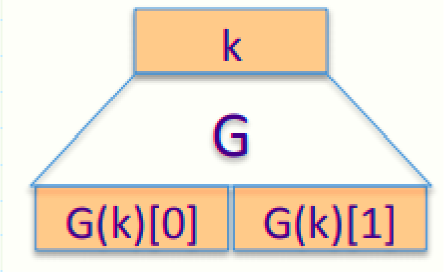
W2 3-6 Block ciphers from PRGs

1、Can we build a PRF from a PRG?

记G: K ⟶ K^2 为一安全PRG

定义一个1 bit PRF F如下，F: K × {0,1} ⟶ K as F(k, x∈{0,1}) = G(k)[x]



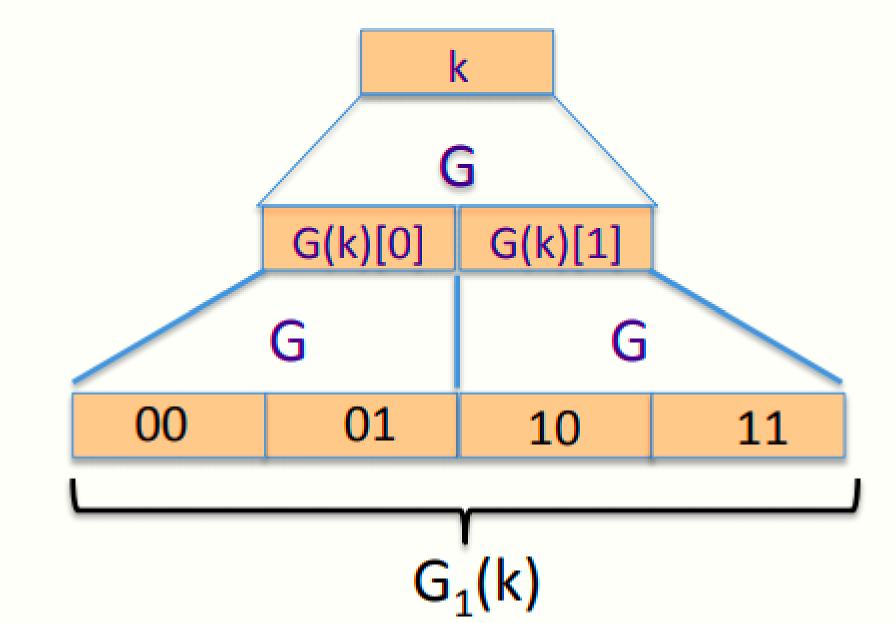
引理：若G为一安全PRG，则F为一安全PRF

2、Extending a PRG

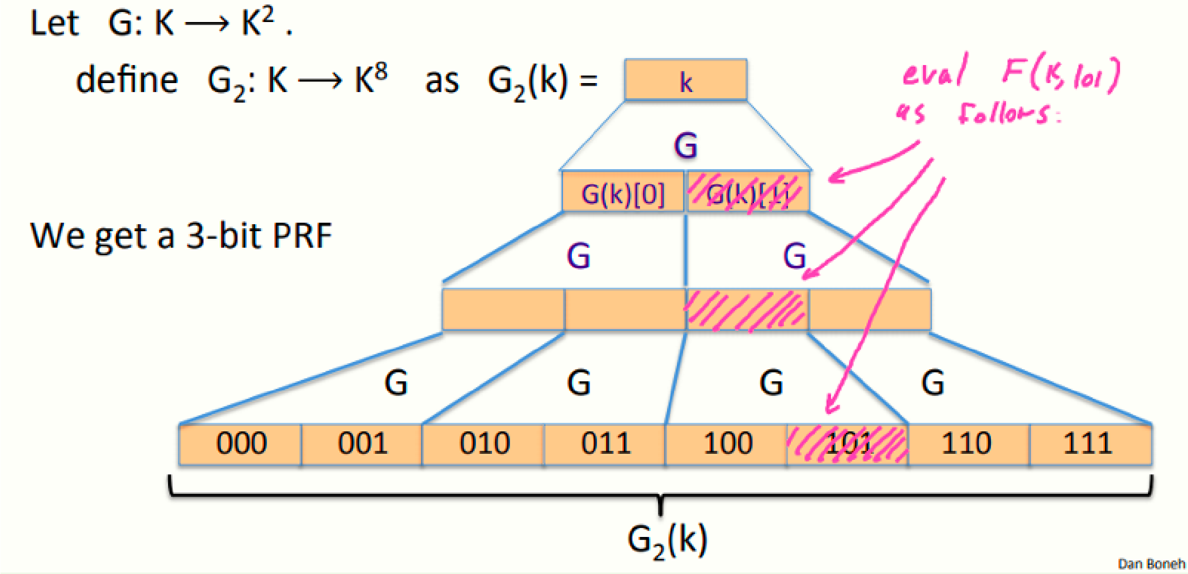
记G: K ⟶ K^2 为一安全PRG

定义G1：K ⟶ K^4 as G1(k) = G(G(k)[0]) ll G(G(k)[1])

因此得到一个2 bits PRF：F(k, x∈$\{0,1\}^2$) = G1(k)[x]



3、Extending more



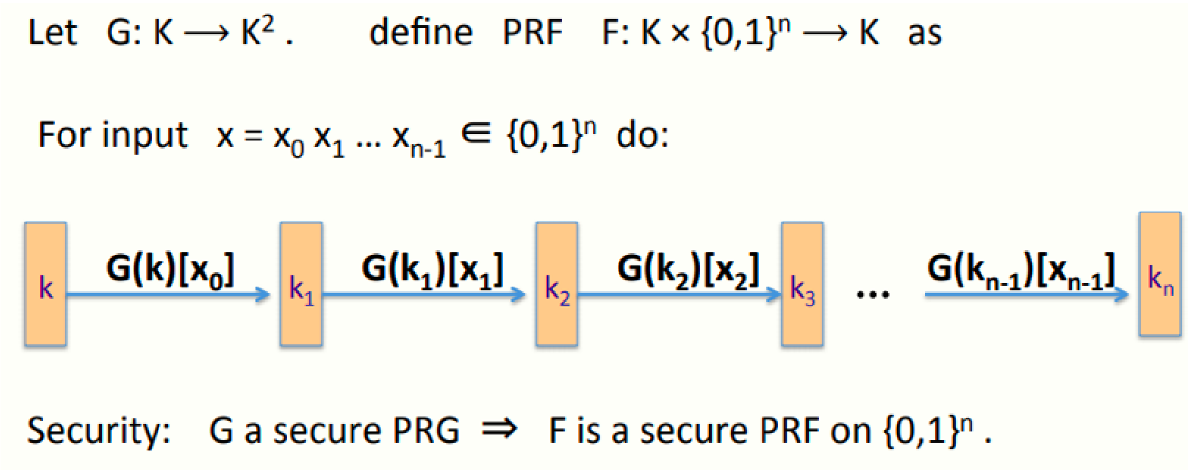
Let $G: K \longrightarrow K^2$.

define $G_2: K \longrightarrow K^8$ as $G_2(k) =$

We get a 3-bit PRF

套娃

4、Extending even more: the GGM PRF



Let $G: K \longrightarrow K^2$. define PRF $F: K \times \{0,1\}^n \longrightarrow K$ as

For input $x = x_0\, x_1 \dots x_{n-1} \in \{0,1\}^n$ do:

Security: G a secure PRG ⇒ F is a secure PRF on $\{0,1\}^n$.

继续套娃，但实际上不应使用这种方式（效率太低）