



RF SUMMIT FINLAND 2025 – Bittium Veturi program and view for using modern modeling methods in RF development

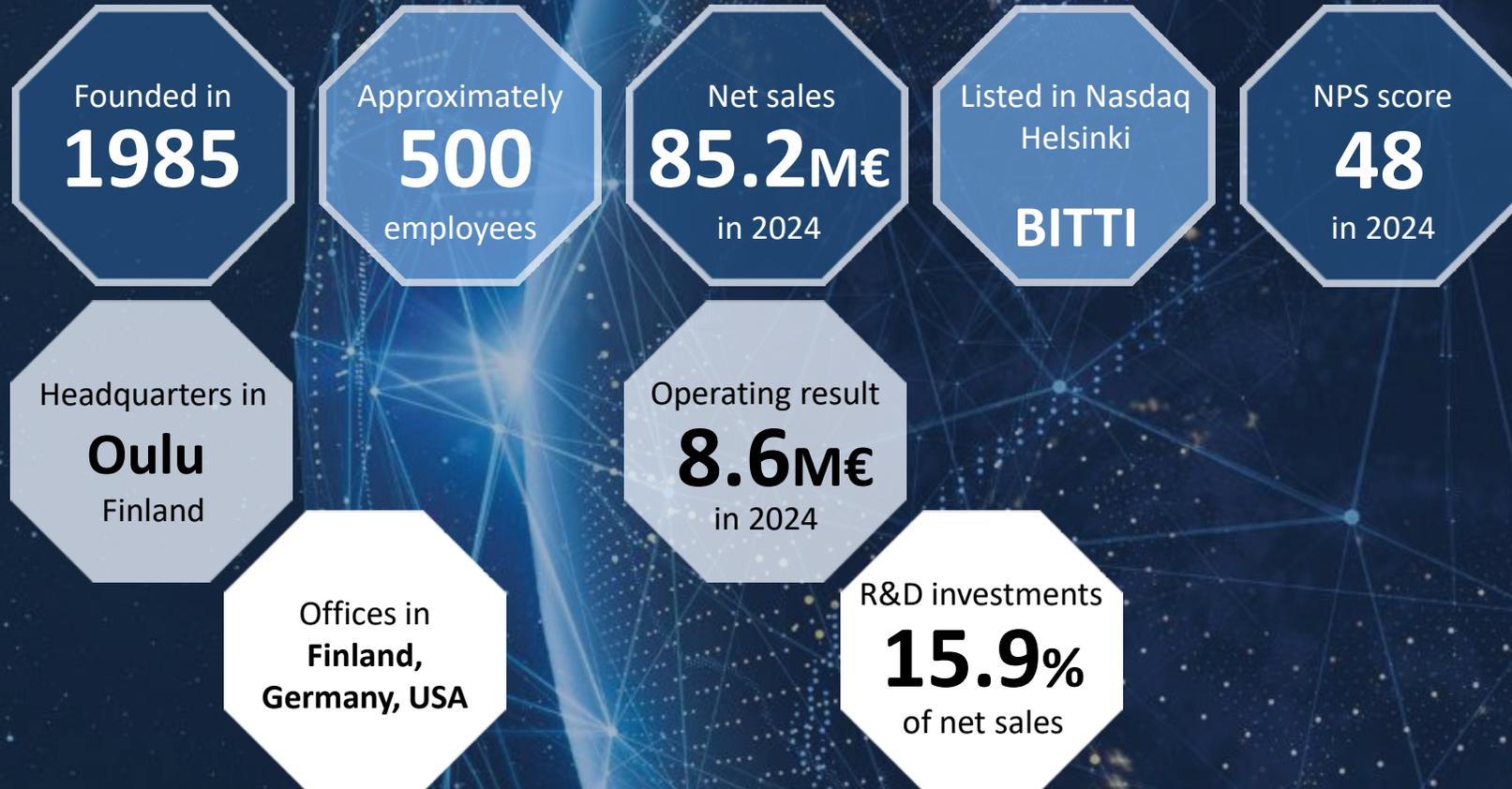
Jari Jauhiainen
19.03.2025

Bittium

About Bittium

Bittium is a high-tech company specializing in tactical and secure communications, engineering services, and medical technologies.

