The Robots are Coming!

AusNOG 2018

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#include <std/disclaimer.h>

Views my own, not necessarily
those of my employer’s!

Act 1

The Robots are Coming!

1991

$27 000 p.a. first full-time salary

vs

$40 000 NMS software
(HP Network Node Manager IIRC)

“Boss, that software is more than what I’m being paid! Pay me that and I’ll do what the software does!”

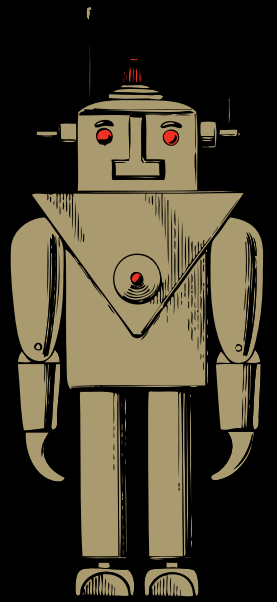
Boss:

“Trouble is Mark, you won’t work 24x7, you need to eat and sleep, and want to take holidays.”

(or something like that)

IOW, I am **not** a robot.

Robots are ...



much **faster**

much **more accurate**

much **more consistent**

when doing repetitive tasks.

AusNOG 2012

“Google Backbone monitoring. Localizing packet loss in a large complex network” - Google

