Management Shamanism and Emergent Simplicity

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Network management is at a critical juncture

- It was possible – in the past – for people to understand network function at all levels.

- This is no longer possible.

- **Network management must be based on something other than complete understanding.**

Watched your netadmins (or service admins) lately?

- Uptime and bandwidth are everything.
- Configuration validation is life.
- Edge cases are death.
- Documentation is not reliable.
- New releases are stressful.
- New technologies are torture.
- And innovation is accelerating…
- **Crowdsourcing is survival.**

Management shamanism

- We are **already** managing networks and services that we cannot fully understand.

- Some key attributes are **unknowable**, due to scale, observability, and even legality.

- Thus we resort to **shamanism** and **ritual** learned from **experiment** and **crowdsourcing**.

Examples

- One can crawl into deep and dark holes by
  - Invoking advanced and untested routing features.
  - Updating software components of a web service.
  - Updating your core router OSes.
- But, the job of management is not to understand, but to assure.
  - Must concentrate on avoiding unacceptable states.
  - This is **ritual**, and not understanding…
  - **"Doctor, it hurts if I do that." "Then don't do that!"**

Naming the elementals

- A **closure** is a predictable (closed) part of an otherwise unpredictable (open) world.
- A closure
    - Creates a zone of predictability.
    - Defines a higher-level interface to intent and behavior.
- Tautology: the job of management is to **create and maintain closures** via human effort, appliances and services, clouds, etc.

Some key questions:

- What things can be efficiently boxed?
- What interface to a box will allow us to keep it closed?
  - What do we have to tell it?
  - What does it have to tell us?
- How can boxes span networks and vendors?

Some successes:

- **Virtualization** solves the problem of multi-purpose configuration without collision.
- **Appliances** isolate the administrator from overly complex configuration.
- **Services** isolate developers from the needs of others.
- Simplicity represents a lower level of effort, and thus is an **emergent property**.

Clouds and rain dances

- Modern web software is **exceptionally brittle** – small configuration mistakes create chaos.
- So they're configured by **ritual**…
- Which is easiest inside **virtual appliances** and **services** (closures)…
- Which can be loaded into **clouds**…
- **Cloud computing is the natural result of our <u>lack of understanding</u> of configuration semantics!**

My bold experiment

- Stop trying to know the unknowable.
- Close grey boxes and recolor them black.
- Study how science and management change under these conditions.
- Inform a future in which unknowability is increasing.

Some game-changing results

- Highly-reactive management strategies can ignore long-term history, outperform machine learning, and better emulate human reactions.

- Multiple, autonomous management agents can cooperate without explicitly communicating, by exploiting a shared world-view as their communication medium.

- Changes in statistical properties of performance measurements can track system health without considering system configuration and resources.

For more information,

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