



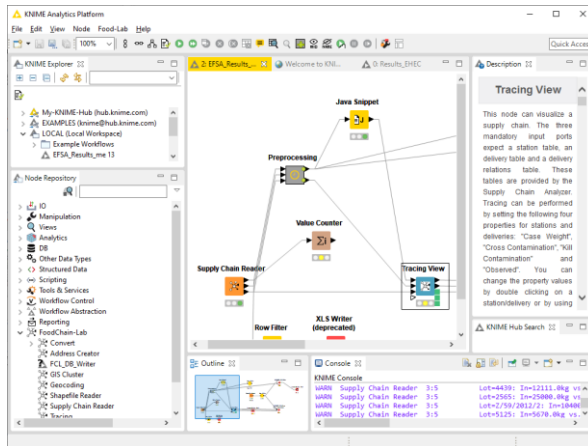
Data for FoodChain-Lab

Collection – Import – Cleaning

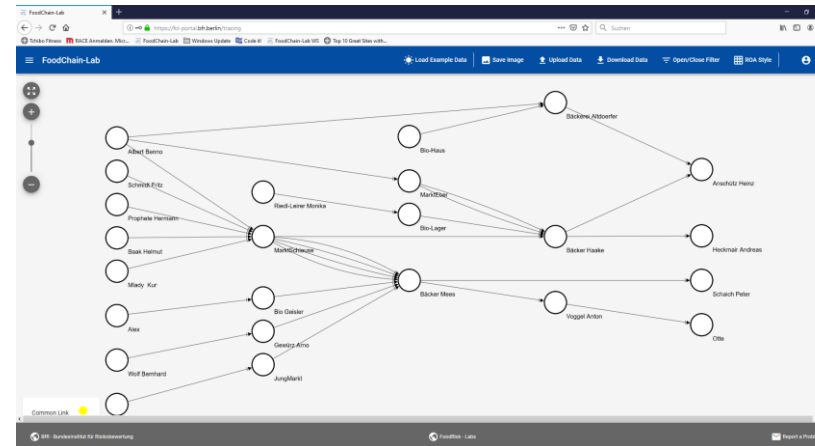
Alexander Falenski, Marion Gottschald, Marco Rügen,
Birgit Lewicki, Christian Thöns, Matthias Filter, Annemarie
Käsbohrer, Bernd Appel, Armin A. Weiser

Overview: FoodChain-Lab Desktop and Web App

Desktop



Web App



- In KNIME (~ 1 GB installation)
- Data is stored locally
- Using KNIME needs to be learned

- In a web browser (no installation)
- Data stays local, browser is only for visualisation
- Intuitive handling

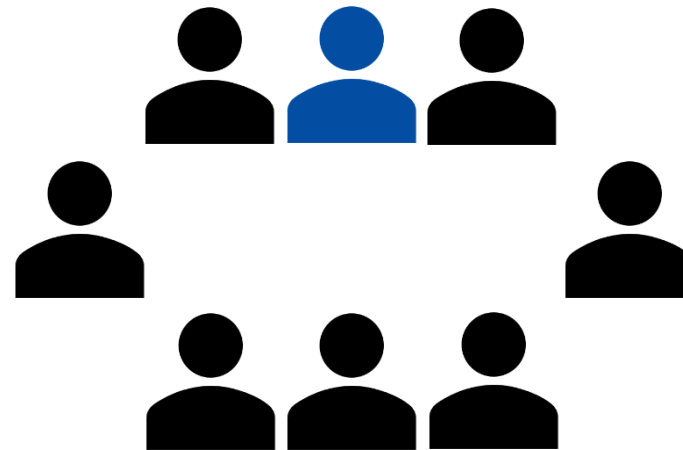
Features

- Database with plausibility checks
- Geocoding
- KNIME Data analytics functionalities
- Graph view and GIS view
- Tracing
- Hypothesis generation
- -

Features

- -
- -
- -
- Graph view and GIS view
- Tracing
- Hypothesis generation
- ROA style for reports

Overview: FoodChain-Lab Desktop and Web App



Direct support

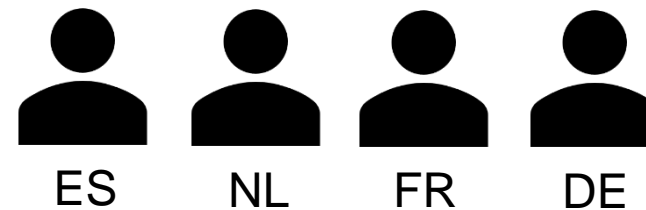
The outbreak investigation experts discuss the FoodChain-Lab results together with the data analyst and test *in silico* new hypotheses.



Data analyst prepares data in FCL desktop

Remote support

Dataset is sent as JSON file to experts



The outbreak investigation experts in different parts of the world upload the JSON file in the FCL Web App and test *in silico* new hypothesis

Collecting Data: Excel Template



StationBacktrace_request_All-Year-Fruits Pic_1732895535_completed.xlsx - Excel

Inquired Company: All-Year-Fruits Pic Supplier

For questions please contact the FoodRisk-Labs team, +49 (30) 18412-4444, foodrisklabs@bfr.bund.de

Outgoing Goods

Line Number	Product		Lot Information		Delivery			Recipient			Comments	
	Name	EAN	Lot Number	Best Before Date or Use-by Date	Day	Month	Year	Amount (e.g. 45 kg)	Name	Address (e.g. Street, ZIP City)		Country
7	Apricots, frozen		Ap20170821		27	10	2017	1.17 kg	Bakersfield Bakery			Manufacturer
8	Blackberries, frozen		Bl20170810		27	10	2017	900 g	Bakersfield Bakery			Manufacturer
9	Peaches, frozen		Pe20170725		27	10	2017	6.6 kg	Bakersfield Bakery			Manufacturer
10	Strawberries, frozen		St20170811		27	10	2017	1.5 kg	Bakersfield Bakery			Manufacturer

Information to complete the sheet:

13 Fill in outgoing goods which are already known (see grey fields above).

14 Please keep track of the ingredients of all sent products - do it in a lot-based manner.

15 In Column A starting with Line Number 23 please enter the line number of the outgoing good being the product of this ingredient. Afterwards, enter the

