TPF Users Group Fall 2007

Main Title:RHT Performance Analysis

Sub-title:

Name:Robert Blackburn Ph.D.

Venue:

Introduction

- Some questions lately on how to size the RHT
  - Have been some system failures
- Methods that follow are useful for hashing analysis in TPF

The RHT

- TPF4.1 must set
  - P= number prime slots
  - O=number overflow slots
- zTPF only set P
  - Overflows are dynamically obtained by the system as needed

Prime Sizing- 1

- Let L(t)= number of locks at time t
  - Number of locks is a stochastic process(collection of random variables indexed by time)
    - Determined by active ECBs and locks held per ECB
    - Both of these are random processes
- P=number of prime slots in RHT
  - Customer fixes this number
  - For good hashing P should be a prime number

Prime Sizing - 2

- Let L= max(t ε I) L(t)
  - where I is a peak interval e.g. (8AM,6PM)
    - optimize performance during peak
- Let U = max (over all time) L(t)
  - ensure never deplete lock space
- Define λ = L / P
  - λ is called the intensity
- Choose prime P >2L
  - Then λ < L/2L =.5
- The probability distribution of slot occupancy counts is Poisson with mean λ
- Mean search length = 1 + λ/2
- At λ = .5 the mean search = 1.25

Overflow size

- Choose O = greater of 2P and 3U
  - Assuming O=2P then RHT size = P+2P=3P
- At λ =.5 we have L=.5P
- Occupied prime slots = P-exp(-.5)P=.39P
- Overflows= L-.39P = .11P
- We choose O=2P for extreme safety
  - penalty for exhausting O is system failure

TPF4.1 Conservative approach

- Assume 10 held locks for each allocated ECB
- Calculation for 2000 ECBs and 48 bytes per RHT entry
  - 2000 x 10 x 50 = 1 Meg
- Approach offpeak requirements in this way

Monitoring choice of P

- Let z = number of empty primary slots
  - Using Poisson we can estimate λ
- P exp(- λ) = z
- Solving we get λ = - ln (z/P)
- Example ; z=370,P=1009
  - thus λ = -ln(370/1009)= 1
  - mean search= 1+ λ/2 = 1.5

zTPF RHT Display

```
 zdrht display stat
CSMP0097I 09.56.00 CPU-B SS-BSS  SSU-HPN  IS-01
DRHT0003I 09.56.00 RECORD HOLD TABLE STATUS DISPLAY
NUMBER OF PRIMARY ENTRIES IN RHT          503
NUMBER OF OVERFLOW ENTRIES IN RHT        1000
NUMBER OF OVERFLOW ENTRIES AT IPL        1000
COUNT OF HELD RECORDS                      42 _
COUNT OF IN USE PRIMARY ENTRIES            40
COUNT OF IN USE OVERFLOW ENTRIES            2
COUNT OF WAITING IOBS                       3
END OF DISPLAY+
```

zTPF data – calculating λ from number of zeroes

- P=503
- z=503-40=463
- Calculated λ = -ln(463/503)=.083
- Actual λ = 42/503 = .084