Perimetric Surveillance and End Point Security Using Intranet & VOIP

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Abstract - Smart security refers to advanced security systems, that utilize biometrics and CCTV footage, to ensure the security of a property. Biometrics are unique physical characteristics, such as fingerprints, facial recognition, and iris scans that are used for authentication purposes. These characteristics are measured and used to ensure the authenticity of the individual attempting to access the secured property. Closed-circuit television (CCTV) is a monitoring system that allows users to view live events and record them for future reference. This system comprises cameras, monitors, and recorders that are used to keep track of events happening around the property. With the advent of the Internet of Things (IoT), it is now possible to remotely monitor and secure properties through a network connection. In the context of home security, the idea of incorporating smart security systems is gaining popularity. This idea focuses on physical perimeter security and a smart wireless database that keeps track of information processed, accessed, modified, and broadcasted through home security systems. In the event of an intrusion, the system can activate security measures such as the use of honeypots and sandboxing mechanisms using intrusion detection systems (IDS) and intrusion prevention systems (IPS). The system also keeps records of all events for future reference. Moreover, the methodology discussed here can also be utilized for security automation by using code binaries. The advantage of this system over others is that the alerts and logs can be managed and operated by the user through a mobile application, even when not connected to the internet, using Voice over Internet Protocol (VoIP) technology. This makes the system more accessible and convenient for the user. the proposed idea of smart security provides a fool proof shield that protects all resources within the perimeter of a home. With the use of biometrics and CCTV footage, this system ensures the security and safety of the property and its resources.

Index-Terms: Monitoring; IOT; Sandboxing; Honeypot; IDS

I. INTRODUCTION

There's a rising interest in tools that give comprehensive info on structural dynamics. This info is necessary for understanding the physics, monitoring dynamics, and updating models. Computer simulations like the finite element method provide full results, but conventional measurement techniques like accelerometers provide limited data at specific points. This mismatch between limited measurement data and high degrees of freedom in computer simulations makes correlation difficult. Some reduction/expansion techniques are used to try to connect measurement data to models, but they are not always accurate. Conventional sensors add mass and require wiring, making them undesirable. Therefore, there is a need for a non-contact measurement approach that provides distributed sensing without affecting true motion or adding mass or stiffness to the structure. 3D reconstruction is a process for capturing the shape and structure of an object by sensing its spatial coordinates either directly or indirectly. The resulting point cloud represents the geometry of the object and can be used for visualization, measurement, and as-built documentation. The common methodologies of 3D reconstruction include laser scanning and photogrammetry, but both have limitations such as prohibitive equipment costs or low resolution due to manual intervention. Videogrammetry was an effective approach that used camera sets to acquire spatial data, but still faced challenges in its time-sensitive nature and level of automation. The goal of time-dependent imaging is to provide real-time spatial data collection while allowing the user to move the cameras.

Computer networks are crucial in the exchange of information globally. They transfer not only text data (such as emails, documents, and websites), but also multimedia communication data such as voice, video, and 3D visuals. The internet allows for instant information transfer worldwide but also presents security risks and threats. Thus, the development of secure and privacy-respecting applications is important to address ethical issues regarding data privacy and accessibility. The INDECT project develops lawful interception applications, which should be compared to industry standards. Our laboratory setup was used to test the ability to capture and analyze specified traffic, including VoIP calls, emails, and web traffic. The initial analysis focused on unencrypted VoIP communication, but security recommendations can be applied to protect the content. There is research on detecting special phrases or speakers in encrypted VoIP traffic, based on the use of variable bitrate codecs and specialized mathematical models.

The Internet and Intranet are two distinct types of networks that serve different purposes. The Internet is a global network of interconnected computer networks that use the standard Internet protocol suite (TCP/IP) to link devices worldwide. It provides access to various types of information, services, and resources such as websites, emails, online documents, multimedia content, and more. The Internet is open and accessible to anyone with an Internet connection. On the other hand, an Intranet is a private network that is restricted to a specific organization or group of people. It uses the same Internet technology but is only accessible to authorized individuals within the organization. An Intranet can be used for internal communication and collaboration, providing employees with access to company resources such as shared documents, databases, and applications. In summary, the Internet is a public network that

provides global access to information and services, while an Intranet is a private network that serves the specific needs of an organization.

