



PSM: FROM REACTIVE TO PROACTIVE WINDCHILL MONITORING

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Windchill Solution Architect – GE Aviation

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AGENDA

- ❑ A little about myself and GE Aviation
- ❑ GE Aviation Architecture
- ❑ What is was like?
 - Reactive Monitoring and many sleepless/restless nights
- ❑ What happened?
 - Enter PTC System Monitoring (PSM) and transitioning away from Reactive to Proactive Monitoring
- ❑ What it is like now?
 - Peace-of-mind Proactive Monitoring and no more sleepless/restless nights
 - Use-case Demonstration in the PSM Client (Time permitting)

WHAT IS MY GOAL?

- Describe the journey as we grow and adapt our efforts to monitor and sustain Aviation's Production Windchill instances.
- Portray life before PSM and life with PSM, as it is right now.
- Leave you with a realistic view of PSM implementation and wanting more!



FIRST, LET'S LEARN MORE ABOUT YOU



- Anyone currently have PSM implemented? Using it?
- If no PSM, what are you doing to monitor Production application?
- How many of you have experienced/worked an Enterprise Down?
 - Follow-the-sun triage?
 - Less than 1 day?
 - More than 1 day?



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PERSONAL AND AVIATION BACKGROUND



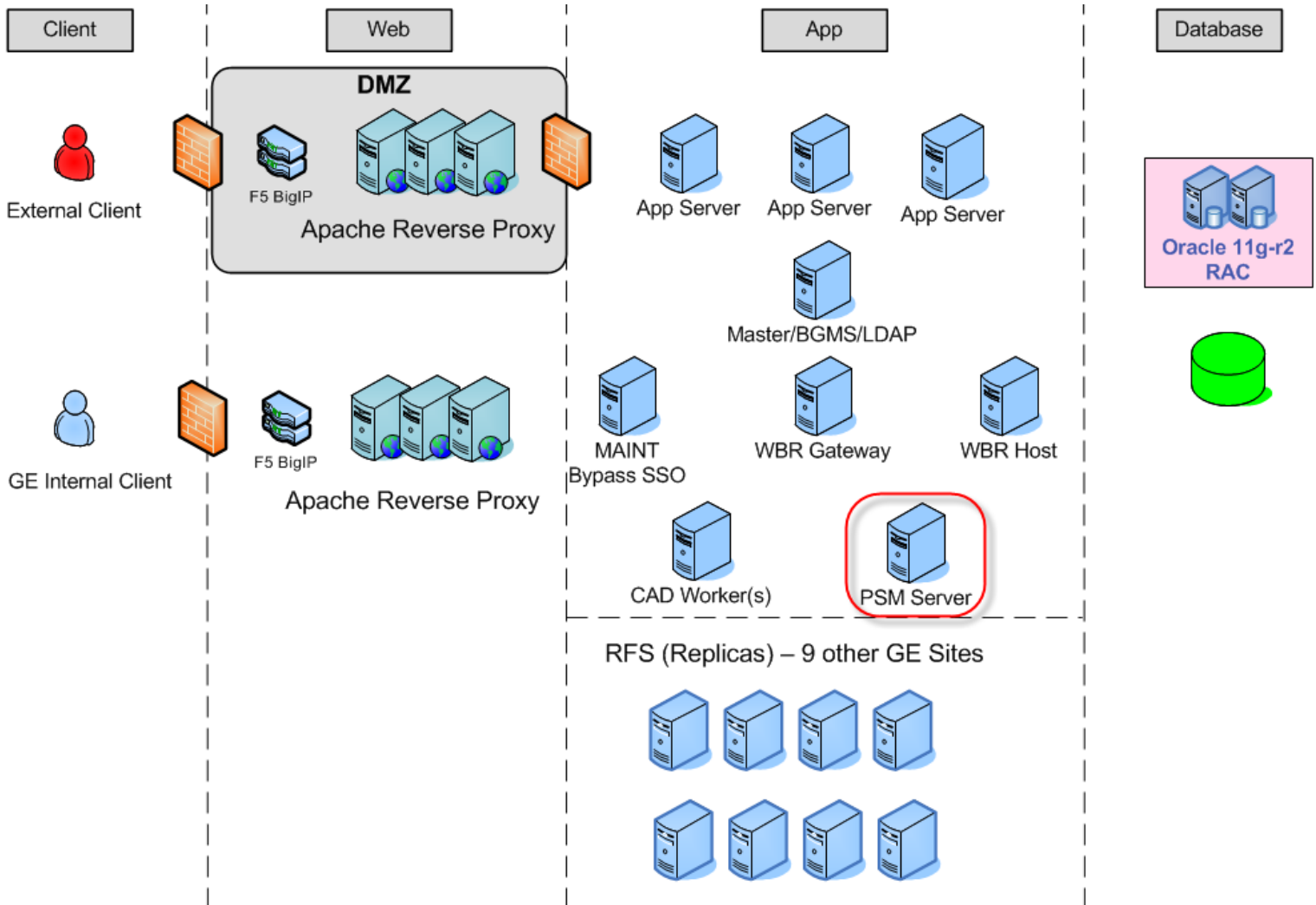
- Jonathan Kim (JK)
 - 15 years working with PTC PLM tools
 - Several as a consultant, traveling for a living
 - Functioned as
 - Developer
 - Dev Lead/Build Master
 - System Administrator
 - Architect
 - Performed many upgrades
 - 6 → 7 → 8 → 9 → 10
 - Support(ed) many PLM environments
 - DEV → QA → PROD
- GE Aviation
 - PLM instance has roots in Version 5
 - 5 → 6 → 7 → 9.1 → 10.2 → 11 (soon)
 - Currently at 10.2 M030
 - PDML, PJI
 - CSM – WBR – PTL
 - ESI – WGM
 - 3rd Party Integrations
 - TWO PRODUCTION Instances (US and UK)
 - Many Non-PROD environments

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PRODUCTION LANDSCAPE

- Multi-Tier Architecture
- Internally/Externally accessible
- All layers are in EC Vault
- Virtualized RHEL
- Oracle RAC
- Single Sign On enabled
- 8 Remote File Servers
- Integrations to ERP, Global Trade Compliance Tool, Salesforce.com
- ~ 6000 named users
- 350 – 450 concurrent users



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WHAT IT WAS LIKE IN A REACTIVE MONITORING WORLD

Windchill is down again....imagine that!?!?!



Why is Windchill so slow!?!?! It was working fine earlier!



Time for a break...maybe it will be done when I get back.



UGH!!! I have to work in Windchill today!!!!



