SpookChain

(from AE to OAE)

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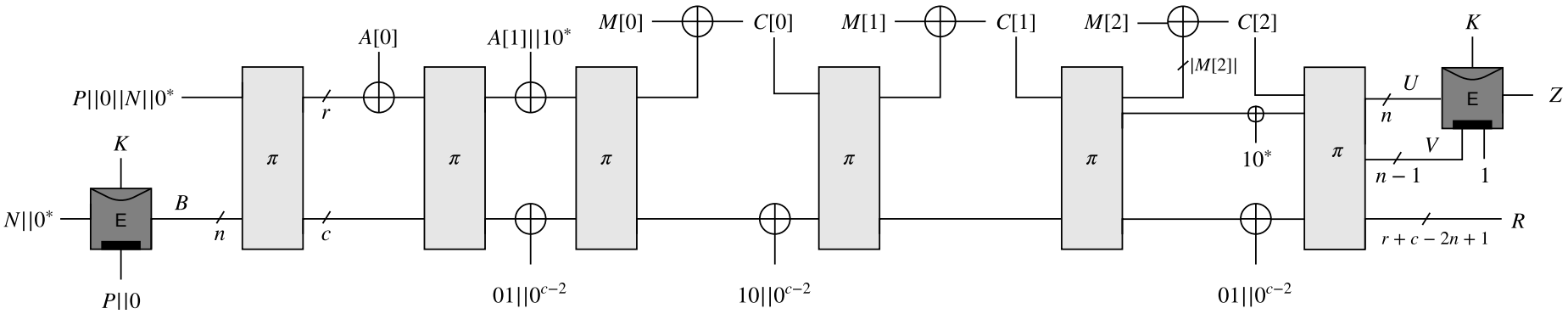
UCLouvain

Louvain-la-Neuve - July 3, 2019

Online(?) Authenticated Encryption

Spook = TETSponge[Clyde,Shadow]



ciphertext $(C[0]C[1]C[2], Z) = \mathsf{Enc}_K^P(N, A[0]A[1], M[0]M[1]M[2])$

- TETSponge: encryption + decryption are already online (S1P)!
- 1-pass decryption gives 2 exclusive choices: KDF + absorb $A[0]A[1]$ +

  $\longrightarrow$ get-&-SEND $M[0]$, absorb $C[0]$ + $\cdots$ + verify Z

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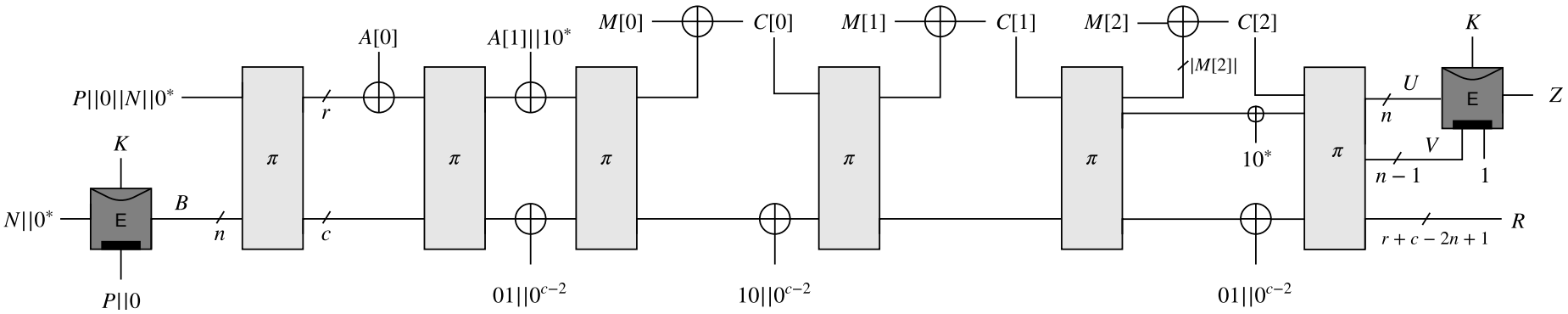

