

MeshDApp: Blockchain-enabled Crowdsourced Internet Access Platform for Mesh Networks

Emmanouil Dimogerontakis
Mennan Selimi
Sergio Mosquera-Dopico
Leandro Navarro
(leandro.navarro@upc.edu)

Universitat Politècnica de Catalunya
Barcelona

Routing of data + economic flows

- Forwarding of data traffic
- Forwarding of economic traffic
- In an operational and sustainable network
- Inspired by the economic compensation in the guifi.net community network

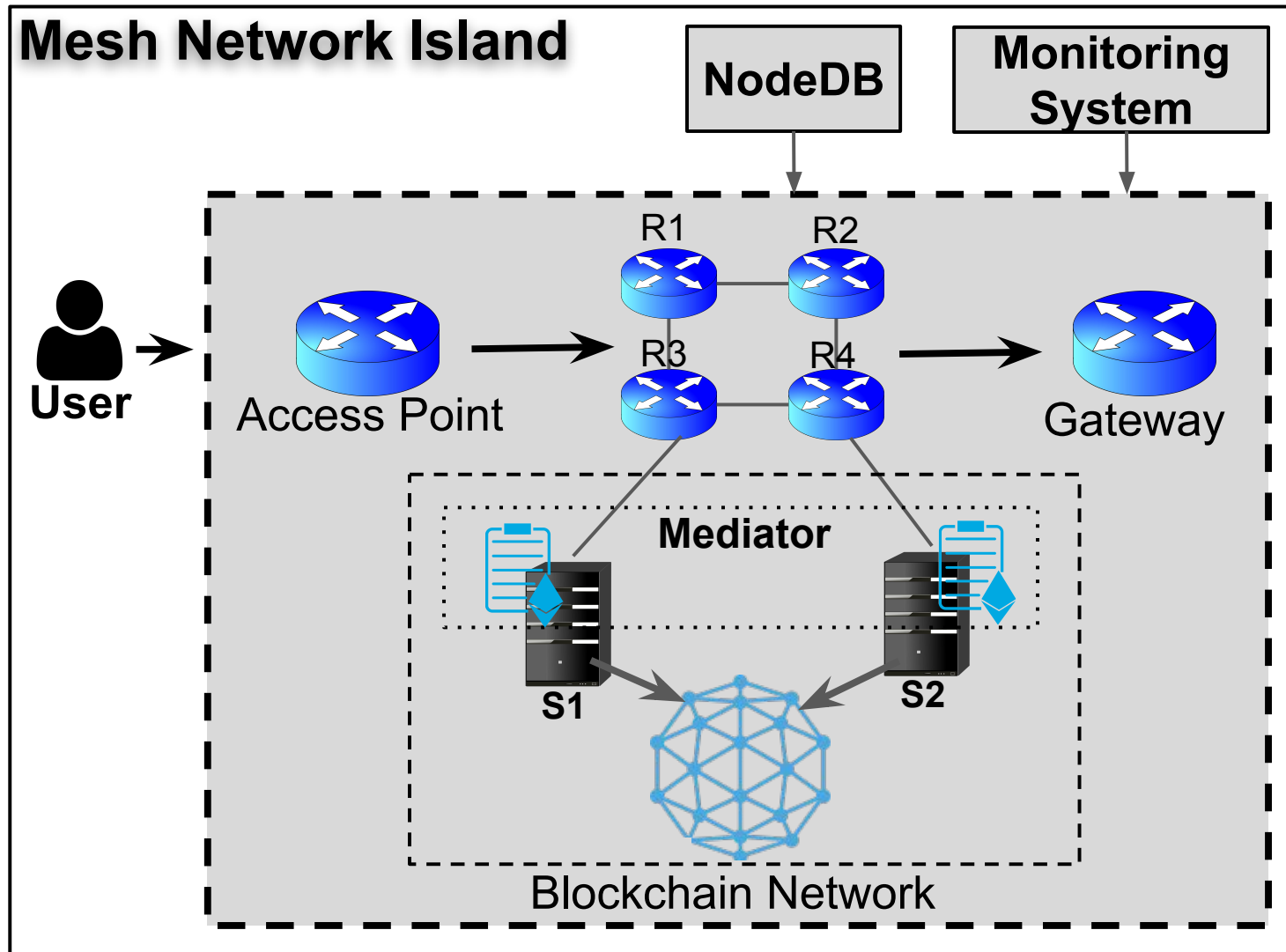
Contribution

- An **automated** mechanism where diverse participants, resource providers and consumers, can pool these resources
- with the confidence that the **consumption** of resources is accounted **fairly**,
- and that these calculations and money transfers are **automated, irreversible, inexorable** and shared across different participants,
- to avoid the cost, delays, errors and potential mistrust from manual accounting and external payments.