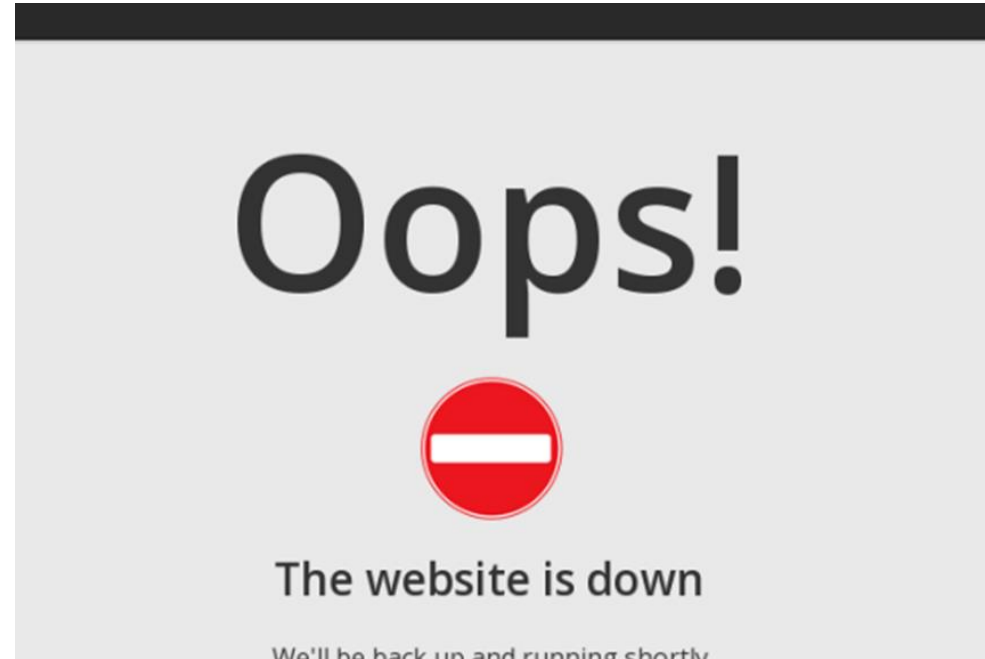
Something is wrong with Windchill! Is it down...again?



REACTIVE MONITORING AND RESPONSE



- How we found out Windchill was performing poorly or down?
 - Immediate team-members
 - Power Users contacting
 - Tickets → Enterprise Down
- Is it truly down?
 - Windchill is fine, but still “down”
 - Many times, 3rd party is root-cause (SSO, LB, etc)
 - Damage already done anyway
- It is down...work around the clock until resolved.
- Many restless/sleepless nights



WHAT WAS THE FALLOUT?

- Productivity suffers and deliveries are frozen
- Shop Floor work stoppage
- Upper management attention and visibility
- Application (user-experience” and credibility is tarnished
- “Black-eye” on support team
- CRUX: LOST DOLLARS and PRODUCTIVITY



End User Satisfaction

- ★★★★★
- ★★★★☆
- ★★★☆☆
- ★★☆☆☆
- ★☆☆☆☆



PROBLEM AND RESULTANT NEEDS



- Current monitors are reactive
- Monitors at the process level and no deeper
- Daily health report
- P&A monitoring from regions
 - Simulates end-user clicks
 - All robots down before notified
- Monitoring getting better, but still usually a “too little, too late”
- Image/credibility really suffering
- Implemented mid-week/weekend bounces for stability
- P&A improvements consistently back-burnered
- Need ability to monitor health, availability and performance in real-time
- Notification of issues early
- Quicker response to issues and “head off at the pass”
- More effective tool(s) to assist with problem resolution and RCA
- Improve User-Experience and Windchill perception

BOTTOM LINE: Tools in place were effective, to an end...but we needed a systemic change to be successful



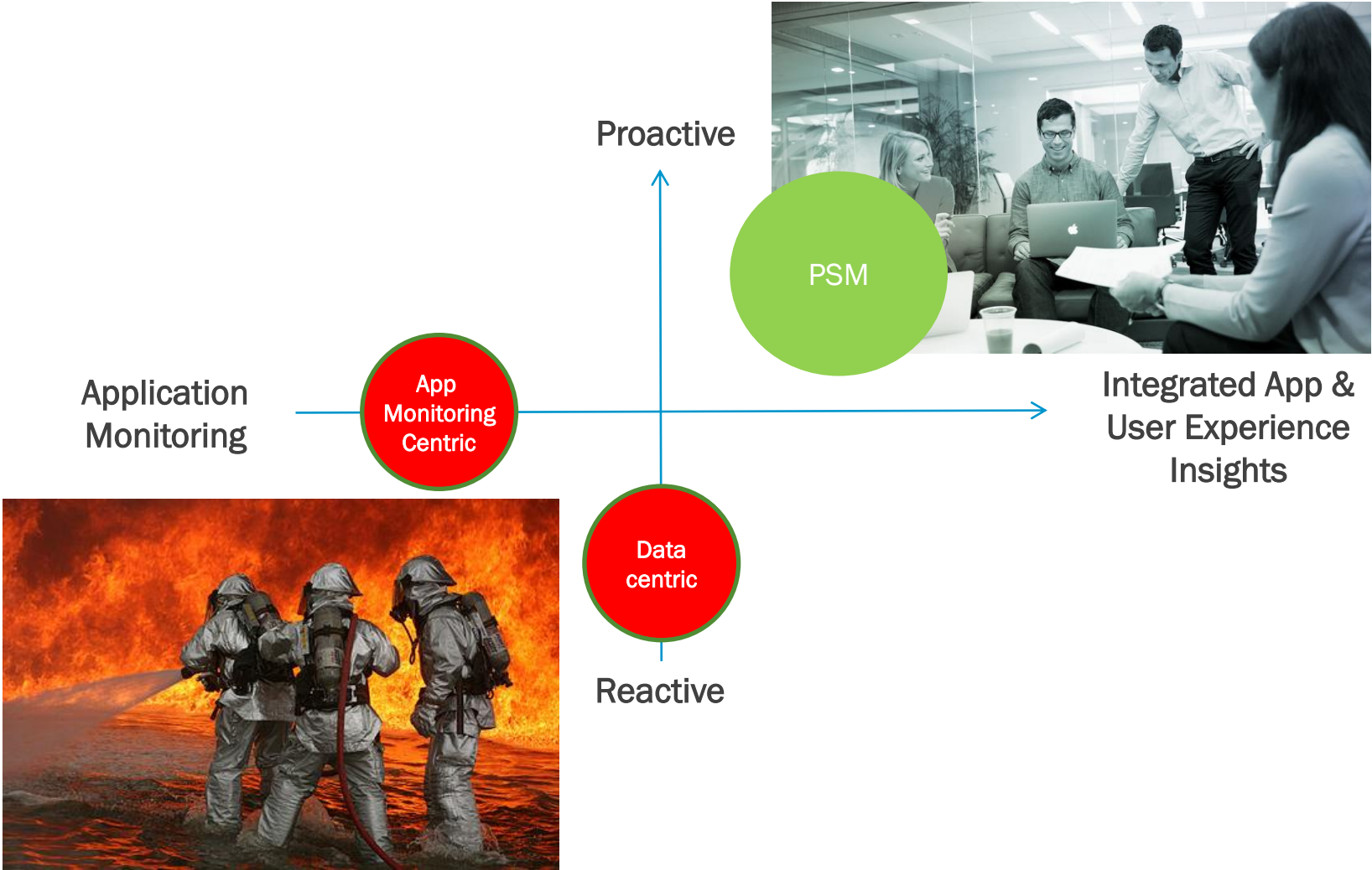
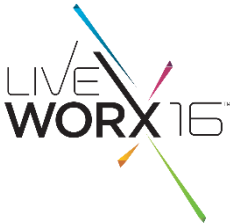
MORE ABOUT YOUR IMPLEMENTATIONS?



