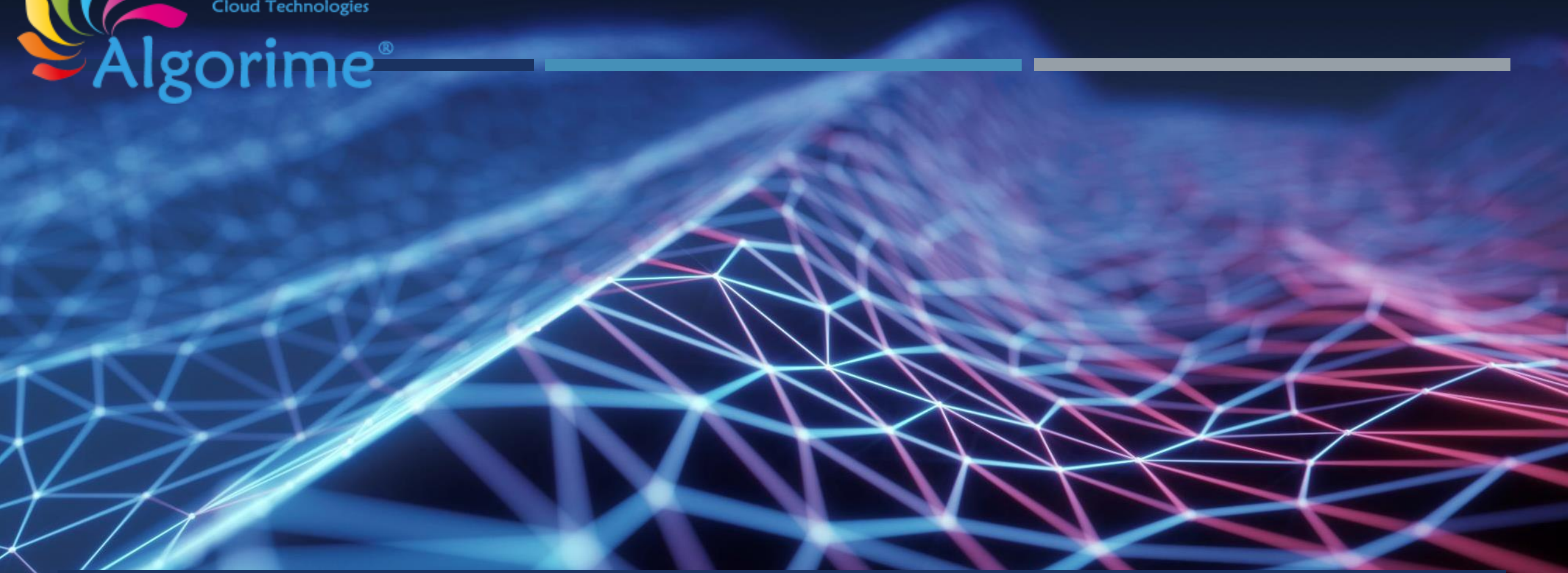
Cloud Technologies

Algorime®



ALGOSASE® AT A GLANCE (EXTENDED DESCRIPTION)

AGILE SECURITY SOLUTION FOR DYNAMIC MESH

NOV 2023

WHY ALGOSASE - AN INNOVATIVE APPROACH

- Never as today the increasing moving of data and information due to digitalization and remote working request high protection to the integrity and the access of a system. Threads like data theft, alteration of the structure, impossibility of access, smarter ackers, for a company can mean risk to stop and block entire manufacturing process, workflow, good delivery, with high costs and losses at different levels.
- The Cloud Security Alliance (CSA) delineated new defensive strategies from aggression on the network with a new concept, called Software Defined Perimeter (SDP), based on the Zero Trust Network Access (ZTNA) , a security framework where access is continuously verified.
- Based on SDP/ZTNA concepts and exclusive capabilities like mesh network with Dynamic Overlay Control (DYNOC©, a patent pending Id #102023000017760 technology) with AlgoSASE® our aim is to enhance the way people connect, to deliver the most agile, safe, and efficient cybersecurity structure.
- **This is the reason why we designed AlgoSASE®.**

THE AGILE SECURITY SOLUTION

- The innovative cyber security strategy
  - AlgoSASE® is an application framework based on idea that no device or user can be trusted, regardless of whether they are inside or outside the network perimeter.
- A one-to-one relationship between user and the data to access
  - AlgoSASE® replaces centralized security controls with distributed software agents that operate under the control of the application manager and provide access to the application infrastructure only after identify verification. These agents create encrypted connections between requesting systems and application infrastructure, with a one-to-one relationship between them.
  - AlgoSASE® IoI
    - An all-in-one device that protects IoT devices providing micro-segmentation, isolation, alert and monitoring.

