Unlocking the Value of The Internet of Things

Hypercat – an international standard driving a secure and interoperable Internet of Things

The Hon Angus Taylor MP (Assistant Minister for Cities and Digital Transformation) and Nick McInnes (Former British Consul General and Director General UK Trade & Investment Australia and New Zealand)

In September 2016 KPMG hosted the launch of Hypercat in Australia with support from the Australian and British Governments as an Anglo-Australian collaboration in the Internet of Things and Smart Cities.

The launch brought together experts from industry, government and academia and the discussion tackled issues surrounding the establishment of Smart Cities, chiefly the importance of interoperability, collaboration, and the human impacts of technological change.

Officiating the launch, the Hon Angus Taylor MP, Assistant Minister for Cities and Digital Transformation said, "The Commonwealth is exploring relationships with different jurisdictions to build Smart Cities that improve our lives. Hypercat Australia is one such partnership which will allow a platform to facilitate cutting edge technology solutions to be applied to urban problems. This will be the focus of our recently announced Smart Cities and Suburbs Program. I congratulate Hypercat on recognising the benefits for industry in sharing data – which can be measured not only in collaborative formal partnerships, but in strong economic rewards."

Piers Hogarth-Scott, National IoT Practice Leader, KPMG Australia said, "The formula for establishing a world-leading smart, IoT enabled Australian economy that drives growth and prosperity involves industry and government working together in focused sectors including Smart Cities. The launch of Hypercat in Australia aims to unlock the benefits of Smart Cities by creating an interoperable IoT ecosystem that gives confidence to cities and local government."

Justin Anderson, founder of the Hypercat Alliance said, "The goal of Hypercat is to accelerate the global explosion of the Internet of Things – by enabling connected devices and data to work together to improve how cities work, and how people live. In just a few years, Hypercat has already been applied to multi-million dollar

Smart City projects including London and Bristol, attracted more than 1,000 industry members such as KPMG, Cisco, BT, Symantec, Flexeye and WSP, and gained support in 47 countries. We're excited that Australia is coming on board as our first international alliance – and hope to use this as a launchpad for global expansion."

Hypercat has been endorsed by IoT Alliance Australia (IoTAA), the Australian Smart Communities Association (ASCA) and the Industrial Internet Consortium (IIC). Hypercat is also collaborating with W3C to standardise a shared vision of a Web of Things.

With Hypercat rapidly becoming a global technology standard for secure and interoperable Internet of Things (IoT) for Smart Cities and Industry, this paper provides an insight as to why Hypercat is a key enabler to helping unlock the trillions of dollars in annual economic impact that is forecast to be derived from the Internet of Things by 2025.

A vast change in the connectivity of the digital and physical domains is widely acknowledged around the world through the concept of an Internet of Things. Whilst such connectivity is not a new concept, the scale and nature of the interconnectivity has accelerated recently due to the exponential advances and convergence of technologies such as: sensors and actuators; ubiquitous communication networks; cloud computing; information security; big data and machine learning. This has been further fuelled by reducing costs associated with components, improving communication networks, and strong economic, social, and political drivers for change.

"The Australian Smart Communities Association Board has unanimously agreed to validate the Hypercat standard to ensure interoperability of new technologies deployed across a city. It strongly advocates its use to both council and industry members and partners to encourage local innovation and avoid vendor lock in."

Michael Whereat, President, Australian Smart Communities Association

Hypercat launch in Australia from L to R: Justin Anderson (KPMG Director and Hypercat Founder), Frank Zeichner (CEO IoT Alliance Australia), Catherine Caruana-McManus (KPMG Director and Director Giant Ideas), Piers Hogarth-Scott (KPMG National Practice Leader, IoT), The Hon Angus Taylor MP (Assistant Minister for Cities and Digital Transformation), Nick McInnes (Former British Consul General and Director General UK Trade & Investment Australia and New Zealand), Mike Briers (CEO Knowledge Economy Institute), John Stanton (CEO Communications Alliance), Chris McLaren (KPMG Partner)

Predictions have estimated that there will be 50 billion 'internet connected' devices by 2020. The IoT will touch every industry. It has the potential to transform products and services as well as business models, supply chains and both the urban and rural environments we live and work in.

