Management Board meeting

24 March 2022

# One Health Whole Genome Sequencing system

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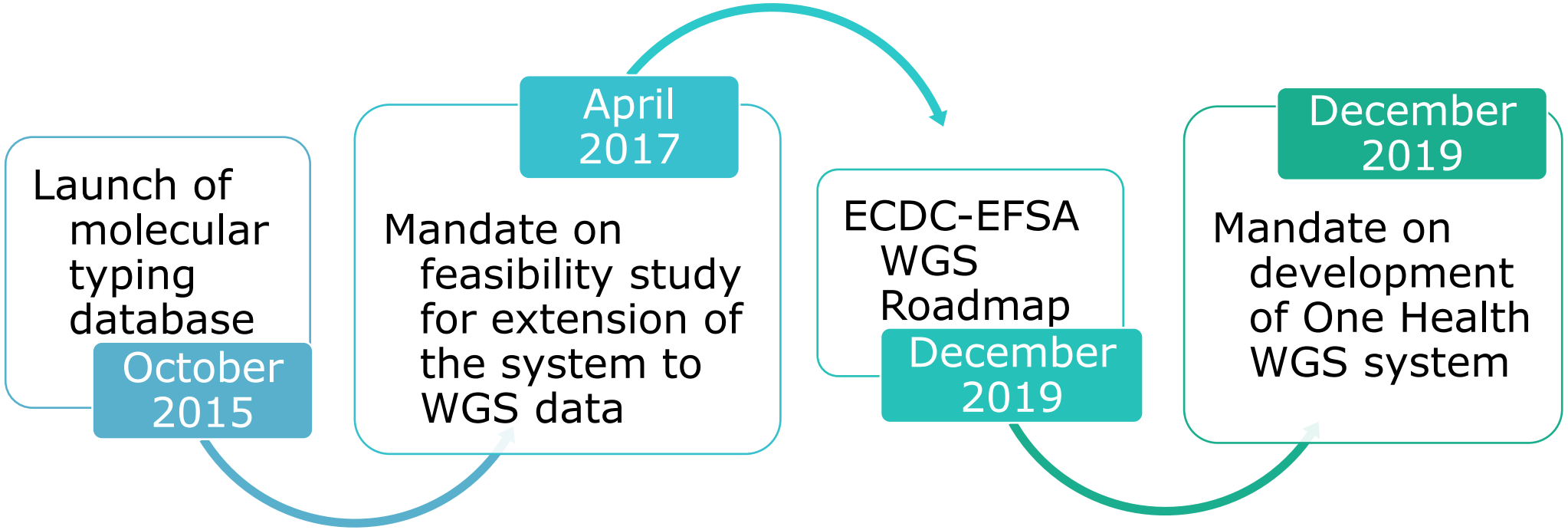
Trusted science for safe food

European Food Safety Authority


https://multimedia.efsa.europa.eu/moleculartyping/index.htm

# Timelines


Launch of molecular typing database
October 2015
April 2017
Mandate on feasibility study for extension of the system to WGS data
ECDC-EFSA WGS Roadmap
December 2019
December 2019
Mandate on development of One Health WGS system

# 2019 EC Mandate

**Subject:** **Request for the implementation of a 'One Health' system for the collection and analysis of whole-genome sequencing (WGS) data from human and food/animal isolates**

## SCOPE

- **Serving public health interests** and protecting European consumers

## APPLICABILITY

- **WGS data** of *Salmonella, Listeria monocytogenes* and STEC isolates

## OBJECTIVE

- Promoting **cross-sectorial data sharing:**
  - for the purpose of molecular surveillance and continuous monitoring of foodborne pathogens
  - in case of ongoing multi-country foodborne outbreaks for the purpose of supporting the investigation of the events

