COMP3000 Computing Project

2021/2022

Project Title

Net+ - Emulating software defined networking functionality on legacy devices.

Links

Source code: *https://github.com/Johncon93/NetPlus*

Project Vision

An automated platform for network providers to maintain, secure and monitor network equipment deployed across several environments. Containing a rich feature list, the Net+ platform seeks to emulate modern Software Defined (SD) network functionality on legacy hardware through a centralised controller. Implementing Net+ can mitigate electronic waste by breathing new life into legacy hardware and help ease the strain caused by the ongoing chip shortage that continues to wreak havoc across countless industries.

The platform empowers providers by streamlining the monitoring and support process through integrated monitoring tools that generate and distribute alerts to all stakeholders based on pre-determined events, further helping contribute towards maintaining SLA timescales within acceptable levels and bolstering the overall support capability by tracking abnormalities within networks. Device security is improved through the implementation of a TACACs server that hosts a centralised store of users and enables 2FA on all devices.

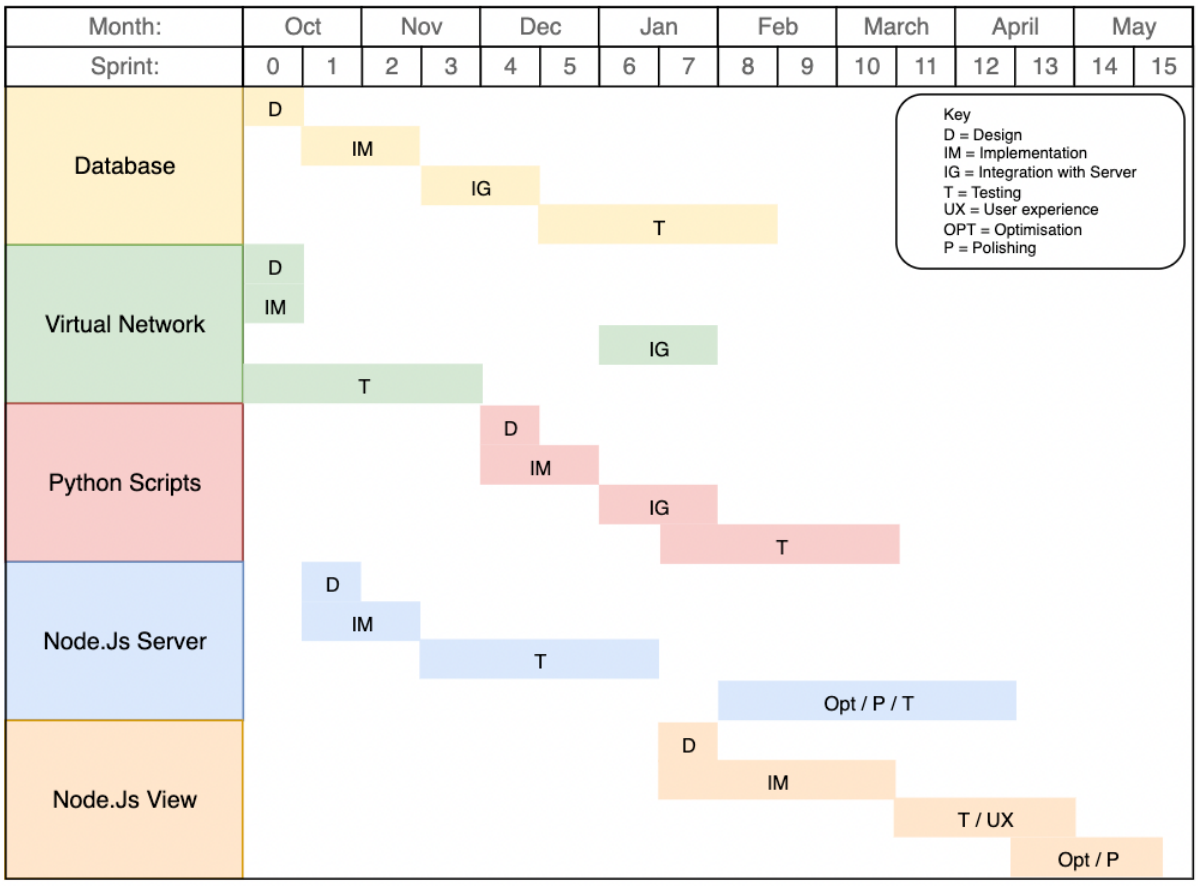
Risk Plan

Risk	Impact	Probability	Influence	Priority	Mitigation actions
Platform Development					
The platform is a multi-aspect solution that involves several key components. There is a risk of losing development time if time is focused on implementing aspects in a less-desirable order.	High	High	Loss of development time lead could lead to a sub optimal product. Loss of development time could lead to a missed deadline.	High	Establish all key components and appropriately link functionality to each aspect in the initial project plan. Development sprints can then be ordered in the best possible way to mitigate the risk of lost time.
The underlying functionality and device interaction between a node.js web server and Cisco network devices has been tested in a lab environment. Other integrations listed in the project vision have yet	High	Low	Features listed in the project initiation document would not be present during the showcase, leading to a lower mark and opening the	High	Development sprints should focus on back-end functionality to ensure that features are implemented with sufficient time to develop and conduct a test plan. Designing and testing functionality in a lab

to be proven and may not achieve the desired results.			platform to additional scrutiny from examiners.		environment prior to implementation will help prevent wasted development time.
The development and presentation deadlines are established and immutable. There is a risk of failing to meet them.	High	Medium	Loss of marks due to re-takes or failure of the module entirely.	High	Establish suitable sprint plans and conduct regular meetings with a supervisor to ensure development remains on track.
