A Container description

Glyn Normington Steve Powell

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This document attempts to describe *container*s (see in, for example, [2]) in a precise fashion.

Contents

1 Introduction

This is a document that records the deliberations of Glyn and Steve as they come to grips with "what containers really are"[1].

2 Overview of this document

This document is a rag-bag of concepts and ideas (at the moment). The intention is to find the right decomposition of ideas to simply describe the state, and state transitions, of *Containers* and the *Jobs* that they *Run*.

3 Containers

MultiSS

$$dummy : \mathbb{N}$$

$$[FILESYSTEM, NETWORK, PID, TASK]$$

Job

$$t : TASK$$

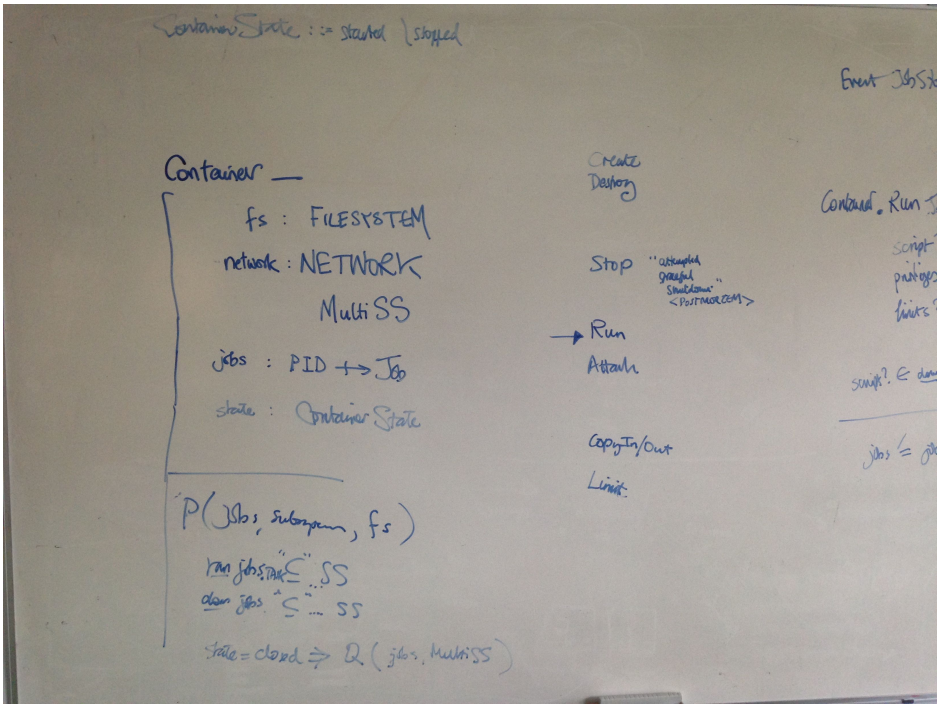
$$ContainerState ::= STARTED \mid STOPPED$$

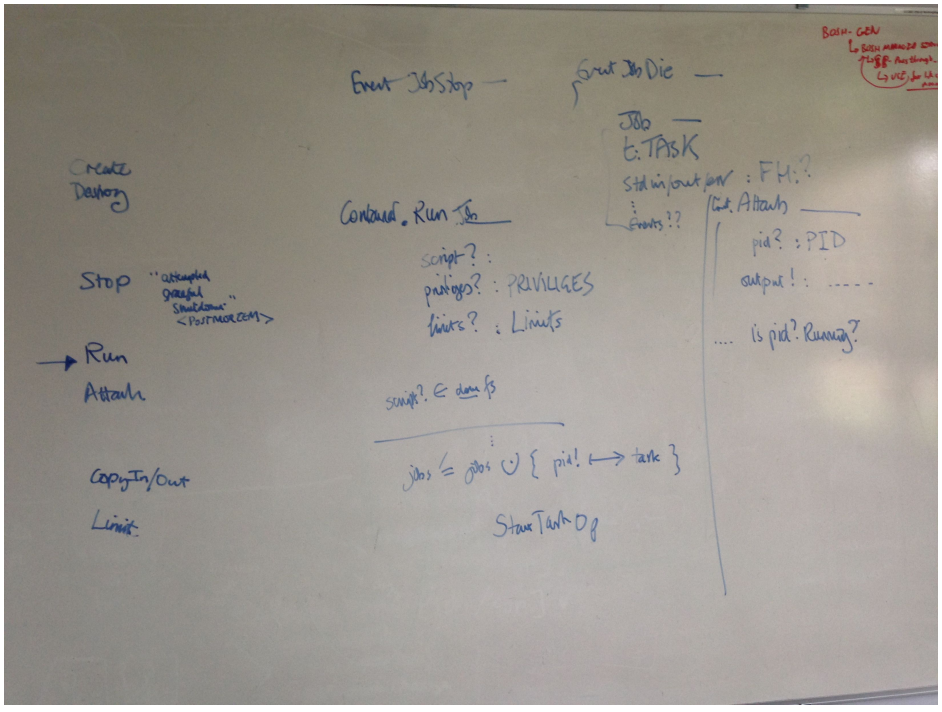
Container

$$fs : FILESYSTEM$$
$$network : NETWORK$$
$$MultiSS$$
$$jobs : PID \pfun Job$$
$$state : ContainerState$$