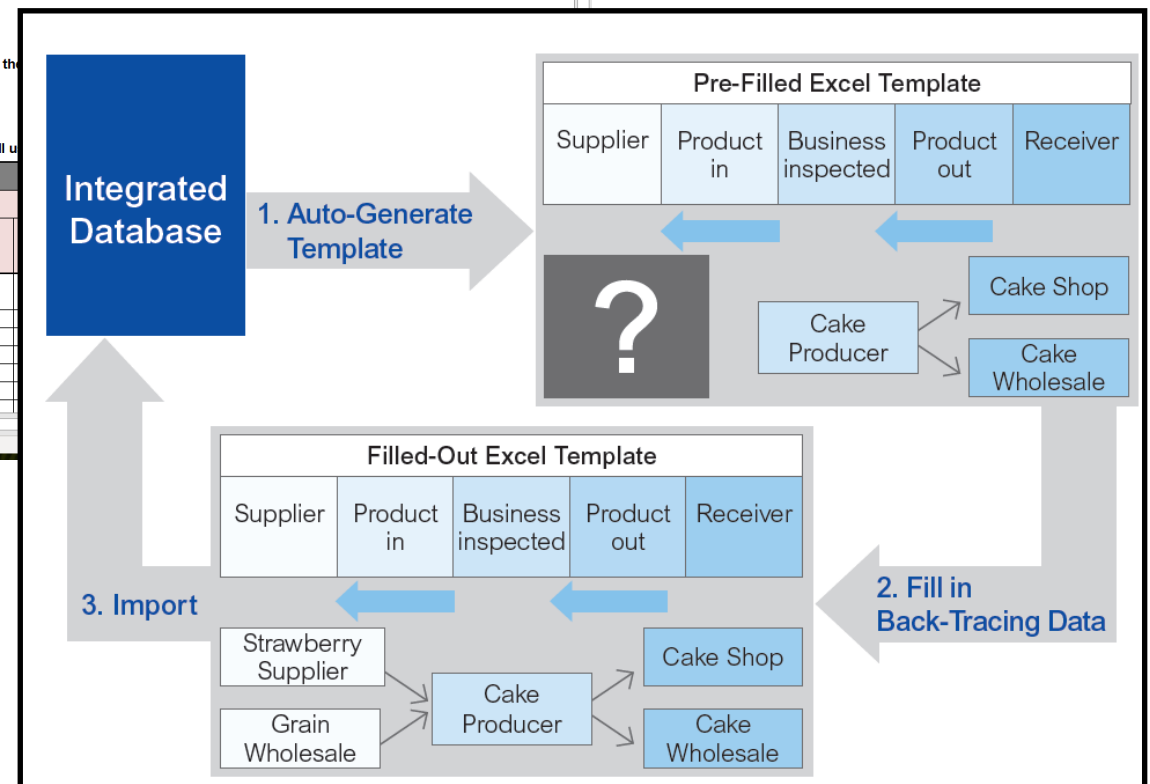
16 Please repeat the outgoing good as often as necessary in order to capture all its ingredients.

17 Then, please assess the data for the next outgoing good(s) accordingly.

18 Digital extracts (e.g. Excel or XML files) of the company database could also be suitable. In this case you do not need to fill this template - please call u

Incoming Goods - lot-based Ingredient List

Line Number or Lot Number from Outgoing Goods	Ingredient		Lot Information		Delivery			Name	
	Name	EAN	Lot Number	Best Before Date or Use-by Date	Day	Month	Year		Amount (e.g. 45 kg)
23	Blackberries		BB001		10	8	2017	500 kg	Black Berry Farm



Online Validation: <https://foodrisklabs.bfr.bund.de/templatevalidator/>

Outbreak: Tracing workflow using FoodChain-Lab I

First information on food producing company involved in foodborne disease outbreak



Template

Start tracing template

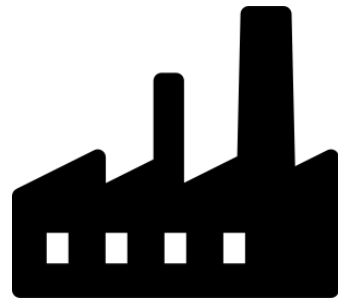
Data needs for tracing – by type



Type of Business

A station

(e.g. a food producer)



Name

Lot No.

A delivery

(e.g. of a food ingredient)



Name

Amount

Longitude
Latitude

Address

Delivery Date

Delivery Relations

Start Forward tracing template: Bakery and patients



Bakery

Inquired Company:		Bakersfield Bakery	[Address]	DE	Manufacturer
For questions please contact the FoodRisk-Labs team, +49 (30) 18412-4444, foodrisklabs@bfr.bund.de					
Products in Focus:	Relevant period of sale:	Onset of disease:			

Information to complete the sheet:

Please keep track of all delivered products matching the product descriptions that were sold during the relevant period in a lot-based manner.

<u>Recipient</u>				<u>Product</u>		<u>Lot Information</u>		<u>Delivery</u>			<u>Comments</u>	
<u>Name</u>	<u>Address</u> (e.g. Street, ZIP, City)	<u>Country</u>	<u>Type of Business</u>	<u>Name</u>	<u>EAN</u>	<u>Lot Number</u>	<u>Best Before</u> <u>Date or</u> <u>Use-by Date</u>	<u>Delivery Date</u>				<u>Amount</u> (e.g. 45 kg)
								<u>Day</u>	<u>Month</u>	<u>Year</u>		
Patient01		DE	Patient	Summer Cake		SC01		6	11	2017	1 Piece	
Patient02		DE	Patient	Summer Cake		SC02		6	11	2017	1 Piece	
Patient03		DE	Patient	Summer Cake		SC03		6	11	2017	1 Piece	
Patient04		DE	Patient	Summer Cake		SC04		6	11	2017	1 Piece	
Patient05		DE	Patient	Summer Cake		SC05		6	11	2017	1 Piece	

