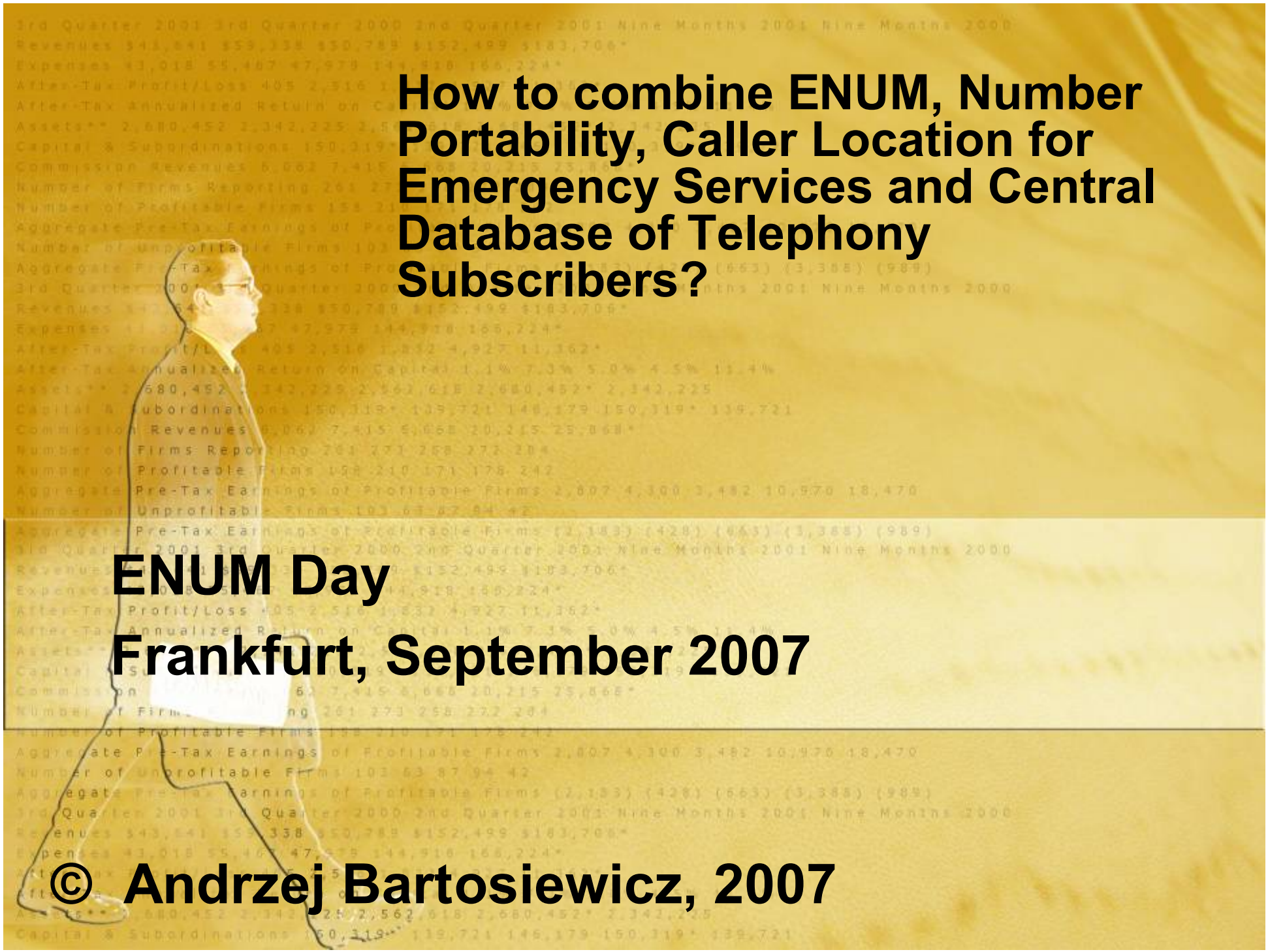

How to combine ENUM, Number Portability, Caller Location for Emergency Services and Central Database of Telephony Subscribers?

ENUM Day

Frankfurt, September 2007

abbreviations

ACN:	**Automotive Crash Notification**
DDDS:	**Dynamic Delegation Discovery System**
EBL:	**ENUM Branch Location**
ECC:	**Emergency Control Center**
EPP:	**Extensible Provisioning Protocol**
ETSI:	**European Telecommunications Standards Institute**
IP:	**Internet Protocol**
MLP:	**Mobile Location Protocol**
NAPTR RR:	**The Naming Authority Pointer DNS Resource Record**
NP:	**Number Portability**
NPDB:	**Number Portability Database**
NRA:	**National Regulatory Authority**
PSAP:	**Public Safety Answering Point**
PSTN:	**Public Switched Telephone Network**
URI:	**Uniform Resource Identifiers**
VPN:	**Virtual Private Network**
XML:	**Extensible Markup Language**

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current situation in Poland

- no central database for Number Portability; no ACQ, QoR implemented
  - expectations to have ACQ for NP,
- no central database for caller location of emergency (112) calls:
  - plans to improve the emergency service (emergency control centers “development” etc),
  - central database for caller location in case of emergency,
- no Infrastructure ENUM implemented,
- problems with existing nationwide telephone directory enquiry.

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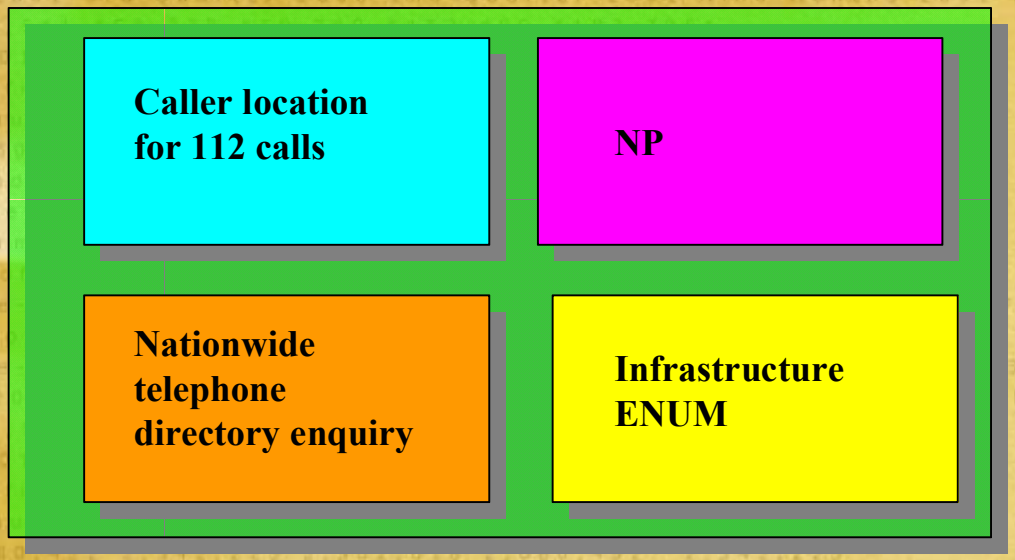
idea…

- to implement one centralized system to support:
  - Number Portability for ACQ method,
  - caller location service,
  - nationwide telephone directory enquiry,
  - Infrastructure ENUM for Telcos,
  - if possible, facilitate User ENUM.



