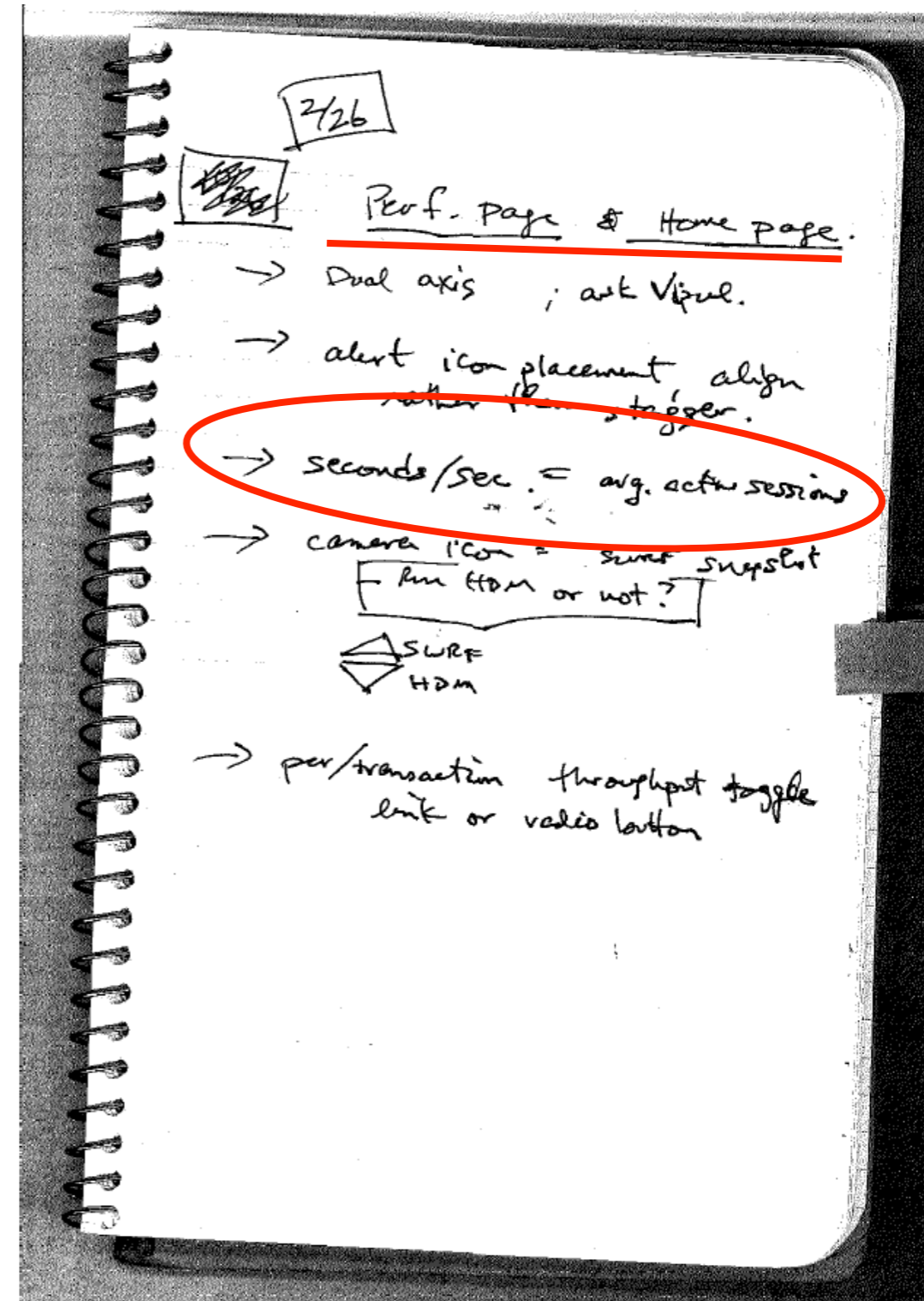


# Average Active Sessions (AAS)

## Deeper Meaning

# Origins of the Term

- EM Performance Page meeting notes
- “Sessions Waiting and Working” inadequate
- Centiseconds / Second
  - “centi-users per second”?



