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Taming the IoT using DAQ: Automating Device Testing to Secure Connected Devices

Google Cloud

faucet : testing switches
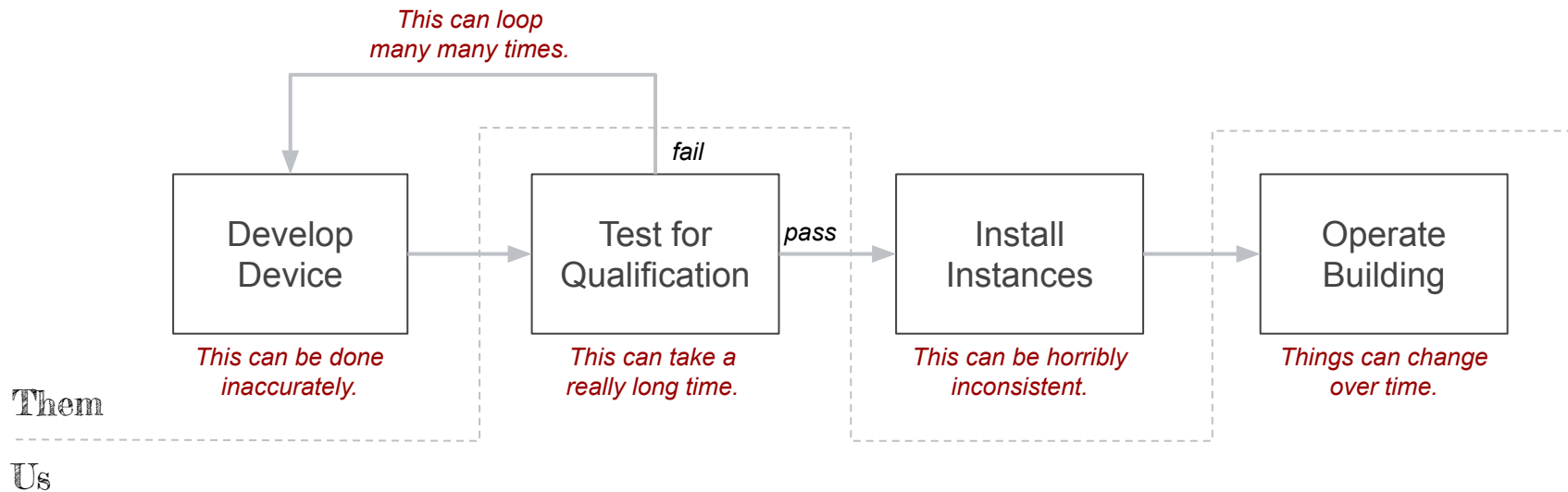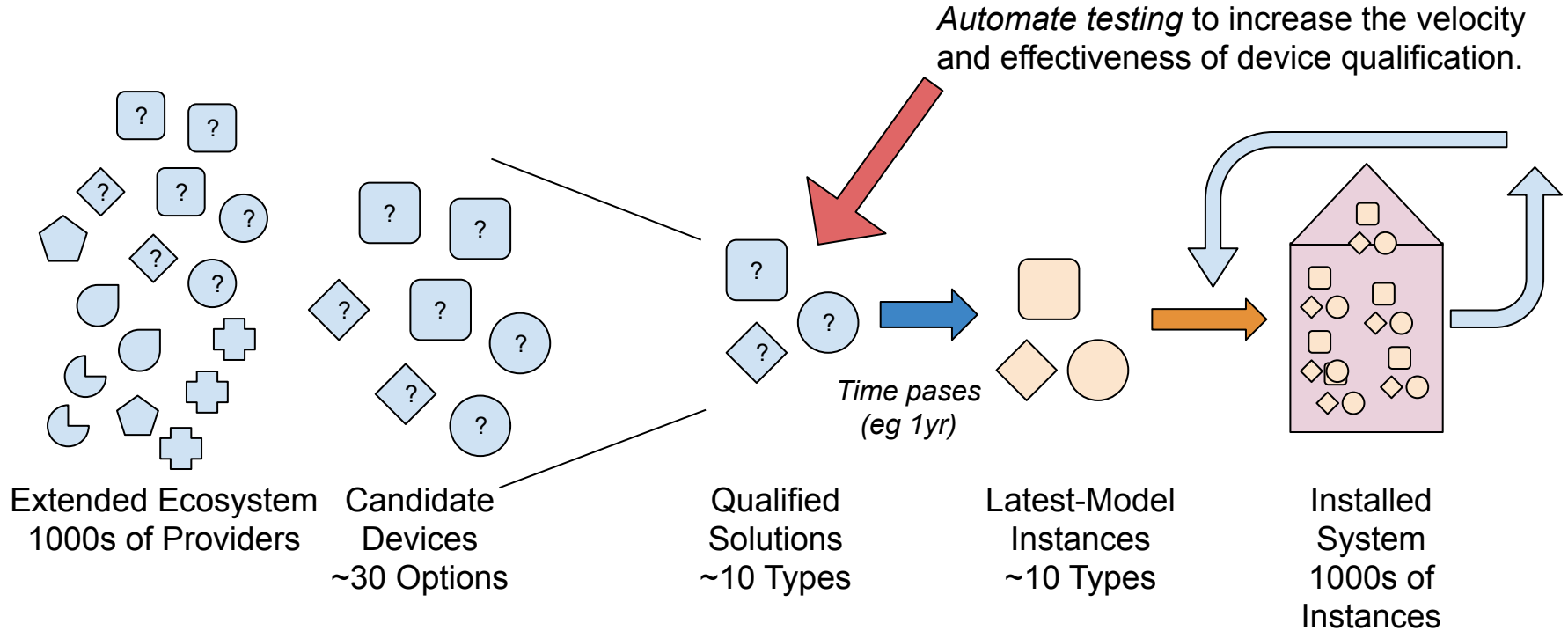## ::
DAQ : testing IoT devices

