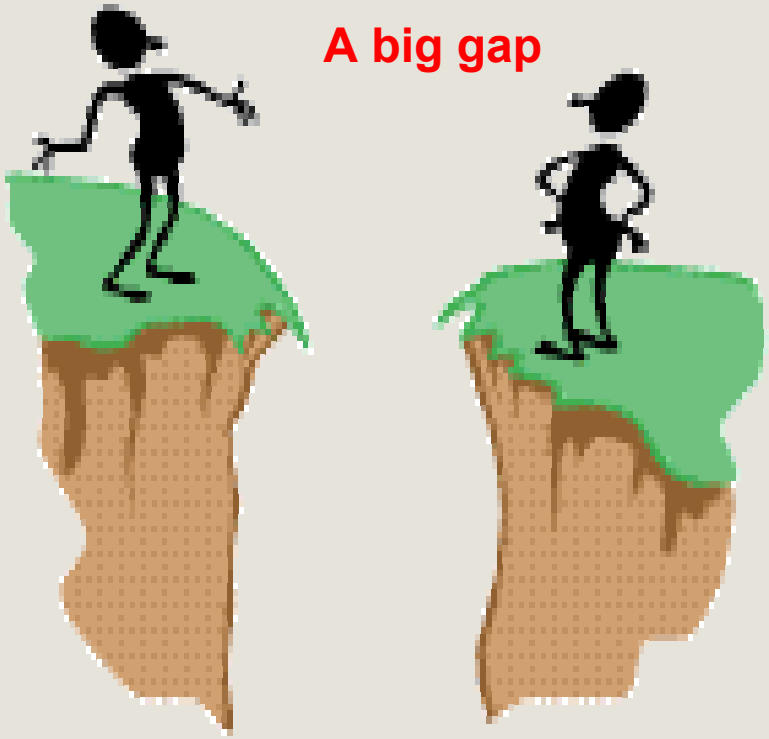
ERICSSON

Legacy - Based Service Architectures for NGN

INSE 7110 – Winter 2004
Value Added Services Engineering in Next Generation Networks
Week #5

Legacy based service architectures …

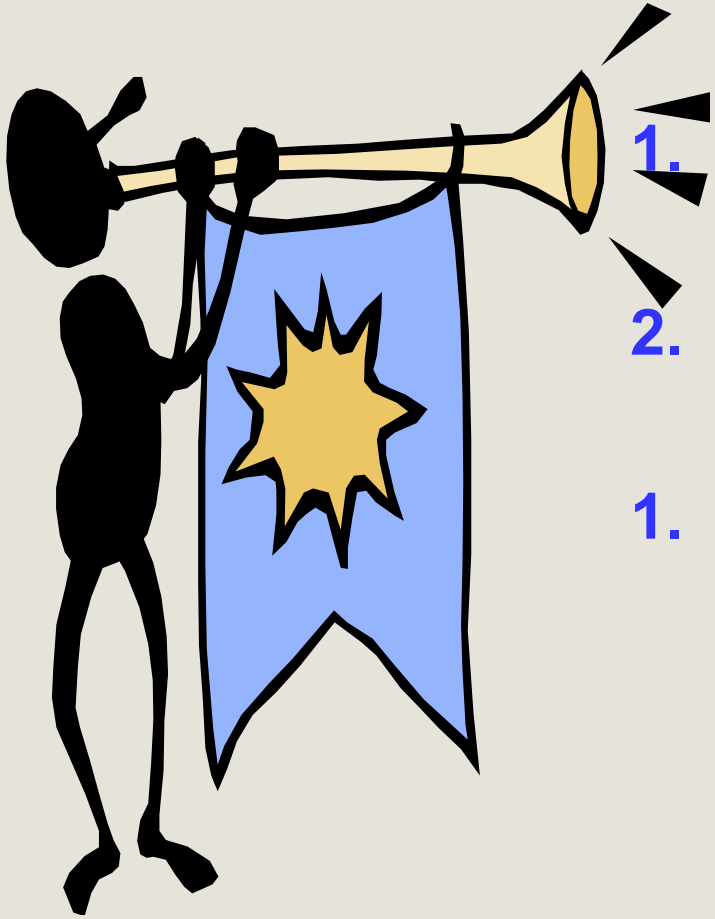
Expectations and Legacy based service architectures ….



1. Re-using IN

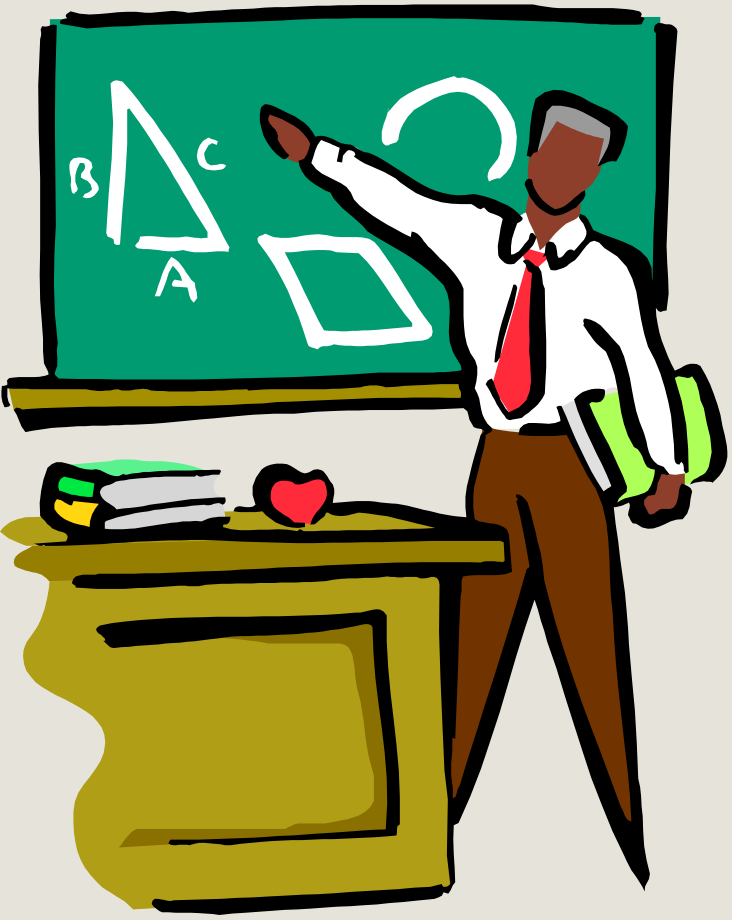
2. Inter-working with IN
   - PINT
   - SPIRITS

