



The July 2 Communication Failure and Our Response

July 29, 2022

KDDI Corporation

President Makoto Takahashi

On July 2, 2022, starting at about 1:35 am,
KDDI experienced a significant communication failure.
We deeply apologize for the inconvenience for
those affected.

As a telecommunications carrier, supporting social infrastructure
and providing stable service, we take such incidents seriously.

We have implemented measures to try to prevent recurrences
and will make every effort to foster smooth operations going forward.

General Outline of Communication Failure

Affected time	From July 2 (Sat) 1:35 am (JST) to July 4 (Mon) 3:00 pm (Total : 61 hours 25 minutes)
Affected area	Nationwide

< The number of affected customers >

Voice (VoLTE)	About 22.78 million
Data (4G/5G)	7.65 million or more

* The scale of impact is estimated and calculated based on the difference (number of calls and number of registered locations) between normal times (the same time zone one week before the communication failure) and during communication failure.

Impact on Corporate Customers

Industries and Infrastructure

Logistics

Delivery status updates
Contact with delivery drivers

Automobile

Connected car services

Administrative services

Weather data collection
Water meters

Banking

ATMs outside of banks

Transportation

Wireless transceivers
in airports
IC cards for buses

Overview of Communication Failure and Response

Failures caused by maintenance work cascaded

July 2

- Outage started (originally about 15 minutes) due to incorrect router settings during maintenance.
- Service interruption continued due to traffic congestion (access concentration), even though router reverted back to previous settings.

July 3

- Congestion occurred at VoLTE ※₁ Nodes and subscriber DB ※₂; data inconsistencies at the subscriber DB triggered a chain reaction which continued the service interruption.
- Despite measures implemented to reduce the load on subscriber DB, and to correct subscriber DB data inconsistencies, situation continued where load was not sufficiently reduced.

July 4

- VoLTE nodes that caused unnecessary excess signals were identified and disconnected.
- Confirmed that both voice and data communications recovered to the same level as the previous week.

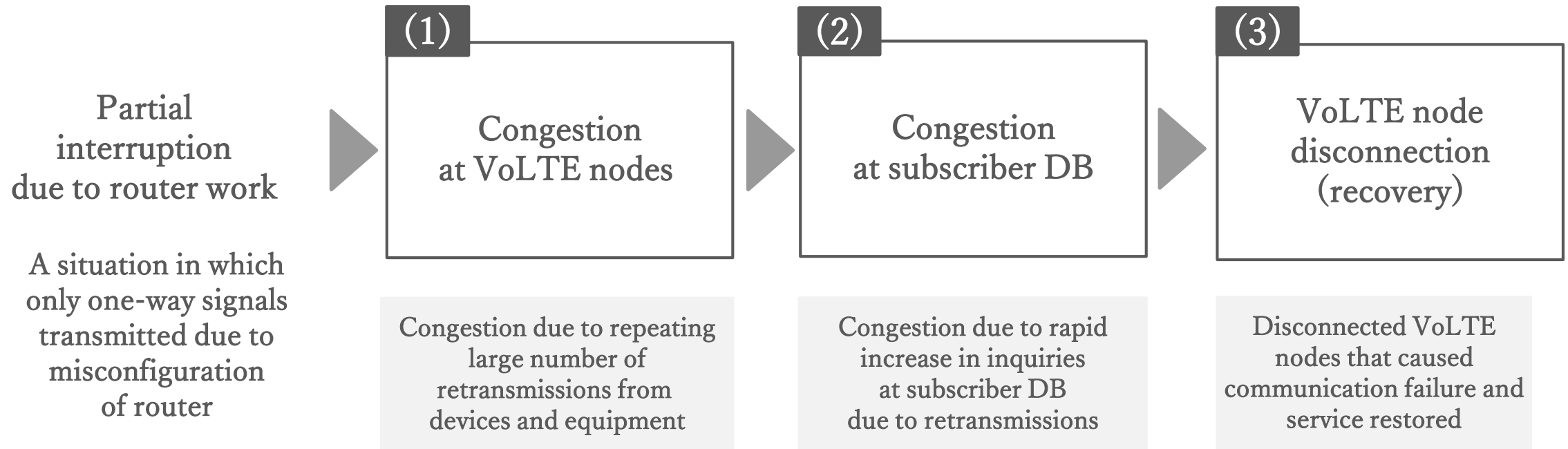
※₁ VoLTE: Voice communication service over LTE network

