Emerging Workloads: Selecting the Best Execution Venue

Elisabeth Stahl
Distinguished Engineer
IBM Systems Client Centers
estahl@us.ibm.com

Session objectives

- The best execution venue for infrastructure selection is based on the fundamental principle that one size does not fit all and that local factors matter. This session discusses these factors and examines how to choose the best fit for your emerging workloads.

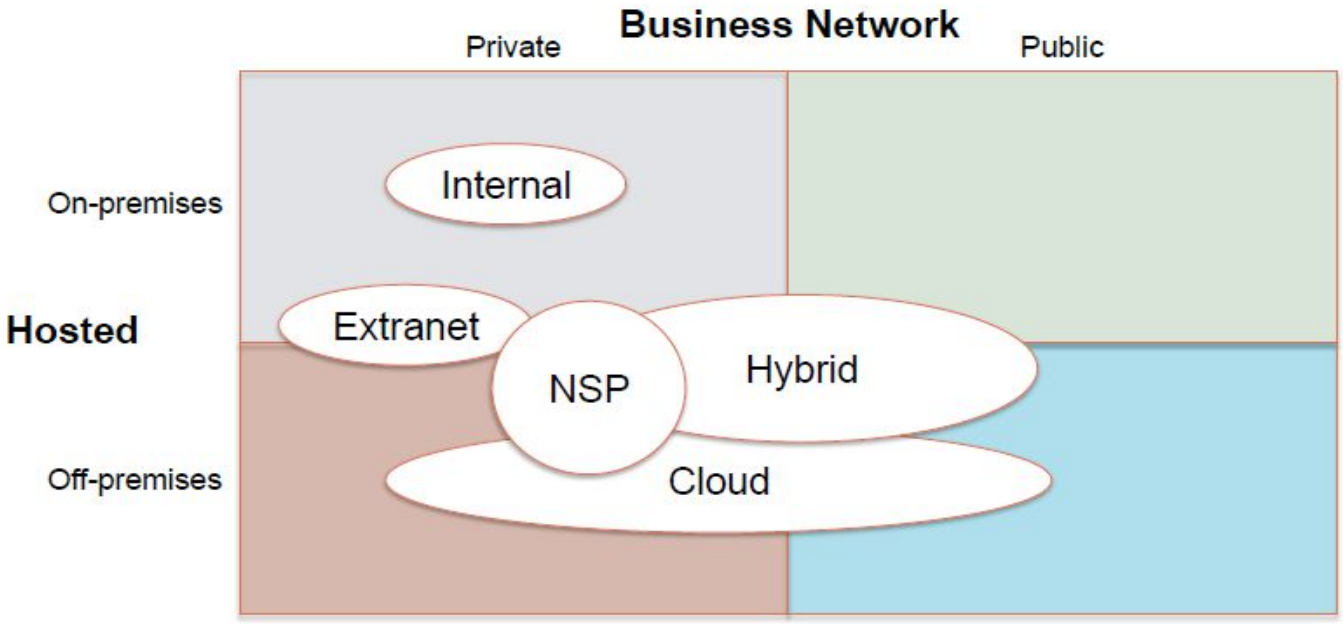
- 3 Emerging workloads will be used as examples:
  - Hybrid Cloud
  - Blockchain
  - Cognitive

Best Execution Venue

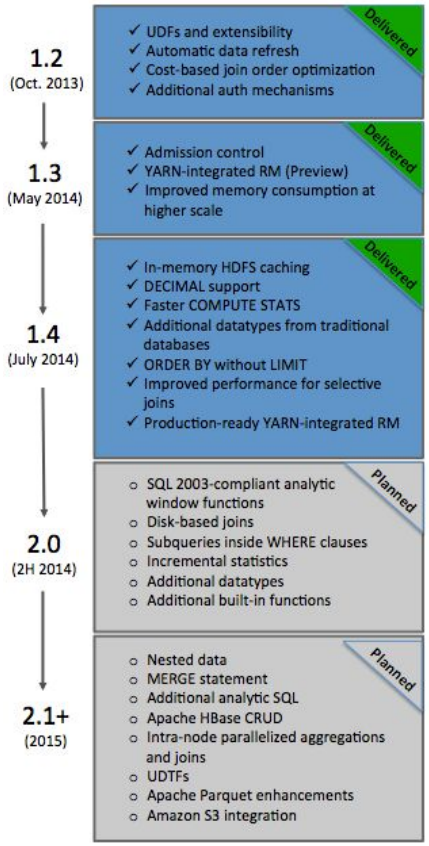
Best Execution Venue is a workload centric thought process that yields rational infrastructure choices which are in line with requirements and local conditions.

It is based on the fundamental principle that “one size does not fit all” and that “local factors matter.”

