VoLTE SIP

MO / MT Call Flow
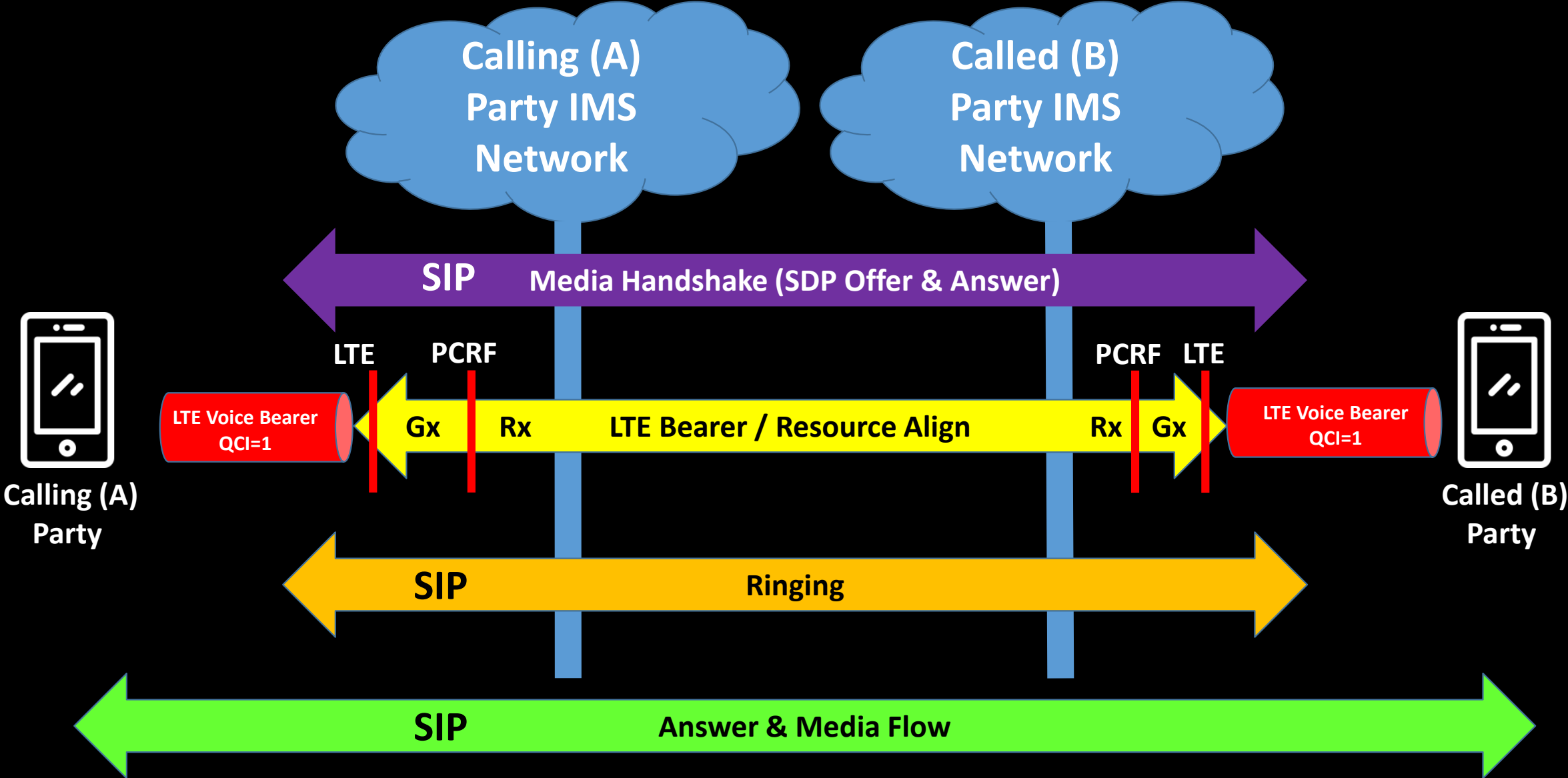
- INVITE
- 200 OK
- 183 Progress
- PRACK
- UPDATE
- 180 Ringing
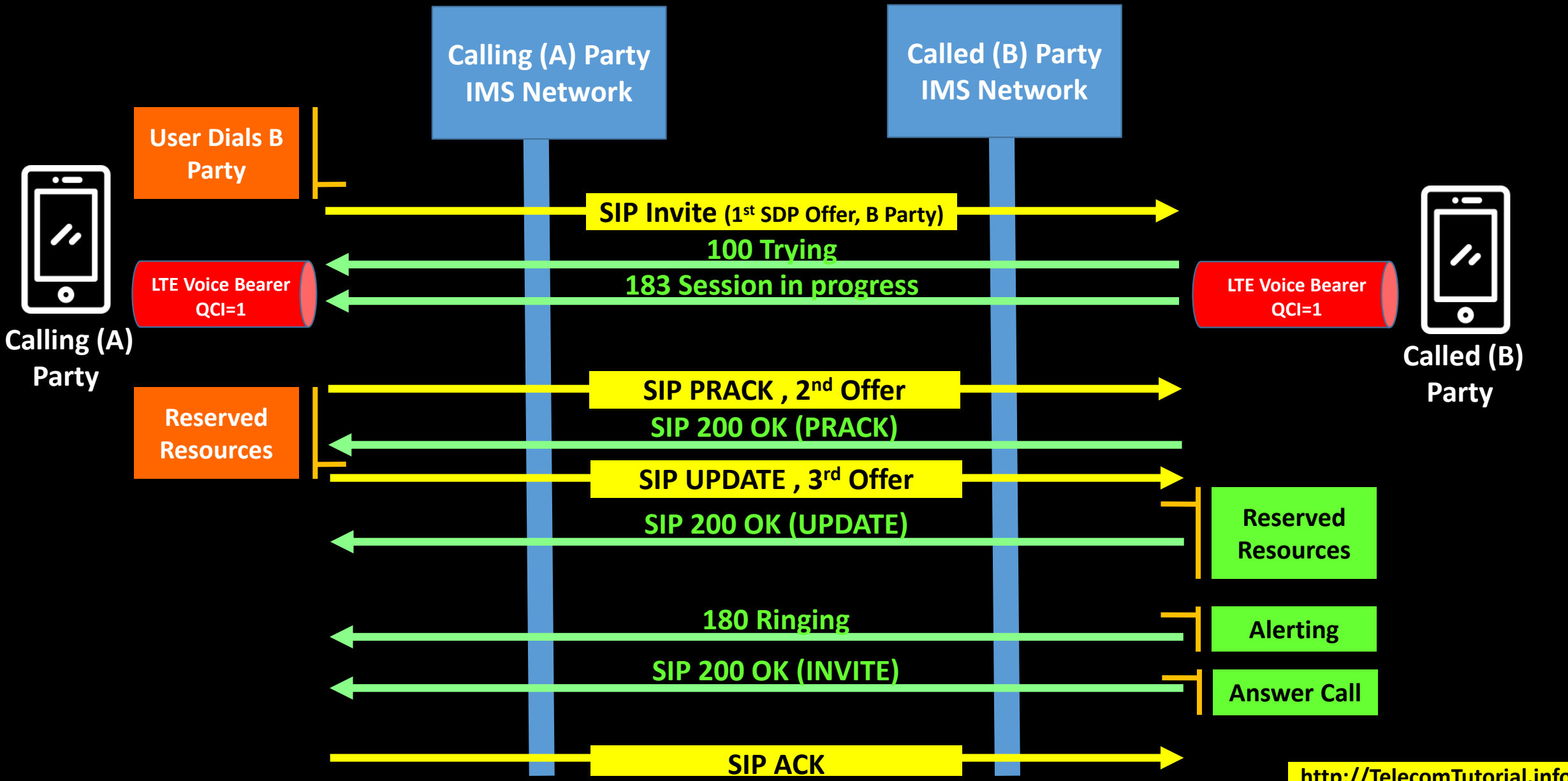- ACK