Outline



1. Re-using IN
2. PINT
1. SPIRITS

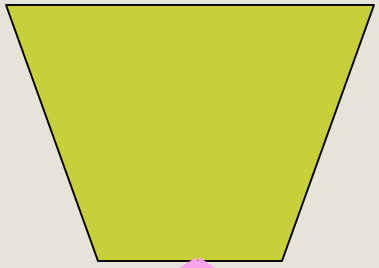
Re-using IN



1. Introduction
2. Issues and tentative solutions
3. A case study
4. Retrospective

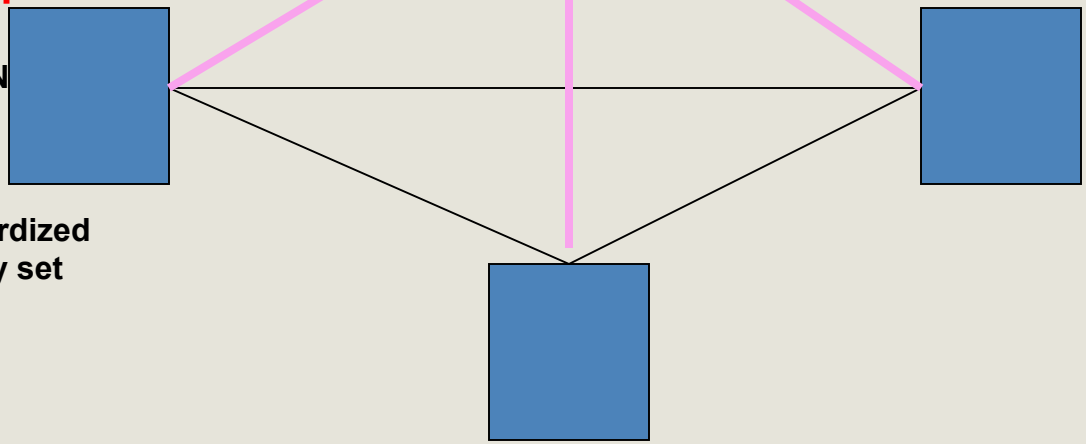
Introduction: IN again ...

INAP
- Application protocol running on top of SS7
- ASN.1 based
SS7 outbound signaling network



Service control point (SCP)
- Contains service logic
- service logic is based on capability set

Service switching point (SSP)
- Switch implementing IN call model (e.g. when to stop and give control to the SCP)
- Call models are standardized and come with capability set



Service switching point (SSP)

Service switching point (SSP)

Introduction: History and motives

History

- Approach popular in the early days of NGN
  - . Several IETF draft standards
  - . A few initiatives in ITU-T

Motives

Business:

Re-use of IN infrastructure

Technical:

Internet telephony standards emerged without credible service engineering components

IN principles are well known

The first issue ...

Communication between NGN switches and SCPs.

- Next generation switches do not support SS7
- INAP is ASN.1 based while some Internet Telephony protocols (e.g. SIP) are text based

Tentative solutions …

Three main approaches

- First: Put the burden on the SCP side
  - IP transport
  - support of text based protocol (if SIP)
- Second: Put the burden on the NGN switches sides (e.g. support of SS7
- Third: Gateways

The second issue ...

Call models

- IN call models were built explicitly for circuit switched telephony
- NGN "call models" were built without IN in mind

.

Tentative solutions

The call model issue: Two main approaches

- Integrated call model
- Call models (I.e. H.323/SIP and IN) running in parallel and interacting

A Case Study: IN Services for Converged Telephony (Ref. 1) ...

Background

- Prototype built by Lucent in 2000
  - H.323 based
- Challenges
  - Communications
    - Burden put on SCCP side (IP used between NGN and SCCP)
  - . Call model
    - Soft SSP on top of an H.323 gatekeeper

A Case Study: IN Services for Converged Telephony (Ref. 2) ...

Main features

- Integration of IN based call model with H.323 call model
  - Possibility to invoke IN services from an H.323 gatekeeper
- Re-use of existing services with no change
- Rapid deployment of new services
- Services supported
  - Number portability
  - Call forwarding
  - Caller name display
  - On-line communications center

A Retrospective ...

