
# SPECIFICATION DOCUMENT

## Framework for the Migration from TDM-based to IP-based Voice Interconnection

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(+356) 2133 6840 info@mca.org.mt www.mca.org.mt

Valletta Waterfront, Pinto Wharf, Floriana FRN1913, Malta

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# Abbreviations

The following abbreviations are used throughout this document:

| Abbreviation | Meaning |
|---|---|
| **3GPP** | 3rd Generation Partnership Project |
| **IETF** | Internet Engineering Task Force |
| **IP** | Internet Protocol |
| **IPvIC** | IP-based voice interconnection |
| **ISUP** | ISDN (Integrated Services Digital Network) User Part |
| **MCA** | Malta Communications Authority |
| **PECN** | Public Electronic Communications Networks |
| **QoS** | Quality of Service |
| **RFC** | Request for Comments |
| **RIO** | Reference Interconnection Offer |
| **SIGTRAN** | Signalling Transport |
| **SIP** | Session Initiation Protocol |
| **SIP-I** | SIP with encapsulated ISUP |
| **SMS** | Short Message Service |
| **TDM** | Time Division Multiplexing |
| **TDMvIC** | TDM-based voice interconnection |
| **VCS** | Voice Communications Services |
| **vIC** | Voice Interconnection |

# 1 Scope

This Specification Document is intended to respond to the prevalent context and industry trends explored in the Proposed Specification Document titled *'Framework for the Migration from TDM-based to IP-based Voice Interconnection'* (MCA/O/23-5126). Its scope is therefore to regulate progress towards four key milestones in the migration to IP-based voice interconnection (IPvIC) at a national interconnection level, and to facilitate lifting the obligation to sustain or offer a TDM-based voice interconnection (TDMvIC).

Accordingly, the Specification Document presents a framework comprising minimum *technical specifications* for setting up IPvIC, and *procedural specifications* centred around four key milestones which, briefly, set out to:

- Harmonise the handling of inter-operator requests to test and implement an IPvIC;
- Ensure that all locally authorised providers of voice communications services (hereafter, 'VCS providers') are to achieve 'ready-state' to test IPvIC by the following deadlines:
    - By 15 January 2025, as a minimum, for all traffic originating from, or terminating in, their respective fixed access network (fixed domain); and
    - By 15 June 2025, for any remaining traffic originating from, or terminating in, their respective mobile access network (mobile domain);
- Ensure that VCS providers publish updated Reference Interconnection Offers (RIOs) within a set timeframe, but no later than 30 September 2025; and
- Lift the obligation to sustain or offer TDMvIC by 1 December 2025.

This Specification Document does not only address the migration for conveying voice (telephony) traffic, but also that for SMS and any other bearer and signalling traffic that may currently be transmitted over TDM links at a national interconnection level. Accordingly, providers should ensure that arrangements are in place to ensure that the conveyance of SMS and any other signalling traffic is migrated to an acceptable IP-based solution (e.g. based on SIGTRAN) that is functionally equivalent to that adopted under TDMvIC.

In the next chapter, the *technical specifications* for IPvIC are established (Chapter 2), followed by the *procedural specifications* (Chapter 3) which shall need to be complied with by providers when handling requests for scheduling and testing IPvIC and eventually phasing out any TDMvIC in place.

# 2 Technical Specifications

These *technical specifications* define the minimum requirements that need to be supported (Section 2.1), the parameters related to the nature of the IPvIC interconnections to be established (Section 2.2), and considerations related to logical segregation of traffic (Section 2.3) or when the VCS provider and the underlying Public Electronic Communications Networks (hereafter, 'PECN') provider are distinct entities (Section 2.4).

## 2.1 Minimum defined IPvIC solution

For the purposes of this framework, the pursued IPvIC solution should support, as a minimum, IETF SIP (RFC 3261) and the G.711 codec (hereafter, 'the minimum defined IPvIC solution').

In setting the above minimum defined IPvIC solution, the Malta Communications Authority (hereafter, 'MCA') took into account the presence of a number of different variants, not just in the domain of the SIP protocol *per se* (e.g. IETF SIP, IETF+3GPP SIP, SIP-I, etc.) but also in terms of the availability of alternative audio codecs, (e.g. G.711, G.722, G.729, etc.). Notwithstanding, and drawing from the feedback received from the four locally authorised VCS providers, the identified protocol (IETF SIP) and codec (G.711) represent an ideal foundation for providers seeking to pursue IPvIC.

