Perry's Résumé - Distributed Systems & P2P Protocols

Perry Kundert <*perry@kundert.ca*> `+1-780-970-8148`

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R&D engineer with 30+ years building distributed systems that treat divergence, loss and partition as the normal case rather than the exception. Architected and prototyped HoloFuel's agent-centric, partition-tolerant transaction engine in Rust at Holo Ltd.: each agent owns its own signed state chain, settlement is bilateral, and nothing waits on global consensus. Built and deployed the Reed-Solomon erasure-coded, multi-route SCADA transport that still carries control traffic for Enbridge's pipeline network, and consensus over lossy RF channels for clearGRID's telemetry. Authored widely used protocol and coding libraries (`cpppo`, `ezpwd-reed-solomon`), and capability-style authorization systems (`localwebauthn`, `crypto-licensing`) that grant scoped rights by possession of a signed token instead of by central accounts and ACLs. Most recently designed and verified a complete cryptographic monetary protocol end-to-end, from mechanism design through zero-knowledge circuits: evidence of carrying a protocol from first principles to a documented, checkable specification. Comfortable reading specs, arguing about invariants, and debugging what the lab result missed. (PDF, Text)

Technical Skills

- **Distributed Systems**: partition-tolerant protocol design, agent-centric and eventually-consistent state, CAP/BFT trade-offs, DHTs, gossip, bilateral settlement without global ordering, conflict resolution and versioning, Holochain
- **Networking & Transport**: protocol design for lossy and partitioned channels, Reed-Solomon and BCH erasure coding, fountain codes, multi-route and multi-path routing, QUIC, WebTransport, WebSockets, mTLS 1.3, JSON-RPC, industrial protocols (EtherNet/IP, Modbus, SCADA)
- **Languages**: Rust (5+ yrs), C++ (25+ yrs), Python (15+ yrs), C, Go, Solidity
- **Security & Authorization**: capability-based authorization (signed, scoped, offline-verifiable tokens), WebAuthn/FIDO2, Ed25519, PKI, Shamir secret sharing (SLIP-39), end-to-end encryption, metadata minimization, zero-knowledge proofs (Groth16, Chaum-Pedersen, Pointcheval-Sanders)
- **Concurrency & Performance**: lock-free wait-free concurrency, real-time pipelines, SIMD (Intel AVX, ARM NEON), hot-path profiling, sustained multi-Msps throughput on commodity hardware
- **Edge & Embedded**: RTOS, microcontrollers, solid-state RTU firmware, satellite-linked field systems running unattended for years, hardware bring-up
- **DevOps & Infra**: Linux, Docker, CI/CD, Git, deterministic builds (Nix), GDB, Valgrind, Linux Perf, reproducible test harnesses over recorded traffic
- **Method**: architectural decision records, executable specifications and sanity checks, AI-assisted implementation with human-owned design: model output is a hypothesis until confirmed by execution or independent derivation

Experience

Distributed Systems R&D, *Holo Ltd.* (Kelowna, BC 2018–2020)

Architected and tested prototypes of HoloFuel's partition-tolerant transaction engine in Rust, on Holochain's agent-centric distributed application framework.

- Designed the accounting model explicitly as an alternative to blockchain-style global ordering: each agent holds its own signed transaction chain, counterparties settle bilaterally, and the network never blocks on a global consensus round.
- Implemented agent-centric accounting enabling linear O(n) scaling vs. $O(n^2)$ blockchain bottlenecks, with settlement continuing during network partitions.
- Validated simultaneous atomic transactions across partitioned networks; demonstrated that mutual-credit systems can reach cryptographic finality without global consensus.
- Developed statistical models and PID control systems for economic stabilization across distributed agents (holofuel-model, and the much more advanced alberta-buck).
- Contributed to R&D for Holochain's DHT-based distributed application framework.

R&D Consultant, *Dominion R&D Corp.* (Remote, 2009–Present)

Protocol, authorization and communications R&D for industrial, energy and fintech clients; remote systems that run unattended for years. Guide teams through cryptographic and distributed systems architecture.