Deployment Patterns

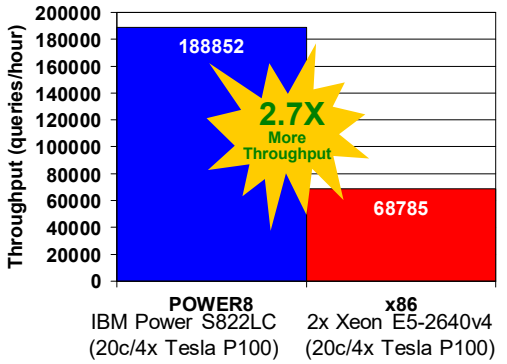


Functional Requirements Example

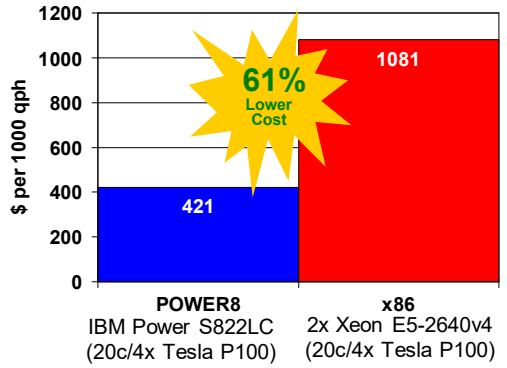


Non-Functional Requirements Example - 2.7x Better HPC Performance at 61% Lower Cost

- Accelerate the performance of Kinetica with **2.7X better performance** than x86

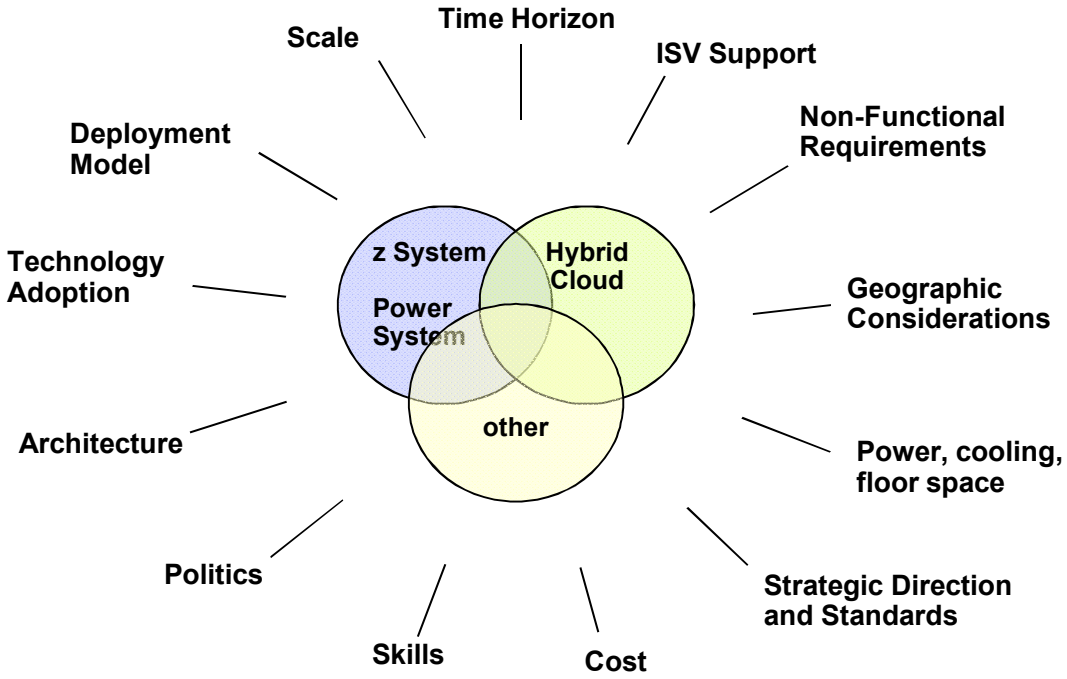


- POWER8 delivers this performance at **61% lower cost per transaction** than x86

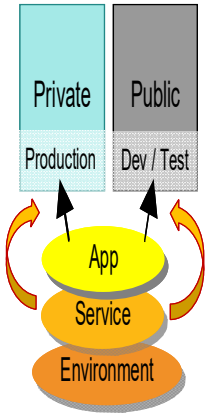
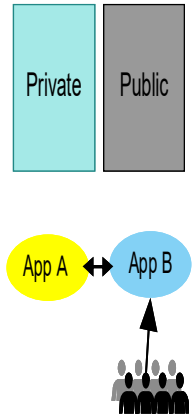
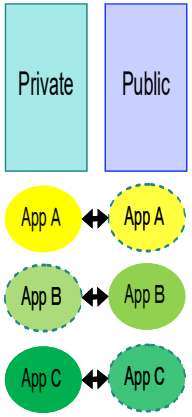
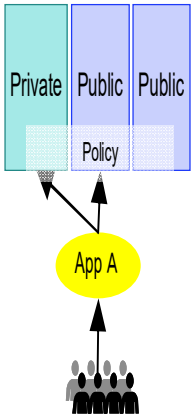
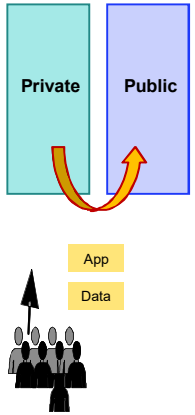
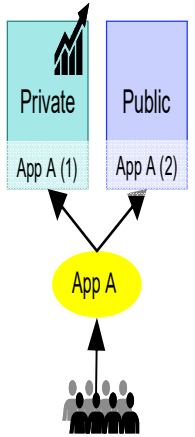
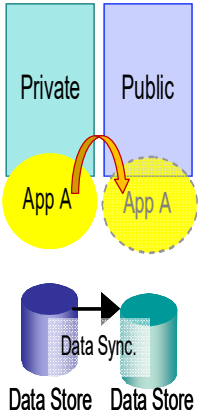


All results are based on running Kinetica "Filter by geographic area" queries on data set of 280 million simulated Tweets with 1 up to 80 simultaneous query streams each with 0 think time.
Power System S822LC for HPC; 20 cores (2 x 10c chips) / 160 threads, POWER8 with NVLink; 2.86 GHz, 1024 GB memory, 2x 6Gb SSDs, 2-port 10 GbEth, 4x Tesla P100 GPU; Ubuntu 16.04.
Competitive stack: 2x Xeon E5-2640 v4; 20 cores (2 x 10c chips) / 40 threads; Intel Xeon E5-2640 v4; 2.4 GHz; 512GB memory 2x 6Gb SSDs, 2-port 10 GbEth, 4xTesla P100 GPU, Ubuntu 16.04.
Pricing is based on list pricing for S822LC for High Performance Computing http://www-03.ibm.com/systems/power/hardware/linux-lc.html on ibm.com and Dell C4130 priced at www.synnexcorp.com/us/govsolv/wp.../GSA70-GS-35F-0143R-**Price**-File-**Dell**.xlsx as of January 2017.

