Red Hat Summit

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Welcome to the Hands-On Day

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Managing the Unmanageable

Device fleet under control with Red Hat Edge Manager

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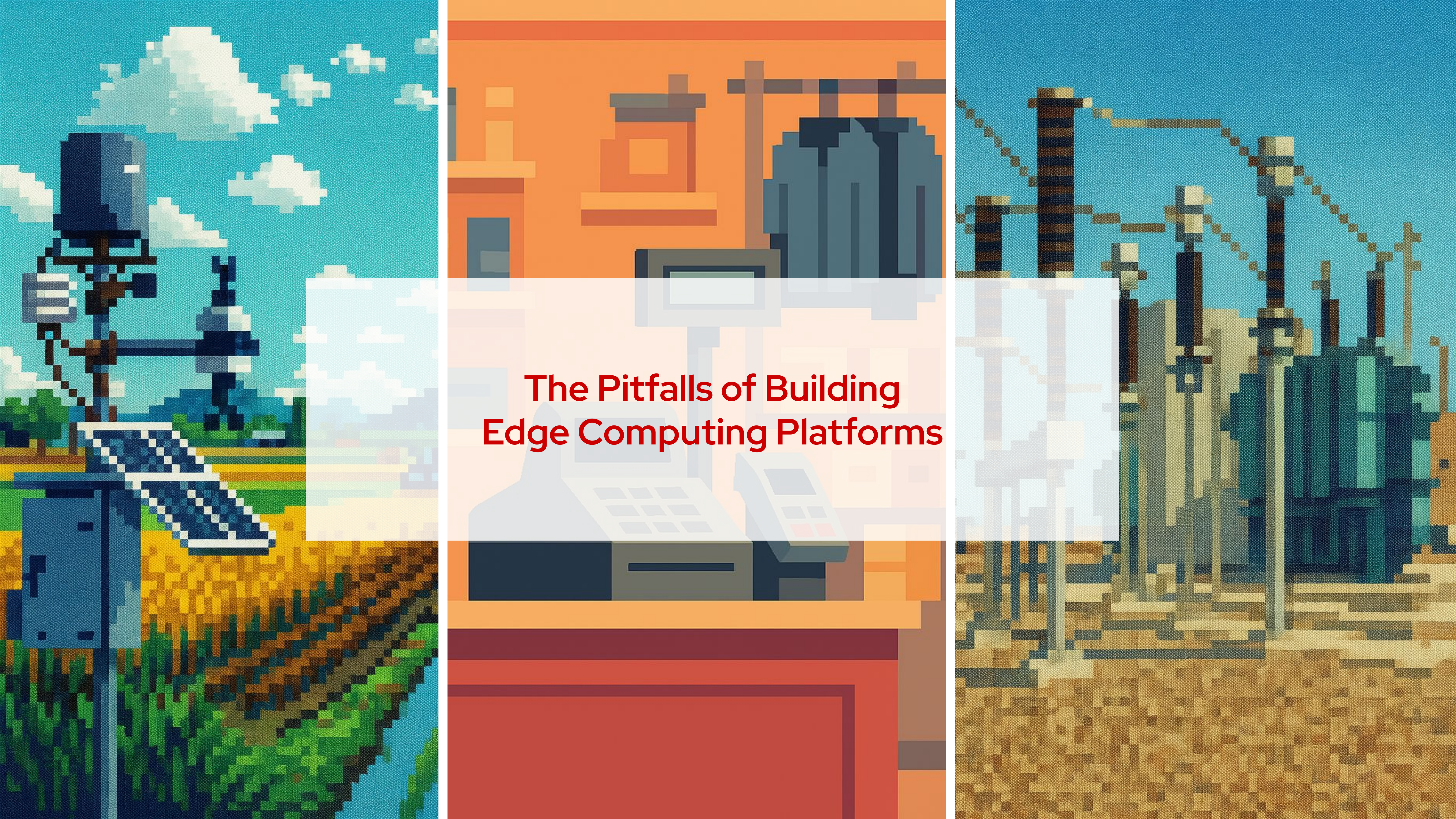
What is Edge Computing?

Compute near the data sources

Fast reaction near the asset

Decisions with little latency

High resiliency due to local processing



The Pitfalls of Building Edge Computing Platforms

Challenge: Resources

Limited Hardware

Edge devices are typically designed for a specific use case, limiting their flexibility

Network Connectivity

Network stability is often fragmented, and bandwidth can be limited

On-Site Personnel

Remote locations frequently lack IT staff for maintenance and troubleshooting

Challenges: Stability and Security

Configuration

System states drift apart over time, leading to inconsistencies

Updates

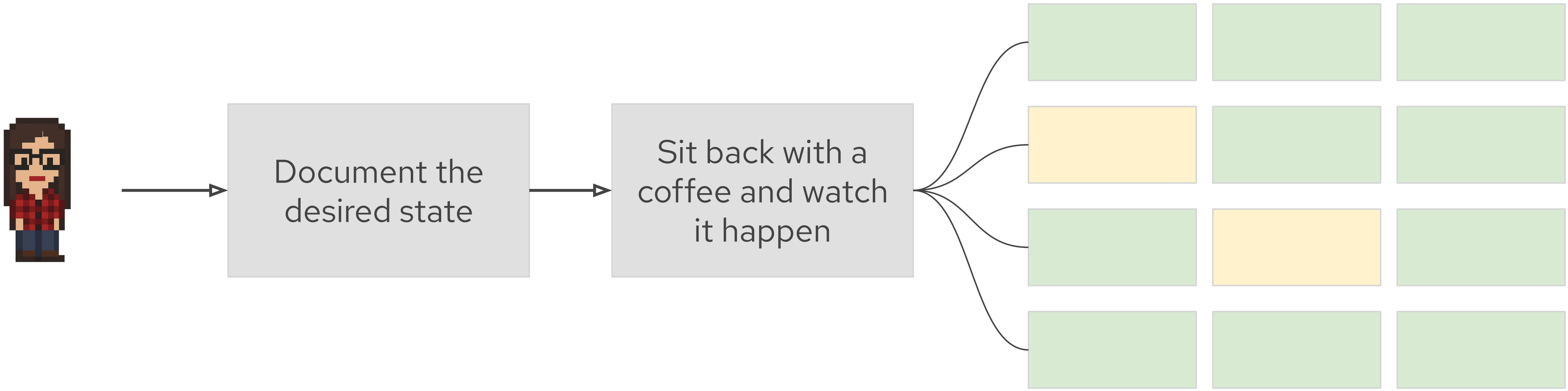
Updates carry risk because rollbacks are usually not an option

Software Supply Chain

Securing the code from development to the end device is done on a best-effort basis