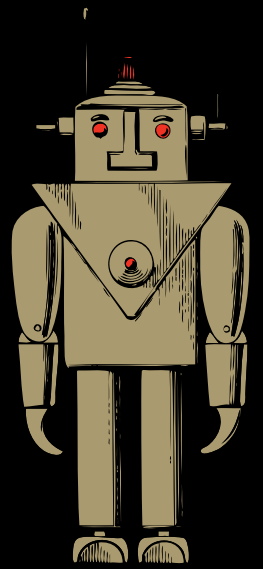
AusNOG 2015

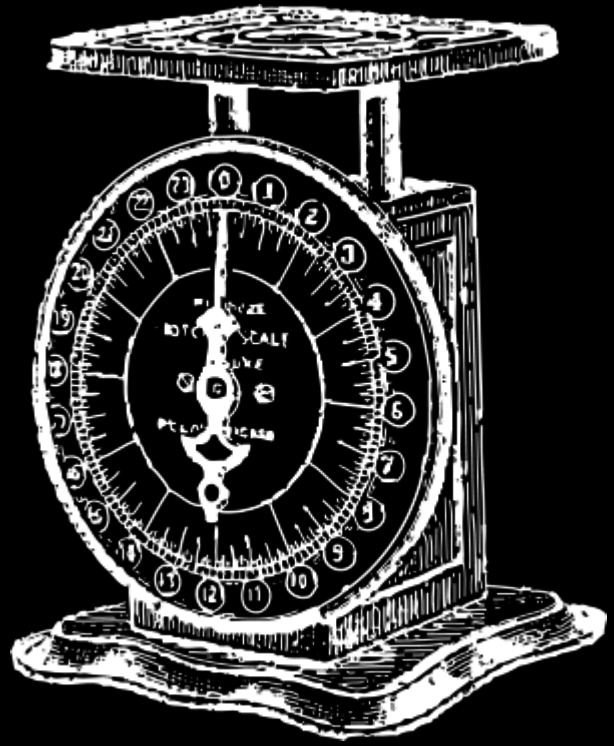
“ONE - One Network Engineer” - Facebook

AusNOG 2016

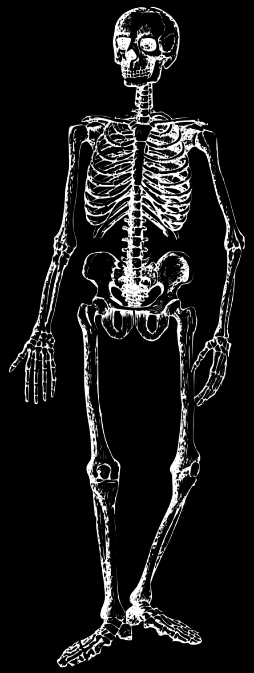
“Untrusting the Network” - Facebook

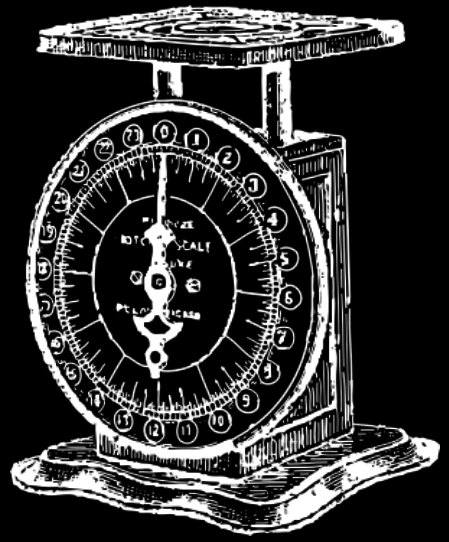
Robot operated networks.





Necessity rather or more than desire, given their scale?





?

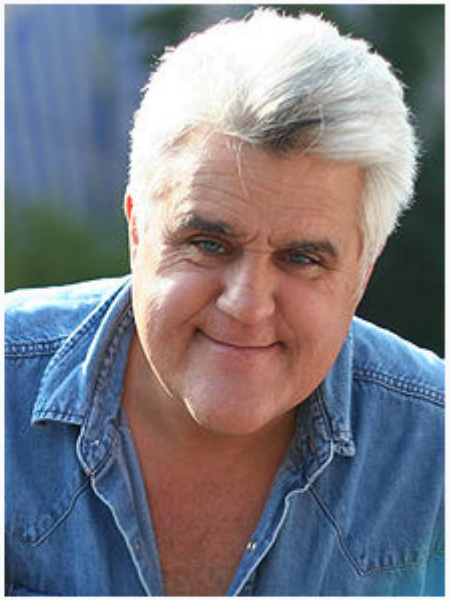
Inevitable

(IMO)

James Douglas Muir Leno (/ˈliːnoʊ/; born April 28, 1950)[1] is an American comedian, actor, writer, producer, and television host. After doing stand-up comedy for years, he became the host of NBC's *The Tonight Show with Jay Leno* from 1992 to 2009. Beginning in September 2009, Leno started a primetime talk show, titled *The Jay Leno Show*, which aired weeknights at 10:00 p.m. ET, also on NBC.

After *The Jay Leno Show* was canceled in January 2010 amid a host controversy, Leno returned to host *The Tonight Show with Jay Leno* on March 1, 2010.[2] He hosted his last episode of *The Tonight Show* on February 6, 2014. That

Jay Leno



Leno in July 2008

Birth name	James Douglas Muir Leno
Born	April 28, 1950 (age 68) New Rochelle, New York, U.S.
Medium	Stand-up, television, film
Alma mater	Emerson College
Years active	1976–present
Genres	Observational comedy, black comedy, surreal humor, sketch comedy, insult comedy, satire

Restoration Blog: November 2016 - Jay Leno's Garage

https://www.youtube.com/watch?v=A06akpknh_I&t=247s

"These things were built when technology was expensive and labour was cheap. Now labour's expensive, and technology is cheap."

- Jay Leno

Technology is used by organisations for 2 reasons ...

To **Save** Money

To **Make** Money

CPU - cheap and plentiful? ☑

RAM - cheap and plentiful? ☑

Network Bandwidth - (pretty) cheap and plentiful? ☑

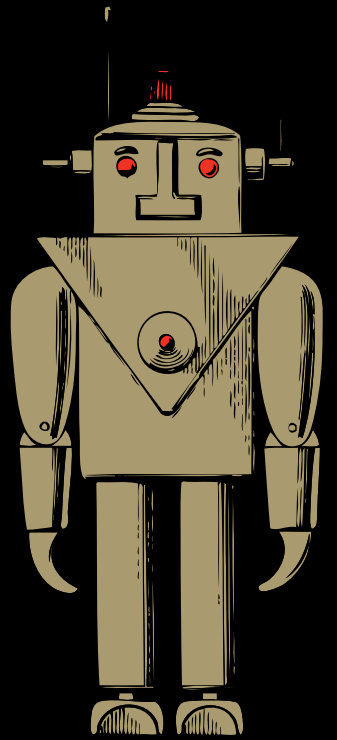
Humans to operate them - cheap and plentiful (relative)? ☒

"Now labour's expensive, and technology is cheap."