The initial interest is understandable

- IN principles are well known
- IN has a relatively large installed base

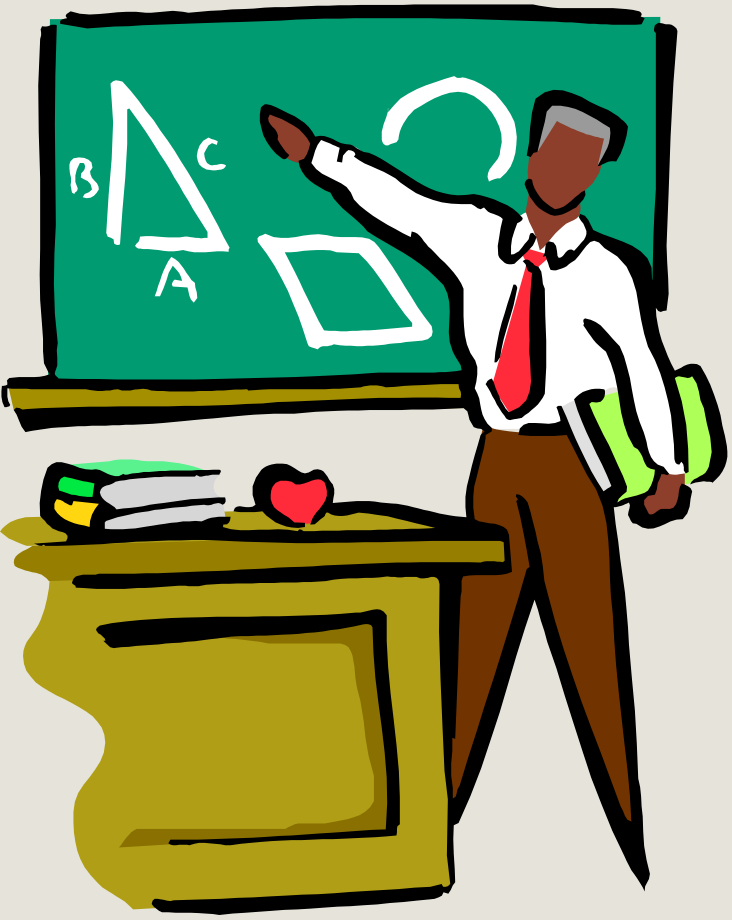
However IN cannot fit the bill for several reasons such as

- Relatively small range of services can be developed using IN principles
- Third parties are not really allowed in IN world
- Creation and deployment are slow

The prospects

- The approach is outdated
- Main standardisation bodies have given up on it (for Internet Telephony):
  - IETF
  - 3GPP

Inter-working with IN: PINT



1. Introduction
2. Benchmark services
3. Architecture
4. Simplified example
5. Pros / cons

Introduction

PSTN/Internet Inter-working (PINT)

IETF initiative

Build new end user services in NGN/Internet domain based on PSTN capabilities

- Services initiated in NGN/Internet domain but executed in the PSTN domain

Re-use as much as possible the emerging NGN protocols in the architecture

- SIP
- SDP

Use a sample of services as benchmarks

Benchmark services

Click to dial

- Callee and caller given as parameters
- Call established in PSTN

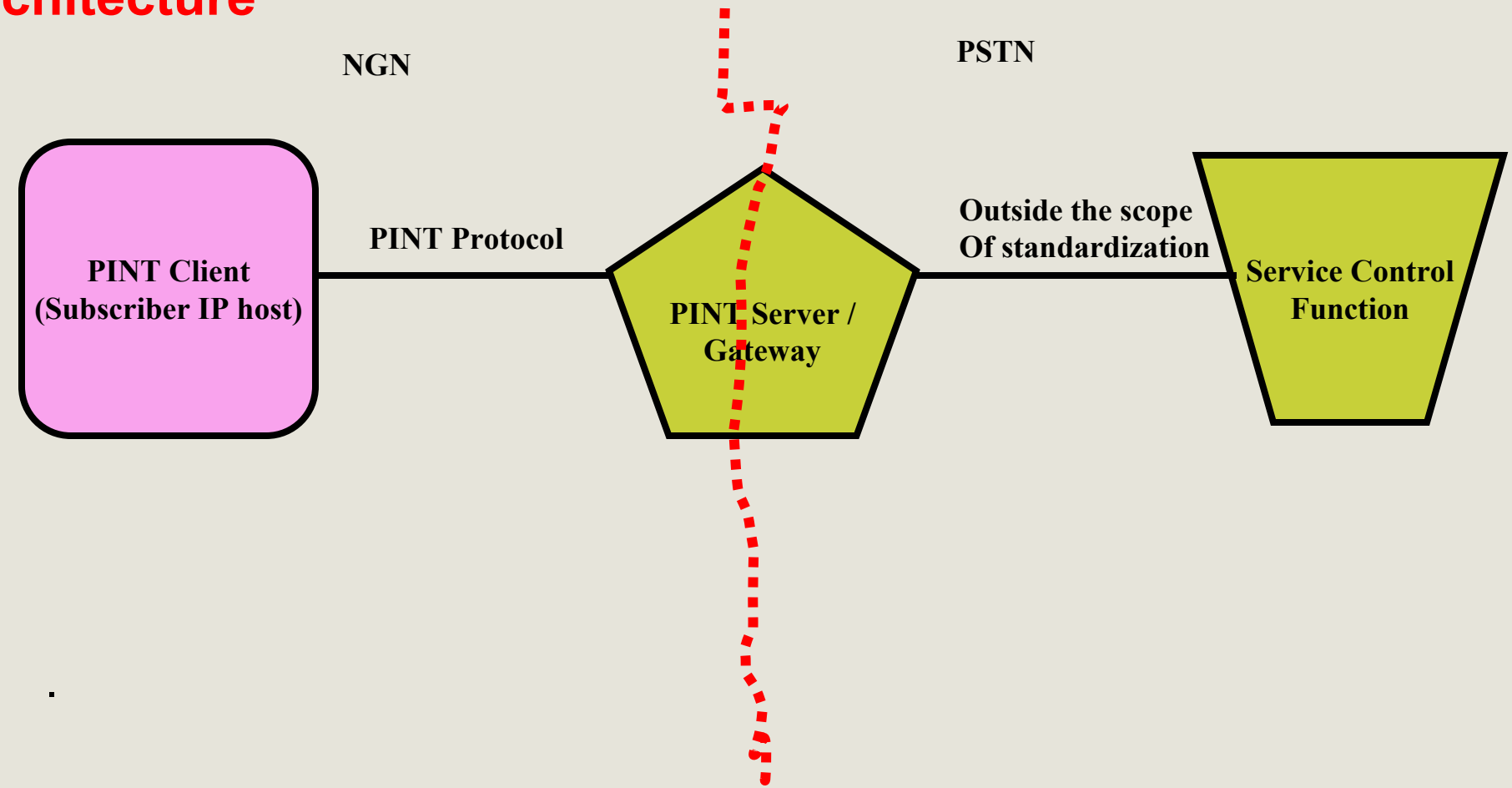
Click to fax

- A pointer to the content may be given as input parameter

Click to speak / send / play content

- A pointer may be given to the content

Architecture



Architecture

PINT Protocol

SIP messages, but with a different semantics

- REGISTER
  - Used by a PINT gateway/server to inform a proxy/redirect of the services it can offer
- INVITE
  - Used by the PINT client to request a specific service
- BYE
  - Used by the PINT client to cancel a previously sent request

