How to analyze hung issue

Yang Jie
WOTSDK,103

Agenda

- What can cause performance issue

- What data needed

- How to gather data

- Analyze data

How to analyze hung issue

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- Analyze data

What can cause performance issue

- ● **System resource contention**

  A system resource is suffering from contention or starvation; for example, CPU time or physical memory.

- ● **Garbage collection performance**

  The Garbage Collector is taking too long or has long individual cycles.
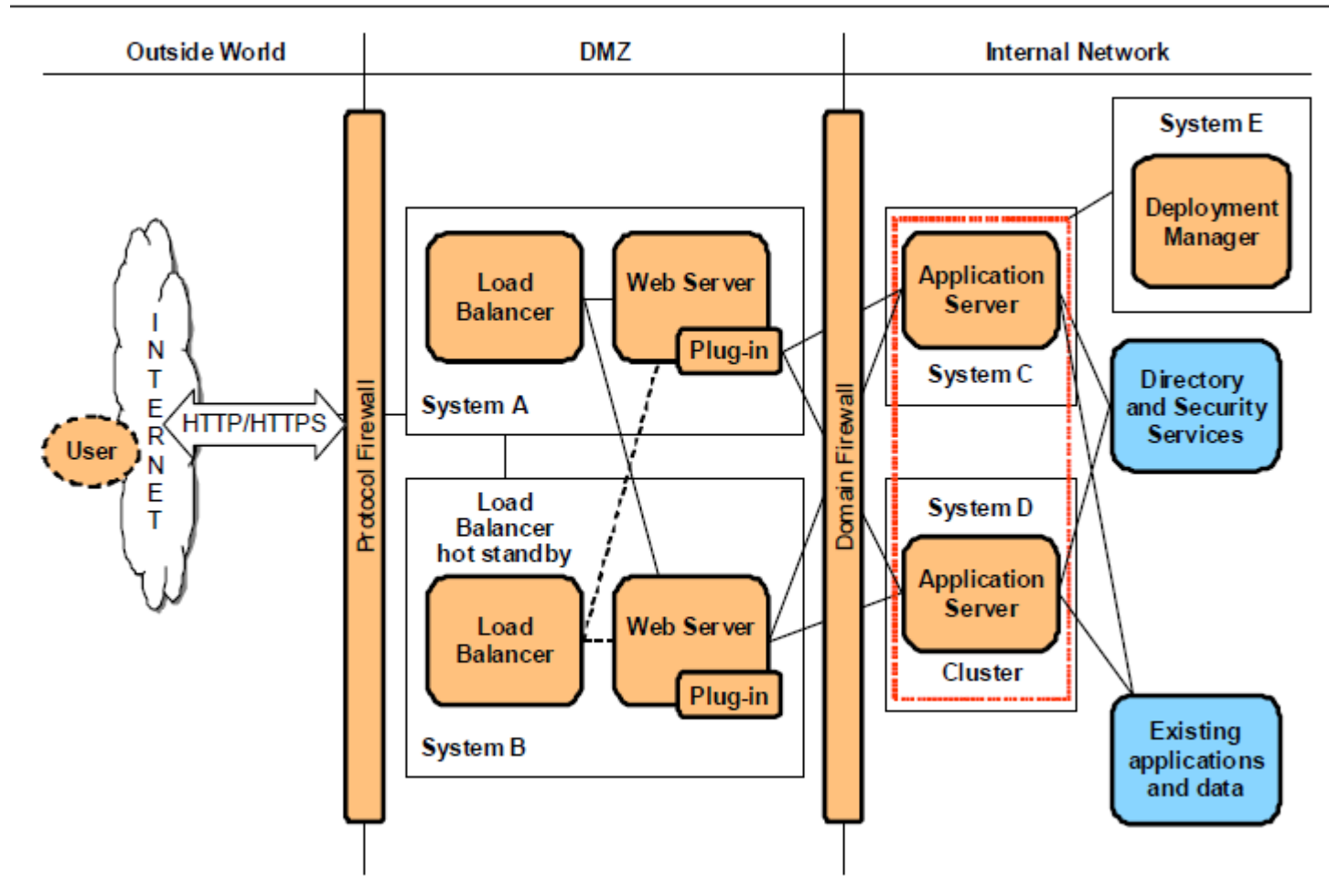
- ● Application code performance

  Synchronized resources are suffering from contention, or code is inefficient or looping.

- ● External delays

  The Java process connects

What can cause performance issue

How to analyze hung issue

- What can cause performance issue

- **What data needed**

- How to gather data

- Analyze data

What date need

- A snapshot of the network activity

- Paging activity information

- System CPU usage information

- Process CPU usage information

- Three time-separated Javadumps

- verbose:gc output

- A system dump if no Javadumps are available

How to analyze hung issue

- What can cause performance issue

- What data needed

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How to gather data

- Different platform has different set of data

"MustGather: Performance, Hang or High CPU Issues on AIX"

http://www.ibm.com/support/docview.wss?rs=180&uid=swg21052641

"MustGather: Performance, Hang, or High CPU Issues on HP-UX"

http://www.ibm.com/support/docview.wss?rs=180&uid=swg21127574

"MustGather: Performance, Hang or High CPU Issues on Linux"

http://www.ibm.com/support/docview.wss?rs=180&uid=swg21115785

"MustGather: Performance, Hang or High CPU Issues on Solaris"

http://www.ibm.com/support/docview.wss?rs=180&uid=swg21115625

"MustGather: Performance, Hang, or High CPU Issues on Windows"

http://www.ibm.com/support/docview.wss?rs=180&uid=swg21111364

"Using TPROF FOR WINDOWS Tool to aid in the debugging of high CPU usage issues on Microsoft Windows"

http://www.ibm.com/support/docview.wss?rs=180&uid=swg21403450

Gather valid data

- What is the issue?

