MDS OPERATIONS

A PROJECT REPORT

Submitted by

NIDHI RAJ (TKM20MCA2025)

to

The APJ Abdul Kalam Technological University

In partial fulfillment of the requirements for the award of the degree of

MASTER OF COMPUTER APPLICATIONS

Thangal Kunju Musaliar College of Engineering
Kerala

DEPARTMENT OF COMPUTER APPLICATIONS

JULY 2022

DECLARATION

I undersigned hereby declare that the project report on **MDS OPERATIONS**, submitted for partial fulfillment of the requirements for the award of degree of Master of Computer Applications of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by me under supervision of Dr. Fousia M Shamsudeen. This submission represents my ideas in my own words and where ideas or words of others have been included,I have adequately and accurately cited and referenced the original sources. I also declare that I have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in our submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University..

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NIDHI RAJ

DEPT. OF COMPUTER APPLICATIONS TKM COLLEGE OF ENGINEERING

KOLLAM

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CERTIFICATE

This is to certify that the report entitled **MDS OPERATIONS** submitted by **NIDHI RAJ** (TKM20MCA2025) to the APJ Abdul Kalam Technological University in partial fulfillment of the Masters degree in Computer Applications is a bonafide record of the project work carried out by him under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Internal Supervisor Head of the Department External Examiner

Acknowledgement

First and foremost I thank GOD almighty and my parents for the success of this project. I owe sincere gratitude and heart full thanks to everyone who shared their precious time and knowledge for the successful completion of my project.

I am extremely grateful to **Dr. Fousia M Shamsudeen**, Head of the Department, Department of Computer Applications, for providing me with best facilities.

I would like to thank my coordinator and project guide **Dr. Fousia M Shamsudeen**, Department of Computer Applications, who motivated me throughout the project .

I would like to thank my Team Lead **Mr. Shivam Rajouria**, Gemini Solutions Pvt Ltd, who guided me throughout my work.

I profusely thank all other faculty members in the department and all other members of TKM College of Engineering, for their guidance and inspirations throughout my course of study.

I owe my thanks to my friends and all others who have directly or indirectly helped me in the successful completion of this project.

NIDHI RAJ

ABSTRACT

MDS OPERATIONS, Applications nowadays are highly data driven. The project is about understanding how the Market Data unit operates for providing seem less and error free data for trading platform .The primary goal of MDS Ops team is to support developers with code analysis and debugging any inconsistencies in the system.

Within the MDS Ops functions there are multiple sections which need to operate efficiently.Keeping track of proper functions of all these units is a very long and time consuming process while done manually. In order to maintain availability of all related services,MDS toolkit is developed which automatically checks for the proper implementation of the services.

In a scenario where a service fails to execute properly, MDS Ops team will analyse the logs to understand problem areas, debug the error and ensure that the services are live. In order to achieve the same, we use multiple tools such as PagerDuty, Solarwinds, Autosys etc. These tools intimates the current on-call Ops team members about the same and they will take care of the circumstance in hand.

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Chapter 1

Introduction

MDS OPERATIONS stands for Market Data Service Operations. TThe team's primary goal is to support the MDS development team. The team keeps an eye on the services that use market data. Market data is the term used to describe the price and other associated information for financial instruments that are reported by trading platforms, market participants, and private companies that produce and sell market data. Market data enables financial industry professionals, including portfolio managers, traders, researchers, and investors, to view historical price movements for financial instruments including futures, shares, and other securities. The only place to get the historical and real-time market data that PIMCO applications need is Market Data Service. It offers access to both live and snapshot intraday market data. The majority of the data in MDS comes from Bloomberg. It also includes timestamp-based snapshots as required by applications, live price, yield, curve, volatility, and other market data, as well as official price levels for closing calculations at the end of the day. Requesting fields like Price, Yield, etc. for a list of securities from Bloomberg supplier for analysis and obtaining curves for analytical computations are typical use cases for MDS end users. The Analytical Platform, the Modular Pricer, the Risk Calculator, PIMCO Live, Kxr, and the TSS are some internal applications that employ Market Data Services (Time Series Service)

1.1 Objective

The goal of an MDS Ops team member:

- Debugging alerts encountered in a service
- Handle developer team request to make necessary changes in monitoring
- Start,Stop and Bounce of autosys jobs as required
- Escalations with developer team
- Monitoring the conditions and failure of autosys job
- Creation of scripts to automate various processes