How Do I Choose the Best Execution Venue?



7 Hybrid Cloud Scenarios

Independent Workloads	Integration	Portability & Optimization	Management	Backup and Archive	Capacity Access	Disaster Recovery
						
Private, public or hybrid based on workload	**Systems of Record on Private and Systems of Engagement on Cloud**	**Application and/or Data can go to and from public and private**	**Management and Brokerage across multiple environments**	**Off-premise resources for backup and archiving of on-premises resources**	**Public cloud as additional resource**	**Parallel environment off-premises**

Do you really Know Your Customer?
A Hybrid Cloud Use Case

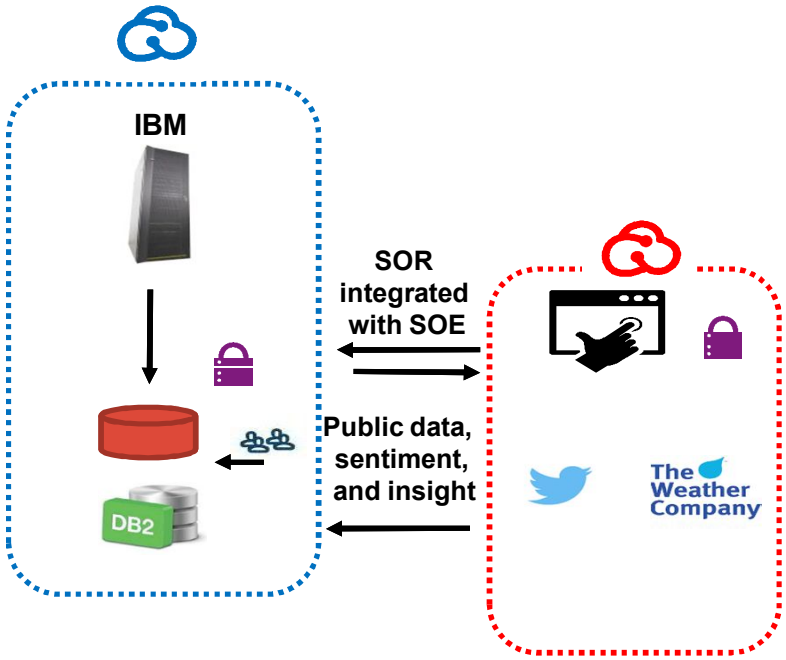
Link new mobile and web-based applications with legacy applications in a secure and competitive fashion. Increase client satisfaction and reduce costs through a continuous feedback process and a 360 external view.

