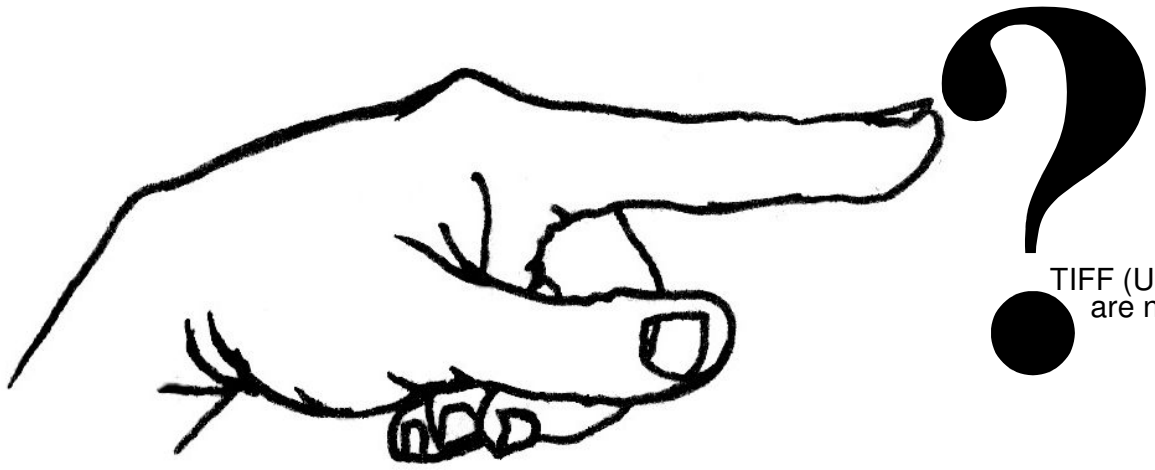
Telephone Numbers in the DNS (ENUM)

Patrik Fältström

with material from Olav Kolkman

Please contact me…



QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

The problem

- Humans can and want to communicate using numerous services
  - Some of those services are IP based
  - Others are PSTN based
  - There is convergence towards IP based communication
- About 2 Billion people in the world use numeric keypads for communication
- We'd like a mechanism that ties these two worlds