1.2 Company Profile

Global IT consulting company Gemini Solutions is also a top provider of offshore outsourcing services with a concentration on the financial services industry. We offer a comprehensive range of support, operations outsourcing solutions, and servicing for offshore development to asset owners and fund managers. Additionally, we provide cutting-edge performance monitoring and analytics solutions, providing our clients with the knowledge they need to make smarter decisions. Gemini Solutions is the brainchild of experts with years of expertise in the financial, IT, and academic sectors. The business was founded with the intention of offering hassle-free application development and offshore consulting services to businesses looking to outsource their middle-of-the-road operations and focus on what they do best.

1.2.1 Services

- **Data Mining Services**

  We process a sizable amount of data in various batches as a service provider to clients in the financial sector. It is crucial to validate the data at various stages of the process in order to spot incorrect data and fix it before it enters the system. We at Gemini are skilled in locating these data points and conducting validations against trends found in the past.

- **Software Quality Services**

  We offer testing for every phase of the SDLC cycle, including project planning and estimations, Quality Assurance (QA), and Quality Control (QC). Through a variety of testing stages and procedures, our QA engineers and testing units guarantee quality control and product stability.

- **Cloud Solutions**

  Our cloud solutions ensure that, despite any unexpected changes in the environment, your organisation can continue to run smoothly.

- **IT Managed Services**

  Gemini provides a variety of management services, and we may mix our service offerings to meet a wide range of demands. In a flexible IT environment, our committed and responsive Managed Services continually provide and act to business needs with proactive support. We offer complete IT support services to assist businesses streamline operations and accomplish their goals, resulting in high performance levels that adhere to predetermined SLAs.

Chapter 2

Literature Survey

A complete analysis of the literature that relates to a given topic is known as a literature review. When one does a literature review, research questions are identified, and one then tries to find and analyze relevant articles to address these research questions. The ability to re-analyze study results can lead to the development of fresh insights, which is one benefit of literature reviews. A literature review summarizes and explains the whole and most recent state of information about a subject that may be found in scholarly books and journal articles. In general, there are two different types of literature reviews: one that students are required to complete as a stand-alone project as part of course completion, and the other that is prepared as part of the introduction to or planning for a bigger context, typically a thesis or research report. Depending on the type of review you are writing, your topic, point of view, and type of hypothesis or thesis argument will all be influenced. Reading published literature reviews or the introductory sections of theses and dissertations in your own field of study might help you better comprehend the distinctions between these two forms. Examine the manner they address the issues and the organisation of their arguments.

2.1 Purpose of the Literature Review

1. By choosing high quality research papers or studies that are relevant, significant, important, and valid and compiling them into a single comprehensive report, makes it simple for readers to get information on a certain issue.

2. It forces researchers to synthesise, assess, and compare original research in that particular area, which gives them a great place to start when conducting research in a new field.

3. It guarantees that scientists do not repeat already completed studies.
4. It ensures that previous research will not be replicated by scientists.
5. It highlights the key findings.
6. It points up shortcomings, discrepancies, and inconsistencies in the literature.
7. It offers a helpful critique of the methods and strategies used by other researchers.

2.2 Related Works

This section comprises of the works related with current project.

- **An open source SCADA toolkit.** SCADA (supervisory control and data acquisition) gives businesses the resources they need to develop and use data-driven choices for their industrial processes.The creation of an open-source toolkit for creating safe, cutting-edge SCADA systems for managing electric power transmission, distribution, and distributed generation is the context in discussion. Basic SCADA and control centre components are included in the toolkit. It can be applied in a number of different ways, including the construction of a starter SCADA for minor utilities and the provision of local control at a distributed generation facility, among others. A trusted operating system platform, authentication, authorization, encryption, role-based access control of SCADA objects, and other techniques are just a few of the ways the toolkit incorporates security functions.[1]

- **Rotbav.** This paper introduces the Rotbav toolkit, which makes it simple to create mixed reality (MR) apps that can be experienced in real time in big indoor spaces using HoloLens. It fixes the issue whereby current MR devices, such as the HoloLens, are unable to scan and model a huge area with numerous rooms at once. To efficiently handle path editing, accelerated rendering, and location, we introduce a unique data structure called VorPa that is based on the Voronoi diagram. Our tests and applications demonstrate that the toolkit is practical and simple to use for developing MR applications aimed at big indoor physical areas where users can move about in real time.[2]