If Jay, a retired comedian has worked it out,

others will too.

This is why the **robots are coming.**



Act 2

What you Need to Know to Build Robots

Basic Tools

<scripting/programming languages>

Bourne Shell/Bash

Expect/Tcl (expect)

autoexpect

Python/Go?

Prefer general and common

- **Bash/Python/Go** -

Specialised tools for specialised jobs

- **Expect/Tcl** -

<unix utils>

cut
paste
grep
tr
sort
uniq
seq
cat
wc
sed
awk
m4

```
cat /etc/hosts | tr -s “ “ |
cut -d “ “ -f 2 | sort | uniq
```

<miscellaneous>

Regular Expressions

> man 7 regex

track and describe,

possibly revert,

source code changes

- **git**, **svn**, **mercurial** -

<trivial example>

```
$ for i in `seq 1 24`; do
> echo "interface Vlan$i";
> echo "no shutdown";
> echo "ip address 10.0.$i.1 255.255.255.0";
> echo "";
> done
```

```
interface Vlan1
no shutdown
ip address 10.0.1.1 255.255.255.0

interface Vlan2
no shutdown
ip address 10.0.2.1 255.255.255.0

interface Vlan3
no shutdown
ip address 10.0.3.1 255.255.255.0

...
```

```
$ sh -c 'echo -e "conf t\n\n"; for i in `seq 1 24`; do echo -e
"interface Vlan$i\nno shutdown\nip address 10.0.$i.1
255.255.255.0\n\n"; done; echo "exit"' > 24vlans-10.0.x.cfg
$
$ cat 24vlans-10.0.x.cfg
conf t


interface Vlan1
no shutdown
ip address 10.0.1.1 255.255.255.0

...
```

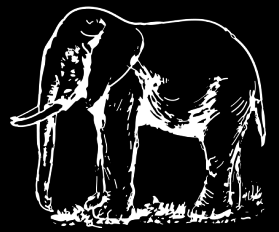
Got RANCID?

```
$ clogin -x 24vlans-10.x.cfg l3sw1
```

Rules of Thumb

How do you eat an elephant?

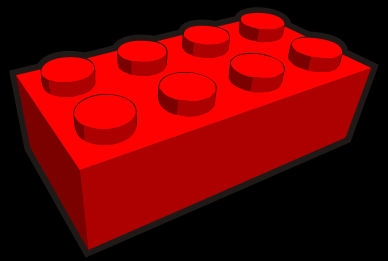
One mouthful at a time.



break into small chunks

usable individually

design to plug together



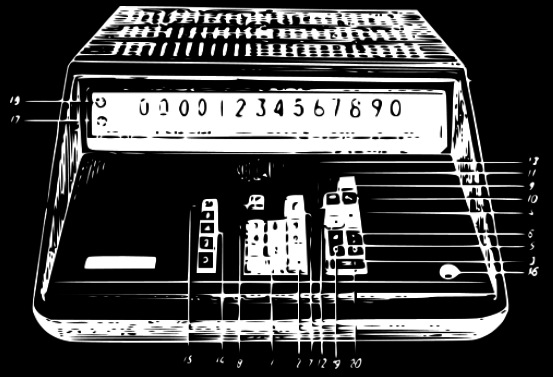
best chunk choice:

- best **faster** value -

- best **accurate** and **consistent** value -

small **benefits** multiplied lots =

big benefits



ALL OR **NOTHING?**

10% automated, **90%** manual?

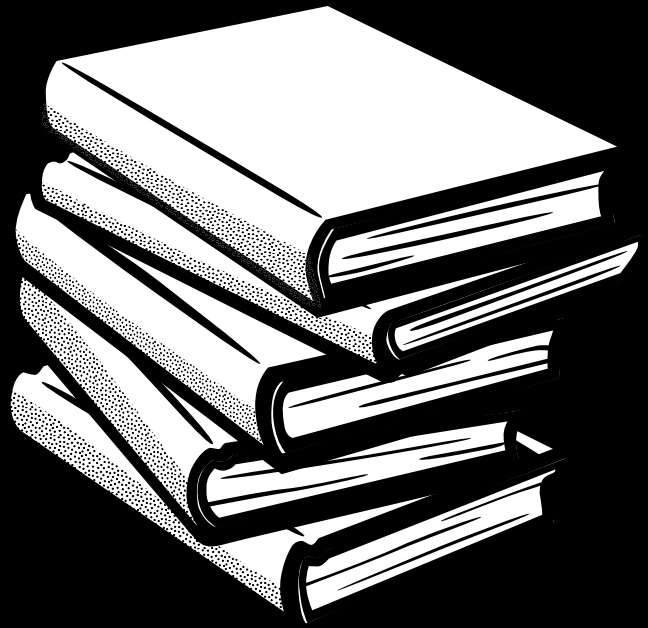
Better Than Nothing!

