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Assimilating WebSphere Application Server into your z/OS WLM Configuration

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IBM

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SHARE in Anaheim

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WebSphere Application Server on System Z

Session	Title	Time	Room	Speaker
14618	Getting Started with WebSphere Liberty Profile on z/OS	Monday 9:30	Grand Ballroom Salon C	Loos/Follis
14692	Getting Started with WebSphere Compute Grid	Tuesday 9:30	Grand Ballroom Salon J	Hutchinson/Loos
14693	Using WebSphere Application Server Optimized Local Adapters (WOLA) to Migrate Your COBOL to zAAP-able Java	Wednesday 9:30	Grand Ballroom Salon K	David Follis
14620	WebSphere Liberty Profile on Windows AND z/OS (among other things) Hands-on Lab	Wednesday 1:30	Platinum Ballroom Salon 7	
14949	Tips Learned Implementing Websphere Application Server (WAS) on Linux for IBM System z	Wednesday 3:00	Grand Ballroom Salon G	Eberhard Pasch
14709	Need a Support Assistant? Check Out IBM's! (ISA)	Thursday 8:00	Grand Ballroom Salon A	Mike Stephen
15050	z/OSMF 2.1 Implementation and Configuration	Thursday 8:00	Grand Ballroom Salon G	Greg Daynes
14832	Web Apps using Liberty Profile Technology in CICS	Thursday 11:00	Platinum Ballroom Salon 2	Ian Mitchell
14722	Assimilating WebSphere Application Server into your z/OS WLM Configuration	Thursday 1:30	Orange County Salon 1	David Follis
15017	Using IBM WebSphere Application Server and IBM WebSphere MQ Together [z/OS & Distributed]	Thursday 3:00	Grand Ballroom Salon A	Ralph Bateman

Agenda

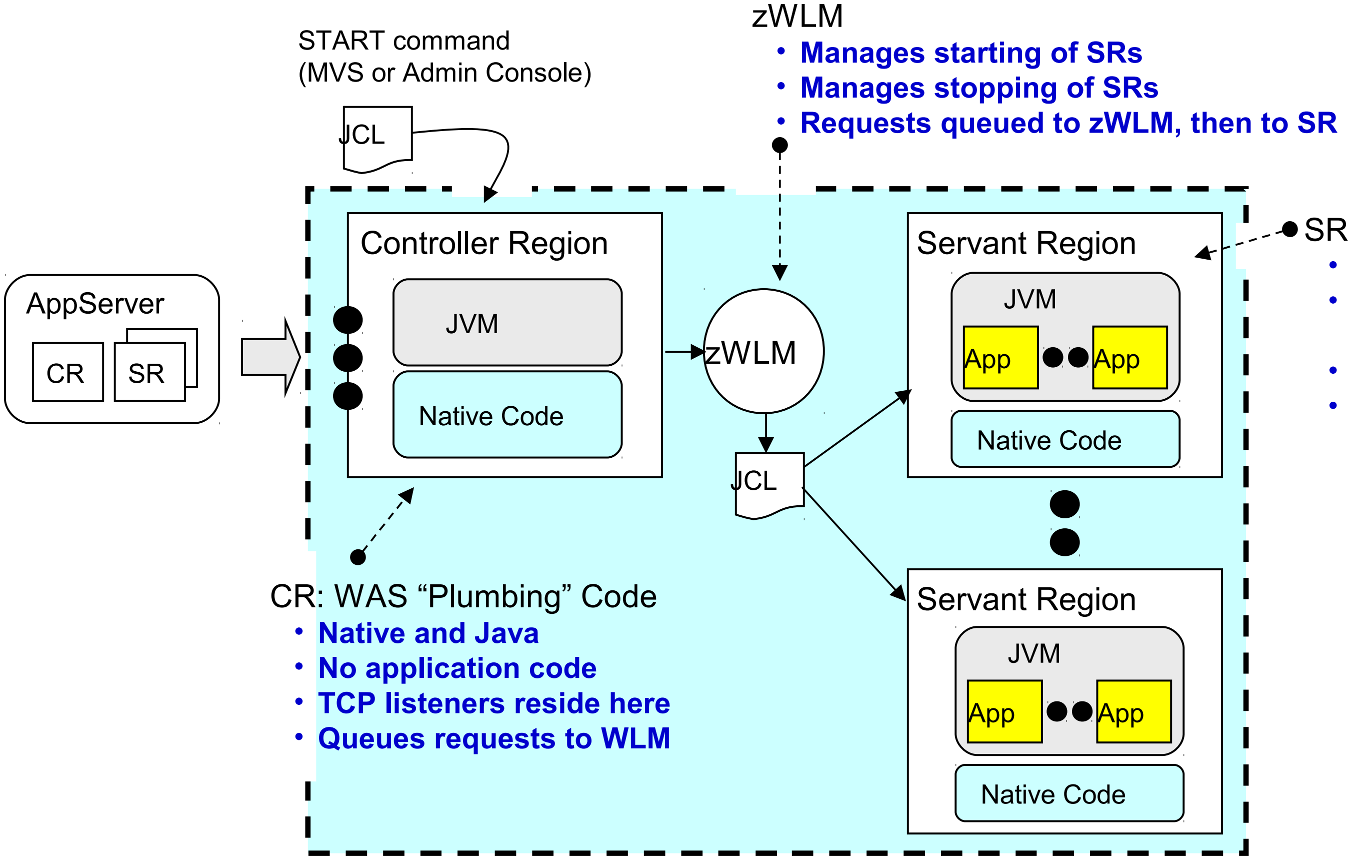
- What are we talking about?
- Defining terms
- The basic flow
- How does WLM pick a servant?
- WLM-less queueing
- What about async beans?
- Hints about classification based on XML file
- How monitoring mechanisms work

