The Gelfand-Pinsker Wiretap Channel: Higher Secrecy Rates via a Novel Superposition Code

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Ben Gurion University and Princeton University

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Aachen

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The Wiretap Channel & The GP Channel

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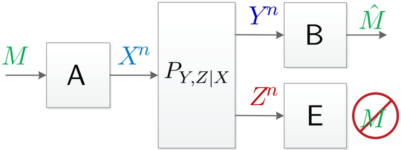

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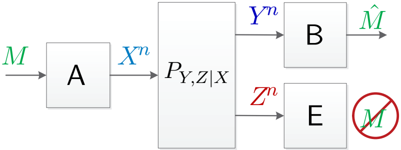

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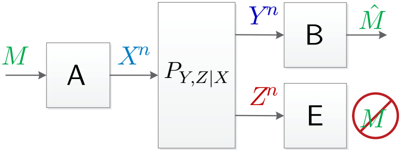

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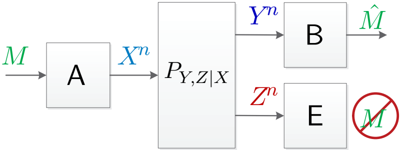

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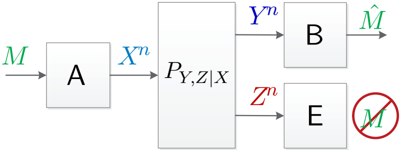

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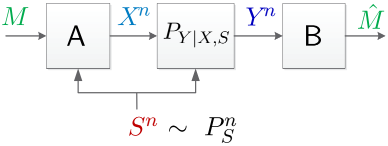

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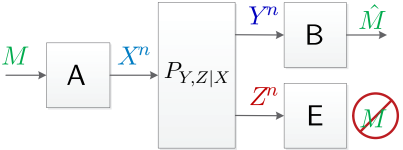

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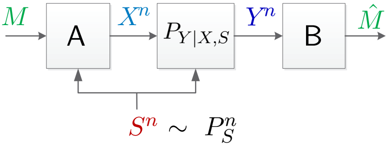

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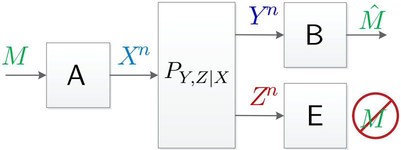

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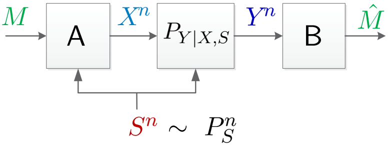

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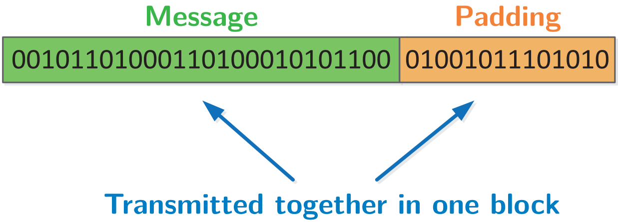

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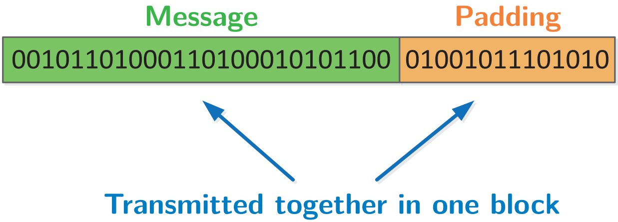

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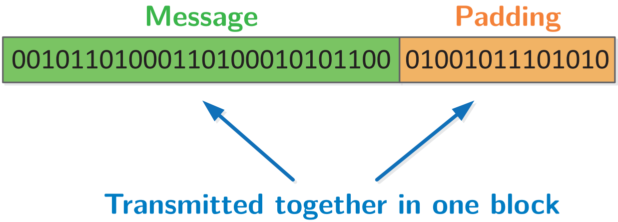

