Performance and Scalability results for Data Warehousing and BI on System z

Presented by: IBM and Numius

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Agenda

- IBM Business Intelligence and Data Warehouse on System z perspective
  - The analysts view of the BI market and IBM's investment in Cognos
  - Cognos 8 BI for Linux on System z
  - IBM Data Warehousing on System z
- Numius team
- IBM Montpellier team
- Numius & IBM Montpellier PoC
  - Description of client context
  - Objectives of PoC
  - Technical architecture
  - Results and conclusions
  - Conclusion from a business/end user perspective
- Q&A

Analysts Predict Move to Right-Time BI

By 2012, BI Platform capabilities will be embedded as a service within 75% of new business applications.

By 2012, emerging technologies will significantly drive adoption of BI to 50% of business users

(e.g. interactive visualization, in-memory analytics, search, SaaS and SOA)

Source : Gartner BI Summit 2008, 4/2008

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Many customers have been telling us…

- We have to cut costs in operations, hardware, software and support
- Our TCO for massive distributed implementations is far more than we anticipated
- Our data mostly resides on System z but we have a lengthy ETL and data warehouse set of processes due to our foray onto LUW solutions
- We would like to do more with System z in the DW and BI arenas but we need enabling technologies there
- We would like to see how IBM has addressed these issues with a powerful new suite of DW and BI solutions

… And we have

IBM is heavily investing in DW and BI Technology

IBM's Aggressive Acquisition & Integration Strategy to Fulfill the Vision

2009 – Exeros (MDM)

2005 | 2006 | 2007 | 2008

Unlocking the Business Value of Information for Competitive Advantage

2004-2005	
SRD,	Entity Resolution & Non Obvious Relationship Awareness
Ascential,	ETL, Data Quality, Data Profiling
Trigo	Product Information Management
DWL,	MDM, Customer Data Hubs
Venetica,	Enterprise content integration
iPhrase	Enterprise search, content management, and Web self-service software

IOD External Launch (March 2006)

LAS Acquisition

DB2 Viper

pureXML

OmniFind YE

Information Server

FileNet P8

Content Analyzer

Content Manager 8.4

IDS 11

DB2 Dynamic Warehouse

WebSphere Business Events

IMS 10

Data Studio

Unicorn Acquisition

FileNet Acquisition

DataMirror Acquisition

Princeton Acquisition

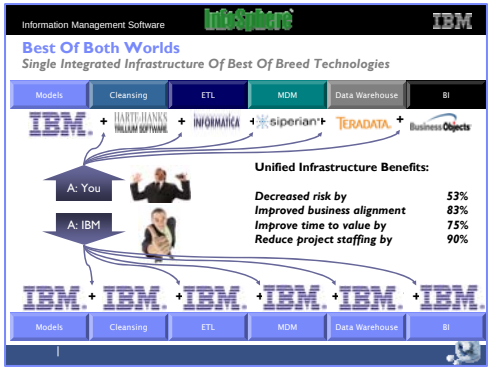
Solid Acquisition

AptSoft Acquisition

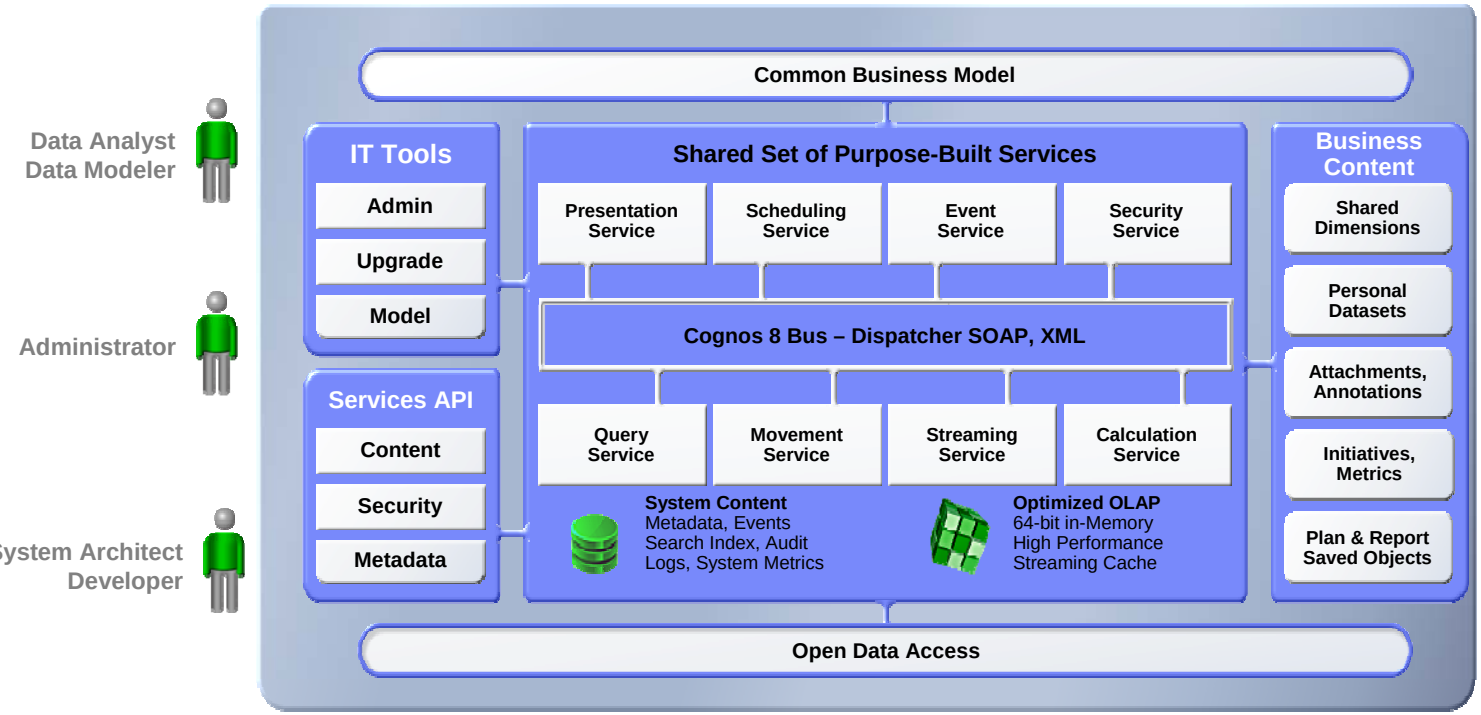
Cognos Acquisition

ILOG Acquisition

- Knowledge based global name matching capability
- Metadata Management
- Content Management
- Real-time changed data capture software
- Enterprise data archiving and test data management software.
- In-memory database software
- Complex event processing
- Business intelligence and performance management
- Business Rules Management Systems software



Built on an SOA to deploy successfully within changing environments



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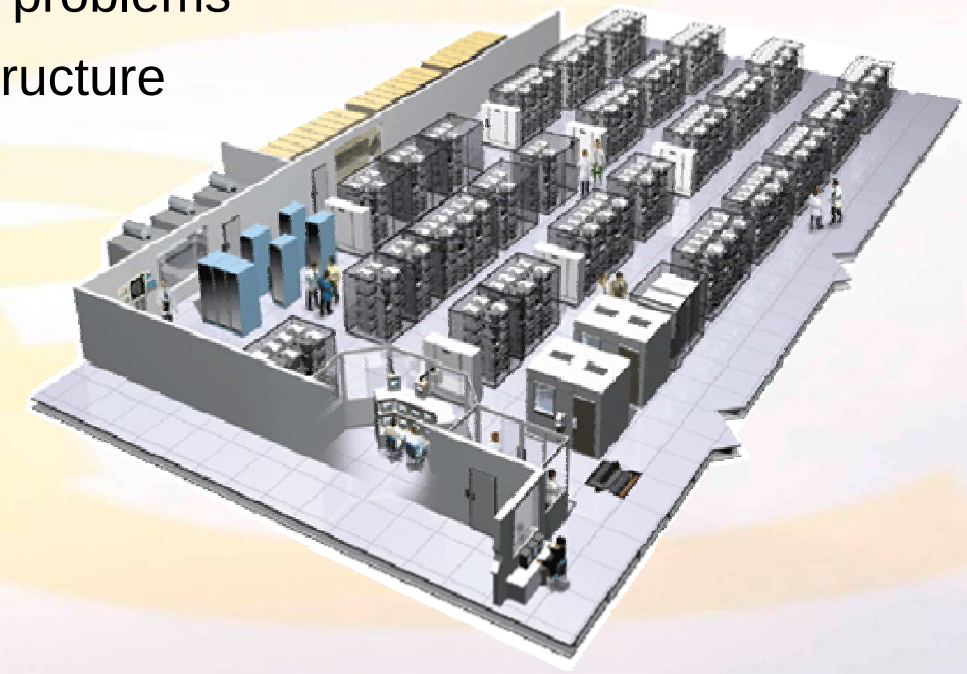
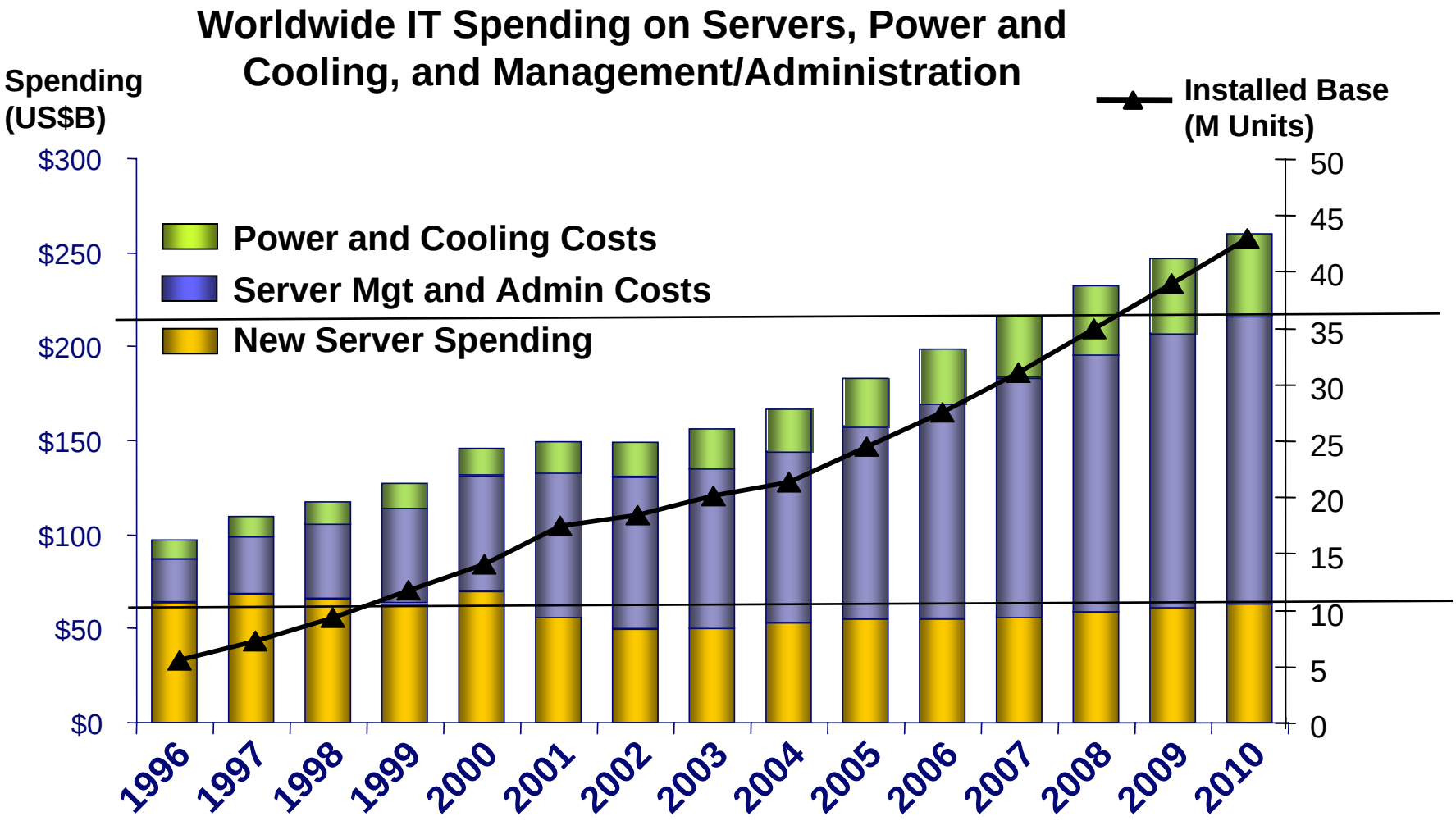
Implications for Growing your BI Deployment

- Cost and complexity (e.g., more physical servers, real network gear)
- Excessive energy usage and heating problems
- Inadequate power and cooling infrastructure
- Data silos and data synchronization
- Linear staffing costs
- Linear per processor software costs
- Frequent outages



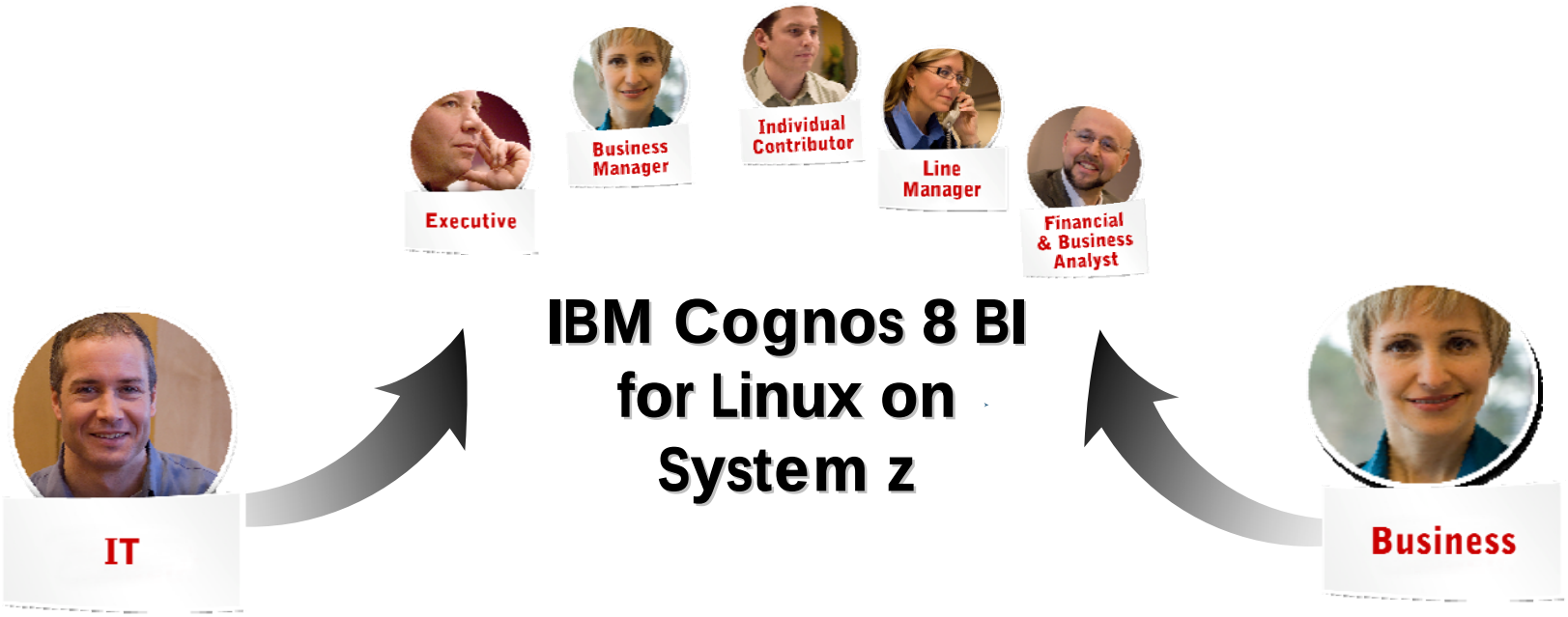
BI is traditionally a distributed workload you can consolidate!

Relative Contributions to TCO



Source: IDC, 2006

The Solution

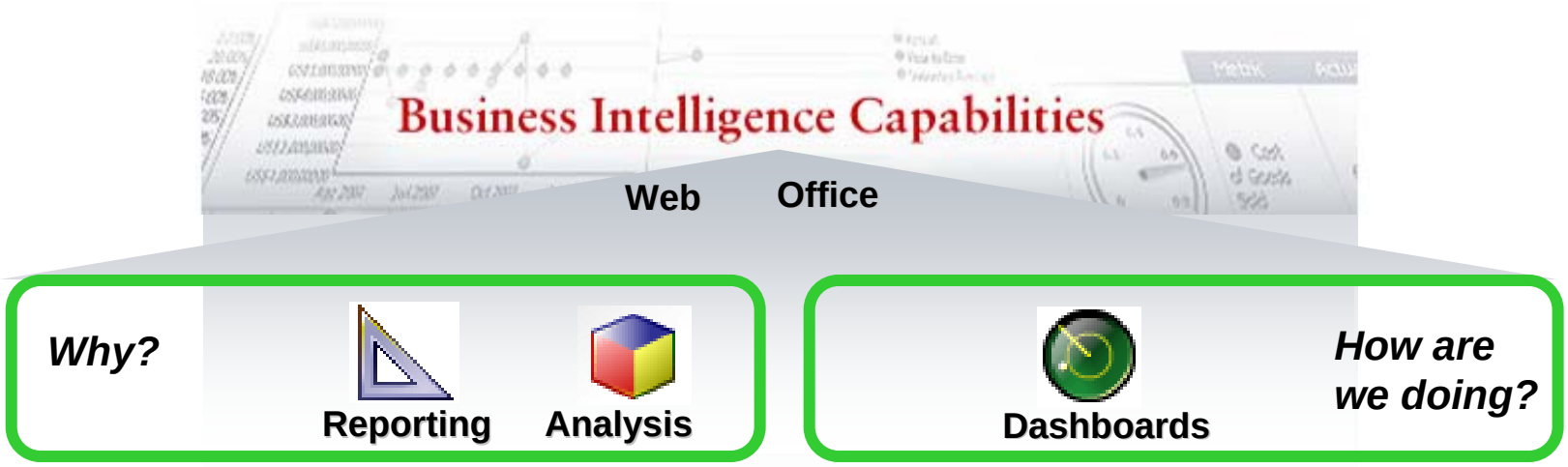


Simplifying the management and maintenance of your enterprise BI infrastructure.

