



Create Insight. Transform. **Go Beyond.**

From Planning to Performing: Best Practices Leveraging IBM Informix

Gayathri Magie, Sr. Development Manager, IBM



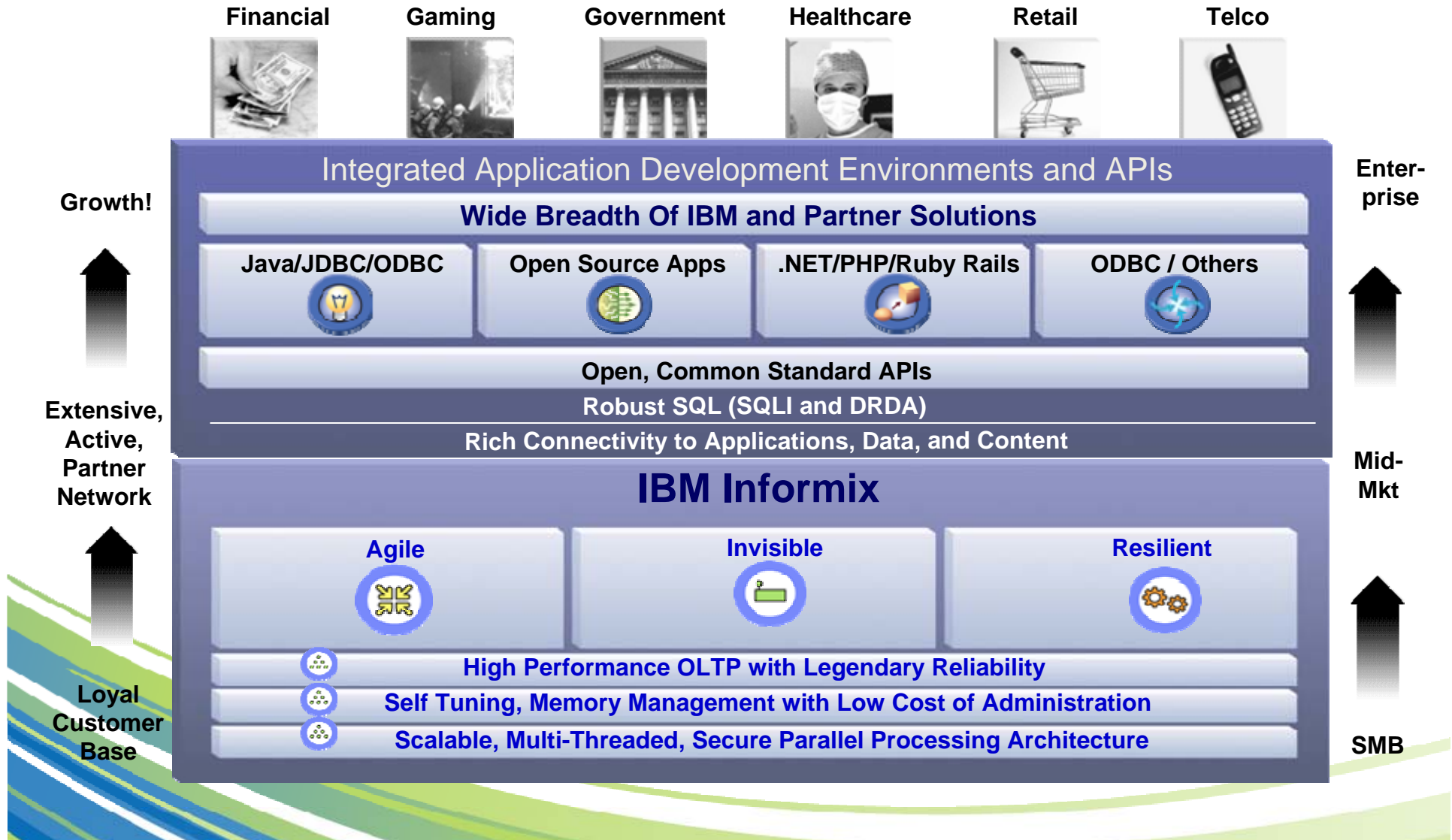
Agenda

- **Informix Overview**
- **Key Informix Features**
 - Performance: Autonomics, Ease of Use, Hands Free
 - Clustering: High Availability, Scalability & Performance
 - Warehouse and Compression: BI, Low Cost and Performance
 - Security: Safety
- **NDB Implementation**
- **Call for action**



IBM Informix

A Strategic Data Server in the Information Management Portfolio



Top Reasons to Upgrade from Informix 7 To Informix 11

Grow your business, reduce costs

- **PERFORMANCE and SCALABILITY** (faster transactions means more business)

- Non-blocking checkpoints
- Workload distribution using secondary servers
- Optimistic Concurrency
- Large Chunks and Configurable Page Size

***Achieve up to 25-40%
performance gains***

- **AVAILABILITY** (Today, downtime means lost business)

- Shared or Replicated storage
- Local or Remote servers
- Faster Recovery with server managed Recovery Time Objective

***Achieve 99.999%
Availability***

- **BUSINESS ANALYSIS and COMPRESSION**

- Compression across all rows
- Improved I/O Performance
- Improved Memory Utilization

***Up to 70-80% of data
compression,
Performance speed up***

- **SECURITY** (Stay compliant; Keep your customer's data safe)

- Column Level Encryption
- Label-Based Access Control
- Encrypted Communications

***Achieve Compliance and
prevent Denial Of
Service (DOS) attacks***

Informix 11 is the most cost effective OLTP data server on the market, the quickest to deploy, with the lowest cost of administration.

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Self Configuring – Auto Parameters

Non Blocking Checkpoints:

- No transaction blocking during the flush of the bufferpools
- Non-blocking checkpoints are triggered by...
 - Physical log 75% full
 - Logical log full
 - CKPTINTVL
 - Initial boot checkpoint
 - A few other miscellaneous cases
- All others are transaction blocking, like...
 - Adding a DBSpace
 - Doing a database backup

When will non-blocking checkpoints block?

During checkpoint processing (disk flush), transactions will continue to consume physical and logical log resources

Transactions will block to

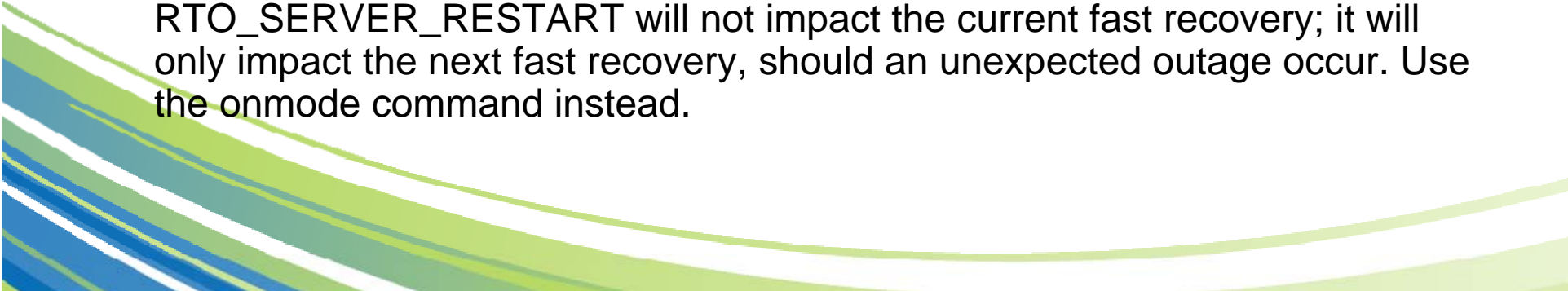
- Avoid physical log overflow
- Avoid logical log overlap

To avoid transaction blocking...

