



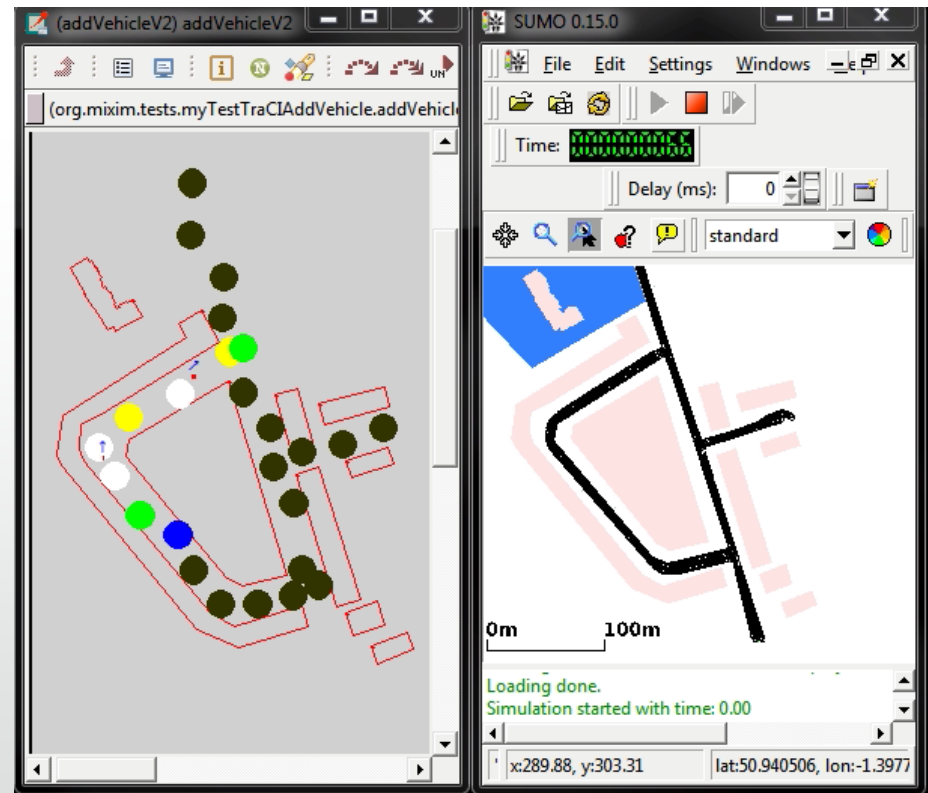
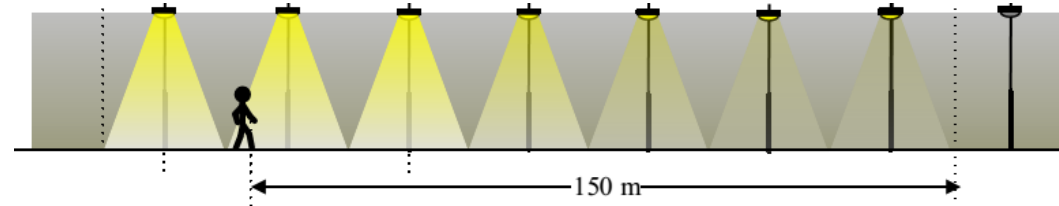
Energy modelling in StreetlightSim

