



INTRODUCTION: **COPPERTREE** AND BUILDING DATA ANALYTICS



Connecting Buildings | Connecting People

DID YOU KNOW?



- Buildings account for approximately 39% of co2 emissions and 70% of the electricity load?*
- That is more than any other sector, including transportation!*
- HVAC and lighting loads account for almost 50% of a building's energy consumption*
- With very inexpensive changes to your buildings (mostly non-capital expenditures) you can greatly reduce your spending on energy and maintenance, while improving your occupant experience

*Source: US Department of Energy

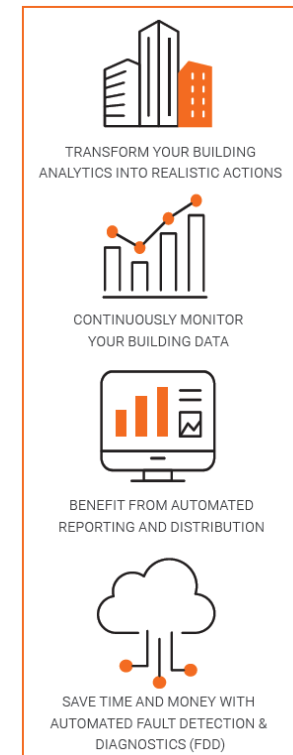
WHO IS COPPERTREE



- CopperTree Analytics was **founded in 2012**
- We are the Canadian-based developer of the software **KAIZEN**, a powerful and patented analytics tool that utilizes rule-based algorithms and Machine Learning (**ML**) to translate your building's data into useful information.
- Currently deployed to close to **2,700 client buildings** on **four continents**
- Each day we intake **~1,300,000,000 (1.3 BILLION) data samples** into our servers
- Analyzing **100's of millions** of square feet of building stock for **~650 end clients**

The CopperTree Analytics Team

- ✓ 40 Employees based in **VANCOUVER, CANADA** and **SEATTLE, USA**
- ✓ 3 Departments:
 - ✓ **Technical Services** – Client Facing Project and Engineering
 - ✓ **Product Development** – Ongoing Innovation and Software
 - ✓ **Sales & Marketing** – Market outreach, Client Acquisition
- ✓ Founders
 - ✓ Veterans of Energy and **Building Automation Industry**,
 - ✓ Successfully **launched** then **grew** and **sold** successful companies **Delta Controls** and **ESC Automation** for \$200M and \$75M respectively

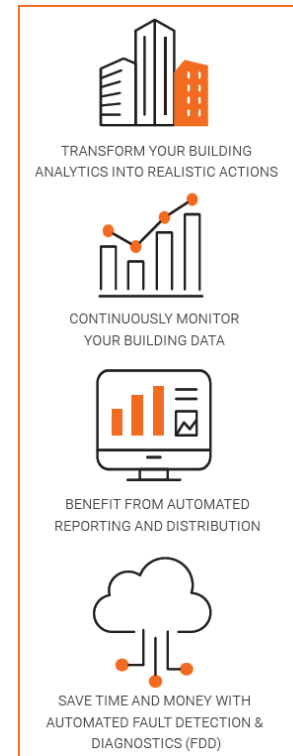


Value Proposition

- From hundreds of projects:
 - ✓ ~ 5-30% savings of total building energy reduction average and improvement in sustainability
 - ✓ ~ 40-60% savings in building operations labor re-direction and reduction in hot/cold complaints from occupants
 - ✓ Very quick payback - positive ROI in less than 2 years – most ROI in weeks!

BUILDING & ENERGY ANALYTICS GOALS

- ✓ Increase Energy Efficiency Reporting
- ✓ Improve Occupant Comfort/Safety
- ✓ Reduce Maintenance Costs (\$/Sqft & Sqm)
- ✓ Prolong Equipment & Plan Capital Upgrades



The Role of Building Analytics

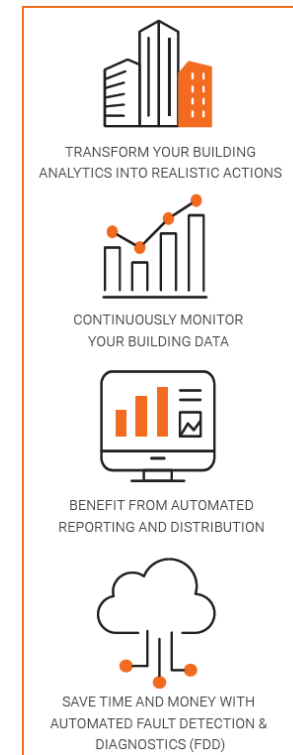
- ❖ Identify control sequence issues
- ❖ Detect installation issues and equipment/device faults
- ❖ Measure performance
- ❖ Report non-compliance
 - ❖ Occupancy safety and comfort
 - ❖ Energy use intensity
 - ❖ Process monitoring and control

