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1. Introduction

1.1. Internship Details:

Company: Indira Gandhi Centre for Atomic Research

Duration: 3 months

Dates: October 28, 2024 – January 27, 2025

My internship at Indira Gandhi Centre for Atomic Research was an opportunity to immerse myself in the world of Application Development and Networking. Over the course of three months, I contributed to various aspects of App Development and networking. This report outlines my experiences, the tasks that I worked on, and the skills I gained.

1.2. Objectives and Expectations:

The internship was designed with the objective of introducing me to a range of technologies and methodologies within the Application development and Networking domains. I was tasked with learning about Electron runtime framework and React.js. My primary responsibilities was to create a **Client Application for NAC system**.

Expectations were set around building both my technical and soft skills. I was encouraged to not only to build the application but also to suggest improvements and innovations that could enhance workflow efficiency.

1.3. Brief Company Overview:

The Indira Gandhi Centre for Atomic Research (IGCAR), established in 1971 at Kalpakkam, Tamil Nadu, is one of India's premier nuclear research institutions. It operates under the Department of Atomic Energy (DAE). IGCAR focuses primarily on the development of fast breeder reactor (FBR) technology, which is vital for India's energy security due to its efficient utilization of uranium and thorium resources.

The centerpiece of IGCAR's research is the Fast Breeder Test Reactor (FBTR), commissioned in 1985, which serves as a platform for testing advanced materials and fuel. IGCAR conducts extensive research in areas like material science, reactor physics, thermal hydraulics, and safety analysis.

Apart from fast reactors, IGCAR engages in cutting-edge research in nanotechnology, robotics, and superconductivity. It also supports applications of nuclear technology in medicine, agriculture, and industry. As a vital institution for India's three-stage nuclear power program, IGCAR is central to realizing a sustainable energy future for the nation.

2. Job Description and Responsibilities

2.1. Job Title and Department:

Title: Project Intern

Department: Scientific Information and Networking Division.

During my internship, I was embedded within the Networking team, responsible for ensuring the smooth automation, deployment, and monitoring of network infrastructure. I worked directly under the guidance of senior Scientific Officer and interacted with teams across development,

QA, and operations.

2.2. Key Responsibilities and Tasks:

My tasks included:

System Information Gathering: I was responsible for initially collecting the information of the current system. The system information includes the OS version, memory, network interfaces, MAC address, anti-virus updates and the patches updates done to the system.

Information validation: Then I created a script using API's to validate whether the OS version, anti-virus and patch updates are updated to the latest version till date. This is necessary to ensure the security in the system, and requires to be done for all the system.

Requirement Verification: The information gained from the system has to validated whether it has the requirements to be the part of the network. I created automated scripts to validate the current information in the system meet the requirements to be the part of the network.

Communicating with NAC server: Then I automated the process of sending the gathered information to the NAC server in the network. The NAC server sends back a reply to the client. The decision whether to allow the system in the network is done here.

Monitoring and Observability: I worked with Prometheus and Grafana to monitor infrastructure and application performance. This involved setting up custom dashboards to visualize real-time metrics and logs from the devices, ensuring the performance and reliability of deployed applications.

Deployment using Electron: I used the electron runtime framework to deploy the application. The electron framework is more flexible to deploy the application.

2.3. Skills and Knowledge Applied:

Throughout the internship, I applied a variety of skills, including:

Runtime Framework: Leveraged Electron to create a single codebase that runs on multiple operating systems (Windows, Linux, macOS), ensuring compatibility and reducing development time.

Scripting: Developed core functionality of the client application, such as handling user inputs, API requests, and data manipulation, using JavaScript.

User Interface: Built the user interface using React.js, organizing the application into reusable components, such as forms, tables, and modals, which streamlined development and maintenance.

API Integration: Established communication between the Electron application and the existing NAC backend through RESTful APIs, enabling secure data transmission and access control.

Database Interaction: Used the NAC system's database to fetch and store access logs, ensuring the application operated seamlessly within the existing system infrastructure.

Monitoring & Observability: Setting up Prometheus for metric collection and Grafana for real-time monitoring and visualization of system performance.