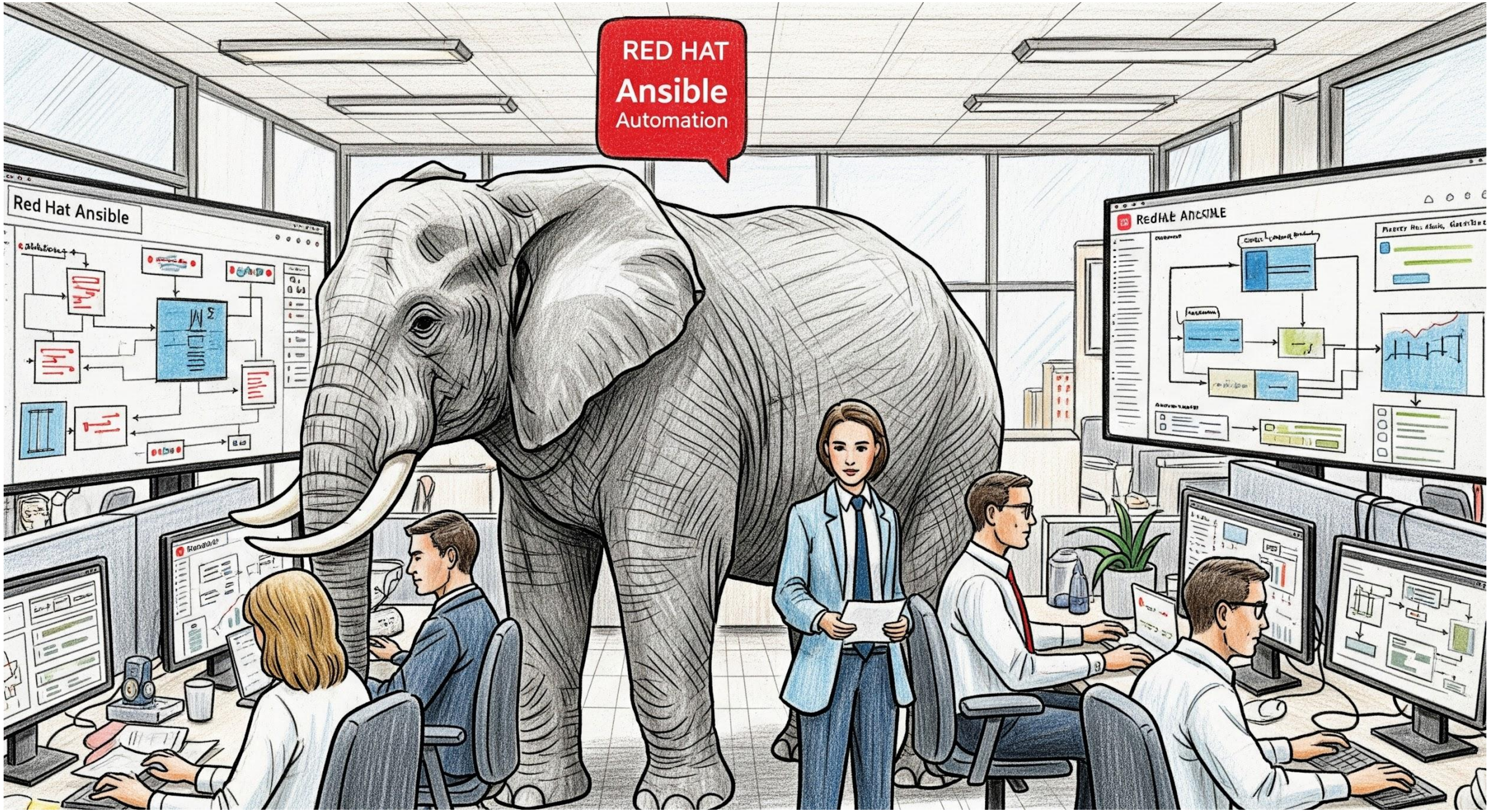
Solution: A straightforward approach to deploying edge applications

What if deploying to thousands of devices were as easy as deploying to just one?



Document the desired state

Sit back with a coffee and watch it happen



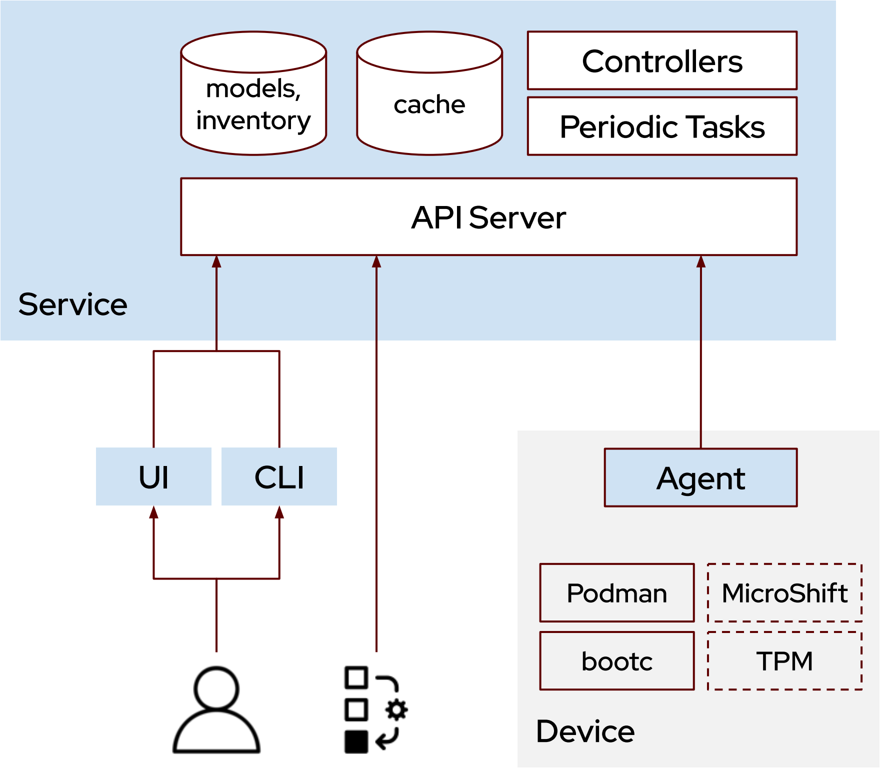
RED HAT
Ansible
Automation
Red Hat Ansible

Today, we're talking about

Red Hat
Edge Manager

as a complementary solution!

Agent-based Architecture



A peek under the hood: bootc

Challenge: Building Linux Images

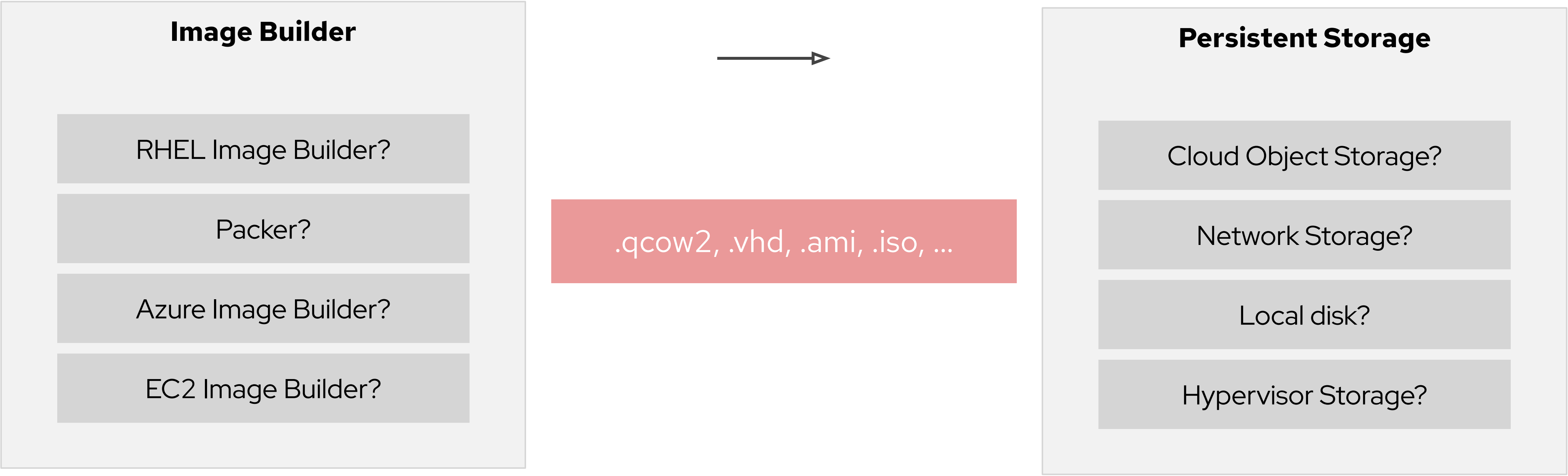


Image Builder

RHEL Image Builder?

