ANALOG DEVICES

AHEAD OF WHAT'S POSSIBLE™

INTELLIGENT BUILDINGS

Creating a Sustainable Future

Accelerate Your Path Towards a Sustainable Net-Zero Future with ADI

Building digitalization is critical to enable the global goal of achieving a sustainable net-zero future. Leveraging our rich history of domain expertise and industry-leading sensing, measurement, power, processing, and connectivity technologies, Analog Devices is unlocking operational insights that transform traditional buildings into intelligent buildings. ADI's commitment to using our technology, people, and voice to protect the planet and improve quality of lives to drive positive change for future generations makes us a co-creation partner of choice. Equip your building with innovative technologies that improve safety, accessibility, building management, and energy efficiency, maximizing building's occupants' comfort.

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The Future of Intelligent Buildings

Digitizing, Connecting, Delivering Sustainability

Building digitalization, coupled with increased levels of interconnected automation systems, intelligent edge sensors and actuators are providing operational efficiencies that deliver long-term sustainable improvements in building management. These actionable insights reduce energy consumption, create safer environments, and increase occupancy comfort, leading to higher productivity and a greener future.

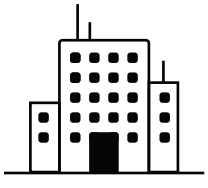
Operational Efficiencies with Interconnected Building Systems

Edge nodes monitor, analyze, and influence the physical operational environment of the intelligent building. Artificial intelligence at the edge and in the cloud is using data to optimize system performance to achieve the required business outcomes and environmental objectives. Data must be able to flow across traditionally siloed IT and OT networks, reinforcing the need for continued convergence. This holistic approach relies on an underlying communications framework that connects the building's automation subsystems to the building management system. Ethernet to the edge is enabling IP-addressable nodes to communicate over existing standard twisted pair cable, thus facilitating a seamless upgrade path for legacy systems.

Localizing Intelligence and Protecting the Edge

To make informed decisions, data from many devices must be collected and interpreted. By decentralizing intelligence, this data can be locally analyzed for more timely decision-making, with only the outcome being communicated to the control layer. With more accessible nodes comes a need to protect the edge. Authentication and secure boot are some of the features that are needed to secure edge nodes from potential cyber-attack.

90%
OF EXISTING BUILDINGS WILL STILL BE STANDING BY 2050



"Questions and Answers on the Renovation Wave." European Commission, October 2020

