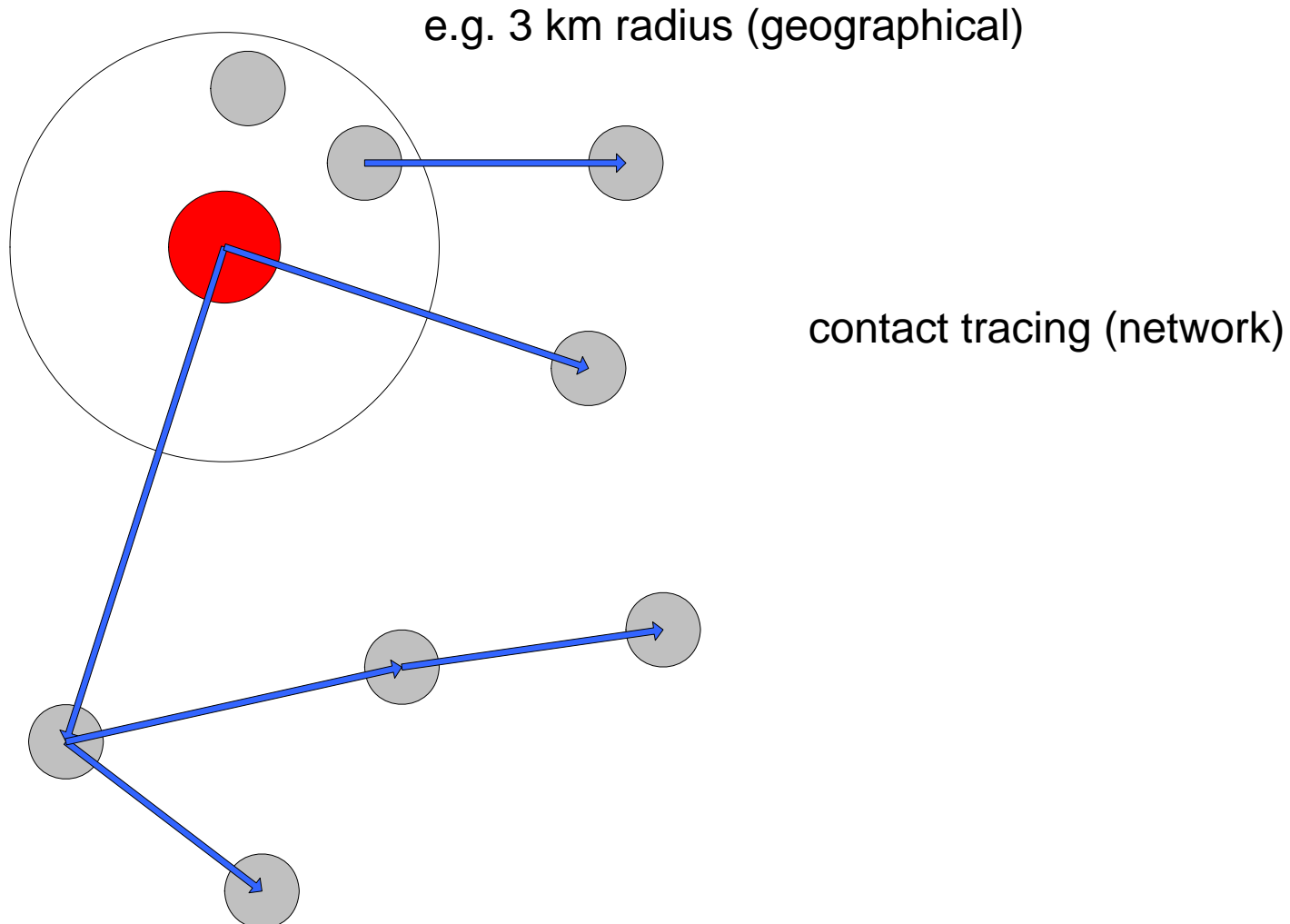


EpiTrace: a tool for emergency management

- Tracing
 - Trace-forward
 - Trace-Back
- Modeling: identifying most likely destinations/origin
 - Generic network traversal (DFC and MapDFC)
 - SIR meta-population deterministic model