- **Enabling the business to easily and securely accelerate BI user adoption while saving money.**
- **Enabling IT to guarantee the quality of service and availability of BI while reducing the time to value and corporate IT costs.**

Introducing IBM Cognos 8 Business Intelligence

- **Make more informed, faster, and more aligned decisions**
  - **Broad range of BI capabilities** for all user communities to receive relevant information how, when and where it is needed
  - **Open enterprise-class platform** to provide IT cost-effectively scale to meet growing user demands
  - **Proven partner -** Customers benefit from deep IBM expertise in both System z and Cognos



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The Core Value Proposition

- Customers who will be interested in Cognos 8 BI for Linux on System z because they…
  - Are “z-centric”
  - Have most of their data there
  - Desire to provide a lower cost, single platform solution for DW and/or BI
  - Position BI as mission critical
  - Are looking at new BI operations such as real-time and/or Operational BI
  - Require assured 24x7 operation (System z is known for its 99.999% availability)
  - Want to consolidate distributed servers or see a need to
  - Want to standardize on one or fewer BI tools
  - Have Linux processors on System z and wish to make them more useful (IFLs)
  - Have stringent data security rules
  - Want an alternative to IBI and SAS
  - Wish to cut costs such as software, hardware, staff support, power

Cost Savings … one element

Your IT Cost may vary:

Up to 80% Saving in IT Cost

Up to 96% Less Hardware

760 x86 Processor Cores vs 26 IFLs

Potential for dramatic reductions in software expense for processor based licenses

Potential reductions in power and cooling

Up to 93% Savings in KWatts and Energy Costs in this scenario

Up to 46% Less Space

Up to 89% People savings

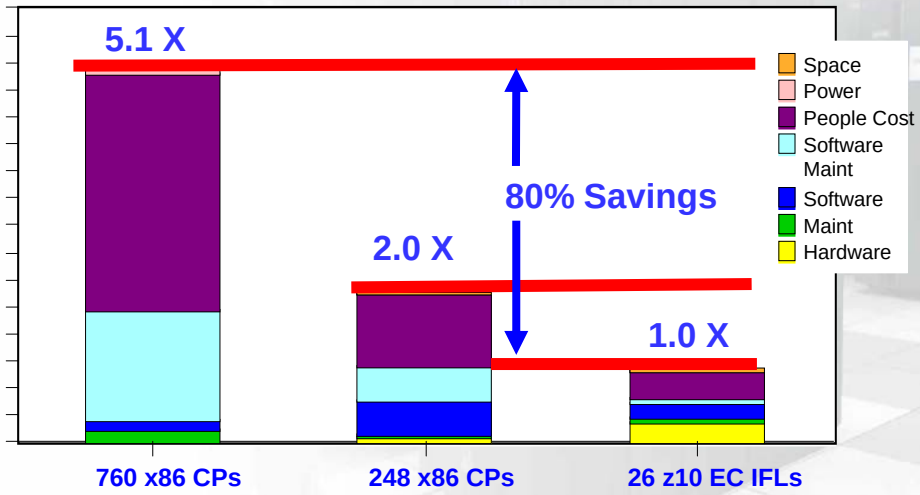
Increased processor utilization

Industry leading Security

Energize your IT savings with z10 EC.

Consolidating 760 Linux servers
z/VM Virtualization versus x86
Oracle DB Workload
3-Year Total IT Cost

$56 M Savings versus
x86 without Virtualization



x86 w/o Virtualization

Sun X2100 Single Core servers

x86 Virtualization

Dell Power Edge Quad Core servers

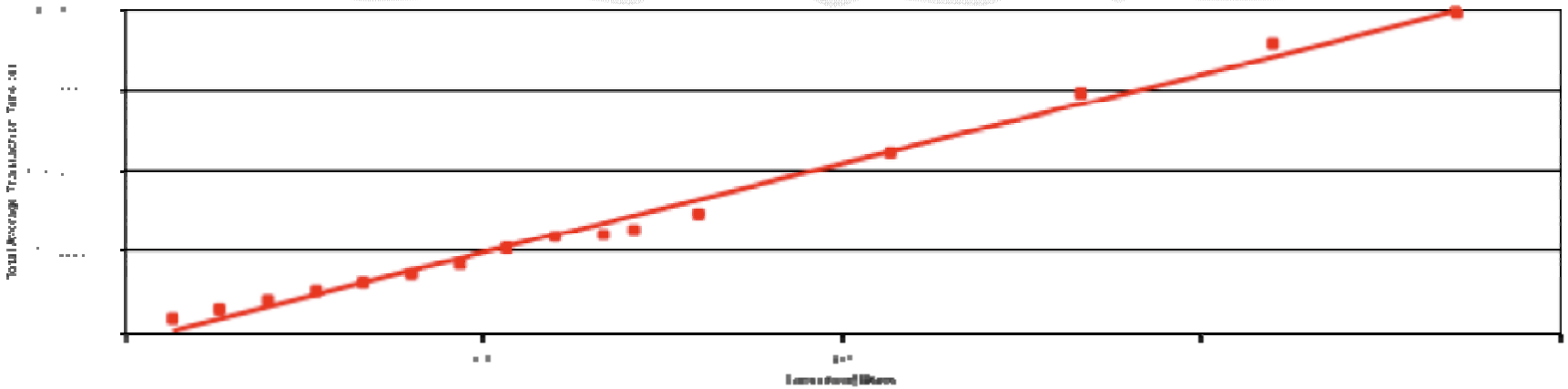
z/VM Linux on System z10 EC

Proven To Scale Across the Enterprise.

- Testing demonstrated IBM Cognos 8 BI for Linux on System z **scales linearly** to large user groups
- Testing was conducted on up to **90,000 named users**

"**Cognos, …makes it easy for companies to deploy BI and PM** to a broader user population, while **minimizing the resulting workload for IT** departments."

- Nucleus Research, Cognos Takes on the Rest of the Enterprise, November, 2007



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The Changing Data Warehouse Market

- The data warehouse is a mission-critical system, with data warehouses serving in an increasingly mixed workload capacity, including as a data source for online applications. "Deep mining" analysts and business analysts are running less-structured but equally complex queries and fast running tactical queries, each with differing service-level expectations. These differing workloads are all competing for CPU, memory and disk access. At the same time, data latency continues to progress from batch to continuous loading demands.

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Benefits of a DB2 for z/OS Warehouse

- Reduce Operational Costs
  - Save on storage using DB2 for z/OS System z hardware based data compression without compromising performance
    - Typical average compression rate of 50% (20-80 % range)
    - DB2 9 for z/OS software based index compression may save even more
  - MDX query workloads can greatly benefit from the Cubing Services cache, avoiding SQL re-execution in DB2 and therefore, save CPU and improve elapsed time for data warehouse applications
    - Elapsed time can be reduced dramatically – internal testing reduced the total elapsed time for a warehouse workload from 11000 seconds to sub second !*
  - Save on labor, energy, and floor space using System z and DB2 for z/OS
    - Save up to 85% on floor space**
    - Save up to 80% on energy costs**
    - Save up to 50% on labor resource**

* Based on internal IBM testing using an actual distribution customer warehouse workload

** Based on calculations of savings realized in internal IBM System z consolidation projects

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Benefits of a DB2 for z/OS Warehouse

- Reduce overall Risk Exposure
  - Highly sensitive personal or financial data is secure and auditable
  - DB2 for z/OS data sharing and GDPS provide unparalleled availability
  - Mixed workloads benefit from the capability of the world class System z workload manager
  - Reduced latency and duplication provide a sound basis for timely and consistent business analysis
- Position for Growth
  - Application growth on System z scales well, while cost savings increase
  - Parallel Sysplex and DB2 for z/OS data sharing enable incremental growth
  - System z provides a non-disruptive upgrade path; System z tech dividends make that upgrade path more cost effective

InfoSphere Warehouse on System z

What the product offers System z customers?

- A highly scalable, highly resilient, lower cost way to design, populate and optimize a DB2 for z/OS data warehouse for BI applications such as Cognos 8 BI

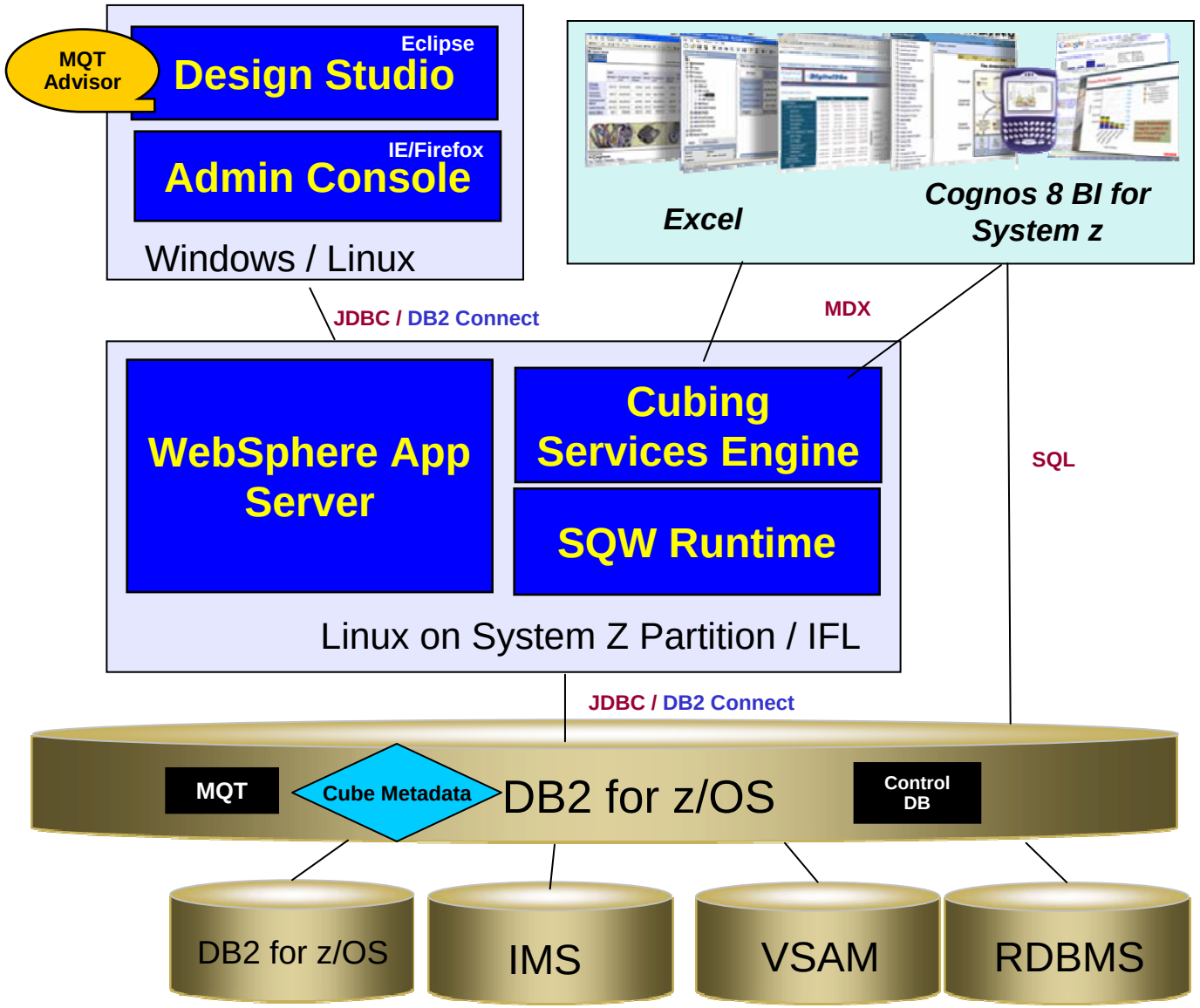
What does the product include?

- Design and Admin Client
- WebSphere Application Server
- Cubing Services Engine
- SQW Runtime
- DB2 Connect

What are the benefits?

- Simplifies operational complexity by deploying both operational and warehouse data on a single platform - - System z
  - ✓ Reduces costs related to data movement; provides data compliance and security
- Dramatically improves query performance
  - ✓ Saves on cpu cost and elapsed time through the use of Cubing Services caching for Multidimensional (MDX) query support
- Exploits unique System z advantages
  - ✓ Hardware based data compression, world class workload management, and high availability through data sharing

InfoSphere Warehouse on System z



Client Layer

- Design and admin client
- BI / Reporting tools and apps

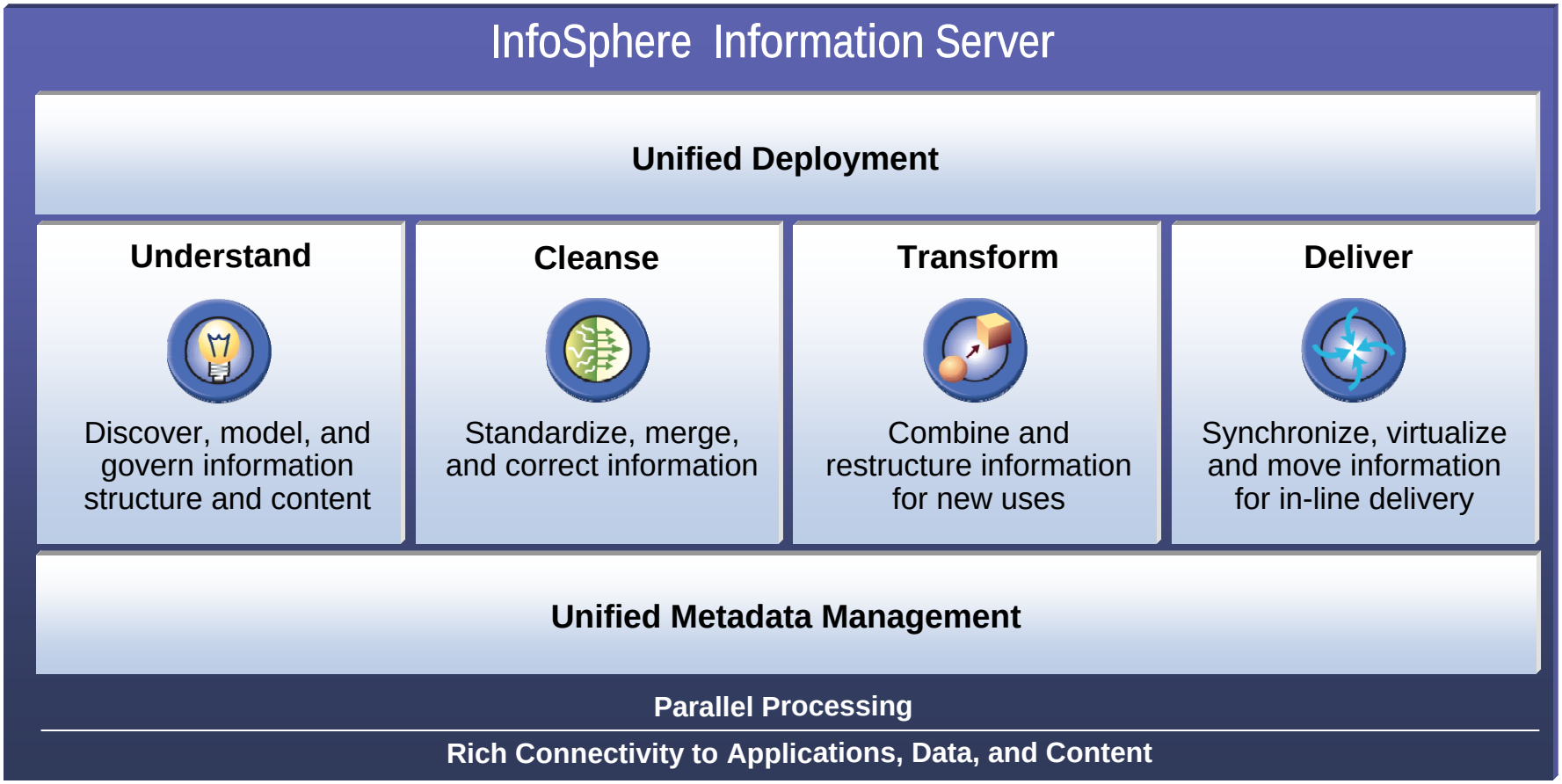
Application Server

Data Warehouse Server

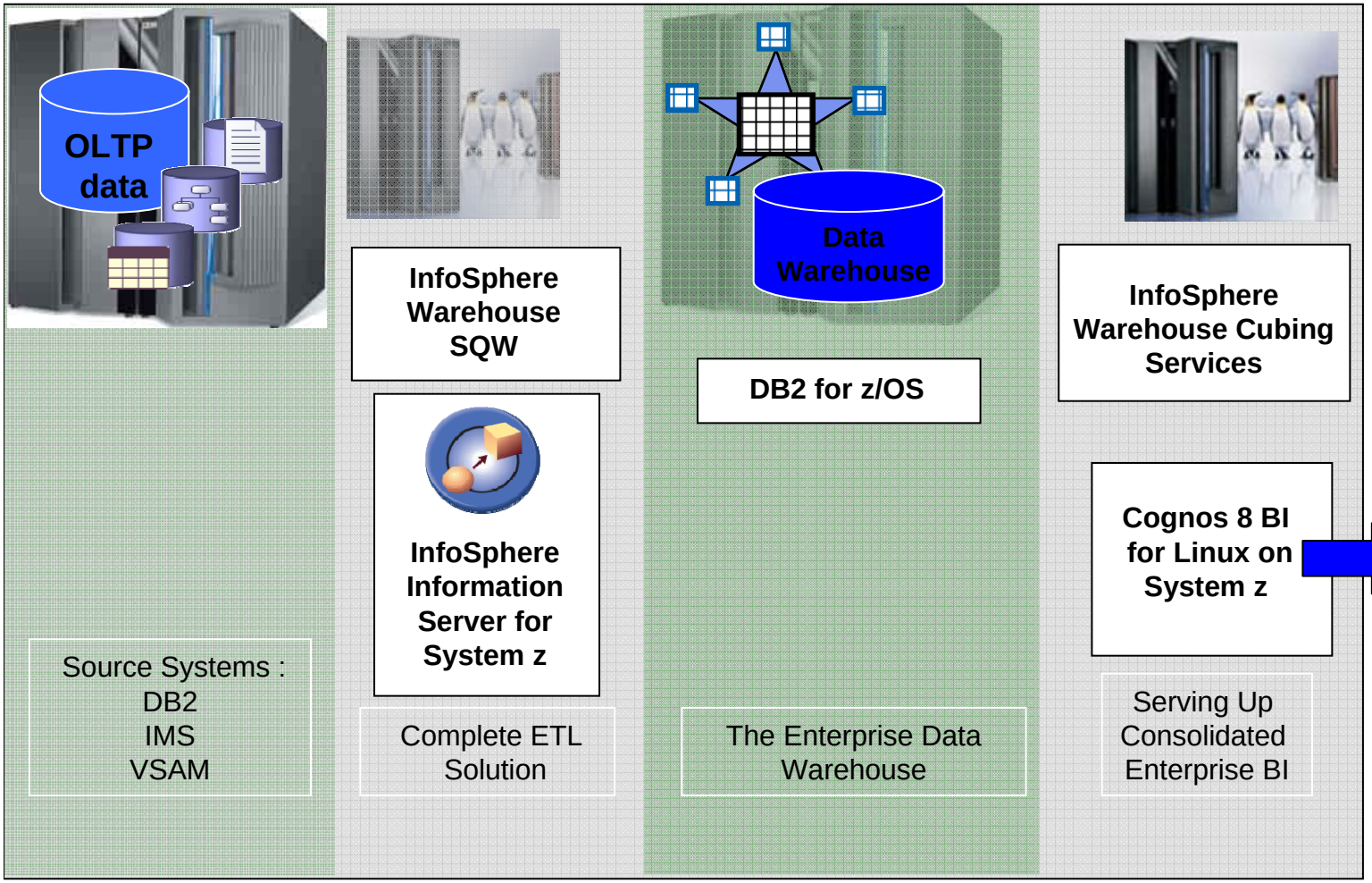
Source Systems

IBM InfoSphere Information Server

Build, Maintain, Grow your DW on System z



IBM Data Warehouse and BI Solution on System z



Teaming the Reliability and Availability of DB2 for z/OS with Cost Effective Applications running on Linux for System z