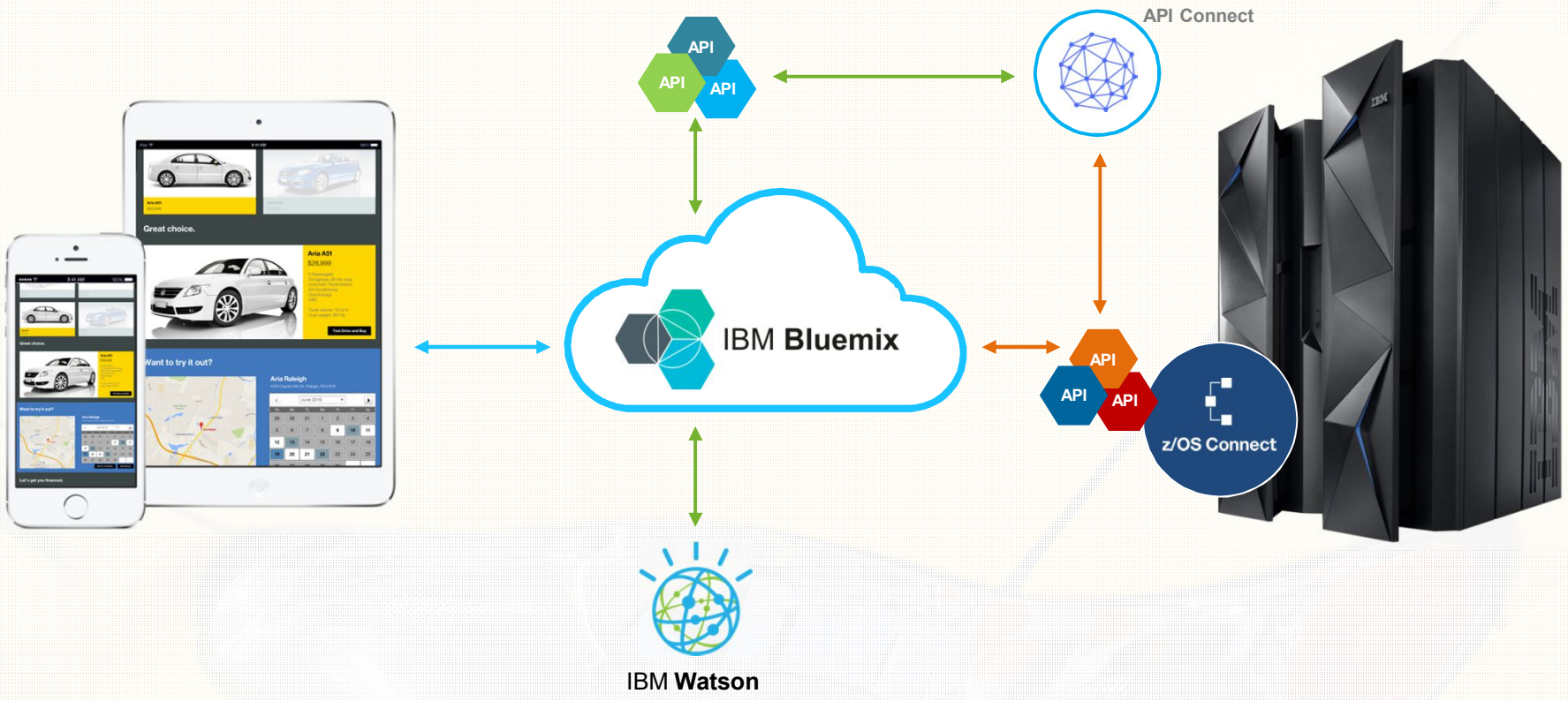
Solution

Hybrid Cloud based solution to integrate traditional on-premise Systems of Record transactions and data with new mobile and web Systems of Engagement and public data on off-premise public

Value

High availability and performance, agility, scalability and security with reduced development and operational time and costs. Deep insights that give agility in strategy. Ability to mass customize and personalize to a single customer.



