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Chief Finance Officers (CFOs)

Chief Human Resources Officers (CHROs)

Chief Information Officers (CIOs)

Chief Marketing Officers (CMOs)

Chief Operating Officers (COOs)

# Big Data Architecture

**Keutlwile Leso**

IBM Enterprise Architecture Leader



## Profile: Keutlwile Leso (*from 1999 to date*)

- 17 years+ international experience (S. Africa, Spain, US, Brazil, Nigeria)
- Management Accounting, Programming, ERP/CRM/BI implementations and training
- Past 10 years mainly on Enterprise Architecture and Open Source Solutions

2015 – Invited into the Global IBM Government Architect Advisory Team

2011 – Co-authored **NIST Cloud Computing Technology Roadmap** for the US Government

2011 – Invited by the **President of Computer Society of India** to present on Open Source

2010 – Architected and Developed the world's first open source-based Intelligent Transport System for the **2010 FIFA World Cup**

2010 – Invited into the Council Board of Free Software & Open Source Foundation for Africa (**FOSSFA**)

2008 – Member of the Real IRM Public Sector team which assisted SITA, GITOC, and DPSA in developing Government Wide Enterprise Architecture (GWEA)



**Keutlwile Leso, Open CA**

The quintessential Senior Executive Advisor on Digital Transformation, with over 17 years international experience.



**IBM**

4 yrs 3 mos



● **Enterprise Architecture Leader**

Aug 2017 – Present · 1 yr 2 mos

Johannesburg Area, South Africa

Industries: Travel & Transportation and Energy & Utilities

Segments: Airlines | Airports | Rail | Freight Logistics | Travel Related Services



= Strategic Advisory on Digital Strategy, Transformation, Innovation and Reinvention initiatives in the Travel & Transportation and Energy & Utilities Industries (Aviation, Freight Rail, Properties, Pipelines, Ports and Port Terminals, Environment)

= Technical Advisory on Cloud, Cognitive (AI & Machine Learning), Blockchain, Big Data & Analytics, Internet-of-Things (IoT), Mobile, Social Business and Enterprise Security from a Business Value, Reference Architecture and Solution Architecture perspective.

= Lead the Overall Enterprise Architecture Strategy and Orchestrate IBM's Global Resources to deliver the best possible World Class Client Experience

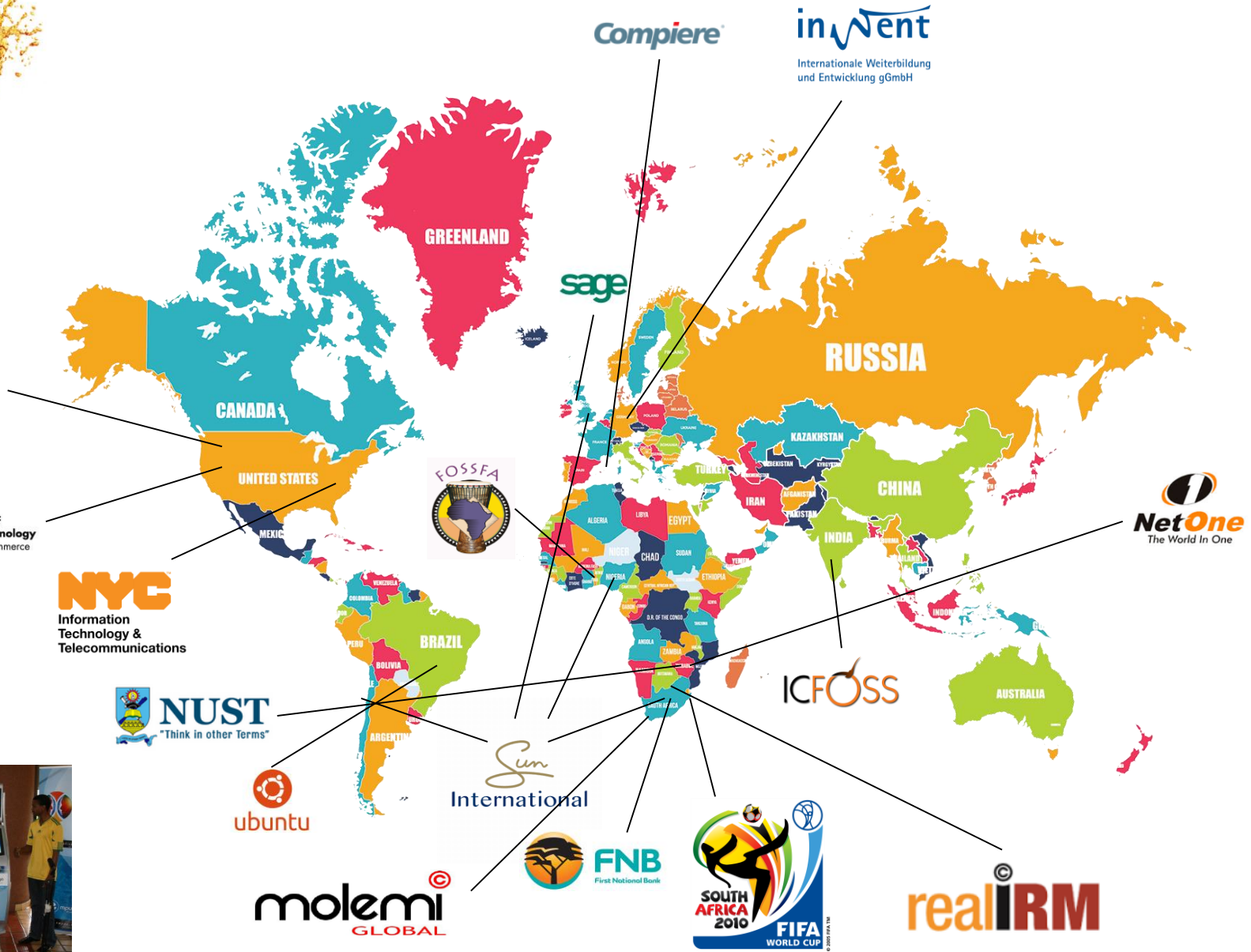
= Build and Manage Relationships with Senior Business Executives and Technical Communities, earning a reputation as one of the Client's Trusted Business Advisers

