DOMINIC LINDSAY

Technical Lead Manager | Distributed Systems Specialist

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Experienced and passionate ***senior engineer*** with demonstrated history of working in both academic, software and financial industries as both contributor and researcher. Currently leading the platforms teams at Oneiro Solutions. Previously researched development of novel resource management and scheduling systems and policies for decentralised clusters.

PROFESSIONAL EXPERIENCE & PROJECTS

March 2024 — Present | Oneiro Solutions Ltd | Technical Lead Manager | Staff Engineer
Focus on systems engineering, infrastructure, security and compliance. *Promoted to Technical Lead Manager during first year.* **Distributed Scheduling System and Kuberenetes system programming:** Engineered a novel distributed scheduling system leveraging rendezvous hashing to deterministically map UUID-based schedule identifiers to executor nodes, eliminating the need for centralised coordination. Utilised Kubernetes headless services for dynamic node discovery, enabling automatic task redistribution during cluster scaling events. This elegant approach achieved consistent schedule distribution across the cluster while maintaining O(1) lookup complexity, with each node independently determining its task ownership through the hashing algorithm. The system's stateless design eliminated both single points of failure and the complexity of distributed consensus protocols typically required for distributed scheduling. **SOC 2 Type 1 & Type 2 Certification:** Led the integration and compliance initiatives for achieving SOC2 Type 1 and Type 2 certifications. Engineered security controls through modular 'terraform' configurations, implementing infrastructure-as-code principles for consistent security posture. Hardened network infrastructure by enforcing TLS 1.3, implementing strict CIDR-based access controls, and deploying WAF policies. Established robust security practices including automated secret rotation, comprehensive audit logging, and encrypted data-at-rest policies. Developed and documented standardised processes for employee onboarding, access management, and security training, ensuring continuous compliance with SOC 2 requirements. Implemented automated compliance checks in CI/CD pipelines to maintain security standards across all deployments. **Scaled multi-region infrastructure and deployments:** Architected and scaled platform deployment across 6 AWS regions utilising multi-account strategy with AWS Organisations and SSO. Managed fleet of 18+ EKS clusters through 'terraform' modules and custom controllers, implementing cross-region disaster recovery and automated failover mechanisms. Transformed deployment workflow by introducing GitOps methodology using ArgoCD, significantly reducing deployment times from hours to minutes while dramatically improving release reliability. Designed custom Helm charts and modular templates for standardised application deployment patterns, enabling self-service infrastructure capabilities for development teams across regions. Architected a centralised GitOps repository structure organised along customer and environment boundaries, implementing hierarchical configuration management with Kustomize overlays for efficient per-customer customisation. This approach streamlined configuration management, reduced deployment complexity, and enabled rapid customer-specific modifications while maintaining consistent base configurations across the platform. **Core Technologies:** JavaScript/Typescript, AWS, Terraform & Terragrunt, Kafka, CockroachDB

September 2021 — March 2024 | iwoca | Senior Software Engineer
My contributions span both software and systems engineering, with a focus on improving performance, increasing cost efficiencies and reducing system complexity across iwocas modelling workflows: **Modeling Platform Development:** Created a platform that incorporates development workflows, model and feature versioning, and continuous model training and serving. This streamlined the modeling process. **Streaming Framework PoC and Evaluation:** Identified challenges and bottlenecks associated with iwoca's batch processing systems (ETL). Scoped out worst performing applications. Deployed and assessed Apache Flink streaming framework and RisingWave streaming database. Developed POC applications used to conduct feasibility analyses. This work will inform a 'streaming' application framework aiming to simplifying development of self serve streaming application for analysts; enabling 'on-demand' feature generator for model inferences. **Rust FFI:** Refactored and improved Rust and Python FFI libraries. Developed new features, implemented testing and managed performance metrics. **Cost Efficiency:** Reduced AWS costs by developing ETL pipelines and observability tools. Additionally, by tracking resource utilisation metrics through a CI pipeline, we identified areas for further AWS cost reductions. **Code Improvement:** Refactored machine learning code by integrating software engineering practices. This not only improved the quality and maintainability of the code but also enhanced our model versioning processes. **Observability Tooling:** Developed DataDog dashboards and alerts, aimed at improving observability by identifying faults and errors before they manifests as failures. **Data Communication Tools:** Developed bots for Slack and GitLab CI to scrape and compile analytics data summaries, enhancing our data tracking capabilities. **Core Technologies:** Python, Rust, AWS, Kubernetes, Docker, Kafka, Flink, RisingWave, PostgreSQL, SciPy, Jupyter Notebooks, MLEM, DataHub

September 2017 — June 2023** | **Lancaster University** | **Associate Lecturer
Academic Teaching & Course Development: Teaching and coursework development across Operating Systems, Networking and Distributed Systems. **Advanced Technical Modules:** Developed lectures on containerisation technologies, examining Linux namespaces, cgroups, and container runtime internals. Created practical modules on container orchestration and Kubernetes, covering scheduling algorithms and distributed systems principles. Designed in-depth version control curriculum exploring Git's internal architecture, distributed consensus mechanisms, and modern DevOps workflows. **Core Computer Science Courses:** Developed coursework for Operating Systems (process management, memory systems, file systems), Distributed Systems (consensus algorithms, fault tolerance, scalability), and Computer Networks (protocol design, network architecture, security). Additional teaching responsibilities included Introduction to Programming, Information Systems, and Technology for E-Business courses.

