Benjamin Tobler Resumé

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ABOUT

Software engineer working in distributed database & storage systems, networking & virtualization.

AWS EC2 team member from founding, through beta & GA, to $1Bn ARR service. Owned hypervisor side of EC2 control plane through GA.

Led the OCI Virtual Machine Service development, defining design and tasks for a growing VM team as well as the Block Storage, Virtual Networking and Bare Metal Compute teams. Identified dependencies and opportunities to parallelize development to meet an aggressive delivery date whilst delivering a control plane implementation that was competitive in the Gartner bulk provisioning benchmarks.

Led development of the AWS VPC control plane.

Designed & implemented zero copy RPC and thread per core (M:N) user mode task & IO scheduling core to provide a high performance platform for Amazon Aurora's distributed storage. Patented novel optimistic concurrency primitives to eliminate transaction aborts due to hot key contention under common workloads.

Designed HSM vendor independent API and EMV (Chip & PIN) verification for financial transaction processing. Implemented 10k connection solution for Java prior to non-blocking IO support.

EDUCATION

M.Sc. Computer Science (Distinction), *Network Security Protocols*, University of Cape Town, 2005
Awarded NRF Prestige Scholarship for Masters study
Published in proceedings IFIP SEC 2004 Toulouse (.pdf) & ISSA 2003 Johannesburg (.pdf)

PATENTS

Selected database & virtualization management patents

  US9223843, US9552242, US20170083565, US20210342311, US9055117, US8504691, US8190682

EMPLOYMENT

Oracle Cloud Infrastructure 2016 - 2021, Consulting MTS

Led design reviews for new services & architectures. Defined team roadmaps, priorities & technical direction. Worked across client teams to define and drive adoption of scalable & resilient approaches to data modelling, transactions & consistency, and distribution at scale from control plane to data plane.

Virtual Machine Service

Led the OCI VM offering design, development and delivery while expanding the team and parallelizing work to bring in the delivery date. Defined, prioritized and assigned development and integration tasks for the VMI, Bare Metal Compute, Block Storage and Virtual Networking teams as well as monitoring, operation and capacity management tooling to deliver a fully featured Virtual Machine Instance product on an aggressive timeline to meet customer demand. Drove a successful effort to reach GA with competitive Gartner bulk provisioning benchmark times as measured by Gartner.

Defined post GA roadmap, including improved and extended automation for operational insights & troubleshooting and capacity management. Defined technical product requirements and implemented proof of concept for Bring Your Own Image support for VMware, VirtualBox, QEMU and other virtualization products.

Strictly serializable database for control planes

Worked with team to transition from a ORM style database library layer, to database as a service,

including cell based architecture to limit blast radius and mitigate noisy neighbours. Worked with client teams on migration and effective use of the service for regional replication, fan out to data plane nodes and data integration use cases.

Designed novel (patent 20210342311) optimistic concurrency primitives (e.g. opaque test-and-increment counters) to eliminate transaction aborts caused by hot key contention under common workload patterns.

Designed (in conjunction with TLA verification) and implemented proof of concept for new scalable transactional storage for future scaling and high availability.

Amazon Web Services 2005 - 2014, Senior SDE

Amazon Aurora distributed storage

Developed task and IO scheduling core (including zero-copy, vectored IO custom RPC) to provide a platform for the team to develop features that met the ambitious latency and throughput requirements of the storage system. E.g. enabled highly concurrent and low latency messaging for the database engine to massively fan out (striped) writes to distributed storage.

Mentored remote Bay Area team through integration of database engine with distributed storage.

Designing to avoid (and profiled to identify) performance bottlenecks on the fast path. E.g. eliding locks and using suitable data structures and concurrency mechanisms for the M:N threading and partitioning model; Eliminating heap allocations by implementing custom C++ function objects for callbacks and completions; Custom message buffer vectors to separate user data payloads from headers without copying.

Virtual Private Cloud

Led design and implementation the VPC virtual network management control plane. The system manages VPC customers' network metadata, including network topology maps to physical resources, metadata ACLs, and provides a stream source for distribution to hypervisors.

Collaborated with AWS Linux kernel team on successful effort to improve packet throughput on hypervisors. Achieved by moving source identification logic from control plane agent in user space, to a kernel module.

Extended and maintained the distributed firewall system that implements EC2 instance security groups across all the hypervisors in a data center.

Optimized in-memory representation of VPC network topology and security policy on hypervisors to support massive VPC & EC2 scaling while making efficient use of limited dom0 hypervisor memory.

EC2 from founding, through beta and GA

Designed and implemented the EC2 control plane hypervisor agent. Ran on > 100K physical hosts (and now > 1M hypervisors) to manage the customer virtual machine (EC2 instance) lifecycle. Extended the agent to collaborate with neighboring hypervisors to download and cache boot images from object store service (S3). The improvement allowed fast EC2 instance launches despite limited edge bandwidth (circa private beta launch).

Implemented many internal and public utilities, micro-services and tools for EC2: e.g. command-line AMI packager and up-loader, internal dynamic DNS vendor for EC2 instances and hypervisors, and network rate limiting at hypervisor to prevent noisy neighbor problems.

Helped grow the EC2 team in Seattle by ramping up new team members tasked with developing new EC2 networking and security functionality.