Intelligent Infrastructure Monitoring

Leverage the power of Smart Spaces & Lumada Video Insights to drive operational efficiency and effectiveness when maintaining your critical infrastructure

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Intelligent Infrastructure Monitoring | Industry Insight

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Surface Inspection & Vision Market Forecast ($B)

10% CAGR

- $13
- $12 — 2026: $12.1
- $11 — 2025: $10.9
- $10 — 2024: $9.9
- $9 — 2023: $8.9
- $8 — 2022: $8.1
- $7 — 2021: $7.3

2021 · 2022 · 2023 · 2024 · 2025 · 2026
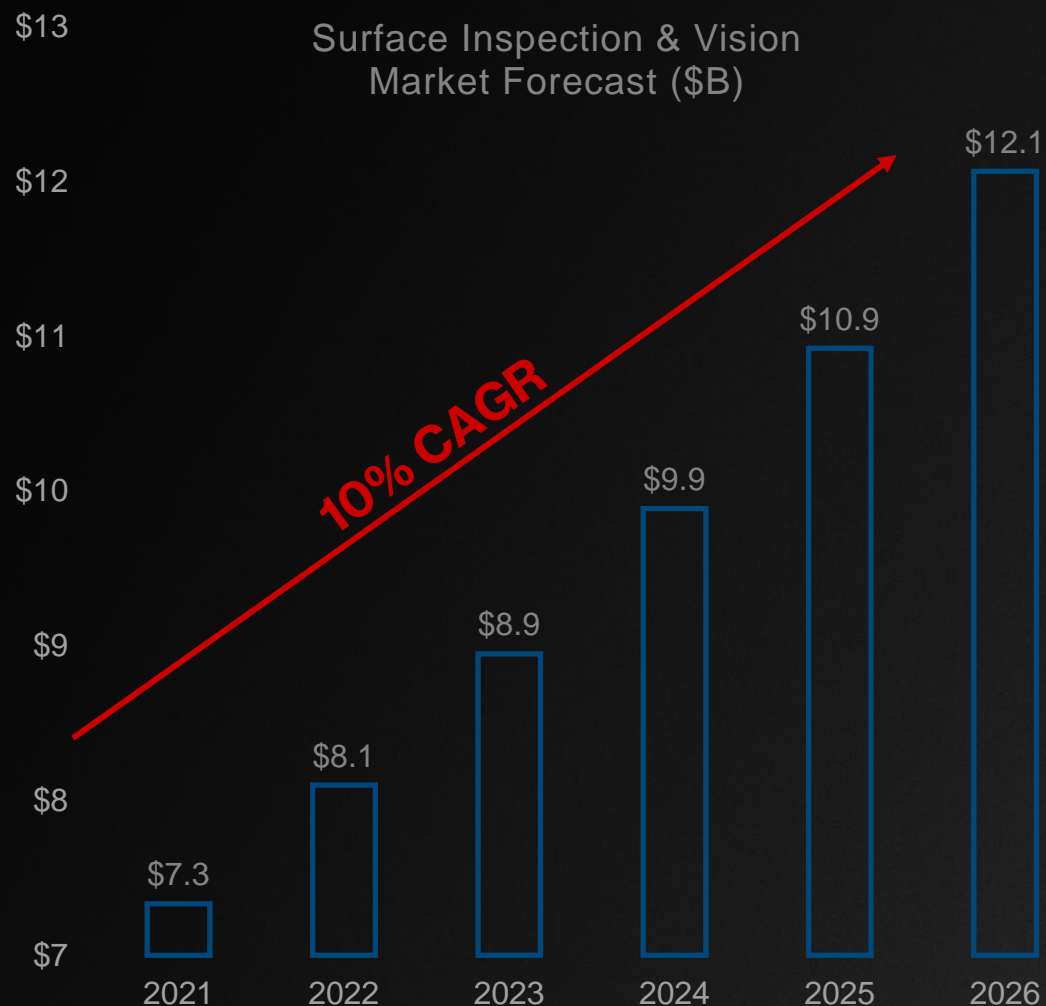
Advancements in AI, ML, Computer Vision