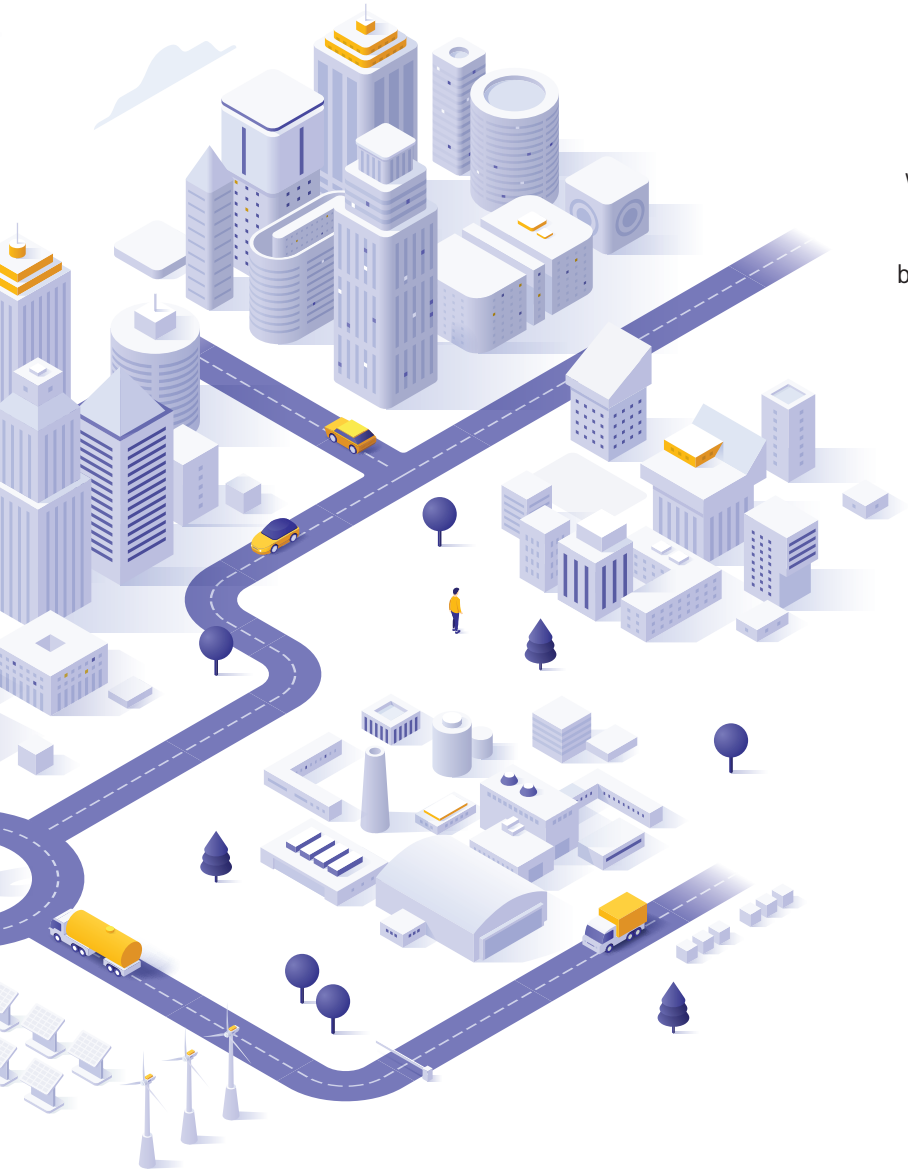
Enabling Adaptable Buildings and Legacy Building Upgrades

Digitalization is the connection of edge sensors and actuators, the extraction of insights and the automation of actions to deliver on operational goals. In new buildings, spaces must be adaptable, with the ability to be reconfigured for new or expanded use cases. For legacy buildings, additional sensing and control must be integrated with existing I/O controllers and cabling, so they can grow organically as investment increases and ROI is realized. A configurable software I/O solution provides the flexibility needed for both new and legacy buildings, enabling owners to maximize the return on their asset investments.

Urbanization on the Horizon

Population growth contributes to urbanization and it's estimated that >65% of the world's population will live in an urban environment by 2050. It is predicted that the global building floor space will double by 2060, equivalent to adding an extra New York to the world every month for 40 years.

UN Department of Economic and Social Affairs, May 2018



Reduced Operational Costs with Increased Automation

The holistic connected building is becoming smarter, automatically reacting to the needs of its occupants both inside and outside of working hours. Automated adjustment of room lighting, temperature, ventilation, and window blinds based on occupancy and external weather conditions is creating a more comfortable and productive environment for workers, while enabling significant reductions in energy usage and cost for the business. With 90% of existing buildings likely to be still standing by 2050, organizations must invest in greater automation to overcome increasing operational costs and to meet their sustainability goals.

Reduced Energy Usage with Efficient Power Design

Fully integrated building management systems can bring significant energy savings through sequencing processes, optimizing the environment for occupancy patterns, and detecting and diagnosing equipment working efficiencies. Savings can also be realized through core system design, requiring a development partner that understands trade-offs and can deliver on the solutions needed for efficient power design.

