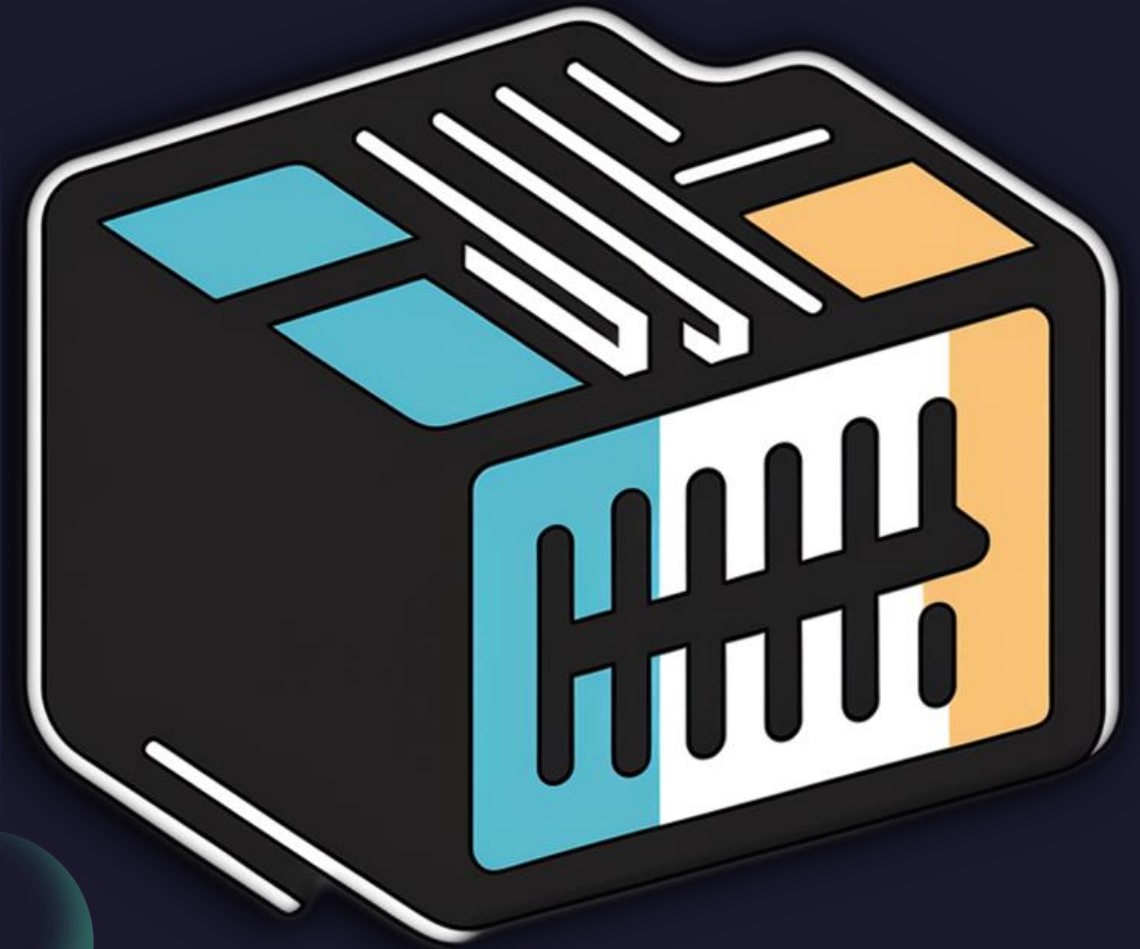




E-Jam

Distributed System for Testing, Monitoring, and Debugging a Network Switch

Sponsored By **SIEMENS**

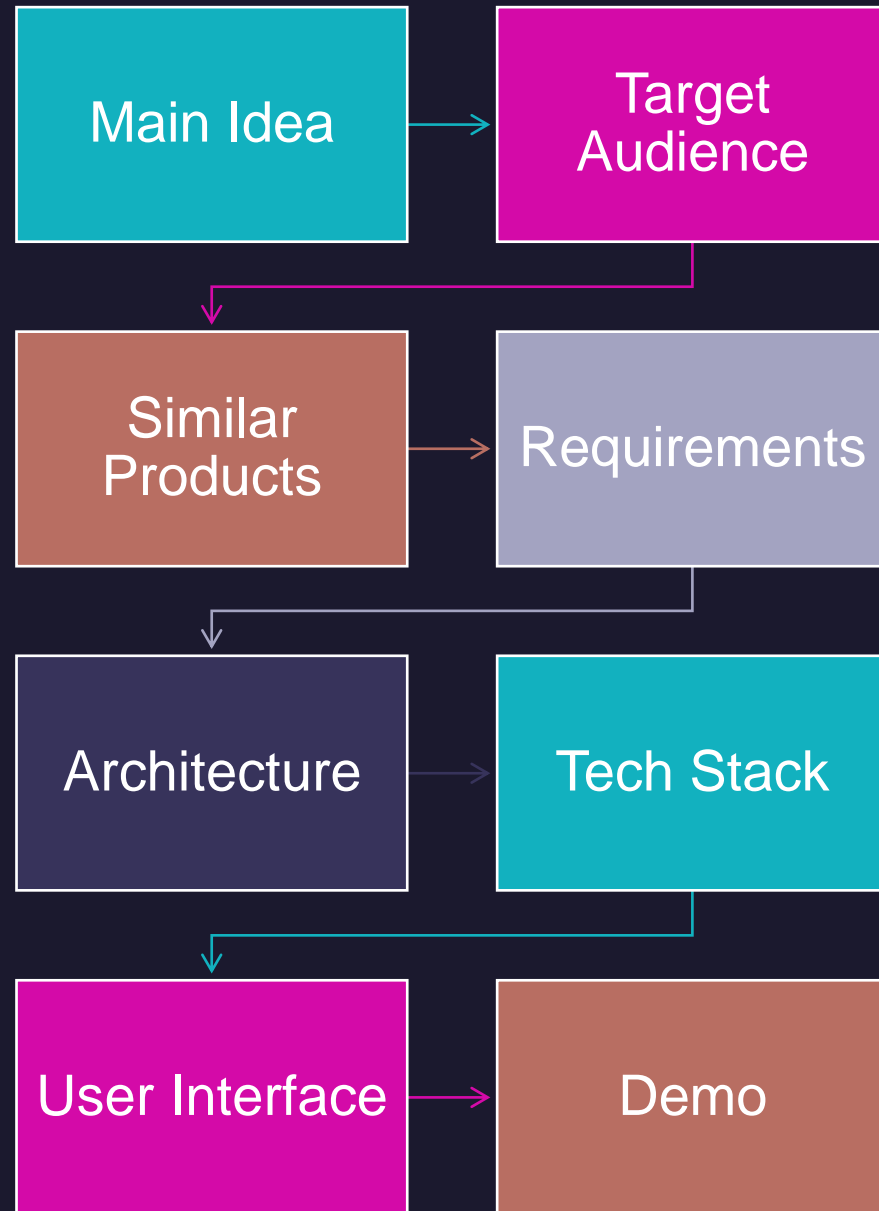


Supervised by

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