The Threat of Ransomware to Critical Infrastructure

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Oct 30, 2025

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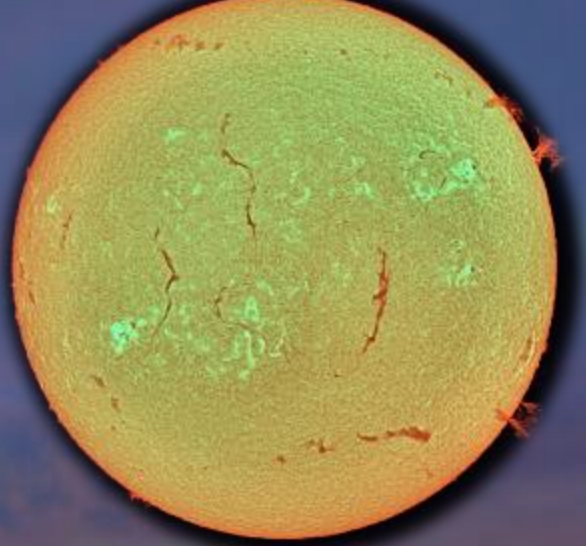

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Agenda

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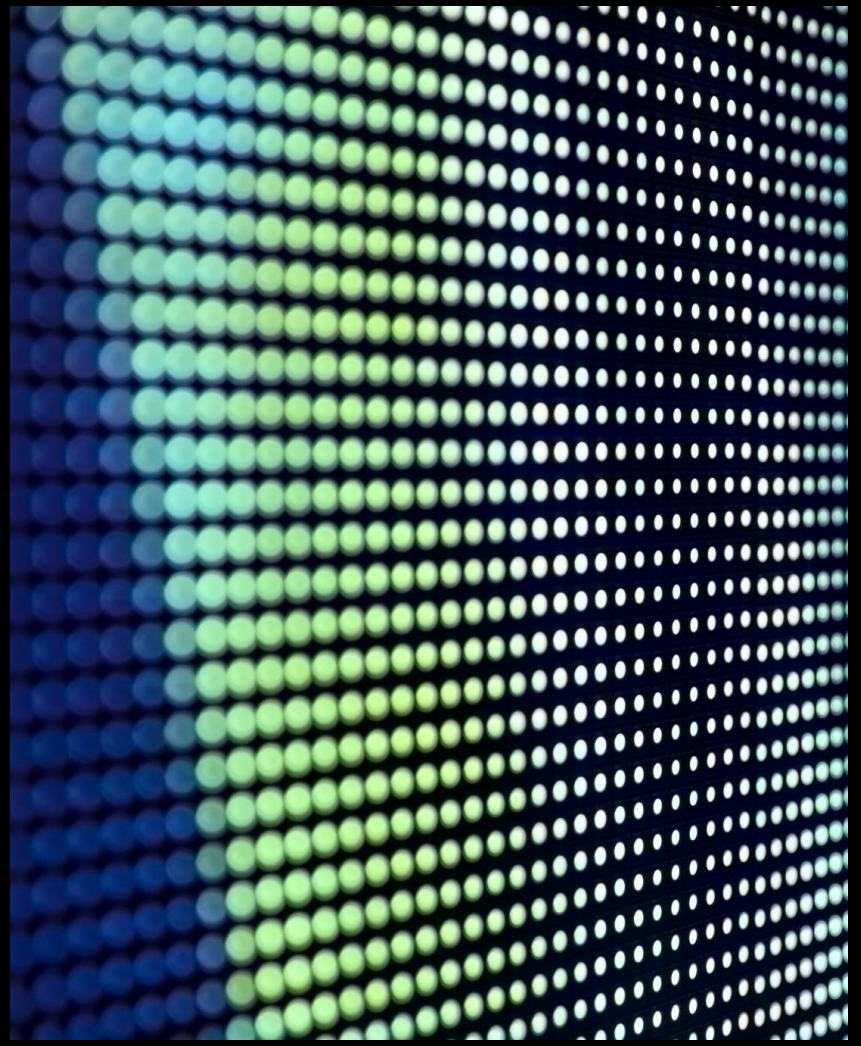

What is critical infrastructure?

- **Critical infrastructure according to the U.S. framework**
- **16 sectors**
- These are systems and assets, physical or virtual, so vital to a country that their incapacity or destruction would have a debilitating impact on national security, economic stability, public health, or public safety.
- Fundamental services whose failure can put the functioning of the nation at risk in key areas.
- They are interdependent: an attack on one can trigger a domino effect in others.
- Their protection is a priority for national security.

