Limiting Liability in Electronic Commerce:
The Liability Cover Service

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Problem: Relying on Transactions

- Can I rely on that Adam will stand by his order?
- Will I suffer damage if he does not?

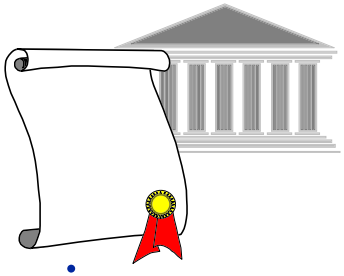
- Will Adam be able to pay?

Adam

Order
Customized PC
à £ 3.500

Retailer
CompBob

Using Public Key Infrastructure



Initially, **CA** identified **Adam**,
certified **Adam's** public key

$sign_{pr\_key\_CA}$ (*pub_key_Adam*, . . .)

- **Can I rely on that Adam will stand by his order?**
- **Will I suffer damage if he does not?**

- **Will Adam be able to pay?**

Adam

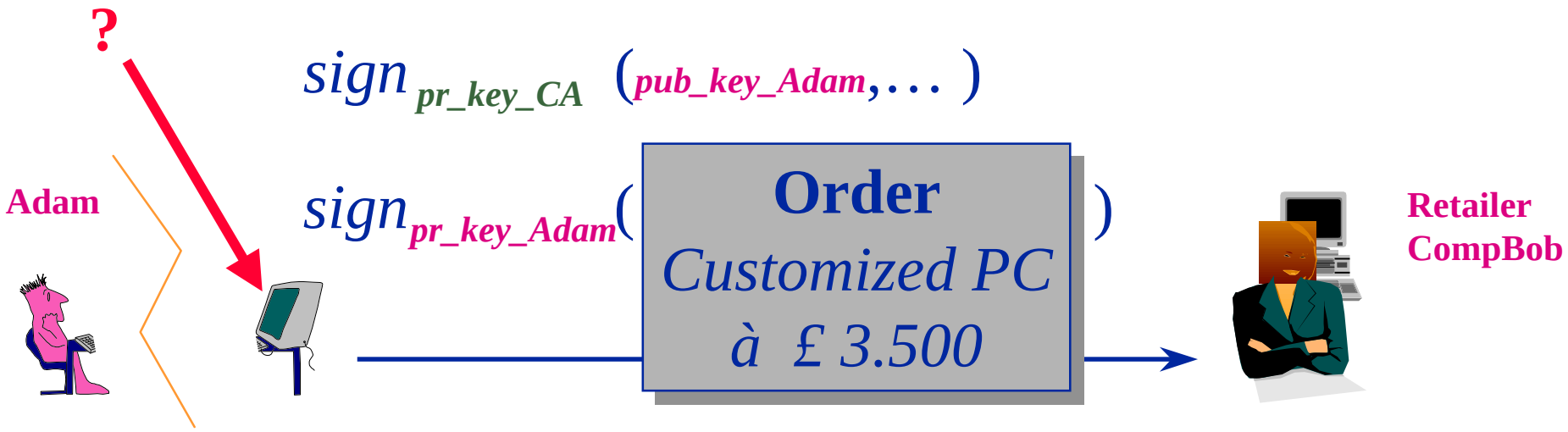
$sign_{pr\_key\_Adam}$ (**Order** *Customized PC à £ 3.500*)

Retailer CompBob

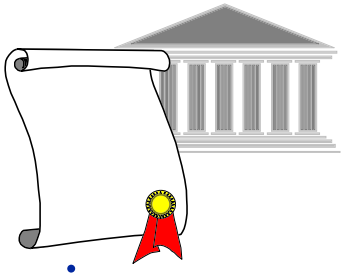
What can go wrong?

Adam's PC creates and signs the order,

but Adam did not authorize it -
at least not ***this order*** to ***this recipient*** with ***this delivery address...***



Assumptions



$sign_{pr\_key\_CA}$ ()

CA is working correctly:
Order was actually signed with ***pr_key_Adam***.

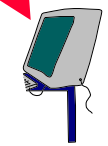
$sign_{pr\_key\_Adam}$( )

Crypto is strong enough, ***pr_key_Adam cannot be broken***

Signature Software, Electronic commerce software are ***completely correct***

?

