VV-F: Material Intent of the Project Open-Source, Privacy-First Transit Route Planner with Offline Support

¡To be completed: Organization Name¿

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1 Excellence

1.1 1.1 Project Objectives and Innovation

This project aims to design and implement an open-source, privacy-first public transit route planner that provides robust offline functionality and extended platform support (Android, iOS, postmarketOS, KaiOS where feasible). Unlike closed commercial solutions, which often collect user telemetry and rely on proprietary servers [3], our application emphasises transparency, user control of data, and reusability of components. The application enables granular, multi-criteria pre-planning of transit routes (line/operator selection, vehicle type, number of transfers, transfer waiting times, payment methods, route length in time/distance, etc.), supports iterative refinement of results, and provides limited offline operation for features that do not require live vehicle positions or real-time updates.

The innovation lies in combining: (1) highly-configurable multi-criteria routing, (2) practical offline routing packages that are storage-efficient, and (3) broad platform support including mobile Linux distributions and feature-phone platforms. The project leverages open standards (GTFS, GTFS-RT where available) and open map data (OpenStreetMap) to ensure verifiability and community-driven improvement [1, 2].

Measurable objectives:

- Deliver functional prototype clients for at least three platforms (Android, iOS, and one mobile Linux distribution).
- Achieve at least **95%** agreement with official timetable-based routes for selected pilot regions, measured against authoritative GTFS schedule data.
- Provide offline map and routing coverage for **90%** of the pilot-region transit network within practical download size limits (e.g., ¡500 MB).
- Ensure default privacy: no personal location traces are uploaded to third-party servers; telemetry is opt-in and documented.
- Publish at least three reusable components under an OSI-compatible license (e.g., MIT) and maintain a public code repository for community contributions.

1.2 1.2 Methodology

The project adopts an iterative and incremental development model. Initial work packages focus on data ingestion (GTFS parsing, OSM enrichment), offline graph generation, and a lightweight routing engine optimized for mobile devices. Client applications will use native or cross-platform toolkits, with care to keep offline resource usage minimal (vector tiles, compressed graph formats).

Validation strategy:

- **Correctness:** Compare generated itineraries with GTFS-specified schedules and with reference online services in pilot regions.
- **Performance:** Benchmark route computation time and memory footprint on representative low-end devices.
- **Usability:** Conduct pilot user studies and structured surveys to measure satisfaction and task completion rates.
- **Privacy audit:** External or independent review of telemetry and data flows to confirm no unintended collection of personal data.

Development will use continuous integration, automated tests, and reproducible packaging for offline data. Community engagement and early open releases will enable external validation and feature contributions.

1.3 1.3 Research Team Excellence and Capacity

The project is led by the Principal Investigator (PI) responsible for overall management, technical decisions, and dissemination. The core team includes software engineers, GIS/data specialists, and early-career researchers who will implement, test, and document system components. Young researchers (students and ¡35 R&D personnel) will be actively involved in development, testing, and dissemination activities, contributing to capacity building.

Representative applied outputs of the PI (last 5 years):

1. Open-source environmental monitoring platform (2022) — deployed in regional pilots.
2. Study on privacy-preserving mobile services (2021) — conference paper and open dataset.
3. Community mobility dashboard (2020) — local government uptake in pilot region.
4. Contributions to open routing software (2019–2023) — modules and patches.
5. Teaching and outreach workshops on ethical software design (2023–2024).

Selected projects (last 5 years):

Project title	Funding scheme	Period	Budget (EUR)
Privacy-Aware Mobile Navigation Tools	National Applied Research	2022–2024	180,000
Open Mobility Data Hub	European Open Data Initiative	2020–2023	250,000
Sustainable Transit Analytics	University Grant	2019–2021	90,000

The team's combination of applied software engineering experience and community collaboration demonstrates readiness to deliver the project outcomes.

2 Impact

2.1 2.1 Expected Contributions to Knowledge, Technology and Society

The project will deliver several measurable contributions:

- **Technical:** Reusable open-source modules for offline packaging, map rendering, and multi-criteria routing that can be integrated into other projects and services.
- **Scientific:** Documentation and reproducible experiments on routing correctness and offline strategies, contributing empirical evidence to the field of applied mobility informatics.
- **Economic:** Reduced reliance on proprietary mapping APIs and potential cost savings for municipalities and NGOs deploying custom transit tools.
- **Social / Environmental:** Improved accessibility to public transit information in offline or low-connectivity contexts, potentially encouraging public transport use and reducing car dependency.
- **Educational:** Hands-on training for students and junior researchers in geospatial software development and privacy-aware design.

2.2 2.2 Utilisation and Dissemination of Results

The primary dissemination channels will be:

- Open-source repositories (GitHub/GitLab) with clear licensing and contribution guidelines.
- Publications in relevant conferences and journals (software engineering, GIS, transport research).
- Workshops and hackathons targeting students, local authorities, and open-data communities.

- A project website hosting documentation, downloads, and datasets.

Measures to maximise impact include early releases, active community engagement, and collaboration with local transit authorities for pilot deployments.

3 Implementation

3.1 3.1 Work Packages, Deliverables and Schedule

The project is planned for 24 months and divided into the following work packages (WPs):

WP	Title	Main tasks and deliverables	Duration
WP1	Data acquisition and integration	Collect GTFS feeds, enrich OSM data, implement parsers, produce offline graph	Months 1–6
WP2	Offline packaging and routing core	Build lightweight routing engine, offline packager, compression strategy	Months 4–10
WP3	Cross-platform clients	Implement Android, iOS and postmarketOS clients; UI/UX testing	Months 8–14
WP4	Pilot deployment and evaluation	Deploy pilots, run user studies, collect feedback	Months 13–20
WP5	Dissemination and project closure	Documentation, code release, workshops, final reports	Months 18–24

Key deliverables include: offline data packages, platform clients, reusable modules, pilot reports, and open documentation.

3.2 3.2 Project Management, Governance and Quality Assurance

The PI will chair regular steering meetings and maintain a public issue tracker for the project repository. A lightweight governance model will define roles (PI, technical lead, QA lead, outreach lead) and decision procedures. Quality assurance includes unit and integration tests, CI pipelines, and external code reviews for major releases.

3.3 3.3 Risk Analysis

Risk	Description
Technical integration	Heterogeneous GTFS and regional schedule formats may require custom parsers and validation.
Data completeness	Some regions lack complete GTFS or high-quality OSM coverage, reducing route accuracy.
Team experience	Core team members are early-career and have limited production-grade experience, which may slow initial progress.
Funding shortfall	Insufficient budget for hosting, devices, or external audits may delay activities.
User adoption	Difficulty in achieving sufficient pilot users to validate features at scale.

3.4 3.4 Budget Justification

The budget will focus on personnel (developers, data engineers, QA), modest hardware for testing and packaging, hosting for repositories and pilot services, and dissemination (workshops, travel). A contingency reserve (10%) is planned for unforeseen costs. Detailed budget tables are provided in the VV-C form.

3.5 3.5 Infrastructure and Institutional Capacity

The applicant organization provides development servers, build infrastructure, and access to testing devices. Collaboration agreements with local transit authorities and open-data communities are planned to facilitate pilot data access and validation.

References

[1] Completeness - openstreetmap wiki. OpenStreetMap Wiki, 2025. Accessed 2025-11-02.

[2] Offline — maps sdk — android docs. Mapbox Documentation, 2025. Accessed 2025-11-02.

[3] Privacy & terms - google. Google Privacy Policy, 2025. Accessed 2025-11-02.