



WATTPEER

Your green energy platform

Enabling P2P sale of renewable
electricity for smart communities

Team 39



Meet our Hackers

Team Hack The Globe 39



Martin Page

Martin is a Bioinformatics Master student at the University of Manchester, UK, with an advanced degree in experimental biology from Stellenbosch, South Africa.



Natalia Nowak

Natalia is a 3rd year dual degree Bachelor student in Business Administration and Data Analytics at IE University, Spain.



Leonardo Tartuferi

Leonardo is a 1st year Master in Management student at HEC Paris, France, with a degree in Economics and Finance at Bocconi University in Milan.



Elie El Hajj

Elie is a 4th year economics students double minoring in business and international law at the American University of Beirut, Lebanon.

533

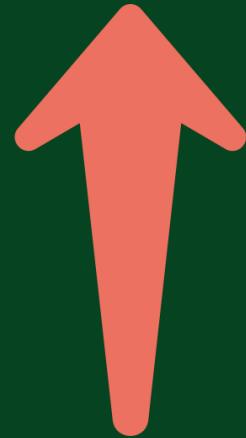
Mt CO₂e

Emissions from electricity and
heat used in buildings in EU

18%

of EU emissions

Comes from generating
power for buildings use



+300%

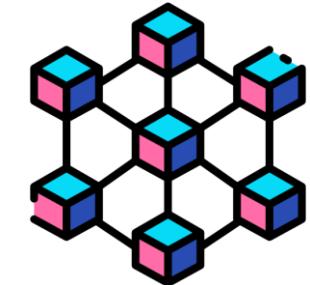
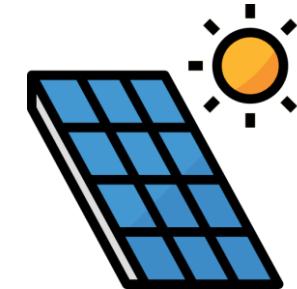
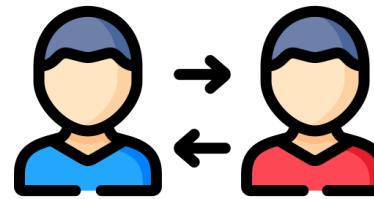
Growth solar panel
Installation in the last decade in EU



Presenting



WATTPEER
Your green energy platform



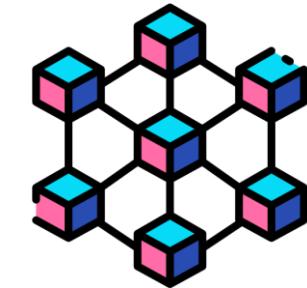
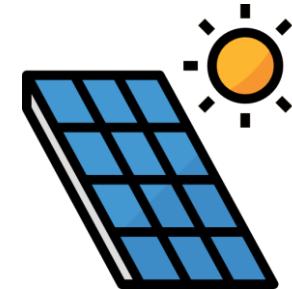
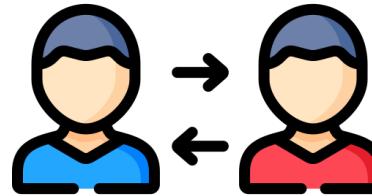
WattPeer is an App that enables the peer-to-peer sale of renewable electricity by different prosumers, technically supported by blockchain.

Presenting



WATTPEER
Your green energy platform

WattPeer is an App that enables the peer-to-peer sale of renewable electricity by different prosumers, technically supported by blockchain.



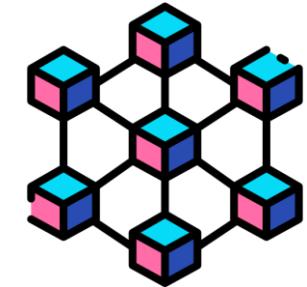
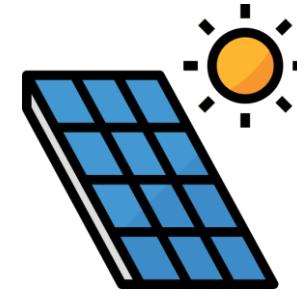
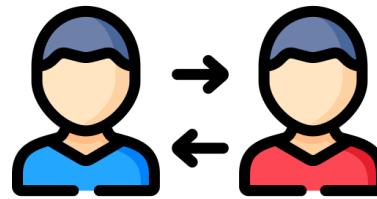
By providing 60% greater value to the sale of renewable electricity, we aim at fostering PV development.