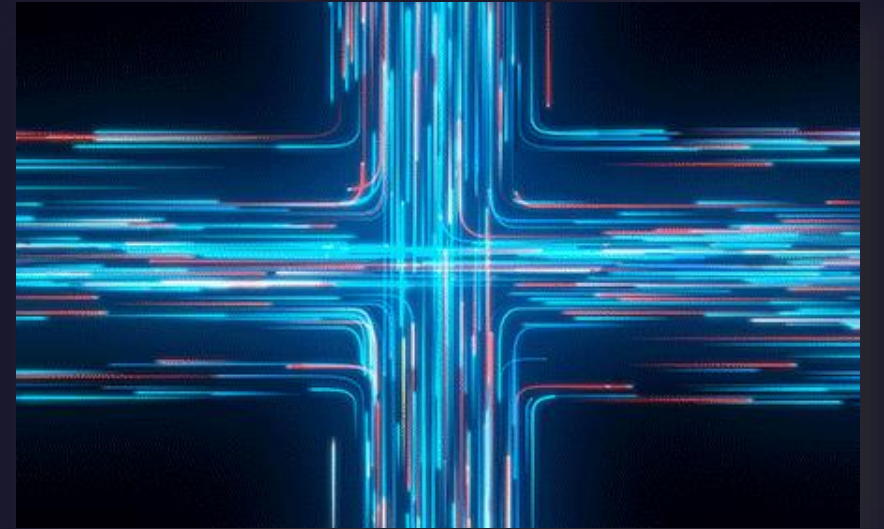
20190190	Khaled Waleed Fawzy El-Saied
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20190329	Abdallah Mohamed Elbelkasy
20190099	Islam Wagih Emam
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Agenda