Calling (A) Party

Called (B) Party

SIP Invite (SDP Offer, B Party) →

← 100 Trying

← 183 Session in progress

SIP PRACK , 2nd Offer →

SIP UPDATE , 3rd Offer →

← 180 Ringing

← 200 OK (Answer)

SIP ACK →
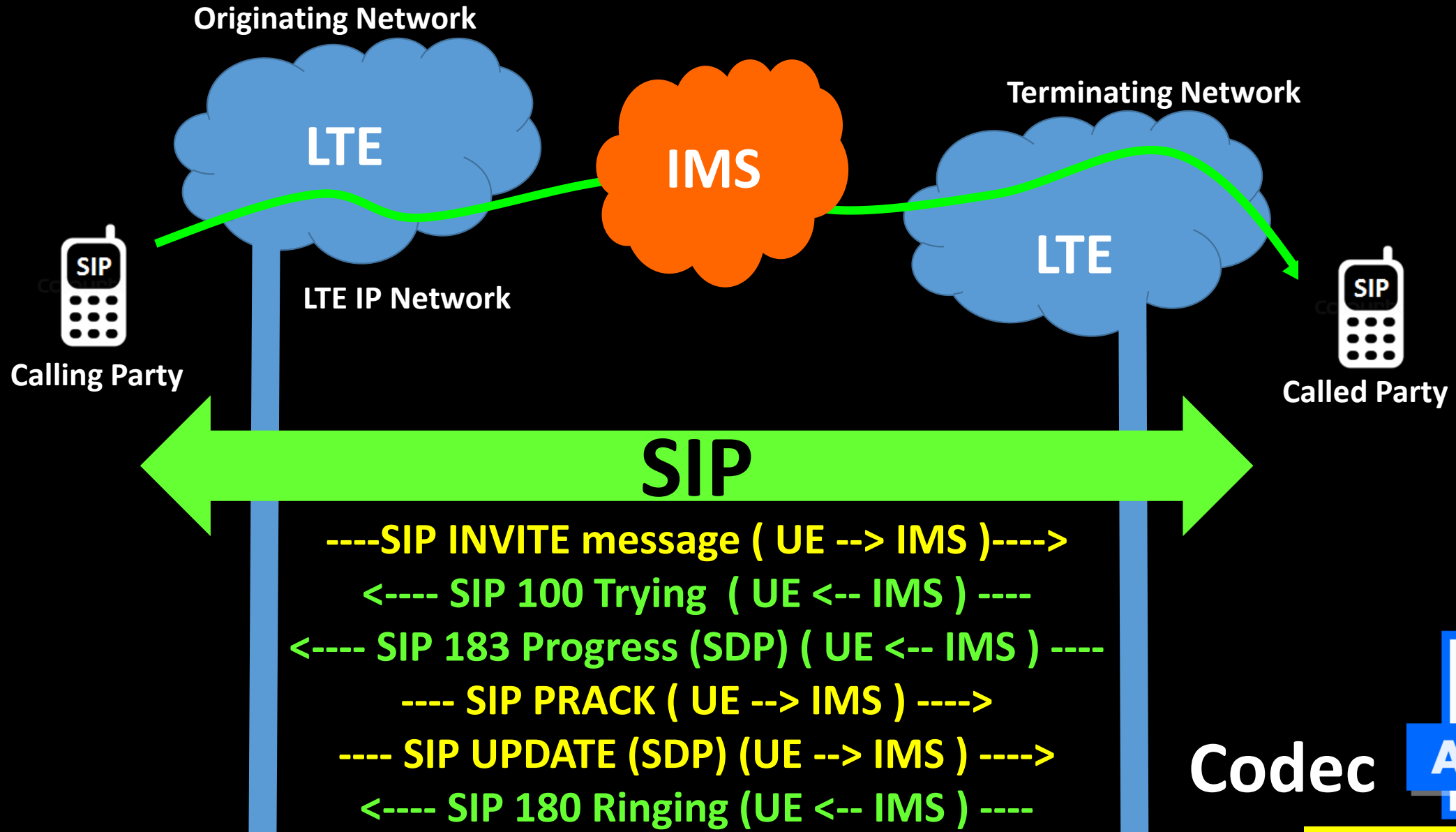
VoLTE Call Overview

VoLTE Call flow Messages (Simple Overview)

Calling (A) Party IMS Network

Called (B) Party IMS Network

Calling (A) Party

Called (B) Party

User Dials B Party

SIP Invite (1st SDP Offer, B Party)

100 Trying

LTE Voice Bearer QCI=1

183 Session in progress

LTE Voice Bearer QCI=1

SIP PRACK , 2nd Offer

Reserved Resources

SIP 200 OK (PRACK)

SIP UPDATE , 3rd Offer

SIP 200 OK (UPDATE)

Reserved Resources

180 Ringing

Alerting

SIP 200 OK (INVITE)

Answer Call

SIP ACK

Call flow
(--> SIP Invite -->)

Calling (A) Party ----- SIP Invite (SDP Offer, B Party) -----> **Calling (B) Party**

Why its used

- Calling (A) Party informs IMS Network & B Party user about New Call

How

- SDP (Session Description Protocol) is used for Carrying & Negotiating Media Information such Bandwidth & Codec