[1] "What *are* containers?" *Jerzy Czaykowski* (adapted)

4 Initial whiteboard stuff





A Z Notation

Numbers:

$\mathbb{N}$ `Natural numbers {0,1,...}`

Propositional logic and the schema calculus:

$\ldots \land \ldots$	And	$\langle\!\langle \ldots \rangle\!\rangle$	Free type injection
$\ldots \lor \ldots$	Or	$[\ldots]$	Given sets
$\ldots \Rightarrow \ldots$	Implies	$', ?, !, {}_0 \ldots {}_9$	Schema decorations
$\forall .. \mid .. \bullet ..$	For all	$\ldots \vdash \ldots$	theorem
$\exists .. \mid .. \bullet ..$	There exists	$\theta \ldots$	Binding formation
$\ldots \setminus \ldots$	Hiding	$\lambda \ldots$	Function definition
$\ldots \mathrel{\widehat=} \ldots$	Schema definition	$\mu \ldots$	Mu-expression
$\ldots == \ldots$	Abbreviation	$\Delta \ldots$	State change
$\ldots ::= \ldots \mid \ldots$	Free type definition	$\Xi \ldots$	Invariant state change

Sets and sequences:

$\{\ldots\}$	Set	$\ldots \setminus \ldots$	Set difference
$\{.. \mid .. \bullet ..\}$	Set comprehension	$\bigcup \ldots$	Distributed union
$\mathbb{P} \ldots$	Set of subsets of	$\# \ldots$	Cardinality
$\varnothing$	Empty set	$\ldots \subseteq \ldots$	Subset
$\ldots \times \ldots$	Cartesian product	$\ldots \subset \ldots$	Proper subset
$\ldots \in \ldots$	Set membership	$\ldots$ partition $\ldots$	Set partition
$\ldots \notin \ldots$	Set non-membership	seq	Sequences
$\ldots \cup \ldots$	Union	$\langle \ldots \rangle$	Sequence
$\ldots \cap \ldots$	Intersection	disjoint $\ldots$	Disjoint sequence of sets

Functions and relations:

$\ldots \leftrightarrow \ldots$	Relation	$\ldots^*$	Reflexive-transitive closure
$\ldots \nrightarrow \ldots$	Partial function		
$\ldots \rightarrow \ldots$	Total function	$\ldots (\!\mid \ldots \mid\!)$	Relational image
$\ldots \rightarrowtail \ldots$	Partial injection	$\ldots \oplus \ldots$	Functional overriding
$\ldots \rightarrowtail \ldots$	Injection	$\ldots \lhd \ldots$	Domain restriction
$\mathrm{dom} \ldots$	Domain	$\ldots \rhd \ldots$	Range restriction
$\mathrm{ran} \ldots$	Range	$\ldots \lhd \ldots$	Domain subtraction
$\ldots \mapsto \ldots$	maplet	$\ldots \rhd \ldots$	Range subtraction
$\ldots^\sim$	Relational inverse		

Axiomatic descriptions:

Declarations
Predicates

Schema definitions:

SchemaName

Declaration
Predicates

B References

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[2] Various authors, *Garden github repository*, `https://github.com/pivotal-cf-experimental/garden`.

[3] Various authors *libcgroup*, `http://libcg.sourceforge.net/html/index.html`.

[4] Paul Menage, Paul Jackson and Christoph Lameter, *CGROUPS*, `https://www.kernel.org/doc/Documentation/cgroups/cgroups.txt`, 2004-2006.

[5] Linus Torvalds, *et al*, *Linux kernel source tree*, `https://github.com/torvalds/linux`.

[6] Various authors, *Memory Resource Controller*, `https://www.kernel.org/doc/Documentation/cgroups/memory.txt`.

[7] Kamezawa Hiroyuki, *et al*, *NOOP cgroup subsystem*, `http://thread.gmane.org/gmane.linux.kernel/777763`.

[8] Martin Prpič, Rüdiger Landmann, and Douglas Silas, *Red Hat Enterprise Linux 6.5 GA: Resource Management Guide*, `https://access.redhat.com/site/documentation/en-US/Red_Hat_Enterprise_Linux/6/pdf/Resource_Management_Guide/Red_Hat_Enterprise_Linux-6-Resource_Management_Guide-en-US.pdf`.

[9] Bertrand Meyer, *On Formalism In Specifications*, IEEE Software, Vol. 2(1), 1985.