# Fundamentals

*Active Session = Foreground in a DB call and not idle  
(on CPU or in active Wait)*

$$DB\ Time = \left[ Total\ Active\ Session\ Time \right]_{t_0}^{t_1}$$

$$AAS = \frac{DB\ Time}{Elapsed\ Time} = \frac{DB\ Time}{(t_1 - t_0)}$$

**MUST use same  
time units in  
numerator and  
denominator!**

# The Calculus of DB Time

$$DB\ Time = F(t)$$

$$F'(t) = \frac{dDB\ Time}{dt} = Active\ Sessions(t)$$

$$DB\ Time(t_1) - DB\ Time(t_0) = \int_{t_0}^{t_1} Active\ Sessions(t) dt$$

*Time Model*

*ASH*

# ASH Math

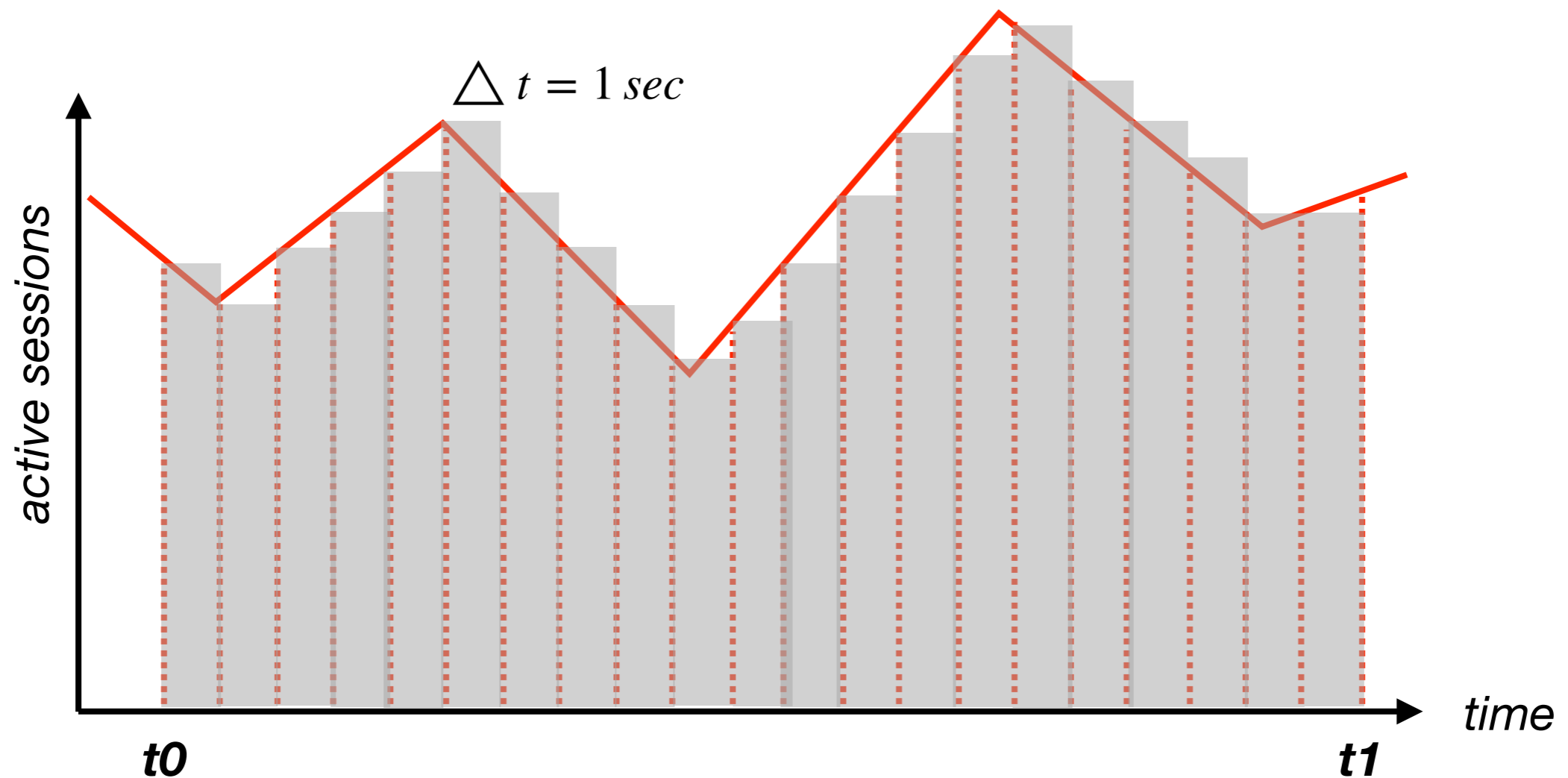
$$COUNT(*) = DB Time$$

$$COUNT(ASH Samples) = DB Time secs$$

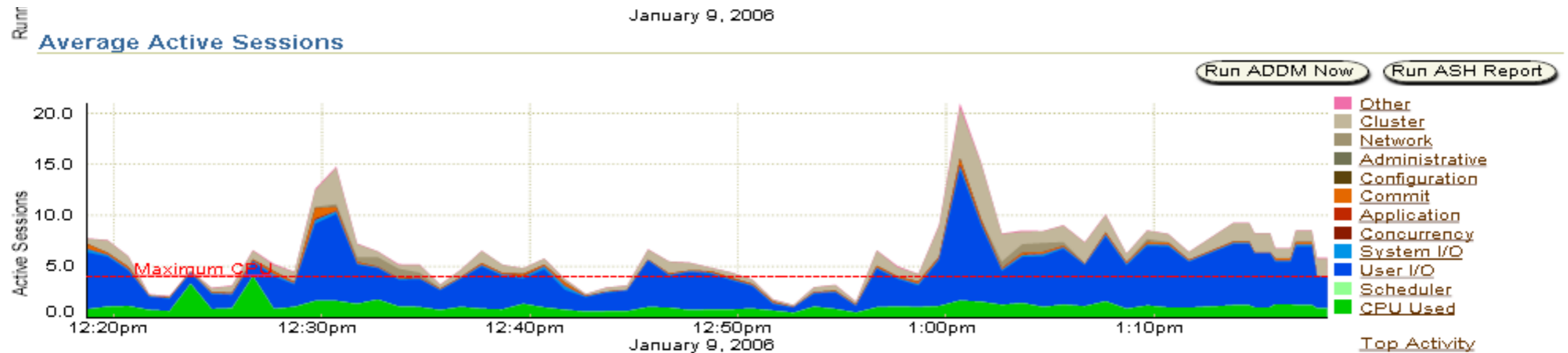
$$\sum_{t_0}^{t_1} Sample Count_i * Sample Interval_i = DB Time ms$$

# ASH Math = Riemann Sum

$$\int_{t_0}^{t_1} \text{Active Sessions}(t) dt \approx \sum_{t_0}^{t_1} \text{ASH Samples}(t_i) * \text{Interval}$$



