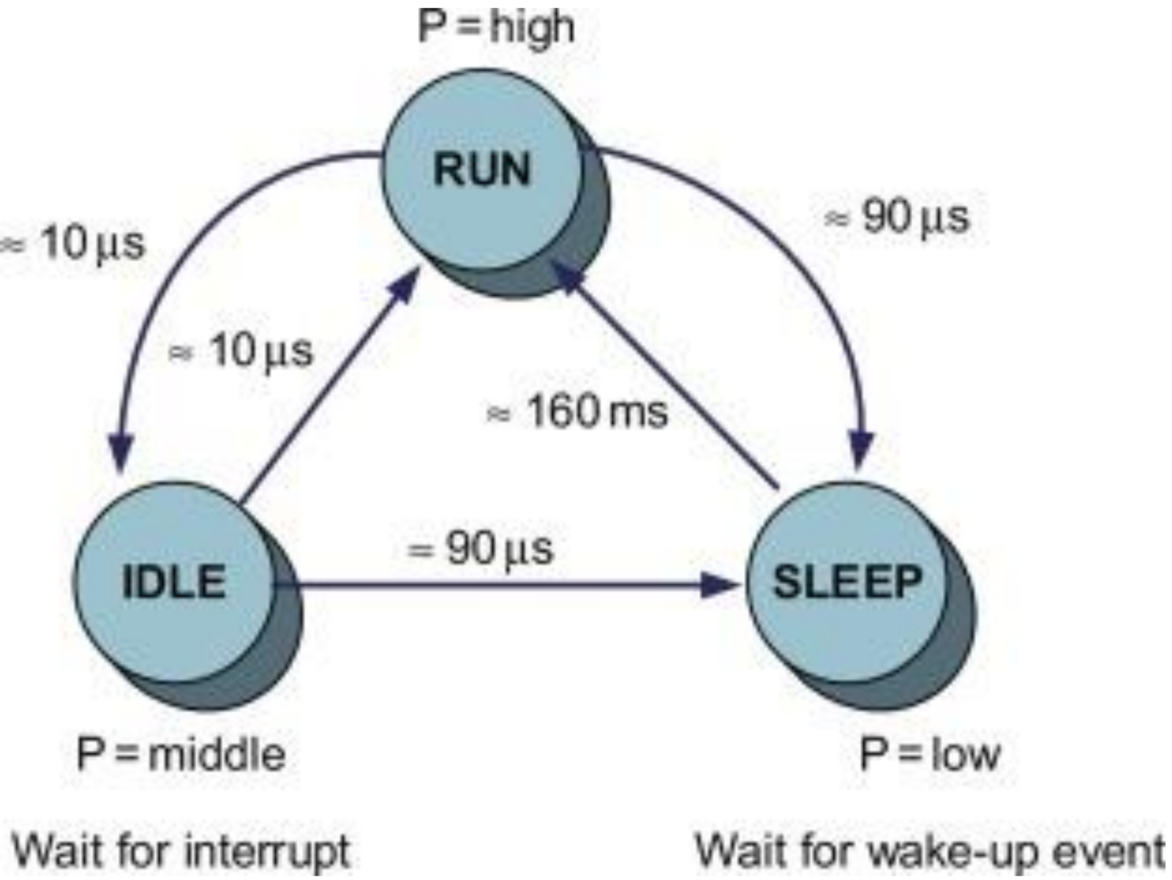
CODECO

ENERGY EFFICIENCY IN EDGE-CLOUD

Funded by
the European Union

INTRODUCTION TO ENERGY EFFICIENCY IN EDGE-CLOUD

In the rapidly evolving domain of **edge-cloud computing**, energy efficiency is a significant concern. The increasing number of edge devices and cloud servers leads to higher energy consumption, making it essential to optimise energy usage. This presentation will explore various techniques and strategies aimed at enhancing energy efficiency in edge-cloud environments, focusing on effective resource management.



