Fig. 1

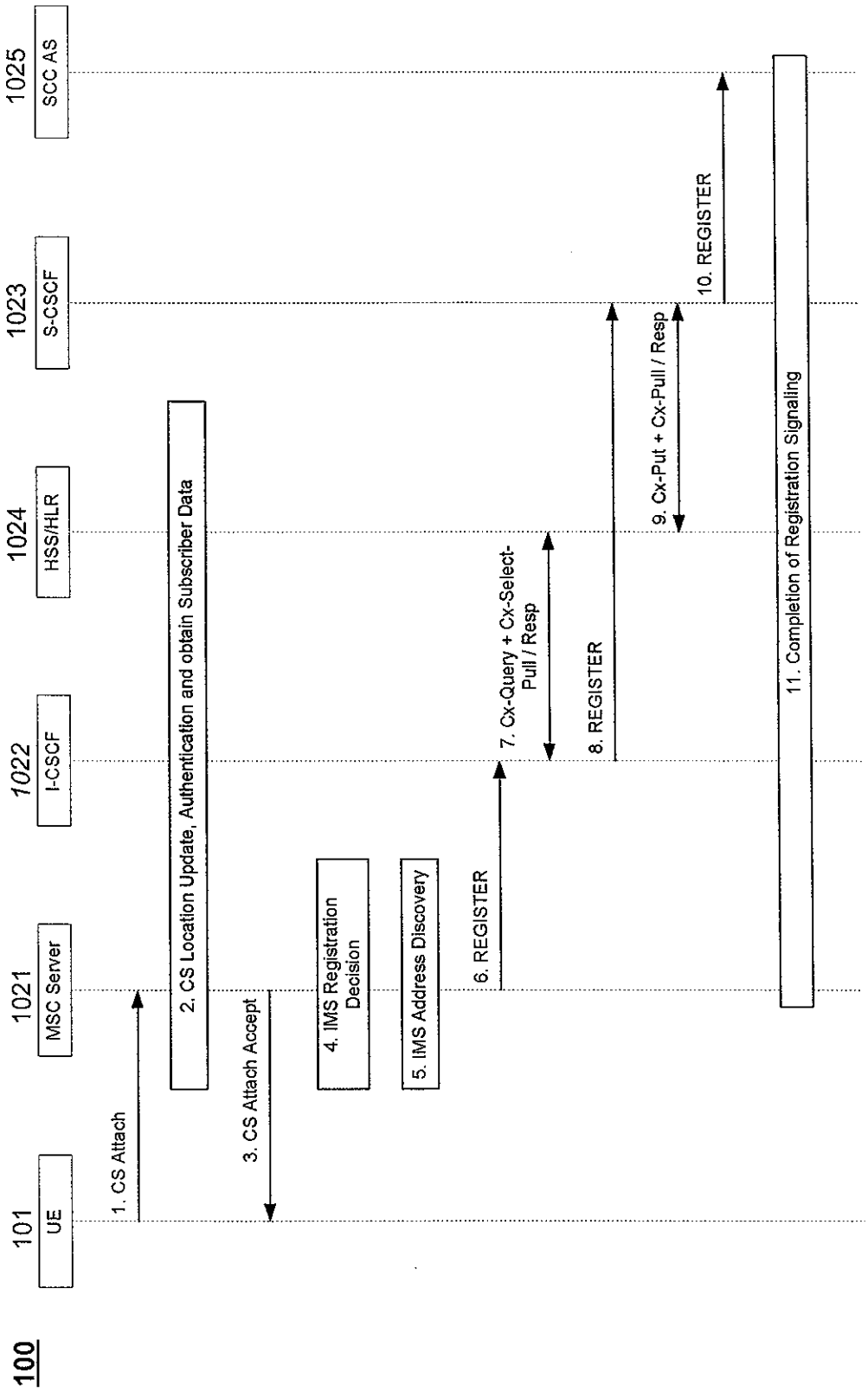

100
101
UE
1021
MSC Server
1022
I-CSCF
1024
HSS/HLR
1023
S-CSCF
1025
SCC AS
1. CS Attach
2. CS Location Update, Authentication and obtain Subscriber Data
3. CS Attach Accept
4. IMS Registration Decision
5. IMS Address Discovery
6. REGISTER
7. Cx-Query + Cx-Select-Pull / Resp
8. REGISTER
9. Cx-Put + Cx-Pull / Resp
10. REGISTER
11. Completion of Registration Signaling