- **Pentools.** There are a number of standard techniques for the collection, storage, manipulation, and measurement of handwritten data across the diverse range of on-line pen computing applications. These techniques serve as the foundation for original research and the implementation of new system architectures.MATLAB offers a robust framework for the quick prototyping of research approaches and methods. There are a number of standard techniques for the collection, storage, manipulation, and measurement of handwritten data across the diverse range of on-line pen computing applications. These techniques serve as the foundation for original research and the implementation of new system architectures. In this paper, a brand-new open-source toolkit for the MATLAB programming environment is described. It includes procedures and data structures for typical functionality in handling dasiaon-line handwriting and drawing data that has been recorded as a time series sequence. The methods enable full integration within MATLAB and offer capture device interrogation, feature extraction, and data processing, thereby supplying an extendable platform for experimentation and study.[3]

- **Performance of Splunk for the TDAQ information service at the ATLAS experiment.** With thousands of interconnected computers and tens of thousands of software processes, the ATLAS Trigger and Data Acquisition TDAQ is a sizable, distributed system. The analysis of the monitored data is done by choosing, aggregating, and correlating monitoring data from various sources. Finally, they can be displayed to the user and visualised. Any system that implements these features must be adaptable to the volume of data generated and the users' requests for analysis and visualisation. The ATLAS TDAQ system is large, thus scalability is crucial from a performance standpoint as well.Splunk is a general-purpose search, analysis, and reporting tool, which is a commercial product launched by Splunk Inc. It also functions as a distributed, non-relational, semi-structured database for time-series text data. This paper discusses how Splunk's performance and features were assessed.[4]

- **A Middleware Solution to Monitoring Composite Web Services-Based Processes.** Web services can be combined to build intricate business procedures spanning numerous firms. A set of service level agreements (SLAs) between service providers and service consumers ensure the quality of service (QoS) of such a procedure. To verify that

the SLAs are met, monitoring is necessary at both the service consumer and supplier ends. Distributed business process monitoring can be difficult and expensive. To allow for the outsourcing of the duty of SLA monitoring of both intra- and inter-organizational composite Web service operations, we present a middleware solution called the performance monitor (PM) framework. To demonstrate the efficiency of the framework in monitoring and validating SLAs for a composite process, we offer a prototype implementation of the PM with experimental data. We also address potential framework expansions for more generalized applications.[5]

- **On SolarWinds Orion Platform Security Breach.** Agents of the persistent threat from all over the world are constantly developing new technological means of accessing these systems and the data they contain. There are no limits to the devastation that can be caused by cybersecurity strikes. To advance our investigation into options for preventing, detecting, and remediating these attacks, we must study and learn from our experiences. The purpose of this article is to analyse the security incident involving SolarWinds' Orion Platform, including the specifics of how it happened, the effects it had on the people involved, the industry at large, the financial sector, the incident response process used by SolarWinds, and any potential backup plans. By offering a case study on a rare security occurrence, this paper aids in the investigation of cybersecurity solutions.[6]

- **Service Level Agreement Monitor.** Service-oriented architecture is currently one of the most popular architectural trends (SOA). Although there are many dependencies between the services in this style of design, each service is still a separate component of the system. In order to change the architecture as quickly as possible in this situation, we need a means to make sure that every service is operating properly and to act when something goes wrong. It might cause a complete or partial system failure, for instance, if one of the lower level services in the service composition ceases functioning. It is necessary in this scenario to be able to create dependable SOA systems. Our suggestion, SALMon, is focused on keeping an eye out for service level agreement (SLA) violations in the services. The SALMon architecture is made up of three different types of components: decision makers who take corrective action to satisfy SLA rules once more, analyzers who check the SLA rules, and monitors made up of measure instruments that use quality attributes from an ISO/IEC 9126-1-based service-oriented quality model. Our

architecture is highly scalable and suitable for its intended use since these three types of components are largely technology-independent and function as services inside of a SOA system.[7]