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Qualification Process

This can loop
many many times.

fail

Develop
Device

Test for
Qualification

pass

Install
Instances

Operate
Building

This can be done
inaccurately.

This can take a
really long time.

This can be horribly
inconsistent.

Things can change
over time.

Them

Us

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Operationalized Qualification

Automate testing to increase the velocity and effectiveness of device qualification.

Time passes (eg 1yr)

Extended Ecosystem
1000s of Providers

Candidate
Devices
~30 Options

Qualified
Solutions
~10 Types

Latest-Model
Instances
~10 Types

Installed
System
1000s of
Instances

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Device Automated Qualification (DAQ)

Internet / External Systems

Test Modules

IoT Devices

Faucet Network Infrastructure

DAQ Framework
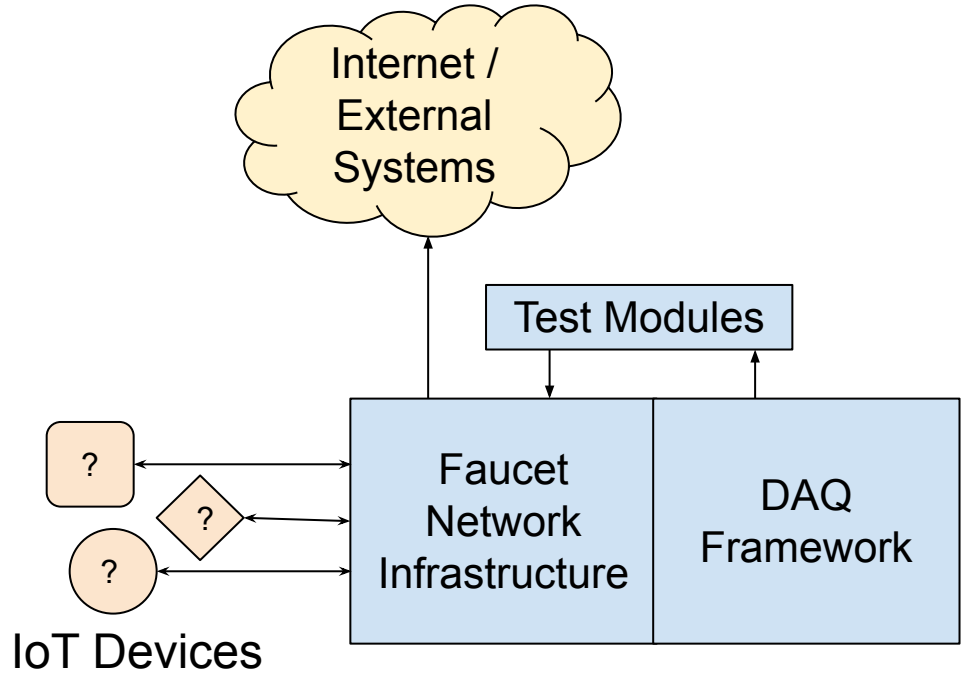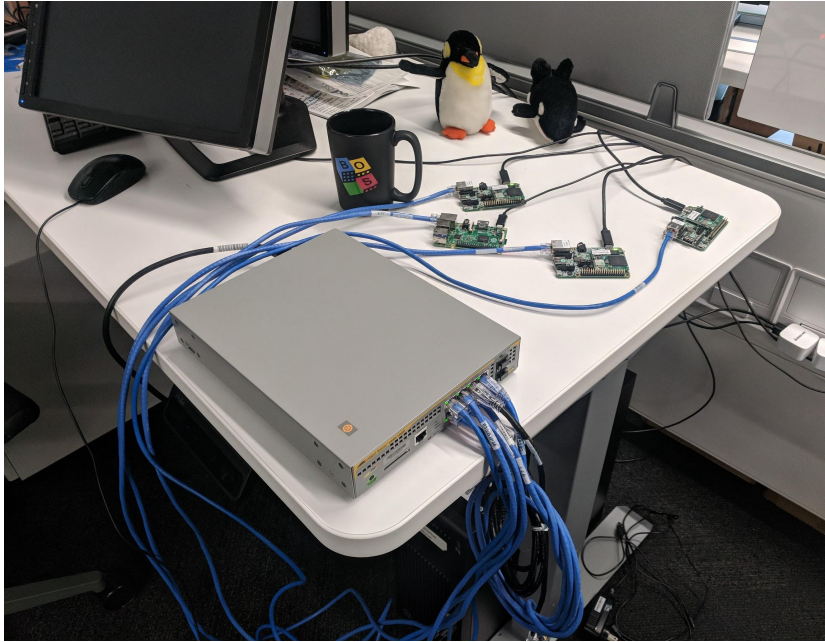
Current Test List & Categorization