Parameters Exchanged

- **A Party** Details - IMPU , IMPI
- **B Party** details such as tel-URI etc..
- **SDP offer** (IMS media capabilities , Bandwidth Information Requested , Codec Supported information)

Call flow
(<-- 100 Trying <--)

Calling (A) Party
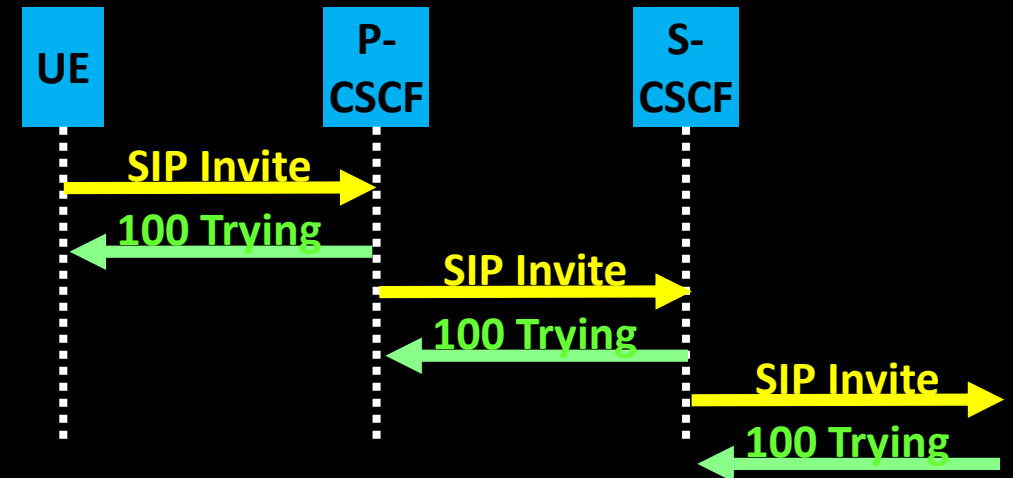
Calling (B) Party

SIP Invite (SDP Offer, B Party) →

← 100 Trying

Why its used

- 100 Trying is Provisional response immediately to the Originator in Order to stop the re-transmissions of the INVITE request

How

- Every Node sent back 100 Trying in response

UE

P-CSCF

S-CSCF

SIP Invite →

← 100 Trying

SIP Invite →

← 100 Trying

SIP Invite →

← 100 Trying

Call flow
(<-- 183 Session in progress <--)

Calling (A) Party

Calling (B) Party

SIP Invite (SDP Offer, B Party)

100 Trying

183 Session in progress

Voice Bearer QCI=1

Voice Bearer QCI=1

Why its used

- B Party informs about **Codec supported** and indicates that preconditions are not met (So Not Ringing as of Now)
- **Dedicated Bearers** are created at both A Party & B Party Side on LTE Networks