Tracing

Typical outbreak scenario



Queries in the national livestock database or in herd registers

RECENT APPROACHES IN MODELLING ANIMAL INFECTIOUS DISEASES - Teramo Italy – 28/09/2010

SELECT origin, destination, type, date, transported FROM tf where origin = '136657' and date >= '2009-01-10' and date <= '2009-01-15'

origin	destination	type	date	transported
136657	115226	MARKET	2009-01-12 00:00:00	8
136657	20285	SLAUGHTERHOUSE	2009-01-12 00:00:00	1
136657	20294	SLAUGHTERHOUSE	2009-01-10 00:00:00	2
136657	20332	SLAUGHTERHOUSE	2009-01-12 00:00:00	2
136657	20332	SLAUGHTERHOUSE	2009-01-14 00:00:00	4
136657	20332	SLAUGHTERHOUSE	2009-01-15 00:00:00	4

SELECT origin, destination, date, type, transported FROM tf where origin = '115226' and date >= '2009-01-12' and date <= '2009-01-15'

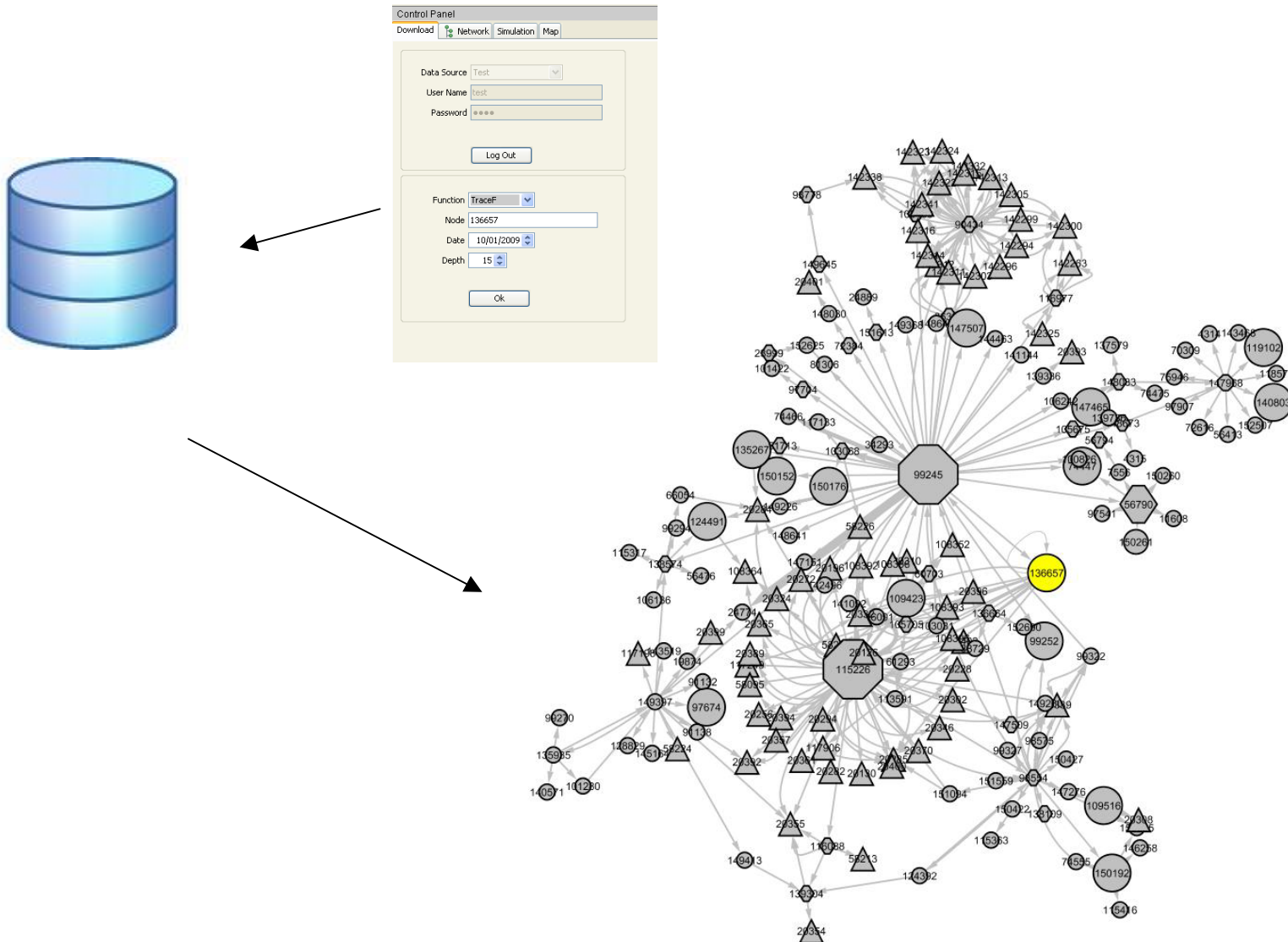
origin	destination	type	date	transported
115226	108364	SLAUGHT	13/01/2009 00:00	1
115226	108392	SLAUGHT	13/01/2009 00:00	5
115226	108396	SLAUGHT	13/01/2009 00:00	1
115226	117249	SLAUGHT	12/01/2009 00:00	10
115226	117906	SLAUGHT	12/01/2009 00:00	4