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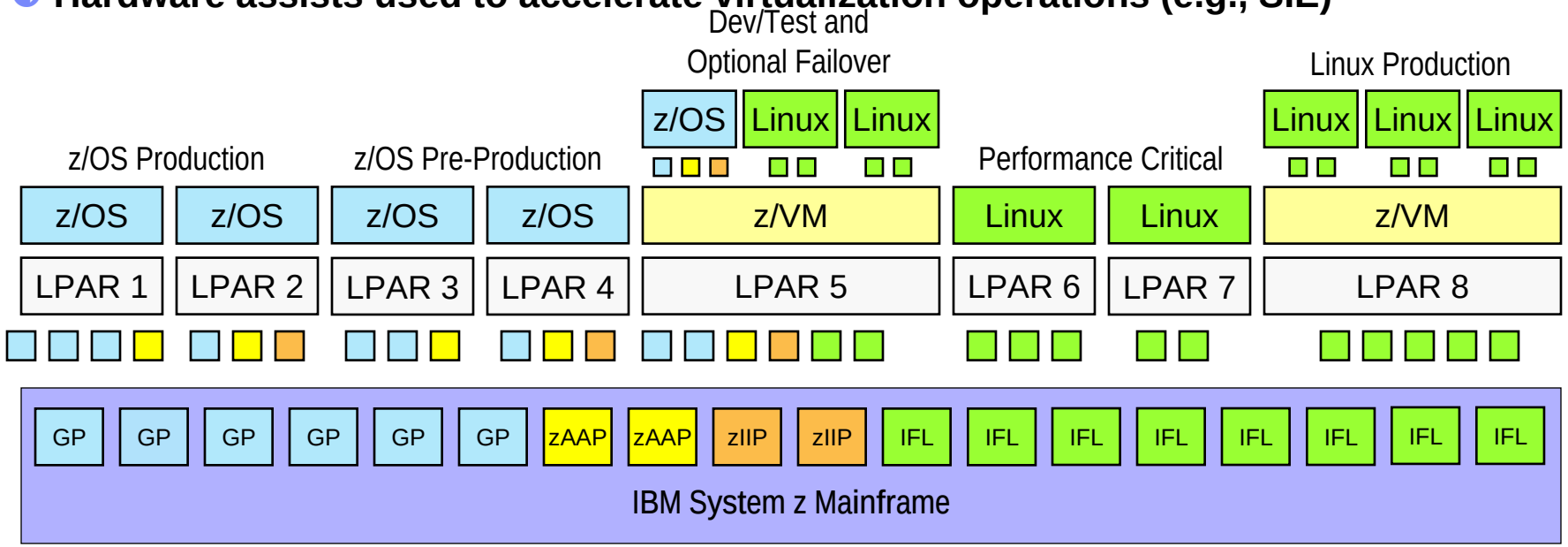
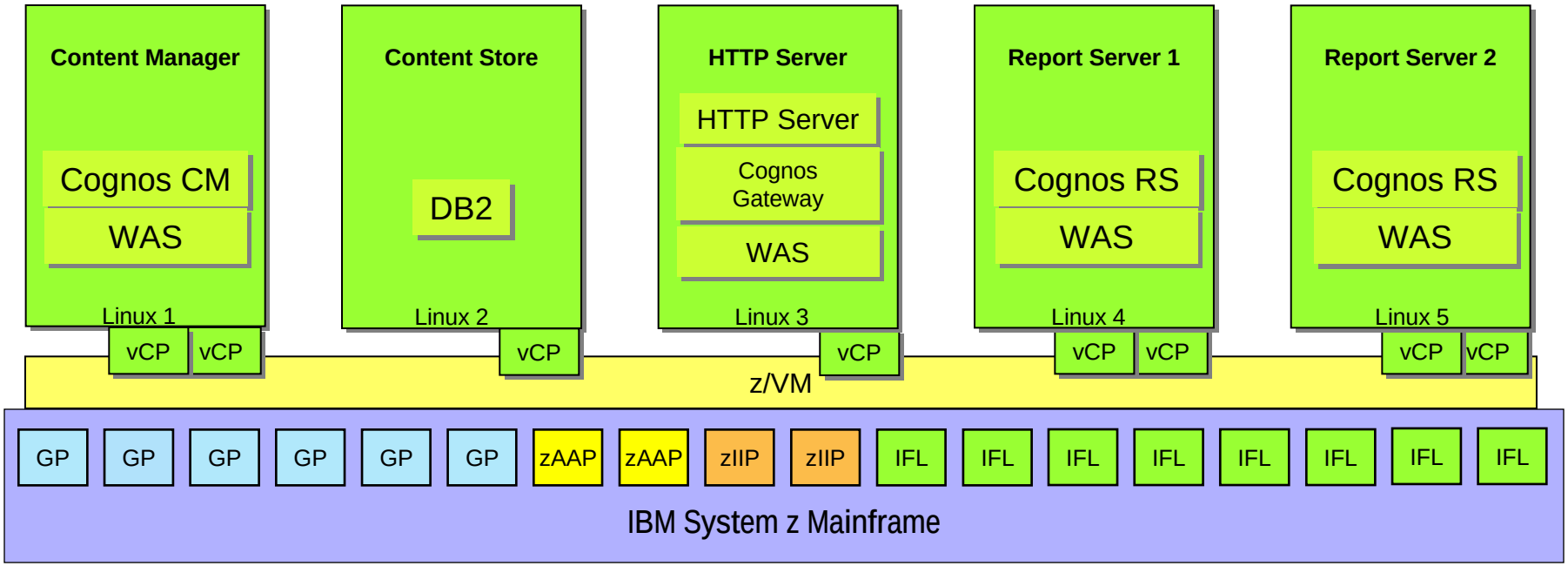
The Power and Flexibility of System z Virtualization

- Over 40 years of continuous innovation in virtualization technologies
- Architecture designed and optimized for resource over commitment
- Multiple images concurrently share all physical CPU and I/O resources
- Resources delivered as needed, automatically, based on business-oriented goals
- New OS images can be started without affecting ongoing work
- Hardware assists used to accelerate virtualization operations (e.g., SIE)

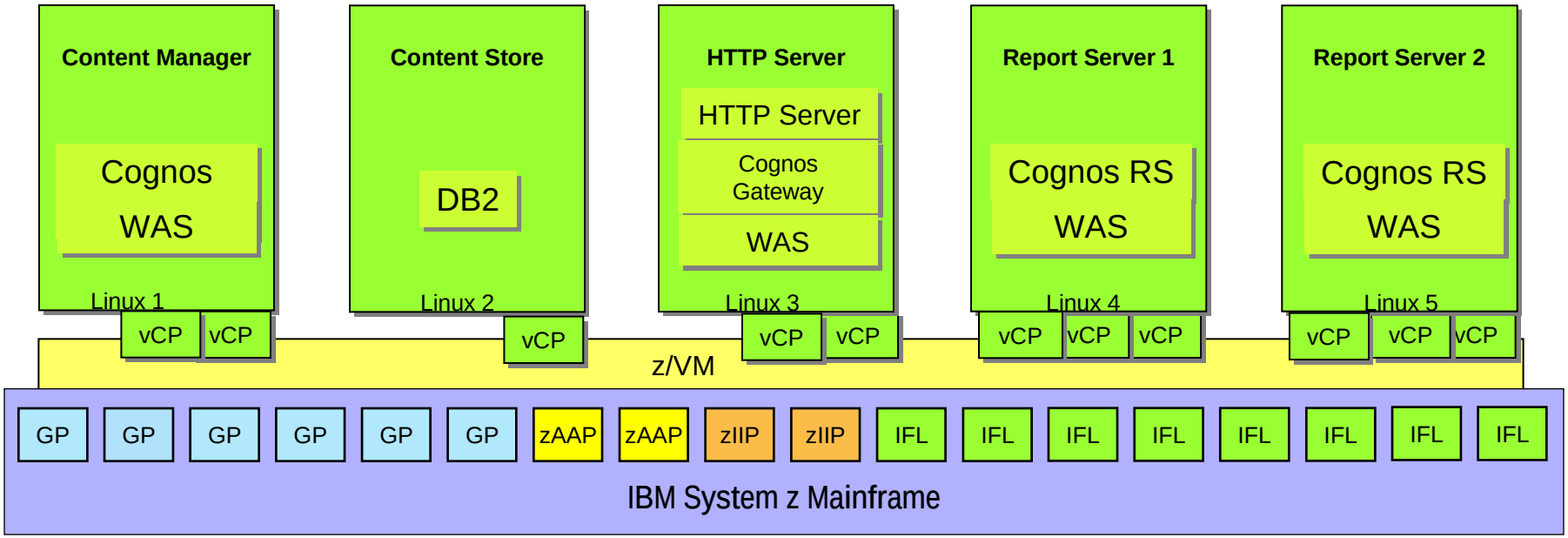


IBM Cognos 8 BI in z/VM "Distributed" Deployment



- Number of virtual Cognos 8 BI instances – similar to other platforms' physical servers
- Cognos 8 BI components distributed on individual Linux "guest" servers
- Number of virtual CPs per Cognos 8 BI instance same as other distributed deployments -- minimum 2 virtual CPs per Content Manager and Report Servers instance

IBM Cognos 8 BI in z/VM
"Distributed" Deployment with Over-commit



- Total allocation of real GPs/IFLs to z/VM remains the same
- Number of virtual Cognos instances – similar to other platforms' physical servers or partitions
- Individual Cognos components distributed on individual Linux "guest" servers
- Number of virtual CPs /Cognos instance increased on high CPU instances to enable use of excess capacity from low CPU instances
- Number of virtual CPs/Cognos instance should be less than or equal to number of GPs/IFLs assigned to z/VM LPAR
- Over-commit ratio (sum of virtual resource type/real resource type assigned to z/VM LPAR) varies from 1.5/1 to 20/1 or more – highly dependent upon how active the guest servers are

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The Benefit of Leveraging System z with IBM Cognos 8 BI for Linux on System z

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Numius team

- Leading provider of Performance Management
- Solutions in Benelux.

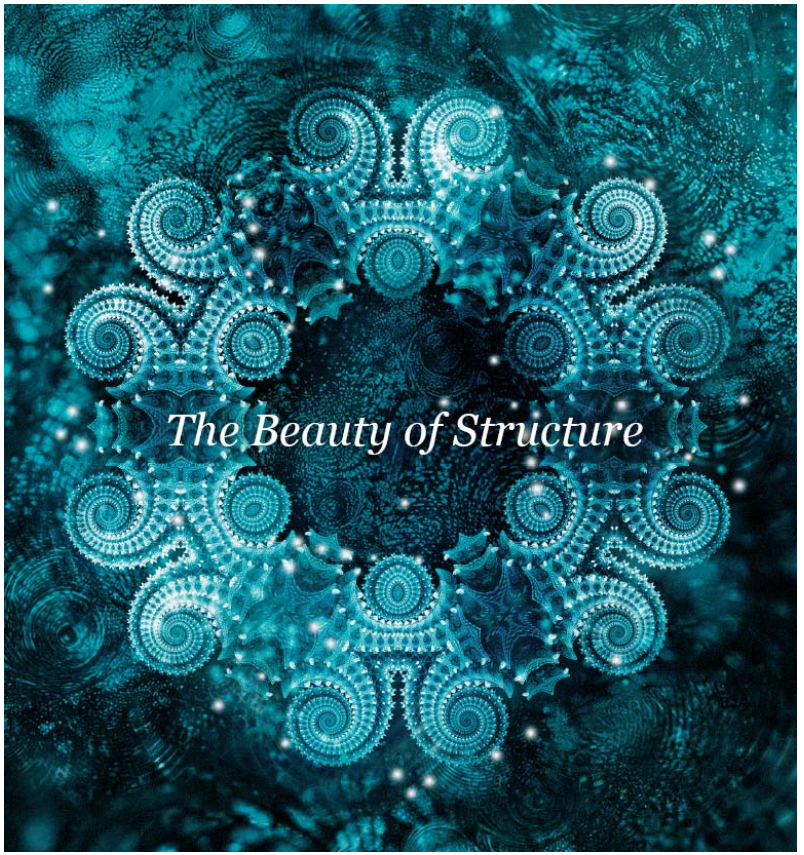
- 30+ highly skilled and professional consultants.

- Full range services, from Vision Creation,
- Business Analysis to Implementation,
- Architecture, Operations and Outsourcing.

- Multi-industry, multi-function experience.

- Focus on long-term partnerships.

- Trusted advisor role.



Numius team

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- 2008 Only Platinum Partner in BeLux
- 2007 Platinum Reseller
- 2007 Partner of the Year
- 2007 Reseller of the Year
- 2006 Partner of the Year
- 2005 Enterprise Planning Partner Award
- 2004 Business Intelligence Partner Award

- IBM Advanced Business Partner

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IBM Montpellier team

PSSC Activities

PSSC Montpellier Customer Center partners with clients to meet their IT infrastructure goals and improve their overall business by demonstrating the capabilities of the IBM server, storage and software portfolio. This is accomplished through a comprehensive approach of designing, developing, benchmarking and validating solutions.

Talk & Teach

- Server Briefings
- Software Briefings
- Industry Showcases
- Software Showcases
- Education & Training
- Consultant & Systems Integrators Support

Design

- Dynamic Infrastructure Leadership Center
- Energy Efficiency
- High Availability Center of Competency
- Design Center
- System z New Technology Center
- WW GDPS Solution Testing
- Telco Competency Centers
- ISV Solution Centers: SAP, Oracle, Siebel
- Power Systems Banking CoC

Prove

- Benchmarks & Proof of Concepts
  - Mainframe System z
  - Power Systems
  - Deep Computing / HPC
  - System x & BladeCenter
  - Storage
- Solutions Testing
- Software zTEC
- Global Product Introduction
- Lab Services - Data Center Services

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The IBM Montpellier team

- **Our mission**: *Accelerate adoption of **Data serving concepts, technologies & products** on pre sale cycle for system z*
- **Our strength:** A end to end New Intelligence approach (business & technical) based on our customers technical relationship & trust

- Run **technical awareness** sessions
- Run customer **Information Architecture Workshop** to define best solution
- Provide pre-sales technical support (RFP, sizing, pilot support, oracle migration, architecture study…)
- Create and maintain **POT** to demonstrate System z added value for Information management
- Create **customer reference**,,white papers and collaterals

New Intelligence Deliverables

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Light Benchmarks for System z offering in Montpellier

- Three offerings
  - z/OS : Single z/OS V1.10 LPAR, 4 to 6 CP Shared, 6 GB or 8 GB Memory, 600 GB storage, set of software is installed (DB2, WebSphere Application Server, WPS, Message Broker, ESB, CICS, MQ & monitoring tools).
  - Linux on System z : one guest hosted on a z/VM LPAR; up to 4 CP shared, 4 GB memory, up to 14 GB storage; software code (WebSphere, Oracle, DB2…) downloadable from a NFS. SUSE and Redhat versions of Linux are available.
  - Oracle Solutions on System z : Oracle AS on one Linux guest + Oracle RAC 10g on 2 Linux guests (cluster), 4 CP per Linux guest, 4 GB memory, up to 300 GB storage.

- 3 System x workstations on a dedicated LAN with external Internet access
- Streamlined qualification process allowing fast start
- First level support by IBM local team (FTSS)
- Second level support by benchmark experts in Montpellier
- Benchmark tests performed remotely by the customer/ISV

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Numius & IBM Montpellier PoC

Description

Objectives

Technical architecture

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Mission statement of the joint IBM-Numius project

- To successfully port an existing business intelligence environment from an Intel-HP / Windows – HPUX – Oracle 10g – MS SQL server 2000 architecture to an IBM Cognos 8.3 on System z – IBM DB2 9 for z/OS architecture.
- To prove that the end-user functionality is maintained.
- To perform tests to determine the performance boundaries of this real-life application on a simple System z hosted architecture.
- To learn what are real-life best practices when executing a “port” of this type.

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Client context

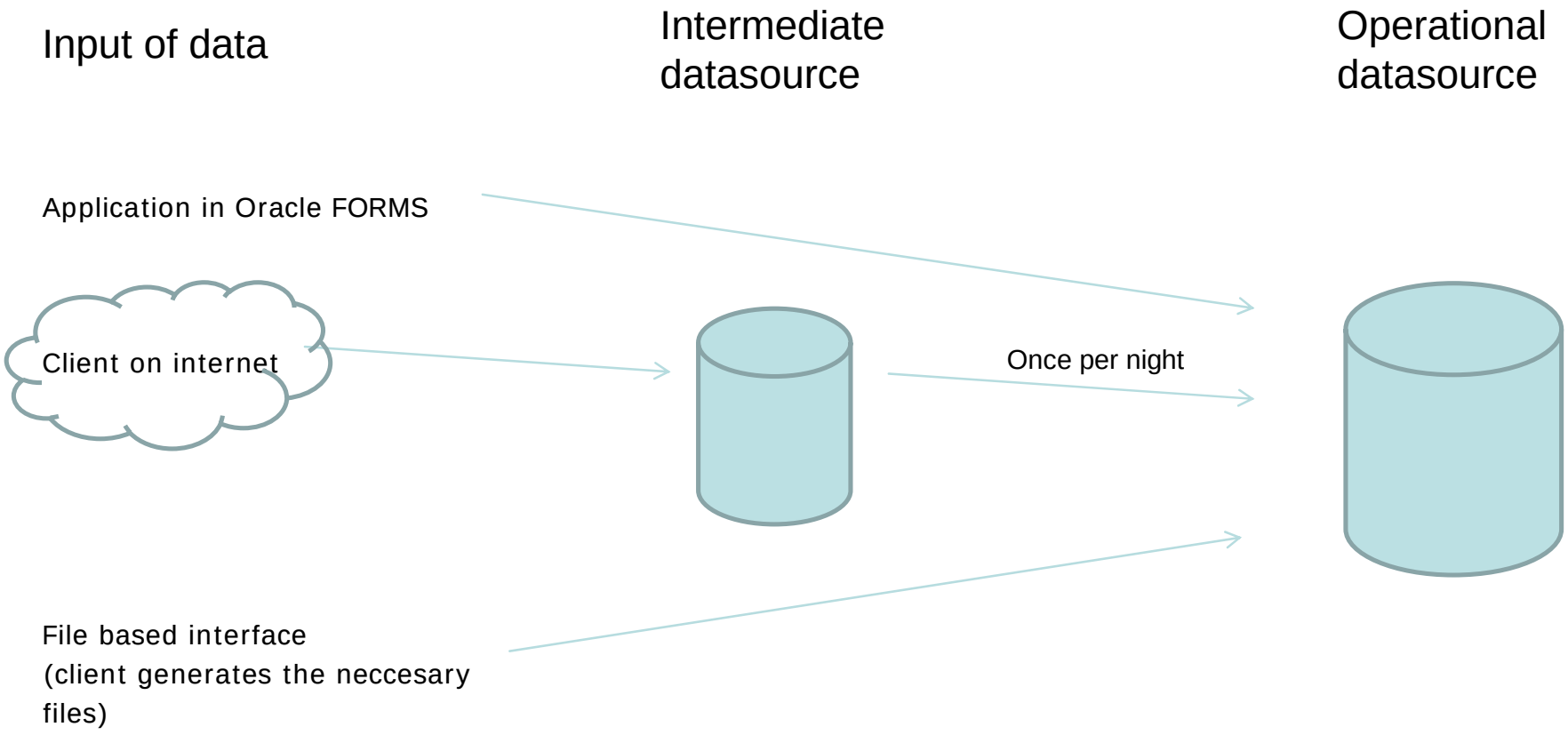
- Numius's client provides administrative and financial (data) services to about 10K Belgian companies, mainly in the retail sector.

- Numius's client uses IBM Cognos 8 for internal data analysis, process management and for external communication with its 10K B2B clients and with about 200 B2B business partners.

