



**Balai
Sertifikasi
Elektronik**

Optimizing Java Containers for Government Usecases

Arga Dhahana Pramudianto, S.Tr.TP
Jk8s Meetup #11
Jakarta, 21 November 2019



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 [bsre.id](https://www.instagram.com/bsre.id)



Nama : Arga Dhahana Pramudianto, S.Tr.TP
NIP : 19930714 201412 1 001
Pangkat : Penata Muda (III/a)
Formal : Sandiman Pertama pada Balai Sertifikasi
Role : Elektronik, Badan Siber dan Sandi Negara
Informal : System Engineer
Role :
Almamater : Sekolah Tinggi Sandi Negara 2015
Sanapati Cendekia (I, V, VII)
Komunitas : Docker Indonesia, Kubernetes Indonesia,
OpenStack Indonesia, openSUSE ID
Sertifikasi : ISO27001 Lead Implementer, COA, CDCP,
CCNA, CCNP, CKA
LinkedIn : s.id/linkedin-arga



BADAN SIBER DAN SANDI NEGARA



What do we do?



**Balai
Sertifikasi
Elektronik**



<https://psre.rootca.or.id/#?e6d59d6f-bb77-46c3-a692-62e7e1091eca>



PSrE

* Penyelenggara Sertifikasi Elektronik
atau
Certificate Authority

<https://bsre.bssn.go.id/>



Balai Sertifikasi Elektronik

Mandiri, Adaptif, Netral, Terpercaya, Akuntabilitas, Profesional

Instansi yang Telah PKS dengan BSrE BSSN

Total **166** *Data 16 Oktober 2019

Pemerintah Pusat
dan BUMN

35

33

Pemerintah Pusat

2

BUMN



Instansi Daerah, Universitas
Pengadilan Negeri

131

17

Pemerintah Provinsi

71

Pemerintah Kabupaten

40

Pemerintah Kota

1

Universitas

1

Pengadilan Negeri

1

BUMD



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BSrE Users Total Amount

*Data 3 Oktober 2019

””
14171

OSD LU

Instansi Pemerintah
Layanan Umum

””
13742

OSD PSE

Lembaga Kebijakan
Pengadaan Barang Jasa
Pemerintah (LKPP)

””
74

IDTRUST

Badan Usaha Milik Negara
(BUMN)