DYNAMIC POWER MANAGEMENT (DPM)

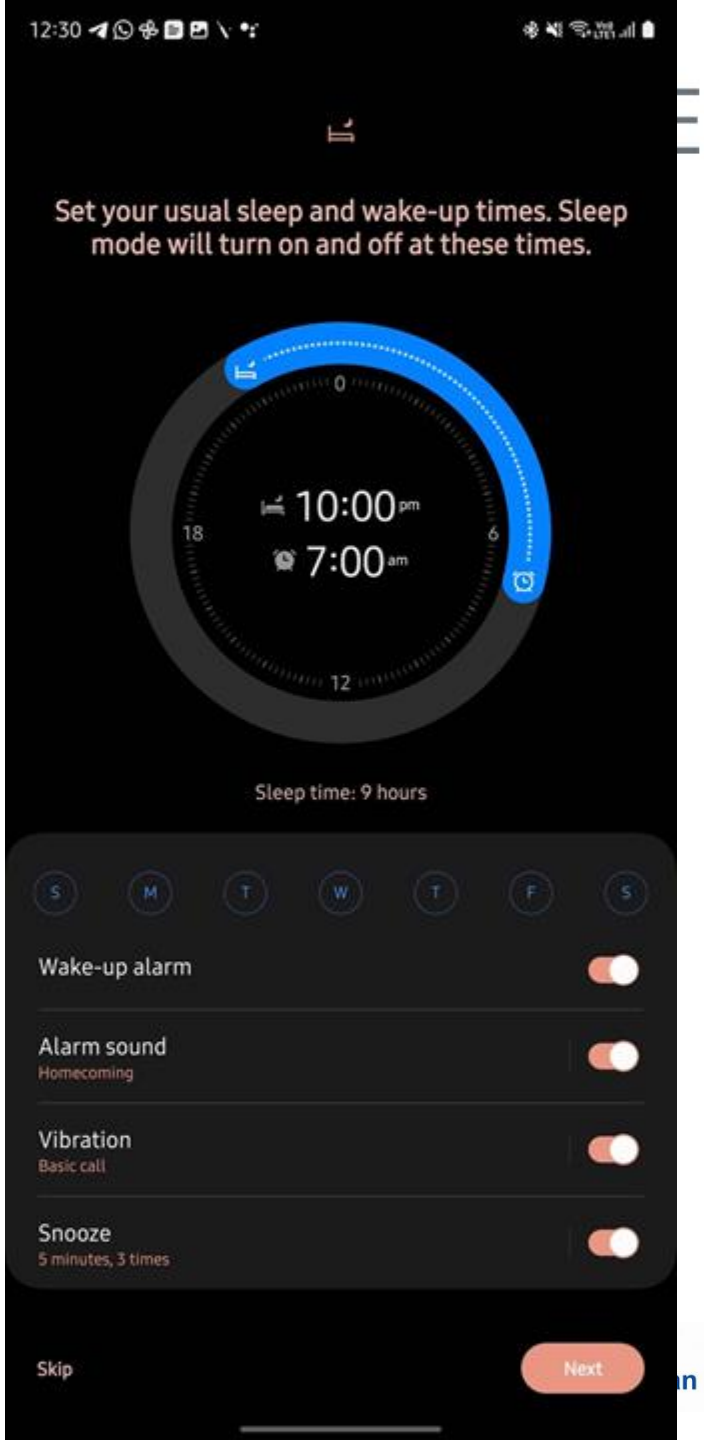
Dynamic power management is crucial for achieving energy efficiency in edge-cloud systems.

- This technique involves adjusting the **power states** of edge devices and cloud servers based on current workload requirements.
- By utilising different power states—active, idle, and sleep modes—DPM effectively reduces unnecessary energy consumption.

Funded by the European Union

SLEEP MODE SCHEDULING

Sleep mode scheduling strategically puts edge devices and cloud servers into **sleep mode** during periods of inactivity. By intelligently scheduling these sleep periods according to workload fluctuations, idle devices conserve energy without compromising overall system performance. This approach is particularly beneficial for edge devices with **intermittent workloads**.