How

- SDP answer sent to originating UE with Codec supported by B Party UE
- Dedicated Bearer flow :-

P-CSCF

PCRF

SAE GW

Voice Bearer QCI=1

AAR

RAR

RAA

AAA

Gx

Rx

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Calling (A) Party

Calling (B) Party

SIP Invite (SDP Offer, B Party) →

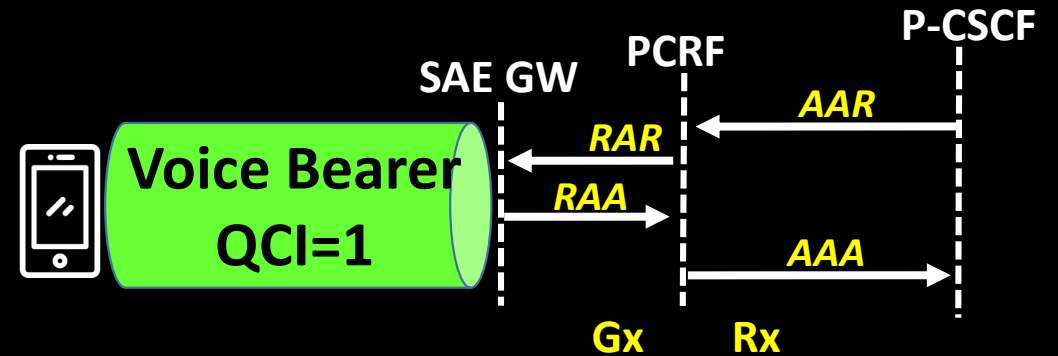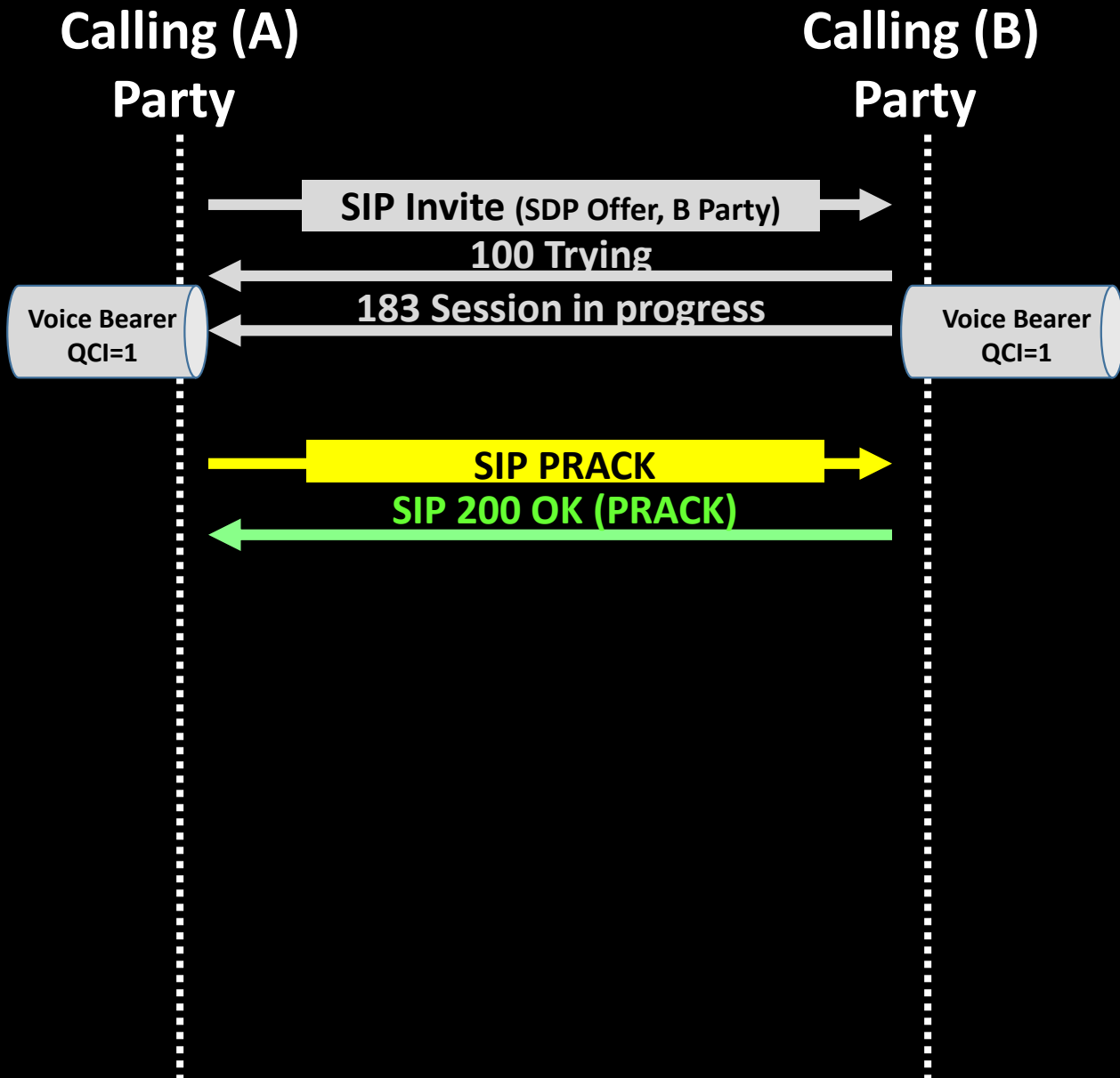← 100 Trying