High-precision AI, ML, and CV models can spot anomalies with superior accuracy, while training on fewer images

Developed Track Record of Success

Success stories across industries of predictive inspections improving KPIs and reducing operating costs

Remote Work + Fewer Experts Needed

Asset inspections via drones / robots addresses remote work trends and reduces need for costly experts
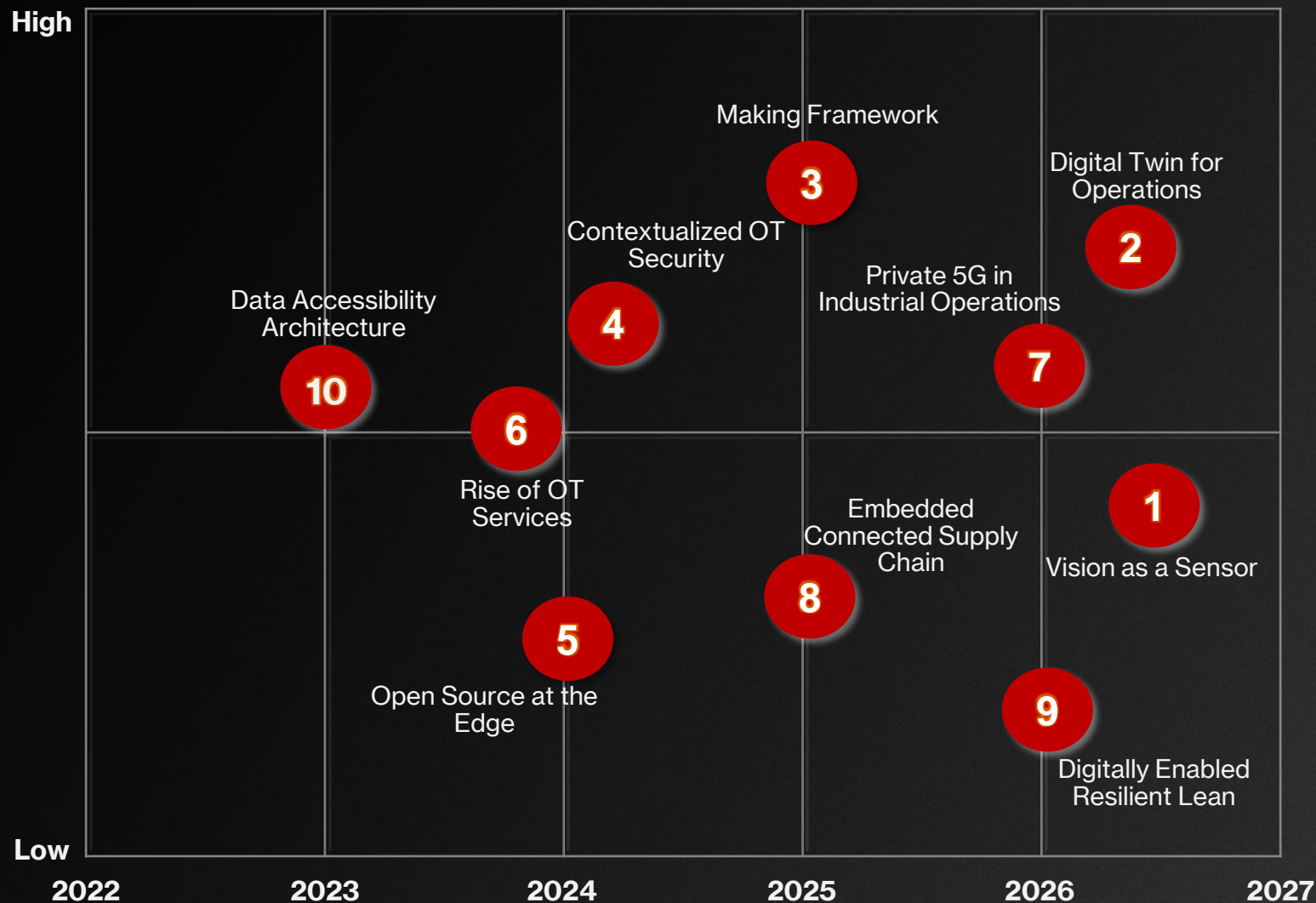
Frictionless Consumption Models