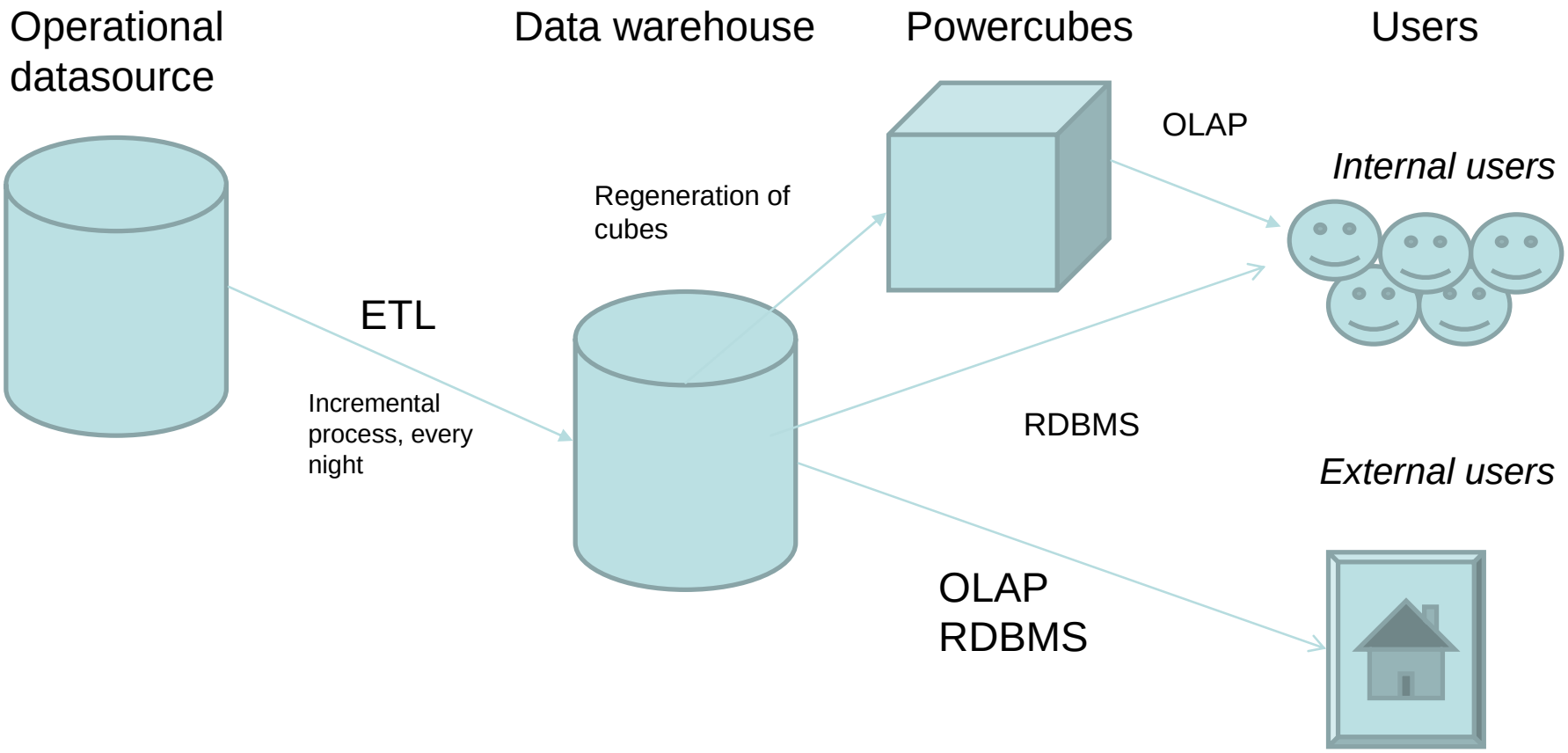
Client challenges

- Numius's client faces strongly degrading performance, both for database queries as well as for OLAP processing.
- Numius's client wants to outsource entire computer infrastructure to a central computing centre.
- Numius's client wants to achieve economies of scale by simplifying the heteregenous distributed computing architecture.
- Numius's client wants to use its business intelligence tools as an individualised communication channel with its stakeholders (clients, business partners, shareholders,...)

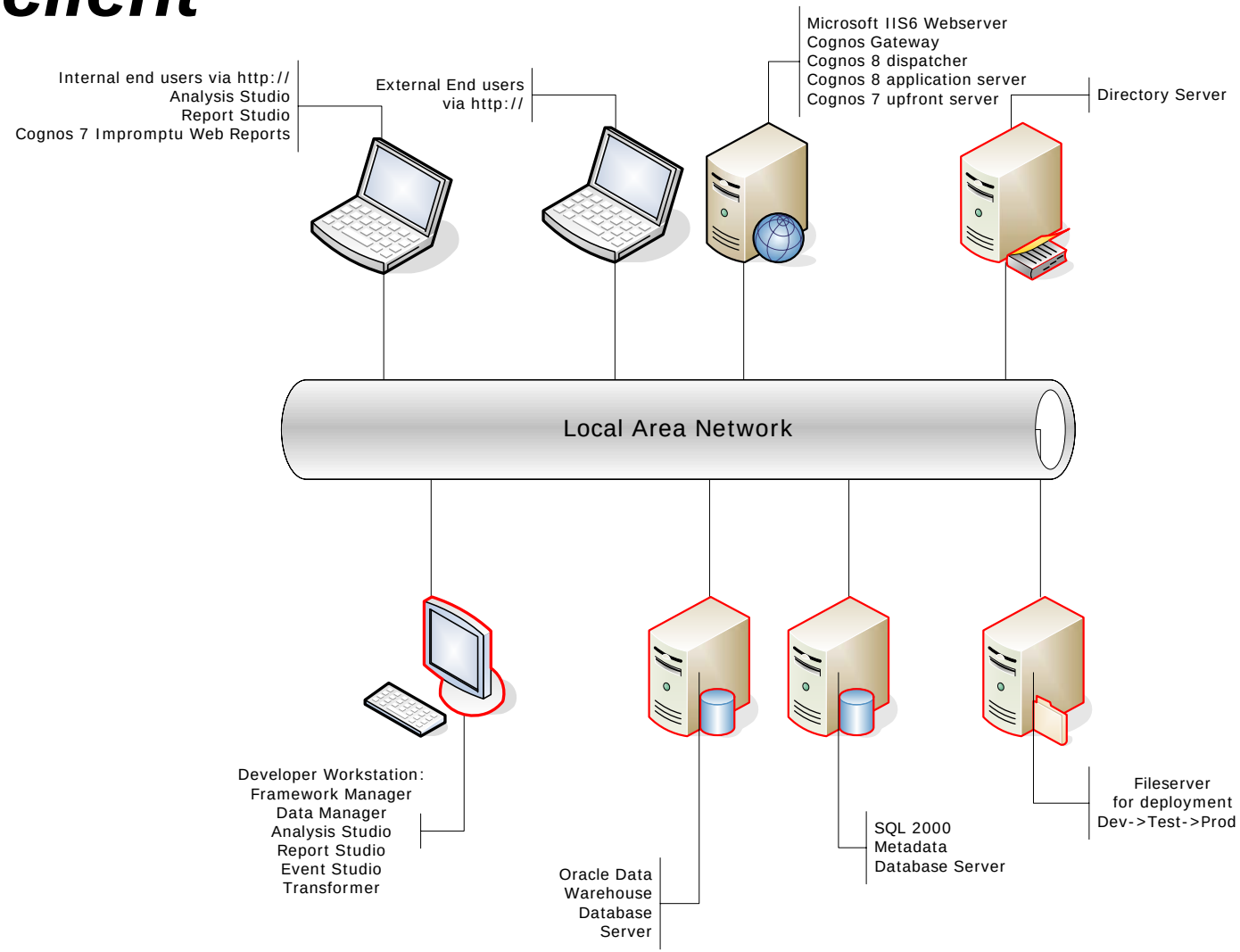
Logical architecture at Numius client



Logical architecture - continued

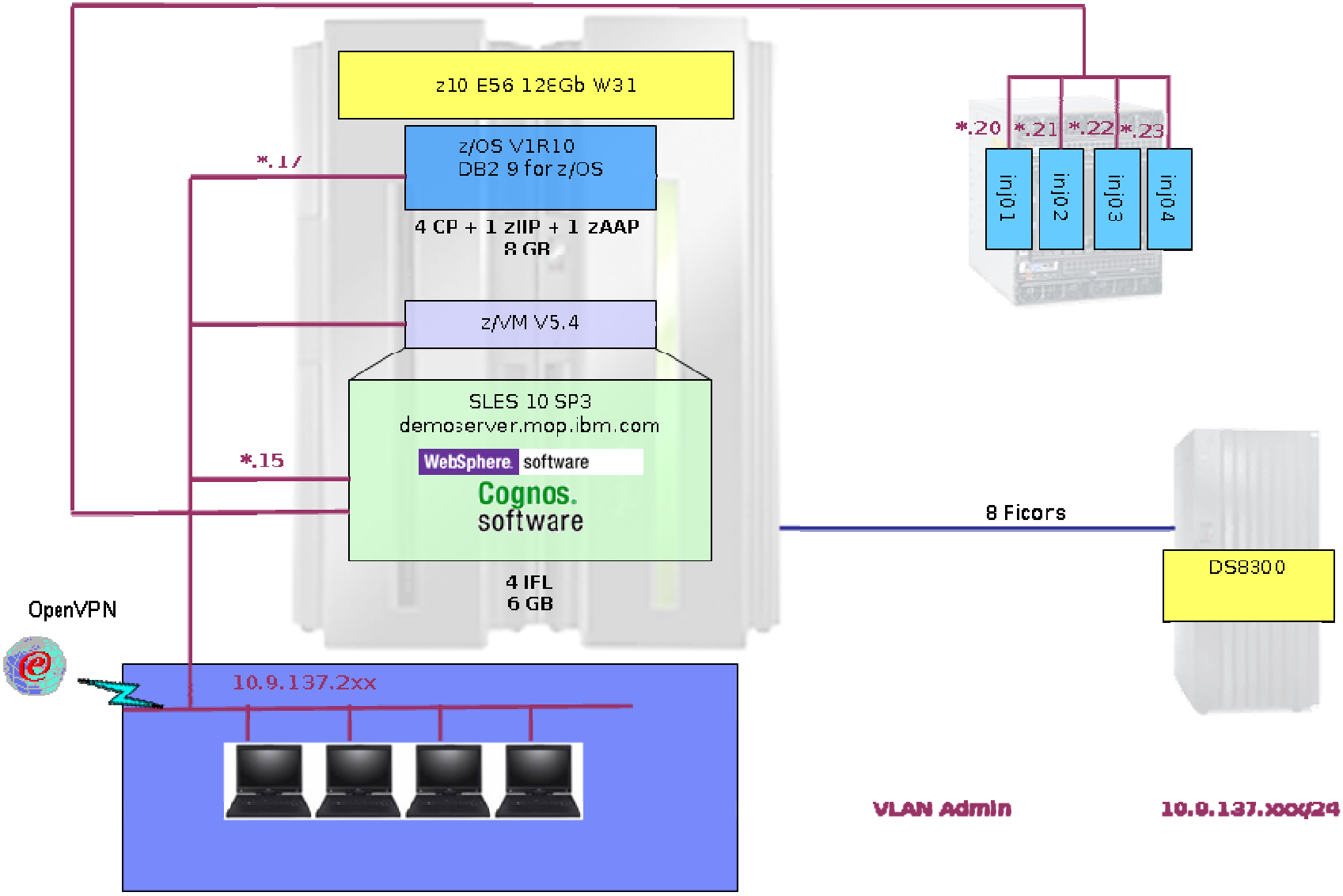


Current physical architecture at Numius client

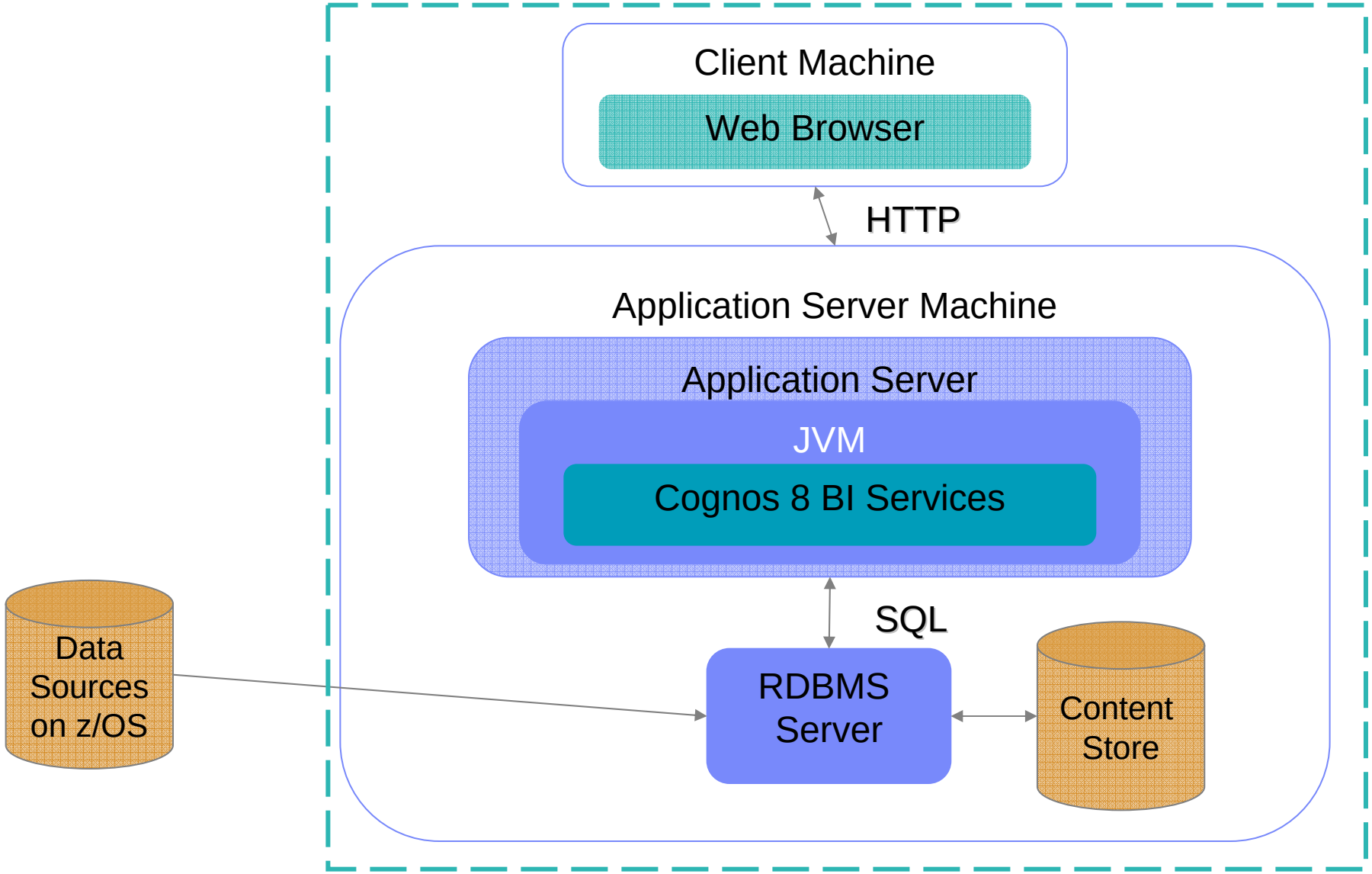


Legend		
Physical Model		
Symbol	Count	Description
	1	Directory server
	1	Local Area Network
	2	Database Server
	1	BI Development
	2	Endusers
	1	File server

The PoC z technical architecture



Logical infrastructure of the PoC



High level test set-up

- All tests aimed to mimic as closely as possible the reality of an end-user on a real-life application and real data.
- All tests generated IBM Cognos 8 BI v3 for System z Audit data and results in the IBM Cognos 8 BI v3 Content Store.
- During all tests, system/application parameters on Linux on System z and DB2 9 for z/OS where monitored and recorded.
- Virtual users and test scenarios where simulated using WebPerformance Suite from WebPerformanceInc.
- IBM Cognos 8 BI v3 results where analyzed and reported using an extention on the IBM Cognos 8 BI v3 Audit reporting and using a specific reporting package on the IBM Cognos 8 BI v3 Content Store in addition to IBM Cognos 8 BI v3 Report Studio reports, all developed by Numius.

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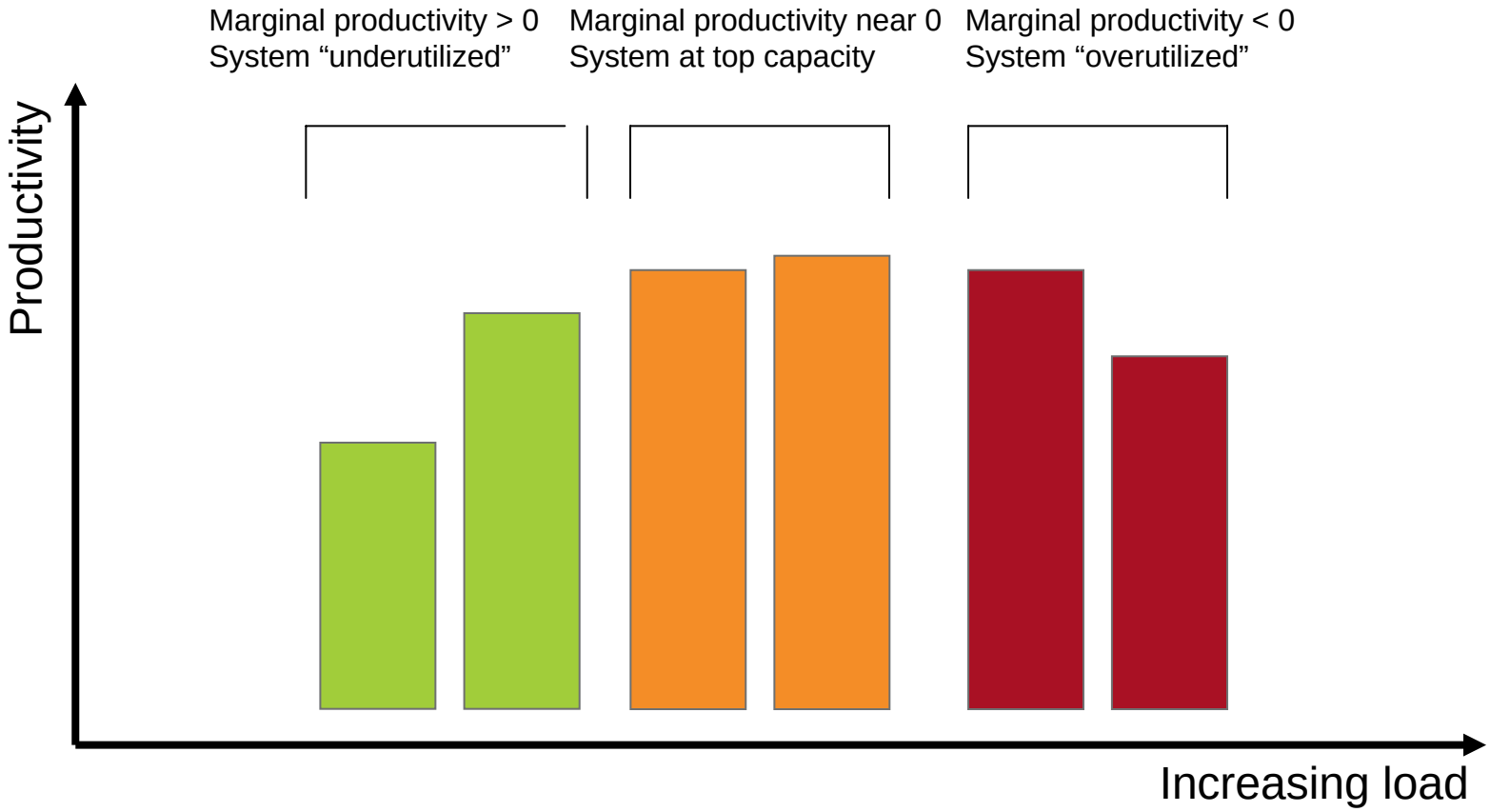
High level test set-up

- Performance tests
  - Submit increasing batch load onto the IBM Cognos 8 BI v3 layer and subsequently onto the IBM DB2 9 for z/OS layer.
  - Save report output in IBM Cognos 8 BI v3 Content Store on DB2 9 for Linux on System z.
  - No end-user interactivity on the IBM Cognos 8 BI v3 layer.
  - Measure output in terms of # of PDF pages generated.
  - Do multiple tests with increasing workload in order to determine the point where the marginal productivity approaches zero.

