

# Performance evaluation and optimisation through the TIFAR-framework.



# Partners of REPRO

## Academic Partners



## Project Partners



## Finances By



## Goal of this talk

- 1) Show the tool we develop in REPRO
- 2) Receive your feedback for continuation

## Central TIFAR-tools in this talk



Dispatch  
Simulator

```
...: Going to disconnect Call 4  
...: Call 4: EMCC status set to  
...: Going to connect Call 3 to  
...: This call is taken from que  
...: Call 3: EMCC status set to  
...: Without an interruption, th  
...: Call 4: Ready for status up  
...: Call 4: Joined the queue EM  
...: Call 4: EMCC status set to
```

Emergency Medical  
Call Center Simulator



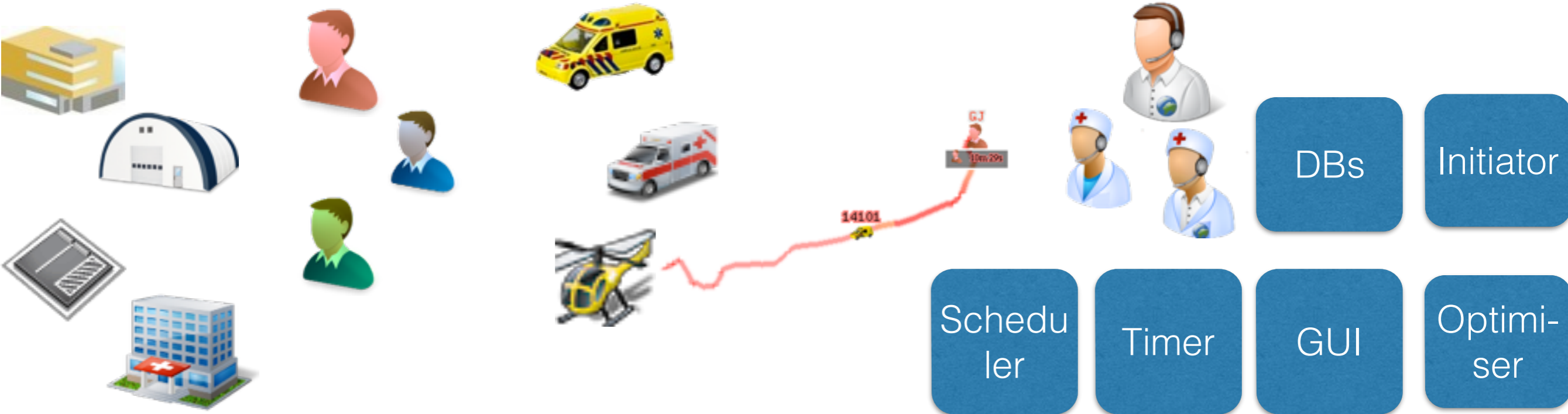
Optimiser

# Classes of TIFAR

Main

Environment    Calls    Fleet    Navigator & Resolver    EMCC    Log

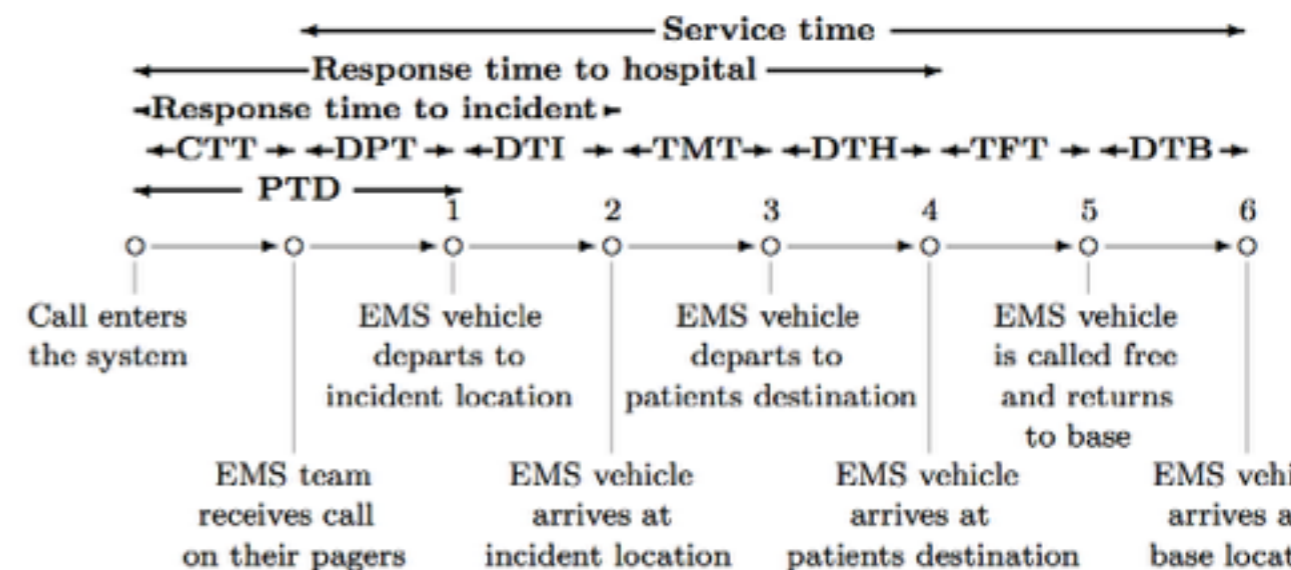
Vertex    Vertex    Call    Call    Ambu    Ambu    Route    Route    CC Agent    CC Agent    Entry    Entry



