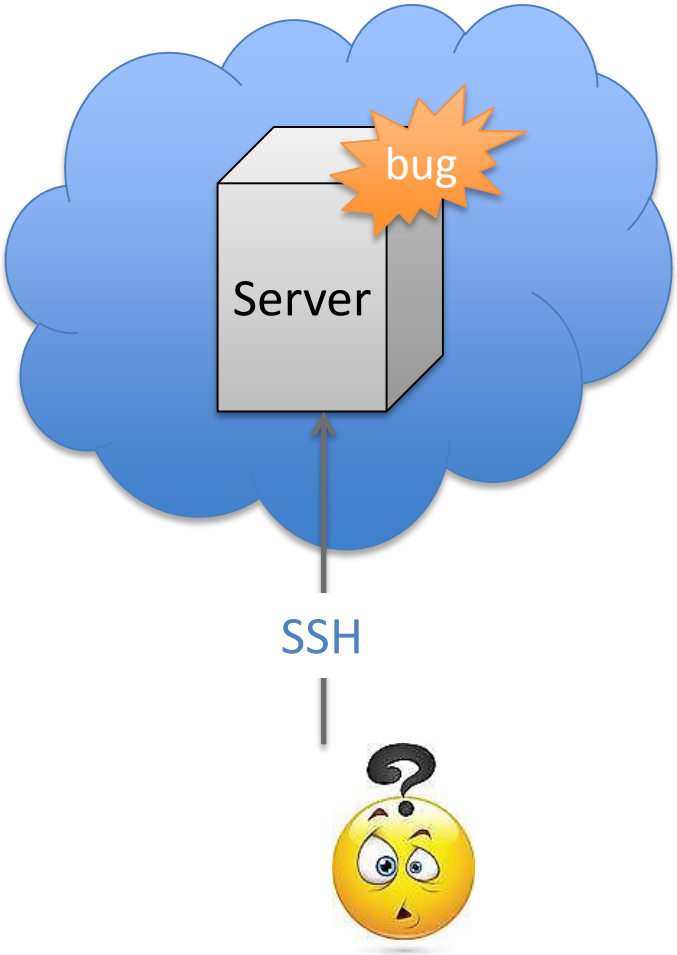
Serviceability in HotSpot

The best tool is your own tool