Fig. 2

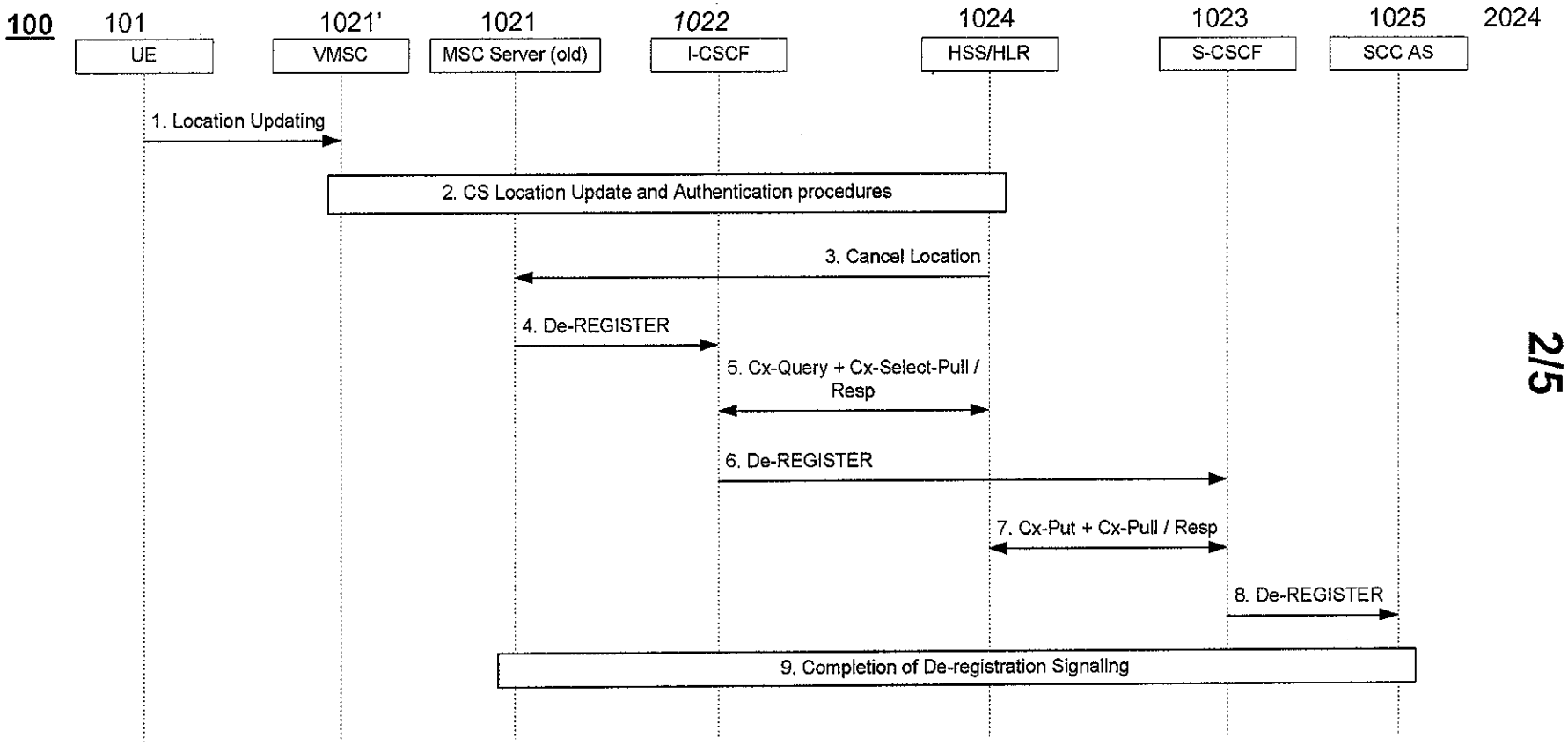

100
101
UE
1021'
VMSC
1021
MSC Server (old)
1022
I-CSCF
1024
HSS/HLR
1023
S-CSCF
1025
SCC AS
2024
1. Location Updating
2. CS Location Update and Authentication procedures
3. Cancel Location
4. De-REGISTER
5. Cx-Query + Cx-Select-Pull / Resp
6. De-REGISTER
7. Cx-Put + Cx-Pull / Resp
8. De-REGISTER
9. Completion of De-registration Signaling

