操作系统原理第 X 章作业

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Question 1： What are some advantages of peer-to-peer systems over client-server systems?

Answer 1： Peer-to-peer is useful because services are distributed across a collection of peers, rather than having a single, centralized server. Peer-to-peer provides fault tolerance and redundancy. Also, because peers constantly migrate, they can provide a level of security over a server that always exists at a known location on the Internet. Peer-to-peer systems can also potentially provide higher network bandwidth because you can collectively use all the bandwidth of peers, rather than the single bandwidth that is available to a single server.

Question 2： Describe a mechanism for enforcing memory protection in order to prevent a program from modifying the memory associated with other programs.

Answer 2： 处理器可以跟踪与每个进程相关联的位置，并限制对程序范围之外的位置的访问。关于程序内存范围的信息可以通过使用基本寄存器和限制寄存器以及通过对每个内存访问执行检查来进行维护。

Question 3： 哪种网络配置最适合以下环境？选择局域网 (LAN) 或广域网 (WAN)。

(a) 校园学生专用网络

(b) 覆盖广州市内所有大学校园的网络

(c) 一个社区

Answer 3：

(a) LAN

(b) WAN

(c) LAN or WAN

Question 4： 投掷 10 枚标准的六面体骰子，假定投掷每枚骰子是独立的。它们的点数之和能被 6 整除的概率是多少？

Answer 4： 由题意，不妨设投掷 9 枚骰子后，9 枚骰子的总点数和为 S_9, $S_9 \in \{9, 10, 11, ..., 53, 54\}$;

记第 10 枚骰子的点数为 X_{10}, $X_{10} \in \{1, 2, 3, 4, 5, 6\}$，且有 $P(X_{10} = k) = 1/6, (k = 1, 2, ..., 6)$;

记事件 $A = \{10$ 枚骰子的点数和可被 6 整除 $\} = \{S_9 + X_{10} = 6k, k \in \mathbb{N}_+\}$

由全概率公式，可得：

$$P(A) = \sum_{k=1}^{6} P(A \cap X_{10} = k)$$
$$= \sum_{k=1}^{6} P(A|X_{10} = k)P(X_{10} = k) \tag{1}$$
$$= \frac{1}{6}\sum_{k=1}^{6} P(A|X_{10} = k)$$

注意到 S_9 与事件 A 之间的关系，且 S_9 与 X_{10} 是相互独立的，式 1可以改写为：

$$P(A) = \frac{1}{6}\sum_{k=1}^{6}\sum_{n=2}^{10} P(S_9 = 6n - k|X_{10} = k)$$
$$= \frac{1}{6}\sum_{k=1}^{6}\sum_{n=2}^{10} P(S_9 = 6n - k) \tag{2}$$

由式 2可知，$6n - k(n \in \{2, 3, 4, ..., 10\}, k \in \{1, 2, 3, 4, 5, 6\})$ 可以取完 $\{9, 10, 11, ..., 53, 54\}$ 中的所有值（即 S_9 样本空间中的所有结果），故 $\sum_{k=1}^{6}\sum_{n=2}^{10} P(S_9 = 6n - k) = 1(n \in 2, 3, 4, ..., 10)$。所以

$$P(A) = \frac{1}{6}\sum_{k=1}^{6}\sum_{n=2}^{10} P(S_9 = 6n - k) = \frac{1}{6} \tag{3}$$