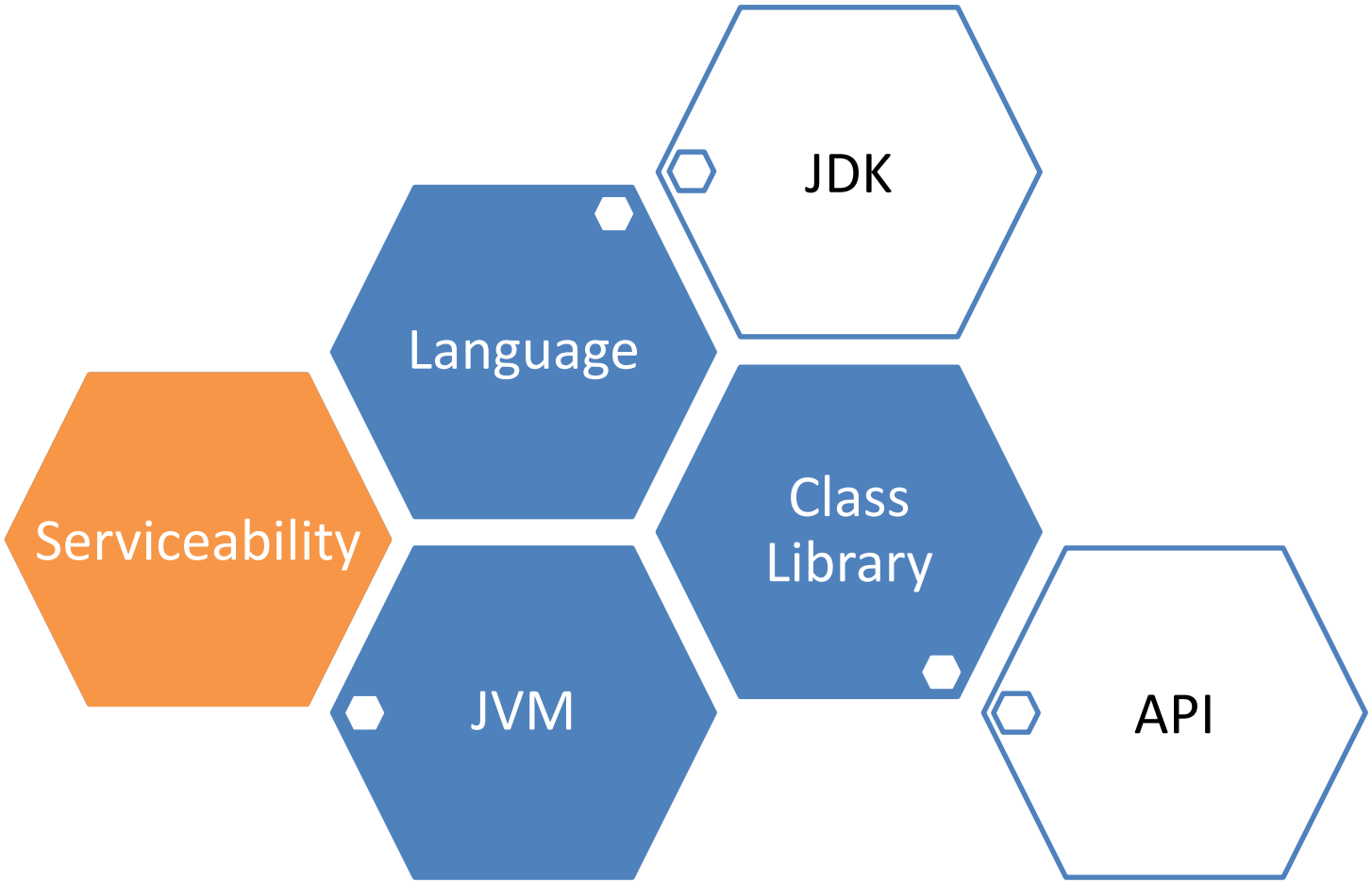
Andrei Pangin
Odnoklassniki

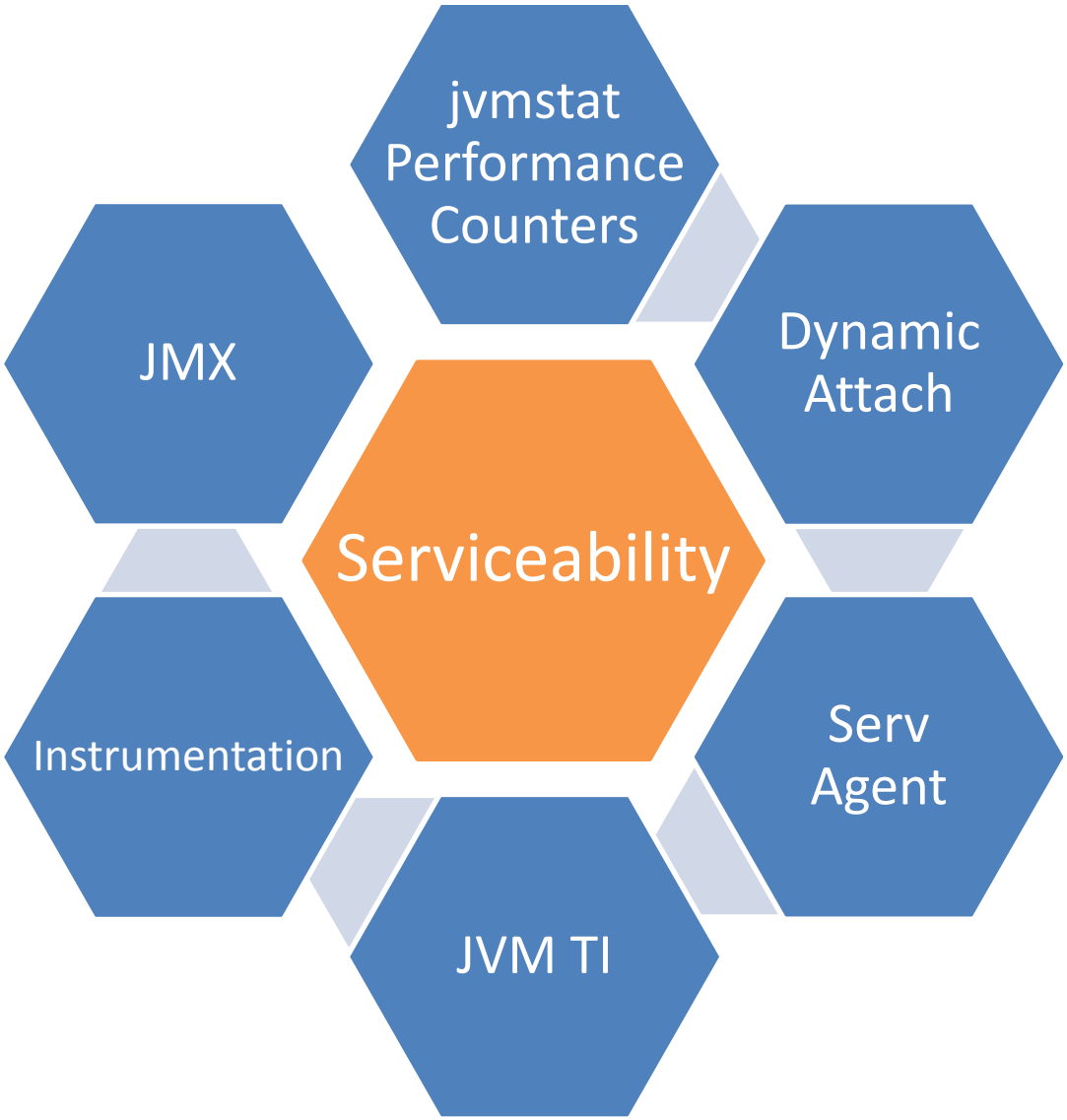
Troubleshooting