Key Figures



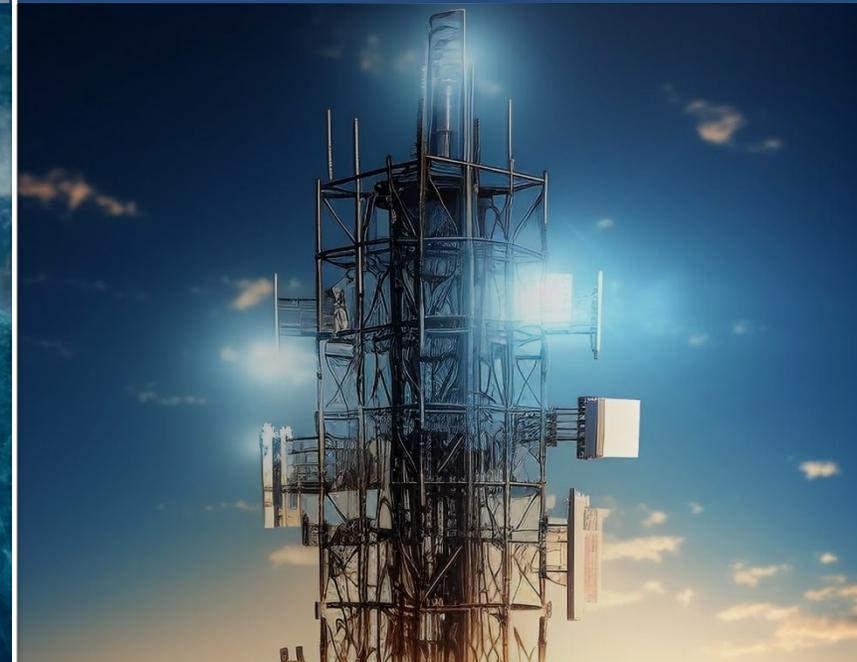
MEDICAL



TACTICAL AND SECURE COMMUNICATIONS



ENGINEERING SERVICES



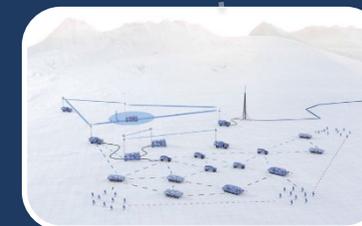
MEASURING AND MONITORING

Enabling Remote Monitoring and Diagnostics



SMART SYSTEMS

Automation, AI, unmanned platforms



APPLICATION AREAS

Medical, Defence, Engineering Services



WIRELESS COMMUNICATION

5G/6G/satellite hybrid networking



DESIGN FOR SECURITY

Ultra Secure End-to-End Encrypted Communication

BITTIUM VETURI PROGRAM ▶

Seamless and Secure Connectivity Ecosystem

Ecosystem Development & Research

19.03.2025

Jari Jauhiainen

BUSINESS
FINLAND



Bittium

Mission

Seamless and cyber secure connectivity and communications is enabled by 2030s in end-to-end vertical domains by creating trustworthy, secure and resilient E2E connectivity architectures and products until lifecycle services.

Status of the Ecosystem

- **27 Finnish partners so far + over 50 international partners**, totally over 50 direct ecosystem partners in collaboration discussions and potentially in projects early 2025
- **5 projects started**, potential up to **7 early 2025**, total **8 applied so far**.
- **2 of the projects EU projects (CISSAN Celtic-Next), (DistriMuse Chips-JU)**, also several **Horizon Europe and EDF projects** either in preparation or starting related to themes.
- **Collaboration universities e.g. UOulu, TAU, UTurku, Aalto, JYU, UH and VTT.**