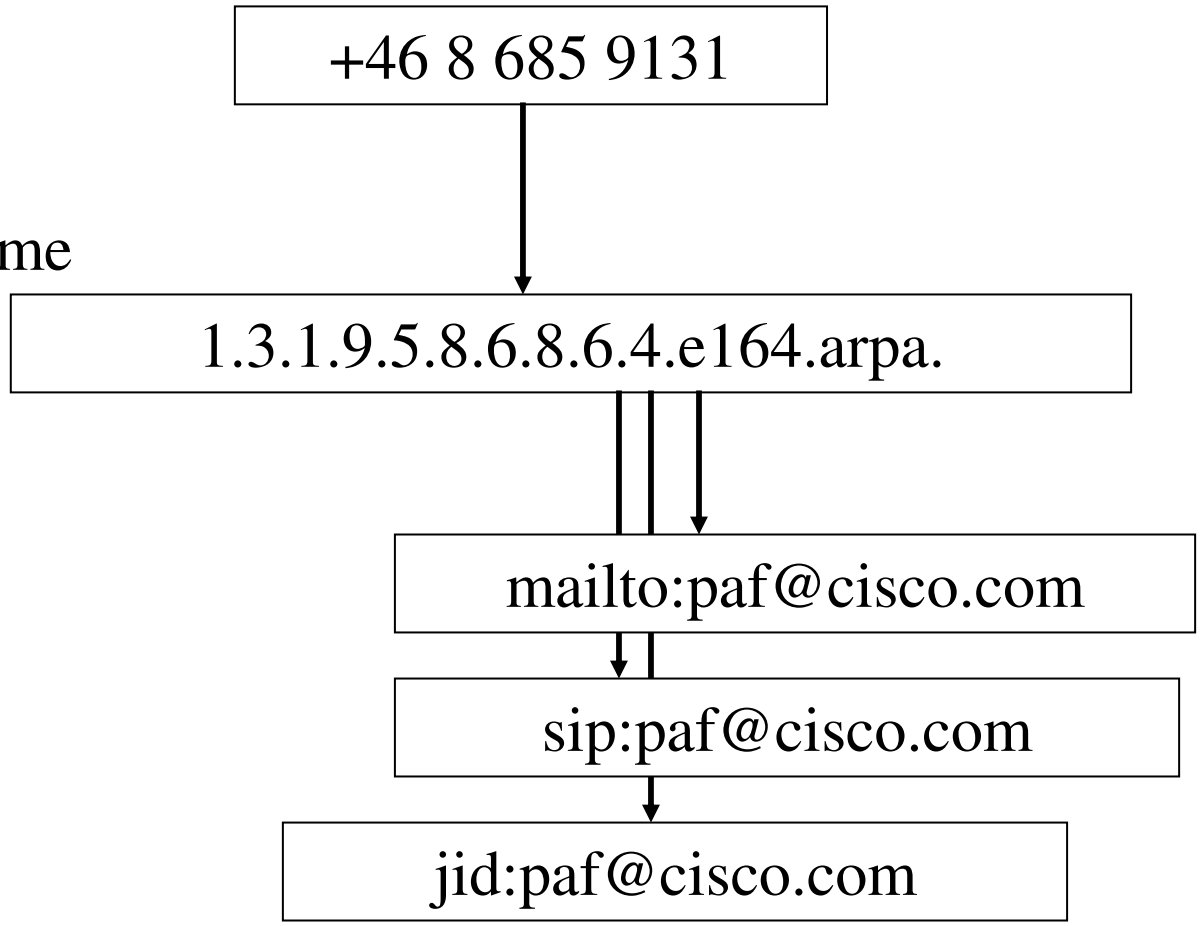
The Solution

- Use e.164 addresses with an service discovery model from the IP world

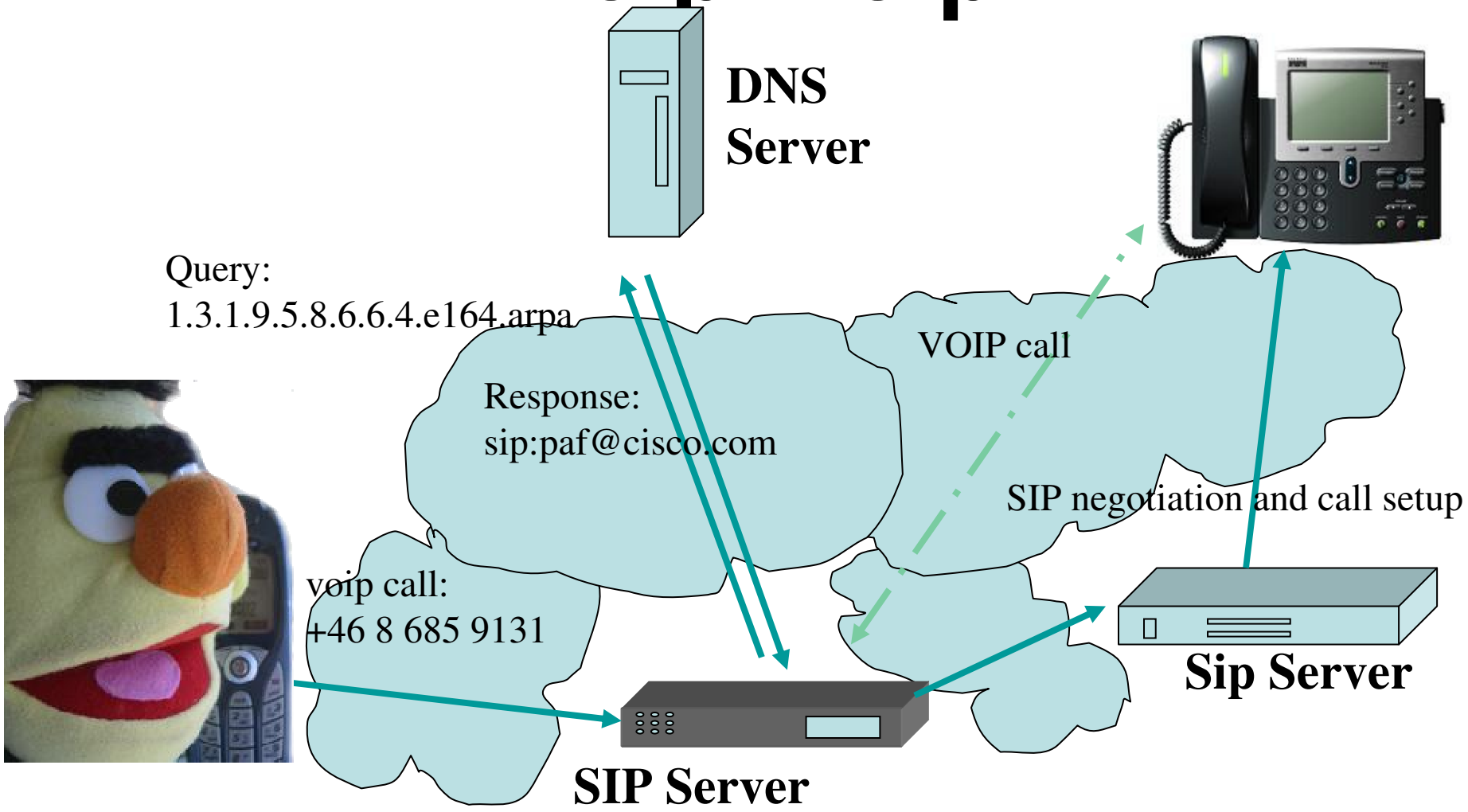
  (Results in trivial business cards)

