MICROSEC
Számítástechnikai Fejlesztő Kft.

Managing SHA-2 migration

Replacing foundations of a PKI

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e-SZIGNO

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The status of PKI in Hungary

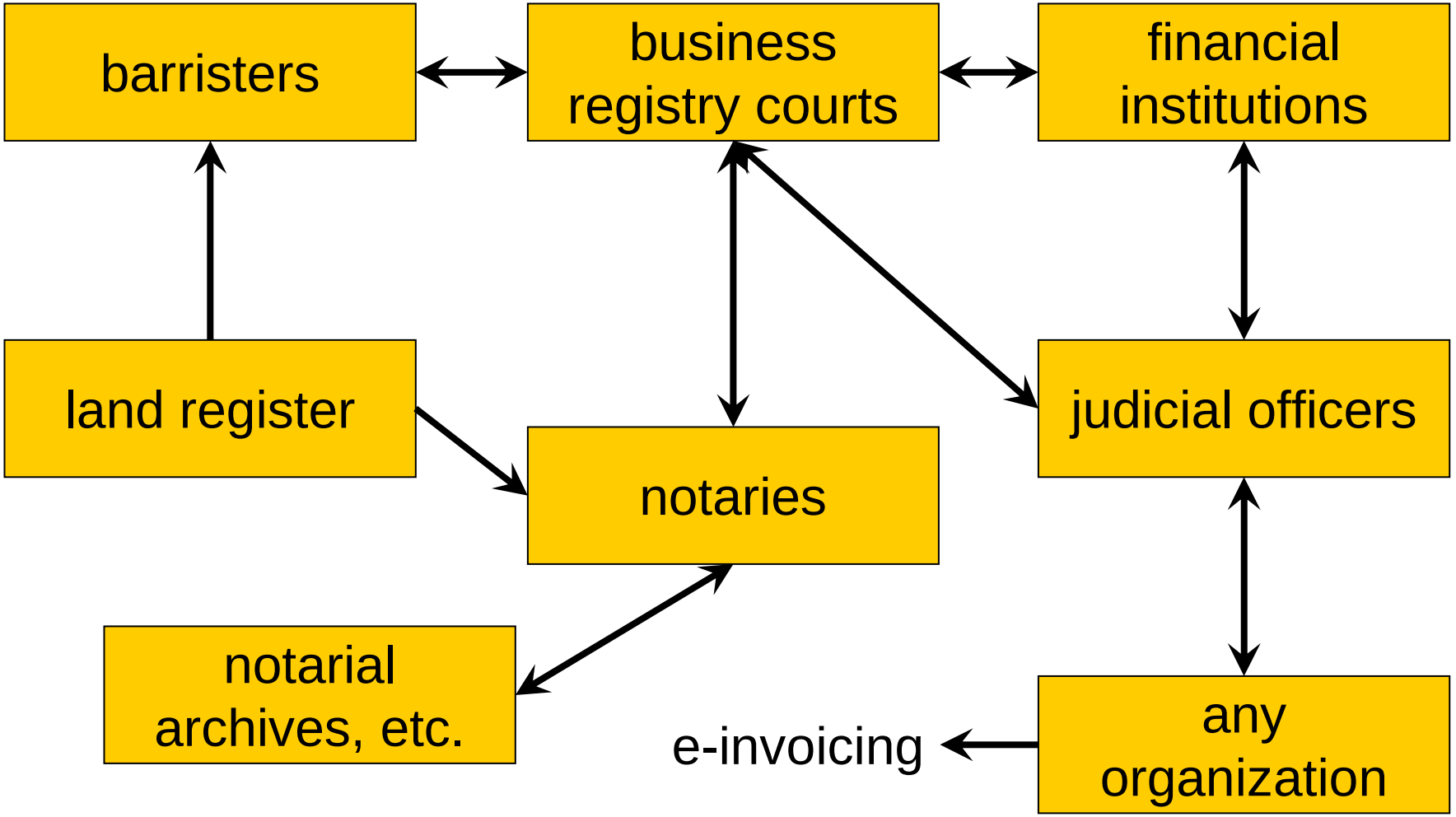
Hungarian e-Signature Act

- Act 2001/31 on electronic signatures
- Defines 4 e-signature „trust services”
  - certification services (issuing & maintaining certificates)
  - timestamping
  - provision of signature creation devices / data
  - long-term archiving
- Each service can be provided as a „qualified” service
  - more rigorous supervision
  - financial liability
  - presumed to be provided „well”, the opposite needs to be proven
- Supervisory authority:
  National Media- and Communications Authority

PKI in Hungary

- Notaries, barristers, judicial officers
  - qualified signatures, ~ 20 000 qualified certificates with SSCD cards
  - electronic business registry system
  - judicial officers and financial institutions
- Electronic invoicing
  - advanced electronic signature + qualified timestamp
- Electronic archiving