Focus Areas



Secure Encryption Technologies



Highly Secure Communications
in the Future Networks



Secure End-to-End Verticals



Scaled Sensor Fusion Applications

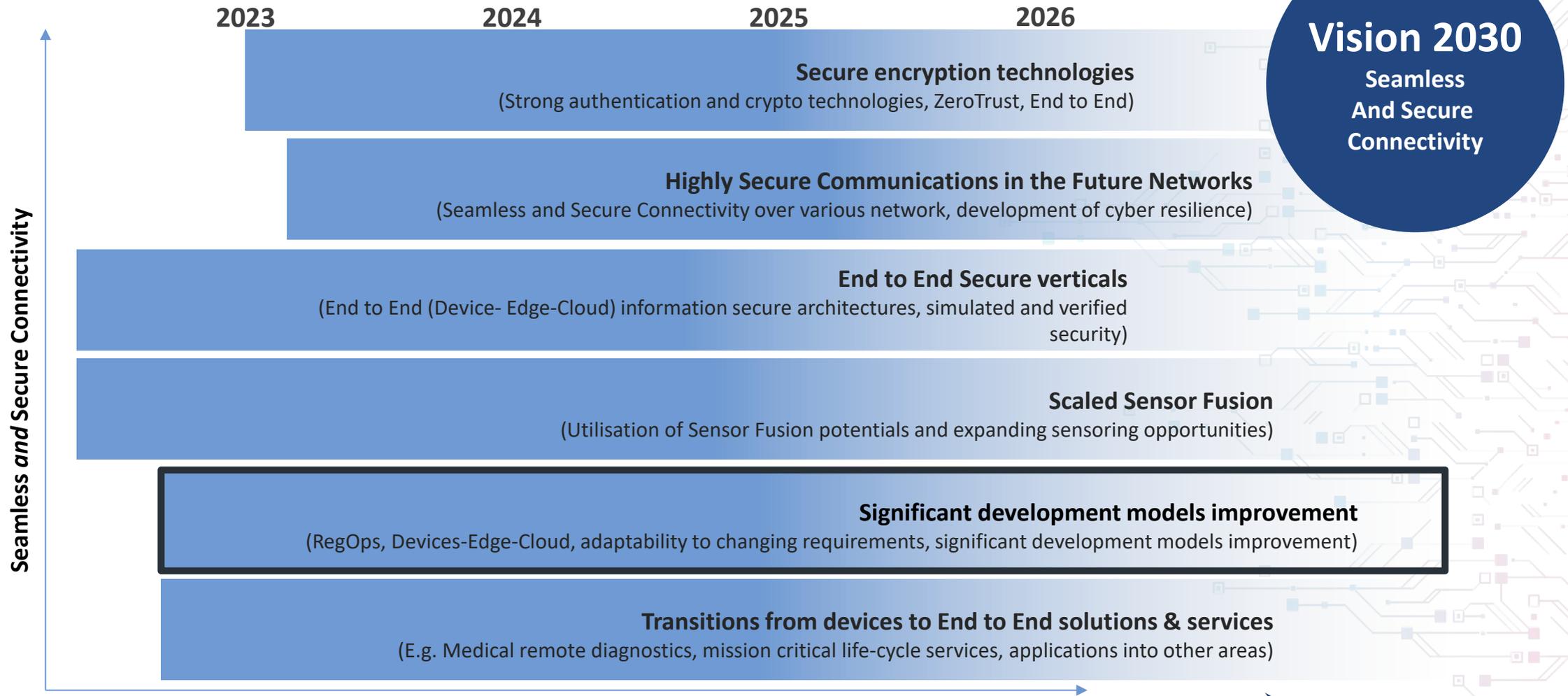


Significant development
models improvement



Transitions from devices
to E2E services

Program Roadmap Assumptions



Bittium view of direction for modeling



Seamless and Secure
Connectivity Ecosystem



Bittium

Bittium view of direction for modeling

- Bittium is **looking for methods that improve** making of **product- and building block's requirements and design choices.**
- Bittium is **seeking ways to build digital twin of product** so that product- and sub-parts of **product performance can be optimized and verified through simulations.**
- **With help of the digitalized approach to R&D Bittium is looking to boost products development efficiency by applying more modeling, simulation and verification methods within products development and R&D services.**

