Resource reservation in a Distributed Session Border Controlled Environment

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Multi Service Access Everywhere
Summary

> Objective

> Session Border Controllers, Distributed SBC and their locations

> Integration of SBC and DSBC with TISPAN/RACS

> Signalling process

> Conclusions
Objective

> To propose a suitable integration of a Distributed SBC (DSBC) architecture with TISPAN/RACS, in order to be able to do resources management

- in a scalable way,
- allowing different business models,
- considering TISPAN/RACS Release 1, functional blocks and interfaces

- defining the required interactions for resources reservations

- with an emphasis in services where explicit application level signalling is used and NAT exists at CPE

→ MUSE is an Integrated Project in the area of Broadband Access, addressing future, low cost, multi-service access networks
Session Border Controllers (SBC)

> SBCs may address a significant number of capabilities:
  
  - Topology hiding
  - Insert added-value features to the call
  - Private/public addressing and NAT traversal
  - QoS and traffic conditioning
  - Protocol adaptation
    - Network level: e.g. different IP versions
    - Application level: e.g. different protocols (H.323, SIP)
  - Security features to prevent DoS (Denial of Service) and pinholing
  - Inform charging entity

> These functions may be organized in two main components:
  
  - BC (Border Controller), dealing with signalling and control, and
  - ABG (Access Border Gateway), dealing with media
Traditional SBC location (communication ex.)

SBC located at edge and consisting of:
- ABG Media
- BC Signaling & Control

Addresses that will appear as S or D of messages:
P@IP in SubNet 1 (e.g. retail)

Link with IETF SIP IMS TISPAN
SX:
- SIP proxy server
- or B2B UA (+ registrar)

S-CSCF
I-CSCF
BC: B2BUA P-CSCF

SPDF
Application
Server

ABG
ASB

ASP backbone
ASP1

Media
Gateway

Signalling packets
Data packets

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Disadvantages of current architecture

> Requires additional NW element of significant dimension
  • Extra cost, configuration, maintenance,…

> Resource control for upstream
  • No means to control resources in Access and Aggregation Network

> SPOF (Single Point Of Failure)
  • Number of users affected by a failure is important

→ Moving SBC entities in the direction of access nodes is a possible solution, making them more distributed and bringing the provided functionalities closer to users
Distribution of SBC to network edges

SBC located at edge and consisting of:
- ABG Media
- BC Signaling & Control

Access Network

IP Backbone

Access Network

SIP

BC

ABG

Soft Switch

Application Server

PSTN

SS7 Network

CPN A

CPN B

SIP

BC

ABG

Soft Switch

Media Gateway

Operator 1: NAP1 + SP1
Owns its Sx

SBC located in Access Node and consisting of:
- ABG Media
- BC Signaling & Control
ETSI/TISPAN architecture

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TISPAN RACS Sub-system

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SBC mapping to TISPAN/RACS

Diagram showing the mapping with nodes and signaling paths:
- CPE
- Access Node
- A-RACF
- RCEF
- L2TP
- Core Border Node
- SPDF
- C-BGF
- ABG
- AF
- BC
- Gq'
- SBC
- SIP signalling
Centralized A-RACS per AN
- Receiving requests, in a per flow basis, from all DSBC in the AN, for the sessions requiring QoS
- Possible existence of a centralized C-RACF in the domain, for overall coordination (e.g. policies distribution)

SPDF with two components
- Distributed A-SPDF (per SBC)
- Centralized C-SPDF

BGF split into two components:
- A-BGF operating at micro-flows level
- C-BGF preferably working with aggregates
Signalling and data flows processes

> CPE (RGW) is routed; it obtains a dynamic public address during the authentication process; terminals behind it obtain a private address

> CPE performs NAPT in both signalling and data flows; it does not have any SIP ALG; it keeps a pinhole for SIP signalling

> DSBC performs Hosted NAT

> Adopted a reserve-and-commit approach (considered in TISPAN/RACS models)

> A simple SIP exchange of messages was considered
  - Triggering required resources reservations actions at each communication end
  - Initial SIP Invite, used to check resources availability, does not take all required information for a detailed reservation (OK is observed only after call is answered)
    - IP address of called party not known yet (consider it will to outside the access network?)
    - Ports for called party to receive media not known yet
    - Session may be asymmetric (considered initially as being symmetric?)
    - Final codecs to be used not known yet (consider initially the preferred codecs OR the most demanding ones for initial resources request)
DSBC and NAT operations

- **Signalling plane; fixed**
- **Data plane; dynamic**

### Terminal A
- **Private Address**
  - IP\_A P\_A
- **RGW A**
  - Public Address
  - IP\_C P\_C P\_C'

### Terminal B
- **Private Address**
  - IP\_B P\_B
- **RGW B**
  - Public Address
  - IP\_D P\_D P\_D'

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Scenario with NAT at CPE – signalling and data flows

1. SIP INVITE
   IP_C P_C
   SDP: IP_A P_A
   IP_Bca P_Bca with P_A = for Rx
   Req to A-RACF1
   QoS parameters set at ABG1

2. SIP INVITE
   IP_Bcb P_Bcb
   SDP IP_xsecToA P_xsecToA
   Req to A-RACF2
   QoS parameters set at ABG2

3. SIP OK
   IP_Bcb P_Bcb
   SDP IP_B P_B with P_B = for Rx
   SIP OK
   IP_Bcb' P_Bcb'
   SDP IP_xsecToB P_xsecToB

4. SIP OK
   IP_Bca P_Bca
   SDP IP_xsecToA P_xsecToA
   IP_Bca' P_Bca'
   QoS parameters set at ABG1

5. RTP IP_C' P_C' IP_fromA P_fromA
   IP_C' P_C' allocated by RGW
   QoS filter change at ABG1

6. RTP IP_D' P_D' IP_fromB P_fromB
   IP_D' P_D' allocated by RGW
   QoS filter change at ABG2

7. RTP IP_xsecToA P_xsecToA IP_xsecToB P_xsecToB

8. RTP IP_fromB P_fromB
   RTP IP_fromB P_fromB
   RTP IP_B P_B
Conclusions

> This work presents DSBC as one evolution trend in enabling access networks with advanced multimedia capabilities
  • SBC is a solution for NAPT; DSBC adds some advantages

> It makes a proposal for resources management, integrating DSBC under TISPAN/RACS
  • It is possible to do resources management for a DSBC infrastructure, without major TISPAN/RACS changes

> Simple SIP signalling presents some limitations not allowing for an efficient resources management process
  • Future work will address the adoption of IMS like SIP signalling

> Need to check work against recent developments regarding TISPAN Release 2; under consideration the submission of a contribution to TISPAN
THANKS FOR YOUR ATTENTION!

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