Examples of critical sectors:

- Chemical
- Commercial facilities
- Communications
- Critical manufacturing
- Dams
- Defense industrial base
- Emergency services
- Energy
- Financial services
- Food and agriculture
- Government facilities
- Health and public health
- Information technology
- Nuclear reactors, materials, and waste
- Transportation systems
- Water and wastewater systems

Importance of Protecting Critical Infrastructure

- **Social**
  - Essential services sustain daily life.
  - Prolonged disruption can cause chaos: massive blackouts, lack of water or fuel, collapse of communications.
- **Security**
  - Direct risk to human lives (example: inoperative hospitals).
  - Compromise of national defense and public safety.
  - Loss of trust in institutions.
- **Economic**
  - Costs of technical recovery plus losses due to interruption of operations.
  - Example: ransomware attack on Ireland's health system (2021) → suspension of medical services, direct costs > €80 million (estimated at ~€100 million).
- **Interdependence**
  - Critical infrastructures are interconnected.
  - An attack in one sector can trigger cascading failures in others.
  - This makes them high-value targets for cybercriminals and hostile state actors.

Ransomware in Critical Infrastructure

- Ransomware has become one of the greatest cyber threats for governments and businesses.
- Criminal groups encrypt critical data, demand multimillion-dollar ransoms, and apply double extortion by stealing confidential information.
- Critical infrastructure includes essential services such as energy, water, health, transportation, finance, and telecommunications, whose operation is vital for society.
- A successful ransomware attack can paralyze essential operations, compromise national security, and affect citizens' daily lives.
- In Latin America, cyberattacks; especially ransomware; have shown drastic growth in recent years.
- According to the Aon Global Cyber Risk Report 2025, ransomware claims in the region grew by 24% in one year.
- The report "The State of OT Cyber Security in LATAM 2024" warns that economic damages from cyberattacks exceed 1% of GDP in some countries and can reach up to 6% when critical infrastructure is affected.
- This growth is explained by rapid digitalization not accompanied by proportional advances in cybersecurity, leaving regional critical infrastructure highly vulnerable to malicious actors.

Global Examples – Ransomware Paralyzing Essential Services

- **Colonial Pipeline – USA (2021)**
- The DarkSide group launched a ransomware attack that forced the shutdown of the largest fuel pipeline on the East Coast, responsible for ~45% of the region's gasoline and diesel supply.
- 8,850 km of pipelines were disrupted, causing fuel shortages and panic buying in 17 states.
- The government declared a state of emergency.
- It was one of the most disruptive cyberattacks in the history of U.S. energy infrastructure, highlighting the vulnerability of interconnected industrial systems.
- **National Health Service – Ireland (HSE, 2021)**
- The Conti ransomware crippled the national health network.
- Hospitals had to return to the use of paper and pencil; Hundreds of surgeries and appointments were canceled.
- The full recovery took months and direct costs exceeded **€80 million**, with estimates close to €100 million.
- This case showed that hospital systems are priority targets for ransomware and that attacks have a direct impact on the lives of citizens.
- **Global lesson**
- Even developed countries have suffered severe consequences from ransomware in critical sectors.
- The response required extraordinary government action, including emergency declarations and federal intervention.
- Latin America must learn from these cases to strengthen preparedness and resilience in the face of similar threats.

Ransomware vs. Critical Infrastructure (Global Trend)

- **Increased attacks**
  - In 2023, 42% of ransomware incidents reported to the FBI affected critical infrastructure organizations.
  - This represents a significant increase compared to the 33% recorded in 2022.
- **Diversity of affected sectors**
  - Of the 16 critical sectors defined in the U.S., at least 14 reported ransomware victims in 2023.
  - The health and manufacturing sectors were among the hardest hit, but no sector is completely safe.
  - Attackers choose critical organizations with vulnerabilities, either to maximize the impact or increase the likelihood of payment.
- **Growth in losses**
  - Reported economic losses from ransomware in the U.S. grew 74% between 2022 and 2023, reaching approximately $60 million in 2023.
  - The real cost is higher, as it includes rescues, operational interruptions, system recovery and collateral damage.
- **Underreporting of incidents**
  - Only about 20% of victims officially report to the authorities.
  - This means that the actual incidence is much higher and that ransomware remains a latent threat to critical infrastructure.

Types of ransomware attacks against critical infrastructure

- **Double extortion (encryption + data theft)**
  - The most common strategy among large ransomware groups.
  - Attackers encrypt systems and steal sensitive information (power grid plans, medical records, etc.).
  - Even with backups, the threat of critical data release increases the pressure and amplifies the impact.
- **Operational disruption of control systems**
  - Ransomware can affect IT systems that are essential for physical operation (OT).
  - Although most incidents do not directly attack ICS/SCADA, companies preemptively stop services to prevent spread (example: Colonial Pipeline).
  - The risk of impact on industrial controllers is real and can force disruptions to critical services.
- **Attacks on third parties and suppliers (supply chain effect)**
  - Cybercriminals target IT, cloud, or telecom service providers that manage multiple critical customers.
- A single attack can impact dozens of organizations.
  - Example: IFX Networks (2023) affected 762 entities in Colombia, Chile, and Panama, including ministries, banks, and companies.
- **Destructive Ransomware (Wipers in Disguise)**
  - Malware designed to sabotage under the guise of ransomware.
  - Case in point: NotPetya (2017) in Ukraine, which paralyzed energy grids and other infrastructure with no intention of bailing out.
  - Although less frequent, it shows that ransomware can also be a weapon in hybrid warfare contexts.