Adam

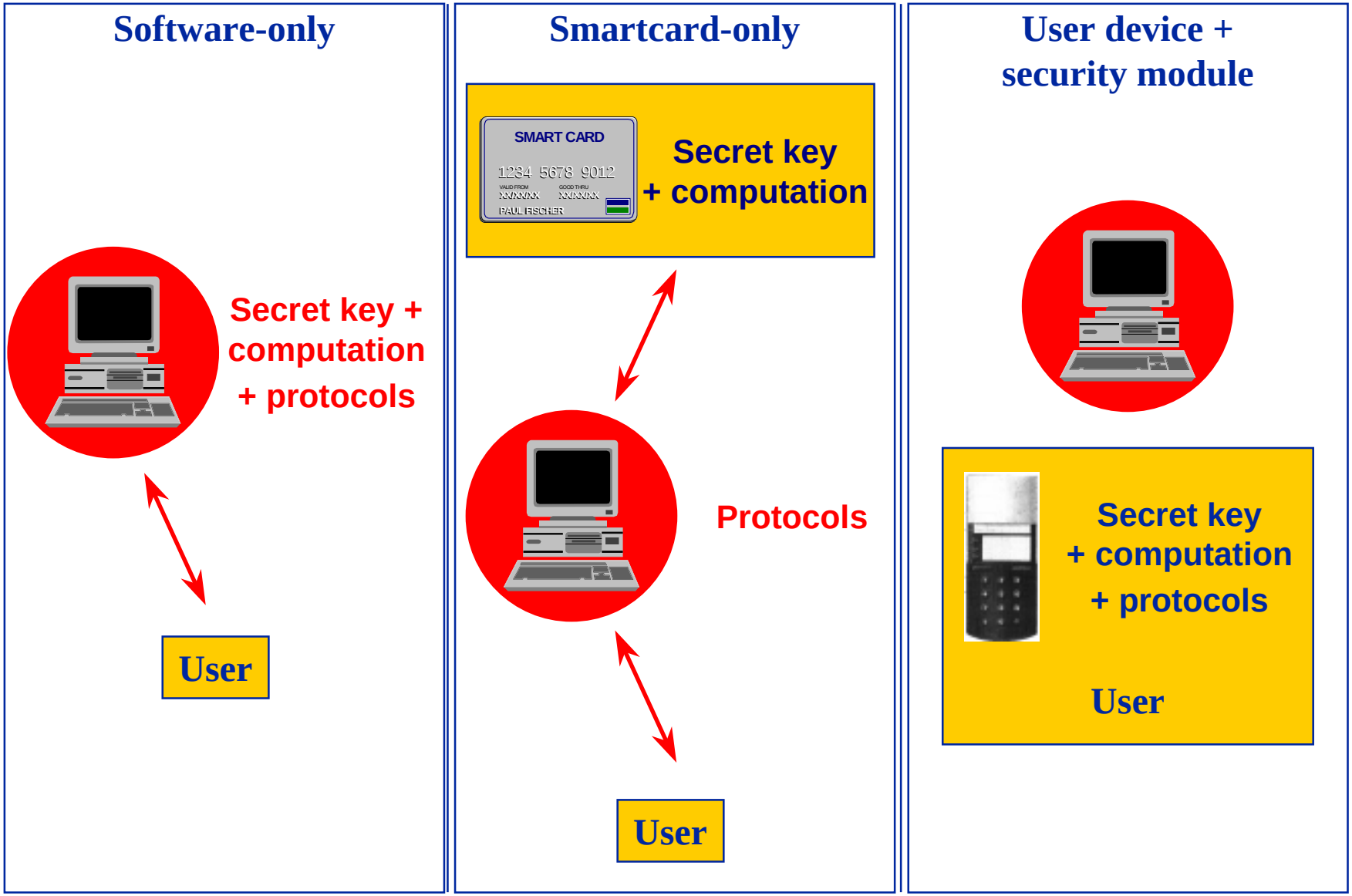


$sign_{pr\_key\_Adam}$(**Order** *Customized PC à £ 3.500*)

Retailer CompBob

SEMPER

Attacks possible through Malicious Software in 'Neighbourhood'



Where are these Threats Relevant?