AlgoSASE® is the Agile Security Solution.

BENEFITS FOR CUSTOMERS

- Trought micro-segmentation AlgoSASE® removes implicit trust and implements micro-perimeter (SDP) preventing techniques of hacking, as lateral movement which can be possible with traditional VPNs.
- It's a SaaS solution (Software as a Service) accessible by client software agents and/or in version with its hardware client.; any apparatus can be connected via LAN/WAN to AlgoSASE®. (Windows, mac OS, Linux, iOS, Android etc..).
- Extremely easy installation, require no change to existing infrastructure.
- Replace traditional VPNs with a superior segmentation solutions in term of security, scalability, easy of installation, management and TCO (Total Cost of Ownership).
- Use modern encryption and communication protocols providing superior performance and security and integrate firewall with the granular access control (IP, ports, services)
- Strong identity control and integration with standard Identity and Access Management (IAM)
- SDK to build agent for a variety of Operating Systems and Hardware architectures.

DESIGN PRINCIPLES

- Cloud native solution based on microservices
  - Small, independents services that communicate over well-defined APIs (RESTful)
  - Leverage microservices and cloud-platforms
- Easy to install (zero-touch configuration).
- Running on COTS devices with low powers, memory and storage (ARM, MIPS processors)
  - Ability to run cheap devices
  - Not linked to a specific device: if it supports Linux (e.g. OpenWRT) we can use it
- Separation of Data Plane from Control Plane
- Zero Trust Network Access principles

KEY FEATURES

- Replaces traditional VPNs with a superior segmentation solution in terms of security, scalability, ease of installation, management and TCO (Total Cost of Ownership)
- Requires no changes to existing infrastructure
- Uses modern encryption and communication protocols providing superior performance and security
- Integrated Host Firewall with the granular access control (IP, service, ports)
- Go SDK to build agents for a variety of Operating Systems and hardware architectures.

KEY FEATURES (CONT)

- All the components are available for inspection and assurance

- Strong identity control
  - Integration with the customer's existing Identity Provider
  - Standard supported are SAML2, OAuth2 or OpenID Connect
  - Integrates 2FA if required