Front-end development will have a lower priority in the initial development sprints, there is a risk that too much focus will be spent on back-end functionality resulting in usability or compatibility issues.	Medium	Low	User experience issues may be identified during the presentation causing a reduced mark. The platform may not appropriately display certain functions which results in a sub-optimal presentation.	Low	Front-end development will include sufficient focus on AAA compatibility and ensure that appropriate design patterns are implemented. The application is based around a dashboard design and research will be conducted on other products during the design process.
Platform Dependencies					
The presentation hardware uses an Apple Silicon Chip which does not have a stable release of virtualisation software available, there is a risk that updates will break the current pre-release version and VMWare may opt to rescind the software entirely.	High	Medium	Loss of virtualisation on the presentation hardware will limit the presentation capabilities. Scalability cannot appropriately be showcased without a large number of devices.	Medium	Prepare backup presentation hardware using an OS with well-established virtualisation software available. Establish baseline presentation requirements and ensure a backup physical device is available.
The platform requires several open-source libraries to function correctly, there is a risk of these libraries being incompatible with the server or each other.	Medium	Low	Instability in application functionality leading to a sub-par presentation. Loss of functionality if the library becomes unstable or unusable.	Low	Appropriately test libraries prior to implementation and research public documents for known issues.
Platform Presentation					

The platform requires multiple network devices to sufficiently showcase functionality and scalability. There is a risk that devices may be unavailable or fail before the project concludes	Medium	Medium	Failure to present a working platform can lead to a lower result.	Medium	Create and appropriately backup a virtual network using emulation software, this will enable multiple network devices to be available for the platform. Prepare physical hardware as a backup, this wouldn't prove scalability but should showcase sufficient functionality.
The platform has multiple components which cover different computer science disciplines, there is a risk that the presentation will not appropriately convey the functionality or purpose.	Low	Medium	Potential loss of marks caused by content being mis-understood, missing or poorly expressed.	Medium	Sufficiently document the platform as it develops, ensure concepts are explained at an appropriate level and practice the presentation with colleagues or friends.

