

Project Resilverse

Enabling smart and resilient infrastructure for future society

BF Co-innovation project application

RESILVERSE

NEEDS

- Seamless, accurate, and cost-effective digital twin creation, capability to monitor environment and stealthy monitoring solutions

APPROACH

- Advanced 3D mapping for different environments
- Reduction of size and cost
- Improved scalability

BENEFITS

- Smarter infrastructure with improved efficiency, resiliency and cost reduction
- Safer AI and robot deployment through extensive simulation and training
- Situational awareness

SECURITY

ECOSYSTEM

EXTENSIVE
SIMULATION

METaverse

ECOSYSTEM

5G

AB

LB

ECOSYSTEM

Project information

- Name: “Project Resilverse”?
- X year co-innovation research project funded by Business Finland.
- Funding rates: TBD
- Application deadline: TBD
- Planned project period: TBD
- Possibility to be part of Nokia Veturi program LEAD / Patria eAlliance



Focus applications in Resilverse

Enhanced, Metaverse, AR, data sharing and Mixed Reality Experiences:

- Digital Twins are essential for creating accurate and immersive augmented reality (AR) and mixed reality (MR) applications.
- By overlaying virtual models onto the physical world, users can interact with real-time data and simulations, leading to improved urban planning, maintenance, and citizen engagement.
- AI Training and Simulation

Infrastructure resilience and security:

- It is vital to be able to have monitoring capability in difficult environments i.e. under water, fog, smoke, dust, and darkness

Dual use:

- Disruptive digital solutions for 3D imaging across civil, security and defence technologies
- Solutions for stealthy mapping or targeting systems protecting users from countermeasures

Challenges we solve with Resilverse project

High Costs of LIDAR Sensors:

- Accurate digital twin and point cloud creation relies on efficient LIDAR sensing.
- High manufacturing costs of LIDAR sensors pose a significant barrier; innovations are needed to reduce manufacturing costs without compromising performance.

Monitoring capability in difficult environments :

- Many solutions for monitoring become un-usable in harsh conditions obstructing vision
- Monitoring systems need to be deployed in various conditions from underseas to drones working in smoke

Stealthy monitoring capability

- In some monitoring and mapping scenarios it is beneficial to maintain invisibility while doing active mapping of environment

Research themes

Introduction of new type of LIDAR solutions with advanced performance and manufacturability

Resilverse Light-detection-and-ranging (LIDAR) demonstrations

1st demo: Time-of-Flight (ToF) LIDAR for optimized for underwater operation

2nd demo: Cost-effective Frequency-Modulated Continuous Wave (FMCW) LIDAR with 10x improvement in lateral resolution over state-of-the-art (SOTA)

4rd demo: Long wavelength FMCW LIDAR for stealthy and adverse weather operation with 10x improvement in optical power over SOTA

Partners

- Tampere University
- VTT
- Nokia (Not confirmed)
- Wisematic
- Picophotonics
- Reflekron
- Murata (Not confirmed)
- Noptel

Consortia strengths

- Finnish value chain from components to mass markets
- Leading expertise in
 - Silicon photonics (VTT)
 - MEMS technology (Murata)
 - MID-IR Light sources and detectors (Tampere University)
 - Range finding systems and imaging components (Noptel)
 - Pulsed lasers (Picophotonics and Reflektron)
 - High speed modulators (Confidential)
 - Customized automation (Wisematic)
 - Robust optics assembly technology (Tampere University)
 - Application and end-user interface (Confidential, Nokia, Noptel)

Focus Areas and link to demos

		LIDAR for Digital Twins	Stealthy "LIDAR"	Under sea LIDAR
	Production tools	SWIR FMCW LIDAR VTT	MIR FMCW LIDAR VTT	VIS TOF LIDAR Noptel
Assembly	Wisematie a byte more automation	VTT Tampereen yliopisto Tampere University	VTT Tampereen yliopisto Tampere University	Noptel Tampereen yliopisto Tampere University PICO PHOTONICS
Scanner technology		muRata	muRata	VTT
Wafer-level Testing	Wisematie a byte more automation	VTT Tampereen yliopisto Tampere University	VTT Tampereen yliopisto Tampere University	REFLEKRON
Detectors		VTT	Tampereen yliopisto Tampere University	Noptel
PIC and Laser technology		VTT	VTT Tampereen yliopisto Tampere University	PICO PHOTONICS REFLEKRON

Demos:

Technical advantages beyond state of the art

VIS TOF LIDAR (Highest starting TRL)

- Compact high peak power green laser technology and optimized detector array
- LIDAR concept suitable for marine use

NIR FMCW LIDAR (Medium starting TRL)

- Very fast 1D solid state scanning using phase array and advanced modulators
- 1D scanning using optimized MEMS scanner for high resolution high signal level
- FM enables both distance and velocity measurement with novel phase modulator
- Large core size PIC technology for good reception and power
- High lateral resolution/frame rate parallel detection with > 10 detectors

MIR FMCW LIDAR (Lowest starting TRL)

- As above +
- High power diode laser technology for extended range
- Advanced NIR-photodiodes for MIR-FMCW LIDAR for enhanced sensitivity
- Long wavelengths allowing advanced reception on poor conditions and stealthy use

Thank you!