Presenting



WATTPEER
Your green energy platform

WattPeer is an App that enables the peer-to-peer sale of renewable electricity by different prosumers, technically supported by blockchain.



By providing 60% greater value to the sale of renewable electricity, we aim at fostering PV development.

But how is this
possible?

Prosumer



Produces renewable energy
from a solar panel system

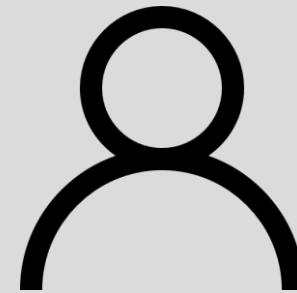
Must sell excess capacity
to the grid at

€0,15/kWh

Before



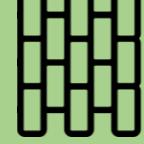
Consumer



Consumes energy from the grid,
coming mainly from fossil fuels.

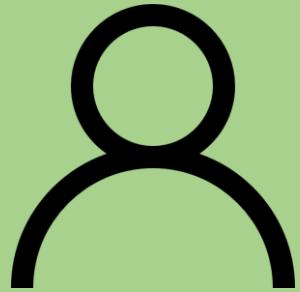
The average buying price
floats around

€0,25/kWh



After

Prosumer

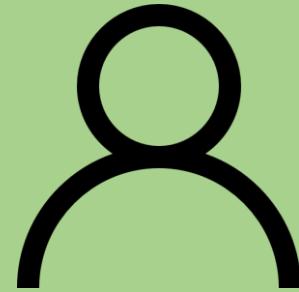


Produces renewable energy from a solar panel system

Can now sell his excess capacity directly to consumers in his local community

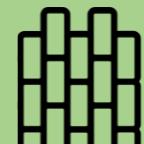


Consumer

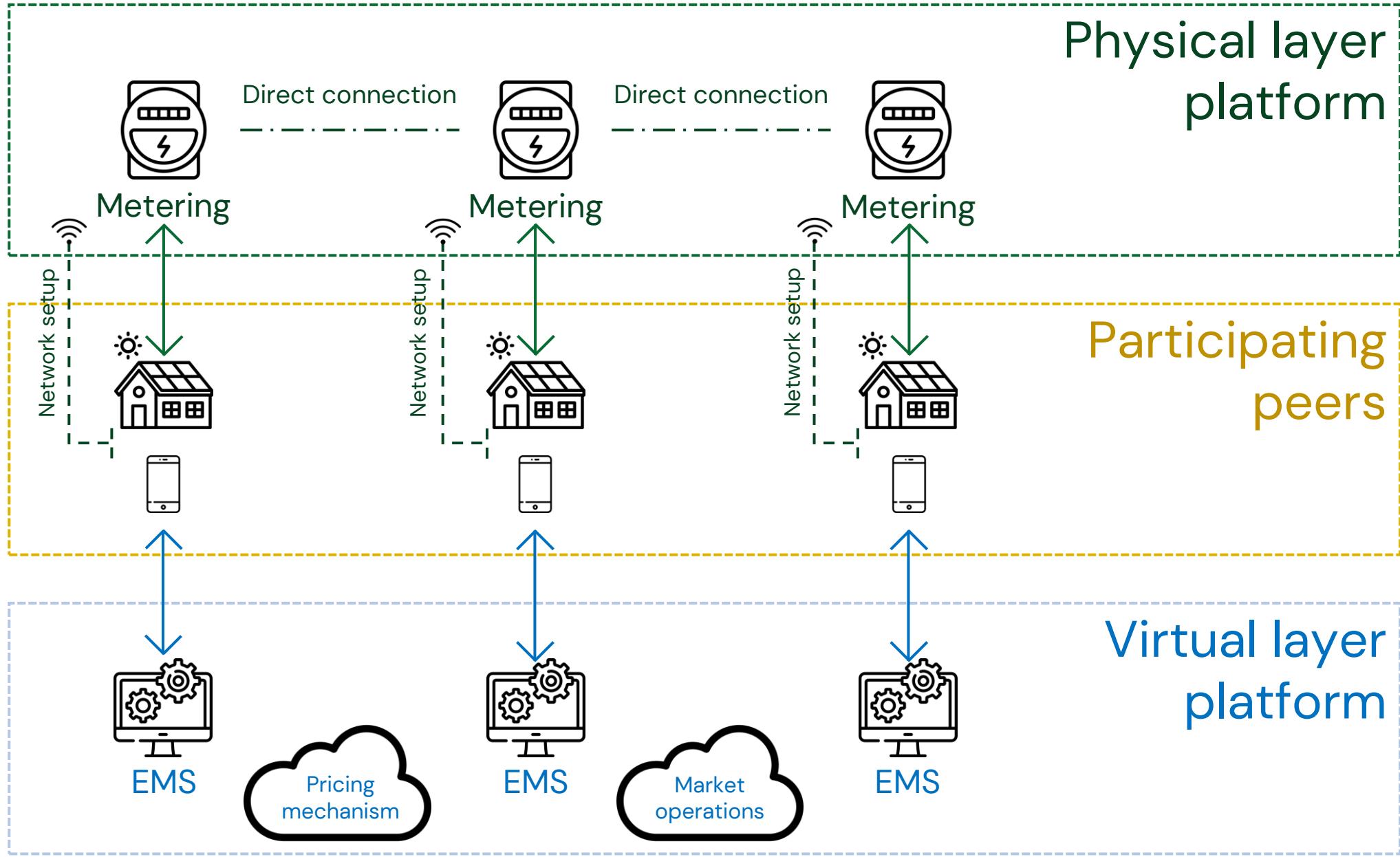


Continues to consume energy from the grid.

Now has the ability of buying cheaper, renewable, locally produced energy from his local community



Problem
Solution
Demonstration
Market
Impact





Martin

He has a 5-kW system on his roof, produces 6250 kWh of energy each year, but needs only 2400.



 `create_user(username='martin', password='marty123', meter='smart_martin', loc=Italy)`
New user with id 'martin' and smart meter id 'smart_martin' added to user database



What happens if they both download WattPeer?



Leonardo

He buys energy from the grid because he doesn't have solar panels.



 `create_user(username='leonardo', password='leo123', meter='smart_leo', loc=Italy)`
New user with id 'leonardo' and smart meter id 'smart_leo' added to user database

