Privacy-Preserving Electronic Transactions

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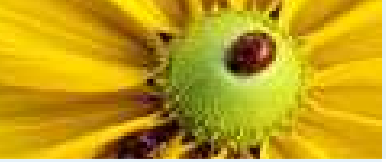
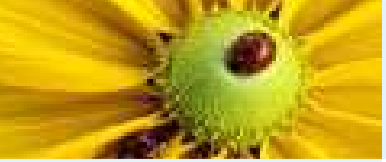
Computer Security Division
National Institute of Standards and Technology

November 2011



Beyond encrypting and hashing.

Some hard problems.



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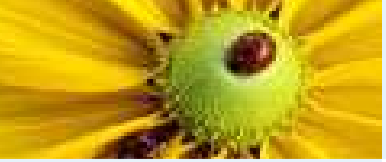

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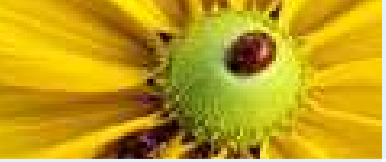

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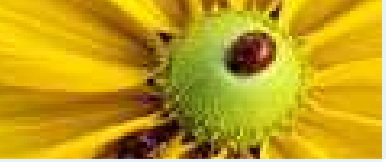

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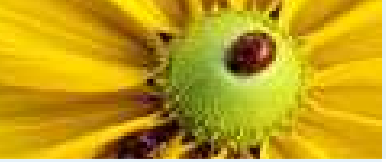
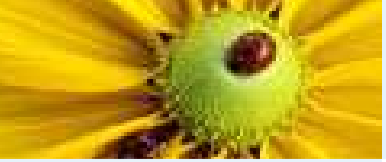
- and much more ...



Problem abstraction

- A set of actors with private inputs would like to compute a function of these inputs.



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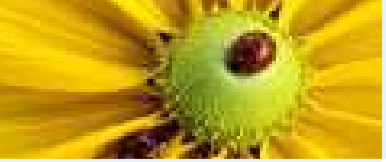

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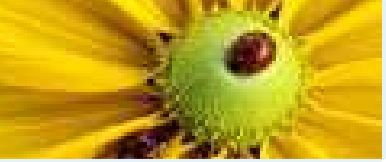

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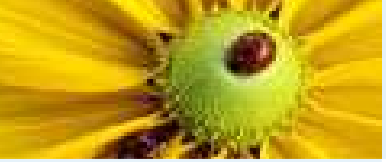
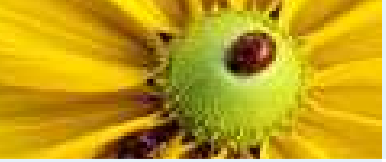
SECURE MULTI-PARTY COMPUTATION.



Milestones

- Danish sugar beet auctions.



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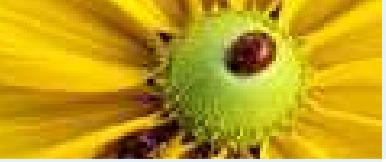

Milestones

- Danish sugar beet auctions.
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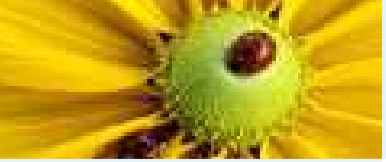
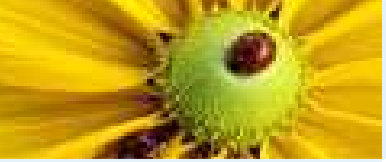
- IARPA projects.



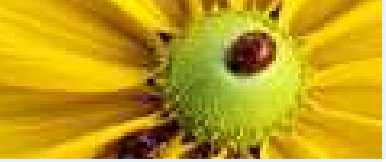
Privacy protection in electronic commerce

- During an electronic transaction, reveal as little as is necessary to complete the transaction.