※₂ subscriber DB (Data Base): Equipment that authenticates services used by subscribers

Overview of the Communication Failure

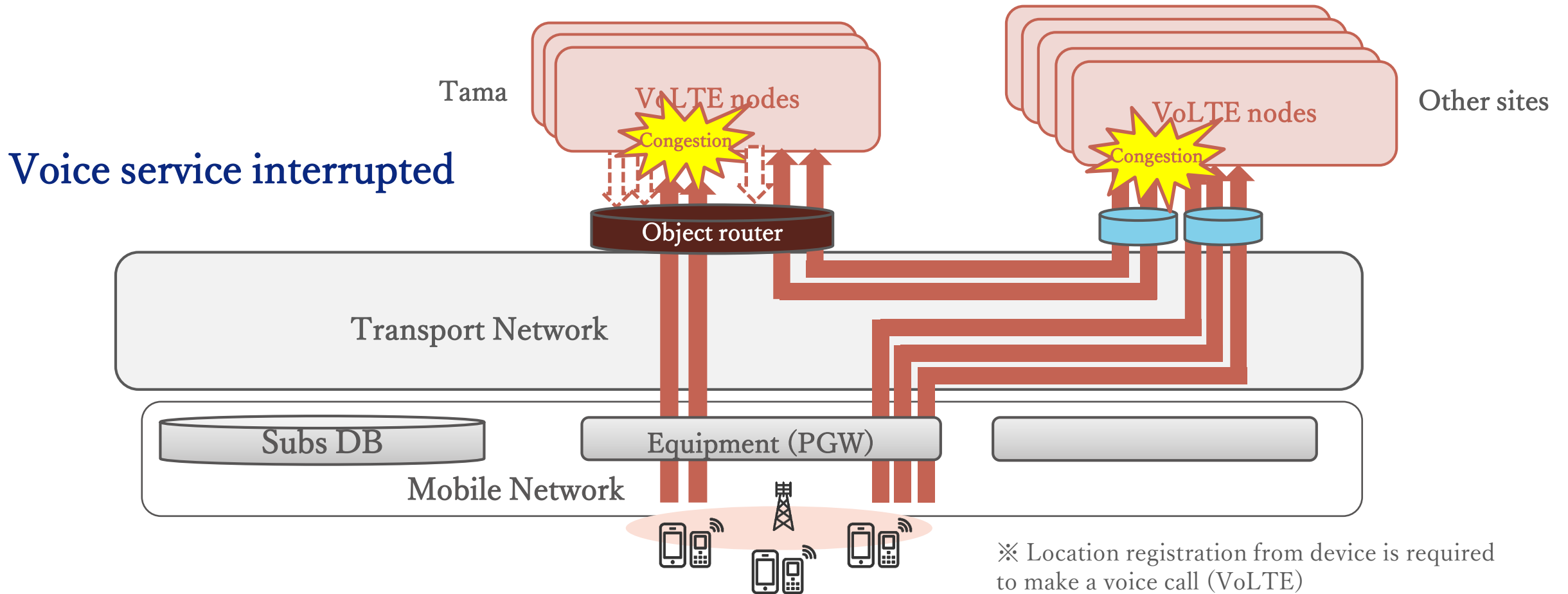
Large number of location registration request signals generated due to incorrect router settings.

VoLTE nodes and subscriber DB nationwide were congested.