Concepts

- Automation = occurring as a necessary consequence
- Fairness = impartial, no discrimination
- Irreversible, irrevocable, unalterable
- Inexorable = inevitable

Conceptual architecture



Economic compensation

- Fairly distribute the economic value of the connectivity supplied by the network among providers: the nodes and services $\{AP, R, GW, S\}$ who contributed to deliver that value.
- **Retailers** (service providers) get Funds in exchange of forwarded Bytes:

$$Collected(t) = \sum_{r=1..R} \sum_{c=1..C} (B_{r,c}, F_{r,c}) = (B, F) \text{ in period } p_t$$

where : r is a retailer among the set R

c is a customer among the set C

Wholesale

$$Owed(t) = \sum_{0 < f < F} Settle_n(B(t, f), F(t, f)) \text{ at period } p_t$$

where : f is a forwarder among the set F

n is a settlement event for period p_t

Mediator

Payments spread across the value/service chain of network devices, achieved according to idea of fairness of settlements, such as proportional share or Shapley value.

$$\text{maximize}_{c, f, t} U_i \quad (\forall \text{ consumer } c, \text{ device } f, \text{ time } t)$$

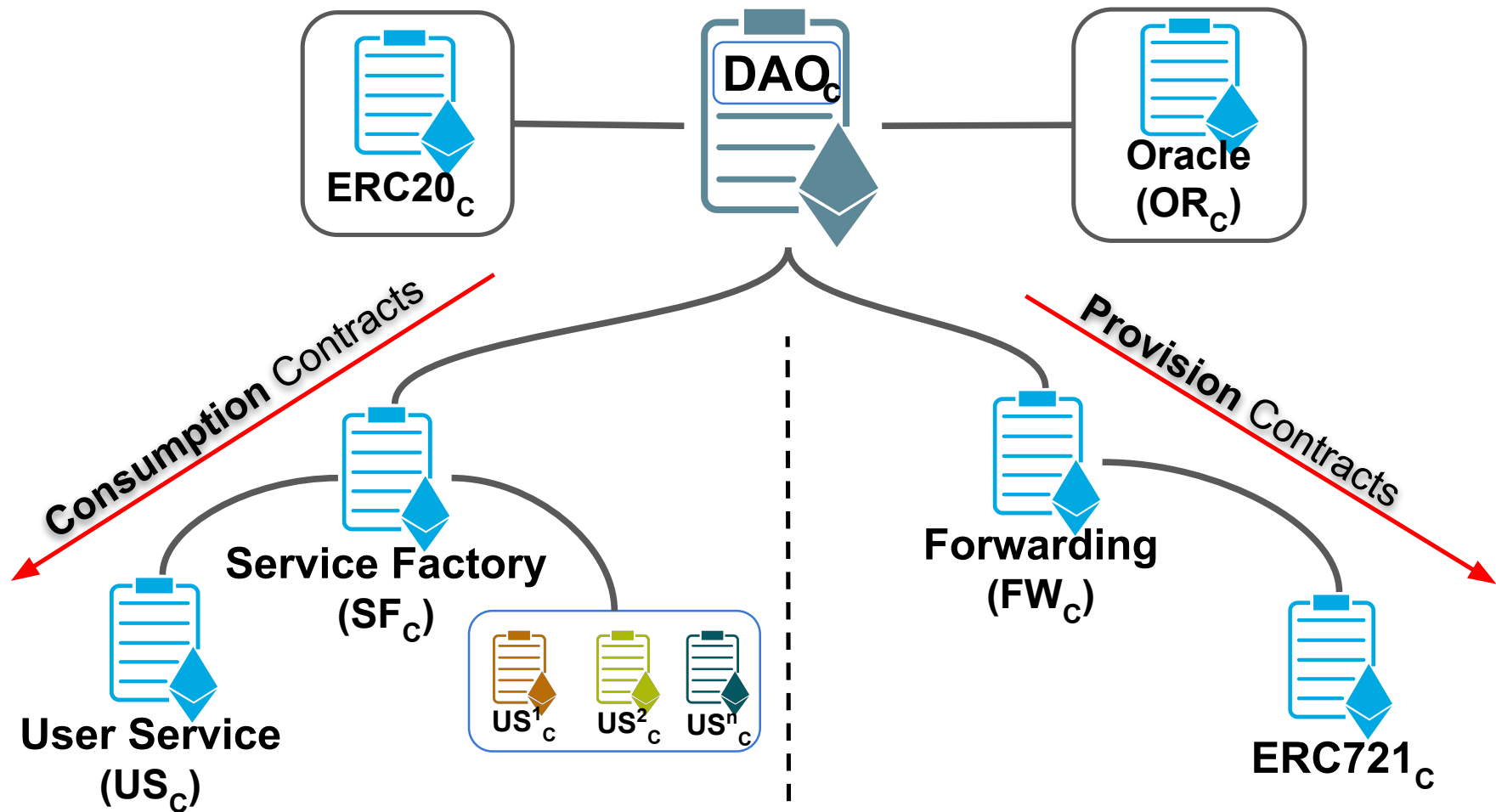
subject to

$$U(c, t) > 0, c = 1, \dots, C,$$

$$U(f, t) > 0, f = 1, \dots, F,$$

$$Owed(f, t) - Price(f, t) \geq 0, t = 0, \dots, T$$

Smart contracts



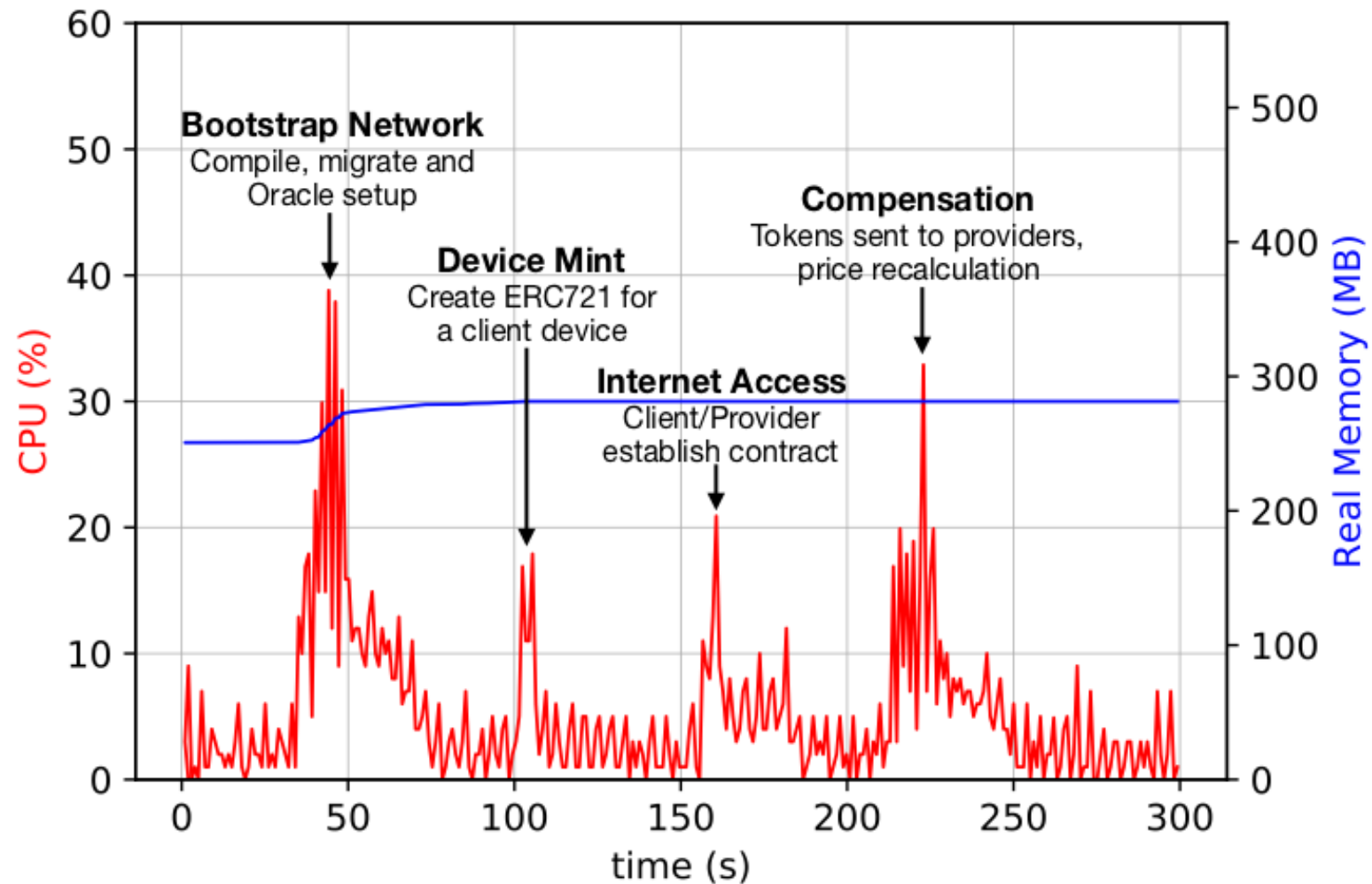
Contracts

- Decentralized Autonomous Organization
 - Fungible connectivity tokens ERC20
 - Non-fungible device ownership tokens ERC721
 - Oracle
 - Service Factory
 - User Service contract
 - Forwarding Contract
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- *Local Ethereum PoA network (permissioned)*

Processes

- Bootstrapping a new network
- Registering (Minting) a new device
- Establishing an Internet connection
- Economic compensation

Implementation



Value flows



Discussion

- Coupling of Data and Value Flows
- Service pricing and incentives
- Diversity and quality
- Private Blockchain pros and cons

Conclusions

- Automated routing of data + economic flows
- Future:
 - Return of investment
 - Cost vs profit oriented
 - Charging policies, differentiation?
 - Pilots
 - Token economy, local currencies
 - Check requirements for identity, anonymity, authorization, traceability