Privacy protection in electronic commerce

- During an electronic transaction, reveal as little as is necessary to complete the transaction.
- Make your transactions unlinkable to you and to each other.

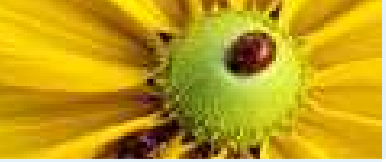


NATIONAL STRATEGY FOR TRUSTED IDENTITIES IN CYBERSPACE

Enhancing Online Choice, Efficiency, Security, and Privacy

APRIL 2011

THE WHITE HOUSE
WASHINGTON



Example: majority of three

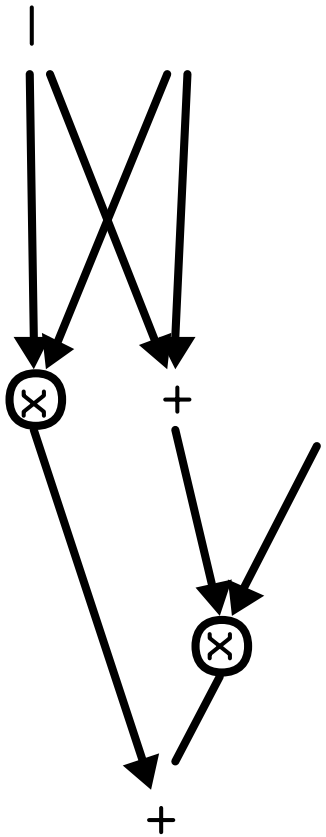
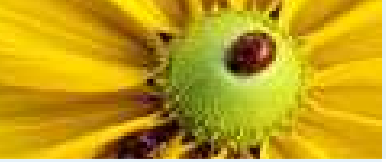
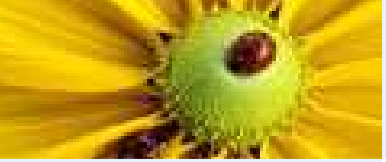


Figure 1: The problem reduces to providing valid bit commitments for each of the wires of the circuit and opening the output.



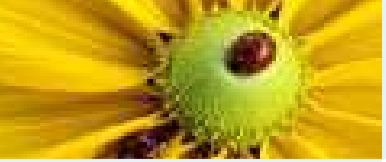
The bottleneck

- Multiplication is hard, addition easy.