“Ransomware-as-a-Service” (RaaS)

What is RaaS?

- Scheme in which ransomware developers rent their tools to "affiliates" (other cyber criminals).
- Affiliates launch the attacks and share the ransom payments with the developers.
- This model has democratized the threat: even attackers with low technical expertise can execute sophisticated campaigns.

Aftermath

- Huge increase in the number of groups and attacks.
- Example: **REvil** once had ~60 affiliates distributing its ransomware, making it one of the most active in the world.
- Other groups such as **Conti, LockBit, and Hive** have also operated under this model, allowing simultaneous attacks in different regions under the same "brand."

Professionalized criminal infrastructure

- RaaS operators offer affiliates:
  - Ready-to-use kits.
  - Command and control servers.
  - Operation manuals and technical support.
- Profit sharing: Affiliates usually keep **50–80% of the ransom,** the rest goes to the developers.
- Result: ransomware has become a **lucrative and scalable criminal industry.**

Implications for critical infrastructure

- The RaaS model multiplies the number of attackers capable of compromising essential services.
- Not only do a few elite groups pose a risk, but a **diverse and ever-changing criminal ecosystem.**
- Defenses must be reinforced in a broad and sustained manner to face this environment.

Common attack vectors and tactics

- **Initial access: phishing and stolen credentials**
  - Phishing emails with malicious files or links continue to be the most common way of entry.
  - The abuse of insecure remote access (e.g. unprotected RDP) has been massively exploited.
  - In 2020, more than **80% of successful attacks** involved compromised RDP credentials or brute force.
  - Teleworking during the pandemic expanded this attack surface, highlighting the need to secure remote connections.
- **Exploiting vulnerabilities in exposed systems**
  - Ransomware groups exploit unpatched software flaws in servers, VPNs, and critical internet-connected applications.
  - They have also used **zero-day** exploits in widely deployed products.
  - Agile patch management is vital: the speed of applying fixes can make the difference between being protected or being a victim.
- **Lateral mobility and quiet preparation**
  - Once inside, attackers move around the network to escalate privileges and reach critical systems.
  - They use legitimate tools (management scripts, common remote access Trojans) to evade detection.
  - They can stay inside the network for days or weeks, stealing credentials and disabling backups before detonating encryption.
- **Multiple extortion**
  - In addition to encrypting and exfiltrating data (double extortion), some groups apply a **third layer of pressure**: DDoS attacks against the victim's public sites.
  - Example: BlackCat/ALPHV launched denial-of-service attacks to pressure those who were late in paying.
  - This combination of **encryption + leakage + DDoS** seeks to corner critical organizations from all fronts.

Panorama in Latin America – What's Happening?

- **Accelerated increase in incidents**
  - LAC is today the region with the highest growth in cyber incidents worldwide.
  - Since 2013, it has registered an average annual growth of **~25% in reported incidents**, a trend that continues in the post-pandemic era.
  - In 2024 it was singled out as the fastest growing region in globally reported incidents.
  - Ransomware attacks **account for a significant portion** of this trend.
- **Higher exposure, lower protection**
  - Mass digitalization (digital government, IoT, online services) has not been accompanied by equivalent investments in cybersecurity.
  - LAC is listed as the **least protected region**, with an average score of **10.2/20** in cybersecurity compromises.
  - This gap leaves the region with **vulnerable targets and insufficient defenses.**
- **Critical infrastructure under attack**
  - In the last 3–5 years, several countries have suffered disruptive incidents against essential services: intentional blackouts, massive leakage of citizen data, attacks on banking systems, and ransomware on government agencies.
  - The region went from being a "secondary" target to a **key battleground in global cybersecurity.**
  - Emblematic case: **Costa Rica (2022)** declared **a national emergency** after a wave of ransomware against state institutions, becoming the **first country in the world** to do so due to a cyberattack.

Why is Latin America an attractive target?