# 2019 EC Mandate

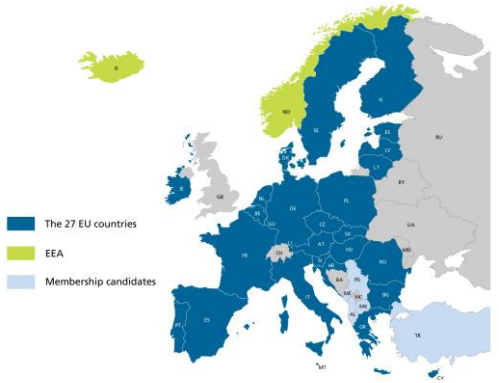
## REQUIREMENT

- Implementation of two systems for the collection of WGS data of food-borne pathogens from human isolates (ECDC) and non-human isolates (EFSA)
- **Full interoperability** between the two systems
  - System interoperability
  - Semantic interoperability

The European Union needs a robust and sensitive tool for rapid detection and management of multi-country foodborne outbreaks with the ultimate purpose of serving public health interests and protecting European consumers. Emphasis will be placed on full interoperability of this joint molecular typing system between the food and public health pillars in order to ensure the protection of consumers within the EU single market in the context of a 'One Health' system approach.

# Benefit for stakeholders – **EU/EEA MSs**

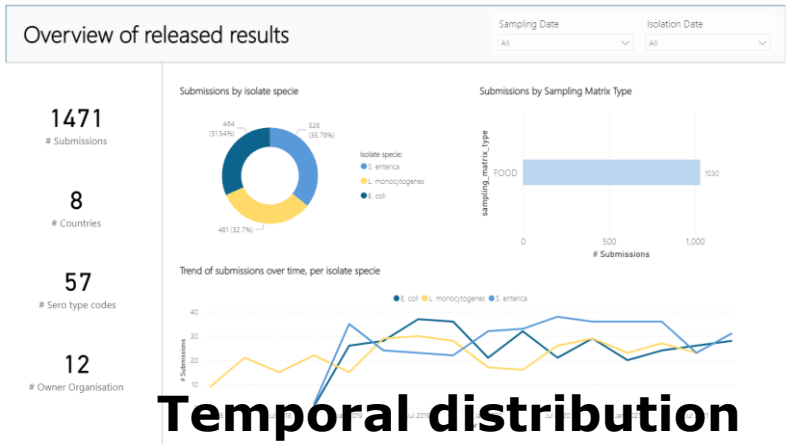
- **Role:**
  - ✓Data providers/Users



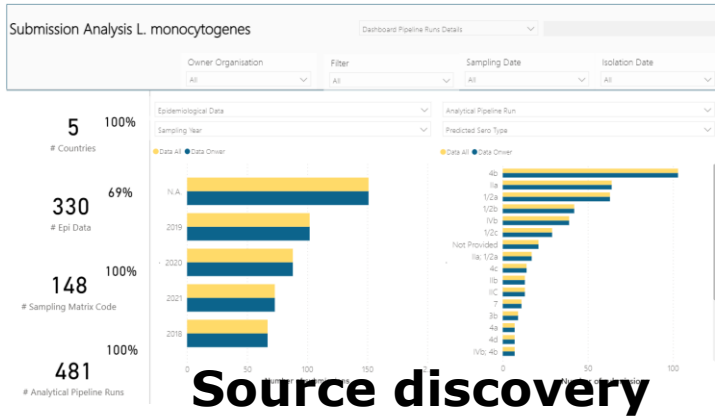

- **Outcome:**
  - ✓Secured system → data confidentiality
  - ✓Customer-oriented service → based on Member States' capacity
  - ✓Capacity building → decentralisation of the bioinformatic analysis
  - ✓Database searchable → data comparison and visualisation

- **Added value:**
  - ✓More efficient investigation at country level
  - ✓Trust in the EU food safety system
  - ✓Engagement