115226	136657	FARM	14/01/2009 00:00	1
115226	20196	SLAUGHT	12/01/2009 00:00	1
115226	20228	SLAUGHT	12/01/2009 00:00	4
115226	20272	SLAUGHT	12/01/2009 00:00	7
115226	20284	SLAUGHT	12/01/2009 00:00	15
115226	20285	SLAUGHT	12/01/2009 00:00	22
115226	20285	SLAUGHT	13/01/2009 00:00	19
115226	20302	SLAUGHT	12/01/2009 00:00	1
115226	20324	SLAUGHT	13/01/2009 00:00	1
115226	20332	SLAUGHT	12/01/2009 00:00	83
115226	20332	SLAUGHT	13/01/2009 00:00	10
115226	20339	SLAUGHT	12/01/2009 00:00	31
115226	20346	SLAUGHT	12/01/2009 00:00	23
115226	20355	SLAUGHT	12/01/2009 00:00	5
115226	20365	SLAUGHT	12/01/2009 00:00	2
115226	20370	SLAUGHT	12/01/2009 00:00	1
115226	20389	SLAUGHT	12/01/2009 00:00	26
115226	20392	SLAUGHT	12/01/2009 00:00	5
115226	20394	SLAUGHT	12/01/2009 00:00	41
115226	20396	SLAUGHT	12/01/2009 00:00	13
115226	20400	SLAUGHT	12/01/2009 00:00	3
115226	20402	SLAUGHT	12/01/2009 00:00	20
115226	58095	SLAUGHT	12/01/2009 00:00	2
115226	58226	SLAUGHT	13/01/2009 00:00	4
115226	60703	ASSEMBL	12/01/2009 00:00	6
115226	98554	ASSEMBL	12/01/2009 00:00	7

