

# Self-powered Wireless for IoT

## People Counting – System Concept

Armin Anders,  
Co-Founder & VP Business Development  
EnOcean GmbH, March 2019





Sub Desk PIR



Seat Vibration



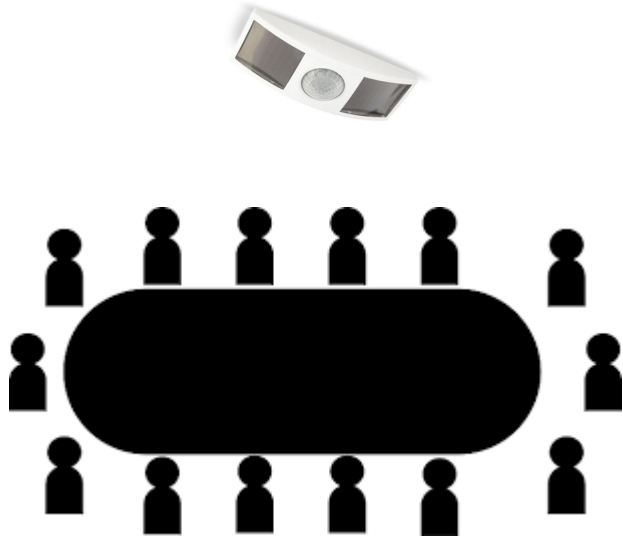
People Activity Counter



Door Contact



Door Handle



EPAC: Solar-powered PIR with activity counter  
attached to the room ceiling  
(reports # of activities per latest 2 minutes)

## Typical Application: Space Utilization

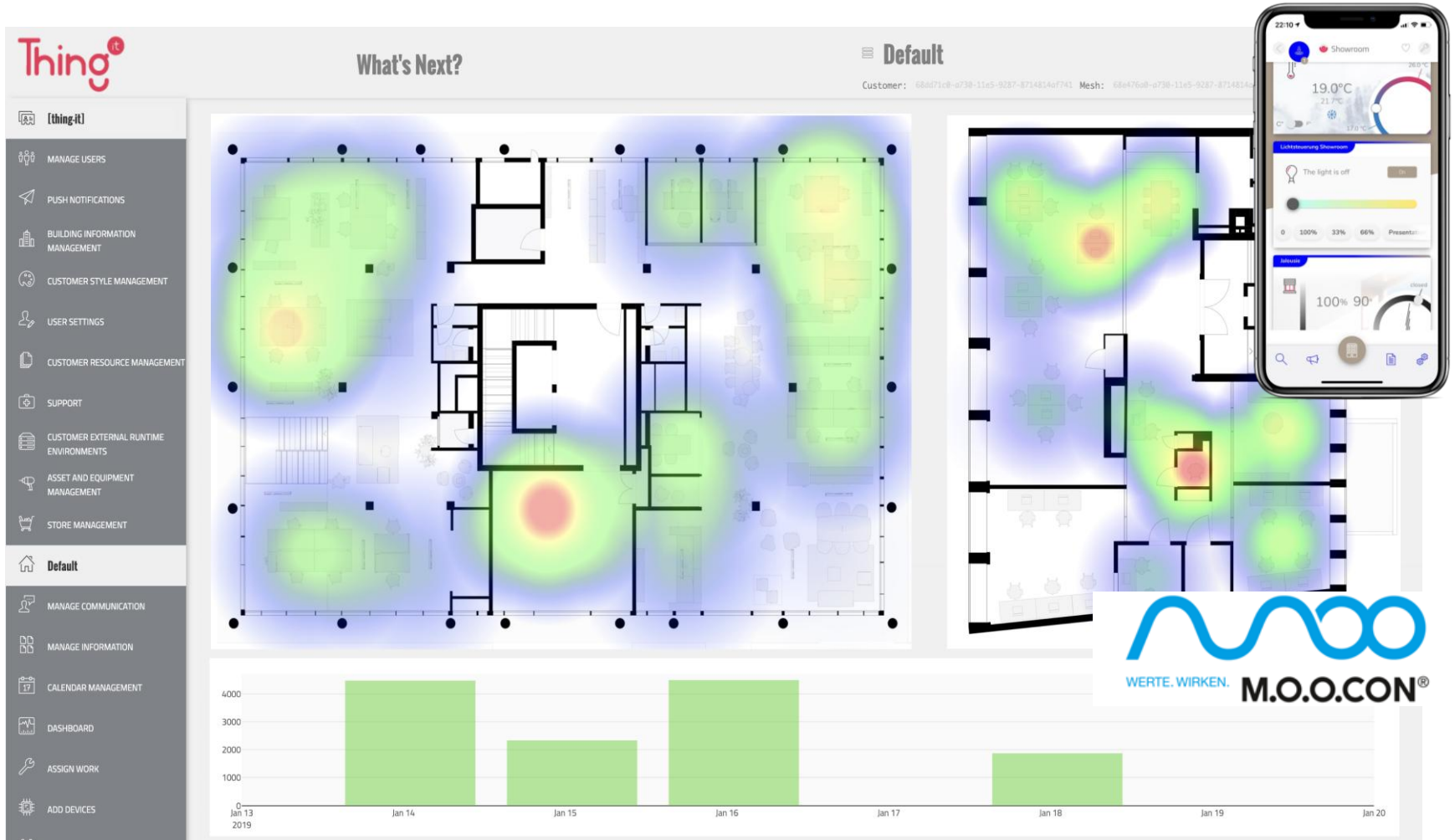
- People distribution in building (heatmap by several sensors)
- Length of a people queue (canteen)
- People count in a meeting room (derived by application)