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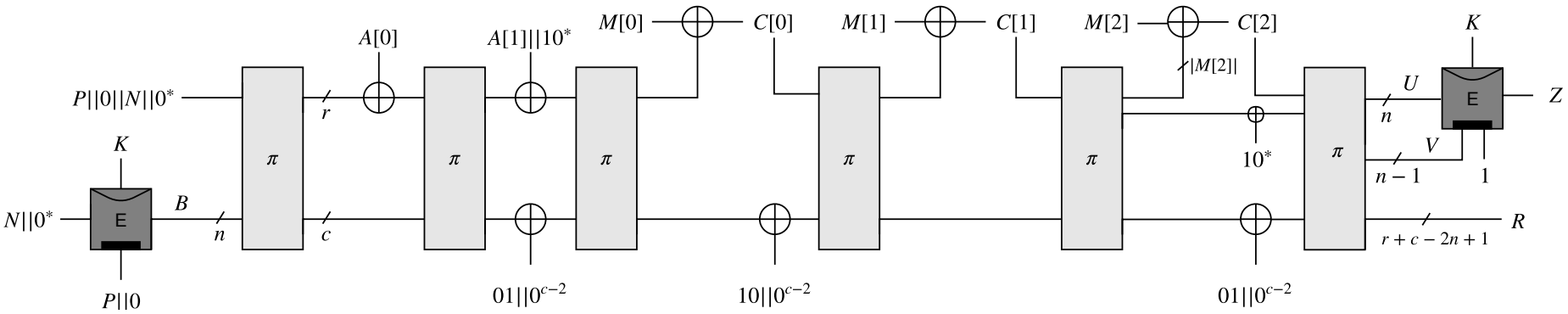

- OAE Goal $\longrightarrow$ security of the stream as a whole

  Somehow, chaining the AE properties of the segments

  Trade-off between space complexity and security level

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  "Partial" misuse resistance & beyond-birthday (black-box)

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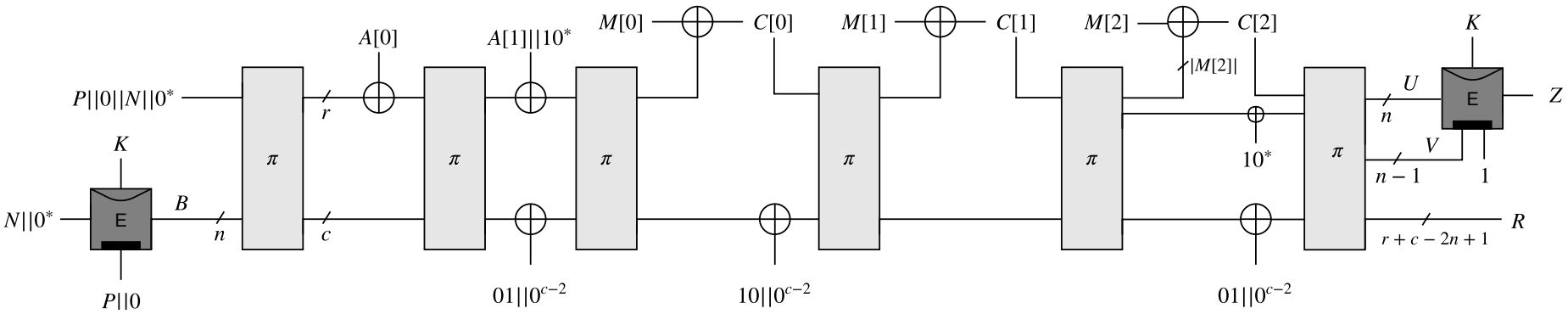

