VFA vs DASD CPU consumption

- Historically considerable discussion of CPU benefits
  - records in VFA or DASD
- General agreement
  - VFA lowers message response time
- Measurement result:
  - VFA has significant CPU savings
- Customer measurements differing
  - Strongly suspect confounders
    - E.g. application change dominating effect signal
# VFA / DASD Measurement

<table>
<thead>
<tr>
<th></th>
<th>Msg/sec</th>
<th>util</th>
<th>ITR</th>
<th>% gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>VFA</td>
<td>5399</td>
<td>.439</td>
<td>12298</td>
<td>26%</td>
</tr>
<tr>
<td>DASD</td>
<td>5365</td>
<td>.552</td>
<td>9719</td>
<td></td>
</tr>
</tbody>
</table>
Test design – AIR1

- Need total logical accesses of AIR1 messages ~ equal
  - got rid of DUPs to lessen variability
- Actual AIR1 logical IO numbers very close
  - All VFA = 15.45  VFA / msg
  - All DASD = 15.18  DASD / msg
- Slight MIPS decrease for VFA message
  - CPUMF used
- Pathlength reduction dominated
  - Roughly 15 x (1700-400) / 85000 = 23%
Summary

• Often new potential VFA candidates
  • unknown hit ratio characteristics
• Err on the side of including records as VFA candidates
  • Non LC customers
• Include a plausible set of records
  • measure the result
• Some customers very accurately modeled by ‘square root rule’
• Others almost unaffected by VFA size changes
  • In the 1G -3G range
DF cache - One number per file

- TPF computes
  - Median usage depth of subfiles over time by DF file
  - suspect little variation over peak time
- Customer sets this value - by DF file
- Predictive information in previous use of fixed subfile is near 0
  - Applications change and dominant effect
  - Say ECB(722) did 42 DASD access
  - Best prediction for future ECB(722) is median
    - not f(42 DASD)
Data Relationships

- VFA
- DF Cache
- DASD
DF Cache

• Let \( b = \) say, 5 = best estimate of usage number for DF file
  • Applies to all subfiles in this file
    • e.g. PNR and specific customer
• Let \( n = \) actual access number for each subfile
  • Random variable \( (N=n) \) across the file
• Statistical costs of two kinds
  • if \( n > 5 \) then \( (n - 5) \) more VFA access must be done
  • If \( n < 5 \) then wasted \( (5 - n) \) moved records in ECB
  • Roughly costs are equally painful (symmetry)
Hit the one in the middle

- Assume throw a 11 sided dice, 0 to 10
- You get to choose one number
  - absolute deviation is cost function
- Realization of 6 dice rolls might be 7,4,0,10,5,3
  - With median = 5 as predictor
    - Deviations 2,1,5,5,0,2
    - sum = 15
  - With 10 as predictor
    - Deviations 3,6,10,0,5,7
    - sum = 31
Best Predictors

- Absolute distance cost => median
- Squared distance cost => mean
  - Worthwhile thinking about which is appropriate
- Consider standard exponential $\exp(-x)$
  - Mean = 1
  - Median = .693
- Conclusion:
  - DF cache -- absolute distance
  - Means and medians can differ significantly
Sizing DF Cache

- Number different files going into DF Cache
  - E.g. PNR, Inventory etc
- Records accessed per day
  - Small – try 100M
  - Larger – try 500M
- TPF has castout and other measures of efficiency
Conjecture - on defect arrival rates

- Suspect $P(\text{defect})$
  - significantly increases when new code is loaded
  - welcome customer data
- Tends to be off peak
  - some component of failure correlated with MIPS used
    - Suspect small
- Off peak has extra MIPS available and higher rate system failure
  - Therefore turn on all suggested traces
Traces of interest – off peak time

- C function trace - extended version
- ECB macro trace with regs
- Enter / Back
- ECB Heap trace
- DF enter trace
- Socket trace
- Stack validation
- NOT recommended in production
  - Block check mode
  - Heap check mode
Lab recommendation

• Run with traces on even at peak times
  • High CPU utilization defects can be severe
    • Difficult to diagnose and solve without trace data

• However if aberrant workload causes CPU overload
  • Turn off some traces
  • Try to keep C function and ECB trace active if possible
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