50%
OF ENERGY CURRENTLY USED BY BUILDINGS IS WASTED

Sustainable Energy Authority of Ireland, 2020

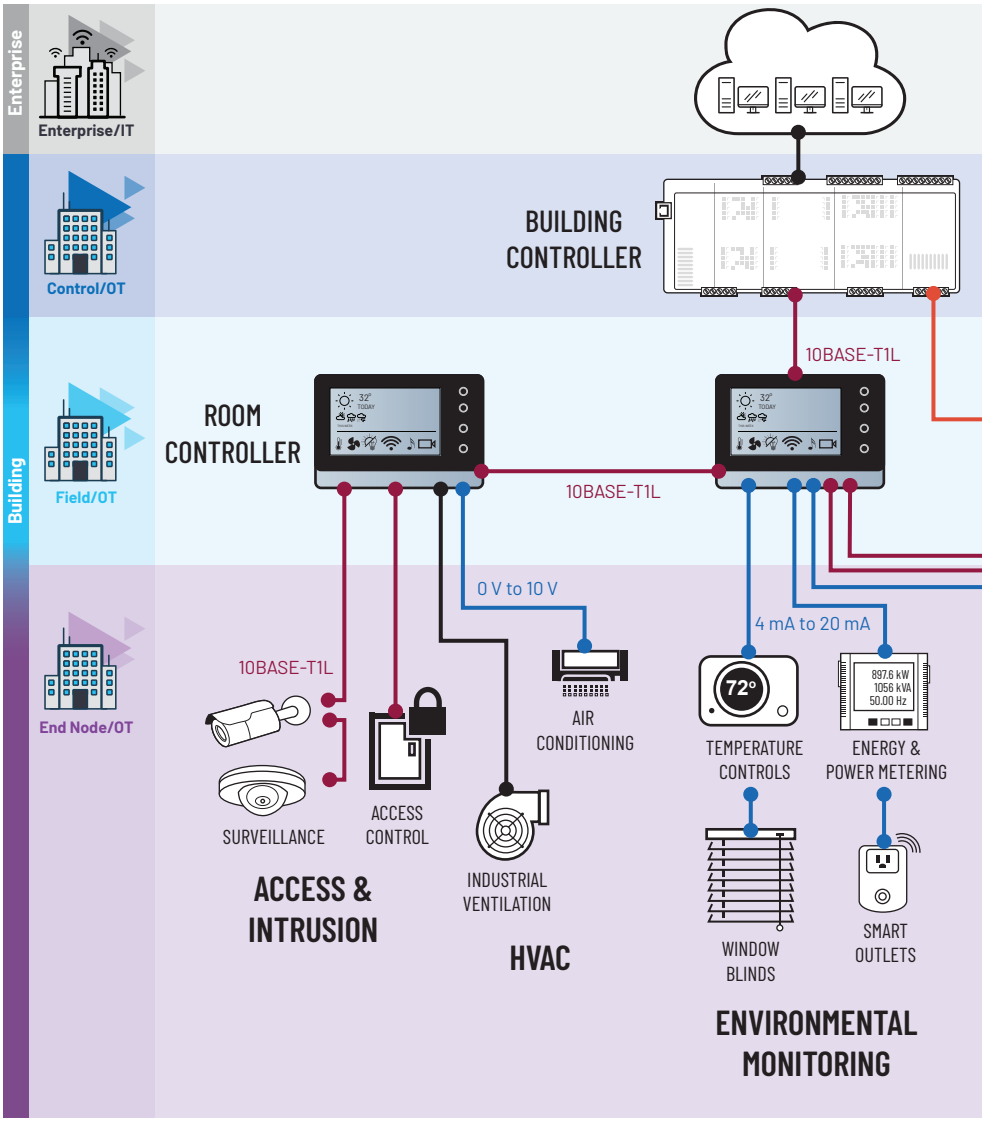
ADI's Key Enabling Technologies

Unlock new sources of efficiency

Making buildings more sustainable is fundamental to reducing global energy consumption and associated carbon emissions. Many new buildings are being outfitted with technologies to remotely monitor and control HVAC systems, sense room occupancy, autonomously control lighting, and monitor environmental conditions, making these buildings more sustainable while also making them safer and more comfortable for their occupants. Analog Devices' industry-leading measurement, connectivity, power, and processing technologies are helping to make intelligent buildings a reality.

Access Control

Utilizing AI, facial and audio access control is now becoming common place. Secure your building from external and internal threats with a host of ADI technologies, including cybersecurity and AI enabled processing solutions. From door access to voice-activated blind control, the **MAX78000** AI microcontroller is built to enable neural networks to execute at ultra low power at the intelligent edge.