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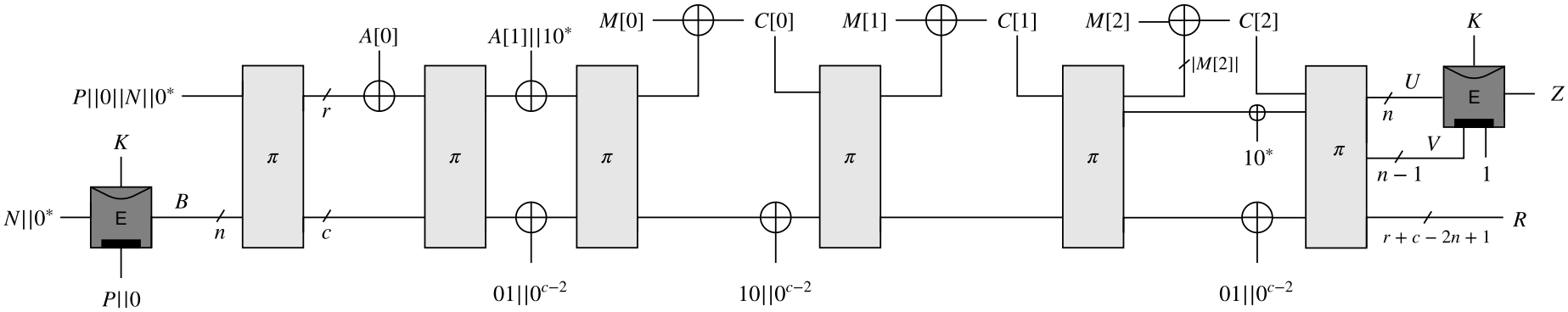

- Bad solution 1 $\longrightarrow$ re-use tags *("not BB-secure")*

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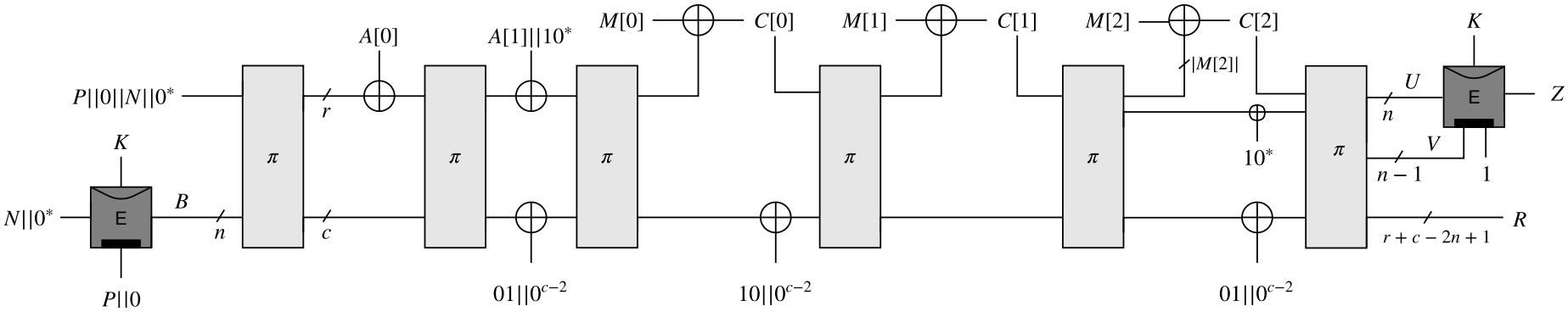

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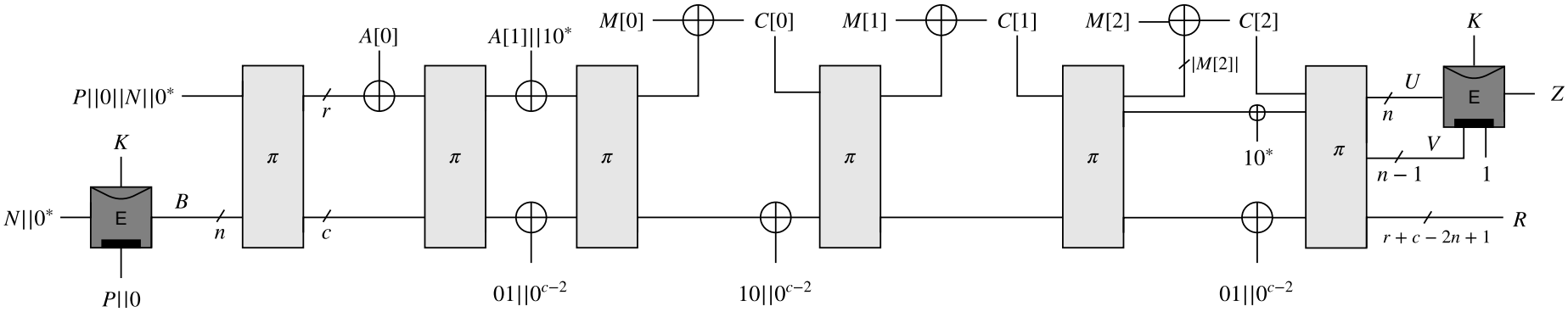