Interaction of some major Hungarian PKI apps



Changes in regulations on secure cryptographic algorithms

Regulations on algorithms for e-signatures

- Electronic signatures are based on cryptographic algorithms
- In Hungary, the National Media- and Communications Authority determines which algorithms can be used for electronic signatures
- It is usually based on ETSI TS 102 176-1 (= the ‘ALGO’ paper)

Change in standards for secure algorithms

- ETSI TS 102 176-1, v2.0.0, 2007-11:
  - SHA-1 and RSA with 1024 bit keys are recommended for 1-3 years only
  - a new version will be issued soon (2011 ?)
- NIST SP 800-57:
  - RSA with 1024 bit keys is being phased out
  - CAs must not issue such certs after 2011, and these certs must expire before 2013.
  - Microsoft, Mozilla, etc.

This change affects…

- Certificates
- Electronic signatures
- Timestamps
- Certificate Revocation Lists
- OCSP responses
- etc.

Microsec, our company is a…

- Certification Authority
- Timestamping Authority
- Long-term archiving service provider
- Developer of a signature creation application
- System integrator

We feel responsible for
the correct PKI operations of
a large part of the Hungarian market

Requirements

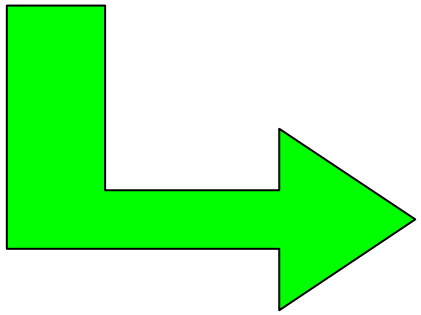
- Existing PKI applications must not break
- The validity of signatures must not be affected; valid signatures must remain valid and verifiable
- End users must not suffer from this change

The solution we followed

Thus, we needed to make changes

Changes in algorithms:

- RSA:
  1024 bits → 2048 bits
- SHA-1 → SHA-256



We modified our…

- CA hierarchy
- Signature creation application
- Timestamping (!)
- Smart cards

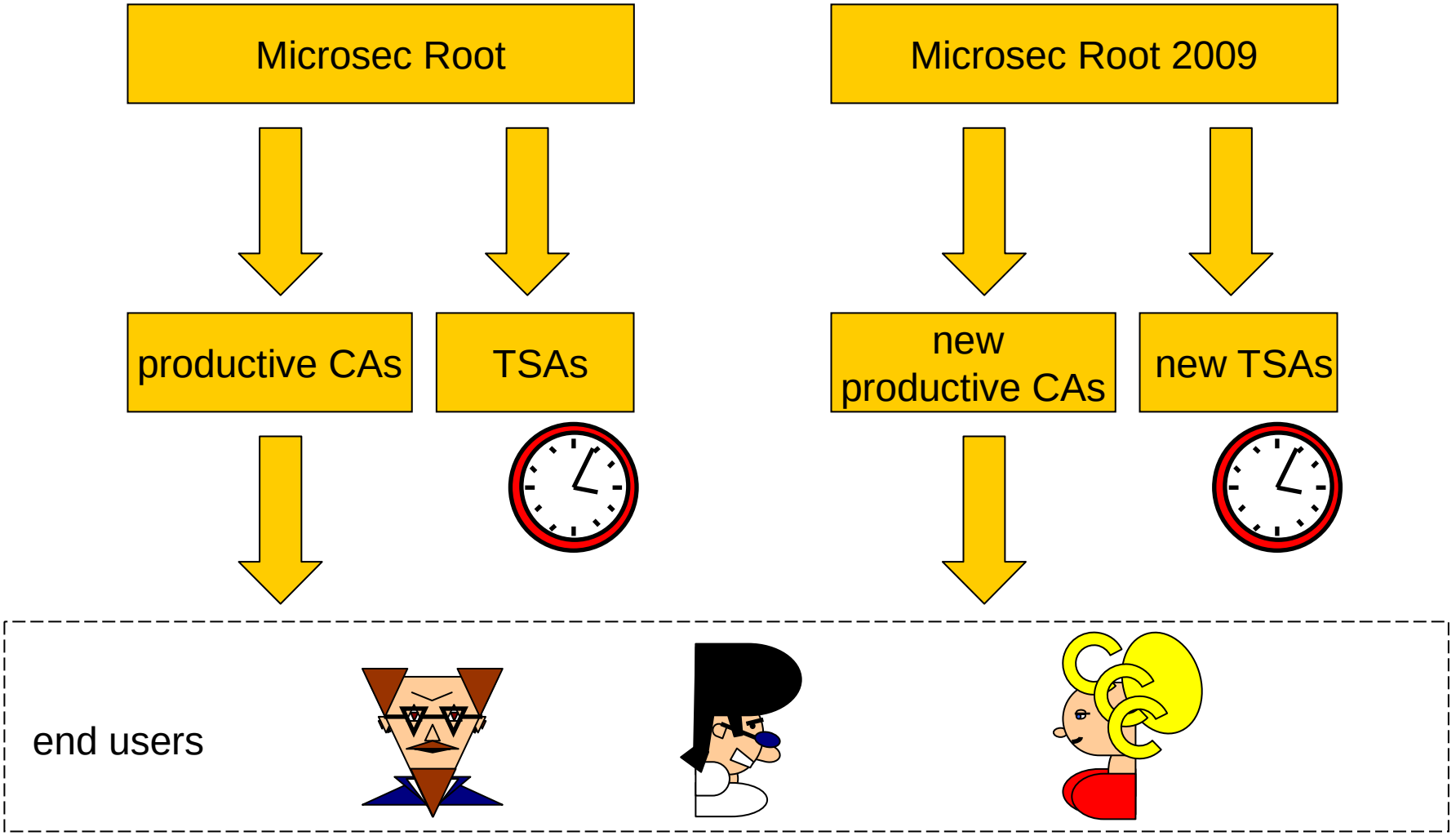
Additional issues:

- Relying parties
- Archival of existing signatures

CA hierarchy (1)

- We decided to start a completely new system, new hierarchy, because…
- It makes it easier for end user to differentiate between new and old signatures.
- We decided not to maintain a hierarchy with mixed algorithms
- In the new hierarchy, all
  - RSA keys are at least 2048 bits
  - hash functions are SHA-256

CA hierarchy (2)



CA hierarchy (3)

- Step 1 (2009): Creation of new CA hierarchy
- Step 2 (2010): Spreading new CA certs
- Step 3 (early 2011): Switch to new CA hierarchy
  - Issue certs from new CA hierarchy only
  - There are still valid certs in the old CA hierarchy
- Step 4 (future): Phase out the old hierarchy

Note: Webserver certs are problematic, as there are still a lot of (unpatched) browsers that do not support SHA-256.

Signature creation application (1)

- Most clients use e-Szignó, our own signature creation and verification application
- We were able to deploy e-Szignó updates via an automatic update mechanism

- Not everyone uses our e-Szignó
- We contacted them via newsletters
- We provide information on our website
- They have to update their software too

Signature creation application (2)

Step 1 (2009):

- allow the acceptance of new signatures, certificates, CRLs, timestamps, etc.
- allow the creation of new signatures

Step 2 (early 2011):

- default to creating new signatures

Step 3 (future):

- reject old signatures (if and only if they were created after they had been outlawed)

Timestamping

- Timestamping is CRITICAL:
- An old signature with a new timestamp will remain OK in the future
- We need to urge everyone to use the new TSAs
- Prerequisites:
  - new CA hierarchy and TSAs ready
  - new CA certs distributed
  - signature creation/verification application distributed

Smart Cards (1)

- Our old SSCD smart cards did not support the new algorithms, but they
  - used a different PIN for signing and for encryption
  - supported PIN pad readers
- We sought new cards with the same properties
- Two new cards were selected
- Currently we need to support three cards in parallel
- All three cards have a different user interface

Smart Cards (2)

- One PIN for signing and another one for encryption
  - there are but a few SSCD cards like this
  - their software support is more than problematic
  - they are handled differently by various applications
- PIN pad readers
  - not all smart card drivers support all PIN pads
  - they support and handle them differently
  - there are a lot of interoperability problems here
- We decided to develop a common user interface
- In most contracts we pay the cost of new cards
- Deployment of new cards…

Relying party applications

- We were able to update our own applications
- Other major relying parties: we contacted them one-by-one and asked them to
  - accept new algorithms
  - accept new CA certs
  - we provided new smart cards for testing
- This takes a LONG time…
- Currently (2011): Most relying parties already accept the new signatures

Archival of signatures

- New signatures are OK, but…
- Old signatures should be
  - timestamped with new timestamps
  - before old algorithms are outlawed
  - XAdES-A signatures should be used
- Long-term archiving (or information preservation) service should be used
- May 2011: New ETSI standards on information preservation service providers
  - 101 533-1: on requirements for IPSP management
  - 101 533-2: on recommendation for auditors of IPSPs

Conclusions

In a nutshell

1. Create the system for new signatures
2. Prepare verifiers to accept new signatures
3. Wait until most verifiers are prepared
4. Make signers create new signatures by default
5. When old signatures are outlawed, make verifiers reject them

Conclusions

- The migration is mostly done
- Our clients create new signatures
- The new signatures work, relying parties are able to accept them
- End users did not have dramatic experience

- Phasing out old crypto algorithms and introducing new ones instead in a PKI
  - is a HUGE change,
  - it requires a LOT of work and
  - takes a LONG time, it cannot be done quickly

Thank you very much! ☺