What are we talking about?

Setting the stage and establishing baseline concepts

The CR / SR Structure ... One More Time

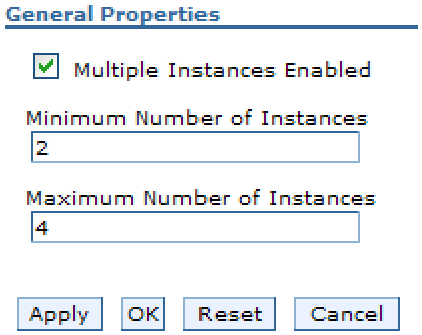
It's worth starting with a review of the essential heart of this:



zWLM
- Manages starting of SRs
- Manages stopping of SRs
- Requests queued to zWLM, then to SR

CR: WAS "Plumbing" Code
- Native and Java
- No application code
- TCP listeners reside here
- Queues requests to WLM

SR: Application Infrastructure
- Maintains app JVM runtime
- May support one or more applications
- Connectivity to data from SR
- Min/Max controllable by admin


General Properties

☑ Multiple Instances Enabled

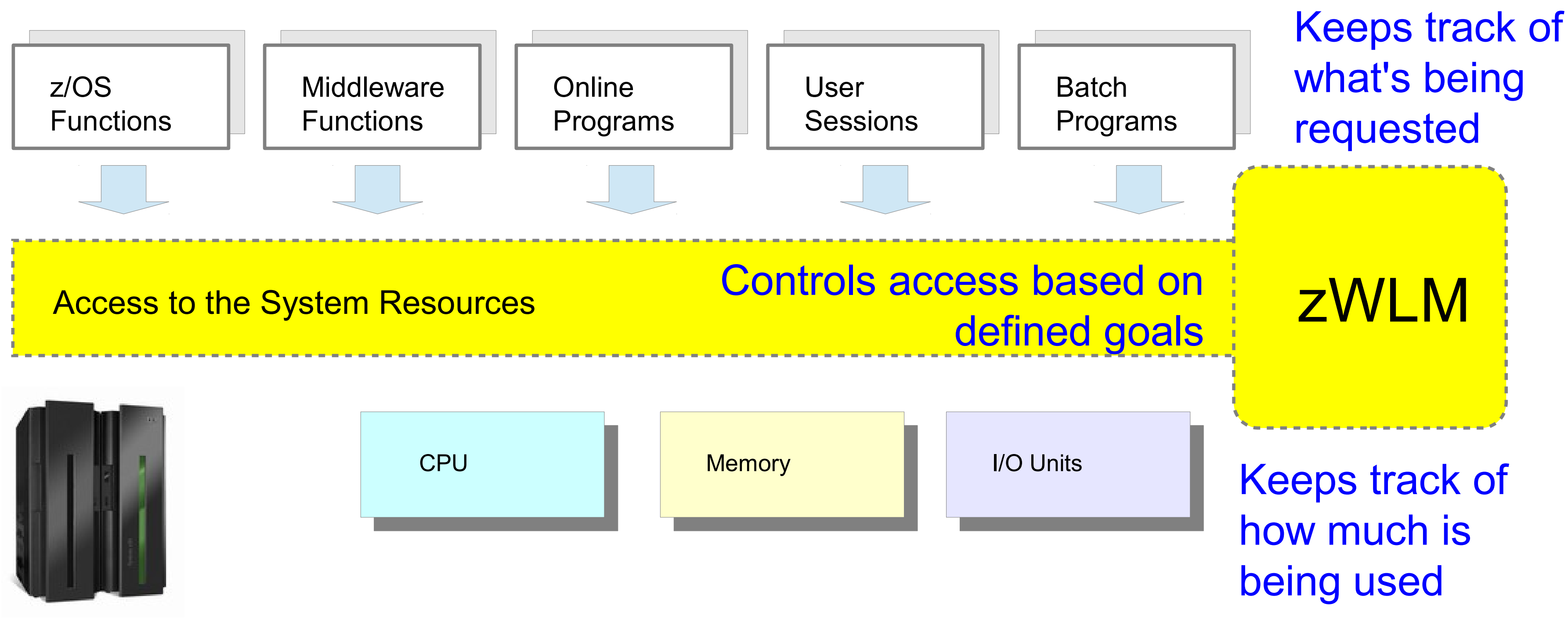
Minimum Number of Instances: 2

Maximum Number of Instances: 4

Default: min=1, max=1

What is "Workload Management" on z/OS?

It is controlled access to system resources coordinated by a function that keeps watch over all the elements of the system:



z/OS Functions

Middleware Functions

Online Programs

User Sessions

Batch Programs

Keeps track of what's being requested

Access to the System Resources

Controls access based on defined goals

zWLM

CPU

Memory

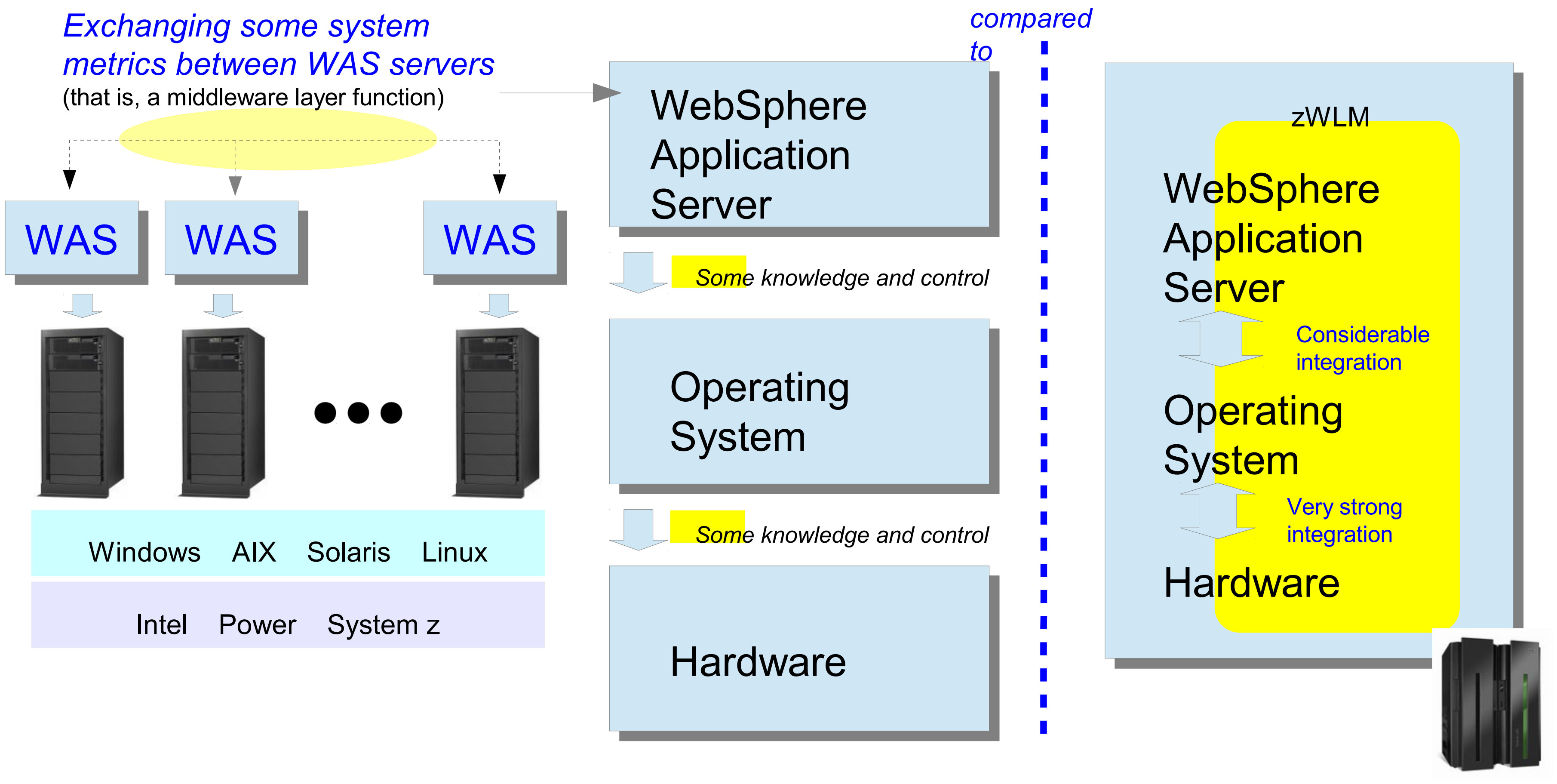
I/O Units

Keeps track of how much is being used

There is a tight integration between the System z hardware, the z/OS operating system with WLM having an exclusive view of it all