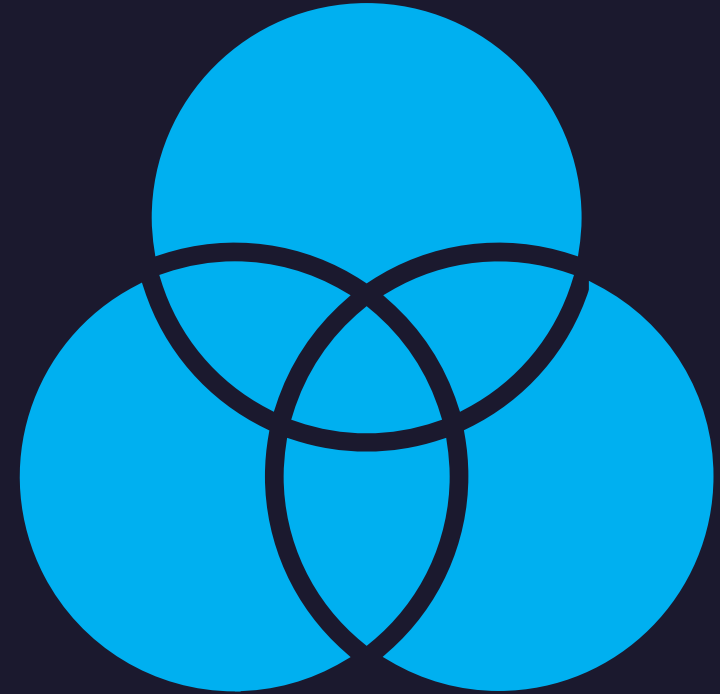
Main Idea

- The network industry's rapid **pace of development** has led to an exponential growth in data generation and processing within switches.
- It is crucial to ensure that switches maintain specific **thresholds** in terms of throughput, latency, and packet loss.
- Network administrators require robust **monitoring** tools to assess **switch performance**, including **metrics** like total packets forwarded and traffic status.