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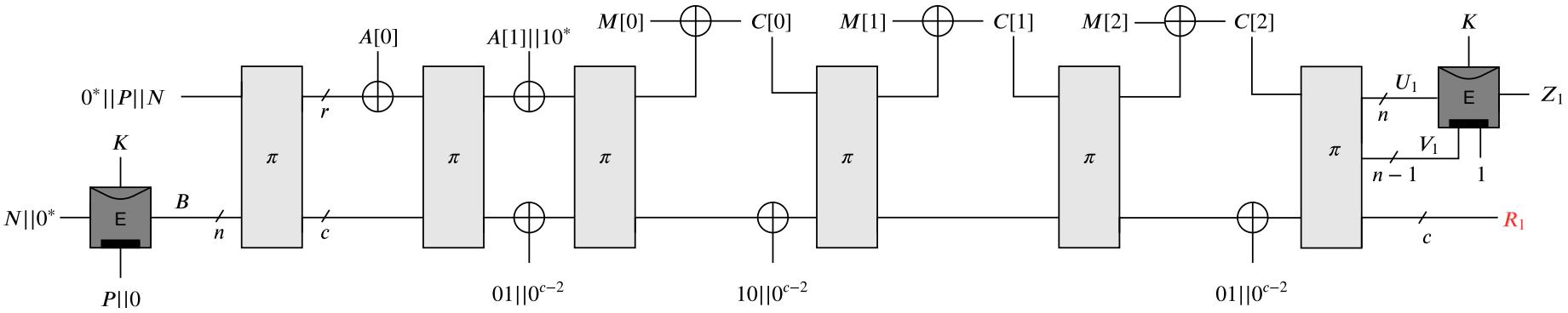
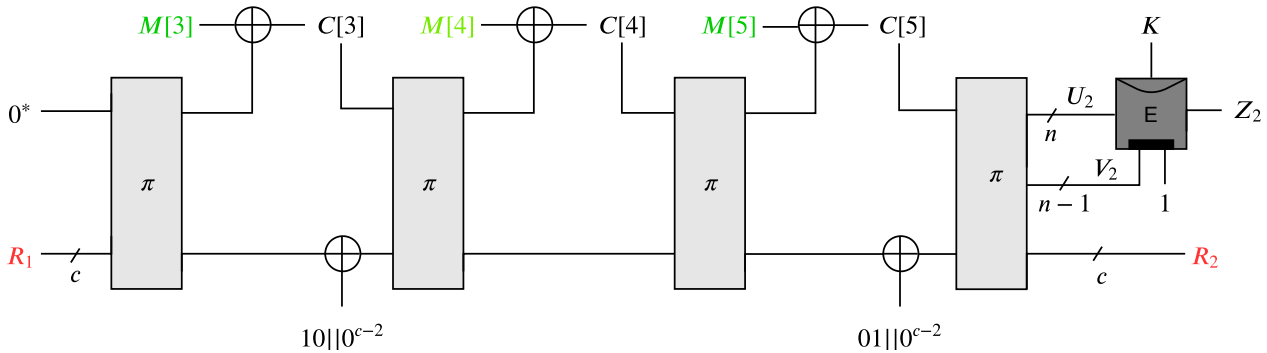