= Manage holistic view of enterprise solutions, including a sound appreciation of quality, industry standards, operational costs, security, performance engineering, availability, scalability, application development (COTS based or custom) and systems management and ensuring the Client Derives Value from the IBM Solutions and Thought Leadership

= Maintain a Thorough Understanding of/Keep Current on the Client's Industry, including Industry Trends, Industry Business Processes, Industry Financial Measurements and Performance Indicators, and Key Client Competitors in their Industry See less



# My Conquests since 1999 to date!





# The other side of my coin!





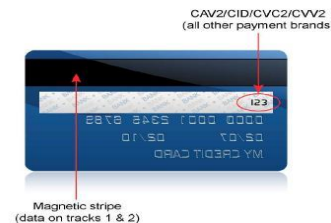
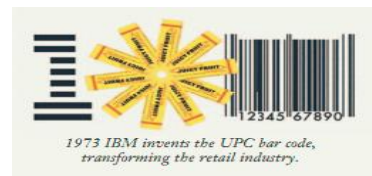
**“DATA IS THE NEW GOLD”**





# IBM: The most essential [innovative] company in the world!

1. **IBM *invented*** the ATM
2. **The Magnetic Strip**
3. **The Barcode**
4. **Hard Drive**
5. **Enterprise Architecture**
6. **AI / Cognitive Computing**
7. **Relational Database**
8. **Quantum Computing**
9. ...



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**A framework for information systems architecture**

by J. A. Zachman

With increasing size and complexity of the implementations of information systems, it is necessary to use some logical construct (or architecture) for defining and controlling the interfaces and the integration of all of the components of the system. This paper defines information systems architecture by creating a descriptive framework from disciplines quite independent of information systems, then by analogy specifies information systems architecture based upon the neutral, objective framework. Also, some preliminary conclusions about the implications of the resultant descriptive framework are drawn. The discussion is limited to architecture and does not include a strategic planning methodology.

