



WEST HIGHLAND
SUPPORT SERVICES

2021 ZABBIX

Financial Services Use Case

ZABBIX

PREPARED By

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CTO/CISO

September 2021

INTRODUCTION



West Highland Support Services is the leading Market Data Solutions company serving the financial services vertical.

WHSS optimize client market data ecosystems by providing cost effective and optimized operations, business management, administration and outsourced services.

Our clients are Investment Banks, Asset Managers, Hedge Funds, Brokers, Wealth Managers, Market Data vendors, PE Firms, Ratings Agencies, Commodities firms, Energy firms, and Exchanges.

We facilitate our client's ability to reduce their overall spend of market data, introduce visibility into expenditures, trends, usage, and establish key metrics to ensure that the operation of their global market data environments achieve maximum uptime at the lowest cost.

One of the tools we use to help clients achieve this, is Zabbix.

AGENDA



- History of Zabbix for West Highland
- What is Market Data
- Financial Vertical Problem
- Critical Metrics for Market Data
- Custom Network Templates / Conflating
- Custom CPU Monitoring / Power Management
- Reporting Metrics
- Resultant benefits to our clients
- Questions ?

History of Zabbix for West Highland



- Started using Zabbix with 1.8 in December 2009
- Goal was to mimic the alerts available from a commercially available tool
- Fully Deployed monitoring to entire site by March 2009 roughly 20 servers
- Lots of growing pains related to the database and the amount of data we were collected.
- Out of the Box Templates don't fit every model, especially Market Data
- We upgraded to Zabbix 2 and were running that until 2019
- Deployed Zabbix 4.0, Then Zabbix 4.2, Then Zabbix 5.0
- Currently Running Zabbix 5.0.15
- Dashboards are Key!

What is Market Data ?



- Real Time
Also known as Tick by Tick Data. What is GOOG trading right now?
- Quote Data
What is GOOG worth right now?
- Trade Data
What did someone else just buy GOOG for?
- Reference Data
Who is the shareholders of GOOG?
- Historical Data
Give me the last 30 years of GOOG closing prices?

Financial Vertical Problem?



- Latency
If your data is slower than your competitor, you're at a competitive disadvantage. Alerting is key.
- Volume
You always need to be ahead of the next peak
- Legacy Monitoring tools or script-based tools
Most tools are only snapshots in time
- Lack of trending
**People forget the previous peaks and we need to see where things are trending.
Are we moving up or down for the week, month, or year**
- Lack of charting abilities
Most of the tools had no charting other than what you watched at that moment
- Inability to integrate with other systems
Closed systems, lack the ability to integrate with other tools
- Lack of intuitive dashboards
Other tools would require you to look in many different tools to get your answers. New dashboards are key
- Poor Service
Poor Response to issues equals Poor Service. If you can't see a problem, you already missed it.

Critical Metrics for Market Data



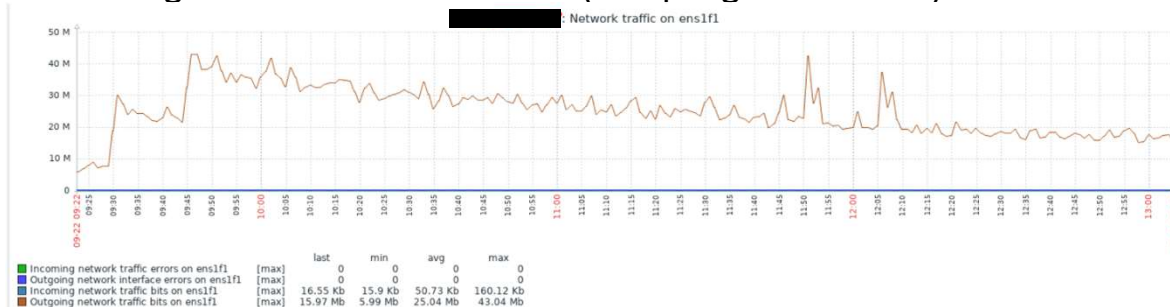
- **Network Bandwidth**
 - Typically, each host has 3 – 4 critical interfaces
 - Client Interface 1,2
 - Messaging Backbone
 - Feed Network
 - All range from 1G -> 10G -> 25G
- **Per Core CPU Usage**
 - Processes are bound core by core for optimal performance
 - Cores are mostly 20 cores+
 - Power Management of Core
- **Distribution Cache Usage**
 - How many symbols are we distributing to users
- **Update Rates / second**
 - How many times has those symbols have changed prices in a second
- **Connections**
 - How many TCP sessions does all of the applications need to support the current load