What About "WLM" on Distributed WAS?

The term "Workload Management" is used, but it's a different thing:



Exchanging some system metrics between WAS servers
(that is, a middleware layer function)

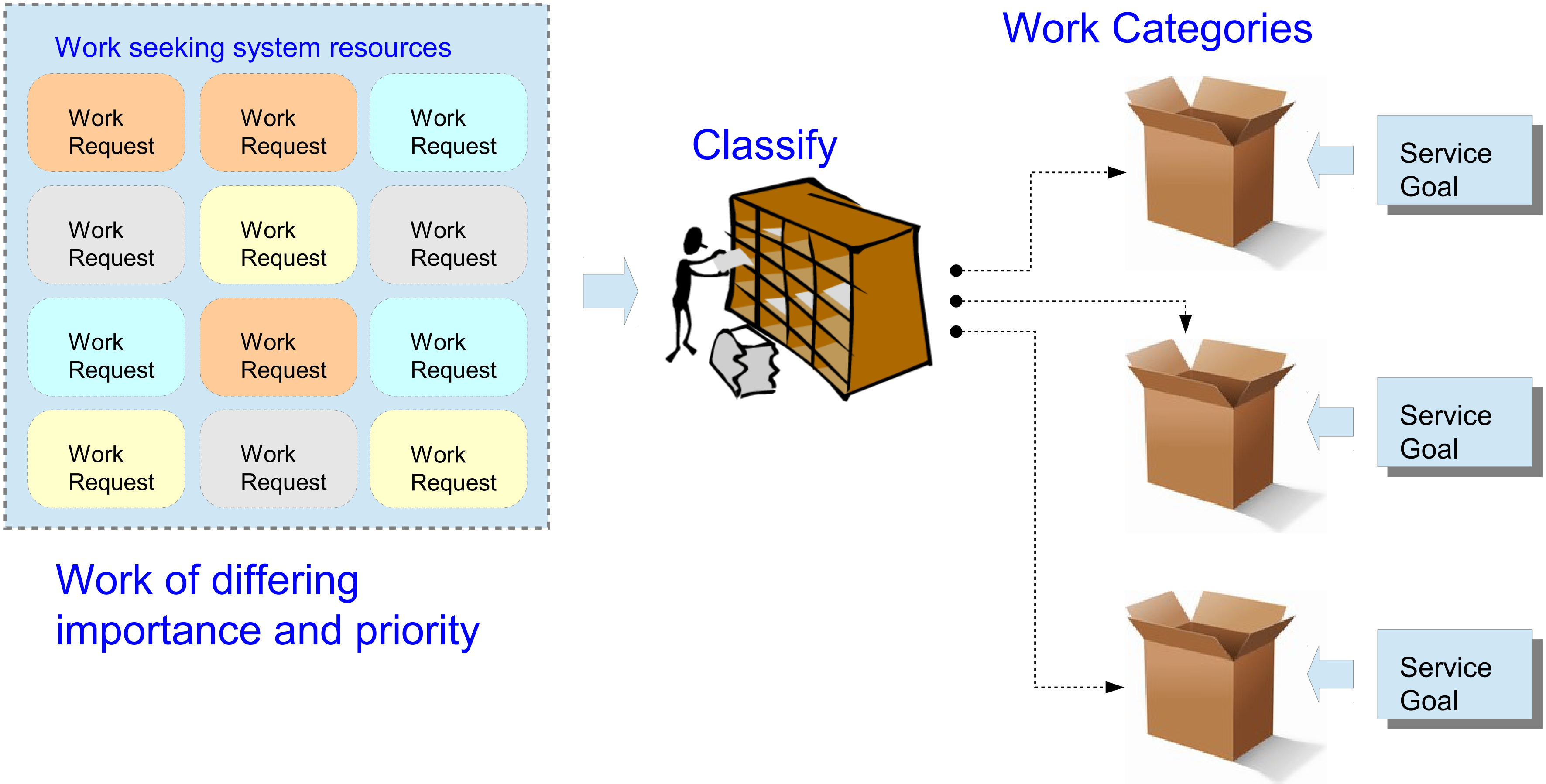
Unlike other operating systems, z/OS is designed to only run on System z hardware ... very tight integration from HW up through OS.