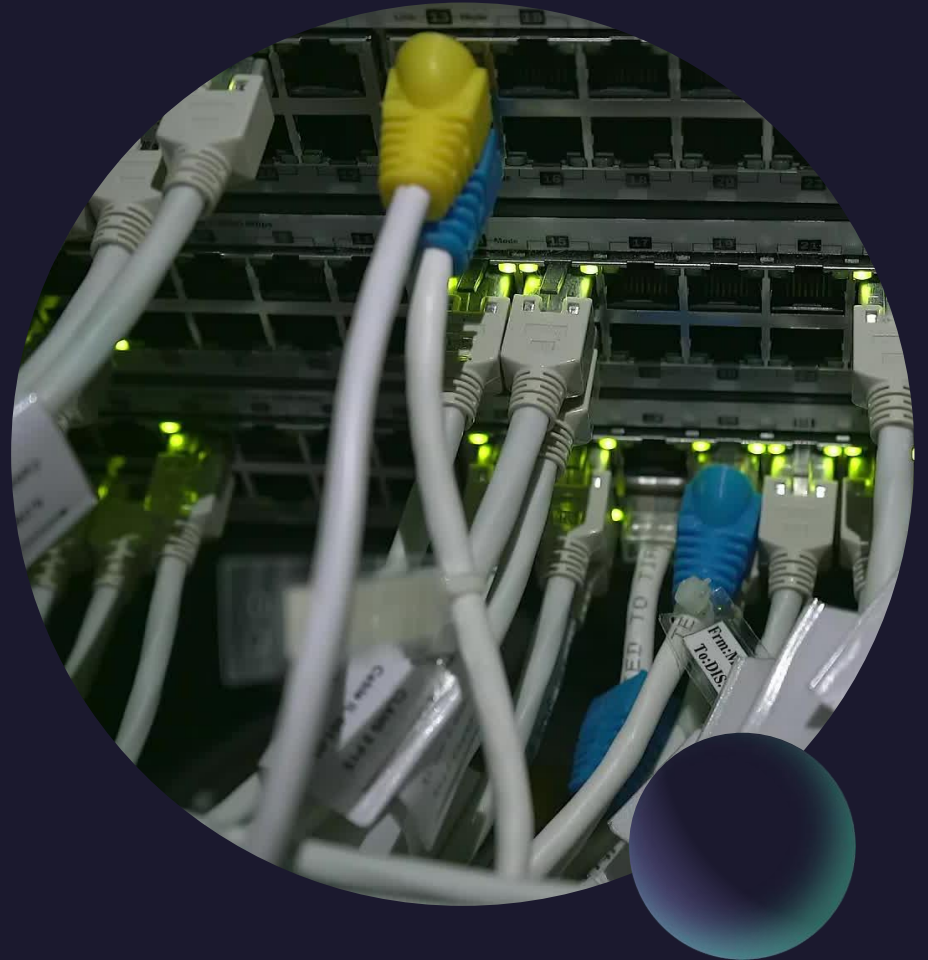
Our Solution

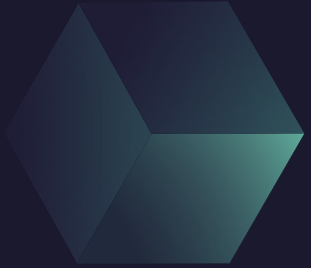
- E-Jam is a comprehensive platform designed to support the **lifecycle** of networking devices and switches.
- Essential facilities provided by E-Jam ensure **seamless** implementation, optimal performance, and adherence to industry **standards**.
- E-Jam offers tools for **verifying**, **testing**, and **debugging** network switches through software, supporting the design lifecycle of switches.



Target Audience

- E-Jam proves great benefit if used in the process of **debugging** and **stress-testing** the network inside a commercial environment.
- Engineers of an **IT division**, **network administrators**, switch **vendors** and **manufacturers** at any business are the main stakeholders of this project.



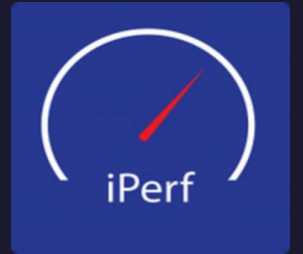


Similar Products



IPerf

An open-source software developed by ESnet / Berkeley National Lab to measure bandwidth of TCP and UDP on IP networks



	E-Jam	IPerf
Pros	- Measures additional statistics (dropped packets, throughput).	- Measures bandwidth and packet loss
	- Provides more visual reporting of data and ease of access	- Allows tuning of TCP parameters and UDP bandwidth
	- Flexible testing using no specific network layer protocol	- Cross-platform compatibility
	- Allows custom tests for simulating real-world environments	
Cons	- Works only on Linux devices For the System API	- Provides limited reporting capabilities
		- Limited to specific network layer protocols

SolarWinds Network Bandwidth Analyzer Pack



A commercial software by SolarWinds for active performance and troubleshooting and networks

	E-Jam	SolarWinds
Pros	- Provides the facility for custom tests	- Identifies bandwidth hogs
	- Offers comprehensive simulation of real environments	- Provides monitoring and analysis capabilities
	- Provides a sleek modern extendable graphical interface	- Analyzes traffic routes and provides hop-by-hop analysis
Cons	- Limited compatibility (Linux devices only)	- Limited to monitoring and analysis capabilities only

A decorative graphic on the left side of the slide. It consists of a small, dark blue sphere with a teal gradient at the top left, and a larger, dark blue ring with a teal gradient below it, partially cut off by the left edge of the frame.

Functional Requirements



Verifying the traffic generated passing through the switch.



Custom tests for measuring switch performance under user-defined conditions.



Pre-set tests to automatically configure streams.



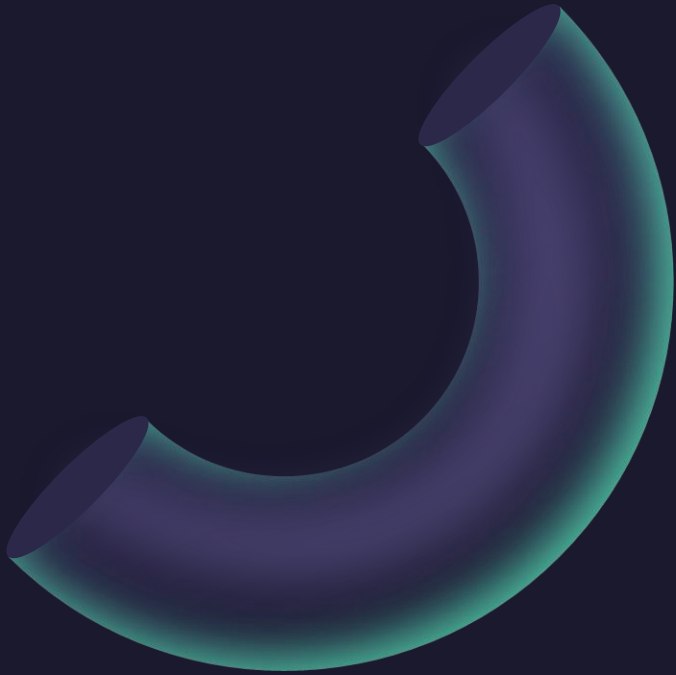
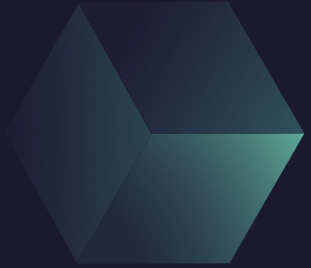
Detailed Logging for events.