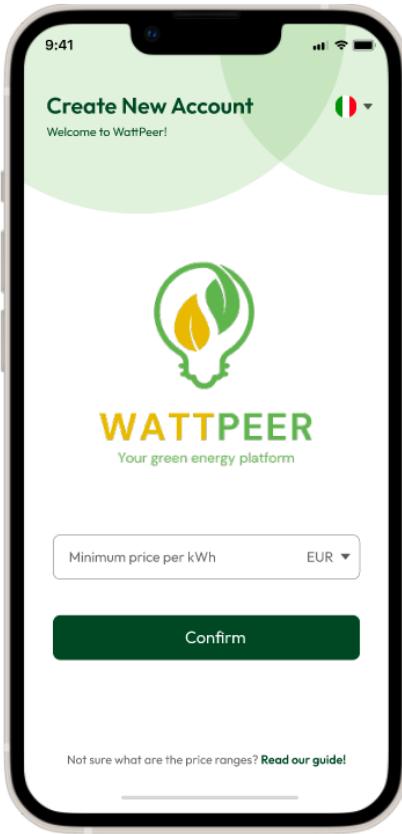
Problem

Solution

Demonstration

Market

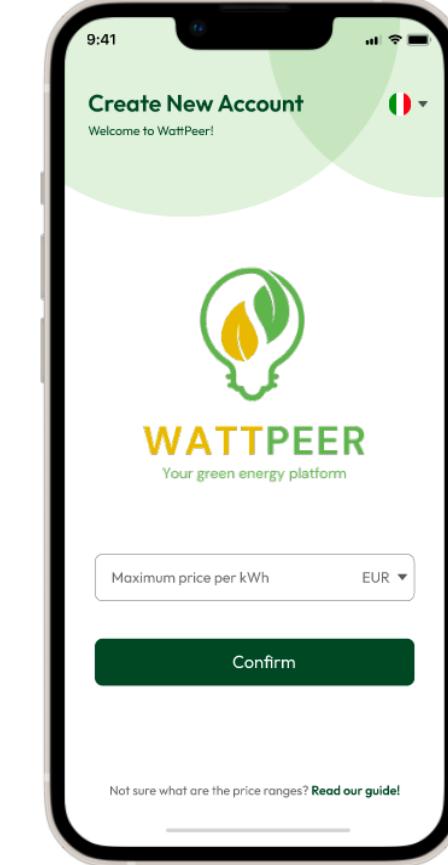
Impact



Martin sets his minimum selling price.



```
update_user_settings(username='martin',  
role='supplier', price=0.15)  
Role (supplier) and price (0.15) updated for martin
```



Leonardo sets his maximum buying price.



```
update_user_settings(username='leonardo',  
role='buyer', price=0.17)  
Role (buyer) and price (0.17) updated for leonardo
```

Problem

Solution

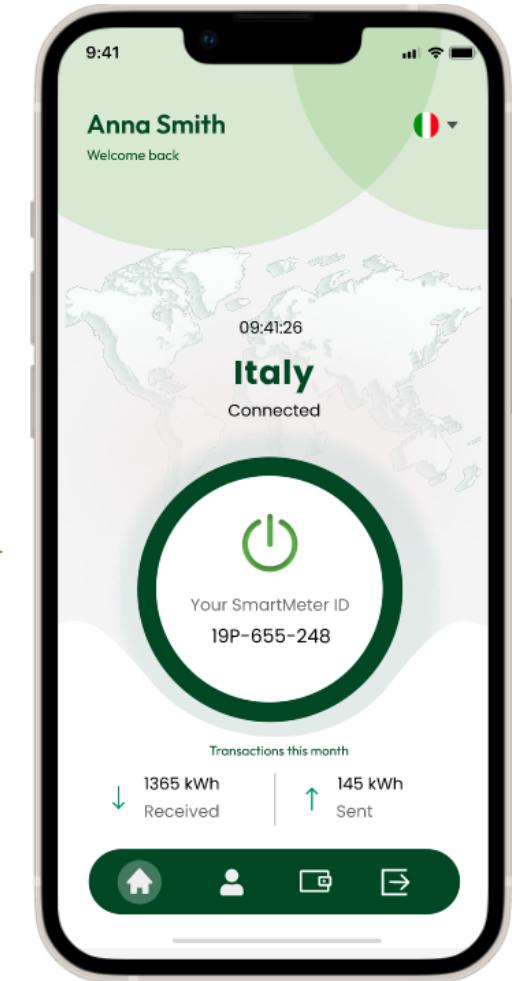
Demonstration

Market

Impact



When Smart Meter detects an excess, the app automatically looks for the match.



When Martin has excess energy, Leonardo enjoys cheaper, more sustainable energy source.

`create_offer('martin', 'supplier', 'energy'=5)`
New supplier offer from smart_martin added to orderbook

`match_offer()`
smart_martin can meet the full energy request from smart_leo of 3 kW.
Transaction will occur at 0.17 EUR/unit.
`execute_smart_contract()`

`create_offer('leonardo', 'buyer', 'energy'=3)`
New buyer offer from smart_leo added to orderbook

They are connected!