Fig. 3

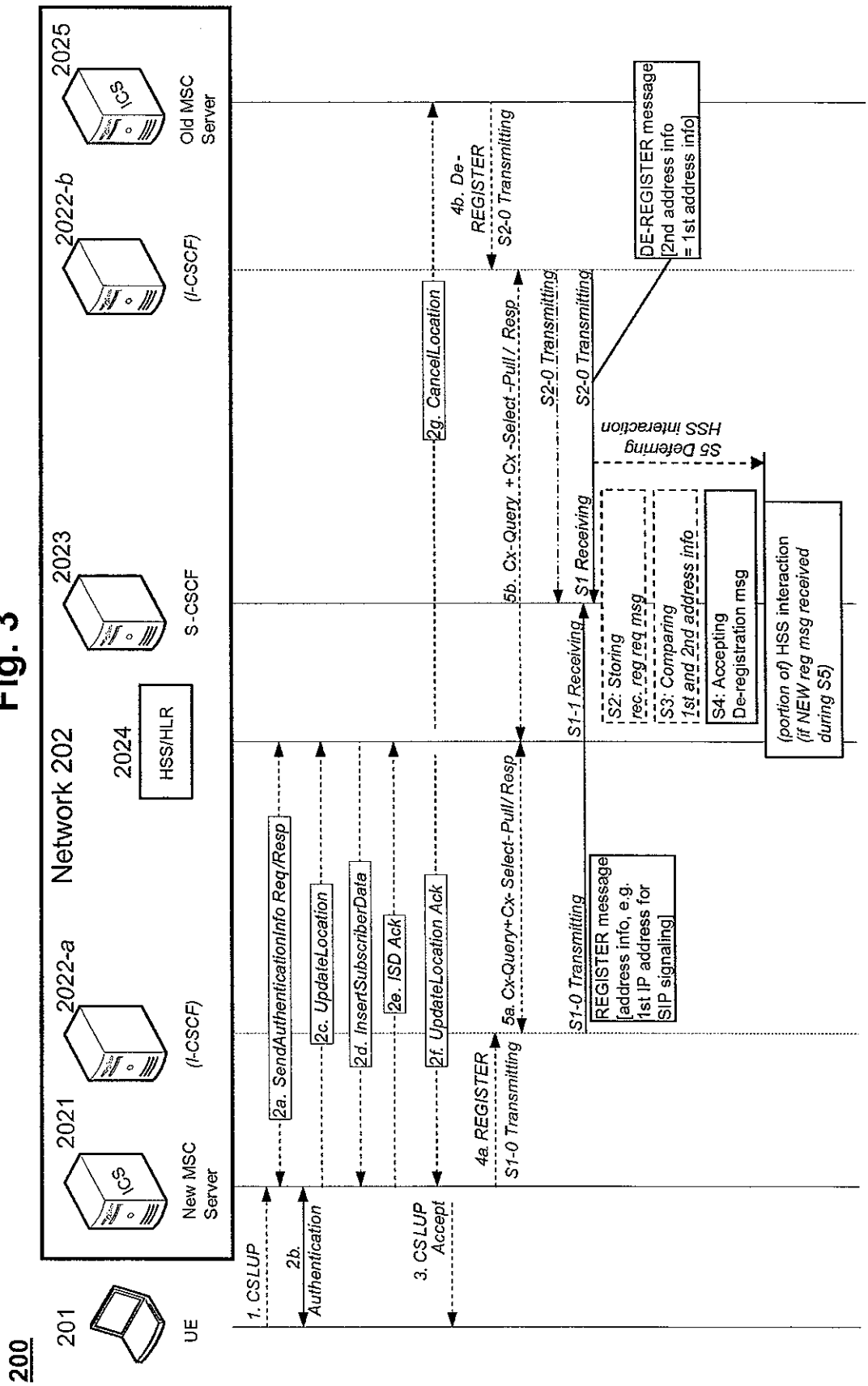

200
201
UE
New MSC Server
2021
ICS
2022-a
(I-CSCF)
Network 202
2024
HSS/HLR
2023
S-CSCF
2022-b
(I-CSCF)
Old MSC Server
2025
ICS
1. CSLUP
2b. Authentication
3. CSLUP Accept
2a. SendAuthenticationInfo Req/Resp
2c. UpdateLocation
2d. InsertSubscriberData
2e. ISD Ack
2f. UpdateLocation Ack
4a. REGISTER
S1-0 Transmitting
5a. Cx-Query+Cx-Select-Pull/Resp
S1-0 Transmitting
REGISTER message [address info, e.g. 1st IP address for SIP signaling]
S1-1 Receiving
S2: Storing rec. reg req msg
S3: Comparing 1st and 2nd address info
S4: Accepting De-registration msg
(portion of) HSS interaction (if NEW reg msg received during S5)
S5 Deferring HSS interaction
S1 Receiving
5b. Cx-Query + Cx-Select-Pull / Resp
S2-0 Transmitting
S2-0 Transmitting
2g. CancelLocation
4b. De-REGISTER
S2-0 Transmitting
DE-REGISTER message [2nd address info = 1st address info]