← 183 Session in progress

Voice Bearer QCI=1

Voice Bearer QCI=1

SIP PRACK →

← SIP 200 OK (PRACK)

Call flow
(--> SIP PRACK -->)
(<-- 200 OK (PRACK) <--)

>-- SIP PRACK -->

- PRACK = **Provisional Response ACK to 183 Session Progress** Message received

- A Party also uses this PRACK to communicate Final Selected Codec which is decided for Voice Call via **2nd Offer**

<--200 OK (PRACK) --<

- With 200 OK , B Party Accepts Final selected Codec Offered by A Party in PRACK Request . **Final Agreement on Codec to be used** have been completed

- Both A & B Party Agree that Reservation of Resources are required but **resources have not yet been reserved**
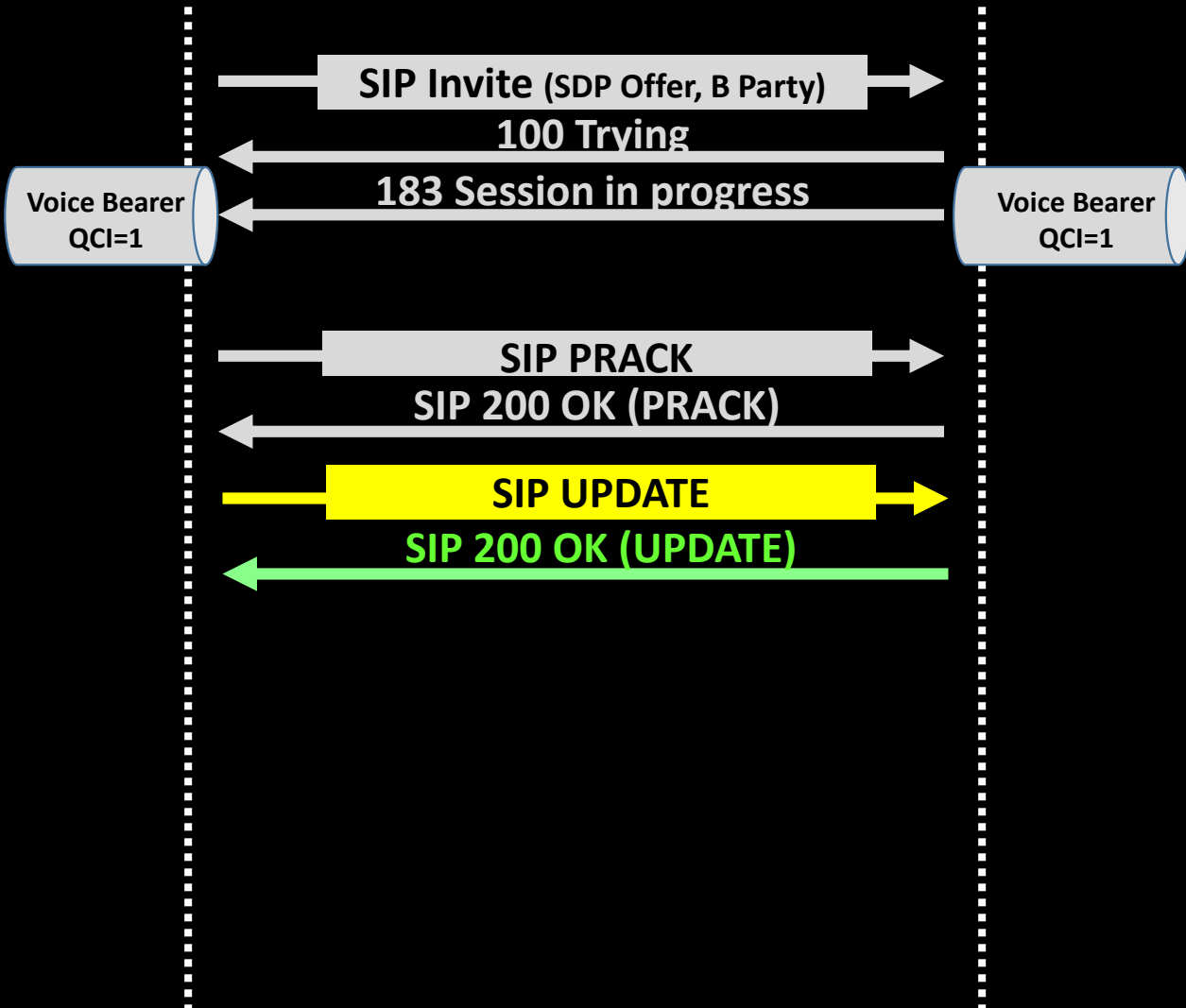
Call flow
(--> SIP UPDATE -->)
(<-- 200 OK (UPDATE) <--)

Calling (A) Party

Calling (B) Party

SIP Invite (SDP Offer, B Party) →

← 100 Trying

← 183 Session in progress

Voice Bearer QCI=1

Voice Bearer QCI=1

SIP PRACK →

← SIP 200 OK (PRACK)

SIP UPDATE →

← SIP 200 OK (UPDATE)

>-- SIP UPDATE -->

- Reservation of Resources on Originator done , Same communicated to B Party via SIP UPDATE
- No Changes in Codec etc..