SELECT origin, destination, date, type, transported FROM tf where origin = '98554' and date >= '2009-01-12' and date <= '2009-01-15'

origin	destination	type	date	transported
98554	115226	MARKET	2009-01-12 00:00:00	7
98554	124392	FARM	2009-01-15 00:00:00	1
98554	150192	FARM	2009-01-15 00:00:00	7
98554	150427	FARM	2009-01-14 00:00:00	2
98554	151094	FARM	2009-01-15 00:00:00	1
98554	151559	FARM	2009-01-15 00:00:00	9
98554	20339	SLAUGHTERHOUSE	2009-01-12 00:00:00	7
98554	99245	MARKET	2009-01-15 00:00:00	5

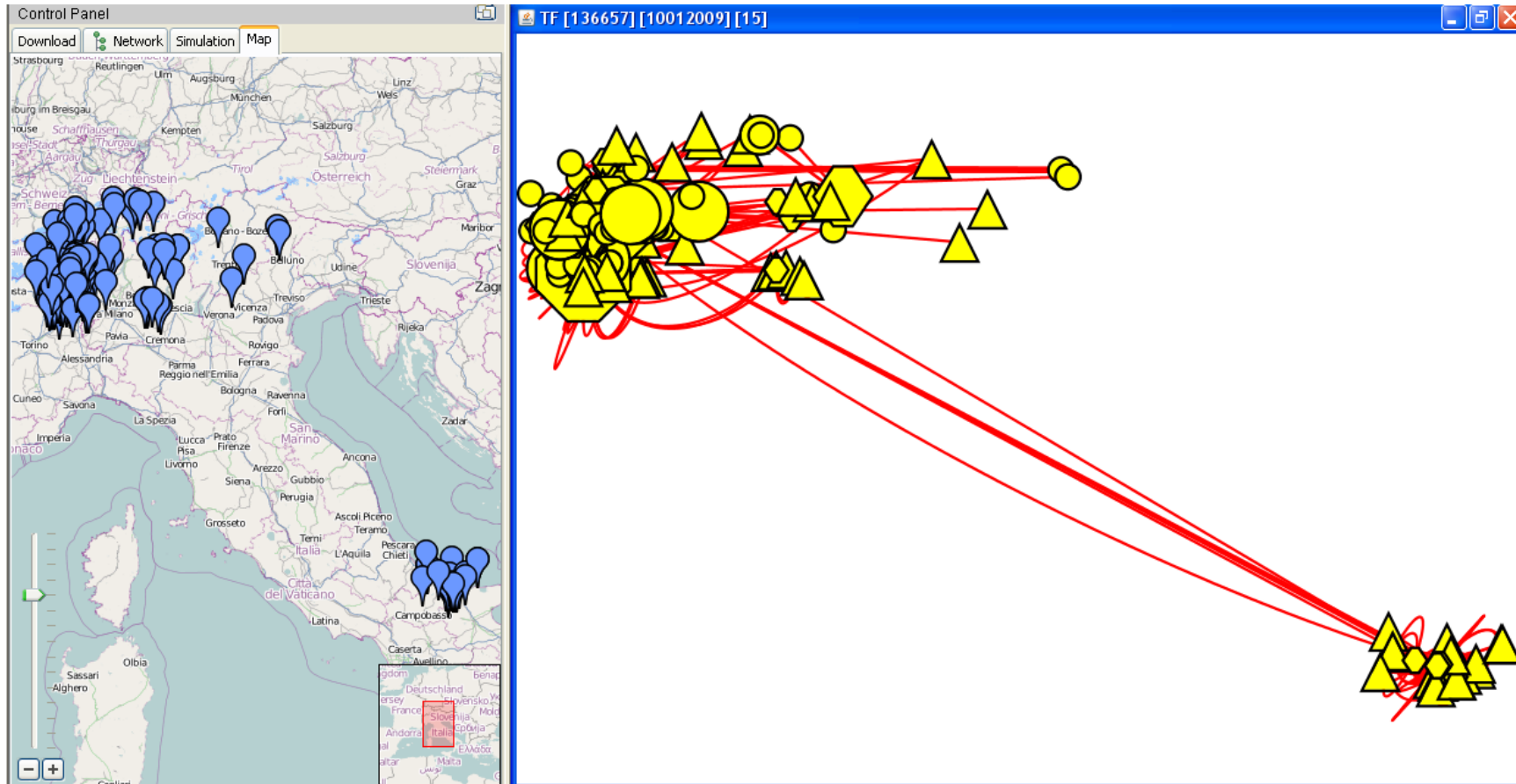
Tracing with EpiTrace

RECENT APPROACHES IN MODELLING ANIMAL INFECTIOUS DISEASES - Teramo Italy – 28/09/2010



Network & geographical visualization

RECENT APPROACHES IN MODELLING ANIMAL INFECTIOUS DISEASES - Teramo Italy – 28/09/2010



Modeling

Geographical seed + network traversal (MapDFC)

RECENT APPROACHES IN MODELLING ANIMAL INFECTIOUS DISEASES - Teramo Italy – 28/09/2010

[Drag markers to define outbreak area](#)

Latitude 45.89811746474E

Longitude 8.611006736813E

Radius (max 20 km) 5

[Define time window](#)