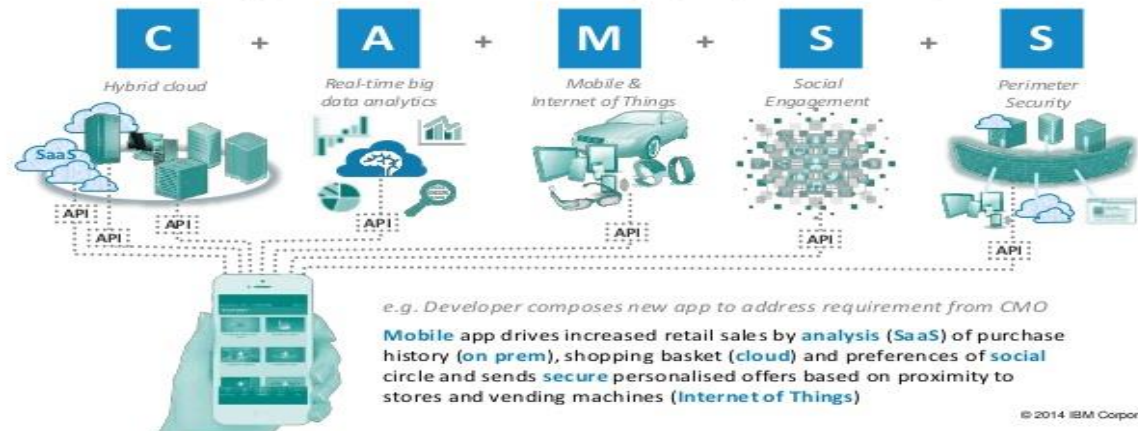
Related Subjects: Architecture

# Data is everywhere!!!



## Clients are focusing on the combined power of CAMSS

- Client's energy around CAMSS is not driven by 5 **distinct** parallel agendas
- Combining CAMSS in tandem **delivers agility** to create new business opportunities
- API-centric approach enable CAMSS to be **rapidly composed** as building blocks



Cloud-connect your Things in minutes  
 Write apps that use the data from real physical devices

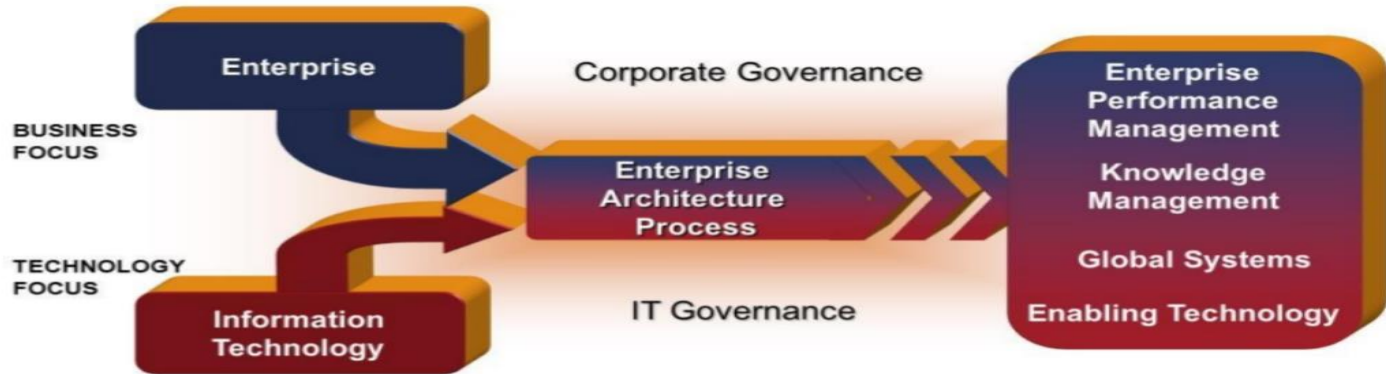




# What the CEO wants! What the CEO needs!



Enterprise Architecture is required to transform a legacy of fragmented applications, organisational structures and processes (both manual and automated) into an integrated environment with optimised processes that are responsive to change and the delivery of the business strategy.



## Six Digital Transformation Capabilities

**Business model innovation** – Building customer value as a core competency across industry, revenue and enterprise models

**Customer and community collaboration** – Driving customer centricity into each part of the enterprise and using social networking tools and capabilities to engage

**Cross-channel integration** – Integrating all customer touch-points across digital and physical channels

**Insight from analytics** – Integrating information across all sources (internal, external) and taking full advantage of the predictive power of advanced analytics

