## BROADCOM<sup>®</sup>

#### WHITE PAPER

### **Data Orchestration:**

How to create agile and efficient data pipelines

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#### **OVERVIEW**

As Jay Baer said, "We are surrounded by data, but starved for insights." and this is even more relevant today than when he said it. While we have been hungrily capturing data for years, unfortunately, many companies haven't followed through with leveraging all that wealth of possible information and insights. Using a simple analogy—data is like oil. By itself, it has untold power and is rich with potential. However, it really can only provide value to the business once it has been refined, or in the case of IT, successfully analyzed and transformed into insights.

# How to build a scalable DATA ANALYTICS PIPELINE





Even if companies manage to analyze their data, many do so inaccurately or incompletely. This could result from datasets not being fully transferred, insights where the analysis was run too early, or even missing quality checks. So worse than no analysis at all, companies are making bad business decisions because of poor data analysis. It is crucial in today's market that companies succeed in both thorough data gathering and quality analysis of that data.

The ultimate end goal of data analysis is, of course, to generate valuable business insights for a company. These insights need to be quick, accurate and use all the data available in your organization regardless of its location. In today's hybrid landscape of on-premise, private and public cloud and geographical data location restrictions, this may be more challenging than it sounds.

Independent of data location, it takes time to deliver new data pipelines to production. The process is simply too slow. With various team members following different procedures, different standards, and different tools it's no wonder that there isn't a clear focus or a clear path to quick implementations of new data pipelines.

Additionally, these new data pipelines can be exceptionally fragile and prone to failure, primarily due to the lack of consistency inherent in running a heterogeneous automation chain. This fragility is particularly pronounced with many cloud-native solutions, which remain largely unproven. Furthermore, these solutions are often adopted and implemented without central oversight, such as an Automation Center of Excellence (CoE), resulting in insufficient security, failover, and other necessary inspections to ensure reliability.

Regardless of the cause of these failures, the consequences are significant: they lead to the failure to deliver the results or analysis that the business expects. As a result, the business is unable to make decisions at all, or can only make incomplete decisions. This inability to make timely and informed decisions means you lose your competitive edge in bringing new ideas or insights to market, falling behind your competitors. As they say, time is money.

What we have found is that there are common challenges that many companies face when trying to implement new data pipelines:

- Delays in completing analysis and identifying trends
- Slow implementations
- Lack of confidence in analysis & results
- Loss of centralized control
- Inaccurate and incomplete compliance reporting

Let's walk through each of these challenges, discussing what your company can do to overcome them and how Automation by Broadcom can help in that process.



#### **DELAYS IN ANALYSIS**

We no longer live in a simple world where all our data is in a single location. With the adoption of and migration to the cloud, as well as geopolitical considerations like GDPR, etc. we're now dealing with our data scattered across a complex landscape. Whereas a few years ago your organization may have been dealing with just on-premise and a single cloud provider, now multi-cloud is on the rise. In a recent survey published by Broadcom, 81% of businesses interviewed have a hybrid cloud strategy. Your business needs to not only manage this complex landscape, but excel at it to avoid being behind the competition.



The impact of multiple locations and lack of knowledge of their existence translates into delays in your business's decision making process. Delays can and will occur because your analysis may have to be completed multiple times because suddenly a data pipeline is determined to be missing from the analysis.

In addition to multiple locations, there is also the added challenge of multiple teams in your organization and a lack of transparency in what data is being stored or shared between them. Companies may find that different teams are storing the same data, or slightly different versions of the same data, instead of maintaining a single source of truth and sharing it from a single location. This can cause additional delays because data cleansing may be necessary to eliminate duplicate data.



Permanently eliminating delays in analysis can only be done by thoroughly understanding and documenting your data storage locations as well as implementing a consistent vetting process for new, incoming data pipelines. Every new data pipeline needs to be on boarded via the same process to ensure consistency. Encouraging your teams to adhere to this across departments can bring simplicity to the forefront of what is a complex landscape behind the scenes.

Broadcom enables you to create powerful templates to take control of your system and create consistent data pipeline implementations. These templates can then be used to create workflows using the existing applications and tools to create a consistent approach to your data pipeline. No more worrying about if there are deviations or discrepancies between your processes. They are the same every time, regardless of what team or employee creates it.



Standards are adhered to, tickets are opened the same way every time and the operations teams can use a consistent approach to any issues. This provides the predictability you have been searching for.

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#### SLOW DATA PIPELINE IMPLEMENTATION

If we circle back to your organization and the various teams involved in gathering and processing data, we have another challenge. Alongside the proliferation of cloud vendors and data locations are a multitude of new tools, such as Airflow and Databricks that are now available. Everyone can appreciate the excitement we all feel when a new technology makes an appearance. Each of these tools is guaranteed to have a new, intriguing feature that you may want to take advantage of. However, multiple deployment processes and multiple on-premises and cloud tools can slow down new implementations of data pipelines.