Build to Leverage

- Build to be **reused** -

- Build to be an **example** -

Build a **Library**



So when?

Repeat same/similar task **5 or more times**?

Consider (trivial or not) automation.

Back-of-Envelope Justification

Deploy 400 Routers

Manual Config, OSS Tasks

2 hours per device
manual config generation,
add to NMS,
add to backup system,
add to DNS

400 * 2 hours = **800 Hours**.

Deploy 400 Routers

Automation of Config, OSS Tasks

3 weeks to develop and test config generation, add to NMS, backup system and DNS, at **5 hours** dev time per day

30 minutes per device do config (manual parameter entry), NMS, DNS, etc.

3 x 25 + 400 * 0.5 hours = **275 Hours**.

Deploy 400 Routers

800 hours manual verses **275 hours automated config**, NMS, etc.

saving 525 hours or **105 days**.

That’s a no brainer!

(And even much, much faster if config parameters come from a database)

Technology is used by organisations for only 2 reasons ...

To Save Money

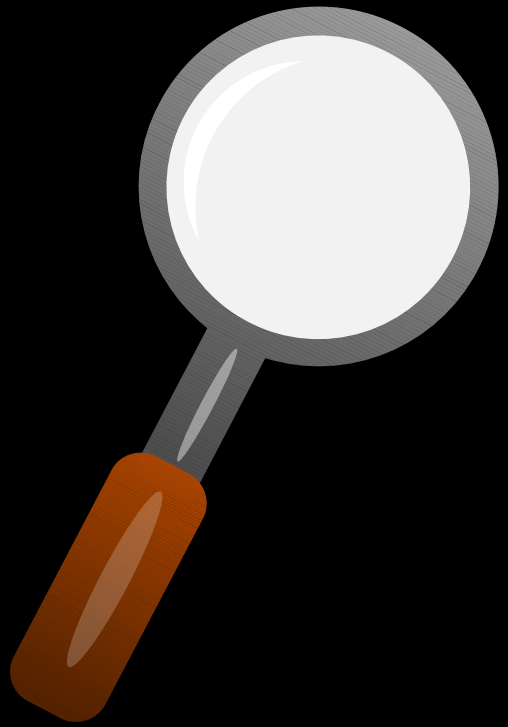
To Make Money

Careless automation?

Blown up network!

Need to be said?

Use development and test lab (virtualised!)



More Focus on Failure Modes

How to avoid.

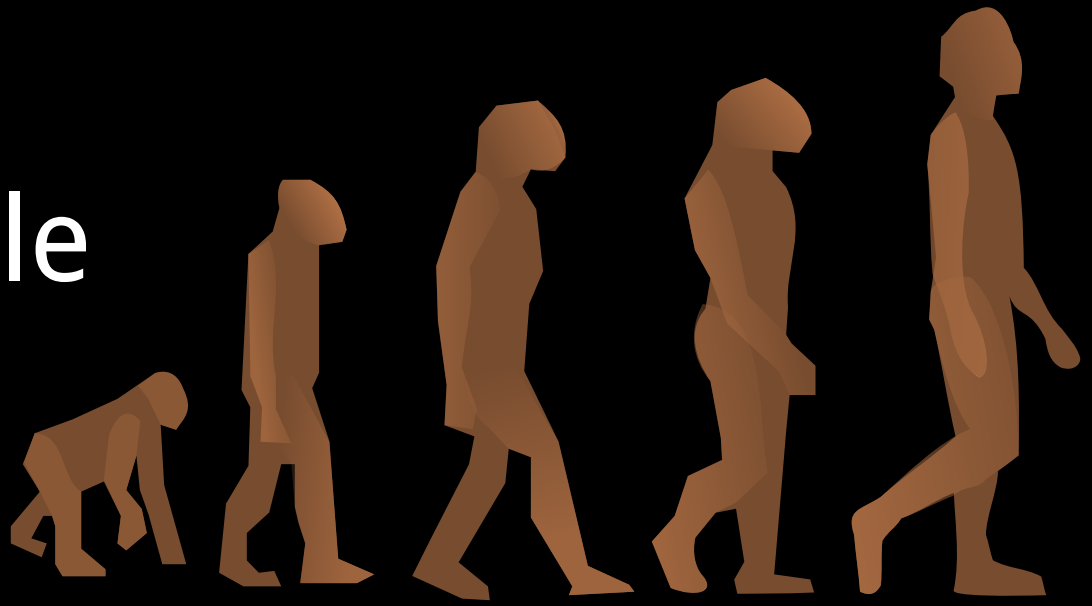
How to recover from.