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caller location (112 cals)

112: legal side

Poland (as example of the regulations in EU):

- **Telecommunications Law**
  July 16, 2004 art.78 & 169
- **National Emergency Medical Service (EMS) Law**
  September 8, 2006 art.25 & 28

EU:

- **Directive 98/10/EC "the application of open network provision (ONP) to voice telephony and on universal service for telecommunications in a competitive environment"**
- **Directive 2002/22/EC "universal service and users' rights relating to electronic communications networks and services"**
- **Commision Paper on the current situation regarding the single European emergency number 112**
  DG INFSO/B2 COCOM06-31 (October 11, 2006)

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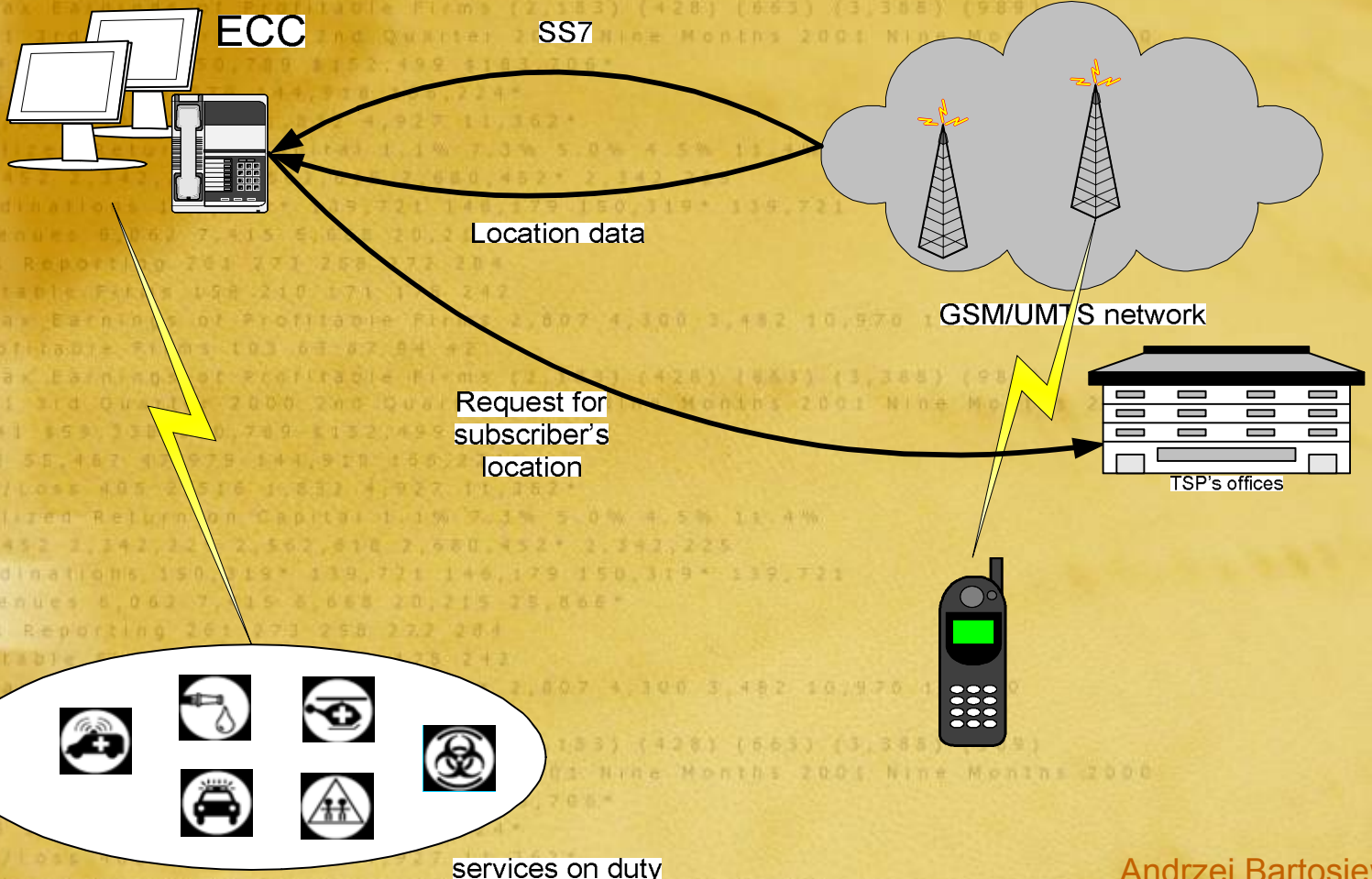
112: data flow (existing situation)



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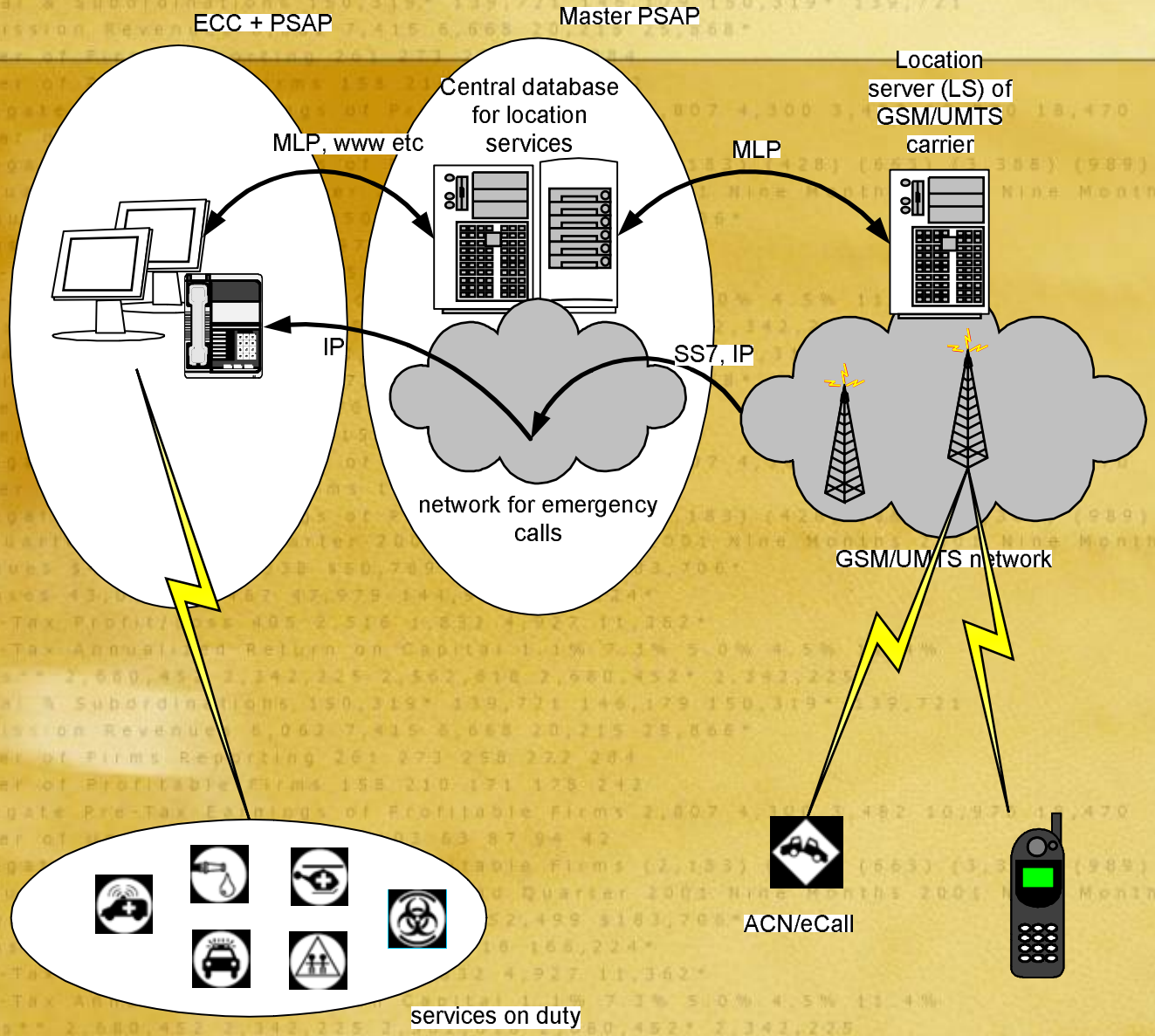
112: data flow *(optimal)*