- Does anyone have reactive type tools in place?
- Anyone experiencing frustrated user-experience or Application performance “black-eyes”?
- Anyone have brief examples of steps taken to improve application stability? (e.g. bi-weekly bounces)



GO FROM FIGHTING FIRES TO PREVENTING THEM



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WHAT HAPPENED???



- Attended PTC Live Global (Anaheim) in 2013
- Saw several session on PSM and its use
- Also met with Dynatrace on exhibition floor....and was floored!

- Up until this point, I was aware of PSM...now had the proof and sufficient knowledge to go fight to get it implemented
- APPROVED! Go implement PSM!

- ALSO APPROVED – User Experience Module (UEM) bolt-on from Dynatrace
 - Track and monitor real user-experience to assess user satisfaction.



WHAT IS PSM?

- What is PTC System Monitor (PSM)
 - Separate, independent application performance monitor, powered by Dynatrace
 - Tailored by PTC for their applications, such as Windchill
 - *** NO INCREMENTAL COST – Included with licensed Windchill ***



Monitor every transaction 24/7
 Host and Application Health Status
 Pre-configured Alerts, Notifications



Rapidly Diagnose and Resolve Problems
 Always-on code level transaction tracing
 Trace and Capture across all Tiers



Report
 Track business-critical transactions
 Trend and correlate over time
 Track user activity, click by click



KEY CAPABILITIES



Dashboards

Monitor host, application and business metrics



Alerts on Key Performance Indicators (KPI)

Real-time notifications of warning and more severe issues



Reports and Charting

Track and gather data on resource and response time trend analysis



User Tracking

Unprecedented view into End-user actions and “problem clicks”



Instrumentation

Logging at key locations enables code level diagnostics



Better cooperation with PTC TS

Save all live data to a session file offline for delivery to PTC TSEs working your case

PSM COMPONENTS



Agent – Allow JVM process monitoring



Collector – Collect and bundle info coming from agents



Dynatrace Server – Workhorse provides analysis, reporting and alerts



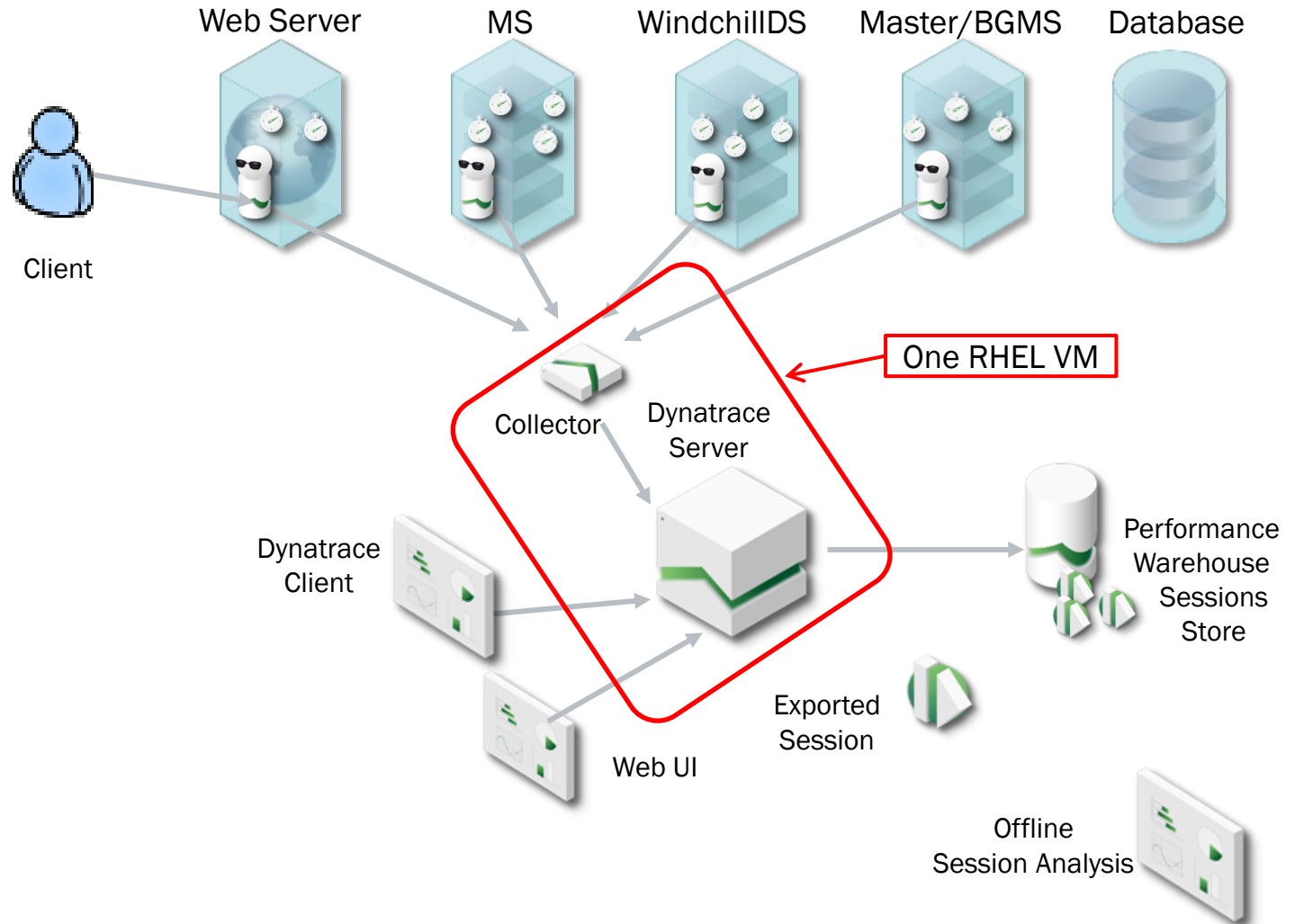
Performance Warehouse – Database used for long-term reporting