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Message	Padding
00101101000110100010101100	01001011101010

Transmitted together in one block

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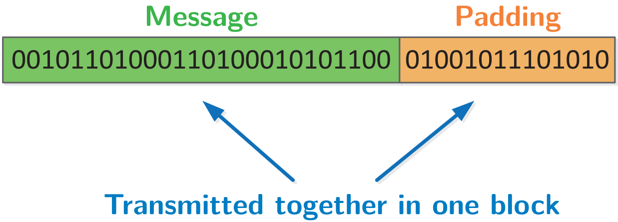

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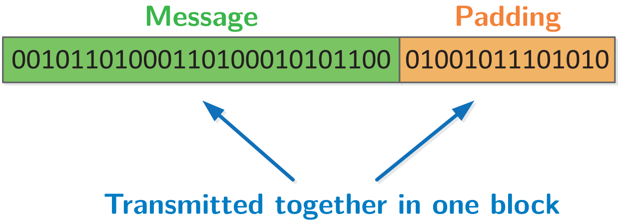

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- **Reliability:** $R + \tilde{R} < I(U;Y)$.

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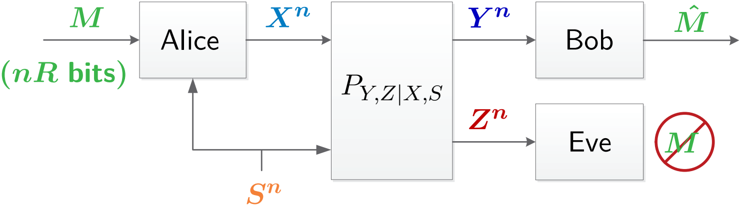

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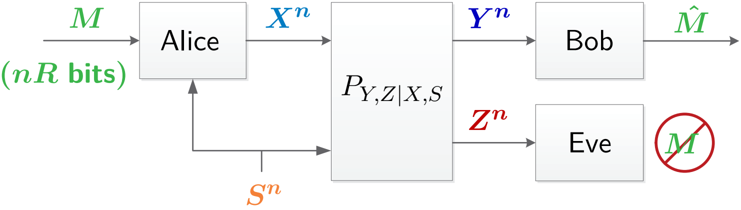

Secrecy Capacity: Reliable and Secure Communication.

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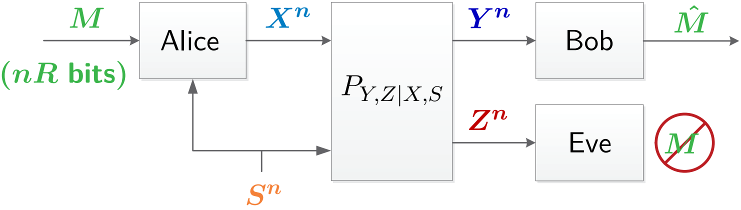

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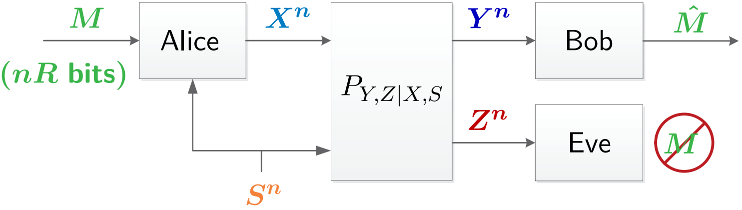

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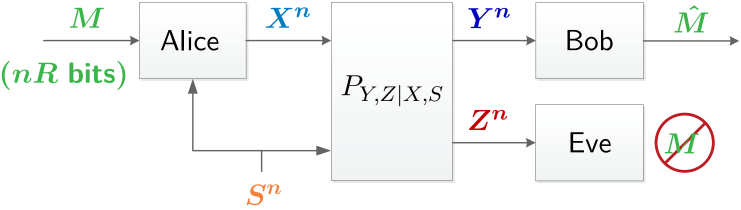

