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NICC Document

Requirements for a UK Common Telephone Numbering Database

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Foreword

This NICC Document (ND) has been produced by the NICC CDB Task Group.

1 Scope

This present document provides the basis for specification, definition, and procurement of a CDB to be used for the UK.

The document scope does not cover the CDB requirements for mobile networks and mobile numbers. However, the intent is not to develop a solution that would preclude mobile requirements from being included in the CDB in the future.
When moving into a STIR/SHAKEN world, the porting of mobile numbers would need to be fully incorporated into any CDB solution.
To meet the additional requirement of the SRI-SM replacement number lookup capability, the porting of mobile numbers would need to be included into any CDB solution.

The CDB TG has identified use cases for a CDB and assigned these to the relevant NICC TG or external industry group most suited to define the requirements for each use case.
The requirements generated for each use case have been consolidated into a core set of mandatory requirements within this document which then lists the technical, sizing, performance and resilience needs of a CDB.

In addition, extra goals and requirements are included which have additional benefits but are not core requirements for a CDB to be operational.

The intended use of this document will be to:

1) Allow a [to be established] industry commercial group to issue an RFI based on the requirements.
2) Form the basis for the technical standards for interfaces to and interaction with the database which the successful CDB provider must deliver.
3) Allow the completed system to be tested against a set of technical, resilience, performance, and security requirements for validation.

2 References

There are no References listed.

3 Definitions, symbols and abbreviations

3.1 Definitions

The key words "**shall**", "**shall not**", "**must**", "**must not**", "**should**", "**should not**", "**may**", "**need not**", "**can**" and "**cannot**" in this document are to be interpreted as defined in the ETSI Drafting Rules.

3.2 Definition of terms

The following definition of terms is to provide clarity on the information contained in this ND.

3.2.1 Response times

These are the terms which should be used when setting out how fast the system should respond to any given query, update, or other transaction.

The times given relate only to the response of the CDB system itself, when the transaction reaches its edge, and how much time may pass before the information is processed and a response issued.

Transmission times across the UK and to major cloud hosting centres are usually in the order of 10-20ms. Therefore when planning connections and responses it can be assumed there may be an additional 'transmission' delay of up to 25ms to allow the request to be sent from the originator and be received back from the CDB, depending on node locations.

3.2.1.1 Real-time

A response is expected to be received within 100ms to avoid excessive Post Dialling Delay experienced by the originator of the call.

3.2.1.2 Web response

A web response is not in the call path and so delays do not impact on PDD or affect call progression. Web responses can be in the order of several seconds, usually under 10 seconds by which time users may start to attempt to retry the operations.

3.3 Abbreviations

All-IPT	All IP Telephony
BSS	Business Support Systems
CDB	Common Numbering Database
CIS	Centre for Internet Security
CP	Communications Provider
CPID	Communications Provider Identifier
DNO	Do Not Originate
GNP	Geographical Number Portability
MCC	Mobile Country Code
MNC	Mobile Network Code
NIST	National Institute of Standards and Technology
NTNP	National Telephone Numbering Plan
OTA2	Office of Telecommunications Adjudicator
PDD	Post Dial Delay
PSAP	Public Services Answering Point
RID	Reseller Identifier
SEIM	Security Event and Incident Management
SHAKEN	Signature-based Handling of Asserted Information Using toKENs
SRI-SM	Send Routeing Information – for Short Message
STIR	Secure Telephone Identity Revisited
TSA	Telecommunications Security Act

4 UK Requirements for a Common Numbering Database

4.1 Summary

The CDB Task Group has proposed that ND1214 should have content which reflects the present status and so highlights that significant effort will be needed to cleanse data before a CDB data load can begin.

4.2 General

The Geographical Number Portability (GNP) feature has been available to fixed voice subscribers for more than twenty years. During this time, and still to this day, business processes to port a subscriber use mainly bi-lateral systems which themselves are elderly and for the most part do not have any regular auditing capabilities. With no regular auditing capabilities, discrepancies have increased in volume, and will remain until addressed via a CDB type project.

For a Central Numbering Database (CDB) to function as intended, there needs to be a high level of accuracy for each recorded phone number. This accuracy needs to exist at launch (whether launched in phases or all at once). The accuracy will need to be maintained through agreed processes and procedures between the CDB maintainer and the operational CPs.

It is known that some CPs have attempted to carry out bi-lateral audits of their 'port-in', 'port-out' configurations. These bi-lateral alignments have largely failed due to the volume of discrepancies and the need to do the audits within a wider community, rather than just bi-laterally. These attempts have been further compounded by discrepancies identified between Business Support Systems (BSS) and actual voice switches. Where BSS to voice switch discrepancies have been identified, the CP will struggle to establish if their BSS or voice switch could be the source of the truth.

From previous audit attempts, the largest discrepancy identified is where a CP has large volumes of phone numbers being exported, but the recipient CP does not acknowledge the numbers are in use (via a port-in). Due to the large volumes of discrepancies, a CP would need a high level of confidence before doing a mass erase of apparently unused Exports, for fear of impacting another CPs customers. Some phone numbers being ‘Exported’ from one CP to another with no corresponding ‘Import’, still appeared to have working customers during some sample test calls.