Dynatrace Client (Desktop or Web) – PSM User interface

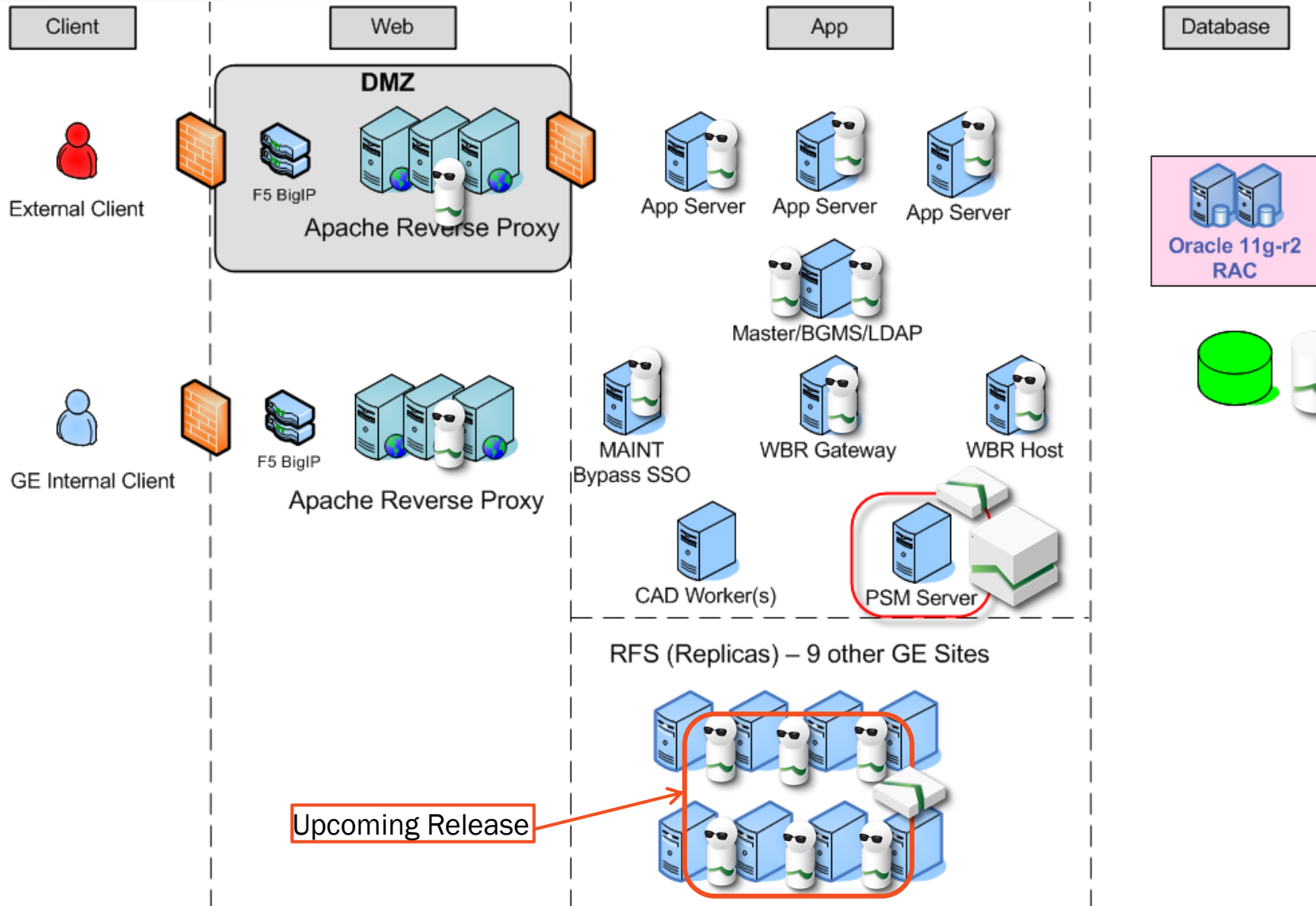


Exported Sessions – For offline analysis or delivery to PTC TS (or demonstrations 😊)




PRODUCTION DEPLOYMENT

-  **Agent**
-  **Collector**
-  **Dynatrace Server**
-  **Performance Warehouse**
-  **Dynatrace Client**
-  **Exported Sessions**



PSM Clients



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WHAT IT IS LIKE NOW?



PSM is a GAME-CHANGER

- Learning curve was very short – OOTB configurations are very powerful
- Dashboards are very intuitive – Point and Click
- Provides immediate visual cues of entire system
 - Visually isolating issues – impossible until now
- Configure and receive warnings of potential issues before they become issues
- All data is easily accessible through one place
 - No more jumping from server to server for logs
 - Captures data down to the transaction (method, sql) level
 - Easy packaging of data for PTC TS
- Helped to repair a tarnished/damaged Application image – You could consider it our “hidden public relations” rep.



HOST MONITORING



6 Hosts | 6 ok | 0 critical | 0 offline | Search hosts

Hosts: avelp0793v01, avelp0793v02, avelp0793v03, avelp0793v04, avelp0793v06, avelp0793v07

OS: Linux
OS Version: 2.6.32-57...i6.x86_64
Virtualization: VMware
Host Health

Host Information for avelp0793v01

OS: Linux
OS Version: 2.6.32-573.8.1.el6.x86_64
OS Architecture: x86_64

Physical Memory: 62.92 GB
CPU Cores: 8
IP Address: 3.56.203.167

Application Processes: 4
Websevers: -
Virtualization: VMware
Cloud: -

CPU Usage

Network Utilization (eth0): In: 0.04 MBit/s, Out: 0.04 MBit/s

Memory: Used, Usable, Page Faults per Second

Disks: /export/Pvault5 (97% used of 1,024.00 GB), /export/Pvault4 (92% used of 1,250.00 GB)

Monitored Processes:

- ptc.wt.MethodServer-v10.x-windchillus.ge.com-80-Windchill-2 (CPU 0.1%, Memory 3.52 GB)
- ptc.wt.MethodServer-v10.x-windchillus.ge.com-80-Windchill-1 (CPU 0.1%, Memory 3.87 GB)
- ptc.wt.ServerManager-v10.x-windchillus.ge.com-80-Windchill-1 (CPU 0.1%, Memory 1.08 GB)
- ptc.wt.MethodServer-v10.x-windchillus.ge.com-80-Windchill-3 (CPU 0.1%, Memory 3.62 GB)



PROACTIVE NOTIFICATIONS



! Severe Incident started: Active Contexts - severe

Details

Time: 2016-05-04 10:37:30
System Profile: PTC Windchill 10.x
dynaTrace Server: avelp0793v09

Violations

MS Active Contexts: [ptc.wt.MethodServer-v10.x-windchillus.ge.com-80-Windchill-12@avelp0793v03](#): Was 25.00 but should be lower than 25.00.



[Open in dynaTrace](#) [Open in browser](#)

! Warning Incident started: MS GC Utilization

Details

Time: 2016-04-20 17:26:20
System Profile: PTC Windchill 10.x
dynaTrace Server: avelp0793v09

Violations

MS GC Total Utilization: [ptc.wt.MethodServer-v10.x-windchillus.ge.com-80-Windchill-1@avelp0793v01](#): Was 7.67 % but should be lower than 7.50 %.
MS Memory Utilization: [ptc.wt.MethodServer-v10.x-windchillus.ge.com-80-Windchill-1@avelp0793v01](#): Was 87.18 % but should be lower than 85.00 %.



