Research Report

The Future of Mainframe and Distributed Systems Management

Executive Summary

Information technology (IT) executives have a big problem: there is a constant shortage of skilled system/storage/network/application/database managers. There are two ways to fix this problem:

1) Simplify the tools that IT managers and administrators use to manage systems; and,
2) Make systems manage themselves.

Information technology (IT) executives need to develop a system/storage/network/-application/database strategy that calls for greater involvement of systems in managing themselves. That strategy should involve:

1) The capture/use of system behavior data (found in structured/unstructured data);
2) The use of analytics software to filter that data (to perform root cause analysis and predictive analytics); and,
3) The use of cognitive computing to learn and think. (Software has come to market that uses machine learning algorithms that can learn and make predictions on data, enabling systems to learn from analytics/cognitive activities and automatically take corrective actions).

In this *Research Report*, *Clabby Analytics* puts forward our vision of the future of mainframe and distributed systems management. We expect to see:

1) Further improvements in the usability of systems/storage/network/database and application management tools and utilities;
2) The number of analytics-driven management software offerings to skyrocket over the next few years;
3) Increased linkage of analytics software with cognitive computing resources; and,
4) Increased usage of machine learning. (Systems can now exploit self-learning/-decision making facilities, machine learning facilities and can process data that has been previously been "dark" to computers. Further, natural language processing can be used to ingest textbooks, Twitter feeds, and more to improve machine learning/decision making capabilities).

Background

Over the past two decades *Clabby Analytics* has tracked the progress that vendors have made in simplifying and automating management tools. Readers can find over twenty reports on systems/storage/network /application/database management (available for free)

on our Website at www.clabbyanalytics.com. In general, these reports describe improvements that vendors have made to user interfaces (moving to more graphically-driven interfaces for younger generation IT managers); to process automation (the scripting and automation of repetitive management processes); to single-pane-of-glass management across systems/storage/-network silos; to application performance management; to adaptive automation; to self-learning facilities and to dynamically-driven threshold adjustments.

> ***All of these improvements have been designed to make humans more effective.***

As far back as 2010, however, *Clabby Analytics* started writing reports about how systems were starting to take a more active role in managing themselves. For instance, this report describes an environment where a fully tuned system takes an inventory of itself – and should a problem occur, this system can refer to a previous image of itself, identify anomalies, and thus make it easier to troubleshoot a problem.

Since 2010, we have written numerous additional reports on various software products that use analytics software to analyze machine data – a field that has become known as "operational analytics".

> ***Operational analytics help SYSTEMS isolate the cause of problems, giving systems a greater role in helping to find the root causes of problems, while lightening the management workloads on humans.***

Operational analytics primarily serves to isolate the sources of problems (what is wrong). Two further steps are needed, however, to enable a system to predict outages, troubleshoot problems and automatically repair themselves:

1) a cognitive element (that determines what should be done, and possibly take corrective action automatically); and,
2) a machine learning element (that enables systems to predict future system behavior).

> ***The future of systems management is all about enabling systems to manage themselves using analytics, cognitive computing and machine learning. And that future is NOW!***

Why Operational Analytics Is Important: The Skill Level Situation

Earlier this year, ComTIA (a non-profit trade organization) published this report (see page 49 – based on 2013 data) that shows that business and IT executives are greatly concerned about being able to hire IT staff with the desired level of skills and experience across multiple geographies around the world. Of the 1,252 business and IT executives surveyed in this report across Brazil, Canada, France, Germany, India, Japan, Mexico, the Middle East, Thailand and the U.K., the greatest concern about finding IT staff with the proper skills can be found in the Middle East (86%); followed by India (85%); Brazil (78%); Mexico (63%) and Canada (61%). As for the U.K., the European Commission predicted in

2013 that the UK will need an additional 500,000 IT professionals by 2015. Further, this 2015 article indicates that Harvard Business Review and Manpower (executive placement) agree that 36% of employers worldwide are having difficulty filling jobs.

> ***Geographies around the world are having trouble finding the skilled/experienced labor that they need to run and grow their businesses. As stated earlier, from Clabby Analytics perspective, there are two ways to fix this problem: 1) simplify management tools; and, 2) enable systems to manage themselves.***

A Recent Compuware Survey

In June, 2015, mainframe software vendor Compuware published a survey entitled "*The New World of Mainframes CIO Survey: Mapping the Platform's Future in a Mobile, Big Data World*" that indicates that C-level executive managers are becoming concerned that as their older mainframe workers retire, they will face skill shortage issues. The key findings in this report are that:

- 88% of responders believe that the mainframe will remain a key business asset over the next decade; but,
- *70% of responders are concerned about mainframe knowledge transfer and risk*; Further,
- 39% of responders have no explicit plans for addressing mainframe developer shortages.

