SUSTAIN 6G

SUSTainability **A**dvanced and **I**nnovative **N**etworking with **6G**

European Lighthouse project

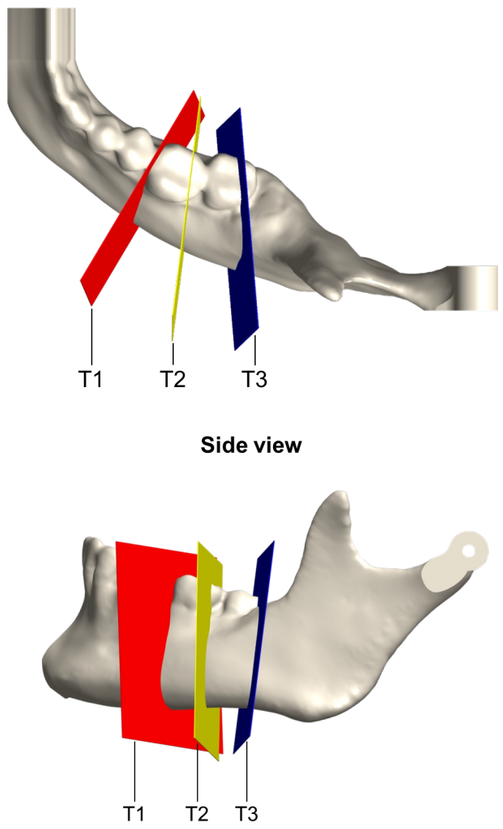
Concurrent Pre-Operative Surgical/Engineering Planning

1) **Cranio MaxilloFacial (CMF) surgery** has a broad scope with dual **goal**: **function + aesthetics** which demands high precision
2) **Preoperative planning** enables patient-specific guides/ implants design, cutting planes definition, osteosynthesis material selection, and surgical simulation
3) **Planning is a collaborative process**:
   - **surgeons** define osteotomies, resection margins, and clinical needs
   - **technicians** convert them into CAD models and 3D-printed guides tailored to the patient
4) **Iterative workflow** with continuous information exchange and shared decisions
5) **Outcomes and safety** hinge on the synergy between clinical and engineering expertise and on planning accuracy

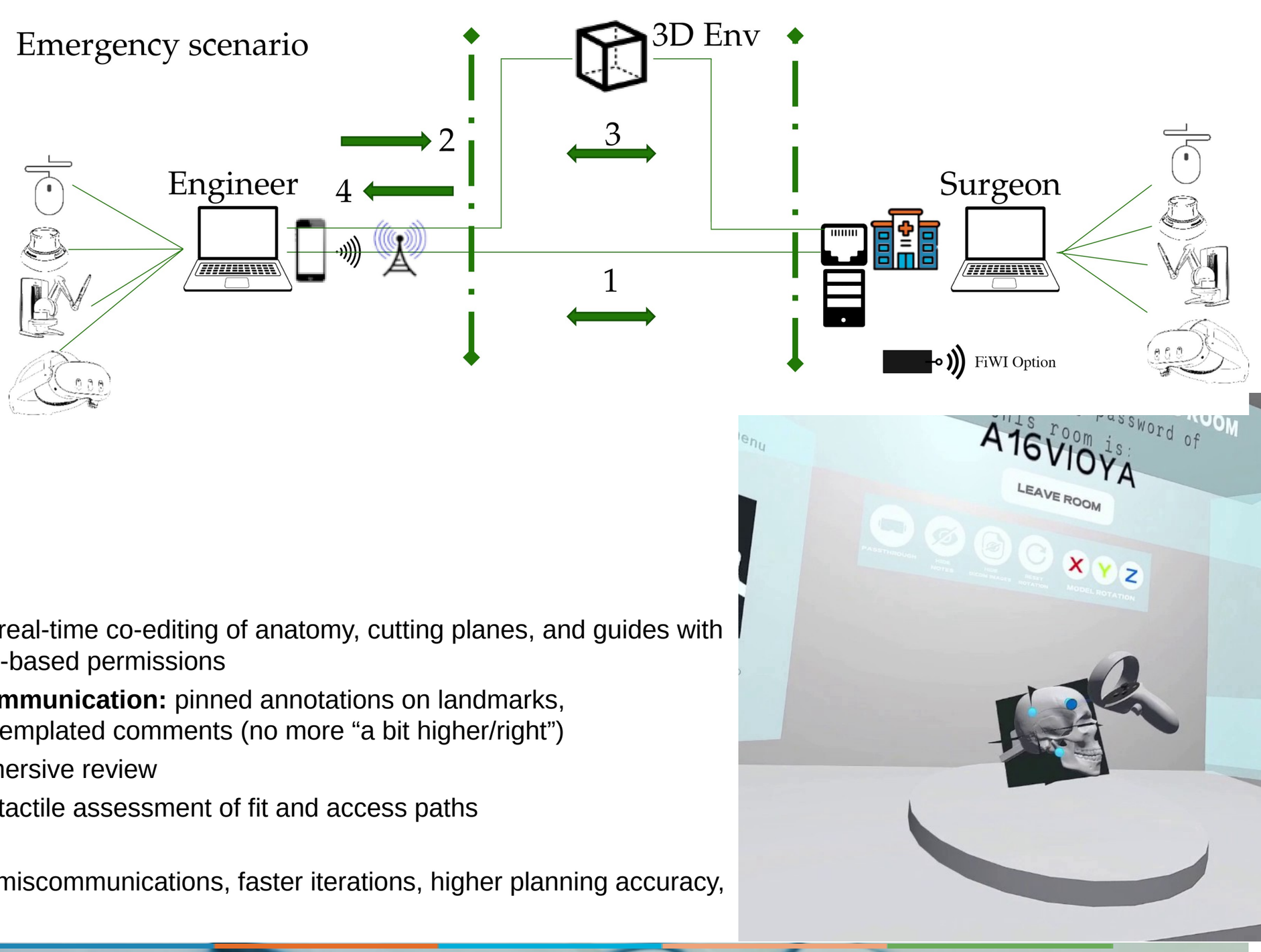
Current Gaps:

- **No structured, purpose-built platforms**: work happens via screen-sharing (e.g., Meet/Zoom) and voice
- **Ambiguous communication**: “a bit higher / more to the right” verbal cues without geometry-bound references or shared rulers/landmarks
- **No true co-editing in 3D**: participants can’t jointly manipulate the same model, planes, or guides with guaranteed sync/versioning
- **Poor traceability**: limited annotation history, approvals, or audit trails linking decisions to anatomy and timestamps
- **Inefficient iterations**: slow back-and-forth, risk of misinterpretation, rework, and extended lead times for patient-specific guides
- **Governance & compliance gaps**: unclear roles/permissions, data security concerns, and inconsistent documentation

Resection planes



System architecture



1) **Shared 3D workspace:** real-time co-editing of anatomy, cutting planes, and guides with presence, locks, and role-based permissions
2) **Geometry-anchored communication:** pinned annotations on landmarks, rulers/angles/distances, templated comments (no more “a bit higher/right”)
3) **VR visualization** for immersive review
4) **Haptics:** haptic tools for tactile assessment of fit and access paths

Expected Outcome: fewer miscommunications, faster iterations, higher planning accuracy, and fully traceable decisions

Co-funded by the European Union

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This work is Co-funded by the European Union under Grant Agreement 101191936. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of all SUSTAIN-6G consortium parties nor those of the European Union or the SNS JU (granting authority). Neither the European Union nor the granting authority can be held responsible for them.

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