# Embracing Disruption:

## Financial Services and the Microsoft Cloud

## Resources

**Security, Privacy & Data Sovereignty**
http://endj.in/cloud/trust
- Microsoft Azure Trust Center
- Key Vault
- SQL Server Encryption
- Swiss Cheese Model
- Azure Model Security Architecture

**Data Ingestion, Transformation & Enrichment**
http://endj.in/cloud/etl
- Azure Data Factory
- Introduction to Azure Data Factory Service

**Big Compute**
http://endj.in/cloud/big-compute
- Big Compute: HPC and Batch
- Spinning up 16,000 A1 Virtual Machines on Azure Batch
- Azure Batch – Time is Money in Big Compute

**Big Data - Insights, Visualisation & Learning**
http://endj.in/cloud/big-data
- HDInsight: Managed Hadoop, Spark, HBase and Storm made easy
- Azure data services part 1: HDInsight
- Azure data services part 2: Stream Insight
- Cortana Analytics Suite
- Azure Data Lake
- Azure Machine Learning
- Power BI
- Visualise your Data with Power BI

**Infrastructure, Ops & Support**
http://endj.in/cloud/ops
- Application Insights
- Operational Insights
- Backup
- Site Recovery
- Accelerating DevOps with the Cloud (Chef, Puppet & Azure)

**The API Economy**
http://endj.in/cloud/api-economy
- Empowering the Digital Bank: The API Economy
- Want to join the API Economy: Here's How (Forrester)

# Executive Summary

*Challenges and Opportunities in the Microsoft Cloud*

**Security, Privacy & Data Sovereignty**
Vast quantities of data are generated, processed and stored by financial organisations like Milliman and Hymans Robertson. How can these organisations prove to their compliance officers and clients that their most valuable and sensitive information is as safe, or safer, in the Microsoft Cloud than with existing data centre providers?

**Data Ingestion, Transformation & Enrichment**
Endjin helps its clients to do amazing things with their data, but the key is shaping it to make it as easy as possible to work with, both on-premises and in the Cloud. From mapping and reduction, to privacy concerns like the masking of personally identifiable information, data ingestion, transformation, and enrichment are at the core of your business. Making this a repeatable, bullet-proof production process is essential for scale.

**Big Compute**
What do you do when you have scaled your compute intensive workloads to the biggest box, with the most cores, and the largest amount of memory that your hardware vendor can supply, but your application creaks inexorably towards the point where it is going to exceed your SLA?

**Big Data - Insights, Visualisation & Learning**
There is a huge opportunity for all financial organisations to become providers in the Data Economy, transforming their assets into valuable business insights and information. Using tools like HDInsight, F#, R, and Azure Machine Learning, you can extract the knowledge you need from your data, publishing it through simple APIs for internal or external consumers, exploring and visualising using tools like Excel and PowerBi.

**Infrastructure, Ops & Support**
Modern financial organisations are innovating faster than ever, consuming larger volumes of data, with greater demand for integration and increasing workloads. This explosion in complexity is beyond human scale, and new, automated approaches are required to ensure that mission critical systems are always available, especially in regulated environments where uptime SLAs are a part of everyday life.

**The API Economy**
Most disruptive start-ups aren't building vertically integrated, full-stack solutions. They connect various pieces of the value chain using public APIs across social media, e-commerce, payment providers, supply chain and more, injecting their special sauce along the way to create new propositions. This allows them to prototype more rapidly, prove business models, and pivot more effectively. We call this the API Economy.

## Security, Privacy & Data Sovereignty

*Vast quantities of data are generated, processed and stored by financial organisations like Milliman and Hymans Robertson. How can these organisations prove to their compliance officers and clients that their most valuable and sensitive information is as safe, or safer, in the Microsoft Cloud than with existing data centre providers?*

**Swiss Cheese: Defence in Depth**
Financial risk management strategies require multiple layers of protection that limit the pathways that could result in a data loss or breach. Also known as the Swiss Cheese model, risk management starts by considering the location and physical infrastructure of data centres, through network and software components, to human factors, coercion and collusion.

Endjin have worked with some of the largest Financial Services companies in the world to create a security model and data privacy architecture for the Microsoft Cloud, which we subject to external audit by both clients and independent third party security consultants.

**Data Privacy**
Using technologies such as Key Vault and SQL Server Always Encrypted, the model architecture employs the latest data encryption, replication and monitoring, ensures rigid access controls, auditing and application configuration, and provides a clear segregation of duties, roles and responsibilities within the organisation.

