CLONETS – Clock Network Services

Strategy and innovation for high performance time and frequency services over optical fibre networks

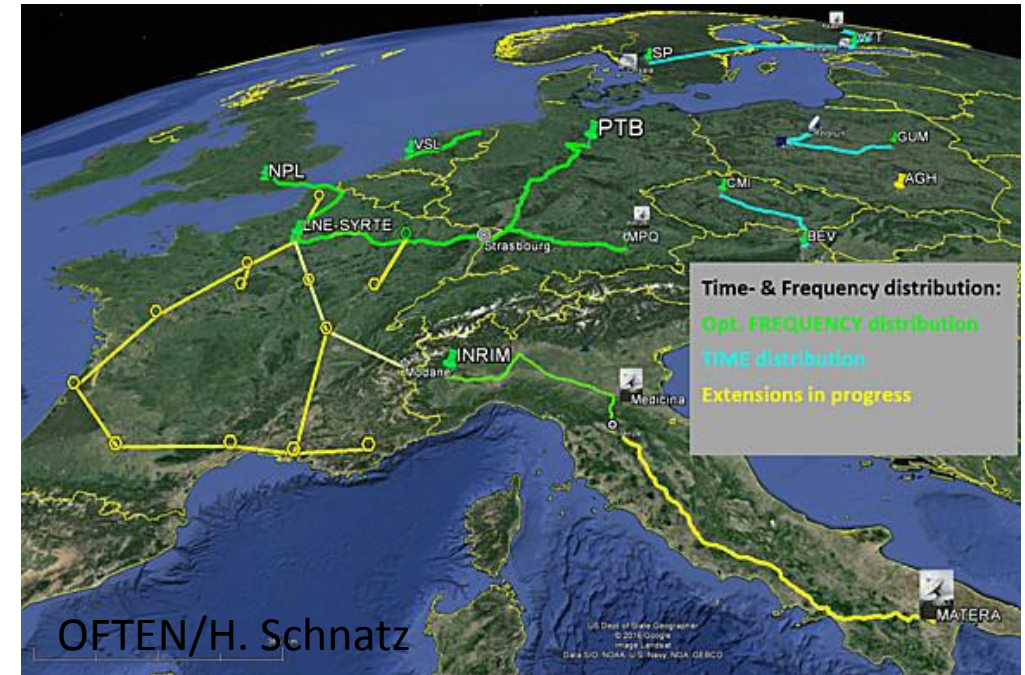Eva Bookjans – Project Manager

Goal and Motivation

CLONETS is a **Coordination and Support Action**, which receives funding from the **European Union's Horizon 2020 research and innovation programme** under grant agreement no. 731107.

The goal of CLONETS is to prepare the creation of a sustainable, **pan-European optical fibre-based network providing high-performance T&F services** to research infrastructures as well as support to a wide range of industrial and societal applications.

CLONETS is motivated by recent progress in time and frequency (T&F) metrology and the **increasing number of applications requiring T&F reference signals through optical fiber.**

Time- & Frequency distribution:
Opt. FREQUENCY distribution
TIME distribution
Extensions in progress

OFTEN/H. Schnatz

⇒ **Strengthen the European coordination** between research institutes, NMIs, NRENs and industry
⇒ **Define the pan-European core network** and a deployment strategy

The Consortium

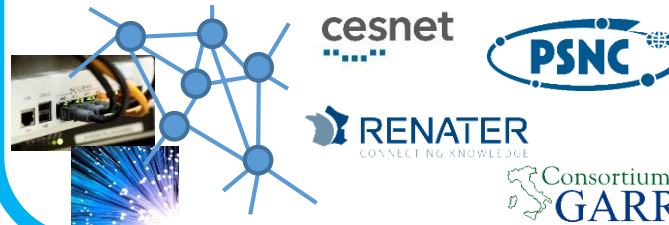## National Metrology Institutes

Operation of state-of-the-art atomic clocks, including optical clocks
Expertise in time and frequency transfer

National Education and Research Networks

Long standing experience in transferring time and frequency signals through optical telecommunications networks