March 2021 — June 2021** | **Unikraft** | **Research Engineer Internship
Unikernel Containerisation and Kubernetes Integration: Lead the design and PoC of an OCI-compatible Unikernel packaging and runtime system, enabling seamless integration of unikernels with container ecosystems. Architected and implemented a custom containerd shim layer that bridged Unikernel virtual machines with Kubernetes control plane, effectively treating Unikernels as first-class container workloads. The solution leveraged libvirt and KVM for VM lifecycle management while maintaining OCI compatibility through custom runtime implementations. **Technical Innovation:** Developed prototype tooling that enabled Unikernels to be packaged and managed as tandard OCI compitable images, significantly simplifying deployment workflows and integration into industry standard solutions. Conducted extensive research into existing solutions like 'KubeVirt' and 'Kata Containers' to inform architectural decisions. **Technical Leadership:** Mentored a University of Bucharest final-year student while working remotely, providing guidance on Golang development and container runtime architectures. Maintained detailed technical documentation and conducted knowledge-sharing sessions on Unikernel technologies and OCI specifications. **Core Technologies:** Golang, Kubernetes, containerd, libvirt, KVM, QEMU, OCI specifications, Unikernels

June 2020 — September 2020** | **Arm Research** | **Research Engineer Internship
seL4-Compatible Hypervisor Development: Contributed to memory and capability pointer management libraries for a formally verified Type-1 hypervisor kernel targeting seL4 compatibility, implemented in Rust. Researched and integrated capability-based security primitives inspired by CHERI and seL4's capability model, focusing on formal verification of memory safety properties. Developed mechanisms for safe capability manipulation and delegation, ensuring compatibility with seL4's capability-based access control system while leveraging Rust's type system for additional compile-time guarantees. This work explored the synthesis of hardware-enforced capabilities, seL4's formal verification approach, and Rust's ownership model to achieve provable security properties.

RESEARCH & PUBLICATIONS

[1] Dominic Lindsay, Ging-Fung Yeung, et al. "An Empirical Study of Inter-cluster Resource Orchestration within Federated Cloud Clusters". English. In: *2021 IEEE International Conference on Joint Cloud Computing (JCC)*. IEEE, Oct. 2021. ISBN: 9781665434805. DOI: 10.1109/JCC53141.2021.00019
[2] Dominic Lindsay, Sukhpal Gill, et al. "PRISM: An Experiment Framework for Straggler Analytics within Containerized Clusters". In: *WoC 2019 Fifth International Workshop on Container Technologies and Container Clouds*. ACM, Dec. 2019, pp. 13–18. ISBN: 9781450370332. DOI: 10.1145/3366615.3368353

EDUCATION

September 2017 — June 2023** | **Lancaster University** | **PhD Computer Science
Orchestration systems for decentralised infrastructures. Investigates impact of inter-cluster characteristics such as sporadic utilisation, cross cluster latency and workload affinity. Specifically focused on development of novel scheduling policies and resource management systems for federated systems. [*DID NOT COMPLETE*]

***October 2012 — June 2016** | **Lancaster University** | **Msci Software Engineering** (1st class honours)*
Core Modules: *Software Design Studio — Part 1 & 2*, *Distributed Systems*, *Advance Distributed Systems*, *Operating Systems*, *Networking*, *Advanced Programming*, *Communication Systems*

AWARDS

- **Best paper award at IEEE JointCloud'21** – Award for best paper at IEEE Jointcloud'21. I received the highest scores for my work "An Empirical Study of Inter-Cluster Resource Orchestration within Federated Cloud Clusters"

SKILLS & EXPERTISE

Programming Languages: C, C++, Rust, GoLang, Lua, Java, Python, R, HTML, CSS, JavaScript, TypeScript, Terraform, Terragrunt, LaTeX.
Technologies: Linux, Linux internals, Docker, QEMU, LibVirt, Kubernetes, Argo, GitLab API, Apache YARN & HDFS, Apache Spark, Pandas, GRPC, Java RMI, CockroachDB, PostgreSQL, RisingWave, Flink.
Expertise: Profiling, Resource Management and Scheduling, Networking, DNS, Systems Programming, PKI, SSL/TLS, Operating Systems, Distributed Systems concepts and design.