The crux of this paper is to combine videogrammetry, VOIP, and intranet for perimetric surveillance, for that, the following technical steps were followed

1. Videogrammetry: This technology involves using video cameras and software to measure physical objects and environments. In this case, the videogrammetry system would be set up around the perimeter to capture visual data.
2. VOIP (Voice Over Internet Protocol): VOIP technology enables real-time voice communication over the Internet. This technology can be used to transmit audio data from the videogrammetry cameras to a central location for analysis.
3. Intranet: The Intranet can be used to securely transmit the videogrammetry and VOIP data from the cameras to the central location for analysis. The Intranet provides a secure and controlled environment for transmitting sensitive data, ensuring that the information remains confidential and accessible only to authorized individuals.
4. Perimetric Surveillance: By combining these technologies, the perimetric surveillance system would be able to capture and analyze visual and audio data in real-time to provide enhanced surveillance and security around the perimeter. The system could be used to detect and alert any potential security threats, allowing for rapid response and increased safety.

In our methodology, we have replaced the hefty and pricy videogrammetry with CCTV footage and hosted the same on the directory

This setup would provide a comprehensive and integrated solution for perimetric surveillance, leveraging the strengths of each technology to achieve the desired outcome.

II. MATERIALS AND METHOD

INTRANET: A part of the network, but controlled and used by a private organisation, Intranet has restrictions and can support only a fewer user. Hence, only limited data can be shared over it. An intranet is usually operated on a client/server platform. This enables the organisations to share files, and data, organise information, manage and share calendars, files, etc

INTERNET: A complete network of globally linked computers, the Internet also enables users to transfer information and communication. This makes use of the TCP/IP protocol suite while communicating. Available in both wired and wireless modes, the internet also includes a wide range of networks such as private, public, government, organisation, etc. It supports multiple users and allows the transfer of a massive amount of data

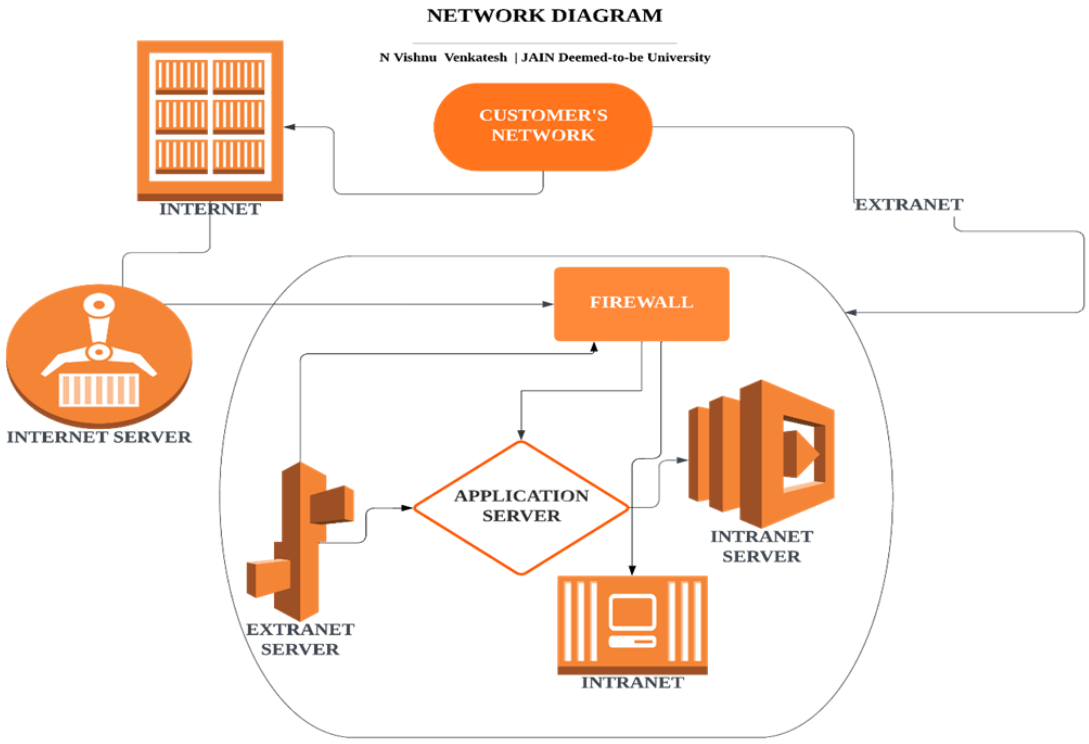


Fig: Network Distribution

VOIP Traceback(Karapantazis & Pavlidou, 2009)