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requirements for the central location system/database (112)

- XML interface to the system:
  - MLP (ETSI TS 102 164) based on XML (for geo-location data and subscribers' postal addresses),
  - EPP or E.115 for accessing subscriber's data (postal address for mobile users and network termination point address for PSTN),
- access for actors: carriers + emergency services on duty,
- requirements for security: secure data flow (based on SSL, IPsec), strong authentication (using digital certificates), data accuracy, etc.,
- requirements for reliability and high availability, "always-on" approach: high % of availablity (99,999% "five 9s") + (optimal) physical layer based on fiber-optic + backup links,
- application performance and scalability required: in case of increase of subscribers (customers for eCall as example).

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types of data to be stored and managed

- for PSTN subscribers:
  - network termination point (postal address).
- for nomadic users:
  - postal address provided by the user in the end-user panel.
- for mobile subscribers:
  - geographical location of the mobile device (phone),
  - postal address of the subscriber (for post-paid users and registered pre-paid users).

methods for data access

- data transfer from mobile to centralized system:

	daily update	PUSH method	PULL method
geographical location	no	yes	yes
postal address of the subscriber	yes	yes	yes

- data transfer from PSTN, nomadic operator to centralized system:

	daily update	PUSH method	PULL method
postal address or network termination point address	yes	yes	yes

"push" versus "pull"

112

EUROPEAN COMMISSION
Directorate-General Information Society and Media

Communications Services
Implementation/Committees

Brussels, 11 O
DG INFSO/B2

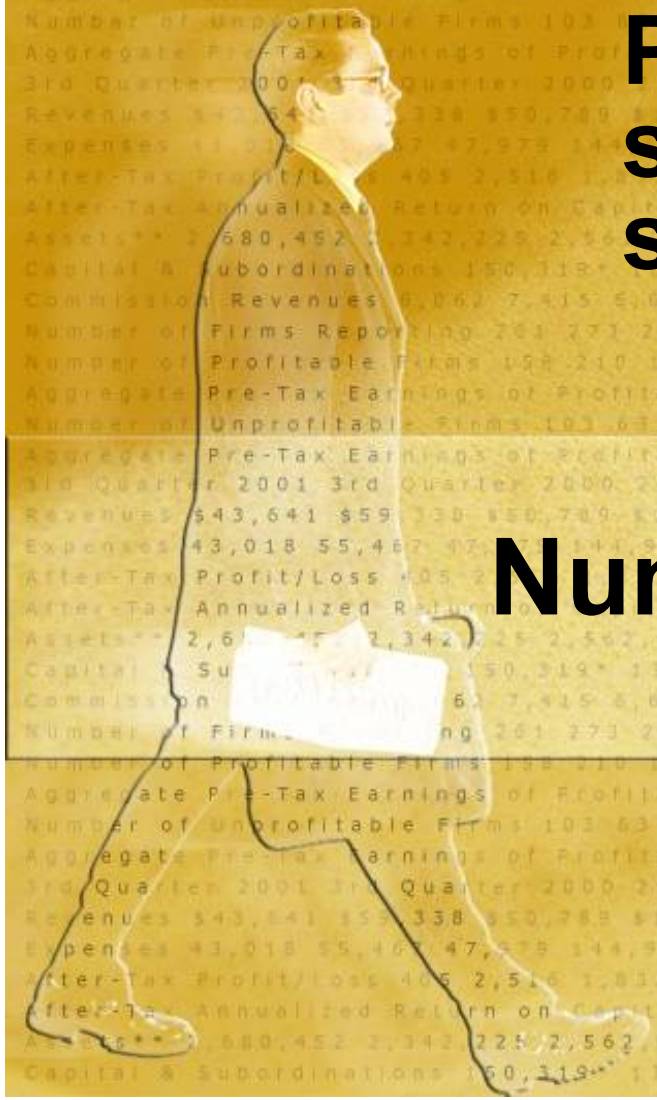
COCOM06-31

The Commission believes that best practices and certain more advanced aspects of caller location information should now be discussed. For emergency services, speed and accuracy of caller location information are two very important attributes. Valuable time is saved when the caller location is automatically "pushed" to the emergency centre by the network operator. A less sophisticated method requires the PSAP to ask the network operator for the caller location, which can take several minutes ("pull").

As use of "pull" technique potentially prolongs the response time and limits the possibilities for introduction of new and innovative solutions, such as eCall, the Commission recommended in July 2003 that Member States should implement the "push" method. Article 4 of the Commission Recommendation states that *"for every emergency call made to the European emergency call number 112, public telephone network operators should, initiated by the network, forward (push) to public safety answering points the best information available as to the location of the caller, to the extent technically feasible. For the intermediate period up to the conclusion of the review as referred to in point 13 below [i.e. Member States are to report to the Commission on the status of implementation by the end of 2004], it is acceptable that operators make available location information on request only (pull)."* It is therefore clear that the "pull" technique is only accepted throughout an interim period following which the availability of "push" technique must be ensured.

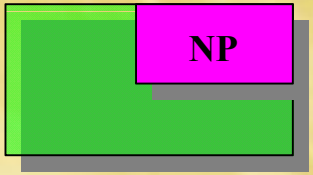
NP

why not integrate Number Portability Database with subscriber's location service?



Number Portability

legal side



Poland (as example of the regulations in EU):

- **Telecommunications Law**
  July 16, 2004 art.78 & 169
- **"Customer's rights in public telephony" – decree**
  March 1, 2006.

