# Red Hat OpenShift on IBM zSystems: Demystifying the steady state load

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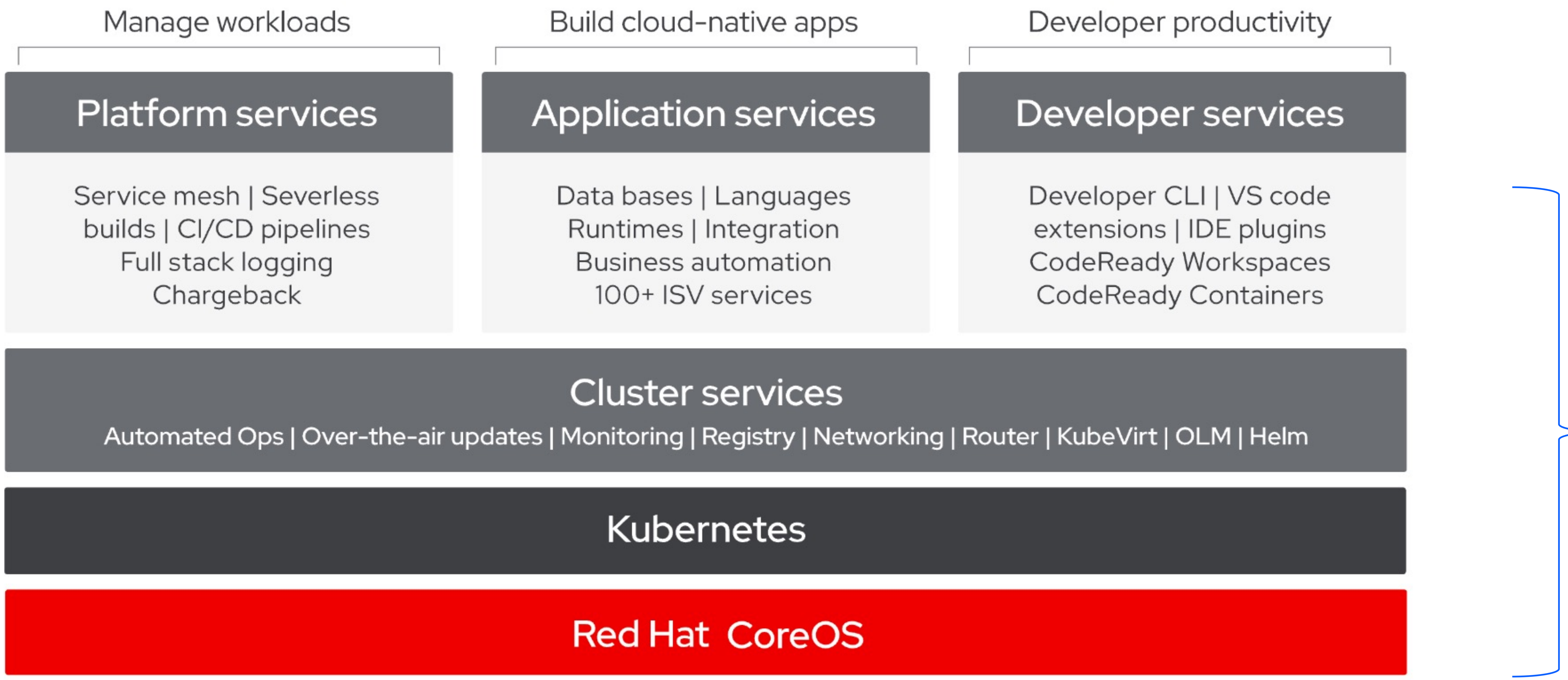
# Definition of the Red Hat OpenShift steady state load

OpenShift **steady state load** is the **physical core capacity** OCP is using for **keeping the platform and the workloads up and running**.

- Supervise availability and correct function of nodes, services/operators and workloads
- Continuous collection of monitoring data
- Maintaining HA synchronization
- All other **platform services**

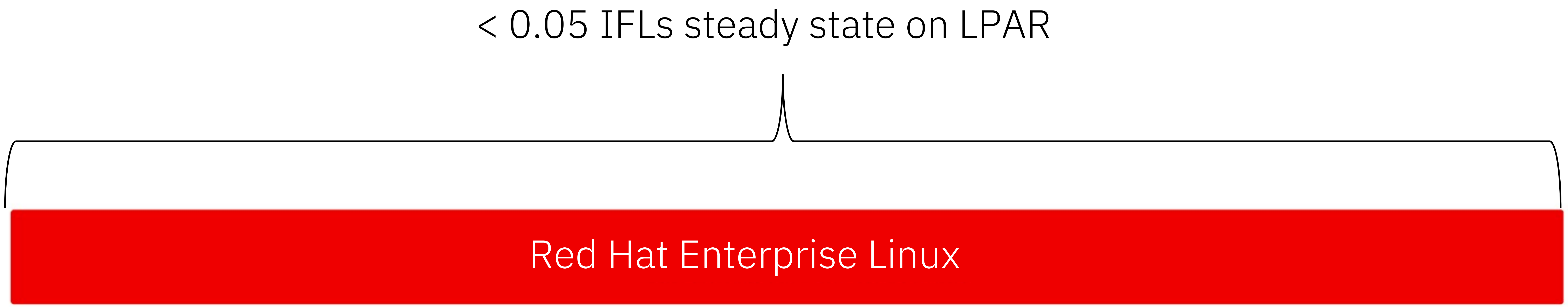
Steady state load **does not include** consumption of client workload and additionally installed operators




Approx. 1.6 IFLs (OCP 4.12, z16)

# Demystifying Red Hat OpenShift steady state load

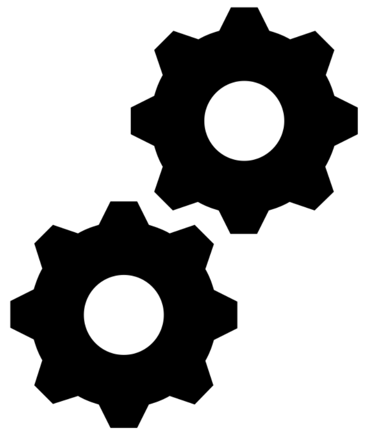
- Red Hat OpenShift steady state load is the amount of CPU utilization of LPAR when Red Hat OpenShift is up and running - without any deployment
- **But**: Red Hat OpenShift is a **platform** not an operating system!
- Nodes of Red Hat OpenShift each **have their own operating systems...**
- ... and **hundreds of processes** that implement the **Red Hat OpenShift operators**



# Business value of Red Hat OpenShift

**Cluster services**

Automated Ops | Over-the-air updates | Monitoring | Registry | Networking | Router | KubeVirt | OLM | Helm



- Replaces manual recurring tasks
- No admin must setup/maintain/configure/patch the framework
- Better efficiency