Live graphs for the ongoing test.



Maintain results of previous tests and **export** the provided results.



Non- Functional Requirements

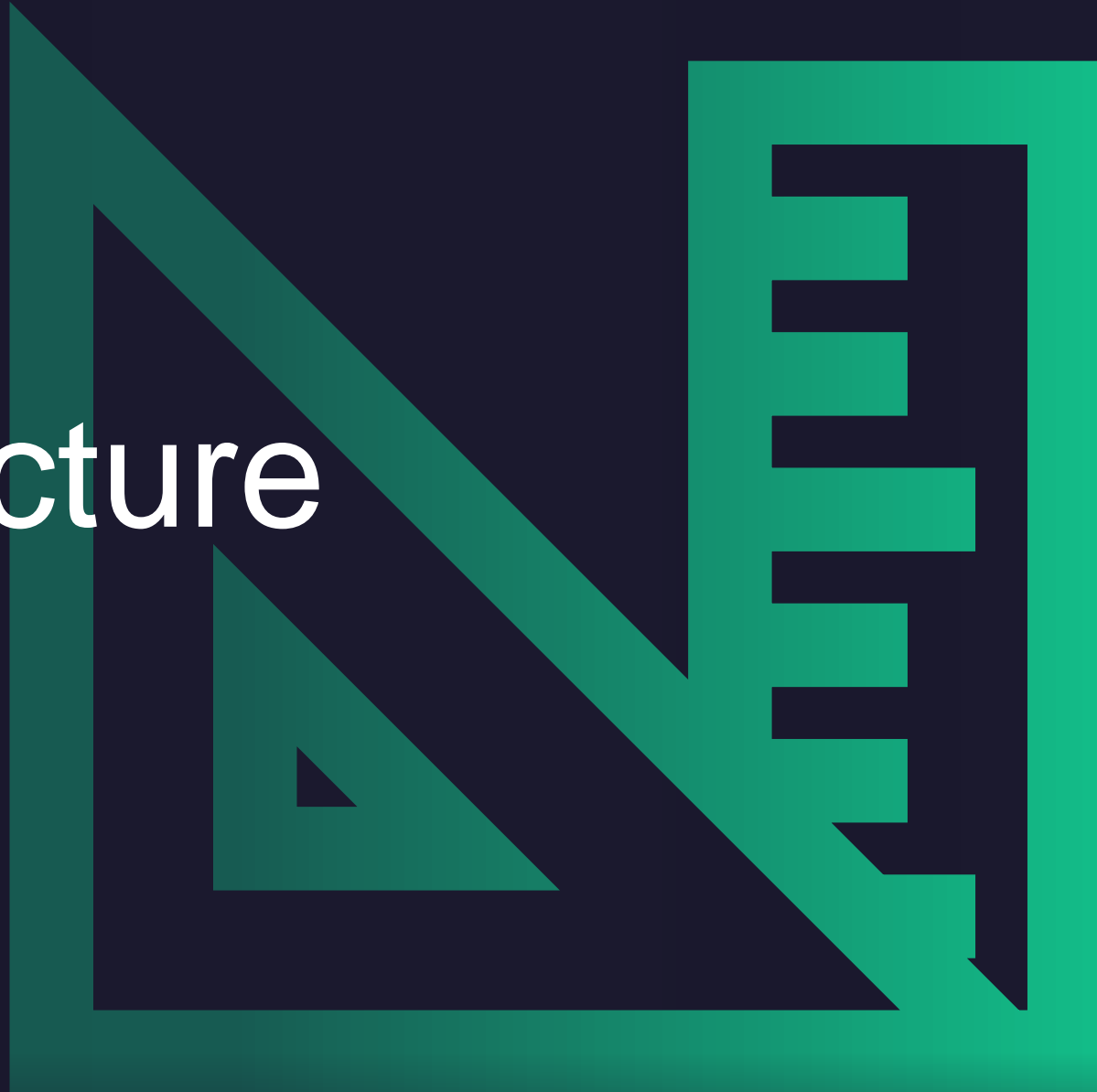


While the core system operates in a **Linux environment**, the User Interface (UI) component of E-Jam is designed to be **cross-platform**.