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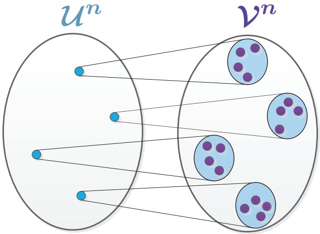

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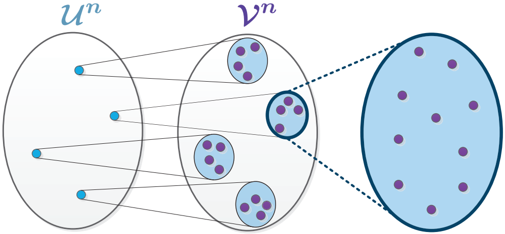

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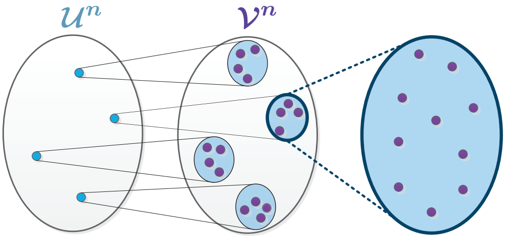

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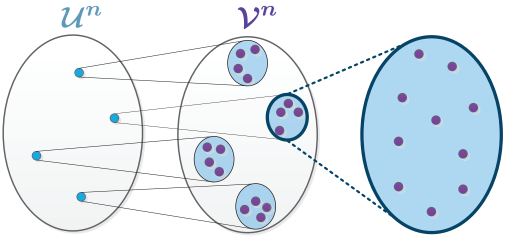

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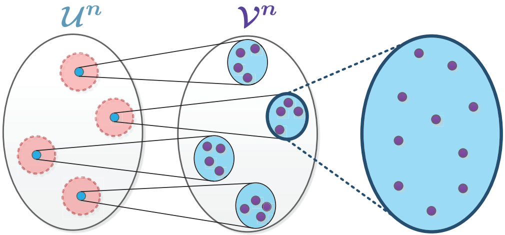

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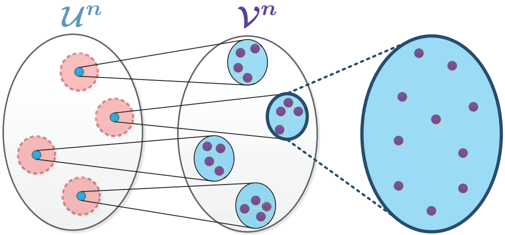

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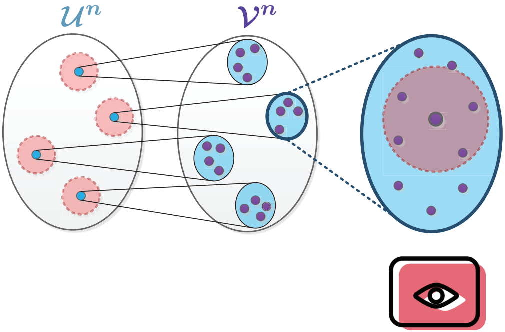

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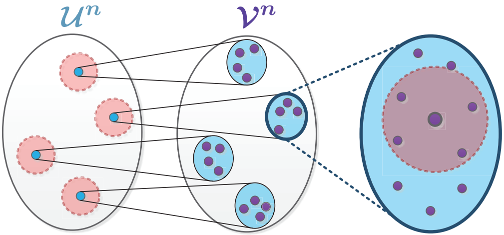

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010010111010101 11010101110 00101101000010101100

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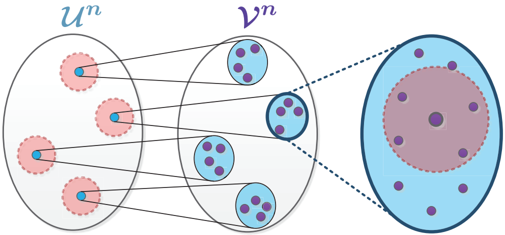