Example Success Story Project

Project Size: 17,193 m2 mixed-use building

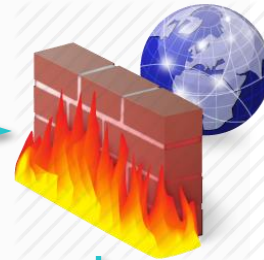
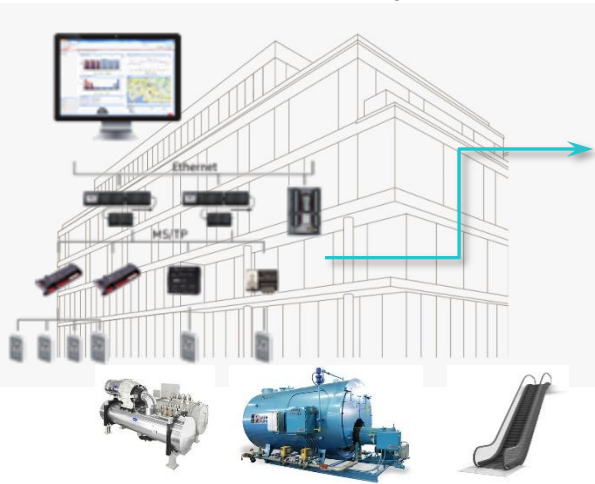
Project Location: London, UK

- ✓ Annual Energy Savings Realized: **£185,000 /YEAR**
- ✓ Reactive Maintenance Reduced: **-40% YEAR/YEAR**
- ✓ Indoor Comfort KPI: **IMPROVED BY 54%**
- ✓ Investment: £30,000: **PAYBACK IN 0.165** years on energy savings alone
- ✓ [Link to Case Study Here](#)

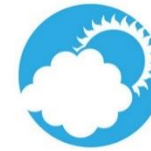


HOW DOES IT WORK?

Client building with Existing Metering & HVAC Control System

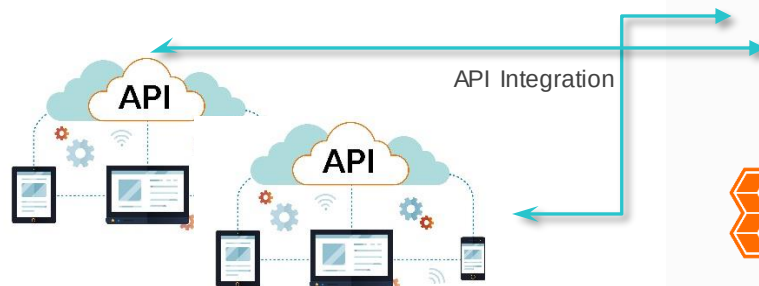


Weather Data API



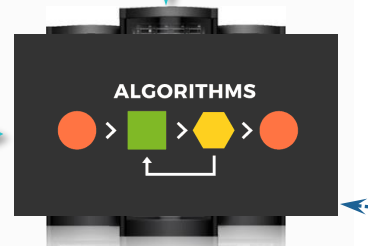
ONSITE DEVICE
ACQUIRES AND
PREPARES DATA FOR
DELIVERY

CLOUD SERVER
ANALYZES THE DATA &
GIVES ACCESS TO
ANALYTICS, CHARTS
AND REPORTS.
NOTIFICATIONS ARE
DELIVERED VIA THE
WEB AND MOBILE



API Integration

Any API/Cloud Data Source



KAIZEN
Analytics Server

Alerts &
Reports



Mobile
& PC

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Data Integration, Mapping & Analytics in Product Offering