Access to inspections as a service enhances the operational and financial flexibility of customers

Solution

Utility Substations

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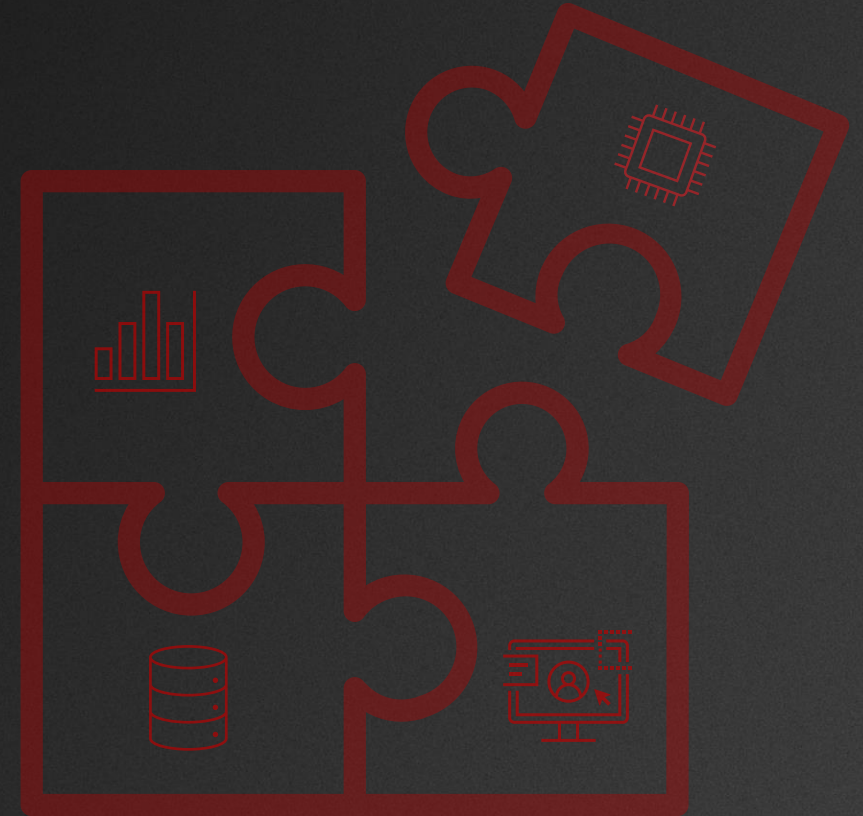
" The Intelligent Infrastructure Monitoring Solution for utility substations is an end-to-end solution. This includes visual spectrum and thermal radiometric cameras, Radar, various sensors, ruggedized PCs, industrial network infrastructure, edge and cloud applications as well as video and data analytics to allow remote monitoring, inspections, and in the future, autonomous operation. "

Utility Substation Challenge| Stats

Utility Substations are challenged financially with increased cost of operations, system downtime and dwindling workforce

Increasing investment in technologies globally to manage the maintenance of utilities critical assets

Department of Energy concluded 70% of power transformers are 25 years of age or older, 60% of circuit breakers are 30 years or older and 70% of transmission lines are 25 years or older

More than a third of the country's 400,000 electric utility employees are headed for retirement

Electricity demand has decreased which has put a strain on operations teams to maintain equipment, as they are operating in a deficit

With limited staff, and the demand for increased inspections is challenging

1. Remote Monitoring:

Monitor your various sites by utilizing network video, thermal equipment, and cloud-hosted applications

2. Remote Inspection:

Perform your inspection checklist items by a remote operator through camera presets that show in greater detail the components and items that are under inspection.