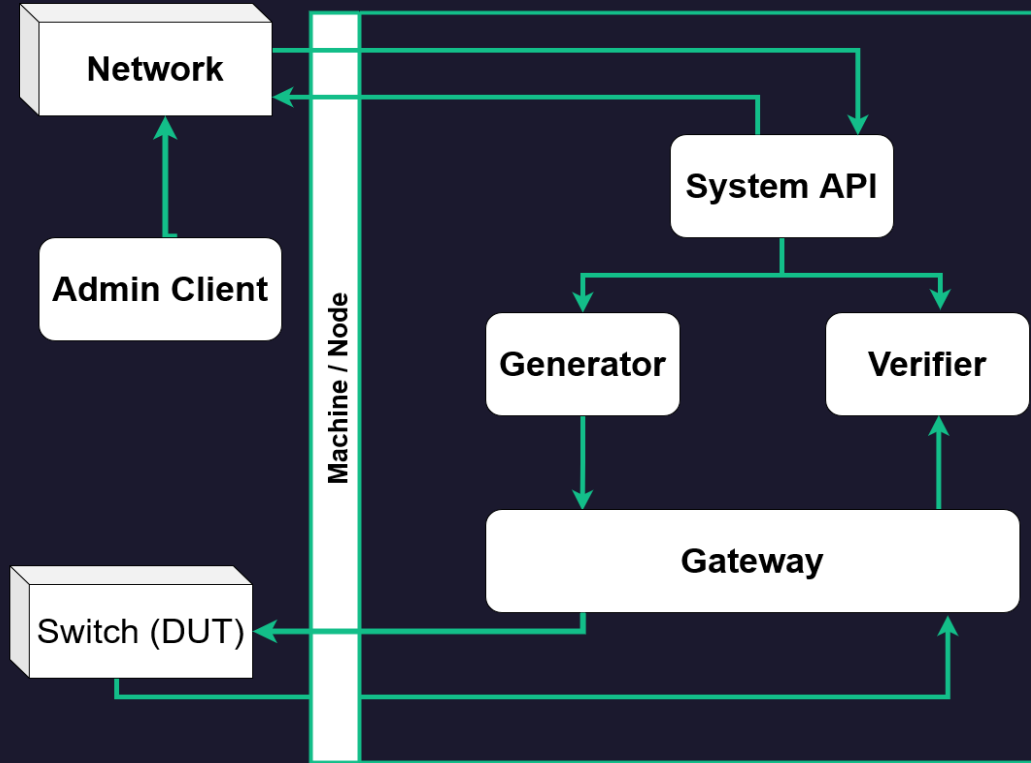


E-Jam is designed to be **user-friendly** and intuitive, even for individuals with **basic knowledge** of switches and their functions.

Architecture



[Centralising controls]



- A test is defined by a set of data streams with a **certain packet configuration**.
- In a stream, groups of devices are specified as **Generators** and other groups are specified as **Verifiers**.
- The software can operate **on one or more** devices (nodes), ideally on multiple devices (to provide more power for tests). All nodes must be connected through **Ethernet** ports to the switch under test (Device Under Test **DUT**).
- The system provides an admin which has a **GUI** where a user can start, control, and monitor test procedures and idle states.