Keep using the last capacity R_1 to chain the next segment $M[3]M[4]M[5]$



Advantage: High security ($c \approx 2n$) + saving TBC-call/segment

(Short) State of The Art

- Bellare-Boldyreva-Knudsen-Namprempre (Crypto'01): "first principle"
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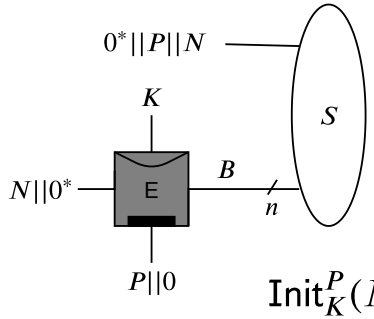
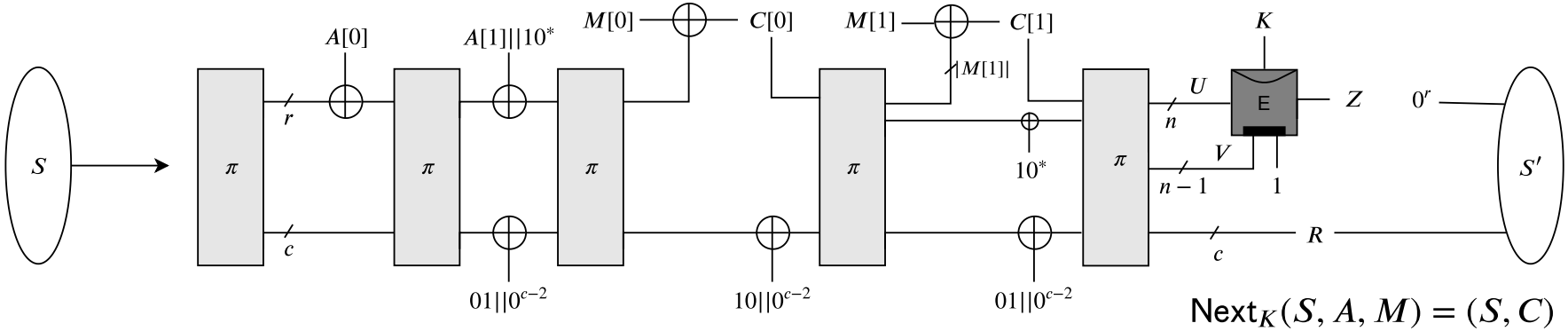


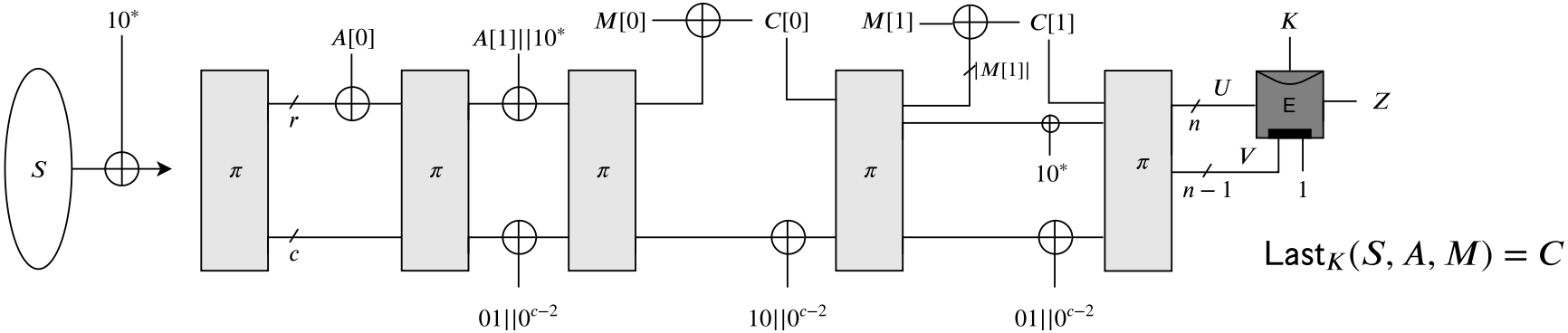
$\text{Init}_K^P(N) = S$

Chaining segmented-AE

Init Next Last



$\text{Next}_K(S, A, M) = (S, C)$



$\text{Last}_K(S, A, M) = C$

Conclusion

New OAE-like Definition

- dOAE in the multi-key setting
- Achievable for **fully** online design
- Room for improvement: black-box & leakage (nOAE, OAE-CIML)

New Construction

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- **Security**: Beyond-Birthday secure + **Efficiency**: 1-TBC per segment
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Questions?