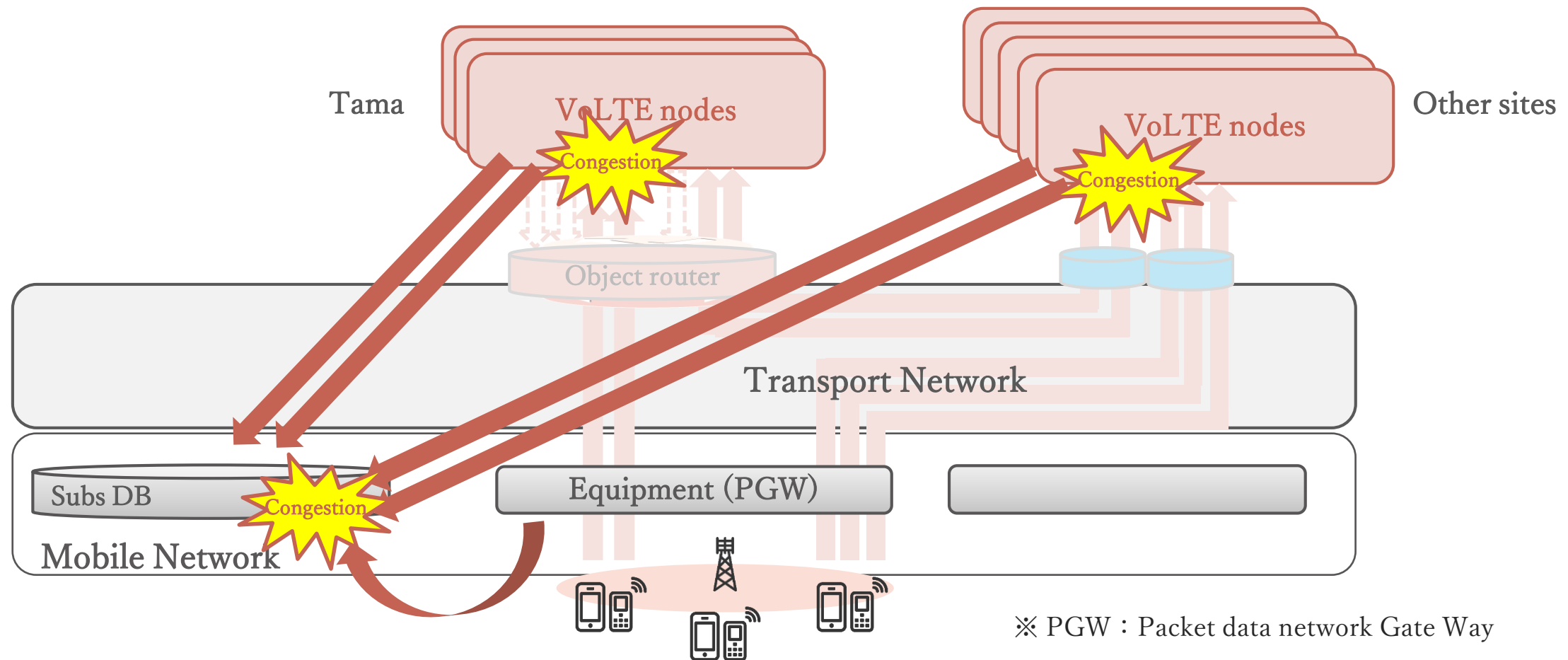
(1) Congestion at VoLTE Nodes

- ✓ Router incorrectly configured during maintenance of nationwide transport network router in Tama. The location registration[※] request was abandoned, rapidly triggering numerous retransmissions in network and Tama's VoLTE nodes became congested.
- ✓ VoLTE nodes at other sites became congested because distributed processing was performed via the nationwide transport network.



(2) Congestion at Subscriber DB

- ✓ As the VoLTE nodes and mobile network equipment (PGW*) authenticate at the subscriber DB each time, it was retransmitted, causing excessive signals flows and subscriber DB became congested.

