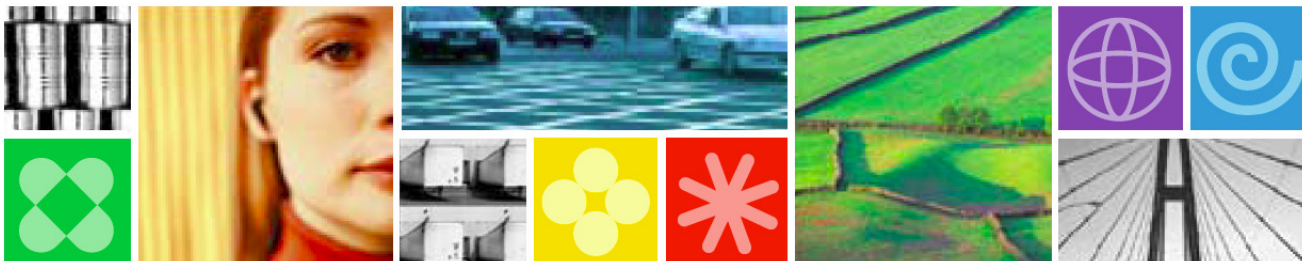




DB2 utilities: Maximize performance and minimize resource consumption





Agenda

- **Availability**
- **Performance**
- **Features & function**
- **Summary**



Availability

- **Ensure utilities are non-disruptive**
- **Introduction of shadow page set technology**
- **Introduction of claim & drain processing**
- **Exploitation of ISO(UR) processing**
- **SHRLEVEL NONE**
- **SHRLEVEL REFERENCE**
- **SHRLEVEL CHANGE**



Availability – what has changed recently?

- **Online create or rebuild of non-unique indexes**
 - REBUILD INDEX SHRLEVEL CHANGE
- **Eliminate outage for partition-level REORGs**
 - Eliminate BUILD2 phase
 - New restriction on concurrent part level REORGs
- **REORG avoidance for data compression**
 - LOAD COPYDICTIONARY
 - PK63324 & PK63325 (V9)
- **Online data consistency checking and repair**
 - CHECK DATA SHRLEVEL CHANGE
 - CHECK LOB SHRLEVEL CHANGE
 - REPAIR LOCATE... SHRLEVEL CHANGE



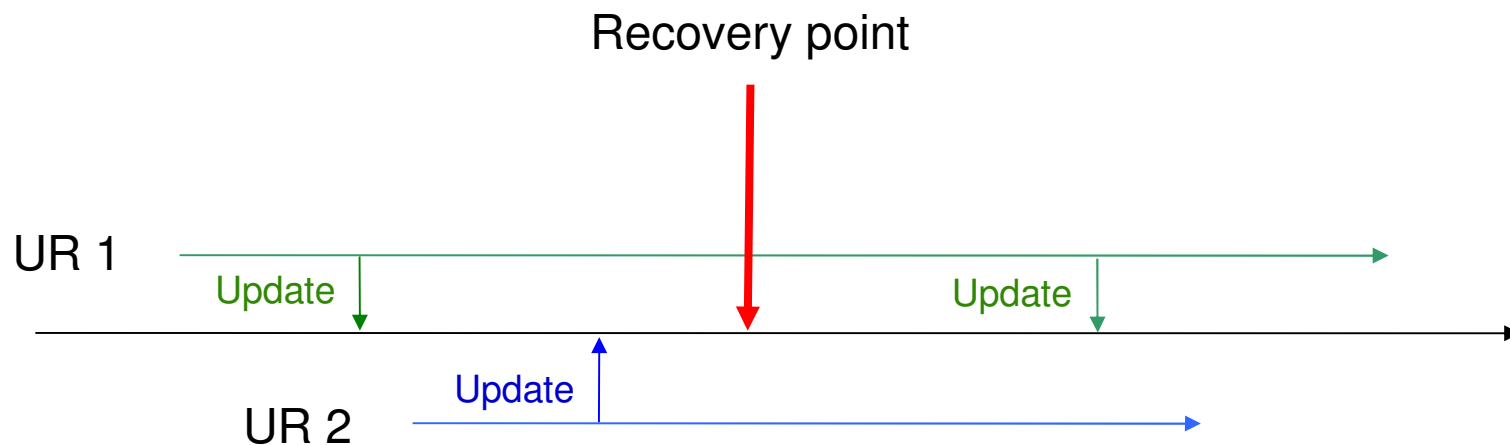
Availability – what has changed recently?