VOIP traceback is a function that enables network administrators to trace the origin of a Voice over Internet Protocol (VoIP) call, to determine the source of a problem or to detect malicious or fraudulent activity. The traceback process typically involves collecting information about the call routing and path, as well as identifying any intermediate devices that may have affected the quality or security of the call. Traceback information can be obtained through various methods, such as examining log files, analyzing network traffic, or using specialized tools that can monitor and analyze VoIP traffic. The traceback function is an important component of network security, as it can help to identify the source of security threats, such as spam or malware, and can be used to prevent future incidents. Traceback information can also be useful for debugging purposes, as it can help network administrators to identify and resolve performance issues, such as voice quality problems or call setup failures. By collecting and analyzing traceback data, network administrators can identify the root cause of problems and implement changes to improve network performance and reliability

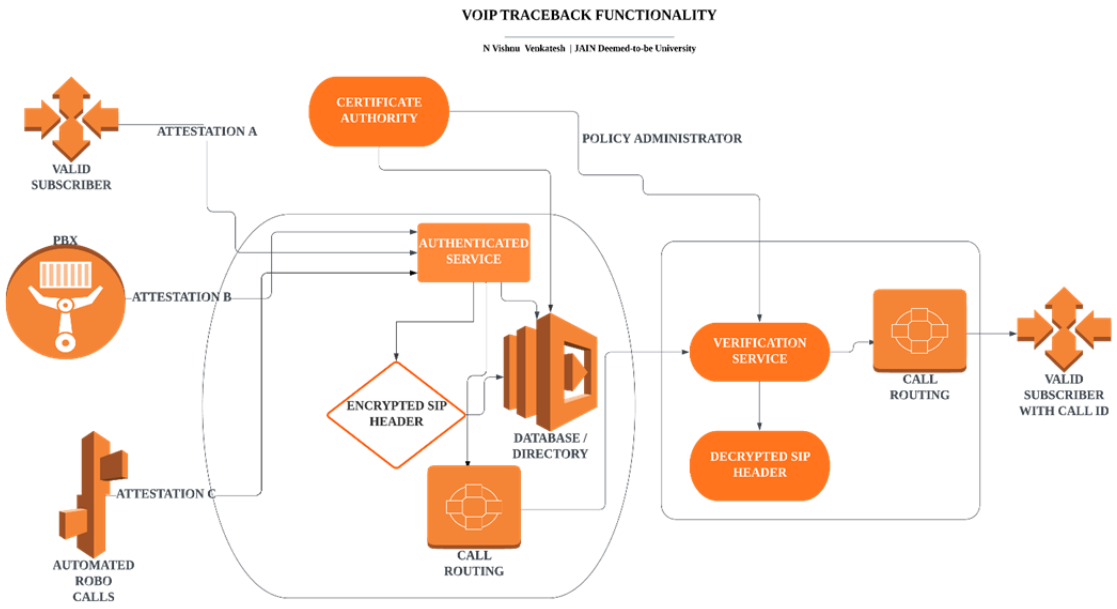


Fig: VOIP traceback(Varma et al., 2025)

TRACEBACK MECHANISM

FUNCTIONALITY	SNIPPET
# Automated VOIP traceback	from scapy.all import * def voip_traceback(pkt):
# Check if the packet contains a SIP message	if pct.haslayer(SIP):(2025) sip_pkt = pkt[SIP] src_ip = pkt[IP].src dst_ip = pkt[IP].dst
# Extract relevant information from the SIP packet	call_id = sip_pkt['Call-ID'] from_header = sip_pkt['From'] to_header = sip_pkt['To']
# Log the extracted information for each SIP packet	print("SIP Packet:") print(" Call-ID:", call_id) print(" From:", from_header) print(" To:", to_header) print(" Source IP:", src_ip) print(" Destination IP:", dst_ip) print("")
# Sniff SIP packets on the network	sniff(filter="udp port 5060", prn=voip_traceback)