Defining Some WLM Terms

Service Classes, Reporting Classes, Enclaves and Goals

Key Starting Concepts

To set the stage for the terminology that follows ...

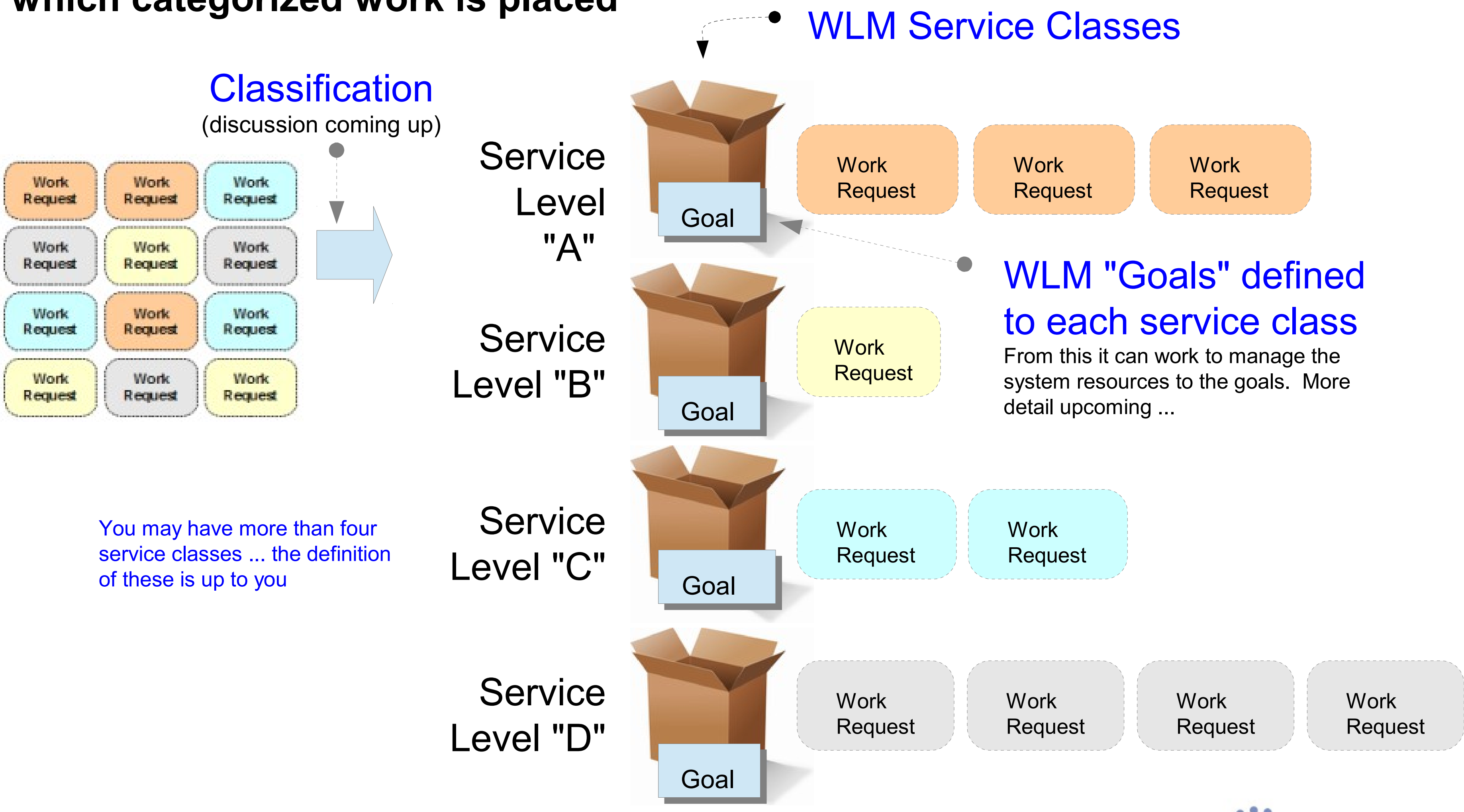


Work of differing importance and priority

In order for WLM to manage resources to goals, we must get the work organized into categories based on your goals

The WLM Service Class

The "service class" is at the heart of this ... it's the container into which categorized work is placed



WLM Service Classes

Classification

(discussion coming up)

Service Level "A"

Goal

Work Request

Work Request

Work Request

Service Level "B"

Goal

Work Request

WLM "Goals" defined to each service class

From this it can work to manage the system resources to the goals. More detail upcoming ...