We also look at safe harbour and data sovereignty issues, and the management and transfer of data within and between Azure's global datacentres.

**Legal and Compliance**
The model also considers the impact on your standard contracts, legal and compliance infrastructure.

Azure's support for regulatory standards for privacy and security, such as SO27001/27002, ISO27018, SOC1, SOC2, PCI DSS Level 1, HIPAA & FIPS 140-2, help mitigate legal, contractual, and compliance risk.

Azure is also the first major cloud provider to be verified by The British Standards Institute as aligning with ISO 27018, the international code of practice for the protection of personally identifiable information in the public cloud.



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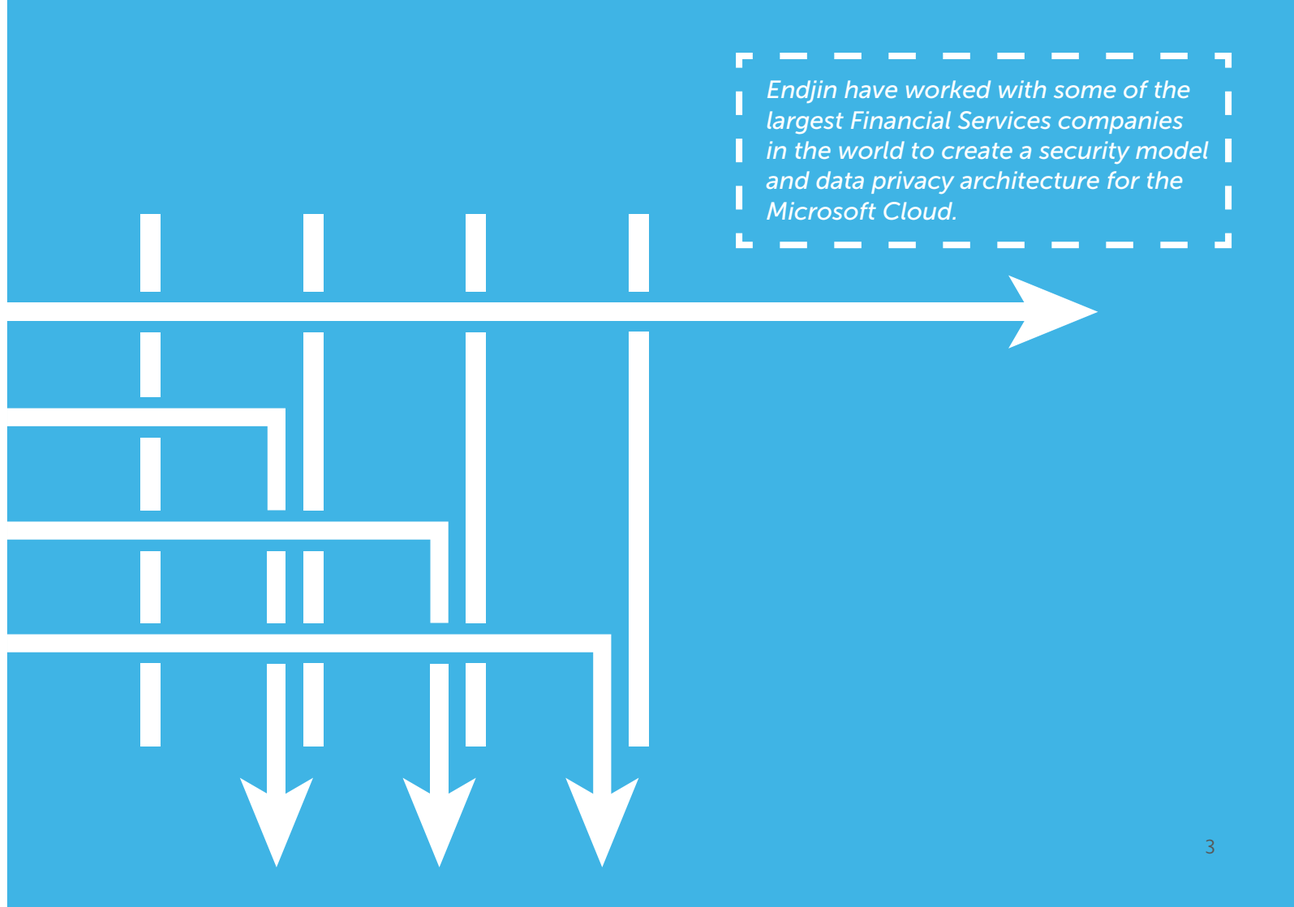