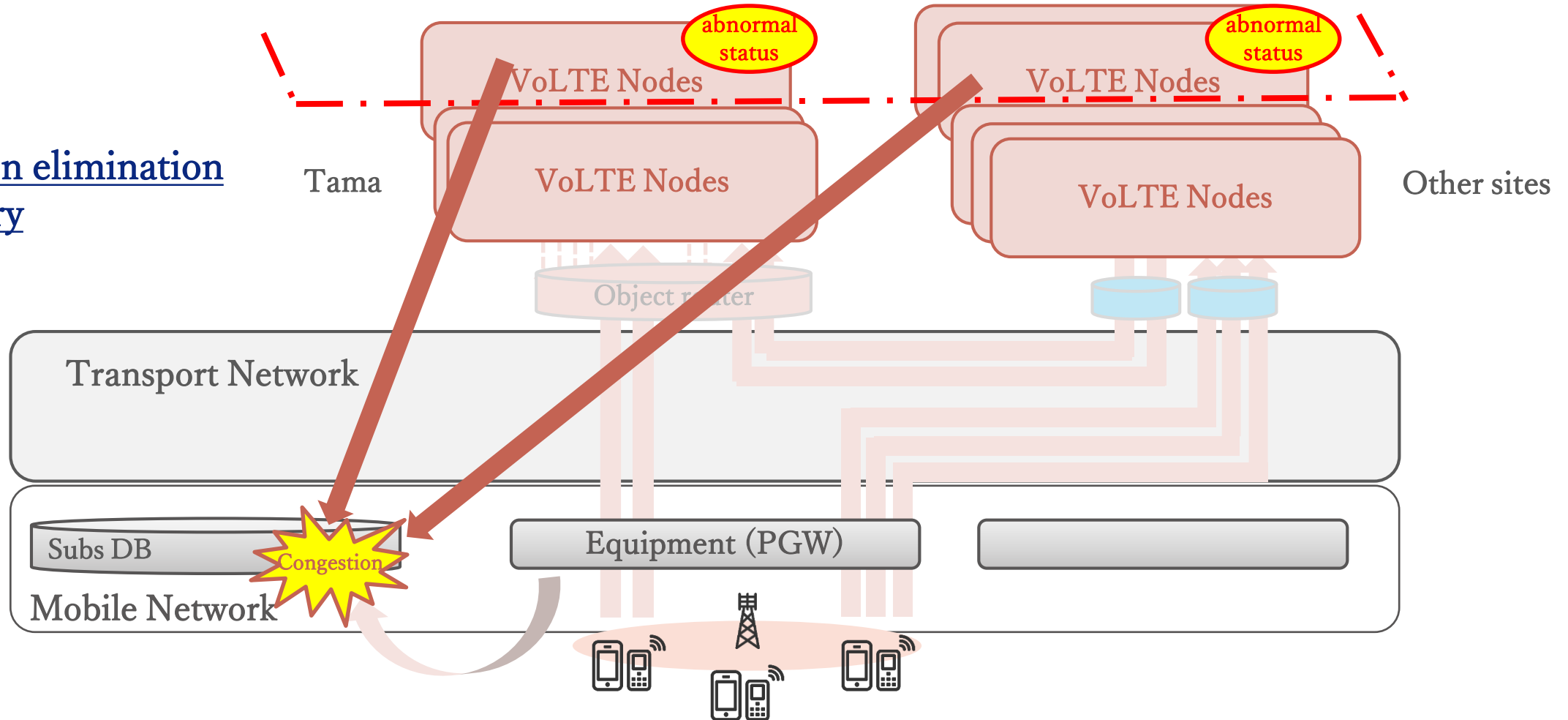


(3) VoLTE node disconnection (recover)

- ✓ In order to reduce congestion on subscriber DB, flow rate control was implemented, but congestion was not eliminated. Some VoLTE nodes continued to send excessive signals, so high volume on subscriber DB continued.
- ✓ The VoLTE nodes (6 out of 18 nationwide) were separated, and thus eliminating retransmission from devices.