- Increase the resource (physical or logical log) to allow more time to flush the bufferpool
- Turn on automatic checkpoints (AUTO_CKPTS)
- Make LRU flushing more aggressive (AUTO_LRU_TUNING)
- Increase I/O performance
 - More AIO VPs and page cleaner threads (AUTO_AIOVPS)
 - Improve performance of I/O subsystem




Self Configuring – Recovery Time Objective

- **RTO_SERVER_RESTART – Recovery Time Objective Server Restart**
 - This configuration parameter allows the DBA to specify a target amount of time, in seconds, that Informix can utilize during fast recovery to bring the server back online after an unexpected outage.
 - When the RTO_SERVER_RESTART configuration parameter is defined, Informix will control the frequency of checkpoints, including automatically adjusting for variable workloads, to make sure Informix can meet the target fast recovery time.
 - The RTO_SERVER_RESTART and CKPTINTVL configuration parameters are mutually exclusive; only one of these parameters can be active at a time. If the server is configured with RTO_SERVER_RESTART, CKPTINTVL is ignored.
 - To be effective, the RTO_SERVER_RESTART configuration parameter must be turned on prior to Informix instantiation. Turning on RTO_SERVER_RESTART will not impact the current fast recovery; it will only impact the next fast recovery, should an unexpected outage occur. Use the onmode command instead.
- 

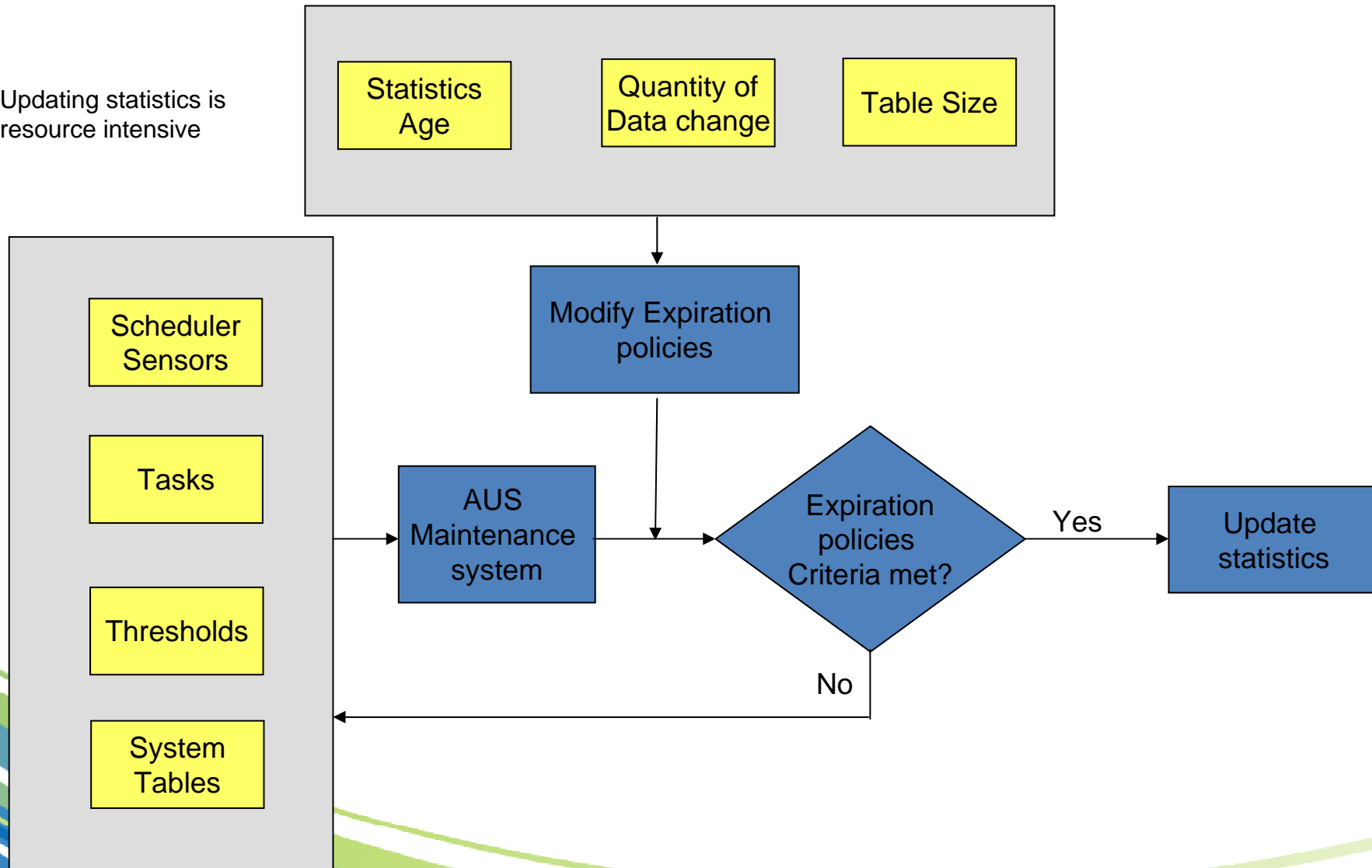


Configurable Page Size

- It is possible to create DBspaces with page sizes of up to 16KB in size.
 - The page sizes available has to be a multiple of the basic page size: 2KB or 4KB.
 - These larger pages can provide better performance when you have a wide table where the row size could be, let say 12KB. This way, you can fit an entire row in a page instead of using page chaining to support these larger rows. The savings in I/O could make a noticeable difference in performance in many situations.
- 

Self Optimizing – Auto Update Statistics

Updating statistics is resource intensive



Customer quotes on Informix autonomic features

- "...We must strive to provide exceptional uninterrupted services while keeping costs down. The new high availability features of Informix 11.5 will enable us to maintain a fault-tolerant environment that leverages resources that otherwise would be utilized only as standby HW." - *Henri Cujass, Senior Consultant, leolo IT & Media Consulting GmbH*
- "We hardly ever use DBA time. The database simply keeps running." - *Nils Myklebust, Milanex*
- "Been extremely reliable and low maintenance" - *Brian Grellinger, Doosan Group*
- "Its dynamic performance, low cost and outstanding availability"- *F.R. Campagnoni, CEO MediaSpan*
- "In our benchmarking process, Informix came out above all other leading solutions for its performance, scalability and reliability." - *Jon Tasker - Project Manager, Trafficmaster, UK*
- "(Informix) provides companies with a powerful, scalable and easy-to-integrate data server for their business applications—one that does not require full-time monitoring. This is critical in helping organizations reduce the time and cost of both launching and managing new services." —*Rob Prop, Manager Professional Services, Informa*
- "New features... will free up the Informix database administrator and justifies the new Informix slogan "Administration Free Zone". - *Wolfgang Kraus, Bytec GmbH, Head of IT-Services*
- "New automated features in Informix... will help the software automatically adapt to workloads, helping further increase DBA productivity and reducing the total cost of administration by 30 percent." —*Rob Prop, Manager Professional Services, Informa*