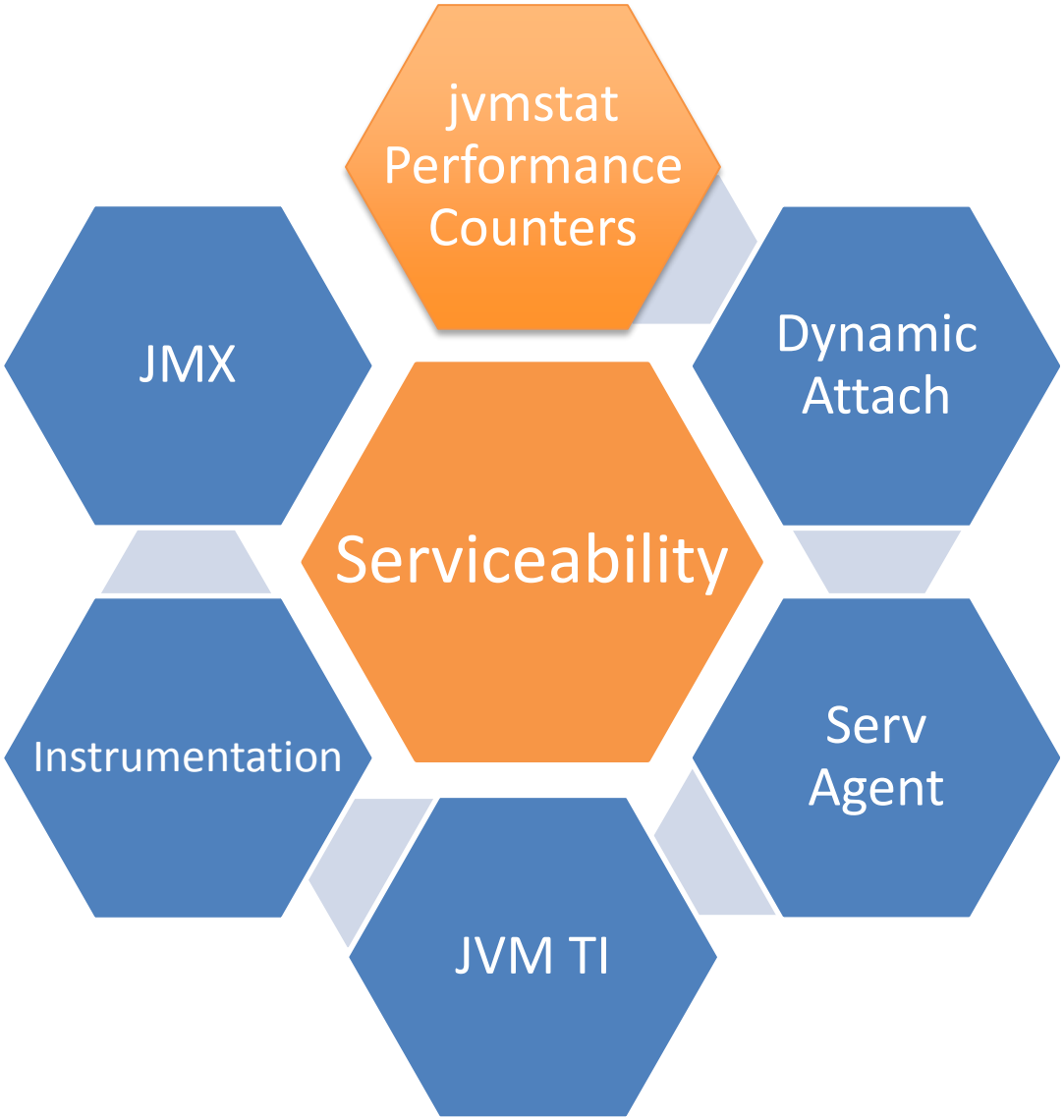
Bugs	Performance	Memory	JVM crash
Debugger	Profiler	Memory analyzer	hs_err.log