# Business value of Red Hat OpenShift

**Cluster services**

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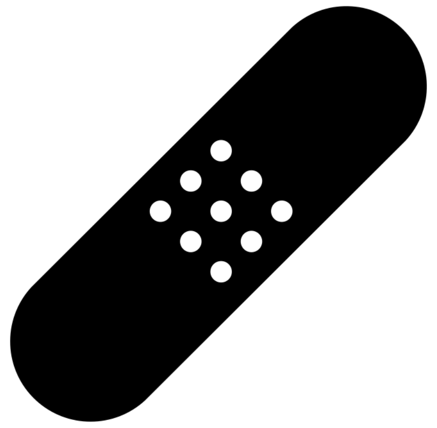


- Replaces manual updating and maintenance of a complex cloud stack (comprised of lots of components)
- No review of release notes, integration tests after update,...
- Just click on update and Red Hat OpenShift updates the overall cloud stack

# Business value of Red Hat OpenShift

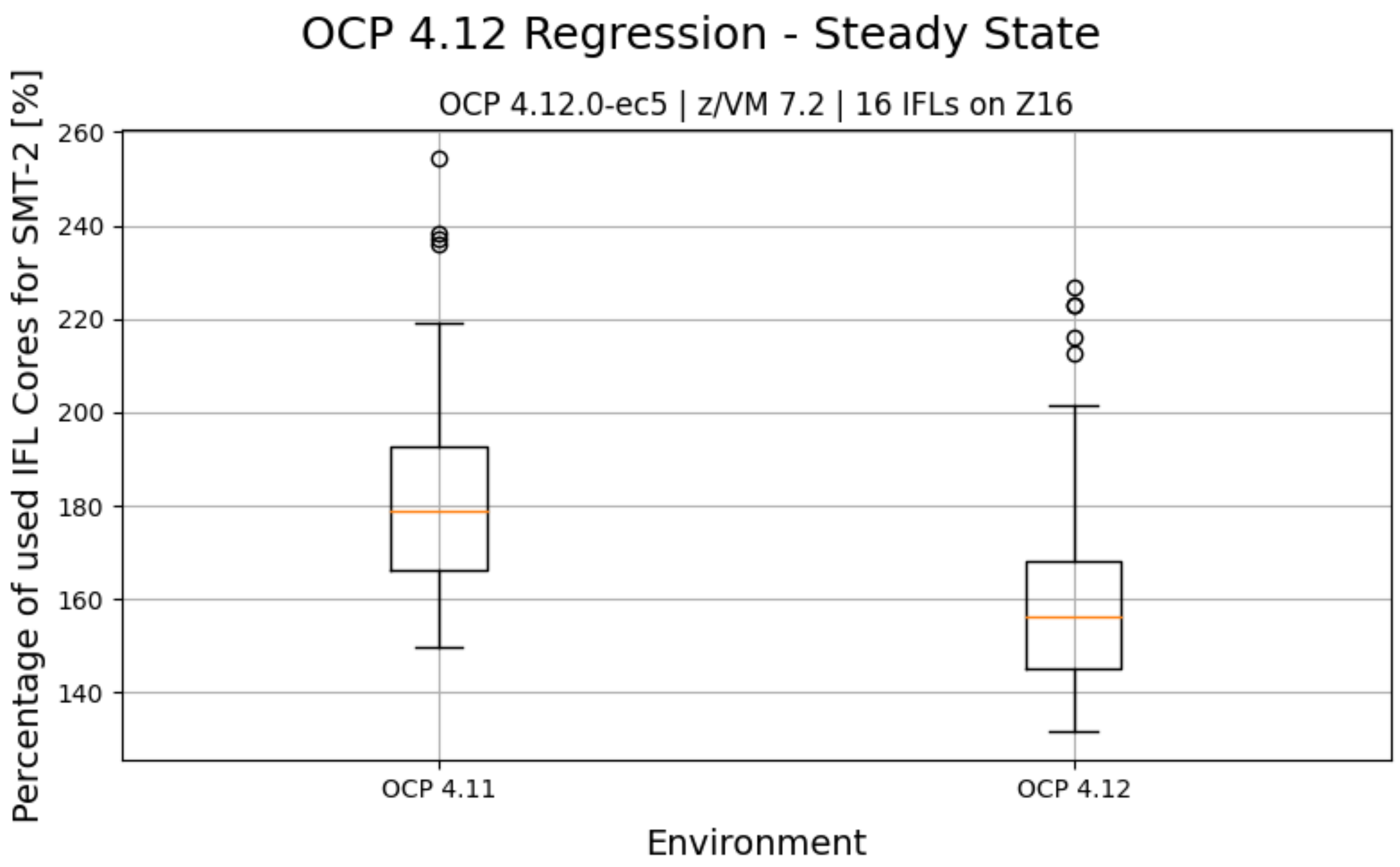
**Cluster services**

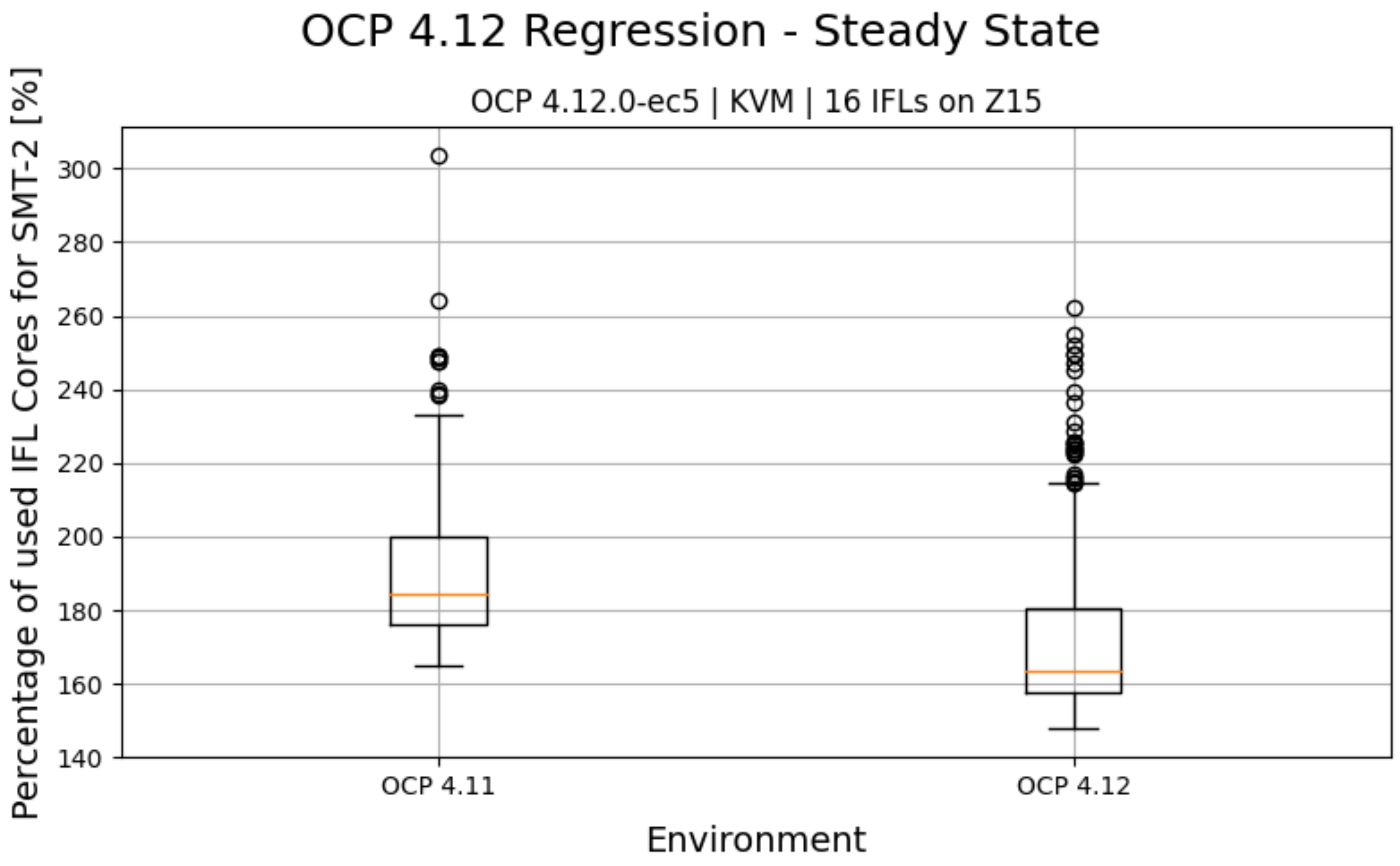
Automated Ops | Over-the-air updates | Monitoring | Registry | Networking | Router | KubeVirt | OLM | Helm