BAS & API
Integration

Mapping & Contextualization

Analytics & Fault Detection
Diagnostics

Group & Split

Group
Context

AutoTagging
& Validate

Review and
Approve

Data
Collection

Auto Apply
Rules and
Analysis

Data Stream
Health

FDD /
Analytics

Discovery

Reduction of Data to Points & Systems
of Value

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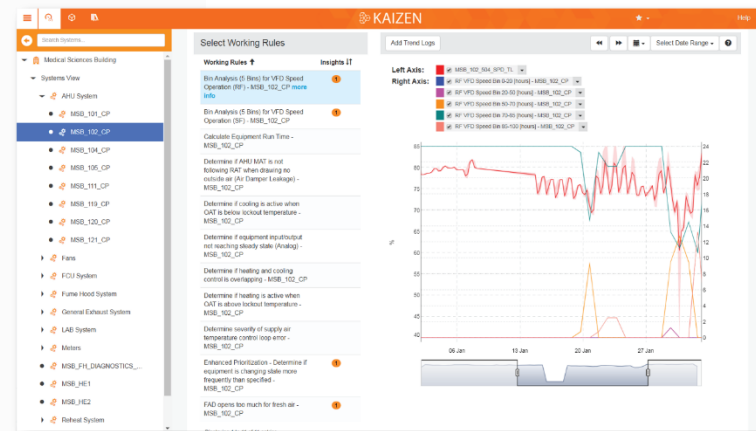
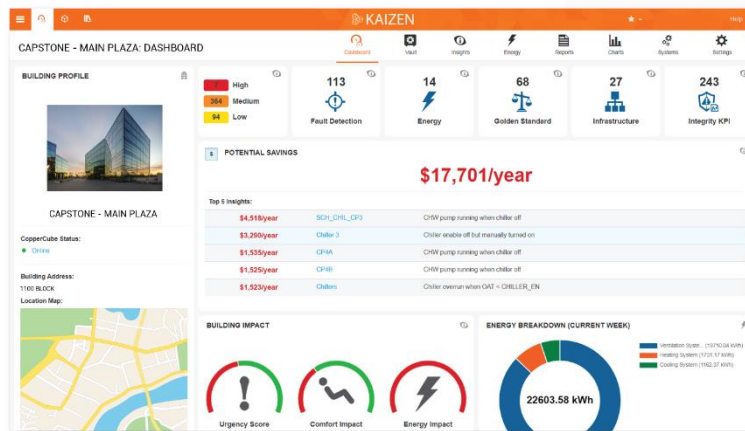


CopperTree
Analytics

SOFTWARE PRODUCTS



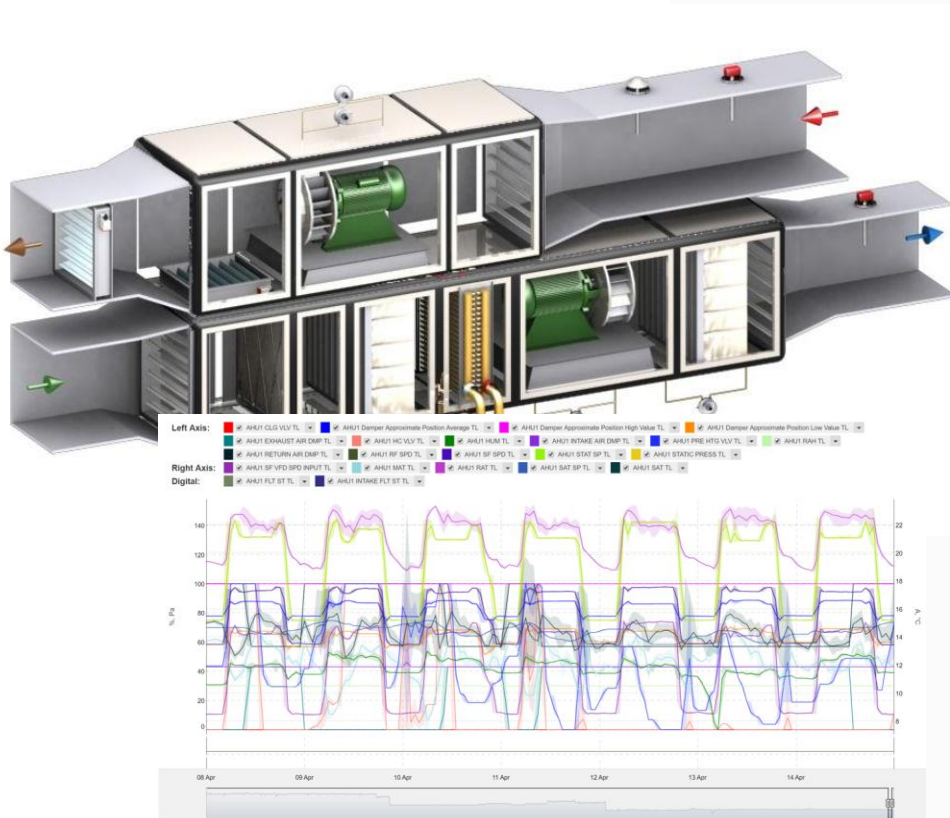
Kaizen FDD, Fault Detection and Diagnostics platform utilizing rule-based algorithms, pattern recognition techniques and machine learning, with portfolio, building and system-level interactive views, system performance auditing and an actionable issue management portal.



