Case Study

Perimeter Defense
Data Security

R2 and Intel Partner to Offer Novel Approach to RF Safety and Security

Intel and startup R2 partnered to expand R2's business opportunities by enabling radio frequency (RF) device detection, localization, and classification on high-performance, commercial off-the-shelf (COTS) products and technologies

An alum of Intel® Ignite in Tel Aviv, RF cybersecurity startup R2 worked in partnership with Intel to hone and optimize their RF safety and security solution, which offers a leap forward in perimeter defense. By migrating their demanding workload to an Intel® platform, R2 was able to bring a cost-effective, commercially viable RF safety and security solution to the market. R2's highly scalable solution can detect wireless threats in any kind of installation or property, using COTS technologies and products. This successful partnership effort showcases how the Intel Ignite startup growth program helps businesses accelerate innovation with COTS solutions that drive fast business results.

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—Dr. Yiftach Richter, CEO, R2

The growing threats presented by RF devices

Wireless, RF-enabled IoT devices such as drones, cell phones, satellites, Bluetooth, and Wi-Fi routers are already ubiquitous, and their presence is growing. These IoT devices are vulnerable to being hacked and manipulated. The hackers can use these devices for clandestine activities to aid data theft or other criminal activities. A powerful tool called RF hacking can enable bad actors to deploy sophisticated threats like rogue access points and devices to jam or spoof critical communications and GPS. These RF hacking tools are easy to assemble with consumer parts and software from the internet and can be deployed in drones, handhelds, or both.

At an airport in England, a single suspected drone incursion led to the cancellation of 1,000 flights.

There are several perimeter safety and security approaches used to detect intruders. Smart cameras and radar are among the most widely adopted strategies, and under ideal operating conditions they provide sufficient levels of information. In practice, however, their performance is degraded by conditions such as rain, snow, dust, obstacles, and variable terrain. What's more, these solutions have a high false alarm (false positive) rate. They also do not provide information about malicious RF attacks.

Passive RF sensors are an alternative to smart cameras and radar. Passive RF sensors provide sensor data that is highly reliable and more actionable. RF safety and security is also less intrusive and easier to deploy. Because of computing complexities, however, RF sensing solutions have been cost prohibitive and used only by governments.

Challenge: Promising startup with a demanding workload

R2 is an Israeli startup with deep expertise in security and signal processing. Employing a patented algorithm, R2's solution transforms a signal into bits for analysis that delivers actionable data to operators. R2 recently signed a commercial agreement to protect a large number of critical infrastructure sites with their novel approach to RF safety and security. R2's solution uses low-power passive RF sensor arrays to observe the RF signal of devices inside the perimeter.

The sophisticated algorithm combines the solution's matrix multiplication workload with deep learning and machine learning models. This workload makes it a challenge to find a scalable compute platform with efficient performance while meeting the size weight, power, cost, and cooling (SWaPC2) requirements for the solution.

Solution: Business and technology acceleration through Intel Ignite

Intel saw the deep value R2 could offer businesses for safety and security applications. From a field of standout startups, Intel selected R2 for participation in the Intel Ignite accelerator program. This partnership helped R2 move rapidly through multiple stages of business and solution development.