- Red Hat OpenShift ships a full functional monitoring stack on default setup
- No setup/maintenance/configuration needed for own monitoring solution to observe cluster core functions (i.e., kubernetes, networking,...) and own deployments
- No in-depth knowledge required about configuring monitoring correctly and efficiently

  - Allows you to do more with less people
  - Runs your cloud more efficient
  - Comes with the cost of some steady state load

# Steady state load z/VM & KVM on zSystems/IBM® LinuxONE



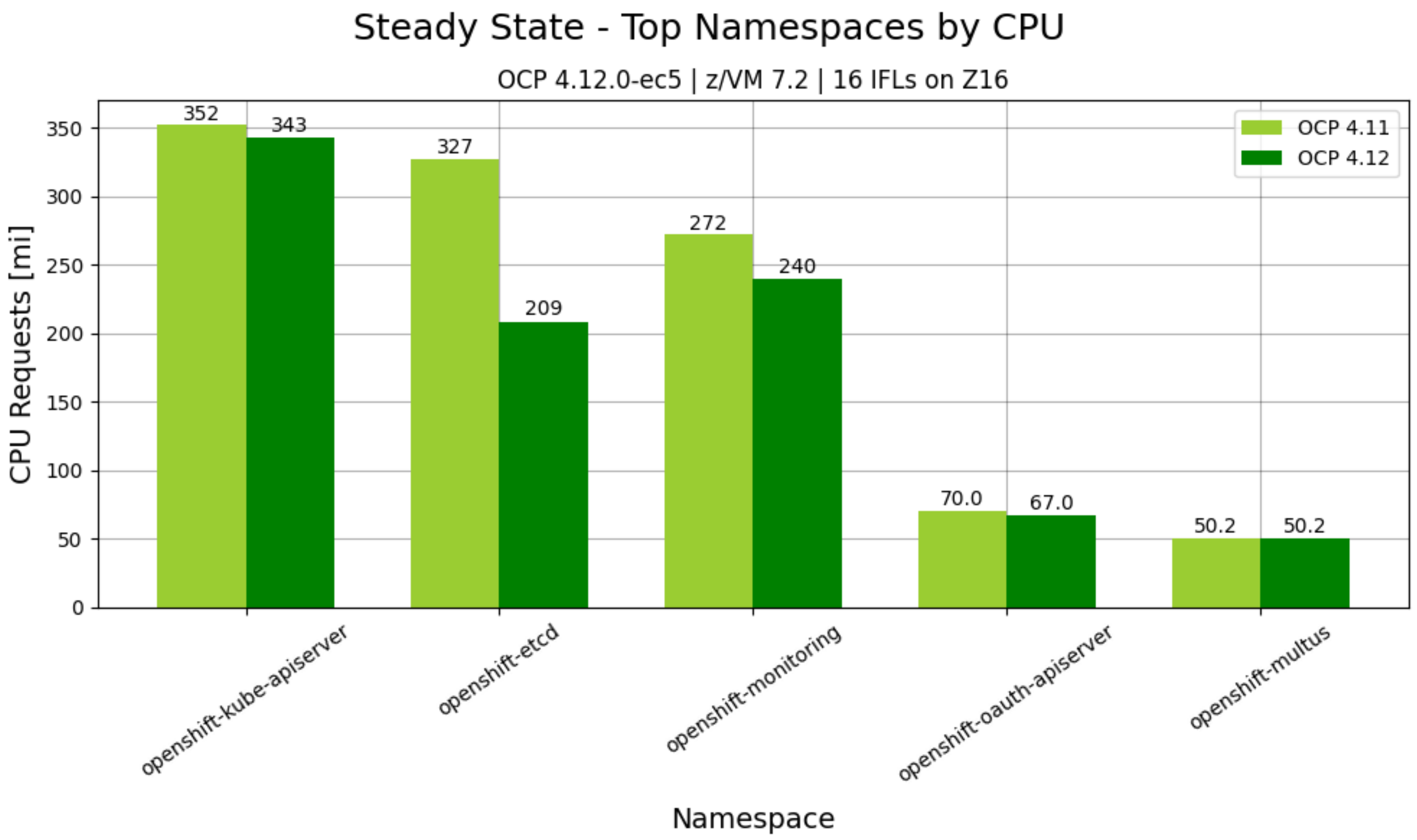




– 9% better steady state load on z/VM
– Less load peaks and lower load peaks

– 11% better steady state load on KVM
– Lower load peaks

- OCP 4.12 Steady state load decreased to approx. 1.6 IFLs (no additional addons)
- OCP 4.13 shows another 10% lower steady state load at approx. 1.39 IFLs (z/VM)