Start date

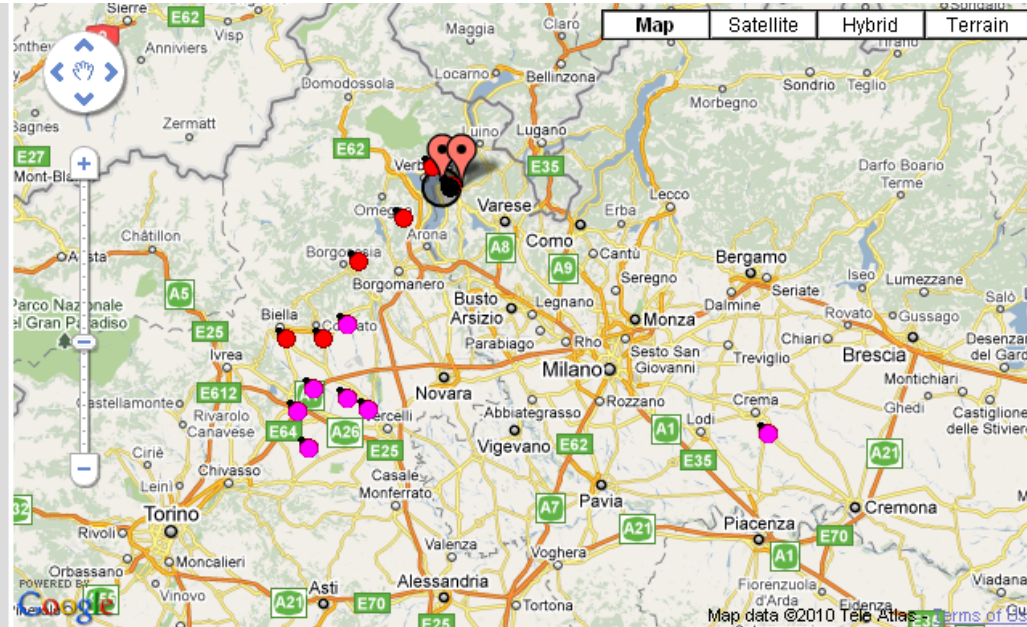
01/01/2009

Depth

15

[Seed epidemic \(and wait...\)](#)

[Show selected holdings](#)



Seeding sites with outgoing movements (total sites: 4)