Service Level "C"

Goal

Work Request

Work Request

Service Level "D"

Goal

Work Request

Work Request

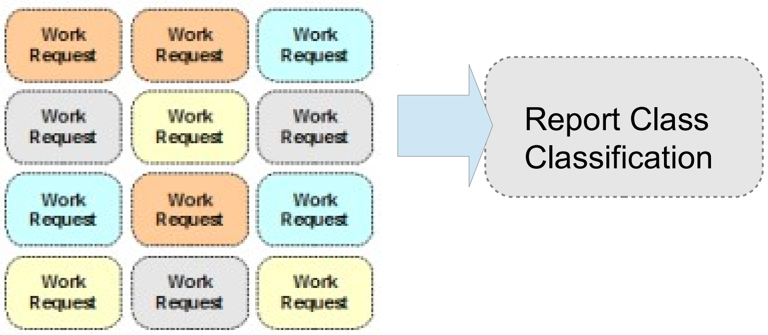
Work Request

Work Request

You may have more than four service classes ... the definition of these is up to you

The WLM Report Class

The "report class" is a variation on the "service class" ... WLM uses it to *report* on activity, but *not to manage* resources



Report Class Classification

Report Class
Ex: "Work related to WAS servers in cell ABCell"

Report Class
Ex: "Work related to CICS region XYZ"

●
●
●

Report Class
Ex: "Work related to transaction DEF"

Provides useful detail on things like CPU usage, zAAP usage and many other system statistics

Generally speaking -- you'll have a handful of service classes and a lot more reporting classes ... based on your needs:

Service Classes -- enough to reasonably categorize work priorities
Reporting Classes -- based on the granularity of your reporting needs

Classification Rules

The next step is to get work associated with a service class and a reporting class. This is done with classification rules:

Classification Types

(in WLM panels)

CB

CICS

DB2

DDF

IMS

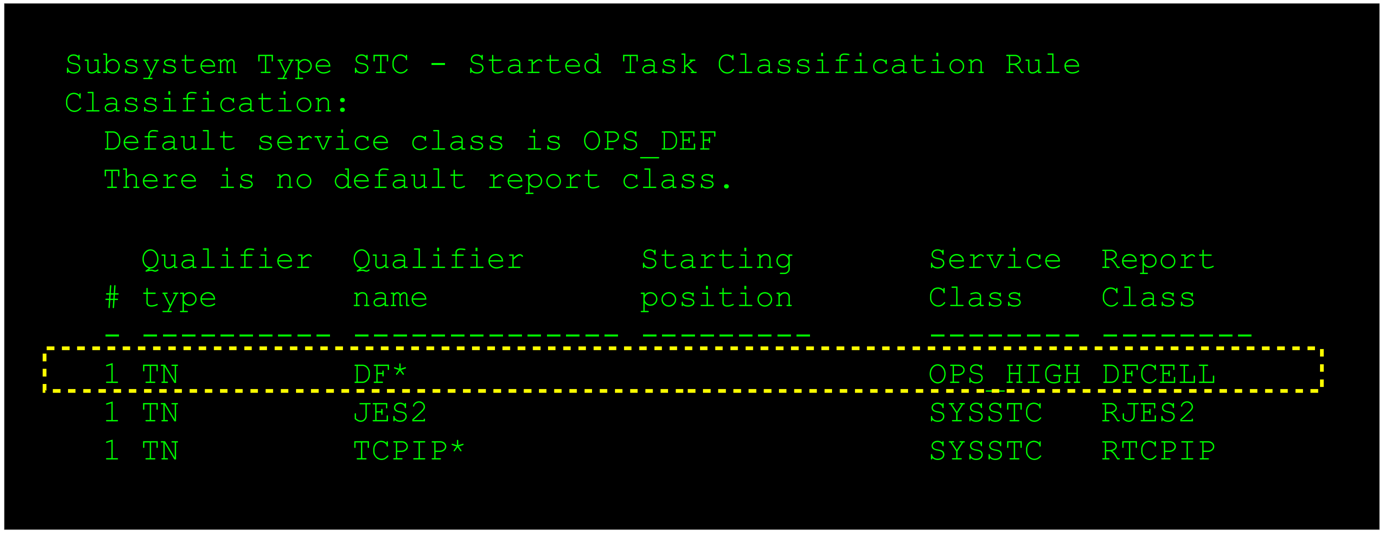
JES

OMVS

STC *Started Tasks*

(others)

