>
</tr>
<tr>
<td>NFS AO</td>
</tr>
<tr>
<td>EPM AO</td>
</tr>
<tr>
<td>WoW</td>
</tr>
<tr>
<td>Virtual Blade #2</td>
</tr>
<tr>
<td>Virtual Blade #3</td>
</tr>
<tr>
<td>Configuration Management System (CMS)</td>
</tr>
<tr>
<td>TCP Proxy with Scheduler Optimizer (SO)</td>
</tr>
<tr>
<td>DRE, LZ, TFO</td>
</tr>
<tr>
<td>Virtual Blades</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Cisco Linux Kernel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy Engine, Filter-Bypass, Egress Method, Directed Mode, Auto-Discovery</td>
</tr>
<tr>
<td>Flash IOS Shell Linux</td>
</tr>
<tr>
<td>Application Storage</td>
</tr>
<tr>
<td>Object Storage</td>
</tr>
<tr>
<td>DRE Storage</td>
</tr>
<tr>
<td>Virtual Blade Storage /vbspace</td>
</tr>
<tr>
<td>Ethernet Network I/O</td>
</tr>
</tbody>
</table>
Virtual Blade—What Is It?

- A virtual blade is like having a generic PC stuffed inside WAAS
- This generic PC has
  - Firmware: BIOS and possible extensions
  - Hardware: one or more CPUs, memory, host bridge, VGA, one or more NICs, disk controller, disk, CD drive, serial port, etc.
- Software configuration of the virtual blade allows control on some of these items
  - How much memory, size of the disk, how many CPUs etc.

Disk Space Utilization

- There’s a new partition for virtual blade storage, /vbspace
- All virtual blade storage will be contained in this partition; User visible items (like CD images) will reside in /local/local1/vbs, which is a symbolic link to /vbspace/vbs
  - Not present on systems that do not support virtual blades
  - Not present on 674, 7341, 7371 systems until they have enabled virtual blade support
- Enabling virtual blade support on the WAE will cause the disk space to be repartitioned
  - DRE cache will be cleared in the process
- Once the disk has been repartitioned on a WAE, it cannot be reversed except by reinstalling WAAS from rescue CD
Support

- Windows support is provided directly from Microsoft
- Cisco provides virtualization support
- Typical VB support should be done from inside VB—using Windows facilities

Statistics:
- show virtual-blade # interface # interface statistics
- show virtual-blade # block cd and disk statistics

Debug Commands
- show virtual-blade vmstats VM activity
- show tech-support shows bridge configuration

Configuration Management System
Wide Area Application Engine (WAE)

Wide Area Application Services (WAAS) Version 4.1

IOS Platform with Services and CLI

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIFS AO</td>
<td></td>
</tr>
<tr>
<td>MAPI AO</td>
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<td>EPM AO</td>
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</tr>
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<td>Virtual Blade # 2</td>
<td></td>
</tr>
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<td></td>
</tr>
<tr>
<td>Virtual Blades</td>
<td></td>
</tr>
</tbody>
</table>

Cisco Linux Kernel

- Policy Engine, Filter-Bypass, Egress Method, Directed Mode, Auto-Discovery
- Flash
- IOS Shell
- Linux
- Application Storage
- Object Storage
- DRE Storage
- Virtual Blade Storage /vbspace
- Ethernet Network I/O

Troubleshooting Management Services

WAE Is Offline or Is Unable to Reach the CM
Verify WAE CMS Service Application Accelerator

WAE612# show cms info
Device registration information :
  Device Id = 191
  Device registered as = WAAS Application Engine
  Current WAAS Central Manager = 10.88.80.133
  Registered with WAAS Central Manager = 10.88.80.133
  Status = Offline

CMS services information :
  Service cms_ce is not running
WAE612#

Verify Service Status
Service Status on CM
Service Is Not Running

Verify WAE CMS Service Central Manager

WAE612# show cms info
Device registration information :
  Device Id = 144
  Device registered as = WAAS Central Manager
  Current WAAS Central Manager role = Primary

CMS services information :
  Service cms_httpd is running
  Service cms_cdm is running
WAE612#

Verify Service Status
Current CM Role
Service Status
Restoring CMS Operation

- Registration information is kept on both the WAE and Central Manager (CM)
- If the information is out of sync, the WAE will not be able to communicate with the CM
- Possible scenarios:
  - CM database has been lost. WAE still has information and tries to contact the CM. WAE is not known to the CM
  
  WAE-612# cms deregister force

  WAE lost database, but it still registered to CM. Delete WAE from CM database and re-enable CMS

Verify Clock Synchronization

- Each WAE system clock must be synchronized with the CM clock for proper reporting and ease of troubleshooting
Verify Clock Synchronization

- Verify clock details and NTP status from the CLI

```
WAE-612# show ntp status
ntp enabled
server list: 10.88.121.253
remote refid st t when poll reach delay offset jitter
--------------------------------------------------------------
10.88.121.253  10.81.254.202    2 - 11   64    1    1.199    0.499   0.000
WAE-612#
```

```
WAE-612# show clock detail
Local time: Sun Apr 29 01:28:25 CST 2007
UTC time: Sun Apr 29 07:28:25 UTC 2007
Epoch: 1177831705 seconds
UTC offset: -21600 seconds (-6 hours 0 minutes)
WAE-612#
```

Central Manager Alarms

- The Cisco WAAS Central Manager provides an alarm reporting facility
- Device alarms can be triggered, which cause the system or device status to change, notifying the administrator of a condition that requires attention

```
<table>
<thead>
<tr>
<th>Device Name</th>
<th>Services</th>
<th>IP Address</th>
<th>CML Status</th>
<th>Device Status</th>
<th>Location</th>
<th>Software Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM</td>
<td>Core</td>
<td>10.10.10.10</td>
<td>Online</td>
<td>Online</td>
<td>System</td>
<td>4.0.100</td>
</tr>
<tr>
<td>CML</td>
<td>Core</td>
<td>10.10.10.10</td>
<td>Online</td>
<td>Online</td>
<td>System</td>
<td>4.0.100</td>
</tr>
<tr>
<td>Core</td>
<td>Core</td>
<td>2.2.2</td>
<td>Online</td>
<td>Online</td>
<td>System</td>
<td>4.0.100</td>
</tr>
<tr>
<td>Edge</td>
<td>Edge</td>
<td>10.10.10.10</td>
<td>Online</td>
<td>Online</td>
<td>System</td>
<td>4.0.100</td>
</tr>
<tr>
<td>Edge</td>
<td>Edge</td>
<td>1.1.1.1</td>
<td>Online</td>
<td>Online</td>
<td>System</td>
<td>4.0.100</td>
</tr>
</tbody>
</table>
```

```
System Status  1 Device: 0 Failures
```
Central Manager Alarms (Cont.)

- When you click the severity column in the device list, or click the system status severity indicator, a popup window appears.
- This window contains a list of all alarms that require attention. Moving the mouse over the alarm provides a menu of options for troubleshooting the alarm.
- A list of alarms and a download location for the alarm book are contained in the notes.

<table>
<thead>
<tr>
<th>Device Name</th>
<th>IP Address</th>
<th>Status</th>
<th>Severity</th>
<th>Alarm Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMG</td>
<td>10.10.10.10</td>
<td>Online</td>
<td>Critical</td>
<td>troubleshooting CMD:</td>
</tr>
<tr>
<td>NODE1</td>
<td>1.1.1.1</td>
<td>Online</td>
<td>Normal</td>
<td>Help/Monitor Device</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>View Event Log</td>
</tr>
</tbody>
</table>

Q and A
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