Determine top capacity



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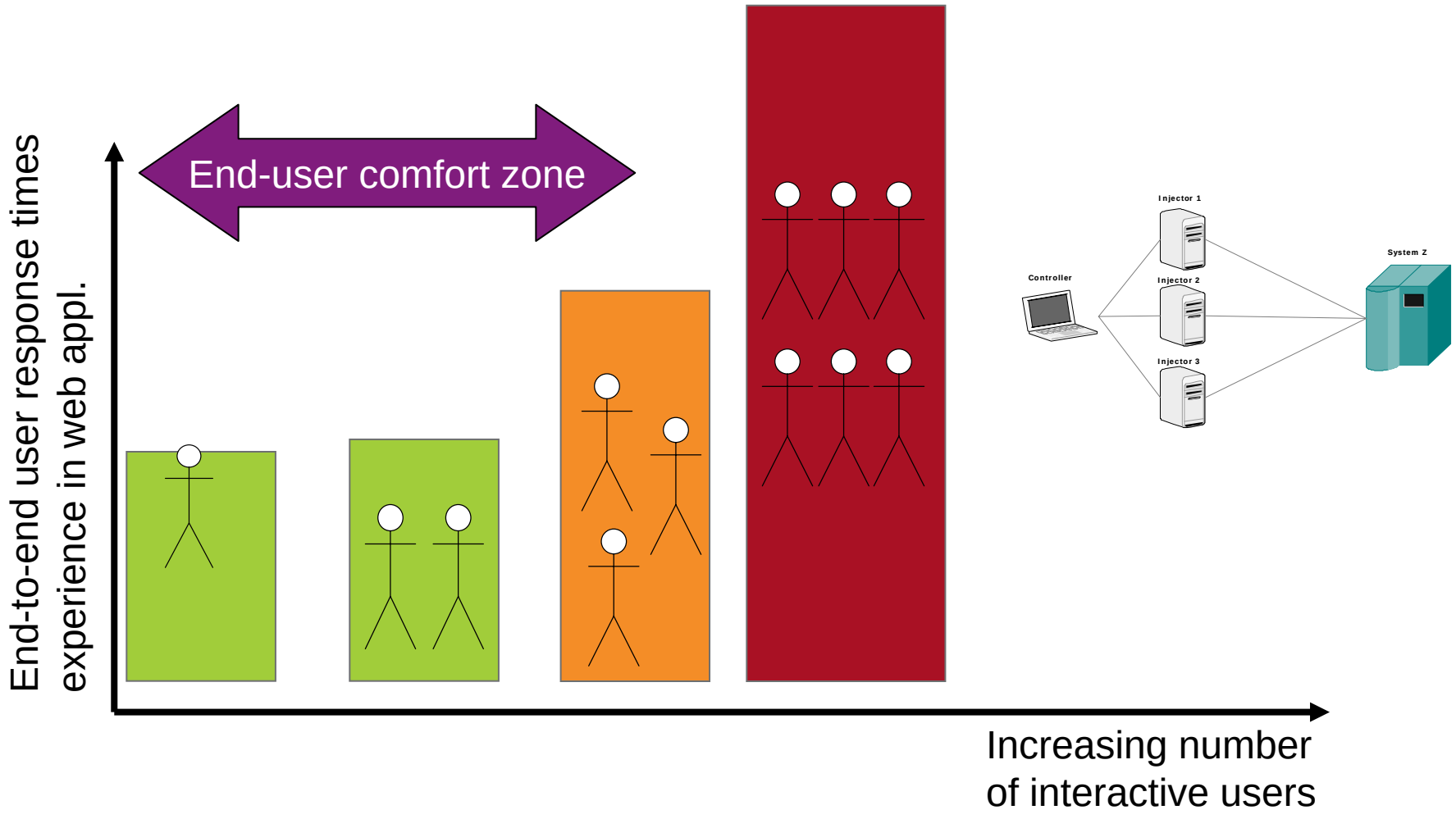
High level test set-up

- Scaleability test
  - Submit increasing interactive load onto the IBM Cognos 8 BI v3 layer, through the IBM Websphere layer and subsequently onto the IBM DB2 9 for z/OS layer.
  - Generate interactive reports in PDF.
  - Include end-to-end simulation of end-users navigating through IBM Cognos 8 BI v3 environment.
  - Increase the number of virtual users, thereby increasing the workload in order to determine the point where the (virtual) end-user starts to experience a slower system (=end-to-end test).
  - Simulate a true end-to-end situation.

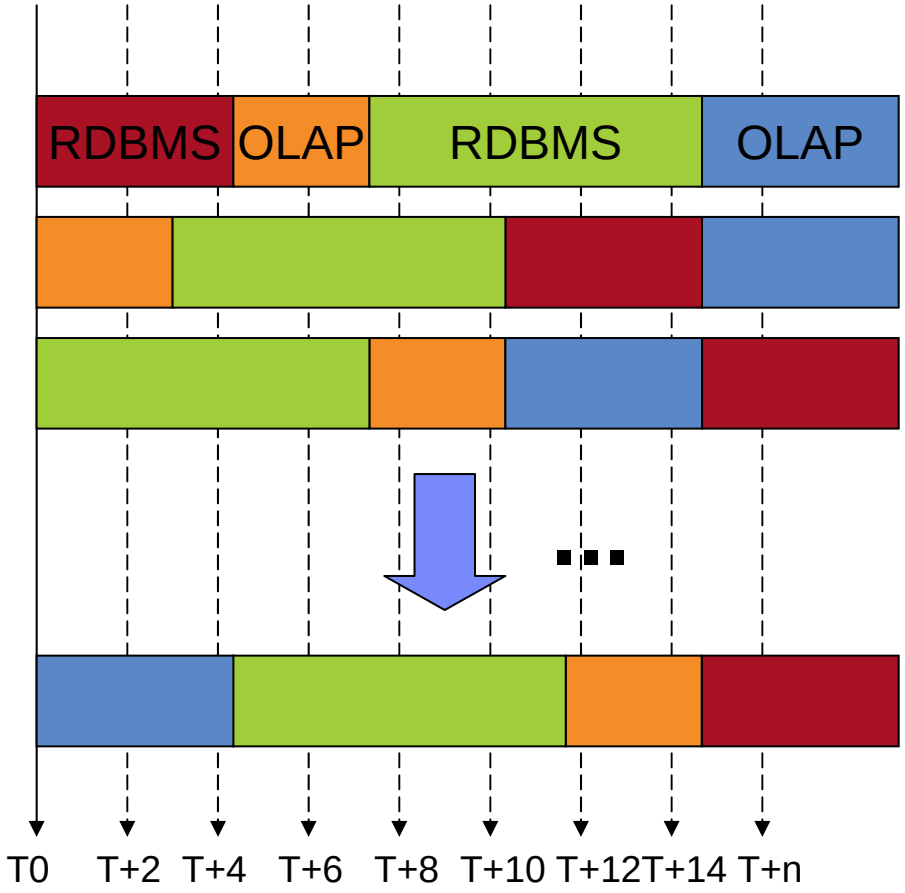
Determine end-user comfort zone



Explanation of Performance test dynamics

- Performance tests content
  - Four reports where developed to mimic realistic situations:
    - Small report output on simple RDBMS query/datasource
    - Large report output on complex RDBMS query/datasource
    - Small report output in simple OLAP query/datasource
    - Large report output on complex OLAP query/datasource
  - Four reports where sequentially scheduled in an IBM Cognos 8 BI v3 report job. We call this a 1 x 4 lane.
  - 100 variants – with report views based on the four reports in random orders – of this 1 x 4 lane where defined.
  - Tests where run to start up to 100 times the 1 x 4 lane at the same time.
  - Output statistics recorded continuously but presented at 2 minute intervals.

Performance test structure



Lane 1 of 1 x 4 reports

Lane 2 of 1 x 4 reports

Lane 3 of 1 x 4 reports

Lane 100 of 1 x 4 reports

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Explanation of Performance test dynamics

- Performance tests environment
  - During all the tests, the same architecture on System z was used.
  - The following parameters where changed to create different test scenarios:
    - Number of parallel 1 x 4 lanes started at a single moment in time.
      - 1 x 1 x 4
      - 10 x 1 x 4
      - 21 x 1 x 4
      - 51 x 1 x 4
      - 100 x 1 x 4
    - With or without z/OS WLM Discretionary Service Goal
    - With or without DB2 9 for z/OS parallelism

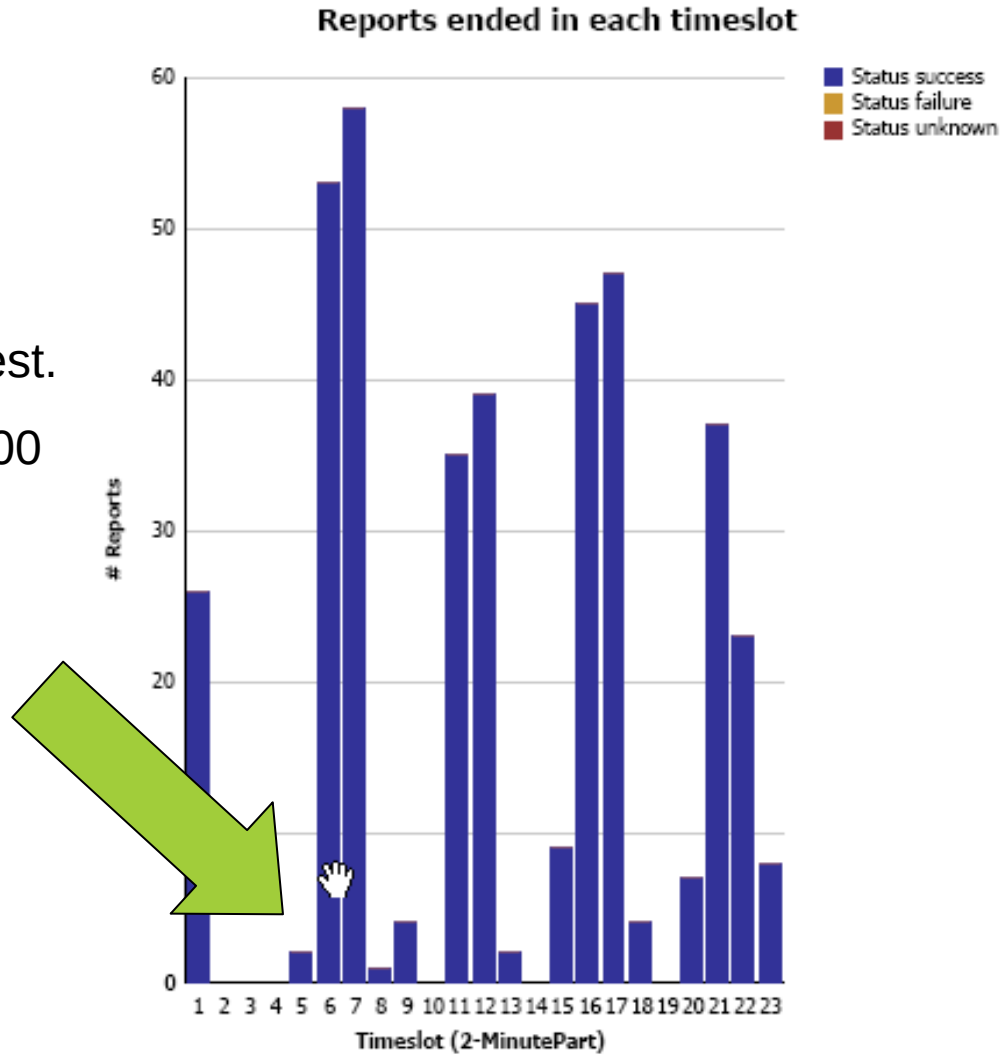
Performance tests official run list

Performance Tests Phase 1 (w z/OS WLM Discretionary Service Goal)					
RUNID	Date	Start	End	Duration	Remarks
L100RP01	31.03.2009	01:34:00	03:26:57	01:52:57	

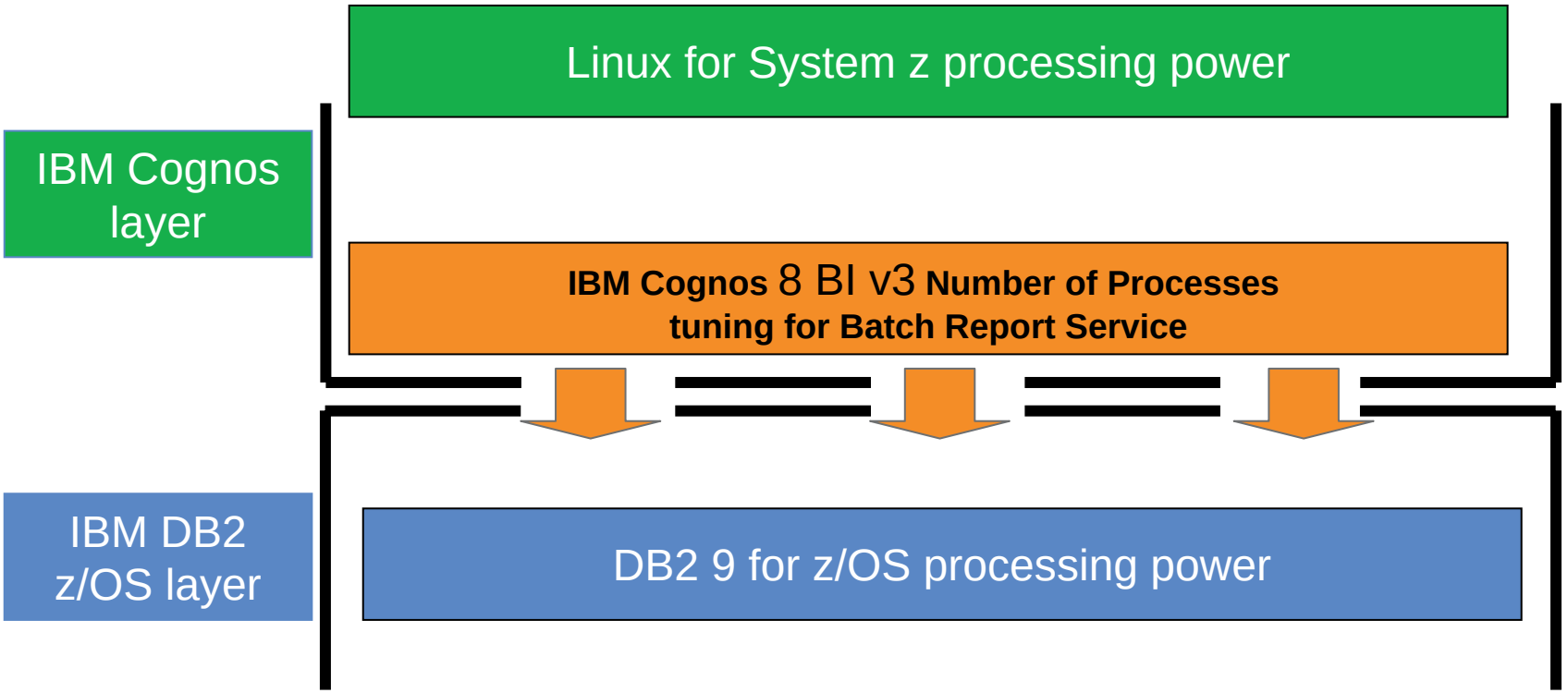
Performance Tests Phase 2 (w/o z/OS WLM Discretionary Service Goal)					
RUNID	Date	Start	End	Duration	Remarks
L01RP01#	13.05.2009	12:29:17	12:32:07	00:02:50	
L10RP01#	13.05.2009	12:40:22	12:46:11	00:05:49	
L21RP01#	13.05.2009	12:46:43	12:57:20	00:10:37	
L51RP02#	12.05.2009	17:08:00	17:37:00	00:29:00	with DB2 parallelism
L51RP01#	13.05.2009	13:00:59	13:24:42	00:23:43	without DB2 parallelism
L100RP01#	13.05.2009	13:29:30	14:14:44	00:45:14	
L151RP01#	13.05.2009	14:19:27	15:21:31	01:02:04	

Results as seen from the end-user point of view – 100 x 1 x 4 reports

- Result without z/OS WLM Discretionary Service Goal
- Output is measured at the end of every two minute slot during the test.
- We have no report failures (400/400 successful).
- In all tests, we have a peak at the start, followed by a “wait time”.



Delicate team play between architectural layers



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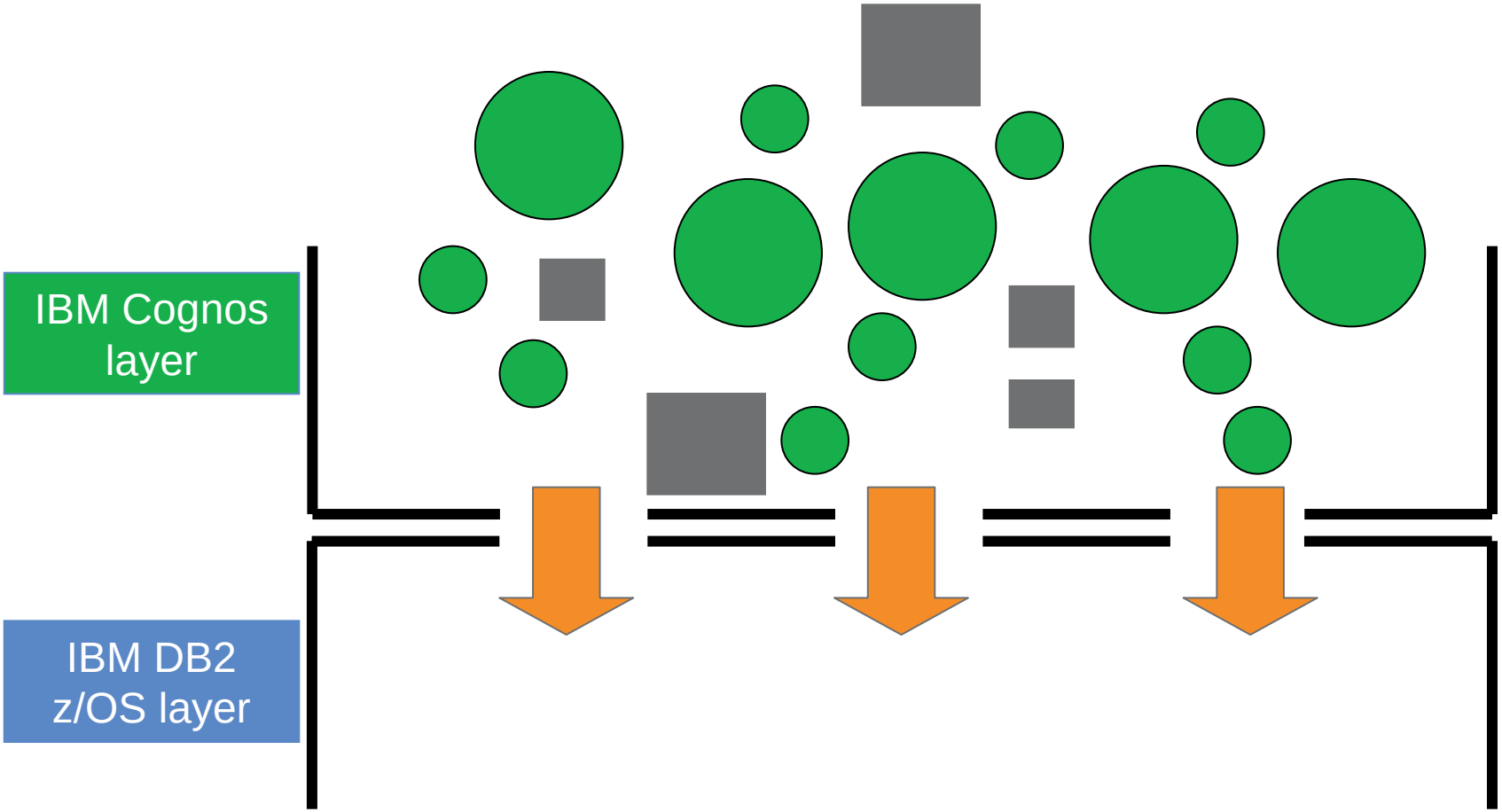
Explaining the "wait time" at the start of the test: Phase 1: N x 4 reports are submitted