Separated 6 VoLTE Nodes

Congestion elimination
➔ Recovery



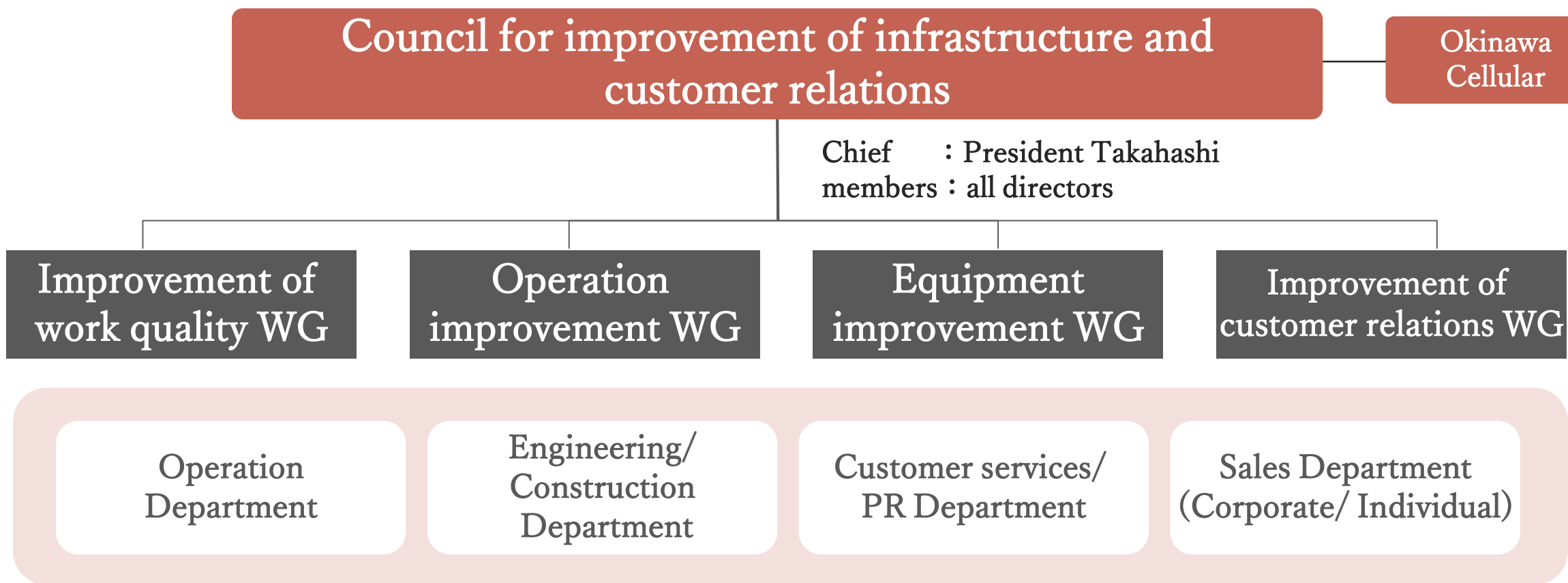
Overview of Occurrence and Cause

Failure occurred due to lack of consideration for congestion caused by an incorrect setting

	Challenge	Reason
During maintenance work	Misconfigured router route	<ul style="list-style-type: none"> ● Work preparation insufficient (management rules, confirmation items and the way of approval)
Get larger scale	Insufficient anticipation of congestion control	<ul style="list-style-type: none"> ● Congestion control in irregular network status was not fully considered, causing congestion nationwide
Prolongation	Recovery work procedure in a congested condition	<ul style="list-style-type: none"> ● No procedure had been established to recover from complex congested condition

Improving Quality and Services

Building a cross-organizational system, granting highest priority to network stabilization and improvement of customer relations



Recurrence prevention measures

Measures and implementations are in progress for each factors

	implementation details	implementation period
Maintenance work	<ul style="list-style-type: none"> ● Review of the procedures for work and project approval ● Project risk analysis of work scheduled to be performed 	<p>July 14, 2022 implemented</p> <p>July 22, 2022 implemented</p>
Get larger scale	<ul style="list-style-type: none"> ● Development of more elaborate tools to detect congestion at VoLTE Nodes ● Review and inspection of design for congestion control 	<p>July 28, 2022 implemented</p> <p>Inspection in progress and to be completed by the end of August 2022, followed by plan formation</p>
Prolongation	<ul style="list-style-type: none"> ● Review of recovery procedures when congestion occurs ● Development of tools to recover congestion at VoLTE Nodes 	<p>July 11, 2022 implemented</p> <p>Planned by the end of August 2022</p>
Announcement for customers	<ul style="list-style-type: none"> ● Improvement of information disclosure to customers; timely and appropriate announcements 	<p>Partially implemented on July 14, 2022, the rest of parts planned by the end of September 2022</p>

Refund for Customers

In addition to refund based on terms and conditions,
express our apology with refund

Refund based on Terms and Conditions

□ Eligible customers 2.71 million

Customers who could not use all communication services consecutively for more than 24 hours, or those who were in the same level of situation, during the communication failure (customers who have made a contract for voice services only)

□ Approach

Subtraction of the amount equivalent to 2 days of basic charge of subscription plan from amount billed

Refund with apology

□ Eligible customers 35.89 million

All customers who have made a contract for smartphones, feature phones, and Home plus phone services (Fixed services with VoLTE), during the communication failure

□ Approach

Subtraction of 200 yen (excluding tax) from amount billed

*Customers who use povo2.0 will be given data topping (1GB/3 days) instead due to 0 yen base plan.



Customer Notice for Refund

July 29	Announcement of refund approach (Refund on terms and conditions / refund with apology) Post the announcement on our website
From July 30	Notice of refund approach in newspapers
<u>From mid August</u>	Eligible customers confirmed <u>SMS notices to eligible customers for refund</u> *Those who use Home plus phone services and corporate customers that cannot receive SMS will check it with invoice after September. <div style="border: 1px solid red; padding: 5px; color: red;">We will not request sensitive information and not include application links in SMS notices.</div>
<u>From September</u>	<u>Subtractions will be applied to bills</u>

We are implementing company-wide efforts to prevent similar future occurrences and continue to provide reliable communication services by taking appropriate measures to support increasing data traffic in this 5G/Beyond 5G era.