According to McKinsey & Company, if policy makers and business get it right, linking the physical and digital worlds together will be worth USD11 trillion a year by 2025. It will be one of the biggest disruptors of our generation. This economic impact could deliver huge value to Australia. It could lead to disruptive new industries and interesting employment opportunities. It could change the way that local government delivers services in the city. It could support more sustainable farming methods. It could help Australia transform to a competitive digital economy.

Interoperability Will Help Unlock The Value

One key to unlocking this value is to ensure IoT systems can easily exchange data and make use of that information, this is the thorny challenge known as 'interoperability'. Of the total potential economic value the IoT enables, McKinsey also estimate that interoperability is required for 40 percent on average and for nearly 60 percent in some settings, or circa USD5 trillion a year. Conversely, without interoperability, these new IoT systems will be designed as vertical 'silos', which will limit innovation and lead to expensive vendor lock in.

The British Government recognised the opportunity presented by the IoT and the importance of interoperability. In 2012, through their innovation agency Innovate UK, they started to invest in innovative organisations working in this space. Hypercat (BSI PAS 212:2016), a standard for interoperability, was born from this investment.

To date the British Government has mandated the use of it in over GBP60m of projects they have supported, from broad Smart City technology to healthcare projects. For example, Innovate UK recently invested heavily in the Greater Manchester Smart City demonstrator, CityVerve, and mandated the use of Hypercat in the project.

Manchester CityVerve

CityVerve is a GBP20m Smart City project jointly funded by government & industry with use cases covering: transport & travel; energy & environment, community & public realm; health and social care. Below are example use cases where Hypercat will provide a data catalogue:

EXAMPLE USE CASES	
Air Quality	Next-Gen BMS
Building Retrofit Energy Reduction	Personal Wellness Platform
City Concierge	Road Safety
Chronic Condition Management	Sensing Trams
Compliance Cost Reduction	Smart Lighting
eBike Sharing	Smart Parking
Enforcement Support	Talkative Bus Stop
Neighbourhood Team Support	

PAS212:2016 A Technical Overview

PAS212:2016 was developed in collaboration with global standards development organisation British Standards Institution (BSI). At this stage in the market, the role of independently managed standards endorsement is pivotal in guiding and nurturing innovation. BSI governed the process of convening experts in IoT from across hundreds of organisations, large and small, to reach consensus of best practice. PAS212:2016 was purposefully designed as a robust, low cost option with extensibility in mind, so it integrates easily with other solutions and could complement other emergent standards in the future.

PAS212:2016 enables IoT interoperability at the application and platform levels through a simple and extensible JSON format and API specification. Put simply it is a hypermedia catalogue format (note the root of the standard's name) that allows a server to provide a catalogue of resources to a client, each with a set of semantic annotations.

The IoT can be loosely described in layers as shown on the right. This shows where PAS212:2016 sits to enable interoperability through applications and IoT platforms. This is a key enabler of IoT innovation, as this location in the 'IoT stack' is often an interface between businesses, such as where a utility acts as a data provider by web-enabling its existing systems, and an IT company then builds services and applications across these data.
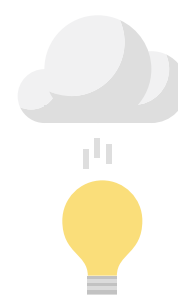
Business processes

Applications
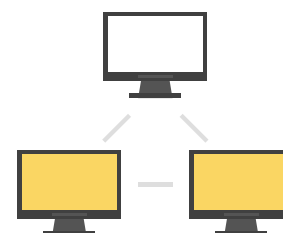
Storage, platforms, support services

Communication networks and edge processing

Physical things

PAS212:2016 The Core Aspects

The main aspects of PAS212 are decomposed into 3 sections:

1. The mandatory Hypercat data format

2. The API specification

3. The other suggested aspects which serve as exemplar recipes for extending the main offering to meet common use cases.

This highlights the main tenet of PAS212:2016; that it is a very lightweight standard which is very easily extensible to suit a wide range of IoT systems. The core aspect of PAS212:2016 is the mandatory file format specification, which requires that a resource discovery server wishing to be Hypercat-compliant must serve a catalogue of resources in a specific JSON format. This simple format consists of a catalogue object, which must contain a set of 'items', a human-readable description, a URL, and a string specifying that it is a Hypercat catalogue. Each of the 'items' stored in the catalogue can then be either another catalogue, or any IoT Thing, which must have a textual description and a URL. All of these aspects are then extensible through the mechanism of 'relationship'-'value' pairs, which is an RDF-like approach, such that each 'relationship' and 'value' can be a URL, and values could also be primitives. Therefore, a Hypercat document could be converted to an RDF document if desired, allowing close integration of a Hypercat approach with the W3C suite of standards and ongoing work, hence the recent agreement to collaborate to further the work of W3C, as the approaches are complementary.

Beyond the mandatory requirement, PAS212 also suggests an API specification for retrieving entire catalogues and modifying individual items, following the RESTful style, and an example key-based authentication method. PAS212:2016 then continues to suggest extensions to this based on fulfilling common use case requirements. These include subscription, further security options, various search methods, a means to integrate Hypercat into the linked data and semantic web ecosystem further, and finally a method for describing the usage licence under which a described item is provided.

Empowering Collaboration Across An Open Ecosystem

Contributors to the development of PAS212:2016 included organisations such as Cisco, Symantec, IBM, ARM, Intel, KPMG & BT. The result was both an internationally applicable standard and a fast growing 'open ecosystem' that has collaborated around the PAS212:2016 and recognised and promoted the importance of interoperability.

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The Hon Angus Taylor MP, Assistant Minister for Cities and Digital Transformation

"IoTAA has endorsed the Hypercat standard for interoperability at the data interface, Hypercat (BSI PAS212:2016).

This creates an open and evolving environment for creativity and innovation by enabling data discovery and sharing."

Frank Zeichner, CEO of IoT Alliance Australia

As well as ensuring systems can automatically discover data in other systems and exchange that data, the Hypercat standard also empowers organisations to collaborate and align their technologies and services to innovate and co-create new solutions. By empowering stakeholders from the private and public sectors and the community to work towards a new vision of the future, the sky really is the limit. Hypercat now presents the best opportunity to immediately accelerate collaborative IoT innovation. Whilst it does not solve all of the challenges associated with interoperability, it greatly reduces barriers to widespread M2M communication in a way that offers immediate benefits whilst allowing for compatibility with future standards.

Where is Hypercat Used?

Hypercat has been used in a wide variety of urban and rural use cases from security on a campus to countryside lighting, highway maintenance, city parking, fleet management. It has been deployed in innovative cities such as Bristol, Milton Keynes and London. The age of the Smart City is upon us.

A number of Australian cities, large and small, are now considering how they might use Hypercat in order to encourage interoperability in the city, avoid lock in and silo thinking.

The Australian Government recently established a $50 million competitive Smart Cities and Suburbs Program designed to help local governments fast-track innovative technological solutions to real, prevailing problems. The Government's goal is to increase the efficiency and effectiveness of urban service delivery, infrastructure and planning to improve the liveability of cities and their suburbs. In their guidelines, Hypercat is referenced as a standard for interoperability.

Adopting Hypercat

The Hypercat standard is simple to adopt. It is described clearly in the free document available on the BSI website (BSI PAS 212:2016). Some partner organisations provide workshops to help encourage innovation using the standard to empower change across the organisation's ecosystem.

Organisations adopting PAS212:2016 are joining a growing ecosystem committed to interoperability of the Internet of Things which will lead to increased innovation and value add from start-ups and global enterprises.

Piers Hogarth-Scott, National IoT Leader of KPMG Australia said, "If we can play a role in fostering a global standard we can unlock the power of the Internet of Things for everybody."

Contact us

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We would like to thank and recognise
Dr Shaun Howell, Cardiff University
for his contribution to this paper.

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