EU:

- **Directive 2002/22/EC "universal service and users' rights relating to electronic communications networks and services".**

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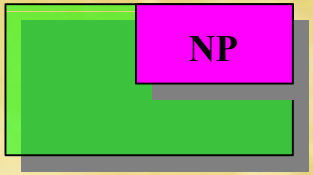
requirements for number portability database (NPDB)



- full support for numbers' porting process (number porting, exceptions handling, timeouts etc.),
- interface to the system: probably based on XML,
- access for actors: carriers + NRA,
- support for ACQ and QoR porting method,
- requirements for security: secure data flow (based on SSL, IPsec), strong authentication (using digital certificates), data accuracy, etc.,
- requirements for reliability and high availability: high % of availability (99,999% in some cases – depends on the national regulations/decisions) ,
- application performance and scalability required: in case of increase of subscribers willing to port the number (see the case in Spain two years ago…), Fix to Mobile portability etc.

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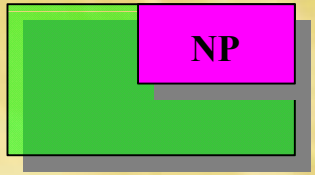
why not integrate?



- for location services, PSAP/ECC must keep information which carrier is responsible for particular number
- solution for <u>on-line integration</u> of NP and 112 location is (anyway) required…

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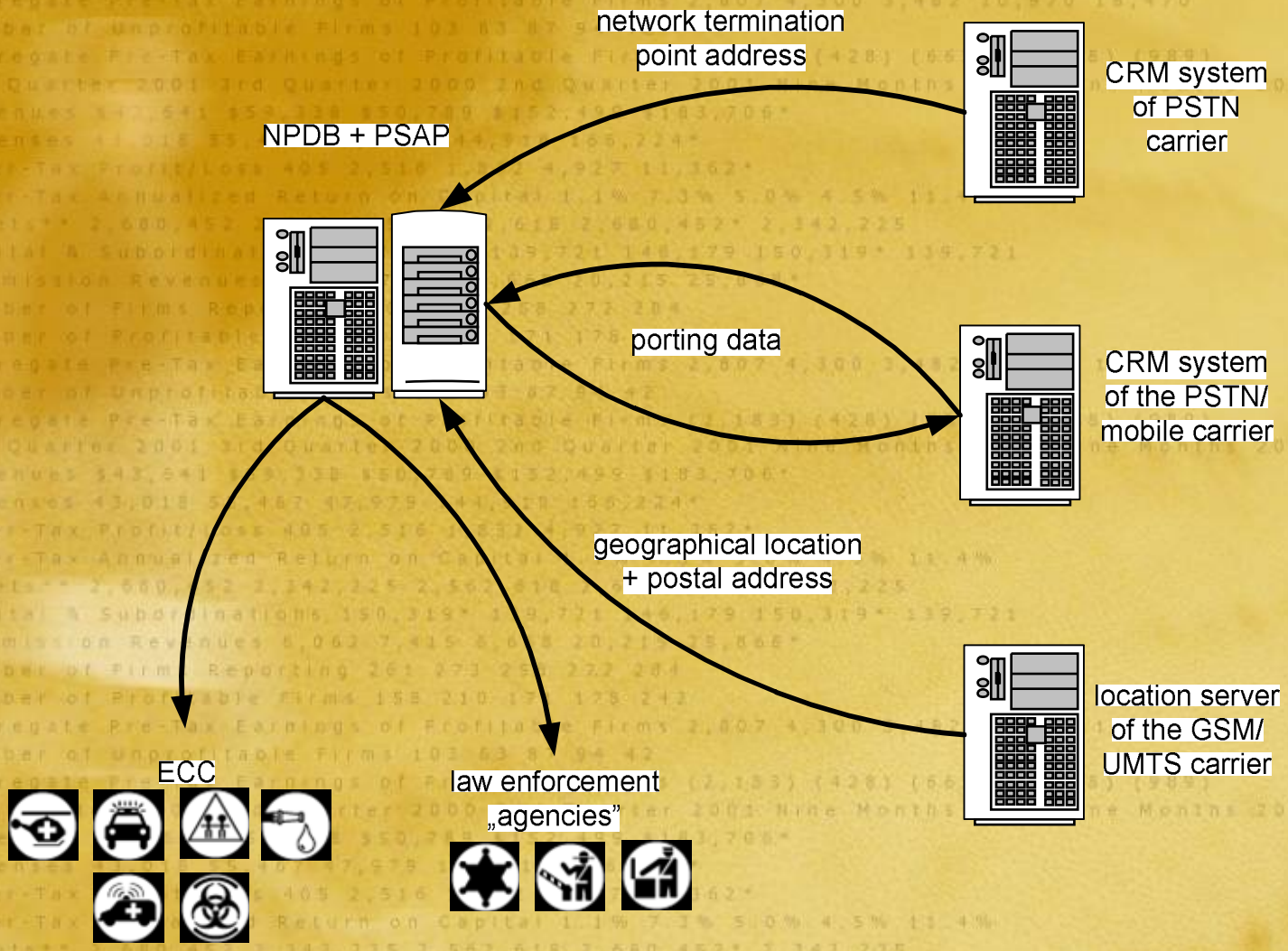
NP & 112 integration



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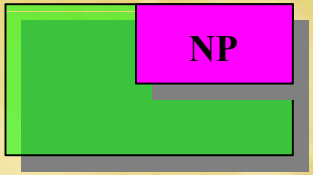
if integrated, profits:



- the same central system (servers, software, collocation, support) = lower costs – government is ☺
- the same access to the central system (VPN, dedicated optical fibers + backup) = the same cost for access 112 and NPDB systems – carriers are ☺
- XML (why not EPP?) for both MLP and NP creates simplicity – auditors are ☺

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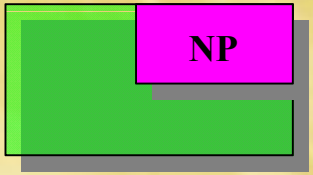
ENUM can support NP – well know idea



$ORIGIN 0.7.5.1.4.2.6.0.6.4.8.e164.arpa.
NAPTR 10 100 "u" "E2U+pstn:tel"
"!^.*$!tel:+48606241570;rn=+48223808595;
npdi!".

- **npdi ("NP Database Dip Indicator") and rn (routing Number) are used in the example,**
- **the "rn" parameter carries the routing number information. The "rn-context" parameter describes how the "rn" parameter value should be interpreted when the value is not a "global-rn",**
- **the NP database dip indicator is used to inform the downstream servers or switches during call setup that there is no need to perform the NP database dip for a geographical telephone number again. The "npdi" parameter carries such an indicator.**

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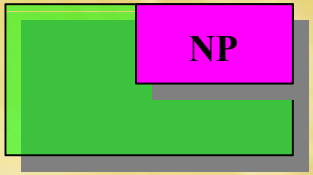
XML schema © NASK for NP




```
<?xml version="1.0" encoding="UTF-8" ?>
<schema targetNamespace="http://www.dns.pl/np-1.0"
xmlns:np="http://www.dns.pl/np-1.0"
xmlns:epp="urn:ietf:params:xml:ns:epp-1.0"
xmlns:eppcom="urn:ietf:params:xml:ns:eppcom-1.0"
xmlns="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified">

<import namespace="urn:ietf:params:xml:ns:eppcom-1.0" schemaLocation="eppcom-1.0.xsd" />
<import namespace="urn:ietf:params:xml:ns:epp-1.0" schemaLocation="epp-1.0.xsd" />

 <annotation>
  <documentation>Extensible Provisioning Protocol v1.0, Number Portability [np] schema.
   </documentation>
</annotation>

<!-- requests   -->

<element name="transfer" type="np:transferType" />
<element name="info" type="np:sNumberType" />
<element name="check" type="np:mNumberType" />
```

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cont...