Fig. 4

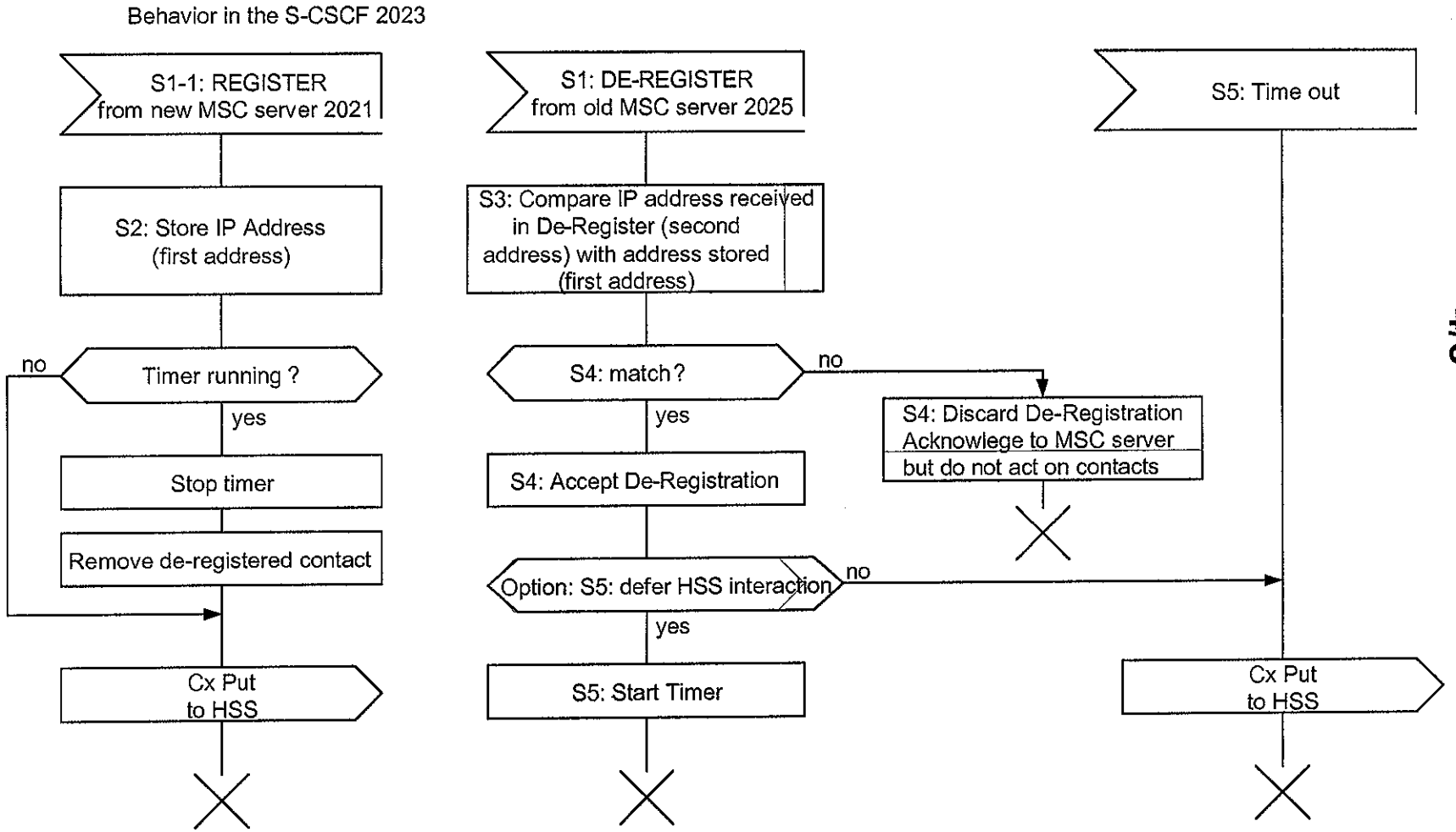