<--200 OK (UPDATE) --<

- With 200 OK , B Party also reserves resources & confirm back to Originator

Call flow
(<-- 180 Ringing <--)
(<-- SIP 200 OK (INVITE) <--)
(--> SIP ACK-->)

Calling (A) Party

Calling (B) Party

SIP Invite (SDP Offer, B Party)
100 Trying
183 Session in progress

Voice Bearer QCI=1

Voice Bearer QCI=1

SIP PRACK , 2nd Offer
SIP 200 OK (PRACK)
SIP UPDATE , 3rd Offer
SIP 200 OK (UPDATE)

180 Ringing
SIP 200 OK (INVITE)
SIP ACK
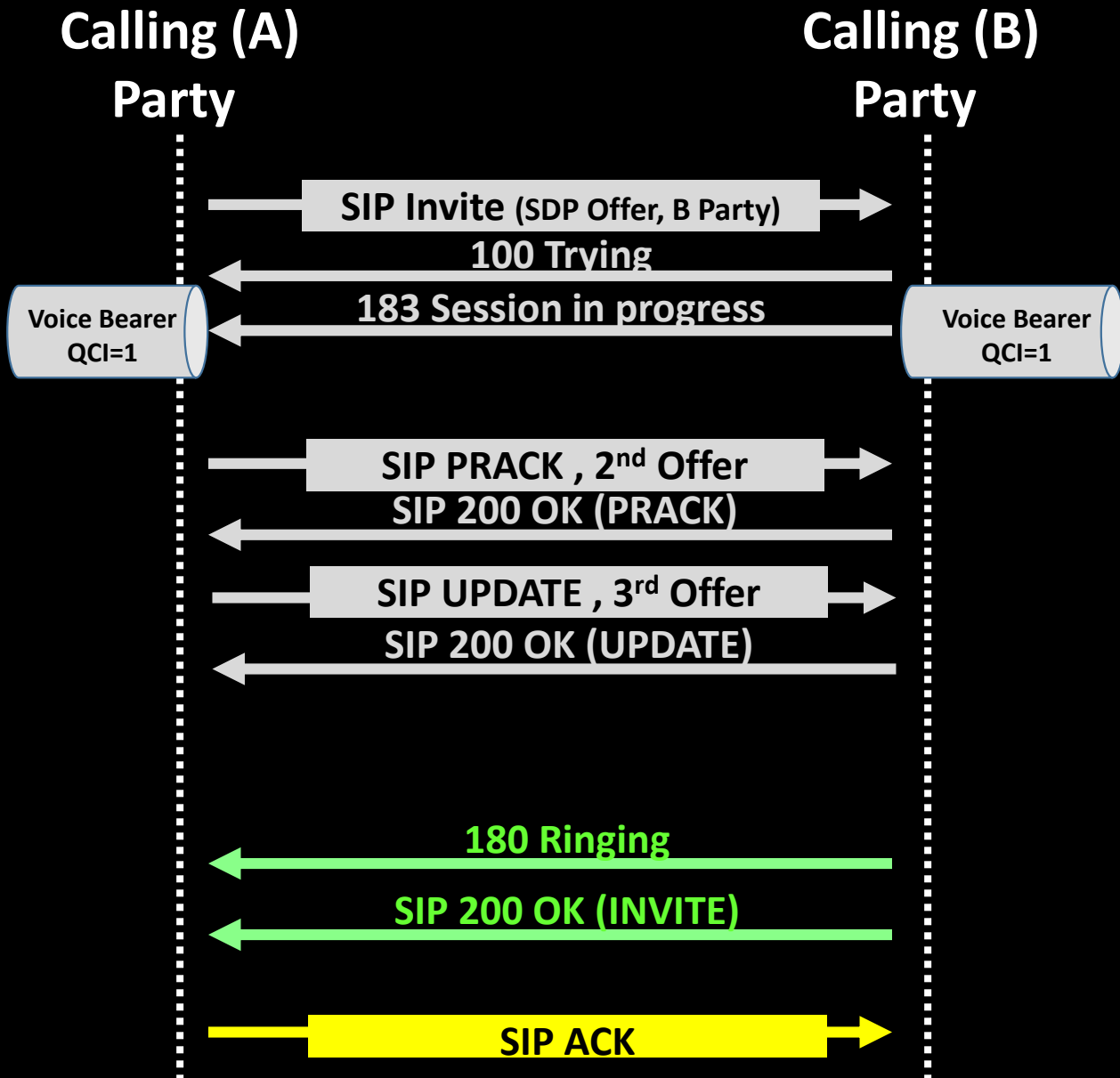
<-- 180 Ringing --<
- All Pre-conditions are satisfied now
- **B Party Alerts the Terminating user** & Sends back 180 Ringing response

<-- 200 OK (INVITE) --< (Answer)
- Called Party **Answers** the call
- B Party sends back 200 OK to Initial Invite

>-- SIP ACK →
- Originator Acknowledge back

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VoLTE Call Flow - SIP Session Establishment

