Splunks Of War: Creating A Better Game Development Process Through Data Analytics

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Agenda

- About Me
- What we do
- Splunk Adoption
- Growing Splunk
- Driving Game Quality
- Future Plans
- Key Takeaways
- Questions





About Me

- Principal Software Engineer
 @ The Coalition (Microsoft)
- Lead of the tools, build and automation teams
- My Job: To make the game development process easier







What we do

- Microsoft studio out of Vancouver, BC, Canada
- We develop AAA games for Xbox One and Windows 10
- 300+ team of software engineers, designers, artists, producers and quality assurance
- Gears of War 4 is out 11th October!

What we do: Workflow Challenges





What we do: Software Challenges

















What we do: Geographic Challenges





Splunk Adoption

- A lot of tools, workflows and people to support
- Users weren't always good at telling us what might be wrong (especially in different time zones)
- We needed a way to centralize our data capturing solution and to be able to act on what we found



Splunk Adoption

- Looked at a few solutions but Splunk provided us with the ability to:
- 1. Require no centralized schema for our logs
- 2. Vast array of plugins like Windows Universal Forwarder
- 3. Searching and visualizing your data is simple
- 4. Easily create alerts and reports on the data we were monitoring

Splunk Adoption: Topology

	search head
LOG log file	indexer



Splunk Adoption

- Started small, ingesting well formatted logs
- All requirements came from within my team
- Very much reactionary to begin with



Splunk Adoption: Workflow Monitoring

• Started to create dashboards for all of our major tools



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Splunk Adoption: Perforce Monitoring

- Our perforce server would randomly crash
- CPU, Disk and Network looked fine
- Started ingesting results of admin commands (p4 monitor)





Splunk Adoption: Perforce Monitoring

- Our outsourcers started to complain about sync times
- We had little insight into how much content was being submitted each day





Splunk Adoption

- For the first time we could get detailed insight into key tools, workflows and infrastructure
- Helped drive operation KPIs for the group and provide alerting coverage
- We started to get the data thirst and so did others!



Growing Splunk

- We started to expand on the logs we were monitoring
- Added direct database connection for static lookups
- Began adding in more windows forwarders from build machines
- We started to move from reactionary to more preventative monitoring
- We started asking more questions, writing more reports and expanding the people allowed to use the system
- Until...



Growing Splunk: Growing Pains

- Noticed Splunk Indexers falling further and further behind
- Searches were taking longer and longer
- We had failed to monitor the hardware we were running Splunk on



Growing Splunk: Topology v2





universal

universal

forwarder3

universal forwarder4

- Game compile times were very long
- Custom build solution in Unreal 4 using Nmake and C#
- Zero telemetry so nothing to action on





-6/30/2016-12:11:26 PM::<Log> UnrealLightmass-UdpMessaging.dll [0:00.76 at +0:45] -6/30/2016-12:11:26 PM::<Log> UnrealLightmass.exe [0:00.71 at +0:45] -6/30/2016-12:11:26 PM::<Log> Telemetry Event(BuildTime) MachineName=TC-BUILD16-DLNV; NumLogicalCores=16; NumPhysicalCores=-1; Targets=UnrealLightmass Win64 Development; NumActions=57; NumCompileActions=44; NumPchCompileActions=4; NumLinkActions=13; ElapsedTime=46.387389 -6/30/2016-12:11:26 PM::<Log> XGE execution time: 95.53 seconds -6/30/2016-12:11:26 PM::<Log> Telemetry Event(PerformanceInfo.2) TotalExecutionTimeSec=95.53; TotalTimeSpentGettingIncludesSec=0.42; TotalIncludesRequested=0; DirectIncludeCacheMissesTotalTimeSec=0.01; TotalDirectIncludeCacheMisses=8; TotalFindIncludedFileCalls=437; IncludePathSearchAttempts=12569; TotalFileItemCount=1716; MissingFileItemCount=43





Filename 🛇	MedianDurationSeconds 0	AvgDurationSeconds 🗸	NumSamples 0	Deviation 0
GearGameServer.exe	443.80	723.985385	13	844.135177
GearGame-XboxOne-Debug.exe	551.9	551.900000	1	0.000000
GearGame-XboxOne-Shipping.exe	438.04	411.920000	2	36.938695
OnlinePlayer.cpp	175.40	159.640230	87	60.766412
GearPhysics.cpp	190.8	158.850000	2	45.183570
Module.GearOnline.9_of_10.cpp	151.00	158.677262	325	49.534070
Module.GearOnline.8_of_9.cpp	153.6	153.600000	1	0.000000
PCH.GearWwiseAudio.Engine.h.cpp	69.20	144.480000	6	206.381432
Module.BlueprintGraph.3_of_4.cpp	198.0	141.100000	2	80.468503





- Our build machines produce ~1TB of builds a day
- Users require auto deployments of 60GB builds to Xbox One and Windows 10 machines









- As we ramped up our team, QA started reporting slowdowns in the system
- Luckily Splunk was already installed and gathering data on all agent!