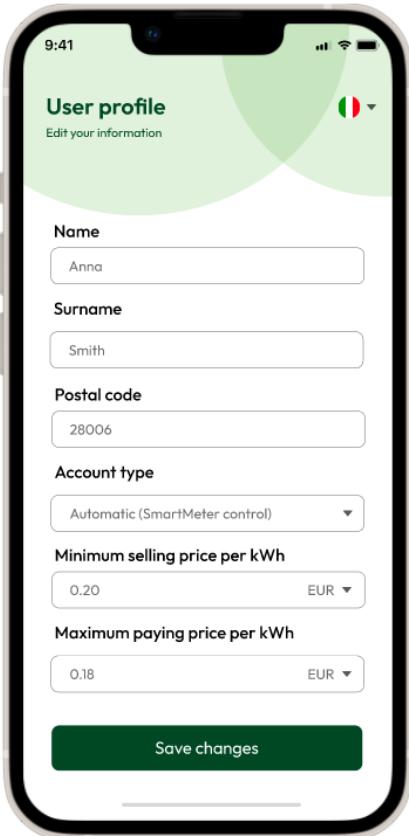
Problem

Solution

Demonstration

Market

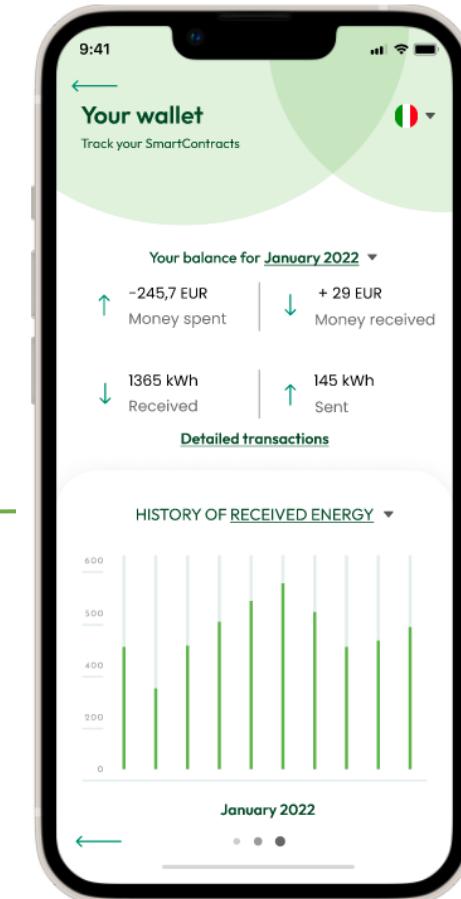
Impact



They can edit their user profile and set new prices any time.



Main interface's functionality



They can track their expenses and transaction from the app's wallet.

~25 TWh

Solar energy produced in Italy in 2020

~10 TWh

Produced by small systems of less than 200 kW

~3 TWh

Produced in small communities

7%

CAGR



Problem

Solution

Demonstration

Market

Impact

Problem

Solution

Demonstration

Market

Impact



Martin

He has a 5-kW system on his roof,
produces 6250 kWh of energy each
year, but needs only 2400.

Without



WATTPEER

€540/year

Selling excess electricity
to the grid

+60%



Makes €36
(€0,01 / kW)