During network level transitions from Circuit Switch to ALL-IPT voice, some of these discrepancies are being exposed and addressed, but this is a slow and largely random exposure of the errors and will not fully resolve all the discrepancies.

As a secondary activity to the CDB development, the CDB maintainer and partner CPs will need to develop a robust audit process which is likely to take quite some time to execute, needing CP to CP engagement, but in some cases internal BSS to voice switch audit developments.

4.3 Mandatory requirements

4.3.1 Required information

Database Fields for all numbers:

- Telephone number in E.164 format (or short codes, allow varying lengths, accompanied by Context)
- Terminating Network Key (Routeing Number) and Routeing Number Context (e.g. Context = +44)
- Part of block allocation Y/N
- Range Holder Network Operator Cupid (CPID)
- Hosting Network Operator Cupid (CPID)
- Losing RID
- Gaining RID
- Losing Network Operator Cupid (CPID)
- Gaining Network Operator Cupid (CPID)
- Port Activation Date / Time
- Number port status indicator
- Transaction/Update Timestamp; CDB User/Member Identity (the last updated by Id)
- DNO Status (Y/N allowed to be CLI)
- Withdrawn Status (Y/N): i.e. withdrawn by Ofcom
- Associated networks authorised to present CLI – undefined number 0…n which for STIR is known as "Also Permitted to be Originated From" networks
- Location Address_Main (UK postal address for emergency location use by UK PSAP providers only)
- Location Address_Temporary (UK postal address for emergency location use by UK PSAP providers only)
- Mobile Country / Network Code: a 5- or 6-digit numeric identifier to the UK country and network responsible for this mobile telephone number. For example: - 23410 – O2 UK
- Global Title: a binary indicator of whether this number can be used as a Global Title
- Global Title function (e.g. SMS, VLR or HLR)
- In Active Service (Y/N): This may be used by a network to indicate that a number is in active use (Y) or is not currently active (N). Where the status indicates the number is not In Active Service this may permit originating or transit networks to terminate calls instead of routeing them to the terminating network, as the call would ultimately be rejected by the terminating network.
  Note: Any change from Not In Active Service, to In Active Service may involve a period where calls are not routed to the terminating network due to lag in third party/upstream networks updating their own routeing tables to the new In Active Service status.

4.3.2 Update requirement

- Regular updates are a mandatory requirement, where 1hr <= update interval <= 24hrs
- The Database must support both full downloads of routeing data, and partial (delta) downloads (of routeing data)
- The ability to validate address entry to ensure only valid UK Postal Address Rules allowed. (This one might need to be in the API)
- The API must allow CP Access to retrieve all records data fields held per record
- The API must allow CPs to populate only their customer records
- The API must allow the Service Provider to modify their customers' identity record for the purpose of updating the Location Address_Temporary field updates are to be via an API. (N.B. A GUI will be required but may be developed by a third party and therefore during any quote process should be considered as an optional and separate item)
- Submitted CDB updates posted by a gaining CP should complete as commits as soon as possible after a service activation event. This activity may take place 24/7 as the process dictates.

4.3.3 Performance/Response requirement

- Response time for administrative interrogations of the master copy should be < 1 minute
- Full downloads should complete < 30 minutes
- Must support simultaneous downloads capability > 25
- Must be able to support >= 1000 CPs; given that we see approximately 500 different number owners in the UK with assigned ranges, so we would suggest, to allow for some growth min 1,000 CP admin users (on assumption of 1 admin user per number owner).
- Updates and allocations of ranges and numbers within web response time scales. Ofcom number range (block) allocations could, in future, be updated on a daily basis (potentially at a set time each day). However, the time between new number allocations being made and them working would be greater than 24 hours – this timing would be for industry (rather than Ofcom) to agree.
- It shall be possible for the live database to be downloaded in its entirety using an industry standard interface.
- It shall be possible to download changes made to the database since a given timestamp.
- The database shall have an agreed mechanism to notify that changes have been made.
- Transactions will predominantly occur during working days/hours. Transaction volumes need to be dealt with by vendors/suppliers under NDAs.

4.3.3.1 Additional optional requirement

- Changes may be automatically pushed to CPs in real-time.

4.3.4 Interrogation of Admin functions

The requirements in this sub section are interactive administrative access to the CDB, i.e. operations will not have significant volumes.

- Eligibility criteria are needed to determine who may gain access to the CDB, how to verify the user and determine their rights to view/change data. There must be no access by end customers.
- Access rights to be controllable by governing and/or other authority (e.g. Ofcom). Restrictions to be tailored in various scenarios to protect data and records (e.g. location information may only be submitted to own number records but routeing information to be available to all relevant CPs).
- Access may be provided to third parties, only with the consent of Ofcom; for example, to vendors who provide cloud signing, validation or attestation services to the CPs.
- The CDB is required to maintain a readily accessible transaction history against each number object for audit, dispute resolution and customer management purposes. This accessible history must persist for a minimum of six years. Transaction histories older than six years must also be maintained indefinitely off-line.
- It is further required that the transaction history pertaining to activity against the number object over the past two years must be readily available on-line. Transaction histories between 2-6 years old can be archived with a reduced on-line availability latency threshold.
- Interrogation of the CDB and manual data entry for the purposes of governance, mediation and audit (e.g. by Ofcom, OTA2, etc). This is to permit any data item to be changed as required in a structured manner, subject to approval processes and authorisations.