Participants:
- A Party UE
- (A) LTE Network
- A Party P-CSCF
- A Party S-CSCF
- B Party I-CSCF
- B Party S-CSCF
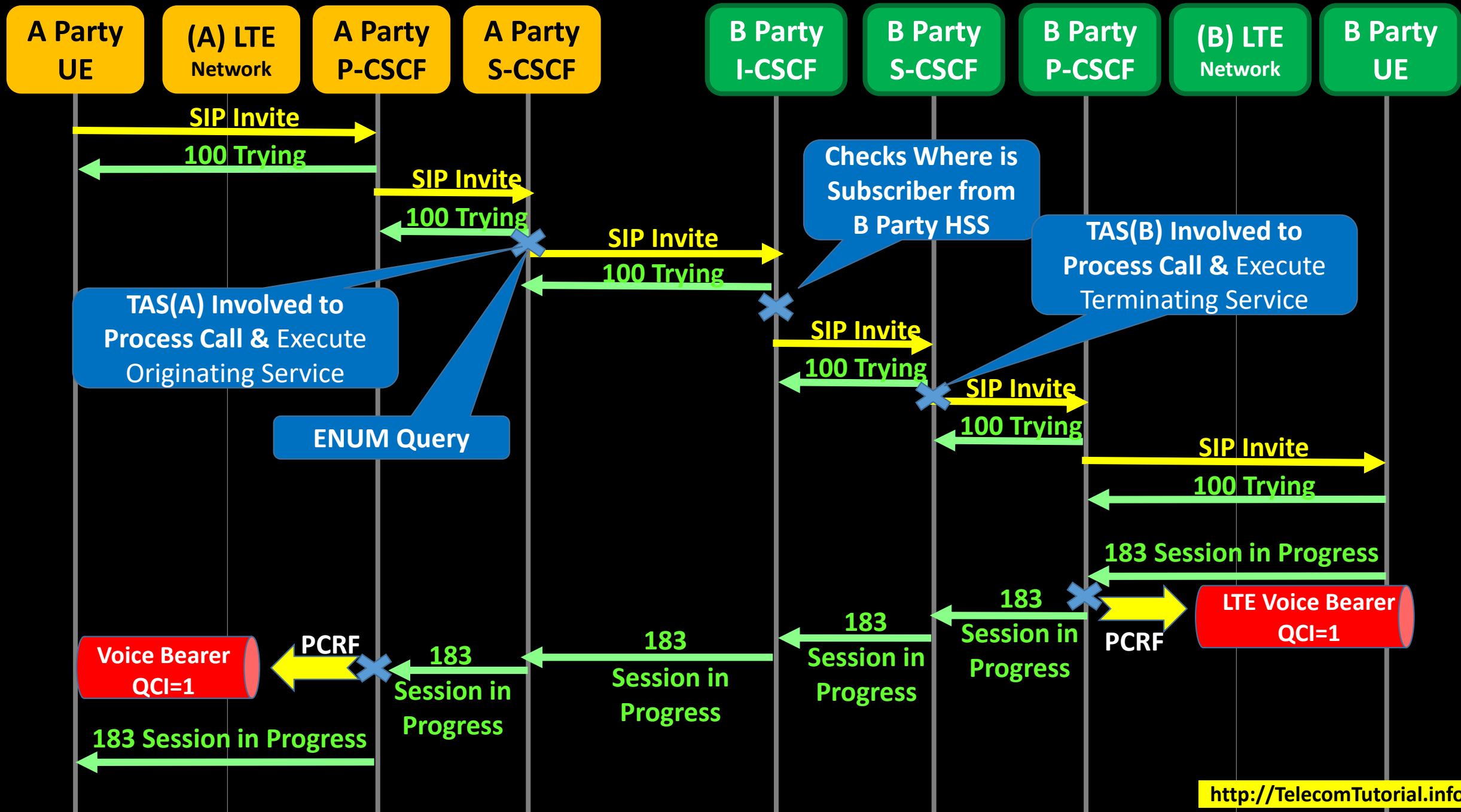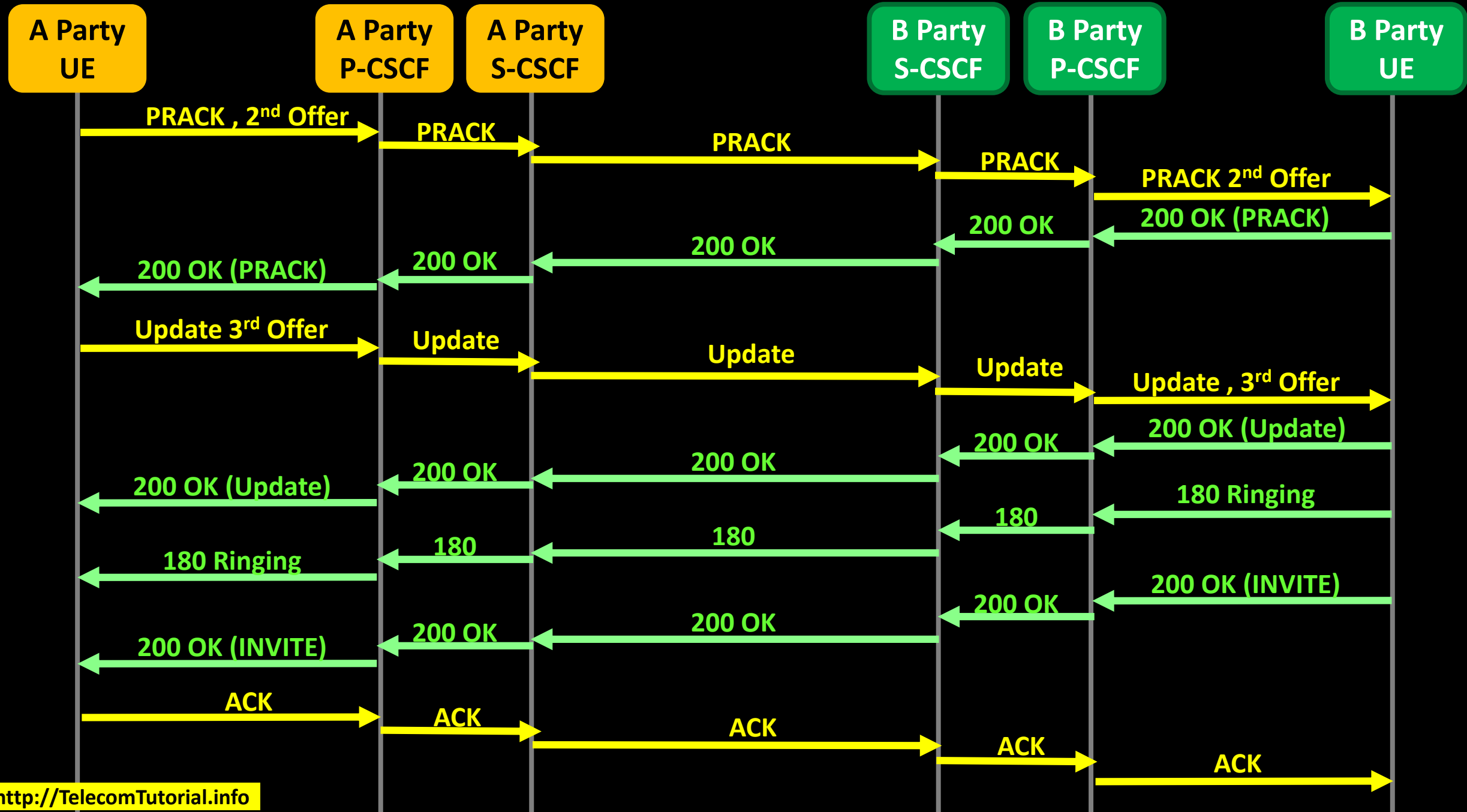- B Party P-CSCF
- (B) LTE Network
- B Party UE