Network

- (implicit DHCP, ipv4)
- base.switch.ping
- base.target.ping
- connection.mac_oui
- connection.port_link
- connection.port_speed
- connection.port_duplex
- poe.power
- poe.negotiation
- poe.support

Security

- security.brute
- security.ports.nmap
- security.tls.v3
- security.x509

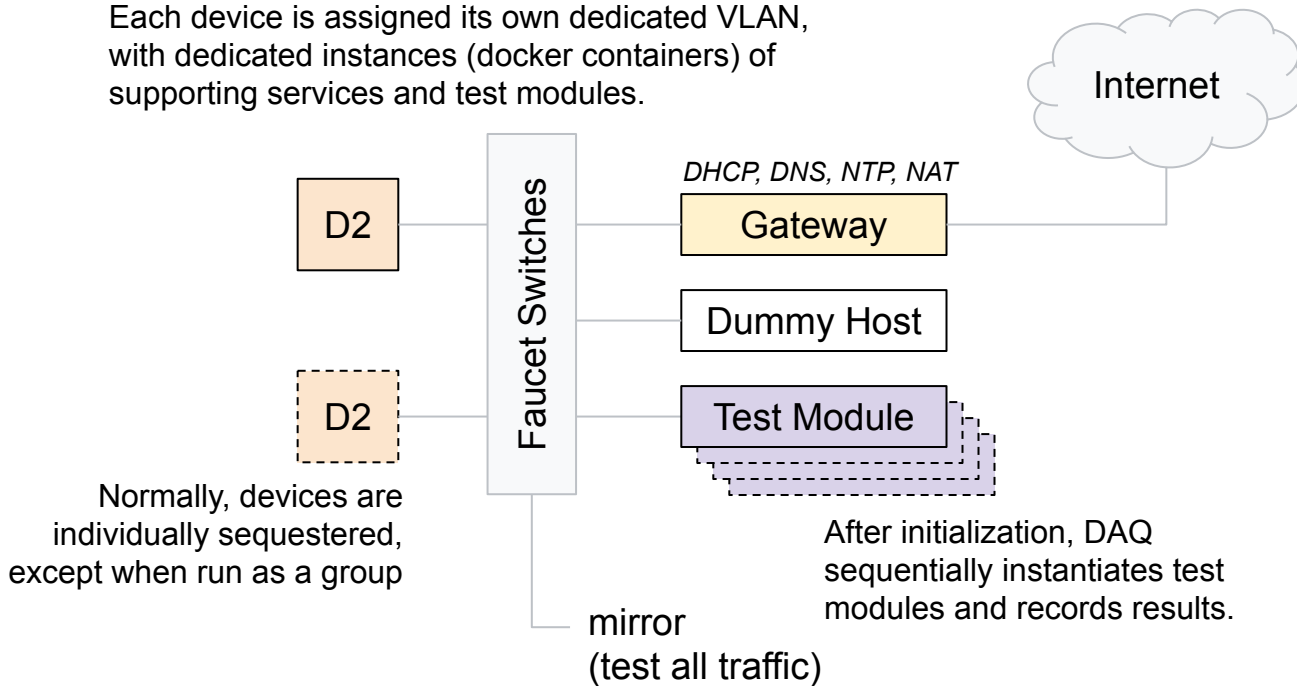## Application

- protocol.bacnet.version
- protocol.bacnet.pic

Software Defined
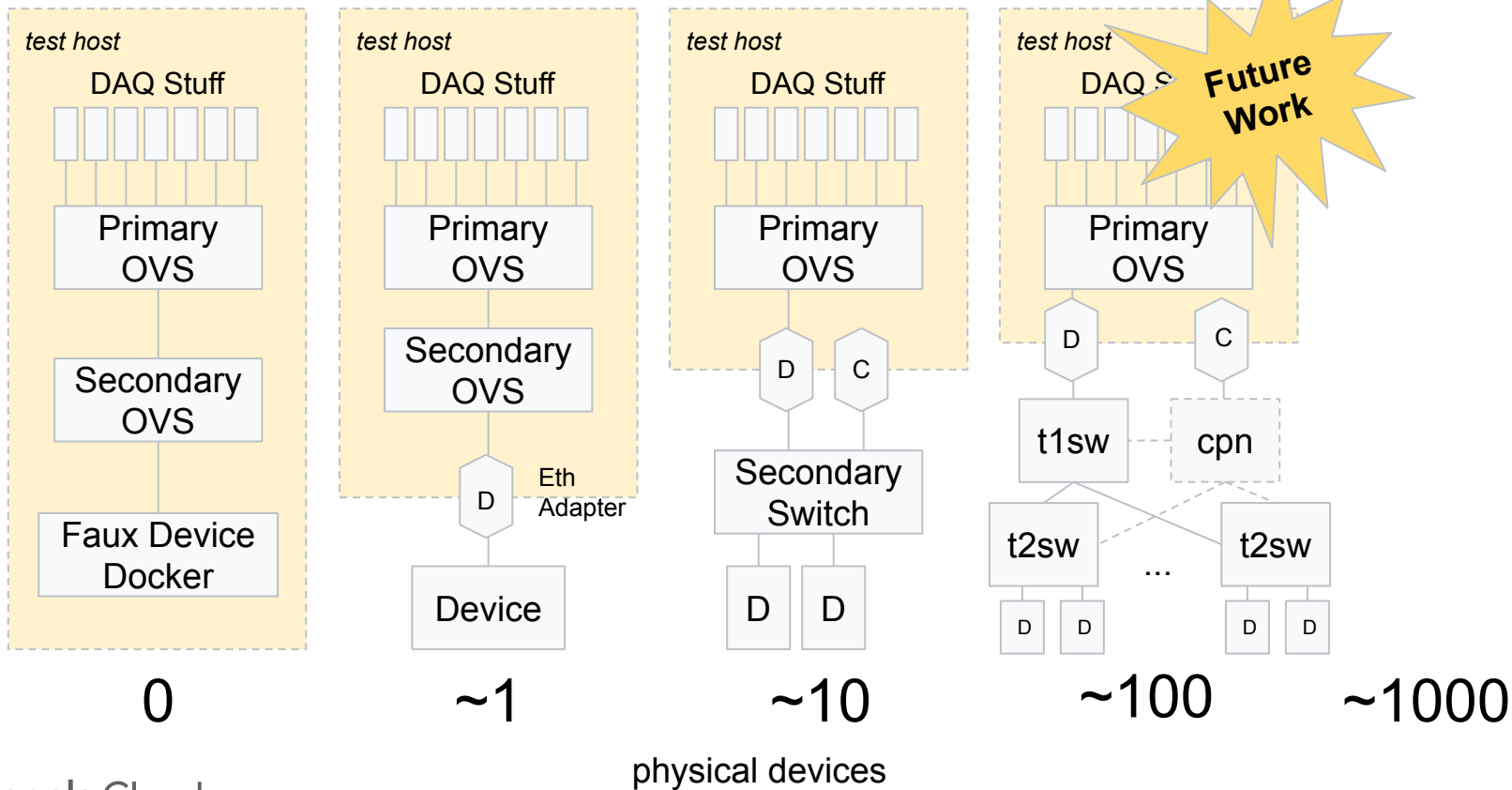
(doing for buildings what y'all did for networks)

- cloud.udmi.pointset

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Device Network Model

Each device is assigned its own dedicated VLAN, with dedicated instances (docker containers) of supporting services and test modules.

Internet

DHCP, DNS, NTP, NAT

D2

Faucet Switches

Gateway

Dummy Host

Test Module

D2

Normally, devices are individually sequestered, except when run as a group

After initialization, DAQ sequentially instantiates test modules and records results.

mirror
(test all traffic)

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Scaling Network Topologies

0	~1	~10	~100	~1000

physical devices

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Testing The Future

Not at all easy to get people to implement a nascent, broadly-defined specification.