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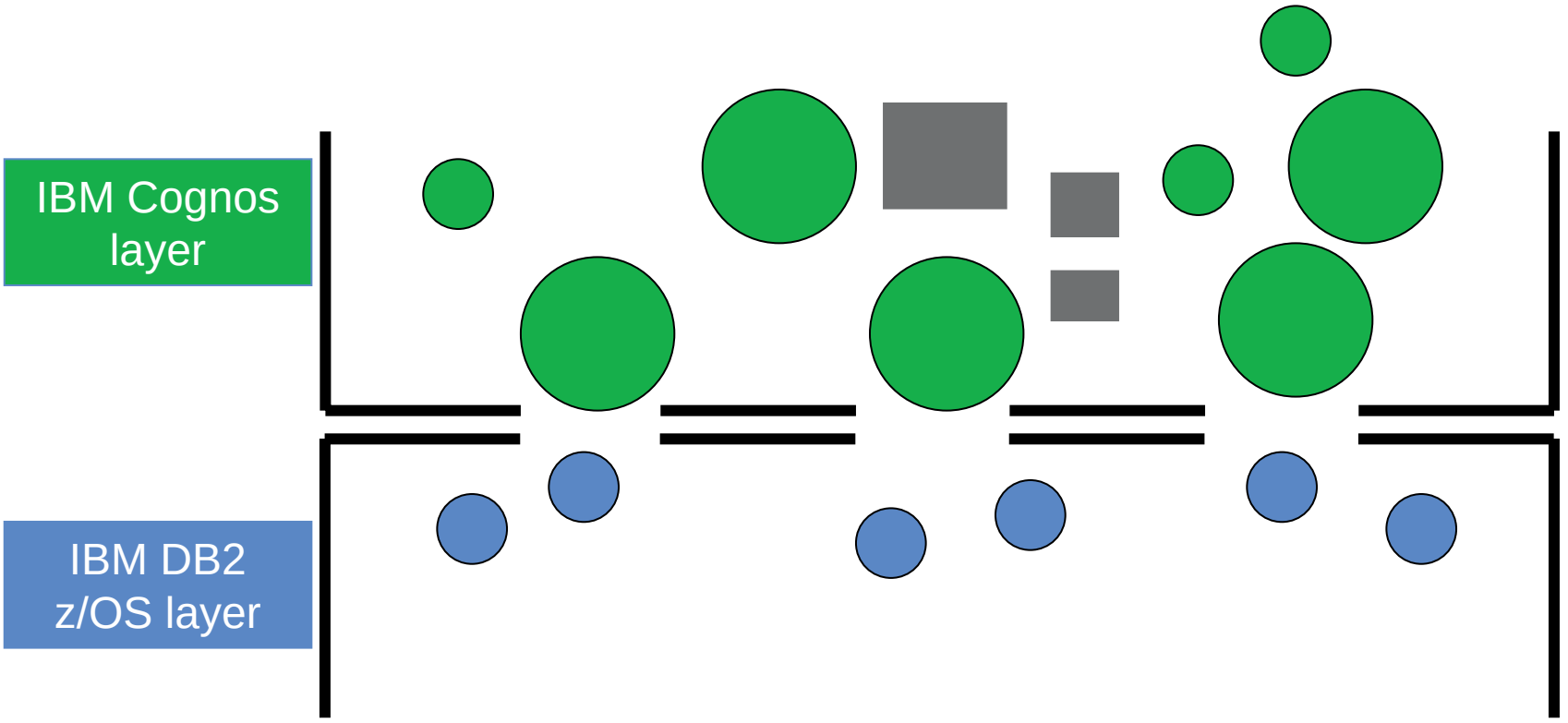
Phase 2A: Simple reports/queries are quickly finished



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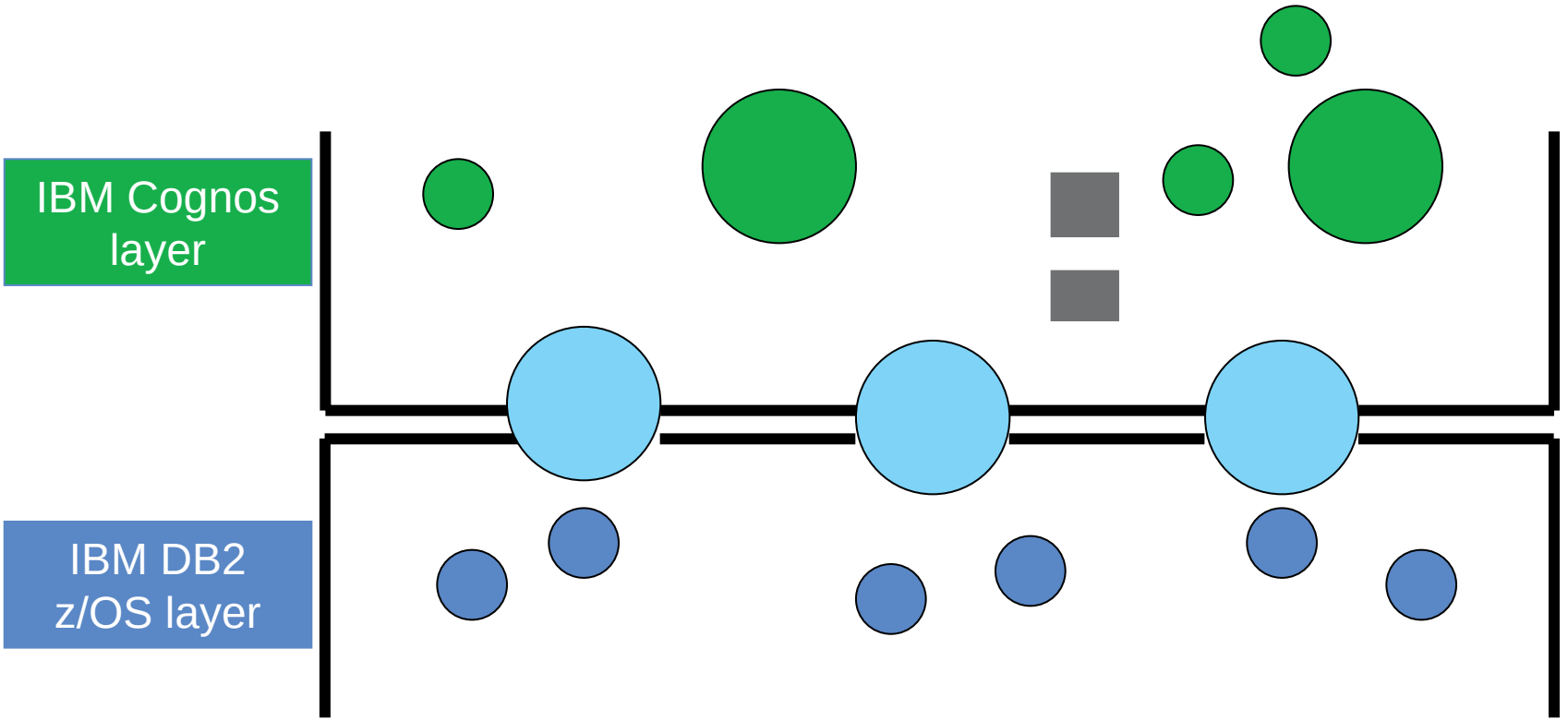
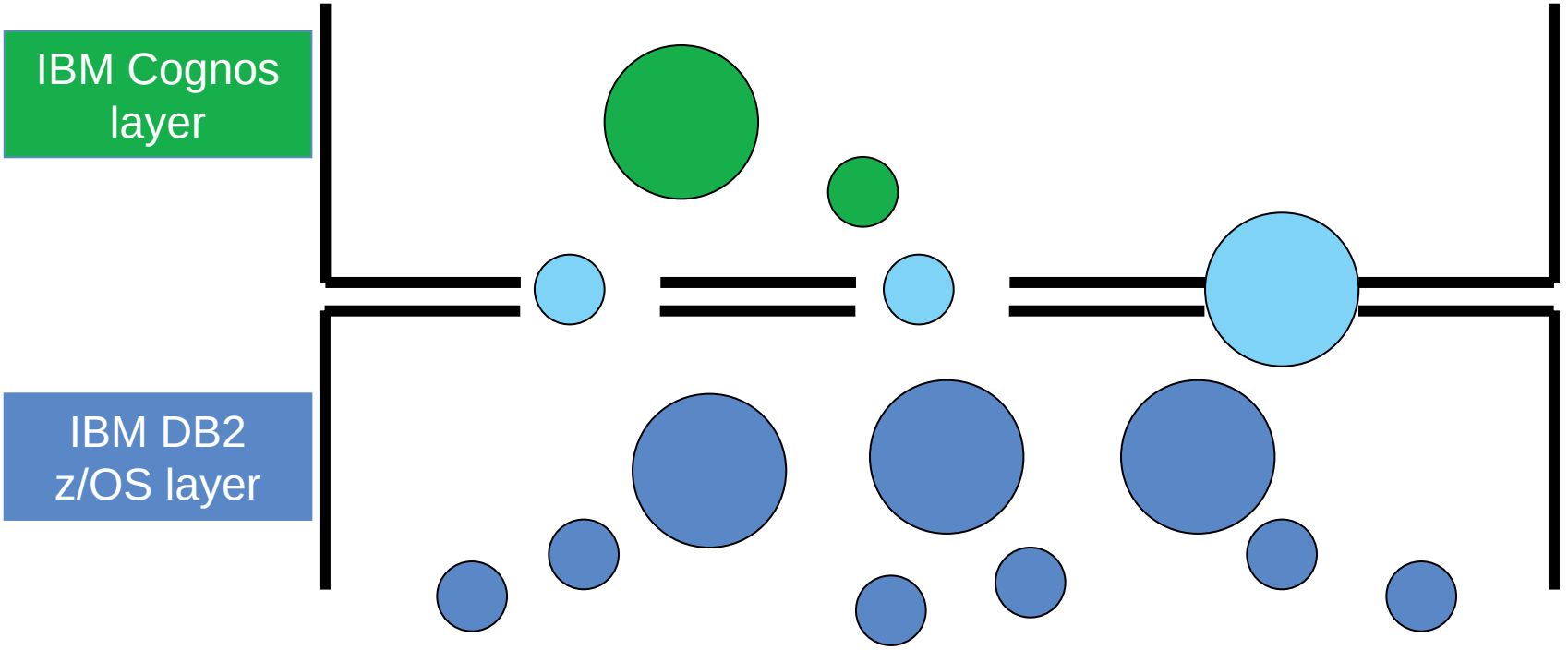
Phase 2B: Complex reports/queries take longer to process → "wait time" in output

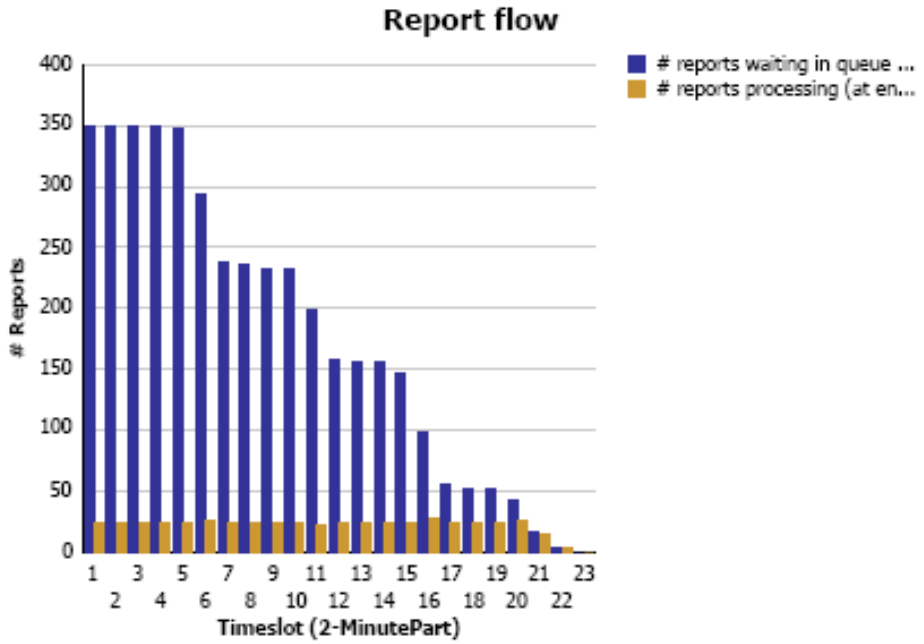


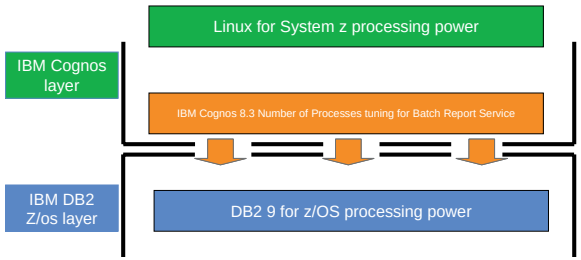
Phase 3: Uniform distribution as easy and complex reports are processed randomly



IBM Cognos 8 BI Report flow for 100 x 1 x 4 test without z/OS WLM Discretionary Service Goal

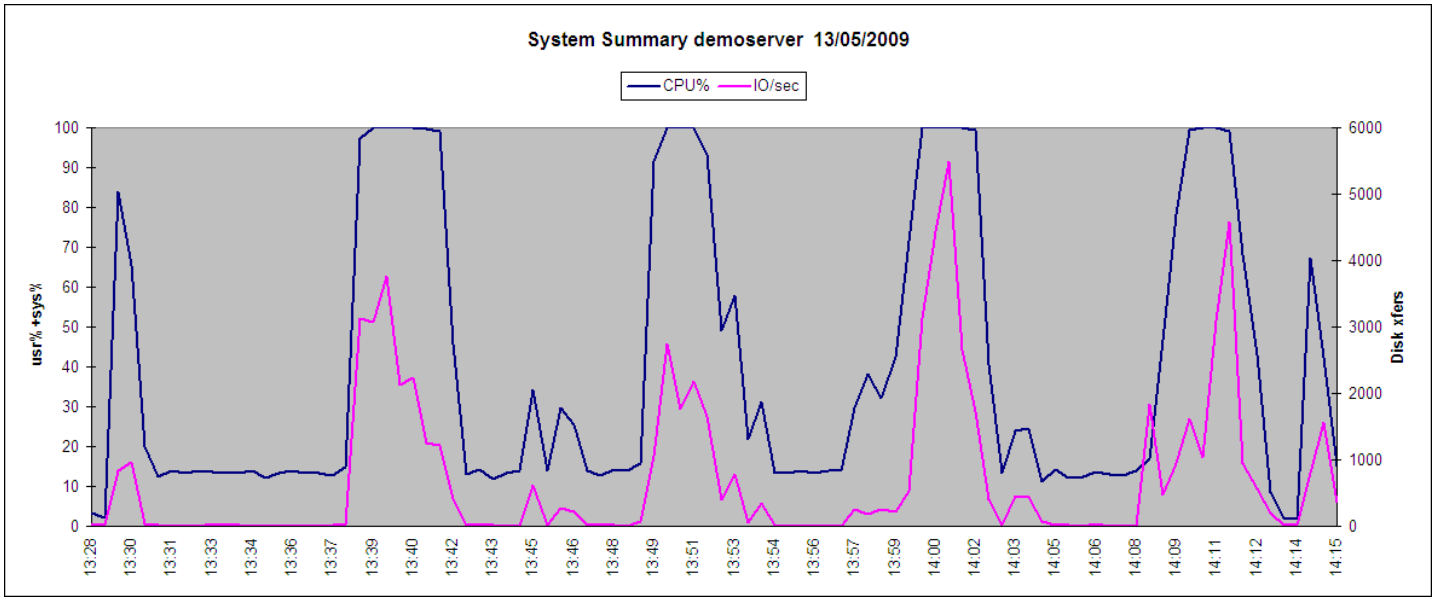
- The IBM Cognos 8 BI batch report service is tuned to allow 6 parallel processes, generating a constant processing flow combined with a steadily decreasing queue of reports that are waiting for a processing slot to become available (in the IBM Cognos 8 BI layer).





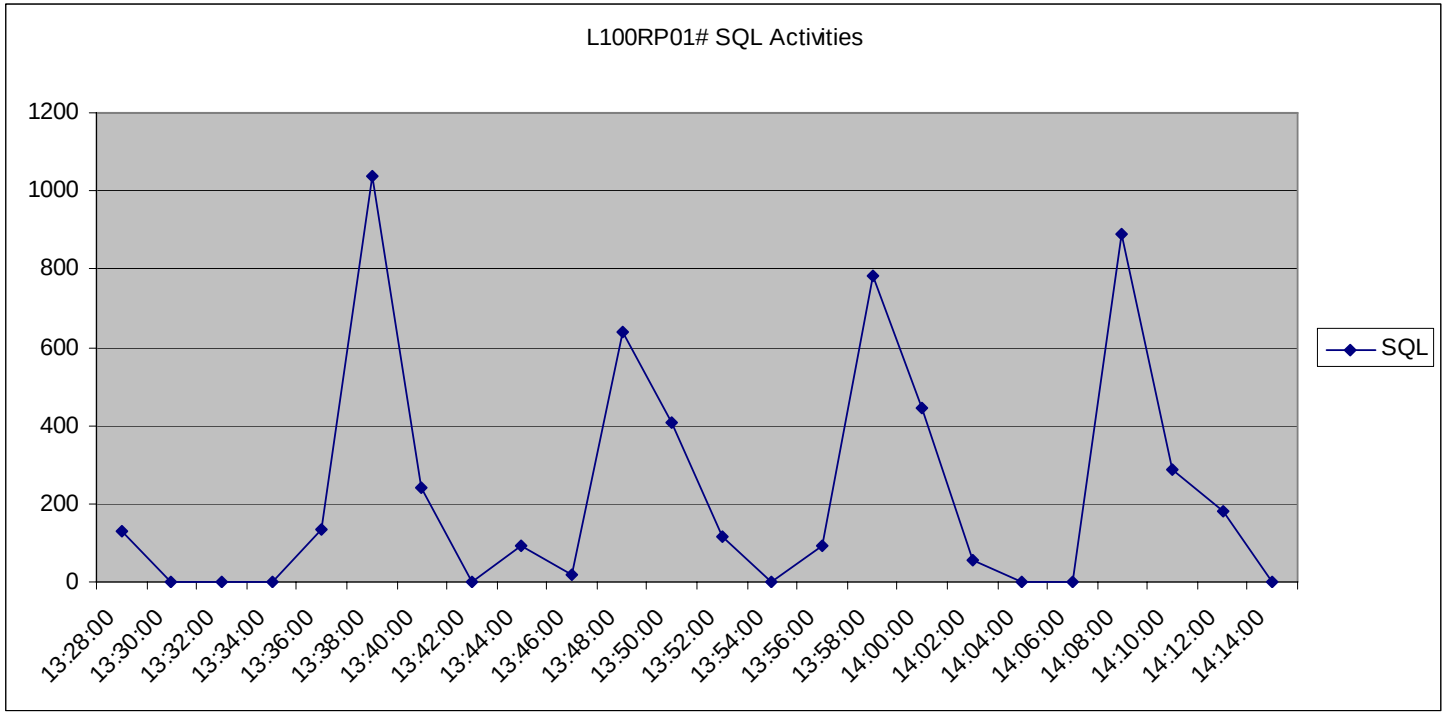
Linux for System z CPU for 100 x 1 x 4 test w/o z/OS WLM Discretionary Service Goal

- At the Linux for System z level, we see peaks of processing and peaks of I/O
- These peaks are caused by the large PDF reports that need to be generated.