In short, this survey shows that C-level executives are becoming concerned about losing mainframe skills as older mainframe managers retire – and some enterprises do not have a formal plan in place to address potential skill shortages.

Why Operational Analytics Is Important

Operational analytics calls for systems to take a greater role in managing themselves. Operational analytics enables faster application diagnosis, helping IT managers and administrators more quickly identify the sources of problems, and more quickly resolve those problems. As a result, operator workloads can be reduced, as can the time to solution. Further, lower skilled individuals (and thus, less costly individuals) can be used to fix problems (because they no longer have to search through large volumes of data looking for a needle-in-a-haystack problems – instead the system identifies the problem).

> ***In short, operational analytics leads to greater efficiency, improved service levels and lower management costs.***

Coping with Skill Set Issues: One Firm's Advice vs. Our Advice

In 2010, Gartner (a competing IT research/analysis firm) had published advice to its subscribers that called for IT executives to consider moving away from mainframe computers to other (unspecified) platforms due to a pending (unsubstantiated) shortage of IT skills. More recently, Gartner is now advising zSystem clients to create a plan to

maintain mainframe skills and to more strategically leverage the z Academic initiative (tens-of-thousands of students are being taught zSystem skills via this initiative).

We think Gartner's advice is half right. What we haven't seen from Gartner (and write to me directly at JClabby1@AOL.com if you have seen this and I'll withdraw this statement) is a recognition that mainframe management (and distributed systems management) is shifting away from people-driven management toward systems-driven management. Systems collect all sorts of data that can be stored in log files, can be streamed, and that can be placed in data repositories – and that data can be analyzed by analytics software. In other words, systems can comb through data looking for anomalies – and identify those anomalies, and recommend solutions to those anomalies. By running analytics software on the loads of Big Data system monitoring files, *systems* can automatically determine what the root cause of a problem may be.

> ***The burden for management is shifting away from humans to machines – so the mainframe of tomorrow will depend less and less on human management, and more and more on analytics, cognitive computing and machine learning to resolve problems. This also holds true for the distributed systems designs of tomorrow – more and more emphasis will be placed on system-driven management vs. human driven management.***
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> ***To address the IT management skill set issues of tomorrow, consider implementing an IT Operational Analytics strategy combined with cognitive computing and machine learning.***

Where Can I Find Analytics-driven Systems Management Tools and Utilities?
Clabby Analytics has written many reports on various new-generation analytics environments that can be used to analyze mainframe as well as distributed systems environments.

The most comprehensive operational analytics environment that we have seen to date is IBM's Operational Analytics Portfolio that includes:

- *IBM Operations Analytics – Predictive Insights* (that uses customized algorithms and cognitive intelligence techniques to predict system behaviors and help with root cause analysis);
- *IBM Operations Analytics – Log Analysis* (that combs through structured and unstructured data such as logs, metrics, trouble tickets or PDF documents across the enterprise using one interface for faster problem resolution. Log Analysis is covered in depth in this new report); and,
- *IBM Netcool Operations Insight* (that uses real-time alarms and alert analytics combined with historic data analytics to enable a 98% reduction critical network events. In this report, we describe how IBM's NetCool uses operational analytics to comb through large volumes of network data.

Other categories of analytics-driven software offerings include:

- *Analytics-driven Application Performance Management tools* – our Website offers a dozen free reports on various application performance management (APM)

vendors – some that use analytics for event processing. For an overview of these APM vendors and their respective strengths and weaknesses, see this report.

- *System capacity management* – Information on IBM's Capacity Management Analytics can be found here. Information on CA Technologies' predictive analytics-driven capacity management environment can be found here.
- *Performance Management* – Several vendors now offer analytics-based performance management environments. *Clabby Analytics* has written reports on Virtual Instruments (found here); on IBM's performance management suite (found here) ; and in this report on how Syncsort Ironstream provides log records to Splunk Enterprise and Cloud environments for real time analytics.
- *Workload Automation* – IBM offers an entire, analytics-driven workload automation suite of products that includes workload schedulers, workload automation for the cloud and even a workload scheduler for Bluemix (an application development environment). More details on this offering can be found here;
- *Single Pane of Glass Infrastructure Management* – CA Technologies recently introduced a tool that can discover all the component speeds-and-feeds within an infrastructure, and can then provide a graphical overview that displays how all components are interrelated. With this single-pane-of-glass, IT managers and administrators are able to visualize problems, understand interrelationships, and then bring the right tools to bear to fix those problems. This tool is known as CA Technologies' Unified Infrastructure Manager. It works within mainframe as well as distributed environments – and makes use of analytics to help identify problems within system/network and storage infrastructures;
- *Troubleshooting Mobile Environments* – IBM's MobileFirst Platform server searches across applications, services, devices, and other sources to collect data about usage or detect problems. It collects data about applications, adapters, devices, and logs to give a high-level view of the client interaction, and uses IBM Worklight Foundation analytics features to search across logs and events that are collected from devices, apps, and servers for patterns, problems, and platform usage statistics; and,
- *Troubleshoot through snapshots* – zAware is a tool that learns from a snapshot of a system that is operating within correct parameters, and then looks for anomalies and discrepancies that occur in real time that may degrade systems performance or operations. By isolating these anomalies (using analytics), zAware makes it easier for systems managers to quickly isolate problems and take corrective actions. Note: CA Technologies has recently released a product known as "Performance Analytics for DB2" that operates in much the same way, taking a snapshot of a known good DB2 environment and using analytics to detect the causes of performance problems and/or anomalies.