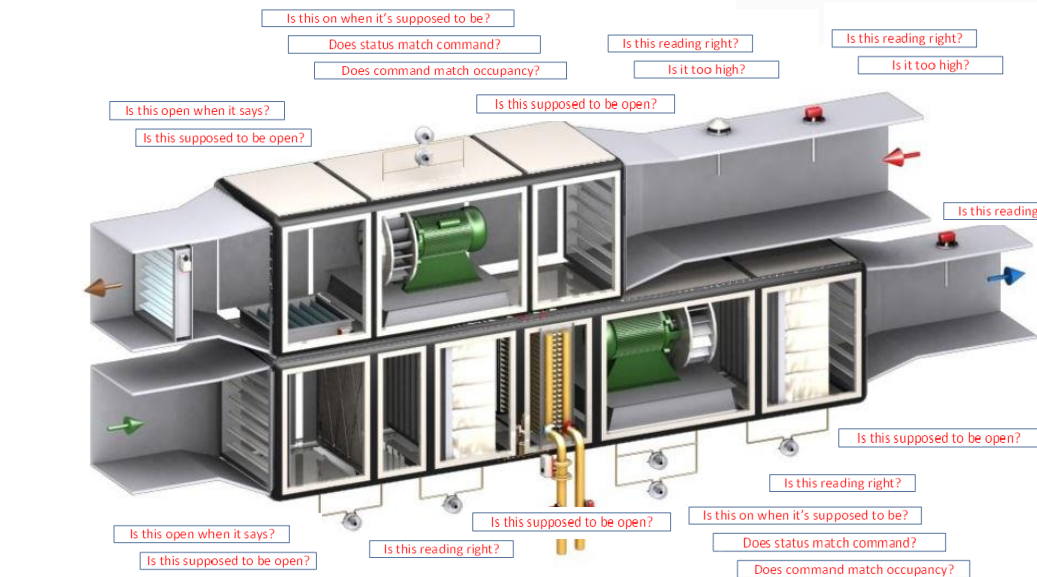
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Automated Fault Detection and Diagnostics - Example of an Air Handling Unit (AHU)



- ✓ One AHU with 30 data points creates over 3,000,000 data samples in a year.
- ✓ With 1,000 similar assets in your portfolio, you're potentially dealing with 3 Billion data samples.
- ✓ It is impossible to properly manage this much data without a sophisticated, dedicated data analytics platform.



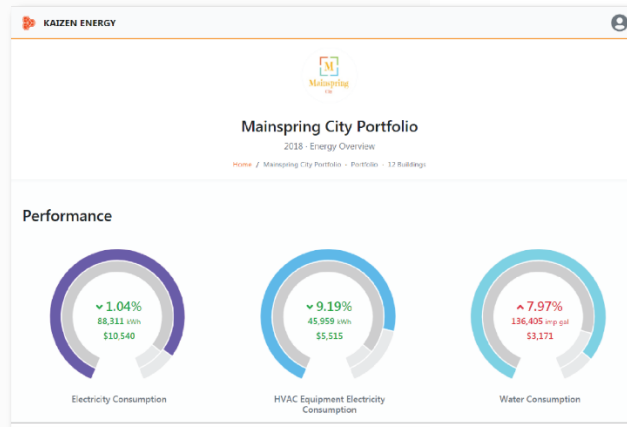
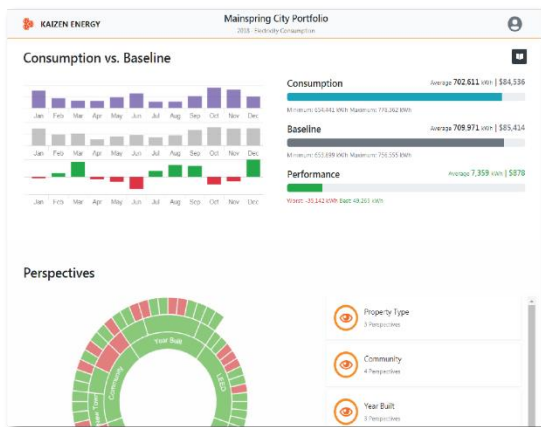
System Level Actionable Insights



SOFTWARE PRODUCTS



Kaizen energy, energy information system (EIS) platform, has portfolio-level and building-level energy management capabilities including powerful energy baselining, multiple resource metering and interactive views with flexible perspectives.