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✔ Informix Overview

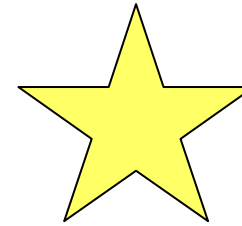
• Key Informix Features

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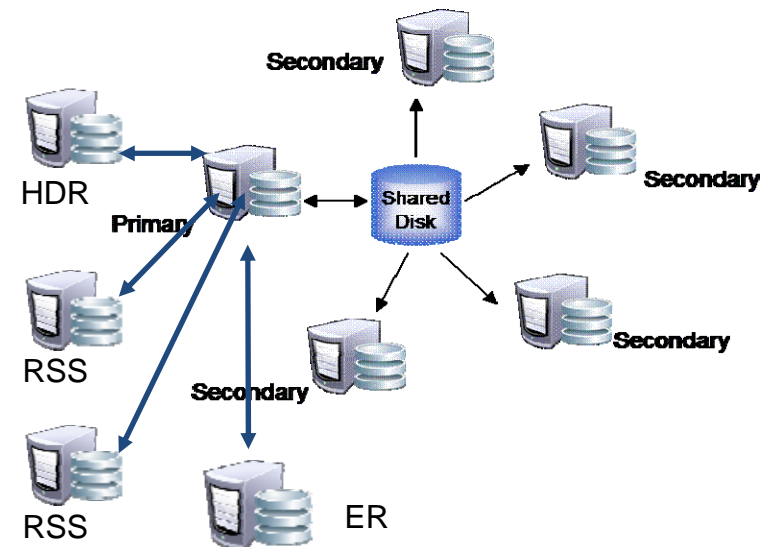
Scale Out on Your Own Terms

- **Active-active shared-disk cluster**
 - Use commodity hardware
 - No specialized hardware required
 - Save on storage and scale out
 - Add servers on demand for peak periods
 - No application changes required
- **Put the data and its processing where they belong**
 - Better responsiveness for regional offices
 - Higher performance on same hardware, reduced bottleneck



Unparallel Flexibility

- Scale Up or Scale Out
- Change dynamically
- Shared disk or remote replicas

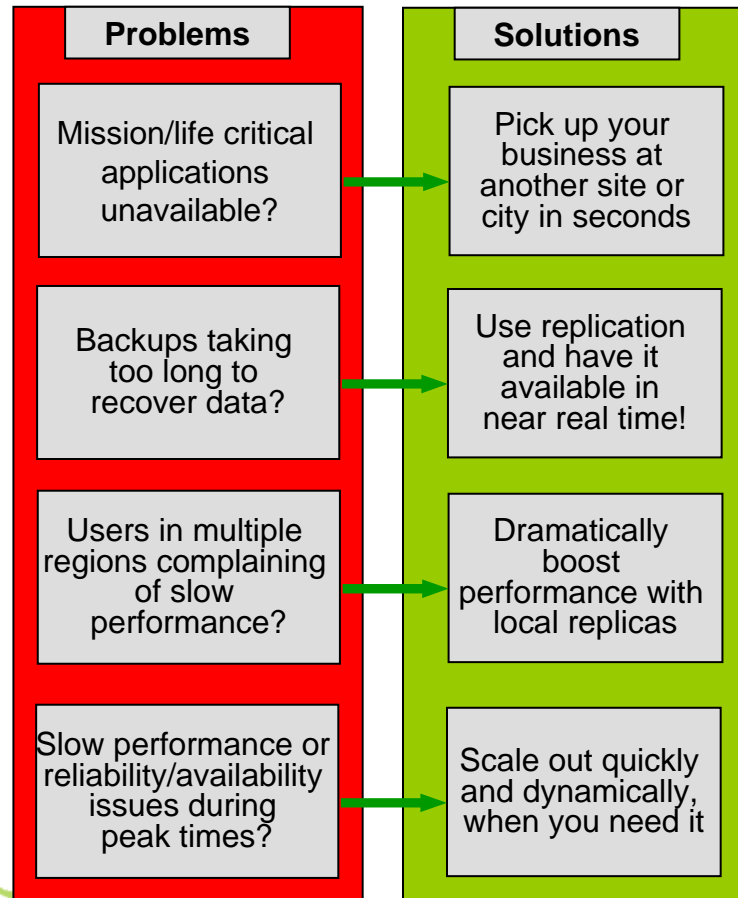


“In our benchmarking process, Informix came out above all other leading solutions for its performance, scalability and reliability.”

- Jon Tasker - Project Manager, Trafficmaster, UK



Does your Business Need Continuous Availability?



How much does 1 hour of downtime cost your

Time Is Money	Application Segment	Average Cost of Downtime/Hour
	Shipping - Distribution	\$28,000 per hour
	Tele-Ticket Sales	\$69,000 per hour
	Airline Reservations	\$89,000 per hour
	Home Shopping	\$113,000 per hour
	Pay Per View - Television	\$150,000 per hour
	Credit Card Sales	\$2,650,000 per hour
	Financial Market	\$6,450,000 per hour

Source: Giga Group

\$6,450,000/hour is \$107,500/minute!