Version Control and Collaboration: Used Git for version control to manage code changes effectively and ensure seamless collaboration with mentors and colleagues during the development process.

3. Achievements and Contributions

3.1. Successful Projects and Tasks:

Development of a Robust Client Application:

- Designed and developed a fully functional client application using the Electron Runtime Framework, enabling cross-platform compatibility across Windows, macOS, and Linux operating systems.

- Built an intuitive and responsive user interface using React.js, ensuring ease of use for end-users, including administrative and operational staff.

Seamless Integration with the NAC System:

- Successfully integrated the client application with the existing backend services of the NAC system through secure RESTful API communication.

- Ensured real-time synchronization of user access requests, logs, and system status updates, enhancing the operational efficiency of the NAC system.

Implementation of Key Features:

- Enabled role-based access control to restrict system functionality based on user roles and privileges, ensuring compliance with security policies.

- Developed dynamic dashboards and interactive components (e.g., tables, modals, and form validations) for efficient data visualization and management.

Security Enhancements:

- Integrated secure authentication mechanisms, including session management and encrypted communication, to safeguard sensitive data.

- Followed best practices in application security to ensure that the client application adheres to the stringent regulatory standards of IGCAR.

3.2. Challenges Overcome:

Cross-Platform Compatibility:

Ensuring the client application functioned seamlessly on multiple operating systems (Windows, macOS, Linux) presented compatibility issues, especially in terms of UI rendering and system-specific configurations. Integrating the new client application with the existing NAC backend, which involved legacy components and undocumented APIs, was complex.

3.3. Innovations or Improvements Suggested:

Enhanced Role-Based Access Control (RBAC)

Current Observation: The existing access control system could be expanded to offer more granular permissions based on specific tasks or roles.

Suggestion: Implement a hierarchical RBAC system that allows finer control over user privileges, ensuring that users can only access the features and data relevant to their roles.

Real-Time Data Monitoring and Alerts:

Current Observation: The system provides updates, but not in a truly real-time manner.

Suggestion: Integrate WebSocket technology to enable real-time data streaming and instant alerts for critical events, such as unauthorized access attempts or security breaches.

3.4. Feedback from the Team:

The team appreciated the smooth integration of the client application with the existing NAC backend system.

The inclusion of real-time updates and notifications for access control was highlighted as a significant improvement in operational efficiency.

Stakeholders particularly appreciated the dynamic dashboards and interactive components like forms, tables, and modals for efficient data management.

4. Skills and Knowledge Acquired

4.1. Technical Skills:

Electron Framework: Gained proficiency in building cross-platform desktop applications and integrating native OS functionalities.

JavaScript and React.js: Enhanced expertise in asynchronous programming, state management, and designing dynamic, reusable UI components.

Secure Development: Applied encryption, authentication protocols, and role-based access control to ensure system security.

Debugging and Optimization: Improved performance tuning and debugging using tools like React Developer Tools and Electron utilities.

Monitoring Tools: Gained proficiency in using Prometheus and Grafana for system monitoring and observability.

4.2. Soft Skills:

Effective Communication: I became more effective at communicating technical concepts to non-technical team members, ensuring that all stakeholders were aligned with project goals and timelines.

Collaboration: Worked closely with cross-functional teams, especially with developers to containerize applications and with operations to monitor system performance.

Problem-Solving: I developed stronger problem-solving skills, especially when troubleshooting deployment issues or optimizing cloud infrastructure.

4.3. Industry Insights and Trends:

Learned the importance of security in critical infrastructure, especially in nuclear systems.

Gained exposure to modernizing legacy systems and emerging trends like block chain and biometric authentication.

5. Challenges and Lessons Learned

5.1. Difficulties Faced:

Integration with Legacy Systems: Understanding undocumented APIs and connecting them to the modern client application posed significant technical hurdles.

Performance Optimization: Managing high data loads and ensuring smooth operation without lags or crashes required extensive testing and code optimization.