Packer?

Azure Image Builder?

EC2 Image Builder?

.qcow2, .vhd, .ami, .iso, ...

Persistent Storage

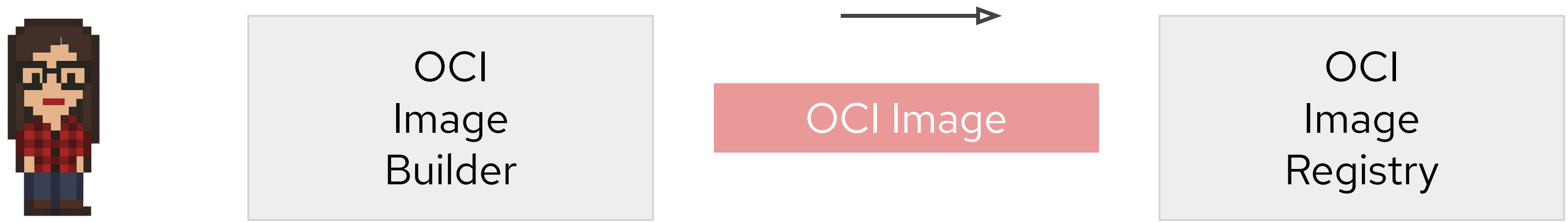
Cloud Object Storage?

Network Storage?

Local disk?

Hypervisor Storage?

Direct Comparison: Building Container Images



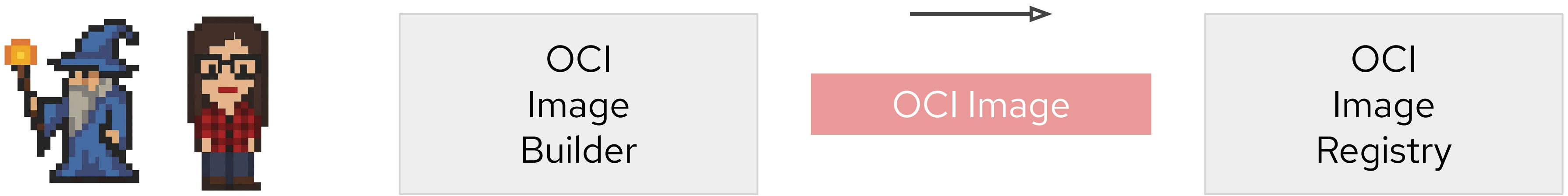
OCI Image Builder

OCI Image

OCI Image Registry

What if it were possible to combine both approaches?

Solution: One tool for both Linux and Container Images



OCI Image Builder

OCI Image

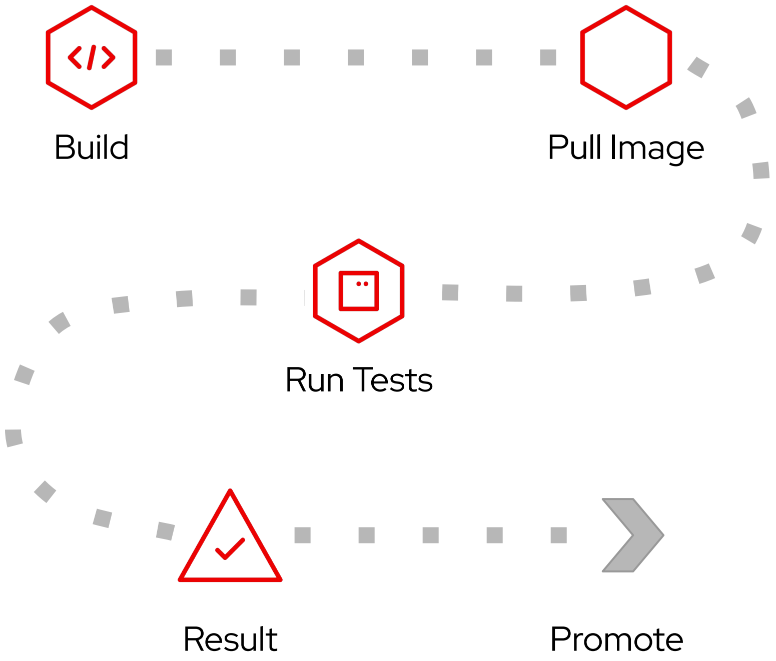
OCI Image Registry

```
FROM registry.redhat.io/rhel10/rhel-bootc:10.0
RUN dnf install -y httpd && \
    dnf clean all

RUN systemctl enable httpd.service

COPY index.html /var/www/html/index.html
```