[Open in dynaTrace](#) [Open in browser](#)

! Severe Incident occurred: Average response time degraded

The average response time (median) is significantly higher than expected. Although the observed response time might be still acceptable for users, this behavior is typically caused by application or infrastructure problems and reduces the maximum throughput you can achieve.

Details

Time: 2016-04-28 10:32:00
Business Transactions: Web Page Requests [Windchill/ptc1/<...>]
System Profile: PTC Windchill 10.x
dynaTrace Server: avelp0793v09
Application: windchillus.ge.com

Violations

Observed response time of 167ms is higher than expected. During the last 7d the average response time was less than 55ms.



SYSTEM HEALTH DASHBOARD

Metrics consolidated into easy to read health indicators

PTC® Windchill®

System Health

MS

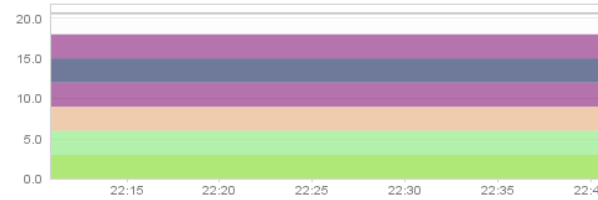
SM

BMS

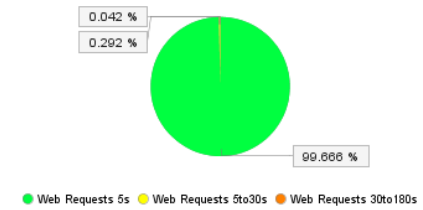
FS



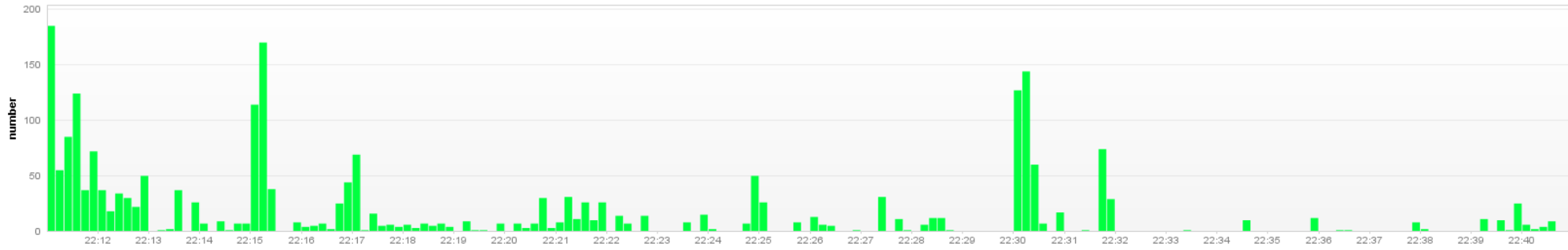