More relevant

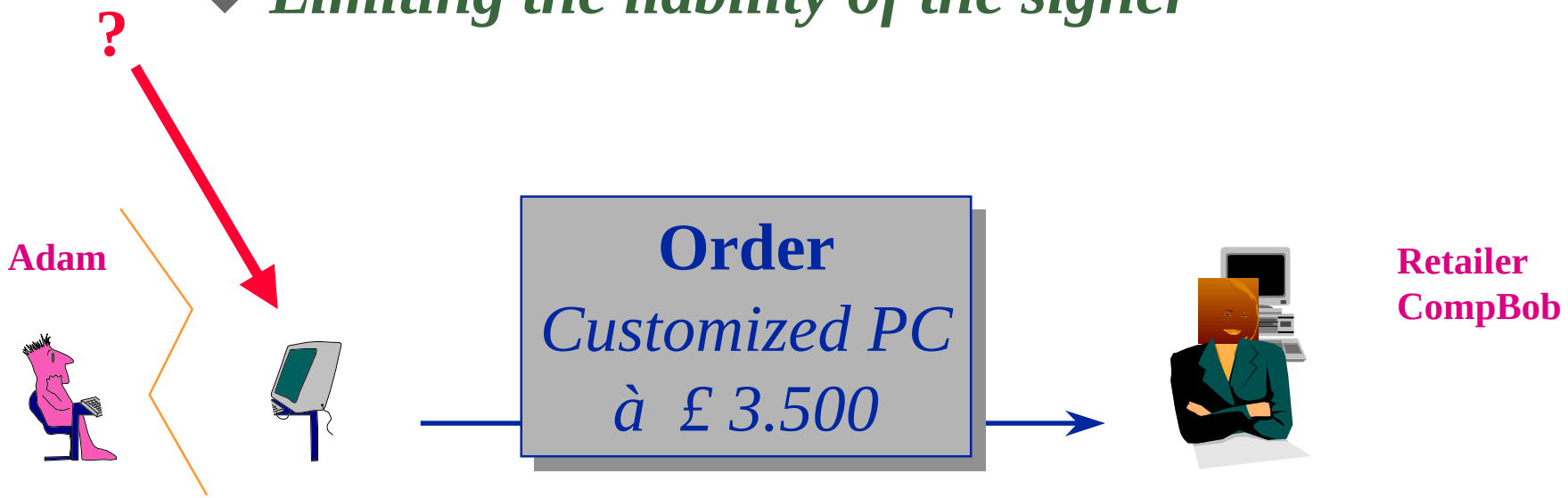
- Well-Established Electronic Commerce Software
  and
- Legal Binding of digital signature with full liability
  and
- Use of signature in open environment, e.g., Internet
  and
- User frequently downloads software from the web
  and
- No secure hardware used

Less relevant

- Application used by few people restricted use
  or
- No legal Binding, or only with liability limit
  or
- Use of signature towards a closed group of recipients
  or
- Use of applications within a closed environment
  or
- Secure Hardware used

Requirements for the Solution

- **Taking into account *impersonating attacks***
- **Use for *non-technical average* Internet user possible**
- **Not forbidding players to *download software***
- ***Non-Deniable Commitment* rather than 'deniable' pre-payment**
- ***Limiting the liability of the signer***



Splitting Signature - Commitment

Non-deniable one-time Commitment

that **Adam** is liable for *£ 500* in case that he denies the signature for **this Order**

$sign_{pr\_key\_Adam}$(**Order** *Customized PC à £ 3.500* ,)

Adam

Retailer CompBob

SEMPER

Splitting: Signature - Commitment

request

response

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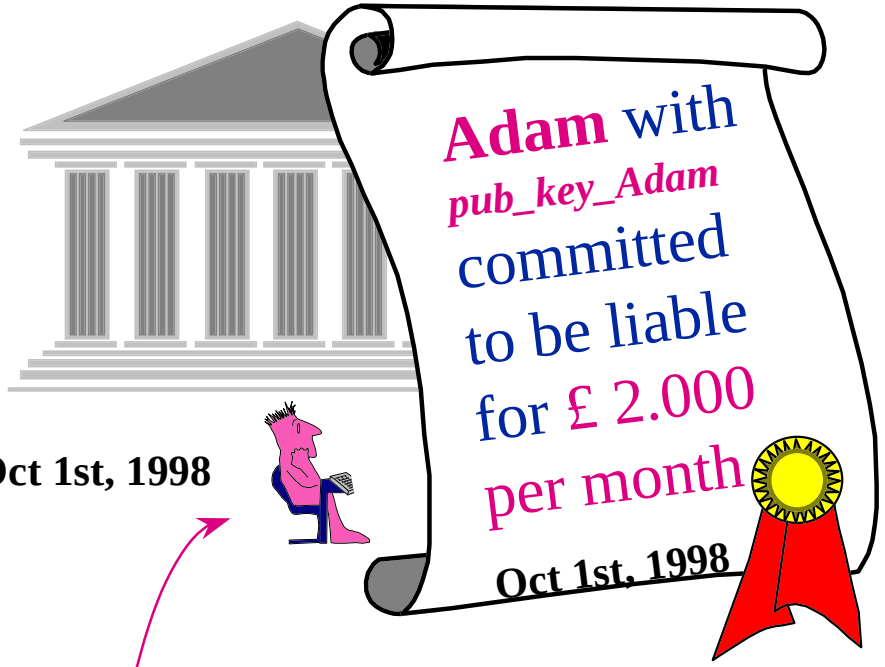
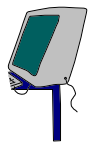
Retailer CompBob