Cross-Platform Compatibility: Ensuring the application worked seamlessly on Windows, macOS, and Linux required resolving platform-specific issues, particularly in file handling and UI rendering.

5.2. Lessons Learned:

Technical Proficiency: Enhanced knowledge of **Electron Runtime Framework**, **React.js**, and **JavaScript** through hands-on experience.

Importance of Secure Development: Learned the significance of secure coding practices and implementing robust authentication mechanisms.

Problem-Solving: Gained confidence in analyzing and resolving technical issues, particularly during integration with legacy systems.

Collaboration and Feedback: Appreciated the value of team collaboration and incorporating feedback to improve the final deliverables.

5.3. Areas for Improvement:

- **Deeper Security Knowledge:** Strengthening knowledge of advanced cybersecurity practices and frameworks to handle more complex systems.

- **Advanced Optimization Techniques**: Exploring more sophisticated methods for application performance tuning and resource management.

- **Continuous Learning**: Staying updated with new trends and technologies, such as machine learning and block chain, to integrate into future applications.

6. Conclusion

6.1. Summary of Experience:

The internship at Indira Gandhi Centre for Atomic Research (IGCAR) was an enriching and transformative experience that provided practical exposure to real-world challenges in a professional environment. Working on the development of a cross-platform client application for the NAC system allowed me to apply modern technologies such as Electron, JavaScript, and React.js while addressing complex challenges like cross-platform compatibility, legacy system integration, and implementing secure access protocols.

This hands-on involvement significantly enhanced my technical

proficiency, problem-solving abilities, and understanding of secure application development. Additionally, collaborating with mentors and team members, along with continuous learning, ensured a holistic growth experience

6.2. Impact on Career Goals:

This internship at IGCAR has been instrumental in shaping my career aspirations and providing clarity on my professional goals. Working on a critical project like the NAC system not only deepened my technical expertise but also gave me a clear understanding of the responsibilities and challenges involved in secure system design and development. The exposure to cutting-edge technologies such as Electron, JavaScript, and React.js, coupled with the need to meet stringent security requirements, reinforced my interest in pursuing a career in software engineering with a focus on developing secure, scalable, and user-friendly applications.

This experience has inspired me to explore advanced fields such as cybersecurity, where I aim to specialize in building robust systems that safeguard sensitive information and critical infrastructure. Additionally, the opportunity to work in a research-driven environment has sparked my interest in contributing to innovative projects that merge technology with societal impact, such as systems for public safety, healthcare, and energy management. I am now more motivated to pursue certifications and training in areas like block chain for secure systems, AI-driven anomaly detection, and modern application frameworks, aligning with my vision of becoming a well-rounded software developer.

Furthermore, the internship helped me recognize the importance of collaboration, adaptability, and continuous learning in professional growth. The skills and insights I gained during this experience will serve as a strong foundation for my future endeavors, whether in advanced education, professional certifications, or high-impact roles in the tech industry. In essence, this internship has not only sharpened my technical and professional skills but also reinforced my determination to pursue a career that blends

innovation, security, and usability to create meaningful solutions in the software development field.

7. Appendices

7.1. Completion Certificate:

Internship offer letter from Indira Gandhi Centre for Atomic Research (IGCAR) has been attached at thebeginning of the report.