- Phenomenon?

- Response time?

- When to gather javacores? interval?

- When need to gather Core Dump?

  - First configure full core

How to analyze hung issue

- What can cause performance issue

- What data needed

- How to gather data

- Analyze data

  - Paging?

  - High CPU?

  - Gc performance caused?

  - Many threads are blocked to wait to be notified to get an object?

  - Deadlock?

  - Waiting response from external system which no response for a long time?

  - Thread long running for other reason?

Paging?

- Is there paging? (vmstat)

Determine the memory requirements of the system and provide enough physical memory.

Analyze data

```
#vmstat 5 20


System configuration: lcpu=2 mem=3072MB


kthr      memory                  page                    faults        cpu
----- ------------ ----------------------- -------------- -----------
 r  b    avm   fre  re  pi  po   fr    sr cy   in   sy    cs  us sy id wa
 3  2 473425 11516   0  12  16   62   120  0  439 13744 5193 88 12  0  0
 4  2 471568 10458   0  10   0    0     0  0  526 18294 6288 85 14  0  0
 4  2 476338  1525   0  20  28  107   700  0  578 13356 8045 85 15  0  0
 6  2 474212  1974   0  12  43   90   579  0  549 11470 6842 88 12  0  0
 6  2 468905  1695   0  24  11   40    58  0  578 15590 6773 87 13  0  0
 7  2 475681   126   0  33  57  188   354  0  528  8693 6358 89 11  0  0
 5  2 466138  5296   0  16  23   84   143  0  625 11375 2989 92  8  0  0
 7  2 470950   118   0  12  50  155   301  0  549 13914 2174 92  8  0  0
11  2 473488   531   0  29 103  326  1547  0  642 14143 6416 85 15  0  0
 9  2 473739  2835   0  19  76  180   366  0  572 13667 6911 85 15  0  0
 8  2 465827  7977   0  27  70  188   833  0  605 13407 7372 84 16  0  0
 9  2 470989  1774   0  24  49  178  1071  0  579 25893 6441 82 18  0  0
 8  2 469419  1327   0  27  10   79   168  0  598 23657 7262 82 18  0  0
 9  2 467734  1236   0  23   0   78   174  0  591 18229 7633 83 17  0  0
10  2 474225   608   0  34  24  172   441  0  725 18781 8010 82 18  0  0
12  3 473474   267   0  39  52  244  1368  0  758 14813 7345 84 16  0  0
11  2 473359  1378   0  18  47  142   318  0  585 15015 6809 85 15  0  0
10  3 481238    14   0  45  79  240  1504  0  665 15185 2764 91  9  0  0
 9  2 476975  1195   0  17  20   72    93  0  496 19177 2278 91  9  0  0
 8  2 477660  1159   0  18  24  104   174  0  595 18130 6596 87 13  0  0
```

Analyze data

Column description:

- **kthr:** kernel thread state changes per second over the sampling interval.
- r - Number of kernel threads placed in run queue.
- b - Number of kernel threads placed in wait queue (awaiting resource, awaiting input/output).

- **memory:** information about the usage of virtual and real memory. Virtual pages are considered active if they have been accessed.
- avm - Active virtual pages. A page is 4096 bytes.
- fre - Size of the free list. A page is 4096 bytes.

- **page:** information about page faults and paging activity. These are averaged over the interval and given in units per second.
- re - Pages input/output list.
- pi - Pages paged in from paging space.
- po - Pages paged out to paging space.
- fr - Pages freed (page replacement).
- sr - Pages scanned by page-replacement algorithm.
- cy - Clock cycles by page-replacement algorithm.

- **faults:** trap and interrupt rate averages per second over the sampling interval.
- in - Device interrupts.
- sy - System calls.
- cs - Kernel thread context switches.

- **cpu:** breakdown of percentage usage of CPU time.

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High CPU?

- ## CPU Utilization Analysis

    - ps   Linux (2.6)*
    - top –H   Linux (2.6, if available)*
    - tprof   AIX (1.5 SDK)*
    - prstat   Solaris**
    - tprof   Windows (if available)**
    - perfmon   Windows
    - tprof with DBX   AIX (1.4.2 SDK)
    - top   Linux (2.4)

Analyze data

- ## Analyze CPU

"Using TPROF FOR WINDOWS Tool to aid in the debugging of high CPU usage issues on Microsoft Windows"

http://www.ibm.com/support/docview.wss?rs=180&uid=swg21403450

"(AIX) Correlating TPROF output to a specific thread in the JAVACORE using DBXTrace -a output"

http://www.ibm.com/support/docview.wss?rs=180&uid=swg21138359

"Correlating High CPU on HP-UX with output from hpux_glance.sh"

http://www.ibm.com/support/docview.wss?rs=180&uid=swg21367002

"(Linux) Correlating CPU usage from top output to a particular thread in the JVM"

http://www.ibm.com/support/docview.wss?rs=180&uid=swg21158192

Determining which Java thread is consuming CPU cycles on Solaris systems

http://www-01.ibm.com/support/docview.wss?rs=180&uid=swg21162381

Where is the bottleneck?

- Analyze gc performance

  - Use Garbage Collection and Memory Visualizer (GCMV)

- Checking for deadlocks from javacore

  - Deadlock detected !!!

- Identifying whether threads are waiting on an external resource

- Profiling wait time for external resource

  - -Xtrace:maximal=mt,output=mtrace#.out,10m,10,methods={com/ibm/as400/access/AS400ThreadedServer.receive*}

Thank you!