The KDDI Group, united as a team, will help mold a truly connected society.

Appendix

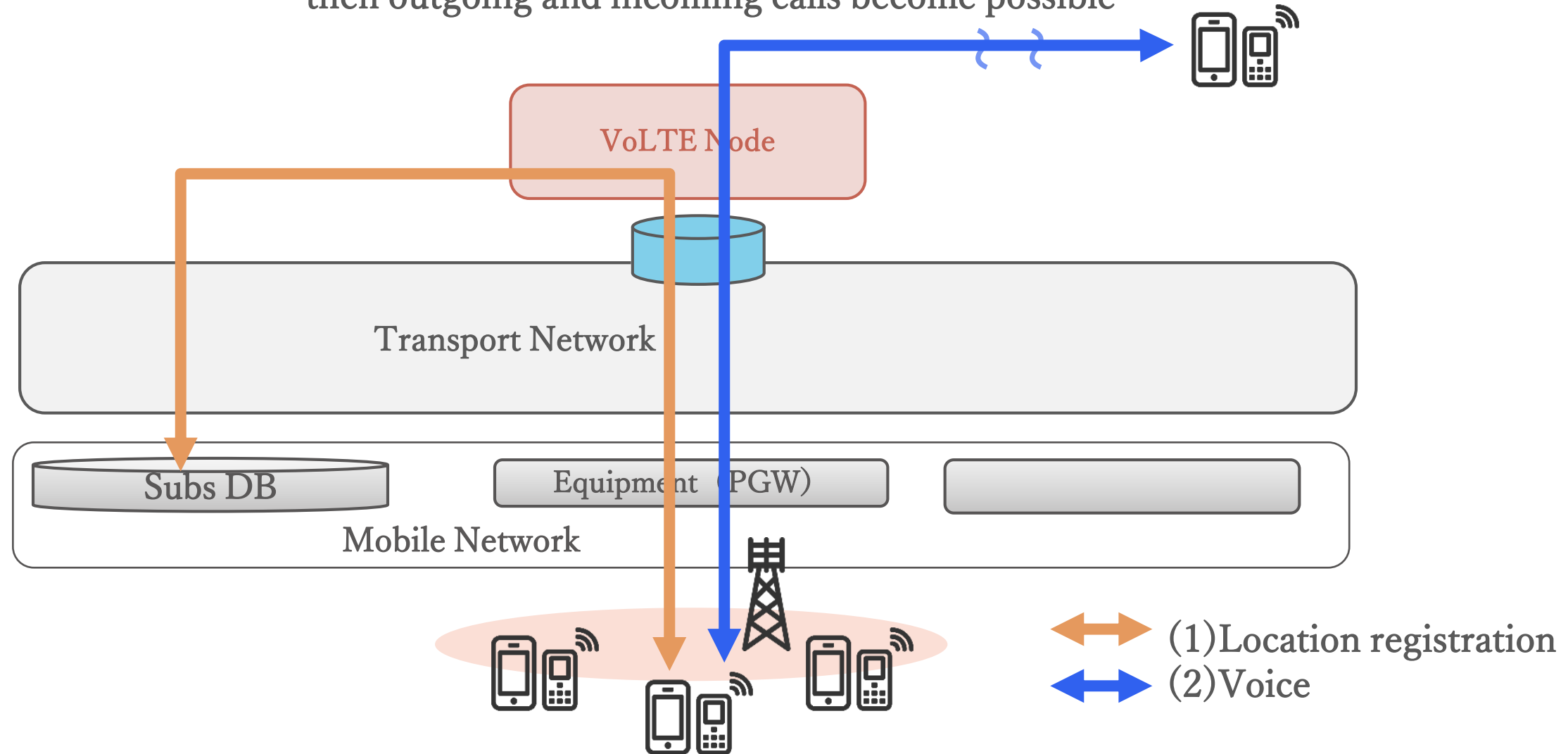
Estimation method of affected scale

Calculated based on differences of the number of calls and location registrations between normal time (at the same time a week ago) and at communication failure

	Affected customers	Details
Voice (VoLTE)	About 22.78 million	Calculated based on differences of the number of calls and average calls per person between at normal time and at communication failure
Data Communication (4G/5G)	7.65 million or more	Difference of the number of location registration for 4G/ 5G services between at normal time and at communication failure (Maximum value)