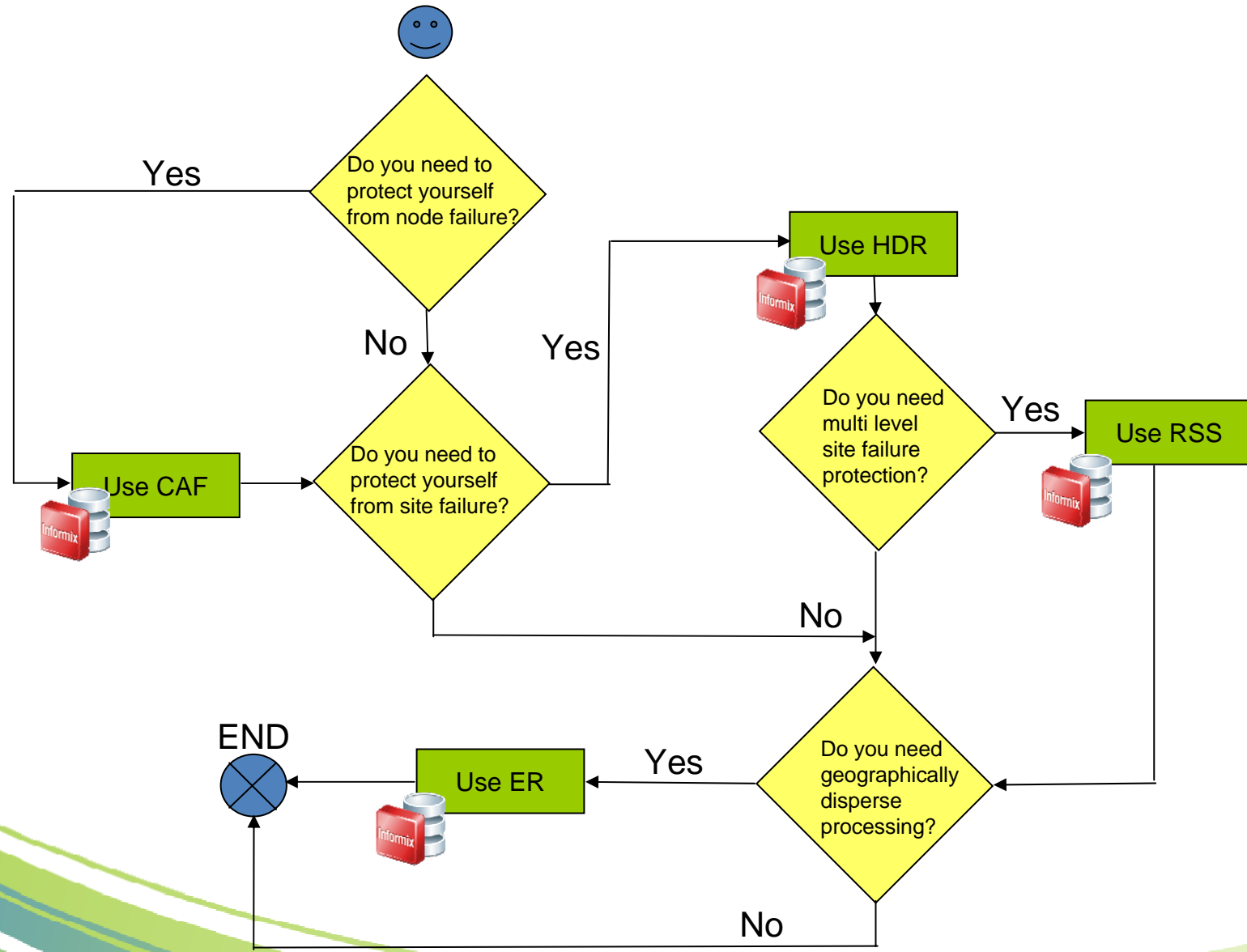
Business needs:

- 24 x 7 x 365 Availability
- The same data for different workloads
 - ex: peak, normal, and sporadic with intermittent network access
- Geographically dispersed data



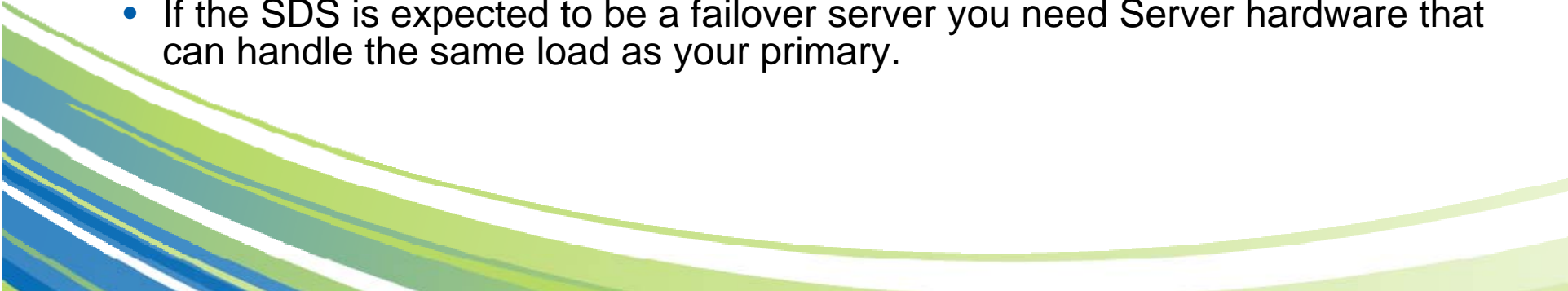
"Its dynamic performance, low cost and outstanding availability"
 - F.R. Campagnoni, CEO MediaSpan

CAF Decision



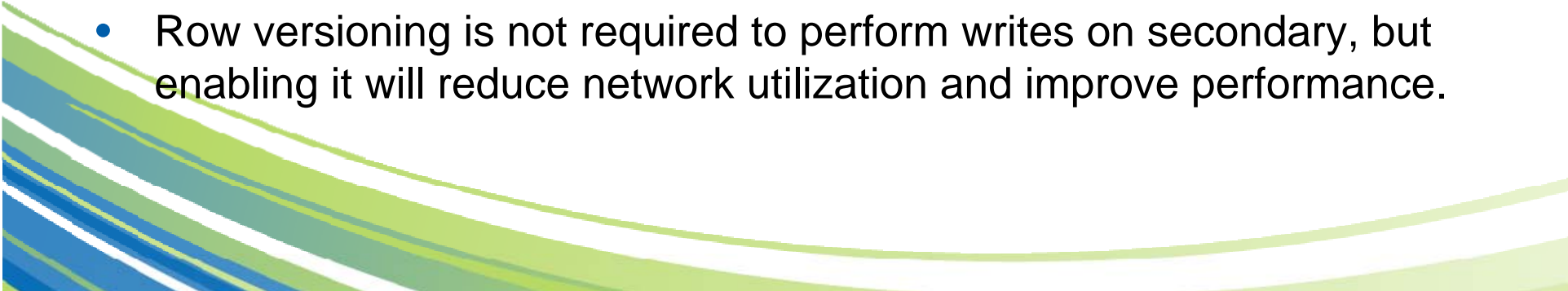


Basic Server Hardware and OS Requirements

- The primary and secondary servers must be able to run the same Dynamic Server executable image, even if they do not have identical hardware.
 - The hardware that runs the primary and secondary database servers must support network capabilities.
 - The amount of disk space allocated to dbspaces for the primary and secondary database servers must be equal. The type of disk space is irrelevant; you can use any mixture of raw or cooked spaces on the two database servers.
 - The chunks on each computer must have the same path names. Symbolic links are allowed for UNIX® platforms, but not for Windows® platforms.
 - If the SDS is expected to be a failover server you need Server hardware that can handle the same load as your primary.
- 



Optimistic Concurrency and Row Versioning

- Basically an update is allowed to proceed if the row about to be updated has not been updated by some other activity.
 - Uses either a comparison of the before image of the row or some form of row versioning
 - If it is determined that the before image on the secondary is different than the current image on the primary, then the write operation is not allowed and an EVERCONFLICT (-7350) error is returned.
 - If the table is created with Column Versions, then only they are compared.
 - If the table does not have Column Versions, then the entire before image of the row from the secondary is compared with the primary.
 - Row versioning is not required to perform writes on secondary, but enabling it will reduce network utilization and improve performance.
- 

CAF Best Practices

Use a low value for DRINTERVAL

- There is no need to 'hold' a log buffer for an extended period of time, especially if using RSS or ER with HDR

If using SDS, include the SDS onconfig parameters on the primary as well so that the old primary can come up as a secondary.