Proposed Gantt chart and design diagrams

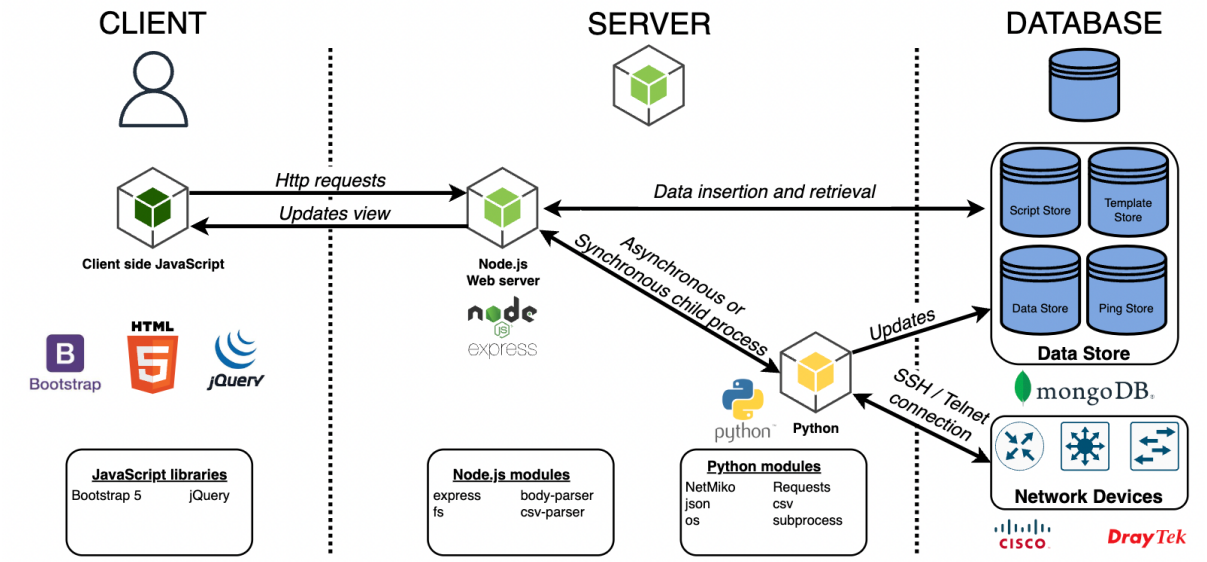


- Initial sprints are focused around building the back-end functionality and ensuring data models are appropriately designed. The proof of concept has already been established so implementing the

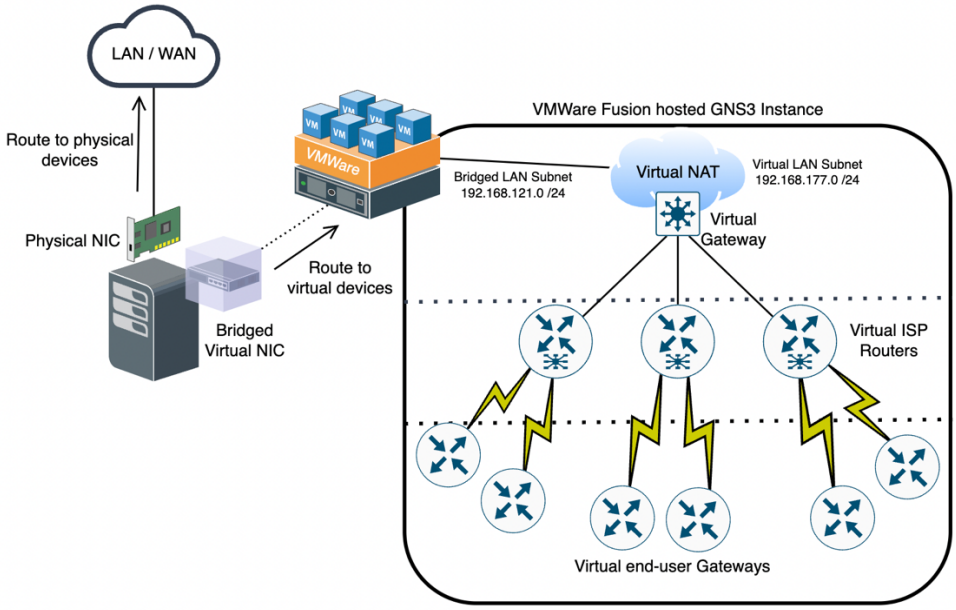
node.js server functionality will be streamlined. Initial designs will focus on functionality rather than visual appearance, but this will be refined as the project progresses.