## Data Ingestion, Transformation & Enrichment

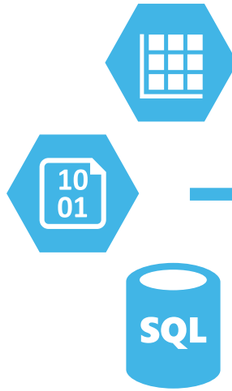
*Endjin helps its clients to do amazing things with their data, but the key is shaping it to make it as easy as possible to work with, both on-premises and in the Cloud. From mapping and reduction, to privacy concerns like the masking of personally identifiable information, data ingestion, transformation, and enrichment are at the core of your business. Making this a repeatable, bullet-proof production process is essential for scale.*

**Dependable data processing**
Whether you have large one off batches, or need to process smaller quantities of data at a regular cadence, you want to ensure that your ETL process is reliable and consistent. At the heart of Azure's data processing story is Azure Data Factory, a production-ready service for orchestrating, monitoring, and managing your ingestion, transformation and validation processes that can connect to a wide range of your on-premises and cloud data sources.

Data enrichment can then become a series of repeatable, automated activities, configurable by the business. That might be using Machine Learning models to make predictions, calling an HDInsight step to process your big data sources, or bursting out to Azure Batch for any custom processing.

**Any size, any shape**
Raw data can be generated from all sorts of places (device telemetry, logging, site analytics, etc.) and you want to capture as much as possible to gain valuable insights into your business.

To bring all of this together, Azure Data Lake then offers a single place to store all of your data in its raw form, however large it gets, and U-SQL (a variant of SQL that will be very familiar to C# developers) is a unified language for querying and reshaping the relevant pieces for a particular application.

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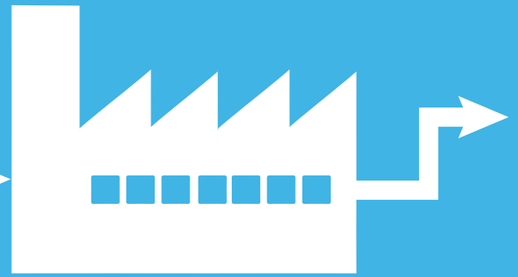
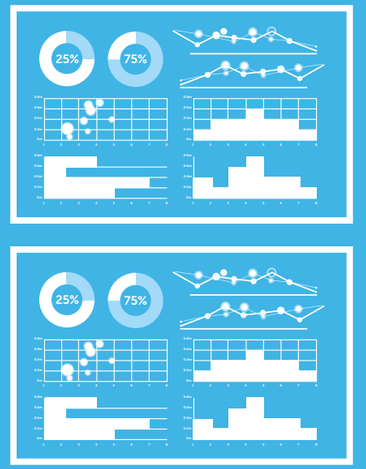




## Big Compute

*What do you do when you have scaled your compute intensive workloads to the biggest box, with the most cores, and the largest amount of memory that your hardware vendor can supply, but your application creaks inexorably towards the point where it is going to exceed your SLA?*

**Lift and shift?**
Sadly, you can't just lift-and-shift your box to the Cloud: the machines in the Azure datacenter are commodity systems, individually less powerful than your creaking behemoth.

**Scalable workloads**
The secret is to re-architect your computational workload to enable execution to be distributed across many different machines. And while redesigning your application to scale from 1, to 2 machines requires a fundamental shift in architecture and a large engineering effort to implement it, once you have worked out how to scale to 2 machines, the effort required to scale to 3, 10, or 100 is small in comparison, and you should be able to scale out until you hit a hard limit (available network bandwidth and storage throughput limits being the two most common constraints), at which point, you may need to come up with additional architectural adjustments to compensate.