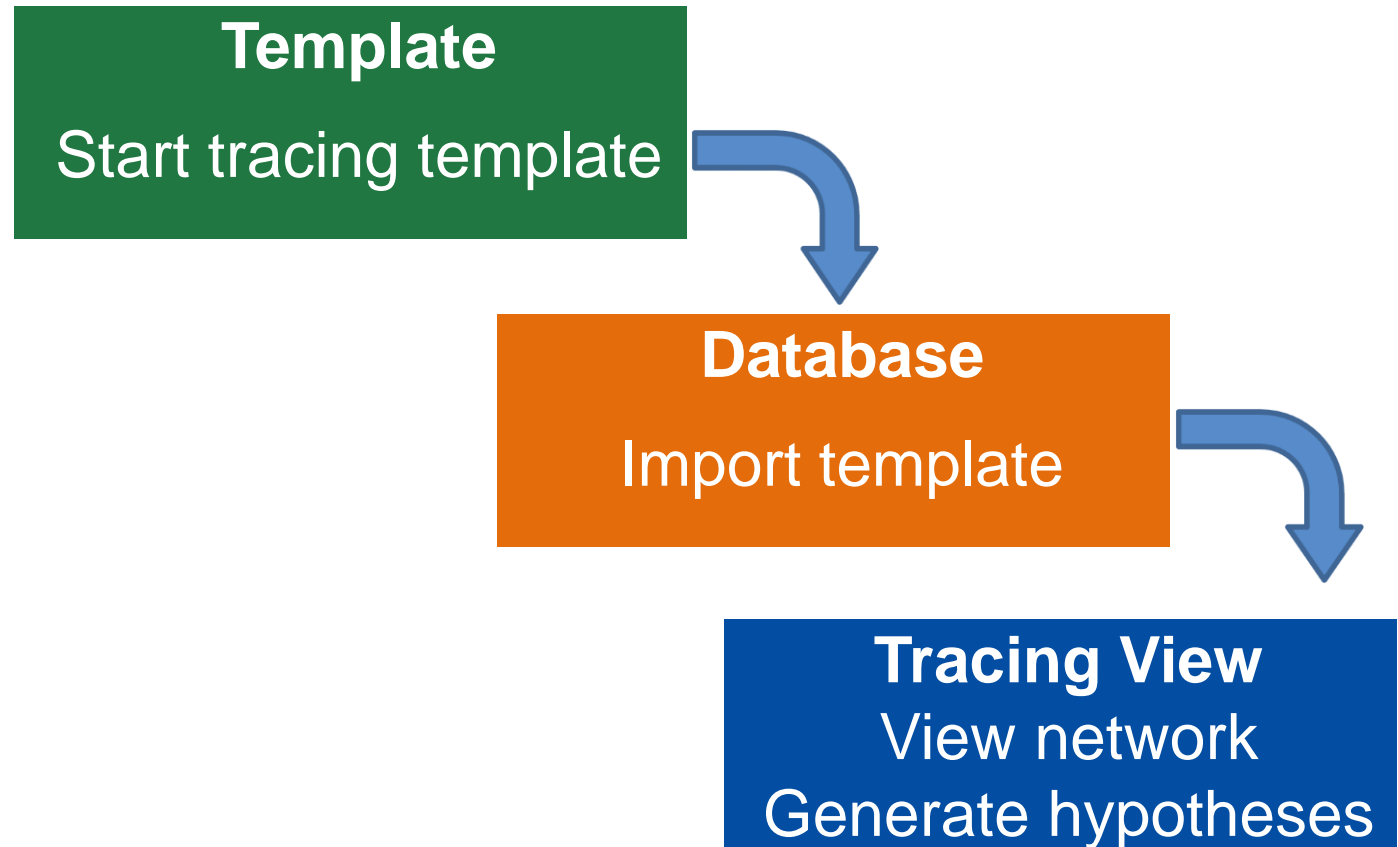
Patients

Contaminated product

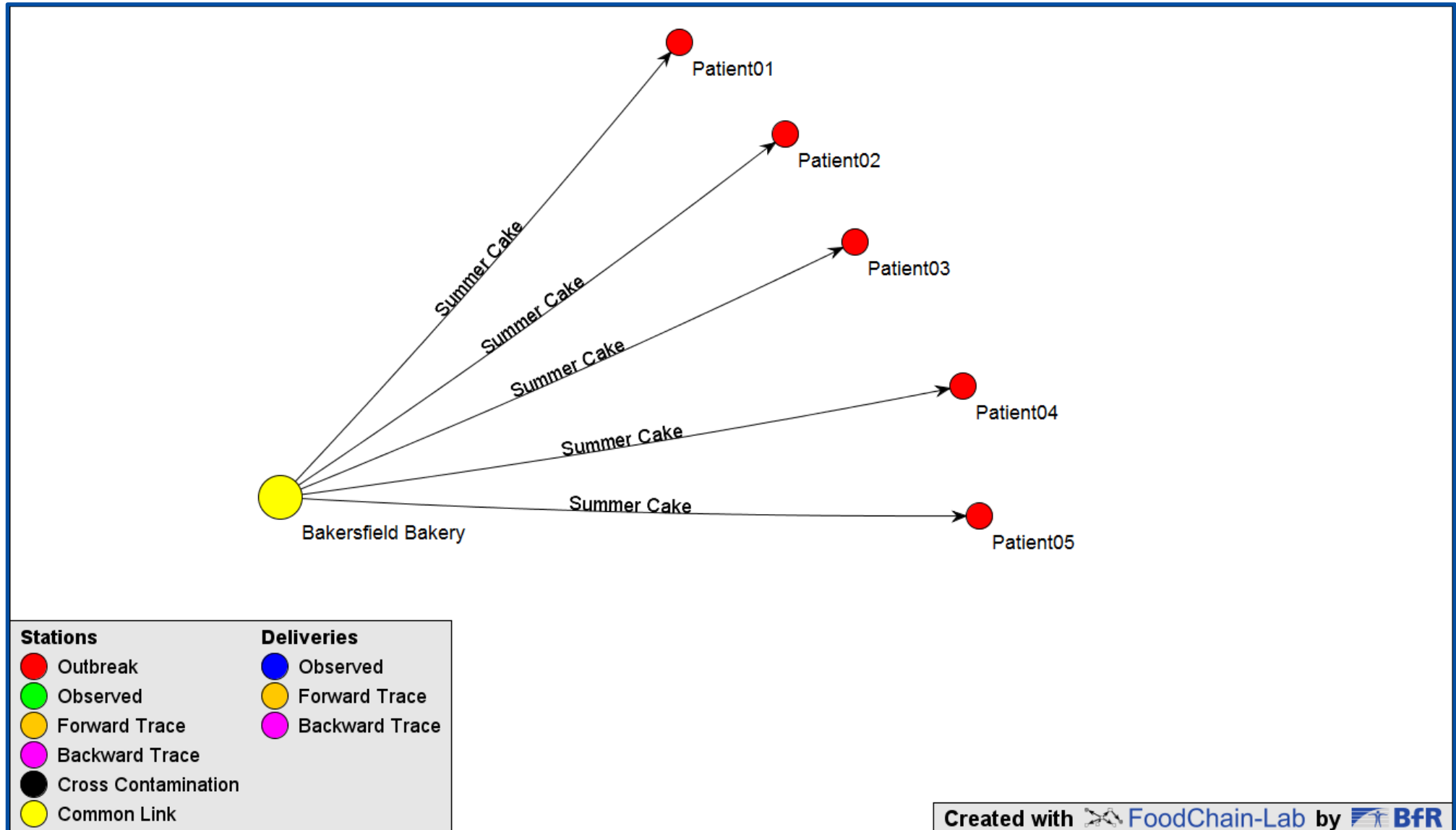
Outbreak: Tracing workflow using FoodChain-Lab II