38%

OF ELECTRIC ENERGY USE IS FOR MOTORS IN COMMERCIAL BUILDINGS

"Energy-Efficiency Policy Opportunities for Electric Motor-Driven Systems," International Energy Agency, 2011

Asset Health Management

Electric motors account for approximately 38% of all electricity used in commercial buildings. Energy usage in HVAC systems can be optimized by monitoring vibration and power quality. ADI's **ADXL359** enables condition monitoring of assets in real time, allowing early diagnosis of mechanical faults and failing equipment. The **ADE9430** power quality monitoring device and accompanying software stack allows a cost-effective way to monitor the health of the motor power supply and to preserve the health of the motor itself.

40%

OF ALL CO_2 GLOBAL EMISSIONS ARE GENERATED BY BUILDINGS

"Bringing Embodied Carbon Upfront" World Green Building Council, 2019

WITH 28% ATTRIBUTED TO THE OPERATION OF THE BUILDING

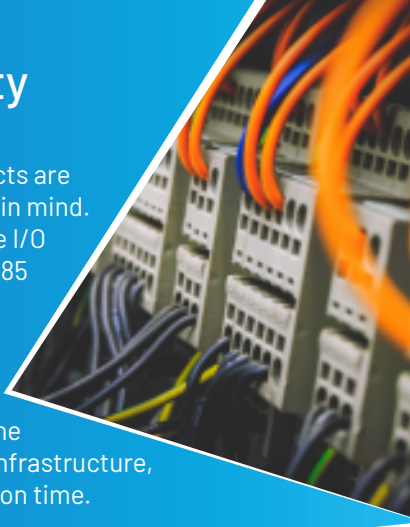
The Connected Building

Seamless connectivity to edge node sensors and actuators is resulting in substantial building operating efficiencies. Analog Devices offers a portfolio of products to bring Ethernet connectivity to all levels of a building automation system. Ethernet PHYs are available for connecting controllers over 10BASE-T/100BASE-T/1000BASE-T links. Single-pair Ethernet products (**ADIN1100**/**ADIN1110**) compatible with the 10BASE-T1L standard bring Ethernet connectivity to room controllers and edge nodes in point-to-point, ring, and line network configurations. The **ADIN2111** 2-port low complexity switch reduces the burden on the room controller's microcontroller, making upgrades from legacy systems easier.

