Benjamin Tobler Resumé

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ABOUT

Software engineer working on distributed database & storage systems, networking, virtualization and concurrency.

AWS EC2 team member from founding, through beta, GA and to $1Bn ARR service. Owned the hypervisor side of the EC2 control plane through GA. Led design & implementation of AWS's VPC control plane. Led design & implementation of OCI's Virtual Machine Service offering.

Designed & implemented zero copy RPC & network messaging stack for Amazon Aurora, with thread per core architecture (M:N task scheduling) and replica partitioning. Implemented early "10k connection problem" solution for Java, and EMV (Chip & PIN) verification HSM vendor abstraction SDKs for financial transaction processing.

PATENTS

Selected database & virtualization management patents

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

EDUCATION & ACADEMICS

M.Sc. Computer Science (Distinction), University of Cape Town, 2005
National Research Foundation Prestige Scholarship for Masters study, 2003
Conference proceedings IFIP Security Workshop 2005, Toulouse & ISSA 2004, Johannesburg

EMPLOYMENT

Oracle Cloud Infrastructure 2016 - 2021, Consulting MTS

Virtual Machine Service

Led the OCI VM offering definition, design & implementation for OCI. Delivered with block storage and virtual network integration (via both VIF and virtio) in ~4 months.

Identified requirements and implemented proof of concepts for Bring Your Own Image (BYOI) support for VMWare, Qemu, VirtualBox and other virtualization products.

Strictly serializable database for control planes

Designed novel optimistic concurrency primitive (opaque, serializable counters) to solve hot key contention problem

Helped team transition to cell architecture to isolate tenants to mitigate noisy neighbours and blast radius

Amazon Web Services 2005 - 2014, Senior SDE

Amazon Aurora distributed storage

Designed and implemented of a Aurora's zero-copy, vectored IO custom RPC to achieve stringent latency, throughput and scaling goals for the data plane.

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

Identified numerous performance bottlenecks in the networking and storage I/O paths via profiling, and implemented solutions: e.g. task scheduler per core to minimize task queue lock contention, eliminating heap allocations on copy of C++ function object callbacks for IO/event completions, and message buffer vectors to avoid copying user data payloads.

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. topology and state of large numbers of virtual networks.

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

Extended and maintained the distributed firewall system that implemented user specified security groups and policies applied to their EC2 instances.

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 > 1MM hypervisors) to manage the customer virtual machine (EC2 instance) lifecycle. Extended the agent to collaborate with neighbouring 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 uploader, internal dynamic DNS vendor for EC2 instances and hypervisors, and network rate limiting at hypervisor to prevent noisy neigbour problems.

Helped grow the EC2 team in Seattle by ramping up new team members brought in to on EC2 networking and security. and engineers.