Architecture

PINT Protocol

SIP messages, but with the same semantics

Subscribe

Unsubscribe

Notify

- Used by PINT clients to be informed of the progress/outcome of a request

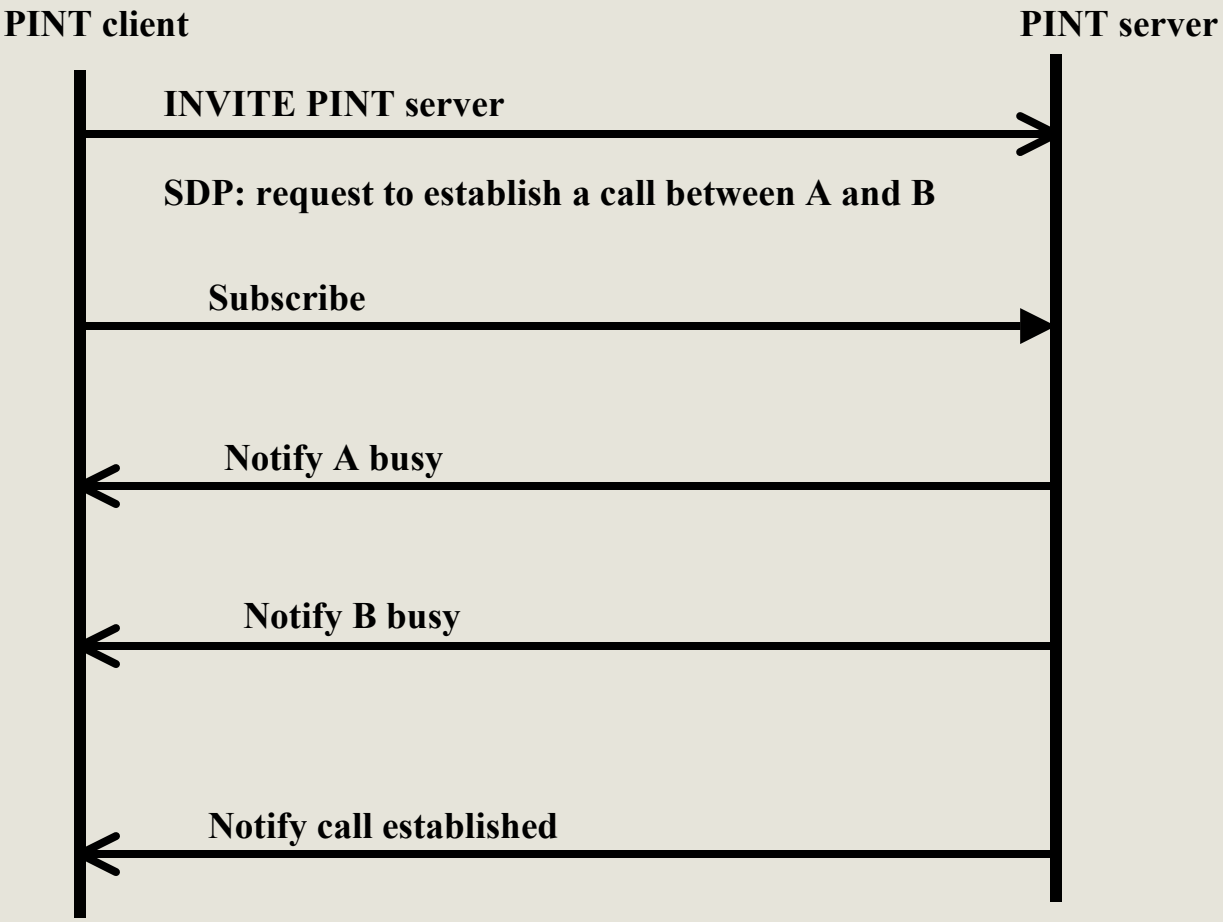
Architecture

PINT Protocol

SDP messages, but with a different semantics

- Used to specify the request (e.g. call) and carry the pertinent parameters (e.g. caller, callee)
- Examples of new keywords
  - Network type (TN) and address type (RFC2543)
  - Attribute Tags to pass information to the telephone network
    - Selection of specific service provider
    - Presentation restriction attribute (callers not divulged)
  - Require attribute
    - To force a server to decline an attribute it does not understand

Examples


PINT client
PINT server
INVITE PINT server
SDP: request to establish a call between A and B
Subscribe
Notify A busy
Notify B busy
Notify call established

Examples

- C->S: INVITE sip:R2C@pint.mailorder.com SIP/2.0
- Via: SIP/2.0/UDP 169.130.12.5
- From: sip:anon-1827631872@chinet.net
- To: sip:+1-201-456-7890@iron.org;user=phone
- Call-ID: 19971205T234505.56.78@pager.com
- CSeq: 4711 INVITE
- Subject: Sale on Ironing Boards
- Content-type: application/sdp
- Content-Length: 174

- v=0
- o=- 2353687637 2353687637 IN IP4 128.3.4.5
- s=R2C
- i=Ironing Board Promotion
- e=anon-1827631872@chinet.net
- t=2353687637 0
- m=audio 1 voice -
- c=TN RFC2543 +1-201-406-4090

