

Public-Key Cryptography

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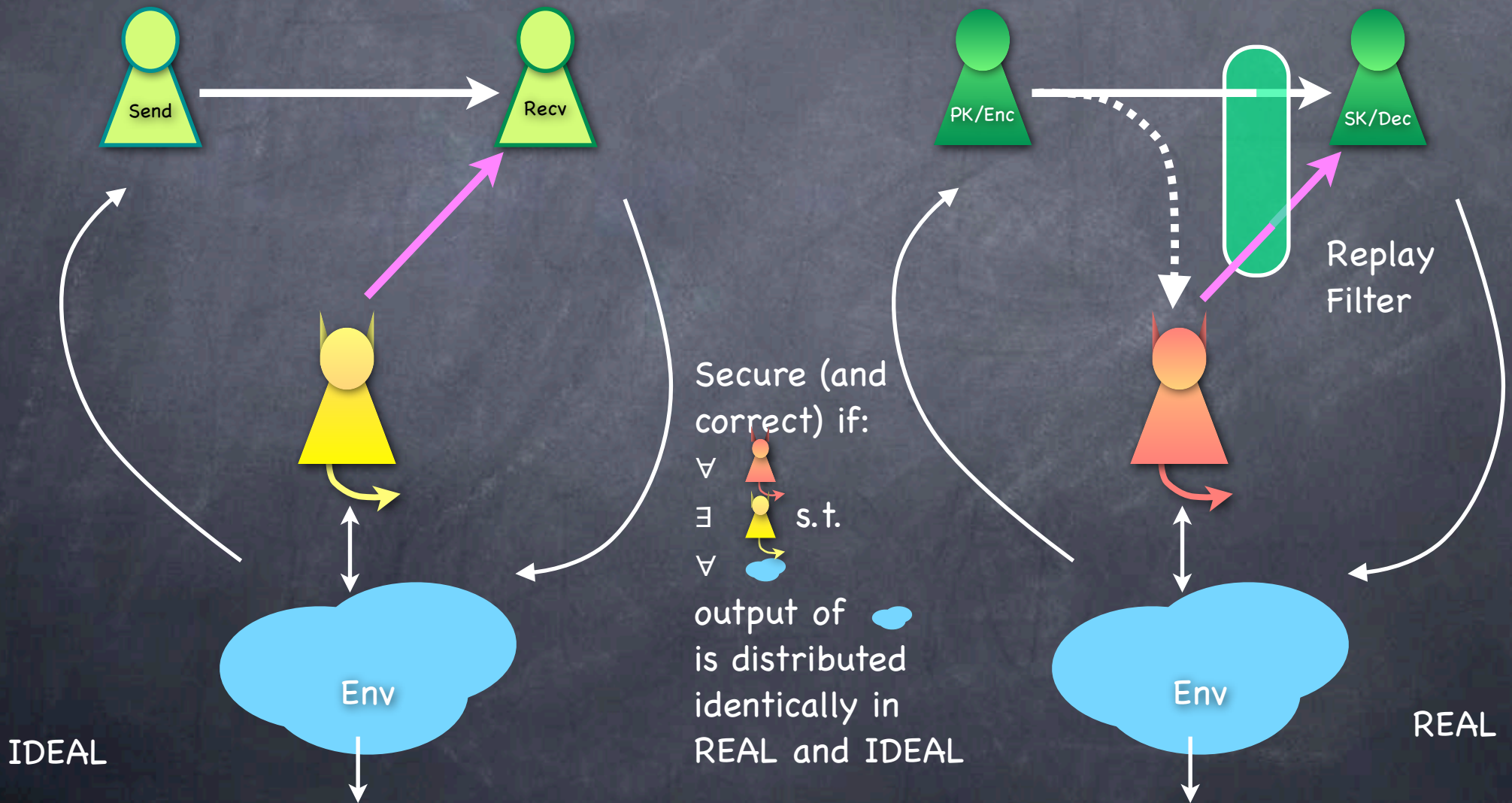
Lecture 9

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CCA Security

SIM-CCA Security (PKE)



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 - $C = (g_1^x, g_2^x, MY^x)$ and $S = (WZ^{H(C)})^x$
 - g_1, g_2, Y, W, Z are part of PK
 - $Y = g_1^{y_1} g_2^{y_2}, W = g_1^{w_1} g_2^{w_2}, Z = g_1^{z_1} g_2^{z_2}$.
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 - If $(g_1^{x_1}, g_2^{x_2}), x_1 \neq x_2$, then " Y^x, W^x, Z^x " vary with different SKs
- Decryption: **Check S** (assuming $x_1 = x_2$) and **extract M**

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- Formally using “hybrid argument” (0 advantage in last hybrid)

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- Part of **RSA Cryptography Standard** (PKCS#1 Ver 2.1).
Commonly used in SSL/TLS implementations

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 - Regular proofs of security, once in the ROM

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- Secure against attacks that treat H as a blackbox (and for which H is pseudorandom)

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 - Relatively low overhead on top of the (fast) SKE encryption

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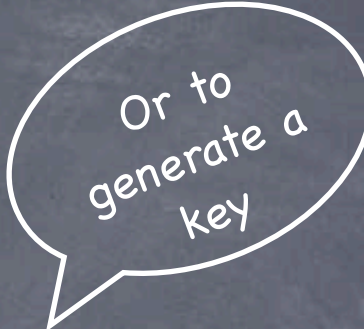
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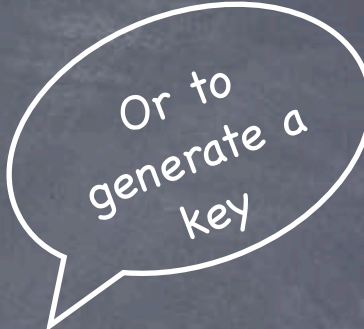
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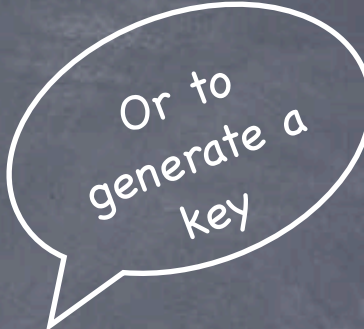
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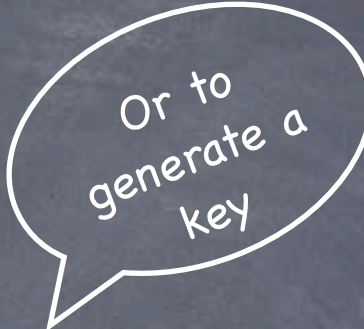
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 - Less security sufficient: KEM used to transfer a random key; DEM uses a new key every time.

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- CCA security based on a complex (non-standard) assumption involving **Hash** and the group: “**Oracle Diffie-Hellman Assumption**”

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 - Very weak security sufficient for encryptions used in KEM and DEM (but only with H, G modeled as random oracles)

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 - In IBE, **receiver has to obtain its SK** from the authority

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 - “Semantic security” for encryption with the ID of honest parties (i.e., with no access to decryption: CPA security)

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