First information on food producing company involved in foodborne disease outbreak



Tracing View: Bakery and patients



Database: Structure of food chains

Station

Product

Lot

Delivery

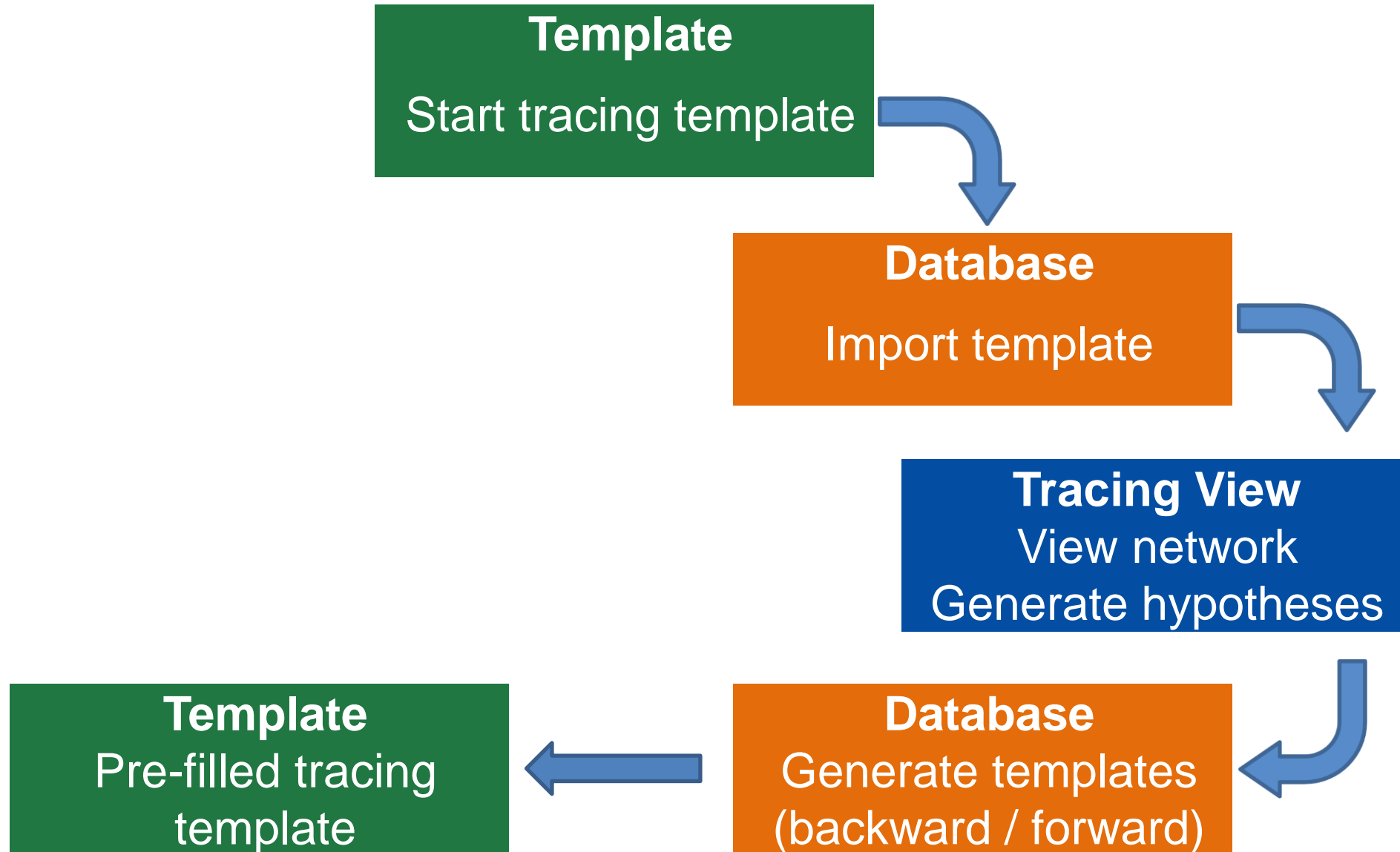
Station



Outbreak: Tracing workflow using FoodChain-Lab III



First information on food producing company involved in foodborne disease outbreak



Pre-filled backtracing template generated by the database



Inquired Company:	Bakersfield Bakery	[Address]	DE	Manufacturer
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For questions please contact the FoodRisk-Labs team, +49 (30) 18412-4444, foodrisklabs@bfr.bund.de

Outgoing Goods												
	Product		Lot Information		Delivery			Recipient				Comments
	Name	EAN	Lot Number	Best Before Date or Use-by Date	Delivery Date			Amount	Name	Address	Country	
					Day	Month	Year	(e.g. 45 kg)		(e.g. Street, ZIP City)		
	Summer Cake		SC01		6	11	2017	1 Piece	Patient01		DE	Patient
	Summer Cake		SC02		6	11	2017	1 Piece	Patient02		DE	Patient
	Summer Cake		SC03		6	11	2017	1 Piece	Patient03		DE	Patient
	Summer Cake		SC04		6	11	2017	1 Piece	Patient04		DE	Patient
	Summer Cake		SC05		6	11	2017	1 Piece	Patient05		DE	Patient

Information to complete the sheet:

Fill in outgoing goods which are already known (see grey fields above).

Please keep track of the ingredients of all sent products - do it in a lot-based manner.

In Column A starting with Line Number 22 please enter the line number of the outgoing good being the product of this ingredient. Afterwards, enter the ingredient information in

Please repeat the outgoing good as often as necessary in order to capture all its ingredients.