ENUM in a nutshell

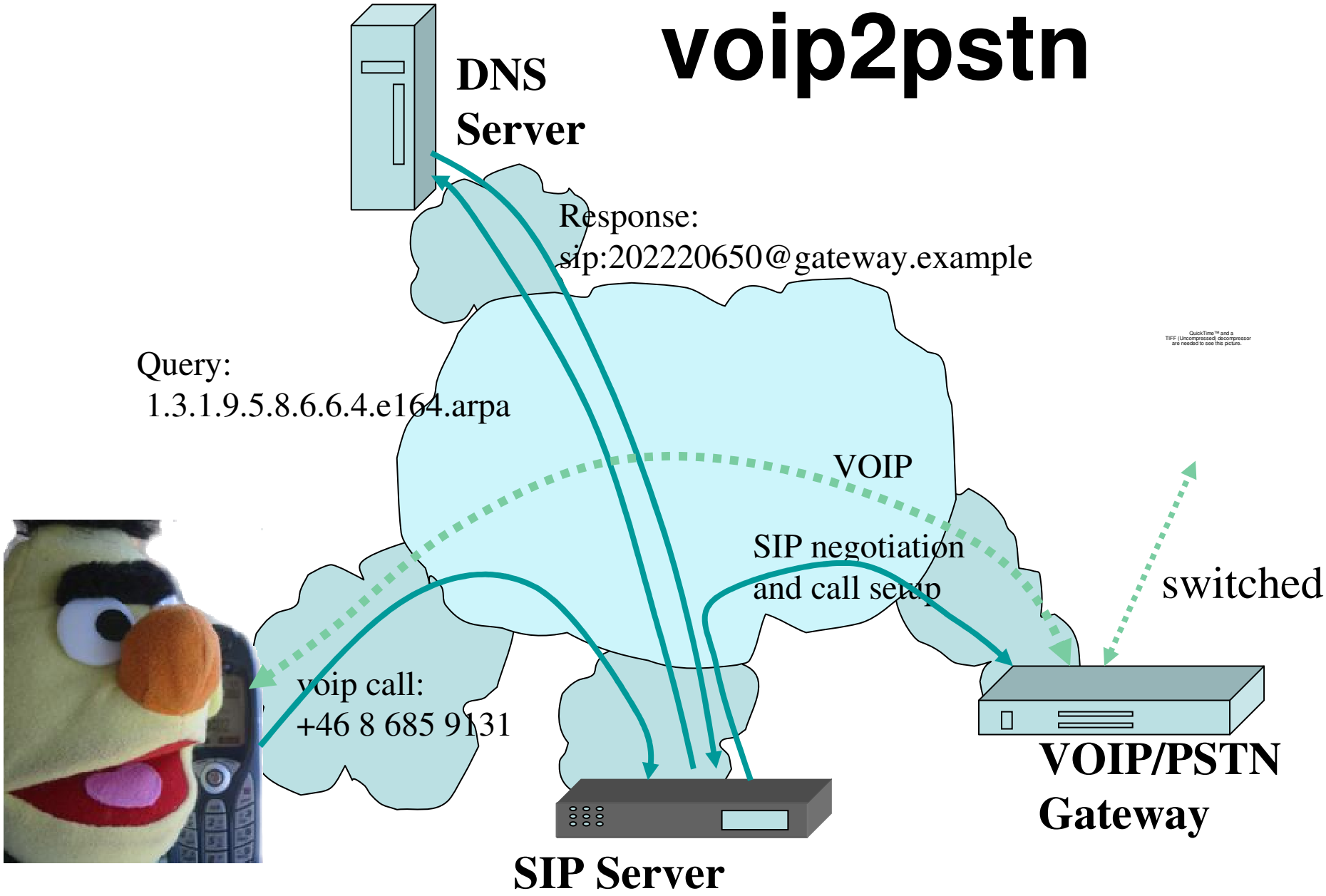
- take phone number
- turn into domain name
- ask the DNS
- return list of URI's



