VOTIRO

GUIDE

A Complete Guide to Content Disarm and Reconstruction (CDR) Technology

Content Disarm and Reconstruction (CDR) Technology

Have you ever heard of Content Disarm and Reconstruction or CDR? If you have, you might recognize these are terms used for a technology that can eliminate all file-borne threats. In this guide, we provide an overview of what CDR is, how it's used, the history and evolution of the technology, its pros and cons, and how Votiro's technology - Positive Selection® technology - takes CDR to the next level in both security and user experience.

What is Content Disarm and Reconstruction?

So, what is CDR? Content Disarm and Reconstruction is a security technology, that depending on the type of CDR involved, flattens malicious files (Type 1), removes active content from the file (Type 2), or cleanses malicious code from files without impacting the usability of the file (Type 3).

Also known as file sanitization, CDR has multiple forms. In general, CDR does not need to rely on detection to prevent threats. Instead of relying on databases of known signatures, the technology assumes all files are malicious and scrutinizes all files that are outside of the approved firewall.

Depending on the type of CDR, which we'll explain in detail further on, content disarm and reconstruction can remove malware, strip any embedded code, and rebuild the file in a way that disrupts any additional covert malicious code.

CDR does not need to rely on detection to prevent threats.

CDR Type 1

A flattened file delivered as a safe but unfunctional PDF.

CDR Type 2

A file with active content, macros, and other malicious and safe content removed.

CDR Type 3 (Positive Selection Technology)

A safe copy of the original file on a clean template, with all functionality intact.

Who is Content Disarm and Reconstruction technology meant for?

CDR is most often used to prevent file-borne cyber security threats from breaching an organization's network. Industries benefiting from CDR include banking, financial services (credit unions/banks), insurance, telecom and information technology (IT), manufacturing, construction, wholesale distribution, non-profit organizations, chemicals, food and beverage, retail, hospitality, government, public sector, health insurance and healthcare, among others.

The #1 channel for enterprise malware delivery is Microsoft Office documents. — Verizon DBIR

Why is CDR technology needed?

File-borne threats are underestimated but highly risky. According to the Verizon Data Breach Investigation Report, the number one channel for enterprise malware delivery is Microsoft Office documents. With the amount of personal information and company secrets flowing through Microsoft Office, it's only a matter of time before threat actors look to infiltrate and expose this data for financial gain.

Let’s take a closer look at why it might be time for your organization to implement CDR to thwart malware threats and privacy risks:

Traditional defenses are no longer effective

Advanced threats are constantly evolving. Research indicates that an average of 10 million new malware threats are recorded per month. Many common cybersecurity technologies, such as anti-malware and antivirus solution (AV), can only detect known threats and cannot detect or protect corporate networks against undisclosed or zero-day attacks, meaning a vulnerability has been discovered but no patch for it has been developed. In fact, 80% of successful breaches are new or unknown zero-day attacks that are not recognized by traditional signature-based detection solutions.

Opportunities for cyber breaches abound

Today’s ever-increasing reliance on data brings with it elevated risks, threats, and vulnerabilities for organizations and communication networks, and many of these vulnerabilities are undetectable by traditional network security solutions. As the complexity of files increase, cybercriminals have more opportunities for exploits, increasing the need for CDR.

Sandboxes are not sufficiently effective

Despite widespread use, sandboxes struggle to keep up with the increasingly advanced techniques deployed by malware creators. Simple Google searches will provide attackers with the information they need to ensure their malware can evade detection within the sandbox – only executing once inside the production environment – or bypass the sandbox altogether. In addition, large file uploads can cause bottlenecks in the sandbox, and maintenance requires extensive IT resources, time and money, as well as the need to continuously update complex security policies.

Human error poses a risk

90% of data breaches are caused by human error. Despite organizational attempts to educate employees about the dangers of opening files from unknown or unreliable sources, clicking on suspicious links or downloading questionable files, 27% of employees in an organization fail phishing or social engineering attacks. This causes some organizations to restrict internet downloads or file attachments, despite the inconvenience and significant decrease in productivity. With CDR in place, you can reduce human error and regain productivity.

Cost of breaches are increasing

Consequences of a malware attack are significant. Many companies suffer data loss, disruption of service, downtime, damage to the enterprise or organization's reputation, and revenue loss. IBM's research of current breaches shows that the average cost of a data breach globally is $4.45 million, with Apple reporting there was a 20% increase in data breaches from 2022 to 2023.

What does Content Disarm and Reconstruction help protect against?

With the increase in file-sharing – both between co-workers working remotely and between customers, partners, and vendors – enterprises face elevated risks, threats, and vulnerabilities from file-borne malware, and many of these vulnerabilities are undetectable by traditional network security solutions.