Examples

. C->S: INVITE sip:faxback@pint.mailorder.com SIP/2.0
Via: SIP/2.0/UDP 169.130.12.5
From: sip:john.jones.3@chinet.net
To: sip:1-800-3292225@steam.edu;user=phone;phone-context=+1
Call-ID: 19971205T234505.66.79@chinet.net
CSeq: 4713 INVITE
Content-type: application/sdp
Content-Length: 218

v=0
o=- 2353687660 2353687660 IN IP4 128.3.4.5
s=faxback
e=john.jones.3@chinet.net
t=2353687660 0
m=application 1 fax URI

Examples

. C->S: INVITE sip:faxserver@pint.vocaltec.com SIP/2.0
Via: SIP/2.0/UDP 169.130.12.5
From: sip:scott.petrack@chinet.net
To: sip:faxserver@pint.vocaltec.com
Call-ID: 19971205T234505.66.79@chinet.net
CSeq: 4715 INVITE
Content-type: application/sdp
Content-Length: 267

v=0
o=- 2353687700 2353687700 IN IP4 128.3.4.5
s=faxserver
e=scott.petrack@chinet.net
t=2353687700 0
m=image 1 fax tif gif
c= TN RFC2543 +972-9-956-1867
a=fmtp:tif uri:http://petrack/images/tif/picture1.tif
a=fmtp:gif uri:http://petrack/images/gif/picture1.gif

Pros and cons

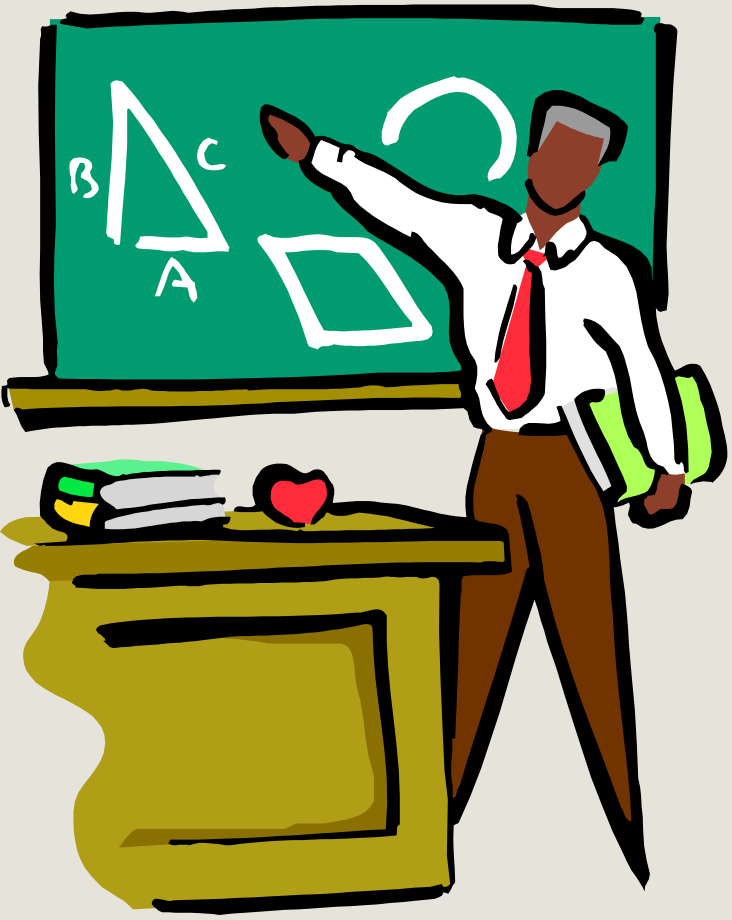
Pros

- Useful set of services
- Simple architecture
- Fits well in an environment where SIP/SDP is already installed

Cons

- Rely on the assumption that SIP/SDP will become quickly widespread
  - The assumption does not hold
    - The use of SIP/SDP become more a stumbling block than a stepping stone for the widespread usage of the standards
    - Proprietary implementations become widespread
- May not fit well in a real NGN environment
  - Calls will be established without using the PSTN

Inter-working with IN: SPIRITS



1. Introduction
2. Benchmark services
3. Architecture
4. Pre-SPIRITS (proprietary) implementations
5. Pros / cons

Introduction

Services in the PSTN / Intelligent Network Requesting Internet Services (SPIRITS)

IETF initiative

Build new end user services in PSTN domain based on NGN/Internet capabilities

- Services initiated in PSTN domain but executed in the Internet domain

Re-use as much as possible the emerging NGN protocols in the architecture

- SIP
- SDP

Use a sample of services as benchmark

Benchmark services

Internet call waiting (ICW)