3. Autonomous Data Collection:

With predefined camera presets and tasks, an orchestrator application enables cameras to collect data autonomously
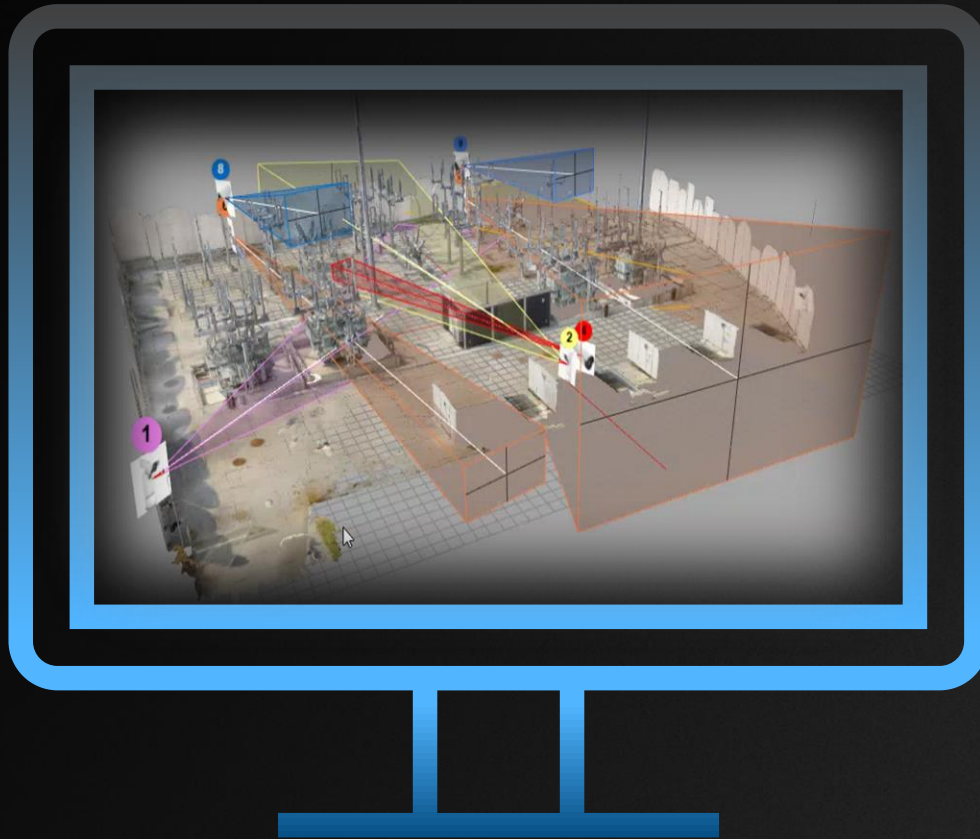
4. Autonomous Monitoring:

Through perfected AI models, the system performs image validation, updates the KPIs, and identifies trends defined in visualization dashboards

Virtually maneuver through your substation

Create 3D image scans and models

Perform inspections on critical assets

Run thermal scans on assets

Monitor for Intruders

Intelligent Infrastructure Monitoring | Benefits

All insights collected with real-time updated trends and key performance indicators (KPIs) based on data collected combined with learning from the AI and ML engine.

Increase the frequency of needed inspections at multiple sites as often as required.

Collect real-time and historical data allows you to better understand your assets' overall health in that moment.

Have greater insight into health of aging infrastructure

Instant notifications when a reading from a particular piece of equipment is out of its normal operating range.

Obtain real-time views of critical infrastructure components from anywhere, at any time.