There are dozens of vendors now using analytics to perform various management tasks. The above mentioned vendors are representative of the market move toward automated, analytics-driven IT operations management.

The Missing Links: Cognitive Computing and Machine Learning

Analytics, cognitive computing and machine learning are linked as follows:

1) Analytics is used to identify the source of a problem – or the potential source of a problem;
2) Cognitive computing is used to help determine what to do about the problem; and,
3) Machine learning is used to predict future system behavior.

> ***The combination of all three of these technologies helps reduce the number of operators required to manage systems; they help speed time to resolution; and they help prevent problems before they occur. This is all accomplished by having systems take a greater role in self-management.***

It is important to note that IBM has taken the lead in the cognitive computing marketplace with a cognitive computing technology that it calls Watson. The way IBM describes Watson is "IBM Watson is a technology platform that uses natural language processing and machine learning to reveal insights from large amounts of unstructured data." But the key aspect of Watson to understand from a system management point-of-view is that *Watson technology can help provide answers to what to do with the results of system analysis information*.

A good example of how cognitive computing compliments the use of analytics is *IBM Operations Analytics – Predictive Insights* (described in the previous section). This offering uses IBM's Watson cognitive computing facilities, customized algorithms and cognitive intelligence techniques to predict system behaviors. It is highly scalable. It is also data agnostic (it can analyze any time series metric data- both IBM and non-IBM). Finally, it is does not need to be configured – and there is no tuning required. It employs self-learning to discover normal behavior of the metrics, as well as to discover the relationships between metrics in the data – automatically. (In other words, IBM Operations Analytics – Predictive Insights employs machine learning algorithms in combination with decision making facilities to help predict future system failures before they occur. This combination helps IT managers and administrators remedy problems before they occur. This results in less downtime and better service levels.

The Market Situation: 3rd Party ISVs Will Have to Adopt Watson

IBM has invested billions of dollars in cognitive computing – none of IBM's major competitors have matched this move. Accordingly, Watson is the only-game-in-town when it comes to commercial cognitive computing. In order to address the requirement for systems to cognitively take action, we expect numerous 3rd party independent software vendors to partner with IBM in order to gain access to Watson cognitive management solutions. This partnership will not require these 3rd parties to purchase Watson, however. Instead, we expect that 3rd party independent software vendors (ISVs) will find ways to link their products with Watson via cloud services.

Summary Observations

We believe that the future of systems management will involve heavy systems self-management. And we also believe that systems self-management will greatly lower the depth of skill needed to manage systems. We expect that system self-management and lower skill level requirements will go a long way toward addressing executive management concerns regarding the availability of skilled IT workers – and we expect self-management and lower skill levels will greatly and significantly reduce the cost of systems management over time.

Our advice to C-level executives is this: formulate an operational analytics strategy that is linked to cognitive computing and machine learning. Start by investing in mainframe and/or distributed system analytics tools. Get current generation managers to put in place the proper management policies and procedures – and then automate those policies and procedures. Simultaneously, involve next generation managers in the process of establishing those policies and procedures (because they will need to understand the logic behind why those policies and procedures have been put in place) – and teach them how to operate the new, analytics-driven management systems. After analytics tools have been put in place, start linking analytics environments to a cognitive environment (such as IBM's Watson) in order to have that cognitive environment examine the analytics findings and indicate appropriate action. Watson will also help deliver machine learning algorithms that will help predict future problems, which can then be dealt with in a proactive manner.

Operational analytics linked with cognitive computing and machine learning represents the wave of the future when it comes to mainframe and distributed systems management. Combined, these technologies will help enterprises overcome shortage-of-IT-skills issues, reduce IT management human-labor-related costs, while delivering greater uptime and greater satisfaction with IT service levels.

Clabby Analytics
http://www.clabbyanalytics.com
Telephone: 001 (207) 239-1211