This is what's used when WAS z/OS creates an enclave. We'll explore that next and for the rest of this presentation. CB stands for "Component Broker," which is an ancestor of present-day WAS.



```
Subsystem Type STC - Started Task Classification Rule
Classification:
  Default service class is OPS_DEF
  There is no default report class.

    Qualifier  Qualifier      Starting        Service  Report
  # type       name           position        Class    Class
  - ---------- -------------- ---------       -------- --------
  1 TN         DF*                            OPS_HIGH DFCELL
  1 TN         JES2                           SYSSTC   RJES2
  1 TN         TCPIP*                         SYSSTC   RTCPIP
```

Translation: any started task that begins with "DF" will be assigned to the service class `OPS_HIGH` and the reporting class `DFCELL` `OPS_HIGH` might have a goal of "Velocity 70%" ... goals are next ...

Standard WLM stuff ... we started with STC because it may be the easiest to understand for those not familiar with WLM processing

Goals and Importance -- Defined in Service Class

Goals tell WLM what to strive for in terms of service; Importance is used to determine relative importance when resources tight

Goals

Velocity	How fast work should be done without being delayed Number 1 to 99	Started tasks and batch programs
Response Time	Percentage of work completed within a specified period of time Example: 95% within 1 second	Online transactional work
Discretionary	WLM services when other priorities not competing for resources	Work that's okay to push aside if resources are needed

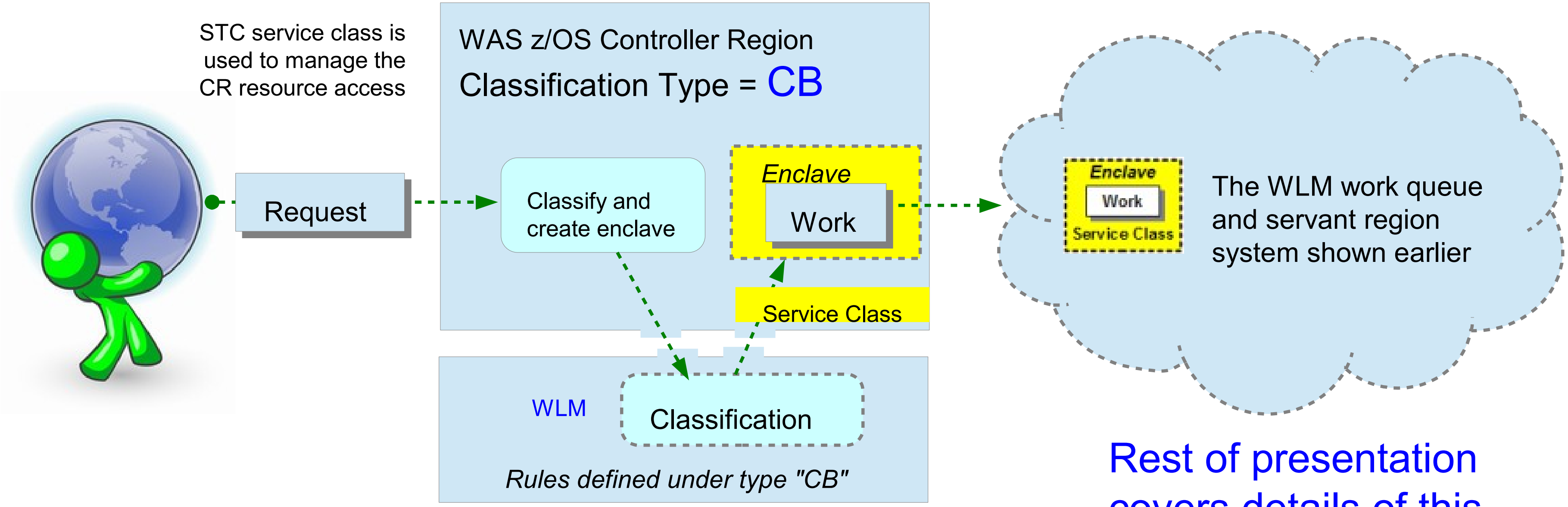
Importance

1 = Most important
2
3
4
5 = Least important

```
Importance indicates how important it is
to you that the service goal be met.
Importance applies only if the service
goal is not being met.
```

The WLM "Enclave"

An "enclave" is a way to identify and manage individual pieces of work *within* the many parts of a running z/OS system


STC service class is used to manage the CR resource access
Request
WAS z/OS Controller Region
Classification Type = CB
Classify and create enclave
Enclave
Work
Service Class
WLM
Classification
Rules defined under type "CB"
Enclave
Work
Service Class
The WLM work queue and servant region system shown earlier