Conservative

Incremental

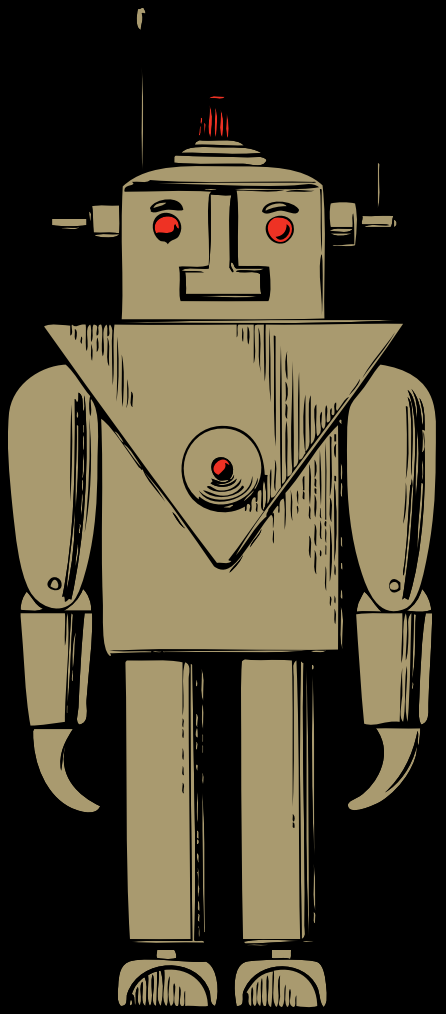
Increasing Scale

Deployment



Enough to get you started?

Hopefully!



Act 3

“Where’s the driverless car for driving networks?”

“Where’s the driverless car for driving networks?”

“Looking back at the Internet’s past decade”, Geoff Huston, 25 Jun 2018.

https://blog.apnic.net/2018/06/25/looking-back-at-the-internets-past-decade/

SDN?

Software **Defined** Network?

Defined ~= Configured
Defined ~= Orchestrated

Defined == Driverless Network?

SON?

Software **Operated** Network

Operated == Self-Managed

Self-Managed

Self-Configuration

Self-Optimisation

Self-Healing

Self-Protection

Internet Research Task Force (IRTF)
Request for Comments: 7575
Category: Informational
ISSN: 2070-1721

Autonomic Networking: Definitions and Design Goals

Abstract

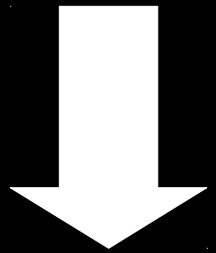
Autonomic systems were first described in 2001. The fundamental goal is self-management, including self-configuration, self-optimization, self-healing, and self-protection. This is achieved by an autonomic function having minimal dependencies on human administrators or centralized management systems. It usually implies distribution across network elements.