If every person or team is doing things differently, how can you expect a quick turnaround? Certainly you will never be able to accurately predict how long a data implementation will take, because the estimate will be different for each team, tool and data pipeline.

Even within the same team, if inconsistent implementation processes are being followed, this can lead to a step being missed and then requiring additional resources to find the error and fix it. While this is going on, your customers and decision makers are waiting for the insights that are not yet available. Eventually they will get the data they need and complete the analysis, but many times it will be too late to make agile decisions.

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Let's be clear though, the variety of tools isn't the problem. The lack of a consistent process and not having any insight into the process is where the issue lies. There's no danger or drawback to leveraging multiple tools to take advantage of their strengths and features—encourage diversity in your tool set! However, each tool should be held to a standard. A consistent, repeatable standard. Your organization shouldn't allow anyone to add in a new data pipeline manually or to go around the process. If everything follows the same procedure and guidelines, then that predictability that was so impossible before suddenly becomes possible.

Predictability is a powerful component of this process. By being able to predict how long a new data pipeline will take to implement, your staff can now go work on other tasks feeling confident that at a certain time they'll be able to switch tracks and do the necessary analysis instead of aimlessly and unproductively waiting around.

Broadcom Automation's no-code / low-code approach to integrations, using the publicly accessible marketplace provides an easy way to speed up implementation and time to value.

The example below shows an Airflow Integration, making sure Airflow DAGs are implemented the same way, every time without needing to code Python code.





You can simply search for the integration you are interested in, review its functionality, maybe view a video to see if it fits your need and then download it directly into your solution.

Another benefit is that less time is spent troubleshooting issues because there is now confidence that your team is working with a known entity. It is no longer a mystery that has to be dug into each time there is a failure. The repeatable consistent process now provides the ability to troubleshoot in a methodical manner which means quicker time for analysis and then resolution.

Additionally, your teams are now able to predict how long the implementation process will take so everyone can plan their work accordingly.



#### LACK OF CONFIDENCE

Although more difficult to measure, lack of confidence can be a very real and very pervasive problem in your organization. Similar to trust, once you've lost it, it's very difficult to get back.

Lack of confidence in your data or even the overall process of implementing new data pipelines can be caused by a variety of factors:

- Fragile processes that fail causing analysis & decision making to be delayed
- · Inability to rely on the data because it is consistently incomplete & inaccurate
- Bad data incorporated in data results due to inefficient categorization of data (Jan data mixed with Aug data)
- · Lack of knowledge of all data sources so data could be missing

This lack of confidence translates into hesitancy on the part of your decision makers. Now they have the data they've been waiting for, but... is it good? Do they feel confident in making decisions based upon it?

This doubt can then cause further delays because they will want to verify and re-verify that it's accurate. More time is lost.

By deploying a consistent process that doesn't fail and works every time, you can nip this "lack of confidence" in the bud. There won't be any need to worry about missing data or bad data because now there is confidence in a process that is the same every time a new data pipeline is implemented. Your decision makers can move forward without any hesitation believing in the data and insights that they have been given.

Given that a lot of cloud data pipeline technologies run as a Blackbox to Operations with zero visibility, it is no surprise there is a lack of confidence in those steps. After all, if you cannot see it—how do you trust it?

Broadcom increases the visibility of those data pipeline applications by not only managing them, but also providing visibility into what's going on, as well as the ability to see the output and share it. For example, by passing a value to another job in another cloud provider or technology.

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This improved observability puts everything in one place, eliminating the need to access multiple tools, applications, etc. thus saving time.



#### LOSS OF CONTROL INCREASING RISK

While our software landscape has changed over the years, one thing that hasn't changed is the necessity of understanding what your business processes are doing, what other business processes could be impacting and possibly delaying others, and whether your SLA's are in jeopardy. It's no longer enough to be monitoring for a single job failure—it's crucial to have a holistic view and understand what downstream impacts that failure or long running process will have.

If you can't address these situations quickly and be able to identify an issue or resolution, then you have a loss of control over your system. This makes it difficult to manage your system and the impact to service delivery. If there is a failure that you aren't even aware of yet, then you certainly can't enact a quick resolution and minimize delays in processing. The frustration can be endless because you're continually chasing a moving target which does not make for a responsive or agile Operations Team.