bug
Server
SSH

Java Platform

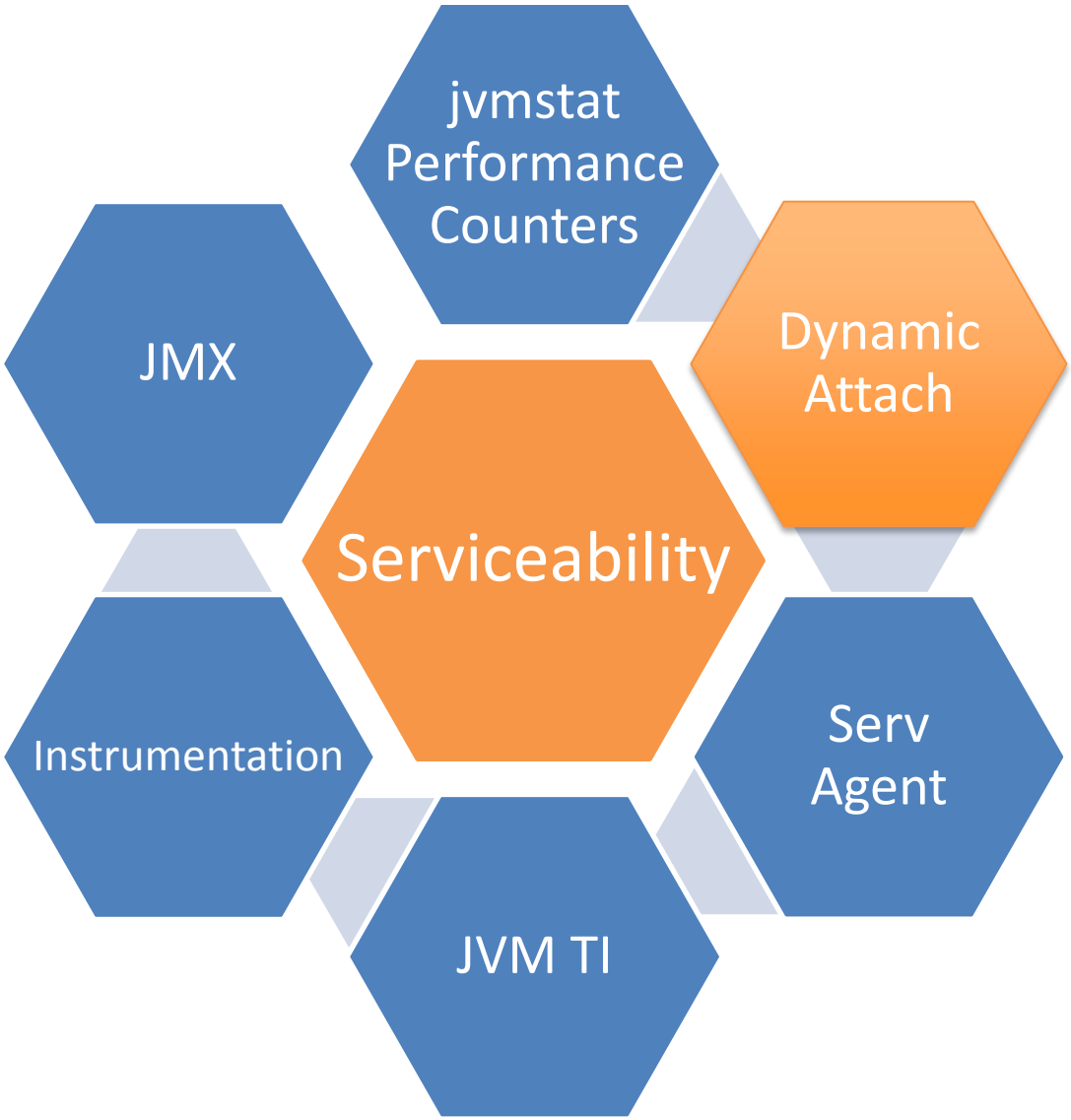



jvmstat
Performance
Counters
JMX
Dynamic
Attach
Serviceability
Instrumentation
Serv
Agent
JVM TI


jvmstat
Performance
Counters
JMX
Dynamic
Attach
Serviceability
Instrumentation
Serv
Agent
JVM TI