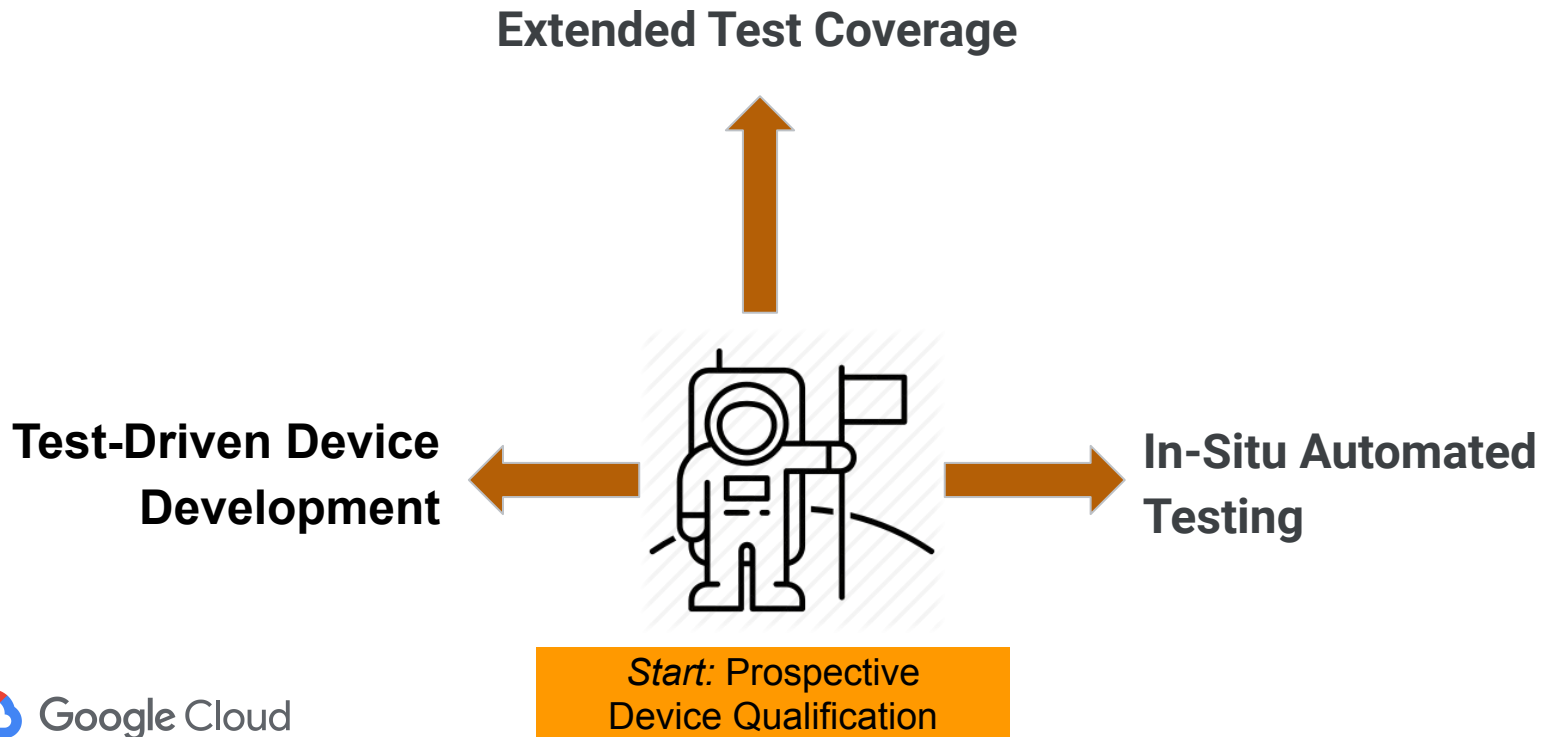**MUD**: Manufacturer Usage Description, IETF RFC 8520.

- Describes the network surface of an attached appliance.
- This is new, and people don't know what it is: *60 pages long.*
- Only partial compliance with MUD required, and some things prohibited.
- Combine with a defacto site device schema standard (what talks to what).
- Map to Faucet ACLs ⇒ *Make sure it still works.*

Implement MUD.

Not everything.

Just the parts we want.

Launch and Iterate

Extended Test Coverage

Test-Driven Device Development

In-Situ Automated Testing

Start: Prospective Device Qualification

In summary...

DAQ is designed to tame the stormy sea of IoT-devices, using the power of automated testing to streamline and enhance the process.

Thank you!

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