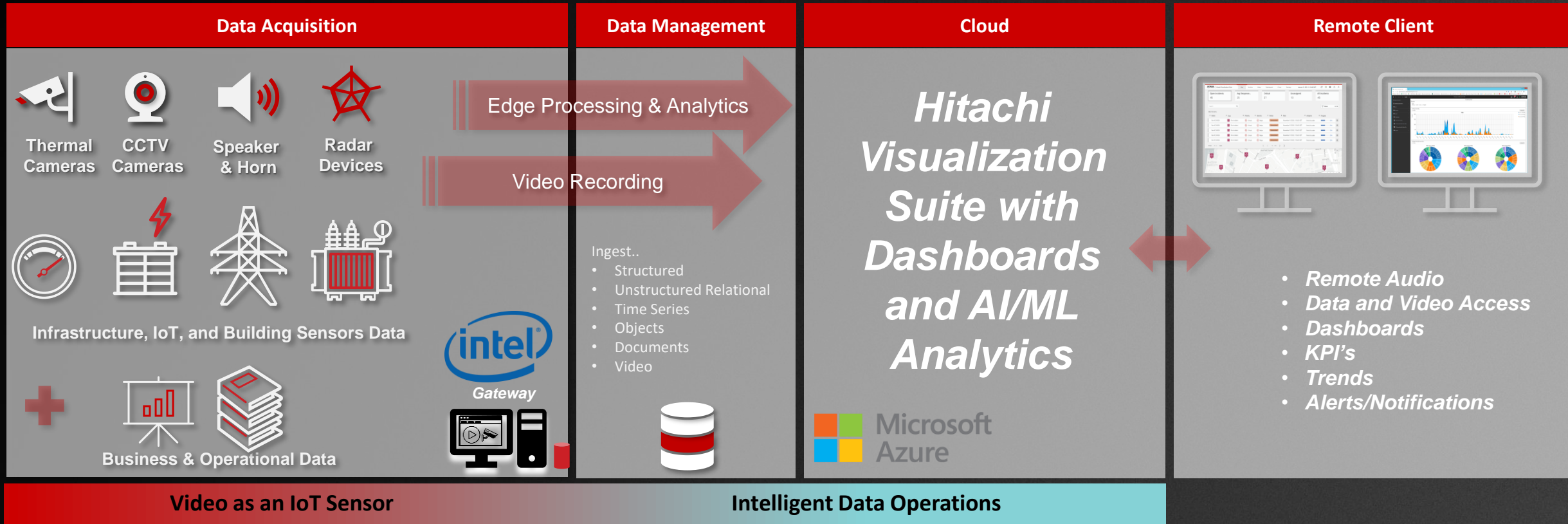With remote inspection, operations teams can drastically reduce travel time & system downtime, while performing on-the-spot monitoring at will.

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Intelligent Infrastructure Monitoring | How It Works

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Data Acquisition	Data Management	Cloud	Remote Client

Data Acquisition

Thermal Cameras

CCTV Cameras

Speaker & Horn

Radar Devices

Infrastructure, IoT, and Building Sensors Data

Business & Operational Data

intel® **Gateway**

Edge Processing & Analytics →

Video Recording →

Data Management

Ingest..
- Structured
- Unstructured Relational
- Time Series
- Objects
- Documents
- Video

Cloud

Hitachi Visualization Suite with Dashboards and AI/ML Analytics

Microsoft Azure

Remote Client

- *Remote Audio*
- *Data and Video Access*
- *Dashboards*
- *KPI's*
- *Trends*
- *Alerts/Notifications*

Video as an IoT Sensor | **Intelligent Data Operations**

3D Image scans and Models
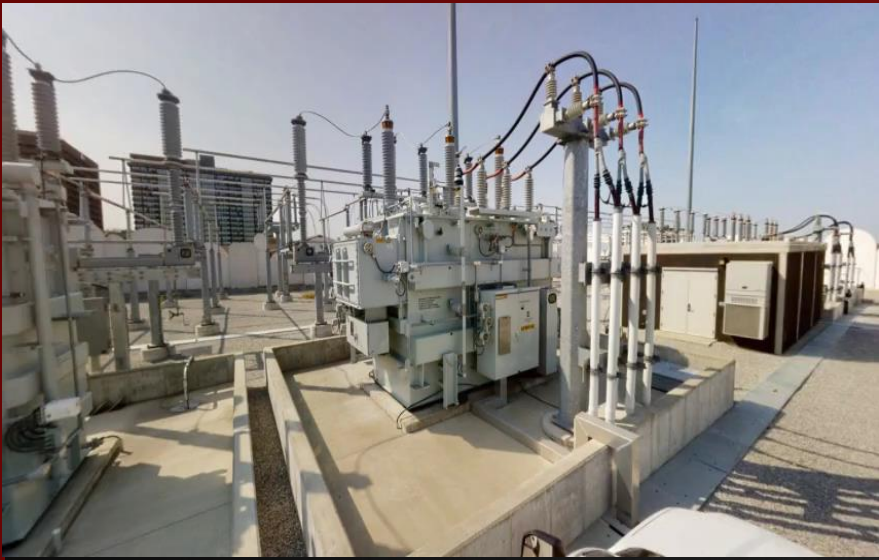
Thermal data and visual image capturing