The Evolution from Runtime to Buildtime configuration

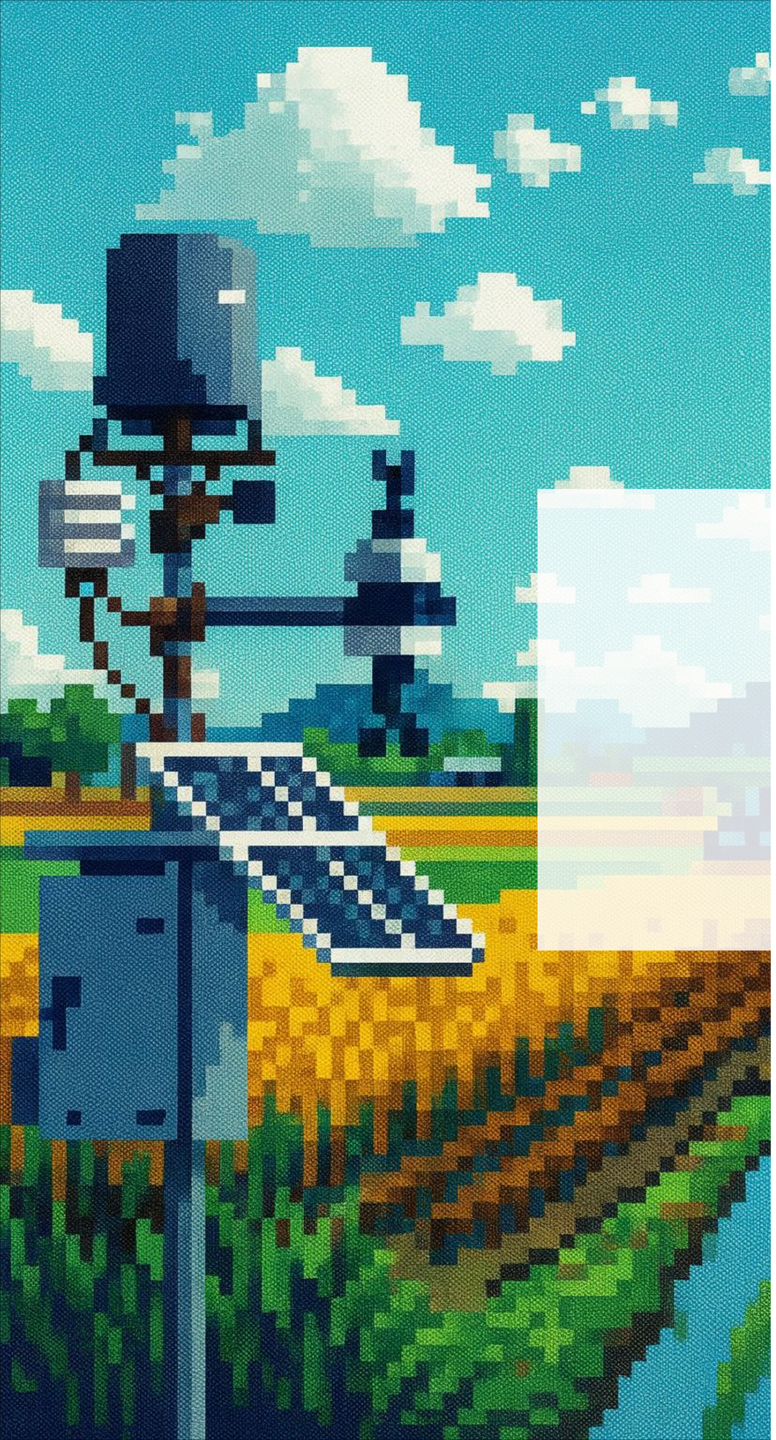


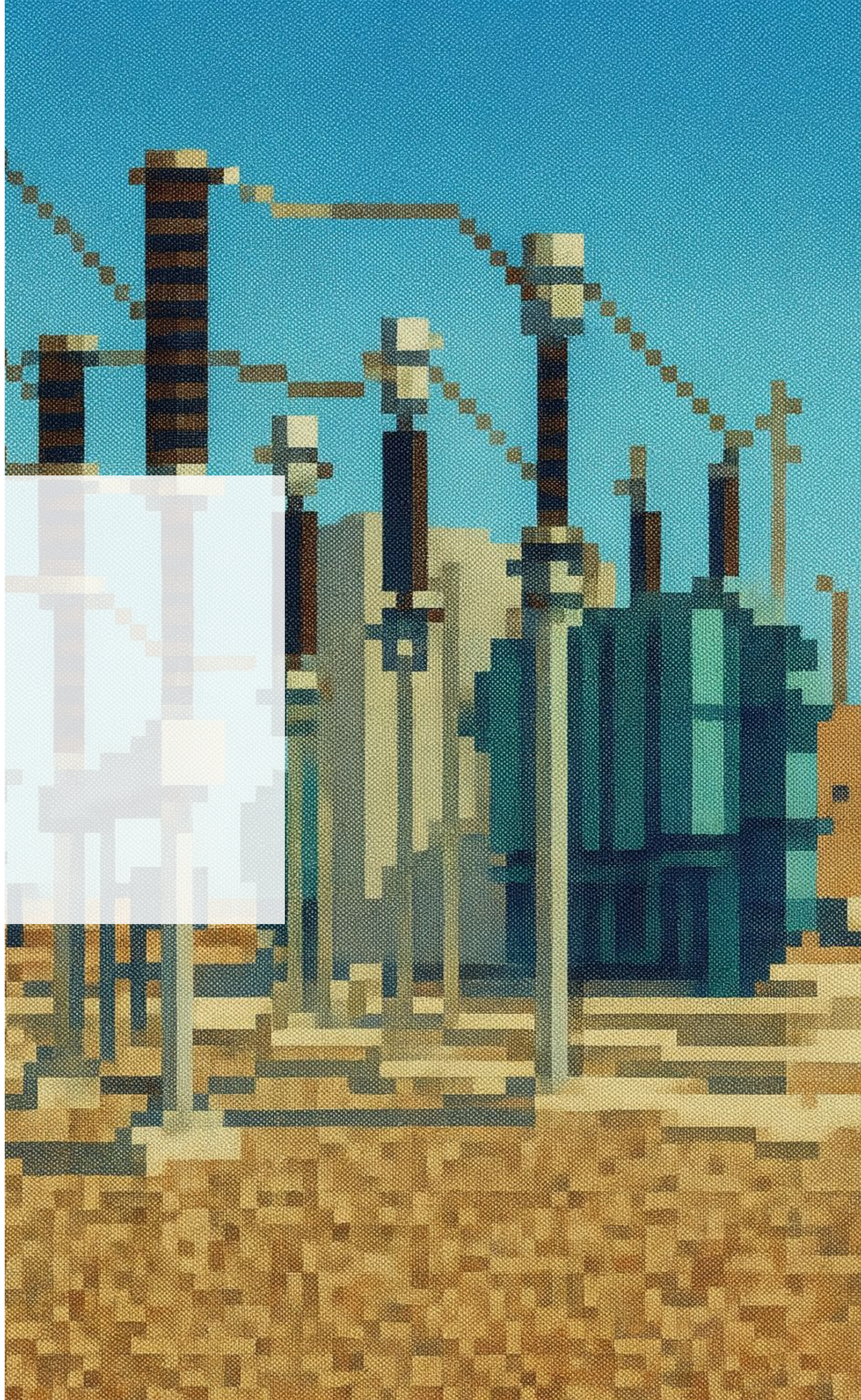
AI/ML Stacks

Edge Geräte

Hypervisor

App + OS Kombination





Challenges with Edge-App-Deployments

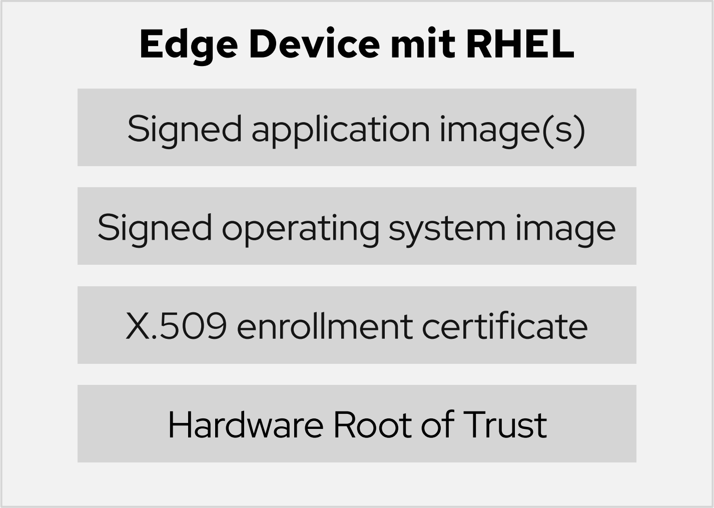
Challenges with Edge-App-Deployments

End-to-End Security

From initial installation, through deployment at an edge location, to ongoing updates.