A use case voip2voip



voip2pstn


DNS
Server
Response:
sip:202220650@gateway.example
Query:
1.3.1.9.5.8.6.6.4.e164.arpa
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VOIP
SIP negotiation
and call setup
switched
voip call:
+46 8 685 9131
VOIP/PSTN
Gateway
SIP Server

E.164 addresses

- E.164 are the numbers used for international public telecommunication number plans
- ITU-T standard
- Different categories:
  - Geographic area
  - Global Services
  - Networks

Geographic Area		
Country code	**National Destination Code (optional)**	**Subscriber Number**
cc=1-3 digits	Maximum 15-cc digits	
National (significant) number		
International public telecommunication number for geographic areas (maximum 15 digits)		
+46	**8**	**6859131**

E.164 and NAPTR

Application unique key

Lookup key

- Take the number:
  - +31-20-2220650
- Remove all non-digits except the leading +
  - +31202220650 (this is the number on which the regular expression is to act, discriminates ‘public enum’)
- Remove the + and reverse the order of the digits
  - 05602220213
- Put each digit in its own domain and hang below e164.arpa
  - 0.5.6.0.2.2.2.0.2.1.3.e164.arpa.

Examples

```
$origin 0.5.6.0.2.2.2.0.2.1.3.e164.arpa.
 IN NAPTR 10 10 "u" "E2U+voice:sip" (
      "!^.*$!sip:olaf@nlnetlabs.nl!" . )
 IN NAPTR 10 10 "u" "E2U+email:mailto" (
      "!^.*$!mailto:olaf@nlnetlabs.nl!"
       . )
 IN NAPTR 10 20 "u" "E2U+voice:tel" (
      "!^(.*)$!tel:\1!" . )
```