Available Method Servers



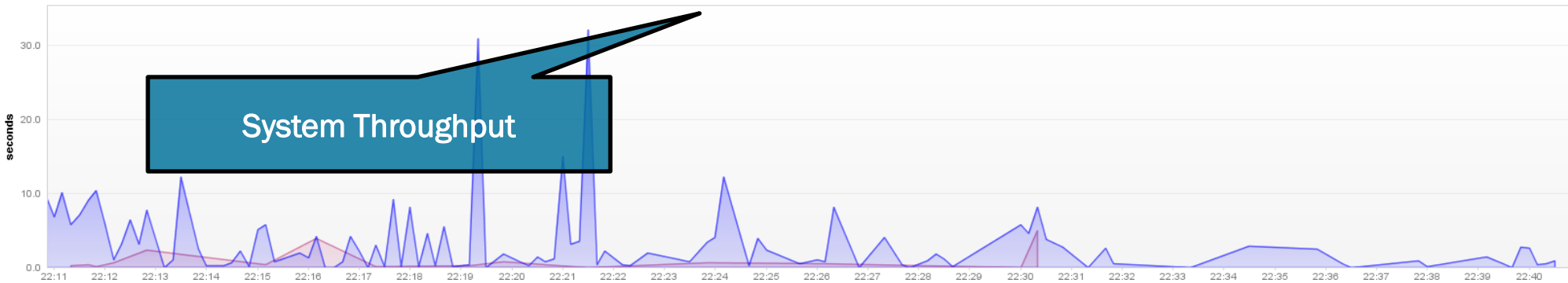
Web Request Times



Transaction Count

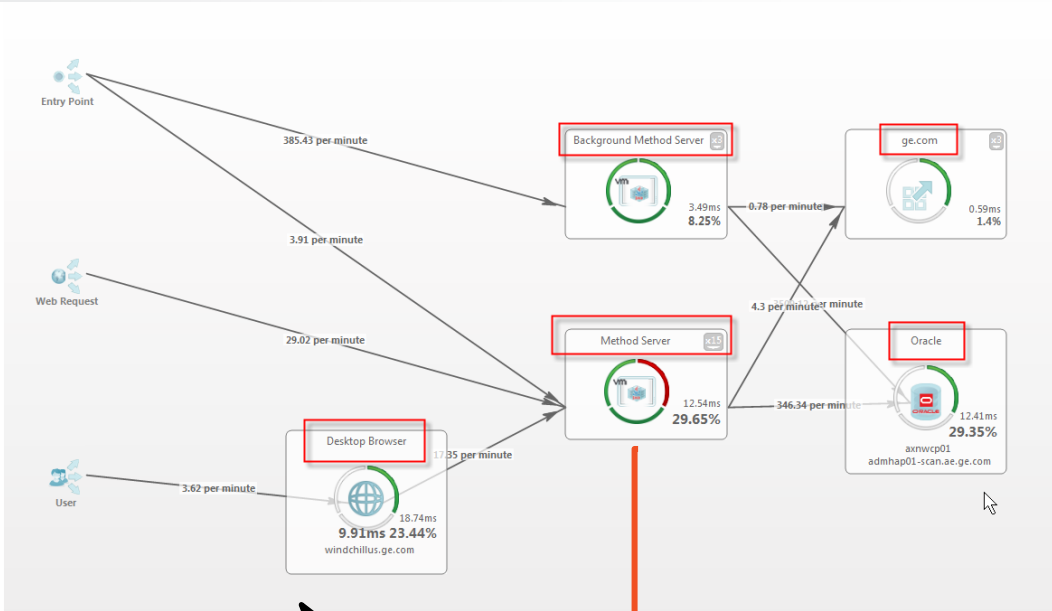


Total Time Spent for Transactions



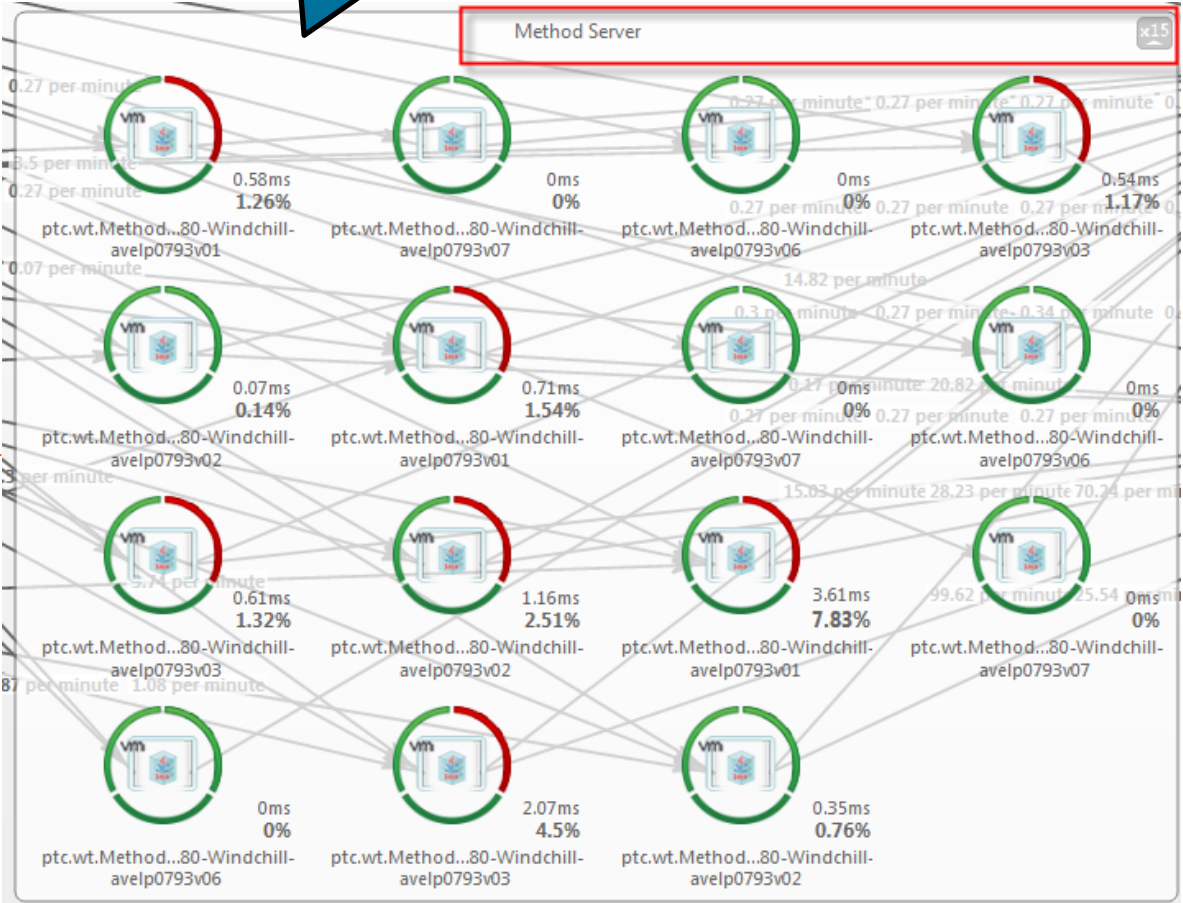
System Throughput

VISUAL DRILL DOWN INTO PROCESS



Graphical layout of VMs and other Processes

Drill down into all MethodServers and can go further



METHODSERVER STATUS DASHBOARD



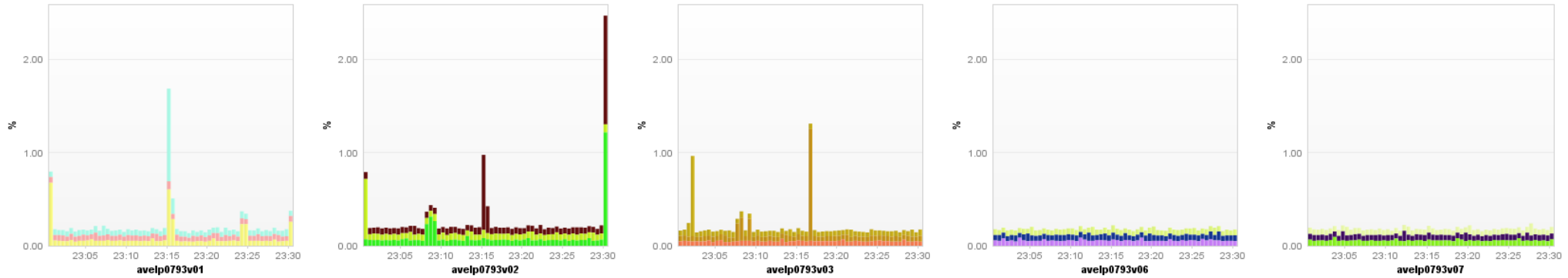
PTC® Windchill®

Method Server Status

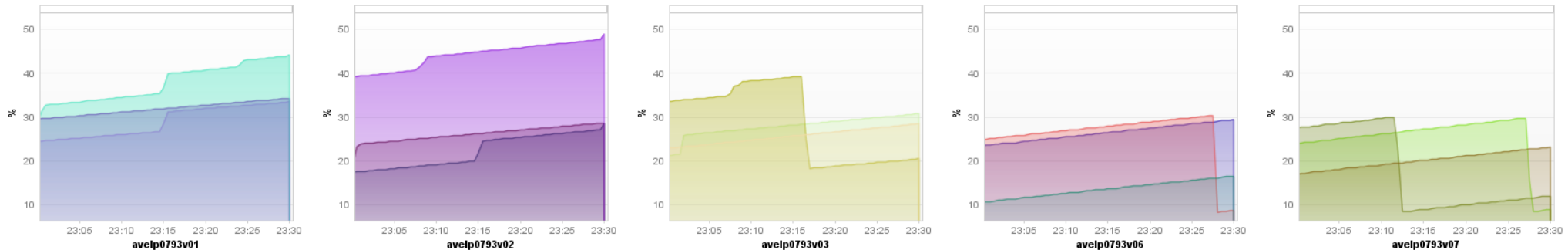
Agent, Monitor or Transaction	MS Memory Utilization [max]		
avelp0793v01	✓		0.01
ptc.wt.MethodServer-v10.x-windchillus.ge.com-80-Win	✓	31.46 ms	0.03
ptc.wt.MethodServer-v10.x-windchillus.ge.com-80-Win	✓	3.70 ms	0.00
ptc.wt.MethodServer-v10.x-windchillus.ge.com-80-Win	✓	23.48 ms	0.00
ptc.wt.MethodServer-v10.x-windchillus.ge.com-80-Win	✓		0.00
ptc.wt.MethodServer-v10.x-windchillus.ge.com-80-Win	✓	77.13 ms	0.01
avelp0793v02	✓		