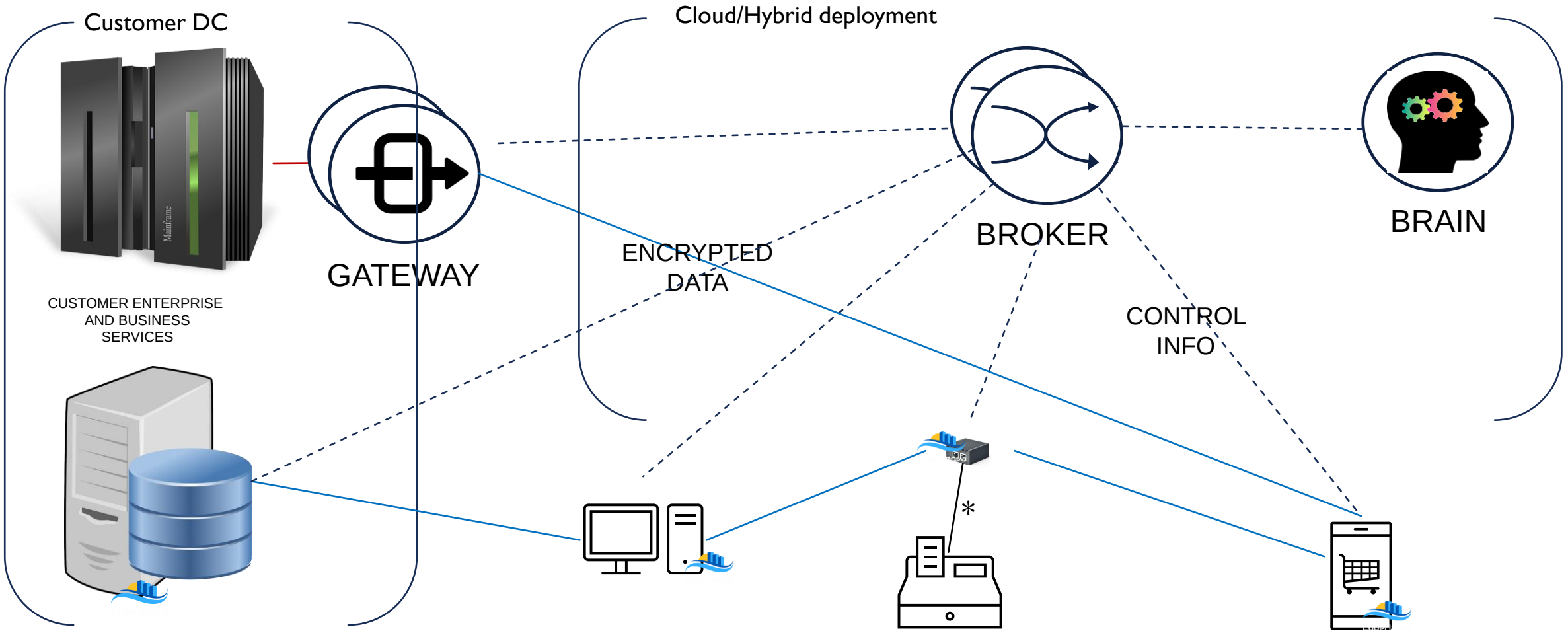
- Granular access filter based on security groups

- Captures and organizes the IP traffic that crosses the mesh by recording it locally and at the same time sending it to the ELK (Elasticsearch Logstash Kibana) for auditing and troubleshooting

FEATURES

Feature	AlgoSASE
Network Segmentation	Yes
Private Virtual Network Mesh	Yes
Active Mesh Isolation	Yes
Running on amd64,arm,arm64,mips,mips64,riscv64,ppc64	Yes
Cloaking (hide device from rest network)	Yes
Support Android and iOS	Yes
Isolation (blocking device internet access)	Yes
Layer 3 Filtering and Access Control	Yes
User Portal	Yes
Active Directory Based Access Control	Yes
Support SAML, OpenID, OAuth2	Yes
Code available for inspection and assurance	Yes
Self-hosted (private)	Yes
Cloud-hybrid hosted	Yes

ALGOSASE OVERVIEW



HOW IT WORKS: DATA LAYER

- AlgoSASE uses Nebula* by Slack to create a private isolated and encrypted mesh groups
  - Nebula is a scalable overlay networking tool with a focus on performance, simplicity and security
  - It has been deployed to over 50,000 devices around the world
  - It runs on Linux, macOS, Windows, iOS, and Android
  - Incorporates: Encryption , Security groups , Certificates and Tunnelling
  - Clients can have their own dedicated implementation
    - Note: this is very important: other similar solutions use "cloud" distributed systems (beacons and relays) owned and operated by a 3rd party. This means that it is not possible to separate traffic between different customers or perform a real pen test (e.g. ZeroTier)
    - We are open to full code inspection and independent security assessment

*An in-depth analysis can be found at https://www.diva-portal.org/smash/get/diva2:1528480/FULLTEXT01.pdf

DATA LAYER: NEBULA & NOISE PROTOCOLS

- Nebula is a mutually authenticated peer-to-peer software-defined network based on the Noise Protocol Framework.
- Nebula uses certificates to assert a node's IP address, name, and membership within user-defined groups.
- Nebula's user-defined groups allow for provider agnostic traffic filtering between nodes.
- Discovery nodes allow individual peers to find each other and optionally use UDP hole punching to establish connections from behind most firewalls or NATs.
- Users can move data between nodes in any number of cloud service providers, data centres, and endpoints, without needing to maintain a particular addressing scheme.
- Nebula uses Elliptic-curve Diffie-Hellman (ECDH) key exchange and AES-256-GCM in its default configuration.
- Nebula was created to provide a mechanism for groups of hosts to communicate securely, even across the internet, while enabling expressive firewall definitions similar in style to cloud security groups.