- **Policy gaps and preparedness**
  - Only **7 out of 32 countries** have national plans to protect critical infrastructure from cyberattacks.
  - Only **20 countries have operational CSIRTs.**
  - The lack of coordinated protection frameworks and protocols makes the region fertile ground for attackers.
- **Limited resources and competing priorities**
  - Budgets focus on health, education, and public safety, leaving cybersecurity in the background.
  - Many organizations operate with nascent security programs and insufficient basic technical defenses (segmentation, 24/7 monitoring, rapid patching).
  - This opens up opportunities for cybercriminals to exploit known vulnerabilities.
- **Perception of low risk of retaliation**
  - Most ransomware groups operate from Eurasia, where attacking the US or Western Europe carries greater international pressure.
  - Latin America is seen as a target with less **probability of immediate punitive response.**
  - Limited legal and operational capacity in cybercrime reduces deterrence.
- **Accelerated digitalization without resilience**
  - After the pandemic, the region massively adopted teleworking, online procedures and electronic payments.
  - Cybersecurity did not grow at the same rate as connectivity (IoT, SCADA connected).
  - This creates a **"perfect storm"**: many exposed systems without patching or constant monitoring.
- **Recent successes that incentivize attacks**
  - Cases such as the **Conti and Hive attacks in Costa Rica (2022)** demonstrated the effectiveness of extorting Latin American governments.
  - Leaks of valuable data (e.g., citizen records) have generated profits on black markets.
  - The region's reputation as **a profitable and vulnerable target** circulates on criminal forums, attracting groups such as **LockBit and BlackCat.**

Top Ransomware Groups (I)

LockBit

- Currently the most prolific group worldwide, with a strong presence in the region.
- It operates under the **RaaS model** and leads with **59 attacks in LATAM** in the last period analyzed (2024).
- Victims: from government agencies to industrial companies.
- Distinctive features:
  - Effective software (LockBit 3.0 variant).
  - Aggressive **double extortion** strategies.
  - Continuous expansion through affiliates.
- Considered the **biggest ransomware threat** currently.

ALPHV / BlackCat

- Active since the end of 2021, successor to BlackMatter/DarkSide.
- Pioneer in using **Rust language**, making it difficult to detect.
- He innovated with the free publication of stolen data to pressure.
- In Latin America it has had a strong impact, especially in **Mexico** (>1000 organizations affected).
- It usually employs **triple extortion** (encryption, filtering, and DDoS).
- Although it suffered disruptions in 2023, it is still active globally with very technical affiliates.

Clop

- Known for massive **zero-day attacks** on third-party software.
- Example: operation of **MOVEit servers** in 2023.
- It operates as **a RaaS**, with a focus on extortion data breaches.
- Strategy: Engage suppliers to impact multiple victims at once.
- Although less publicized than LockBit, it has been behind **high-profile breaches** and continues to be active.

Jellyfish

- Emerging group observed in 2023 with a focus on the region.
- Emblematic case: attack on the **National Securities Commission of Argentina** (June 2023).
- Characteristics:
  - Ransom note "!! READ_ME_MEDUSA!!!"
  - Files encrypted with **. MEDUSA.**
- He also claimed attacks against **Garbarino (Argentina)** and mentioned victims in **Bolivia, Brazil, Chile, Colombia and the Dominican Republic.**
- Although smaller, its **regional focus and diversity of sectors** make it a group to watch closely.

Top Ransomware Groups (II)

Conti

- One of the most feared bands until its dissolution in 2022.
- Responsible for high-profile attacks, including the massive coup against the **government of Costa Rica.**
- Famous for multimillion-dollar lawsuits and data leaks, he even threatened to overthrow the Costa Rican government.
- After the leak of its internal chats (*Conti Leaks*) and international pressure, it announced its closure.
- Many members migrated to other groups such as **BlackCat** and **Hive.**
- Legacy: It left chaos in the region and forced improvements in government cyber resilience.

Hive

- Active between 2021 and 2022, with a focus on the **health sector and public agencies.**
- Emblematic attack: **CCSS (Costa Rica, 2022),** which affected hospitals and medical records.
- He applied **double extortion** and used very efficient malware.
- The FBI infiltrated its infrastructure for months and in January 2023 announced its dismantling, releasing decryption keys to victims around the world.
- Its affiliates then migrated to other RaaS programs.

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REvil (Sodinokibi)

- RaaS Group very active between 2020 and 2021, with dozens of affiliates.
- Emblematic cases:
  - **JBS Foods** (Brazil, paid from ~11 MUSD).
  - Chain attack via **Kaseya.**
- It attacked companies in Brazil, Mexico and other countries.
- Pressure from the US led Russian authorities to announce its dismantling in 2022.
- Although its activity fell, it set a trend in extortion and laid the foundations for new groups

Top Ransomware Groups (III)

- **DarkSide / BlackMatter**
  - DarkSide was responsible for the attack on the **Colonial Pipeline (USA, 2021).**
  - Following worldwide attention, he announced his retirement, but briefly reappeared as **BlackMatter.**
  - Main objectives: energy and industry.
  - Attacks on a hydroelectric plant in Chile (2021) and agro-industrial cooperatives in the US are attributed to him.
  - It ceased operations at the end of 2021 citing police pressure.
  - Its modus operandi (focused on physical infrastructures) inspired later groups.
- **Final note**
  - The 'brand' of ransomware groups is volatile: they disband, rename, or resurface.
  - Example: after the disappearance of **Conti** and **Hive**, its members were integrated into **BlackCat, Royal** and other variants.
  - These groups left a significant mark on global **and Latin American critical infrastructure**.