**Digitally enabled supply chain** – Optimizing all supply chain elements, effectively integrating cross enterprise

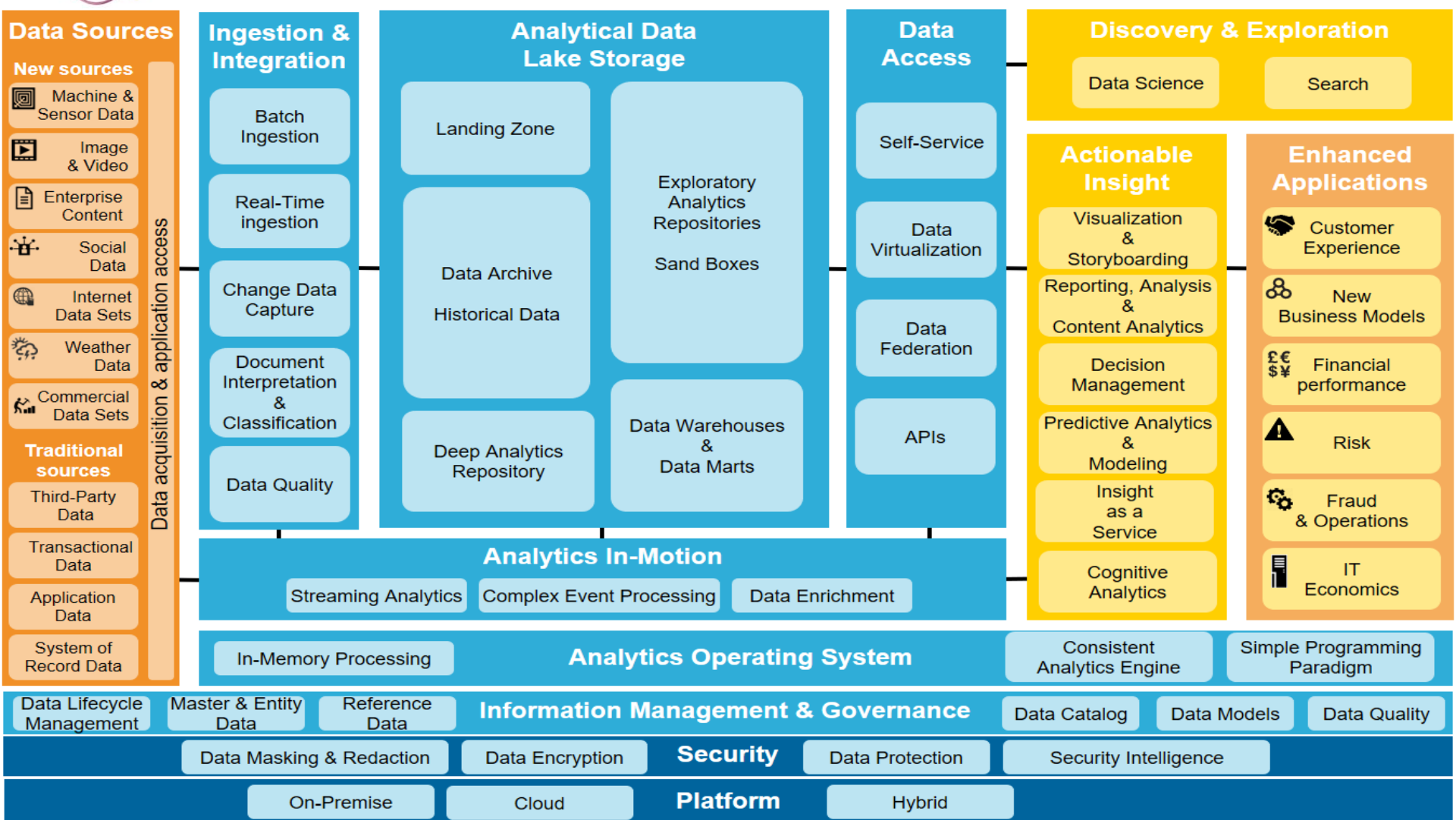
**Networked workforce** – Getting the right skills aligned around the right business opportunities