Custom Templates - Network Bandwidth

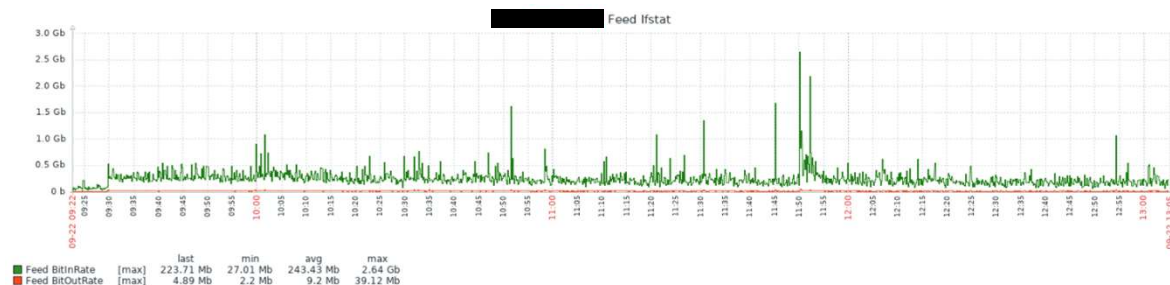


Network Discovery

Traditional Monitoring Tools of Network Traffic (Sampling 30 Seconds)



Zabbix Enhanced Monitoring (10 Second Samples of 100ms peaks)

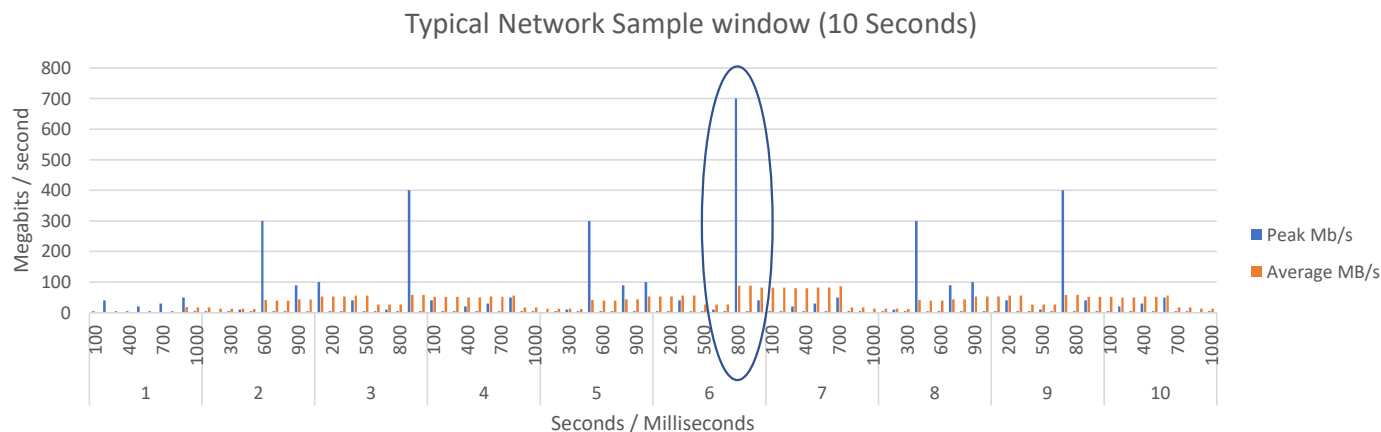


Even if we turn Zabbix down to the smallest interval we could never see the 100ms peaks. In market data we call this conflating data into the database.