- **Run data consistency checks without impacting BACKUP SYSTEM or disk mirroring**
 - PK41711 (V9)
- **Avoid CHKP after PIT recovery of RI set in V9**
 - PK80304 (V9)



Availability – what has changed recently?

- **Replace data with virtually no outage**
 - CLONEs effectively provide LOAD REPLACE SHRLEVEL CHANGE
 - UTS only
- **Read LOB data during REORG**
 - REORG SHRLEVEL REFERENCE for LOBs
- **RECOVER to point in time with consistency**
 - Avoid need for QUIESCEs





Performance

- **Elapsed time**
 - DB2 enhancements
 - z/OS & architecture improvements
 - Parallelism
- **CPU cost**
 - DB2 enhancements
 - z/OS & architecture improvements
 - zIIP



Performance – what has changed recently?

- **Faster REORGs**
 - Parallel unload of partitions
 - Parallel reload of partitions
 - Parallel log apply
 - ▶ Greater likelihood of REORG keeping up with logging rates
- **Faster CHECK INDEX SHRLEVEL REFERENCE**
 - Parallel index processing
- **Up to 40% faster COPY & RECOVER RESTORE phase to/from tape**
 - Support Large Block Interface for image copies to tape
- **Reduced impact on applications when running COPY**
 - COPY uses MRU for buffers to improve BP hit ratio for online applications
- **Reduced impact on applications when running LOAD & REORG**
 - Auto-invalidate of cached dynamic statements on completion of LOAD & REORG
 - PK47083 (V8 & V9)



Performance – what has changed recently?

- **Greater utility parallelism with SORTNUM elimination**
 - PK45916 (V8), PK41899 (V9)
 - Major improvement in utility sort processing
 - Simpler, more efficient, more reliant on RTS
- **SORTBLD performance improvement**
 - PK60956 (V8 & V9)
 - Up to 20X performance improvement in SORTBLD for indexes with small SECQTY
- **LOAD & REORG performance improvement**
 - PK61759 (V8 & V9)
 - 10% CPU & elapsed time improvement in RELOAD phase
 - 10% CPU reduction in SORT phase
- **COPY performance improvement**
 - PK74993 (V9)
 - 20% elapsed time improvement for copy of multiple small datasets to tape



Performance – what has changed recently?

- **Crossloader performance improvement for CCSID data conversion**
 - PK76860 (V8 & V9)
- **LOAD/UNLOAD LOB file reference variable performance**
 - PK75216 (V9)
 - PDS only, not HFS
 - 56% ET reduction on UNLOAD, 93% ET reduction on LOAD
- **UNLOAD performance for multi-table table spaces**
 - UTILINIT phase – use DBD rather than catalog lookup
 - PK77313 (V8 & V9)
 - In one case 1.5 hours -> 11 secs
- **COPY performance with large LISTDEF lists**
 - PK78865 (V8 & V9)
 - Reduce writes to SYSUTILX



Performance – what has changed recently?

- **REORG PART of empty partition performance**
 - Avoid NPI scan
 - PK67154 (V8 & V9)
 - Sample SORTBLD phase: 98% CPU reduction, 70% ET reduction
- **COPY of partitioned tablespace with many parts**
 - PK81232 (V9)
 - Correct CPU regression in V9 - up to 80% CPU reduction
- **COPY SHRLEVEL CHANGE performance improvement for LOBs**
 - PK83096 (V9)
- **LOAD and UNLOAD to/from virtual file**
 - USS named pipe support with templates
 - PK70269 (V8 & V9)



Performance – what has changed recently?