Case 1 – Costa Rica 2022 (Hack Accounts)

Context

- In April 2022, Costa Rica suffered a devastating attack by the **Conti** group, targeting multiple state agencies simultaneously.

Affected organizations

- At least **27 government entities** were infiltrated, including:
  - Ministry of Finance (finance and taxes).
  - Ministry of Labor.
  - Social security.
- Tax, customs, human resources and public procedures systems were disabled.

Demands and actions

- Conti demanded **US$10 million** in ransom.
- The government refused to pay.
- In retaliation, the attackers gradually leaked **~97% of 672 GB** of stolen data, exposing sensitive information of citizens and officials.

Impact and duration

- State operations affected for almost **two months.**
- **Tax collection and international trade paralyzed,** with serious economic effects.
- A cost equivalent to **2.4% of the national GDP** is estimated.

Extraordinary response

- The president declared **a state of national emergency,** the first time in the world due to a cyberattack.
- Emergency funds were activated and assistance was received **from the U.S.,** including reward for Conti leaders.

Lessons

- A criminal group managed **to bring a state to its knees.**
- Urgency to strengthen the security of critical government systems.
- The need for international cooperation to confront these threats.
- Escalation in criminal rhetoric: Conti went so far as to threaten to **"overthrow the government."**
- With external support, Costa Rica gradually restored systems, leaving this case as a **global milestone of ransomware against a State.**

Caso 2 – Costa Rica 2022 (Hive Hack)

Context

- Just weeks after Conti's attack, in May 2022, Costa Rica was hit by Hive ransomware, targeting the **Costa Rican Social Security Fund (CCSS).**
- The CCSS is the pillar of the country's public health: hospitals, clinics and medical records.

Scope of the attack

- Critical hospital IT services were **encrypted.**
- Hospitals lost access to:
  - Patient databases.
  - Laboratory and pharmacy systems.
- Staff had to resort to **manual processes.**

Impact on the population

- Cancellation and delay of **appointments, surgeries and treatments.**
- Physicians without access to medical records.
- Delays in test results (including COVID-19).
- Suspension of online appointment issuance and payment of pensions.
- Thousands of citizens affected in their health and daily lives.

Answer

- The government refused to pay ransom.
- With international support (including the **FBI)** systems were restored from backups.
- The national emergency already declared by Conti was extended to cover the **health sector.**

Outcome and police action

- Hive leaked some data to press.
- In January 2023, the **U.S. Department of Justice.** announced the **dismantling of Hive**, after infiltrating its operation and releasing decryption keys to victims around the world.
- The attack on Costa Rica was one of the triggers for this international operation.

Lessons

- The double crisis of Conti and Hive showed the **vulnerability of multiple critical sectors in the same country.**
- He underscored the **interconnectedness of threats**: Hive's collapse was driven by its global impact.
- For Costa Rica, it resulted in urgent improvements:
  - Creation of a **national CSIRT.**
  - Investment in **offline backups.**
  - **Segmentation of critical hospital networks .**

Case 3 – Colombia 2023

Context

- In September 2023, a ransomware attack against **IFX Networks,** a provider of cloud services and datacenters in 17 countries, caused a cascading effect in the region.
- The ransomware used was identified as **RansomEXX** (or similar variant).

The incident

- The attackers encrypted the **virtualization servers,** taking the Infrastructure-as-a-Service **(IaaS) platform offline.**
- The drop affected both public and private customers.

Affected entities

- **20 Colombian public entities paralyzed** and another 78 with interruptions.
- More than **762 private companies** affected in Colombia, Chile, Panama, Argentina and other countries.
- Concrete impact:
  - **Colombian Foreign Ministry** → temporary suspension of visas and passports.
  - **Judicial branch** → the procedures portal crashed.
  - Universities, banks and digital providers affected.

Crisis response

- The Colombian government declared the incident a **national digital security issue.**
- Contingency plans and migration of critical services to alternate infrastructure were activated.
- Response teams worked 24/7 alongside IFX; Recovery took more than a week.

Regional dimension

- The attack showed the **risk of concentration** in a single service provider.
- The fall of IFX simultaneously impacted **several countries in the region,** a rare occurrence.
- Governments of Chile and Panama issued alerts and offered assistance to their affected institutions.

Lessons

- An attack on a **common provider** can morph into a regional critical infrastructure event.
- Organizations should:
  - Assess **third-party risks.**
  - Have **contingency plans** in place in case of supplier failure.
  - Review the **resiliency of critical cloud services** and geo-segmentation of backups.

Case 4 – Chile 2023

Context

- On October 23, 2023, the Chilean company **GTD**, a telecommunications, cloud, and data center provider, suffered a ransomware attack.
- The malware identified was **Rorschach (aka BabLock),** a rare variant.
- The attackers encrypted the **Infrastructure as a Service (IaaS) platform**, forcing the suspension of cloud services.
- **Disrupted Services**
- More than **3000 customers affected**, including private companies and public entities in Chile and Peru.
- Impact on:
  - Data center.
  - IP telephony.
  - Corporate VPN.
  - Internet connectivity.
- Days after the attack, more than 300 customers were still experiencing significant problems.