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info.bsre@bssn.go.id

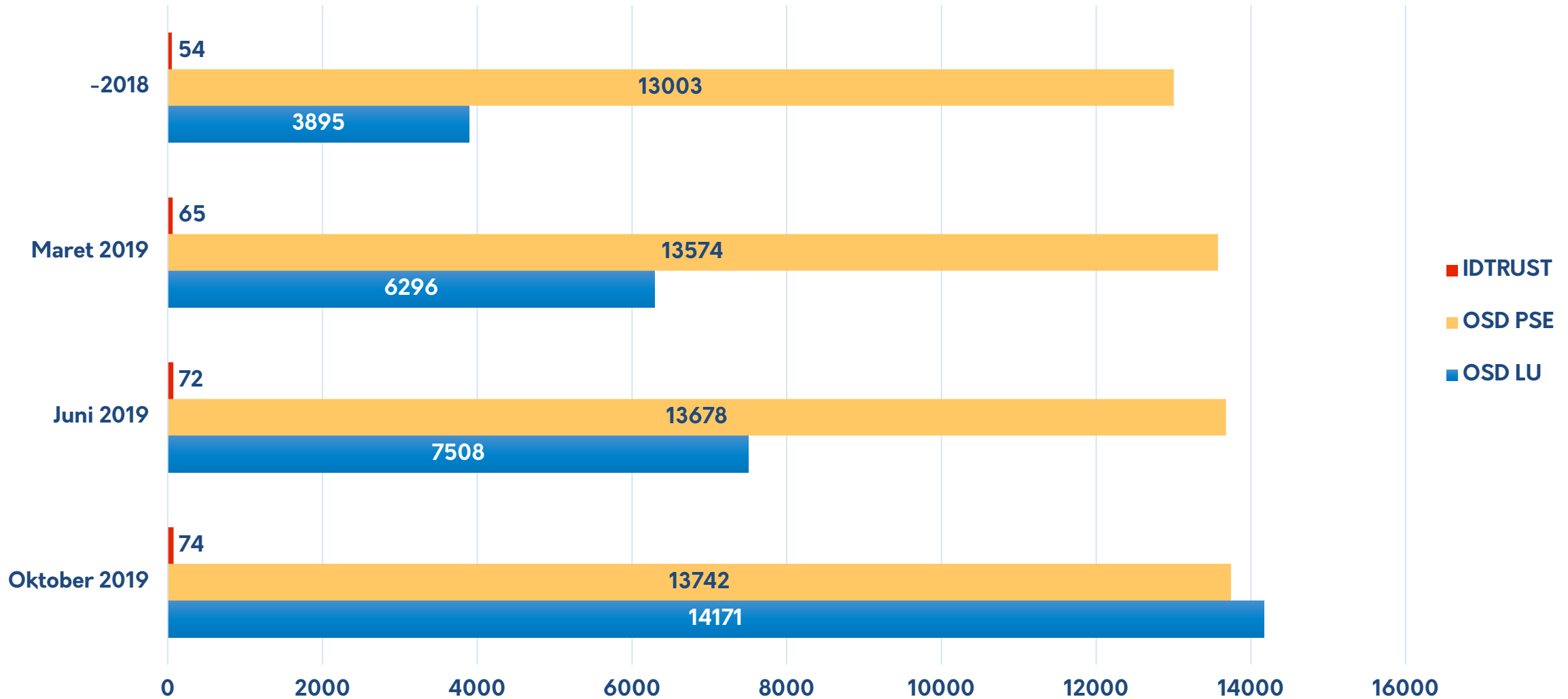


bsre.bssn.go.id



bsre.id

BSrE Users Growth Last 2 Years



*Data 3 Oktober 2019



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info.bsre@bssn.go.id



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The Users Fact and Why?

*Data 3 Oktober 2019



13.947 of 14.171 (98,4%) are digital signing service users



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info.bsre@bssn.go.id



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Anyone ever heard about digital signature?



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Anyone ever heard about digital signature?

Acrobat Pro DC
Help
receipt hotel.pdf x

1 / 1 125%

CUSTOMER DETAILS
Name : Arga Dhahana P
Email : arga.daywalker@gmail.com :
Contact Number +6285210296474

PAYMENT DETAILS
P.O. NUMBER : 527509802
METHOD : Mandiri Debit
STATUS : Paid

GUEST
Arga Dhahana P

HOTEL DETAILS
Noah Villa & Chapel
Address: Jl Indraprasta,Ungasan, Kuta Selatan, Indonesia, 80361
Check-in: 04-10-2019
Duration: 3 nights

PURCHASE DETAILS

No	Type of Item	Item Description	Qty	Price per unit Rp	Total Rp
1	Accommodation	Noah Villa & Chapel, Villa, 1 Bedroom, Private Pool - 2 guest	1	2.159.997	2.159.997
TOTAL					2.159.997
ADMINISTRATION FEE					-195
PAYMENT AMOUNT					2.159.802

Acrobat Pro DC
Help
receipt hotel.pdf x

1 / 1 125%

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Name : Arga Dhahana P
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TOTAL					3.159.997
ADMINISTRATION FEE					-195
PAYMENT AMOUNT					3.159.802



Balai Sertifikasi Elektronik

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Anyone ever heard about digital signature?

reimbursement signed2.pdf - Adobe Acrobat Pro DC

File Edit View Window Help

Home Tools reimbursement sig... x

Signed and all signatures are valid.

Signatures

Validate All

Rev. 1: Signed by Arga Dhahana

Signature is valid:

Source of Trust obtained from manually imported trusted identity.

Document has not been modified since this signature was applied.

Signed by the current user

The signature includes an embedded timestamp. Timestamp time: 2019/11/21 11:52:54 +07'00'

Signature is LTV enabled

Signature Details

Last Checked: 2019.11.21 12:09:

Field: Signature2 on page 1

[Click to view this version](#)

Signature Properties

Signature is VALID, signed by Arga Dhahana Pramudianto <arga.dhahana@bssn.go.id>.

Signing Time: 2019/11/21 11:52:52 +07'00'

Source of Trust obtained from manually imported trusted identity.

Validity Summary

The document has not been modified since this signature was applied.

The certifier has specified that Form Fill-in, Signing and Commenting are allowed for this document. No other changes are permitted.

The document is signed by the current user.

The signature includes an embedded timestamp. Timestamp time: 2019/11/21 11:52:54 +07'00'

Signature was validated as of the secure (timestamp) time: 2019/11/21 11:52:54 +07'00'

Signer Info

The path from the signer's certificate to an issuer's certificate was successfully built.