- The database requires active networking devices in order to have stored information, so the Virtual Network and Database aspects must be designed and implemented together.
- The Node.js server will need access to the database to retrieve and store data, this will need to be implemented after the database has been created. Once the server has been created the Database can be integrated into the solution.
- Python scripts are initiated by the server and will need to be designed and implemented following the server integration. The Python scripts will use credentials from the database so this must be integrated with the server beforehand. Devices on the virtual network must be present and available to fully integrate and test python functionality.
- Views are present throughout development, but the initial focus will be on functionality and not visual or UX design, this aspect will be refined following the integration of other functionality. This ensures that regular reviews can take place as the visual requirements will vary depending on the type of data being retrieved and displayed.
- Rough testing timescales are displayed but will always follow full integration of the feature before a test plan is implemented. Individual features are tested as they are deployed but the full test plan will only be conducted once the feature is fully implemented.

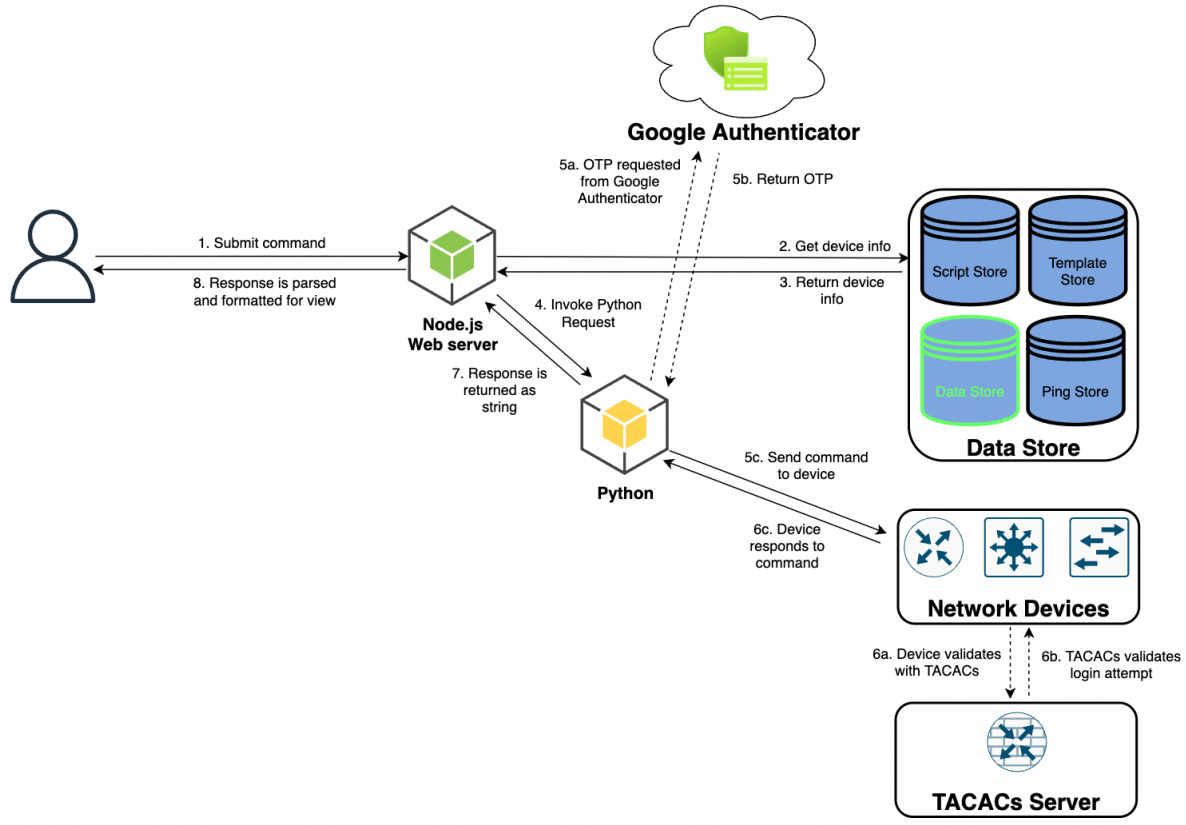
Initial MVC web application diagram



Virtual Network topology diagram



TACACs server implementation diagram



Keywords

Networking, Networks, Cyber Security, Info Sec, Information Security, Automation, Node, JavaScript, Web Application, Python, monitoring, SSH, SNMP, IDS, Alters, Cisco, VMWare, emulation, virtualisation, TACACs, confidentiality, integrity, authentication, authorisation, mongo db, database, MVC, model view controller.