Communication and regulations

- GTD handled the incident with **transparency and collaboration** with authorities.
- The case occurred shortly after the entry into force of the Chilean regulations on mandatory **notification of incidents** in state entities.
- GTD coordinated reports with its government clients, exemplifying **good response practices.**

Recovery

- Proactive suspension of services slowed the spread of ransomware.
- Restore backups and harden systems before reactivating the platform.
- In about **a week** , most services were restored, although there was **loss of unbacked data** in some customers.

Lessons

- The case reinforces the importance of **security in critical service providers.**
- Even advanced technology companies are vulnerable.
- The fall of a vendor affects an entire **ecosystem of dependent organizations**.
- GTD's **rapid response and clear communication** helped contain damage, showing the value of robust response plans.

Case 5 – Argentina 2023

Context

- In June 2023, the **National Securities Commission (CNV),** the regulator of Argentine financial markets, suffered a ransomware attack.
- The **Medusa group** claimed responsibility for the attack, which was officially confirmed on June 11.

The incident

- Network entry, server encryption, and theft of confidential information.
- The CNV isolated its systems and **suspended online platforms** to contain the spread.
- Digital capital market procedures (authorizations, reports, stock market consultations) were out of service for several days.

Impact

- Concern in the financial sector about the possible leakage of data from **listed companies and investors.**
- Risk of loss of confidence and possible effects on market stability.

Data exfiltration

- Medusa stole a significant volume of documents.
- He posted samples on his dark web site, including internal reports and personal data.
- He also mentioned other companies from Argentina and neighboring countries, evidencing a **regional campaign.**

Answer

- The CNV worked with the cybercrime unit to investigate the attack.
- Backup systems and recovery procedures were strengthened.
- No ransom payment was recorded; Some of the stolen information was published by the attackers.

Lessons

- Regulatory **bodies** are also strategic targets.
- An attack on a financial regulator can have **systemic effects**: loss of trust and even market manipulation.
- It is necessary that **good banking cybersecurity practices** also be extended to supervisory entities.
- It confirms Medusa's active presence in the region, targeting critical targets beyond the central administration.

Case 6 – Brazil 2020

Context

- On November 3, 2020, the **Superior Tribunal de Justiça (STJ),** Brazil's second-highest court, suffered a ransomware attack.
- The attack occurred during a virtual trial session.

The attack

- RansomUX-linked group compromised the court's network.
- More than **1,200 servers** (mainly virtual machines) were encrypted.
- The attackers **destroyed backups** to prevent recovery.

Suspension of activities

- All court sessions (virtual and face-to-face) were suspended for a week.
- **Procedural deadlines** and electronic access to files were paralyzed.
- The president of the STJ publicly reported the attack and involved the **Federal Police** from the beginning.

Cascade effect

- Other interconnected federal agencies were preemptively affected.
- Several ministries disconnected their links with the judicial network for security.

Research and response

- The attackers exploited a **domain administrator account** to spread.
- There was persistence prior to the detonation, which facilitated mass encryption.
- RansomEXX ransom note was found, but the court **did not pay ransom.**
- With the support of the **Federal Supreme Court,** systems were restored with **external backups** and manual reconstruction.

Lessons

- It was the **most serious cyberattack against a Brazilian public institution** to date.
- It highlights the importance of:
  - Target critical networks.
  - Keep **offline backups up to date.**
- It showed that **justice is also a target of ransomware,** directly affecting citizens' access to justice.
- Following the attack, Brazil created specific protocols to **protect digital judicial infrastructure.**

Latin America Incident Overview – Impact and Trends

Governments in the crosshairs

- Ministries, judicial courts and public entities are priority targets.
- A paralyzed government generates enormous pressure to negotiate and great media impact.
- Emblematic case: **Costa Rica**, the first country to declare **a national emergency** due to a cyberattack.

Essential services affected

- Health (Costa Rica), telecommunications (Chile, Colombia), finance (Argentina), justice (Brazil).
- Tangible impacts: lines at gas stations, patients without care, detained courts, risk of economic instability.
- It confirms that **all strategic sectors** are vulnerable.

High economic costs

- Costa Rica: losses estimated at **2.4% of GDP**.
- IFX Networks: companies and ministries with disrupted operations.
- Incidents show that **not investing in cybersecurity is more costly** in the long run.

Cooperation and intelligence sharing

- Examples: support from the **FBI in Costa Rica**, international operation against **Hive**, regional coordination after the IFX case.
- No country can face these threats alone.
- Cooperation with governments and the private sector is essential to mitigate large-scale attacks.

Need to improve preparedness

- Common gaps: unpatched systems, compromised credentials, lack of network segmentation.