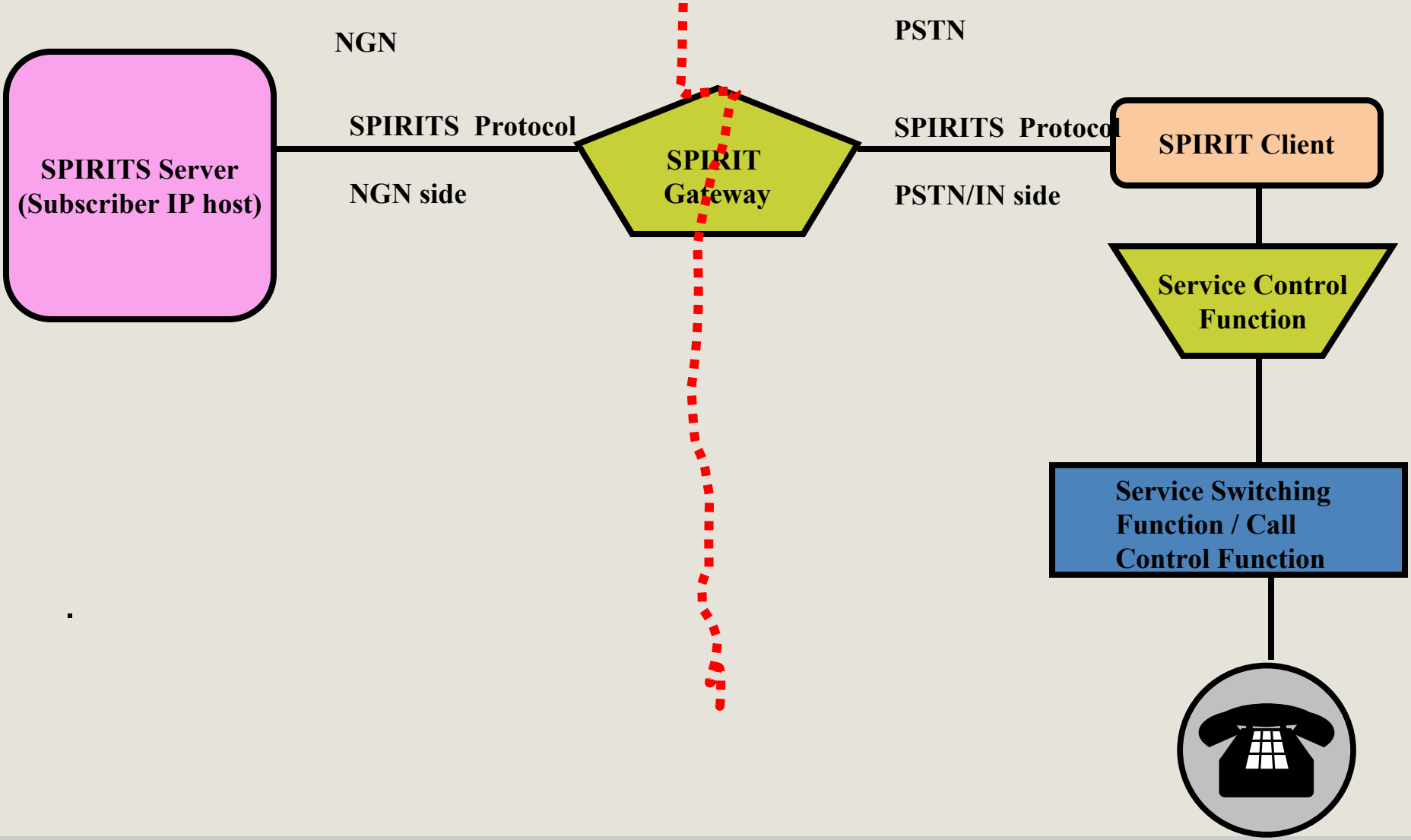
- Being informed of incoming PSTN calls while line busy because of Internet connection
- Specify the desired treatment for the call (e.g. accept, reject, forward, play announcement)
- PSTN carries out specified treatment

Internet call id delivery

Internet call forwarding

- A pointer to the content may be given as input parameter

Architecture



Architecture

Protocol requirements (NGN side)

- **Communications between PINT server and PINT gateway**
- **SIP as basis**
  - SDP for carrying parameters (or Multi-purpose Internet Mail Extensions (MIME))
  - Subscriber / notify
  - PINT extensions (optional requirement)

Protocol requirements (PSTN/IN side)

- Communications between PINT client and PINT gateway
- IN related requirements
  - CS3
  - Conversion between ASN.1 / binary encoded parameters ans text encoded ones.

