CERIAS

the center for education and research in information assurance and security

Dynamic Virtual Credit Card Numbers

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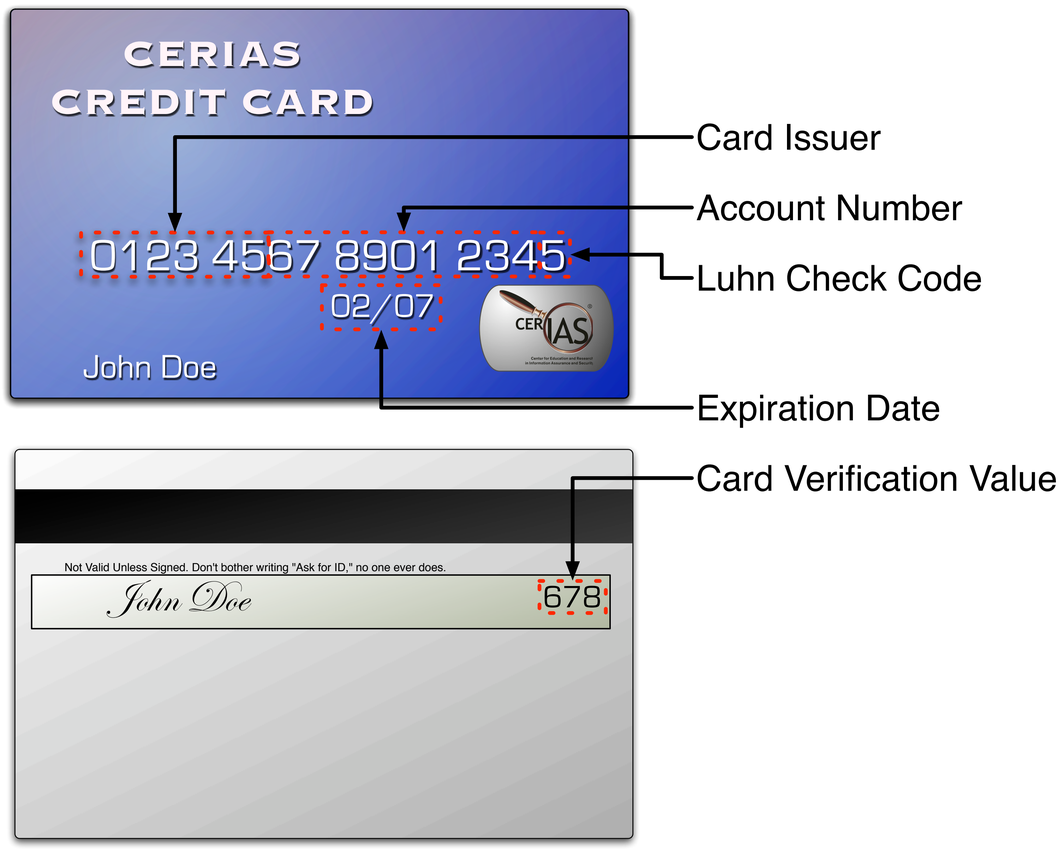
What's the problem?

Credit Card Numbers get Stolen

- Laptop with credit card info for 80,000 DOJ workers stolen
  March 31, 2005
- Hotels.com Credit-Card Numbers Stolen
  June 2, 2006
- Amazon Unit Loses Credit Card Data to Hackers
  March 6, 2001
- 40 Million Credit Card Numbers Hacked
  June 18, 2005



Why do we send our *actual* account number?

Previous Work

- Microsoft Patent 5883810 Transaction-proxy Numbers
  - Implemented by Orbiscom for Discover, CitiBank, MBNA, and PayPal
  - Requires Card Issuer to generate new account number

Can we do this *offline*?

Dynamic Virtual Credit Card Numbers

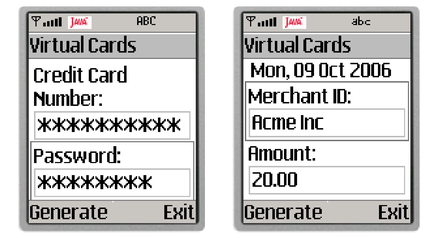
- Calculate Keyed MAC of transaction
- Use MAC in place of account number
- Card Issuer can verify the MAC
- Binds the merchant, date and amount to the account number
- Stolen card numbers loose their value
- Don't need to trust the merchant

Miscellaneous

- We can create multi-use numbers
- Unaffected by collisions in the account space
- Can handle collisions from AVS

Implementation

- Java 2 MicroEdition MIDlet 2.0
- Runs on everyone's favorite ubiquitous computing device: mobile phones



Transaction Parameters

- Expiration Date
- Merchant
- Amount
- Billing Address

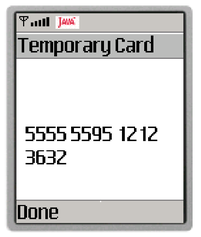
Shared Secrets

- Account Number
- Password

Account & CVV

$$k = \text{SHA1}(\texttt{Account}||\texttt{Password})$$

$$V = \text{HMAC}_k(\texttt{Transaction})$$



Security

- Complete
  - Can always generate an account number
- Sound
  - Can always identify the correct account
- Secure Against Forgery
  - No VCC numbers can be forged
- Secure Against Account Recovery
  - No adversary can gain the *actual* account number

For further details, see our paper in the *Eleventh International Conference on Financial Cryptography and Data Security 2007*

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