- SDS_TEMPDBS
- SDS_PAGING

Recovery Threads

- **Pay Attention to the Recovery Threads** OFF_RECVRY_THREADS
 - Applies log records on the secondary
- **Ways to avoid recovery thread imbalances & potential bottlenecks**
 - Do not underutilize resources on secondary, causing a backflow & impacting performance on primary
 - Make OFF_RECVRY_THREADS at least 3 times the number of CPUVPS
 - Don't be skimpy or performance will suffer
 - Monitor onstat –g cpu to check if one of the recovery threads is doing the bulk of the work
- **Use round-robin fragmentation on most active tables and indexes**
 - Helps balance workload
 - **Fragment indexes which are frequently updated**
- **Do not put an index in the same partition as the table**
 - Helps balance workload




ER Best Practices

Use smaller transactions

- Parallelism is significantly improved by using many smaller transactions than a single larger one

DDRBLOCK –

- If the database server comes close to overwriting a logical log that ER has not yet processed, ER enters DDRBLOCK mode.
 - In DDRBLOCK mode, user transactions are blocked
 - Don't be stingy with logical logs
 - Minimum log wrap about once every 4 hours
 - Consider using CDR_MAX_DYNAMIC_LOGS
 - This will cause ER to dynamically create a new log file rather than enter a DDRBLOCK
 - To minimize DDRBLOCK risk, set LTXHWM and LTXEHWM down
 - LTXHWM 50
 - LTXEHWM 70
- 



Connection Manager Best Practices

Use the Connection Manager for failover arbitration instead of DRAUTO 1,2 with HDR

Use Multiple Connection Managers

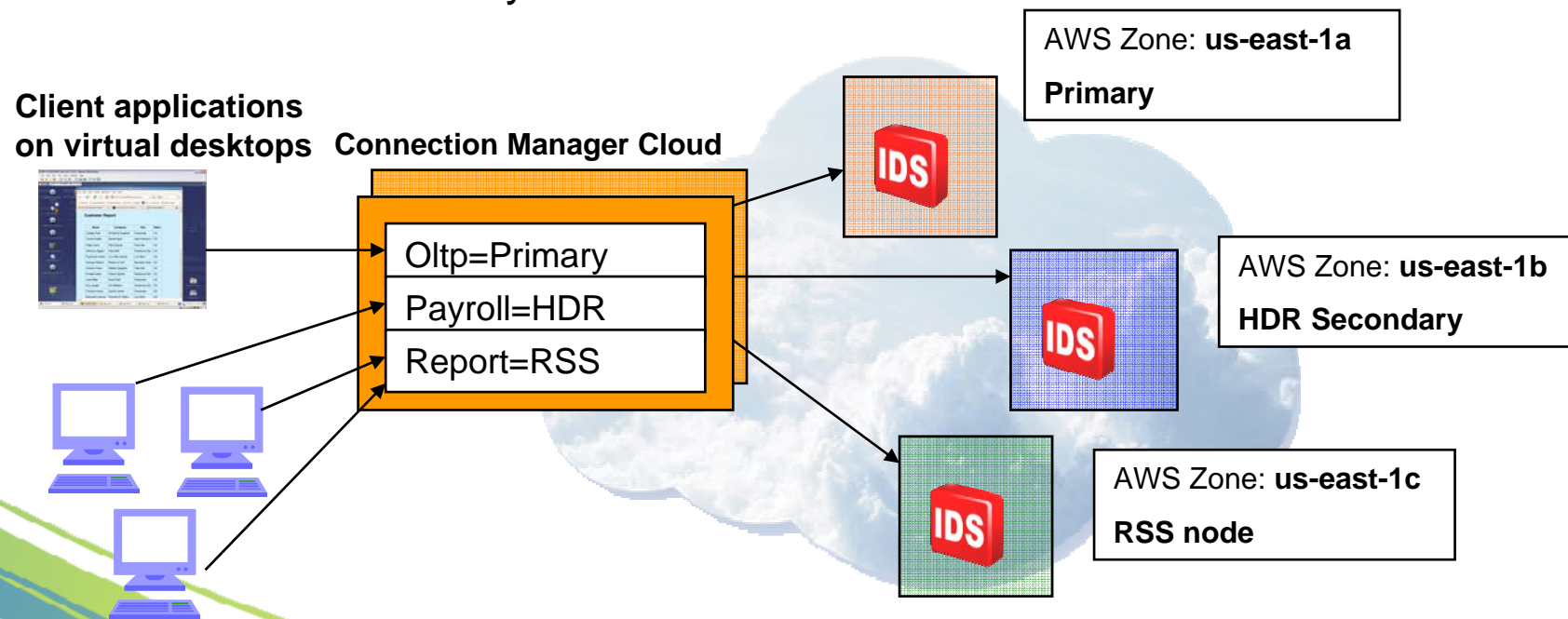
Do not have the Connection Manager use the same network path as the Database

Try to have the Connection Manager on a different machine than the database



Informix Cluster Across Availability Zones

- Integrate Informix HA solutions with Cloud HA features (like availability zones)
 - provides a management structure to make it easier to leverage the resiliency cloud computing infrastructures can provide
 - A client application connects to Informix Connection Manager, which maintains a continuous connection to Informix Servers in different Amazon Availability Zones



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Informix Warehouse Business Intelligence



“Learn to make informed decisions in a downturned economy”

Run your OLTP and BI applications on the same server or create a separate warehouse

✓ 40% of clients also use Informix for warehousing, leveraging its ease of use, reliability and availability

✓ Now customers can use tools optimized to work with the Informix warehouse



*The current economic crisis shows the importance of trust and transparency in the information that organizations use to run their business and **Integrate the analytical insights derived from this information into the decision-making processes throughout the company.***

- Gartner Predicts 2009 Business Intelligence and Performance Management will Deliver Greater Business Value

External Tables

External Tables

- table where the data is external to the database server
- To load/unload massive data sets with highest performance & flexibility

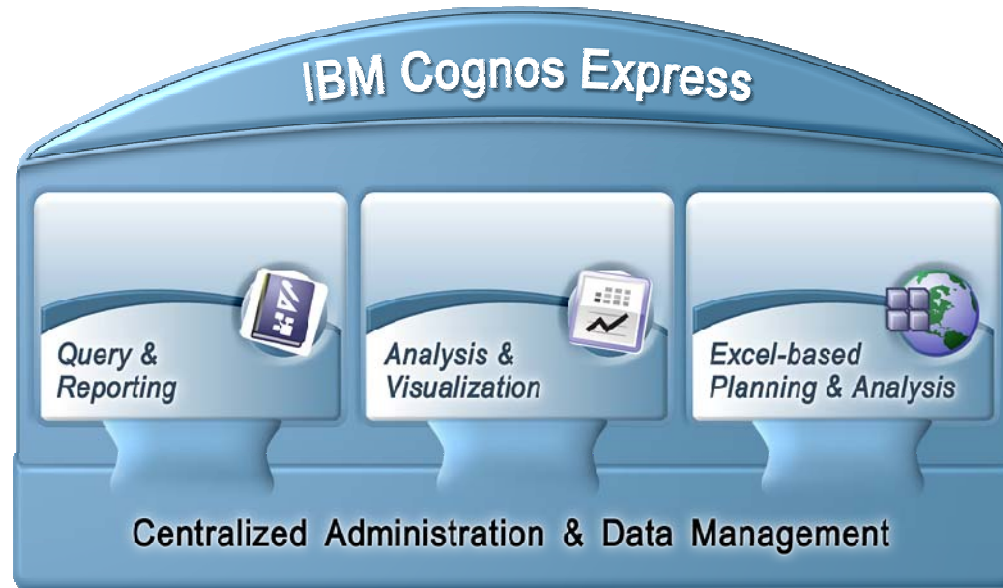
Best Practices

- Unload the data on a secondary server, preferably a read-only secondary
- Load the data on primary during non-peak hours
- Use the SAMEAS clause in schema creation scripts
- Have an explicit delimiter and escape options
- Define external table with multiple files instead of one huge single file; when executing load or select operation with PDQ priority set, Informix exploits the parallelism
- While loading, if the target base table is fragmented, the load happens in parallel under the PDQ environment
- Pipes in external tables can be used to transfer data between two instances and save on the disk space

Load operations reduced by over 50% using External Tables features

- John Magie, DBA, USDA

Introducing IBM Cognos Express



I would like to see Informix become the "no-brainer" decision for *any* IBM product team that needs embedded relational storage.