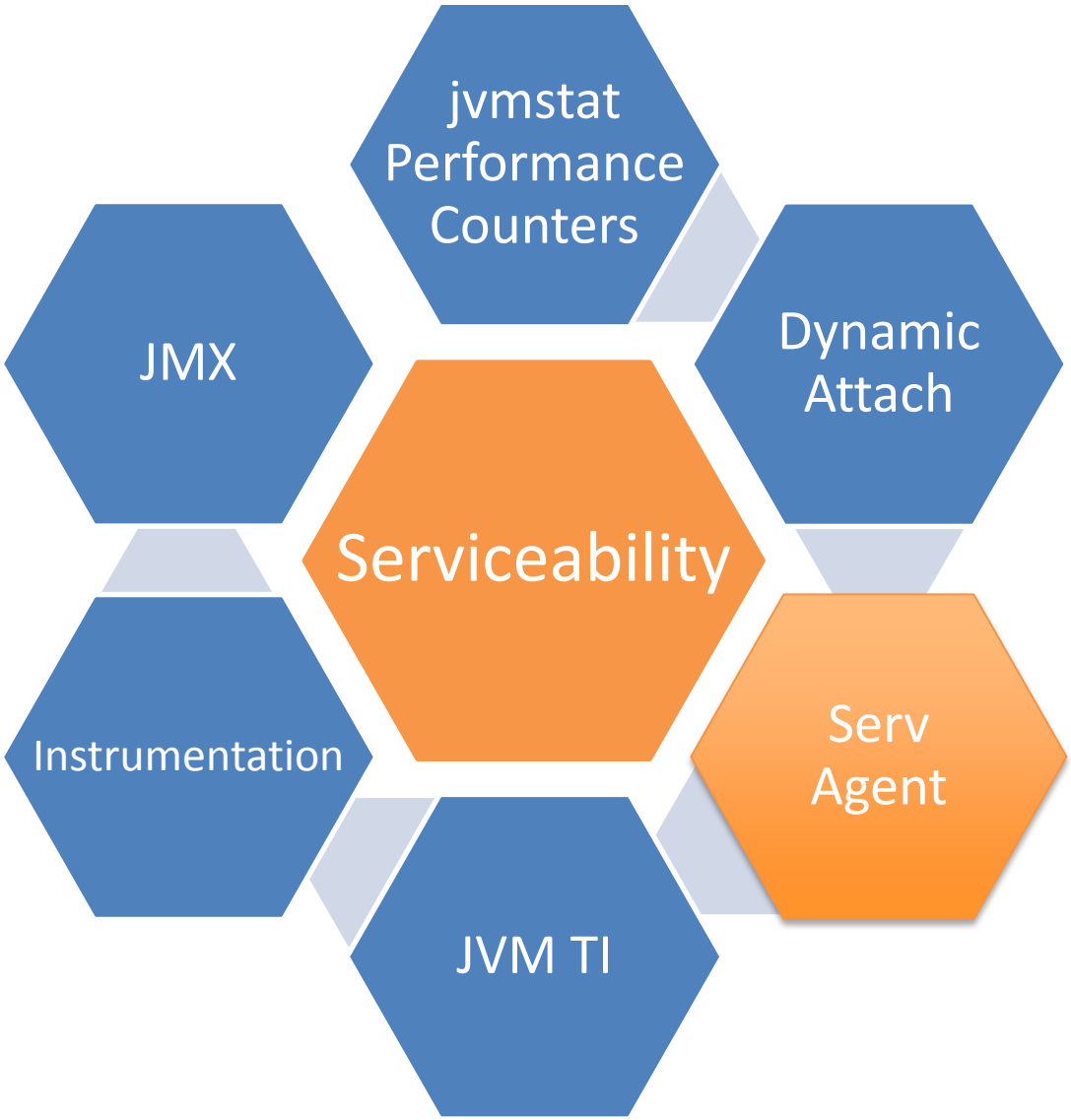
Performance Counters

- /tmp/hsperfdata_user
  - pid1
  - pid2
- Backed by mmap’ed file
- jstatd
- -XX:-UsePerfData


jvmstat
Performance
Counters
JMX
Dynamic
Attach
Serviceability
Instrumentation
Serv
Agent
JVM TI