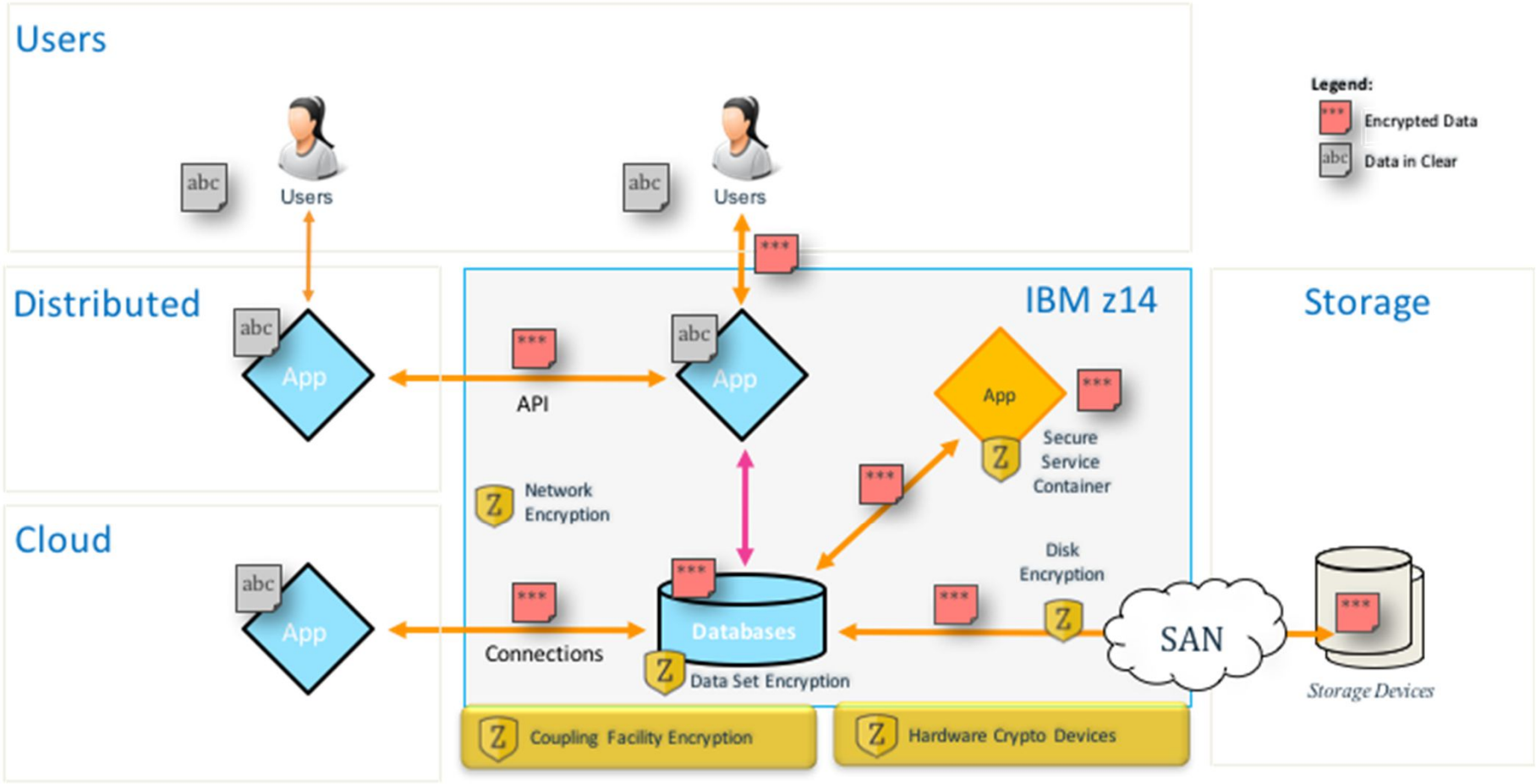


IBM **Client Center**

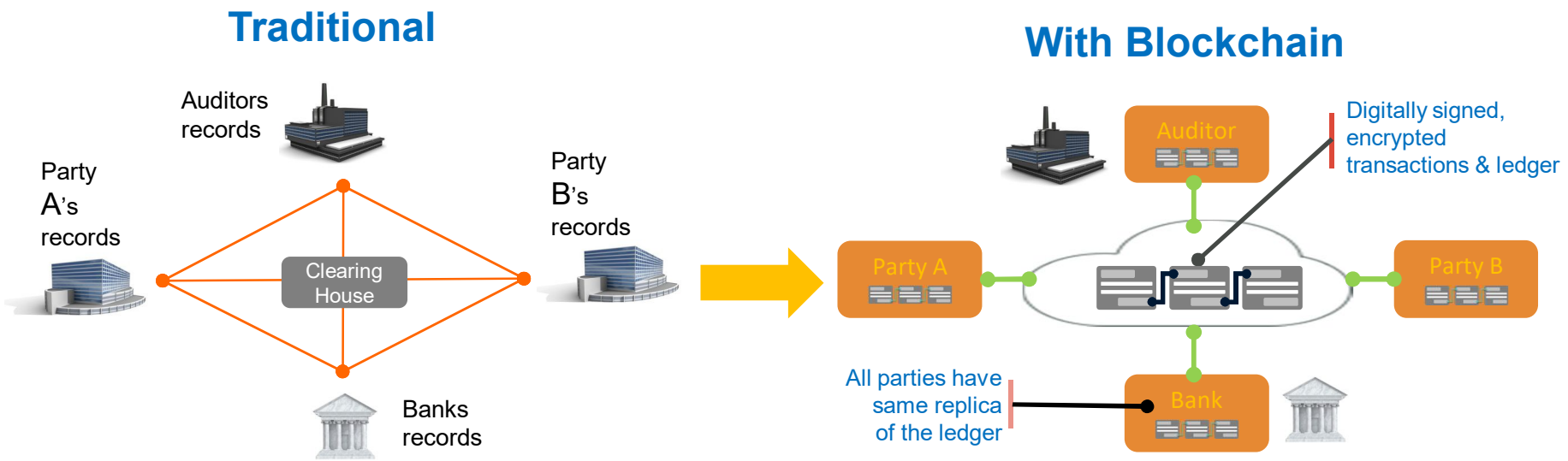
Payments Application on Hybrid Cloud

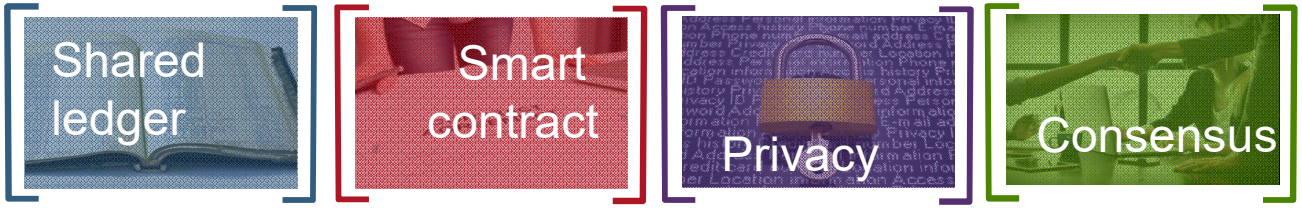
- Considerations for Success:
  - Deployment and Provisioning
  - Management Capabilities
  - Cost: OPEX vs. CAPEX
  - “Noisy Neighbor”
  - Non-Functional Requirements: Performance, RAS, Security…
  - Private vs. Public vs. Hybrid