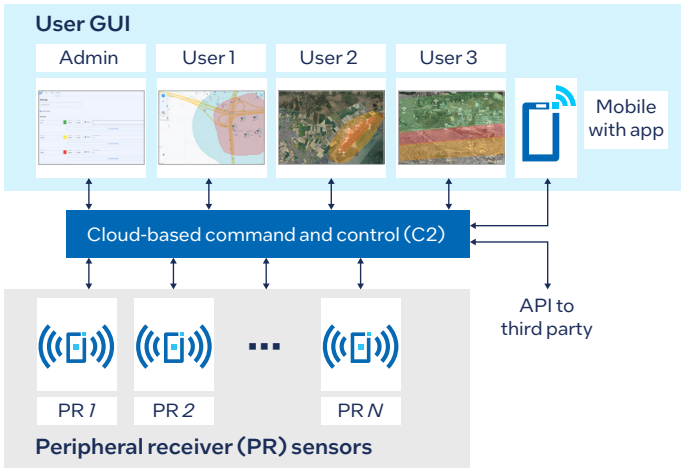


Figure 1: The R2 system uses passive observation of RF signals and proprietary signal processing technology to classify, identify, and locate RF devices in a given area. It also provides actionable data in near-real time via cloud-based dashboards, so operators can quickly mitigate threats.

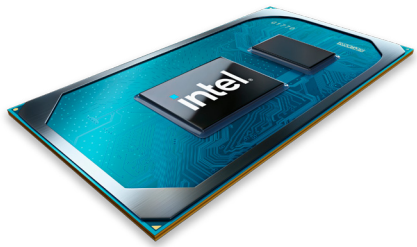
When R2 joined Intel Ignite, the R2 solution was dependent on a specialized GPU architecture to handle their complex signal processing workload. R2 wasn't exposed to the scalable, COTS, lower-cost, open ecosystem options enabled by Intel® technologies and products. Intel Ignite provided R2 with the right support, including hardware platforms for trial products.

"Migration to Intel® architecture from specialized GPU architecture was easy and quick for R2. What's more, transitioning between Intel® platforms for testing to address SWaPC2 needs took only a few hours," says Dr. Yiftach Richter, CEO of R2. The speed of this transition helped reduce R2's development time. Before long, R2 was able to build an optimized platform that delivered their customers' performance needs at a dramatically lower overall SWaPC2 than a specialized GPU-based solution.

Bringing down the cost and complexity of RF safety and security

Using Intel COTS and open-ecosystem–based products and technology rather than specialized architectures, R2 was able to bring down the cost and complexity of their RF safety and security solutions. In R2's testing, 11th Gen Intel® Core™ processors were highly performant and more cost-effective overall than the specialized, GPU-centric infrastructure they had previously employed.

Most importantly for R2's product development, Intel offers a range of solutions that meet a variety of SWaPC2 requirements. This flexibility allowed them to optimize their offering for maximum efficiency across the different parts of their solution—from low-power sensors at the edge to the high-performance cloud instances. Intel also offers a variety of ruggedized platforms that meet the demanding standards of industrial and other harsh environments.



11th Gen Intel® Core™ Processors

Key features that enhance the value of R2's RF detection solution and help reduce their time to market:

- Support for Intel® oneAPI and the Intel® Distribution of OpenVINO™ toolkit
- Intel® Advanced Vector Extensions 512 (Intel® AVX-512)
- Advanced hardware-based security and enterprise-grade manageability

R2's proprietary RF safety and security technology helps to protect critical sites

With advanced RF signal detection and processing technology, R2's tools enhance situational awareness and terrain dominance for sites such as industrial facilities and government installations. Using passive RF detection, their solution finds, classifies, and identifies wireless emitting devices within even the widest perimeter. This can help prevent the aerial or terrestrial intrusion of devices and individuals into secure areas. Unlike smart camera solutions, the system passively intercepts signals from devices without capturing biometric data. Detection information from the solution's sensor arrays is processed and delivered to central dashboards for assessment and action.

Unique benefits of R2's solution:

- Doesn't interfere with local communications (e.g., cellular, Wi-Fi, Bluetooth)
- Uses commercial off-the-shelf (COTS) components
- Can easily identify allowed vs. unknown or disallowed devices
- Doesn't infringe on personal privacy: doesn't require the capture of personally identifiable information
- Offers cloud-based controls and dashboards at the command control and processing center located in user's back end
- Can protect wide areas—no limitation on the scalability
- Able to deploy in a wide variety of types of sites and environments

Underlying Intel® hardware features that benefit R2's solution

Vector processing capability: R2 benefited greatly from Intel® Advanced Vector Extensions 512 (Intel® AVX-512), which dramatically boosts the speed and performance of the most demanding vector-based computational tasks. Intel also provides the tools to be able to optimize the applications with the right compilers and tools.