By design, an exploit targets a vulnerability in an application and typically triggers an intruder's code. A vulnerability is a "hole" in an application—say, Adobe Reader—that can be exploited to launch an attack on a computer or network system. A common method used by attackers to exploit vulnerabilities is phishing or targeted spear-phishing: sending email messages that contain a malicious attachment and look harmless to the recipients. When a recipient opens the attachment, malware is deployed and the targeted attack begins.

To ensure a successful exploit, malware writers often carefully design and build multiple suspicious objects and embed them in a malicious complex file. For example, a Microsoft® Word file may contain an ActiveX® or OLE object to execute an attack, plus shellcode that is triggered by a malicious image or macro. (Shellcode is a small piece of code used as the payload in the exploitation of a software vulnerability).

As these attacks become more aggressive, novel approaches to security are needed to successfully protect enterprises. CDR technology protects organizational networks from cyber threats that originate from multiple channels, including files from many sources, such as email, web browsers, file servers and FTP, the cloud, and computer endpoint devices.

CDR technology protects organizational networks from cyber threats that originate from multiple channels and go on to give cybercriminals access to private information.

Content Disarm and Reconstruction's evolution over time

CDR – as most technologies – has advanced over time, improving its capabilities and mitigating any drawbacks.

Here are the different types of CDR to be aware of:

CDR Type 1: Converting files to PDF

This type of CDR technology utilizes file conversion or transformation in order to render the file safe. The technology converts all files into a PDF file format, which eliminates the possibility of a hacker activating malicious code when a user clicks on a link or opens a document. However, it also creates a flattened document, without any legitimate macros, tracked changes, image transparency, form fields, layers, etc., effectively transforming the file into an unusable document and negatively affecting the organization's productivity.

CDR Type 2: Stripping out active code and embedded objects

The next level of CDR technology aimed to improve on its earlier capabilities. It focuses on stripping out only certain types of content, such as embedded objects or potentially active content, in order to ensure the safety of each file. However, the file still loses functionality, such as links, essential macros, and business logic. It also overlooks a security risk by allowing fundamental, yet vulnerable, templates to remain within the document.

CDR Type 3 – Votiro's Positive Selection Technology

The most advanced form of an evolved CDR, this technology focuses on template-based reconstruction that allows full preservation of features and full functionality. Positive Selection technology rebuilds the document, copying only the known-good, positively selected content and ensuring only the safe template elements remain.

Content Disarm and Reconstruction's evolution over time

Votiro's Positive Selection technology is the next evolution of the popular content disarm and reconstruction technology. Positive Selection uses template-based reconstruction to recreate clean templates with only the known good content included.

Unlike detection-based file security solutions that scan for suspicious elements and block some malicious files, Positive Selection singles out only the safe elements of each file, ensuring every file that enters your organization is 100% safe.

How is Positive Selection technology different than CDR?

While most types of CDR rely on malware detection, signatures, and predictive analysis, only Positive Selection technology delivers fully functional content in milliseconds that is always effective against zero-day attacks with a 0% false positive rate.

	CDR Type 1	CDR Type 2	CDR Type 3: Positive Selection
Usability & End User Experience	Flattens files into PDFs, rendering them static and useless	Removes active content, including safe, business-essential content	**Retains full file usability, functionality, and fidelity**
Password-Protected & Zipped Files	Does not sanitize ZIP or password-protected files	Does not sanitize ZIP or password-protected files	**Sanitizes ZIP and password-protected files**
Files Blocking	Blocks files with known threats	Blocks files with known threats	**No files are blocked; all files are sanitized of both known and unknown threats**
Templates	Original, potentially malicious template retained	Original, potentially malicious template retained	**Template-based reconstruction places content on new, clean, safe template**
Active Content	File is flattened	Removes all active content	**Retains active content, just removes malicious elements**
False Positves	High false positive rate	High false positive rate	**0% false positive rate**
Maintenance	Maintenance involved	Maintenance involved	**No maintenance required; plug and play**
Latency	Latency – seconds to minutes	Latency – seconds to minutes	**Latency – milliseconds; employees receive safe files instantly**

How does Positive Selection technology work?

Built with deep expertise in the architecture of every file format, Positive Selection understands and protects all file types—from .ppt, docs, pdfs and image files, all the way to more complex formats like Autodesk files. Positive Selection technology protects against even the most obscure, challenging file types that no NGAV or Sandbox can possibly detect.

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Step 1: Identify the File Format

Every file must adhere to strict, vendor-based specifications that are unique to that particular file format. Positive Selection technology uses an intelligent fingerprinting technique that identifies a file's content type and format based on file structure and characteristics.