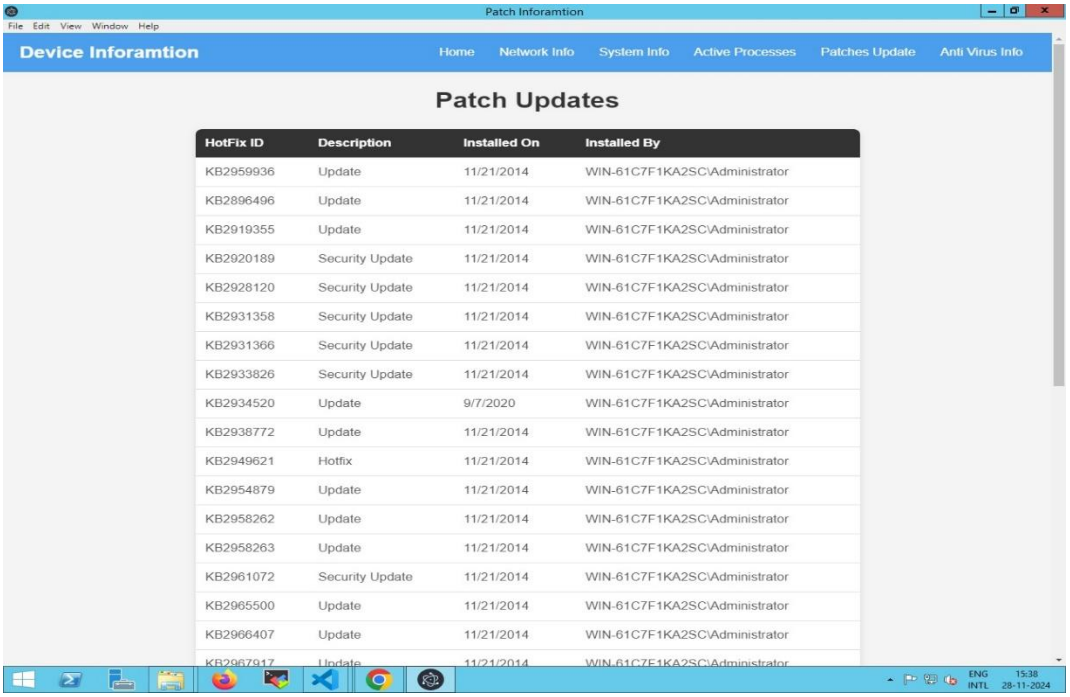
7.2. Samples of Work:

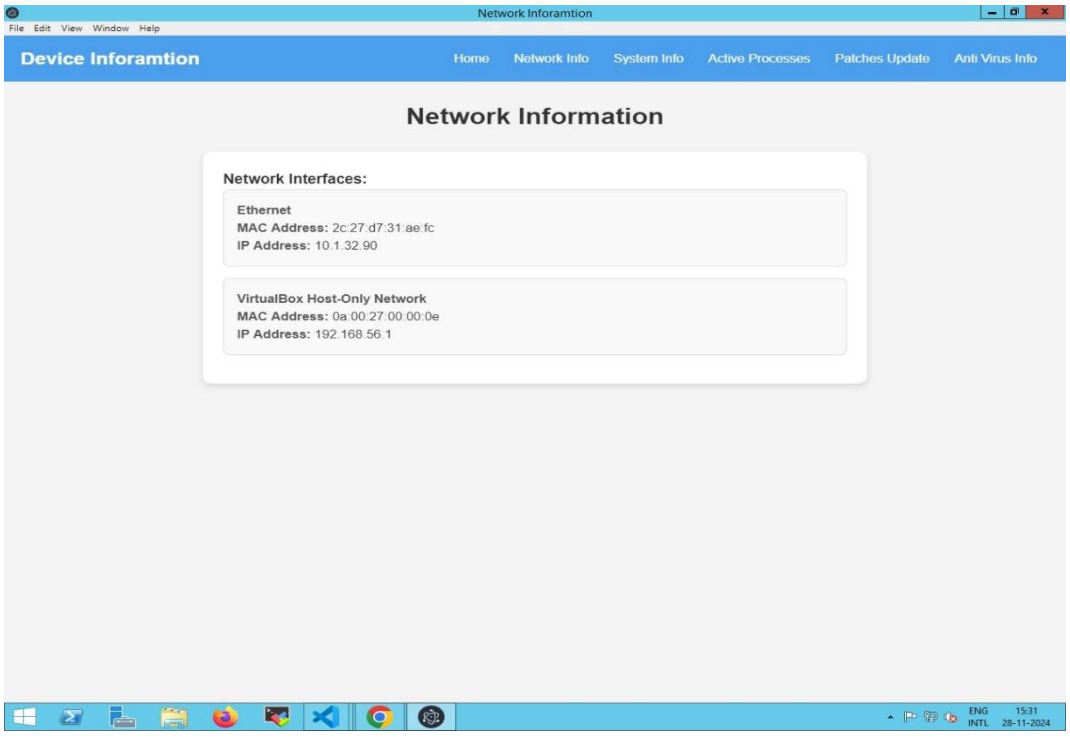
JS server.js

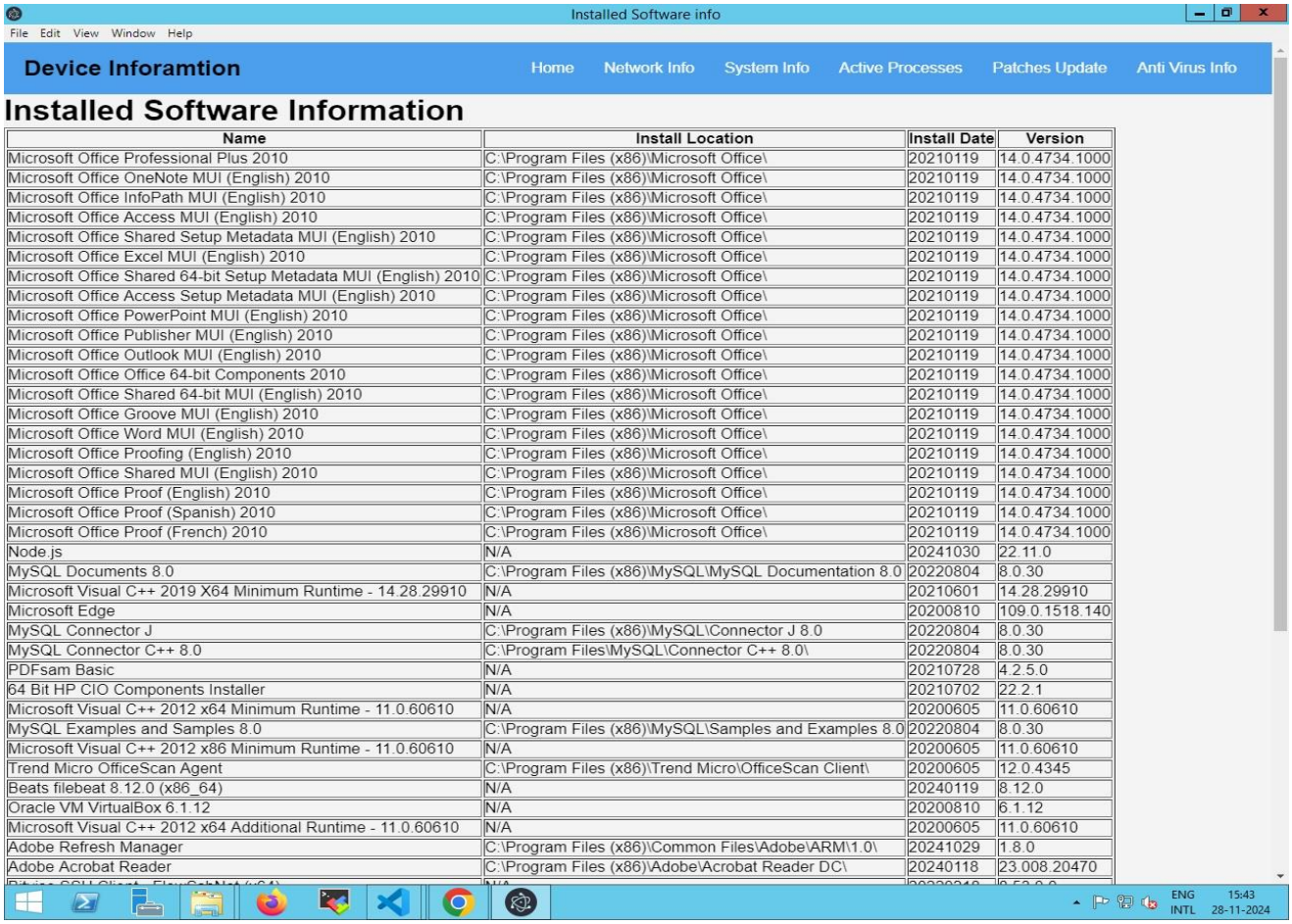
Book-Store-main > Backend > JS server.js > app.on('ready') callback

```
1   const { app, BrowserWindow, ipcMain } = require('electron');
2   const path = require('path');
3   const si = require('systeminformation'); // System Info Library
4   const wmi = require('node-wmi'); // Windows Management Instrumentation
5
6   let mainWindow;
7
8   app.on('ready', () => {
9     mainWindow = new BrowserWindow({
10      width: 800,
11      height: 600,
12      webPreferences: {
13        preload: path.join(__dirname, 'preload.js'),
14        contextIsolation: true,
15        enableRemoteModule: false,
16      },
17    });
18
19    mainWindow.loadFile('index.html');
20  });
21
22  // IPC handlers to provide system info
23  ipcMain.handle('get-system-info', async () => {
24    const info = await si.system();
25    const cpu = await si.cpu();
26    return { system: info, cpu };
27  });
28
29  ipcMain.handle('get-network-info', async () => {
30    return await si.networkInterfaces();
31  });
32
33  ipcMain.handle('get-antivirus-info', async () => {
34    try {
35      const antivirus = await new Promise((resolve, reject) => {
36        wmi.Query({
37          class: 'AntiVirusProduct',
```