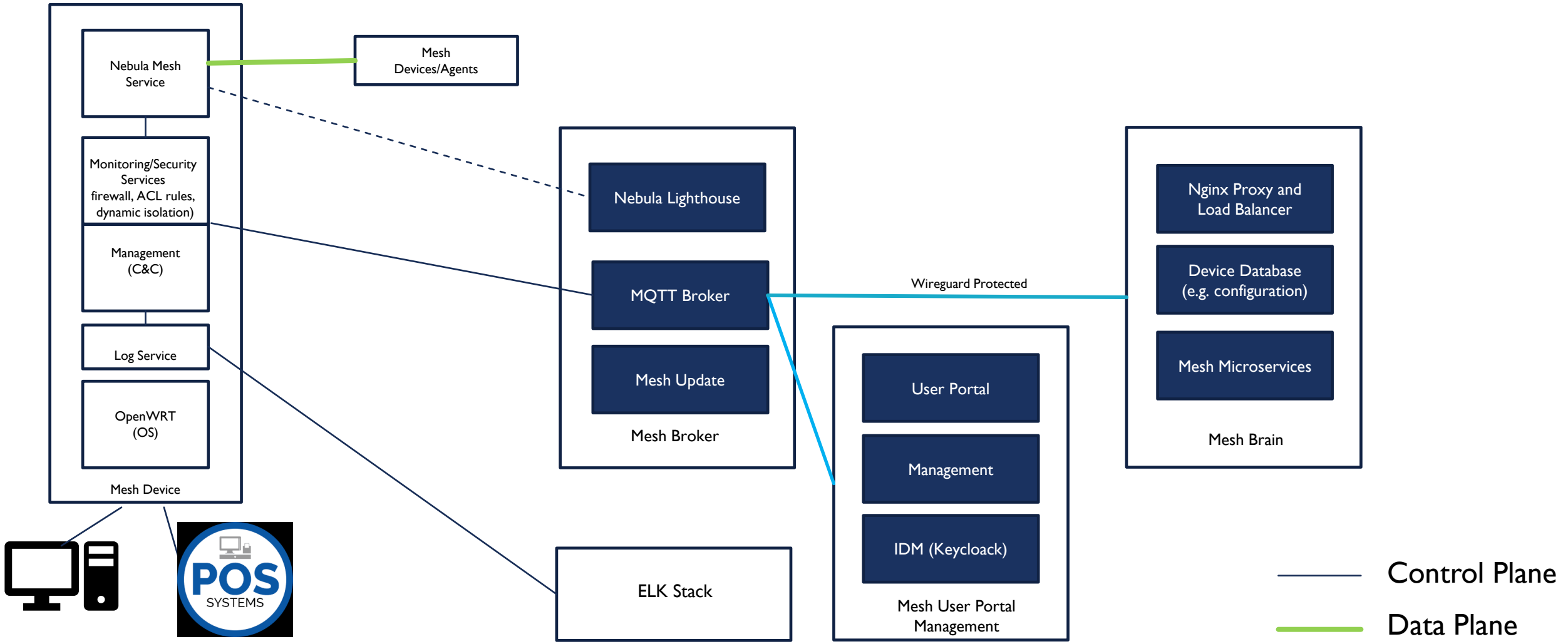
ALGOSASE DEVICE SECURITY

- The security of the Operating System
- All hardware devices qualified by us have Linux based operating systems.
- The security of the Linux system firewall built into the kernel (iptables).
- The security of the Data Layer.
- Encryption of the certificates and configuration are encrypted on the device and in transit.
- Serial numbers are unique and calculated at every boot: the solution prevents two devices with the same ID and only one device can write/read to its own MQTT topic.