Bittium view for using modern modeling methods in RD development

- Currently **Matlab and Simulink** are dominant tools
 - **Both tools allow system performance simulations while varying per system block performance parameters.** i.e. one can find out minimum performance parameters requirements per design block, for example.
 - Matlab and Simulink have been **used for example to build modeling and linearization simulator for RF PA development.**

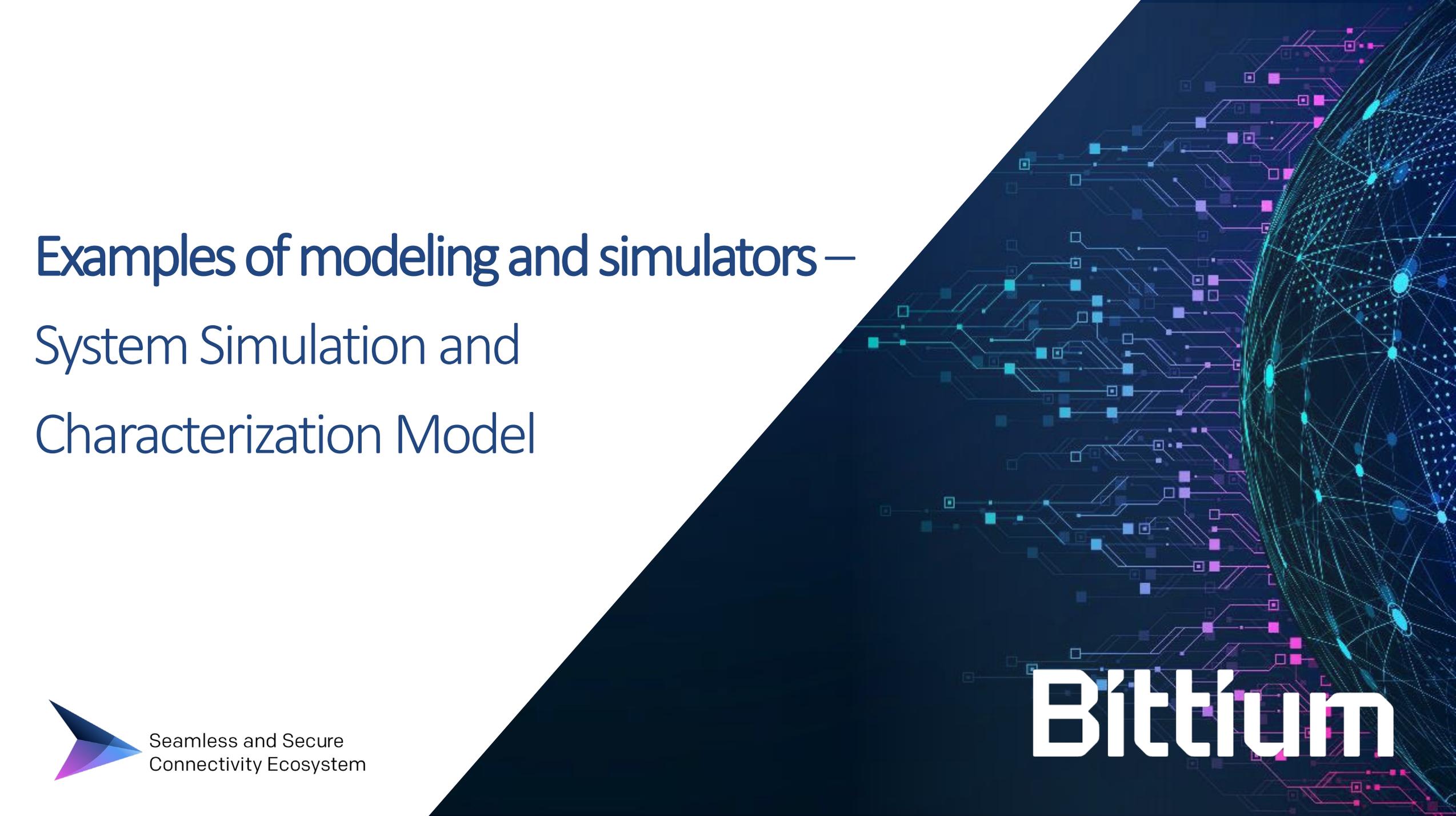
Bittium view for using modern modeling methods in RD development

