HIVEMQ

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Proximie is a fast-growing MedTech scaleup that is revolutionizing how surgical clinicians collaborate in the operating room and remotely. The company has developed a cloud-based platform that combines machine learning, artificial intelligence, and augmented reality that enables surgeons to virtually collaborate from anywhere in the world. With hubs in London, Boston, San Francisco, and Beirut, Proximie is bringing connectivity to operating rooms around the globe. Currently used in 500+ hospitals in over 50 countries, Proximie has supported more than 18,000 procedures across every surgical discipline and is improving patient safety and access to safe surgery through enabling thousands of users to share skills, learn, educate, and exchange best practices.

Proximie relies on HiveMQ as a pivotal component in their Distributed Communication Platform. Leveraging the established interoperability of the MQTT protocol and the advanced capabilities of the HiveMQ MQTT broker, Proximie software allows multiple people in remote locations to virtually interact in a way that mimics what they would experience if they were standing in the same operating room. This means surgeons can physically show each other where to make an incision, in real-time, use physical gestures to illustrate a technique, or even guide one another through procedures. As a result, Proximie can effectively remove the barrier of geographical location to amplify the impact individual clinicians can have and rapidly scale access to vital surgical care.

The intersection of technology and healthcare

The Lancet Commission and World Health Organization (WHO) estimate that 5 billion of the world's 8 billion people lack access to safe, affordable surgery. Proximie aims to help bridge that gap with technology that amplifies the impact of the work surgeons do. The goal of the Proximie team is to create a world where operating rooms everywhere are connected, digitized, collaborative, and intelligent so that all patients have the best access to care, the first time, every time.

Proximie

Location
London, United Kingdom

Application
Distributed Clinical Collaboration Platform

Key Challenge
- Non-intrusive, absolutely reliable, bi-directional device communication
- Interoperability and accessibility on any device with no vendor lock-in
- Ability to work on low bandwidth while still delivering low latency

Results
- A robust highly available and reliable distributed communication platform that facilitates real-time collaboration. Proven ease of implementation and operation on a full range of devices in diverse contexts around the world
- Unlimited scalability with excellent expandability options for future development. Huge acceleration in skill acquisition. An unobtrusive and intuitive user experience that fits smoothly into existing OR workflows

Under the leadership of CEO and founder Dr. Nadine Hachach-Haram, the Proximie team has worked hard to develop open technology that can work with many different players. Proximie believes that to be truly transformational, their technology must be something that everyone can access, not siloed into one specialty, device, or geographical region. To achieve that end, the company implements a 'software first' approach with clear criteria:

- An intuitive design that can plug into any part of the global healthcare ecosystem.
- Lightweight and easy to deploy on low bandwidth networks.
- Hardware agnostic software with no vendor lock-in.
- Ability to run on any device a hospital or clinician has available.
- Equally usable in a challenging environment as in a high-end hospital.
- Unobtrusive, absolutely reliable user experience for all participants
- MQTT and HiveMQ guarantee seamless real-time communication

To ensure that their platform can run on any reasonably capable laptop, Proximie opted for a browser-based solution. Google Chrome or Microsoft Edge is all you need to connect. Log in to my.proximie.net and you are in a case with three clicks. The difficulty was that a purely browser-based solution would limit them to interact with device hardware that Chrome and Edge can recognize.

"What we like about HiveMQ is that we never have to worry about it. Our HiveMQ MQTT broker just works. "

Richard Carter, VP of Engineering at Proximie

"What we wanted is to decouple Proximie from the underlying hardware and its operation. We looked for a standard that would allow us to communicate with basically any device anywhere (even over low bandwidth networks). That's clearly MQTT. If you want to communicate in an assured, easy-to-understand way, and you want to be able to make sure that devices are operating correctly, you need a protocol. We believe MQTT is the right protocol." asserts Richard Carter, VP of Engineering at Proximie.

