ZNES Zentrum für nachhaltige Energiesysteme
Fachhochschule | Universität Flensburg

open_loadFlow (OLF) – An open tool for static load flow calculations

The tool and future challenges

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Agenda

- Motivation for the development of OLF
- Introduction to OLF
- Outlook: The future of OLF

MOTIVATION FOR THE DEVELOPMENT OF OLF

Motivation

- Build up own knowledge (coming from being a SINCAL user)
- Not being dependent on commercial products
- open source
- Using the tool as part of electricity system model such as renpass (compatibility)
- One step towards bringing the economic world closer to the electric world
- Giving electricity system models (market simulations) an higher relation to the physics to increase its reputation especially among the technical stakeholders of the Energiewende (e. g. grid operators)

INTRODUCTION TO OLF

General characteristics

- AC load flow calculation
- Static (no dynamics)
- PV and PQ knot characteristics
- Full Newton-Raphson iteration
- Simple data structure
- No time series calculation (so far)
- No transformer model (so far)
- Written in R (so far)
- Main developer: Malte Schaf (as a student assistant)

Input Data

- Grid data, line.csv:

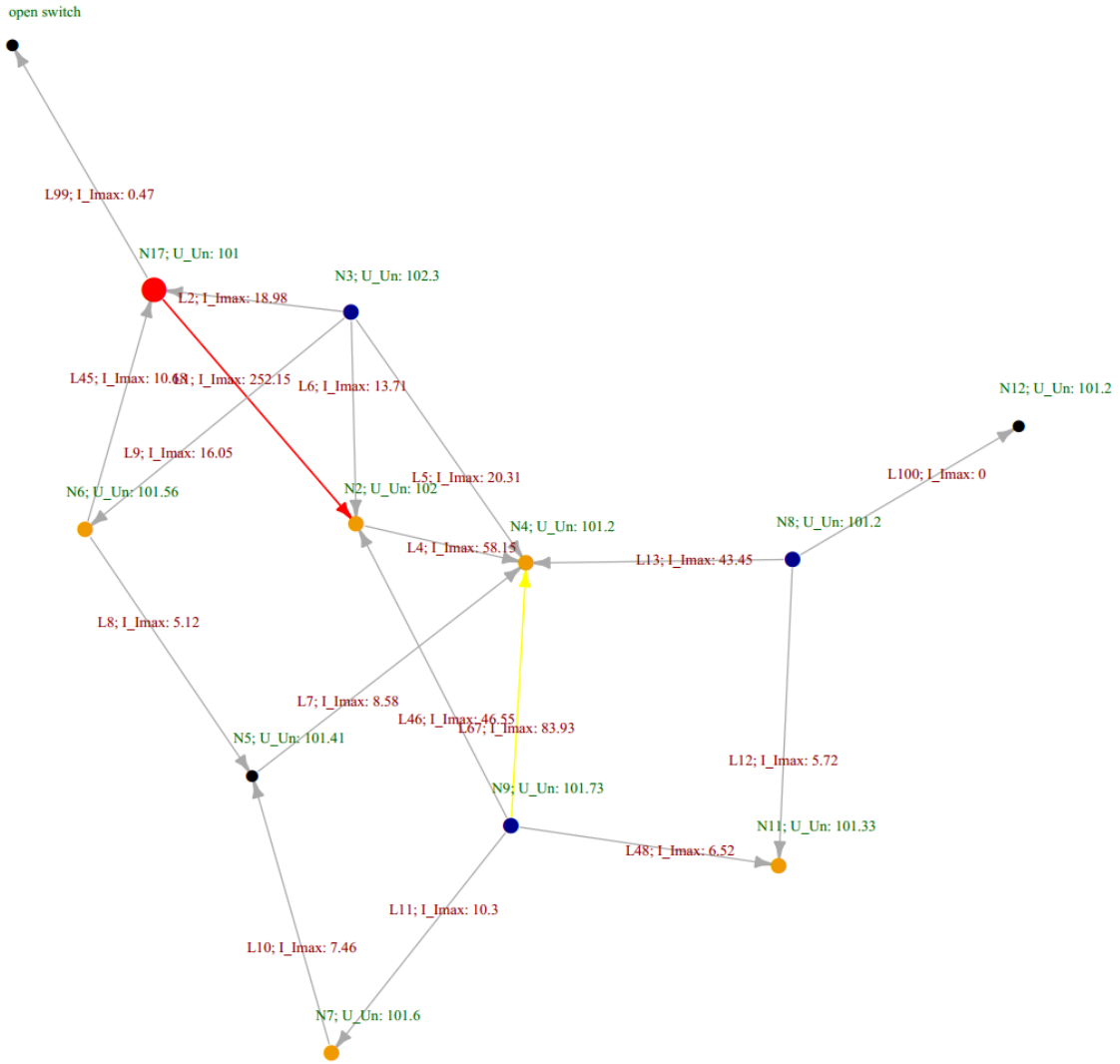
	A	B	C	D	E	F	G	H
1	l_id	n_id_1	n_id_2	l	r	x	c	Imax
2	13	4	8	0	0.1	0.122	255	300
3	2	17	3	2	2.894	0.244	508	70
4	4	4	2	2	0.89	0.366	762	70
5	5	3	4	2	0.2	0.488	1016	319