Lessons:

  - Countries with **external backing** and **defined crisis protocols** recovered faster.
  - Improvisation delayed recovery in other cases.
- Cross-cutting message: **investing in preparedness and resilience is crucial**.

Strategic Implications - National and Defense Level

Threat to sovereignty and national security

- Mass attacks can weaken the state's ability to ensure basic services.
- Compromised sectors such as energy, telecommunications and finance leave the country vulnerable to external coercion.
- A cyberattack can degrade **military readiness** without firing a single bullet.
- Security doctrines must consider ransomware on the same level as physical threats.

Risk of social and political instability

- Prolonged disruptions to water, electricity, health or transportation can lead to **protests, panic and loss of trust in the government**.
- In fragile democracies, it can lead to political crises.
- Although attackers seek profit, their actions can destabilize governments.
- **Governance and crisis communication plans** are required in the face of major attacks.

Convergence with hostile state actors

- Adversary states could **sponsor or cloak behind ransomware groups** for geopolitical purposes.
- World Bank: **59% of incidents in developing countries would be politically motivated**.
- It blurs the line between cybercrime and cyberwar.
- Possible hybrid **war scenario**, using ransomware as a weapon to cripple infrastructure.

Need for national cyber defence policies

- Comprehensive national strategies with a focus on critical infrastructure.
- Define roles and responsibilities: Who leads in a serious national cyberattack?
- It requires **civilian-military-private coordination.**
- Creation of **specialised cyber defence units** and carrying out **national simulation exercises.**

Diplomacy and international cooperation

- Participation in global anti-ransomware initiatives (e.g. **U.S.-led initiative**).
- Joint intelligence sharing and training.
- Make critical **infrastructure cybersecurity** a recurring topic in multilateral forums (OAS, UN).
- Only an **international common front** can deter attackers and put pressure on states that tolerate them.

Operational implications - Organizations and industries

Prolonged business disruption

- Ransomware can halt operations **for days or weeks**, far beyond what was foreseen in traditional continuity plans.
- Cases: pipeline closed for 5 days, Brazilian court for 1 week, Costa Rican government for 2 months.
- It requires **rethinking BCPs** with extreme scenarios and manual contingency plans.

Data loss and trust

- Even if systems are restored, the **confidentiality and integrity** of the information can be compromised.
- Sensitive data exposed (energy, health, finance) leads to lawsuits and loss of public trust.
- A critical supplier's reputation can be severely eroded.

Unexpected operating costs

- Recovery involves overtime expenses, consultants, equipment, and audits.
- It forces **you to update obsolete infrastructure** in an accelerated manner.
- It can generate financial losses and a drop in shareholder value (example: Telecom Argentina, 2020).

Need for robust response protocols

- Many entities lacked specific anti-ransomware plans.
- Keys: isolate networks quickly, communicate effectively, coordinate with authorities, decide on payment/non-payment.
- Companies with **24/7 SOC** better contain attacks, reducing damage and attacker dwell time.

Supply chain disruption and contractual obligations

- The fall of a critical supplier generates **cascading effects** on customers and partners.
- Breaches of contracts, penalties and loss of commercial confidence.
- More and more contracts include **cybersecurity SLAs** and immediate notice clauses.
- Resilience is also a **criterion for selecting suppliers**.

Organizational Culture and Training

- Cybersecurity isn't just an IT issue – it needs to permeate the entire organization.
- Trained employees are the first line of defense against phishing and human error.
- Attack simulations and **red team/blue team** exercises strengthen preparation.

Implications for public policies and regulations

Updating legal frameworks

- Many countries still lack laws that require critical companies to implement cybersecurity measures or report incidents.
- It is urgent to develop specific regulations for the protection of critical infrastructure, with:
  - **Minimum safety standards.**
  - **Mandatory audits.**
  - **Fines for gross negligence.**
- Include legal mechanisms to facilitate **public-private cooperation** during incidents.

Centralization and national coordination

- Create or strengthen a **national cybersecurity authority** with a mandate on critical infrastructure.
- Define the priority sectors in each country (e.g. energy, finance, transport, health).
- Establish **specialized Response Teams** (sectoral or multi-sectoral).
- Today only **7 countries in the region** have dedicated plans for infra-critical.

Incentives and support for the private sector

- Most critical infrastructures are operated by **private companies.**
- Possible incentives:
  - Tax benefits for investments in security.
  - Joint training programs.
  - Threat intelligence sharing.
- Promote **public-private partnerships (PPPs)** in cybersecurity.
- Example: In the US, **sectoral ISACs** allow rapid alerts to be disseminated among critical companies.

Non-payment vs. save services policy

- Define in advance the national position on the **payment of ransoms**.
- Costa Rica, for example, maintained the policy of not paying despite the great impact.
- It is necessary to establish clear protocols for cases where **human lives are at immediate risk.**
- Evaluate options such as the **legal prohibition of payments**, already discussed in some countries.