Conflating - Network Bandwidth



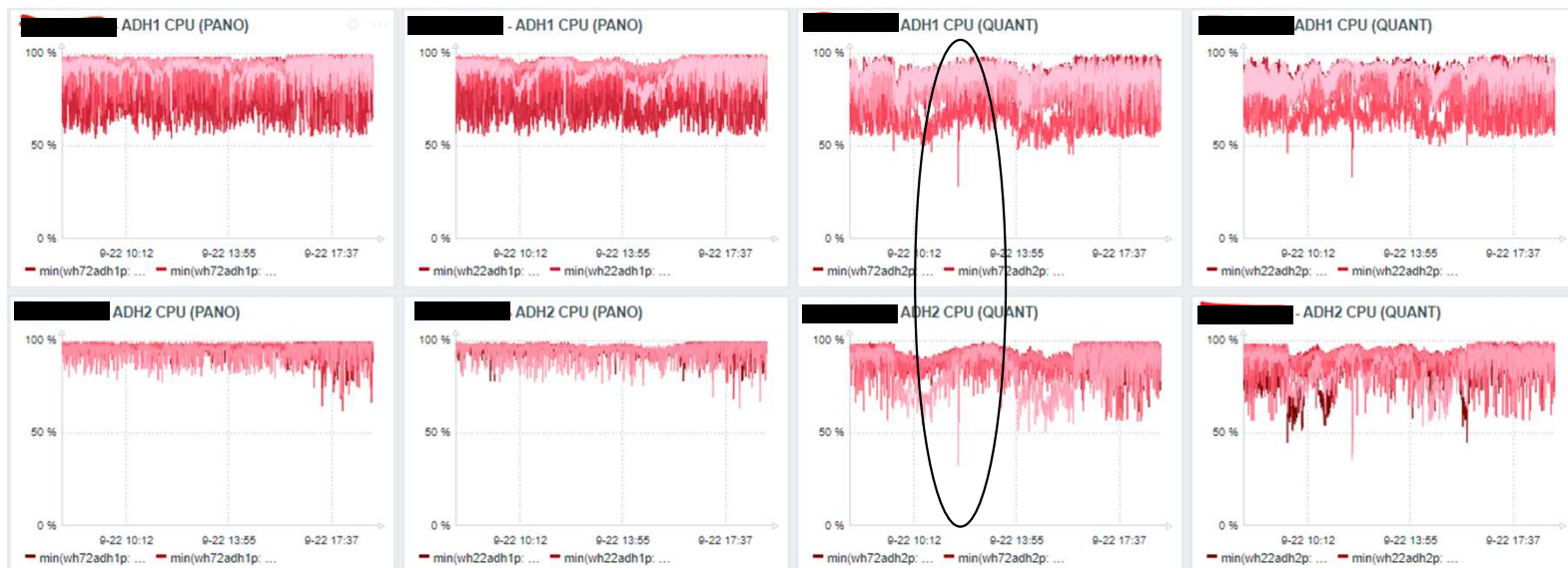
- Here is a 10second sample window.
- For simplicity, its show 100 data points (10 seconds X 10 100ms samples)
- Traditional monitoring would probably grab this as a peak of 90mb/s
- Conflating the data to get the peak of the 10 second window grabs this as 700mb/s
- Combine this with auto discovery on critical boxes. You have great monitoring.



Custom – CPU Monitoring



Conflation was key for CPU metrics. Combine mpstat with Zabbix user_parameters to get down to 1-second minimums. These graphs are showing idle CPU a low dip is a problem. 30 second Zabbix samples are utilized.



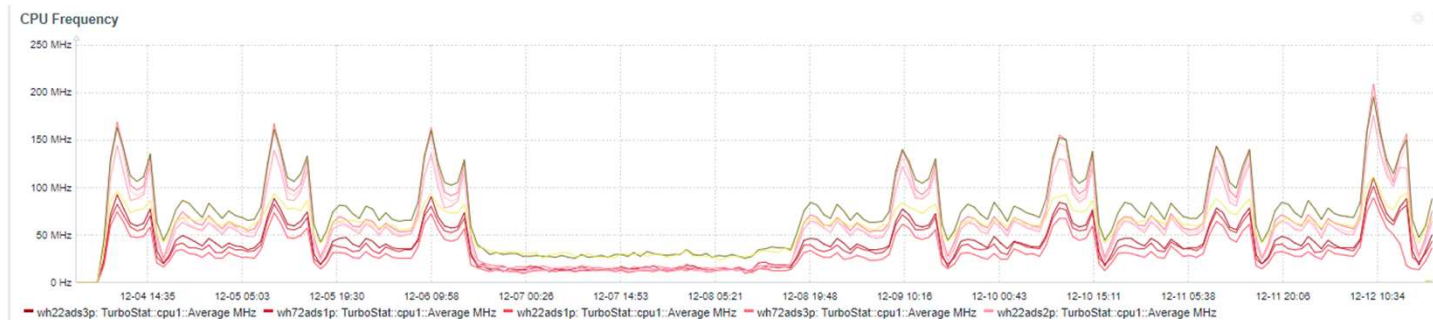
Quick View of critical CPU's is now possible thanks to dashboards
Dashboards allowed us to pick and chose which CPUs to show in a quick and easy way. Now we can see the impact to the system during the US Fed announcement