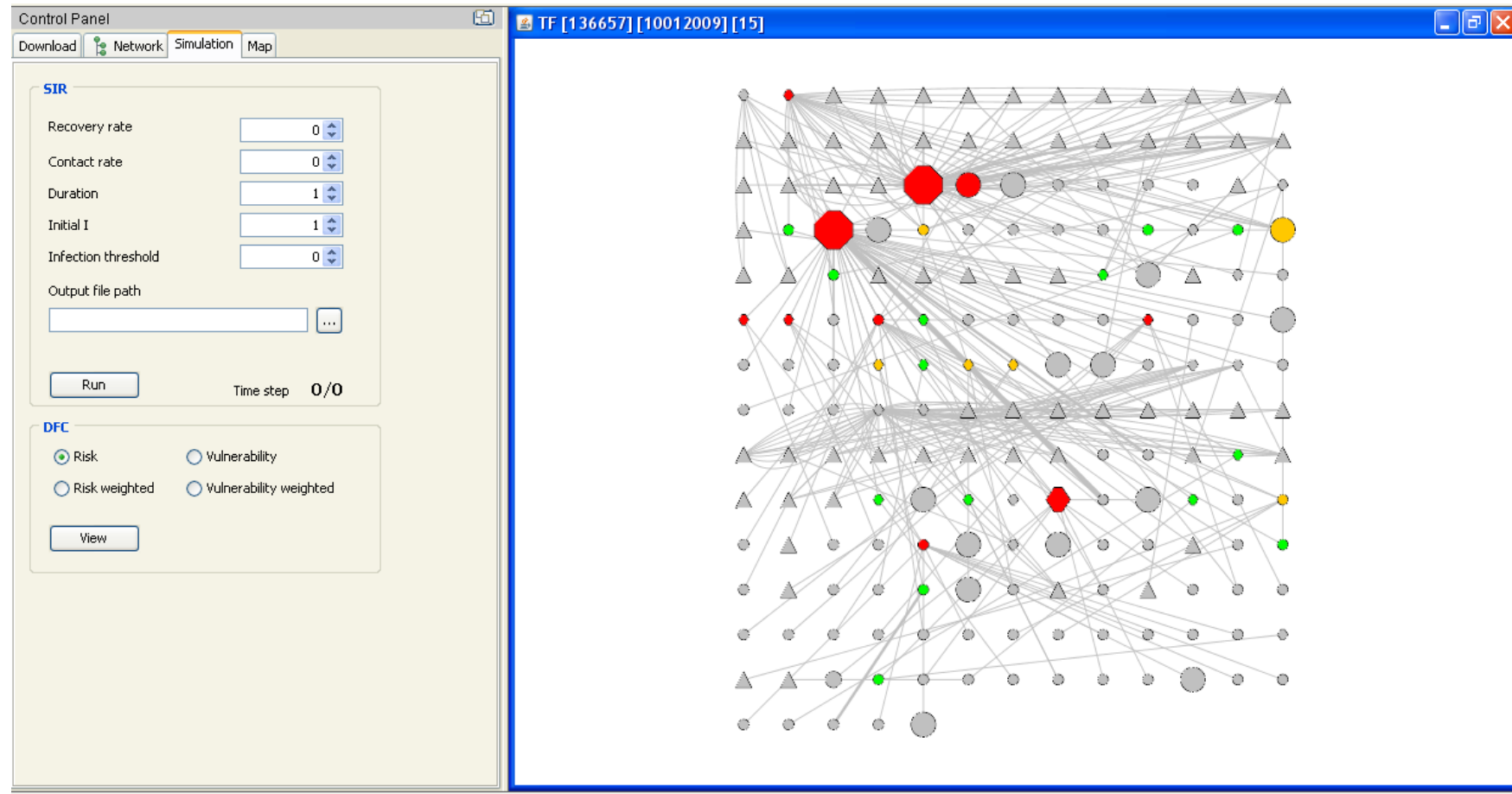
Reached (total sites: 126)

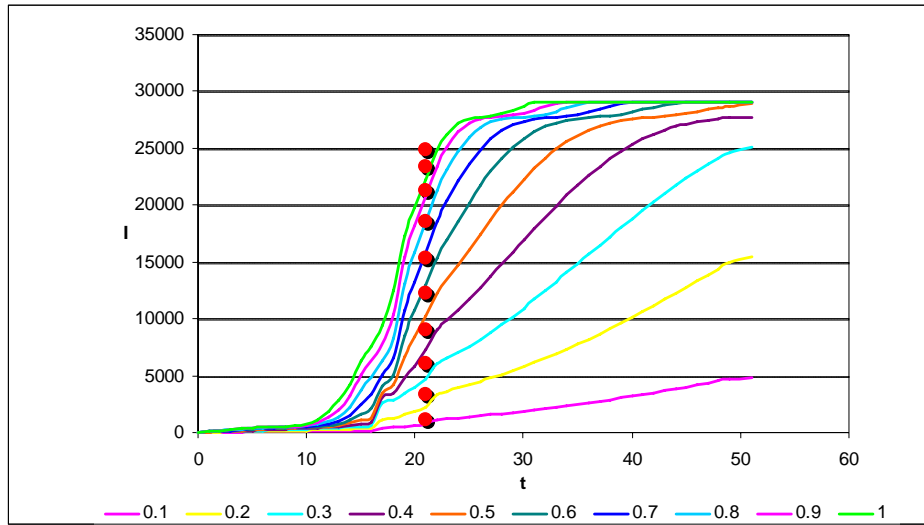
Traversed (total sites: 35)

ID	latitude	longitude	DFCt	type
<input checked="" type="checkbox"/> 121816	45.872658	8.645331	274	FARM
<input checked="" type="checkbox"/> 2493	45.917310	8.577231	101	FARM
<input checked="" type="checkbox"/> 116324	45.942495	8.618032	1	FARM
<input checked="" type="checkbox"/> 121817	45.868650	8.640517	1	FARM