7.3. Photos or Screenshots of Projects:







Installed Software Information

Name	Install Location	Install Date	Version
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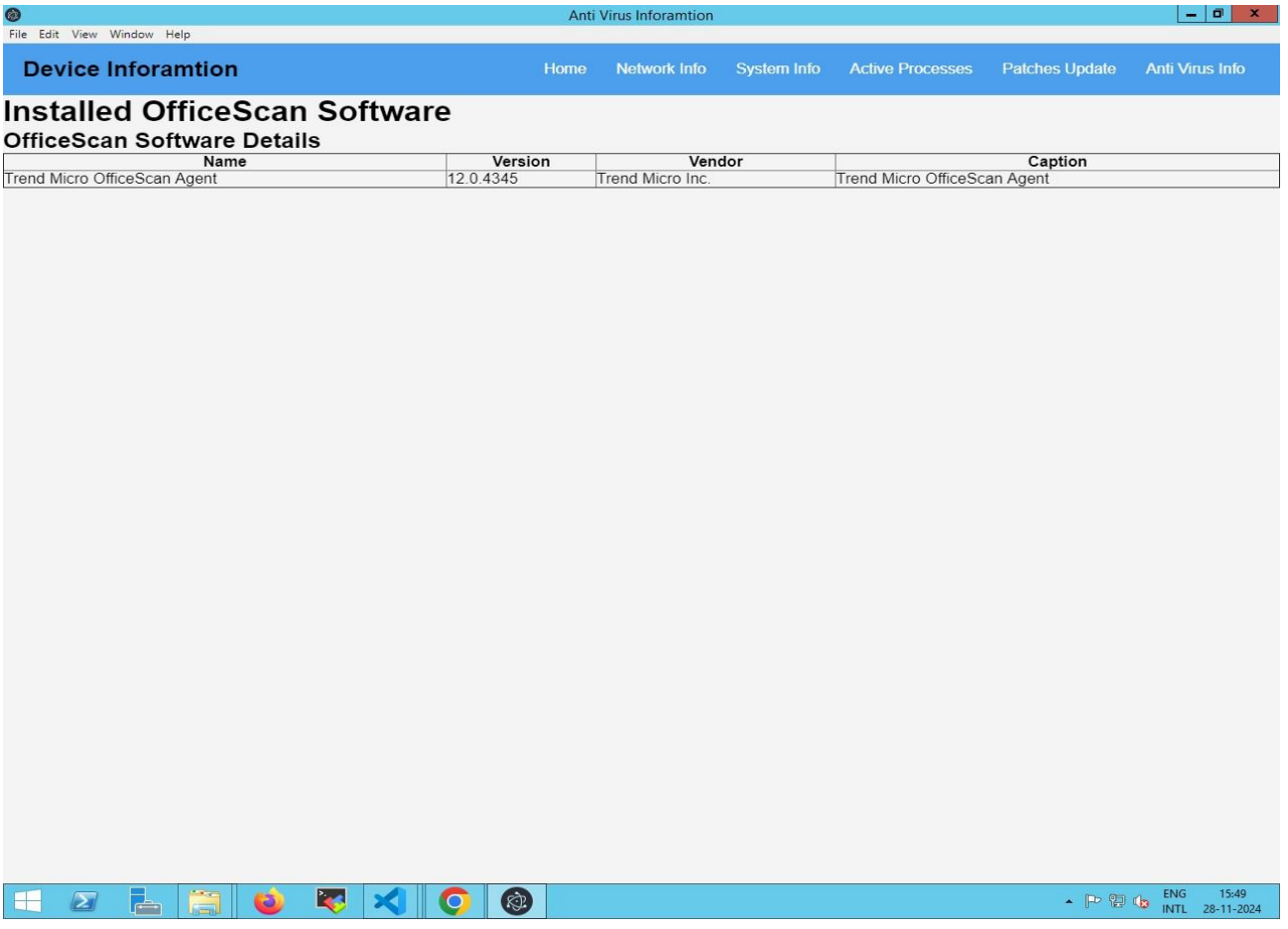
Microsoft Office OneNote MUI (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office InfoPath MUI (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Access MUI (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Shared Setup Metadata MUI (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Excel MUI (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Shared 64-bit Setup Metadata MUI (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Access Setup Metadata MUI (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office PowerPoint MUI (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Publisher MUI (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Outlook MUI (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Office 64-bit Components 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Shared 64-bit MUI (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Groove MUI (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Word MUI (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Proofing (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Shared MUI (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Proof (English) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Proof (Spanish) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Microsoft Office Proof (French) 2010	C:\Program Files (x86)\Microsoft Office\	20210119	14.0.4734.1000
Node.js	N/A	20241030	22.11.0
MySQL Documents 8.0	C:\Program Files (x86)\MySQL\MySQL Documentation 8.0	20220804	8.0.30
Microsoft Visual C++ 2019 X64 Minimum Runtime - 14.28.29910	N/A	20210601	14.28.29910
Microsoft Edge	N/A	20200810	109.0.1518.140
MySQL Connector J	C:\Program Files (x86)\MySQL\Connector J 8.0	20220804	8.0.30
MySQL Connector C++ 8.0	C:\Program Files\MySQL\Connector C++ 8.0\	20220804	8.0.30
PDFsam Basic	N/A	20210728	4.2.5.0
64 Bit HP CIO Components Installer	N/A	20210702	22.2.1
Microsoft Visual C++ 2012 x64 Minimum Runtime - 11.0.60610	N/A	20200605	11.0.60610
MySQL Examples and Samples 8.0	C:\Program Files (x86)\MySQL\Samples and Examples 8.0	20220804	8.0.30
Microsoft Visual C++ 2012 x86 Minimum Runtime - 11.0.60610	N/A	20200605	11.0.60610
Trend Micro OfficeScan Agent	C:\Program Files (x86)\Trend Micro\OfficeScan Client\	20200605	12.0.4345
Beats filebeat 8.12.0 (x86_64)	N/A	20240119	8.12.0
Oracle VM VirtualBox 6.1.12	N/A	20200810	6.1.12
Microsoft Visual C++ 2012 x64 Additional Runtime - 11.0.60610	N/A	20200605	11.0.60610
Adobe Refresh Manager	C:\Program Files (x86)\Common Files\Adobe\ARM\1.0\	20241029	1.8.0
Adobe Acrobat Reader	C:\Program Files (x86)\Adobe\Acrobat Reader DC\	20240118	23.008.20470