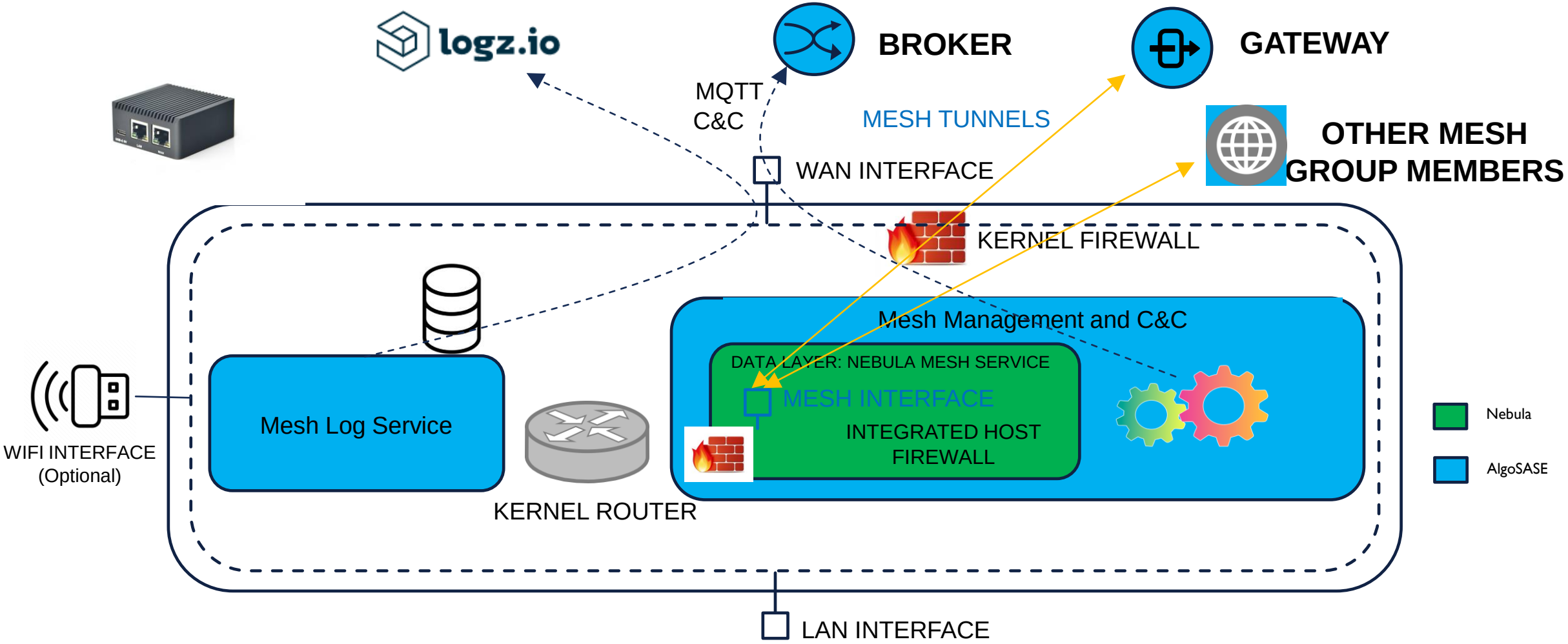
HOW IT WORKS: CONTROL LAYER

- The Control Layer is Algorime's intellectual property:
  - Orchestration and the management of the mesh technology (Nebula)
  - Zero-touch configuration of the device
  - Active Mesh Isolation
  - Autoenrollment, registration and activation of the device/agent
  - Monitoring and control (e.g. update)
  - Dynamic configuration (e.g. group management, access rule, routing)
  - Deployment management
  - Integration with Identity Management solutions (e.g. AD, SSO)
  - Automatic Nebula certificate management
  - Additional security features such as the encryption of the Nebula certificates and configuration in transit and at rest