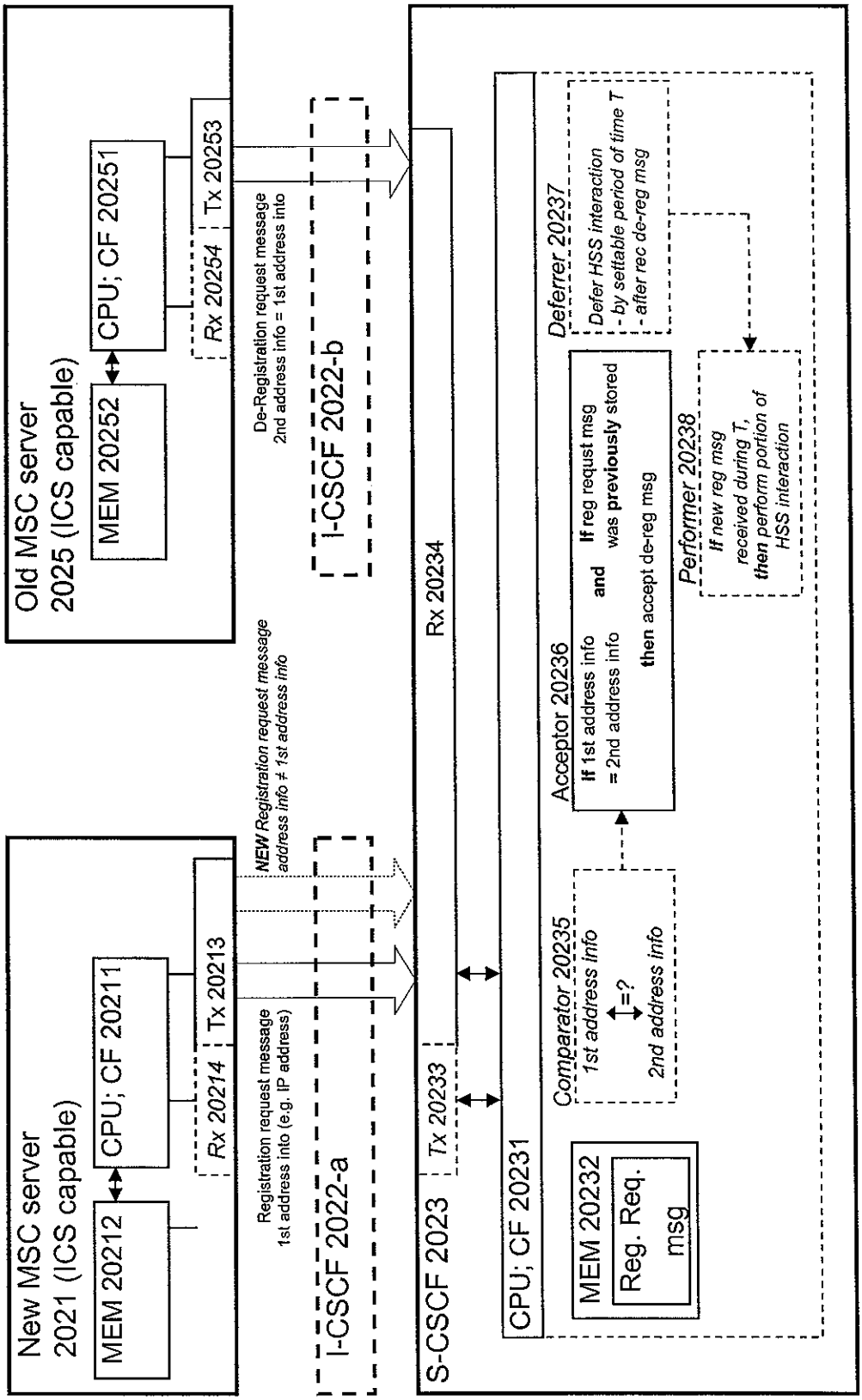