In recent years, the push has been to reduce the amount spent on KTLO or "keeping the lights on". Unfortunately, this loss of control in understanding our processes and the extra effort being expended to troubleshoot what should be repetitive, error-free processes, does not take us down that path of saving money. Instead, the Operations Team is forced to continuously try to figure out what is going on in their chaotic, disjointed system, instead of seeing the overall status at a glance. They end up addressing problems after they have already happened and repeatedly missing SLAs instead of proactively identifying problems.



Regaining control doesn't require an extensive project to migrate to a single tool or methodology, but rather putting an orchestrator of all systems in place that can seamlessly integrate all of these different technologies. This single pane of glass view allows you to re-establish control over your data pipelines.

When you apply a manager-of-manager approach to your business flows, then you regain control. Note that this does not mean ripping and replacing what the application teams did and are doing, but creating a single view across all the applications, cloud vendors, cloud technologies and SaaS applications.

When something happens, you can see the issue immediately. You can understand the context (such as the upstream and downstream dependencies—aka critical path) and see how much time you have before it impacts your timelines and SLAs.

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In addition you can see historical data and understand and predict what's going to happen later today, tomorrow or the following week.

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As important as visibility is, alerting is equally, if not more important. Once you know there is a potential issue, you want to be informed about it as soon as possible. This is where granular altering criteria come in. You want to know if there is a chance you're missing your SLAs and time-critical deliverables. However, you also want to know if you are back on track if a job finishes early for example. Broadcom provides a variety of flexible alert options giving you insight into not only when a problem arises, but also when the critical incident has passed.

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#### **INCOMPLETE REPORTING**

The bane of IT departments everywhere is the dreaded "audit" or being asked to supply data for regulatory or compliance purposes. This has never been a task that people happily volunteered for, but at least it used to be easily accomplished by running a single, simple report. There would be follow-up questions assuredly, but the task was essentially completed.

However, with today's complex landscape of multiple data storage locations, multiple tools being utilized, and a lack of knowledge or even lack of access across all applications and underlying systems, the audit process has managed to become a much larger challenge.

Now a report may be required to be run on every application, system, and tool you have. Who will be tasked with figuring out how to tie all those reports together in a cohesive manner? Generate the reports and hope for the best? That's not exactly going to minimize or shorten the time and resources spent on your audit, let alone endear you to the auditors or garner confidence in the accuracy of your reports.

Another important aspect about migrating to the cloud is that since you no longer manage your resources directly your view of those systems becomes somewhat murky. In many cases, you may not have direct access to the servers to be able to generate the necessary reports. This may be an unwelcome surprise to some, as on-premise systems do not suffer from this same malady. This can be a double whammy with both issues with reporting as well as contributing to the lack of control issue discussed previously.

Unfortunately, audits aren't just an inconvenient task. They can cause very real problems for your business if you cannot generate accurate reports. This could result in fines, legal difficulties, lack of confidence in your business from your customers and have a lasting impact on your brand.

By delegating the scheduling of all your disparate tools to your enterprise automation solution, you maintain visibility into your system. You will have the ability to report on everything in a concise manner in a single format.

Reporting comes in a variety of forms, shapes and sizes. While some reporting needs can be accomplished with the respective platforms, Broadcom can provide an end-to-end view of the business process, across all applications and technologies. When was the object started, when was it completed and what was the return code—at a click of a button.





The same is true for audit history on workflows, for example, when was this object added, who decided to skip today's execution, or who restarted this object and why, etc. All interaction is logged and can be reported on whether it is while analyzing the root cause of an issue or an audit.

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Broadcom's automation can also integrate external source code repositories, like Github, to enable users to work as code on their automation release train, check-in code as they complete work and even code promotion can be done.

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	Commit History     Packs			EST directory		Mar 1, 2023 7:38:43	PM	Dave Kellermanns	9e8ad2691240f5591d7d87bbceaf0793ab00f6ce
				ld v1	Mar 1, 2023		PM	AUTOMIC/AUTOMIC	63c9d9f7a2f0da5b04df0d687fa9f4db50745565
						Mar 1, 2023 7:25:32	PM	AUTOMIC/AUTOMIC	4bcbc56d1a7e86a46a22712448bccb4c057d9a1c
			Delete C	LIENT_QUEUE.xml		Mar 1, 2023 7:23:09	PM	Dave Kellermanns	f9e8538458e22a3c6c4117f297c910bb82624401
			Init Repo	sitory		Mar 1, 2023 7:10:04	PM	AUTOMIC/AUTOMIC	45963fb0e43725e5b1bbfff905847e092db18ee3

In addition, these reports can be generated in a variety of different formats, such as Dashboards for easy access, PDF files for distribution, as well as spreadsheets for future data archival or analysis.