DIRECTORY DATABASE (Gomes et al., 2022; Shukla et al., 2023)

A database is a structured collection of information or data that is often kept electronically in a computer system. A database management system often oversees a database (DBMS). The

term "database system," which is sometimes abbreviated to "database," refers to the combination of the data, the DBMS, and the applications that are connected to it. To facilitate processing and data querying, the most popular types of databases now in use usually describe their data as rows and columns in a set of tables. The data may then be handled, updated, regulated, and structured with ease. For creating and querying data, most databases employ structured query language (SQL).

SQL is a computer language that is used by practically all relational databases to query, manage, and define data, as well as to provide access control. SQL was initially created at IBM in the 1970s, with Oracle as a key contribution, leading to the establishment of the SQL ANSI standard. SQL has spawned several modifications from businesses like as IBM, Oracle, and Microsoft. Even though SQL is still commonly used today, other programming languages are emerging(Kumar & Megha Kamble, 2020).

III. TYPES OF DATABASES

DATABASE MANAGEMENT SYSTEM (Venkatesh et al., 2023)

A database is a collection of interconnected data that aids in the effective retrieval, insertion, and deletion of data from the database and organizes the data into tables, views, schemas, reports, and so on. An academic database, for example, organizes data on students, teachers, administrative staff, and so on, making it easier to retrieve, insert, and delete data from it.

There are four types of Data Languages

1. Data Definition Language (DDL)

2. Data Manipulation Language (DML)
3. Data Control Language (DCL)
4. Transactional Control Language (TCL)

DDL is an abbreviation for Data Definition Language, which is concerned with database schemas and specifications of how data should be stored in a database.

- CREATE: creates a database and its objects (table, index, views, store procedure, function, and triggers)
- ALTER: changes the structure of an existing database
- DROP: deletes objects from the database
- TRUNCATE: removes all records from a table, including all spaces allocated for the records
- COMMENT: adds comments to the data dictionary

DML is an abbreviation for Data Manipulation Language, which is used to save, edit, retrieve, remove, and update data in a database. It contains the most typical SQL commands such as SELECT, INSERT, UPDATE, DELETE, and so on.

- SELECT: retrieve data from a database
- INSERT: insert data into a table
- UPDATE: updates existing data within a table
- DELETE: Delete all records from a database table
- MERGE: UPSERT operation (insert or update)
- CALL: call a PL/SQL or Java subprogram
- EXPLAIN PLAN: interpretation of the data access path
- LOCK TABLE: concurrency Control

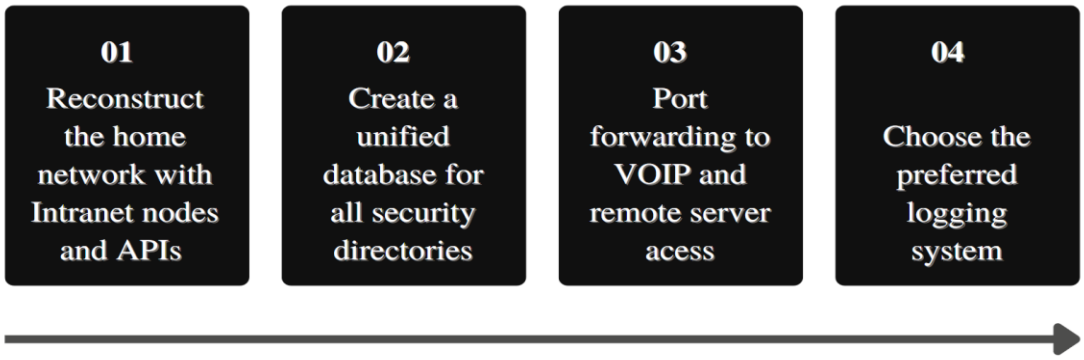
DCL is an abbreviation for Data Control Language, which serves as a database access specifier. (Basically, to grant and remove rights to database users.)