NP

```
<!--   The transfer of  object is equivalent to the porting request.   -->
<complexType name="transferType">
  <sequence>
<!--  phone number in E164 format -->
<element name="number" type="np:e164Type" />
<!--  routing number, routing prefix?  -->
<element name="routingNumber" type="string" minOccurs="0" />
<!--  requested porting date -->
<element name="portingDate" type="dateTime" minOccurs="0" />
<!--  service type -->
<element name="service" type="np:serviceType" minOccurs="0" />
<!--  donor identifier -->
<element name="donorId" type="string" minOccurs="0" />
<!--  optional subscriber info -->
<element name="subscriber" type="np:subscriberType" minOccurs="0" />
<!-- request identifier -->
<element name="id" type="np:e164Type" minOccurs="0" />
  </sequence>
</complexType>

<complexType name="serviceType">
<!--  mobile/fix -->
<attribute name="type" type="token" use="required" />
<!--  additional info -->
<attribute name="subtype" type="token" use="optional" />
</complexType>
```

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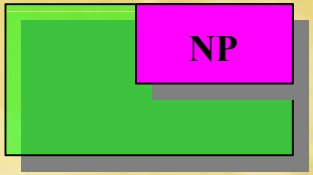
cont...




```
<complexType name="sNumberType">
<sequence>
    <element name="number" type="np:e164Type" />
</sequence>
</complexType>
<complexType name="mNumberType">
<sequence>
 <element name="number" type="np:e164Type" maxOccurs="unbounded" />
</sequence>
</complexType>
<complexType name="subscriberType">
<sequence>
 <element name="individual" type="np:IndividualType" minOccurs="0" />
 <element name="nonIndividual" type="np:NonIndividualType" minOccurs="0" />
</sequence>
</complexType>
<complexType name="IndividualType">
<sequence>
 <element name="nip" type="np:nipType" />
 <element name="idNumber" type="token" />
 <element name="passportNumber" type="token" minOccurs="0" />
 <element name="name" type="np:PersonType" />
 <element name="telephoneNumber" type="np:e164Type" minOccurs="0" />
 <element name="faxNumber" type="np:e164Type" minOccurs="0" />
 <element name="email" type="token" />
 <element name="address" type="np:AddressType" />
 <element name="mailingAddress" type="np:AddressType" />
</sequence>
</complexType>
```

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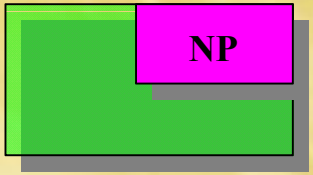
cont...




```
<complexType name="PersonType">
<sequence>
 <element name="firstName" type="token" />
 <element name="lastName" type="token" />
</sequence>
 </complexType>

<complexType name="AddressType">
<sequence>
  <element name="street" type="normalizedString" maxOccurs="unbounded" />
  <element name="city" type="token" />
  <element name="postalCode" type="token" />
  <element name="CountryCode" type="np:ccType" />
</sequence>
</complexType>

<simpleType name="nipType">
<restriction base="token">
  <pattern value="[0-9]+" />
</restriction>
</simpleType>

<simpleType name="ccType">
<restriction base="token">
  <pattern value="[a-z][a-z]" />
 </restriction>
</simpleType>

<!--  child response elements -->

<element name="chkData" type="np:chkDataType" />
<element name="infData" type="np:infDataType" />
<element name="trnData" type="np:trnDataType" />
```

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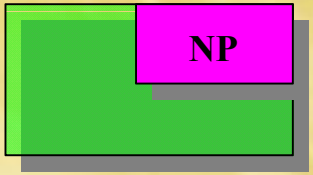
cont...




```
<complexType name="chkDataType">
<sequence>
 <element name="cd" type="np:checkType" maxOccurs="unbounded" />
</sequence>
</complexType>

<complexType name="checkType">
<sequence>
 <element name="number" type="np:checkNumberType" />
 <element name="reason" type="eppcom:reasonType" minOccurs="0" />
</sequence>
</complexType>

<complexType name="checkNumberType">
<simpleContent>
 <extension base="eppcom:labelType">
<attribute name="avail" type="boolean" use="required" />
</extension>
</simpleContent>
</complexType>
<complexType name="infDataType">

<sequence>
 <!--  phone number -->
<element name="number" type="np:e164Type" />
 <!--  routing number, routing prefix  -->
<element name="routingNumber" type="string" />
 <!--  current service provider identifier -->
<element name="splD" type="string" />
<element name="portingDate" type="dateTime" />
<!--  service type  -->
<element name="service" type="np:serviceType" minOccurs="0" />
</sequence>
</complexType>
```

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cont...

```
<complexType name="panDataType">
<sequence>
 <element name="number" type="np:paNameType" />
 <element name="paTRID" type="epp:trIDType" />
 <element name="paDate" type="dateTime" />
</sequence>
</complexType>

<complexType name="paNameType">
<simpleContent>
 <extension base="eppcom:labelType">
<attribute name="paResult" type="boolean" use="required" />
 </extension>
</simpleContent>
</complexType>

<complexType name="trnDataType">
<sequence>
 <element name="id" type="token" />
 <element name="number" type="np:e164Type" />
 <element name="trStatus" type="eppcom:trStatusType" />
 <element name="reID" type="eppcom:clIDType" />
 <element name="reDate" type="dateTime" />
 <element name="acID" type="eppcom:clIDType" />
 <element name="acDate" type="dateTime" />
</sequence>
</complexType>

<simpleType name="e164Type">
 <restriction base="token">
<pattern value="(\+[0-9]{1,3}\.[0-9]{1,14})?" />
<maxLength value="17" />
 </restriction>
</simpleType>          </schema>
```