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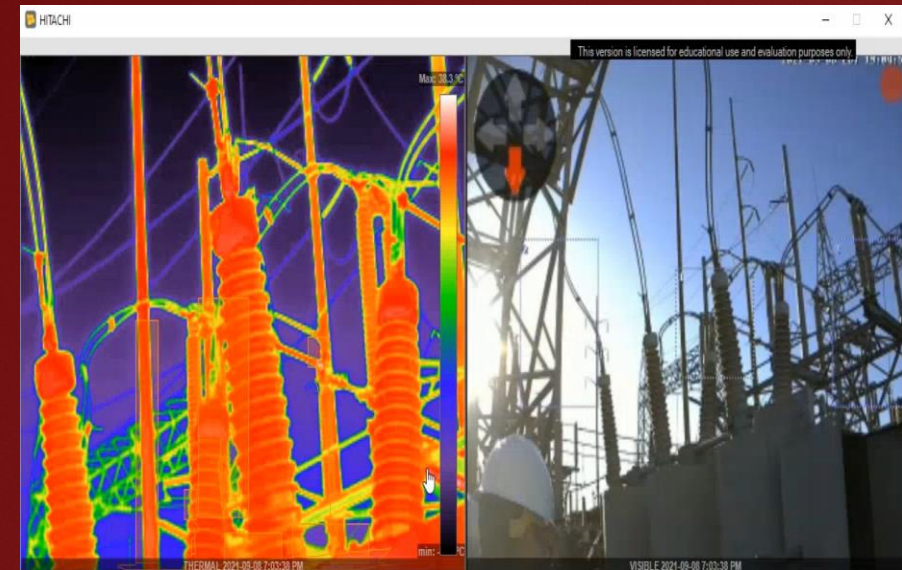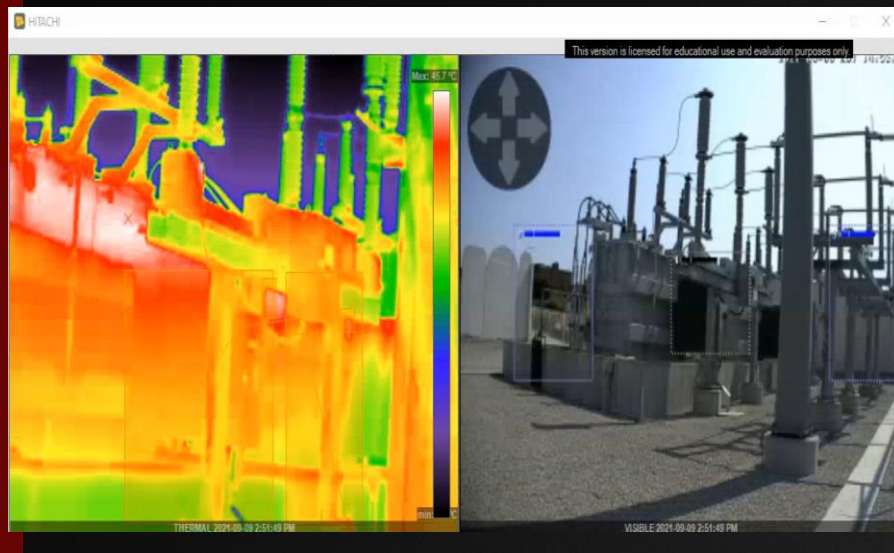
Hardware