The signer's certificate is valid and has not been revoked.

Show Signer's Certificate...

Advanced Properties... Validate Signature Close

Signature Panel

subject description authorized

Plane	Round-trip from Jakarta to Bali	EUR114.50
Lodging	3 nights hotel in Bali	EUR26.75
		authorized EUR141.25

12:10 21/11/2019



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Anyone ever heard about digital signature?

reimbursement signed2_modif.pdf - Adobe Acrobat Pro DC

File Edit View Window Help

Home Tools reimbursement sig... x

At least one signature is invalid.

Signatures

Validate All

Rev. 1: Signed by Arga Dhahan

Signature is invalid:

Source of Trust obtained from n

Document has been altered

Signed by the current user

The signature includes an en

Signature is LTV enabled

Signature Details

Last Checked: 2019.11.21 12:11:

Field: Signature2 on page 1

[Click to view this version](#)

1 Page(s) Modified

Signature Properties

Signature is INVALID.

Signing Time: 2019/11/21 11:52:52 +07'00'

Source of Trust obtained from manually imported trusted identity.

Validity Summary

The document has been altered or corrupted since the Signature was applied.

The certifier has specified that Form Fill-in, Signing and Commenting are allowed for this document. No other changes are permitted.

The document is signed by the current user.

The signature includes an embedded timestamp. Timestamp time: 2019/11/21 11:52:54 +07'00'

Signature was validated as of the secure (timestamp) time: 2019/11/21 11:52:54 +07'00'

Signer Info

The path from the signer's certificate to an issuer's certificate was successfully built.

The signer's certificate is valid and has not been revoked.

Show Signer's Certificate...

Advanced Properties... Validate Signature Close

Signature Panel

9

9

subject	description	authorized
Plane	Round-trip from Jakarta to Bali	EUR214.50
Lodging	3 nights hotel in Bali	EUR26.75
		authorized EUR241.25

12:11
21/11/2019



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Digital Signature Legal Standing in Indonesia



Undang Undang Nomor 11 Tahun 2008
Informasi dan Transaksi Elektronik



Peraturan Pemerintah Nomor 71 Tahun 2019
Penyelenggaraan Sistem dan Transaksi Elektronik



Peraturan Presiden Nomor 95 Tahun 2018
Sistem Pemerintahan Berbasis Elektronik



Major Problems

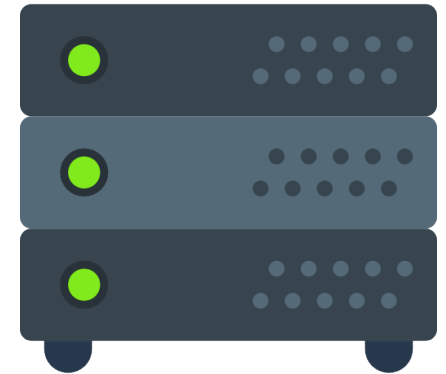
Our users are multiplying



Bottleneck occurs due to overload



- **There is no self-healing mechanisms**
- **Service can't be scaled easily**



Digital Signature as a BSeE Service



kubernetes

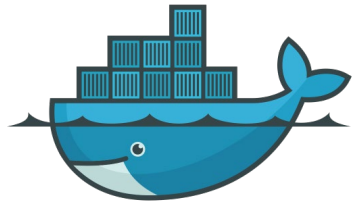


WildFly

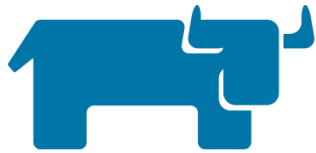
NGINX



Kubic



docker



RANCHER®



MariaDB



spring
boot



Java®

WSO₂

SignServer
PKI by PrimeKey

EJBCA
PKI by PrimeKey



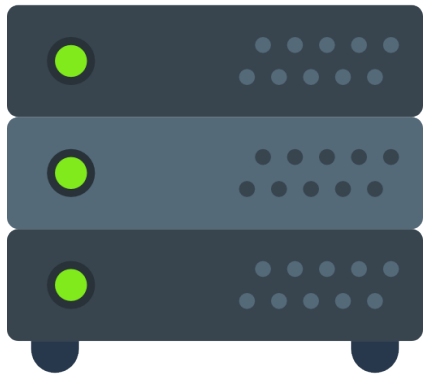
and much more ...