Sei Ping Lau

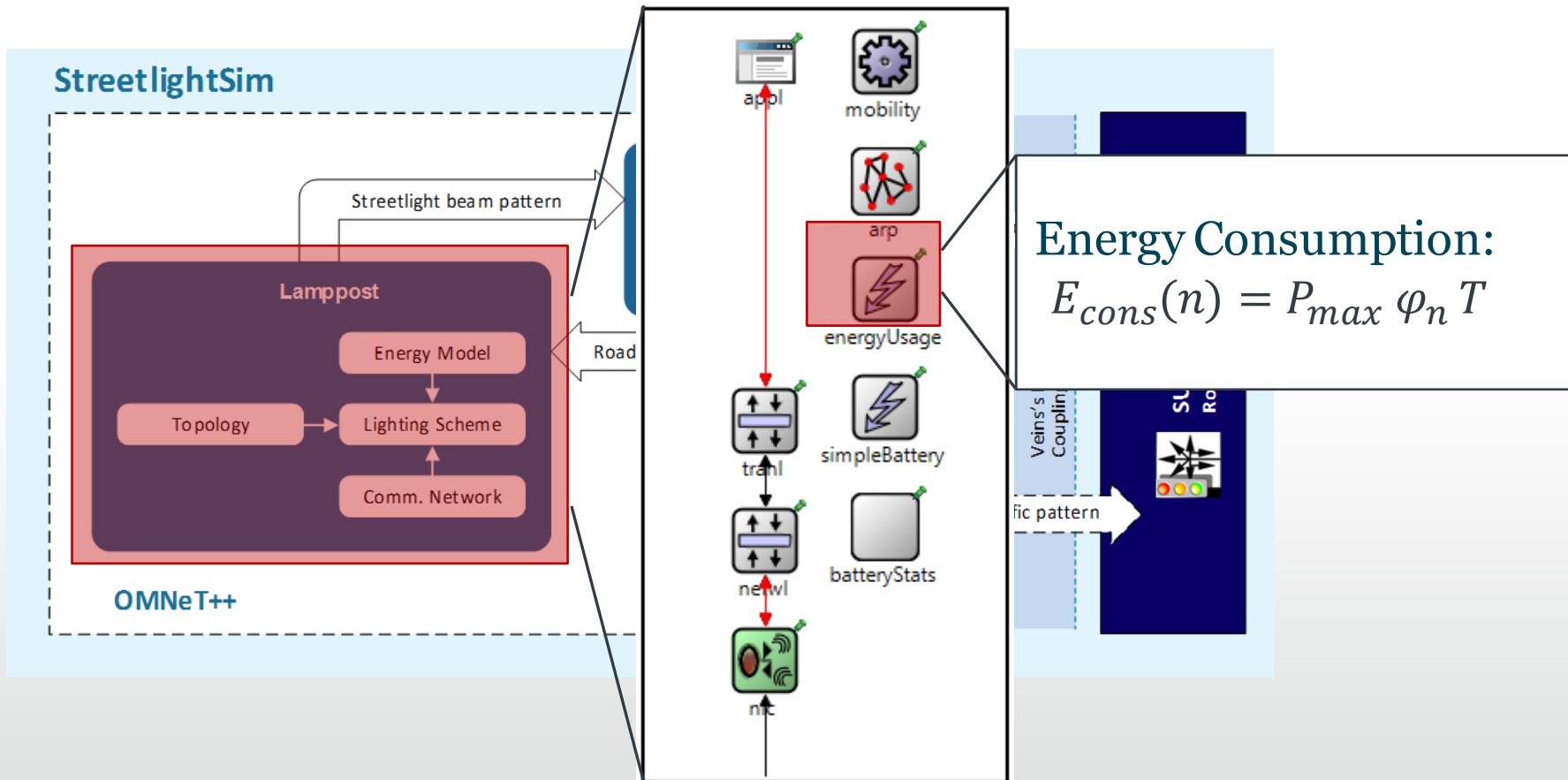
Supervisory Team: Geoff Merrett, Alex Weddell, Neil White
University of Southampton

Our interest

- To evaluate adaptive & networked street lighting schemes
 - Sensing and distributed lighting control
- StreetlightSim
 - built on top of MiXiM framework and SUMO
 - Use bidirectional coupling module from Vehicle in Network Simulation (Veins) framework
 - **No** energy modelling for sensor nodes
 - Open-source and available at www.streetlightsim.ecs.soton.ac.uk

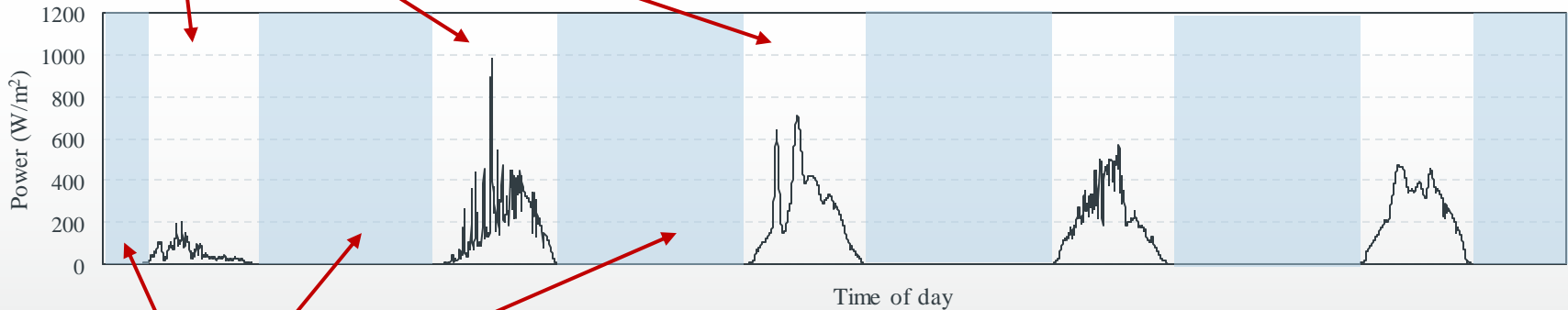


Overview of StreetlightSim



Energy Model: Solar-powered Streetlights

$$E_{harvest}(n) = \alpha_{solar} P_{efficiency} P_{size} \int_{n-1}^n P_{solar} dt$$