With



WATTPEER

€864/year*

Selling excess electricity
to local community

*assuming seller seizes
all additional value



With



WATTPEER

€100 mil/year

Additional value added for small
communities

For



WATTPEER

€10 mil/year

Revenues from charging a
€0,01/kW fee for using the
platform





Encouraging local consumption of energy



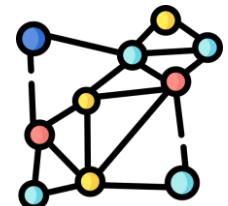
Encouraging production of green energy



Empowering small communities



Raising awareness on climate change issues



Fostering the creation of microgrids



Providing data for the balancing of the grid





WATTPEER

Your green energy platform

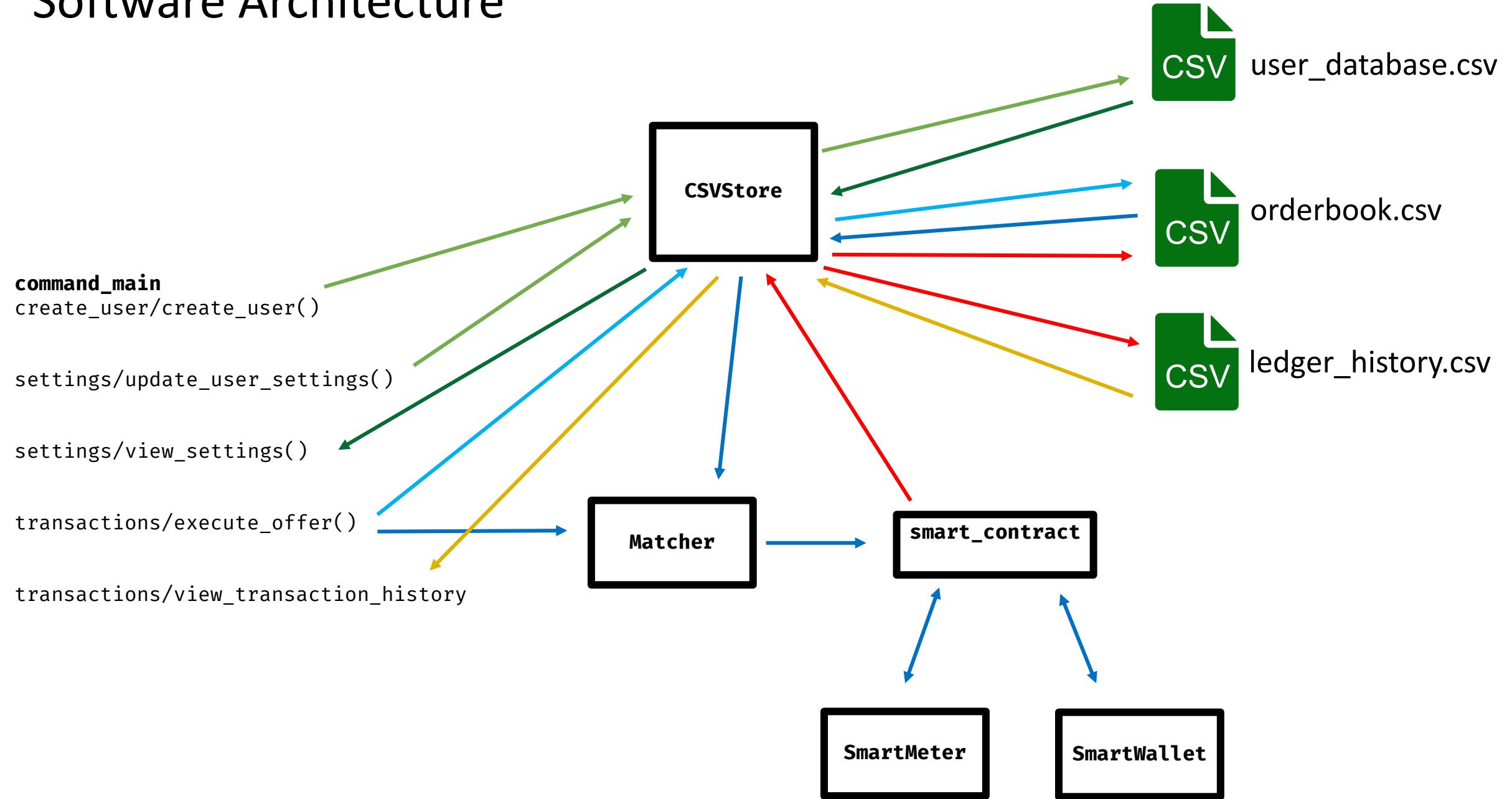
Thank you for your attention



Other App Pages



Software Architecture



Command Line Execution of Prototype (1)

```
> python .\smart_match.py signup --username martin --password martin123 --meter_id smartmartin --location Italy  
New user with id 'leonardo' and meter id 'smartmartin' added to user database.
```

```
> python .\smart_match.py signup --username leonardo --password leo123 --meter_id smartleo --location Italy  
New user with id 'leonardo' and meter id 'smartleo' added to user database.
```

```
> python .\smart_match.py signup --username leonardo --password leo123 --meter_id smartleo --location Italy  
ValueError: A user with name "leonardo" already exists.
```

```
> python .\smart_match.py signup --username natalia --password nat123 --meter_id smartmartin --location Italy  
ValueError: A meter with meter id "smartmartin" already exists
```

```
> python .\smart_match.py update_settings --username martin --password martin123 --role supplier --price 0.15  
Role (supplier), price (0.15), start (2022-03-20) and end (None) date updated for martin.
```

```
> python .\smart_match.py update_settings --username leonardo --password leo123 --role buyer --price 0.17  
Role (buyer), price (0.17), start (2022-03-20) and end (None) date updated for leonardo.
```

```
> python .\smart_match.py view_settings --username martin --password martin123  
username password location meter_id role price start_date end_date  
0 martin martin123 Italy smartmartin supplier 0.15 2022-03-20 NaN
```

```
> python .\smart_match.py view_settings --username leonardo --password leo123  
username password location meter_id role price start_date end_date  
0 leonardo leo123 Italy smartleo buyer 0.17 2022-03-20 NaN
```

Command Line Execution of Prototype (2)

```
> python .\smart_match.py supplier --username martin --password martin123 --energy 5
```

New supplier offer from smartmartin added to orderbook.

