

Technology for Justice

Confidential Computing and the Fight to End Modern Slavery

A Human Rights Tragedy of the 21st Century



In today's modern world, most people see slavery as a historical phenomenon. While the media occasionally covers stories about victims, we tend to think of slavery and human trafficking as tragedies whose time has passed.

Not so. Most people today would be shocked to know that there are more than 50 million human beings trapped in slavery today, more than at any point in history.¹ Slavery in the 21st century is a crime that takes many forms, including sexual exploitation (primarily of women and children), forced labor, domestic servitude, criminal exploitation, organ harvesting, and forced marriage. It also includes human trafficking and smuggling, which often involves recruiting individuals through threats, force, fraud, coercion, or deception on the part of criminals in positions of power.

Standing in opposition to these crimes are groups such as **Hope for Justice**, a non-governmental organization working to end modern slavery and human trafficking and protect the rights of victims and survivors. Founded in 2008, Hope for Justice works to prevent human trafficking; to investigate and identify cases and accompany survivors as they claim their rights to justice, protection, and redress; and to partner with survivors' and other civil society organizations, companies, and governments to address the root causes of people's vulnerability to modern slavery.

Data as a Tool for Justice

In combating modern slavery, data plays a role that is hard to overstate. Imitating legitimate businesses, criminal organizations that profit from human exploitation are skilled at using data and technology to advance their efforts. In response, institutions and organizations like Hope for Justice are looking to harness technology and data to close the technology gap, utilizing it as a tool for good.

Globally, organizations working on cases of human trafficking have collected large pools of valuable data on both victims of slavery and perpetrators, as well as contextual information relating to emerging patterns and trends.

Victim data is incredibly sensitive and invariably includes personally identifiable information, while data on perpetrators may include the financial flows and organizational structures of criminal enterprises.

All of this data is crucial information towards effective investigation and mitigation. However, if this sensitive data is leaked via mismanagement, rogue actors, or cyber threats, it can result in dire consequences for victims, compromise investigations, and hinder prosecutions. As a result, the safest approach for each organization has been to keep all information private, with little or no data exposed to any other actor. However, these relatively strict data practices can also slow or hinder effective investigations and interventions, especially where there are concerns for the safety of an individual. To date, anti-trafficking forces have lacked the tools to overcome the fears around data privacy and securely share data to extract information crucial to the fight for human dignity.



Confidential Computing

Intel and Edgeless Systems enabled Hope for Justice to take advantage of Confidential Computing—a technology that enables sensitive data to be processed confidentially, out of view from unauthorized software or system administrators.

Confidential Computing enables encrypted data to be processed in memory while lowering the risk of exposing it to the rest of the system, thereby reducing the likelihood that sensitive data will be compromised. In addition, it provides a higher degree of control and transparency for users in multi-tenant environments where data can be isolated from other privileged portions of the system stack.

With its focus on securing data and code during processing, Confidential Computing relies on hardware-based controls such as the Trusted Execution Environments (TEEs) enabled by Intel® Software Guard Extensions (Intel® SGX) enclaves. Intel SGX helps provide protection for applications and data independent of the operating system or hardware configuration. This enables multiple organizations to collaborate on shared analyses and validate algorithms while shielding their confidential information or regulated data from the other parties. Intel SGX:

- Helps protect against software attacks, even when other elements of the stack are compromised.
- Helps increase protection for secret content (personally identifiable information and data, sensitive legal information, keys, etc.).
- Provides options for hardware-based attestation to validate code and signatures.

Confidential Computing lies at the heart of the Intel-Edgeless Systems-Hope for Justice collaboration.

The Intel-Edgeless Systems-Hope for Justice Project

Intel, Edgeless Systems, and Hope for Justice built the Private Data Exchange (PDEX), a powerful application to be offered to the global movement to end human trafficking. PDEX enables the various organizations working against slavery to confidentially pool data related to individual cases. After data from these groups is uploaded, the application aggregates and analyzes it, then notifies appropriate agencies when relevant data matches are uncovered.

Given the sensitivity of the data, maintaining high security and compliance is mission-critical. To reap the benefits of collaboration, each organization must trust its data will be kept confidential and private, and the integrity of that data will be ensured. The Edgeless Systems EGo platform is specifically designed to deliver this high level of protection. By leveraging the built-in security and attestation features of Intel SGX, Conclave provides organizations with increased confidence that information about the victims of slavery or those seeking to help them won't be exposed.

The Hope for Justice application workflow:

1. Case data from participating organizations is manually uploaded.
2. The data is encrypted and passed from Client component to PDEX instances shared by the various organizations.
3. The application scans the data to ensure it is appropriately formatted. This takes place within an Intel SGX enclave.
4. The matching code runs inside an Intel SGX enclave so all records are encrypted and inaccessible from outside.
5. Alerts are sent to the appropriate agencies, notifying them that a relevant match has been discovered.