Initialisation





Adam

Retailer
CompBob

Splitting Signature - Commitment

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$sign_{pr\_key\_Adam}$ (**Order** *Customized PC à £ 3.500* ,)

Adam

Retailer CompBob

Cases

Adam *stands* by his signature	Adam *denies* having made this signature	
Order processed as usual Commitment has no function	Adam claims order invalid, but has to pay *£ 500* .	Adam has actually been attacked
	Adam claims order invalid, but has to pay *£ 500* .	Adam ***lies***

Non-deniable one-time Commitment

that **Adam** is liable for *£ 500* in case that he denies the signature for **this Order**

Adam

$sign_{pr\_key\_Adam}$ (**Order** *Customized PC à £ 3.500* ,)

Retailer CompBob

Role of Liability Cover Authority

- **Registration** and **Certification Authority** for *pub_key_Adam*
- **Witness** for Adam's commitments
- **Controls limit** of issued commitments
- Confirms that *pub_key_Adam* was **not revoked**
- **Timestamps** Order information

Non-deniable one-time Commitment

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$sign_{pr\_key\_Adam}$ (**Order** *Customized PC à £ 3.500* ,)

Adam

Retailer CompBob

Types of Liability Cover Service

Type H (high sensitivity)	*Type N (normal sensitivity)*
◆ LCA has full responsibility and **liability for correct user identification** for 'request'- additional means might be used by the LCA	◆ For identity authentication, LCA has **only to check** Adam's **signature** on the '**request**'
◆ Higher values	◆ Lower values
◆ Higher Liability limit	◆ Lower Liability limit

response

request

Adam

Non-deniable one-time Commitment

that **Adam** is liable for *£ 500* in case that he denies the signature for **this Order**

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Content of LCC Request

Minimum:

- **Adam's LCS Service ID**
- **Adam's ID** (which Adam wants to show to beneficiary)
- **hash**[*)] **(**
  - **unique transaction context ID** of Adam,
  - **a beneficiary's ID** (e.g., fingerprint of his pub_key) **)**
- **amount** (e.g., *£ 500*)
- ***other transaction information***, if any
- **Adam's digital signature**

request

Adam

Content of the Commitment (LCC)

- **Version number of issued certificate**
- **Adam's public key** *pub_key_Adam*
- **Adam's ID** (which Adam wants to show to beneficiary)
- **hash**[*)] **(**
  - **unique transaction context ID** of Adam,
  - **a beneficiary's ID** (e.g., fingerprint of his pub_key) **)**
- **amount** (e.g., *£ 500*)
- ***other transaction information***, if any
- **Date/Time**
- **LCA's signature** and **certificate information**

response

Adam

Anonymity

Anonymity can be achieved:

- Signer towards relying party
  by pseudonyms

Retailer
CompBob

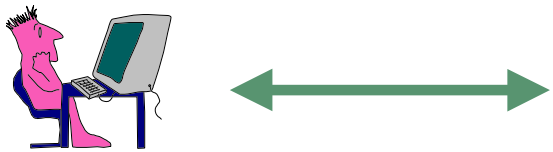
PSAdam

Who sent the order???

- Relying party and transaction towards Authority
  by hashing transaction information is hashed.

?

What kind of business is Adam doing?
With whom?