## All built around ambulance data!

*We use multiple databases:*

- Call records (RAVIS, Opencare Ambu, Ambite, Mios(+))
- Call Center Records (Arbi)
- Duty Rosters
- Base and Hospital Locations
- EXT: Geographical Information
- EXT: Addresses and Buildings



*External tools:*

- CityGIS Navigator for shortest path and route information
  - RIVM Look-up table
- Quantum GIS for maps

# TIFAR Dispatch Simulator

## *Purpose*

To evaluate dispatch strategies:

- DAM
- Major happenings, regional changes

## *Input*

We use the following as input:

- Regional geographical information
- Demand information (where & quant.)
- Fleet information
- Dispatch policy

## *Output*

- Call record database -> All possible performance indicators!



# TIFAR Dispatch Simulator



**Demo!**

# TIFAR Dispatch Simulator

Main

Environment

Calls

Fleet

Navigator & Resolver

EMCC

Log

Vertex

Vertex

Call

Call

Ambu

Ambu

Route

Route

CC Agent

CC Agent

Entry

Entry

DBs

Initiator

Scheduler

Timer

GUI

Optimizer





# TIFAR EMCC Simulator

*Joint work with Geert Jan Kommer*

## Purpose

To evaluate call center staffings:

- Performance given a staffing

## Input

We use the following as input:

- Interarrival time distributions (Call intensities)
- Feedback probabilities
- Service time distributions (Call durations)
- Staffing (Call takers, Dispatchers, Generalists)

## Output

- Call Center Records 'arbi'
- All possible performance EMCC indicators!