Nevertheless, the MCA will not prohibit providers from commercially agreeing to use alternative protocols and/or codecs (hereafter, 'alternative IPvIC solution'), provided that this approach is without prejudice to such providers' ability to support and commercially offer interconnection based on the 'minimum defined IPvIC solution'. Furthermore, the technical parameters in Sections 2.2 to 2.4 hereunder shall apply regardless of whether VCS providers implement the minimum defined IPvIC solution or an alternative IPvIC solution.

## 2.2 Nature of the Interconnection

The establishment of IPvIC should be based on secured, point-to-point physical links.

Such an approach eliminates the need for national interconnections to depend on infrastructure located in part or in its entirety outside of Malta (e.g. international submarine cables, foreign internet exchange points), thus ensuring the autonomy of interconnection traffic conveyed between points of interconnection in Malta. In this respect, sufficiently secured point-to-point physical links are the best safeguard from both a national security and public safety perspective.

Furthermore, the MCA is making it mandatory for VCS providers to ensure resiliency in the established setup, whereby such resiliency could be attained via redundancy in the physical links set up, or via sufficiently secured fallback solutions over the public internet. Nevertheless, any fallback solutions over the public internet should be used solely on a temporary basis and for impacted physical links.

In this respect, VCS providers should strive to resume the operations of the impacted point-to-point physical links within the shortest time possible in order to ensure the conveyance of national interconnection traffic through secured, point-to-point physical links to the maximum extent possible.

The MCA notes that the above parameters for the nature of the interconnection are aligned with international best practices in the field of voice interconnection. Indeed, insights available to the MCA suggest that physical point-to-point links are typically more reliable in terms of quality of service (hereafter, 'QoS') aspects, and are a preferred approach when it comes to safeguard not only network security, but also access to critical infrastructure, particularly in matters relating with national security and public safety.

## 2.3 Logical segregation of traffic by type

Providers may use the same point-to-point physical link(s) to convey all bearer and signalling traffic exchanged between the connected parties at a national level (hereafter, 'national interconnection traffic'), that used to be transmitted over TDM links. It should be noted that a locally authorised undertaking who provides fixed and mobile VCS may make use of the same point-to-point physical link(s) to convey national interconnection traffic in both its fixed and mobile domain.

However, logical segregation of the traffic being conveyed should be implemented, particularly to sufficiently isolate voice traffic (fixed, mobile or both) from other traffic carried (e.g. SMS), mainly to reflect the characteristic requirements of the traffic type itself, such as different QoS requirements for distinct traffic types.

## 2.4 Distinct VCS provider and underlying network provider

A VCS provider may be a distinct entity from the undertaking providing the underlying network. In this regard, while a VCS provider is obliged to provide at least one point of interconnection in Malta, the VCS provider may either utilise its own infrastructure, in which case this VCS provider would also be required to be notified as a PECN provider with the MCA, or alternatively utilise the infrastructure of another undertaking notified as a PECN provider with the MCA.

Where a VCS provider enters into a commercial arrangement to utilise a PECN provider's infrastructure for the point of interconnection in Malta, the VCS provider remains responsible to comply with all interconnection obligations applicable to VCS providers. However, the PECN provider is also required to conform with this Specification Document.

In the scenario indicated above, the involved parties may agree for the PECN provider to carry the VCS provider's national interconnection traffic on a physical link(s) which is also being used to carry the national interconnection traffic of one or multiple other VCS providers. However, in such a case, the entire national interconnection traffic pertaining to each VCS provider using the same physical link(s) should be carried on logically segregated paths, in addition to the logical segregation of such traffic on the basis of its type as detailed in Section 2.3.

# 3 Procedural Specifications

The *procedural specifications* establish the respective timeframes and deadlines for each milestone in the drive towards migrating to IPvIC and the subsequent lifting of the TDMvIC obligation. An overview of the four milestones is presented in Section 3.1, followed by details on each milestone in the subsequent Section 3.2. Lastly, in Section 3.3, the MCA provides regulatory parameters on specific aspects.