- **Efficient Brute-force handling methodology using Indexed-Cluster Architecture of Splunk.** Hacking techniques called ”brutes forces” are used to decode login credentials, keys, and passwords. Brute Force attacks strive to be the quickest, cheapest, and easiest way to access a website, while hacks that take advantage of flaws in software are uncommon. It may be quite advantageous to use Splunk to analyse enormous amounts of data. Real-time log information can be captured, searched for, and analysed using the application. Security events can be found by analysing logs and numerous other sources of system data. A log file, which describes the events that have taken place in the application's environment and the server on which it runs, is an important piece of data. By analysing and comparing this data, it is feasible to pinpoint the attacks on these systems. With its better resolution, enormous amounts of uncertain and amorphous data can be analysed. The document provides guidance on how to build up a Splunk server and route data from various sources to it. There are pre-built add-on applications and useful search examples included as part of paper. Splunk is a strong tool that makes it easier for people to investigate massive data. It is possible to track seizures in almost real-time and conduct log searches. Using map-reduce technology, huge data analysis may be completed quickly. In order to comprehend how the apps work better, unstructured log data analysis is helpful. The client can use Splunk's robust query language to find patterns in the data.A client can be informed about an ongoing (suspected) behavior and receive a notification in real-time by setting up alerts and warnings based on the queries.[8]

- **IT Infrastructure-Monitoring Tools.** The health of IT systems and, consequently, the profitability of enterprises, depend on monitoring. The techniques used today to monitor networks for problems, guarantee the availability of components, and gauge resource consumption of those components are covered in this article.[9]

- **Monitoring Infrastructure: The Challenges of Moving Beyond Petascale.** As HPC moves towards exascale, scaling clusters is no longer the primary challenge. While it is generally acknowledged that scaling components like the network and file systems is necessary, monitoring is frequently overlooked when purchasing these massive

systems. Monitoring is frequently added as a kind of afterthought to the established infrastructure. Even petascale systems are beginning to stretch the capabilities of monitoring infrastructure and their capacity to gather and analyse comprehensive system wide logs, even though that frequently works for tiny systems. Scale will only increase the complexity of the desire and requirement to do more cross-component linkages. It takes a lot of work to get ready for monitoring an exascale class machine.The enhanced sub-system monitoring for Trinity, as well as thoughts and concepts for advancing toward exascale class monitoring, are presented in this paper together with the current overhaul of our commodity monitoring infrastructure.[10]

Chapter 3

Methodology

MDS OPERATIONS stands for Market Data Service Operations. The main purpose of the team is to provide support to the MDS developer team. The team monitors services which consumes market data.

Market data is price and other related data for financial instruments reported by a trading venues, market participants and commercial market data providers and vendors. Market data allows investment professionals, such as portfolio managers, traders, researchers, as well as investors, to know the latest price and see historical trends for financial instruments such as futures, equities etc.

Market Data Service is the single source for live and historical market data required by PIMCO applications. It provides access to intraday live and snapped market data. Most of the data available in MDS is sourced from Bloomberg. It includes live price, yield, curve, volatility and other market data, timestamp based snapshot as required by applications, and at the end of the day official price levels for close calculations. Typical use cases for MDS end users are requesting field like Price, Yield etc. for a list of securities from Bloomberg provider for analysis and getting curves for analytical calculations.The services provided by MDS Operations team are as follows:

- **Service Monitoring** Service Monitoring includes usage of various monitoring tools to keep the services under our radar up and running.The different tools used are PagerDuty, Autosys, Solarwinds, Splunk.

- **Development** In Development side, we are working on creating a MDS Toolkit. It is a python script on running which we can understand if the services in context is

implementing its functionality or not.The piupose of this project is to help MDS Ops members in cases of production issue.