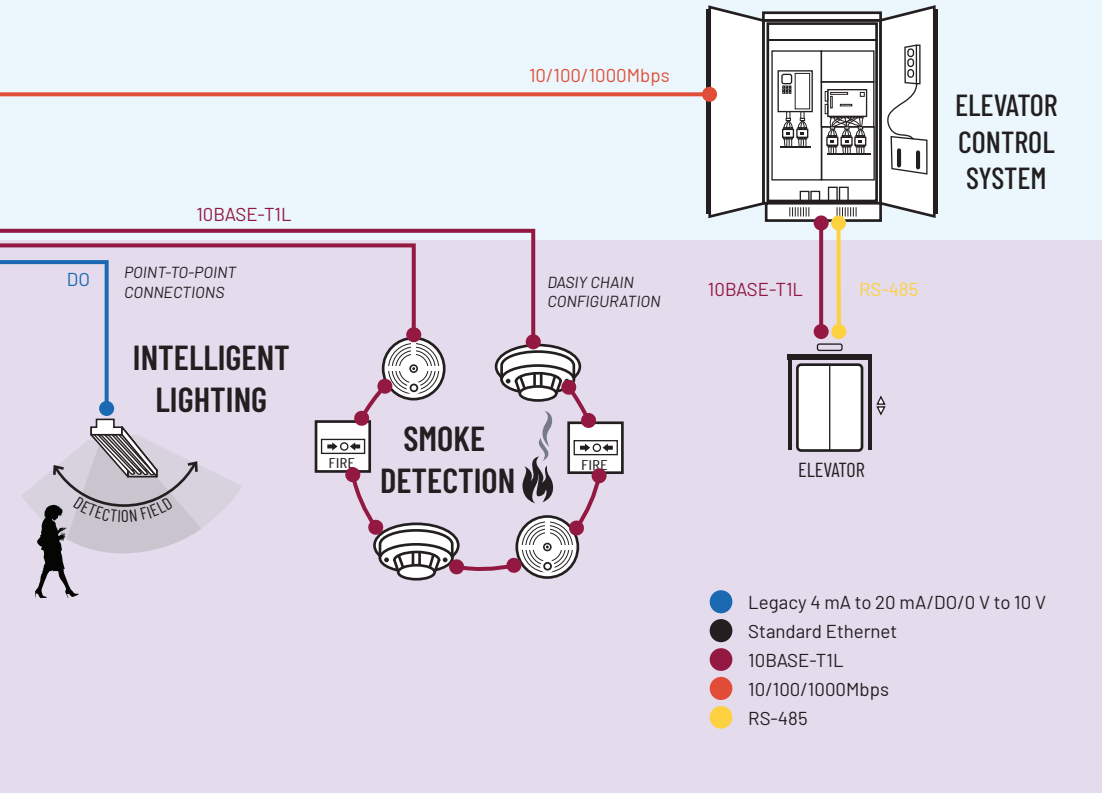
Retrofitting a Prioritity

Building retrofits are key to achieving sustainability targets, and ADI's products are designed with a staged upgrade path in mind. The **AD74412R** software configurable I/O enables legacy (**ADM2867E** for RS-485 and **ADM3055E** for CAN) and new flexible communication systems (10BASE-T1L) to co-exist for optimum retrofitting.

10BASE-T1L installations use the existing twisted pair cabling infrastructure, reducing waste and installation time.



BUILDING MANAGEMENT SYSTEMS NEED REAL-TIME DATA THAT ENABLES INTELLIGENT, IMPACTFUL DECISIONS



Edge Intelligence

Integrating state-of-the-art sensors and controls into most commercial buildings can save as much as an estimated 29% of site energy consumption. Building intelligence and adaptability into edge devices requires high performance inputs and outputs. Software configurable I/O (**AD74412R**) brings a new level of flexibility to room controllers, while the **AD4130-8** is an advanced multichannel ADC that can be mated with a variety of sensors and inputs. Precision temperature sensors such as the **MAX31825** and **ADT7420** can provide real-time feedback on the ambient temperature, while the **TMC5130A** is a high performance noiseless stepper motor driver, enabling efficient, quiet operation of heating valves (TRVs) and airflow units.

Fire Safety

Building safety is an integral part of a holistic building management system. The **ADPD188BI** is a complete smoke detection solution from Analog Devices that enables smaller form factor designs, and reduced nuisance alarms while meeting the latest, strictest international fire safety standards. Distinguishing between life threatening and non-life threatening sources of smoke is critical. The **CN0537** reference design contains a smart detection algorithm, fully verified to UL 217 and EN 14604 standards, that can make this distinction.

INTEGRATING STATE-OF-THE-ART SENSORS AND CONTROLS CAN SAVE

~29%

Office of Energy Efficiency & Renewal Energy
US Department of Energy

OF SITE ENERGY CONSUMPTION

ANALOG.COM/ELEVATE-SURVEILLANCE

Intelligent Surveillance Cameras that Detect and Track

AI enabled cameras provide protection to people and infrastructure, as well as productivity insights to retailers, manufacturers, and city planners. Increasing resolution, and additional sensing, such as radar and audio, enable cameras to see and hear more, with greater clarity, and in any condition.

Cameras also need to rapidly target events, then smoothly track and record, even when exposed to vibration. Whether using a stepper motor or a more complex BLDC motor, ADI Trinamic™ motor control solutions and multiturn position sensors simplify camera design, improve efficiency, and enable precision movement.