Custom Templates – CPU Power Management

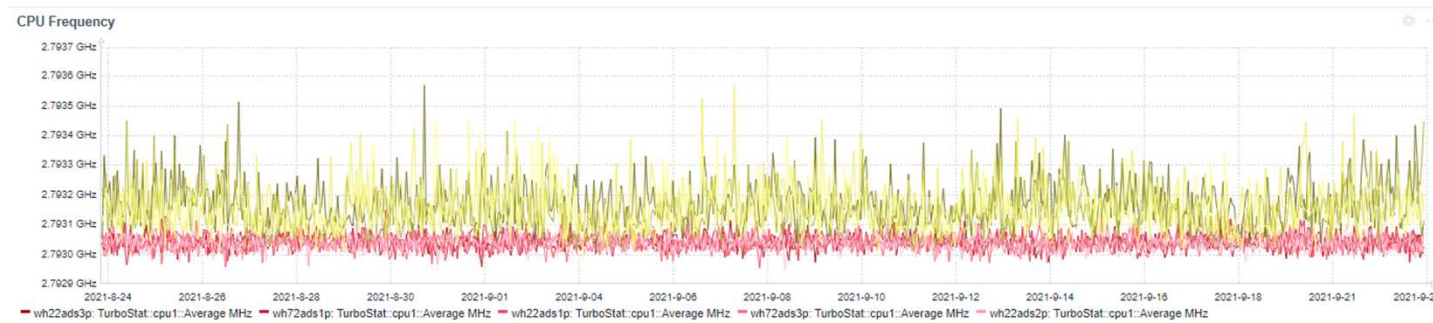


Using tools like Turbostat we are able to see the crippling effect of power management from the Intel Skylake processors. (Simple Scraper -> zabbix_trapper)

Before: Disabling Power Management (CPU sitting at under 300mhz)



After: Disabling Power Management (CPU set to Poll)