# Steady state: Where does it come from and why we can't get rid of it



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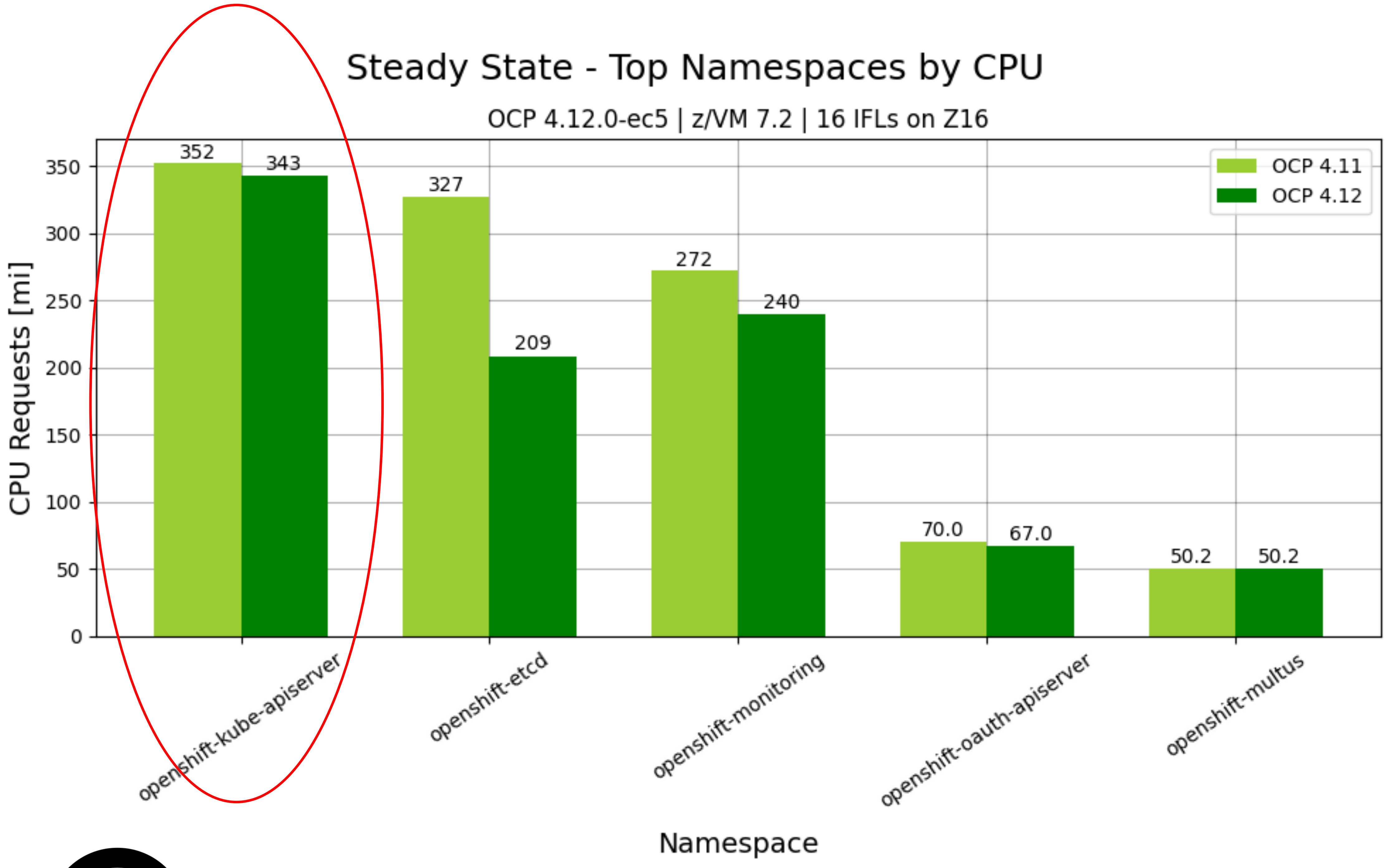


Security

kube-apiserver:

- central component of kubernetes
- handles communication of the operators
- communication broker for etcd

Enables **authentication, authorization,** and **admission controls**

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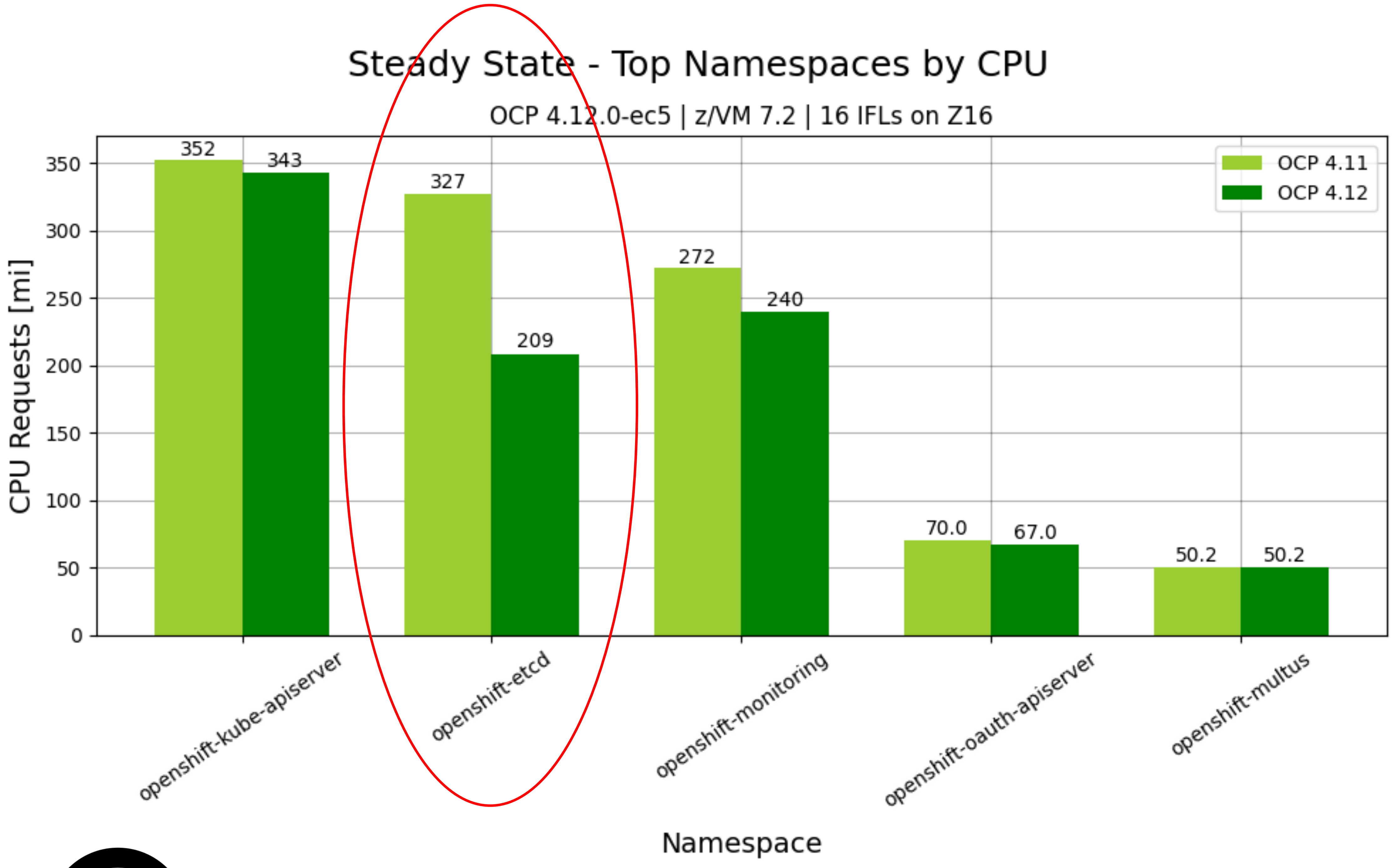



