

Towards an Enabling Regulatory Framework for Mobility-as-a-Service: A European and Italian Perspective

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Abstract—Mobility as a Service (MaaS) is widely presented as the digital answer to urban congestion, fragmented mobility services and the decarbonisation targets of the Green Deal. From an engineering standpoint, an open MaaS aggregator — a platform that ingests data from heterogeneous mobility operators and lets travellers plan, book and pay for multimodal journeys through a single interface — can be built today with available open standards; whether it can also be lawfully deployed at scale depends on a dense, evolving regulatory landscape. Taking as concrete reference OMNIMOVE, the standards-based aggregator presented in a companion paper, we review the current European and Italian framework — the ITS Directive and MMTIS, the Open Data Directive, the Data Governance Act, the Data Act, the GDPR, PSD2, NIS2, the Digital Markets Act and MaaS4Italy — and trace each provision to the design choices it imposed on the aggregator and to the residual gaps that still hinder full deployment. We then discuss the adjustments that would facilitate adoption: harmonised data-sharing duties, a clearer National Access Point mandate, explicit public-administration roles, and proportional safeguards on user data and inclusion.

Keywords—*Mobility as a Service, MaaS aggregator, regulatory framework, ITS Directive, MMTIS, Data Act, GDPR, National Access Point, smart cities.*

I. INTRODUCTION

Urban areas are responsible for roughly three quarters of global CO₂ emissions and are expected to host more than 60 % of the world population by 2030 [1]. Much of this pressure originates from passenger transport, still centred on the private car. The UN 2030 Agenda, the European Green Deal with the European Climate Law, and Italy's National Recovery and Resilience Plan (NRRP) converge on reorganising urban mobility around shared, multimodal, low-emission services [2], [3].

Within this policy context, Mobility as a Service (MaaS) integrates public transit, taxi, vehicle sharing and micromobility into a single digital interface [4]. The enabling actor is the *MaaS aggregator*: an intermediary platform that (i) ingests static and real-time data from heterogeneous mobility service providers, (ii) offers unified multimodal journey planning and comparison, (iii) mediates booking and integrated payment or ticketing, and (iv) manages user accounts and support. In the MaaS integration taxonomy this places aggregators at levels 2–3, beyond mere information services [4]. Pioneering initiatives — Whim in Helsinki, Jelbi in Berlin, the Italian

MaaS4Italy pilots [3] — show that functions (i)–(ii) are technically mature, whereas (iii)–(iv) remain hard to generalise — the very functions whose viability rests on regulation, presupposing a lawful, machine-readable exchange of data among operators, rather than on technology.

This paper assesses that *regulatory feasibility* with direct reference to OMNIMOVE, the aggregator described in a companion paper [5]. OMNIMOVE implements functions (i)–(ii) through a standards-based ingestion layer — any operator exposing GTFS, GTFS Realtime, GBFS, NeTEx, SIRI or TOMP-API feeds is onboarded by configuration — and ranks alternatives by cost, time and an environmental Green Index; its low-cost tracking prototype CASSITRACK turns small municipal fleets into standard-compliant real-time sources, federated via the regional access point into the national NAP. That design reflects the analysis presented here: standards-first architecture, Progressive-Web-App delivery limiting app-store dependence, minimised trip data, and integrated ticketing — function (iii) — deferred until PSD2-compliant payment integration. Section II surveys the relevant provisions; Section III derives the residual gaps, traced back to Section II and summarised in Table I.

II. CURRENT REGULATIONS

A. Intelligent transport systems and multimodal travel data

The keystone is Directive 2010/40/EU on Intelligent Transport Systems, updated by Directive (EU) 2023/2661, with its Delegated Regulation (EU) 2017/1926 (MMTIS), strengthened by Regulation (EU) 2024/490, which obliges Member States to operate *National Access Points* (NAPs) where operators publish static and dynamic travel data — stops, schedules, fares, real-time information — in standard formats (NeTEx, SIRI, GTFS, GBFS) [6]: the very feeds OMNIMOVE's adapters consume. The framework, however, mandates *availability*, not *transactability*: no operator is obliged to let third parties book or sell its services.

B. Open data, data governance and the data economy

Directive (EU) 2019/1024 (Open Data Directive) extends re-use duties to public-sector transport, mapping and parking data, listed among the High-Value Datasets of

Implementing Regulation (EU) 2023/138 [7]. The Data Governance Act and the Data Act extend a similar logic to private actors: connected-vehicle and shared-mobility data must be accessible to the user and, on FRAND terms, to third parties, with safeguards for SMEs [8]. Personal data — profiles, trip histories, geolocation — remain governed by the GDPR (legal basis, minimisation, retention, data-subject rights).