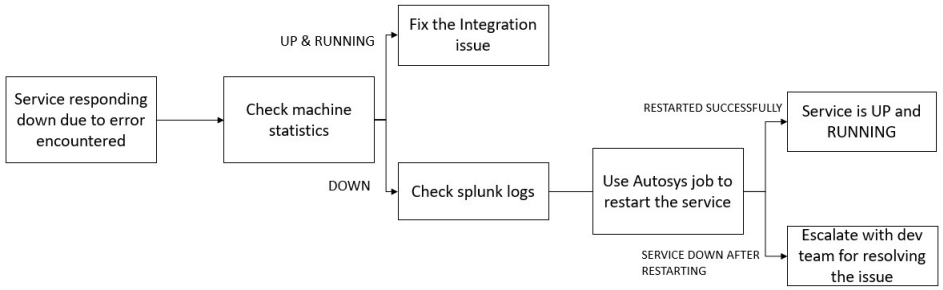

Figure 3.1: Work flow in Service Monitoring

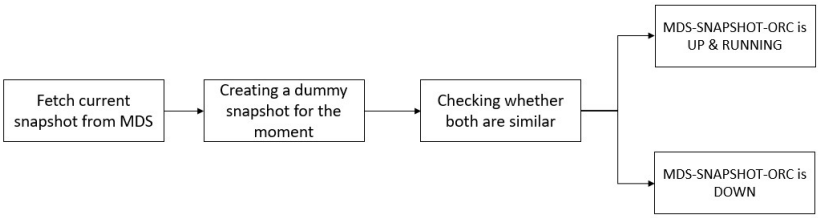

Figure 3.2: Work flow in MDS Toolkit

3.1 System Specifications

The tools used by MDS Ops members in service monitoring and development is discussed in this section.

3.1.1 Tools Required

- **Splunk.** It is an excellent platform for evaluating machine data, which machines produce in large quantities but which is rarely used in useful ways. In the world of technology, machine data is already significant, and its significance in business is growing.Indexing is the first step in the Splunk process, which entails gathering all the data from various sources and putting it together into centralised indexes. System administrators would

have needed to log into numerous different computers in the past to access all the data using much less capable technologies. Splunk can swiftly scan the logs from all servers at the time the issue occurred using the indexes. Splunk speeds up the process of figuring out when a problem happened using its speed, scale, and usability. Splunk may then investigate the specific time frame where the issue initially appeared to identify its root cause. The issue can then be prevented in the future by creating alerts. Splunk's operational intelligence ultimately enables enterprises to use a combination of real-time and historical data, displayed in clearly understandable dashboards and graphical tools, to ask the correct questions, resulting in responses that give business insights.

- **PagerDuty.** PagerDuty is a service that dispatches and aggregates alarms for system administrators and support teams. It provides alerting, on-call scheduling, escalation procedures, and issue tracking to increase the uptime of the apps, servers, websites, and databases. It also assists in aggregating system information at each stage of the event lifecycle.Some of its important features include:
  - Automatic escalation of alerts
  - The infrastructure of PagerDuty is completely replicated across several data centres, with quick failover in the event of issues.
  - On-call duty scheduling- Easily creates schedules to divide up on-call duty tasks across the workforce.
  - Integration of currently used monitoring tools: SolarWinds, Splunk, and other monitoring tools function perfectly with it.
- **Autosys.** It is an automated system for planning, tracking, and reporting jobs. Any network-connected system with AutoSys setup can host these jobs. A Windows batch file, script, or single command can all be considered an AutoSys job. Each autoSys job specification includes a number of qualifying features, such as the circumstances under which a task should be executed. Every job's status or current condition is recorded by AutoSys. The value of a job's status is used to determine when to start other jobs that are dependent on the job. The job report produced by the autorep command includes a section that shows the job status.
- **Solarwinds.** With the help of the robust and moderately priced SolarWinds Network Per-

formance Monitor (NPM), you can easily identify, assess, and fix network performance issues and outages.Its important feature includes:

  - Enhances service levels, expedites troubleshooting, and minimises downtime. Advanced network troubleshooting with critical path hop-by-hop analysis for on-premises, hybrid, and cloud services.
  - Data correlation across stack networks to speed up problem identification.
  - Displays and keeps track of network device performance, availability, and response time.
  - Enhance operational effectiveness with pre-built dashboards, warnings, and reports. Automatically locates network devices and often deploys in an hour.

- **Pimbook.** It is a Data Science Platform at Pimco. It is a collection of tools built on top of Jupyter, a free and open-source web application that lets you create and share documents with live code, equations, graphics, and text. Data transformation and cleaning, numerical simulation, statistical modelling, data visualisation, machine learning, and other applications are just a few examples. In addition to the functionality provided by Jupyter, PimBook also provides the following:

  - Access to PyPimco libraries without any extra configuration
  - Access to Pimco database, micro services and other data sources without any extra configuration
  - Access to BigData cluster. Ability to launch parallel Spark jobs, access to data in HDFS, BigData databases, sql on unstructured data.
  - Access to Machine Learning libraries
  - Ability to share the notebook or email the output
  - Ability to schedule your notebook

3.2 System Design

Design has been defined as a multi-step process that synthesises information requirements to reflect data structures, programme structures, interface features, and procedural detail. All

subsequent software engineering and maintenance steps are built on the design phase. It is a decision-making activity, frequently of a structural kind. Design creates cogent, well-thought-out representations of programmes that focus on how different sections interact at a higher level and how logical processes are carried out at a lower level. A good design is one that enables the production of efficient code and whose implementation is as compact as possible, depending on the applications and project needs.