Currently there are no buy offers in the orderbook. No match can be made at present.

```
> python .\smart_match.py buyer --username leonardo --password leo123 --energy 3
```

New supplier offer from smartmartin added to orderbook.

New buyer offer from smartleo added to orderbook.

smartmartin can meet the full energy request from smartleo of 3.0 kW. Transaction will occur at a unit price of 0.17 EUR.

Seller authenticated. Energy available.

Buyer authenticated. Money available.

smartmartin's energy balanced updated by -3.00 kW.

smartleo's energy balanced updated by 3.00 kW.

smartmartin's wallet balanced updated by 0.51 EUR.

smartleo's wallet balanced updated by -0.51 EUR.

Removing fulfilled orders from orderbook:

```
  meter_id location  role energy price end_date
```

```
1 smartleo Italy buyer 0.0 0.17   NaN
```

Recorded transaction between smartleo (buyer) and smartmartin (supplier) for 3.0 kWh at 0.17 EUR per kWh (total: 0.51 EUR).

Currently there are no buy offers in the orderbook. No match can be made at present.

Command Line Execution of Prototype (3)

```
> python .\smart_match.py history --username martin --password martin123
```

No buyer history.

Supplier History:

	buyer	supplier	price	energy	total_price	date
0	smartleo	smartmartin	0.17	3.0	0.51	2022-03-20

```
> python .\smart_match.py history --username leonardo --password leo123
```

Buyer History:

	buyer	supplier	price	energy	total_price	date
0	smartleo	smartmartin	0.17	3.0	0.51	2022-03-20

No seller history.

Financial data

Market data				Pricing decisions				Assumptions	
Average price of system (€/W)	0,3			Price charged per kWh traded		0,01		% energy consumed in loco	
% increase N of systems 2018-2020	13,8%					% energy sold to grid		40%	
N of secondary transmission stations	447250			Price grid energy		0,25		% energy sold to grid	
% energy consumed in loco	40%			Selling price to grid		0,15		CAGR PV	
% energy sold to grid	60%							% small communities	
								30%	
								% adoption	
								60%	
								% increase in renewable capacity	
Types of systems		Max price for system	N of systems 2018	Energy capacity in 2018 (kW)	Energy produced in 2018 (GWh)	N of systems 2020	Energy Capacity in 2020 (kW)	Energy produced in 2020 (GWh)	
< 3 kW		3500	279681	760000	854	318277	813200	940	
3 - 20 kW		30000	476396	3500000	3934	542139	3745000	4331	
20 - 200 kW		400000	54209	4200000	4721	61690	4494000	5197	
200 kW - 1 MW		1200000	10878	7400000	8317	12379	7918000	9157	
1 - 5 MW		-	948	2300000	2585	1079	2461000	2846	
5 - 10 MW		-	146	1100000	1236	166	1177000	1361	
> 10 MW		-	43	896000	1007	49	958720	1109	
Total			822301	20156000	22654	935779	21566920	24942	
Target segment									
Types of systems		Max price for system	N of systems 2018	Energy capacity in 2018 (kW)	Energy produced in 2018 (GWh)	N of systems 2020	Energy Capacity in 2020 (kW)	Energy produced in 2020 (GWh)	
< 3 kW		3500	279681	760000	854	318277	813200	940	
3 - 20 kW		30000	476396	3500000	3934	542139	3745000	4331	
20 - 200 kW		400000	54209	4200000	4721	61690	4494000	5197	
Total			810286	8460000	9508	922105	9052200	10469	
Revenues/year	11.306.314 €								
Customer gain/year	101.756.826 €								
Owner of 5kW system									
Energy sold/year	3850								
Net gain	346,5								