- **TMC5072** Integrated Motor Driver
- **TMC4671** Servo Controller
- **ADMT4000** Multiturn Position Sensor

Broad and Scalable Processor Platforms for the Edge

Best-in-class power and secure computing

Power
Flexible power management and ultra low power consumption solutions

Performance
High speed secure peripherals

Connect
Supporting wired and wireless protocols

Scale
Broad offering, supported by shared development tools

Develop
Rich library of drivers and software modules

Secure
IP protection and system authentication

Securing the Intelligent Edge

Ensuring your data is protected

For security at the edge, the **DS28S60** DeepCover® cryptographic coprocessor easily integrates into embedded systems enabling confidentiality, authentication, and integrity of information. With a fixed command set and no device-level firmware development required, the **DS28S60** makes it fast and easy to implement full security for IoT devices. The **MAXQ1065** ultra low power cryptographic controller offers solutions for access control, providing turnkey cryptographic functions for root-of-trust, mutual authentication, data confidentiality, and integrity.

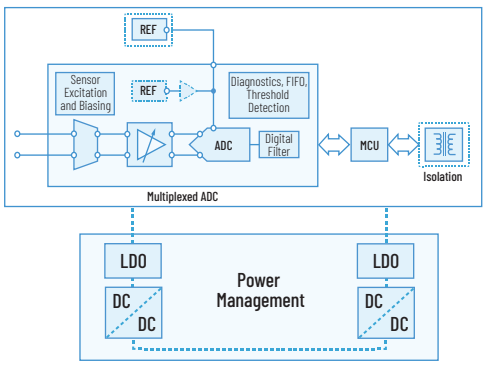
- **DeepCover®** embedded security solutions protect against device-level security attacks. Invasive and noninvasive countermeasures are implemented including active die shield, encrypted storage of keys using the ChipDNA PUF technology, and externally callable algorithmic subroutines.

- **ChipDNA™** is a physically unclonable function (PUF) providing a cost-effective solution with the ultimate protection against security attacks

Precision Signal Chains for Sensor Measurement

Quickly digitize sensor data in every corner of the building

Offering high performance, ultra low power, and support for a diverse range of sensor interface and measurement solutions, ADI's Precision Signal Chains accelerate the design of sensor devices needed throughout intelligent buildings. Pre-selected technology combinations, tools and expertise create a simplified design journey, with variations available for key performance specifications such as power efficiency, solution size, noise immunity, and bandwidth. LTspice® signal chain level schematics allow fast simulation, optimization and onward design, while power management solutions are provided to ensure optimal performance and efficiency.



Powering the Intelligent Edge

Intelligent buildings rely on a foundation of power. Efficient and robust power technology reduces operating costs and environmental impact of buildings. ADI offers trusted power solutions, enabling the design of smarter buildings of the future.

Maximize Battery Life
with Charging and Fuel Gauge Solutions
LTC3440 / LTC4085-3

Achieve Crisp Imaging Output
with Ultra Low Noise LDOs
LTC3042

Enable Robust Industrial Lighting
with LED Driver Solutions
LT3519 / LT1618

Accelerate Image Sensor Design
with High Current µModule solutions
LTM4644

Improve EMI Performance
with Silent Switcher Technology
LT8641

Eliminate Wasted Energy
with Robust Ideal Diode Controllers
LTC4412

Reduce High Voltage Power Usage
with Boost Regulators
LT3461

Extend Battery Life
with Power Supply Supervisory Technology
MAX16162

Support Power over Data
with Robust PSE and PD Solutions
MAX5980 / MAX5974A

Simplify Isolated Power Supply Design
with Flyback Technology
LT3748 / LT8302

Optimize Power Regulation
with Efficient DC-DC Regulators
LT3502 / MAX15062

Analog Devices, European Research & Development Building, Limerick, Ireland
Platinum LEED Certified

LEED BUILDING

Analog Devices is leading by example for a sustainable future

100,000kWh
KILOWATT HOURS A YEAR SAVED

19,000 TONS OF CARBON DIOXIDE **SAVED**

100%
RENEWABLE **ENERGY**

Decades of Experience Combined with Expert Knowledge Have made ADI a Co-Creation Partner of Choice for Intelligent Buildings, Pioneering a Sustainable Future.

With Platform Solutions and Cutting Edge Software, ADI Is Ahead of What's Possible.

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