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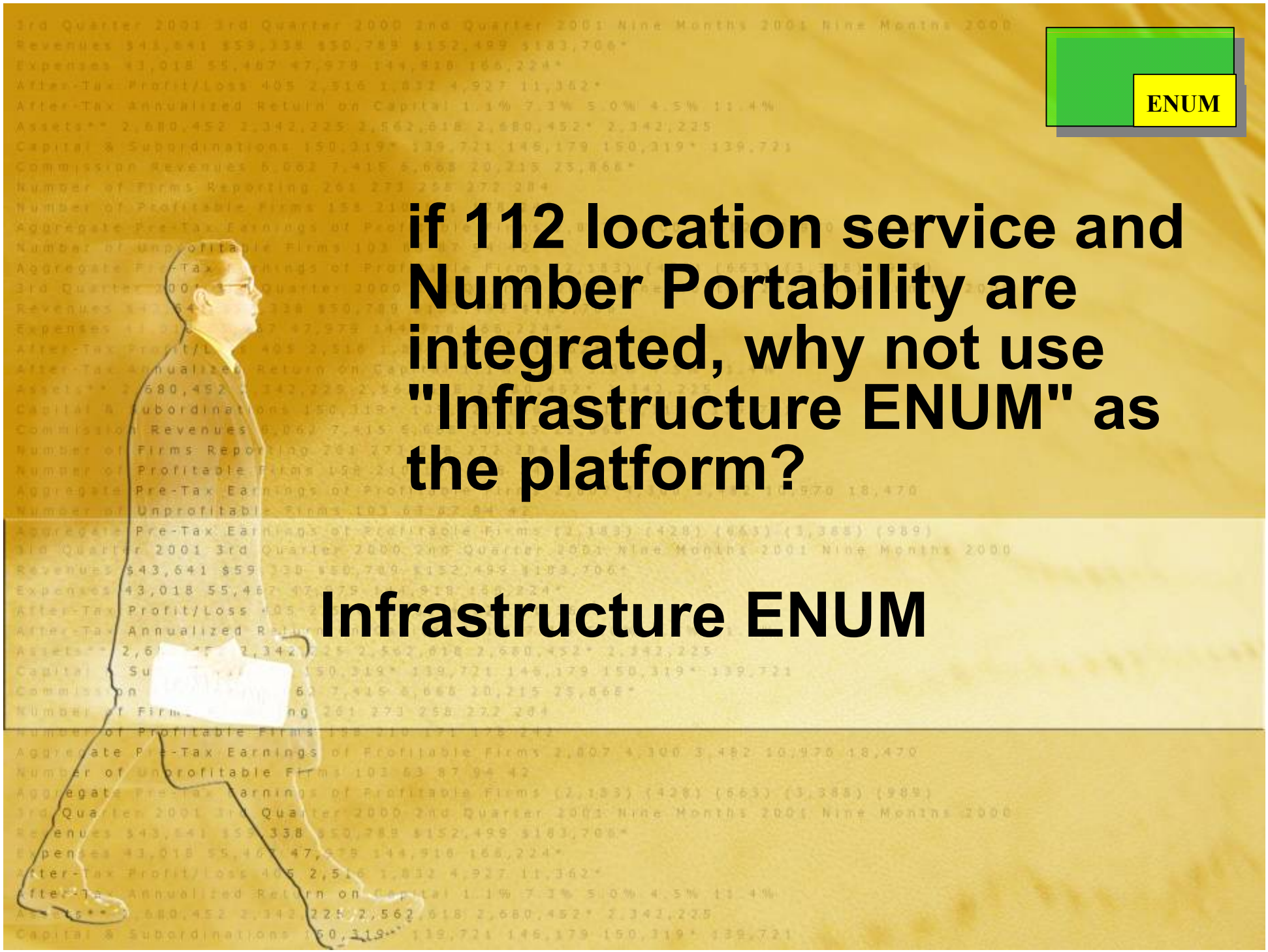
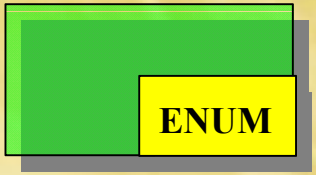
other services to be implemented on ”CBD”

Discussion on NP brings other ideas what should be supported by the integrated system:

- database storing information on the numbering ranges assigned by NRA (equivalent to numbering plan),
- database storing information on the numbering ranges that were reassigned (assigned by NRA to carrier ”X” and than carrier ”X” has assigned it to carrier ”Y”) + references to the agreements between


ENUM
if 112 location service and Number Portability are integrated, why not use "Infrastructure ENUM" as the platform?
Infrastructure ENUM

reasons for integration



- typical interfaces of the ENUM registries are based on XML and EPP,
- NP and 112 should be anyway integrated,
- anyway, carriers move their networks to NGN,
- VoIP carriers will be (probably) finally forced to implement EU regulations on 112 (and Skype with their alergy to emergency calls too…)
- EPP fullfils all requirements for NP protocol,
- all the security, availability, scalability requirements for 112 and NP are applicable for Infrastructure ENUM too,
- carriers play key role in 112, NP and “Infrastructure ENUM”.

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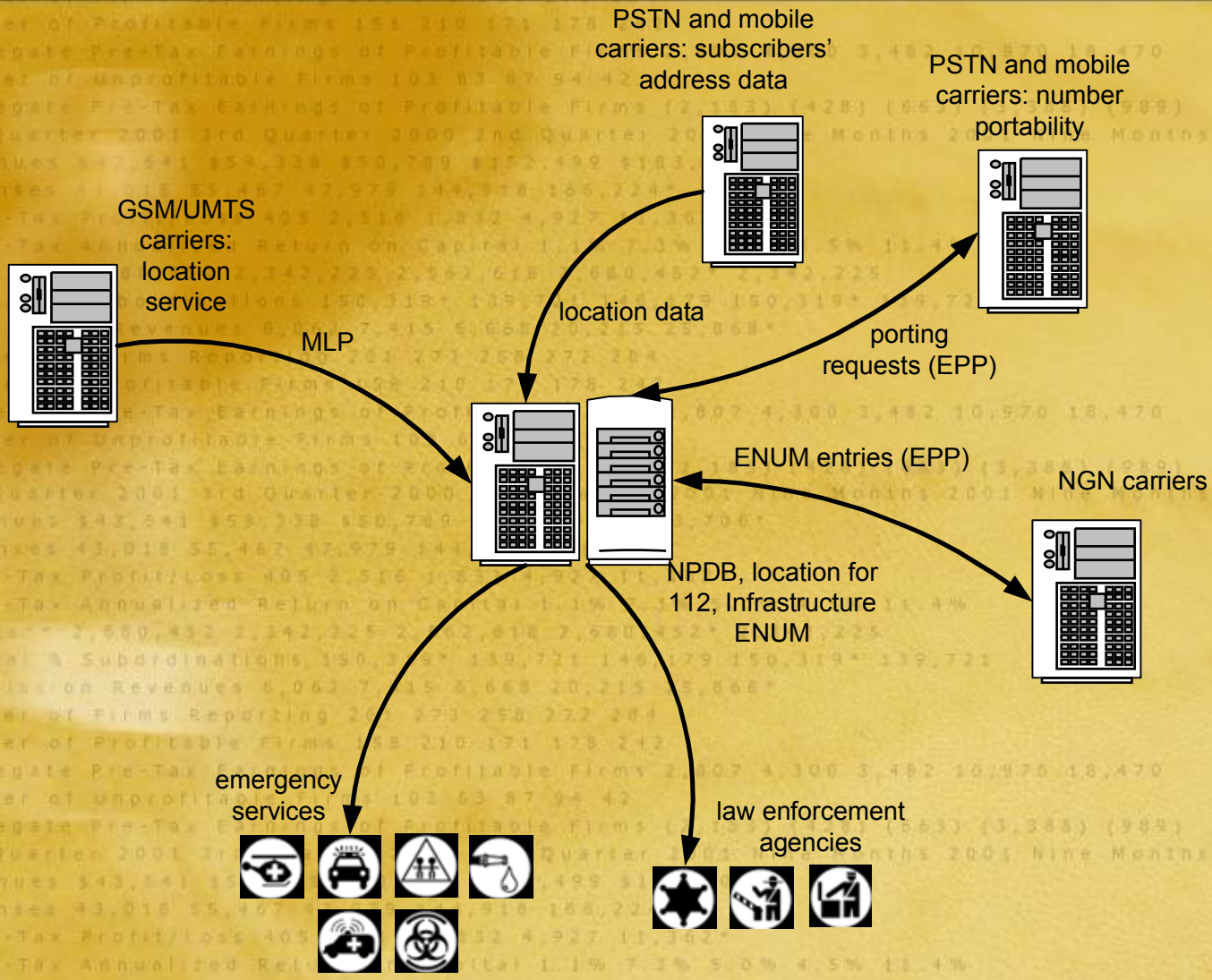
logical structure