- Joseph L. Pusztai
Program Director, IBM Cognos Mid-Market Products

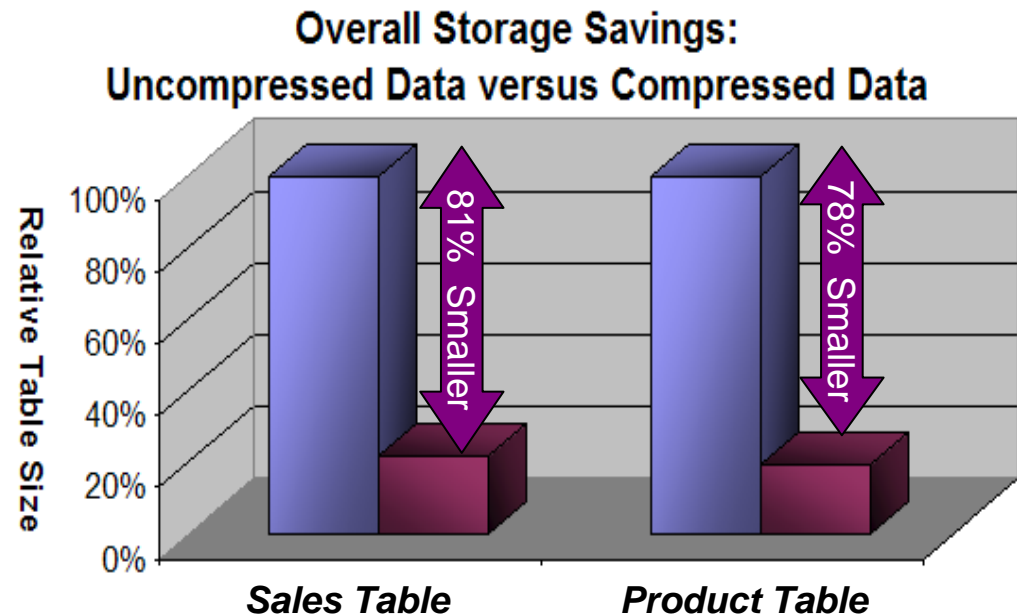
The *only* integrated Reporting, Analysis and Planning solution purpose built and priced for midsize companies

- IBM Cognos Express is built for midsize companies (100-999 employees)
 - That are just getting started on their BI/PM and information management initiatives
 - That need just the essential reporting, analysis and planning capabilities
 - Have limited IT resources to manage complex BI/FPM initiatives
 - Need a solution that is easy to install, deploy and manage

Informix: Storage Optimization

- Reduce Costs, Increase Performance

- Best in industry
- Minimize storage costs
- Improve performance
- Reduce energy consumption
- Easy to implement
- Customers achieving 70% storage savings



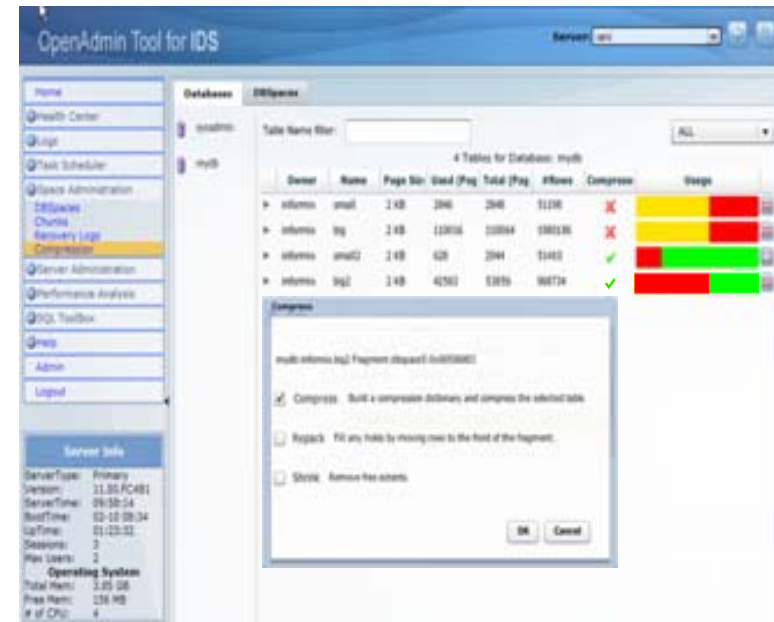
"With millions of financial transactions each day, we rely on IBM Informix to deliver high speed and reliability. With the new compression capabilities, we can gain even greater value by reducing our storage requirements by 50%."

- IT Manager, Large Financial Services Company

Compression Tools

Easily Calculate your Compression Savings

1. For customers on any version of Informix
 - Estimation tool on ibm.com/informix/compression
2. For customers with Informix 11 who want more accuracy
 - Estimation utility within OpenAdmin Tool (OAT)
3. Business Value Assessment (BVA) provides the ROI for any environment
 - Evaluate where you are and where you could be



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Issues to Think About

- Regulations that affect your organization
 - Legislation
 - Industry standards
 - Good practices
- Design goals
 - Different contents, different requirements
- Operational procedures
 - Backup and restore
 - Offsite storage of database archives
 - HMRC? - Encrypt backup – Store keys separate
 - Monitoring performance
 - Open Admin Tool <http://openadmintool.org/>
 - Server Studio Java Edition <http://serverstudio.com/>
 - Establish baseline performance, monitor, review changes when there is problem
 - Monitoring Security



Encrypted Communications

- Data flowing between client and server is easily monitored
 - Guardium does it, for example
- You cannot tell whether you are being monitored
 - Snooping on the wire does not leave any evidence
 - Reading shared memory does not show either
- Encrypted data cannot be understood
 - A snooper can only see that data was exchanged
- Passwords are sent unencrypted
 - Unless you use a Communication Support Module (CSM)
 - Or olsocssl added to Informix 11.50
- At the bare minimum
 - Use Simple Password encryption - SPWDCSM
- Better to use fully encrypted communications
 - ENCCSM or olsocssl



How to Encrypt Data at Rest?