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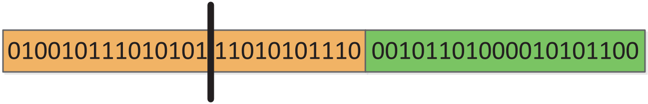

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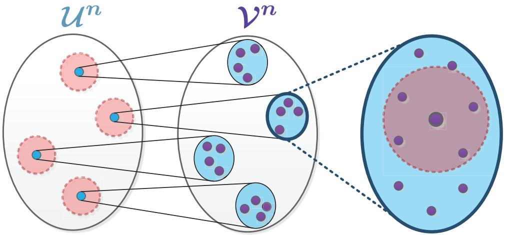

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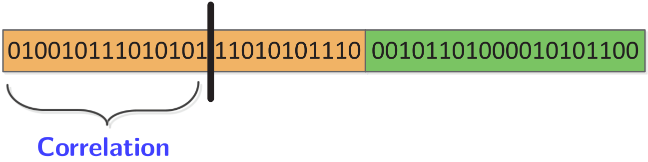

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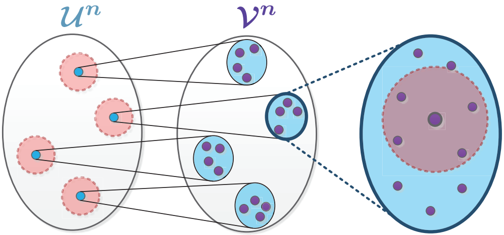

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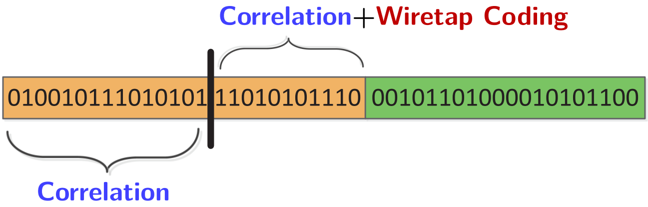

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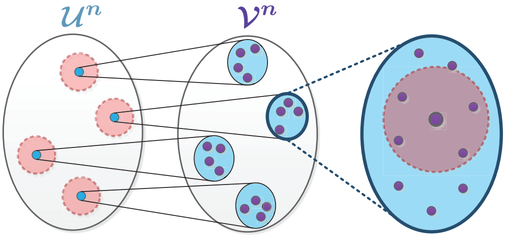

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Correlation+Wiretap Coding

$\underbrace{010010111010101}_{\text{Correlation}}$ | $\overbrace{11010101110}^{\text{Correlation+Wiretap Coding}}$ 0010110100001010110 0

Correlation

★ Use extra **security** resources as key to OTP **data** in **inner layer** ★

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Theorem (Prabhakaran-Eswaran-Ramchandran 2012)

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Joint distribution $P_S P_U P_{V,X|S,U} P_{Y,Z|X,S}$.

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Superposition Coding for the GP Wiretap Channel

Relax Independence:

Superposition Coding for the GP Wiretap Channel

Relax Independence:

⋆ Analysis via **Likelihood Encoder** & **Superposition Strong SCL** ⋆

Superposition Coding for the GP Wiretap Channel

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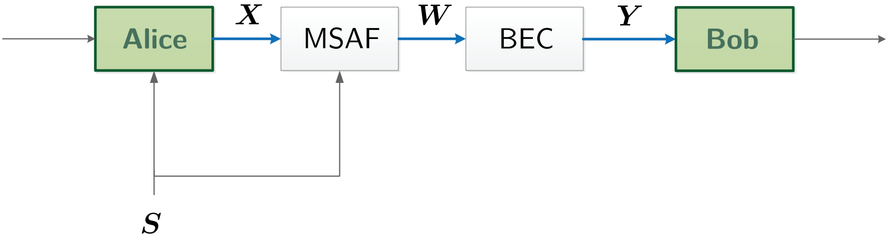
Example of Strict Improvement