Easily identify with server in cluster is running into an issue

Method Server CPU Usage



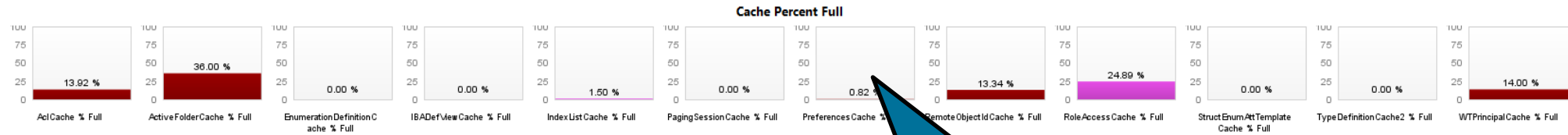
Method Server Memory Usage



PTC WINDCHILL CACHE DASHBOARD



D100 - Cache Dashboard 10.x shows data of PTC Windchill 10.x in timeframe: last 30 minutes



Dynamic Measure Matrix

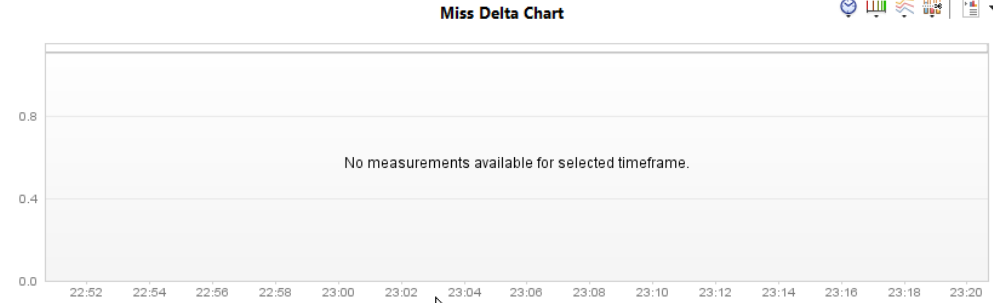
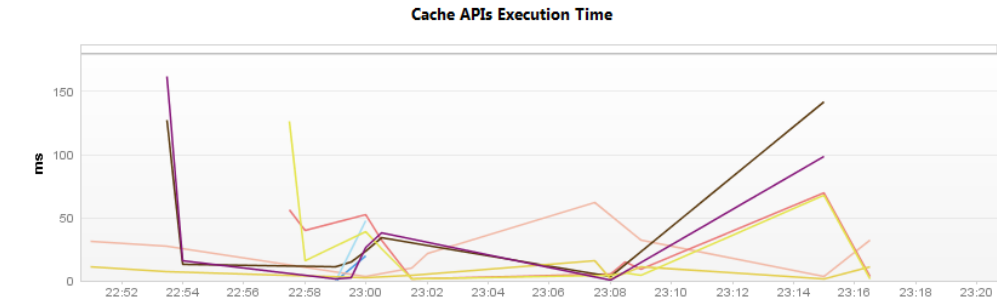
Agent, Monitor or Transaction	AclCache - Ag...	AclCache - Capacity ...	AclCache - Entries...	AclCache - Hits [max]	AclCache - Misses	AclCache - Del...	ActiveFolderC...	ActiveFolderC...	ActiveFolderC...	ActiveFolderC...	ActiveFolderC...
avelp0793v07	0.00	18000.00	10.00	244.00	10.00		0.00	100.00	33.00	8.00	50
ptc.wt.MethodServer-v10.x-windchillus.ge.com-80-Win	0.00	18000.00	10.00	244.00					33.00	8.00	50
ptc.wt.MethodServer-v10.x-windchillus.ge.com-80-Win	0.00	18000.00	10.00	244.00					33.00	8.00	50
ptc.wt.MethodServer-v10.x-windchillus.ge.com-80-Win	0.00	18000.00	10.00	244.00					33.00	8.00	50
ptc.wt.ServerManager-v10.x-windchillus.ge.com-80-Wir	0.00	18000.00	10.00	244.00					33.00	8.00	50
avelp0793v06	0.00	18000.00	30.00	2552.00					33.00	8.00	50
avelp0793v01	0.00	18000.00	1228.00	302752.00	1234.00		0.00	100.00	35.00	72.00	52
avelp0793v03	0.00	18000.00	2252.00	105296.00	2299.00		0.00	100.00	36.00	117.00	53
avelp0793v02	0.00	18000.00	2505.00	311268.00	2522.00		0.00	100.00	35.00	36.00	52

Live monitoring of Windchill Cache

Cache Activity

Method	Count	Time [ms] Sum	Time [ms] Avg	Cpu Time [ms] Sum	Cpu Time [ms] Av
wt.session.SessionUsers	222	16485.50	74.26	4906.53	22.1
wt.recent.RecentUpdateCache	85	14815.12	174.30	6555.82	77.1
wt.preference.PreferencesCache	47	9727.63	206.97	4261.69	90.6
com.ptc.netmarkets.roleAccess.RoleAccess...	42	10089.47	240.23	4961.20	118.1
wt.org.WTPrincipalCache	25	7868.30	314.73	1999.48	79.9
wt.access.AclCache	14	10722.86	765.92	3088.49	220.6
com.ptc.core.meta.server.impl.LogicalIdenti...	14	3084.33	220.31	915.05	65.3
wt.intersvrcom.SiteMonitor\$SiteMonitorCac...	4	401.71	100.43	115.79	28.9
com.ptc.netmarkets.roleAccess.RoleAccess...	4	2624.84	656.21	847.05	211.7
wt.intersvrcom.ContentURLCache	2	210.14	105.07	20.71	6.7

Even broken down by SM/MS



USER ACTIVITY DASHBOARD



User Activity

To extend PSM visibility into browser - see www.ptc.com/WCMS/files/142899/en/UEM_ForWindchill.mp4 for more information on User

User Activity Breakdown

Use ctrl-F to find a user by name, and right-click to drill down to PurePaths and other diagnostic information.

Splittings	Count	Time [ms] Sum	Time [ms] Avg	Cpu Time [ms] Sum	Cpu Time [ms] Avg
502085981	640	34583.57	54.04	12999.06	20.31
212361931	109	29925.67	274.55	3679.73	33.76
21003224	37	17705.92	478.54	1004.84	27.16
21005228	29	9138.63	315.13		
21246023	28	4245.15	151.61		

PurePath

PurePath	Response Time [ms]	Breakdown
/Windchill/wtcore/jsp/com/ptc/windchill/search/Search.jsp	202.40	cpu (46.0%) io (54.0%)
/Windchill/ptc1/comp/folderbrowser_table	199.14	cpu (67.0%) io
/Windchill/ptc1/comp/folderbrowser_table	198.45	cpu (60.0%) wait io
/Windchill/ptc1/comp/folderbrowser_table	186.73	cpu (62.0%) wait io
/Windchill/wtcore/jsp/com/ptc/windchill/search/Search.jsp	186.67	cpu (61.0%) io (39.0%)
/Windchill/ptc1/comp/folderbrowser_table	186.56	cpu (70.0%) wait io
/Windchill/ptc1/comp/folderbrowser_table	180.61	cpu (61.0%) io (39.0%)
/Windchill/wtcore/jsp/com/ptc/windchill/search/Search.jsp	176.26	cpu (57.0%) io (43.0%)
/Windchill/wtcore/jsp/com/ptc/windchill/search/Search.jsp	174.46	cpu (60.0%) io (40.0%)
/Windchill/ptc1/comp/infoPage	167.18	cpu (67.0%) io (33.0%)
/Windchill/ptc1/search/historySavedSearchDisplay	165.78	cpu (78.0%) io
/Windchill/ptc1/comp/folderbrowser_table	155.56	cpu (58.0%) io (42.0%)