Incoming Goods - lot-based Ingredient List												
Line Number or Lot Number from Outgoing Goods	Ingredient		Lot Information		Delivery			Supplier				Comments
	Name	EAN	Lot Number	Best Before Date or Use-by Date	Delivery Date			Amount	Name	Address	Country	
					Day	Month	Year	(e.g. 45 kg)		(e.g. Street, ZIP City)		

Outbreak: Tracing workflow using FoodChain-Lab IV



First information on food producing company involved in foodborne disease outbreak

Template
Start tracing template

Database
Import template

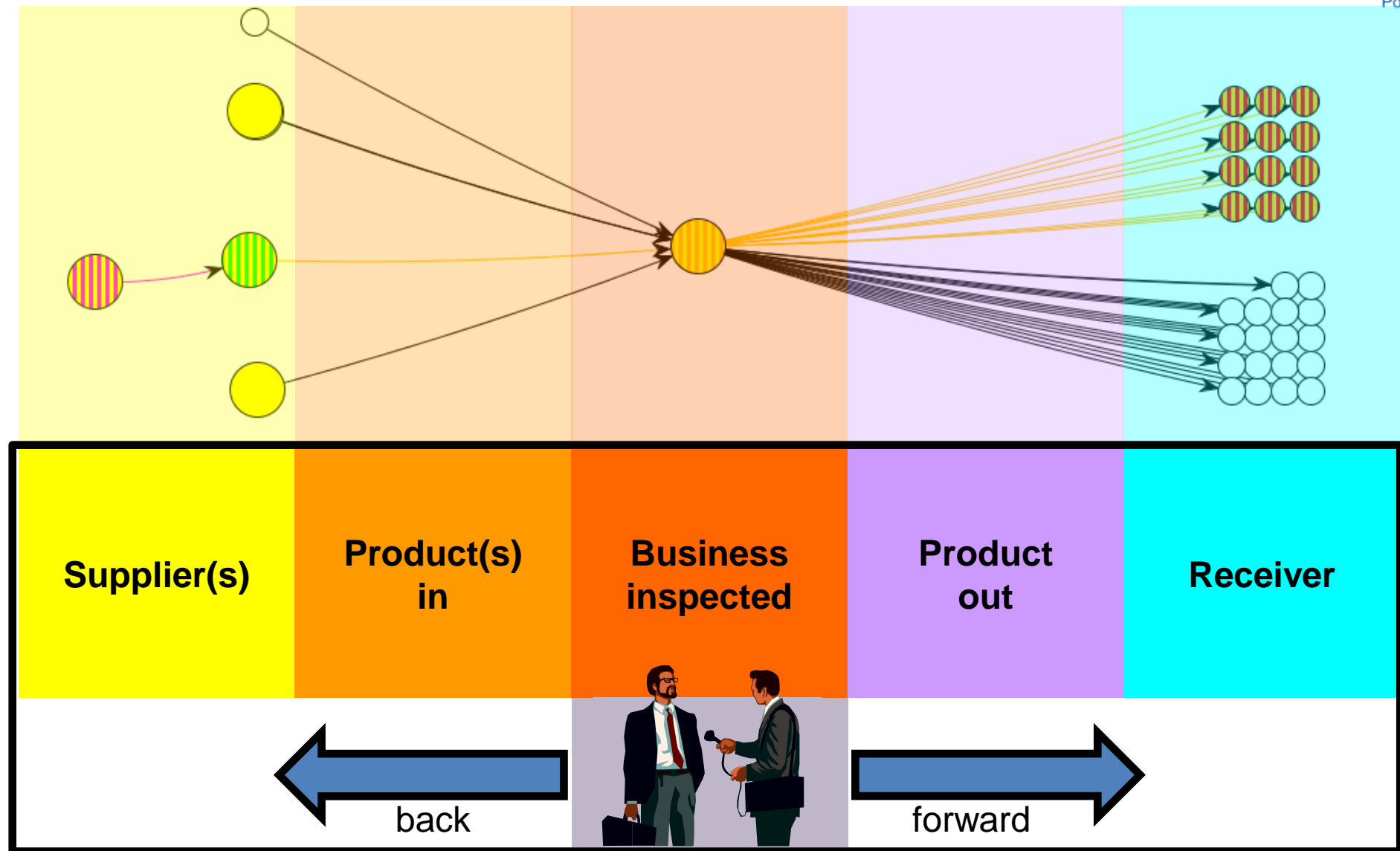
Tracing View
View network
Generate hypotheses

Database
Generate templates
(backward / forward)

Template
Pre-filled tracing template

Food Safety Officer
Conducts interviews
with companies

Inquiry at a cake manufacturer



REGULATION (EC) No. 178/2002, Article 18, Traceability



(1) **at all stages of production, processing and distribution**

The **traceability** of food, food-producing animals, and any other substance intended to be, or expected to be, incorporated into a food or feed shall be established **at all stages of production, processing and distribution**.

(2) **Food and feed business operators** shall be able to **identify any person from whom they have been supplied**

To this end, such operators shall have in place **systems and procedures** which allow for this information to be made available to the competent authorities **on demand**.

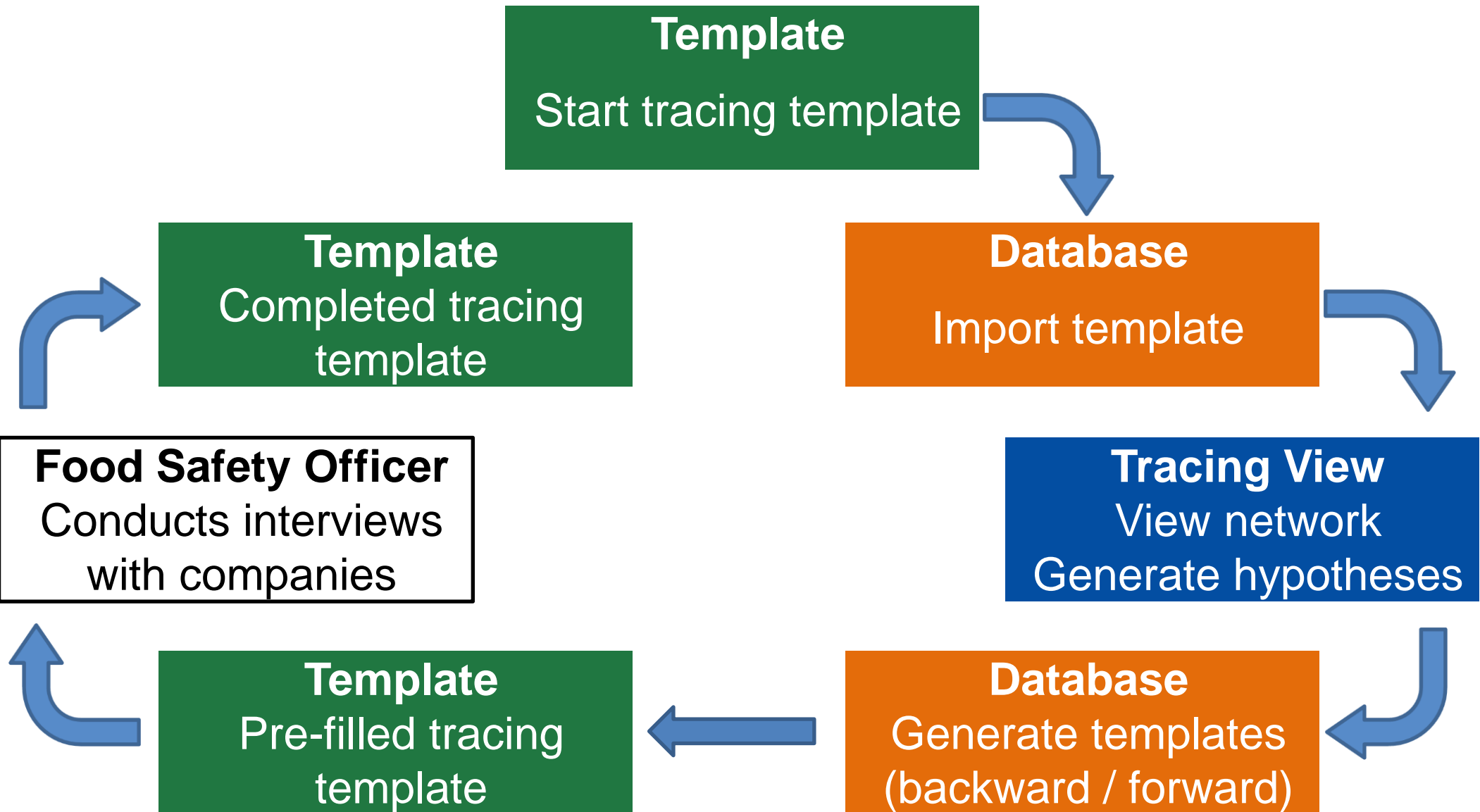
(3) **Food and feed business operators** shall have in place systems and procedures **to** which their products have been **supplied**