- **DSN1COPY performance**
 - Improved VSAM buffer allocation for page sets with cylinder allocation
 - Up to 20% ET improvement
 - PK78516 (V8 & V9)
- **RUNSTATS histogram statistics**
 - Improved query optimization for non-uniform distribution
 - Example - 1, 3, 3, 4, 4, 6, 7, 8, 9, 10, 12, 15 (sequenced), cut into 3 quantiles

Seq No	Low Value	High Value	Cardinality	Frequency
1	1	4	3	5/12
2	6	9	4	4/12
3	10	15	3	3/12



Performance – what has changed recently?

- **CPU cost reduction in V9**
 - 10-20% for COPY & RECOVER
 - 5-30% for LOAD, REORG, REBUILD INDEX
 - 20-60% for CHECK INDEX
 - 35% for LOAD partition
 - 30-40% for RUNSTATS INDEX
 - 40-50% for REORG INDEX
 - 70% for LOAD REPLACE partition with dummy input
- **zIIP enablement for utility index processing in V8**



Performance – what has changed recently?

- **In spite of CPU reduction in V9, there is continued focus on CPU consumption for utilities**
- **Sort can consume ~60% of total utility CPU time**
- **DB2 in concert with DFSORT will provide zIIP offload of DB2 utility memory-object fixed-length record sort processing**
- **Requirements:**
 - DB2 APAR PK85889 (V8 or V9)
 - DFSORT APAR PK85856
 - z/OS 1.10
- **PTFs can be applied independently of each other**
- **Exploitation is automatic**



Features & function

- **More powerful utilities for greater flexibility...**
- **... yet simpler utilities for reduced complexity**
- **New utilities & more options**
 - COPYTOCOPY
 - BACKUP SYSTEM & RESTORE SYSTEM
 - LISTDEF
 - TEMPLATE
 - File Reference Variables
 - ...
- **Intelligent defaults**
- **Autonomics**
- **Synergy with Information Management Tools**



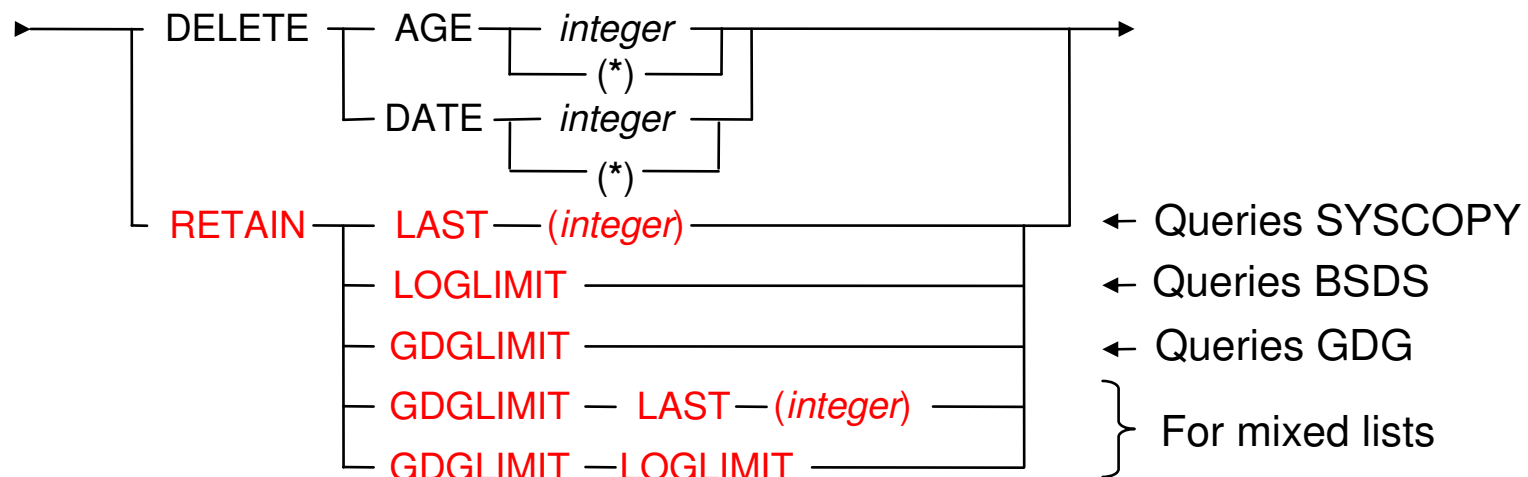
Features & function – what has changed recently?