Commitment Service

- **General Service**, it includes LCS as special case
- **Any possible validity condition** can be specified by Adam (on initialization, or in the ‘request’), e.g.,
  - **“If I withdraw this order”**
  - **“on your birthday”**
  - **“if you give me X in exchange”**
  - **“unconditionally”**
- **Any commitments possible:** Commitment Authority controls a **set of Commitments** (per month), also such like **“10 hours piano tuning”**

Liability Cover Service

- **Special Service Type** of Commitment Service
- **Fixed validity condition:**
  - **“If the signature is claimed compromized”**
- Only **commitments over amounts of money:** LCA controls an **amount of money** (per month), e.g., £ 2.000

Problem: Relying on Transactions

- **Can I rely on that Adam will stand by his order?** ***No.***
- **Will I suffer damage if he does not?** ***No.***

- **Will Adam be able to pay?**

If LCS is performed **by a bank,**
it can be used as a **combined**
Liability Cover Service
and
‘Solvency Service’

Retailer
CompBob

Fit in Legal Framework

Separation between:

Order *Customized PC* *à £ 3.500*	**Non-deniable one-time Commitment** that **Adam** is liable for *£ 500* in case that he denies the signature for **this Order**
Signature	**Undeniable Commitment**

enables **Agreements** regulating scope, validity and liability limit of signatures

Validity and Scope of Signature can be restricted to

- validity only within the **conditions specified in an agreement** (e.g., ***SEMPER Electronic Commerce Agreement***)
- validity only if **not denied**

An **Undeniable Commitment** might satisfy the relying party, if signature is denied

General Limit, Partner specific Limit, Liability Cover Limit

only relevant for compromised signature

commitment always issued on request, normally not due

£ 2000

£ 1000

£ 0

Unspecific limit (fix)

Partner-specific limits (fix)

Liability Cover Service limit (monthly)

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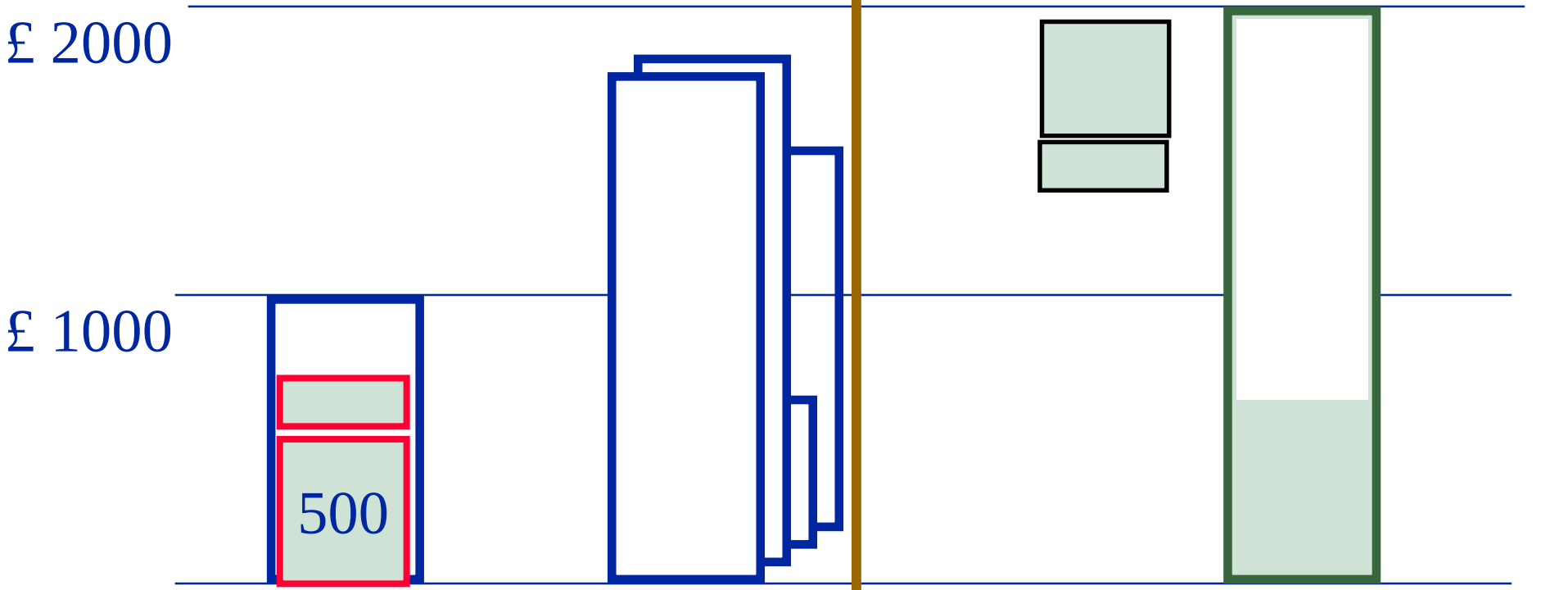