Signals application that there is a preference for SIP instead of PSTN

Slowly moving up a few layers

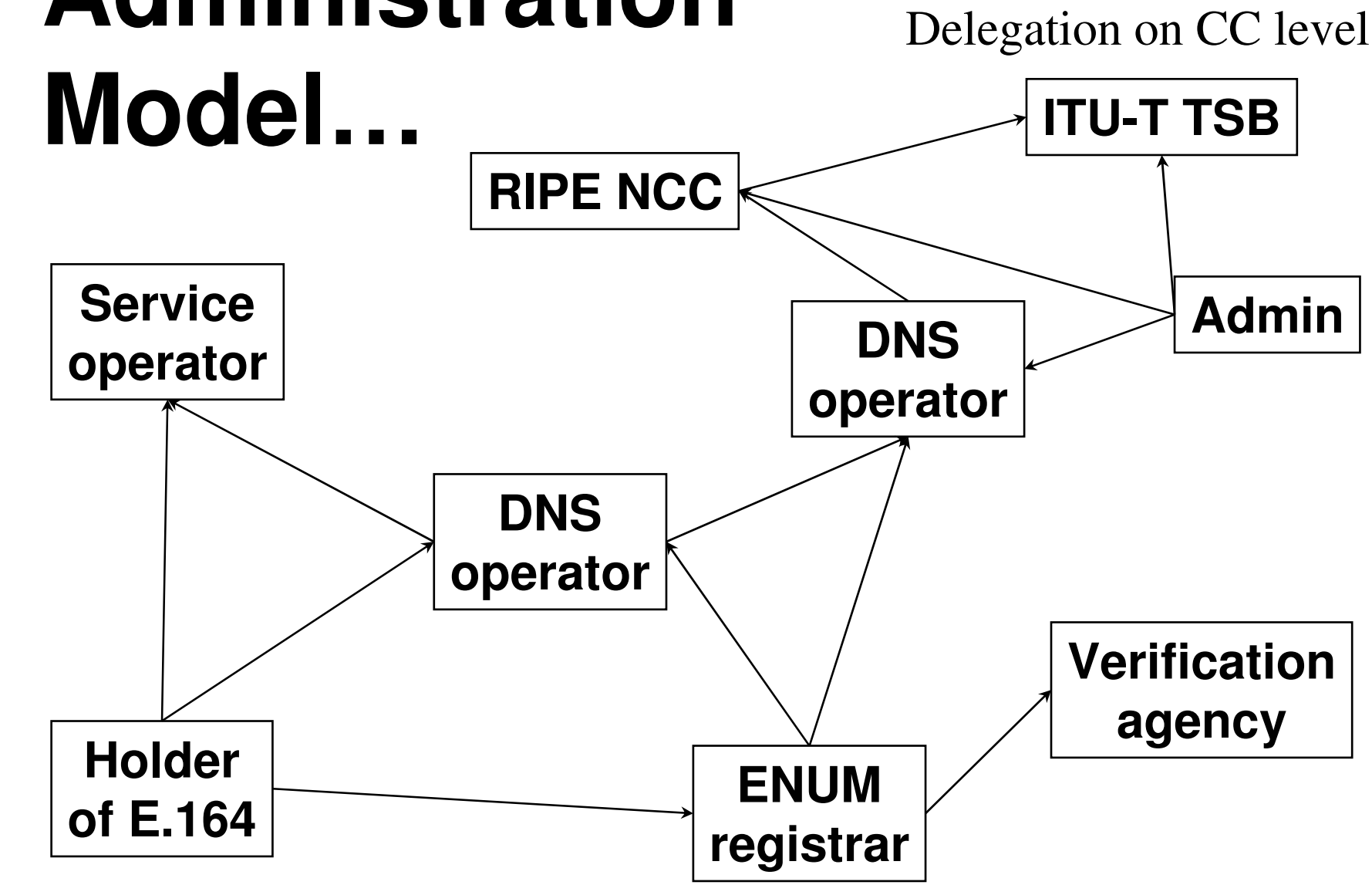
QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Source: ISC, where you can buy this shirt

Delegation and Administration

- E.164 space is ‘owned’ by ITU-T
- Administrative responsibility for content is left to the member states
- e164.arpa. zone is maintained by RIPE NCC
  - Delegation from RIPE to whom?
  - Who is requesting this delegation?
- Do we use registry/registrar mechanisms for all DNS roles?
- Who is running the services?