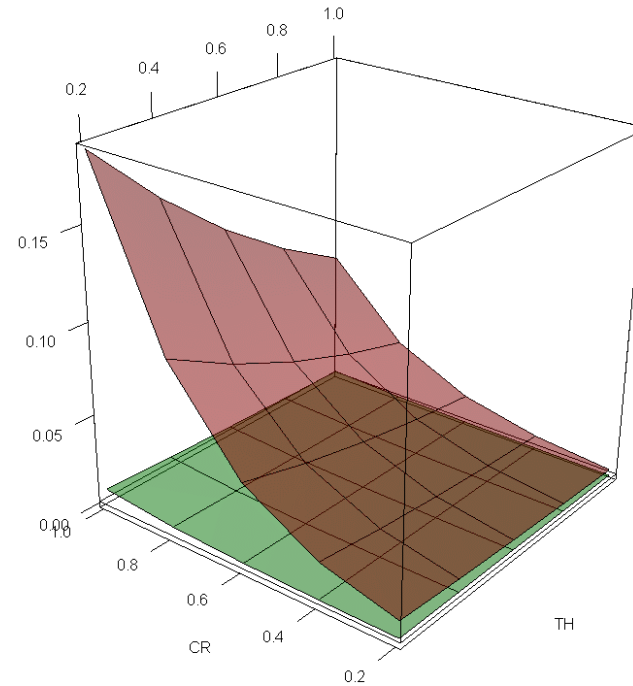
ID	latitude	longitude	DFCt	Seed	type
<input checked="" type="checkbox"/> 150427	45.339631	8.360413	15	0	FARM
<input checked="" type="checkbox"/> 150192	45.333495	8.117151	14	0	FARM
<input checked="" type="checkbox"/> 98554	45.541153	8.288658	12	0	ASSEMBLY CENTRE
<input checked="" type="checkbox"/> 115226	45.243768	8.154661	12	0	MARKET
<input checked="" type="checkbox"/> 124392	45.366726	8.286543	12	0	FARM
<input type="checkbox"/> 151094	45.390596	8.142244	12	0	FARM
<input checked="" type="checkbox"/> 151559	45.389934	8.172163	12	0	FARM
<input checked="" type="checkbox"/> 60703	45.281114	9.725757	11	0	ASSEMBLY CENTRE

ID	latitude	longitude	DFCt	Seed	type
<input checked="" type="checkbox"/> 149397	45.797449	8.478343	373	0	FARM
<input checked="" type="checkbox"/> 99245	45.893018	8.325423	311	0	MARKET
<input checked="" type="checkbox"/> 121816	45.872658	8.645331	274	1	FARM
<input checked="" type="checkbox"/> 2493	45.917310	8.577231	101	1	FARM
<input checked="" type="checkbox"/> 115226	45.243768	8.154661	80	0	MARKET
<input checked="" type="checkbox"/> 148033	45.507813	8.078848	66	0	ASSEMBLY CENTRE
<input checked="" type="checkbox"/> 98554	45.541153	8.288658	64	0	ASSEMBLY CENTRE
<input checked="" type="checkbox"/> 138574	45.507755	8.205152	40	0	ASSEMBLY





nr of infected animals for different values of the contact rate (CR); transmission threshold=0; RR=0



% of infected nodes at t 21 for different values of the contact rate (CR) and transmission threshold (TH); red (lowest RR) green (highest RR); fitted with logistic regression

Next steps

- On EpiTrace
 - Extend approach, methods and tools to other Livestock databases in EU MS
- On SIR
 - More sensitivity analysis
 - Validation of the model for a given disease (e.g. IBR)
- On MapDFC
 - Improve performance of the DFC algorithm
 - Implement DFC weighted and backwards DFC in C++

From IZS

- Lara Savini
- Luca Candeloro
- Armando Giovannini
- Paolo Calistri
- Diana Palma
- Luigi Possenti

Project of the Italian Ministry of Health “Epidemiological tools for the evaluation and management of risks related to the spread of infectious diseases spread in cattle farms”.

From JRC

- Gianluca Fiore
- Johann Hofherr
- Fabrizio Natale
- Fabrizio Grassi

EpiTrace uses extensively libraries of Cytoscape
DFC uses some libraries from Igraph