Solution: Secure Installation and Software Deployments

Zero-Touch and Zero-Trust via the FIDO Device Onboard (FDO) Standard



Edge Device mit RHEL

Signed application image(s)

Signed operating system image

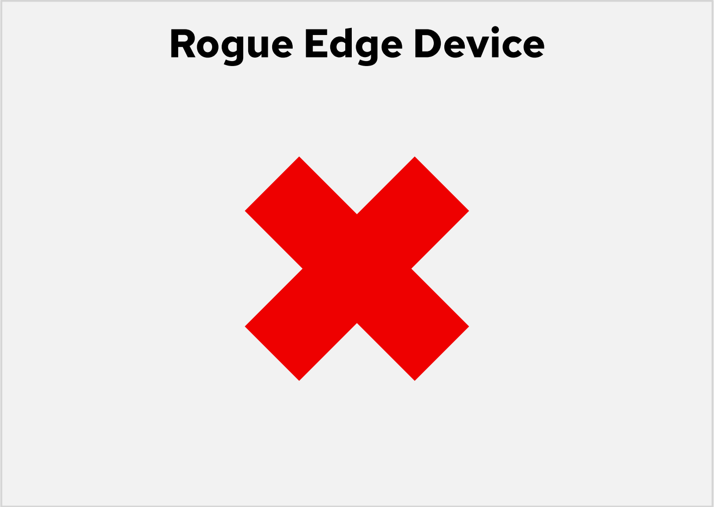
X.509 enrollment certificate

Hardware Root of Trust

- Digitally signed and verified
- Orchestrated via mTLS

Solution: Secure Installation and Software Deployments

Signed Applications, Operating Systems, and TLS Certificates


Rogue Edge Device

🔒❌ Unsigned applications will not start

🔒❌ No connection to Red Hat Edge Manager

In Summary: What is the process for rolling out a new device?

On-Site Technician:

- Powers on the device
- Connects it to the network
- Authorizes the device for operation

Challenges with Edge-App-Deployments

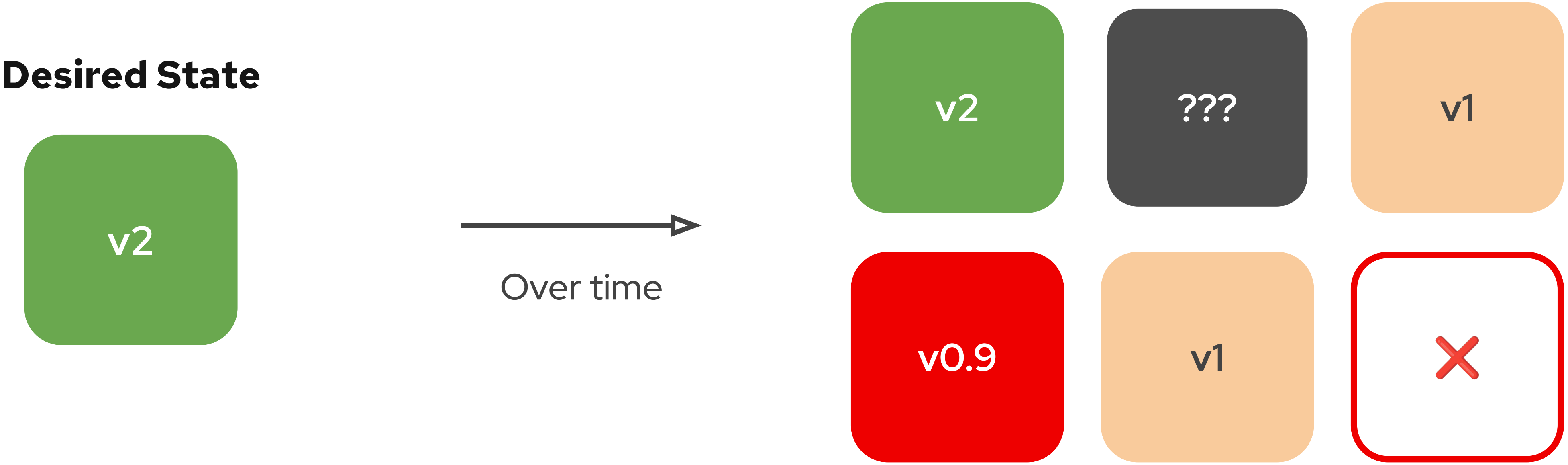
End-to-End Security

From initial installation, through deployment at an edge location, to ongoing updates.

Coordination of Updates

Updates without downtime or impact on network performance.

Challenge: Configuration Drift



Desired State

v2

Over time

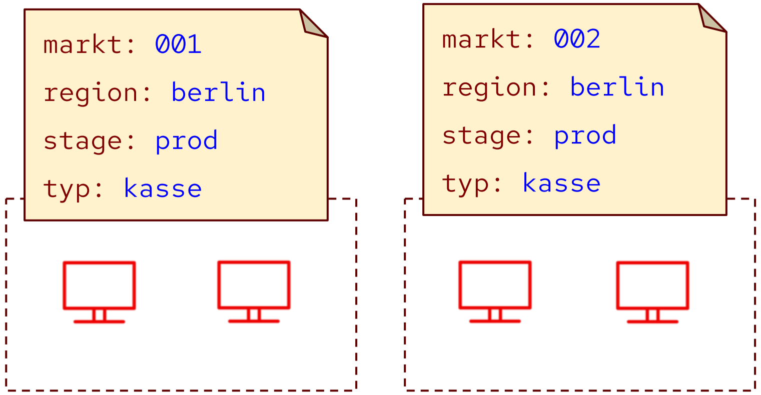
v2 ??? v1

v0.9 v1 ❌

Solution: Declarative Configuration and Abstraction

"Fleets" define the desired state, labels assign devices accordingly

Select devices using labels:



```
markt: 001
region: berlin
stage: prod
typ: kasse
```

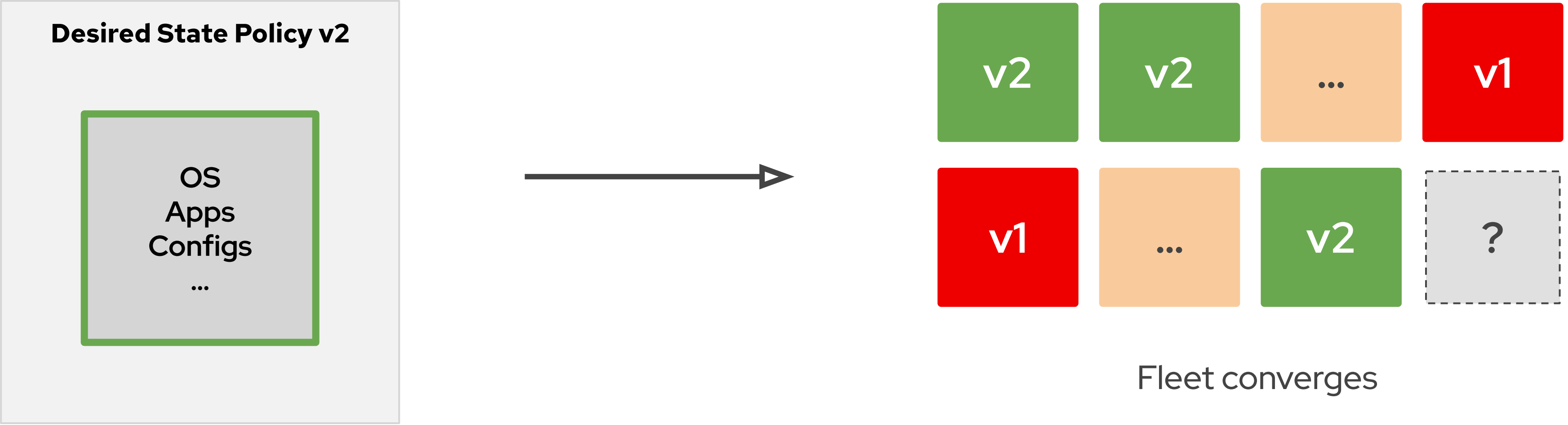
```
markt: 002
region: berlin
stage: prod
typ: kasse
```

