Performance Modeling and Design of Computer Systems- Ch

Exponential Distribution and the Poisson Process

Debobroto Das Robin

Definition of the Exponential Distribution

Performance Modeling and Design of Computer Systems- Ch 10 Exponential Distribution and the Poisson **Process**

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Overview

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Performance

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Definition of the Exponential Distribution Definition of the Exponential Distribution

Exponential Distribution

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Definition of the Exponential Distribution ullet A random variable X is distributed Exponentially with rate λ .

$$X \sim Exp(\lambda)$$

If X has the probability density function:

$$f(x) = \begin{cases} \lambda e^{-\lambda x} & x \ge 0\\ 0 & x < 0 \end{cases}$$

The cumulative distribution function,

$$F(x) = P\{X \le x\} = \int_{-\infty}^{x} f(y)dy = \begin{cases} 1 - e^{-\lambda x} & x \ge 0\\ 0 & x < 0 \end{cases}$$

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Definition of the Exponential Distribution • Mean of Exp Dis.

$$E[X] = \int_{-\infty}^{\infty} x f(x) dx = \frac{1}{\lambda}$$

second moment of Exp Dis.

$$E[X^2] = \frac{2}{\lambda^2}$$

variance of Exp Dis.

$$Var(x) = E[X^2] - (E[X])^2 = \frac{1}{\lambda^2}$$

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• Exp Dist. is memoryless : next state ((t = 1)th) is independent of current state (t'th)

