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Stream: Future Networked Systems

Chipnet: Enabling Large-scale Backscatter Network with Processor-free Devices:
https://dl.acm.org/doi/10.1145/3544492
This paper introduced a chipnet system that can allow hundreds of processor-less devices to communicate over long distances with a single gateway. The aim is to support large scale deployment without needing power hungry or complex machines, only using backscatter networks.

Challenged Setting:
A challenged setting in the context of this paper is anything that limits the communication ability of the processor free chipnets correctly. For example, signals could be blocked by the wall leading to a no line in sight conditions beyond the scope of testing. A lot of devices could try to communicate at the same time, sending signals concurrently leading to collision. Also, devices that are too far away could experience degraded signal quality.

i) The three key findings for me were the processor free MAC layer protocol that supports broadcasting downlink data while also concurrently managing a lot of devices. Apart from that, it significantly improves the coverage upto almost 5 times compared to R2B networks. Lastly, because it's a processor free architecture, it allows a lot of devices to transmit together.
ii) The three key technology insights gained were the use of a PIE-SPI lightweight circuits to reduce the cost. It also used chirp signals to handle interference effectively. The communication was also made bidirectional to handle downlink, uplink and synchronization.
iii) Since the architecture is processor free, it can accommodate hundreds of concurrent devices without increasing the cost which makes it very scalable. Hardware simplification also reduces costs significantly making it very scalable for bigger infrastructures and large scale deployments. Generally throughput increases the more devices you add, but with this Chipnet design the network can handle more tasks as it grows.

A Hierarchical Namespace Approach for Multi-Tenancy in Distributed Clouds:
https://ieeexplore-ieee-org.elib.tcd.ie/stamp/stamp.jsp?tp=&arnumber=10443611&tag=1
This paper discusses the impact of multi-tenancy in distributed micro clouds, edge networks and virtual cloud environments and how it is a challenge. This paper aims to solve it by introducing hierarchical namespacing, which is a way to redistribute resources and storage dynamically.

Challenged Setting:
Real world performance and scalability aren't tested, multi-cloud doesn't have a lot of resources available therefore scaling multi-tenancy is a challenge. Some resources might be more rigid and have constraints or bounds. Adoption with other cloud providers is also a challenge.

i) The key contributions I find valuable are the introduction of the hierarchical namespace model that partitions and isolates the resources (like CPU, GPU, etc) dynamically, making it easier to share with other tenants. Secondly, the introduction of a new protocol for security profile management. Lastly, bounding these security profiles to namespaces.
ii) The use of graph rewriting provides a mathematical way to distribute resources. The Multiparty Asynchronous Session Types (MPST) protocol allows for verification and isolation. Namespace abstraction enables context switching and accurate resource distribution across distributed clouds.
iii) Using the hierarchical namespace tree we can scale resources in isolation and avoid naming collisions and noisy neighbor problems, the MPST protocol also reduces risk of deadlocks thus making it more scalable. The security profile management technique reduces manual overhead and bottlenecks which can thus be extended in all distributed systems.