Fleet: Cash Registers in Store A

Fleet: Cash Registers in Store B

Solution: Consistency through Policies

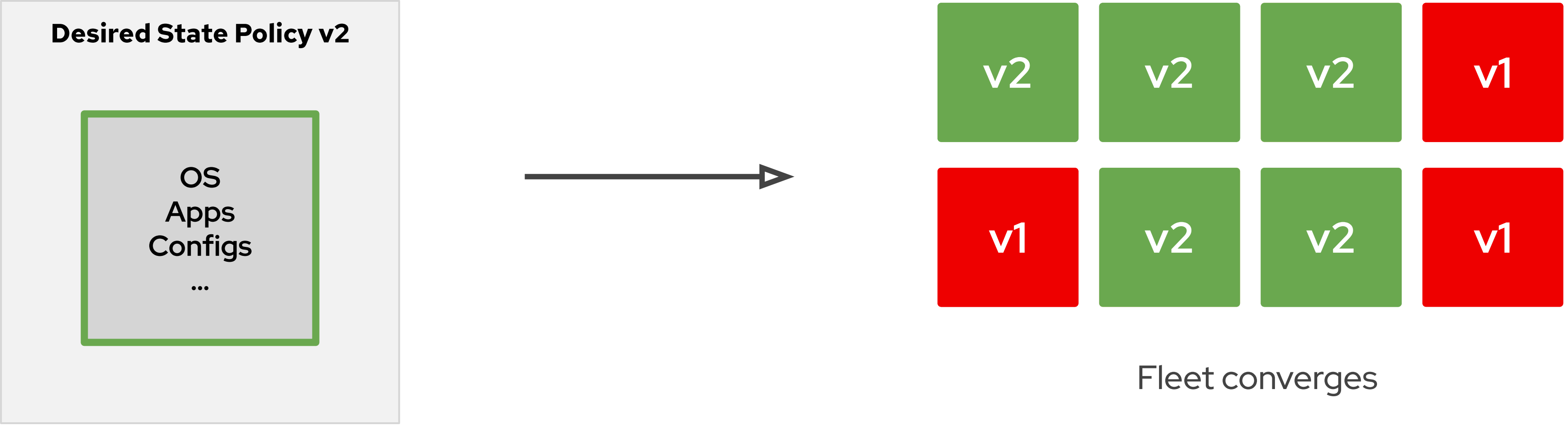
Automatic alignment of desired and actual state



Fleet converges

Solution: Consistency through Policies

Automatic alignment of desired and actual state



Desired State Policy v2

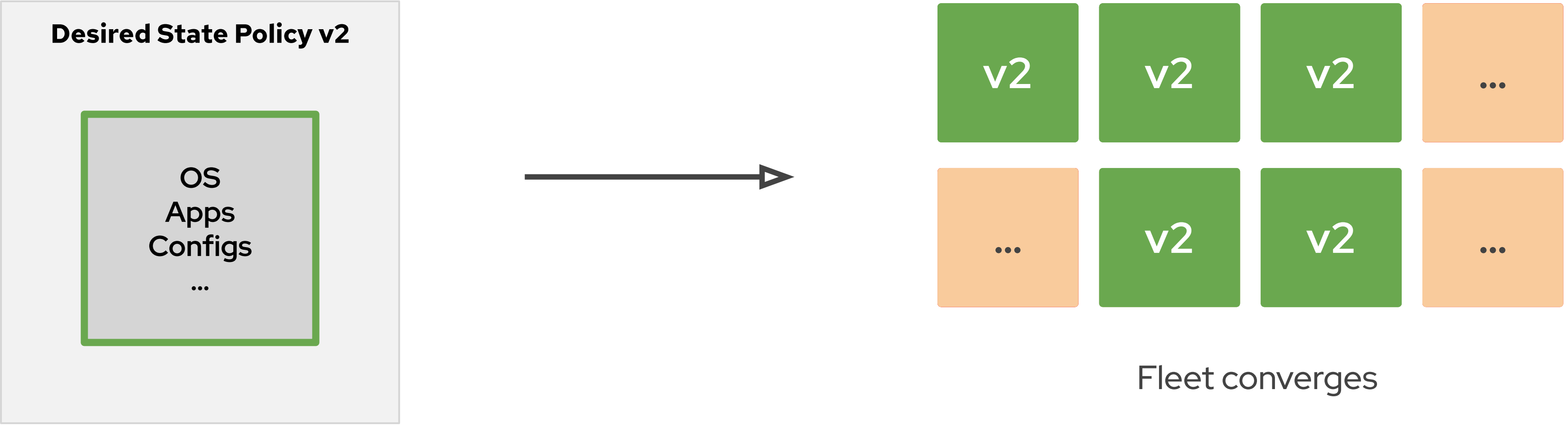
OS
Apps
Configs
...

v2 v2 v2 v1
v1 v2 v2 v1

Fleet converges

Solution: Consistency through Policies

Automatic alignment of desired and actual state



Desired State Policy v2

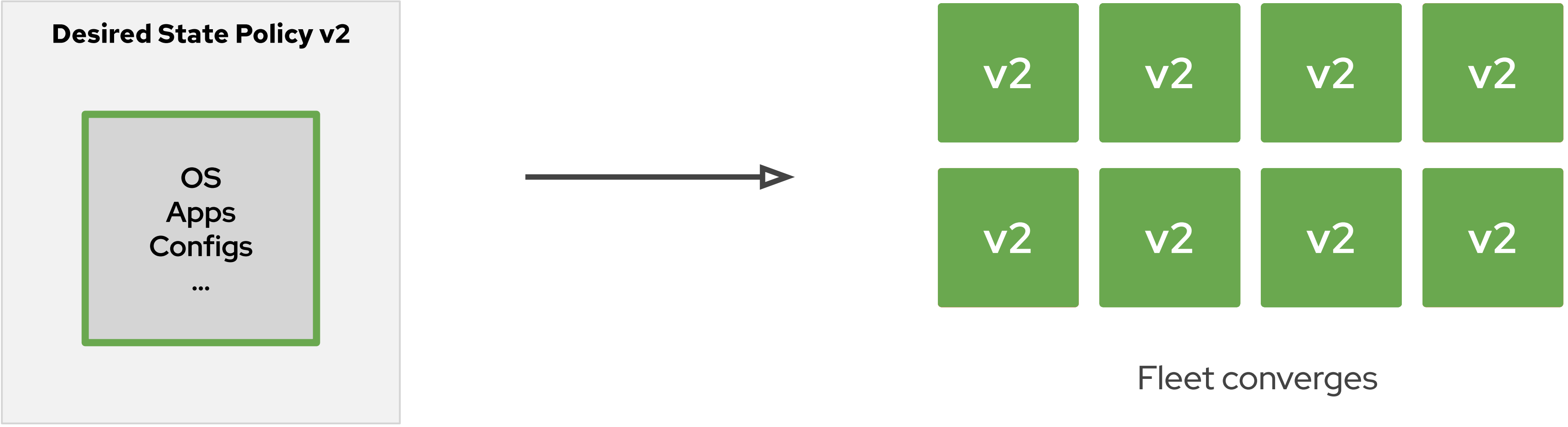
OS
Apps
Configs
...

v2	v2	v2	...
...	v2	v2	...