4.3.5 Resilience

- Mandatory availability >= 99.9%
- Desirable availability >= 99.99%
- The CDB needs to be resilient to total failure.

- CDB maintenance downtime must be scheduled for out of UK working hours. During these periods, submitted incremental updates will need to be queued by the CP for implementation once the platform restarts.

4.4 Additional requirements

The following requirements should be considered during the implementation phase.

- The ability to allow visibility to overseas CP's and third parties to the CDB. For example, given a fully qualified UK E164 number would include –
  - which MCC/MNC is responsible for terminating calls to that number ("Not allocated" or "Invalid" are legitimate responses)
  - what (if any) use as a Global Title is permitted
- UK postal addresses and codes must be validated to ensure that only correct addresses, at the time of entry, can be entered. Addresses will not be revalidated once on the database.
- The database shall be extensible to provide a limited number of additional fields as agreed from time-to-time. For example, the database could hold a flag to indicate that a given number is not permitted to be used as a CLI.
- The facility to query the database in real-time may be provided to support CPs who do not wish to take a full download and simply query online as the need arises.
- Records must be held for every live (i.e. in service) telephone number from the UK National Telephone Numbering Plan (NTNP).
- In order to facilitate numbering administration, records must be held for telephone numbers that are allocated by Ofcom to a Communications Provider (CP), but not yet assigned to an end customer.
- Ability to scale the volume of identity records held, for Emergency Location, without limit to account for multiple devices per individual within the UK.

4.5 Operational requirements

4.5.1 Resilience

It is assumed that the system must be setup such that it will form a permanent and enduring record of the state of numbers within the UK.

Outside of the availability periods, or during downtime, the system will be unavailable, and any transactions/queries sent will not be queued or acknowledged and will not receive a response once the system comes back online.

Once available, the system will be returned to its previous state, without any data loss.

If queueing of requests is required to be done by the CDB itself (as opposed to being queued and retried at the querying system) then this requirement should be noted and included in the resilience levels required.

4.5.2 Availability/Planned downtime

Standard terms such as four/five nines are well defined, understood and are preferred over less well used definitions.

Unless noted, availability is assumed to be ongoing, without specific breaks or outage periods.

If planned 'downtime' periods are acceptable (e.g. overnight) then the inclusion of this exception to the availability criteria is useful. All contributors are encouraged to consider and specify this exception to ensure that the systems can be maintained in a sensible way and not require higher levels of availability than is intended.

If not specified, then the maximum downtime for the given resilience will define the size of any planned downtime periods. For example, for 'five nines' if no maintenance period exception is specified, then this is equivalent to 26 seconds of time per month when the system is not available.

4.5.3 Redundancy

The system must be sufficiently redundant such that it can provide the resilience and response criteria specified. The form of any redundancy is very much related to the solution and should be provided as part of any proposal.

If the system meets the other criteria, then there is no advantage in defining requirements due to the many options which are very implementation specific.

4.5.4 Disaster recovery

In the event of a critical failure with one or more parts of the system, the recovery time to bring a backup or new system online in these exceptional circumstances must be confirmed by the provider.

If the system remains one of primary record, where CPs are able to download and cache information, then during such a disaster, phone calls will not be affected as CPs can operate from the cached values. As transfers between operators cannot be confirmed whilst the system is offline, they will still connect to the original target.

The NICC IP Routeing TG has allowed for a 24-hour period during which a losing CP will continue to perform onward prefixed routeing of calls. This period will provide continued routeing and availability for newly ported numbers, while the CDB is being recovered.

Outside of this period, some work may be required by CPs to ensure that calls continue to route, so if the recovery time is longer than 24 hours, CPs may need to build in their own processes to ensure continued availability.

5 Security Requirements

These are outline requirements for the security of the Central Number Database. This should not be taken as a verbatim list rather a starting point to create detailed requirements for an RFI.

Requirements -

- Any solution should comply with all relevant CIS benchmarks for the technology being used (e.g. Database, operating system, Cloud provider)
- The provider of any solution should prove their compliance to ISO27001
- The provider should note their compliance to relevant NIST standards
- The provider should demonstrate their compliance to the Cyber Assessment Framework
- The provider should demonstrate their compliance to the Cyber Essentials
- The provider should demonstrate their compliance (or route to compliance) to the Telecom Security Act (TSA)
- The provider should provide methods for cryptographic protection of the solution both for the database itself and for secure access to the data
- The provider should show methods to meet logging requirements of both the TSA and how SEIM could be integrated

History

Document history		
Version	Date	Milestone
1.1.1	14th August 2023	Initial publication