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SEMPER

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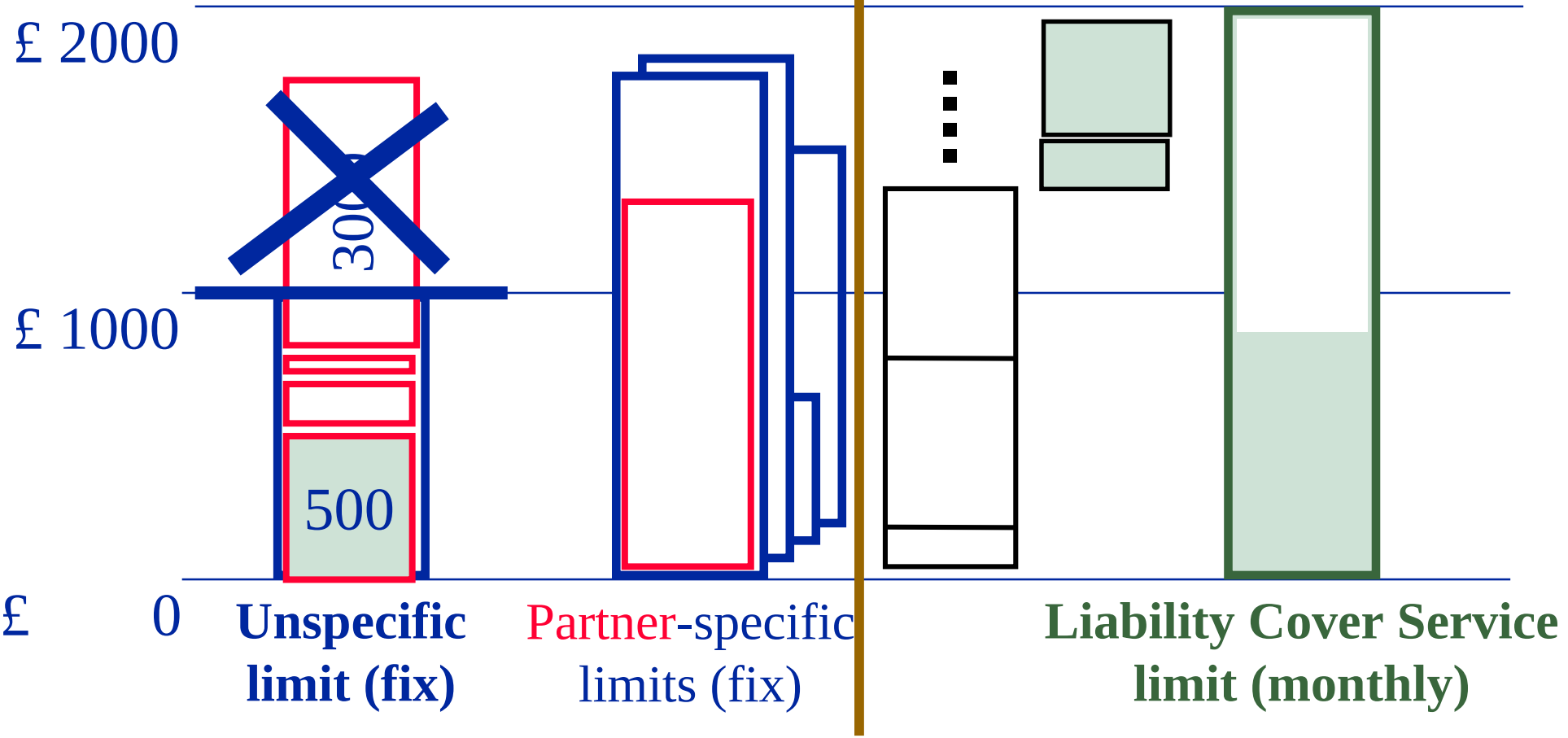

Benefits of Commitment Service

- Enables **Separation**

Order
Customized PC
à £ 3.500

Signature

Non-deniable one-time Commitment

that **Adam** is liable for *£ 500* in case that he denies the signature for **this Order**

Undeniable Commitment

- Protects **Relying party** by **enabling undeniable commitments**
- Protects **Signer** by **limiting the issued commitments** in the compromized case, also in case of **Advanced Attacks** which **might not be able to be proven**
- Is the **only existing Multiparty Security solution** for **Open Electronic Commerce** and digital signatures to be performed by the **average non-technical Internet user**, with insecure equipment and using downloaded software