European Food Safety Authority

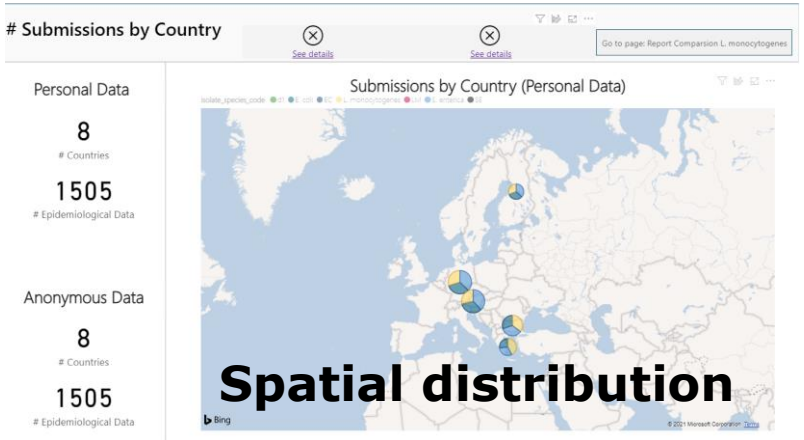



**Temporal distribution**

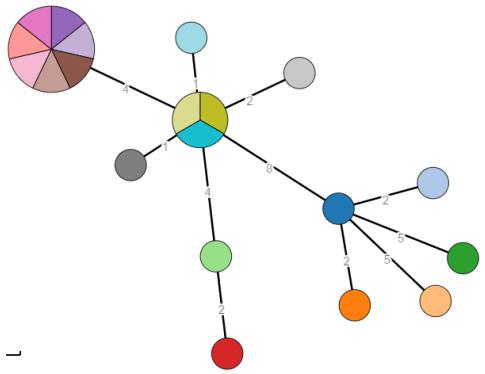



**Source discovery**

*These are prototypes based on fictional data*




**Spatial distribution**

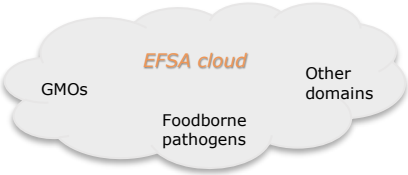


**Phylogenetic analysis**

# Promoting EFSA core values

- **Role:**
  - ✓ Coordinator

- **Outcome:**
  - ✓ Real-time data availability 
  - ✓ System incorporated in IT EFSA strategy and architecture → Azure cloud system
  - ✓ Use of open-source community-validated bioinformatic tools → Agility and resilience to technological changes
  - ✓ Open-source distribution of bioinformatic pipeline → Transparency