Step 2: Generate a New Version of the File

Positive Selection technology then generates a new, clean template of the file and imports over the positively verified content from the original file while leaving behind exploits and malicious objects. This regenerated, safe version of the file, based on known good templates from the file vendors, ensures that all the good content (including active content and embedded objects) is kept in its original format while preserving file functionality.

Macros, scripts, OLE objects, and all other elements are sanitized and regenerated into the new file as usable elements, neutralizing any exploitation attempts. This process ensures that both the user experience and file security remain intact. All files —suspicious or not—go through this process, which takes less than a second and is invisible from the user's point of view.

Phase 3: Use the New File

All malicious code and exploit threats are eliminated, positively selected elements transferred, and the new file preserves the integrity and functionality of the original file. The file is now safe to save, edit, use, and share.

Which vulnerabilities does Positive Selection protect against?

A software vulnerability opens the door to cybercriminals. A hacker who discovers a vulnerability can use it to gain entry to a system and then obtain unauthorized access to data—including PII, PHI, and PCI. A vulnerability has a lifecycle consisting of three stages: undisclosed, zero-day, and patched. Positive Selection protects organizations from file-borne threats brought on by exploits at all three stages of the lifecycle.

Stage 1: Undisclosed

At this stage, a vulnerability in an application, system or hardware is unknown to the vendor or the security community but has been discovered by someone, possibly a researcher in a cyber warfare organization—or the hacker community. This type of vulnerability presents a high security threat to everyone and can go undetected for years.

Since the application's vendor does not know of the vulnerability, countermeasures cannot be developed to prevent or block its exploitation. Undisclosed vulnerabilities are frequently used by groups that gather cyber intelligence or trade information to receive large cash payouts.

Stage 2: Zero Day

At this point, the vulnerability has been disclosed to the vendor and the security community. A zero-day vulnerability is a software weakness that has just appeared for the first time, and no patch has been developed to overcome it. This type of vulnerability presents a high risk of exploitation; intrusion detection systems or traditional protection systems using signature-based detection might identify exploitation activity after gathering and extracting several samples, but an exploit that a hacker has manipulated will be able to avoid signature detection.

Zero-day vulnerabilities can go unaddressed for some time, because vendors may take 90 days or even more to respond to reported threats.

Step 3: Patched

At this stage, although the vendor has already issued a patch for the vulnerability, it can be opportunistically exploited in non-patched environments of out-of-date applications. Large enterprises may be particularly susceptible to opportunistic attacks, because patch management is more cumbersome than in smaller organizations. The threat level at this stage is low, because the vendor has provided a patch.

What file formats does Positive Selection support?

Positive Selection technology handles many types of files that Level 1 or Level 2 CDR solutions are not able to. These include:

Password-Protected Files

Positive Selection can, in one seamless user experience, completely cleanse password-protected files. This is done without the need to bring IT in to open or unblock a password-protected file.

Zipped Files

Positive Selection supports containers, such as ZIP and other archive files, as well as the files within the containers. In the latter case, multiple compressed layers are recursively decompressed, analyzed for known elements, and recompressed, preserving the files' original functionality.

Documents

Positive Selection supports PDF, RTF, and text formats. Documents are broken down into individual elements for analysis. The trusted elements of the document are transferred to a known good template, resulting in the delivery of fully functional and completely threat-free document.

Images

Positive Selection removes malicious content from all the common raster and vector image formats: JPEG, GIF, BMP, PNG, TIFF, EMF, and WMF.

Archives

Positive Selection supports all common archive formats: ZIP, RAR, 7Z, and CAB. As the container is unpacked, the Positive Selection process runs recursively to analyze individual elements in each file. After the content is successfully analyzed for known and trusted elements, the elements are transferred to known good templates and the file is repacked for safe delivery.

Email Containers

Positive Selection supports several email containers, including EML, MSG, and PST. Votiro for Email Attachments works with your Email Server to ensure incoming emails flow through Votiro's Positive Selection engine to have the trusted elements transferred to known good templates, ready to be passed safely to the recipients.

Microsoft Office Files

The advanced Positive Selection process unpacks a Microsoft Office file, recursively checking embedded objects such as images, documents, and OLE objects to the finest element. Trusted elements are transferred to known good templates, and safely delivered to the recipient or target location.

How effective is Positive Selection technology?

Votiro’s patented technology has been proven to achieve prevention levels of 100% for advanced file-based attacks.

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What are the advantages of Positive Selection technology?