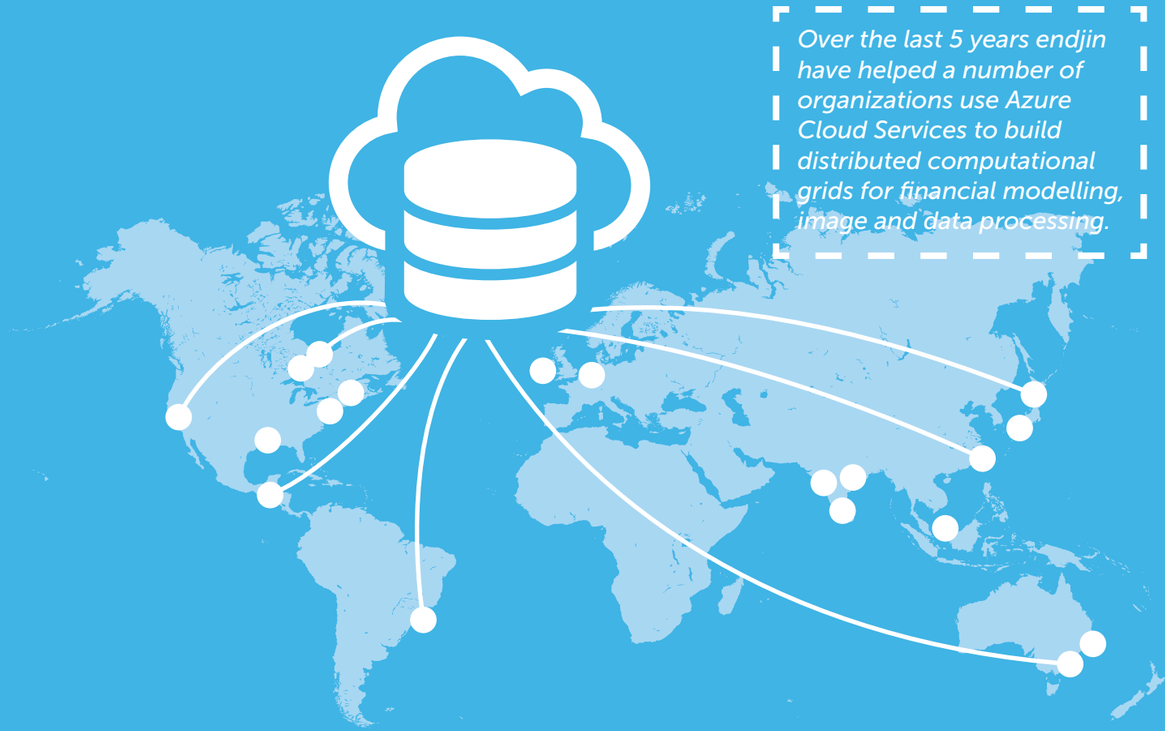
**Distributed architecture is hard**
Building distributed architectures is hard; it requires a root and branch understanding of your application, from the shape of your data, to the algorithms you use to process it, as well as network and storage I/O considerations, and the user experience you are delivering; but the rewards are significant.

**Azure Batch**
Over the last 5 years endjin have helped a number of organizations use Azure Cloud Services to build distributed computational grids for financial modelling, image and data processing; these architectures have been complex multi-year efforts; but Azure Batch significantly lowers the barrier to entry, with a prescriptive, easy to follow architecture that allows you to distribute and schedule your computational workload.

This is a "bring your data to the computation" play, great if your model can be decomposed into many parallelizable chunks of data processing, each of which can be executed in memory on a single box. This is typical of most financial models.

But what if you need to process larger chunks of data? A "bring your computation to the data" architecture is required...





## Big Data - Insights, Visualisation & Learning

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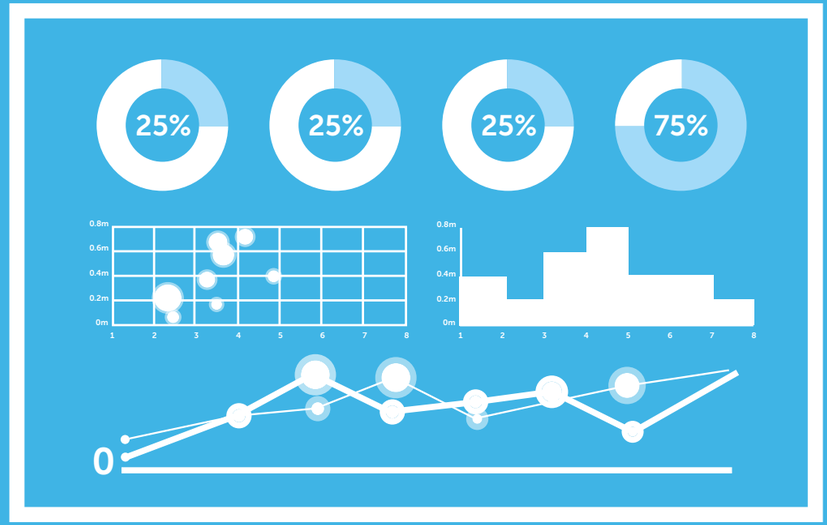
**Big Data Stores and Analytics**
Effective decision-making starts with being able to make sense of the vast amounts structured and unstructured data generated from numerous applications and business solutions. Azure Data Lake, part of the Cortana Analytics Suite, takes the complexity out of storing and accessing this data while enabling high performing analytical workloads on fully managed platforms including Hadoop/HDInsight, Spark, Storm and HBase. Developers and data scientists are free to focus on building solutions in tools they are familiar with rather than spend time with operational or infrastructure concerns.

