

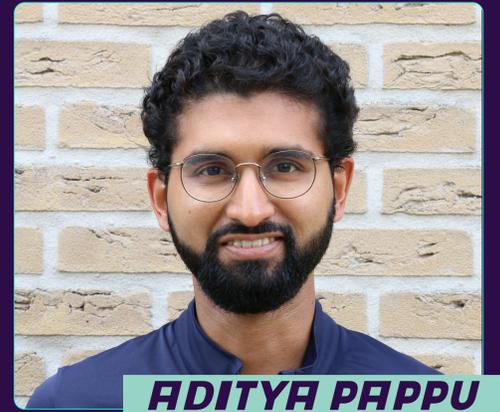
# HOLOS

## BUILDING THE ENERGY

## GRID BOTTOM-UP

DISTRIBUTED COORDINATION  
ENERGY MANAGEMENT  
PEER-2-PEER NETWORKS

## DISTRIBUTED ASYNCHRONOUS ENERGY MANAGEMENT



ADITYA PAPPU

GERWIN HOOGSTEEN

MARCO E. T. GERARDS

JOHANN L. HURINK

Greek for something that is both independent and yet part of a larger system.

### WHY?

- Current electrical grid is facing increasing share of renewables and electrification e.g. heat pumps.
- This results in grid congestion and energy scarcity issues.

### HOW?

- Flexibility from heat pumps and electric vehicles can be used to help the grid via demand side management.
- This needs distributed coordination among devices and houses.

holos()

=

probe()

&

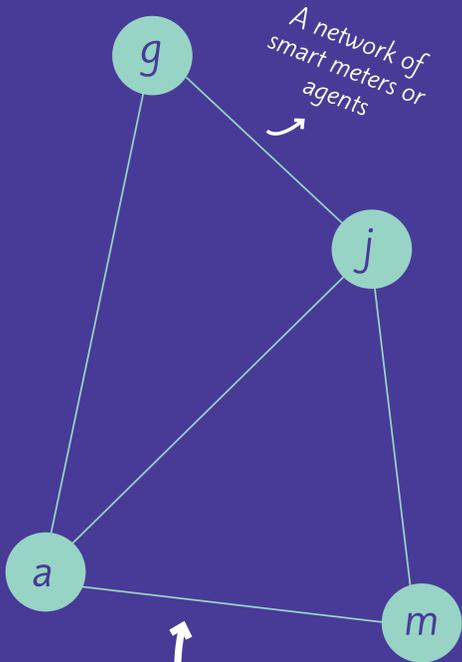
gossip()

+

loadbalance()

+

plan()



A network of smart meters or agents

#### Symmetric Random Walk

Agent probes do random walks to find network size.

#### NeighborCast Gossip

Agents gossip and agree on network size.

#### Load-balancing

Agents communicate peer-2-peer and converge to group average.

Agents use network size to calculate group aggregate.

#### Async replanning

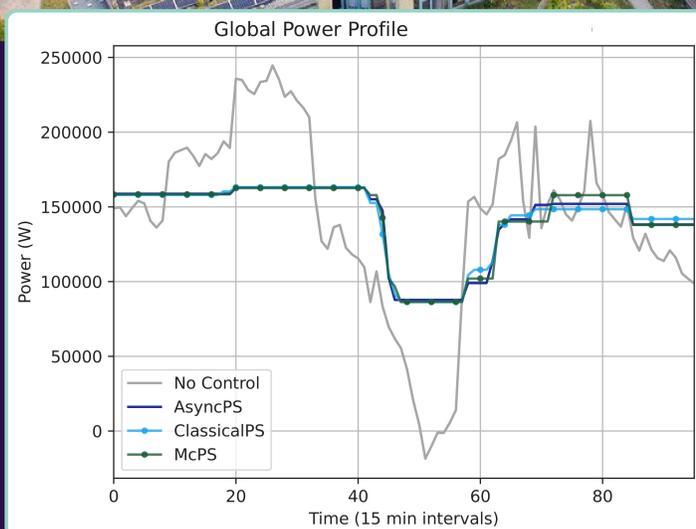
Agents do a replanning and update the group aggregate



ARDEHUIZEN, NL  
24 HOUSES

### DOES IT WORK?

The graph shows the peak-shaving performance of the Holos approach when compared to that of a state-of-the-art decentralized synchronous heuristic.



Holos achieves a solution which has only 1.35% deviation from that of the state-of-the-art.

UNIVERSITY OF TWENTE.



ENERGY GROUP

GET IN TOUCH!