Communication flow at a normal time

To make voice calls (VoLTE), devices register locations, then outgoing and incoming calls become possible



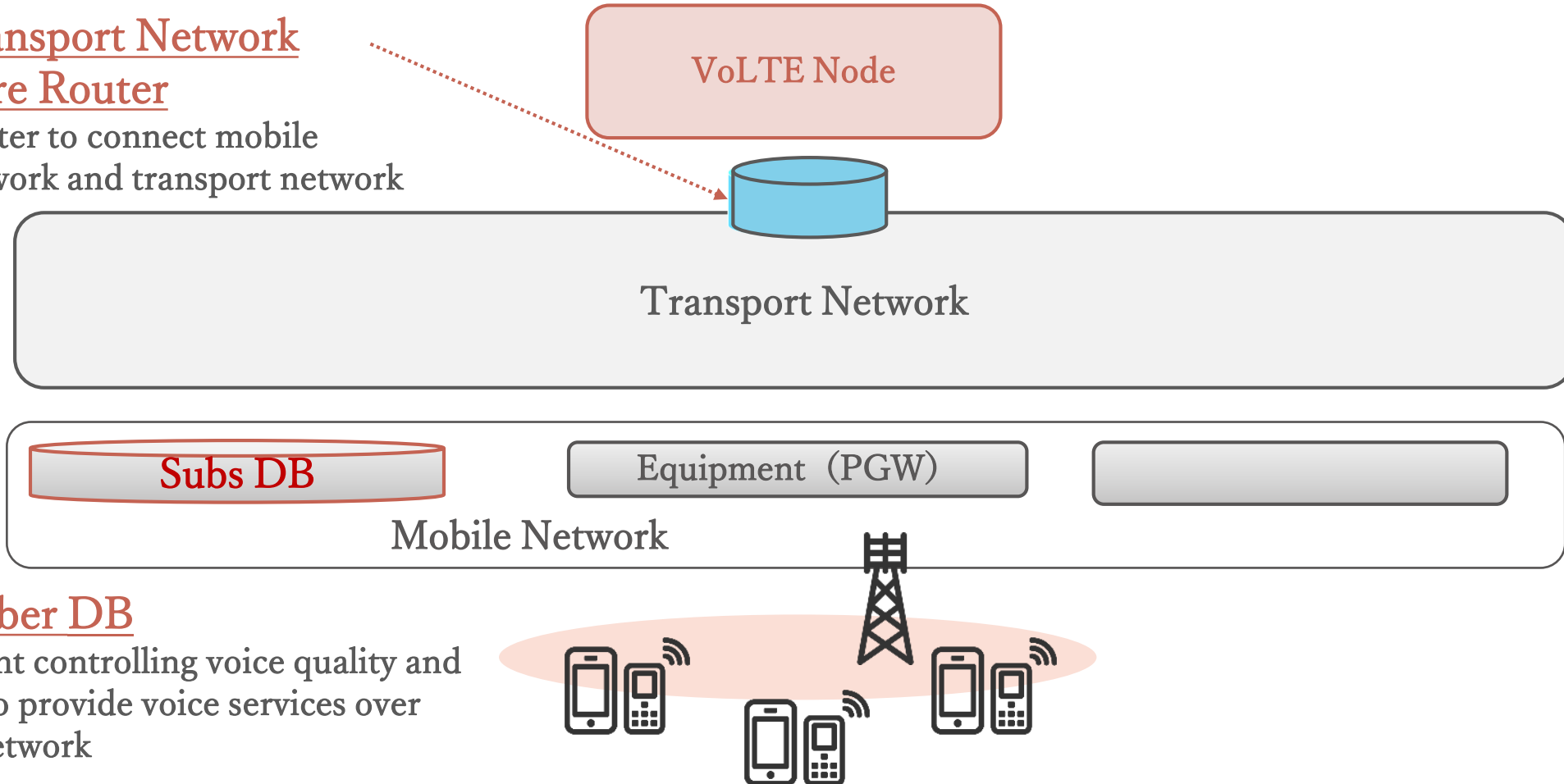
System configuration diagram

VoLTE Node

To provide voice services over mobile network

Transport Network Core Router

Router to connect mobile network and transport network



Subscriber DB

Equipment controlling voice quality and charges to provide voice services over mobile network

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