IETF WG

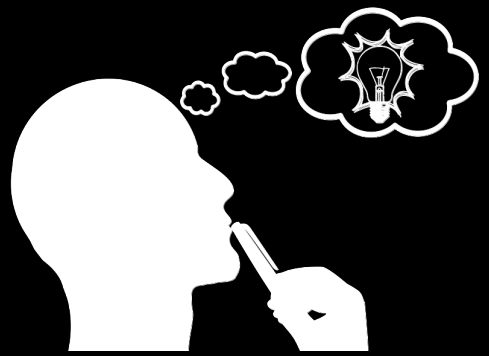
Autonomic Networking Integrated Model and Approach

(ANIMA)

individual node operated model



fleet of self-managed nodes model



Automatic OSPF ID

OSPF Enabled By Default

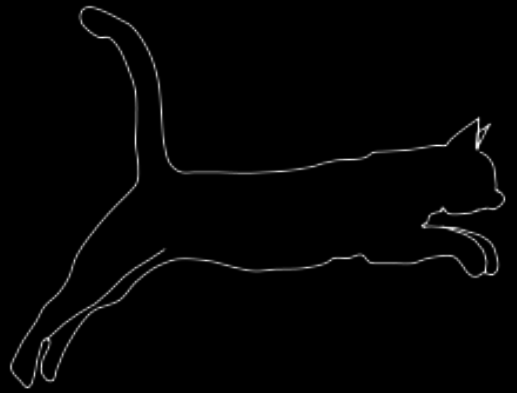
IPv6 Link-Local Addressing

OSPF bootstrapped automatically

OSPF discovers topology

OSPF will adapt to link failures

Small leap!



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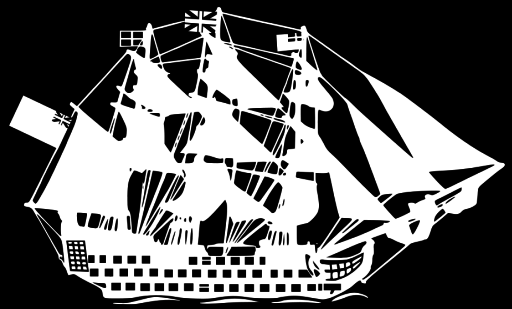
IP networking was initially designed with similar properties in mind. An IP network should be distributed and redundant to withstand outages in any part of the network. Routing protocols such as OSPF and IS-IS exhibit properties of self-management and can thus be considered autonomic in the definition of this document.

Operating the network?

Instructions to the fleet

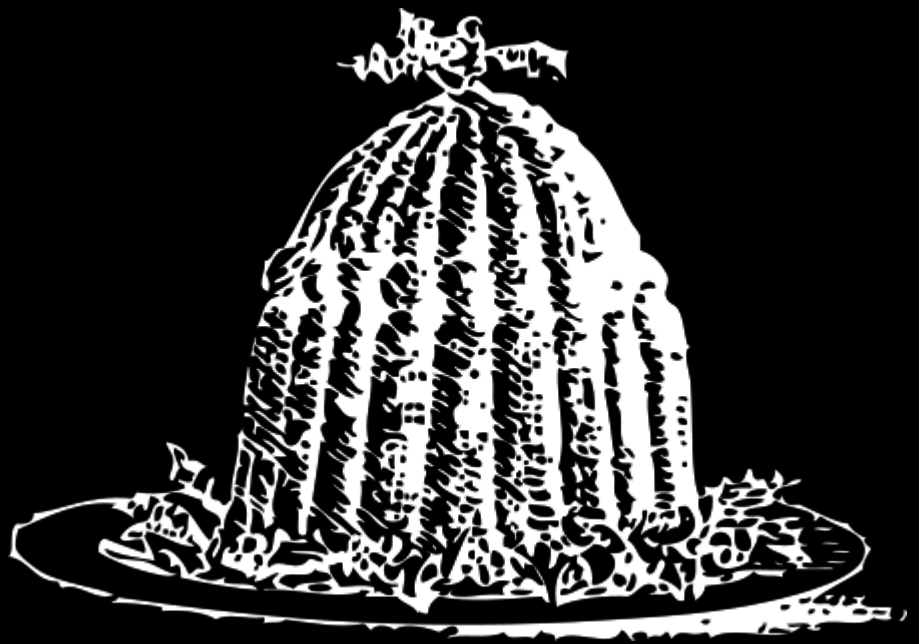
- An “Intent”



We’re not going to be replaced robots.

We’re going to be **their leaders**!

Proof is in the pudding?



Autonomic Networking Configuration and Deployment Guide

Updated: December 15, 2016

Contents

Q: “Where’s the driverless car for driving networks?”

A: Autonomic Networks

AusNOG 2023?

AuSNOG 2023!

Australian Software Network Operators Group 2023!

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