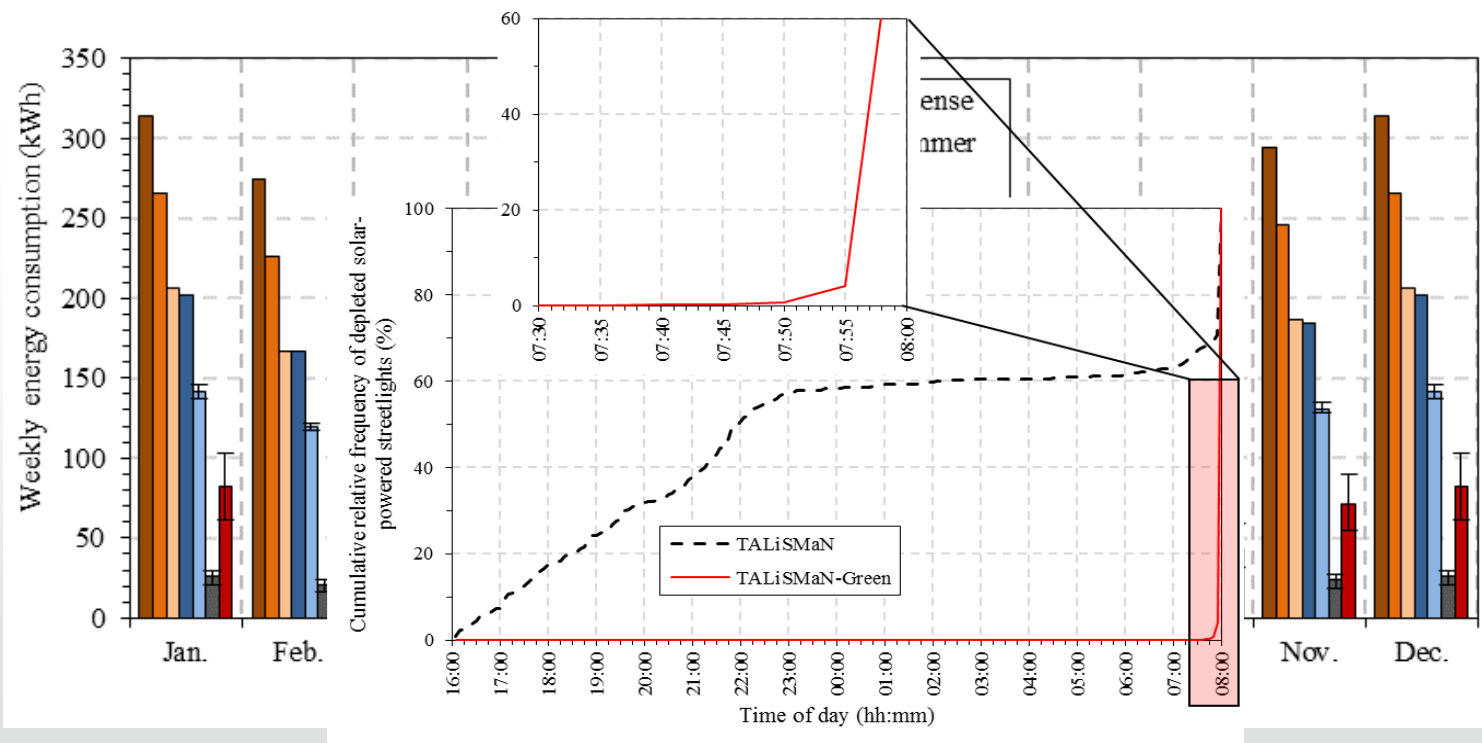
$$E_{stored}(n) = \min\{E_{cap}, E_{init} + E_{harvest}(n) - E_{cons}(n)\}$$

Status

- Evaluated several lighting schemes for both grid- and solar-powered streetlights
- Created energy models for street lighting
- Good to have
 - More realistic energy model for solar-powered streetlight, e.g. power conversion loss, energy leakage...

Progress

- Evaluated several lighting schemes for both the grid- and solar-powered streetlights



References

1. S. P. Lau, G. V. Merrett, A. S. Weddell, and N. M. White, “A Traffic-Aware Street Lighting Scheme for Smart Cities using Autonomous Networked Sensors”, *Computers & Electrical Engineering*, Special Issue on Green Engineering Towards Sustainable Smart Cities, 2015.
2. S. P. Lau, G. V. Merrett, A. S. Weddell, and N. M. White, “StreetlightSim: A simulation environment to evaluate networked and adaptive street lighting”, in *Proceedings of IEEE Asia Pacific Conference on Wireless and Mobile*, Bali, 2014, pp. 66 -71.
3. S. P. Lau, A. S. Weddell, G. V. Merrett and N. M. White, “Energy-neutral solar-powered street lighting with predictive and adaptive behaviour”, in *Proceedings of 2nd International Workshop on Energy Neutral Sensing Systems*, Memphis, 2014, pp. 13-18.

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