**Machine Intelligence**
Endjin have helped organisations to exploit the power of their data with machine learning by building and integrating automated intelligence into their workflows. Azure Machine Learning can be used to build, train, and run predictive models that can be easily consumed by custom applications, data processing pipelines, and business intelligence solutions.

With a growing marketplace providing a range of preconfigured machine learning solutions it is simple to build applications around existing services or to monetise your own.

**Powerful Visualisations**
Using Power BI it is possible to create rich, interactive dashboards, reports, and datasets that make big data and complex analytics easy to consume and understand. There are a huge number of integrations available for Power BI, making it simple to share and collaborate intelligence, which lets the organisation make more informed decisions.



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## Infrastructure, Ops & Support

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**Insights**
With Azure Operational Insights, organisations gain real-time operational intelligence allowing IT teams to react to issues before they become problems. By continuously monitoring the operating environment, Azure can provide a complete view into the health of the enterprise, highlighting and alerting teams to potential issues so corrective action can be taken before there is any degradation or loss of service.

Visual Studio Application Insights allow organisations to continuously monitor the health of their applications. Using rich configurable dashboards, DevOps teams can see how solutions are performing in real-time.

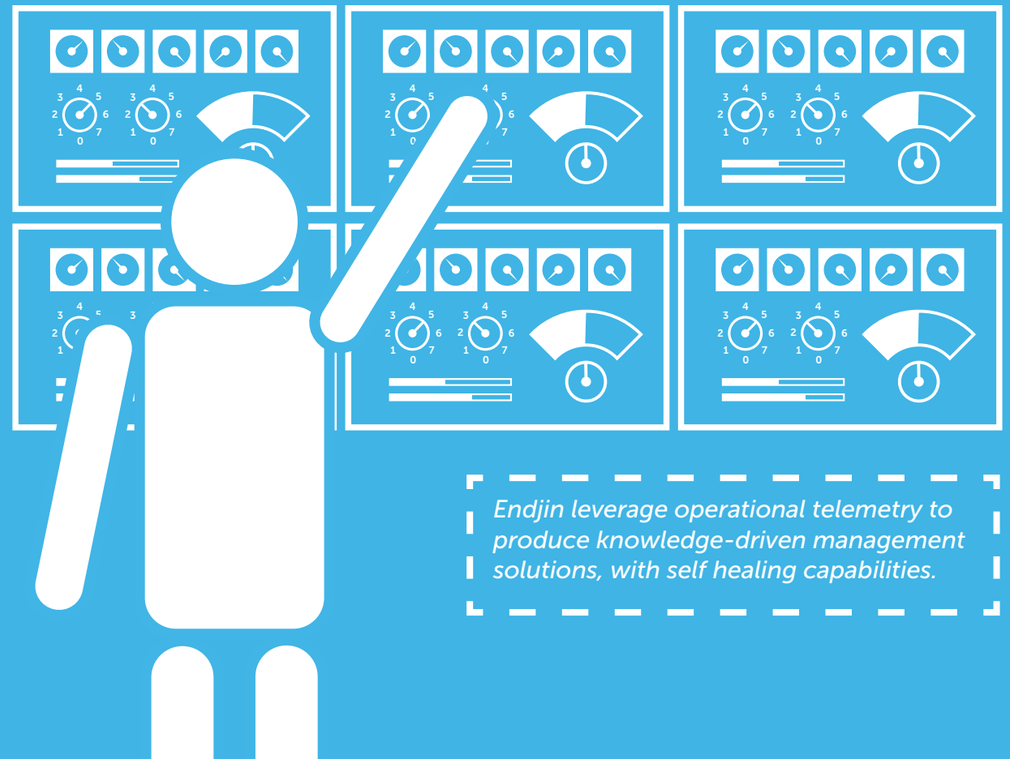
Endjin have leveraged this telemetry for their clients to produce knowledge-driven, operational management solutions, with self-healing capabilities, and streamlined diagnostic and repair processes.