## Component Business Model for Big Data & Analytics – V1

Data & Analytics Strategy		Data Management		Data Enablement			Data Innovation	Business Insights		Analytics		
CDO Business Strategy	CDO Business Administration	CDO Resource Management	Policy and Change Management	Architecture Enablement	Meta Data & Data Classification	Data Quality		BI Architecture - Technology	BI Architecture - Services			
Direct	BPM Framework	CDO Business Model	BI Competency Operating Model	BI & DG Policies, Principles	Big Data (Arch., Design, R&D)	Metadata strategy	Data Quality Management Strategy	Innovation strategy	BI Architecture Strategy	BI Services competency (BI/CC)	Voice of the customer/research	
	Data & Analytics Strategy & Roadmap							Governance Strategy & Roadmap			HR & Talent Strategy	Data Governance Operating Model
	Value Benefit Model	Communications	Data Services (Arch., Design, Dev. R&D)	MDM strategy	Managing new growth platforms	Data Integration Strategy		Security, Privacy Strategy	Customer segmentation strategy			
					Consumption (Strategy & Standards)				Collaboration and partnering		Multi-channel plan/approach	
Control	Governance performance metrics	Financial Control and Accounting	BI Competency Centre processes	Best practices, standards, guidelines	Common Data Hierarchies	Unified Business Glossary	DQM processes	Innovation portfolio management	Transition to strategic BI Architecture	Systems management & ops planning	Customer behaviour modelling/trend analysis	
	Business Requirements	Site and Facility Administration	Data Governance Processes		Data Model Management	Data Classification		Innovation process development			Migrate/Decommission Legacy systems	Operational Statistics
	Projects Portfolio Planning	Human Resource Planning and Administration	Data Governance Stewardship community set up		Communications planning	Data Standards and Guidelines	Define Master Data Elements	Management of employment relationships	Develop BI Applications	BI method adoption		Real time predictive analysis & action
	Manage Projects	Sourcing and Vendor Management	Embed IA tasks in SDLC methods		Define System of Record	Embed DQ tasks in SDLC methods	Define System of Record	Conflict management			Consumer experience analysis & redesign	
Execute	Data & Analytics Strategic Solutions	Procurement and Contracts	Steward scorecard	Change management and Communications	Tool / Technology Management	Define Meta Data	DQ Issue / Tracking / Resolution	Acquisition and allocation of resources and funding	Deploy BI Applications	Systems Management & ops	Report Development, Visualization, Web (e.g. Predictive or Cognitive) Development and Validation	
	Tactical Data & Analytics solutions	Vendor Service Coordination	Steward Training		Exploratory Provisioning & Decommissioning	Rapid Development (Environment)		Tools Adoption			Innovation portfolio analysis	Infrastructure support
	Value Scorecards/dashboards	Customer Contracts and Pricing	Periodic Reviews	Periodic Compliance reviews	Capacity Planning & Monitoring	Upgrades, Implementations & Migrations	Periodic Reviews	DQ Tools Adoption	Tracking and measuring innovation	Systems Tools adoption	BI dev Tools adoption	Report Delivery
					Security & Access Control	Enterprise collaboration	Process Control (Schedule, Reporting)					

# Analytics Reference Architecture is key!





# Open Source Big Data Explosion!!!



## The Datafloq Open Source Landscape 2.0

### Data Analysis & Platforms

Hadoop  
 Storm  
 Dremel  
 Hortonworks  
 Spark  
 SAMOA  
 APACHE DRILL  
 IKANOW | BRILLIANT DECISIONS  
 HIVE

### Databases / Data warehousing

InfiniDB  
 Cassandra  
 4store  
 H2  
 riak  
 Infinispan  
 HYPERTABLE  
 MariaDB  
 Drizzle  
 GlobalDB  
 SQLite  
 RethinkDB  
 Firebird  
 ORACLE BERKELEY DB  
 HyperSQL  
 monetdb

### In-Memory Computing

GridGain  
 hazelcast  
 TERRACOTTA  
 NMemory

### ERP BI Solutions Business Intelligence

talend  
 Jaspersoft  
 Palo Alto  
 BIRT  
 spagobi  
 pentaho  
 jedox

### Data Mining

orange  
 rapidminer  
 KNIME  
 WEKA  
 mahout  
 togaware  
 SPMF

### Big Data search

Lucene  
 Apache Solr  
 elasticsearch

### Multivalued database

Rocket U2  
 REVELATION  
 northgate  
 jBASE INTERNATIONAL  
 ScarletDME

### Programming

julia

### Data aggregation

ogloop

### Key Value

AEROSPIKE  
 leveldb  
 redis  
 Chordless  
 Tokyo Cabinet  
 SCALIEN

### Document Store

mongoDB  
 Couchbase  
 CLUSTERPOINT  
 Tokutek  
 RaptorDB  
 EJDB  
 djon  
 JasDB  
 sisodb  
 CouchDB

### Graph databases

Gephi  
 Gremlin  
 GraphBuilder  
 FRANZ INC  
 Sparksee  
 INFO GRID  
 HYPERGRAPHDB  
 InfiniteGraph  
 Neo4j  
 FlockDB  
 GraphBase  
 BrightstarDB

### Operational

VOLTDB  
 Cloudera  
 chubwa

### Object databases

db4objects  
 Zope Magma  
 NEOPPOD  
 Picolisp  
 siaqodb  
 RAMER  
 PERSEVERE  
 EyeDB  
 NDatabase  
 Sterling  
 STARCOUNTIE