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Java Heap Sizing Basics in a VM



```
[root@jumphost ~]# cat /etc/redhat-release
CentOS Linux release 7.7.1908 (Core)
[root@jumphost ~]# free -m
```

	total	used	free	shared	buff/cache	available
Mem:	1715	246	229	16	1239	1242
Swap:	3071	1	3070			

```
[root@jumphost ~]# java -version
openjdk version "1.8.0_232"
OpenJDK Runtime Environment (build 1.8.0_232-b09)
OpenJDK 64-Bit Server VM (build 25.232-b09, mixed mode)
```

Risks on wrong Heap Sizing:

- **Resources and money wasting**
- **Application getting killed**



Java Heap Sizing Basics in a VM

No Param Added

```
[root@jumphost ~]# java -XX:+PrintFlagsFinal -version | grep -Ei "maxheapsize|maxram"
  uintx DefaultMaxRAMFraction          = 4                      {product}
  uintx MaxHeapSize                     := 450887680              {product}
  uint64_t MaxRAM                       = 137438953472             {pd product}
  uintx MaxRAMFraction                  = 4                      {product}
  double MaxRAMPercentage                = 25.000000              {product}
openjdk version "1.8.0_232"
OpenJDK Runtime Environment (build 1.8.0_232-b09)
OpenJDK 64-Bit Server VM (build 25.232-b09, mixed mode)
```

Xmx Param Added

```
[root@jumphost ~]# java -XX:+PrintFlagsFinal -Xmx1g -version | grep -Ei "maxheapsize|maxram"
  uintx DefaultMaxRAMFraction          = 4                      {product}
  uintx MaxHeapSize                     := 1073741824             {product}
  uint64_t MaxRAM                       = 137438953472             {pd product}
  uintx MaxRAMFraction                  = 4                      {product}
  double MaxRAMPercentage                = 25.000000              {product}
openjdk version "1.8.0_232"
OpenJDK Runtime Environment (build 1.8.0_232-b09)
OpenJDK 64-Bit Server VM (build 25.232-b09, mixed mode)
```



Java Heap Sizing Basics in a VM

MaxRAM Param Added

```
[root@jumphost ~]# java -XX:+PrintFlagsFinal -XX:MaxRAM=1g -version | grep -Ei "maxheapsize|maxram"
  uintx DefaultMaxRAMFraction          = 4                      {product}
  uintx MaxHeapSize                     := 268435456             {product}
  uint64_t MaxRAM                       := 1073741824             {pd product}
  uintx MaxRAMFraction                  = 4                      {product}
  double MaxRAMPercentage                = 25.000000             {product}
openjdk version "1.8.0_232"
OpenJDK Runtime Environment (build 1.8.0_232-b09)
OpenJDK 64-Bit Server VM (build 25.232-b09, mixed mode)
```

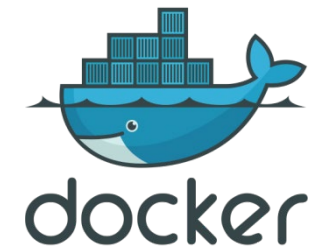
MaxRAM & MaxRAMFraction Param Added

```
[root@jumphost ~]# java -XX:+PrintFlagsFinal -XX:MaxRAM=1g -XX:MaxRAMFraction=2 \
> -version | grep -Ei "maxheapsize|maxram"
  uintx DefaultMaxRAMFraction          = 4                      {product}
  uintx MaxHeapSize                     := 536870912             {product}
  uint64_t MaxRAM                       := 1073741824             {pd product}
  uintx MaxRAMFraction                  := 2                      {product}
  double MaxRAMPercentage                = 50.000000             {product}
openjdk version "1.8.0_232"
OpenJDK Runtime Environment (build 1.8.0_232-b09)
OpenJDK 64-Bit Server VM (build 25.232-b09, mixed mode)
```





Java Heap Sizing in a Containers

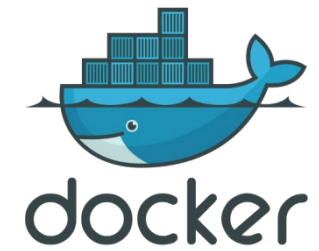


```
[root@jumphost ~]# free -m
              total        used         free       shared    buff/cache   available
Mem:           1715          246           226           16         1242         1241
Swap:          3071             1          3070
[root@jumphost ~]# docker run --rm -m 1g alpine free -m
              total        used         free       shared    buff/cache   available
Mem:           1715          339           175            0         1199         1191
Swap:          3071             1          3070
[root@jumphost ~]# docker run --rm alpine cat /sys/fs/cgroup/memory/memory.limit_in_bytes
9223372036854771712
[root@jumphost ~]# docker run --rm -m 1g alpine cat /sys/fs/cgroup/memory/memory.limit_in_bytes
1073741824
```