C. Digital services, payments and cybersecurity

As a digital service, a MaaS platform falls under the e-commerce Directive and the Digital Services Act (transparency, fairness, accountability) [9]. Integrated ticketing triggers Directive (EU) 2015/2366 (PSD2) and its Strong Customer Authentication (SCA) regime; NIS2 brings critical mobility operators into the EU cybersecurity perimeter; and the Digital Markets Act addresses — only in part — the dependence on gatekeepers for mapping, identity and app distribution [9].

D. Italian framework and constitutional anchors

At national level, MaaS4Italy (NRRP, M1C1, Inv. 1.4.6) funds pilot deployments in major cities [3]. The Constitution provides the higher-rank anchors: Article 9 (environment as a fundamental principle), Article 41 (private initiative subordinated to social utility, health and the environment) and Article 117 (transport competences split among State, Regions and Municipalities) [10].

III. DISCUSSION

The landscape of Section II is increasingly favourable to MaaS, yet its facilitation potential is not fully realised. Table I traces each family of provisions to its OMNIMOVE design response and residual gap; four adjustments would, in our view, materially lower the deployment barrier.

TABLE I. FROM PROVISIONS (§II) TO OMNIMOVE DESIGN RESPONSES AND RESIDUAL GAPS (§III)

Provisions (§II)	OMNIMOVE design response	Residual gap (§III)
ITS Dir.; MMTIS as amended (§II.A)	Adapter-based ingestion of NAP-format feeds (GTFS/-RT, NeTEx, SIRI, GBFS)	NAP heterogeneity; data available but not transactable (§III.A)
ODD + HVD; DGA; Data Act (§II.B)	Configuration-only onboarding of any FRAND-accessible feed	Duties asymmetric across modes; taxi/NCC and ride-hailing weakly covered (§III.B)
Const. Arts. 9, 41, 117; MaaS4Italy (§II.D)	CASSITRACK as low-cost feed for municipal fleets, federated RAP → NAP	PA orchestration role and fall-back publishing duty not allocated (§III.C)
GDPR (§II.B); PSD2, DSA, DMA (§II.C); EAA	Minimised trip data; PWA delivery; ticketing deferred pending SCA	Geolocation control, digital divide, gatekeeper dependence (§III.D)

A. Strengthening the National Access Point as a true one-stop shop

The MMTIS framework (§II.A) guarantees availability but tolerates wide heterogeneity in NAP implementations and stops short of transactability. A facilitating reform should mandate uniform interfaces, service levels on freshness and uptime, and a duty of completeness covering real-time positions and shared-mobility availability: for OMNIMOVE, one certified integration instead of per-source adapter variants. Italy's MaaS Data Sharing Infrastructure should evolve into such a one-stop shop, federating regional access points — CASSITRACK's path — into the national NAP.

B. Harmonising data-sharing duties across mobility modes

Publication duties differ by mode (§§II.A–B): detailed for scheduled public transport, looser for shared

micromobility, weakest for taxi/NCC and ride-hailing — in practice, an aggregator can plan a bus leg but often cannot even see taxi availability. A horizontal *urban-mobility data act* — or a targeted extension of the Data Act — should introduce proportionate, mode-neutral duties (real-time availability, fares, operating areas) accessible under FRAND conditions to any registered aggregator.

C. Public administration as orchestrator, not operator

Articles 9 and 97 of the Constitution (§II.D) justify an active steering role for the public administration without turning it into an operator. Regulation should clarify the role of municipalities in (i) setting interoperability and data-quality standards for operators licensed to use public space; (ii) coordinating shared-mobility zones; and (iii) acting as fall-back data publishers when small or municipal fleets lack resources — the gap CASSITRACK fills at commodity-hardware cost, but for which no legal duty yet exists.

D. Users, inclusion and proportional safeguards

Three residual risks must be governed: (i) profiling and geolocation under the GDPR (§II.B), requiring purpose limitation, retention caps and user control over trip histories — reflected in OMNIMOVE's data-minimising defaults; (ii) the *digital divide*, requiring non-digital fallbacks and accessibility duties under Directive (EU) 2019/882 — OMNIMOVE schedules a dedicated audit; and (iii) concentration of mobility data and gatekeeper dependence (§II.C), which the Digital Markets Act addresses only partially. Together, the reforms above would convert the current *possibility* of building an open MaaS aggregator into a stable, predictable *right* — a precondition for the smart, inclusive cities envisaged by the Green Deal and the UN 2030 Agenda.

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