Intelligent Infrastructure Monitoring | Hardware
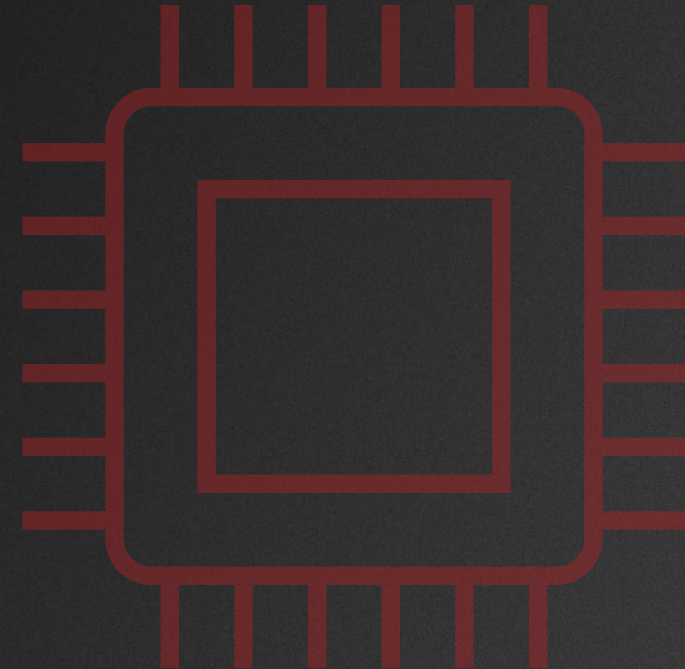
Sample equipment for a small substation

Item	Description	Type
1	CCTV PTZ Camera w/LED illuminator	Visual Spectrum
2	Thermal PTZ Camera	Thermal Radiometric
3	Radar	RF (Animal identification)
4	Speaker Horn	Audio
5	Door Station	Video and Audio Intercom
6	Gateway	Edge Compute for Video Management and Video Analytics
7	Tropos Wi-Fi	Local Device Connectivity
8	Switches and power supplies	Provides networking and power.

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Software

Sample software for a small substation

Item	Description	Notes
1	Video Management	Manages cameras, user access, recordings and video export for both visual spectrum and thermal cameras.
2	Visualization Suite	Web based application to access video and data from edge applications and analytics. Allows dashboard visualization.
3	Edge Thermal App	Retrieves temperature data from cameras off of external environment that camera is looking at.
4	Edge Video Analytics app	Real-time analytics to track intrusion and object detection by sitting on the Edge.
5	Cloud Video Analytics app (future)	Performs on-demand image processing. Requires data to create and train computer vision models.
6	Edge audio application	Allows performing SIP calls to intercom and speaker-horn devices and playback of audio clips and messages.

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Document 1

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OPERATIONAL EFFICIENCY AND EFFECTIVENESS
Utility Substations

Objective
Decrease power-substation downtime due to damage caused by small animals and unauthorized intruders.

Challenge and Market
Power substations suffer anywhere from US$250,000 to US$1 million in damages per year due to intrusion of animals and small rodents, as well as the actions of unauthorized personnel. These damages potentially could leave thousands of customers without power for time periods that could exceed weeks or even months, yielding a forecasted economic and utility cost ranging from thousands to millions of dollars. Utility companies are looking for ways to proactively identify these entry points of intruders that cause damage to equipment, which results in customer downtime. They also seek to be alerted to threats in real time, to address them in a timely manner.

How It's Done Today
Utility companies send teams of technicians to manually perform on-site visits. Many times, the damage has already occurred, and maintenance staff still are not 100% aware of when the intruder entered the restricted zone, and where entrance occurred to prevent future intrusions. Some sites will have CCTV cameras available for recording events, but without somebody watching that video feed, it may be too late to prevent damage.

How Technology Will Address the Challenge
With Hitachi Intelligent Infrastructure Monitoring solution, you can monitor your equipment and sites virtually from anywhere. With our software overlay, intruders crossing into a restricted zone will be recorded, and the appropriate staff will receive notifications and alerts regarding their entry. This alleviates drive time and allows your truck rolls to focus only on challenges that require their immediate attention.