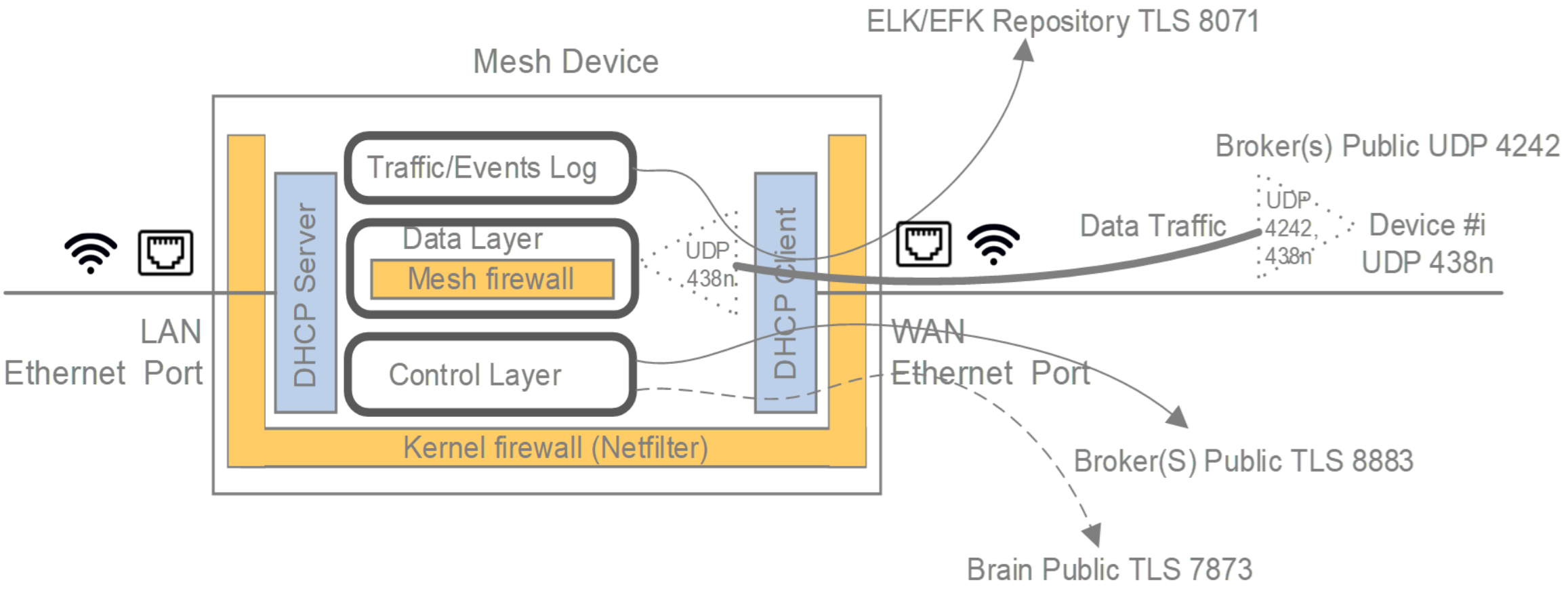
ARCHITECTURE OVERVIEW



DEVICE – MAIN FLOW



DEVICE – CLIENT FLOW



COMPONENTS

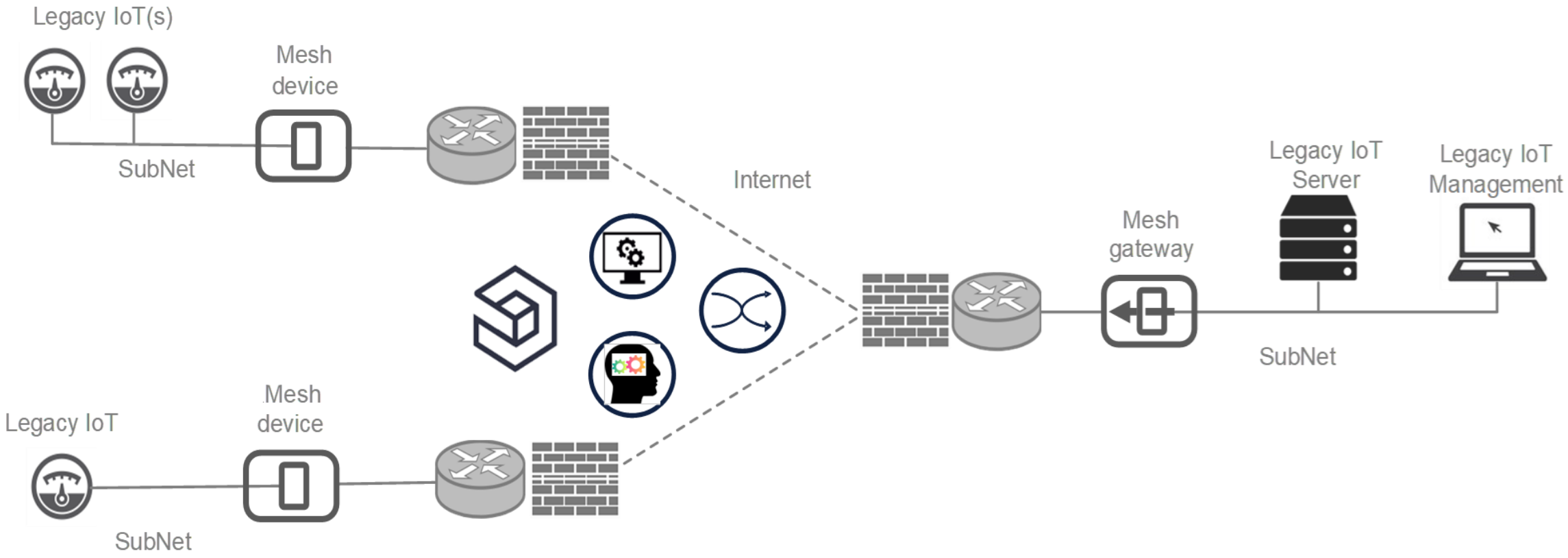
- AlgoSASE Brain:
  - The "Heart" of the system
  - Written in Node.js (efficient performance, easy deployment process, ability to handle multiple requests and scale smoothly)
  - Some of the microservices:
    - Start/Stop mesh
    - User enrolment/activation
    - Device enrolment/activation
    - Nebula enrolment/activation
    - Group management
- Communicates only with the Broker over a secure (Wireguard) connection
- Can be hosted in our cloud (as a service) or at the Service Integrator cloud/DC, or customer cloud/DC
- Code available for inspection and assurance

COMPONENTS

- AlgoSASE Broker:
  - Connections from behind most firewalls or NAT
  - Based on the facto IoT messaging protocol MQTT (Mosquitto Eclipse server)
  - All communication encrypted and mutually authenticated
  - Lighthouse for Nebula mesh
- AlgoSASE ELK stack
  - Collect stats about mesh usage and traffic (metadata): time mesh started stopped, user/device link, data rate and amount of data transfer, IP addresses, protocols and ports
  - Offered as a managed service, or for integration with Client Solutions
  - Can be replaced by other log management /aggregation services
- AlgoSASE Agent/Device
  - Nebula Service (create the mesh) (written in Go)
  - Mesh agent: Management and C&C (command and control) (Written in Go)
  - Mesh Log Service (Written in Go)