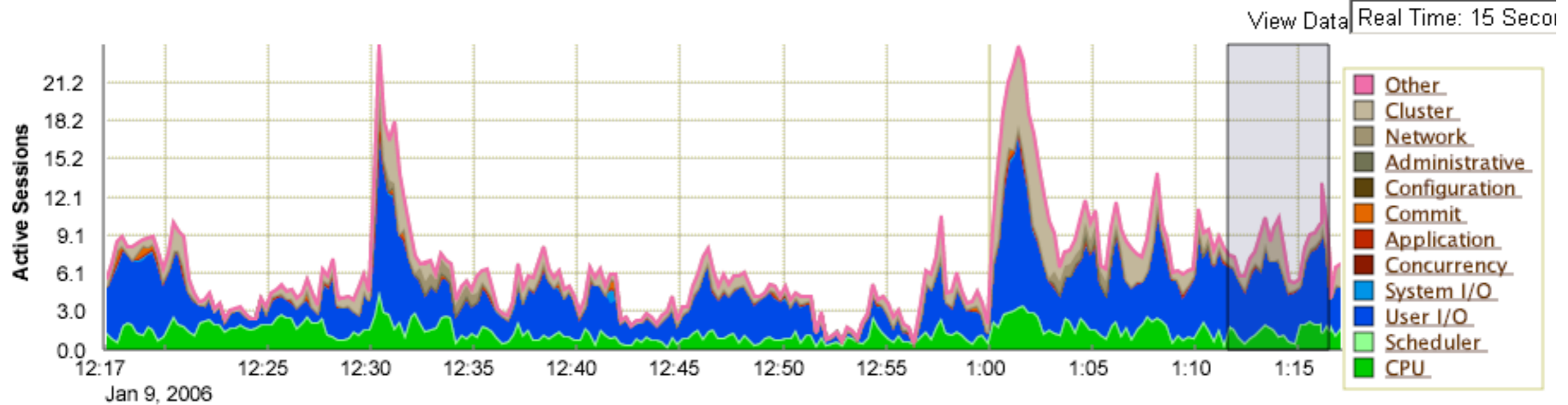
# ASH ~ Time Model



### Top Activity

Switch Database Instance

Drag the shaded box to change the time period for the detail section below.



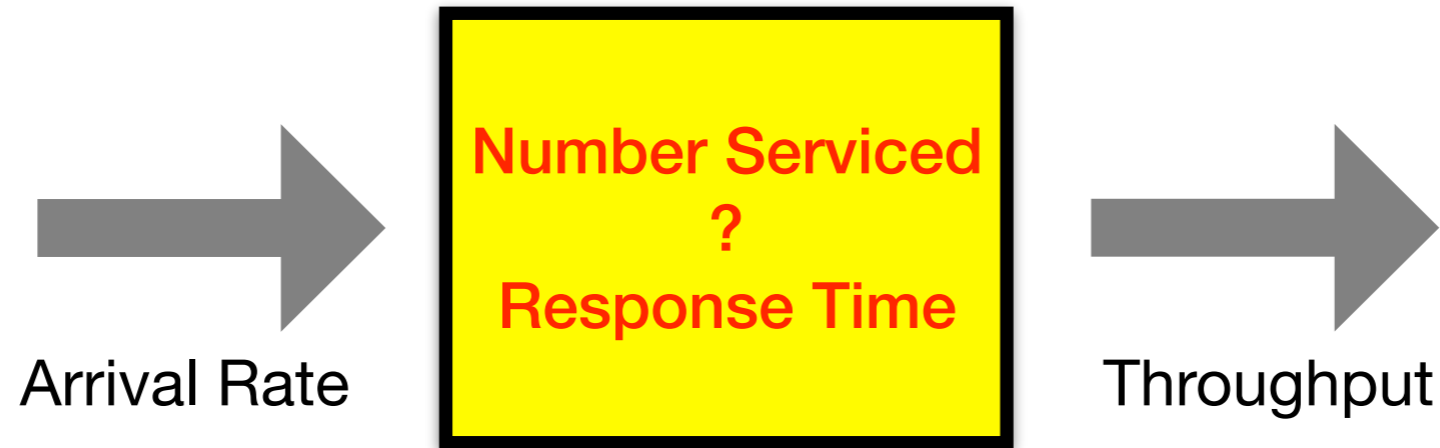
*By the Fundamental Theorem of Calculus!*

# Takeaways

- Active Sessions(t) is the derivative of DB Time(t)
  - Thus DB Time is the integral of the Active Session function
    - Area under the curve = amount of DB Time
    - DB Performance Page is literally a picture of DB Time
    - “click on the big stuff”: UI directly supports the Method
- ASH counts are Riemann sum estimates of DB Time
  - Top Activity and Performance Page are equivalent
  - “ASH Math” works
- *Average Active Sessions is a powerful and fundamental concept*



# Queuing Theory



*stable system: arrival rate = throughput*

## **Little's Law**

*number being serviced = throughput \* mean response time*

# Little's Law and Sysmetrics

*number being serviced = Average Active Sessions*

*Average Active Sessions*

*= Calls per Second \* Response per Call*

*= Txns per Second \* Response per Txn*

***DB Time increases with either an increase in throughput or a degradation in response time***

# Thank You

Github:

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