**Seamless Deployments**
As organisations innovate and become more dynamic, their ability to release software in a timely and reliable manner becomes critical to their business. Azure makes it easy to build robust deployment pipelines that allow applications to be deployed in a quick and seamless fashion, ensuring customers benefit from the latest and greatest. At the same time, Azure itself is automatically updated with the latest security patches and feature developments, without impact to the services and solutions it runs.

**Flexible Backup**
With increasing volumes of data comes the need for a scalable backup solution that can grow with the business. Organisations can replace or supplement their data centre backup solutions with Azure Backup, a highly available, geo replicated backup service. SQL Azure also has baked-in, point-in-time rollback.

**Hybrid Cloud Disaster Recovery**
Organisations running solutions on premise can take advantage of Azure for disaster recovery, or to handle short bursts of demand that would otherwise affect the availability or performance of business critical services. Using Azure Site Recovery, on premise solutions can be replicated and ready for action whenever needed in Azure.





*Endjin leverage operational telemetry to produce knowledge-driven management solutions, with self healing capabilities.*

# The API Economy

*Product development teams cannot keep pace with the rate of innovation demanded from the business.*

**Connecting the value chain**
If you look at the most disruptive start-ups, they aren't building the vertically integrated, full-stack solutions common in established enterprises.

They connect various pieces of the value chain using public APIs across social media, e-commerce, payment providers, supply chain, and more, injecting their special sauce along the way to create new propositions. This allows them to prototype more rapidly, prove business models, and pivot more effectively. We call this the API Economy.

**Public APIs in Financial Services**
Financial Services start-ups are already leading the way in the API Economy. PayPal has transformed the way that payments are made, delivering over $65bn in transactions in 2015 Q2.

TransferWise is managing over $1bn in currency conversions, and crowdfunding platforms like Kickstarter transformed the seed capital market, with $16.2bn raised last year. All of these are enabled by the API Economy.

**Unlocking the internal API economy**
One reason start-ups are raging ahead is that established businesses with vertically integrated solutions end up rebuilding a lot of technology, every time.

Attempting to share code at a component level across teams is fraught with difficulty when, often, it is not actual code that embodies the greatest part of the value, but the data, configuration, capacity, and infrastructure management, which surround that code.

Businesses that embrace the API economy and publish internal APIs as if they were public APIs suddenly enable the potential for explosive innovation. Development teams can quickly prototype propositions by connecting internal and 3rd party APIs, leveraging the advantages of previous investments.

The discipline of API development also allows the business to identify opportunities for new consumer or partner propositions, and be ready to exploit them very rapidly, particularly as they intersect with emerging segments like the Internet of Things where there is little prior art.

Underpinning all of this, the security, manageability, and elastic scale of the Microsoft Cloud is a great match for the API opportunity.

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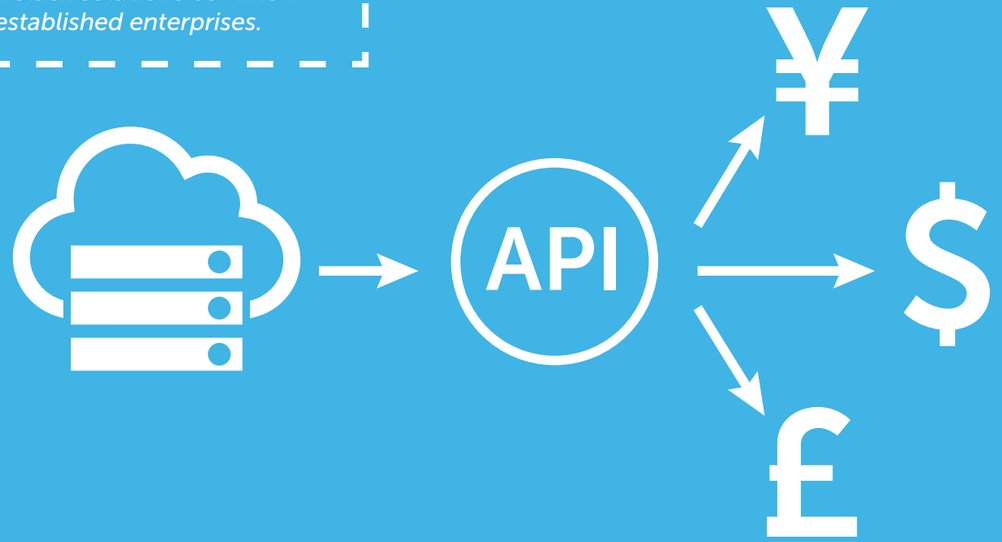