The Admin Client Submodules



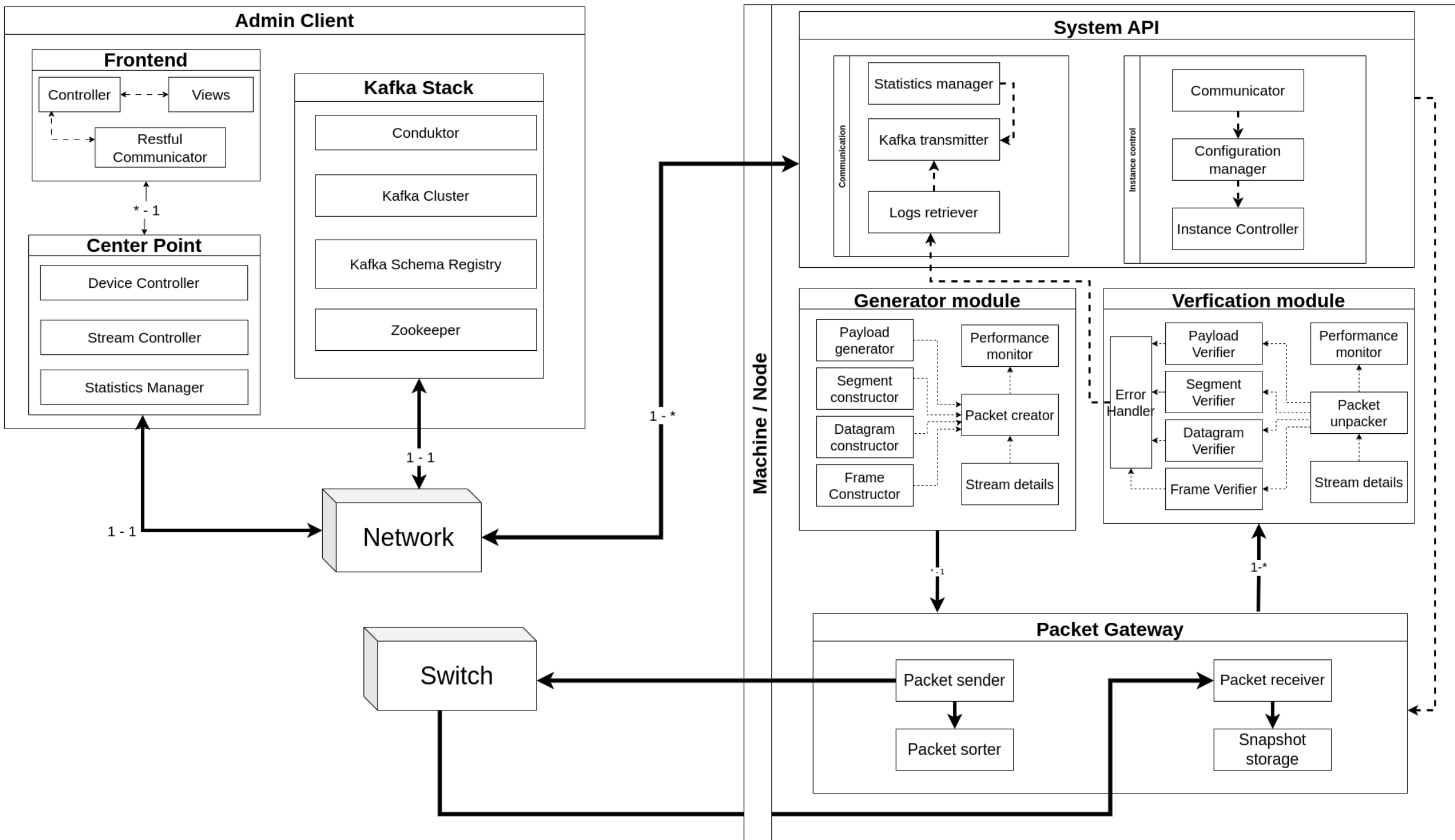
Center Point



Admin Client
API

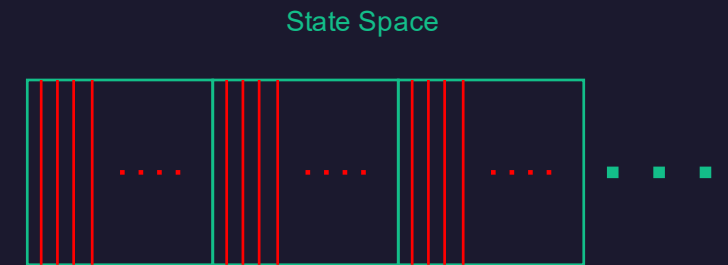


Admin Client
GUI



Generation of Parallel Random Streams

- We need multiple random streams for parallel generators to be truly random.
- We Implement this by using pseudo random number generators which have a facility to jump ahead in state (F2-Linear Random Number Generator).
- This allows us to partition the state space amongst different generators, and to further partition the larger partitions into smaller partitions for each packet.



Sequencing

- We detect out of order packets by attaching a sequence number to each packet in a stream (per generator).
- We maintain a small number of previous missing packets to check if they were out of order.
- After arrival of a certain number of packets with a greater sequence number, the packet is considered dropped.