Behavior in the S-CSCF 2023
S1-1: REGISTER from new MSC server 2021
S2: Store IP Address (first address)
Timer running ?
no
yes
Stop timer
Remove de-registered contact
Cx Put to HSS
S1: DE-REGISTER from old MSC server 2025
S3: Compare IP address received in De-Register (second address) with address stored (first address)
S4: match?
no
yes
S4: Discard De-Registration Acknowlege to MSC server but do not act on contacts
S4: Accept De-Registration
Option: S5: defer HSS interaction
no
yes
S5: Start Timer
S5: Time out
Cx Put to HSS

Fig. 5


New MSC server
2021 (ICS capable)
MEM 20212
CPU; CF 20211
Rx 20214
Tx 20213
Old MSC server
2025 (ICS capable)
MEM 20252
CPU; CF 20251
Rx 20254
Tx 20253
Registration request message
1st address info (e.g. IP address)
NEW Registration request message
address info ≠ 1st address info
De-Registration request message
2nd address info = 1st address info
I-CSCF 2022-a
I-CSCF 2022-b
S-CSCF 2023
Tx 20233
Rx 20234
CPU; CF 20231
MEM 20232
Reg. Req. msg
Comparator 20235
1st address info
=?
2nd address info
Acceptor 20236
If 1st address info = 2nd address info
and
If reg requst msg was previously stored
then accept de-reg msg
Deferrer 20237
Defer HSS interaction
- by settable period of time T
- after rec de-reg msg
Performer 20238
If new reg msg received during T,
then perform portion of HSS interaction