The bottleneck

- Multiplication is hard, addition easy.
- Multiplication forces interaction



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- Multiplication is hard, addition easy.
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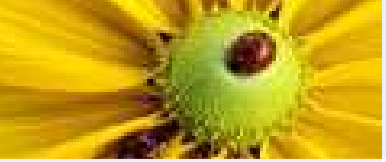
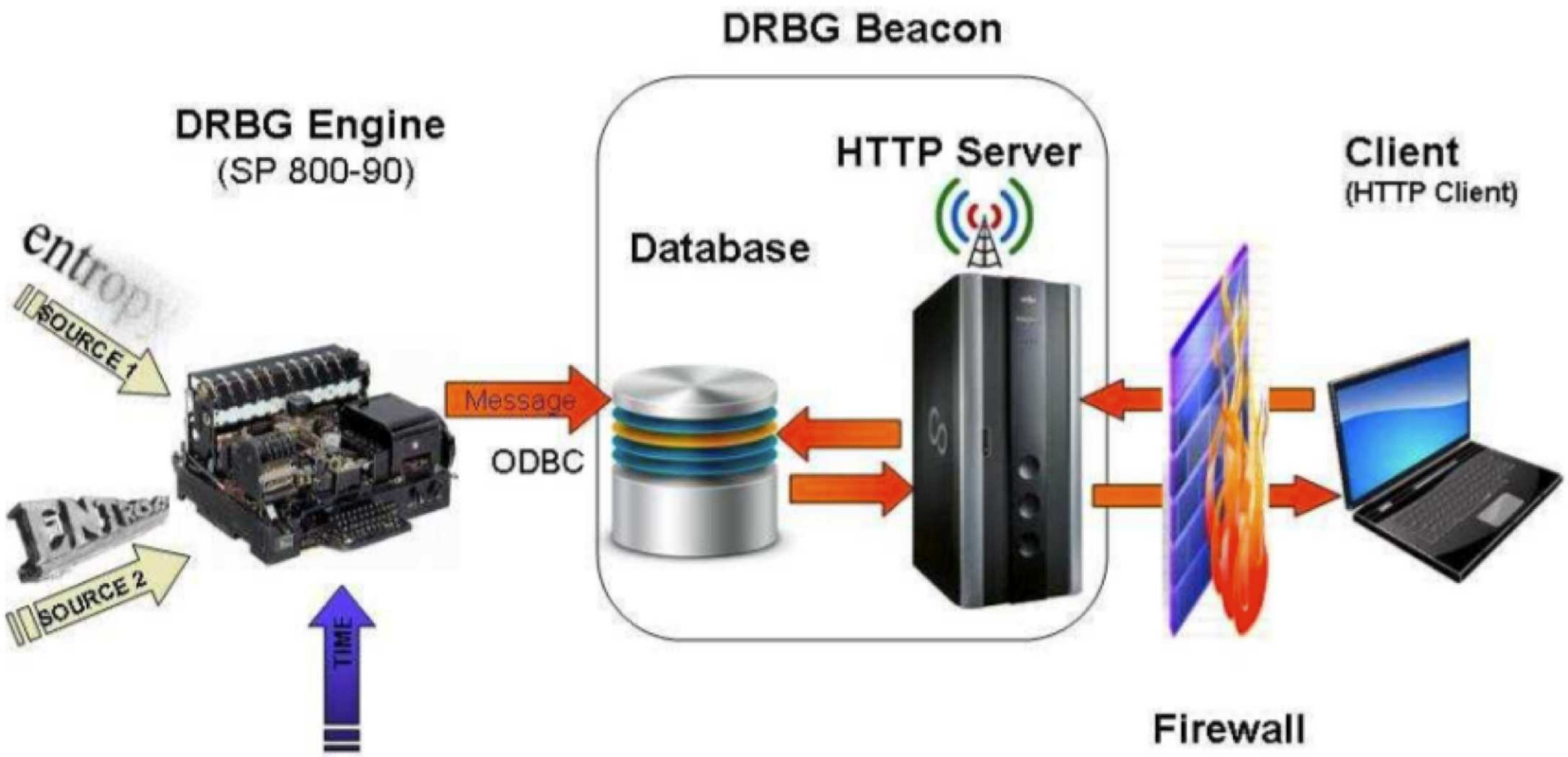
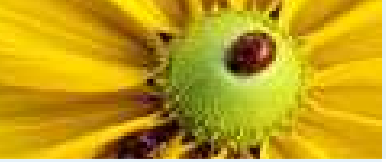


The bottleneck

- Multiplication is hard, addition easy.
- Multiplication forces interaction **in the standard transaction environment**.
- Let's enhance the environment.

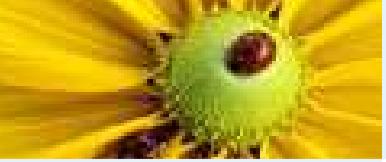
Prototype architecture.





Set certification

- How about an online service that certifies encrypted values have a given property.



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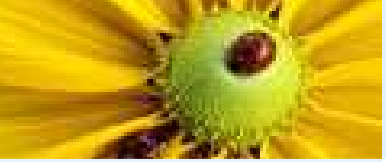
- How about an online service that certifies encrypted values have a given property.
- The property is generic. It does not reveal information about any particular attribute of the user.