- IBM Database Encryption Expert

- Encrypts data in regular files
- Access by authorized and identified programs
 - ◆ Even administrators cannot see plain data
- See: <http://tinyurl.com/45y9u4>
 - ◆ <http://www.ibm.com/software/data/db2/db2imstools/database-encryption-expert>



Self Protecting - About Roles

- User informix must seldom be the sole arbiter of database administration
 - It should be like root is in a secure environment
- Most compliance rules require separation of roles
 - So distinct jobs are handled by different people
- This means you must separate those groups
 - And the best method is by the use of roles
 - Default roles:
 - DBSA – Database System Administrator Group
 - DBSSO – Database System Security Officer Group
 - AAO – Audit Analysis Officer Group
 - Bargroup is not officially a role
 - But it is effectively one
 - It determines who can run backups

Self Protecting - LBAC

Data is labeled
- by columns and/or rows

Users

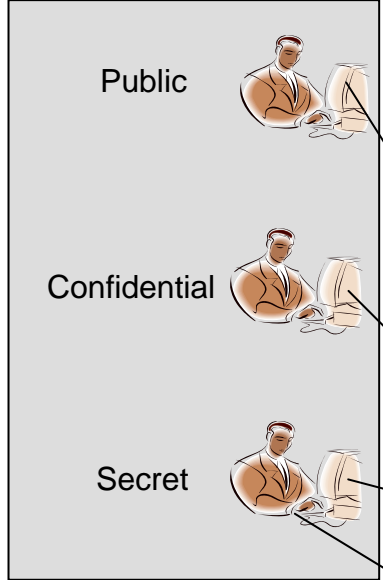


Table People

Security Label	Name	Rank	Task
Secret	Verity Dolittle	M & A	Buy Google
Public	John Smith	CEO	Run Company
Confidential	Heinrich Messier	Accountant	SEC Relations
Secret	Alex Grimwald	M & A	Buy Yahoo!
Public	James Talbot	CFO	Run Accounts
Confidential	Jessica McHenry	IT Specialist	Networks
Secret	Jane Ferguson	M & A	Buy Microsoft
Confidential	Melissa Williams	IT Specialist	Databases
Secret	Kate Ball	M & A	Buy Oracle
Public	Malcolm Knight	CIO	Run IT

select * from people;

Provides extra control over who can see what

Users are granted

Security Label	Name	Rank	Task
Secret	Verity Dolittle	M & A	Buy Google
Public	John Smith	CEO	Run Company
Confidential	Heinrich Messier	Accountant	SEC Relations
Secret	Alex Grimwald	M & A	Buy Yahoo!
Public	James Talbot	CFO	Run Accounts
Confidential	Jessica McHenry	IT Specialist	Networks
Secret	Jane Ferguson	M & A	Buy Microsoft
Confidential	Melissa Williams	IT Specialist	Databases
Secret	Kate Ball	M & A	Buy Oracle
Public	Malcolm Knight	CIO	Run IT

Provides extra protection to most sensitive data

Self Protecting - LBAC Tips

SETSESSIONAUTH – new privilege

- To prevent unauthorized access
- Allows DBSECADM to control who can use SET SESSION AUTHORIZATION statement
 - *Only users with SETSESSIONAUTH privilege can use the SET SESSION AUTHORIZATION statement*
- SET SESSION AUTHORIZATION statement
 - Allows DBA to assume identity of another user
 - DBA can see other users' data in protected table

DBSECADM role

- Database Security Administrator
- *Can be granted by DBSA only*
- *Only DBSECADM can grant SETSESSIONAUTH*

Load/Unload utilities

- *User must have necessary labels or exemptions if all rows in protected tables are to be loaded/unloaded*

Why use auditing?

Needs

- to know which data is modified by the applications and/or users
- Need to monitor who uses each Informix utility
- Need to know which result sets users see

Security Audit

- Informix has the ability to audit security relevant events related to its security functions.
- Onaudit
 - An authorized administrator, using the onaudit utility program, can enable and disable the audit feature
 - can select specifically which security relevant events should be audited based on event type and user.
 - Audit records are stored within files in the IT environment.
- onshowaudit
 - The onshowaudit utility allows an authorized administrator to extract the audit records from the audit trail into a file that could potentially be viewed directly using tools available in the IT environment or alternately it can be loaded into an Informix database table, using dbload, so that the features of Informix can be used to more effectively review the audit records with searching and sorting capabilities.



Installation Security

- A database cannot be secure if the system it runs is not
- Protect the machine running the DBMS
- Protect the network the machine is connected to
- Protect the software the machine is running



ON-Security

- Informix 11.50.xC4 Feature
- ON-Security checks the security of paths:
 - Files, directories, and symlinks
 - Especially \$INFORMIXDIR
 - Directories on the path must
 - Belong to a trusted user
 - Either be unwritable by group
 - Or belong to a trusted group
 - Not be publicly writable
- ON-Security reports issues & recommends changes
 - It never changes permissions on anything
- ON-Security is used during install too
- If \$INFORMIXDIR is insecure
 - oninit and other utilities refuse to run
- There is a system of overrides
 - User root must activate them
 - Only root may risk the security of the machine
- Basic command usage:
 - onsecurity \$INFORMIXDIR
 - onsecurity -r \$INFORMIXDIR
 - onsecurity -h

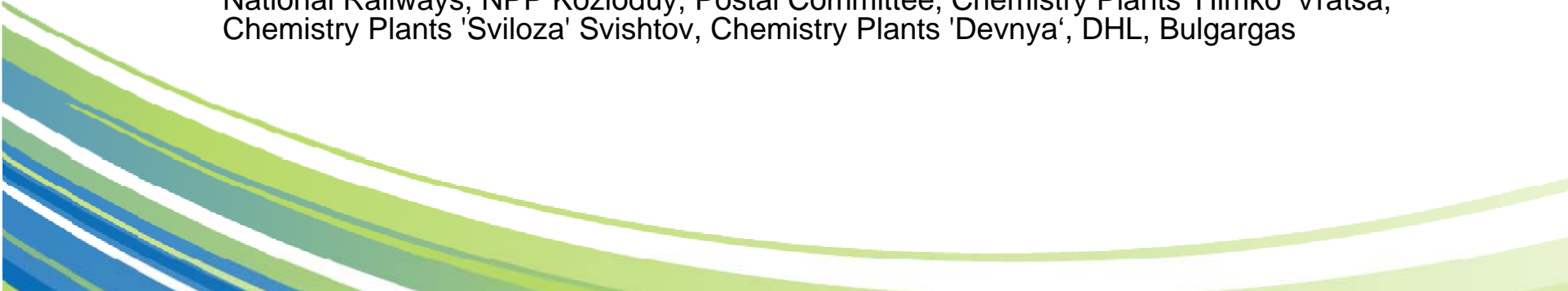
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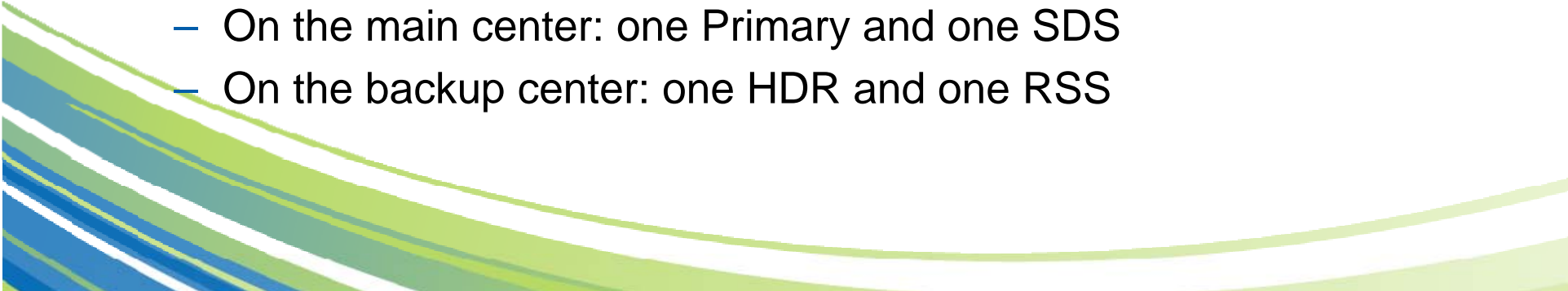


