The Evolution Of Data Within Buildings

EDGE SEMANTICS

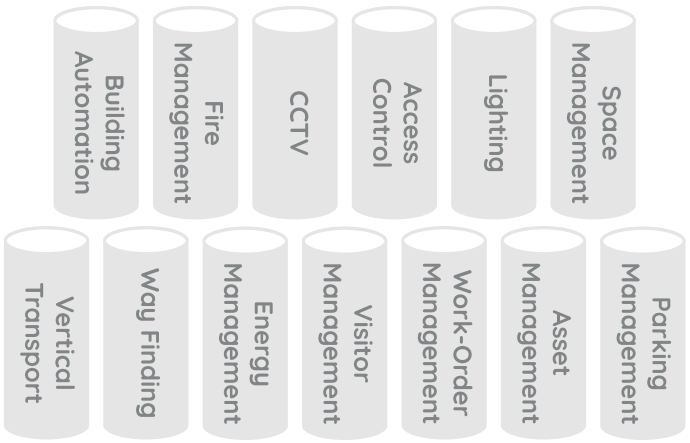
THE EVOLUTION OF DATA WITHIN BUILDINGS

INTRODUCTION

This article explains how data in Buildings has evolved from very simple non-descriptive text, through to exceptionally well structured and descriptive information that is able to automatically manage its relationships with other data.

THE EVOLUTION OF DATA

Buildings have many disparate systems all performing critical functions within them; HVAC, security, space utilisation, fire, maintenance, vertical transport and energy to name just a few. All these individual systems are delivered by experienced professionals with the required domain knowledge to engineer, install and maintain them. These systems can be thought of as independent application silos, each with thousands of their own data points.



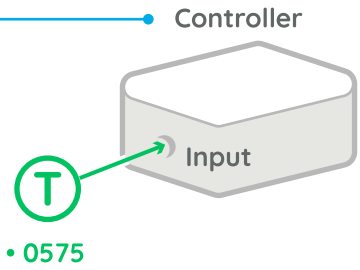
These disparate systems all operate independently, keeping their data within themselves without necessarily being interoperable with other systems. With the emergence of Smart Buildings, we are now seeing an increase in systems integration allowing data from multiple systems to be used to create smarter workflows, exceptional analytics and real-time optimisation.

System integration has existed for many years and every integration has its own complexities. While some are relatively straightforward, others can be very time consuming, complex and expensive to implement and maintain. With the implementation of data tagging, also known as Metadata, integration is now quite simple.

Metadata *noun;*
Data that provides information about other data.

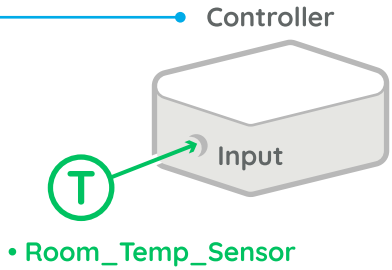
GENERATION 1

Gen-1 systems used very basic 'data point addressing' made up of simple characters such as #23F or 0575. While adequate for engineering purposes, they offered no Metadata or even human readable information as to what the data point was.



GENERATION 2

As system capabilities improved, the ability to store limited character text names became available. Points could now have names such as "Room_Temp_Sensor" to provide simple information about what the data point was; helpful information for human interrogation. However, there was no single naming convention standard so integration still required manual point mapping which was labour intensive and as with any human processes, susceptible to errors.

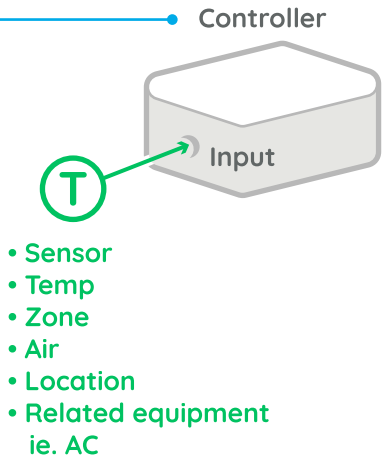


GENERATION 3

While the transition from Gen-1 to Gen-2 was evolutionary, Gen-3 was revolutionary. Gen-3 allowed data modelling through data point tagging. This tagging allowed relationships between the data points (Child, Parent, Grand Parent, etc) to be manually defined.

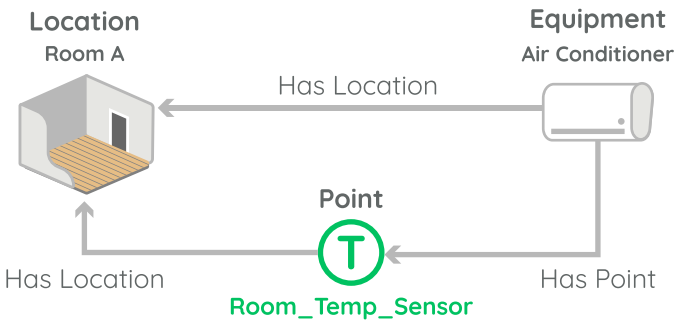
Relationships *noun;*
The way in which two or more things are connected.