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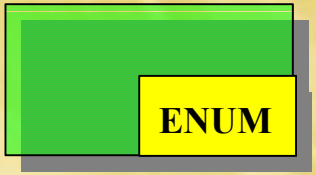
requirements…



	112	NPDB	Infrastructure ENUM for convergent services
access for carriers	Yes	Yes	Yes
access for emergency services	Yes	Yes	No
access for NRA	Yes	Yes	Yes
access protocol based on XML	Yes (MLP)	Not necessary	Yes (EPP)
special requirements for security	Yes	Yes	Yes
special requirements for reliability and availability	Yes	Yes	Yes
application performance and scalability required	Yes	Yes	Yes
two datacenters (separated)	Yes	Yes	Yes
dedicated reliable links (fiber-optics as example)	Yes	Yes	Yes
24 / 7 / 365 support (call center)	Yes	Yes	Yes

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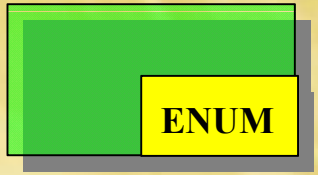
should we think about it?



yes, if:

- there is no central database/system for subscribers' location (112/911),

OR

- there is no ACQ, QoR and NPDB,

OR

- NPDB and subscriber's location service are not integrated,

OR

- NPDB doesn't support porting flows (only storing the records containing E.164 numbers + rn).

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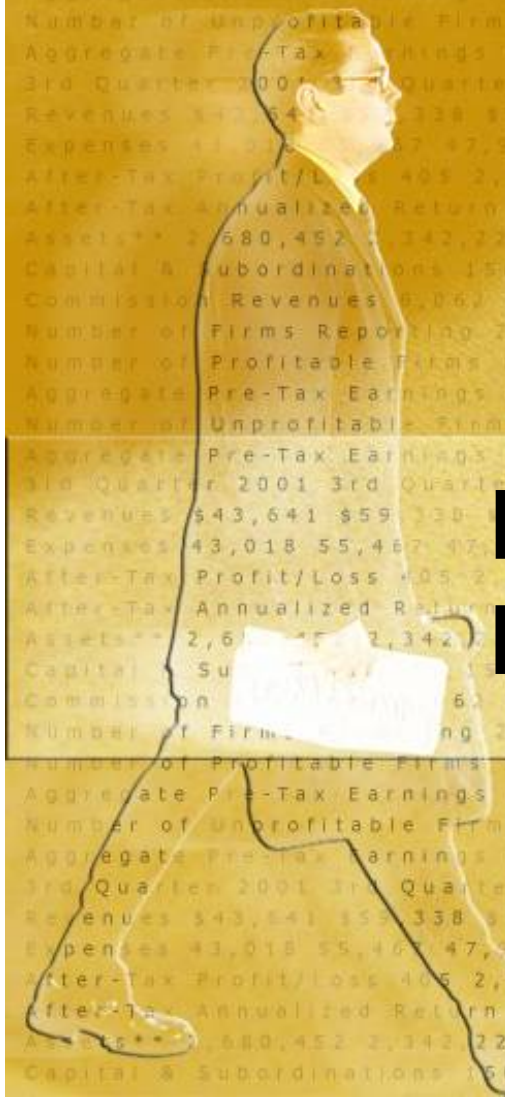
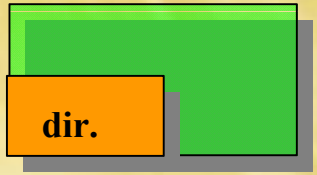


if 112 location Number Portability and "Infrastructure ENUM" are integrated, why not use it for Nationwide Telephone Directory Enquiry?

Nationwide Telephone Directory Enquiry

requirements for nationwide telephone directory enquiry



- subscribers' data (name/company name + postal address) to be stored in the system ,
- necessary to have access to the NP data,
- interface to the system: probably based on XML,
- access for actors: end users via dedicated call center,
- requirements for security: secure data flow (based on SSL, IPsec), strong authentication (using digital certificates), data accuracy, etc.,
- requirements for reliability and high availability: low % of availability (98% - depends on the national regulations/decisions) ,

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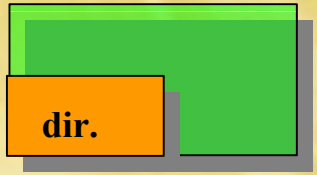
legal side



Poland (as example of the regulations in EU):

- **Telecommunications Law**
  July 16, 2004 **art.67**

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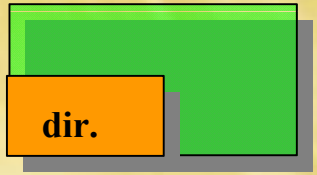
why not to integrate?



- telephone directory enquiry requires up-to-date subscribers data (postal address + name/surname or company name) to be on-line accessible – exactly what is stored by the system for location services,
- end users wants to know who is “carrier of record” – to be able to determine the prices when calling the number.