- The RF PA modeling and simulation was also built to include **HW-in the loop**. Thus, **real RF signaling and RF PA** was included within simulations.
- Matlab and Simulink-based tool environments are planned to developed further.
 - > **Real FPGA and RF cards** are to be **integrated into developed simulation environments**.
Aim is to be able to simulate with HW-in the loop, but also open possibility for real implementation tests.
- Modeling and analysis aspects are studied further, for example, **how to build environment that allow co-work with 3rd parties**, and find out and **develop simulation and analysis methods that help design optimization**.

Examples of modeling and simulators – System Simulation and Characterization Model

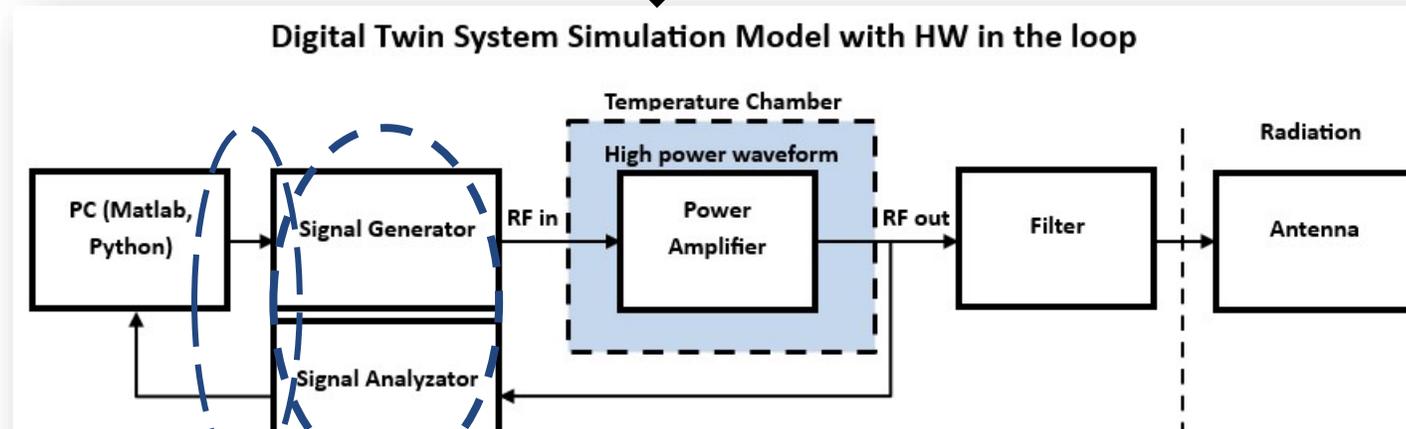
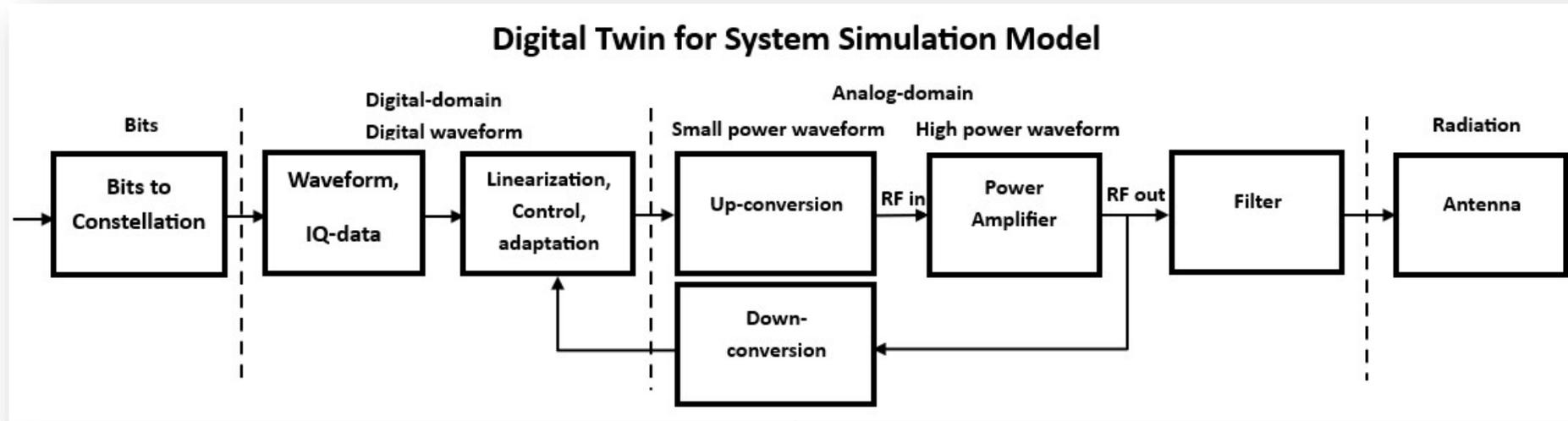