Design elements often contain functional hierarchy diagrams, screen layout diagrams, tables of business rules, business process diagrams, pseudo code, and a complete entity-relationship diagram with a full data dictionary. These elements explain the required software features in detail. These design aspects are meant to sufficiently define the software so that skilled programmers may create it with little extra input design.

The fundamental design concept specifies the following methods to develop a project are:

- Abstraction
- Modularity
- Software Architecture
- Structural Partitioning
- Data Structure
- Software Procedure

There are two levels of system design:

- Logical design
- Physical design

In logical design, the designer creates a specification of the key aspects of the system that achieve the goals. The system's actual design is revealed via the physical layout.

- **Design Concept**

  The design concepts give the software designer a baseline from which to apply more complex techniques. There has developed a collection of basic design ideas.They are:

- Abstraction - Abstraction is the action or outcome of decreasing the information content of a notion or an observable occurrence in order to generalize; normally, this is done in order to keep only the information that is pertinent to the goal at hand.
- Refinement - It is the method of elaboration. A hierarchy is created by gradually breaking down a macro statement of function until programming language statements are reached. One or more instructions from a given programme are broken down into more specific instructions in each stage. Refinement and abstraction are complimentary ideas.
- Modularity - Software architecture is divided into components called modules.
- Software Architecture - It speaks of the overall organisation of the programme and the ways in which that organisation ensures the conceptual consistency of a system. Regarding the project's desired outcome, such as performance, quality, schedule, and cost, effective software architecture will provide a strong return on investment.
- Control Hierarchy - A programme structure that shows how a system component is organised and suggests a chain of command.
- Structural Partitioning - Both horizontal and vertical divisions of the programme structure are possible. Vertical partitioning indicates that control and work should be spread top down in the schema whereas horizontal partitioning defines independent branches of the modular hierarchy for each significant programme function.
- Data structure - It illustrates the logical connections between data pieces.
- Software Procedure - It concentrates on handling each module separately.
- Information Hiding - Modules should be created and specified in a way that prevents information from being accessed by modules which don't require it.

Major Activities Carried out during Design Phase includes the following:

- Logical Design
- UMI Diagrams
- Architectural Design

- Module Design
- Database Design
- User Interface Design
- Input Design
- Output Design

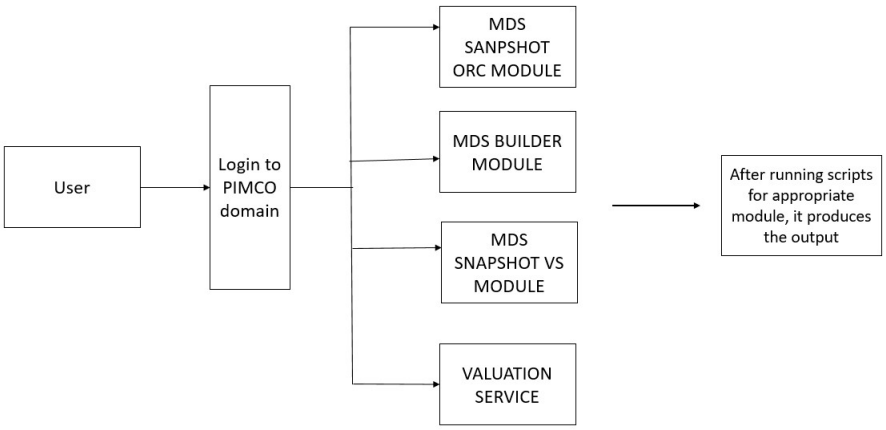

Figure 3.3: System Design of MDS Toolkit

Chapter 4

RESULT AND DISCUSSION

This module discusses the impact of monitoring all the MDS related services and the result of MDS Toolkit.

- **Service Monitoring.**

  On monitoring the alerts for the past 6 months, we can see that there was unusual noise in the beta environment which was due to the presence of dev and sandbox elements. Those services creating abnormal amount of alerts were removed from the appropriate Splunk and Karma alerts.