NDB Overview

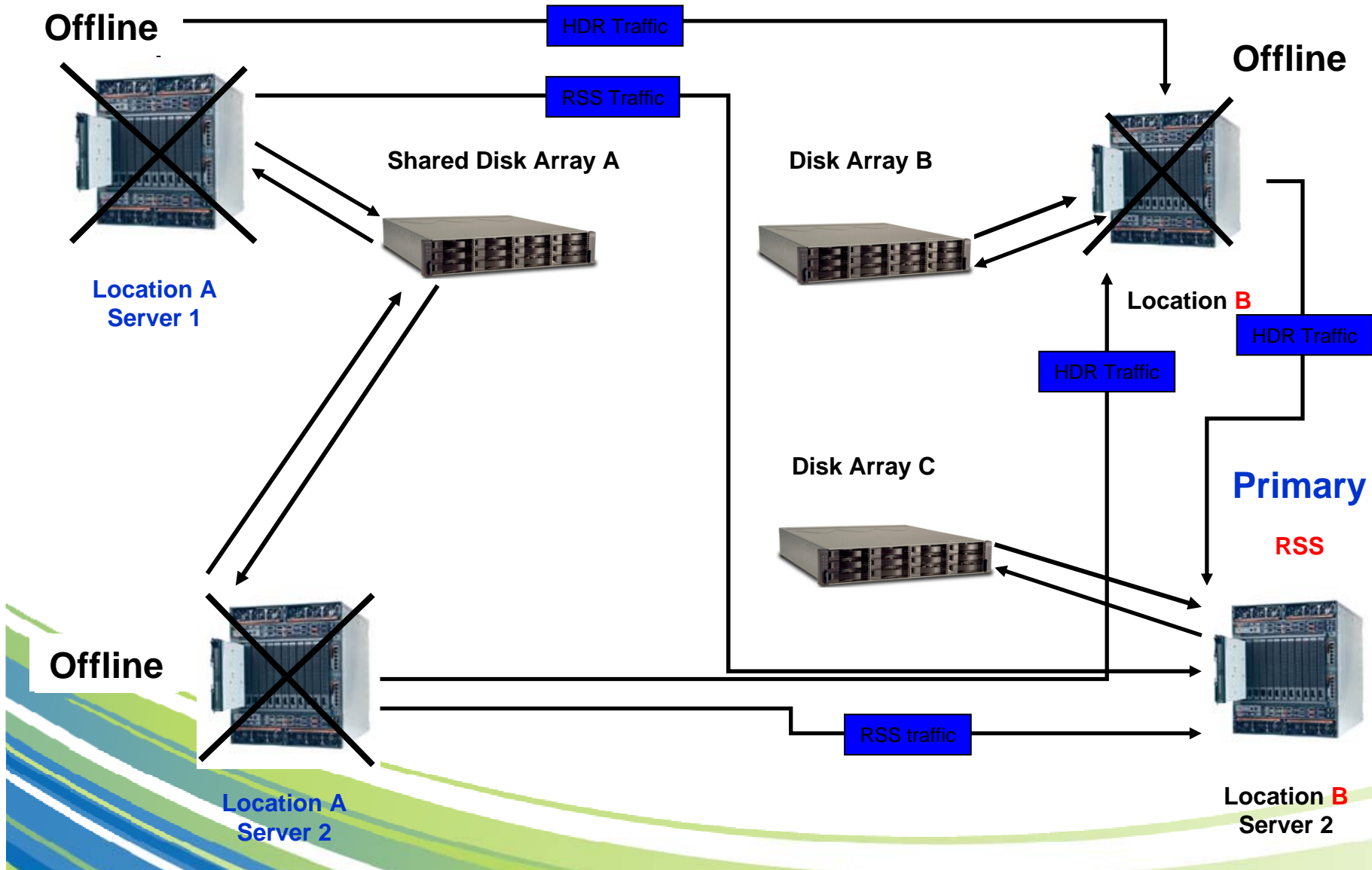
- Key IBM partner
 - 15 years of experience in the IT field
 - Currently supports critical national databases all around Bulgaria
 - Services offered:
 - Business partner training and qualification, Product update sessions for partners, Sales assistance, Technical consultations by our certified specialists, Project assessment, Configurations, Pricing and licensing, Order and delivery of product licenses, Installation, Technical support, Renewals and reinstatements orders
 - Customers
 - Government - Ministry of Interior, Ministry of Regional Development and Public Works, Ministry of Finance, Ministry of Justice, Ministry of Defence, Ministry of Transport and Telecommunications, Ministry of Agriculture and Woods
 - Telco – MobilTel, Globul
 - Finance - UniCredit Bulbank, United Bulgarian Bank, SG Express Bank, Central Cooperative Bank
 - Private and State Companies - National Statistical Institute, Head Department GRAO, Customs Agency, Patent Department, State Agricultural Fund, National Refugees Agency, National Railways, NPP Kozloduy, Postal Committee, Chemistry Plants 'Himko' Vratsa, Chemistry Plants 'Sviloza' Svishtov, Chemistry Plants 'Devnya', DHL, Bulgargas
- 



NDB Customer – National Bulgarian Schengen Visa System

- **Current Project:**
 - Project Name: National Bulgarian Schengen Visa System
 - Start time: May 2010
 - Deployment time: Sep 2010
 - **Environment**
 - The system is supported from 4 administrators.
 - The system and its data will be accessible by multiple ministries
 - **Current Plan:**
 - Implement 4 Informix servers
 - On the main center: one Primary and one SDS
 - On the backup center: one HDR and one RSS
- 

The server at location B fails



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Call for action...

- Download Informix Developer Version or the Virtual Appliance at:
<http://www.ibm.com/developerworks/wikis/display/im/IBM+Virtual+Appliances#IBMVirtualAppliances-ids>
- Participate in Panther Early Validation Program
 - EVP start – Mar 2010
 - EVP end – Oct 2010
- Questions & Comments
 - Gayathri Magie – gayathri@us.ibm.com



Data Management Communities for Informix

- IIUG – the worldwide community of Informix users
 - Membership is FREE – join today! www.iiug.org
 - Data Management Community – share and interact with peers around the world
 - www.ibm.com/software/data/management/community.html
 - developerWorks – IBM’s resource for developers & IT professionals
 - www.ibm.com/developerworks/data/products/informix
 - Information Champions – recognizes individuals who have made the most outstanding contributions to the Information Management community
 - www.ibm.com/software/data/champion
- 



Thank you