Security: Pervasive Encryption

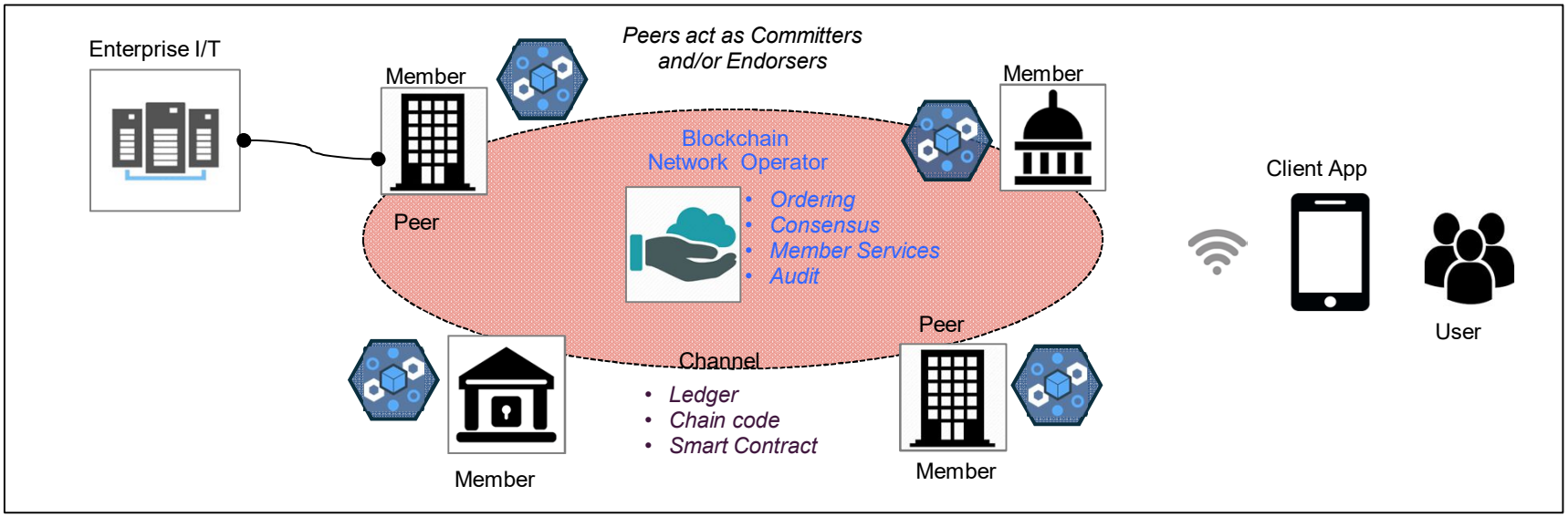


Blockchain will fundamentally change business processes





What's in a Blockchain Business Network



Blockchain Benefits

Saves time

Transaction time from days to near instantaneous

Removes cost

Overheads, paper-intensive processes and cost intermediaries

Reduces risk

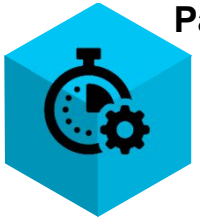
Tampering, fraud & cyber crime caused by single-party system control

Increases trust

Through shared processes and recordkeeping via new digital economy built on blockchain applications

Hyperledger Fabric: built for Cross-Industry use in regulated businesses from the ground up

Confidentiality

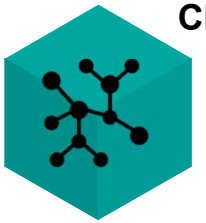


Partitioned execution

Optimize network performance by separating chaincode execution and transaction ordering

Permissioned membership

Operate a trusted blockchain network with known participants and regulatory oversight



Channels

Enable multi-party transactions with the privacy and confidentiality needed for regulated industries

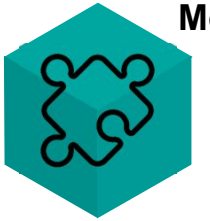
Production Workloads

Transaction history

Searchable transaction history for efficient auditing and dispute resolution

Network tools

IBM provides tools for monitoring, logging, and for compliance reasons backup/restore



Modularity

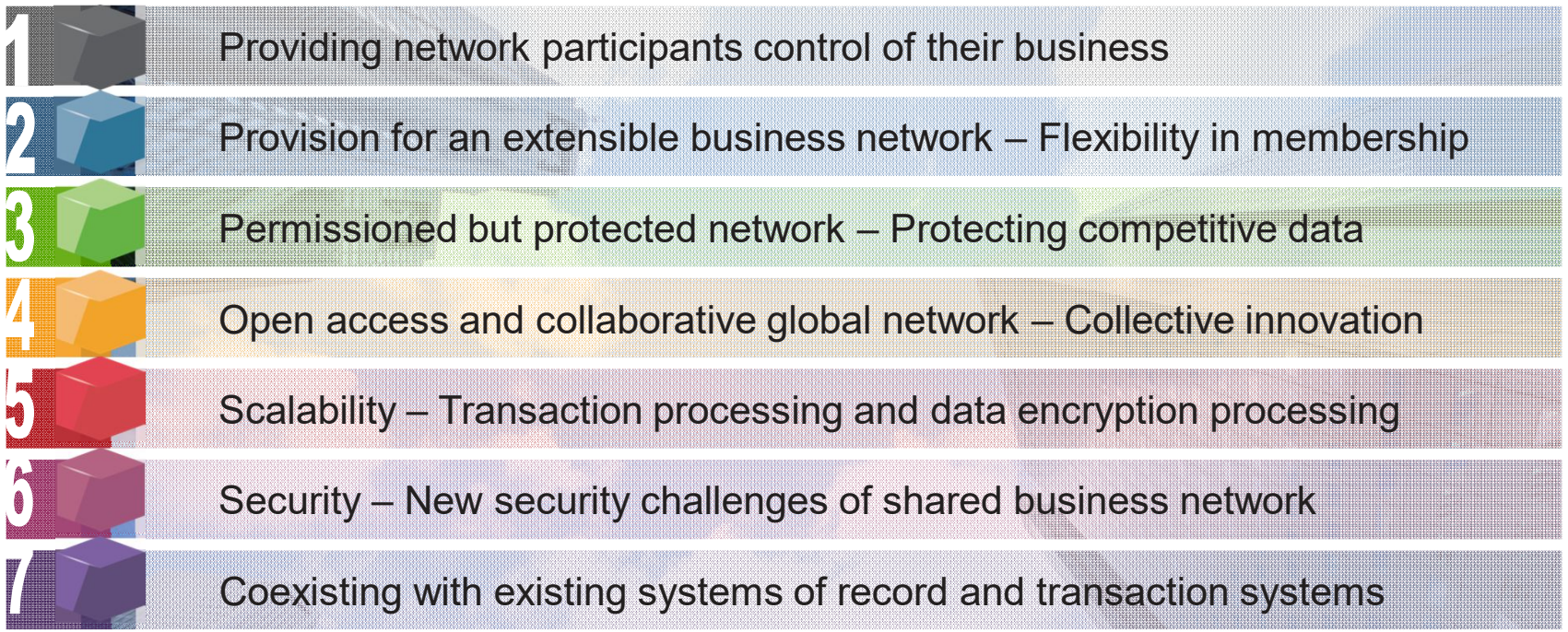
Select preferences for number of peers, consensus, identity management, and encryption to dynamically grow a business network