  Another approach to reduce the number of alerts triggered was to document all the common errors occurring daily on specific channels. These documents are then later verified by the developer team and take suitable steps to remove its occurrence. This allows the Ops team to get more knowledge on the service and it in turn helps in debugging issues more proactively.

  Actively monitoring various channels during weekend helped us to understand the services causing issues during maintenance window. Looking more into the same led us to the conclusion that the pagerduty services related to the processes are in enabled state which created unwanted disturbance in proceeding with weekly maintenance. To solve the issue, we created various autosys jobs that run pre and post maintenance to appropriately disable and enable the pagerduty and splunk alerts. This action item helped the weekend on call members to closely monitor necessary alerts.

  On encountering various production issues, it was noticed that the service specific splunk dashboard can help us in identifying the black spots in data flow. One such instance is of

MDS-risk-engine-gw service. This particular service returns the tickers required by the risk engine application which is later used by portfolio managers for further proceeding with various financial decisions.

Tracking the statistics for multiple services in both beta and prod environment led us to acknowledge the fact that services differ in their settings such as Memory, Disk storage etc. in both prod and beta environment. This has previously mislead the developer team in testing components in beta assuming beta is equivalent to prod. The same was then updated to the developer team who took appropriate steps to alter the settings and make both the environment identical. This led to the effective and successful testing of new features in beta environment.

Working closely with services is an integral part as an Ops team member. To provide the best, each member should be aware of the service in context and how to debug the same. For achieving the same, we have taken care to establish various documentation regarding the service, how to debug specific re occurring issue and whom to reach out in case of escalation.

Implementing the above resulted in decreasing large number of alerts getting triggered. The following table shows the difference in number of alerts pre and post the exercise for MDS BETA SERVICES. The fist table shows the Number of alerts triggered before cleanup excercise.The later figure renders the Number of alerts post cleanup excercise.

Service	Incident Count
MDS-REFINTIV-FX-GW [BETA]	657
MDS-REFINITIV-FUT-GW [BETA] [APM0001638]	453
MDS-BUILDER-SVC [BETA] [APM0001638]	379
MDS and VS Service [Beta] [APM0001638]	283
MDS-REFINITIV-EQIDX-GW [BETA] [APM0001638]	88
MDS-NEWSEC-AMPS-PUB [BETA] [APM0001638]	45
MDS-SNAPSHOT-VS-SVC [BETA] [APM0001638]	39
MDS-RISK-ENGINE-GW [BETA] [APM0001638]	38
MDS Archive [Beta] [APM0001638]	34
MDS-SNAPSHOT-ORC [BETA] [APM0001638]	32
MDS-SNAPSHOT-ARCHIVE-SVC [BETA] [APM0001638]	31
MDS-INFOREACH-AMPS-BEACON-PUB [BETA] [APM0001638]	30
MDS-KDB-DATA-SERVICE [BETA] [APM0001638]	27
MDS-BEACON-KDB-PUB [BETA] [APM0001638]	22
MDS-KDB-VALIDATION-DMN [BETA] [APM0001638]	21
MDS-ALGOMI-KDB-PUB [BETA] [APM0001638]	13
MDS-SNAPSHOT-MIGRATION-SVC [BETA] [APM0001638]	13
MDS-ALGOMI-GW [BETA] [APM0001638]	11
MDS-HIST-DATA-SVC [BETA] [APM0001638]	11
MDS-LOOKUP-SVC [BETA] [APM0001638]	10
MDS-SMA-AMPS-BEACON-PUB [BETA] [APM0001638]	3
MDS-BBG-ALLQ-GW [BETA] [APM0001638]	2
TOTAL	2242

Service	Incident Count
MDS-REFINITIV-FUT-GW [BETA] [APM0001638]	1001
MDS-BUILDER-SVC [BETA] [APM0001638]	449
MDS-REFINITIV-FX-GW [BETA] [APM0001638]	80
MDS and VS Service [Beta] [APM0001638]	79
MDS-SNAPSHOT-ORC [BETA] [APM0001638]	27
MDS-KDB-DATA-SERVICE [BETA] [APM0001638]	10
MDS-SNAPSHOT-ARCHIVE-SVC [BETA] [APM0001638]	10
MDS-SNAPSHOT-VS-SVC [BETA] [APM0001638]	10
MDS-KDB-VALIDATION-DMN [BETA] [APM0001638]	9
MDS-NEWSEC-AMPS-PUB [BETA] [APM0001638]	9
MDS-RISK-ENGINE-GW [BETA] [APM0001638]	9
MDS Archive [Beta] [APM0001638]	8
MDS-BEACON-KDB-PUB [BETA] [APM0001638]	4
MDS-INFOREACH-AMPS-BEACON-PUB [BETA] [APM0001638]	4
MDS-SMA-AMPS-BEACON-PUB [BETA] [APM0001638]	2
MDS-SNAPSHOT-MIGRATION-SVC [BETA] [APM0001638]	2
TOTAL	1713