## 3.1 Overview

Given the inherent risks in the migration process, the MCA is sensitive to the fact that the national drive to migrate all national interconnections to IPvIC rests heavily on the extent of coordination and cooperation in place between all providers. Should such coordination and cooperation not be forthcoming, national progress on this front would be derailed. In this regard, the MCA developed these *procedural specifications* to act as the regulatory framework for providers.

This regulatory framework is structured around four key milestones, each of which is intended to instil inter-operator accountability and certainty in this process. This will be done through conditions, tied to each milestone, which will give providers certain rights and obligations when they are either submitting, or responding to, requests to test and establish an IPvIC. Furthermore, the milestones also establish deadlines for specific objectives that are central to successfully migrating away from TDMvIC, namely to ensure cross-industry readiness to commence testing IPvIC, as well as deadlines for the publication of updated RIOs and the eventual lifting of the TDMvIC obligation. An overview of the four milestones is presented in Table 1 below.

| Milestone | Description |
|---|---|
| **Milestone 1**<br>Start of Phase 1<br>*From 15/1/2024 to 14/1/2025* | **Harmonisation of process to test and establish an IPvIC**<br>*Providers required to comply with parameters intended to govern how to handle requests to test and establish an IPvIC.* |
| **Milestone 2**<br>Start of Phase 2<br>*From 15/1/2025 or 15/6/2025 (depends on network domain)* | **All VCS providers to be in 'ready-state'**<br>*'Ready-state' implies that a VCS provider already interconnects, is testing, or able to test an interconnection, with other VCS provider(s) through the minimum defined IPvIC solution.* |
| **Milestone 3**<br>Updated RIOs submitted to MCA<br>*From 15/1/2024 to 30/9/2025* | **Requirement to submit updated IPvIC RIOs to the MCA**<br>*Either within six (6) months of their first migration to IPvIC, or no later than 30 September 2025, whichever is the earliest.* |
| **Milestone 4**<br>TDMvIC obligation lifted<br>*From 1/12/2025 onwards* | **Lifting of TDMvIC obligation**<br>*VCS providers no longer obliged to sustain or offer a TDMvIC.* |

*Table 1 – Overview of Key Milestones*

A graphical representation of the above timeframes and deadlines is provided in Figure 1, and the applicable measures for each milestone are specified in further detail in the next section.