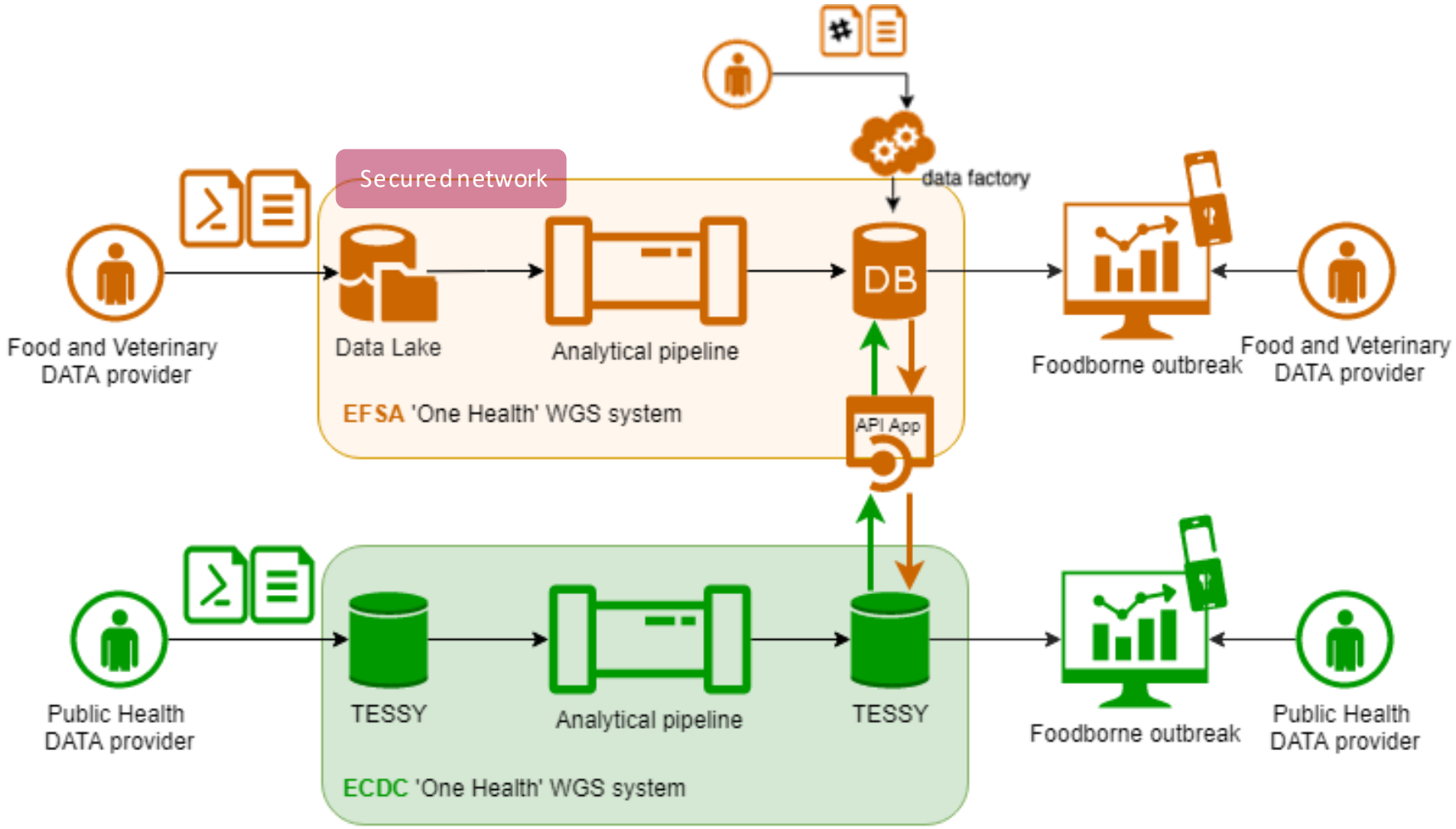

- **Added value:**
  - ✓ Capacity to promptly support outbreak investigation at EU level