#### **CUSTOMER EXAMPLE**

Broadcom customer 84.51 is a subsidiary of Kroger and is responsible for providing consumer insights and patterns to some of the world's leading CPG manufacturers and partners. Before implementing Automic Automation, 84.51 management, staff and customers were all suffering from an extreme lack of confidence in their system. They were completely unable to predict how long it would take to onboard new processes or predict when recurring processes would be completed. Additionally, they lived in fear of doing any maintenance on their system because they just weren't sure it would come back up. Their staff was spending inordinate amounts of time monitoring, managing and troubleshooting issues with the system because of frequent failures and outages.

All of these issues caused:

- Inconsistencies in job run times which made it difficult to deliver results to their customers in a timely manner.
- Missed SLAs because they couldn't predict how long processes or maintenance would take, which led to decreased revenues due to financial penalties.
- A lack of confidence in the system itself anytime maintenance windows were scheduled that required shutting down the system.
- Inefficient use of staff resources and excessive overtime because of the inability to predict when maintenance would be complete or how long it would take to address system failure issues.
- Inability to quickly resolve issues because every process was different leading to additional time necessary to troubleshoot.
- A lack of visibility across all systems and processes in a single view due to the need to host the solution across 18 separate and distinct environments.
- Disorganized onboarding system caused by lack of consistency in processes leading to delays in taking advantage of new data quickly.

Within less than 90 days, Automic Automation was able to solve all these issues by:

- Leveraging the client model which reduced the number of environments that had to be maintained from 18 to 2, while still
  maintaining independent, separate areas for their customers. This reduced the time spent on maintaining these systems
  thus realizing resource efficiencies. This action also eliminated confusion and delays due to logging into the wrong system
  for the wrong customer.
- Reducing the number of moving parts, which caused the system to stabilize and then re-established confidence that the system would come back up and more importantly, come back up on time. Automic was back in operation in minutes as compared to hours with the previous system.
- Using Automic's object-oriented model, implemented a single process across all tools for onboarding new customers and new data pipelines. This eliminated any question of unpredictability as well as cut down on any failures as the same process was used repeatedly and easily troubleshooted. This enabled a rinse and repeat approach for each new customer added to the system.
- Improved ability for quick decision making due to fewer failures, improved monitoring and elimination of capacity bottlenecks.
- Provided robust auditing for compliance and reduced the risk associated with change management.

Leveraging Automic Automation didn't force 84.51 to take on huge migrations to narrow down their tool set, rather it was a game changer for them by allowing them a single window into all of their processes and the ability to focus on important things like their customers. The recurring mantra at 84.51 throughout their transformation was simple: "It just works".



#### **SUMMARY & CONCLUSION**

What should be clear at this point is that your data and being able to quickly analyze it and make decisions based off of it is key. If you are suffering from any of the challenges that we've discussed here such as:

- You know you have data somewhere. You're just not sure where.
- When data or insights are delivered to you-you don't trust them.
- Your teams can't thoroughly explain how new data pipelines are onboarded or how long it might take to start using the new data.
- You miss SLAs frequently because your Operations Team doesn't have a high level overview of the system and what failures could be causing further impacts hours from now.

Then yes, you may have some work ahead of you to address and resolve these so that you can get back to the work of making agile business decisions. However, we want to be sure to communicate that although these are real, tangible, sometimes frustrating problems; they are solvable!

By allowing Automation by Broadcom to oversee all your processes you can now achieve that control, reliability and repeatability that you were missing. From eliminating missing data pipelines to making your Audit Team happy, you now have the capability to solve these challenges, as well as all those in between.

Your team won't need to spend time and resources migrating to a single tool. Nor will you upset your staff by forcing them into a single technology. Instead, you can keep processes and technology status quo. Automation by Broadcom will provide a manager-of-manager approach overseeing things, but everyone can keep their autonomy.

One key takeaway throughout all the potential fixes to these challenges is consistency. By implementing consistency throughout your data pipeline process—onboarding the data, collating the data, cleansing the data, massaging the data, and finally analyzing the data—you solve a multitude of problems.

- No more worrying about important data not being included in your decisions.
- No mysteries about when the data & insights can be delivered.
- No fears about failures causing impacts downstream that can't be addressed in a timely manner.
- No forcing staff to conform to a single tool set.
- No black holes for your Operations Team for a complete view of your processes, regardless of what third party tool they
  may be leveraging.
- No more scary audits!

Broadcom helps you automate any number of processes and third party tools in a single place thereby giving you the flexibility you need, but the oversight you require. Making your processes repeatable adds another benefit by saving your staff time and resources. Let them return to innovating new products instead of drudge work that can be automated and more importantly run error-free. In adopting Broadcom's automation manager-of-manager approach you'll be on the right track to moving your business ahead of your competition.

For more resources, visit Automation by Broadcom on the Broadcom Software Academy.



For more information, visit our website at: www.broadcom.com

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