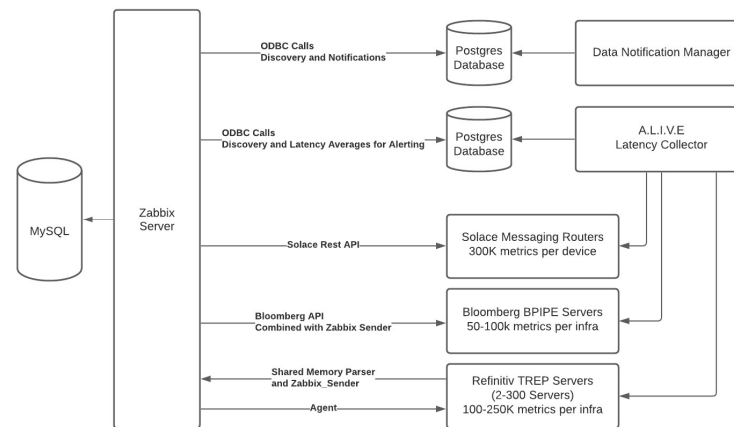


How WHSS applied Zabbix

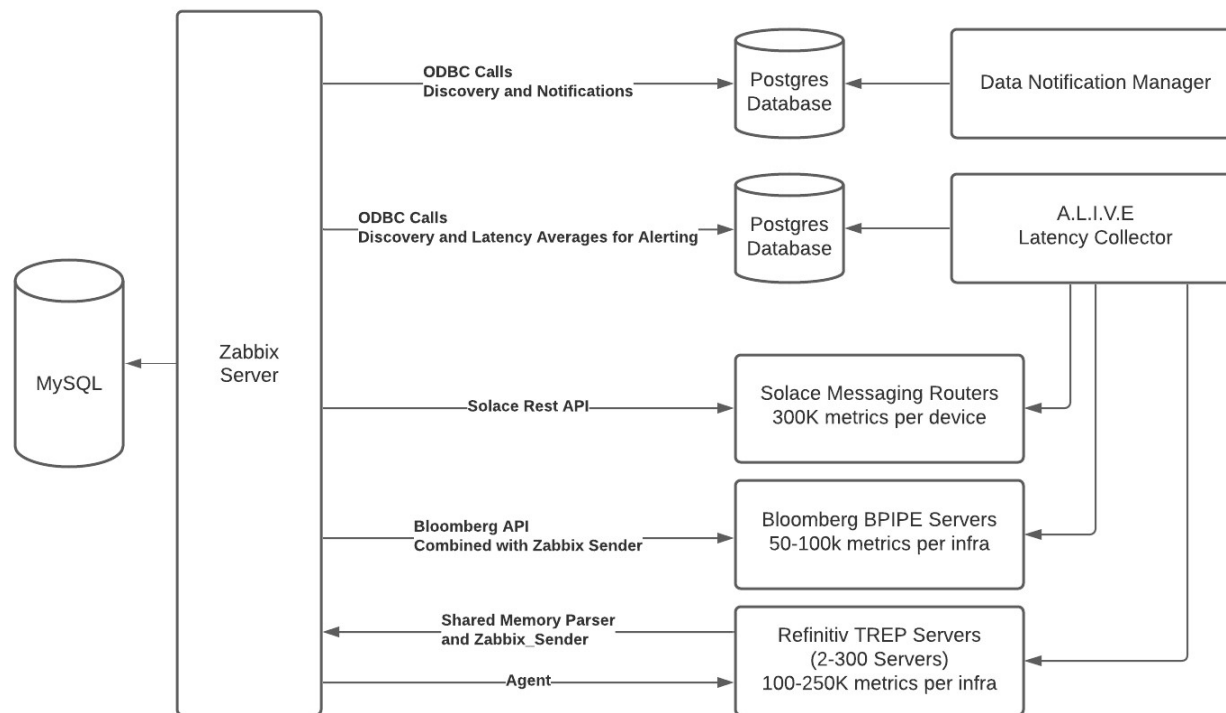


Zabbix is our single pane of glass to monitor all environments

- Refinitiv TREP
Parsing Scraper -> Zabbix_sender
- Bloomberg BPIPE
Java App -> Zabbix_sender
- Solace Messaging Router
SEMP Poller and Parser -> Zabbix_sender
- A.L.I.V.E.
Separate App recording tick by tick timestamps
Zabbix polling averages to alert on.
- Data Notification Manager
Looking for up coming notifications and alerting of problems.
Key tool (ODBC / Zabbix trappers)
- Other metrics
Lots of zabbix_trappers



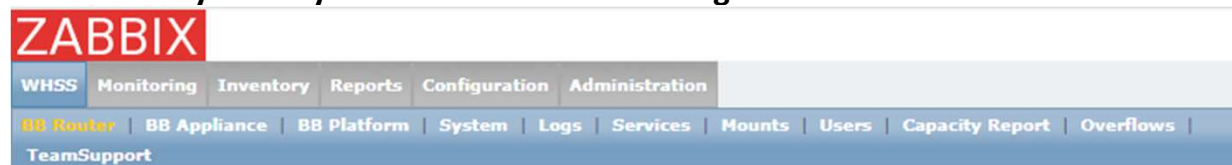
How WHSS applied Zabbix



Zabbix Frontend Add-ons

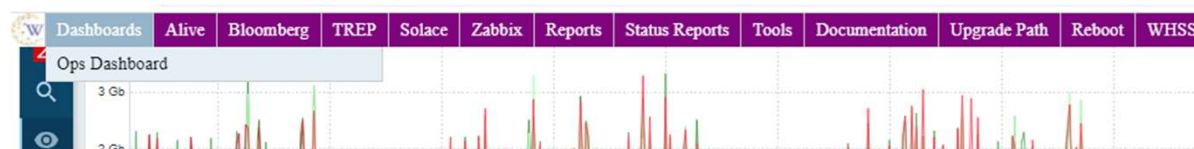


- Zabbix 2.0
We used to add custom pages by modifying the core PHP scripts
☹ **This was no fun when it came to upgrades**
Hence why we stayed on Zabbix 2.0 for so long



- Zabbix 5.0
All add-on pages are written in PHP using zabbix-api to pull data from zabbix.
Easy to point to different pages in zabbix like (latest data)
Pages are navigable via a top bar and we embed zabbix in it.

Upgrades are minor upgrades now when pages names change in zabbix.