Seamless and Secure
Connectivity Ecosystem



Bittium

System Simulation and Characterization Model



Portion of Matlab parts is also possible to transfer to FPGA (e.g. DPD)

Real FPGA and RF cards are to be integrated to the simulation environment



System Simulation and Characterization Model

- The implemented environment **tackle especially for Base Station PA's planning and testing challenges** because it can be used for **simulation, modeling, testing and analysis**:
 - **Defining of PA's requirements and design is challenging process** and therefore development cycle is quite slow. Usually couple of R&D rounds is required for developing PA because 1) **lack of accurate simulation models and analysis methods**, which leads into 2) **PA doesn't fit into the module requirements** and/or 3) **it doesn't linearize well enough**.
 - **Developed environment opens improvement possibilities for whole development cycle** because **PA can be within linearization simulations as a model**, but also as a **real implementation** and analyses can be made and developed using **real PA within simulations**.
 - **Real PA can be tuned inside simulations or model updated with real data** and **analyses can be done while real PA is included within linearization and characterization simulations**.

RF ECO³- Bittium

Research goals

- Research and apply modern RF/HW simulation, modeling and testing methods for improving R&D effectiveness and energy efficiency.

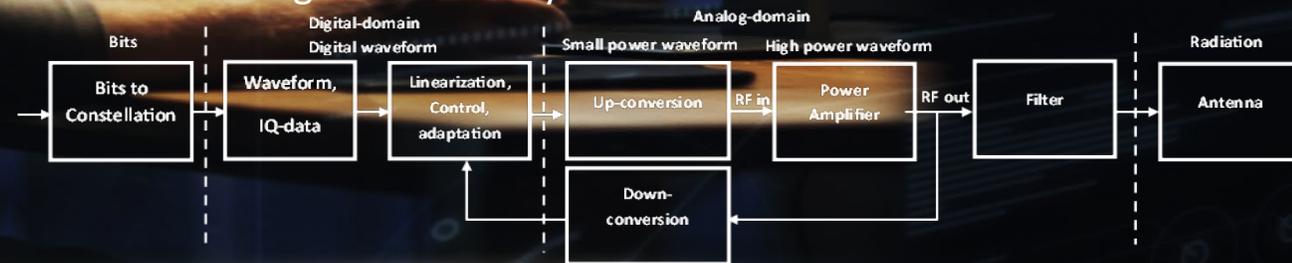
Targeted results

- Improve R&D productivity, energy efficiency and competitiveness within industry 5G and beyond RF generations by exploiting more efficient methods and procedures.

Co-creation

- Develop modern methods in co-operation with the research and industry partners.

Digital Twin for system simulation model



Join the ecosystem

Development initiatives for co-innovation
and research collaboration

veturi.ecosystem@bittium.com



Seamless and Secure
Connectivity Ecosystem



Bittium