In Numbers

19 Partners
    16 Consortium Members / **3** Third Parties
  4 Types of Institutions
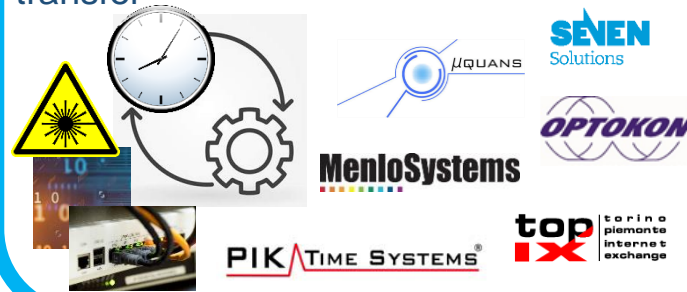 **7** European Countries
30 Months – project duration

Academic Research Laboratories

Development and research of new time and frequency transfer techniques, laser sources and novel frequency standards

Industrial Partners (SMEs)

Development and commercialization of innovative products of time and frequency transfer

Why T&F reference signals over optical fibre ?

- **Security, resiliency and reliance** – Satellite signals are vulnerable to jamming, spoofing and interference. This is increasingly becoming a concern, in particular for critical infrastructures, such as telecommunications and smart grids. A fibre link could therefore serve as a backup solution.

- **Traceability** – A fibre link to a UTC(k) lab can guarantee traceability to UTC. This is important with regards to regulations, such as the new financial directive of the EU (MiFID2), which requires traceability to UTC. Additionally, in many countries, the legal national time is defined by the UTC(k) maintained by the NMI of the respective country.

- **Fibre** – Some applications are performed in locations outside the range of satellite signals and therefore require other methods for transferring T&F reference signals. Examples are large particle accelerators (CERN) and neutrino array detectors (KM3Net).

- **Optical reference** – For applications requiring a reference signal in the optical domain, such as high precision laser spectroscopy, optical sensing and optical clock comparisons, it is advantageous to have a reference in the optical domain.

- **High performance** – There is an increasing need for more stable and accurate T&F reference signals than are currently available through satellite techniques. (optical clock comparisons, quantum metrology, tests of fundamental physics, high-resolution spectroscopy, radio astronomy, geodesy)

Formulating an Overall Vision

- **Study applications** of fibre-based T&F reference signals and their requirements
- **Identify key technologies** for T&F transfer over optical fibre