To achieve bidirectional MQTT communication in a dependable way that clinicians could trust, Proximie knew they would need an absolutely reliable MQTT broker. Multiple considerations led to their selection of the HiveMQ Enterprise MQTT broker:

- Personal health information calls for extremely precise network data routing and control of where the data is at rest. The possibility to host the HiveMQ MQTT broker in specific public cloud data centres met a key requirement for Proximie. That requirement ruled out the service offerings of large cloud-based SaaS platforms.
- Proximie places great emphasis on interoperability and being able to leverage hardware infrastructure that already exists in hospital operating rooms. HiveMQ's full compliance with the MQTT 3 and 5 specifications ensures that device implementations that are coded to the MQTT standard will work as designed (even if the Proximie SDK is not used).
- Extensibility also played a part in the decision to use HiveMQ. Proximie uses the HiveMQ Enterprise Security Extension to tightly manage device access to specific topics and sessions. Proximie engineers also take advantage of HiveMQ's powerful extension framework to build custom extensions for necessary tasks such as device registration, device authentication/ authorization, and matching the correct Chrome instance with the right device no matter where it is located around the world. For Proximie, HiveMQ's ability to hand control to the right device and the right participants in a secure way with no latency is critical.
- HiveMQ elastic clustering uses a truly distributed and masterless cluster architecture. There is no single point of failure and the cluster can grow and shrink at runtime without losing data or availability. For Proximie, the scalability and high availability HiveMQ offers are indispensable.

Richard Carter sums up, "*We looked around and, if we are completely honest, HiveMQ was really the only MQTT broker candidate that ticked all the boxes. We saw no advantage in going out and recreating everything HiveMQ already delivers. Building our own MQTT broker would be too expensive, too risky, and simply not something we wanted to do.*"

A journey of collaboration to accelerate change in a complex system

Proximie has a strategic partnership with Teladoc, a large manufacturer of telehealth devices, to produce a compact robotic stack that is there to assist the surgeon. The Teladoc hardware consists of a highly repositionable Microsoft Surface as a core computing hub that provides the screen and a range of fixed and moveable cameras. Two cameras are incorporated onto the case and one is mounted on the end of an overhead boom. The central case is capable of 360-degree movement to enable the operating room (OR) surgeon to precisely position the cameras and screen.

The Surface in the OR establishes a WebSocket connection within Chrome for MQTT messages. Using a custom SDK that Proximie created for the Teladoc integration, remote participants can control aspects of the Teladoc device over HiveMQ from within the session.

Their collaboration with HiveMQ has enabled Proximie to bring a Teladoc Lite 4 with Boom Arm to market that enables real-time clinical collaboration and doesn't require a lot of behavior change for clinicians who are in the operating room. Proximie is keenly aware that at the point of care, surgeons think only about the welfare of the patient. If technology gets in the way of patient care, you can be certain it won't be used. The reliability HiveMQ provides is essential to Proximie's ability to support and assist without being intrusive. If Proximie fails, surgeons will simply stop using it. That is the risk Proximie faces and why they place such a premium on reliability.

"*What we like about HiveMQ is that we never have to worry about it. Our HiveMQ MQTT broker just works. As for scalability, we are not going to stretch HiveMQ to its limits straightaway, but it is important for us to know there is plenty of headroom. With HiveMQ's clustered architecture, we're confident that no matter what it is that we have to do HiveMQ will be able to handle it.*" remarks Richard Carter.

Using HiveMQ, Proximie can control aspects of the Teladoc device that are completely invisible to Chrome. MQTT messages go over WebSockets to the HiveMQ broker and are distributed to the right topic. Two HiveMQ broker clusters, one in the US and one in the EU, ensure that all MQTT messages are forwarded to the correct connected devices. The specified device picks up the MQTT message and moves as instructed in near real-time.

Feedback from participants consistently applauds the absence of any noticeable latency and the feeling of actually being present in the room that creates.

"What HiveMQ is really being used for is an enabler for every participant whether human or digital in the OR to be able to send and receive communication messages to each other at the device level. This isn't about chats. This isn't about video. This is about how you communicate and pass data both around the OR and between participants and the OR.

We see a lot of possibilities for expansion with HiveMQ. It has not just solved this one problem. It's given us the opportunity to enable a much more cohesive assembly of devices in the OR that is under very tight control." concludes Richard Carter.

Reliable connectivity for medical devices with highest availability demands

Connected devices, especially medical devices, and emergency response systems, require reliable, secure and near real-time IoT data connectivity.

HiveMQ and our consulting partners can help develop a robust messaging architecture for your IoT platforms.

Contact us to discuss how HiveMQ's MQTT platform can be a game changer for your connected devices solution.

Contact us sales@hivemq.com
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