# One Health WGS system

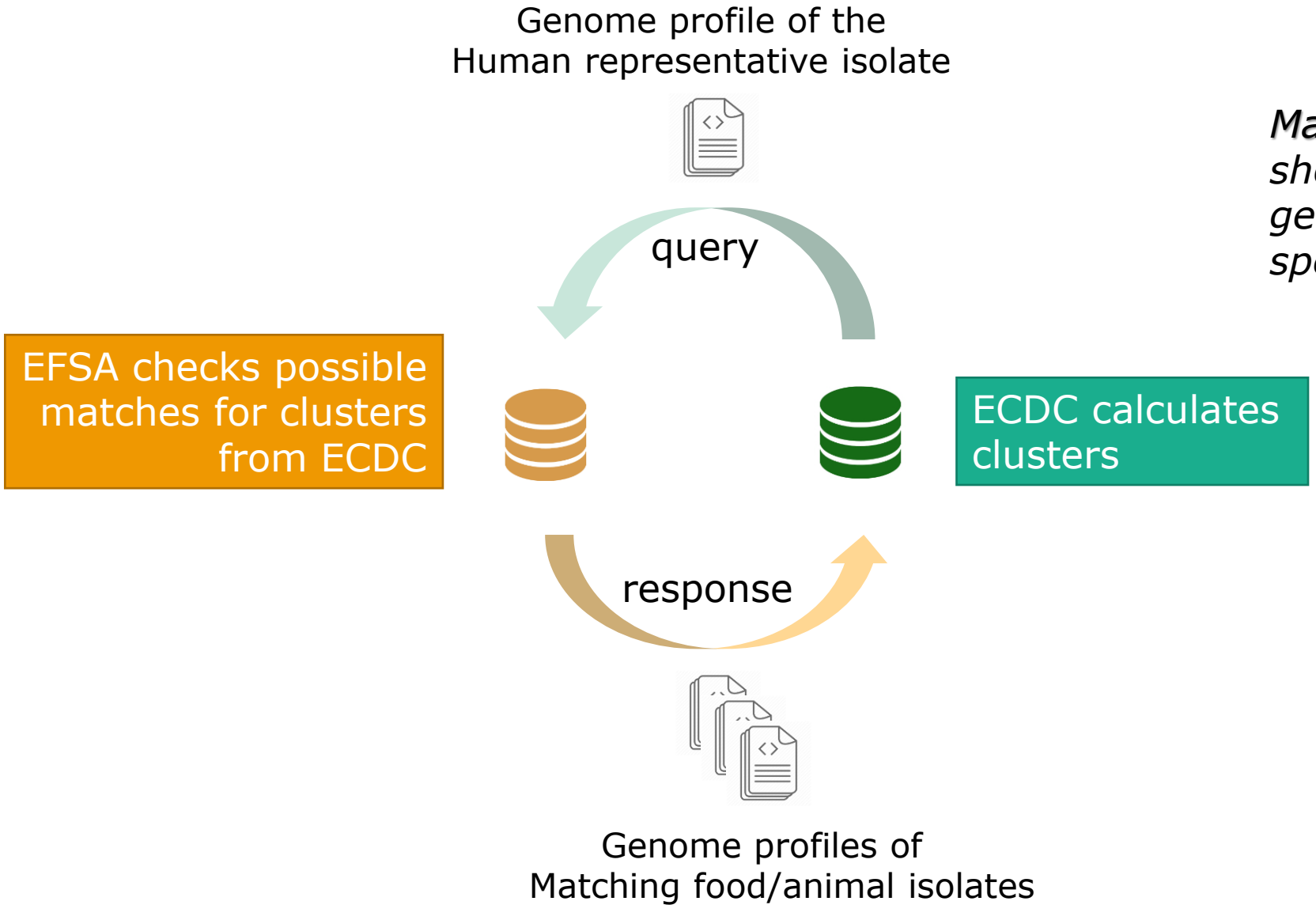
**Interoperability**

**Cross-sector matches**

**Machine-to-machine**



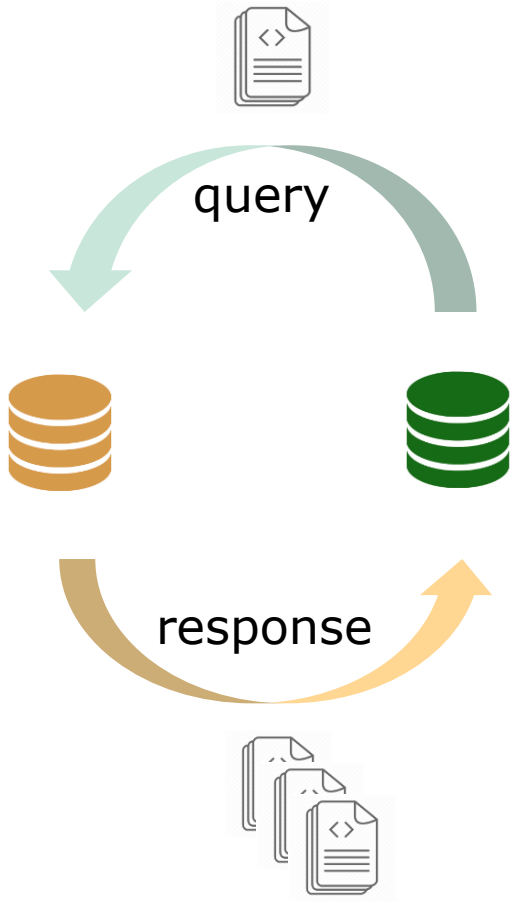
# EFSA-ECDC interoperability




*Matching profiles= isolates showing similarity in their genomic profiles based on a specific threshold*

# An example

Genome profile of the
Human representative isolate




Genome profiles of
Matching food/animal isolates

***Yes!! we found 3 food isolates from fish products countries X and Y all from 2019 with 3, 4, and 6 allelic differences to any human isolates.***

***There is a cluster of 5 human isolates of Listeria monocytogenes. Do you have isolates with less of 8 alleles of difference in cgMLST?***