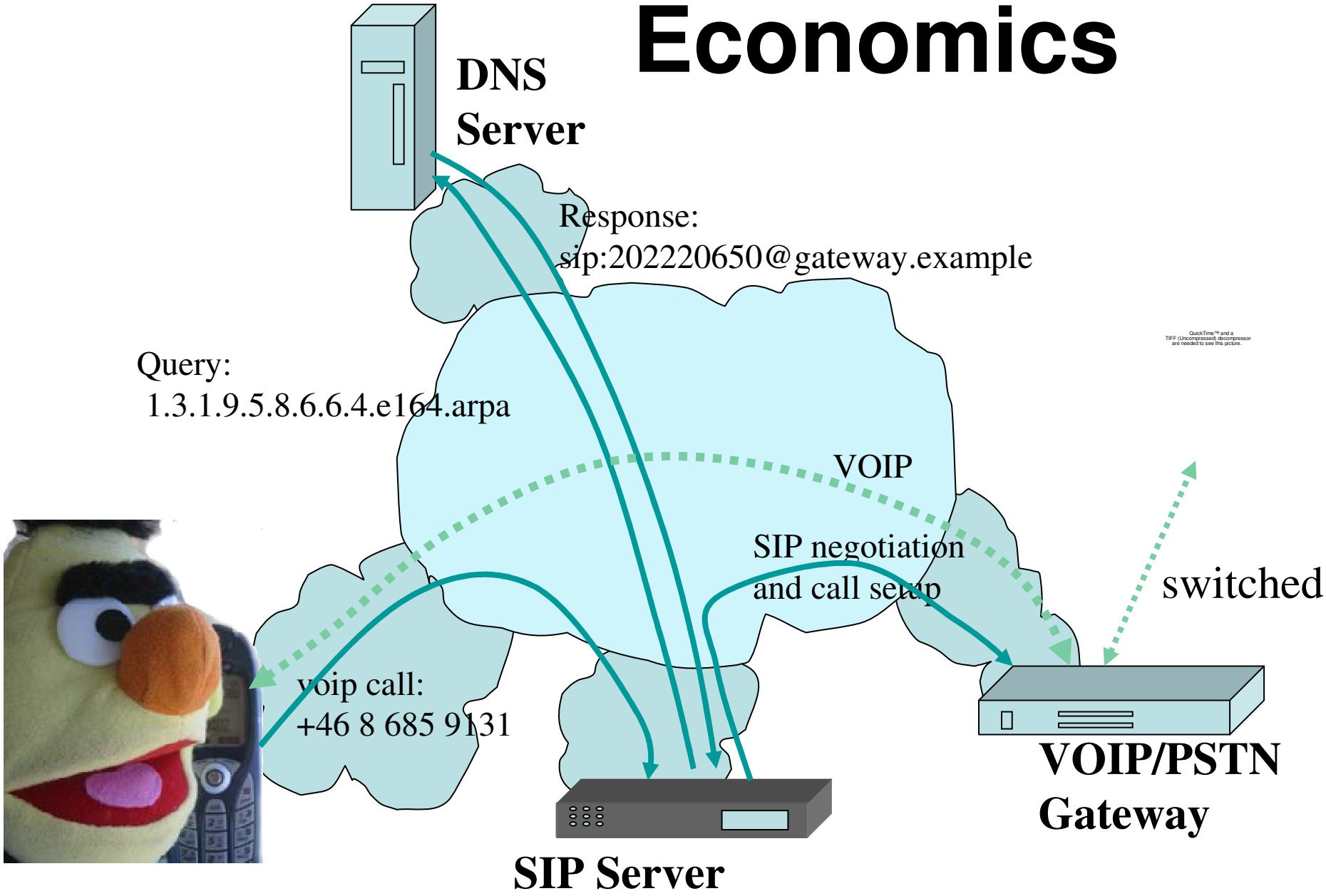
Administration Model…



But ENUM for infrastructure

- Convergence of telcos to ENUM
- Infrastructure information in the public DNS
  - Publish routing information
- ENUM was always intended for the public
  - 0.5.6.0.2.2.2.0(…) NAPTR <point to SIP service for user>
  - 0.5.6.0.2.2.2.0(…) NAPTR <point to SIP service for infrastructure>
- Two owners of the same record in the same zone