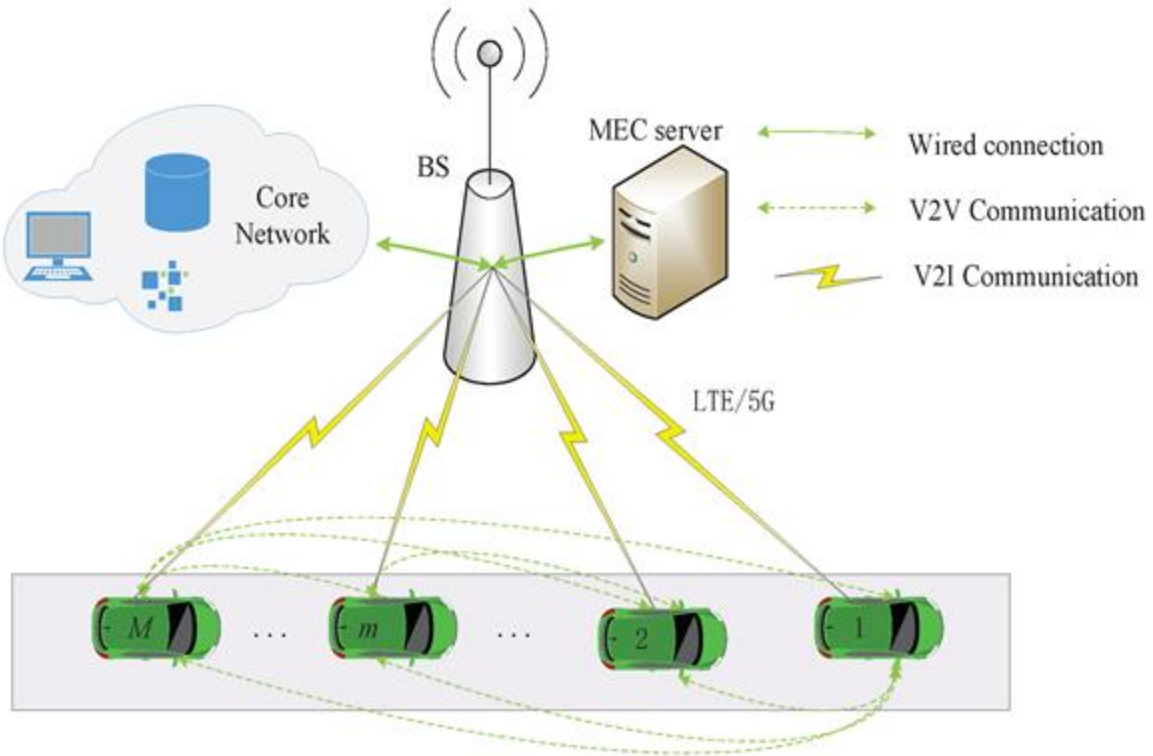
RESOURCE CONSOLIDATION

Resource consolidation focuses on dynamically consolidating tasks onto fewer active devices or servers. By mapping tasks to a smaller number of powerful devices, energy consumption is minimised. This technique leverages the fact that operating a few high-capacity devices is more energy-efficient than running many less powerful ones.