⇒ **Define a global vision for a T&F service** over optical fibre
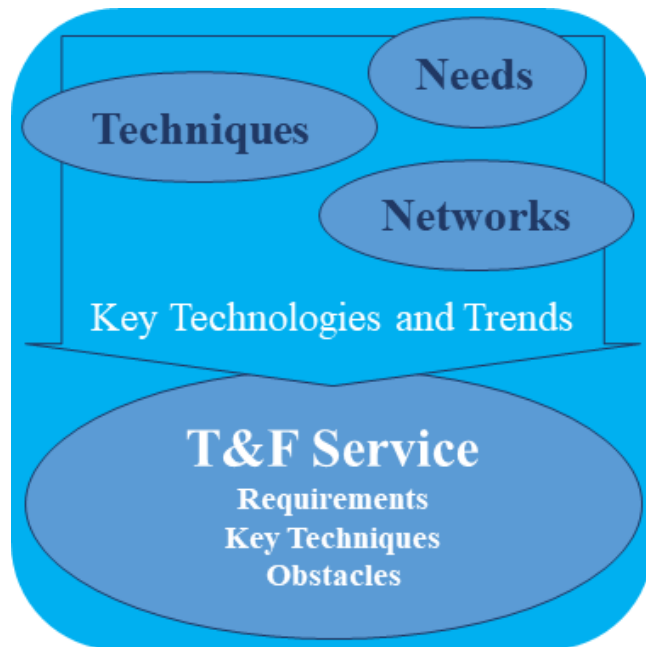
T&F as a Service
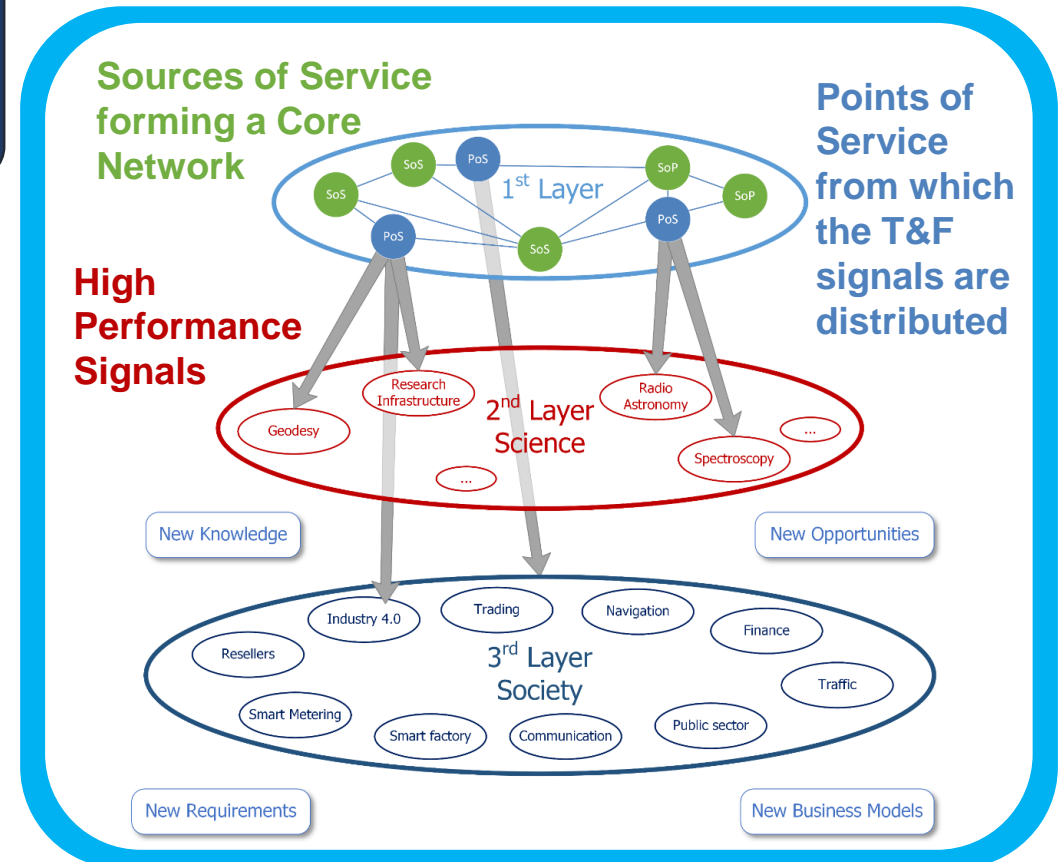
Training

Regional Training Event

NPL
National Physical Laboratory

Introduction to time and frequency transfer over fibre networks

February 26th 2019

Summer School – Les Houches

FIRST TF

High Precision Physics using an Optical Fibre Link and Optical Frequency Combs

LPL Laboratoire de physique des lasers   UNIVERSITÉ PARIS 13

April 22nd-26th 2019

POLITECNICO DI TORINO **Pilot Master's Programme** **INRiM** ISTITUTO NAZIONALE DI RICERCA METROLOGICA
in
Photonics for Data Networks and Metrology

Thank you for your attention

CLONETS – CLock NETwork Services

Strategy and innovation for clock services over optical-fibre networks

Proposal ID: **731107**
Topic: **INFRAINNOV-2016**
Duration: **30 months**
Start date: **1st January 2017**
Web page: **http://www.clonets.eu**

Coordinator

l'Observatoire de Paris — SYRTE
Systèmes de Référence Temps-Espace

Participants

INRiM — ISTITUTO NAZIONALE DI RICERCA METROLOGICA | PTB | NPL National Physical Laboratory | RENATER CONNECTING KNOWLEDGE | cesnet | PSNC | LPL Laboratoire de physique des lasers | UNIVERSITÉ PARIS 13 | μQUANS

MenloSystems | PIK TIME SYSTEMS | ISI CAS Institute of Scientific Instruments The Czech Academy of Sciences | SEVEN Solutions | OPTOKON FIBER OPTIC TECHNOLOGY CALIBRATION LABORATORY | AGH | UCL

Third Parties

cnrs | Consortium GARR | top ix | torino piemonte internet exchange