- Authorization without central accounts:
  - `localwebauthn`: self-hosted WebAuthn/FIDO2 passkey relying party; credentials and authentication material never leave the operator's infrastructure.
  - `crypto-licensing`: Ed25519-signed, offline-verifiable licenses with DNS-based public key distribution (DKIM model); possession of a signed token grants a scoped right to a specific resource, with no license server in the critical path.
- Protocol and coding libraries in wide use:
  - `cpppo`: Python EtherNet/IP and CIP protocol implementation, deployed globally as the integration layer between analytics systems and PLCs.
  - `ezpwd-reed-solomon`: high-throughput C++/JS/Python Reed-Solomon and BCH codecs, used by aerospace and defence developers for data on lossy channels.
  - `python-slip39`: cross-platform Shamir secret sharing for seed backup and recovery.
- Delivered rugged satellite-connected monitoring, communications and video systems across Alberta oilfields: intermittent, high-latency links, field-serviceable, diagnosable from 400 km away.
- Designed and delivered a production generative-AI service with three interchangeable inference backends and copy-on-write session cloning, chosen deliberately for vendor reversibility and data sovereignty.
- Mitigated a critical security flaw in a globally deployed enterprise collaboration suite.
- Designed the **Alberta Buck** protocol, a complete wealth-backed monetary system, as a worked example of carrying a protocol from mechanism design to a checkable specification:

  - Identity-aware transfers gated on Chaum-Pedersen re-encryption proofs; unlinkable Pointcheval-Sanders credentials; privacy-preserving bearer notes over Poseidon Merkle commitment pools with Groth16 spend circuits.
  - Composed and sanity-checked the full cryptographic stack with executable `py_ecc` tests on BN254; proved completeness, special soundness and honest-verifier zero-knowledge of the bilateral disclosure proofs (independent formal review remains to be done).
  - PID-controlled issuance with median-aggregated independent controllers for oracle manipulation resistance; multi-year economic simulations in Python.
  - Architecture · Formal Proofs · Identity System · Implementation
- Actively share research code and papers; author technical articles on Holochain, consensus, signal recovery and industrial communications.

Software Engineer, *clearGRID Ltd.* (Kelowna, BC 2017–2022)

Replaced custom radio telemetry with commodity hardware and SDR; reached agreement on meter readings across lossy RF channels without global coordination.

- Built a fault-tolerant SDR system processing 25 Msps I/Q across 120 channels on commodity CPUs.
- Designed the decoding and reconciliation pipeline so that independently received, partially corrupted readings converge on a consistent result at the edge, with no central arbiter.
- Optimized multi-channel demodulation with AVX/NEON; integrated with flight-approved hardware, power and communications equipment.

Sr. IT Advisor, *Enbridge Pipelines* (Edmonton, AB 2002–2009)

Designed and deployed a cryptographically secured, Reed-Solomon erasure-coded, multi-route communications protocol for real-time pipeline SCADA; still in operation today.

- Architected the transport to keep control traffic flowing through crippling communications failures: erasure coding across independent routes rather than retry on a single path.
- Implemented multi-path routing maintaining cryptographic integrity across hostile networks.
- Developed solid-state RTUs for 24/7 control; <1 defect per 10K LOC in mission-critical firmware protecting $100B+ infrastructure.
- Deployed hundreds of ruggedized units across critical infrastructure sites.

Software Developer, *Hewlett-Packard* (Calgary, AB 1989–1996)

Re-architected the core alarm system of the RTAP SCADA platform around DFA state machines.

- Enabled deterministic state transitions across geographically distributed SCADA nodes without a central coordination authority.
- Enabled end-users to configure complex, distributed safety-critical workflows.
- Remains in operation in pipeline SCADA systems continent-wide, 30+ years on.

Education

B.Sc. Computer Science, *University of Calgary* (Calgary, AB 1984–1989)