id	simulationid	agentid	agenttitel	callid	callnummer	callurgency	calltimePriority	callstatus	simstatusat	simstatusnbmed	simstatusnbused	durationFinal
91391	1386	0	call taker	1	politie	AD	medium	addressed by call taker	2008-05-01 00:11:27	2008-01-01 00:11:27	2008-01-01 00:16:00	3519413
91392	1386	1	dispatcher	1	politie	AD	medium half	addressed by dispatcher	2008-05-01 00:16:00	2008-01-01 00:16:00	2008-01-01 00:16:35	3508776
91393	1386	1	dispatcher	1	politie	AD	medium	assigned to ambulance	2008-05-01 00:16:35	2008-01-01 00:16:35	2008-01-01 00:17:01	3885075
91394	1386	1	dispatcher	1	politie	AD	medium	ambulance at scene	2008-05-01 00:17:01	2008-01-01 00:17:01	2008-01-01 00:17:51	5129184
91395	1386	1	dispatcher	1	politie	AD	medium	patient being brought to dest.	2008-05-01 00:17:51	2008-01-01 00:17:51	2008-01-01 00:19:48	2950018
91396	1386	0	call taker	2	multidomein	AD	medium	addressed by call taker	2008-05-01 00:19:18	2008-01-01 00:19:18	2008-01-01 00:19:53	3438418
91397	1386	1	dispatcher	1	politie	AD	medium	patient transferred at destination	2008-05-01 00:19:48	2008-01-01 00:19:48	2008-01-01 00:19:53	2284490
91398	1386	1	dispatcher	2	multidomein	AD	medium half	addressed by dispatcher	2008-05-01 00:19:53	2008-01-01 00:19:53	2008-01-01 00:20:24	3188365
91399	1386	1	dispatcher	1	politie	AD	medium	patient transferred at destination	2008-05-01 00:19:48	2008-01-01 00:20:24	2008-01-01 00:20:42	2284490
91400	1386	1	dispatcher	2	multidomein	AD	medium	assigned to ambulance	2008-05-01 00:20:24	2008-01-01 00:20:42	2008-01-01 00:21:35	3268124
91401	1386	1	dispatcher	1	politie	AD	medium	patient at destination	2008-05-01 00:20:42	2008-01-01 00:21:35	2008-01-01 00:22:10	1700394
91402	1386	1	dispatcher	2	multidomein	AD	medium	ambulance at scene	2008-05-01 00:21:35	2008-01-01 00:22:10	2008-01-01 00:23:30	4277903
91403	1386	1	dispatcher	2	multidomein	AD	medium	patient being brought to dest.	2008-05-01 00:21:30	2008-01-01 00:23:30	2008-01-01 00:24:13	4277903
91404	1386	1	dispatcher	2	multidomein	AD	medium	patient transferred at destination	2008-05-01 00:24:13	2008-01-01 00:24:13	2008-01-01 00:24:13	1797170
91405	1386	1	dispatcher	2	multidomein	AD	medium	patient at destination	2008-05-01 00:24:13	2008-01-01 00:24:13	2008-01-01 00:24:13	13264171
91406	1386	0	call taker	3	zorginstelling	BF	medium	addressed by call taker	2008-05-01 00:49:19	2008-01-01 00:49:19	2008-01-01 00:50:18	1821191
91407	1386	1	dispatcher	3	zorginstelling	BF	low half	addressed by dispatcher	2008-05-01 00:50:18	2008-01-01 00:50:18	2008-01-01 00:50:58	1787183
91408	1386	0	call taker	4	hulpkarts	AD	medium	addressed by call taker	2008-05-01 00:50:03	2008-01-01 00:50:18	2008-01-01 00:50:58	1896812
91409	1386	1	dispatcher	3	zorginstelling	BF	medium	assigned to ambulance	2008-05-01 00:50:58	2008-01-01 00:50:58	2008-01-01 00:50:58	3448103
91410	1386	1	dispatcher	4	hulpkarts	AD	medium half	addressed by dispatcher	2008-05-01 00:50:58	2008-01-01 00:50:58	2008-01-01 00:51:47	12822189
91411	1386	1	dispatcher	3	zorginstelling	BF	medium	assigned to ambulance	2008-05-01 00:50:58	2008-01-01 00:51:47	2008-01-01 00:51:30	3448103
91412	1386	1	dispatcher	4	hulpkarts	AD	medium	assigned to ambulance	2008-05-01 00:51:47	2008-01-01 00:51:30	2008-01-01 00:51:58	3850159
91413	1386	1	dispatcher	3	zorginstelling	BF	medium	ambulance at scene	2008-05-01 00:51:30	2008-01-01 00:51:58	2008-01-01 00:54:49	5040143
91414	1386	1	dispatcher	4	hulpkarts	AD	medium	ambulance at scene	2008-05-01 00:51:58	2008-01-01 00:54:49	2008-01-01 00:54:46	5689125
91415	1386	1	dispatcher	3	zorginstelling	BF	medium	patient being brought to dest.	2008-05-01 00:54:49	2008-01-01 00:54:46	2008-01-01 00:56:46	6505781
91416	1386	1	dispatcher	4	hulpkarts	AD	medium	patient being brought to dest.	2008-05-01 00:51:46	2008-01-01 00:56:46	2008-01-01 00:57:17	3104714
91417	1386	1	dispatcher	3	zorginstelling	BF	medium	patient transferred at destination	2008-05-01 00:56:46	2008-01-01 00:57:17	2008-01-01 00:57:13	3527045
91418	1386	1	dispatcher	4	hulpkarts	AD	medium	patient transferred at destination	2008-05-01 00:57:17	2008-01-01 00:57:13	2008-01-01 00:58:14	3982018
91419	1386	1	dispatcher	3	zorginstelling	BF	medium	patient at destination	2008-05-01 00:57:13	2008-01-01 00:58:14	2008-01-01 00:59:42	4856019
91420	1386	1	dispatcher	4	hulpkarts	AD	medium	patient at destination	2008-05-01 00:58:14	2008-01-01 00:59:42	2008-01-01 01:01:04	8217803
91421	1386	0	call taker	5	hulpkarts	AD	medium	addressed by call taker	2008-05-01 01:00:42	2008-01-01 01:00:42	2008-01-01 01:10:15	1219128
91422	1386	1	dispatcher	5	hulpkarts	AD	medium half	addressed by dispatcher	2008-05-01 01:00:15	2008-01-01 01:10:15	2008-01-01 01:10:46	3112161
91423	1386	1	dispatcher	5	hulpkarts	AD	medium	assigned to ambulance	2008-05-01 01:00:42	2008-01-01 01:10:46	2008-01-01 01:12:43	1171011