International cooperation and joint frameworks

- Participate in global anti-ransomware initiatives and multilateral forums (OAS, UN).
- Promote **mutual legal assistance** (extraditions, judicial cooperation).
- Consider **public attribution** of attacks when there is foreign state support.
- Critical cyberattacks can escalate to the diplomatic level:
  - Example: after **Colonial Pipeline**, the US put pressure on Russia.
  - In LATAM, **Costa Rica sought international support** against Conti and Hive.

Recommendations for Governments and the Public Sector

National Cybersecurity Strategies

- Design plans with a focus on **critical infrastructures.**
- Include national inventory, risk analysis and sectoral protection plans.
- Create **multisectoral committees** that integrate civilian and military agencies and regulatory entities.

Institutional strengthening

- Establish or strengthen **national CSIRT/CERTs** with infracritical scope.
- Provide them with **expert personnel, sufficient budget and sectoral links** for rapid response.
- Invest in **training cybersecurity talent** (academic programs and certifications).

Regulatory and normative framework

- Oblige infra-critical operators to apply controls aligned with **international standards** (ISO 27001, NIST CSF).
- Require **continuity and incident response plans** specific to cyberattacks.
- Implement **mandatory reporting** of relevant incidents within a defined timeframe.
- Use the **OAS as a guide** to harmonize regional regulations.

Investments in resiliency and redundancy

- Financing the modernization of **obsolete systems** (ICS, hospitals, etc.).
- Ensure **offline backups** and alternative manual plans.
- Decentralize critical services (e.g. **alternate national data centers**).

High-level exercises and awareness

- Conduct **periodic national cyberattack drills** on critical infrastructure.
- Involve ministers, armed forces and CEOs of strategic sectors.
- Integrate cybersecurity into the **presidential and cabinet agenda.**
- Awareness from the top ensures political priority and resources.

Final note

- These measures seek **to raise the national defensive posture** and close the regional preparedness gap.
- They require **sustained political will** and **public-private collaboration.**

Recommendations for Private Operators of Critical Infrastructure

Good practice frameworks

- Adopt recognized standards (NIST CSF, IEC 62443 for industrial environments).
- Cover all functions: **identification, protection, detection, response, and recovery.**
- Measure and continuously improve the level of maturity in cybersecurity.

Segmentation and protection of industrial systems

- Separate **corporate IT** and **industrial OT networks** with secure gateways and monitoring.
- Apply **Zero Trust** principles: no connection is trusted by default.
- In plants, use **safe jump servers** and ensure manual operation capacity in case of a fall.

Robust backups and recovery plans

- Maintain frequent, encrypted backups stored **offline.**
- Periodically test restoration in simulated environments.
- Have a **Disaster Recovery Plan (DRP),** with alternate centers or recovery agreements.

Staff training and awareness

- Train at all levels in digital hygiene: **phishing, MFA, secure passwords.**
- Internal drills (simulated phishing, red team/blue team).
- Foster a **culture of early reporting** without blame.

Incident Response Capability

- Have an **internal CIRT** or an agreement with specialized providers.
- Clear procedures: isolation, preservation of evidence, communication with authorities.
- Define protocols for interacting with attackers under legal supervision.

Third-Party and Cyber Insurance Assessment

- Review the security of **critical suppliers** (audits, certifications).
- Consider **cyber insurance** as a risk transfer mechanism.
- The assurance process helps to detect gaps and raise internal controls.

Key message

- The private sector must operate under the logic of **"when it happens, not if it will happen".**
- Investment in prevention and resilience is minimal compared to the cost of catastrophic disruption.

Conclusion

Ransomware: A Strategic Threat

- It has established itself as one of the most serious threats to **critical infrastructure**, with effects comparable to natural disasters or terrorist acts.
- It can paralyze governments, slow down justice, cut off fuel, and compromise public health.

Latin America in the crosshairs

- It is the **region with the highest growth in cyberattacks** but with lags in protection.
- This has made it a priority target for criminal gangs.
- Recent incidents have raised awareness **of the problem**, creating an opportunity to turn alert into action.

Comprehensive and collaborative approach

- Isolated responses are not enough: **cooperation between governments, the private sector and international partners** is required.
- Early **coordination**, **intelligence sharing,** and **incident reporting** are key to crisis containment.

Readiness and resilience

- Organizations must assume that **they will eventually be attacked.**
- Those who invest in security and planning reduce the impact; those who improvise multiply it.

Protection of society and sovereignty

- Defending critical infrastructure is protecting **daily life, the economy and national sovereignty.**
- It is a technical challenge, but above all strategic **and managerial.**
- Military, government, and private leaders have a central role to play in driving improvements.

Final conclusion

- Cybersecurity **of critical infrastructures** must be treated as a **top national priority.**
- The next few years will be decisive in closing the gap in Latin America.
- With **political will, investment, and cooperation,** it is possible to build a safer and more resilient future against ransomware.

The end! Thank you for your time!