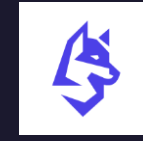
Tech Stack



Flutter



Docker



Conductor



Kafka



Rust



Spring boot



Java



C++



Linux

Graphical User Interface



Dashboard



Stream View



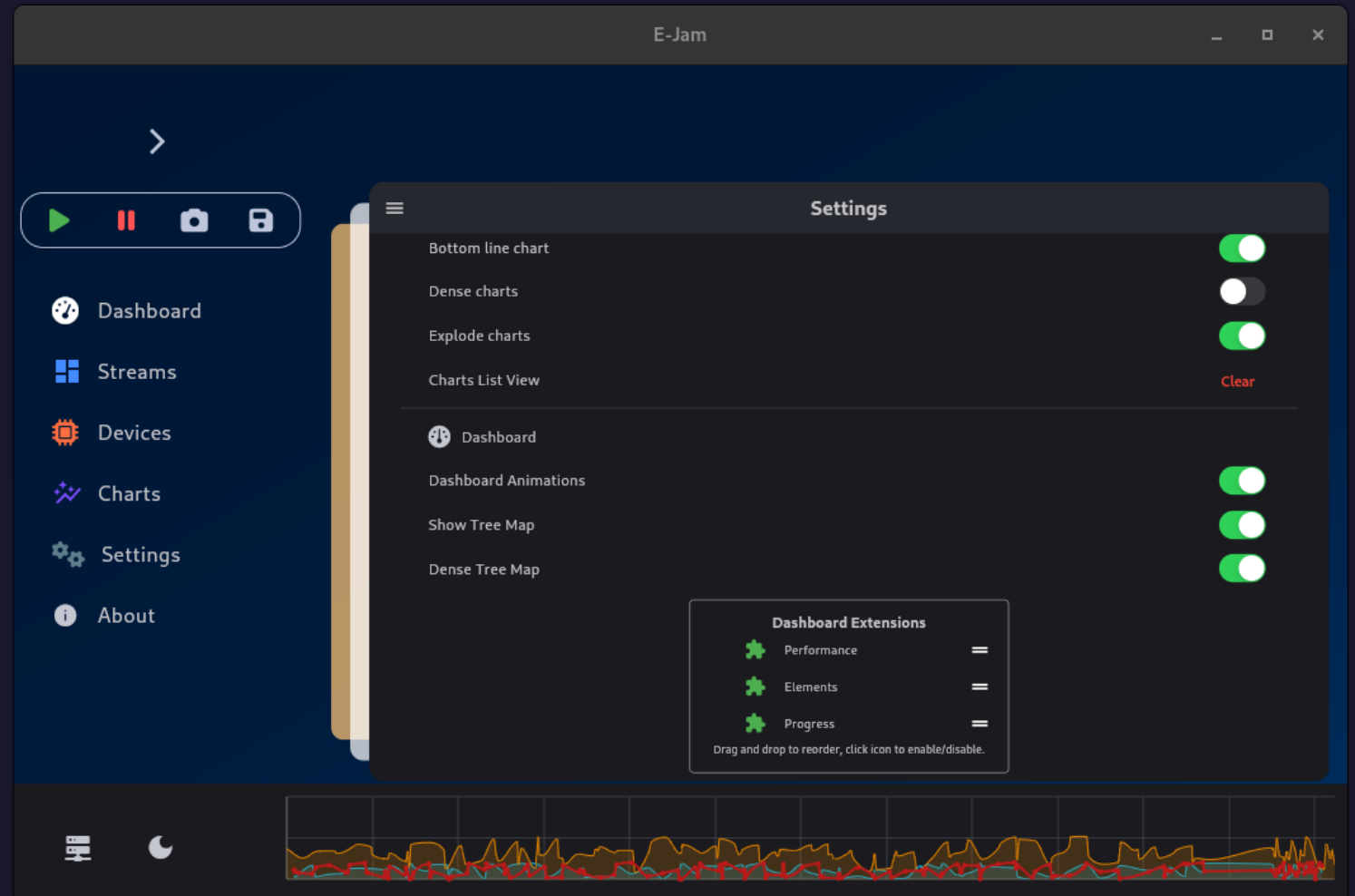
Device View



Pinned Charts



Setting View





Video Demo

This video will be highlighting some key features and functions of the project and explaining how they work.



Live Demo



Special Thanks to the MED Division at Siemens EDA

- We extend our heartfelt gratitude to the MED division at Siemens EDA for their invaluable support, guidance, and feedback throughout the project.
- Regular Biweekly Meetings:
 - We conduct biweekly meetings with the division at their premises to review our progress and receive consistent guidance.
- Special Thanks to:
 - Mr. Mohamed Shaaban: Senior Tech Lead.
 - Mr. Momen Adel: Senior Software Development Engineer.
 - Mr. Ehab Fawzy: Junior Software Development Engineer.
 - Mr. Belal Hamdy: Junior Software Development Engineer.



Thank You

Questions