# TIFAR EMCC Simulator



**Demo!**

# TIFAR EMCC Simulator

Main

Environment Calls Fleet Navigator & Resolver EMCC Log

Vertex Vertex Call Call Ambu Ambu Route Route CC Agent CC Agent Entry Entry



# TIFAR Optimiser

*Joint work with Theresia van Essen*

## *Purpose*

To find 'optimal' staffing using Erlang blocking per demand pt. (WIP)

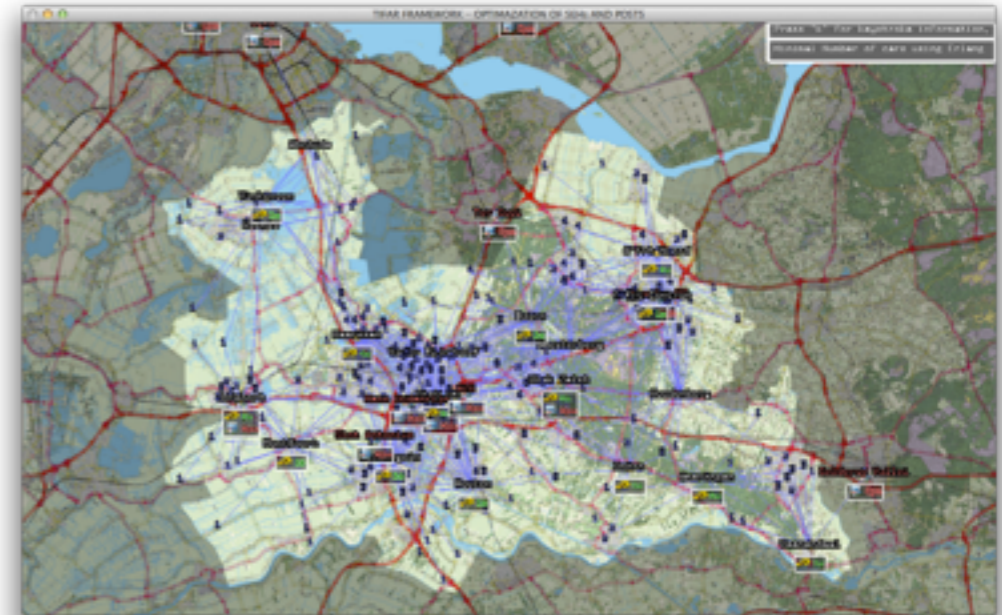
## *Input*

We use the following as input:

- Demand information
- Possible base locations and hospitals
- Service time constants
- Performance indicators

## *Output*

- Staffing per base, graphical and textual in the log.



# TIFAR EMCC Simulator



**Demo!**

# TIFAR Optimiser

Main

Environment

Calls

Fleet

Navigator & Resolver

EMCC

Log

Vertex

Vertex

Call

Call

Ambu

Ambu

Route

Route

CC Agent

CC Agent

Entry

Entry

DBs

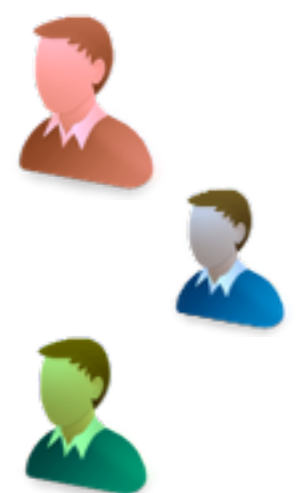
Initiator

Scheduler

Timer

GUI

Optimiser



# Future Research

- Validate all models:
  - *Theory and Practice*
- Implementing REPRO policies into TIFAR
- Combining optimisation tools with evaluations
  - for real time decision support tools.
- Better user interface for mostly used indicators
- Help out our partners and make great articles!

# Concluding

- TIFAR is an all round ambulance simulation framework, incl:
  - Simulating the 'road domain'
  - Simulating the 'call center domain'
  - Decision support for tactical decisions
- Many performance indicators possible
- Useful for evaluating dispatch rules & DAM