Security

Reliability

kube-apiserver:

- central component of kubernetes
- handles communication of the operators
- communication broker for etcd

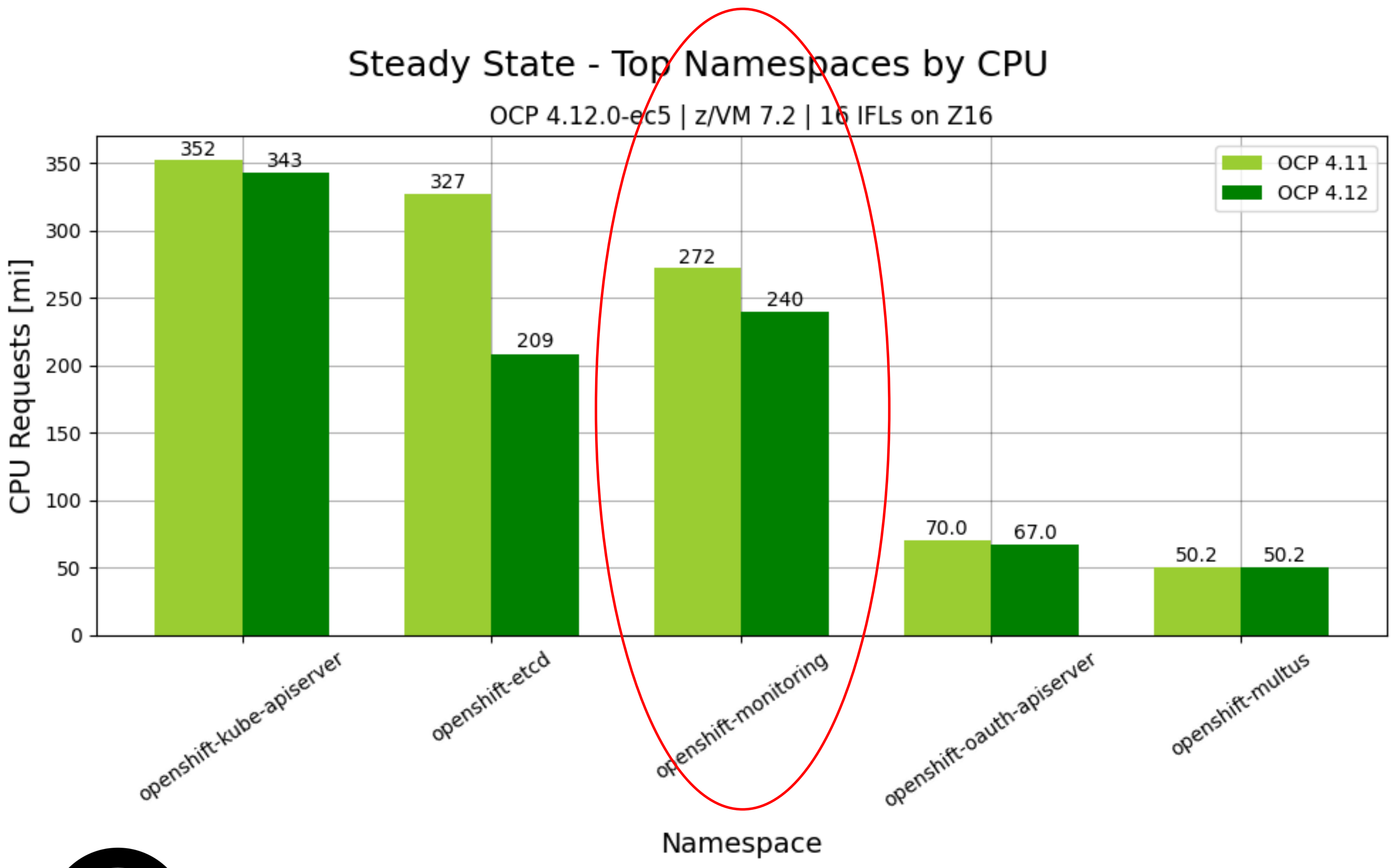
Enables **authentication, authorization**, and **admission controls**

openshift-etcd:

- central component describing the state of your cluster
- stores cluster state, networking information, and other persistent information

Among others etcd is required to restore your cluster after downtime

# Steady state: Where does it come from and why we can't get rid of it




Security Reliability Observability

openshift-monitoring:

- manages and updates the Prometheus-based cluster monitoring stack
- Includes several critical components: Prometheus, Alertmanager, kube-state-metrics, node_exporter,...