Blockchain Performance

- GO Lang
- + RocksDB
- + Security
- + Consensus

- Multithreading, Scaling, Capacity,

7 design principles of sustainable blockchain business networks

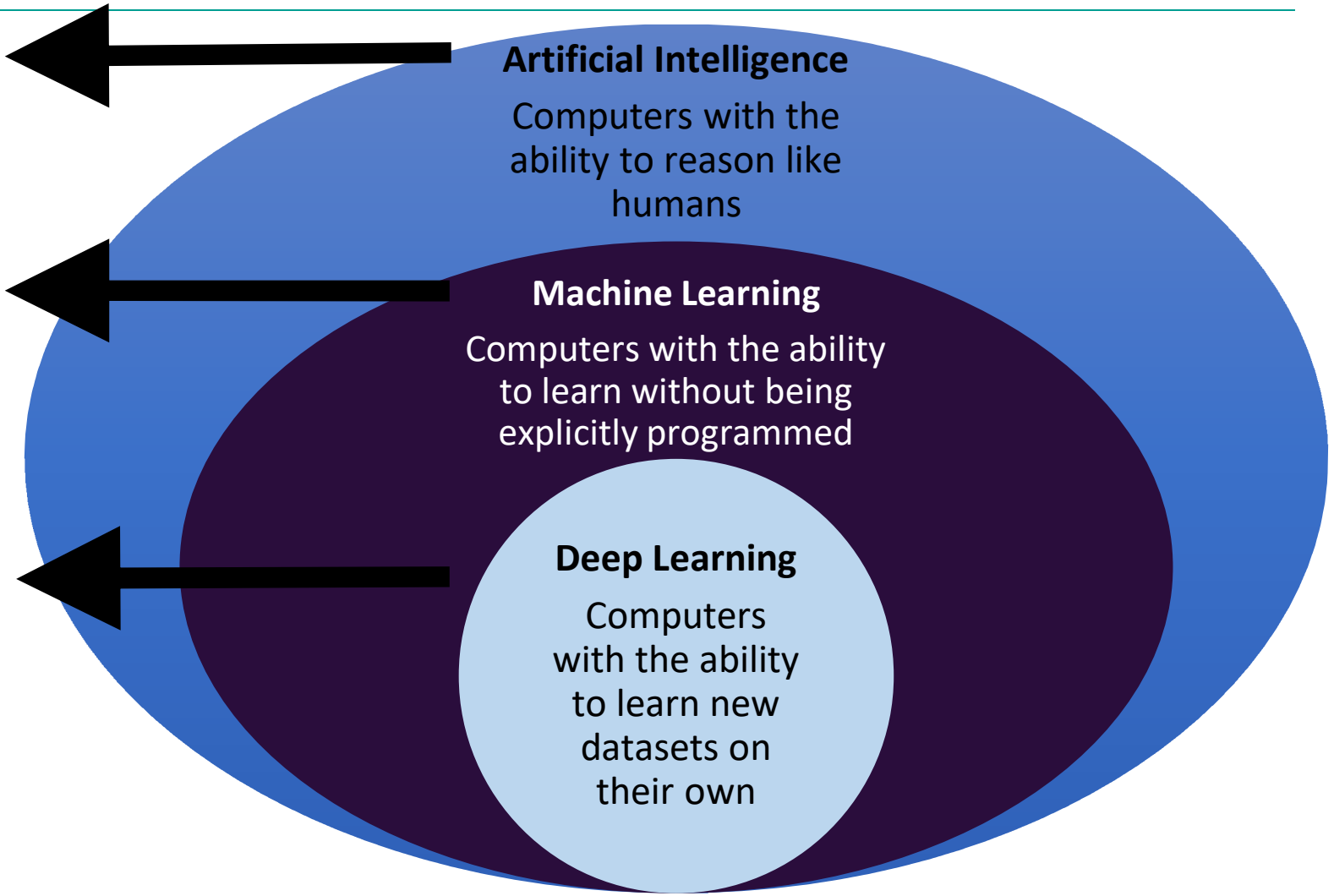


Cognitive Systems

Watson Conversation, Alexa… Playing Chess

Weather Forecasting, Rankings... Learning to reduce error

Spam filters, Watson Health, News Feed sorting…

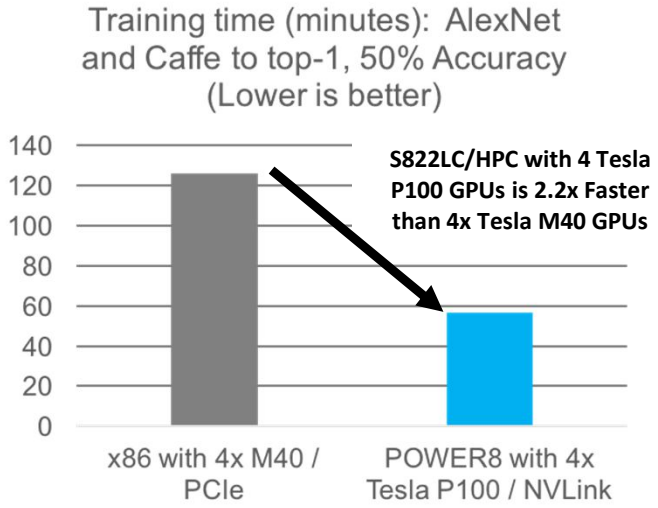


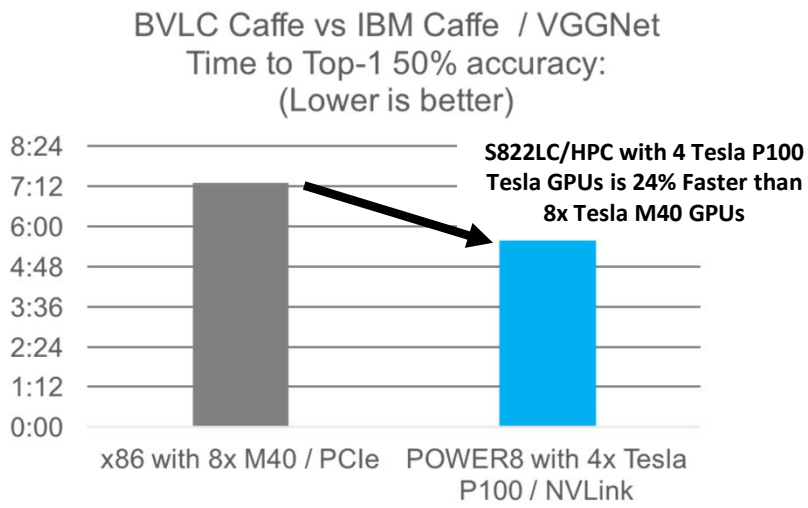
Platform Comparison: HPC Cloud vs. Private Cloud

	HPC Cloud	Private Cloud
Ease of Use	Easy to use	Automated, simple to request and access
Cost	Pay-As-You-Go or Subscription. No Capital outlay. Only includes hardware. Considerably more expensive as resources increase **$$$$**	Capital cost. Includes SME support and 24x7 availability. Less expensive based on extreme capacity and scaling **$**
Maintenance	Managed system maintenance	Systems maintenance included
Setup	Cloud system management setup	Easy automated setup
Configuration	Self service model. Limited ability to tune	Very flexible
Capacity	On Demand resource expansion	Capacity increments requested through chat or email and implemented within minutes
Software	Ubuntu only. Platform support for ML/DL Apps, PowerAI, GPU's at additional cost	Red Hat and Ubuntu available at no cost. HPC or Cognitive solutions including SW at no cost
Performance	Limited tuning. Variable performance. High Performance fast launch times.	Tuning and updating parameters to achieve best performance. Highest performing storage options

Power LC leadership for Deep Learning

PowerAI on S822LC for HPC: 2.2x faster





IBM S822LC 20-cores 2.86GHz 512GB memory / 4 NVIDIA Tesla P100 GPUs / Ubuntu 16.04 / CUDA 8.0.44 / cuDNN 5.1 / IBM Caffe 1.0.0-rc3 / Imagenet Data
