Verdigris uses Arm technology to enable smart buildings on Arm campuses

Verdigris transforms passive buildings and real estate portfolios into dynamic, efficient assets.

Advancements in connectivity, data storage, and cloud services are digitizing and connecting people to devices and their surroundings. Verdigris elevates these technologies with our smart energy meter and building data platform. Our systems collect and analyze energy data to provide insights to make buildings intelligent and responsive. As a technology company, Arm understands the competitive advantages of investing in smart buildings using Verdigris.

Smart buildings have become a catch-all phrase for the next generation of high-performance buildings. The industry is competitive and crowded with a variety of technology options and offerings. Navigating the range of value propositions with buzzwords like big data, artificial intelligence and machine learning is daunting and overwhelming. Fundamentally we believe that smart buildings use data and connectivity to be predictive, preventative, and responsive. It's a tall order and a long, complex journey.

Not one to shy away from a challenge, we believe in the capabilities for Verdigris systems to support three pillars of enterprise smart buildings:

- Environmental and cost savings
- Comfort
- Business resilience

Arm, a multinational company, often uses its own IoT technology, such as Pelion Smart Spaces, as well as those from its partners in its own facilities. This led to the collaboration with Verdigris, as Arm's employees occupy a mix of legacy buildings and new construction that leverage different types of connectivity and provide varying degrees of data availability and accessibility. Arm's first objective was to bring transparency to the energy data it collects from its facilities. Martin Frohock, Head of Facilities UK and EMEA, understands the value of the simple, but impactful detail of gathering information.

"Verdigris is a key part of our Arm Smart Building Initiative, which includes our own Pelion Smart Spaces," said Martin Frohock, Head of Facilities UK & EMEA, Workplace Experience, Arm. "Arm relies on Verdigris for detailed energy insights in real time as we strive to curb energy waste, improve critical equipment uptime and achieve corporate sustainability goals."

Martin Frohock, Head of Facilities UK & EMEA, Workplace Experience, Arm

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The relationship expanded to the US in Austin, Texas for a mixed-use laboratory and office space. The building itself contains multiple tenants. Since there is shared occupancy, Arm was interested in submetering and LEED certification in their occupied areas. The growth in green building construction has been driven by multiple business benefits. Green building owners have reported an asset value more than 10% greater than traditional buildings and over 5% decrease in operating costs[1]. Verdigris systems provided the granularity on energy consumption for the Arm spaces and helped achieve advanced monitoring points for US Green Building certification.

Existing BMS (left) and example of sensors installed in panels at ARM SJ (right)

And recently in 2019, Verdigris deployed systems in a new building in San Jose, California where the ultimate goal is to integrate Verdigris into areas with an existing building management systems (BMS). This capability will help control building HVAC equipment for optimized environmental comfort and energy demand management through forecasting and adaptive automation.

Verdigris systems can enable a work environment that increases employee comfort, happiness and productivity with added benefits of being energy efficient, automated and

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[1] http://images.marketing.construction.com/Web/DDA/%7B6d6973d4-6045-4abc-a8af-48af95f48a64%7D_SMR0918_NorthAmerica_25Nov18.pdf

transparent. For Arm, the effort begins with one of their most valued resources, their workforce.

Employee happiness and comfort has many dimensions and can be difficult to measure. Attributes such as perceived space, air quality, lighting contribute to physical and psychological factors of well-being and satisfaction. Studies have shown an increase in workplace productivity and a Harvard School of Health study found that employees working in green buildings were over 50% better at making decisions[2]. Investments in the real estate portfolio with products such as Verdigris yields returns which are orders of magnitude greater than the initial costs.

> Employees working in green buildings were over 50% better at making decisions.

The relationship between Arm and Verdigris is interesting because not only is Arm customer, Arm technology is used inside the Verdigris product. The processing core in Verdigris systems uses the Arm Cortex-A8 processor. It is a high performance, efficient microprocessor, the first of its kind to be widely adopted for consumer and mobile applications. Arm technology powers unique feature extraction on the Verdigris platform and provides computational capability in a low-power form factor. The technology allows for extraction and compression of time series data that can be further processed using machine learning in cloud. In addition to signal processing, it enables edge control solutions as well. Without Arm architecture, Verdigris' differentiating features and applications would not be possible.

Verdigris and Arm have plans to deploy in other Arm buildings and the journey continues. We are expanding our footprint and satisfying the pillars of smart buildings. Stay tuned.

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[2] https://dash.harvard.edu/handle/1/32644538