About us

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What is Dropbox today?

Scale:

• 500 million users
• 200,000 business users
• 1.2 billion files saved every day
What is inside?
Infrastructure

- Application servers
- Metadata storage
- Block storage
Infrastructure

- Application servers
- Metadata storage
- Block storage
Metadata storage

- Sharded MySQL databases
- Edgestore
What is Dropbox again?

- Tens of thousands of servers
- Multiple datacenters
- Multiple regions
- Multiple continents
- Petabytes of metadata
- Exabytes of raw data
Engineering challenges

- Shit happens
- Lots of unknown unknowns
- Way less engineers than hardware
HANG IN THERE
Different levels of automation

- No automation at all
- Scripting
- Parallel and/or remote execution
- Unattended execution
- Automatic batch job execution
- Self-managing servers
Scripting

Pros:
• Easy
• Good for start
• Predictable

Cons:
• Limited reusability
• Lots of repetition
• Still 1 to 1
Scripting++: parallel and/or remote

- Run the same script on multiple hosts
- Run it remotely

Examples:
- gsh
- Fabric
- Ansible
Improving further

Unattended execution

Automatic batch execution

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Self-managing servers

Periodical checks:
• cron

Reactive:
• certain conditions
• events

So you can focus on the important things! 😊
Automatic remediations: Naoru

DiagnosePlugins:
- Find root cause
- Decide action to take

RemediatePlugin:
- Actually fix the problem

Alerting:
- Automate away ‘finding problems’

pre_remediate hooks:
- Possibly POSTPONE the remediate plugin
  - Rate limits
  - Sanity checks

Human Authorization Required
Example: SSHUnreachable alert

1. If SSH actually works → do nothing
2. If repeated reboot history → deallocate
3. Check out-of-band IPMI console
   • If no response → reboot
   • If initramfs shell → deallocate
   • If cpu soft lockup → reboot
Naoru helps a lot

- "Simple" logic
- Alerts are easily handled
  - Process is dead → restart it
  - Disk full → rotate logs
  - Hardware issue → deallocate
- Takes care of great number of issues
There’s always more…

• Some tasks are non-trivial
  • Involve multiple hosts
  • Run for hours
  • Require synchronization
  • Require ability to be paused and resumed

• Some tasks must be done immediately, other can wait

We need

• Smarter scheduler
• Throw different events/signals
• State machines to describe complex workflow
• Prioritization
• Granular tasks: beyond check + run.
Local agent

Agent
• throws events with some payload

Dispatcher
• takes events from bus
• dispatches them to reactors

Reactor
• subscribes to events
• takes action
Signals / events

Any source of information:

• Nagios alerts
• Service health checks
• Time-series database metrics
• Human action
Event-based FSM

Mathematical model

Easy to argue about correctness

Reactive transitions on events

Easy to suspend in between or completely cancel

Easy to represent
FSM representation
FSM representation
Scheduler

Prioritization

Synchronization
Our solution: Wheelhouse
Example #1: MySQL slave failure

1. Find new machine
2. Make a clone of slave
3. Add new healthy slave to production
4. Remove broken slave from production
5. Send broken slave to reinstall or repair
Example #2: MySQL master failure

Almost the same as #1. But...

1. Promote a healthy slave to be the master

Logic can be reused with hierarchical state machines: one FSM could be a part of another
Example #3: Kernel upgrade

“Simpler”:

1. Allocate new machine
2. Upgrade kernel to required one
3. Add new machine into production
4. Remove machine with old kernel from production

Just maintenance — lower priority
Example #4: Verifying data consistency

1. Clone new slave
2. Stop at defined checkpoint
3. Run data consistency verification
4. Report result
5. Deallocate it
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Thanks