From ARCnet to Ethernet: A Middleware Approach for Interoperability in Legacy Industrial Networks

Introduction:
In the manufacturing sector, especially among SMEs, legacy equipment often relies on outdated network protocols such as ARCnet for communication between machines and subsystems. While ARCnet was widely used in the 1980s and 1990s, modern systems primarily use Ethernet. Many SMEs still depend on ARCnet-based systems, creating a significant barrier to digital transformation.

This thesis investigates middleware-based ARCnet-to-Ethernet protocol translation, enabling seamless interoperability, data collection, and process automation, while preserving legacy equipment.

Research Questions

1. How can ARCnet protocol messages be accurately and reliably translated to Ethernet protocol messages to enable seamless interoperability between legacy manufacturing equipment and modern networked systems?
2. What are the design and implementation requirements for a middleware solution that translates ARCnet token-passing messages to Ethernet-based communication?
3. How can the middleware ensure data integrity and real-time performance during protocol translation in legacy manufacturing systems?

Why This Project?
By developing a robust ARCnet-to-Ethernet protocol translation middleware, you will contribute to:

- **Interoperability:** Allowing seamless data exchange between legacy ARCnet devices and contemporary Ethernet-based systems.
- **Preservation of Equipment**: Extending the useful life of existing equipment, reducing the need for costly replacements.
- **Modernization Readiness**: Providing SMEs with a practical pathway to adopt Industry 4.0 technologies without disrupting current operations.

Expected Skills & Experience

- Familiarity with computer networks (OSI model, industrial protocols, Ethernet).
- Programming experience in C/C++ (preferably with embedded or low-level networking).
- Knowledge of real-time systems or middleware design is a plus.
- Interest in protocol translation and legacy system integration.

Supervision and Location

- This thesis will be carried out at FIP-AM@UT.

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