### Multimodel

ArangoDB  
 alchemydatabase

### XML Databases

existdb  
 BASE  
 Qizx  
 sedna  
 LIQUIBASE

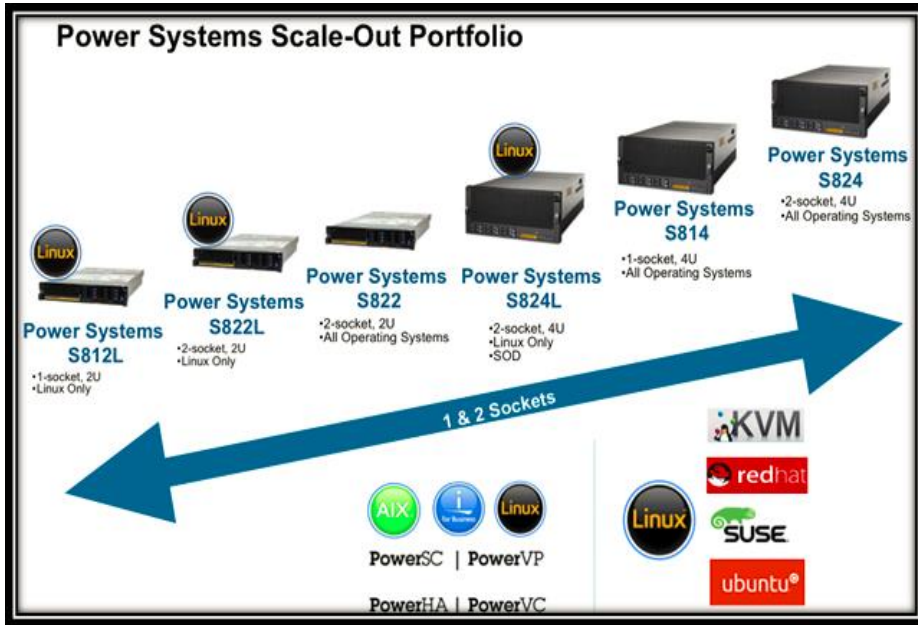
### Multidimensional

FIS  
 SciDB  
 rasdaman

### Grid Solutions

GIGASPACE  
 Galaxy

# The Engines enabling the Technologies

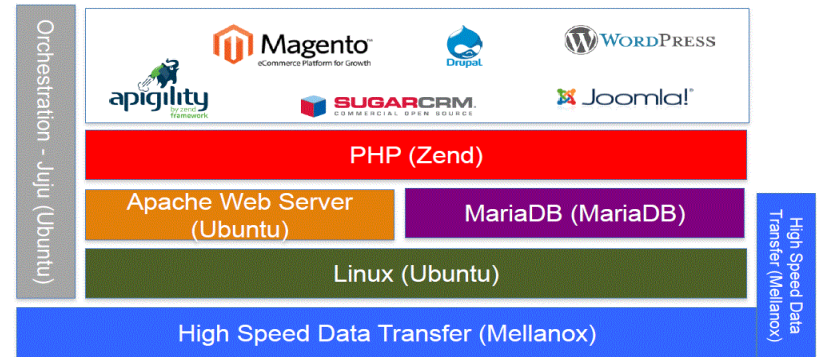


### IBM Partners with NVIDIA to Build Next-Generation Supercomputers

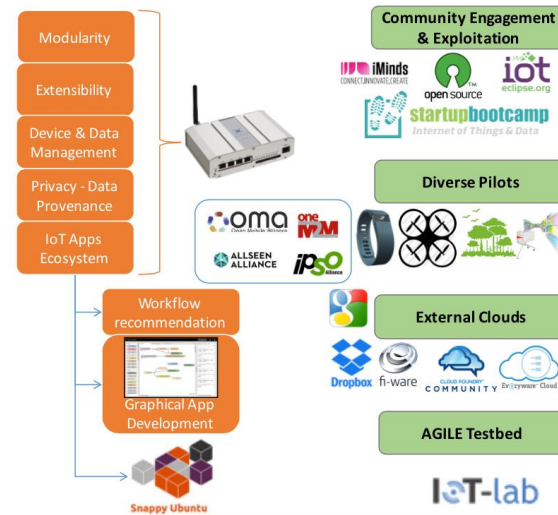
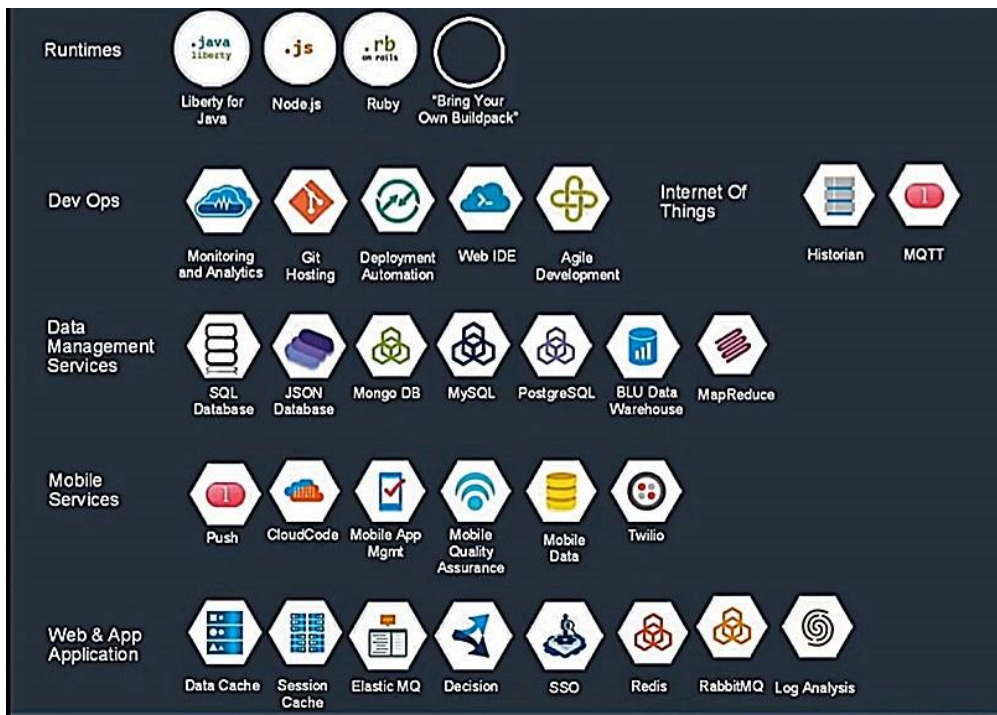
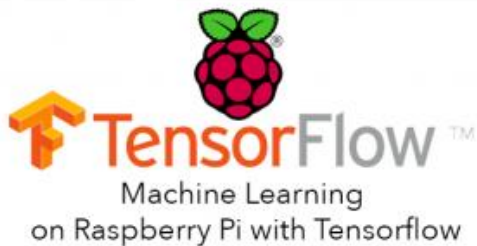