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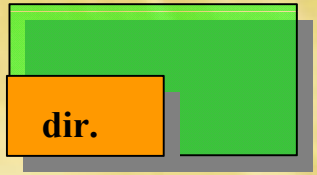
methods for data access



- data transfer from mobile, PSTN, nomadic to centralized system:

	daily update	PUSH method	PULL method
subscribers' data including postal address	yes	no	yes

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Poland as an example of *potential* integration of Infrastructure ENUM, Number Portability database and central database for emergency services (location, calls routing)

Case study

background (1)

- 2003 Technical WG (UKE + gov. representatives + carriers) for NP has been created @ UKE (NRA of Poland): *http://www.uke.gov.pl/uke/index.jsp?place=Menu01&news_cat_id=289&layout=3*
- 2004 – new Telco Law implementing NP… theoretically only, no NP in real life… *http://www.bartosiewicz.pl/Telecommunication_Act_2004.pdf*
- 2005 – all GSM/UMTS carriers working on central database to be maintained by separated entity; *failure of the project…*
- End of 2006 – ”real” NP deployment:
  - OR method implemented for PSTN; customers complain on difficult, long and not efficient procedure
  - GSM/UMTS - each carrier maintain own NP database of all ported numbers, it’s not central database…

background (2)

- **January 2007 – UKE decided to integrate NP and caller location for 112 and create central database**
  http://www.uke.gov.pl/uke/index.jsp?place=Lead01&news_cat_id=259&news_id=1732&layout=3&page=text
  - two open sessions dedicated to Central Database (”CBD”)
    http://www.uke.gov.pl/uke/index.jsp?place=Lead01&news_cat_id=259&news_id=1969&layout=3&page=text
  - Technical Working Group for ”CBD” created (representatives of telco and media Chambers + gov. people)
- **All GSM/UMTS carriers + some PSTN supporting the idea of CBD integrating ENUM, NP and subscriber’s location service:**
  http://www.piit.org.pl/_gAllery/63/78/6378.pdf

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background (3)

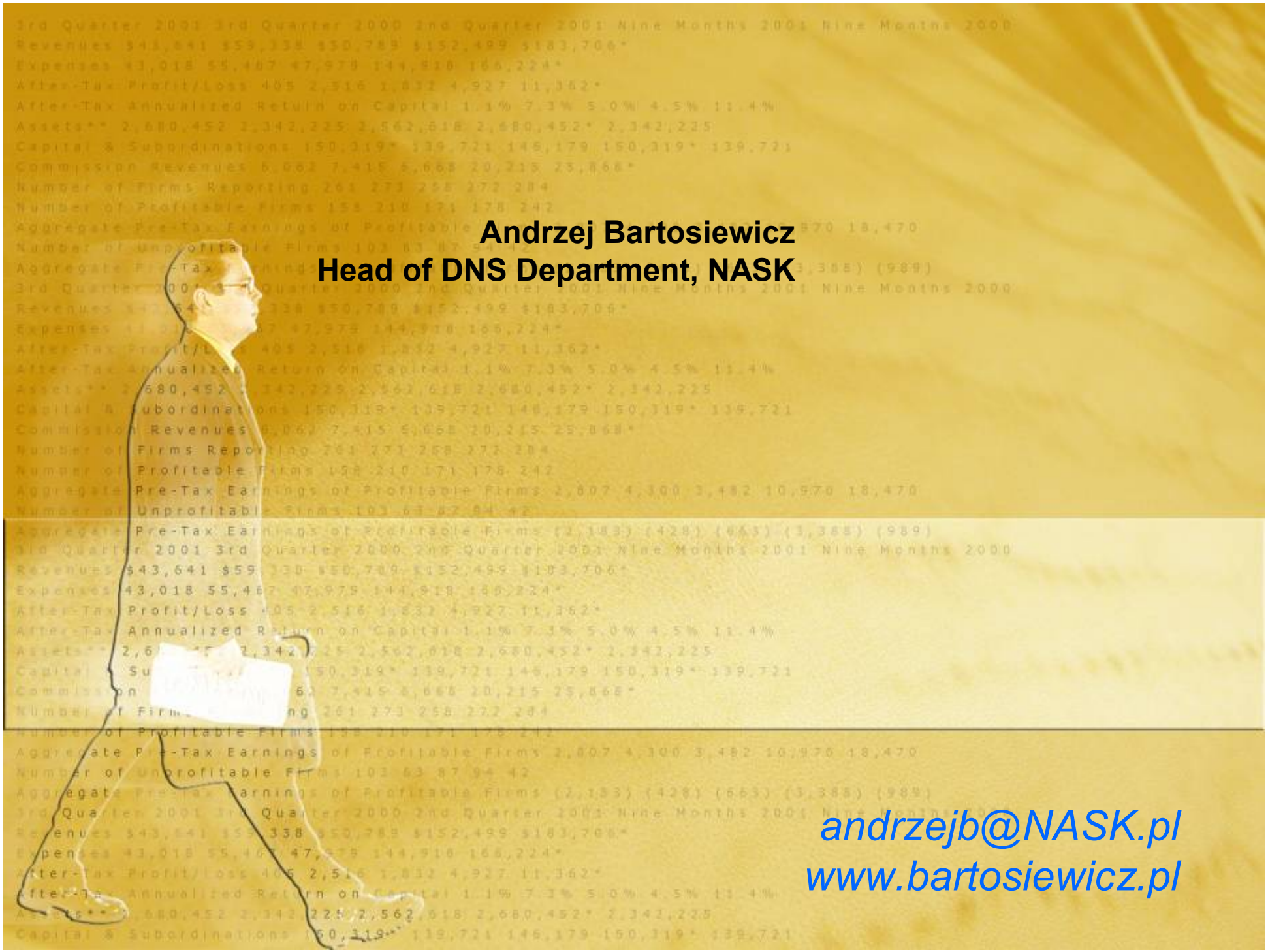
- **Parlament working on new Telco law; unfortunatelly there are ”more” imporant issues for our Parlament now…**
- **In case of early elections, upgrade of Telco law will be postponed and “CBD” tender will have to wait**
- **New Telco Law will cover *inter alia:***
  - UKE to maintain (directly or outsourced to 3rd party) ”CBD” for subscriber’s location + NP,
  - ”CBD’s” costs to be covered from the charges for assigned numbering ranges.
- **UKE & Tech WG view on ”CDB”:**
  - [portability]: Support for administrative flows (all porting scenarios / processes); data to be retained during porting process only; possibility to deactivate this function for PSTN carriers on request,
  - [portability]: Data necessary for calls’ routing (number, routing number, carrier) to be stored in database,

background (4)

- UKE & tech WG view on ”CDB” cont.
  - [portability]: NP data to be distributed once per day (porting window) and on demand *[no decision yet]*,
  - [portability]: Export of the porting data in different formats; ENUM not the only format to be implemented; ENUM as platform for NGN or interested parties,
  - [location]: Support for TS 102 164 standards between „CBD” and carriers for geo-location data,
  - [location]: Support for PUSH method for subscriber’s location service *[no decision yet]*,
  - [location]: No direct exchange of information between ECC and carriers.
  - [location]: Support for XML based protokol for data echange between “CBD” and carriers for subscribers’ address data (both for 112 and directory enquiry) – E.115 v2 or EPP *[no decision yet]*,

background (5)

- **Technical WG (112/NP) results to be announced in September (optimistic) / November (realistic) 2007,**
- **As of September 1st. 2007, nine meetings of "CBD and 112 Tech. WG" took place.**
- **Next step (probably) is the public tender:**
  - UKE will choose the company responsible for "CBD" development,
  - UKE will choose the collocation facilities for "CBD's" datacenter(s),
  - "CBD" to be implemented and deployed; ACQ or QoR to be choosen,
  - PSAP / ECC will be integrated with "CBD" (for clarification: in Poland ECCs play PSAP role too, no centralised PSAP so far).



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