- GRANT: grant permissions to the user for running DML (SELECT, INSERT, DELETE,) commands on the table
- REVOKE: revoke permissions to the user for running DML (SELECT, INSERT, DELETE,) command on the specified table

TCL is short for Transactional Control Language which acts as a manager for all types of transactional data and all transactions. Some of the commands of TCL are

- Roll Back: Used to cancel or Undo changes made in the database
- Commit: It is used to apply or save changes in the database
- Save Point: It is used to save the data temporarily in the database

IV. METHOD



To combine CCTV footage, VOIP, and intranet for perimetric surveillance, the following methodology can be followed:

1. Planning and Design: The first step is to plan and design the system, taking into account the specific requirements and goals for the surveillance system. This includes determining the number and placement of CCTV cameras, the type of VOIP technology to be used, and the network infrastructure needed for the Intranet.
2. Installation of CCTV directory System: The next step is to install the CCTV system, which involves placing cameras at strategic locations around the perimeter and connecting them to the Intranet. The cameras should be configured to capture high-quality visual data and transmit it to the central location.
3. Installation of VOIP System: The VOIP system should then be installed and configured, including the installation of microphone and speaker equipment at the cameras and the installation of software to manage the VOIP communication.
4. Integration of Intranet: The Intranet should then be set up, including the installation of routers, switches, and firewalls to secure the network. The Intranet should be configured to allow the CCTV and VOIP data to be transmitted securely and efficiently.
5. Data Collection and Analysis: Once the system is installed and configured, it can be used to collect and analyze data in real time. The CCTV data is transmitted to the central location for analysis, and the audio data from the VOIP system is also analyzed to provide additional information and insights.
6. Maintenance and Monitoring: Regular maintenance and monitoring should be performed to ensure the system functions optimally. This includes regularly checking and updating the software, monitoring the network infrastructure, and performing regular security checks to prevent unauthorized access.

By following this methodology, the system can be effectively combined to provide comprehensive and integrated perimetric surveillance. This setup would provide a complete solution for monitoring the perimeter, leveraging the strengths of each technology to achieve the desired outcome.

The traceback or lookback can be ensured in the following manner

1. Capture network packets: You can use a packet sniffer library like Scapy or Pyshark to capture network packets and extract relevant information, such as source and destination IP addresses, port numbers, and timestamps.
2. Store the captured data: You can store the captured data in a database, file, or any other data storage solution, depending on your needs.
3. Analyze the data: You can write Python scripts to analyze the captured data, extract relevant information, and build a call graph that shows the routing path of each call.
4. Visualize the results: You can use a data visualization library like Matplotlib or Plotly to display the results of the traceback analysis in a meaningful way.

Unifying Database/directories is the crucial step for generating enough data to create a 3D model of the infrastructure and it can be done in the following ways

1. Assess the current state of the databases: Before starting with the unification process, we need to take inventory of our existing databases and understand the structure, schema, and data content of each.
2. Determine the target schema: Once we have a good understanding of our existing databases, we need to determine the structure and format of our unified directory database. We will have to decide which data is most important and how it should be organized.
3. Clean and normalize data: We have to clean up and standardize our data so that it can be easily combined. This might involve removing duplicates, fixing incorrect data, and converting data into a common format.
4. Map data from source databases to target schema: After the data has been cleaned and normalized, we need to map the data from our source databases to the target schema of our unified directory database. This process involves defining how the data in each source database should be transformed and loaded into the target database.
5. Load data into the target database: After the data has been mapped, you can begin to load it into the target database. We have to decide how to transfer the data, such as through a batch process or a real-time integration.
6. Verify and validate data: After the data has been loaded into the target database, we need to verify and validate the data to ensure that it has been loaded correctly. We may need to compare the data in the source databases with the data in the target database to ensure that everything has been loaded accurately.
7. Maintain and manage the unified database: After the data has been loaded and verified, we need to maintain and manage the unified directory database. This might involve creating backup and recovery procedures, as well as performing regular maintenance and updates to keep the database running smoothly.