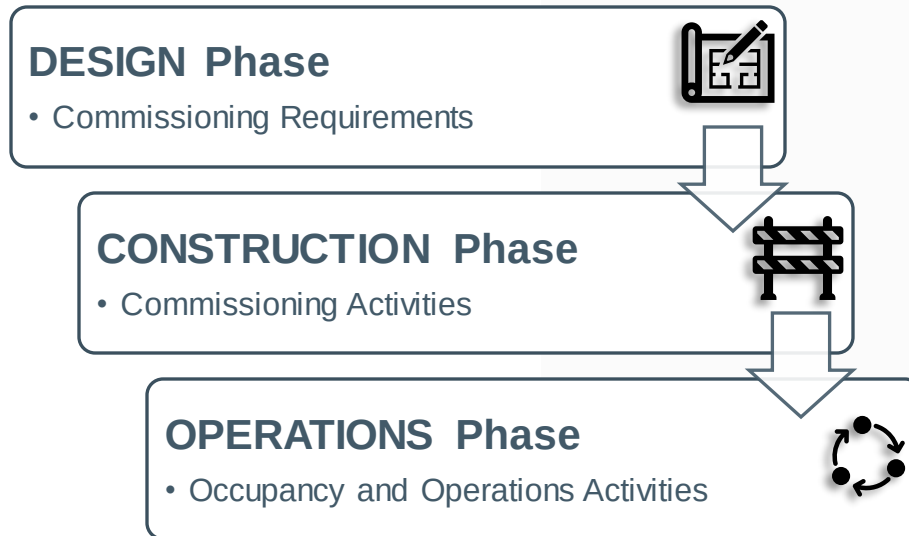
TECHNICAL SERVICE TEAM



- Analytics Implementation & Engineering Services
 - ✓ Full turn-key implementation of analytics for client projects
 - ✓ Scoping and planning for new projects
- Ongoing Managed Services
 - ✓ Continuously delivered analysis and help from our Building & Energy Engineers
 - ✓ Assistance with client workflow, prioritizations, and further customization of analytics deployments
- Training & Technical Support Services
 - ✓ Standard and customized training services to fit every client's needs
 - ✓ Technical support for all clients

Building Commissioning – Phases

Commissioning Process



Role of Analytics Platform



Measuring

- Data – what and how?
- How to organize and identify?



Validating

- Control sequence verification
- System-to-system interaction
- Occupancy-ready reporting



Sustaining

- BAS parameter benchmarks
- Performance metrics

Building Commissioning – Findings

- BAS network/controller issues
- Systems operating outside schedule
- Setpoint settings outside expected parameters or lacking reset strategies
- Control loops performing poorly, either sluggish (too slow) or unstable (too fast)
- Control sequences not as designed
- Sensors/control devices malfunctioning and/or mislabeled





DESIGN Phase: Commissioning Requirements

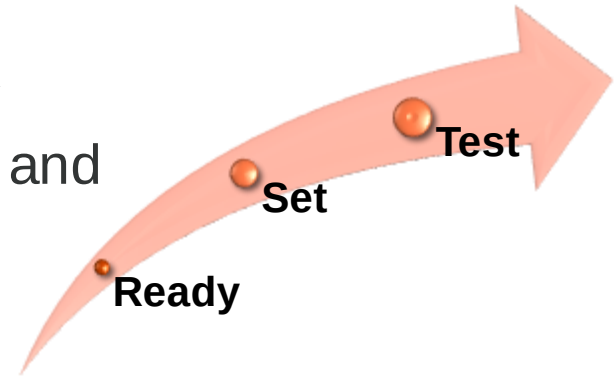
- Develop the **functional testing** scope for each system or piece of equipment.
- Verify trending of all systems monitored and controlled via the BAS, a requirement that is part of the **functional testing**. Trend logs help confirm proper operation of all major control loops, equipment staging and time of day scheduling, etc.





CONSTRUCTION Phase: Commissioning Activities

- Develop a master list of commissioned equipment, systems and assemblies.
- Confirm **functional test** readiness aided by field observation, review of start-up reports, and control system trend log analysis.





OPERATIONS Phase: Occupancy and Operations Activities

- Provide performance tracking and status reporting of outstanding commissioning items.
- Complete deferred functional testing.
- Identify opportunities to optimize systems, including fine-tuning control loops, and adjusting schedules, sequences, and setpoints.
- Monitor, benchmark, and evaluate building energy performance.
- Establish ongoing commissioning program.



OCx, MBCx, FDD and EMIS

*“[Ongoing Commissioning] **OCx** often incorporates processes such as Monitoring-Based Commissioning (**MBCx**), including technology-specific Fault Detection and Diagnostics (**FDD**), Energy Management and Information Systems (**EMIS**) and other performance tracking analytics solutions...”*

From: [Ongoing Commissioning Best Practices](#), Building Commissioning Association (BCxA).
Page ii. Accessed March 2021.