Application Workflow

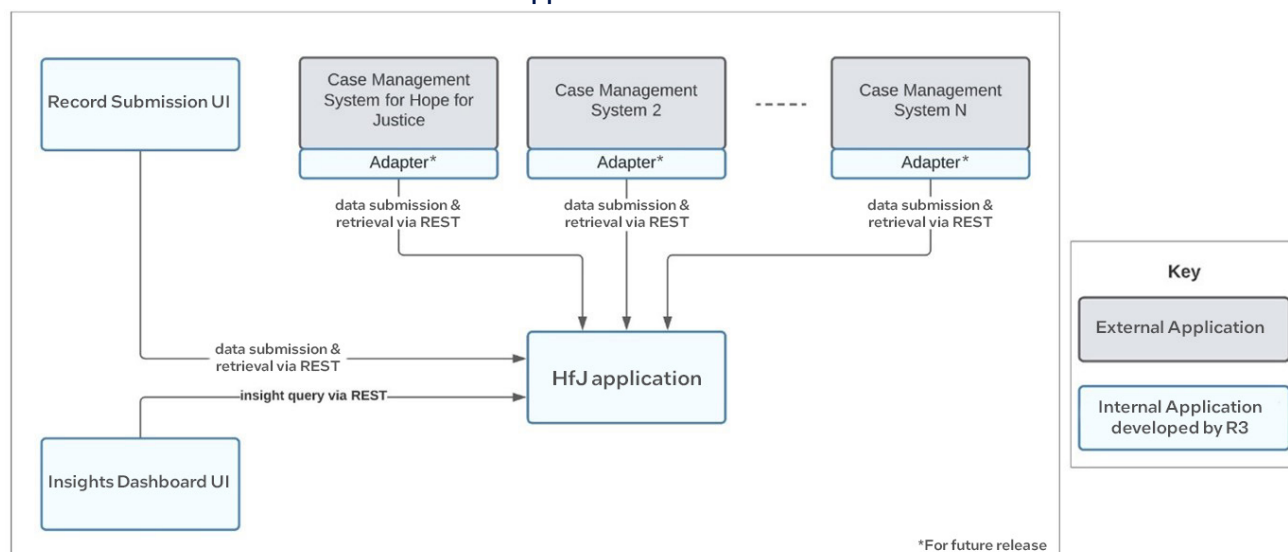


Figure 1: Systems context of the Hope for Justice Private Data Exchange application

Real-world Consequences

The match information will enable participating organizations to realize tangible outcomes in the fight against slavery. For instance:

- Perpetrator matching. If the same person appears in multiple matches, they may be involved in numerous cases of trafficking and be a serial offender or part of organized crime. The appropriate group can begin an investigation or notify law enforcement.
- Victim family name matching. Discovering the same surname in multiple cases may indicate that two or more family members have been trafficked separately. Linking the two cases may accelerate rescue and help reunite the family.
- Address matching. If the same property keeps showing up in results, it may be owned or operated by perpetrators or criminal organizations. This can be enough to trigger an investigation.
- Less obvious matches may not result in immediate investigations but can reveal previously unseen trends. For instance, matches uncovering multiple cases of forced labor in the construction industry might instigate outreach efforts toward construction companies and local governance boards.

Edgeless Systems

Edgeless Systems is a cybersecurity company based in Germany. The company's technology elevates the security of applications and workflows, enabling new and exciting forms of trustworthy data processing. The company is built on the principles of open source, using a community-driven approach to deliver confidential computing technology that is easy to use, scale, and integrate.

EGo

EGo is a framework for building confidential apps in Go. Confidential apps run in always-encrypted and verifiable enclaves on Intel SGX-enabled hardware. EGo simplifies enclave development by providing two user-friendly tools:

- ego-go, an adapted Go compiler builds enclave-compatible executables from a given Go project while providing the same CLI as the original Go compiler.
- ego, a CLI tool that handles all enclave-related tasks such as signing and enclave creation.



Intel and Edgeless Systems are members of the Confidential Computing Consortium, a leading force in advanced data security around the world.

"Human traffickers are exploiting new technology and globalisation at a staggering scale and pace. Most trafficking is now facilitated via the Internet and other digital technologies that pay little attention to borders or jurisdictions. We cannot lose the technology race against human trafficking.

That is why we are so pleased that the Private Data Exchange platform has the potential to revolutionise how the sector collaborates across borders and overcomes issues surrounding data privacy and confidentiality. For the first time, civil society, governments, UN agencies and businesses can truly collaborate to make technology a force that will help to end human trafficking."

Tim Nelson, CEO, Hope for Justice

Industry-leading Intel Technologies



The Intel-Edgeless Systems-Hope for Justice research, development, and innovation (RDI) initiative takes advantage of the industry-leading security capabilities delivered by Intel SGX, the set of security features built into 3rd and 4th generation Intel® Xeon® Scalable processors. Designed specifically to support trusted computation, Intel SGX enables

developers to partition code into hardened enclaves. Data processed inside an enclave is not accessible to other applications, the operating system, or hypervisor.

The combination of Edgeless Systems aggregation features and the power and functionality of Intel technology opens new possibilities for organizations seeking to benefit from the security of confidential cloud computing. Intel technology can serve as the critical link, bringing together widely dispersed data so organizations can extract the previously inaccessible value hidden in it.

Intel's Purpose

We create world-changing technology that improves the life of every person on the planet. Find out more about Intel's corporate responsibility commitment:

<https://www.intel.com/content/www/us/en/corporate-responsibility/corporate-responsibility.html>

Learn more

Hope for Justice

<https://hopeforjustice.org>

Hope for Justice Annual Review

<https://hopeforjustice.org/annual-review/>

Edgless Systems

<https://edgeless.systems.com>

EGo

<https://www.edgeless.systems/products/ego>

Intel® Confidential Computing

<https://www.intel.com/content/www/us/en/security/confidential-computing.html>

Intel® SGX

<https://www.intel.com/content/www/us/en/architecture-and-technology/software-guard-extensions.html>

Intel® Xeon® Scalable processors

<https://www.intel.com/content/www/us/en/products/details/processors/xeon/scalable.html>



NOTICES AND DISCLAIMERS

1. Hope for Justice UK=Modern-Slavery=Human-Trafficking-Briefing=Document-June-2022.pdf. See <https://hopeforjustice.org/resources-and-statistics/resources-facts-figures/>.

Intel technologies may require enabled hardware, software or service activation.

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