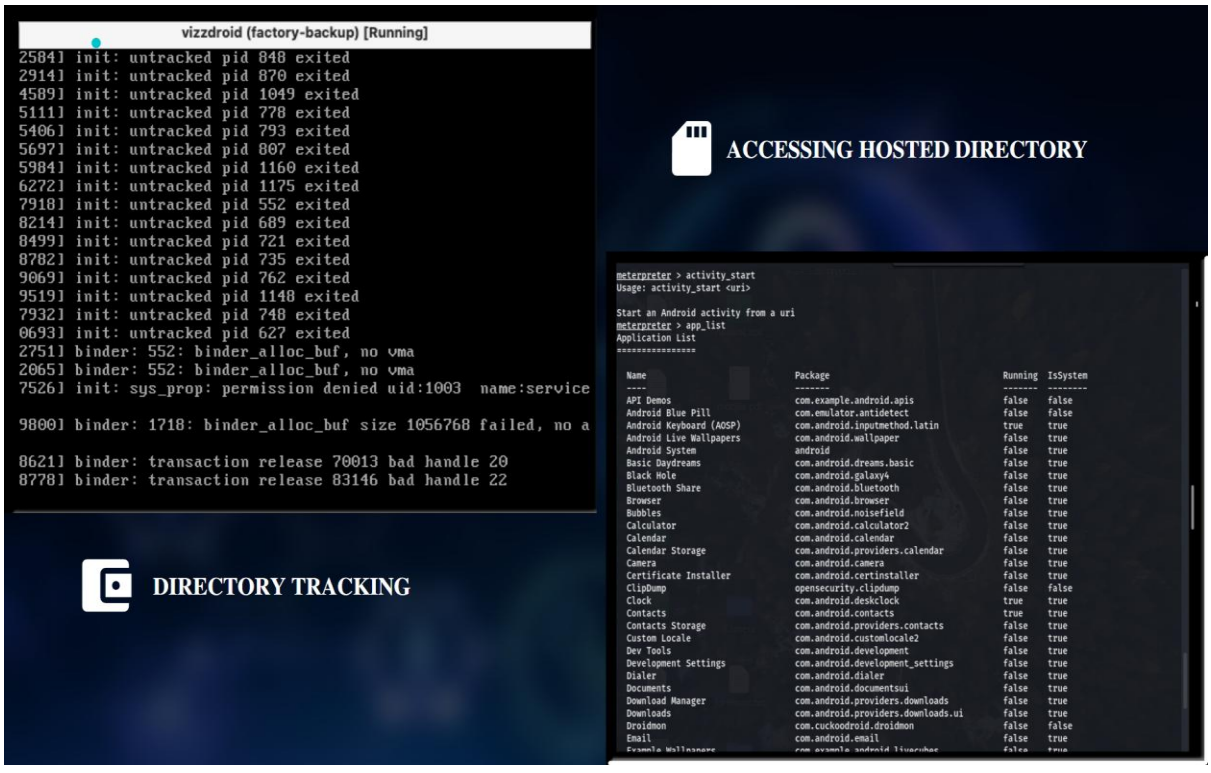
V. RESULTS AND DISCUSSIONS

The process of creating a 3D model from a database involves several steps: obtaining the necessary data, cleaning the data, converting the data into 3D, mapping the data to the model, fine-tuning the model, and saving and exporting the model.

To start, we need to extract the data from the database that we want to use to create the 3D model. This data should then be checked for errors and inconsistencies and cleaned up so that it's in a format that can be used for modelling.

Once the data is ready, we can use software such as AutoCAD, Blender, SketchUp, or other 3D modelling tools to convert the data into a 3D model. After the conversion, we need to map the data from the database to the 3D model, making sure that each piece of data corresponds to the right aspect of the model.

The next step is to fine-tune the model, adjusting its lighting, texture, and other elements to make it look and function the way we want. Finally, we can save the 3D model and export it in the file format of our choice, such as STL, OBJ, or FBX, so that it can be used in other applications.



3D LAYOUT OBTAINED FROM RECORDED FOOTAGE

2D LAYOUT CONVERTED FROM RECORDED FOOTAGE

VI. CONCLUSION

The proposed methodology for perimetric security using intranet and VOIP involves utilizing port forwarding and a unified database. This will ensure that information processed by home security systems is accessible, modified, and broadcasted efficiently. A systematic approach to

data extraction, cleaning, conversion into a 3D model, mapping to the model, fine-tuning, and exporting in a preferred file format is crucial in creating an effective surveillance system. The implementation of this methodology will result in improved security, better information management, and enhanced overall performance of the perimetric security system.

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