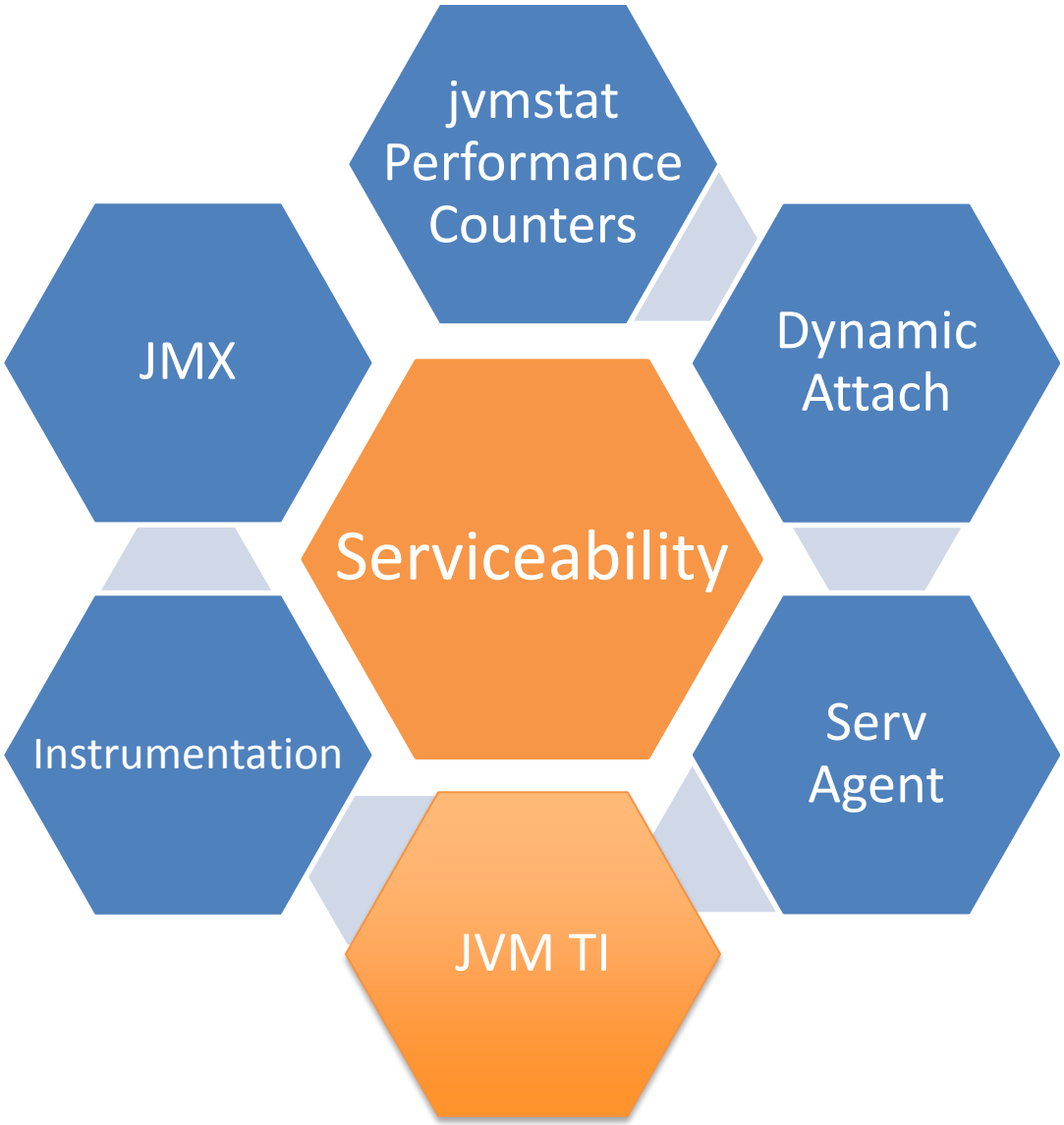
Dynamic Attach

- Commands
  - Dump threads, dump heap
  - Invoke GC
  - Manage VM flags
  - Load agent
- UNIX socket or named pipe
- -XX:+DisableAttachMechanism


jvmstat
Performance
Counters
JMX
Dynamic
Attach
Serviceability
Instrumentation
Serv
Agent
JVM TI