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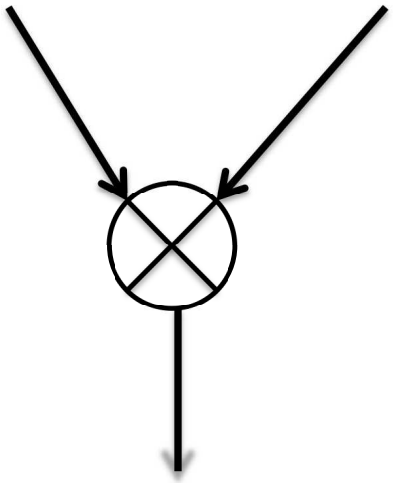

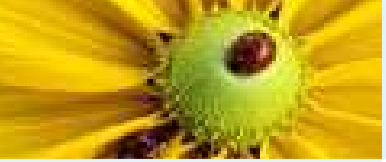

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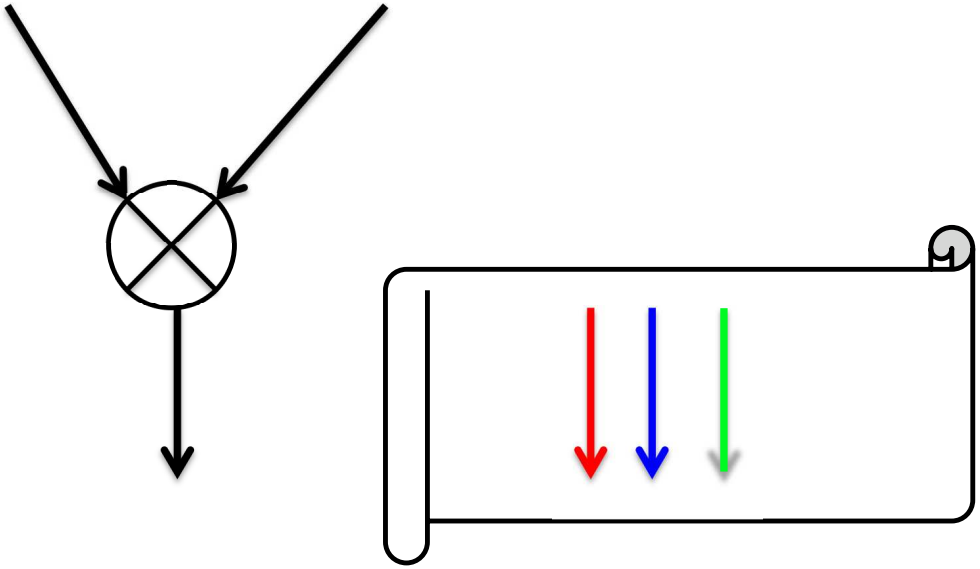
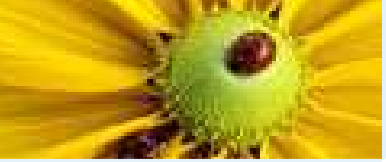


Certify as belonging to the set {000,010,100,111}



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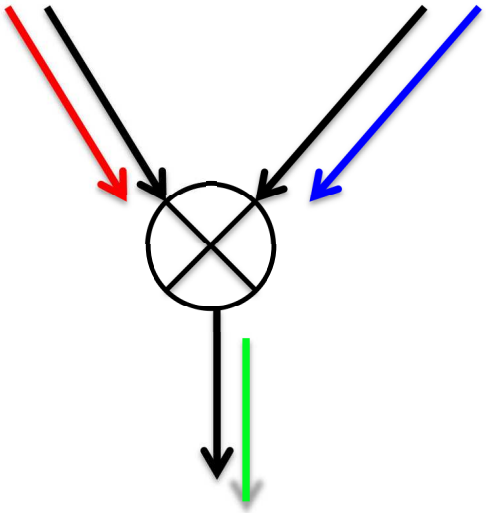

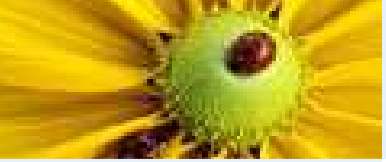

THANK YOU.