Compared to CDR types 1 and 2, and detection-based solutions, Positive Selection technology enables the following:

- Prevents cyber threats from multiple sources and vectors
- Protects against malware, including zero-day threats
- Promotes productivity; technology runs efficiently in background
- Eliminates need to rely on human compliance
- Allows greater access to content, with less restrictive Internet policies required

Even more benefits of Positive Selection technology:

You receive the same exact files, minus the risk.

Positive Selection guarantees you receive the exact same file, while getting rid of all potential risk. That way, your file remains 100% authentic and functional, yet 0% dangerous.

Positive Selection file sanitization does not impede the business workflow.

Unlike other slow, time-consuming solutions, Positive Selection eliminates weaponized files without disrupting your business for even a single moment.

Automate file security for your organization and reduce the manual workload.

Blocking and quarantining files doesn't just cost your business time—it also forces your security team to focus on the grunt work of unblocking files and taking them out of quarantine. With Positive Selection, you don't block or quarantine anything. Files smoothly and safely enter your organization the instant they're received.

Votiro's Positive Selection® Technology Seamlessly Integrates Into Your Existing Architecture

Easy implementation: just about 10 minutes for SaaS and less than 60 minutes for on-prem

Open API offers seamless integration with existing solutions

Blazing fast: ultra-low latency

Zero training required

By adopting a proactive stance and integrating a zero-trust approach, Votiro provides a robust defense mechanism that addresses potential vulnerabilities before they can be exploited.

To learn more about Votiro's Data Detection and Response capabilities, powered by Positive Selection technology, sign-up for a one-on-one demo of the platform, or try it free for 30 days and see for yourself how Votiro can proactively defend your data's security and privacy.

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Try Votiro Free for 30 Days

Take a free 30-day trial and see how Votiro stops threats and privacy risks before they ever reach your endpoints.

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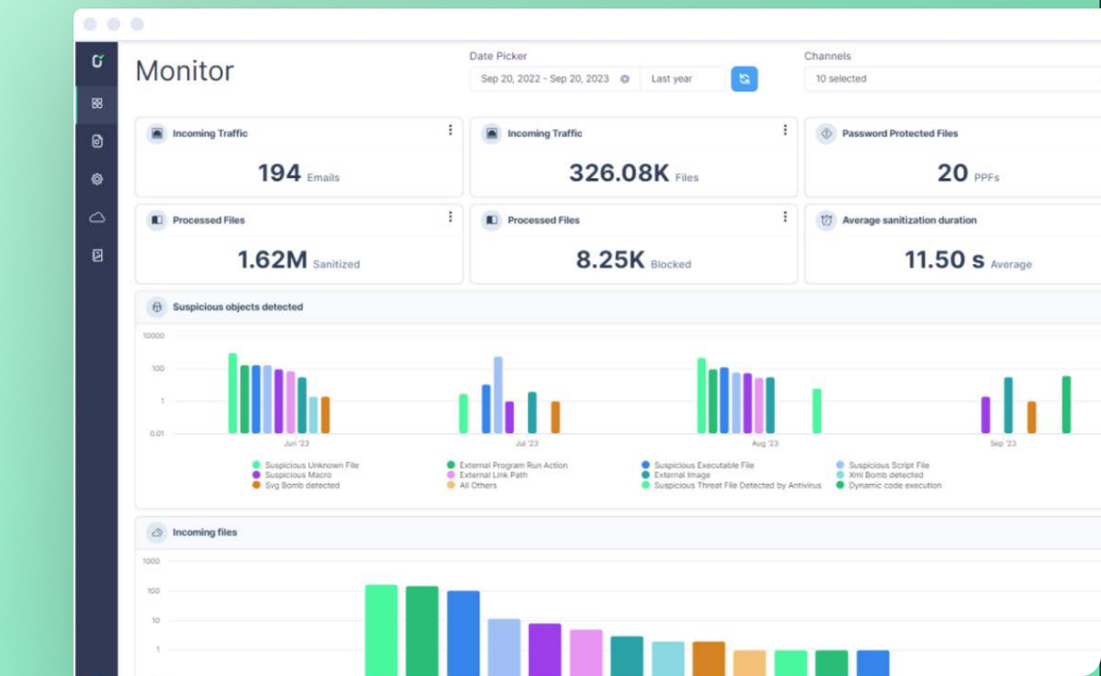

Monitor

Date Picker: Sep 20, 2022 - Sep 20, 2023 | Last year

Channels: 10 selected

Incoming Traffic: 194 Emails

Incoming Traffic: 326.08K Files

Password Protected Files: 20 PPFs

Processed Files: 1.62M Sanitized

Processed Files: 8.25K Blocked

Average sanitization duration: 11.50 s Average

Suspicious objects detected

Incoming files