- **MDS Toolkit.**

  The aim of MDS Toolkit is to provide the ease in checking whether a specific service is UP and RUNNING or NOT. For members outside of MDS Ops, the working of various MDS services are unknown. This may lead to a gap in communication with dev team during production issue and it renders an inefficient group. In order to achieve the later we introduced the concept of MDS Toolkit.

  Any user using having PIMCO login ID can access the project and check if functionality is implemented. On entering the toolkit, different modules are listed with different MDS services as its name. On running appropriate module, the user will be provided with output i.e., whether the service is running or not.

  One of the use cases of the toolkit can be explained using an example. In case of MDS-SNAPSHOT-ORC, the objective of the service is to create snapshot every minute. A snapshot is the data captured from Bloomberg at that time. A lag in snapshot creation

renders the end applications without data. To check the same, we retrieve the current snapshot from MDS. Then we proceed to create a dummy snapshot and both are then compared. On comparing if both seems similar the we can conclude that the service is running. Else it can assumed that the service is down. Another check implemented for the same is to examine the time required in creation of these snapshots. This can be checked using splunk logs. Retrieve the current snapshot ID and check the time mentioned in logs to update the same on AMPS with NEW status. On investigating more, if the amount of time to create a snapshot exceeds its average, then we can say there is an issue with the service in context.

4.1 Output Screens and Results

MDS Toolkit

When user hits the URL this page is loaded

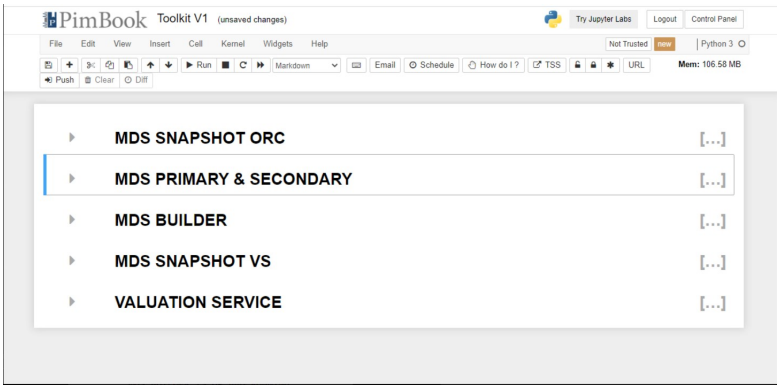

Figure 4.1: Mds Toolkit User Interface

The results on running various modules

```
MDS-SNAPSHOT-ORC IS RUNNING
```

Figure 4.2: Mds-snapshot-orc module

```
MDS PRIMARY IS UP AND RUNNING
```

Figure 4.3: Mds primary module

```
MDS BUILDER IS UP AND RUNNING
```

Figure 4.4: Mds builder module

```
MDS SNAPSHOT VS IS UP AND RUNNING
```

Figure 4.5: Mds-snapshot-vs module

Chapter 5

CONCLUSION

Market data is price and other related data for financial instruments reported by a trading venues (such as a stock exchange), market participants and commercial market data providers and vendors.Market Data Service is the single source for live and historical market data required by PIMCO applications. It provides access to intraday live and snapped market data. The data provided by MDS is then later accessed by multiple platforms that allows portfolio managers to make informed decisions. This helps us understand the level of quality required by the end users and its impact on the same. This is achieved by continuous monitoring by Operations team. On handling various issues, we are equipped to handle them before it leading to situations where user is facing loss of data.

5.1 Future Enhancement

The system is set up so that adding additional modules can be done without too much trouble. The system's reconstruction will make it easier for the member of the operations team to handle production-related concerns. In order to make the system as versatile and user-friendly as possible, the advanced characteristics of this technology were taken into consideration. All SRS requirements have now been implemented in the system.

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