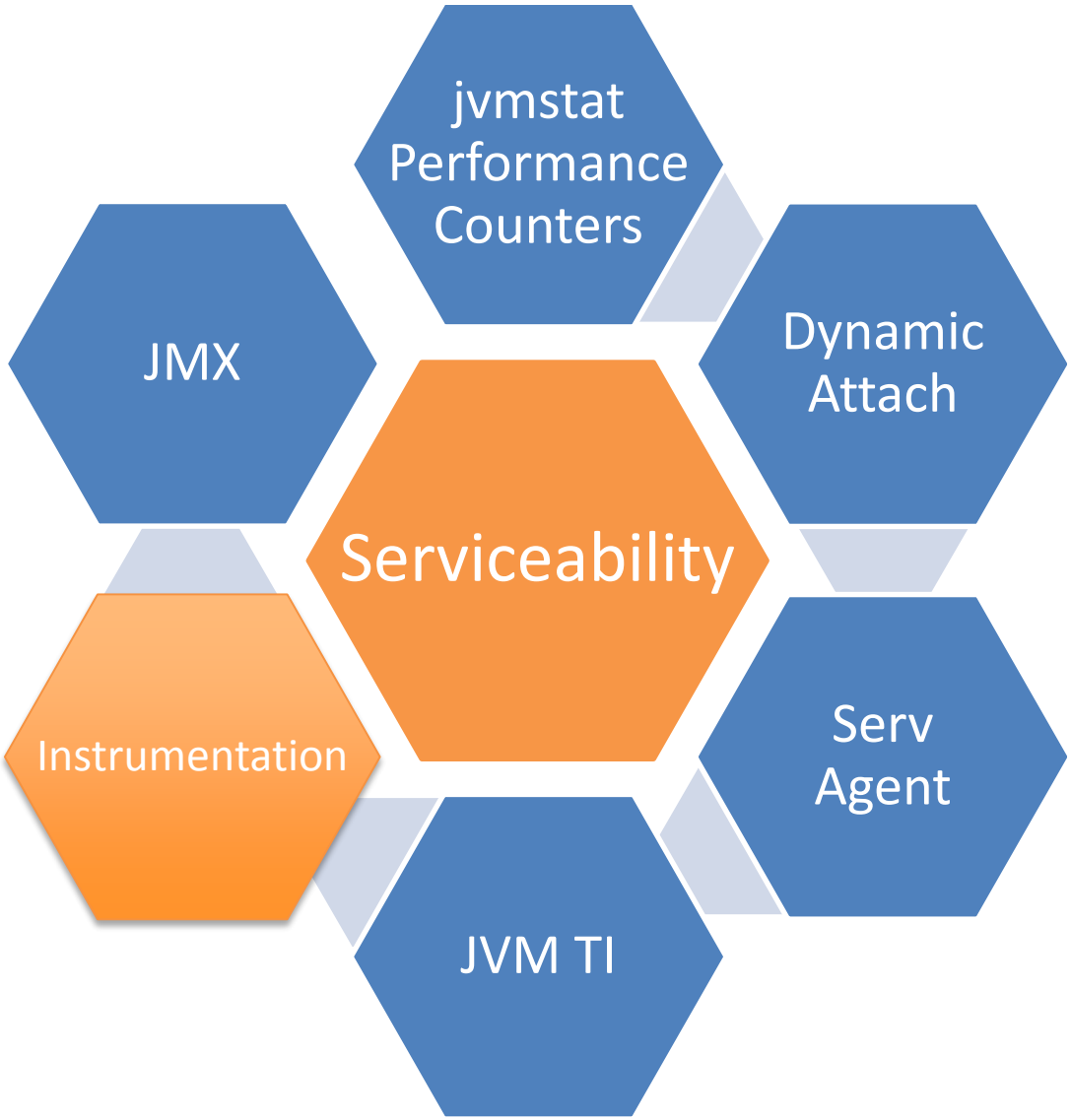
Serviceability Agent

- Internal VM structures → Java API
- ptrace or WinDbg + sa-jdi.jar
- No cooperation from target JVM
- jsadebugd


jvmstat
Performance
Counters
JMX
Dynamic
Attach
Serviceability
Instrumentation
Serv
Agent
JVM TI