Reporting Metrics – Status Reports



All of our status reports are based on the zabbix api. Get a full snapshot of the production environment at click of a button. These reports used to be scripts and took 5-10 minutes to complete now its only 2 seconds.

Global EDGE State									
Location	Edge	Cache	24 Hr % of Cache	Refinery Connection	Perms Missing	Upstream Host	Platform	RDMD Dictionary	
72 Cummings Plant Ref	EDGE NY C030	29.936	32.563	6.000%	Up	0	120-dbgp217a	HPF Proclant DL360 Gen10	4:20:49
22 Subhouse Ref	EDGE NY C030	29.734	32.563	6.000%	Up	0	120-dbgp217a	HPF Proclant DL360 Gen10	4:20:49
Production - PA									
Location	Hostname	Instance	Process	Service	RDMD Status	HS Status	Watchdog	State	Max Cache % of Max Dict Version
72 Cummings Plant Ref	4472avh1a	1	Up	EDGE_CONF	Up	Standby	25025	0	0
22 Subhouse Ref	4422avh1a	1	Up	EDGE_CONF	Up	Standby	25025	0	0
72 Cummings Plant Ref	4472avh2a	2	Up	EDGE_DELAYED	Up	Standby	25148	0	0
22 Subhouse Ref	4422avh2a	2	Up	EDGE_DELAYED	Up	Standby	25148	0	0
Production - QUANT									
Location	Hostname	Instance	Process	Service	RDMD Status	HS Status	Watchdog	State	Max Cache % of Max Dict Version
72 Cummings Plant Ref	4472avh1a	1	Up	EDGE	Up	Standby	45045	0	0
22 Subhouse Ref	4422avh1a	1	Up	EDGE	Up	Standby	45045	0	0
72 Cummings Plant Ref	4472avh2a	2	Up	EDGE_CONF	Up	Standby	15851	0	0
22 Subhouse Ref	4422avh2a	2	Up	EDGE_CONF	Up	Standby	15851	0	0
72 Cummings Plant Ref	4472avh2a	2	Up	EDGE_DELAYED	Up	Standby	4551	0	0
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72 Cummings Plant Ref	4472avh1a	1	Up	EDGE	Up	Standby	13114	0	0
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Reporting Metrics - Capacity Planning



West Highland performs benchmarks of the environments and displays key metrics in a Capacity Report.

This report lets our clients know how their system fared today compared to yesterday / last week / last month / last year.

All this data is based on Zabbix trends via php using mysql queries. Its not the most elegant but it works well.