- **BACKUP SYSTEM & RESTORE SYSTEM enhancements**
 - Support for tape
 - Support for incremental FlashCopy
- **Object-level recovery from system-level backup**
- **RECOVER to any point in time with consistency**
- **SORTNUM elimination**
 - Simplified utility invocation
- **Remove restriction on REORG of >254 compressed parts**
 - ZPARM restricts LOAD in V9 – restriction removed in X
- **Better information for DPROPR/QRep or other IFI 306 readers**
 - Write diag log record at utility termination so IFCID 306 readers can trigger refresh
 - PK78558 (V9)



Features & function – what has changed recently?

- **MODIFY RECOVERY simplification & safety**



- **Template switching for COPY utility**

- E.g. copy to disk if small, to tape if large

```

TEMPLATE LRG DSN &DB..&TS..D&DA..T&TI. UNIT=TAPE
TEMPLATE SML DSN &DB..&TS..D&DA..T&TI. UNIT=SYSALLDA LIMIT(20 CYL, LRG)
COPY TABLESPACE SMALL.TS COPYDDN(SML)
COPY TABLESPACE LARGE.TS COPYDDN(SML)
    
```



Features & function – what has changed recently?

- **Permit use of ALIASes for LOAD, RUNSTATS and UNLOAD**
 - PK77061 (V9)
- **New DSNACCOX stored procedure to gather statistics from catalog and make utility recommendations**
 - See PK44133
 - DSNACCOR still supported
- **More information**
 - All utility messages in job output have julian date & timestamp
 - -DISPLAY UTILITY enhanced to show progress of logapply

```
DSNU116I csect-name RECOVER LOGAPPLY PHASE DETAILS:  
  STARTING TIME = timestamp  
  START RBA = ss START LRSN = rr  
  END RBA = ee END LRSN = nn  
  LAST COMMITTED RBA = cc LAST COMMITTED LRSN = ll  
  ELAPSED TIME = hh:mm:ss
```



What's coming?

- **Remove usability restrictions for REORG**
 - LOBs
 - PBG
 - Catalog/directory SHRLEVEL CHANGE REORG
 - Rebalance of partitioned page sets with LOB columns
 - Disparate parts
- **REORG avoidance**
- **Remove UTSERIAL lock for greater utility concurrency**
- **RTS enhancements & greater reliance upon RTS**
- **Intelligent & autonomic statistics gathering**
- **BACKUP SYSTEM / RESTORE SYSTEM enhancements**



What's coming?

- **FlashCopy exploitation**
- **Faster & better COPY processing**
 - Incremental, CHANGELIMIT, FlashCopy
- **LOAD & UNLOAD enhancements**
 - Improved LOB/XML processing
 - Performance options
- **CHECK utility enhancements**
 - XML, availability, data correction,...
- **Faster point in time recovery**
- **... and more**



Summary

- **Continued delivery of performance improvements & features of real value**
- **Toleration, support & exploitation of new features from day 1**
- **Ensure utilities are non-disruptive**
 - ▶ Eliminate outages
 - ▶ Improve performance
 - ▶ Reduce resource cost
- **Reduce complexity & improve automation**



THANK
YOU