PurePath Tree (showing only relevant nodes)

Method	Argument	Exec Total [ms]	Breakdown	Class	API	Agent	Elapsed Time [ms]
doFilter(ServletRequest, ServletResponse, FilterChain)	/Windchill/wtcore/jsp/com/ptc/windchill/search/Search.jsp	202.40	cpu (43.0%) io (57.0%)	ServletRequestMo...	Servlet	ptc.wt.MethodSer...	0.00
getRemoteAddr()		0.01	cpu (94.0%) io	ServletRequestWr...	Servlet	ptc.wt.MethodSer...	0.05
getRemoteUser()		0.01	cpu (83.0%) io	HttpServletRequest...	Servlet	ptc.wt.MethodSer...	0.10
getRemoteUser()		0.01	cpu (83.0%) io	HttpServletRequest...	Servlet	ptc.wt.MethodSer...	0.12
getRemoteUser()		0.01	cpu (82.0%) io	HttpServletRequest...	Servlet	ptc.wt.MethodSer...	0.36
getRemoteUser()		0.01	cpu (85.0%) io	HttpServletRequest...	Servlet	ptc.wt.MethodSer...	0.39
getRemoteUser()		0.01	cpu (81.0%) io	HttpServletRequest...	Servlet	ptc.wt.MethodSer...	0.66
getRemoteAddr()		0.01	io (100.0%)	ServletRequestWr...	Servlet	ptc.wt.MethodSer...	0.68
notifyDynaTraceOfContextRegistration(MethodContextMBean)	w6k6h;io3ezyes;1535;pm1w3f13114;null	0.01	cpu (80.0%) io	MethodContext	Method	ptc.wt.MethodSer...	0.79
service(HttpServlet request, HttpServletResponse resp)		201.12	cpu (42.0%) io (58.0%)	JspServlet	Servlet	ptc.wt.MethodSer...	0.97
serviceJspFile(HttpServlet request, HttpServletResponse, Str)		201.07	cpu (42.0%) io (58.0%)	JspServlet	JSP	ptc.wt.MethodSer...	-
service(ServletRequest, ServletResponse)		201.07	cpu (42.0%) io (58.0%)	HttpServlet	Servlet	ptc.wt.MethodSer...	-
jspService(HttpServlet request, HttpServletResponse)		201.07	cpu (42.0%) io (58.0%)	Search.jsp	Servlet	ptc.wt.MethodSer...	1.01
getRemoteUser()		0.01	cpu (82.0%) io	HttpServletRequest...	Servlet	ptc.wt.MethodSer...	1.72
getRemoteAddr()		0.01	io (100.0%)	ServletRequestWr...	Servlet	ptc.wt.MethodSer...	1.74
service(HttpServlet request, HttpServletResponse)		200.00	cpu (42.0%) io (58.0%)	JspServlet	Servlet	ptc.wt.MethodSer...	2.01
serviceJspFile(HttpServlet request, HttpServletResponse)		199.96	cpu (42.0%) io (58.0%)	JspServlet	JSP	ptc.wt.MethodSer...	-
service(ServletRequest, ServletResponse)		199.96	cpu (42.0%) io (58.0%)	HttpServlet	Servlet	ptc.wt.MethodSer...	-
jspService(HttpServlet request, HttpServletResponse)		199.96	cpu (42.0%) io (58.0%)	search.jsp	Servlet	ptc.wt.MethodSer...	2.04
getRemoteAddr()		0.01	cpu (81.0%) io	ServletRequestWr...	Servlet	ptc.wt.MethodSer...	2.18
getRemoteAddr()		0.01	cpu (93.0%) io	ServletRequestWr...	Servlet	ptc.wt.MethodSer...	2.20
getRemoteUser()		0.01	cpu (100.0%)	HttpServletRequest...	Servlet	ptc.wt.MethodSer...	2.21
getConnection()		0.03	cpu (94.0%) io	POMHandler	Persistenc...	ptc.wt.MethodSer...	2.71
prepareStatement(String)	SELECT 'wt.preference.PreferenceInstance',A0.classnamekeyD4,A0.idA3D4,A0.commen...	0.11	cpu (99.0%)	PhysicalConnection	JDBC	ptc.wt.MethodSer...	2.92
executeQuery()	SELECT 'wt.preference.PreferenceInstance',A0.classnamekeyD4,A0.idA3D4,A0.commen...	3.26	cpu (92.0%)	OraclePreparedSta...	JDBC	ptc.wt.MethodSer...	3.10
prepareStatement(String)	SELECT 'wt.preference.PreferenceDefinition',A0.clientData,A0.clientDelegate,A0.clientO...	0.04	cpu (96.0%)	PhysicalConnection	JDBC	ptc.wt.MethodSer...	6.69
executeQuery()	SELECT 'wt.preference.PreferenceDefinition',A0.clientData,A0.clientDelegate,A0.clientO...	0.65	cpu (97.0%)	OraclePreparedSta...	JDBC	ptc.wt.MethodSer...	6.77
prepareStatement(String)	SELECT 'wt.org.WTUser',A0.administrativeLockIsNull,A0.typeadministrativeLock,A0.allo...	0.04	cpu (97.0%)	PhysicalConnection	JDBC	ptc.wt.MethodSer...	7.91

Drill down to code path execution

#LIVEWORX

Imagination at work

30

USE CASE DEMONSTRATIONS

IN SUMMARY



- PSM has enabled us to monitor Windchill proactively – Hosts and Application continuously monitored against KPIs
- Quickly notified of potential issues...before they become issues.
- Rarely have E-Down and application remains up for 1-2 months at a time
- User-experience is considerably better and we have repaired the Windchill image
- PSM has changed the way we troubleshoot – Issues are identified and resolved much quicker
- No more sleepless/restless nights! Ok, they are very rare now.



QUESTIONS?

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The image features several colorful geometric shapes, primarily triangles and lines, scattered across the background. A large, multi-colored triangular shape is prominent on the right side, composed of various shades of blue, green, yellow, orange, pink, and purple. Several thin, colored lines (blue, pink, green, orange) radiate from the center towards the edges. The text 'LIVE WORX 16' is centered in the upper half, with 'LIVE' in a thin, outlined font and 'WORX 16' in a bold, solid black font. A small 'TM' trademark symbol is positioned to the right of the '16'.

LIVE
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TAKE A FRESH LOOK AT THINGS

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