This information shall be made available to the competent authorities **on demand**.

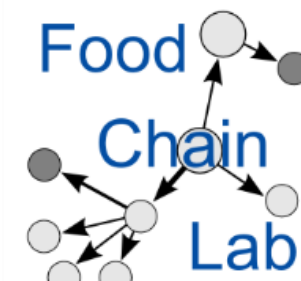
Outbreak: Tracing workflow using FoodChain-Lab V



First information on food producing company involved in foodborne disease outbreak



The pre-filled backtracing template has been completed



Inquired Company:	Bakersfield Bakery	[Address]	DE	Manufacturer								
For questions please contact the FoodRisk-Labs team, +49 (30) 18412-4444, foodrisklabs@bfr.bund.de												
Outgoing Goods												
Product	Lot Information			Delivery		Recipient			Comments			
	Name	EAN	Lot Number	Best Before Date or Use-by Date			Amount (e.g. 45 kg)	Name		Address (e.g. Street, ZIP City)	Country	Type of Business
Summer Cake			SC01	6	11	2017	1 Piece	Patient01		DE	Patient	
Summer Cake			SC02	6	11	2017	1 Piece	Patient02		DE	Patient	
Summer Cake			SC03	6	11	2017	1 Piece	Patient03		DE	Patient	
Summer Cake			SC04	6	11	2017	1 Piece	Patient04		DE	Patient	
Summer Cake			SC05	6	11	2017	1 Piece	Patient05		DE	Patient	

Information to complete the sheet:

Fill in outgoing goods which are already known (see grey fields above).

Please keep track of the ingredients of all sent products - do it in a lot-based manner.

In Column A starting with Line Number 22 please enter the line number of the outgoing good being the product of this ingredient. Afterwards, enter the ingredient information in columns B

Please repeat the outgoing good as often as necessary in order to capture all its ingredients.

Incoming Goods - lot-based Ingredient List														
Line Number or Lot Number from Outgoing Goods	Ingredient		Lot Information			Delivery			Supplier				Comments	
	Name	EAN	Lot Number	Best Before Date or Use-by Date			Delivery Date		Amount (e.g. 45 kg)	Name	Address (e.g. Street, ZIP City)	Country		Type of Business
				Day	Month	Year	Day	Month						
SC01	Butter		Bu100	3	11	2017	6,3 kg		Dairy Products Ltd.		DE	Supplier		
SC01	Sugar		Su200	1	11	2017	12,8 kg		Dry Stuff Inc		DE	Supplier		
SC01	Eggs		Eg220	4	11	2017	90 Piece		Chickens & Eggs Farm		DE	Supplier		
SC01	Flour		Fl101	1	11	2017	11,2 kg		Dry Stuff Inc		DE	Supplier		
SC01	Salt		Sa121	1	11	2017	116 g		Dry Stuff Inc		DE	Supplier		
SC01	Baking Powder		BP001	1	11	2017	368 g		Dry Stuff Inc		DE	Supplier		

Outbreak: Tracing workflow using FoodChain-Lab VI



First information on food producing company involved in foodborne disease outbreak