Teste GPU + POWER8 CPU

NVIDIA | IBM

GPU-Accelerated POWER-Based Systems Available in 2014



# What can you do now, today, ikozvino, nhasi ??





# Digital Skills for 4<sup>th</sup> Industrial Revolution!



www.fossfa.net

hite... Getting Started



## FREE SOFTWARE AND OPEN SOURCE FOUNDATION FOR AFRICA

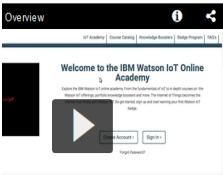
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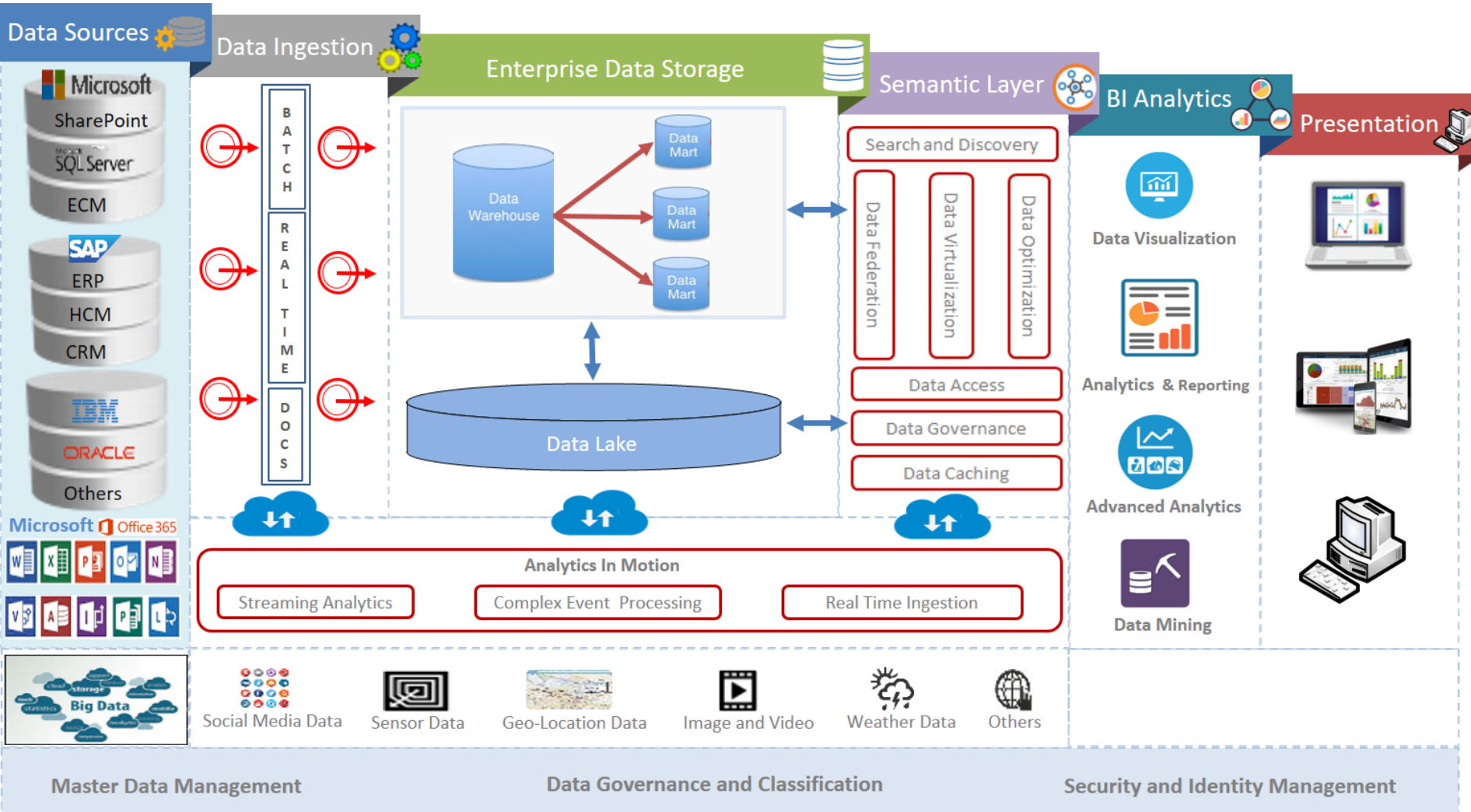
## What's new in Ubuntu 18.04 LTS and OpenStack Queens