_time



Driving Game Quality: Challenges

- Driving quality is hard (especially in games)
- Requires getting the right information to the right people at the right time
- The information must be actionable and understandable by the target audience
- You require one source of truth as not to confuse people
- Most of our work was very engineering focused in the past



Driving Game Quality: Challenges

- A number of KPIs when looking at a game product:
- 1. Visual Quality
- 2. Gameplay Quality
- 3. Technical Quality
- How can you quantify and track these values to be able to report on them?



Driving Game Quality: Challenges

- It was hard!
- Technical quality was the easiest to quantify and measure
- Expanded KPIs:
- 1. Frames per second
- 2. Memory usage
- 3. Crashes
- 4. Test Coverage



Driving Game Quality: Implementation









Driving Game Quality: Implementation v2

- Good start but our users wanted more data
- Tests only gave a snap shot of the state of the game
- Again we got the data thirst!



Driving Game Quality: Implementation v2





- With all of this data a rework of our dashboards was required
- We needed to make the data actionable to designers, artists, project managers and engineers
- We made our first Splunk app



		QA			Automation		Extras
MapName	FPS	% Over 30 FPS	Lowest Available Memory (MB)	FPS	Lowest Available Memory (MB)	Load Time (Seconds)	00M Crashes
SP_	1553809 [07-04-2016] 28.98	1553809 [07-04-2016] 76.89	331.87	1556548 [07-04-2016]	1556548 [07:04-2016] 494.04	1553809 [07-04-2016] 70.31	7 in last 7 days
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SP_	1550626 (07-03-2016)	1550626 [07:03-2016] 94.42	1550626 (07:03-2016) 596.17	1556548 [07-04-2016]	1556548 (07-04-2016) 848.63	1553809 [07-04-2016] 70.2	0 in last 7 days
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SP_	1522290 [06-29-2016]	1522290 [06-29-2016] 99.83	1522290 [06-29-2016]	1556548 [07-04-2016]	1555548 [07-04-2016]	1553809 [07-04-2016] 70.39	O in last 7 days
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		QA			Automation	
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			QA							Automation			Extras
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• All built using standard web technologies

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config.js	4 <head></head>							
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- Accelerated searches
- Great for large data sources

Searches, reports, and alerts » QA	Stats - Aggregated Raw Data
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OAStats - Aggregated Raw Data

- Saved Searches are your friend
- Watch out for expiring artifacts

Advanced Edit: BTJira - (Searches, reports, and alerts » BTJira - Cras	Crashes that have Coordinates in last 7 hes that have Coordinates in last 7 days	7 da
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action.summary_index.ttl	120	8
action.webhook.ttl	10p	8
auto_summarize.dispatch.ttl	60	0
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Driving Game Quality

- Unification of telemetry and reporting was a huge success
- One single source of truth
- Trend visualization for KPIs
- Faster issue discovery and resolution
- Saved time and money reporting on data
- Delivers consumable and actionable data



Driving Game Quality

- The team now uses Splunk for its daily performance meetings and to help drive what levels need to be looked at
- Many additions requested for future titles now people can see what Splunk can do



- Deal with ~15 outsourcing partners on a project
- Different timezones
- Different languages
- Different or custom workflows
- Much harder to provide support









- Less dependencies on other solutions
- Easier to setup and maintain
- Help us track and resolve issues with partners much more efficiently

- Currently only a single Splunk instance
- Most work currently goes on in live environment
- Some development on local instances
- We have lost .conf and dashboard changes
- We need a development environment!





- Store all settings in source control
- Code reviews and rollbacks are easy





- Lock down access to production
- People less likely to break something or lose work
- Everything is backed up
- Hope to roll this out in the next 3 months



Key Takeaways

- Start with a reasonable hardware topology
- Gather as much information as you can, you never know when it might be useful
- Splunk can ingest any form of data (but give it a hand)
- Make your reporting relevant to your audience



Resources

- Splunk Topology Examples: <u>http://docs.splunk.com/Documentation/Forwarder/6.4.2/Forwarder/</u> <u>Forwarderdeploymenttopologies</u>
- Logging Best Practices: <u>http://dev.splunk.com/view/logging-best-practices/SP-CAAADP6</u>
- Custom Visualization Example: <u>http://docs.splunk.com/Documentation/Splunk/6.4.2/AdvancedDev/</u> <u>CustomVizTutorial</u>



Special Thanks

• Special thanks to my team back home in Vancouver



Questions?





THANK YOU



