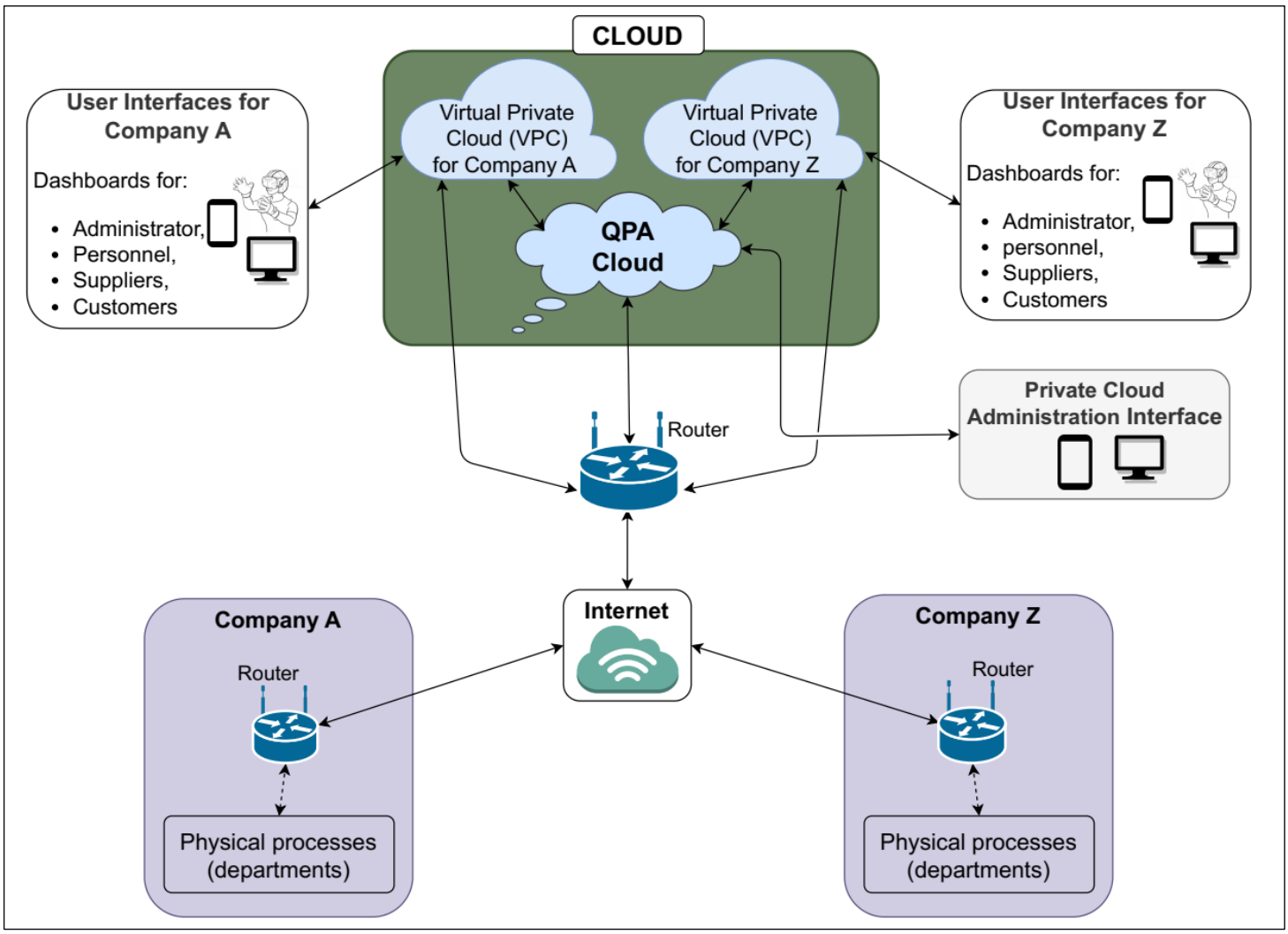
Project:
Real-Time Quality Assurance and Extended Reality

CQPA: A Centralized Cloud-based system for Quality and Performance Assurance in Distributed Companies

This project will incorporate a system and method for real-time monitoring and control of environment, product quality, process health and process performance in physical processes like those found in supermarkets, grocery stores, or any other physical process found in supply chain including procurement, manufacturing, inventory and distribution processes, across multiple institution that are geographically distributed in different locations. It will be a Data-driven Quality and Performance Assurance (DQPA) system that leverages IoT devices, cloud-based tools, Artificial Intelligence programs, and Extended Reality for four main objectives: (1) Collect, store, process, analyze, and interpret data related to environment, product quality, process health, and process performance parameters. This comprehensive data analysis is explored to provide valuable insights into the current states of these parameters and enables accurate future predictions. (2) Based on these insights, appropriate measures can be suggested to ensure the highest possible product and service quality, enhanced environment quality, as well as optimal health and performance of physical processes. (3) Introduce new techniques for controlling and enhancing environment, process health, process performance and product quality capable of recommending effective quality control measures based on the cause-and-effect analysis (CEA) methods. (4) Seamlessly integrate both the cyber and physical environments, enabling users to remotely control and interact with shop floors machines, leading to enhanced efficiency and productivity. By leveraging advanced, Digital Twin, XR, data analytics and cloud technologies, our framework will enable efficient decision-making and empowers institutions to proactively monitor and manage their remote operations across distributed locations. Therefore, the current solution will be particularly valuable for large corporations with multiple branches or any private institution aiming to support the manufacturing industry.


CLOUD
Virtual Private Cloud (VPC) for Company A
Virtual Private Cloud (VPC) for Company Z
QPA Cloud
User Interfaces for Company A
Dashboards for:
Administrator,
Personnel,
Suppliers,
Customers
User Interfaces for Company Z
Dashboards for:
Administrator,
personnel,
Suppliers,
Customers
Private Cloud Administration Interface
Router
Internet
Company A
Router
Physical processes (departments)
Company Z
Router
Physical processes (departments)

Project:

Far-Field Wireless Power Transmission (WPT)

Far-field wireless power transmission (WPT) is crucial for transmitting electrical power over long distances without the need for wired networks by employing radio frequency (RF) power, including microwaves and mm waves, or light-based methods like laser transmission. The push for WPT system advancements is driven by the demand for reliable power transfer to remote and inaccessible areas, such as mountainous terrains and islands, or harvesting solar energy in space. However, WPT systems still face several obstacles that impede their seamless integration, such as power efficiency concerns, restricted transmission range, and the need to maintain consistent power delivery under diverse environmental
conditions. This project aims to advance Microwave Power Transmission (MPT) systems, a subset of WPT using microwave radiation for power transfer. We will focus on enhancing Solid-state Power Amplifiers (SSPAs) within these systems. The primary goal will be to develop a system for wirelessly harvesting energy from the space and charging moving objects (cars, train, etc). Firstly, we will mitigate energy losses and parasitic capacitances in RF amplifiers, commonly arising between transistor terminals. Then, we will develop optimized antennas for meeting the effective and efficient wireless power transmission goals.