Client Bandwidth Summary - 100ms Samples									
Hostname	Daily High	% of Bench	Daily High Time	Yesterday High	Weekly High	Monthly High	Yearly High	Yearly High Date	Benchmark
CLIENT / Client Prod Summary	11,051,387	28.12	11:25 AM	8,488,695	11,188,394	11,812,219	14,318,206	Mar10-2021 01:00 PM	28258375
CLIENT / Client Prod Summary	8,157,814	25.3	10:22:00 PM	6,360,025	8,157,814	8,157,814	13,554,376	Feb10-2021 10:00 AM	26258875
Client Interface in Mbit/Sec - 100ms Samples									
Hostname	Daily High	% of Bench	Daily High Time	Yesterday High	Weekly High	Monthly High	Yearly High	Yearly High Date	Benchmark
wh2zabbix / Client1	42,725	8.63	01:41 AM	62,842	62,842	62,842	5,152,857	Nov11-2020 03:00 PM	10000000
wh2zabbix / Client2	1,238,695	12.4	10:22:00 PM	325,685	1,238,695	1,238,695	1,964,884	Feb10-2021 01:00 PM	10000000
wh2zabbix / Client1	43	8	07:00 PM	17	17	174	4,360,348	Oct10-2020 02:00 PM	10000000
wh2zabbix / Client2	1,794,483	17.3	10:22:00 PM	885,747	1,794,483	1,794,483	1,794,483	10:22:00 PM	10000000
Client Pod									
wh2zabbix / Client1	5,568,088	55.68	10:22:00 PM	8,205,174	5,568,088	5,568,088	5,568,088	10:22:00 PM	10000000
wh2zabbix / Client2	3,967,987	39.68	11:52 AM	3,241,237	4,782,136	4,782,136	8,988,845	Feb10-2021 10:00 AM	10000000
wh2zabbix / Client1	4,915,185	49.15	10:22:00 PM	3,450,224	4,915,185	4,915,185	4,915,185	10:22:00 PM	10000000
wh2zabbix / Client2	794,593	7.95	12:02 PM	423,348	794,593	1,241,208	1,683,924	02:00:00 PM	10000000
wh2zabbix / Client1	1,527,727	15.28	10:37 AM	1,821,286	2,836,224	2,836,224	2,842,764	May20-2021 03:00 PM	10000000
wh2zabbix / Client2	2,385,085	23.85	10:22 PM	1,525,170	2,384,746	2,384,746	2,384,746	May20-2021 03:00 PM	10000000
wh2zabbix / Client1	681,505	6.82	10:40 PM	342,459	1,180,025	1,180,025	1,854,576	Jan10-2021 03:00 PM	10000000
wh2zabbix / Client2	43	8	11:37 AM	17	17	22	1,835,381	Nov10-2020 03:00 PM	10000000
QA Daemonless									
wh2zabbix / Client1	1,568,744	15.61	11:55 AM	1,268,385	1,568,744	1,568,744	1,568,744	Mar10-2021 03:00 PM	10000000
wh2zabbix / Client2	2,724,658	27.24	10:22:00 PM	1,537,887	2,724,658	2,724,658	2,724,658	Feb10-2021 03:00 PM	10000000
wh2zabbix / Client1	789,295	7.81	12:00 PM	545,586	789,295	789,295	1,741,887	Jan10-2021 04:00 PM	10000000
wh2zabbix / Client2	1,973,175	19.73	02:18 PM	1,253,738	1,973,175	2,316,390	5,165,341	Oct10-2020 03:00 PM	10000000
BACP Backbone 100ms Peaks									
Hostname	Daily High	% of Bench	Daily High Time	Yesterday High	Weekly High	Monthly High	Yearly High	Yearly High Date	Benchmark
Pano RBCP Backbone	1,405,112	14.05	10:22:00 PM	546,488	1,405,112	1,405,112	1,584,838	Jan11-2021 02:00 PM	8788425
Client RBCP Backbone	4,894,583	48.95	10:22:00 PM	7,440,191	4,894,583	4,894,583	4,907,793	Feb10-2021 03:00 PM	8788425
QA RBCP Backbone	3,293,496	32.93	10:22:00 PM	1,942,915	3,293,496	3,293,496	4,473,761	Oct11-2020 03:00 PM	8788425
EED Message In Bit Rate									
Hostname	Daily High	% of Bench	Daily High Time	Yesterday High	Weekly High	Monthly High	Yearly High	Yearly High Date	Benchmark
CTEDGEHY0883	58,222	7.62	07:00 PM	58,764	58,165	64,507	81,844	Nov10-2021 10:00 PM	3000000
CTEDGEHY0884	26,124	7.62	07:00 PM	26,399	26,399	54,576	79,889	Mar11-2021 03:00 PM	3000000
AND EED Cache									
Hostname	Daily High	% of Bench	Daily High Time	Yesterday High	Weekly High	Monthly High	Yearly High	Yearly High Date	Benchmark
wh2zabbix / Client1	0	0	07:00 PM	0	0	0	0	0	3000000
wh2zabbix / Client2	0	0	07:00 PM	0	0	0	0	0	3000000
wh2zabbix / Client1	0	0	07:00 PM	0	0	0	0	0	3000000
wh2zabbix / Client2	0	0	07:00 PM	0	0	0	0	0	3000000
wh2zabbix / Client1	33,237	7.65	08:16 AM	36,483	43,348	48,853	48,853	10:22:00 PM	3000000
wh2zabbix / Client2	33,237	7.65	08:16 AM	36,483	43,348	48,853	48,853	10:22:00 PM	3000000

Client Benefits



- Realtime Alerting
- Millisecond data
- Instant Notification as the issue occurs
- Proactive monitoring
- Capacity Planning
- Ability to analyze what happened during the last outage
- Deep level forensics

Best-in-Class Managed Services



West Highland Support Services has a demonstrated history of working in the financial services industry for 23+ years. Bringing together strong technical, administration and business experience allows us to look at broader cost savings opportunities for our customers while also providing enhanced 24-hour support. With offices in New York, Connecticut and London we leverage our industry and client experience to provide a best practice approach to our engagements.



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