Special Thanks to A. Bunin, S. Shamai and P. Piantanida



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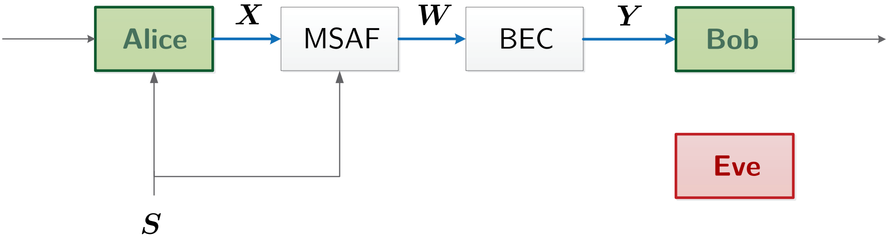

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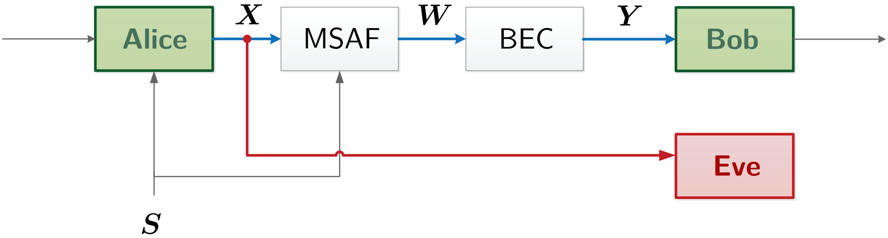

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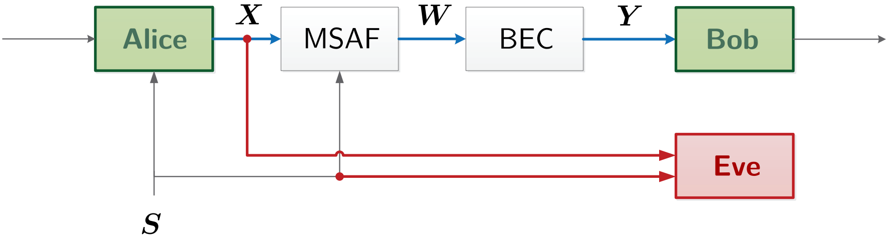

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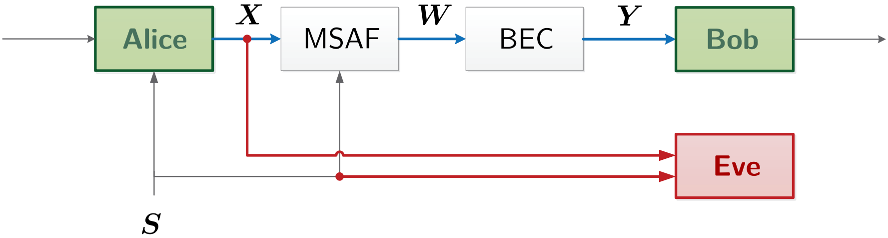

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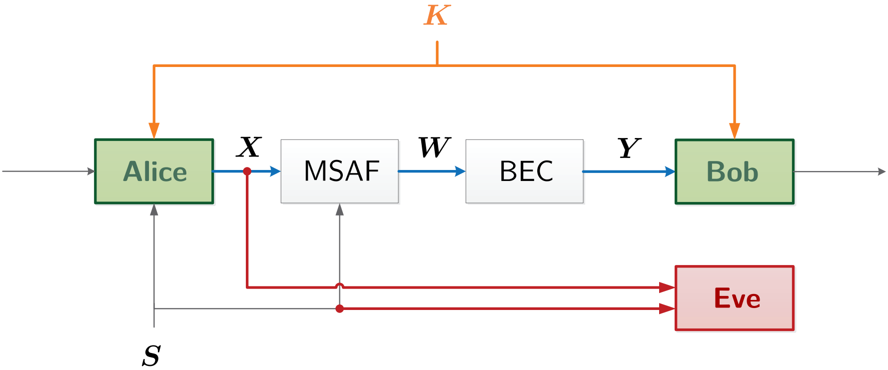