## Case study: Milliman

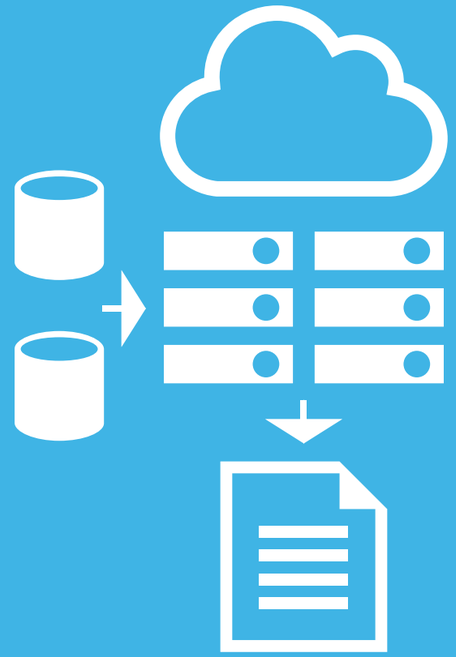
*Independent for over 60 years, Milliman delivers market-leading services and solutions to clients worldwide, with no agenda, other than getting it right. They offer unparalleled expertise in Employee Benefits, Investment Consulting, Healthcare, Life Insurance & Financial Services, and Property & Casualty Insurance.*

Regulatory requirements are transforming the insurance industry - compressing reporting timelines and multiplying the number of projections required. Matching actuarial workflows to increasing regulatory demands and product complexity is a critical concern that requires an entirely new approach.

**Endjin have helped Milliman to:**

- Adopt Azure Batch for improved grid scalability and performance
- Design a data ingestion pipeline for customer data using HDInsight and Azure Data Factory
- Develop unique visualisations of the grid "in flight"
- Architect a data visualisation and reporting solution using Power BI
- Adapt organisational governance, structures and processes to enable a faster pace of innovation in a global product team



*"The Microsoft Cloud underpins Milliman's technology strategy. Endjin's depth of experience & evidence-based approach has helped me to focus my team on delivering real innovation & business value."*

**Paul Maher** - Chief Technology Officer (MG-ALFA Practice)

# Case study: Hymans Robertson

*Hymans Robertson is an independent consultancy that does it all, offering a wealth of services, from actuarial valuations, to plan design, to member communications*

A 100 year old, £67m company wanted to harness the power & cost savings of the cloud to modernize their infrastructure and enable new product innovation.

**We are delivering:**

- Innovation & security
- Compute grid with Azure Batch
- Board-level strategy
- Guidance & mentoring
- Application migration & re-engineering



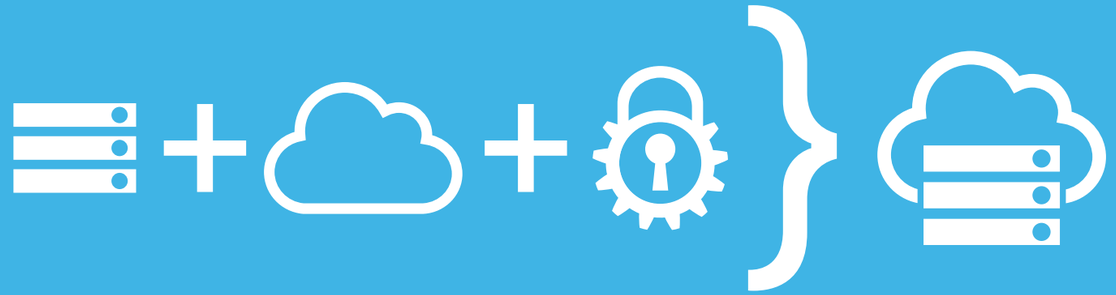


Pages from Hymans Robertson Inform Autumn 2015



*"Endjin have worked with us in partnership to accelerate our journey to the cloud and to develop our maturity around software engineering and software product governance."*

**Barry Smart** - IT Director, Partner



## Say hello

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