Template
Start tracing template

Template
Completed tracing template

Database
Import template

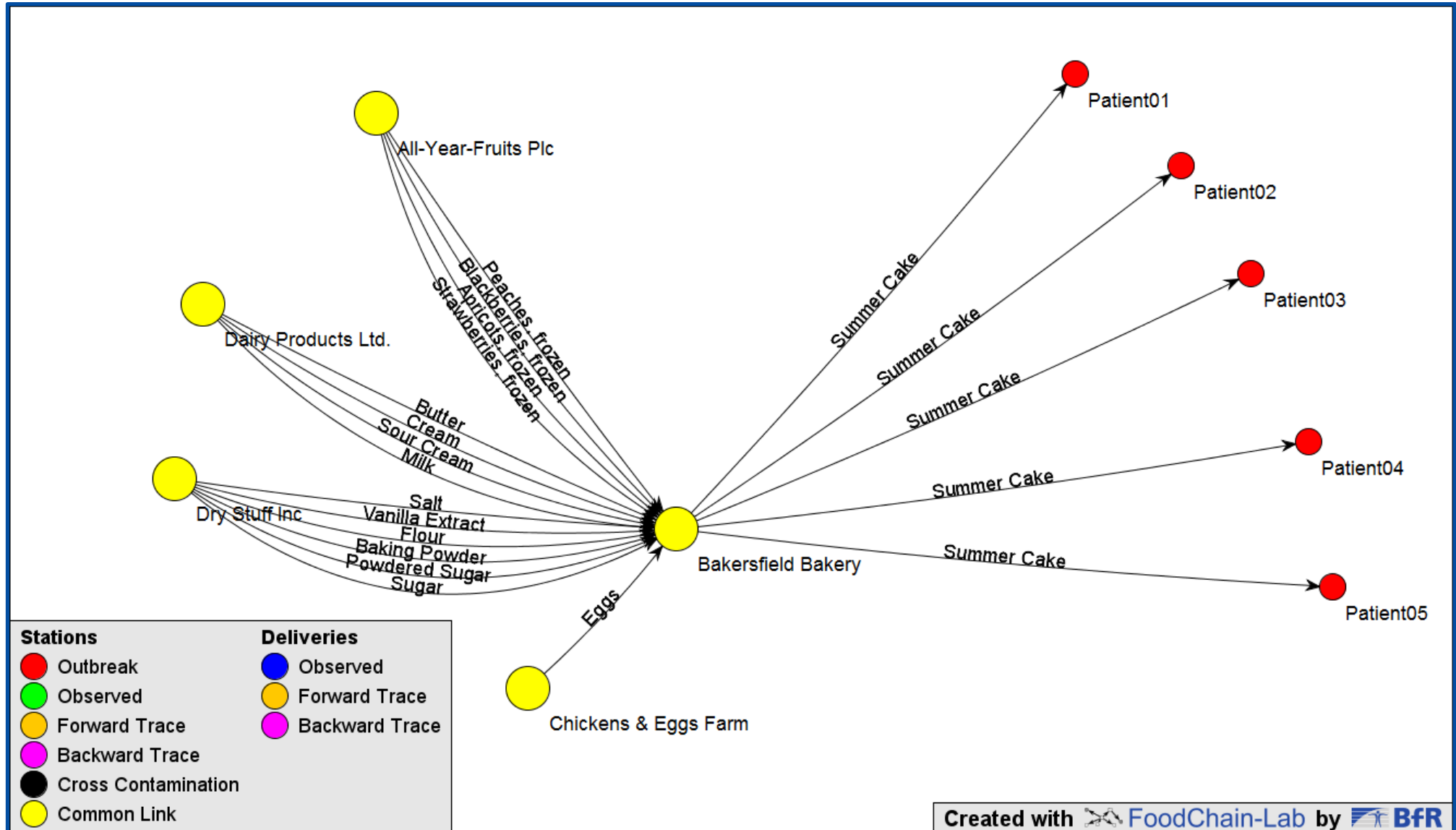
Food Safety Officer
Conducts interviews with companies

Tracing View
View network
Generate hypotheses

Template
Pre-filled tracing template

Database
Generate templates (backward / forward)

Tracing View: Bakery and patients



Created with FoodChain-Lab by BfR

Outbreak: Tracing workflow using FoodChain-Lab VI



First information on food producing company involved in foodborne disease outbreak

Template
Start tracing template

Template
Completed tracing template

Database
Import template

Food Safety Officer
Conducts interviews with companies

Tracing View
View network
Generate hypotheses

Template
Pre-filled tracing template

Database
Generate templates (backward / forward)

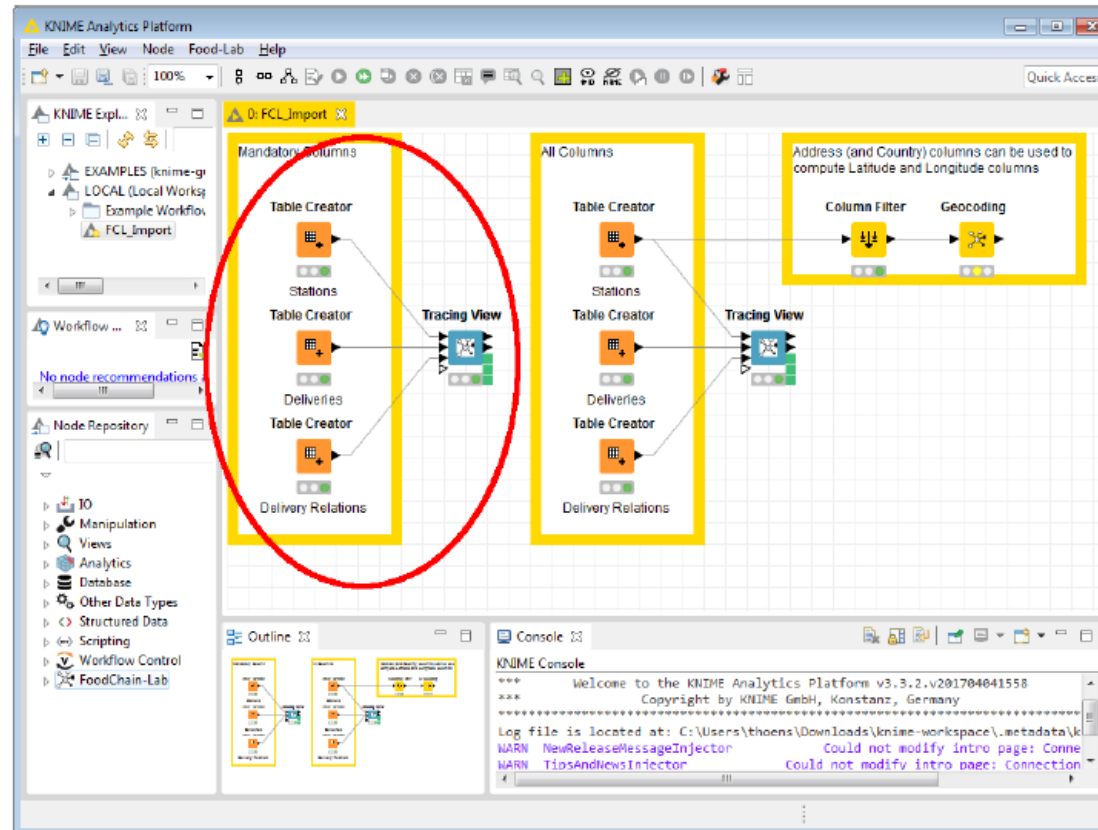
Individual import of data from external sources



Import Data from External Sources

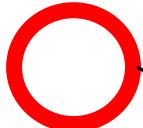
Topics

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16



- FoodChain-Lab needs three tables to perform a tracing analysis: **Stations**, **Deliveries** and **Delivery Relations**.
- The **Table Creator** nodes on the left show all mandatory columns for these three tables.