Intel Broadwell E5-2640v4 20-core 2.6 GHz 512GB memory / 8 NVIDIA TeslaM40 GPUs / Ubuntu 16.04 / CUDA 8.0.44 / cuDNN 5.1 / BVLC Caffe 1.0.0-rc3 / Imagenet Data

Machine Learning for z/OS

Differentiating Value		Capability
Create better models in less time	▪ Rapidly optimize the algorithm that best fits the data and business scenario	**Cognitive Assistant for Data Scientists (CADS)**
	▪ Provide optimal parameters for any given model	**Hyper Parameter Optimization (HPO)**
Simplify model creation	▪ Wizards make it easy for users to create and train a model	**DSX Pipeline User Interface**
Improve models over time	▪ Monitor model accuracy with feedback data and performance history ▪ Notification of model performance deterioration for more efficient retraining	**Continuous Monitoring and Feedback Loop**
Easily integrate with existing tools and applications	▪ Ease collaboration across users (e.g., Data Scientists and App Developers)	**Modern RESTful APIs**
Simplify model management	▪ Easily manage thousands of models in an enterprise environment	**Single UI for Deployment**

How Do I Get Started ?

1. Discuss technology
2. Explore customer business model
3. Show Application demo

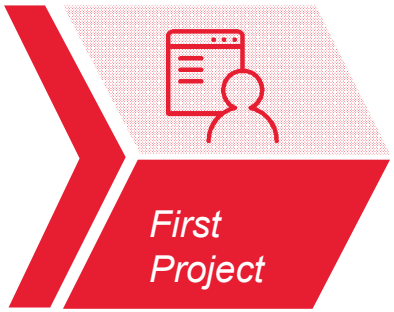
Remote or face to face

Free of charge

1. Understand concepts & elements
2. Hands on
3. Standard demo customization

Remote or face to face

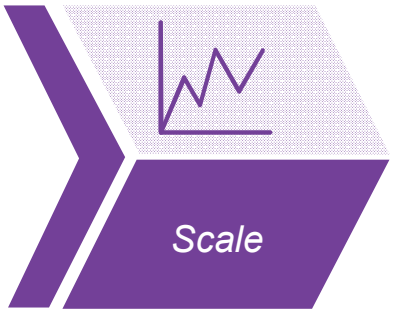
Free of charge



1. Design Thinking workshop to define business challenge
2. Agile iterations incrementally build project functionality
3. Enterprise integration

Face to face

For fee



1. Scale up pilot or Scale out to new projects
2. Business Process Re-engineering
3. Systems Integration

Face to face

For fee