Message Flow:

1. A Party UE → A Party P-CSCF: SIP Invite
2. A Party P-CSCF → A Party UE: 100 Trying
3. A Party P-CSCF → A Party S-CSCF: SIP Invite
4. A Party S-CSCF → A Party P-CSCF: 100 Trying
5. TAS(A) Involved to Process Call & Execute Originating Service
6. ENUM Query
7. A Party S-CSCF → B Party I-CSCF: SIP Invite
8. B Party I-CSCF → A Party S-CSCF: 100 Trying
9. Checks Where is Subscriber from B Party HSS
10. B Party I-CSCF → B Party S-CSCF: SIP Invite
11. B Party S-CSCF → B Party I-CSCF: 100 Trying
12. TAS(B) Involved to Process Call & Execute Terminating Service
13. B Party S-CSCF → B Party P-CSCF: SIP Invite
14. B Party P-CSCF → B Party S-CSCF: 100 Trying
15. B Party P-CSCF → B Party UE: SIP Invite
16. B Party UE → B Party P-CSCF: 100 Trying
17. B Party UE → B Party P-CSCF: 183 Session in Progress
18. PCRF → LTE Voice Bearer QCI=1
19. B Party P-CSCF → B Party S-CSCF: 183 Session in Progress
20. B Party S-CSCF → B Party I-CSCF: 183 Session in Progress
21. B Party I-CSCF → A Party S-CSCF: 183 Session in Progress
22. A Party S-CSCF → A Party P-CSCF: 183 Session in Progress
23. PCRF → Voice Bearer QCI=1
24. A Party P-CSCF → A Party UE: 183 Session in Progress

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A Party UE | A Party P-CSCF | A Party S-CSCF | B Party S-CSCF | B Party P-CSCF | B Party UE

PRACK , 2nd Offer
PRACK
PRACK
PRACK
PRACK 2nd Offer
200 OK (PRACK)
200 OK
200 OK
200 OK
200 OK (PRACK)

Update 3rd Offer
Update
Update
Update
Update , 3rd Offer
200 OK (Update)
200 OK
200 OK
200 OK (Update)

180 Ringing
180
180
180
180 Ringing

200 OK (INVITE)
200 OK
200 OK
200 OK (INVITE)

ACK
ACK
ACK
ACK
ACK

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VoLTE Codecs

Type of Codec	Bit Rate (kbps)
Narrowband (NB)	5.9, 7.2, 8, 9.6, 13.2, 16.4, 24.4
Wideband (WB)	5.9, 7.2, 8, 9.6, 13.2, 13.2 channel-aware, 16.4, 24.4, 32, 48, 64, 96, 128 (6.6 ~ 23.85 for AMR-WB IO)
Super-wideband (SWB)	9.6, 13.2, 13.2 channel-aware, 16.4, 24.4, 32, 48, 64, 96, 128
Full band (FB)	16.4, 24.4, 32, 48, 64, 96, 128

http://www.3gpp.org/news-events/3gpp-news/1639-evs_news

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