Hardware-level security: Because of the highly distributed nature of R2's RF safety and security solution, elements of their solution need to be placed in far-flung places. Intel® products provide hardware-based security capabilities that enable R2 to protect the solution from threats all the way to the application level.

AI acceleration: Intel® processors offer exceptional performance for the most demanding AI workloads. To help with edge compute–intensive solutions, 11th Gen Intel Core processors are available with built-in acceleration for AI workloads. Intel products can provide better performance per watt per dollar (perf/W/$) than specialized architectures for most applications.

Cloud integration: A key aspect of R2's solution is the command and control (C2) dashboard that is delivered to users on nearly any device via the cloud. Intel-based cloud instances are available in markets across the globe and offer exceptional performance and total cost of ownership (TCO) for businesses.

Software tools that speed results

R2 also leveraged the Intel® oneAPI toolkit, which provides free compilers and tools for debugging software. The Intel oneAPI toolkit offers resources to find bottlenecks and optimize solutions while also creating a unified platform for software development. Developers can write once and deploy anywhere on any Intel-powered device—from dedicated accelerators to low-power edge devices to the cloud. R2 also took advantage of the Intel® Distribution of OpenVINO™ toolkit, which optimizes computational workloads on a given hardware.

Intel Ignite: Accelerating the success of game-changing startups

Intel Ignite gives ambitious entrepreneurs hands-on mentorship, technical support, and business development guidance so that they can achieve their ambitions and change the world for the better. From hosting lectures on recruiting business talent to assisting with venture capital connections, Intel Ignite is designed to move promising businesses forward. It also eliminates the layers of bureaucracy that startups can sometimes encounter when engaging with a large corporation.

"Intel® Ignite is the best ecosystem for deep tech startups, as you can become part of a prestigious environment—from the entrepreneurs to the Ignite team to the mentors. Among others, Ignite opens worldwide connections to accelerate the validation of the product through advice that inspires you."

—Dr. Yiftach Richter, CEO, R2

Startups chosen for Intel Ignite, like R2, get access to Intel's extensive resources for innovation. Intel Ignite helps startups strengthen their go-to-market strategy by aligning their products with what customers are looking for. This enables startups to overcome significant product development hurdles in less time. After the acceleration period ends, Intel Ignite maintains regular check-ins as the relationship and the startup mature.

Creating a safer, more secure world

When R2 began their journey as a business, they had incredible talent, a sophisticated solution, and a vision for a world transformed by their technology. But technical barriers and market complexities inhibited their ability to scale. Working with Intel Ignite, R2 was able to find a new path to market on Intel® technology. Together with Intel's technical and business experts, R2 was able to bring down the costs to deliver their service and found a flexible platform that could grow fast. The result of this partnership is going to bring RF safety and security protection to more places than was possible before.

Learn more

Intel technologies for IoT

Explore Intel® solutions at the edge.

Read more ›

Intel Ignite

Helping deep tech startups enhance their valuation, optimize their fundraising strategies, and achieve significant strategic impact.

Explore ›

intel® ignite

Why are so many startups eager to take part in Intel® Ignite?

When Intel Ignite selects a startup, their only focus is the startup's success. Participants like R2 get business coaching and technical insights from mentorships with Intel's deep roster of leading experts. The mentors help them hone and focus their professional skills, technology offerings, and business strategy. Intel Ignite also helps amplify their pace of innovation with access to technology solutions for trials and proofs of concept.

About R2

With a team of experienced experts in signal processing and cyber, R2 protects critical infrastructure with proprietary passive RF-based technology at a fraction of the cost of existing solutions.

r2-wireless.com

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