Fleet converges

Solution: Consistency through Policies

Automatic alignment of desired and actual state



Fleet converges

Challenges with Edge-App-Deployments

End-to-End Security

From initial installation, through deployment at an edge location, to ongoing updates.

Coordination of Updates

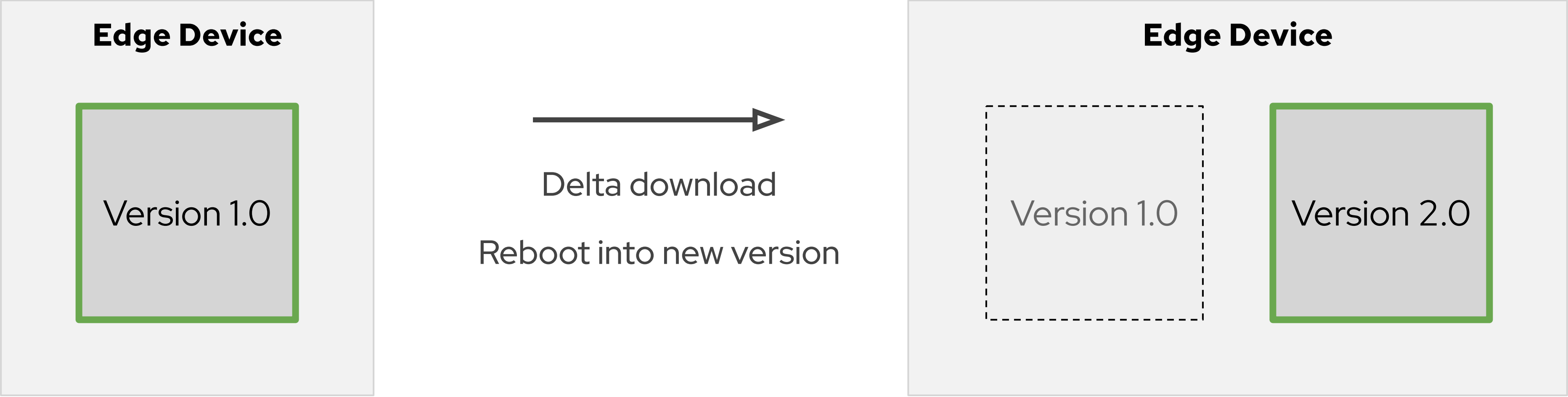
Updates without downtime or impact on network performance.

Troubleshooting

No on-site staff, or staff with limited IT experience or inadequate tools.

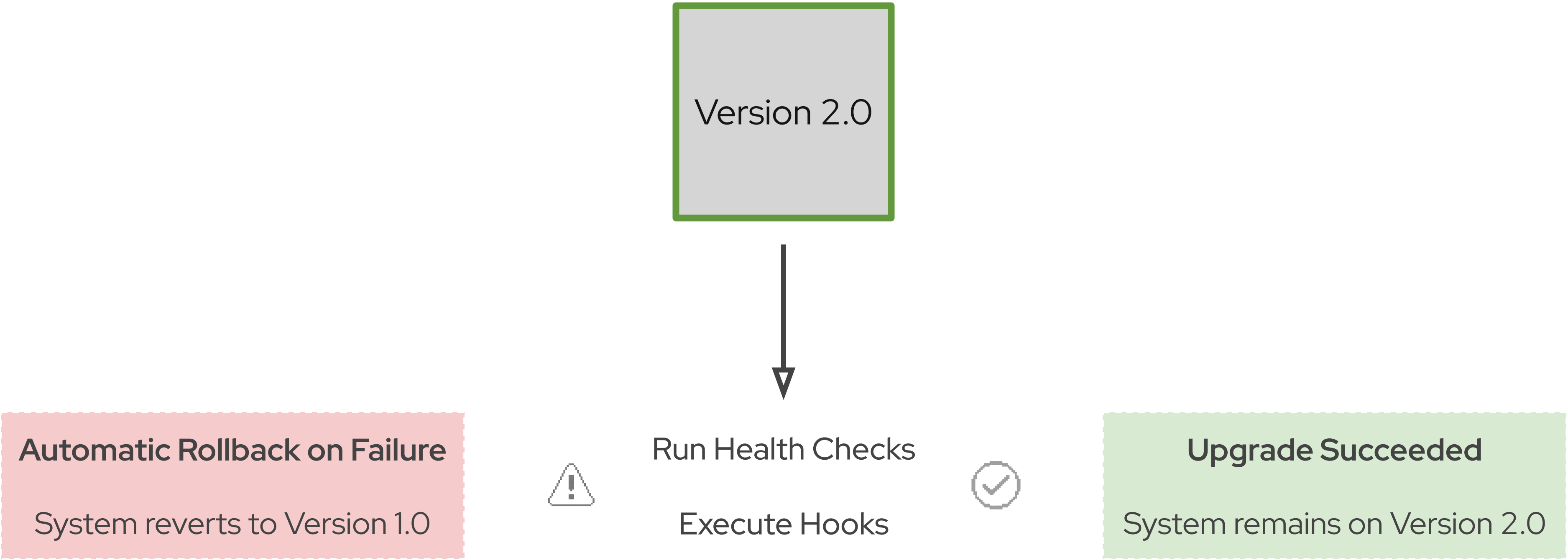
Solution: Atomic, reliable upgrades with intelligent rollback

Updates are all-or-nothing, ensuring system stability.



Solution: Intelligent rollback

Custom health checks automatically revert failed upgrades.



Version 2.0

Run Health Checks

Execute Hooks

Automatic Rollback on Failure ⚠

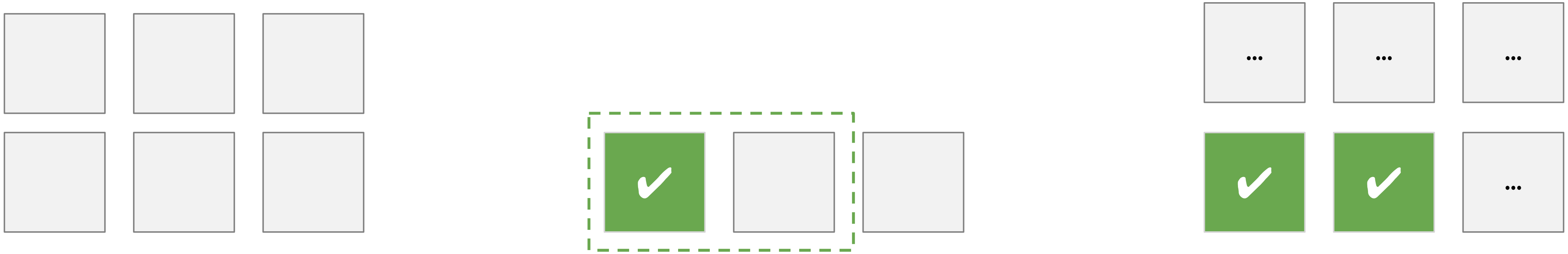
System reverts to Version 1.0

✓ **Upgrade Succeeded**

System remains on Version 2.0

Solution: Rollout and update policies

Update in scheduled, controlled, validated waves.



