

# ADEEB ALQAHTANI

## Senior Software Integration Engineer | Technical Lead (R&D)

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## Summary

**Senior Software Integration Engineer** with 12+ years of experience leading **Research, Development, and Systems Integration** for high-stakes defense and aviation programs. Specialized in end-to-end software and hardware integration. Expert in low-latency C++ (17+) backend systems and real-time middleware. Proven in modernizing legacy hardware, upgrading systems, and deploying new solutions. Expert integrator of **Boeing, CAE, L3Harris, Thales, and Collins Aerospace** platforms.

## Experience

### Rheinmetall Arabia

Riyadh

#### Senior Software Integration Engineer | Technical Lead (R&D)

Nov 2024 – Present

- **R&D Strategy & Architecture:** Directed the full-lifecycle engineering of technical solutions, advancing concepts from initial R&D prototypes to fully operational, field-ready systems.
- **Technology Replacement:** Architected and deployed a proprietary, high-performance middleware suite from scratch to replace restricted foreign legacy systems, restoring full data sovereignty and eliminating external dependencies.
- **Reverse Engineering & Modernization:** Leading complex reverse-engineering initiatives to decode proprietary legacy protocols, enabling the integration of modern engineering solution with aging military hardware.
- **System-of-Systems Architecture:** Created framework that unifies simulation engines, defining new Interface Control Documents (ICDs) that allow complex, multi-vendor environments to function as a single entity.
- **Core Engine Development:** Engineered a custom data distribution engine using shared memory and lock-free queues, establishing a new internal standard for microsecond-latency communication in mission-critical loops.

### Saudia Academy

Jeddah

#### Flight Simulator Engineer | Integration Lead

Jan 2019 – Oct 2024

- **Complex Systems Integration:** Led the hardware-software integration of avionics, motion platforms, and visual systems.
- **Technology Transfer:** Collaborated with international OEMs to transfer technical knowledge and capabilities to local engineering teams during major system upgrades.
- **Diagnostic Research:** Resolved complex issues using software and hardware diagnostic tools.

#### Flight Simulator Engineer Maintenance Supervisor (D)

Jan 2024 – June 2024

- **Engineering Leadership:** Managed a team of technicians and engineers, instilling a culture of root-cause analysis.
- **Operational Research:** Analyzed performance data to predict component lifecycles and reducing operational downtime.
- **Safety & Standards:** Ensured technical compliance with aviation and safety standards (EASA/FAA) during system updates.

#### Full Flight Simulator Technician

Nov 2008 - Dec 2013

- **Technical Operations:** Maintained and supported the installation, calibration, and validation of simulation hardware.

## Certifications & Advanced Studies

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- Software Engineering in Defense Systems – **GAMI**
- Developer Certificate – **TÜBİTAK Defense Industry R&D Institute, Türkiye**
- Advance Software engineering – **L3Harris**
- 1-Year of Intensive Training Program – **Canadian Aviation Electronics, Canada**
- 1,000+ hours of training in Real-Time integration, interface and network – **(CAE, Thales, L3Harris, Collins)**
- Deep Learning (AI) Nanodegree – **MISK Foundation**
- Project Management Professional course – **Saudia Academy**

## Projects

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### **Cougar Full Mission Simulator – Middleware System Development (Royal Saudi Air Force)**

- Engineered the core C-based middleware architecture with critical subsystems, including host, CGF, IOS, BDS, and IG.
- Engineered a **zero-copy** communication architecture using **Single-Producer Single-Consumer (SPSC)** shared memory queues.
- Developed a real-time **DIS to CIGI protocol converter**, **coordinate system mapping** algorithms and high-precision **timestamping and synchronization** between distributed simulation entities and image generation systems.

### **Bell 412 Mission Simulator – Middleware System Development**

- Engineered a high-performance C++ middleware to interface the flight dynamics engine with a simulator sub-system.
- Designed and deployed a custom Instructor Operator Station (IOS) using a C++ backend for real-time scenario management.

### **Engagement Skills Trainer (EST) Shooting Simulator**

- Developed a shooting training simulator using computer vision and sensor fusion.
- Integrated **OptiTrack** sensors via **C++ SDK** to detect **IR laser weapons** via Temporal Synchronization and hardware Time Stamp.

### **SFATE Tactical Simulation – Host Integration**

- Architected a **C++ backend** software to integrate simulated aircraft into SFATE simulation engine via vendor SDK plugin.
- Visualized SFATE events into image generator for tactical training purposes.

### **Real-Time Protocol Stress Engine & Performance Validator (Internal Tool)**

- Developed a high-performance C++ utility to **stress-test** middleware stability using high-frequency DIS and CIGI data.
- Implemented **latency profiling** and jitter analysis to identify performance bottlenecks under worst-case density scenarios.

## Core Competencies

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- **R & D Leadership:** Systems Prototyping, Technology Roadmap Development, Feasibility Studies.
- **Defense Standards:** Interoperability (**DIS, CIGI**), FAA Part 60, ICAO, Avionics Interfaces (**ARINC 429**)
- **Advanced Integration:** Sensor Fusion, Computer Vision, Legacy System Modernization.
- **System Architecture:** Embedded Systems, Real-Time Middleware, High-Performance Data Pipeline, Low-Latency Design
- **Concurrency & Low-Level Optimization:** Shared Memory, **Lock-Free** Queues, **SPSC** Pipelines, **Multithreading**, **Atomics**, Real-Time Synchronization
- **Networking & Communication Protocols:** UDP Socket Programming, DIS, CIGI, PTP (IEEE 1588), Data Distribution Service (DDS)
- **Programming Languages:** C++ (**C++17+**), Python, MATLAB, Verilog.

## Education

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**California State University San Bernardino**

*Jan 2015 – June 2018*

*B.S. in Computer Engineering - high-performance and embedded systems*

**Yanbu Industrial College**

*Aug 2004 – June 2008*

*Associate Degree of Science in Instrumentation and Control*