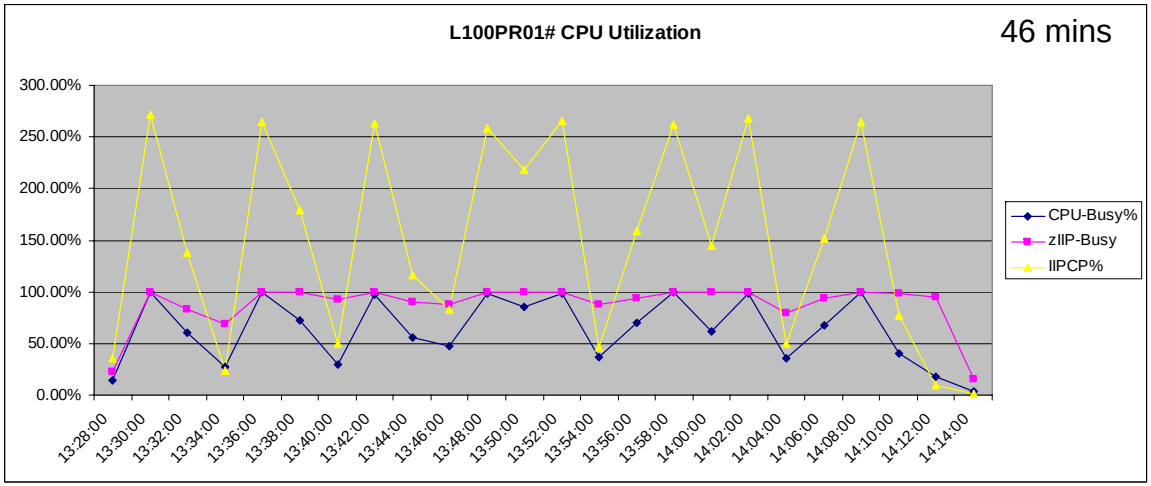
SQL activities for 100 x 1 x 4 test w/o z/OS WLM Discretionary Service Goal

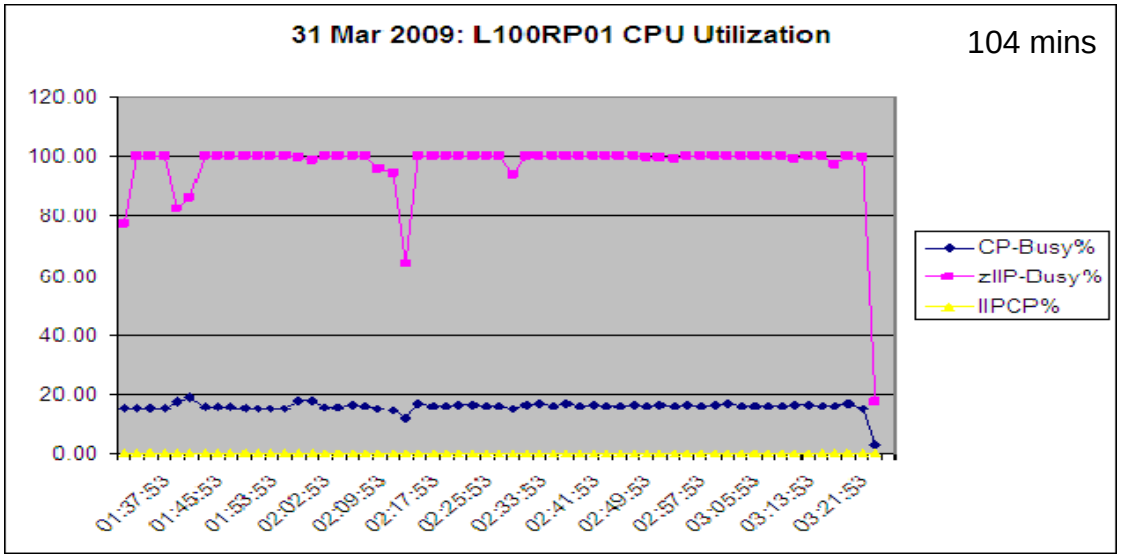
- At the DB2 9 for z/OS level, we also notice an increase in corresponding SQL requests.



DB2 9 for z/OS CPU for 100 x 1 x 4 test comparison

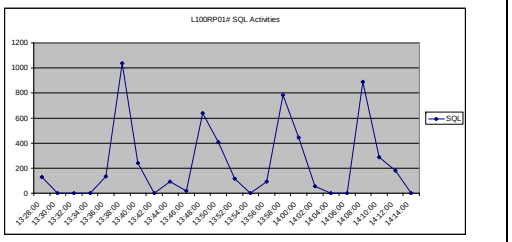
- 6 CPs = 100% blue line
- 1 zIIP = 100% pink line
- IIPCP yellow line
  e g first peak approx. 250% equates to additional 2.5 zIIP capacity
- We notice a big difference in elapse time
- Total CPU time is equivalent in both runs

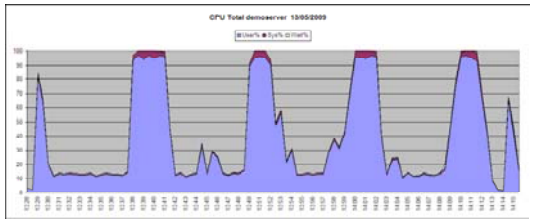


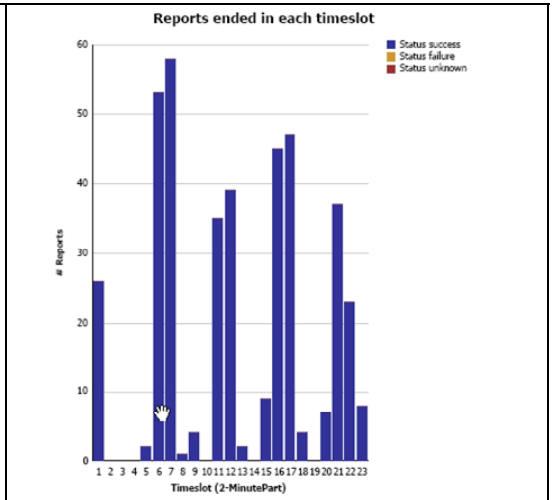


Teamplay of different layers

- We notice how the production of complex reports on complex queries requires coordinated teamplay between the different layers of the architecture.
- Query resolution is followed by PDF generation which in turn results in report delivery to the end-user.







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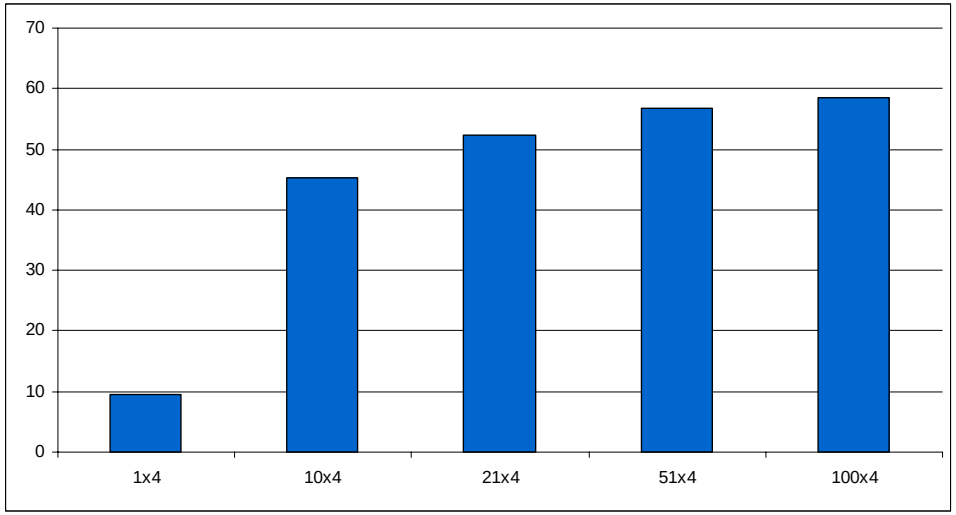
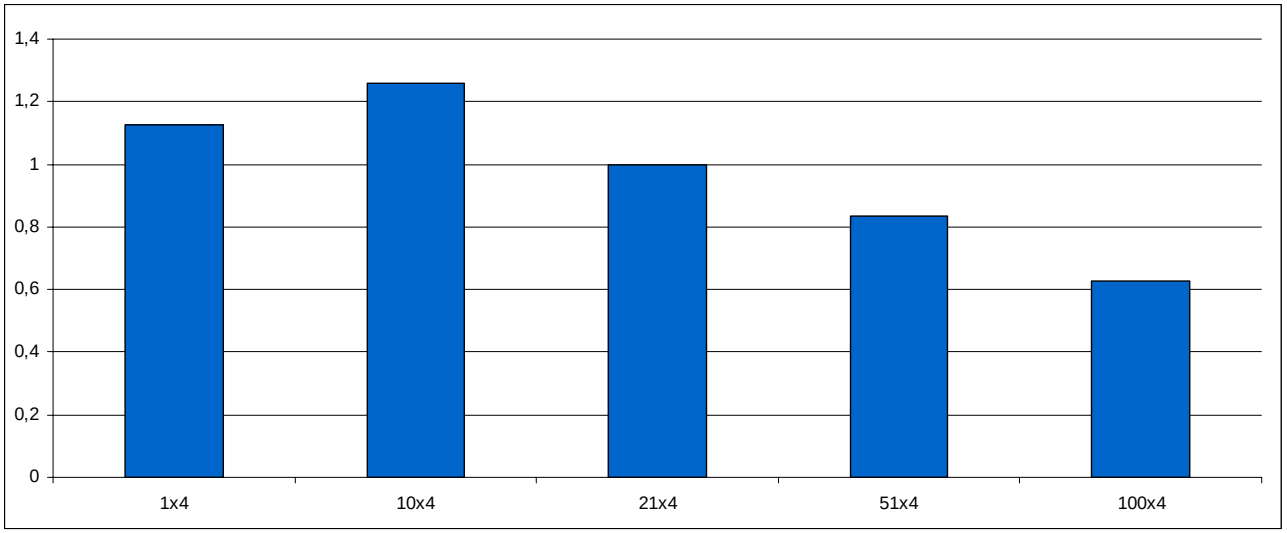
Evolution of Productivity

- As we increase the number of parallel lanes, productivity in terms of pages generated per second increases.
- The degree of the increase (marginal productivity) starts to decrease as one or more components of the architecture reach their maximum level.
- In this case (with z/OS WLM Discretionary Service Goal at the DB2 9 for z/OS), it is the Linux for System z processing that periodically achieves 100% of processing.

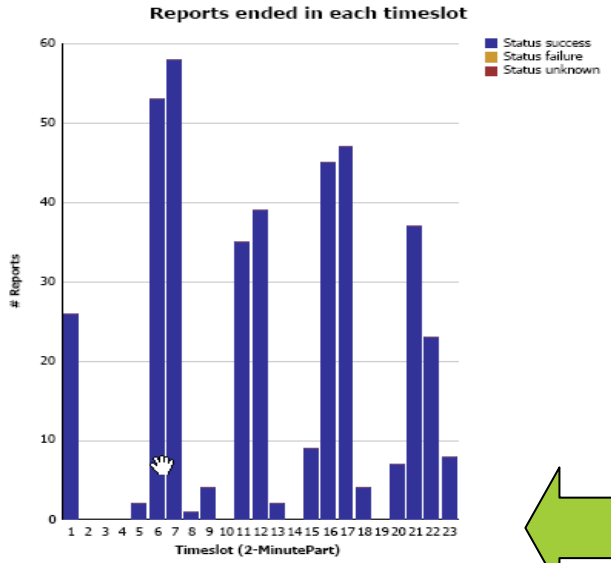
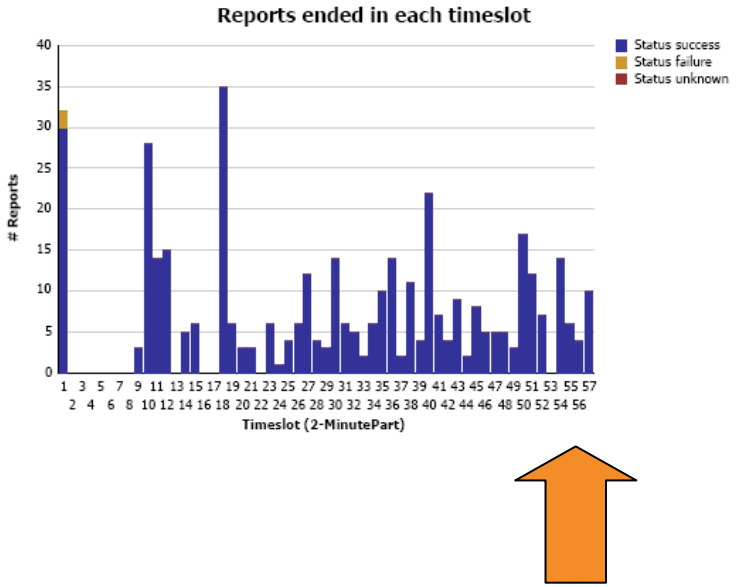


Regularity of Productivity

- As the load on the system increases through a higher degree of parallelism, the degree of variation in report execution times is reduced.
- On a system that is only scarcely loaded, report execution times may go extremely fast (no other processing going on) or slower (accidental overlap with complex other processing). On a heavy loaded system, average times may go up, but the behavior becomes more regular.



Comparison of results with and without z/OS WLM Discretionary Service Goal

Without	With
	

Much shorter total duration

Shorter “silence” in beginning of test

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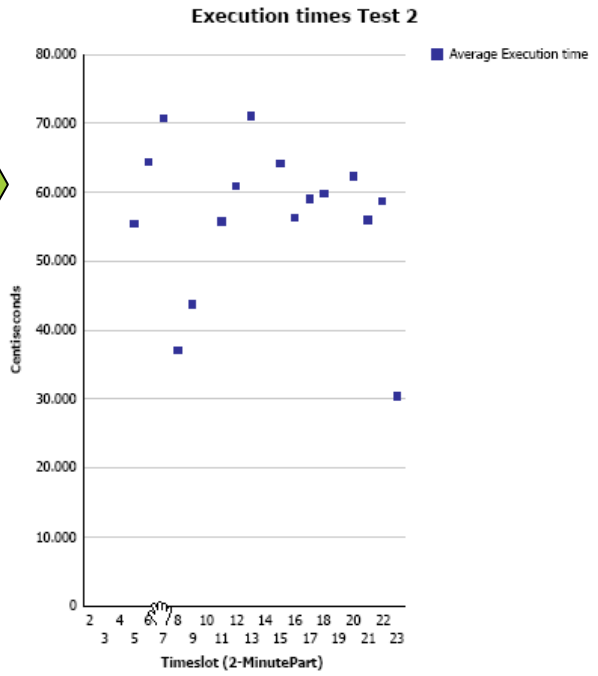
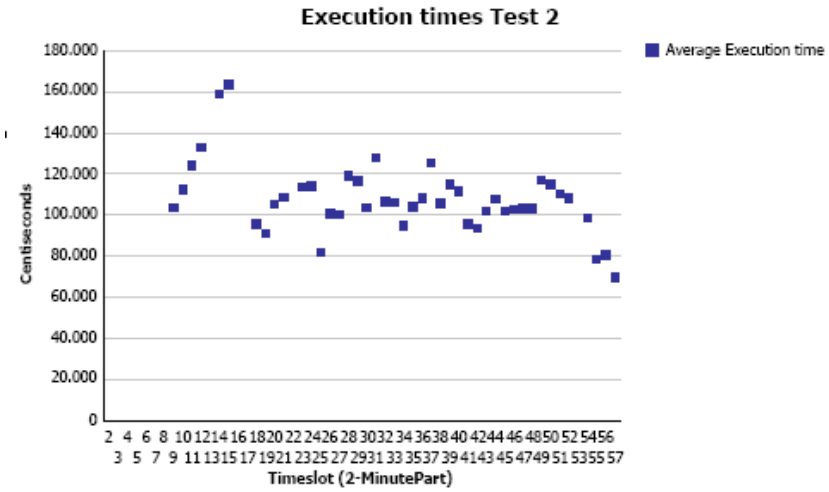
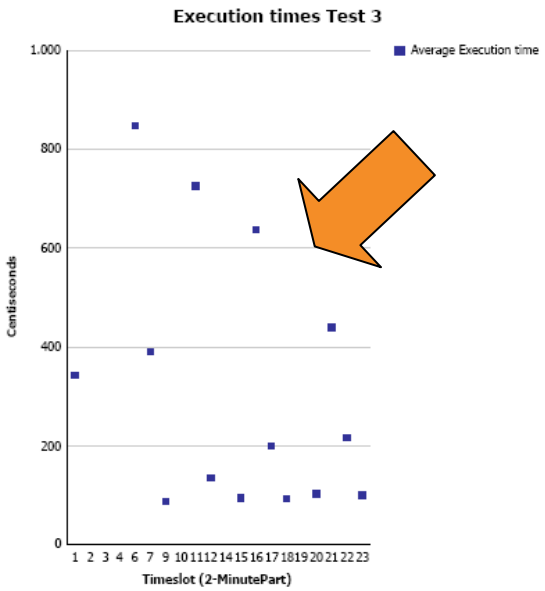
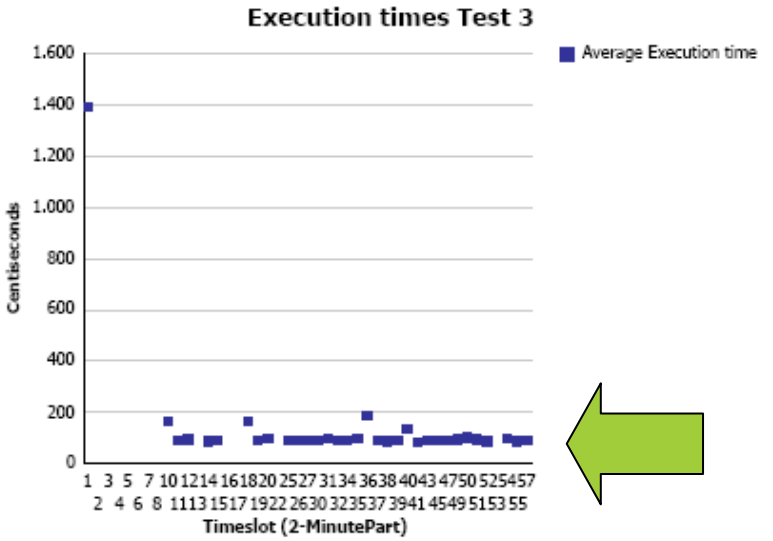
Comparison of query execution time with and without z/OS WLM Discretionary Service Goal

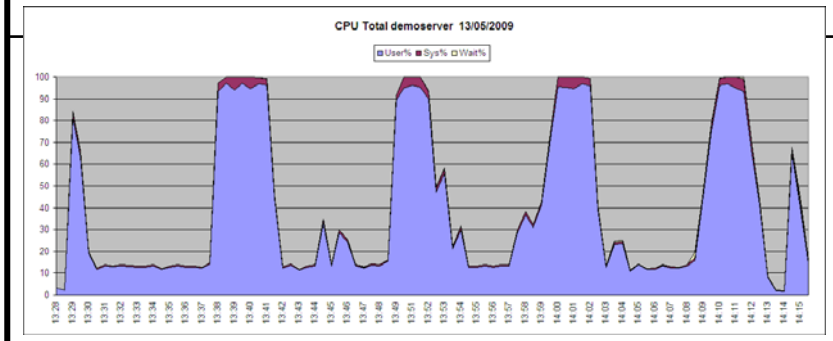
Without	With
	
Significantly shorter query processing times.	

Comparison of effect on OLAP processing with and without z/OS WLM Discretionary Service Goal

Without	With
	
More irregular processing times on OLAP (➔why?).	