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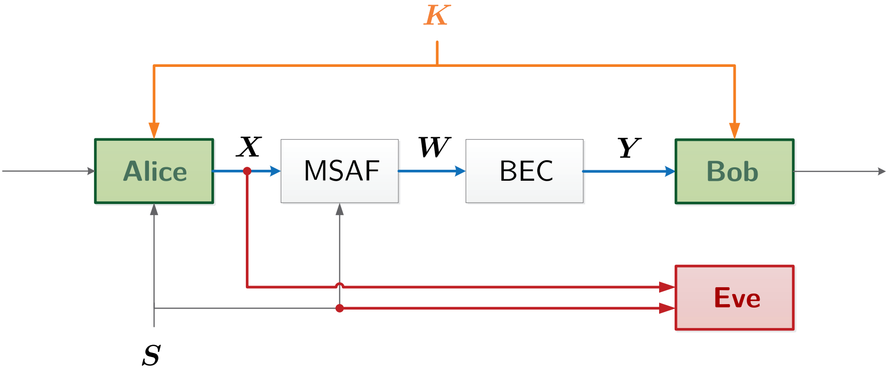

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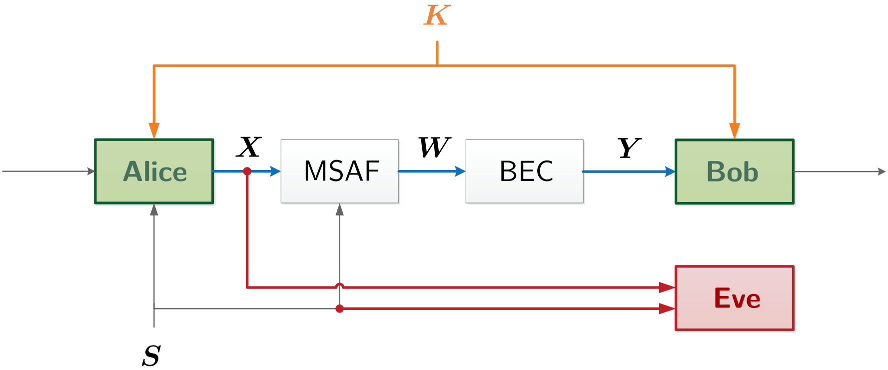

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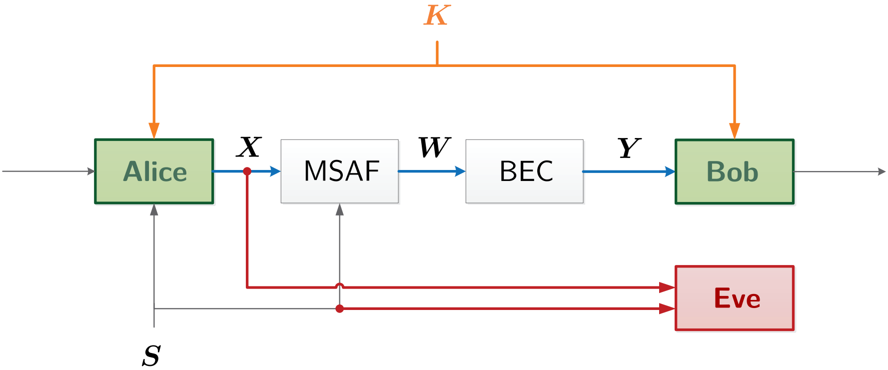

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Thank you!

The Wiretap Channel & The GP Channel - Coding

The Wiretap Channel

Pad nR **message bits** with $n\tilde{R}$ **random garbage bits**.

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