Solution
Hitachi Video Analytics, Hitachi Visualization Suite, Hitachi Video Management and Hitachi Smart Cameras, Thermal Cameras

Hitachi Vantara

Smart Spaces and Lumada Video Insights

Benefits

- Increase system uptime.
- Improve customer satisfaction.
- Decrease operational expenditure by addressing weak points in entry.
- Decrease capital expenditure by addressing intruders before damage occurs.
- Improve maintenance effectiveness and efficiency.
- Identify proactive maintenance procedures for intruders.
- Reduce carbon footprint by minimizing truck rolls.
- Enable overall reduction in operation and maintenance expenses.
- Support just-in-time materials management, and so forth.

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Focus Your Mindset on a Future Built on Intelligent Infrastructure. Download the eBook.

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OPERATIONAL EFFICIENCY AND EFFECTIVENESS
Utility Substations | Remote Facilities

Objective
Perform more frequent inspections on aging critical infrastructure.

Challenge and Market
Due to limited resources and steady but increasing demand on utilities the challenge to maintain older and aging equipment while operating on a deficit is becoming drastically more problematic. Much of this aging critical infrastructure requires more frequent attention. In fact, the Department of Energy reports that 70% of power transformers are 25 years of age or older, 60% of circuit breakers are 30 years or older and 70% of transmission lines are 25 years or older. Simply replacing infrastructure costly and sometimes unnecessary. And waiting to make the determination to replace or leave equipment as is until the next scheduled inspection of that equipment is conducted, could result in a decision that comes too late.

How It's Done Today
To date, utilities struggle to prioritize resources such as people and capital budget to the appropriate pieces of their infrastructure, such as transformers, circuit breakers, or gauges. The inspection of critical infrastructure occurs in a reactive state: where a truck and crew is deployed, where the issue is addressed after the equipment has already failed, or where the equipment is on a planned maintenance inspection schedule. Although these options are applicable to some extent, they still do not allow for more frequent inspections to catch equipment failure before it happens. Limitations of these current approaches can lead to massive system downtime, loss of revenue, and many dissatisfied customers.

How Technology Will Address the Challenge
With Hitachi Intelligent Infrastructure Monitoring solution, you utilize the power of video data, trending, and artificial evaluations to identify past, current, and future condition of those assets, on-site. This comprehensive, end-to-end solution includes visual spectrum and thermal radiometric cameras, ruggedized PCs, edge and cloud applications, and video and data analytics, to allow remote monitoring, inspections, and in the future autonomous operation.

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- Increase system uptime.
- Improve customer satisfaction.
- Increase inspection frequency of gaining equipment.
- Improve capital expenditure forecasting.
- Improve maintenance effectiveness and efficiency.
- Implement proactive maintenance procedures.
- Reduce carbon footprint by minimizing truck rolls.
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- Support just-in-time materials management.

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Intelligent Infrastructure Monitoring

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OPERATIONAL EFFICIENCY AND EFFECTIVENESS
Utility Substations

Objective
Maximize the efficiency and effectiveness of field maintenance teams.

Challenge and Market
To accommodate our growing world, demand is mounting to maintain critical infrastructure, and utilities are under pressure to increase their operations. In addition, resources to maintain those infrastructure sites are dwindling as more than a third of the country's 400,000 electric utility employees are headed for retirement.

How It's Done Today
Today infrastructure maintenance teams respond to failures in equipment reactively or perform inspections on a scheduled basis. Sometimes these manual inspections can take hours on top of drive times and conflicting priorities, allowing for only one to three inspections a day. These current approaches drive up operational cost, which can domino into other issues and hold back appropriate technicians from performing critical work where they are needed most.

How Technology Will Address the Challenge
With Hitachi Intelligent Infrastructure Monitoring solution, you can monitor your equipment virtually, from anywhere. You can perform inspections as frequently as needed for various pieces of critical infrastructure, such as transformers, gauges, circuit breakers, and more. This alleviates operational team drive time and allows your truck rolls to focus only on challenges that require their immediate attention.

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Thank You