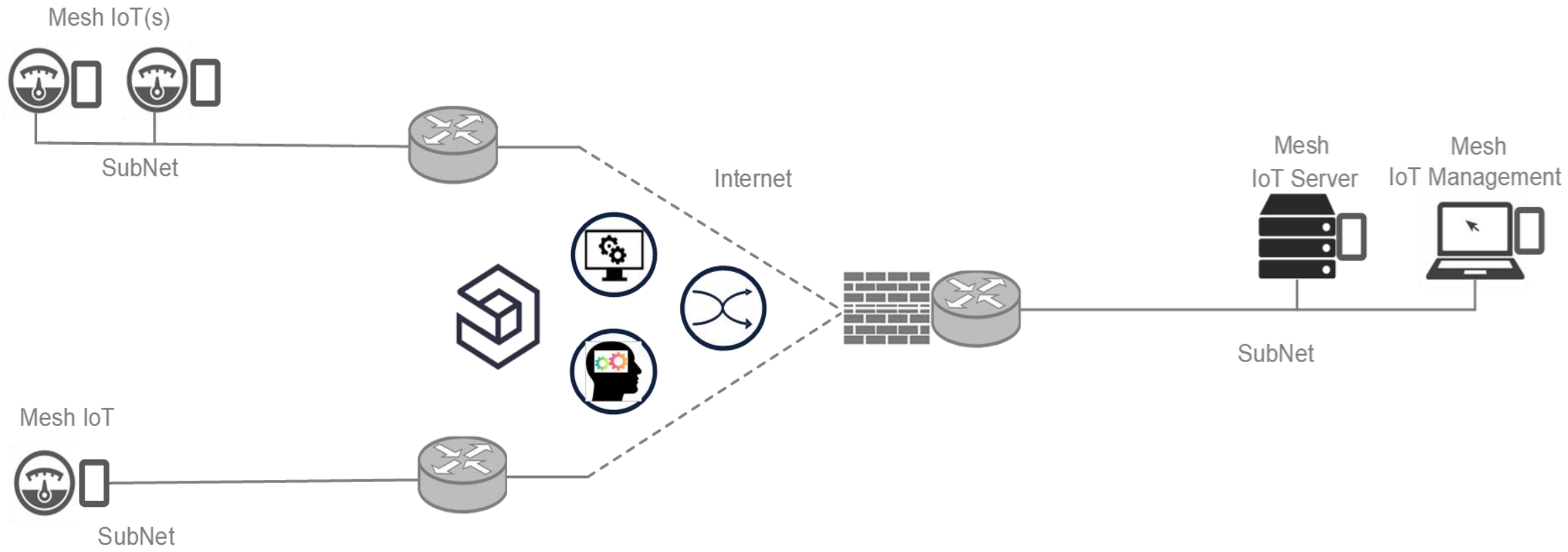
DEVICE – LEGACY IOT USE CASE

Possible use case of legacy IoT(s), AlgoSASE devices and server(s)



ALGOSASE DEVICE – EMBEDDED IOT USE CASE

Possible use case of Industry 4.0. IoT(s) with AlgoSASE embedded and server(s)



ALGOSASE PLATFORMS

- Two Integrated Solutions:
  - AlgoSASE® IoT: an all-in-one device that protects IoT devices by providing microsegmentation, isolation, alert and monitoring
  - AlgoSASE® Remote Worker(*): an all-in-one device that provides remote/home users with microsegmentation and isolation replacing traditional VPN
  - All solutions are in the portable Go language for PC/Server Linux/Windows. Also available integrated into standard hardware network devices (OpenWRT, Linux, RutOS, etc.) to protect legacy targets.

(*):In advanced stages of development, expected by the end of 2024

ALGOSASE: SOME CERTIFIED DEVICES

Model	Manufacturer	SoC	O.S.
GL-AR750S	GL.iNet	Qualcomm QCA9563, single-core @775MHz ARM Cortex A7 32bit	OpenWRT
GL-B1300	GL.iNet	Qualcomm IPQ4028, quad-core @717MHz ARM Cortex A7 32bit	OpenWRT
RUTX08	Teltonika Networks	Qualcomm IPQ4018, quad-Core @717 MHz ARM Cortex-A7 32bit	RutOS
NanoPi R1	FriendlyElc	Allwinner H3, quad-core @1.2GHz ARM Cortex-A7 32bit	OpenWRT
NanoPi NEO3	FriendlyElc	Rockchip RK3328, quad-core @2,4 ARM GHz Cortex-A53 64bit	OpenWRT
NanoPi R2S	FriendlyElc	Rockchip RK3328, quad-core @2,4 GHz ARM Cortex-A53 64bit	OpenWRT
Hypervisor	Microsoft, VMware etc	Intel i9-9980HK, octa-core @2.40GHz x86 64bit	OpenWRT, Linux

STATUS & ROADMAP

- AlgoSASE IoT is at the Minimum Viable Product stage, has successfully completed two POCs
  - Largest IT Service provider to Italian Local Government administration (>50 devices, distributed sites across EU)
  - West-Sud uses AlgoSASE for his developers in smart working connections

- AlgoSASE Remote Works is in advanced stages of development, expected by the end of 2024

- Next development includes:
  - Management portal for IAM configurations and roles
  - Expand functionalities of User Portal
  - Dockerizing inside Kubernetes for large enterprise

THANKS FOR YOUR ATTENTION

Cloud Technologies

Algorime®