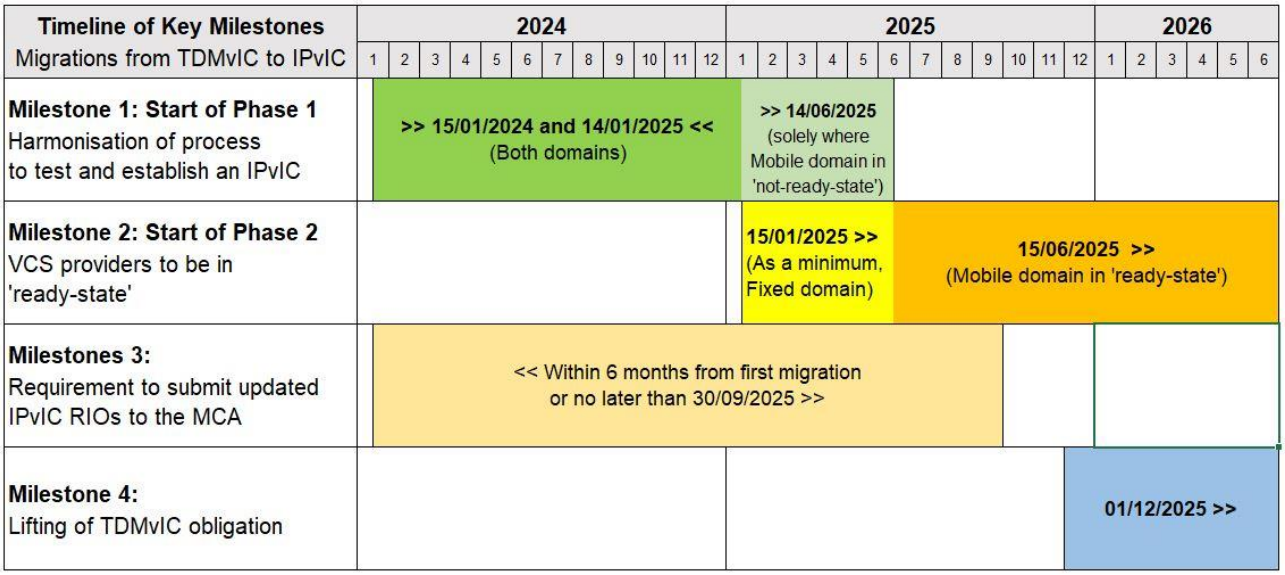



*Figure 1 – Graphical Timeline of Key Milestones and Timeframes*

## 3.2 The Four Milestones

### 3.2.1 Milestone 1: Harmonisation of process to test and establish an IPvIC

The objective tied to the first milestone is the initiation of the first phase of the migration process, (hereafter, 'Phase 1'), during which period providers will have to comply with procedural parameters intended to harmonise the process to submit or receive requests to test and establish an IPvIC. Accordingly, as from 15 January 2024, a VCS provider who receives a request (*receiving party*) from any other VCS provider (*requesting party*) to test and establish an IPvIC should:

a. Ascertain that the *requesting party* is a VCS provider who can support the minimum defined IPvIC solution. The *requesting party* must declare this capability when submitting the request;

b. Indicate to the *requesting party* its state of readiness vis-à-vis IPvIC, namely whether the *receiving party* is, at that point in time, either in*:*
   i) 'not-ready-state', that is, a VCS provider who is unable to test interconnection with other VCS provider(s) through the minimum defined IPvIC solution, solely due to unavailability of functionality to support such a solution; or
   ii) 'ready-state', that is, a VCS provider who already interconnects, is testing, or able to test an interconnection, with other VCS provider(s) through the minimum defined IPvIC solution.

c. Where the *receiving party* is in the 'not-ready-state' (condition b.(i) above):
   i) The *receiving party* must communicate this status ('not-ready-state') to the *requesting party* within two (2) weeks from the receipt of the request to commence testing, and commit to inform the *requesting party* within two (2) weeks from the date that its status changes to 'ready-state'.

d. Where the *receiving party* is in the 'ready-state' (condition b.(ii) above):
   i) The *receiving party* must communicate this status ('ready-state') to the *requesting party* within two (2) weeks from the receipt of the request to commence testing, and provide a date to commence testing IPvIC with the *requesting party*.
   ii) Depending on the status of the *receiving party* regarding any ongoing or committed testing, the commencement date must be either:
      - within one (1) month from the receipt of the request to commence testing if the *receiving party* has no ongoing or committed testing upon receipt of the request; or
      - within one (1) month from the envisaged completion date of any ongoing or committed testing;

      whichever is the latest.
   iii) Unless agreed otherwise on a bilateral basis, the *receiving party* and the *requesting party* should commit to complete testing within a timeframe of three (3) months from its commencement date.

e. Provided that testing undertaken between the *receiving party* and the *requesting party* to establish the minimum defined IPvIC solution has been successfully completed, and any issues identified have been resolved, such parties are to:
   i) migrate their operational interconnection to the minimum defined IPvIC solution, at a time when this is satisfactory to both parties; and
   ii) phase out any existing TDMvIC in place between the *receiving party* and the *requesting party*, at a time agreed upon by both parties, where such TDMvIC is solely serving these two parties.

Compliance with the above parameters would reinforce inter-operator accountability with regards to requests to test and establish an IPvIC, and introduce certainty, based on the regulated timeframes, which could facilitate coordinated planning. A flowchart for the above process is provided in Figure 2 hereunder:

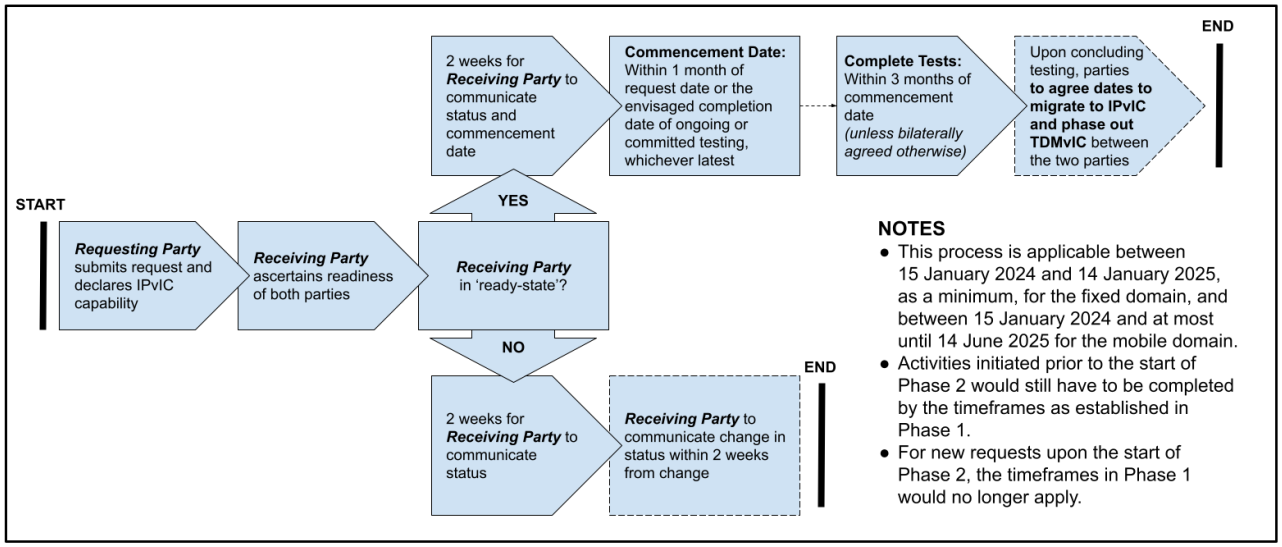



*Figure 2 – Flowchart for Phase 1: Harmonisation of process to test and establish an IPvIC*

### 3.2.2 Milestone 2: All VCS providers to be in 'ready-state'

For the second milestone, the objective is to ensure that all providers achieve 'ready-state'. In this regard, the MCA is sensitive to the possibility that efforts to evolve the mobile core network to All-IP may result in delays to attain 'ready-state' for the mobile domain by the respective VCS provider.

Thus, two distinct deadlines to achieve this state, differing based on the network domain of the *receiving party*, are being imposed. These two deadlines mark the staggered starting point of the second phase of the migration process (hereafter, 'Phase 2'). Throughout Phase 2, the MCA will enforce tighter timeframes in the procedure governing the submission or receipt of requests to test and establish an IPvIC, in order to prevent unnecessary delays in the national migration process.

Accordingly, by 15 January 2025, all VCS providers should, as a minimum, achieve 'ready-state' in the fixed domain, and thus be able to test interconnection for all traffic originating from, or terminating in, their respective fixed access network. Furthermore, (and where applicable), by no later than 15 June 2025, all VCS providers should achieve 'ready-state' in the mobile domain, and thus be able to test an IPvIC for any remaining traffic originating from, or terminating in, their respective mobile access network.

It should be noted that, for any VCS provider who achieves 'ready-state' in both the fixed and mobile domain by 15 January 2025, the timeframes established for Phase 2 (hereunder) would become applicable (for both domains) as from this date. On the other hand, solely for any VCS provider who was unable to achieve 'ready-state' in the mobile domain by 15 January 2025, the timeframes established for Phase 2 (hereunder) would still become applicable as from 15 January 2025 for the fixed domain while the timeframes established for Phase 1 (above) will remain applicable until 14 June 2025 for the mobile domain.

Notwithstanding the above distinct deadlines, the MCA encourages all VCS providers who are active in both the fixed and mobile domain to strive to achieve 'ready-state' for both domains by the first deadline of 15 January 2025. Such efforts would be conducive to a smoother national migration process towards IPvIC and more manageable transition for all involved parties.