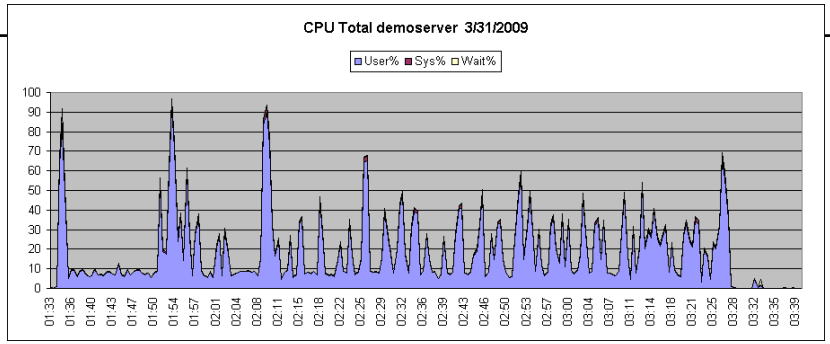
Comparison of Linux for System z CPU with and without z/OS WLM Discretionary Service Goal

Without



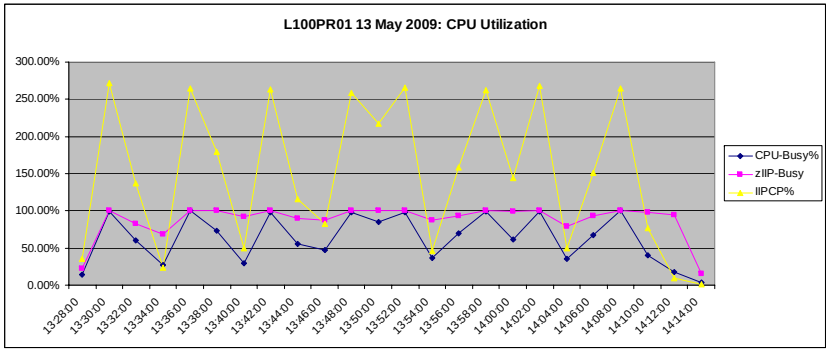
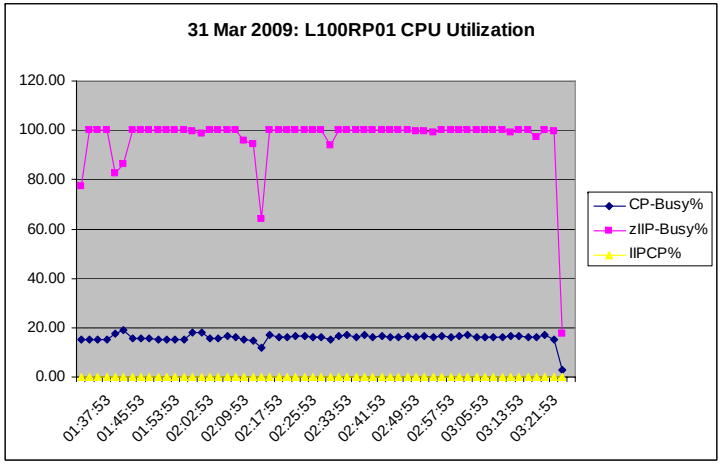
- Higher processing power of DB2 9 for z/OS generates more intensive peak load on Linux for System z.
- If the OLAP processing – which is entirely handled on the Linux for System z – coincides with one of these peaks, then the OLAP processing time will go up.

With

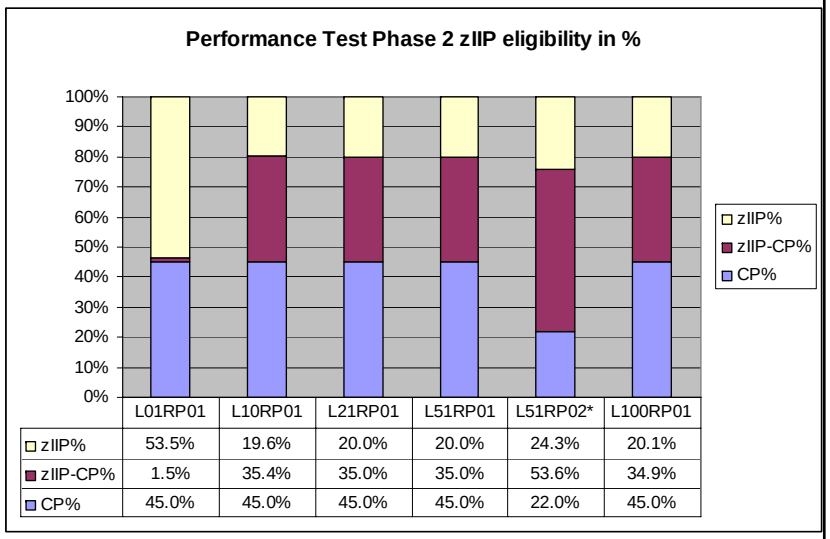
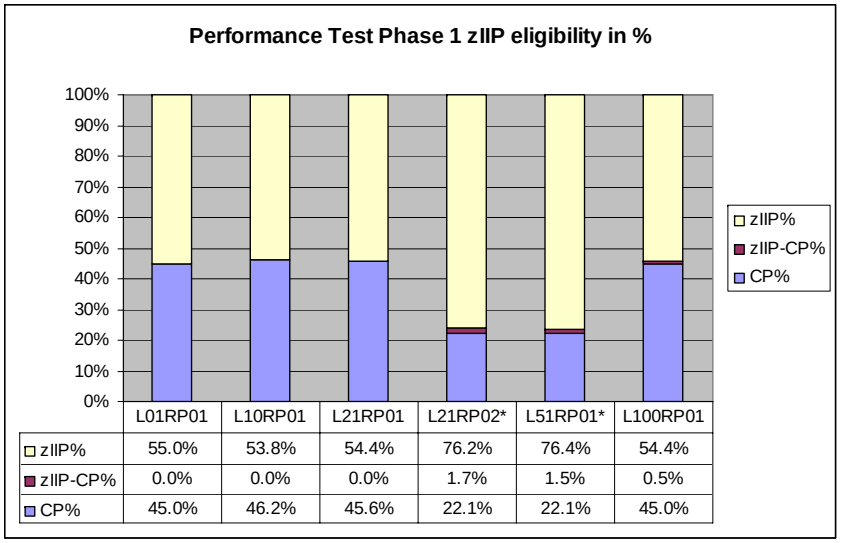


- Lower processing power in DB2 9 for z/OS leads to longer elapse time in querry resolution.
- It translate in a more uniform load distribution on Linux for System z, and no impact on OLAP processing.

Comparison of DB2 CPU with and without z/OS WLM Discretionary Service Goal

Without	With
	

CPU distribution over zIIP / IIPCP / CP

Without	With
	
zIIp-CP processing takes up a substantially larger proportion.	

	L01RP01	L10RP01	L21RP01	L51RP01	L51RP02*	L100RP01
zIIP%	53.5%	19.6%	20.0%	20.0%	24.3%	20.1%
zIIP-CP%	1.5%	35.4%	35.0%	35.0%	53.6%	34.9%
CP%	45.0%	45.0%	45.0%	45.0%	22.0%	45.0%

	L01RP01	L10RP01	L21RP01	L21RP02*	L51RP01*	L100RP01
zIIP%	55.0%	53.8%	54.4%	76.2%	76.4%	54.4%
zIIP-CP%	0.0%	0.0%	0.0%	1.7%	1.5%	0.5%
CP%	45.0%	46.2%	45.6%	22.1%	22.1%	45.0%

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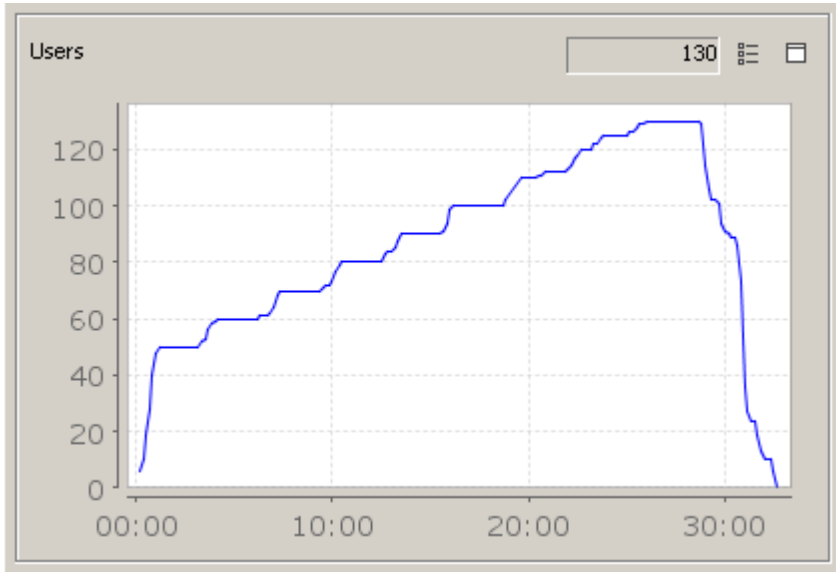
Conclusions on performance tests

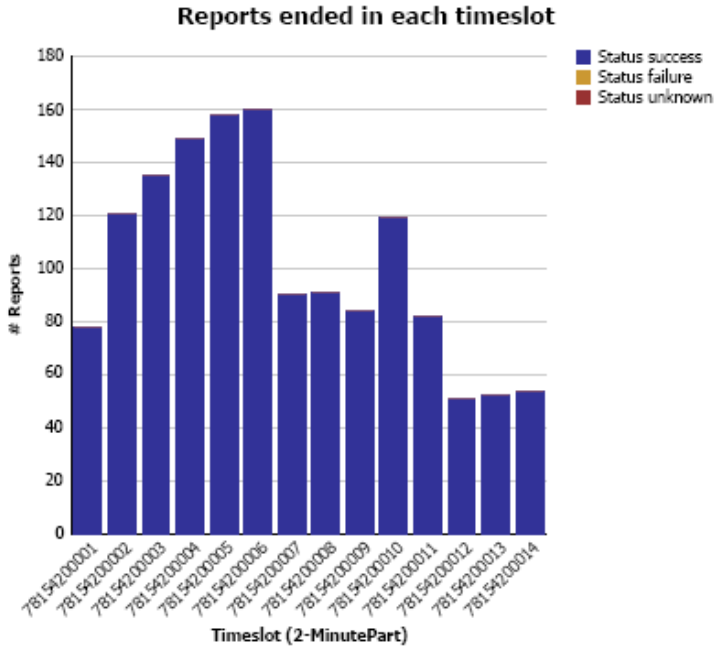
- The platform behaves in a stable and predictable manner.
- System behavior is driven strongly by the report types. Architecture behaves in function of usage.
- A good architecture is “TeamPlay”. The teamplay must be geared to the usage type of the platform.
- All components must be tuned appropriately.
- A multi-tier IBM Cognos 8 BI architecture remains relevant, but System z can significantly reduce TCO.
- A SINGLE 1x4 lane on the Numius customer system took approximately 45 minutes of processing time.

Understanding Scaleability tests

- Our scaleability test is an end-to-end test that aims at mimicing the end-user's experience.
- An end-user will complain that "the system is slow" when he/she experiences a "slow webpage".
- "Slowness" can be caused by:
  - Web-tier cannot handle requests fast enough (least likely cause)
  - Network latency due to saturation or distance (likely on WAN, not likely on LAN) → indirect effect of holding IBM Cognos 8 BI v3 processes for too much time.
  - Application-tier slows down due to processing power limitations, memory limitations or disk I/O queueing (software components must be tuned to match with hardware architecture).
  - Application-tier slows down because database-tier cannot resolve requests fast enough, hence causing a "traffic jam" on the application-tier (likely cause with most drastic effects if database-tier is not adequately tuned or sized or if the datamodel is not well suited).

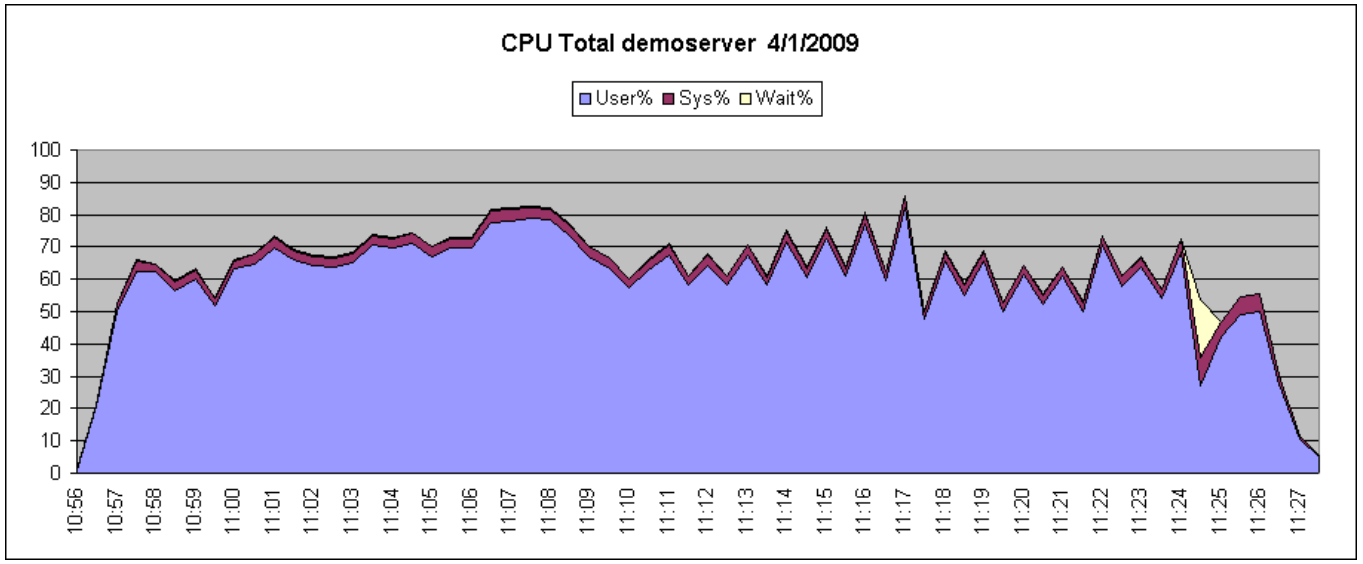
Results of Scaleability Test on a IBM DB2 9 for z/OS RDBMS datasource





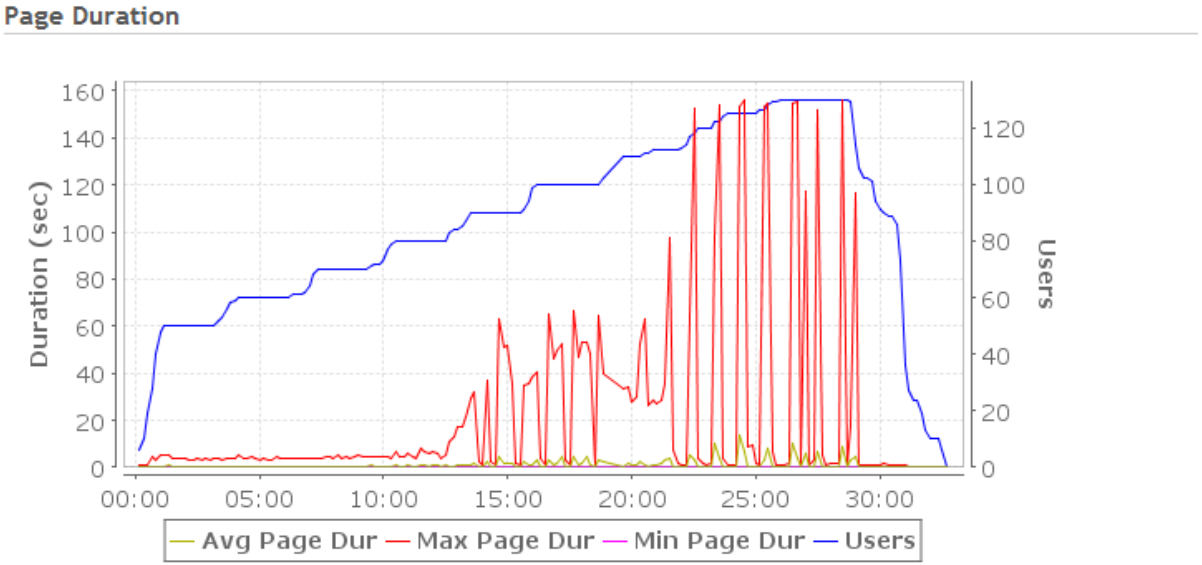
- Virtual users are simulated to “surf” through the IBM Cognos 8 BI portal and to launch a report on an RDBMS datasource.

Results of Scaleability Test on a IBM DB2 9 for z/OS RDBMS datasource



- Linux for System z is charged much more regularly because in this end-to-end test, interactive end-user behavior must be accomodated too by the Linux layer.

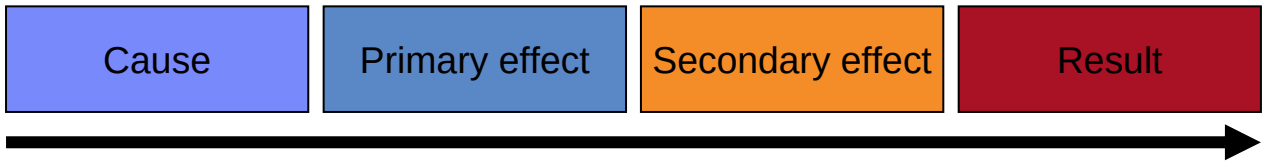
Results of Scaleability Test on an IBM DB2 9 for z/OS RDBMS datasource



- The test ran successfully for the full 130 virtual concurrent users that were included in the test.
- As of 114 users we experience slower “surfing” behavior.
- We learned that this was caused by the fact that we artificially limited each virtual user’s bandwith, thereby unnecessarily “occupying” processing power of the Linux for System z at larger user numbers.
- In real life, this number of virtual users should be multiplied by 10 to 50 to achieve a number of potential “named” users.
- ***On the client’s system, this test could only be run for 8-12 users.***

High-level cause-effect overview*

	End user comfort zone	Cognos app server CPU	Cognos app server memory	Cognos app server I/O	Database server processing	Database server memory	Database server I/O
End user bandwith or latency							
Cognos app server CPU							
Cognos app server memory							
Cognos app server I/O							
Database CPU							
Database server memory							
Database server I/O							



- All components are interrelated but the cause of a “bad” end user experience can trace back as far as the database server’s various capacities.
- * Abstraction was made of the web server tier

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Conclusions from end-user perspective

- Numius, as a representative to the client, can conclude the following:
  - The application was successfully and without loss of functionality ported to the System z platform. This required no redevelopment.
  - The client's application would not require a redesign to accomodate its growth in data volumes or in terms of users.
  - Reports that are not practically useable at client's site now become relevant again. Reports that did not run at client's site now are runable.
  - Client would be able to serve many multiples of current number of users with the very simple architecture from this PoC.
  - Client could scale out to more complex architecture without increased hardware complexity.

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Questions

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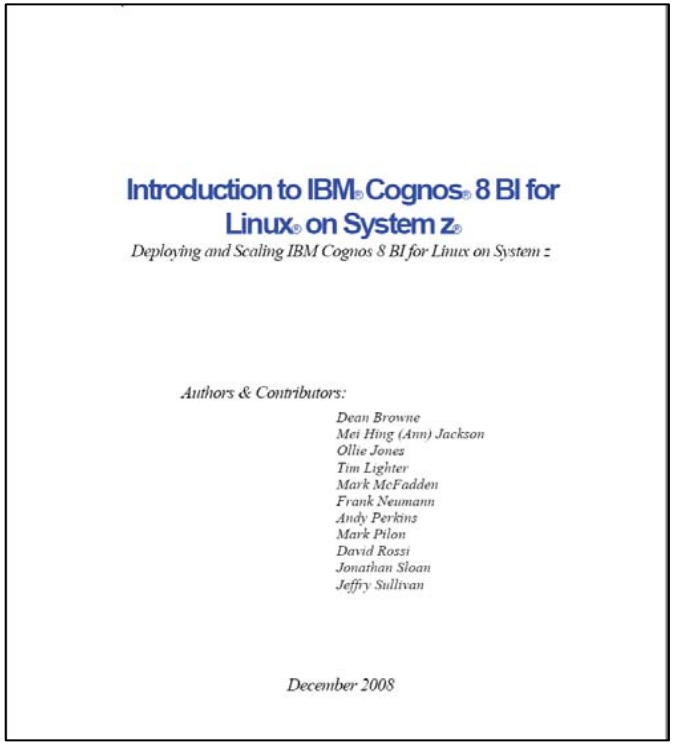
Resources

A Key Resource

- Available to you – an IBM Cognos white paper with IBM Cognos 8 BI v4 accessing a 10 TB z/OS DB2 data source
  - Deploying and Scaling IBM Cognos 8 BI for Linux on System z



Introduction to IBM® Cognos® 8 BI for Linux® on System z®

Deploying and Scaling IBM Cognos 8 BI for Linux on System z

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December 2008

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Additional Information Sources

- **IBM Redbooks**
  - Cognos, Linux and System z Redbooks
  - SG24-7637, Enterprise Data Warehousing with DB2 9 for z/OS
  - SG24-7674, 50 TB Data Warehouse Benchmark on IBM System z