Economics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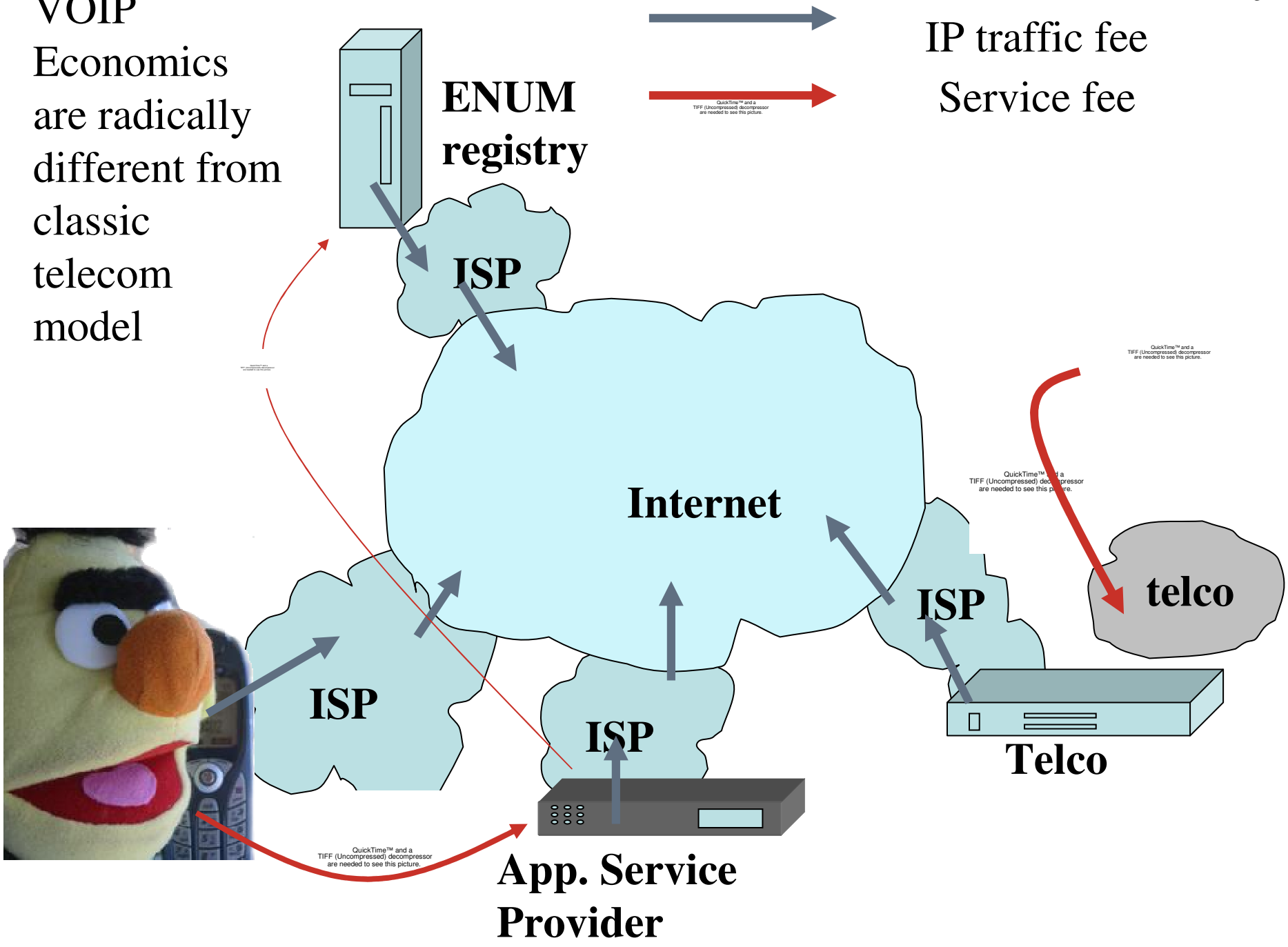
VOIP Economics are radically different from classic telecom model



Payments

- PSTN
  - Fixed fee
  - Termination fee (per minute charge) that follows the call
- Email
  - Payment for IP
  - Payment for both incoming and outgoing
- VoIP
  - Payment for IP
  - Payment for both incoming and outgoing
- New business models for VoIP compared with PSTN
  - Internet is “bill and keep”
  - No termination fees for VoIP?

Back to technology Services

- E2U+H323
- E2U+SIP
- E2U+ifax:mailto
- E2U+pres
- E2U+web:http
- E2U+web:https
- E2U+ft:ftp
- E2U+email:mailto
- E2U+fax:tel
- E2U+sms:tel
- E2U+sms:mailto
- E2U+ems:tel
- E2U+ems:mailto
- E2U+mms:tel
- E2U+mms:mailto
- E2U+vpim:mailto
- E2U+vpim:ldap
- E2U+voice:tel

And we are still counting

Administrational mess and protocol problems

- Different ASPs for services, but only one delegation
  - Do you want your mms:mailto record to be maintained by your cell phone operator?
- There could be a lot of data in an RRSet
  - 512bytes limit set by DNS easily exceeded
  - With DNSSEC one ads an extra blob of data
- EDNS0 support seems to be a necessity