From the start of Phase 2 onwards, the following timeframes shall apply:

a. Within one (1) week from the receipt of a request to commence testing, a *receiving party* must revert with a commencement date that is within one (1) month from the receipt of such request. During Phase 2, in view of the impending lifting of the TDMvIC obligation, providers should be in a position to adhere with more stringent timeframes and to run multiple test (IP-based) interconnections in parallel, such that no provider would be required to exclusively depend on TDMvIC once the respective obligation is lifted off.

b. Unless agreed otherwise on a bilateral basis, the *receiving party* and the *requesting party* should commit to complete testing within a timeframe of three (3) months from its commencement date.

c. Provided that testing undertaken between the *receiving party* and the *requesting party* to establish the minimum defined IPvIC solution has been successfully completed, and any issues identified have been resolved, such parties are to:

   i) migrate their operational interconnection to the minimum defined IPvIC solution, at a time when this is satisfactory to both parties; and

   ii) phase out any existing TDMvIC in place between the *receiving party* and the *requesting party*, at a time agreed upon by both parties, where such TDMvIC is solely serving these two parties.

A flowchart for the above process is provided in Figure 3 hereunder:

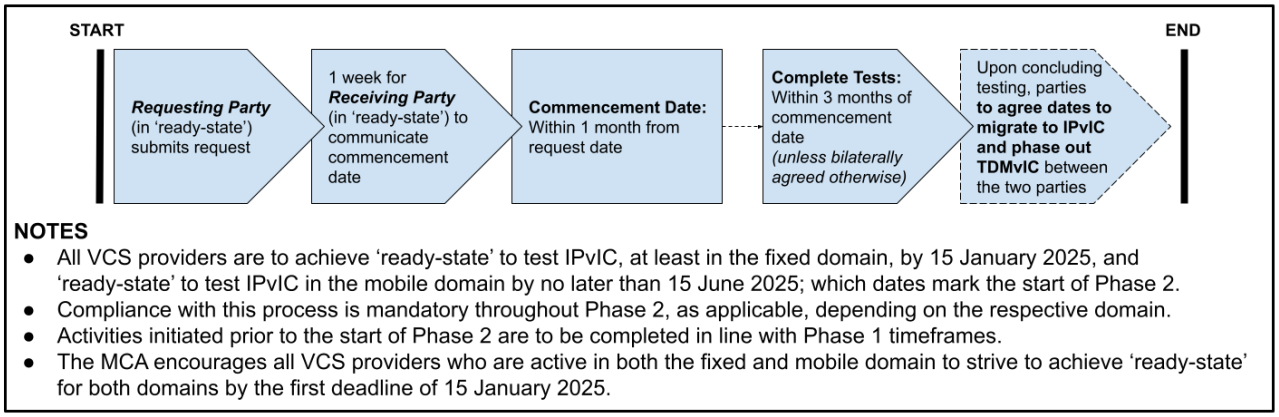



*Figure 3 – Flowchart for Phase 2: All VCS providers to be in 'ready-state'*

### 3.2.3 Milestone 3: Requirement to submit updated IPvIC RIOs to the MCA

The migration towards IPvIC would also entail updates to the RIOs. In this regard, any VCS provider is obliged to submit an updated RIO to the MCA within six (6) months of its first migration to the minimum defined IPvIC solution, or by no later than 30 September 2025, whichever date is the earliest.

Updated RIOs should clearly indicate any amendments introduced to take into consideration the minimum defined IPvIC solution (e.g. document in track changes). VCS providers may also include information on any alternative IPvIC solutions that they may be capable of supporting in addition to the minimum defined IPvIC solution. Following the MCA's review, the final versions of the updated RIOs are to be published on the respective provider's website.

### 3.2.4 Milestone 4: Lifting of TDMvIC obligation

By 1 December 2025, all VCS providers will no longer be obliged to sustain existing TDMvIC, nor meet requests for the establishment of new, commercial offerings of a TDMvIC to other VCS providers. At this stage, any network elements used solely for TDMvIC at a national interconnection level may be decommissioned.

## 3.3 Other Aspects

### 3.3.1 Establishing interconnection through the alternative IPvIC solution

Whilst the above procedures were presented around the use of the minimum defined IPvIC solution, it should be clarified that some providers may, bilaterally in specific cases, opt to implement an alternative IPvIC solution when agreeing to test and establish an IPvIC. In such cases, the respective provider would not be exempt from ensuring that the testing is implemented in accordance with the same timeframes established in respect to the minimum defined IPvIC solution. Furthermore, said providers would not be exempt from achieving 'ready-state' *to support the minimum defined IPvIC solution* by the start of Phase 2, and should also be able to fulfil any other obligations envisaged across the four milestones above.