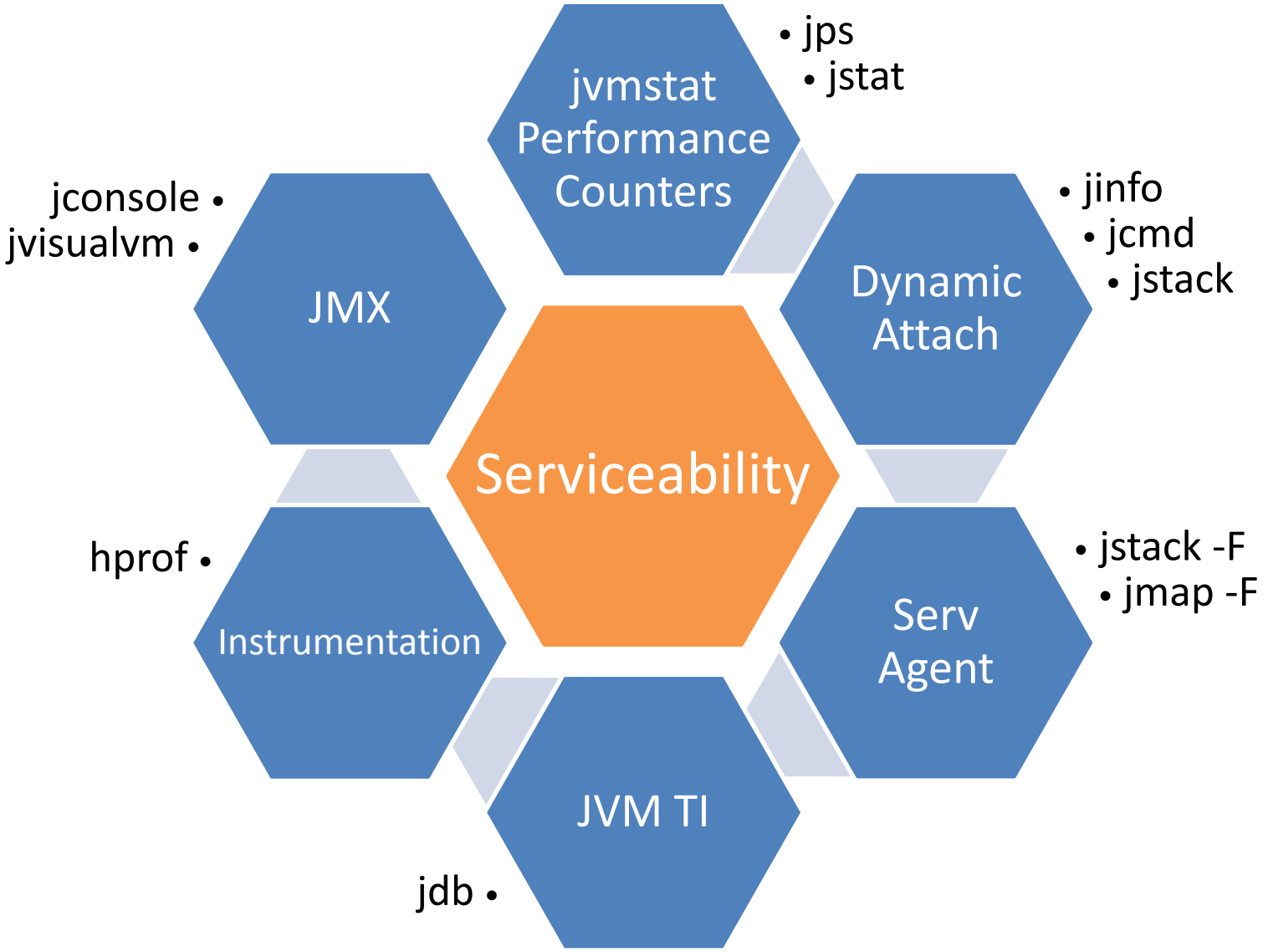
JVM Tool Interface

- Standard native API for debuggers
  - Threads and stacks
  - Local variables
  - Breakpoints, watchpoints
  - Event callbacks
- jvmtiCapabilities
- -agentpath or dynamic attach


jvmstat
Performance
Counters
JMX
Dynamic
Attach
Serviceability
Instrumentation
Serv
Agent
JVM TI

Instrumentation

- java.lang.instrument.Instrumentation
  - redefineClasses
- Patch bytecode
  - Profiling, benchmarking, interception...
  - Javassist
- -javaagent or dynamic attach


jvmstat Performance Counters
• jps
• jstat
JMX
jconsole •
jvisualvm •
Dynamic Attach
• jinfo
• jcmd
• jstack
Serviceability
Instrumentation
hprof •
Serv Agent
• jstack -F
• jmap -F
JVM TI
jdb •

Documentation

- http://openjdk.java.net/groups/serviceability/
- http://openjdk.java.net/groups/hotspot/docs/Serviceability.html

- http://docs.oracle.com/javase/8/docs/jdk/api/attach/spec/
- http://docs.oracle.com/javase/8/docs/platform/jvmti/jvmti.html

- Examples:
  $JDK_HOME/demo/jvmti

Thank You

- Contacts
  - andrey.pangin@corp.mail.ru
- Our blog
  - http://habrahabr.ru/company/odnoklassniki/blog/
- Open source @ OK
  - https://github.com/odnoklassniki
- Work @ OK
  - http://v.ok.ru