Watch our latest webinar to see how Ubuntu and OpenStack can power the next generation of workloads.

[Watch on-demand](#)

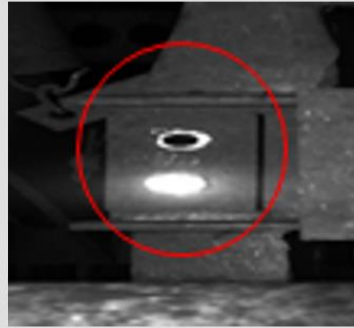


# Use Case 1

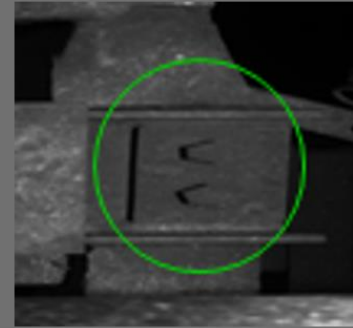


Asset  
Performance &  
Reliability  
Video Analytics  
and Visual  
Inspection POC

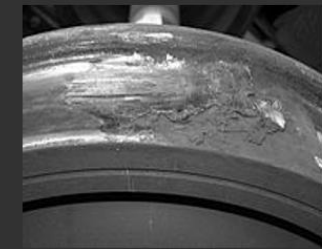
## Illustrative Images



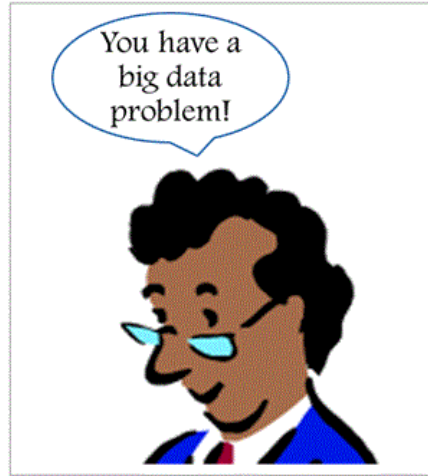
Defect - Missing Bolts



No Defect Found







## I Thank You



Keutlwile Leso

Enterprise Architecture Leader

Client Technical Advisory, Architecture, and Leadership

**IBM Certified Enterprise Architecture Expert**

**The Open Group Master Certified Architect (Open CA)**

**IBM Certified Solution Advisor - Cloud Reference Architecture**

Strategic Partner Member, IATA Passenger and Airport Data Interchange Standards (PADIS)

Member, IBM Global Government Architect Advisory Committee

Member, Association of Enterprise Architects

Member, IBM Academic Initiative

Council Member and CTO, Free Software & Open Source Foundation for Africa (FOSSFA)

Member, Smart Cities Council

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