### 3.3.2 VCS providers who complete all migrations before 1 December 2025

VCS providers who manage to migrate all their established TDMvIC to IPvIC before 1 December 2025, that is, when the TDMvIC obligation would be lifted by the MCA, will be allowed to cease their TDMvIC offering after three (3) months from the completion date of the last migration to IPvIC and to subsequently decommission any network elements used solely for TDMvIC at a national interconnection level. Such VCS provider would retain the right to cease sustaining or offering the TDMvIC on the 1 December 2025 if this would be an earlier date than three (3) months after the last migration to IPvIC.

Furthermore, the above is without prejudice to such VCS provider's obligation to achieve 'ready-state' by the start of Phase 2.

### 3.3.3 Market entry in the interim period

Given that the TDMvIC obligation is due to be lifted on the 1 December 2025, any new VCS provider entering the Maltese market in the interim period until that date should, preferably, be in a position to adopt an IPvIC solution compliant with the *technical specifications* in Chapter 2 from the outset, in order to avoid investing in TDMvIC-related equipment that would, regardless, have to be phased out within a short time period. However, some providers may not be in a 'ready-state' before the start of Phase 2. In this regard, the MCA is amenable to permit interim arrangements for new market entrants whereby national interconnection would only be established with those providers already able to establish an IPvIC, who would thereafter act as transit operators towards other VCS providers for the new market entrant.

Once all other VCS providers can set up an IPvIC with the new market entrant, such a transit arrangement would no longer be needed and could thus be phased out accordingly. The MCA is committed to provide guidance to this effect to any new market entrant that may arise in the interim period, taking into account the commencement date of operations for such new entrant.

### 3.3.4 Migrating from an existing IP-based voice interconnection

This Specification Document is primarily scoped around the need to regulate progress towards a migration to IPvIC at a national interconnection level. Accordingly, whilst the *technical specifications* in Chapter 2 establish a minimum defined IPvIC solution (in Section 2.1), this chapter proceeds, in Sections 2.2 to 2.4, with establishing technical parameters that are applicable regardless of whether the IPvIC to be pursued is aligned with the minimum defined IPvIC solution or is an acceptable alternative IPvIC solution.

Furthermore, it should be noted that these *technical specifications* apply regardless of whether the migration process was initiated for an existing *TDM-based* voice interconnection, or, alternatively, for an *IP-based* voice interconnection that is not fully aligned with the established *technical specifications* (hereafter 'non-aligned IPvIC'). By way of example, an IPvIC where the principal link is established over the public internet would not be compliant with the *technical specifications*, and would thus also need to be migrated in accordance with the applicable parameters in this Specification Document.

To this effect, and to safeguard inter-operator accountability across the migration process regardless of the nature of existing interconnections, the timeframes established in the *procedural specifications* should also be considered as applicable for the migration process from a non-aligned IPvIC solution to the minimum defined IPvIC solution or an alternative IPvIC solution (which would meet the parameters established in Sections 2.2 to 2.4).

For clarity's sake, the timeframes established for Phase 1 shall apply for migrations which commence between 15 January 2024 and 14 January 2025 while the timeframes set for Phase 2 shall apply for migrations which commence from 15 January 2025 onwards. Furthermore, any non-aligned IPvIC solution is to be migrated to an IPvIC solution compliant with the *technical specifications* in Chapter 2 by no later than 30 November 2025.