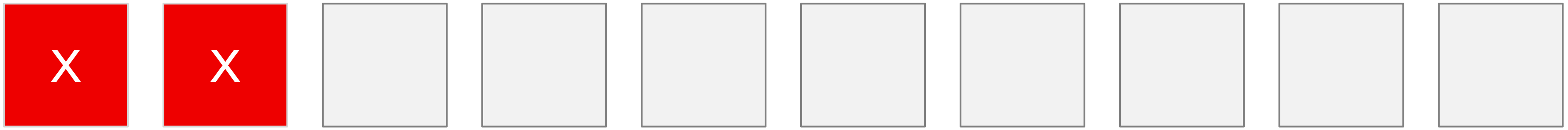
Fleet

Update eines Subsets

Fortsetzen bei Erfolg

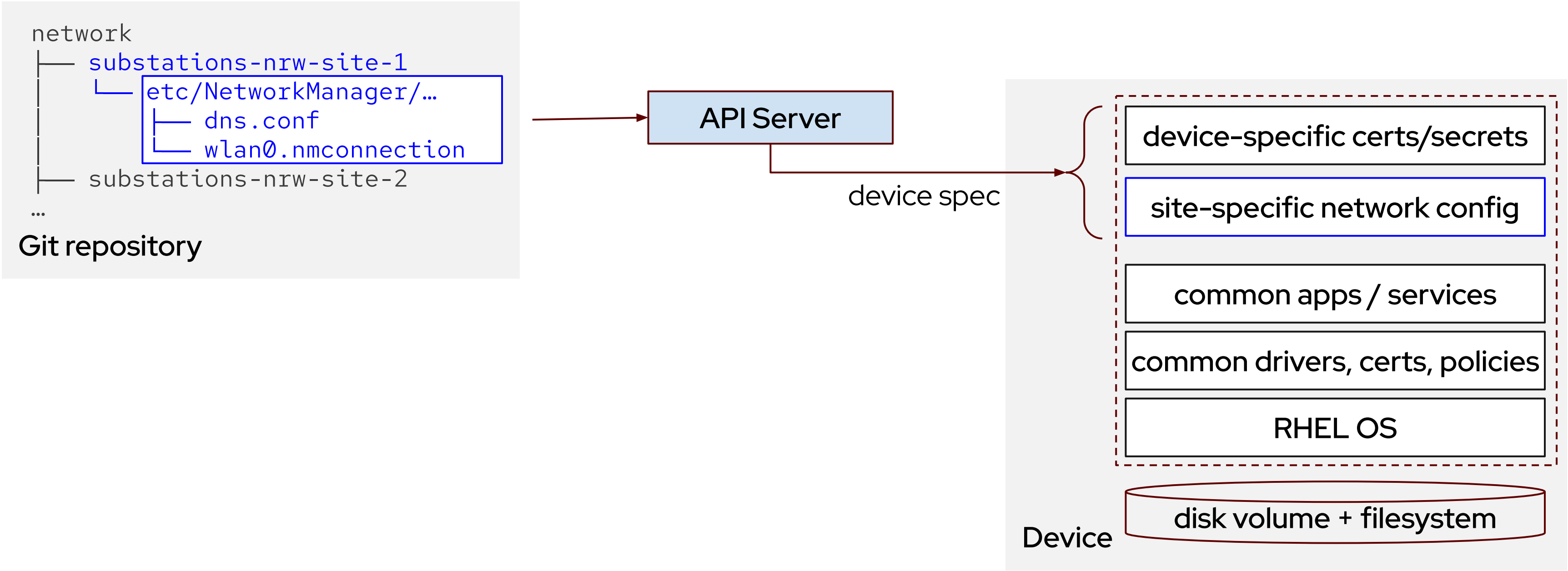
Solution: Disruption budgets

Limit concurrent updates to ensure availability.



The rollout is automatically halted if 20% of devices are offline

Solution: device- or group-specific configuration



```
network
├── substations-nrw-site-1
│    └── etc/NetworkManager/…
│        ├── dns.conf
│        └── wlan0.nmconnection
├── substations-nrw-site-2
…
```

Git repository

API Server

device spec

device-specific certs/secrets

site-specific network config

common apps / services

common drivers, certs, policies

RHEL OS

disk volume + filesystem

Device

Challenges with Edge-App-Deployments

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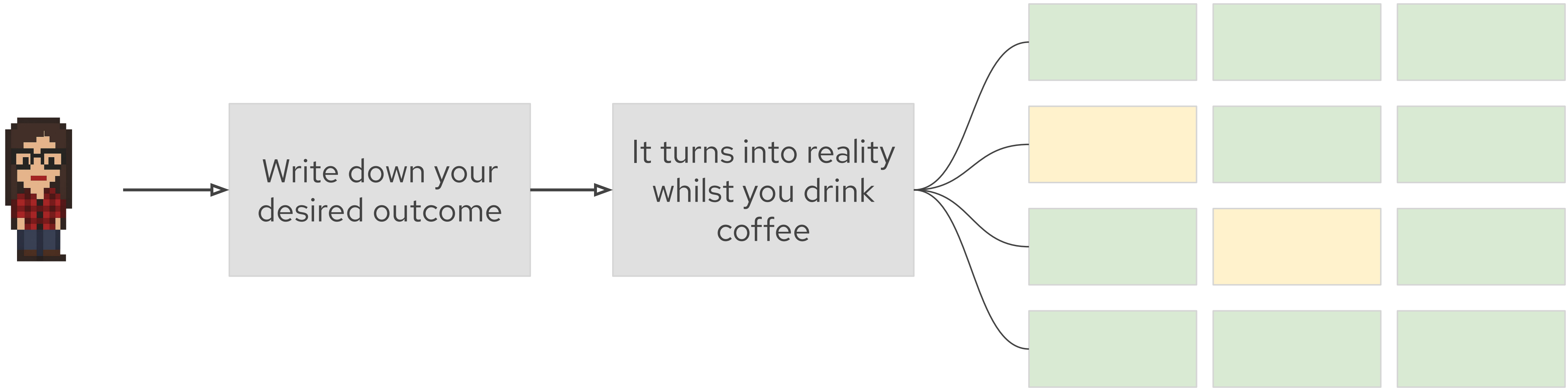
Vision: A radically simplified approach to edge application delivery

What if deploying to thousand of devices was as easy as deploying to one?


Write down your desired outcome
It turns into reality whilst you drink coffee

Join the Community. Try the Tech Preview.

Documentation

For more details, see the official Ansible and OpenShift documentation.

Demos

Hands-on demos and workshops are available through the Red Hat Demo Platform.

Questions?

Feel free to reach out to us after the presentation or contact us via email.

Red Hat

Open Tech Quest

Solve technical challenges around Ansible, OpenShift & RHEL as a team

Nicht vergessen!

Schließt euch zu Teams von rund 5 Personen zusammen, legt eure jeweiligen Benutzeraccounts an und startet dann ab 14:45 Uhr gemeinsam durch!

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