The actual protocols have not been specified

Pre-SPIRITS implementations

A very wide range

A few described in detail in an IETF RFC

- Korea Telecom
- Lucent
- NEC
- Telia / Nortel

Korea Telecom implementation

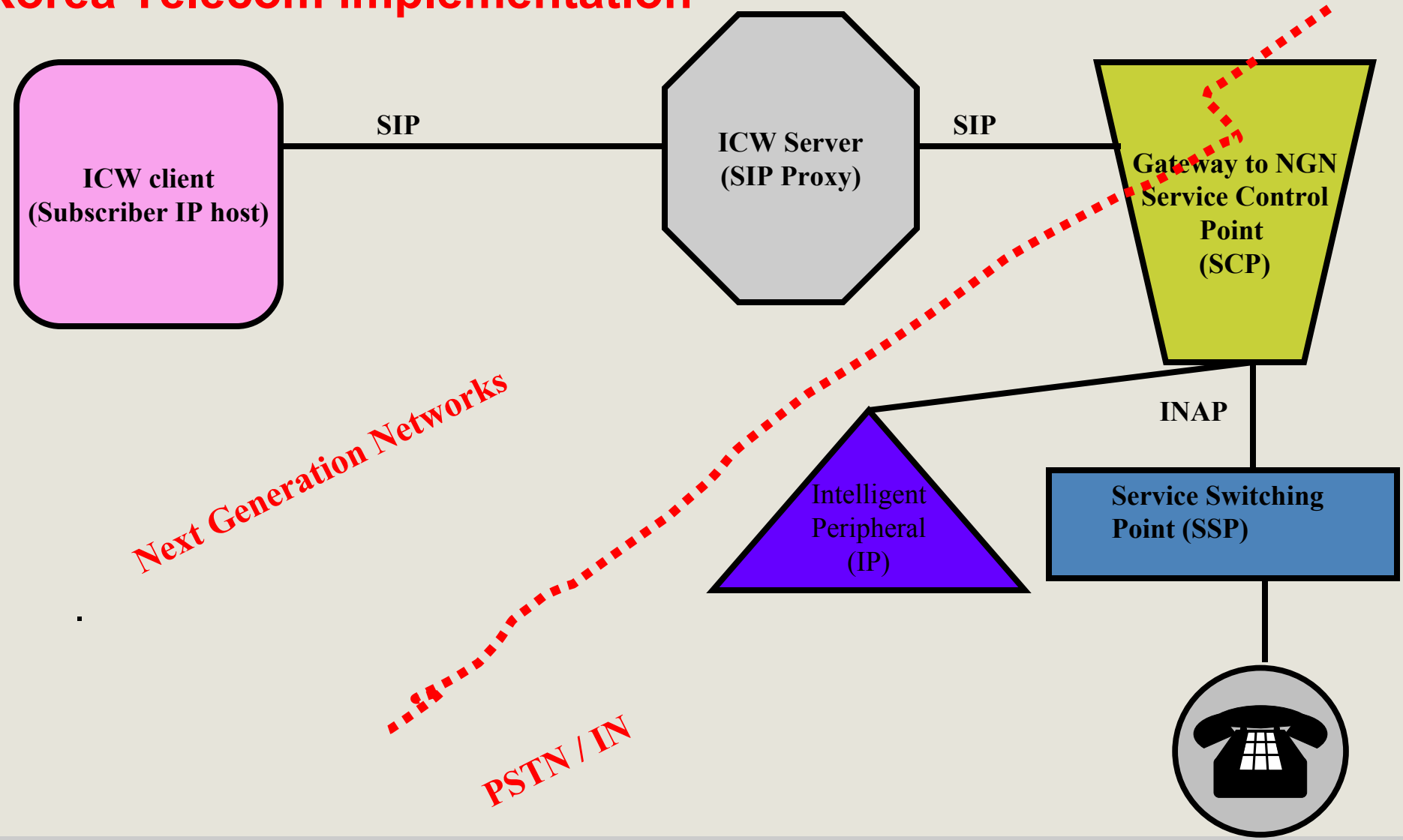
Functionality

- Comprehensive Internet Call Waiting
- Flexible activation / de-activation

Network entities

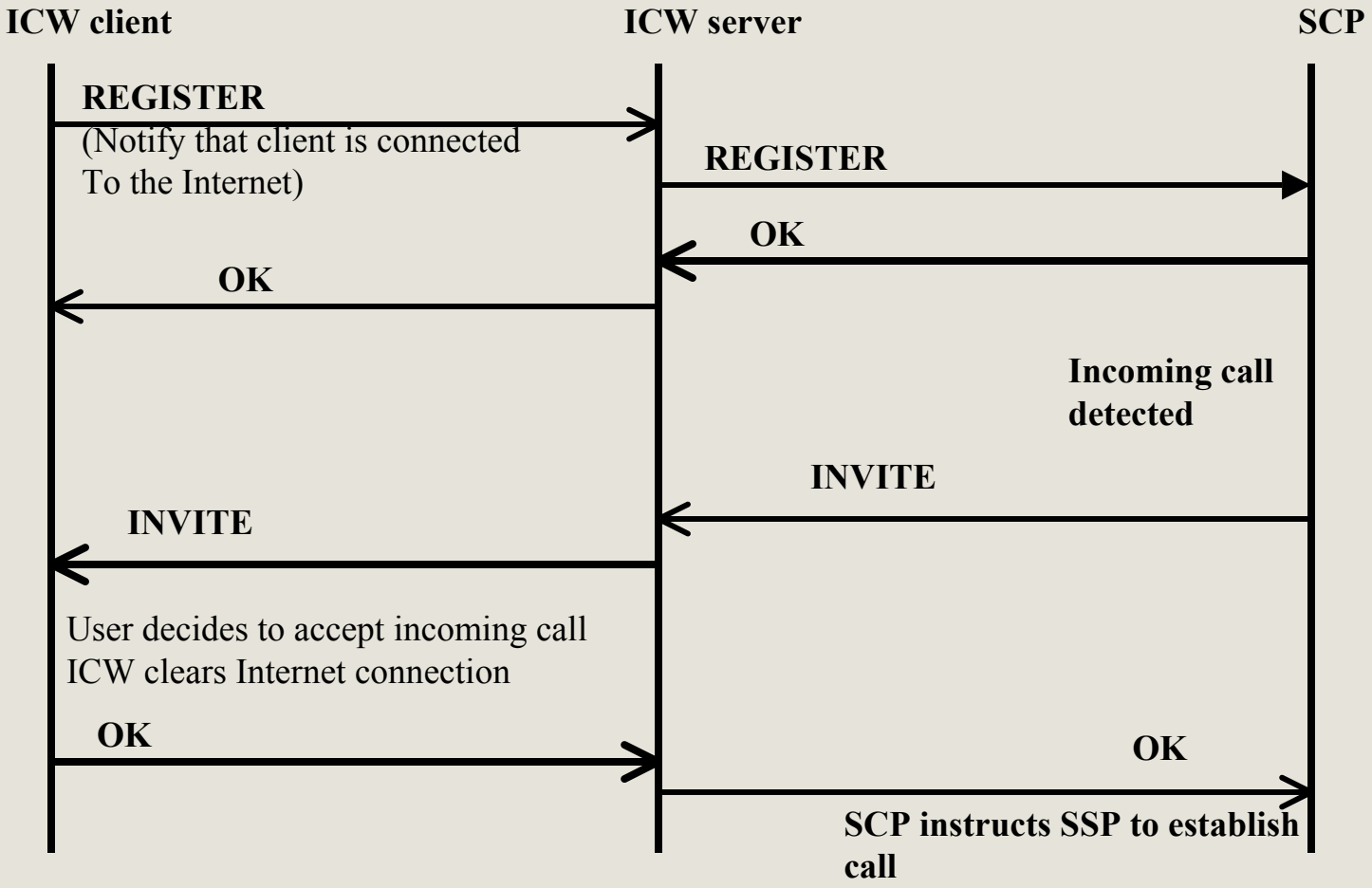
- IN side
  - CS-1 based entities / protocol
    - SCP (SCF, SDF, plus a gateway to NGN world)
    - Intelligent Peripheral (IP)
    - INAP (SCP/IP communication and SCP/SSP communications)
- NGN side
  - SIP based entities
    - ICW server system (acts as SIP proxy/redirect server)
    - ICW client system (application running on subscriber PC)