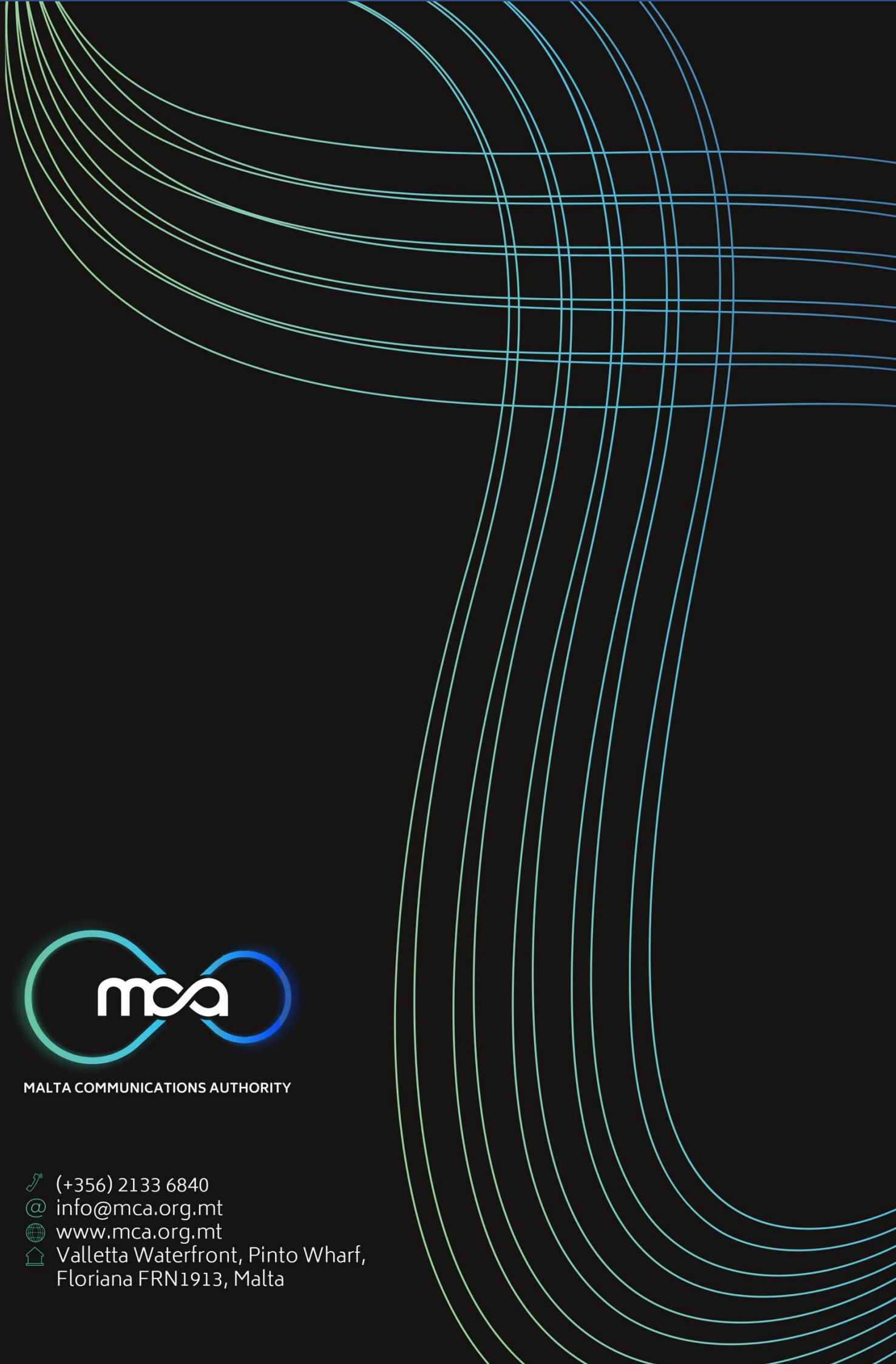
Moreover, the above is without prejudice to the obligation being imposed on all VCS providers to achieve 'ready-state' by the start of Phase 2.

# 4 Conclusion

The MCA is confident that VCS providers would do their utmost to migrate from TDMvIC to IPvIC with minimal impact on end-users. Nevertheless, should it transpire that the migration to IPvIC is negatively impacting end-users, the MCA reserves the right to introduce additional obligations related to IPvIC to safeguard end-users' interests, such as requirements related to services supported, or to further specify elements related to QoS, resiliency, security, etc.

Furthermore, the *technical specifications* envisaged for this migration framework shall remain in force beyond the realisation of all the milestones, provided there are no revisions implemented by the MCA. On the other hand, the *procedural specifications* would no longer apply once the national migration process is fully concluded to the MCA's satisfaction, and consequently the procedures established in each VCS provider's RIOs would be applicable.

Lastly, the MCA would like to highlight that the requirements and obligations emanating from these specifications are without prejudice to any other applicable legislation, regulations and decisions however so described.



MALTA COMMUNICATIONS AUTHORITY

(+356) 2133 6840
info@mca.org.mt
www.mca.org.mt
Valletta Waterfront, Pinto Wharf,
Floriana FRN1913, Malta