Funded by the European Union

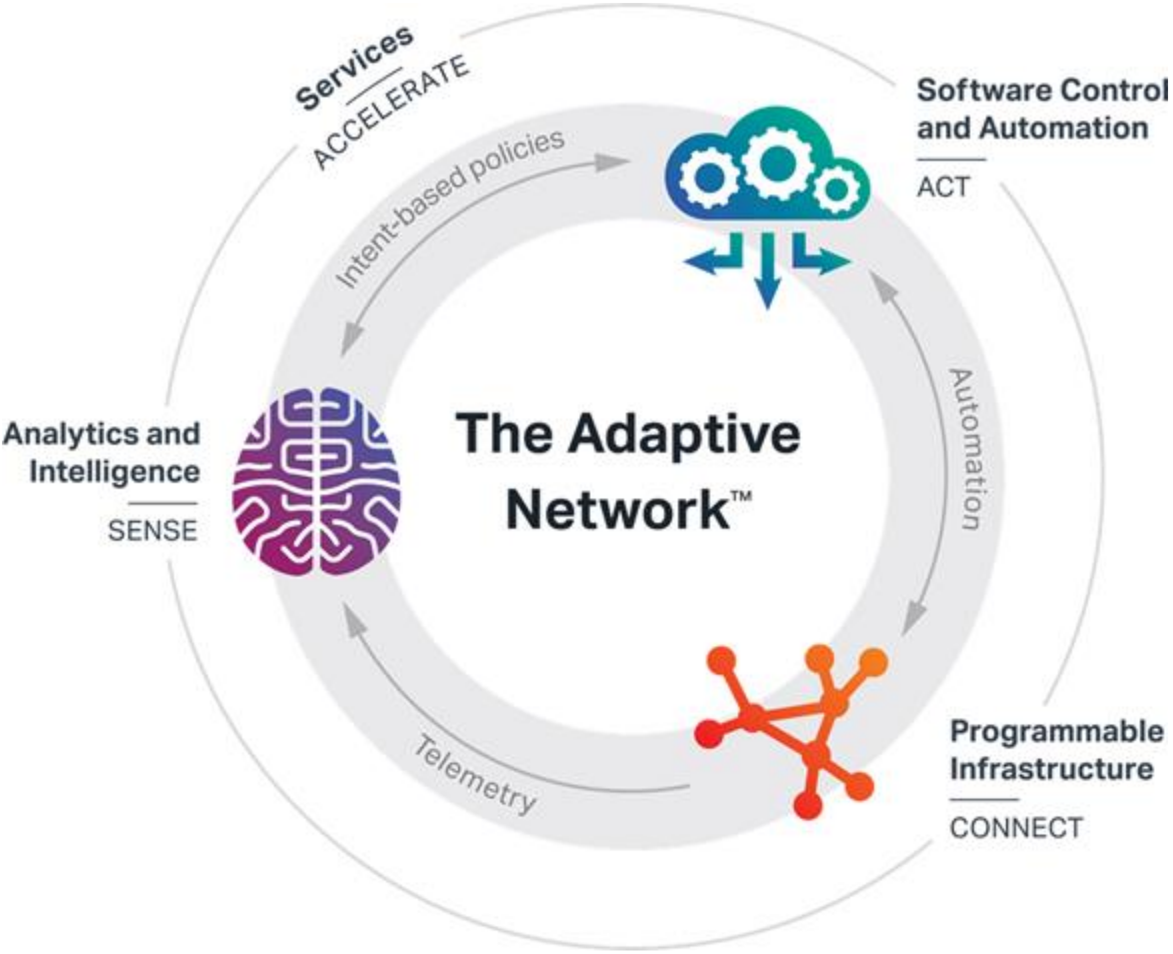
TASK OFFLOADING

Task offloading involves migrating resource-intensive tasks from edge devices to cloud servers with greater processing capabilities. This technique significantly reduces energy consumption on edge devices while allowing for efficient handling of demanding workloads. It presents an effective strategy for minimising the **energy footprint** of edge devices.



Funded by the European Union

ADAPTIVE NETWORKING



Adaptive networking techniques optimise energy consumption across network resources in edge-cloud environments. By dynamically adjusting network configurations based on workload patterns, energy waste from unused or inefficient components is minimised. Approaches such as **traffic routing**, link sleeping, and network scaling contribute to optimal energy utilisation.

Funded by the European Union

PREDICTION AND OPTIMISATION ALGORITHMS

Employing machine learning algorithms and predictive models can enhance energy efficiency by estimating future workload patterns. Accurate predictions enable edge devices and cloud servers to dynamically adjust their power states and resource allocation strategies, optimising overall energy efficiency.

CODECO

MONITORING AND OPTIMISATION TOOLS

Effective energy management in edge-cloud systems requires comprehensive **monitoring and optimisation tools**.

These tools provide real-time insights into energy consumption, workload patterns, and system performance.

Analysing this data allows administrators to identify inefficiencies and make informed decisions to enhance the system's energy performance.

Funded by the European Union

CONCLUSION

Achieving energy efficiency in edge-cloud environments is vital for reducing energy consumption, lowering operational costs, and promoting sustainable computing practices.

Techniques such as dynamic power management, sleep mode scheduling, resource consolidation, task offloading, adaptive networking, and predictive optimisation play a crucial role in this endeavor.

Funded by
the European Union