**Continuous and real-time observation and monitoring** of your cluster, workloads, networks, hardware,...

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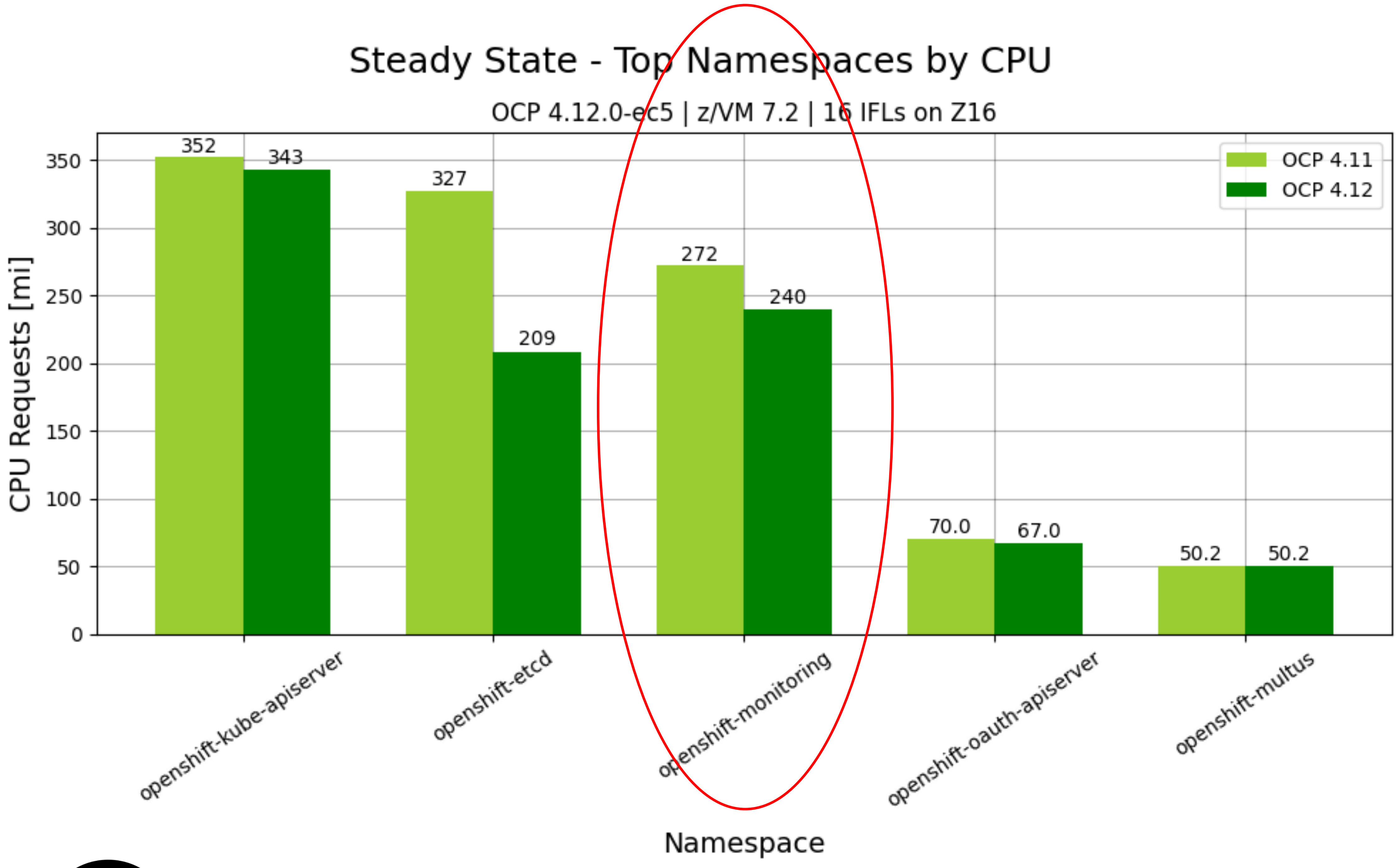



openshift-monitoring:

- manages and updates the Prometheus-based cluster monitoring stack
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✓ **Continuous and real-time observation and monitoring** of your cluster, workloads, networks, hardware,...

Many others ...

✓ kube-scheduler: Schedules pods on nodes

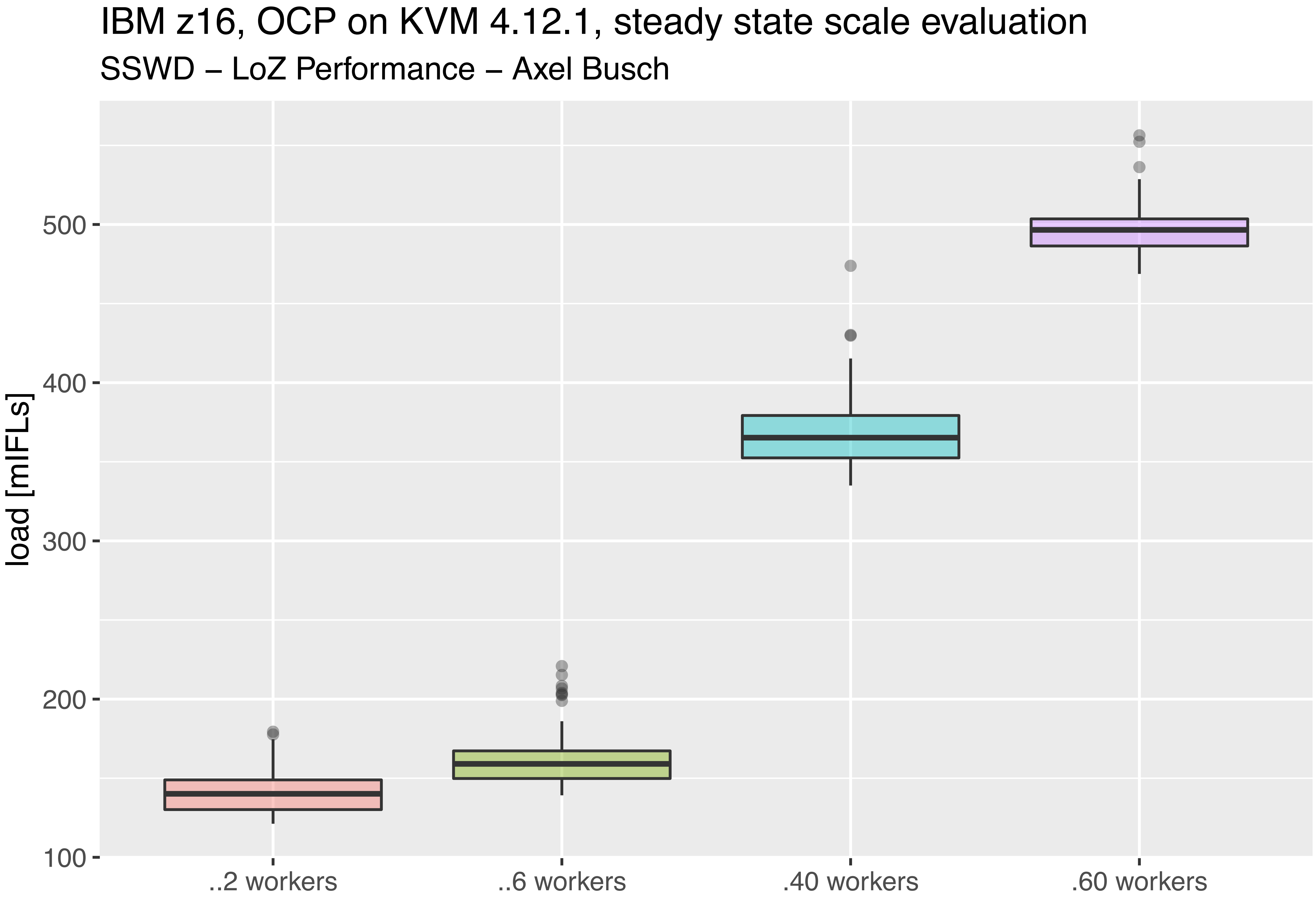
✓ kube-controller manager: Determines and adjusts cluster state

✓ OpenShift-SDN/OVN-kube/kube-proxy: Manage and make network connectivity available

# Update: Steady State IFL estimation model for KVM on z16

*Can we calculate IFL requirements for given cluster sizes before installation time?*

*Estimating steady state load when we install 2, 6, 40,60 compute nodes?*




Cluster setup:

- z16 KVM cluster
- LPAR with 12 IFLs + SMT-2 = 24 processors
- Red Hat OpenShift version 4.12.1 Each control/compute node with 4 vCores and 16 GiB memory
- No other processes running in the same LPAR

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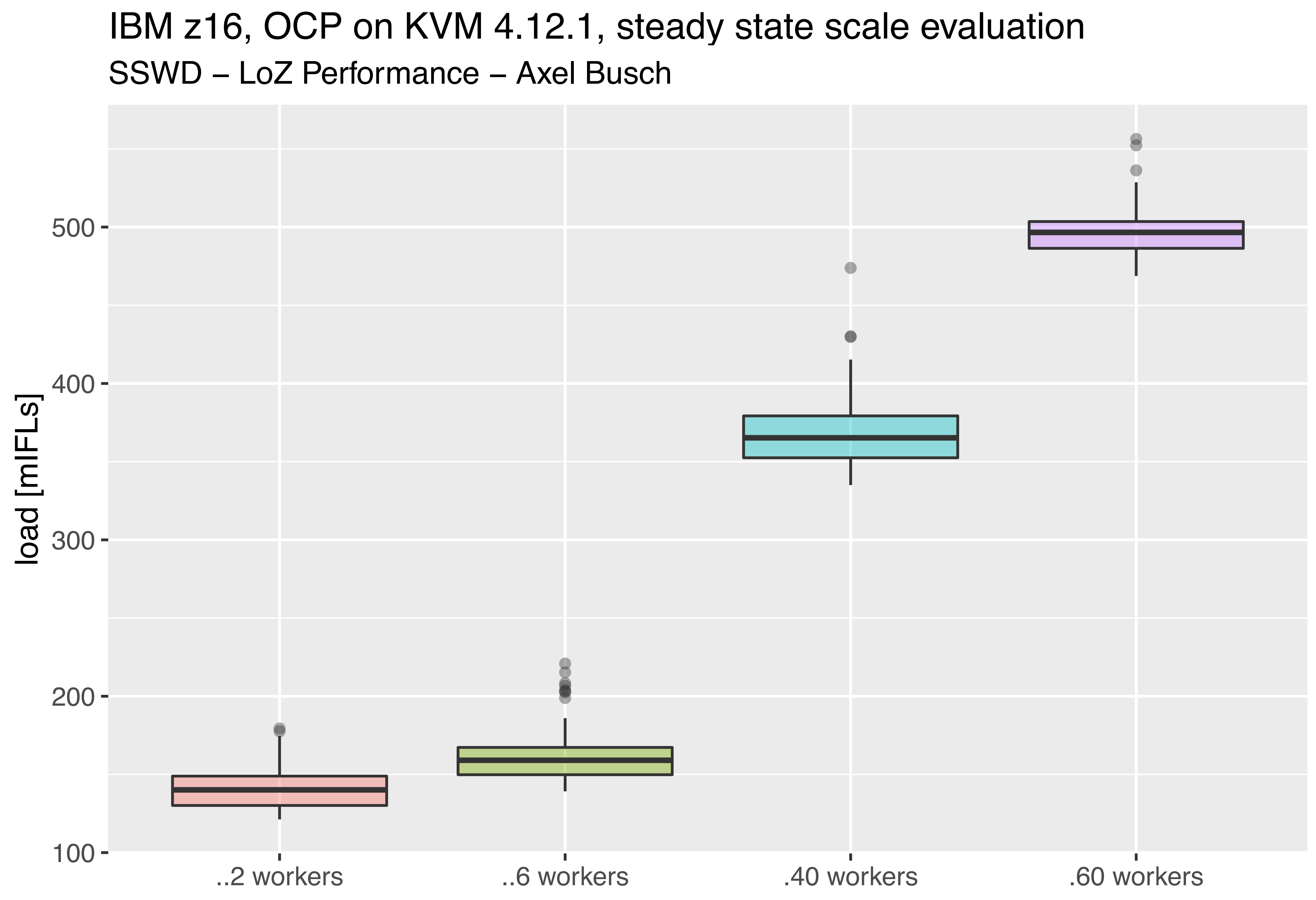



Estimation function for OpenShift 4.12:

$$f(x) = 1.261 + x * 0.061$$

constant overhead — compute node dependant overhead

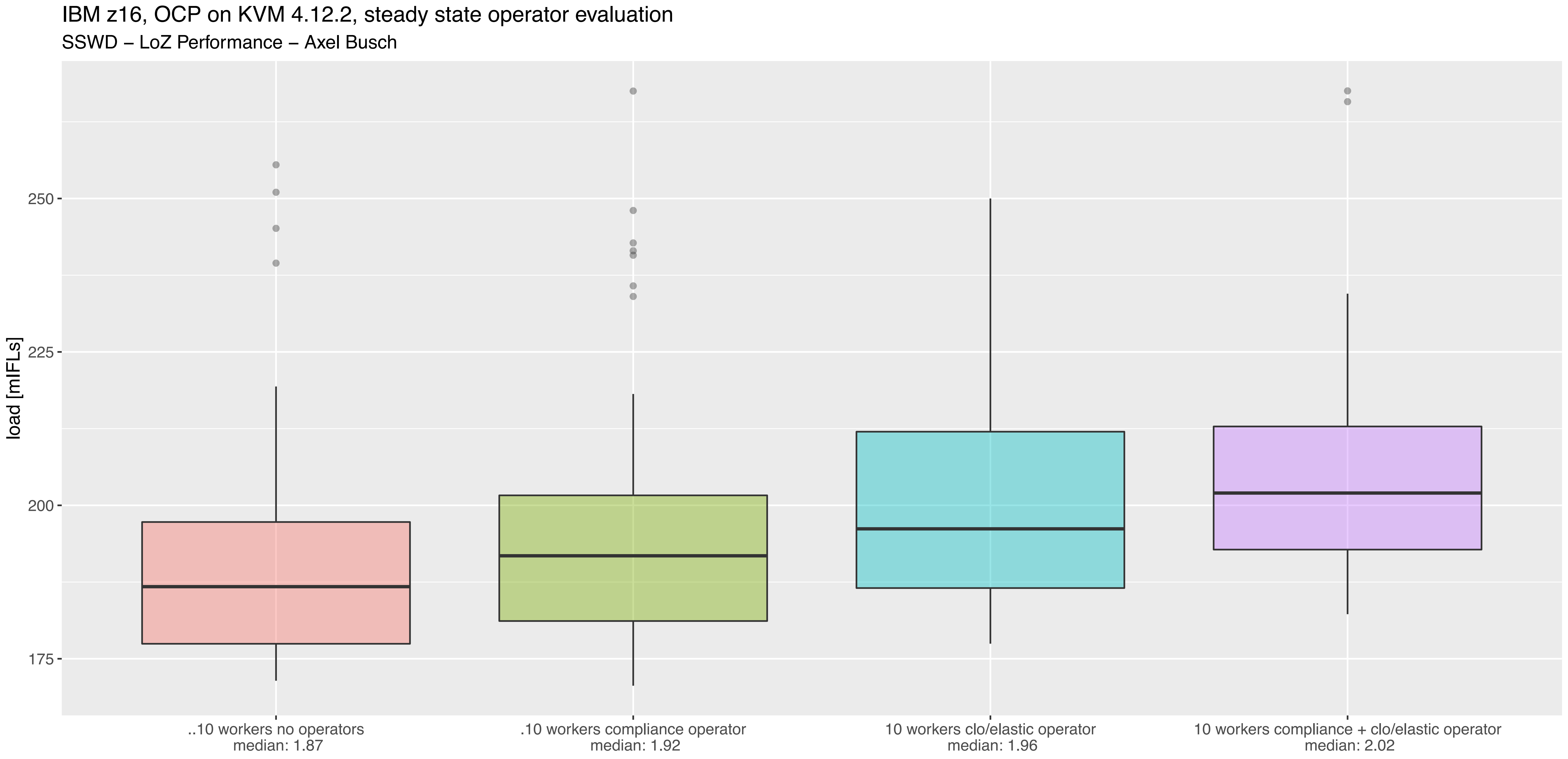
- Estimation accuracy is < 5% for 2-100 workers
- Lower constant overhead compared to 4.10
- 18% lower overhead for each node*
- No additional operators installed