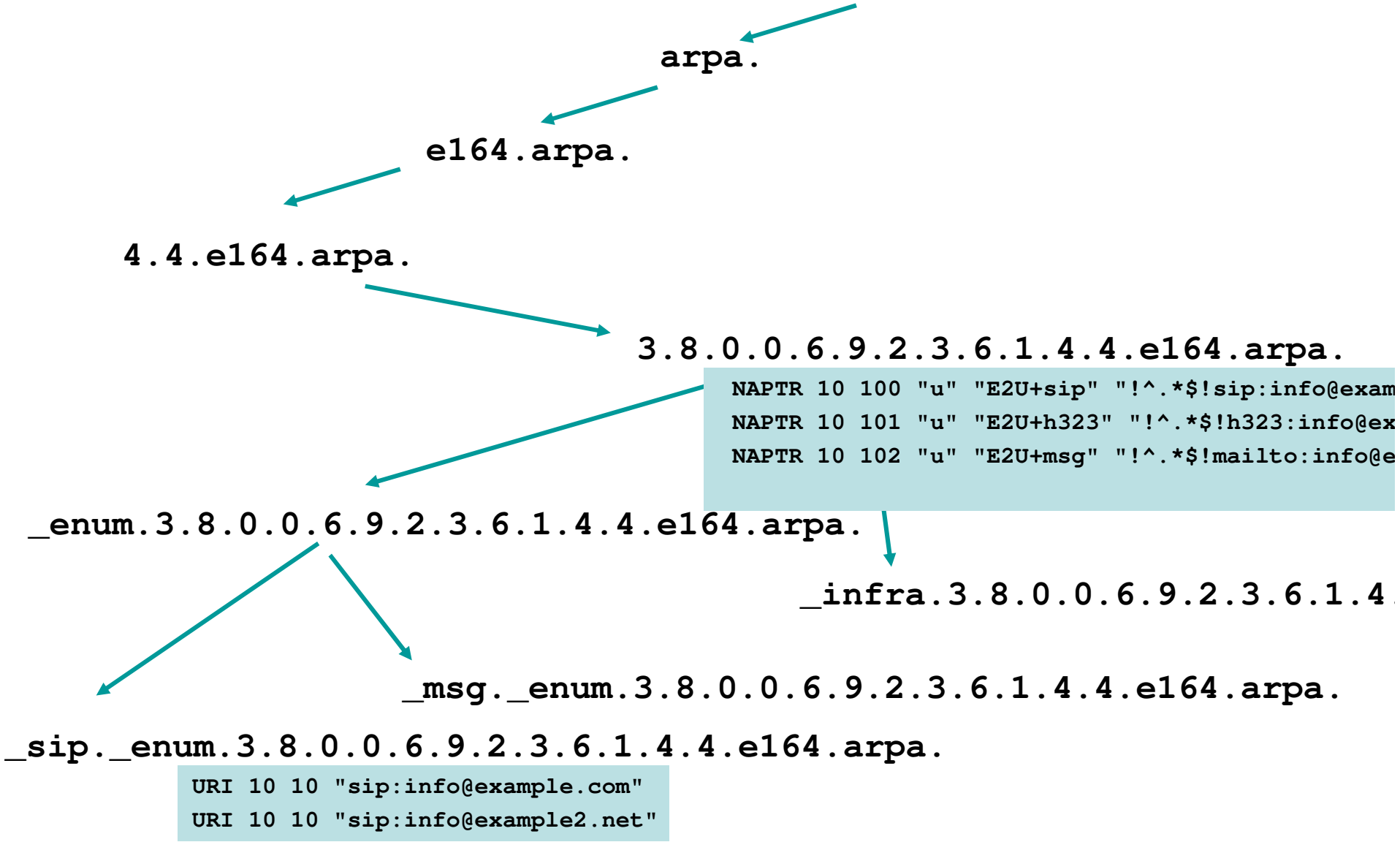
ENUM Next Generation Current idea

```
$ORIGIN 3.8.0.0.6.9.2.3.6.1.4.4.e164.arpa.
   NAPTR 10 100 "u" "E2U+sip" "!^.*$!sip:info@example.com!" .
   NAPTR 10 101 "u" "E2U+h323" "!^.*$!h323:info@example.com!" .
   NAPTR 10 102 "u" "E2U+msg" "!^.*$!mailto:info@example.com!" .

$ORIGIN 3.8.0.0.6.9.2.3.6.1.4.4.e164.arpa.
_sip._e2u   URI 10 10 "sip:info@example.com"
_sip._e2u   URI 10 10 "sip:info@example2.net"
_h323._e2u  URI 10 10 "h323:info@example.com"
_msg._e2u   URI 10 10 "mailto:info@example.com"
```

Slide courtesy: Patrik Fältsröm

More delegation structure



ENUM Next generation

- Today, query for NAPTR and get back every URI “connected” to the domain
- Should we separate between
  - What services exists for this domain?
  - What URI should I use for this service?
- Will this at the same time make delegation possible of separate URI specifications to different organisations?
- Backward compatibility?

Conclusion

- ENUM is an open standard for tying services to globally unique identifiers that people been using for over 100 years
- Working with the technology opens regulatory and economic challenges
- ENUM is evolving, current players are early players

QUESTIONS?