## USP: Attach & Forget

- **Ideal for retrofit** (Wireless)
- **No complaints** (Cameraless)
- **No maintenance** (Batteryless)
- **Lowest cost** (no wires)

# ROOM & SPACE UTILIZATION – People Heatmap using EPAC

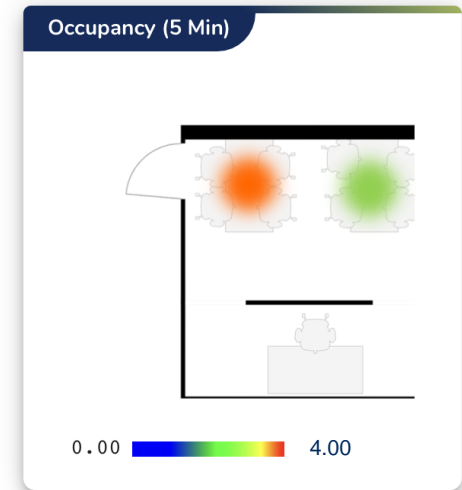
People distribution heatmap can easily be generated by using several EPACs:



# ROOM & SPACE UTILIZATION – People Count using EPAC

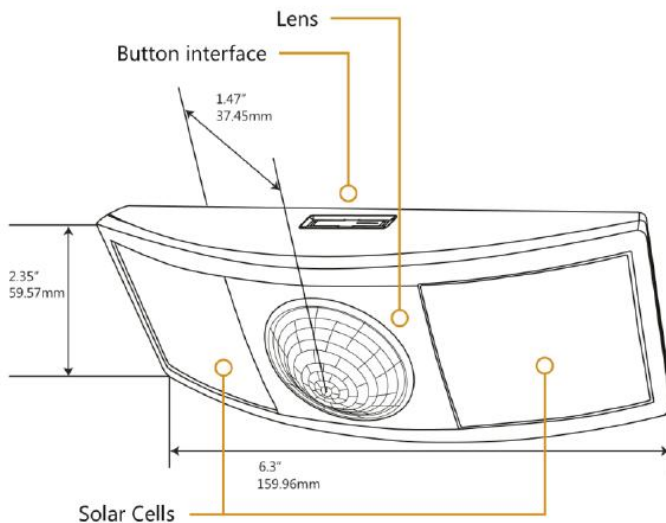
For counting people additional know-how is needed:

- EPAC measures the number of activities within the last 2 minutes with a resolution of one second (people activity count)
- There is a **correlation between the number of activities and the absolute number of persons** in a dedicated room
- This correlation is **NOT part of the EPAC** product offering (has to be derived by Manual Calibration or by Machine Learning)
- An accuracy of 80-90% can be achieved (according to lead customer)
- EPAC covers an area of around 30 sqm. To reduce coverage an application note is provided for 3D printing of suited lens covers (incl. 3D printing data)



2 EPACs ceiling mounted  
(with 13mm lens covers)

# EPAC Specifications



## Specifications (typ. values)

EnOcean Equipment Profile	D2-15-00
Power Supply: Optional:	Indoor light energy harvesting. Supplemental battery (CR2032) or external power (3-5 VDC, 2-wire)
RF Transmission Range	25 m (80 ft.)
Motion Sensing Range	10 m (34 ft.) diameter (refer to coverage diagrams)
Startup Charge Times*: • First radio transmission • Light Test / Walk Test	(operation from empty energy store) 5 minutes @ 200 lux (linking) 1.5 hours @ 2000 lux
Time to Full Charge*	25 hours @ 200 lux
Life time in total darkness	72 hours (after full charge, no activity, and break-in of several days)
Sustaining charge time for battery free operation**	8 hours per 24 hours @ 100 lux
Optional Battery Life**: • Infrequent Bright Light • Consistent Low Light • Total Darkness	CR2032, min. 230 mAh 15 yrs (with 200 lux for 2 hrs/day, 7 days/week) 10 yrs (with 70 lux for 5 hrs/day, 7 days/week) 5 yrs
Measurement cycle time	0.9 seconds +/- 10%
Transmission cycle time	2 minutes +/- 10 % (counter value = number of activities detected)
Heartbeat Transmission Interval (unoccupied)	60 minutes +/- 10% (no activity, counter value NOT changed)
RF Communications	EnOcean 868 MHz (EPACA) EnOcean 902 MHz (EPACU)
Dimensions (L x W x D)	160mm x 60mm x 37mm (6.30" x 2.35" x 1.47")
Weight	125 g (4.4 oz.)
Mounting Height	2-3 m (7-10 ft.) recommended
Environment	Indoor use only! 20% to 95% relative humidity (non-condensing). Operation 5°...30°C (41° to 86°F), Storage -10°...+40°C (14° to 104°F).
Agency Compliance	RoHS, CE, RE-D

# Internet of Things – IP / Cloud connectivity using Gateway