Java Heap Sizing in a Containers



- We need to make the CGroup memory limits visible to it
- Param `-XX:+UseCGroupMemoryLimitForHeap` was introduced on Java 9, backported to Java 8u131

```
[root@jumphost ~]# docker run --rm -m 1g openjdk:8-jdk-alpine cat /sys/fs/cgroup/memory/memory.limit_in_bytes
1073741824
[root@jumphost ~]# docker run --rm -m 1g openjdk:8-jdk-alpine sh -c "java -XX:+PrintFlagsFinal \
> -XX:+UnlockExperimentalVMOptions -XX:+UseCGroupMemoryLimitForHeap -version | grep -Ei 'maxheapsize|maxram'"
    uintx DefaultMaxRAMFraction                = 4                                {product}
openjdk version "1.8.0_212"
OpenJDK Runtime Environment (IcedTea 3.12.0) (Alpine 8.212.04-r0)
OpenJDK 64-Bit Server VM (build 25.212-b04, mixed mode)
    uintx MaxHeapSize                          := 268435456                            {product}
    uint64_t MaxRAM                            = 137438953472                       {pd product}
    uintx MaxRAMFraction                      = 4                                {product}
    double MaxRAMPercentage                   = 25.0000000                       {product}
```





Java Heap Sizing in a Containers



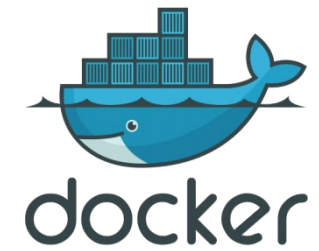
- Param `-XX:+UseCGroupMemoryLimitForHeap` and `-XX:{Min|Max}RAMFraction` were deprecated
- Param `-XX:+UseContainerSupport` and `-XX:MaxRAMPercentage` was introduced on Java 10, backported to Java 8u191

```
[root@jumphost ~]# docker run --rm -m 1g openjdk:8-jdk-alpine sh -c "java -XX:+PrintFlagsFinal \
-version | grep UseContainerSupport"
    bool UseContainerSupport                = true                        {product}
openjdk version "1.8.0_212"
OpenJDK Runtime Environment (IcedTea 3.12.0) (Alpine 8.212.04-r0)
OpenJDK 64-Bit Server VM (build 25.212-b04, mixed mode)
[root@jumphost ~]# docker run --rm -m 1g openjdk:8-jdk-alpine sh -c "java -XX:+PrintFlagsFinal \
-version | grep MaxHeapSize"
    uintx MaxHeapSize                      := 268435456                    {product}
openjdk version "1.8.0_212"
OpenJDK Runtime Environment (IcedTea 3.12.0) (Alpine 8.212.04-r0)
OpenJDK 64-Bit Server VM (build 25.212-b04, mixed mode)
```





Java Containers Recommendation



- Find the most suitable Java framework for your own usecase (e.g. SpringBoot, Play, etc)
- Update to latest Java 8 (8u232) or Java 10+
- Lightweight containers oriented, don't waste your resources
- Utilize resource request and resource limit on Kubernetes deployment, combine with `JAVA_OPTS = -XX:+UseContainerSupport` and `-XX:MaxRAMPercentage=75.0`

DOCKERFILE

```
FROM alpine
...
copy app.jar ./
run apk add jre8
expose 8080
cmd ["java -jar app.jar"]
...
```

SOURCE CODE



```
[root@jumphost ~]# docker run --rm -m 1g openjdk:8-jdk-alpine sh -c "java -XX:+PrintFlagsFinal \
-XX:MaxRAMPercentage=75.0 -version | grep MaxHeapSize"
    uintx MaxHeapSize                               := 805306368                {product}
openjdk version "1.8.0_212"
OpenJDK Runtime Environment (IcedTea 3.12.0) (Alpine 8.212.04-r0)
OpenJDK 64-Bit Server VM (build 25.212-b04, mixed mode)
```





**Balai
Sertifikasi
Elektronik**

“Build Trust In Electronic Transactions”

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Email : info.bsre@bssn.go.id



Terima Kasih

Badan Siber dan Sandi Negara