* z15 vs. z16 did not show significant changes in steady state load

# Steady State IFL Estimation –
How to use the approximation model?

- For each individual setup regarding number of compute nodes, you can **forecast the minimum required IFLs** for steady state before installation time
- Use the model for estimating minimum IFL requirements: If 60 compute nodes are required it makes sense to think about using at least 5 IFLs
- Cluster efficiency goes up when using less **compute nodes but instead installing more virtual CPU in each compute node.** This improves cluster steady state efficiency as well as workload efficiency

# Steady state with additional operators

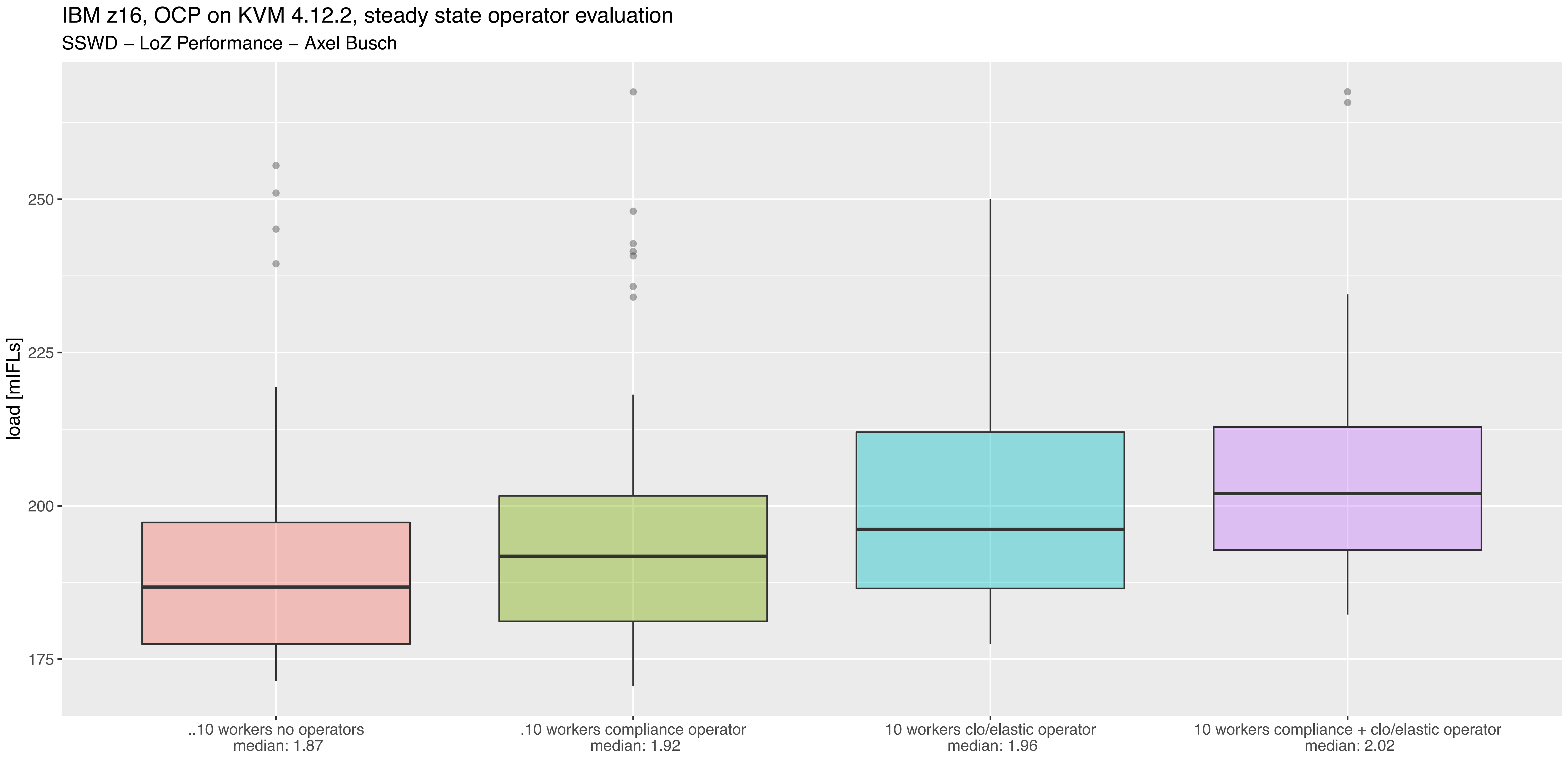



| operator | z16 IFL | ratio |
|---|---|---|
| OpenShift base | 1.87 | 1.0 |
| Compliance | 1.92 | 1.027 |
| CLO + Elastic | 1.96 | 1.048 |
| Compliance + CLO + Elastic | 2.02 | 1.08 |
| Compliance + CLO + Elastic + FIPS* | 2.40* | 1.28* |

* Extrapolated numbers from FIPS Red Hat OpenShift 4.11

→ Quite comfortable within the 3+3 IFL offering

# Steady state with additional operators




- Operators are just installed, no instances created (except ODF)
- Overhead seems to be constant: does not increase with additional compute nodes significantly

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| Compliance + CLO + Elastic + FIPS* | 2.40* | 1.28* |
| ODF 4.12** | 3.23** | 1.72** |
| ODF + Compliance + CLO + Elastic + FIPS*** | 3.76*** | 2.01*** |

- Extrapolated numbers from FIPS Red Hat OpenShift 4.11
- ** Due to a bug, the value was adjusted for the overhead
- *** Calculated and adjusted

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