- Generator and load data, gen_load.csv:

	A	B	C	D
1	n_id	P	cos_phi	U
2	9	-0.5	0.9	
3	2	0.2		102
4	2	0.8		
5	3	0.8	0.9	
6	3	-2.3	0.8	
7	4	0.8	0.7	

Graphic Results

Graphic visualization of the grid schematic and the results



Tabular Results

- Line result table:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	line_name	line_ID	Node1	Node2	I	I_Imax	P	Q	S	cos_phi	Pl	Ql	Sl	dU
2		13	4	8	0.13034	43.44658	0.47365	-2.235	2.28464	-0.20732	0	0	0	0
3		13	8	4	0.13034	43.44658	-0.47365	2.235	2.28464	-0.20732	0	0	0	0
4		2	3	17	0.01301	18.59264	-0.22483	-0.05136	0.23062	0.97489	0.00305	-0.03273	0.03287	0.13337
5		2	17	3	0.01356	19.36857	0.22177	0.08408	0.23718	0.93505	0.00305	-0.03273	0.03287	0.13337
6		4	2	4	0.03934	56.19885	-0.17495	-0.67262	0.695	0.25173	0.00885	-0.04578	0.04663	0.13569
7		4	4	2	0.04207	60.09519	0.1661	0.71841	0.73736	0.22527	0.00885	-0.04578	0.04663	0.13569
8		5	3	4	0.06291	19.72236	-0.02507	-1.11453	1.11482	0.02249	0.00504	-0.0538	0.05404	0.11838
9		5	4	3	0.06666	20.89775	0.02004	1.16834	1.16851	0.01715	0.00504	-0.0538	0.05404	0.11838

- Node result table:

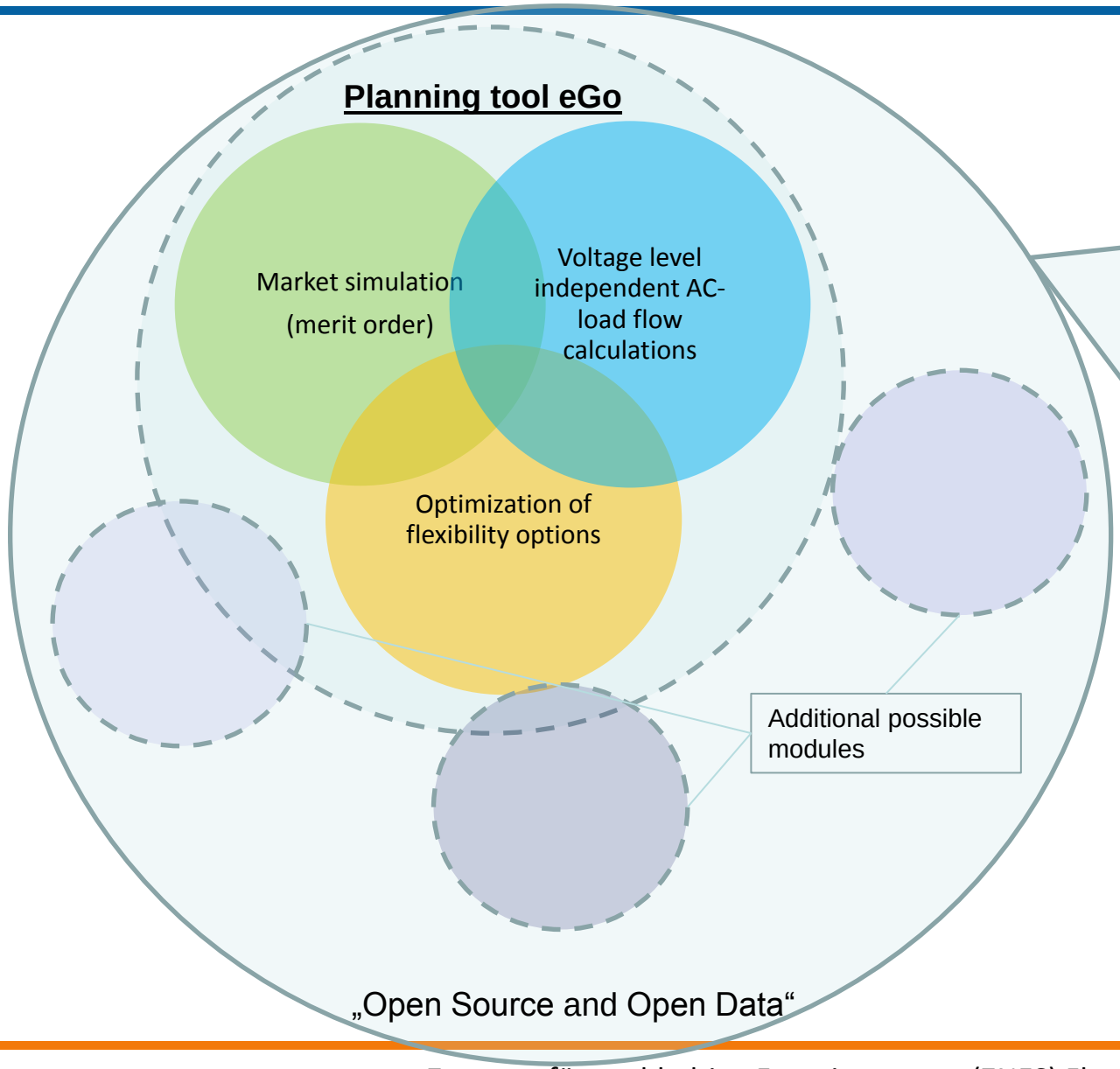
	A	B	C	D	E	F	G	H
1	node_name	n_ID	U	U_Un	phi	P	Q	S
2		2	10.2	102	-0.53513	1	-6.2956	6.37453
3		3	10.23041	102.30407	-0.15761	-1.5	-1.33755	2.00974
4		4	10.12	101.2	0.08297	0.8	0.81616	1.14286
5		5	10.14105	101.41049	-0.19474	0	0	0
6		6	10.15636	101.5636	-0.24652	0.2	0	0.2
7		7	10.16008	101.60079	-0.26601	0.067	0.03245	0.07444
8		8	10.12	101.2	0.08297	-0.50002	2.57038	2.61856

OUTLOOK: THE FUTURE OF OLF

Micro Outlook

- Publication under copy left license
  - If someone is interested in usage or further development contact me!
- Switching to another open source load flow calculation tool e.g. OpenDSS, PSAT/DOME or developing OLF further?
- Further development:
  - Time series functionality
  - Transformer model
  - Implementation in python
  - Interface to electricity market model
  - …

Macro Outlook: OLF as part of open_eGo



OpenEnergy-Plattform

- Standardization of meta-data and model documentation
- Regulated collaborative work on joint models
- Stabil, cross-sector analysis
- Interfaces for different models/modules
- Scientific discussion of the models and assumptions

Thanks for your attention!
Time for questions and comments!

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