Tagging initiatives such as Haystack V3 is a good example of HVAC Metadata being applied to Building Automation System (BAS) points. Tagging a point with structured and detailed information about itself, permits the data to be reliably used within software packages for analytics and building optimisation.



GENERATION 4

Gen-4 introduced technology used for data modelling on the Internet, known as Semantic Web technology. This converts all data into a single industry accepted format used by the likes of Google and Microsoft. This technology not only allows for relationships to be manually defined, but allows for new relationships to be automatically built based on known data.



This conceptual modelling requires each data point to reference three entities to define its relationship to other related things. Taking the temperature sensor example below;

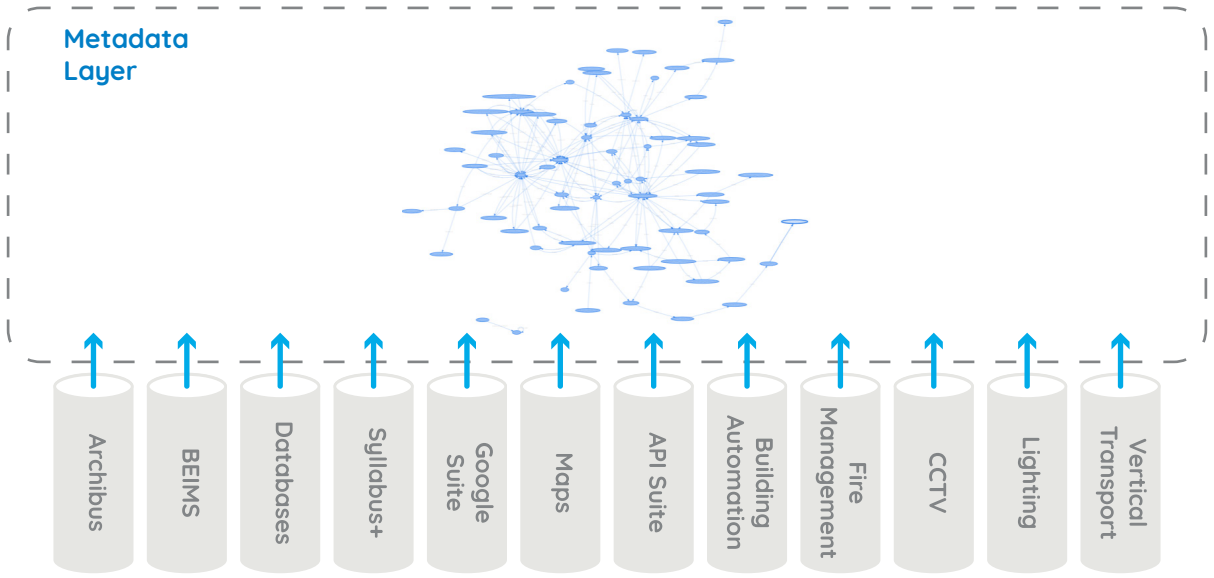
1. The temperature sensor is related to the air conditioner.
2. The air conditioner is related to a location.
3. The temperature sensor is also related to a location.

Beyond the temperature sensor there are potentially hundreds of other points related to either the room or/and the air conditioner, all of which have their own relationships other things/points/data defined in the same way. With all of these connected relationships and overlaps, the data model is no longer simple data point Tags, but a vast spiderweb of inter-connected data.

https://brickschema.org/tools/BrickViewer/

Such is the structure and depth of the interconnected data, Gen-4 systems can discover new relationships and automatically update any relationships that have changed. This artificial intelligence (AI) effectively replaces the manual tasks associated with maintaining the data set because the system detects and updates any inconsistences or errors that are present. For example, if the temperature sensor was moved from room A to room B, the model would automatically refresh (update) all of the relationships that are affected with that change. Previously any relationships associated with this would need to be manually updated.

While our temperature sensor example relates to the Building Automation System, it is important to note that all of the building's data can be modelled in the same way. All systems and data in a building are related to each other by various shared things or entities; being equipment, locations, systems etc. Gen-4 systems don't differentiate between systems, industries or applications and because of this, the model contains data from all systems elevating previously separate data silos into a single Metadata layer.



The Metadata layer is what enables the data to be used for advanced analytics and 'Single Pane of Glass' user interfaces. With the data self-managing its relationships, analytics and visualisation software packages can be simply configured without the initial and ongoing cost of data management and maintenance.