Installed OfficeScan Software

OfficeScan Software Details

Name	Version	Vendor	Caption
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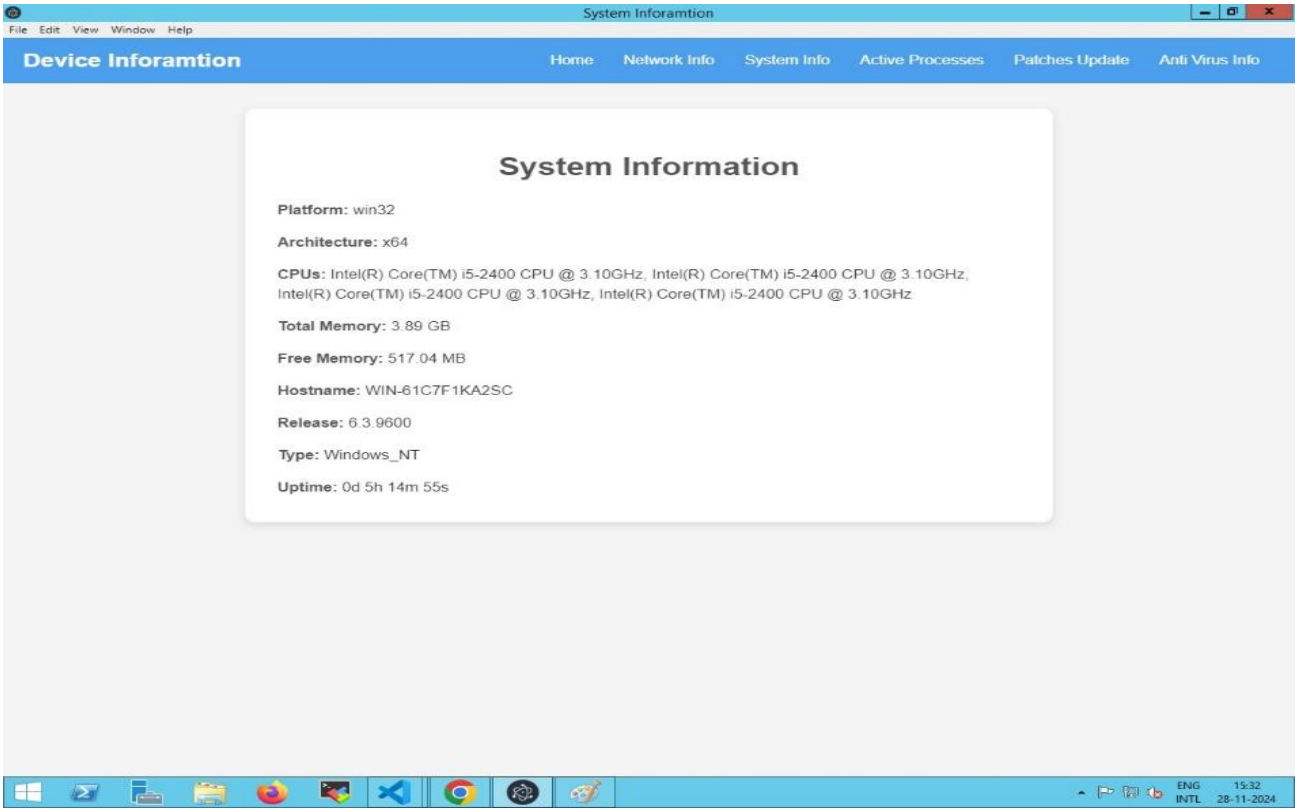
System Inforamtion
File Edit View Window Help
Device Inforamtion
Home
Network Info
System Info
Active Processes
Patches Update
Anti Virus Info
System Information
Platform: win32
Architecture: x64
CPUs: Intel(R) Core(TM) i5-2400 CPU @ 3.10GHz, Intel(R) Core(TM) i5-2400 CPU @ 3.10GHz, Intel(R) Core(TM) i5-2400 CPU @ 3.10GHz, Intel(R) Core(TM) i5-2400 CPU @ 3.10GHz
Total Memory: 3.89 GB
Free Memory: 517.04 MB
Hostname: WIN-61C7F1KA2SC
Release: 6.3.9600
Type: Windows_NT
Uptime: 0d 5h 14m 55s
ENG
INTL
15:32
28-11-2024