Korea Telecom implementation



Korea Telecom implementation

A simplified call flow …



Telia implementation

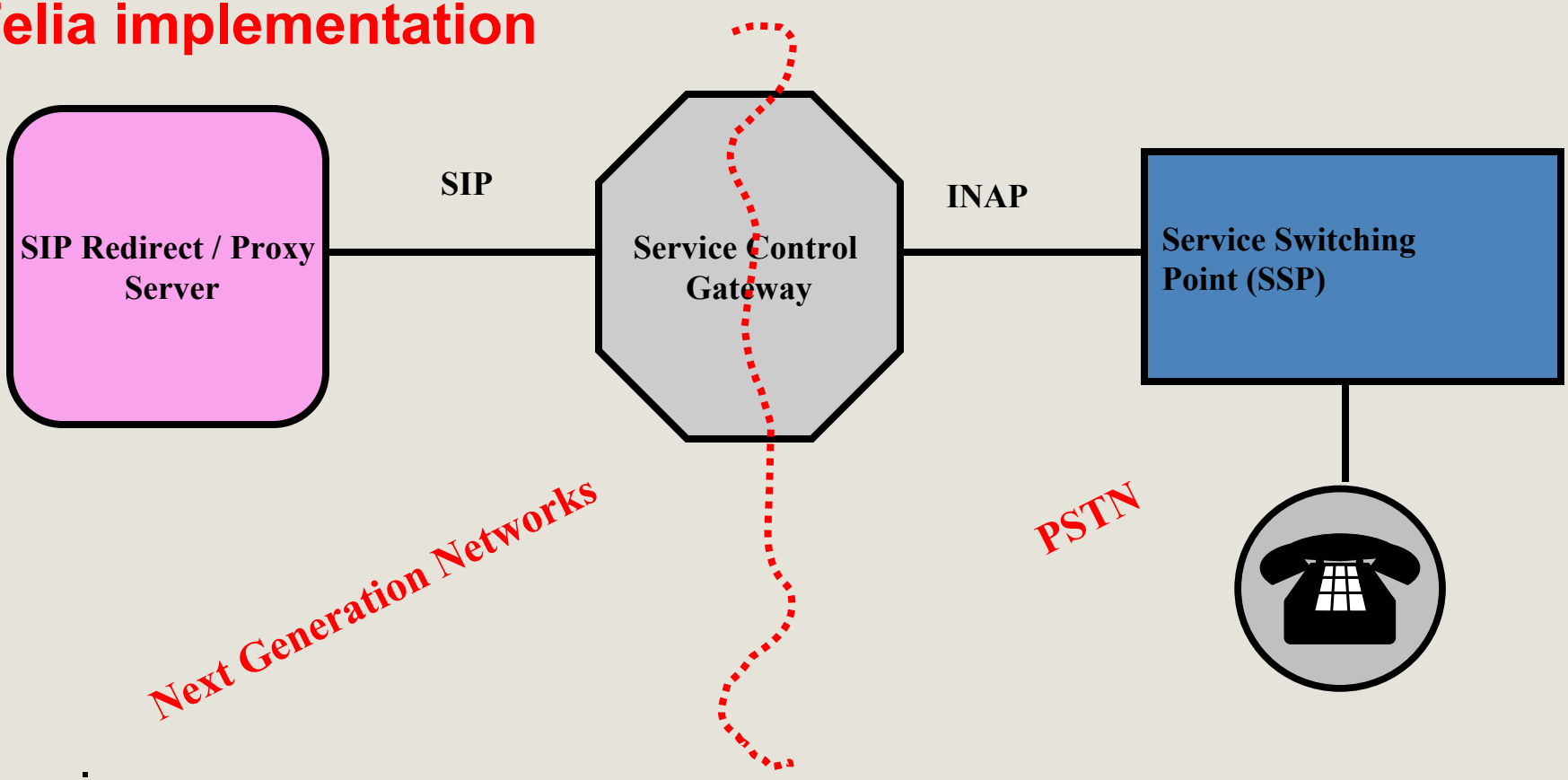
Benchmark services

- Call transfer and number portability
- Call waiting and call offering for announcing a pending call
- Call screening and and do not disturb for filtering incoming calls
- Free phone …

Main principle

- use of a SIP redirect/proxy server

Telia implementation



Telia implementation

- Server operating in redirect mode
  - Number portability for calls initiated in PSTN
  - Call screening
  - Free phones
- Server operating in proxy mode
  - Call initiated in PSTN and redirected to a number in NGN

Pros and cons

Pros

- Useful set of services
- Simple architecture

Cons

- Too little, too late
  - Protocols not fully specified
  - Large number of deployed proprietary systems
  - Emerging proprietary systems for taking incoming calls without disconnecting from the Internet

To probe further ...

Re-using IN

1. T-C Chiang et al., IN Services for Converged (Internet) Telephony, IEEE Communications Magazine, June 2000, Vol.38 No6, pp.108-115

2. R. H. Glitho, Alternatives to Today's IETF and ITU-T Advanced Service Architectures for Internet Telephony: IN and Beyond, *Elsevier Computer Networks 35 (2001)*, April 2001, pp. 551-563

Inter-working with IN

1. S. Petrack and L. Conroy, The PINT service protocol: Extending SIP and SDP for IP Access to Telephone Call Services, RFC 2848, June 2000
2. I. Faynberg et al., Service in the public switched telephone network / intelligent network (PSTN/IN) requesting Internet services (SPIRITS): Protocol requirements, RFC 3298, August 2002
3. I. Faynberg et al., Pre-SPIRITS Implementations of PSTN-initiated services, RFC 2995, November 2000