Tutorial: <https://foodrisklabs.bfr.bund.de/data-import-from-external-sources/>

 Bakery 1, **Sesame** Street 15, 12345 Crumbling Hills, Germany

Summer Cake

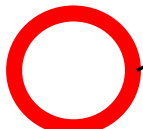
Luxury Hotel

Hilltop 1

12234 Pompous Hills

Germany

Chocolate Cake

 Bakery 1, **See Same** Street 15, 12345 Crumbling Hills, Germany

FoodChain-Lab: Data Cleaning



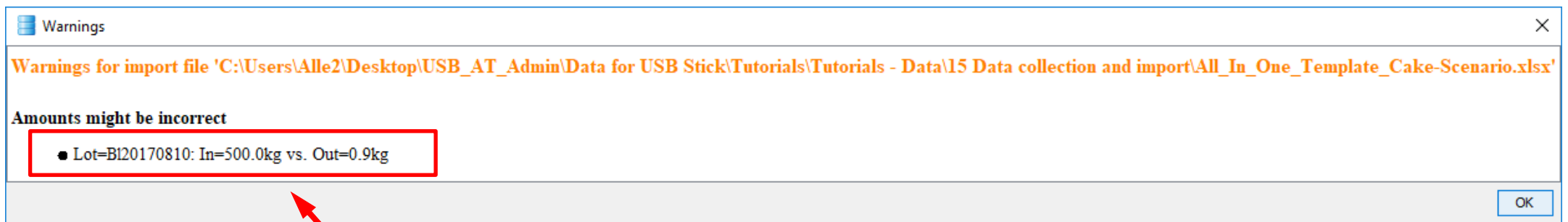
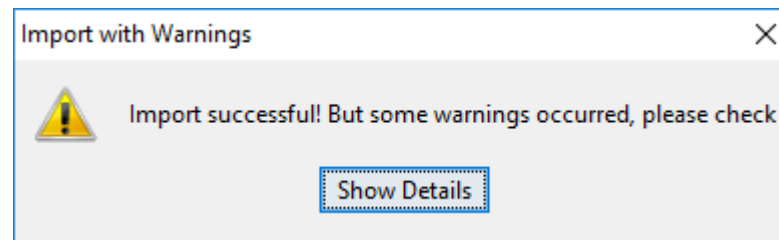
Levenshtein distance

M	A	Y	O	N	N	A	I	S	E
=	=	=	=	=	-	=	=	=	=
M	A	Y	O	N		A	I	S	E

E	L	E	P	H	A	N	T
=	=	=	o	-	=	=	=
E	L	E	F		A	N	T

Works well for finding duplicates

Plausibility checks: Amounts



● Lot=B120170810: In=500.0kg vs. Out=0.9kg

Data – sometimes still analogue...

...luckily often digital

Excel spreadsheet, XLSX



Caterer A

Menu 1 on 1st September

Pasta with ground beef
tomato sauce

Vanilla pudding with straw

Menu 2 on 3rd September

Potato soup with bread
Fruit yoghurt

Station	Product Name	Lot Number	Lot size		Delivery Date Departure			Delivery Date Arrival			Unit weight/vol./pck.		Recipient
			Quantity	Type / Unit	Day	Month	Year	Day	Month	Year	Quantity	Type / Unit	
6	Blackberries	BB001	500	kg	9	8	2017	10	8	2017	500	kg	36
1	Butter	Bu100			2	11	2017	3	11	2017	6,3	kg	2
37	Sugar	Su200			30	10	2017	1	11	2017	12,8	kg	2
38	Eggs	Eg220			4	11	2017	4	11	2017	90	Piece	2
37	Flour	Fl101			30	10	2017	1	11	2017	11,2	kg	2
37	Salt	Sa121			30	10	2017	1	11	2017	116	g	2
37	Baking Powder	BP001			30	10	2017	1	11	2017	368	g	2
1	Milk	Mi05			2	11	2017	3	11	2017	8,9	Litre	2
37	Vani												2
1	Crea												2
1	Sour												2
37	Pow												2
36	Peac												2
36	Apri												2
36	Strav												2
36	Black												2
39	Doug												2
2	Sum												3

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  Salmonella (presence /25g) in frozen salted chicken breast pieces from Thailand
</Subject>
<DateOfCase>29/12/2015</DateOfCase>
<NotificationType>
  food - alert - border control - consignment released
</NotificationType>
<ActionTaken>informing authorities</ActionTaken>
<NotificationFrom>Netherlands (NL)</NotificationFrom>
<DistributionStatus>distribution to other member countries</DistributionStatus>
<Product>frozen salted chicken breast pieces</Product>
<ProductCategory>poultry meat and poultry meat products</ProductCategory>
<RiskDecision>serious</RiskDecision>
<PublishedInRCP/>
</Details>
  
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Handwritten, sent by fax

RASFF notification, XML

Tracing in foodborne outbreaks – the present...



- Database takes any data format (XLSX, PDF, XML, CSV)

2) Ministry of federal state

- Accesses database
- Reads results
- Describes situation to food safety officer from administrative district in own words



3) Local food safety officer

- Visits food company
- Conducts interviews
- Takes samples
- Fills in FoodChain-Lab templates

1) FoodChain-Lab Team

- Receives supply chain data in an individual data format (e.g. CSV)
- Copies data to FCL templates, adds information (type of business, geolocalisation)
- Analyses
- Sends resulting tracing templates and description to German database

4-6) The same way back

- Time-consuming
 - flow of information
 - re-structuring data
- Information loss

... and (a possible) future

- Database with a harmonised data standard (e.g. XML)

2) Ministry of federal state

- Receives results automatically, no need to actively access the database
- Has a task force which decides immediately whether to block or to forward information



2) Local food safety officer

- Receives original analysis from FoodChain-Lab



1) FoodChain-Lab Team

- Receives supply chain data in harmonised data format
- Analyses
- Sends resulting tracing templates and description to German database

... and (a possible) future



- Database with a harmonised data standard (e.g. XML)



2) Ministry of federal state

- Receives results automatically, no need to actively access the database
- Has a task force which decides immediately whether to block or to forward information

1) FoodChain-Lab Team

- Receives supply chain data in harmonised data format
- Analyses
- Sends resulting tracing templates and description to German database

4+5) Direct feedback via database

- Fast
- No data loss
- High data quality

2+3) Local food safety officer

- Receives original analysis from FoodChain-Lab
- Receives order from the ministry
- Visits food company
- Conducts interviews and takes samples
- Fills in tracing data in harmonised standard

COS – a ‘bus stop’ for FoodChain-Lab – as a first approach on the way to a harmonised standard:



Commodity Online Services (COS)

- Collects (NRW-) Tracing Data
- Contains a food business database with curated data
- Is doing validation internally based on existing master data
- Outputs data into newly defined xml-structure and sends it into a newly developed webservice

FCL

- Monitors the webservice, awaits new data
- Analyses data (semi)-automatically
- Prepares analysis reports and sends it back to the webservice

COS

- Fetches the report – management measures or further data collections will be initiated



Thank you for your attention

Alexander Falenski

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bfr@bfr.bund.de □ www.bfr.bund.de/en