Multi-country foodborne cluster identified

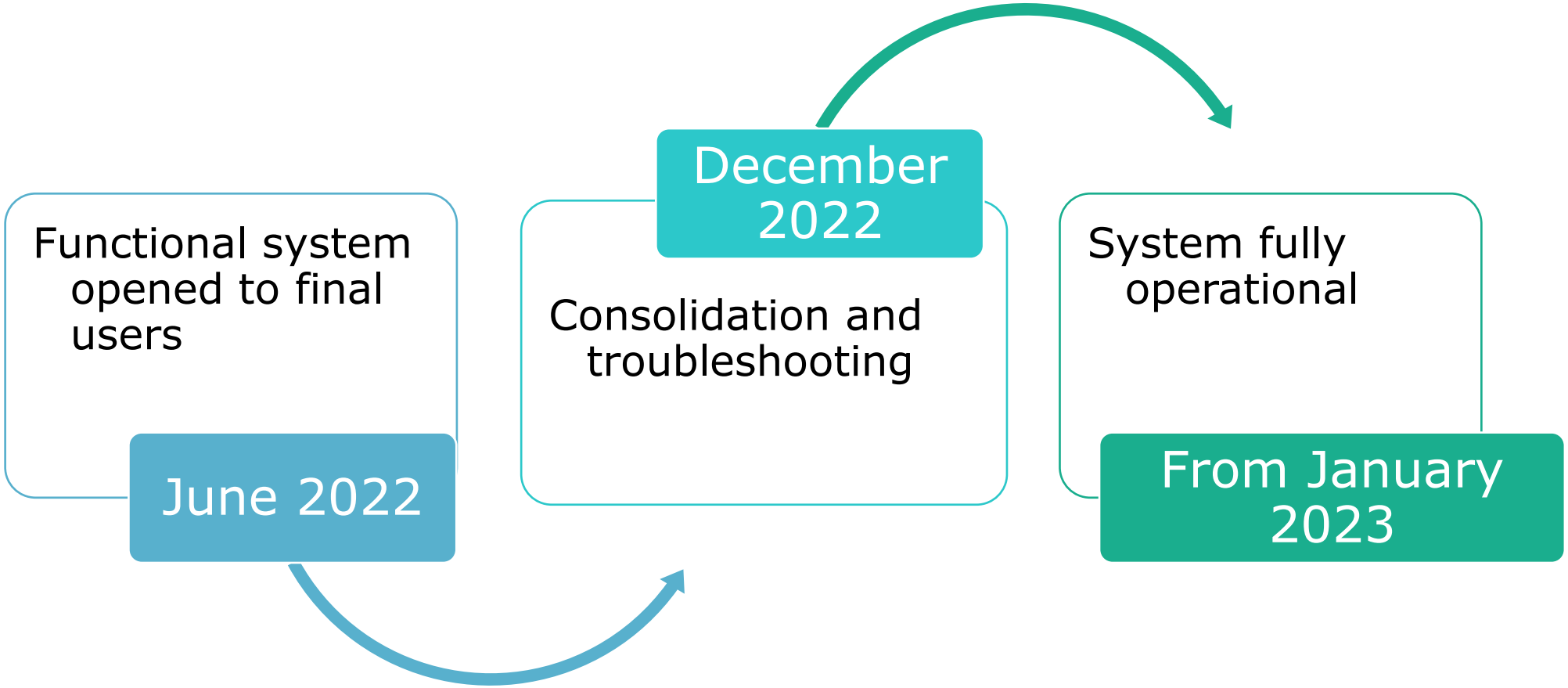
*ROA*

# Total cost

- Setup (from December 2019 to December 2022)
  - 1.5 Mio
  - Staff (3.0 FTE) = 0.3 Mio

- Running
  - IT Cost 0.20-0.35 Mio/year
  - Staff (2.2 FTE)= 0.22 Mio /year

# Timelines


Functional system opened to final users
June 2022
December 2022
Consolidation and troubleshooting
System fully operational
From January 2023

# Thank you for your attention


## Acknowledgments

EFSA: Mirko Rossi, Valentina Rizzi, Denise Pezzutto, Ernesto Liebana, Chiara Bianchi, Giancarlo Costa, Giovanni Iacono, Giulio Di Piazza

ECDC

EURL *E. coli*

EURL *Listeria monocytogenes*

EURL *Salmonella*

SANTE G4