

# **FiberGround Final Project Summary**

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FiberGround is a digital platform designed to automate and optimize the underground fiber optic installation process. The system's primary objective is to maximize profitability for Internet Service Providers (ISPs) by simultaneously increasing installation efficiency and field safety. By providing algorithmic pathfinding to minimize material length and interactive 3D utility mapping to prevent subterranean "line strikes," FiberGround aims to reduce material waste and worker compensation costs by a target of 15%. This report provides a comprehensive overview of the project, detailing the system's scope and operational context, functional and performance requirements, architectural design and subsystem decomposition, validation through structured acceptance testing, and an analysis of implementation risks and associated costs.

Bridging the gap between office planning and field execution, this platform centralizes the installation lifecycle into a single digital environment. It delivers a suite of tools including automated maps that merge historical records with field data, a pathfinding engine to optimize routes, and a monitoring dashboard that tracks installation in real time. To maintain a clear project focus, the software design excludes physical excavation, legal permitting, and payroll tasks. Successful operation depends on coordinating data from four key sources: the ISP Planner defines the project goals, JULIE Locators provide initial utility maps, the Construction Crew provides verified site depths, and the Boring Rig provides the live position of the drill head.

FiberGround is designed with a set of requirements to ensure that the system is practical, safe, and effective for underground fiber installation projects. Functional deliverables include the ability to create installation projects, import underground utility data, generate optimization routes, accept field verifications updates, monitor live boring rig telemetry, trigger hazard alerts, and produce finalized as built records. Other requirements we implemented focused on more of the performance side like role based access control, encrypted data handling, and audit logging. Usability requirements ensured the system would be accessible for all users such as planners and field crew. Specifically for crew members we wanted mobile friendly interfaces for harsh outdoor environments.

The technical architecture of FiberGround has been built as an integrated platform combining desktop planning tools, mobile fields applications, cloud infrastructure, GIS mapping systems, and real time telemetry processing. Office users like ISP planners would interact through a dashboard in order to be able to create projects, route optimization, and reporting. Field crews would use a mobile tablet to submit ground truth data and monitor live operations. A centralized cloud database would store project records, utility maps, route geometry, telemetry streams, and final as build documentation. The design also includes interfaces for importing data and external

locator services such as JULIE/811 and connecting to drilling rig telemetry hardware. To organize interactions between users and components we use case diagrams, scenario flows, and subsystem architecture. This architecture results in scalability, collaboration, and real time decision support across all stages of the fiber installation process.

Field testing such a software application is crucial in validating its functionality and establishing trust that the app will be reliable and encourage safe and efficient fiber installations. Route optimization tests must be performed to verify that the system generates optimized routes that respect safety clearances and successfully minimize the material costs of the installation. Field data entry tests are needed to confirm that construction workers are able to easily enter information during less than ideal conditions, such as wearing bulky gloves, working in bright sunlight, or in more remote areas with unstable network connection. Live telemetry tests are important for safety to verify that the boring rig's drill head position is accurately represented and hazard alerts are consistently displayed to the operator in a timely fashion. These and many more acceptance tests are detailed in the final project report.

Overall there are many things to consider when implementing a software system like FiberGround. There are risks involved with relying on the software because the accuracy and completeness of historical utility data is questionable, so it is by no means a total replacement for true human judgment. The software is only as good as the data it is fed, so users must be careful to enter trustworthy data. The migration to such a software may also be met with some pushback. Construction workers who historically would rely on face-to-face communication, spray painted lines for utility markers, and other more primitive means of doing the job may not like the change to a more digital workflow. Extensive training must be provided to ensure that all users are comfortable and knowledgeable about the product. If given the opportunity though, we believe that FiberGround could have a massively positive impact on the business of underground fiber internet providers.