Rest of presentation covers details of this

Key points from this chart

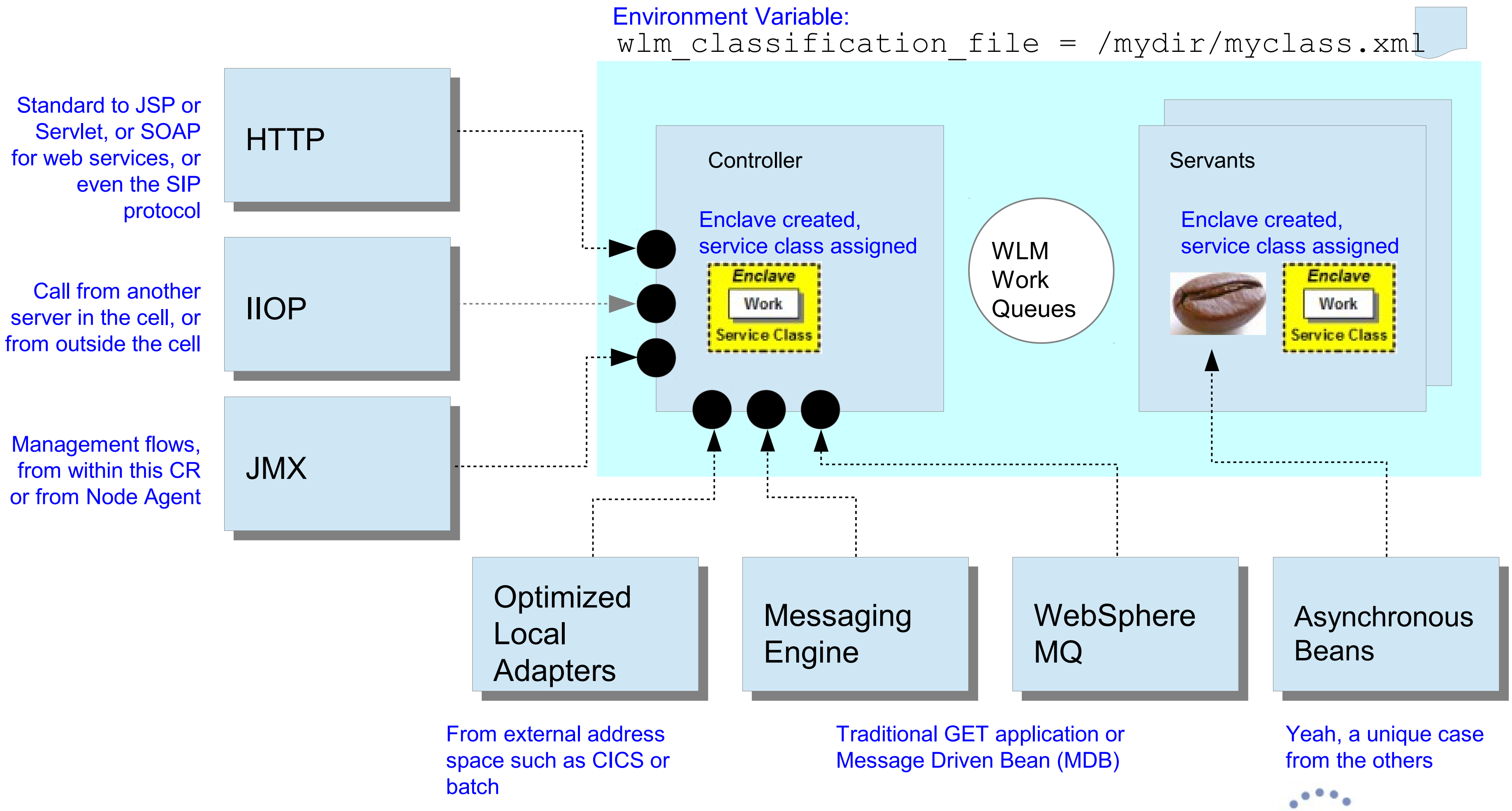
- An "enclave" is simply a way for WLM to understand priorities at a work unit level
- WAS does this automatically ... if you do no other configuration it'll still do this with default values

The Basic Flow

From work into the server through the response back

What Work Gets a WLM Enclave?

There's a lot of work that goes on inside WAS z/OS. How much of it involves WLM enclaves? "Inbound Requests":



Environment Variable:

```
wlm_classification_file = /mydir/myclass.xml
```

Standard to JSP or Servlet, or SOAP for web services, or even the SIP protocol

Call from another server in the cell, or from outside the cell

Management flows, from within this CR or from Node Agent

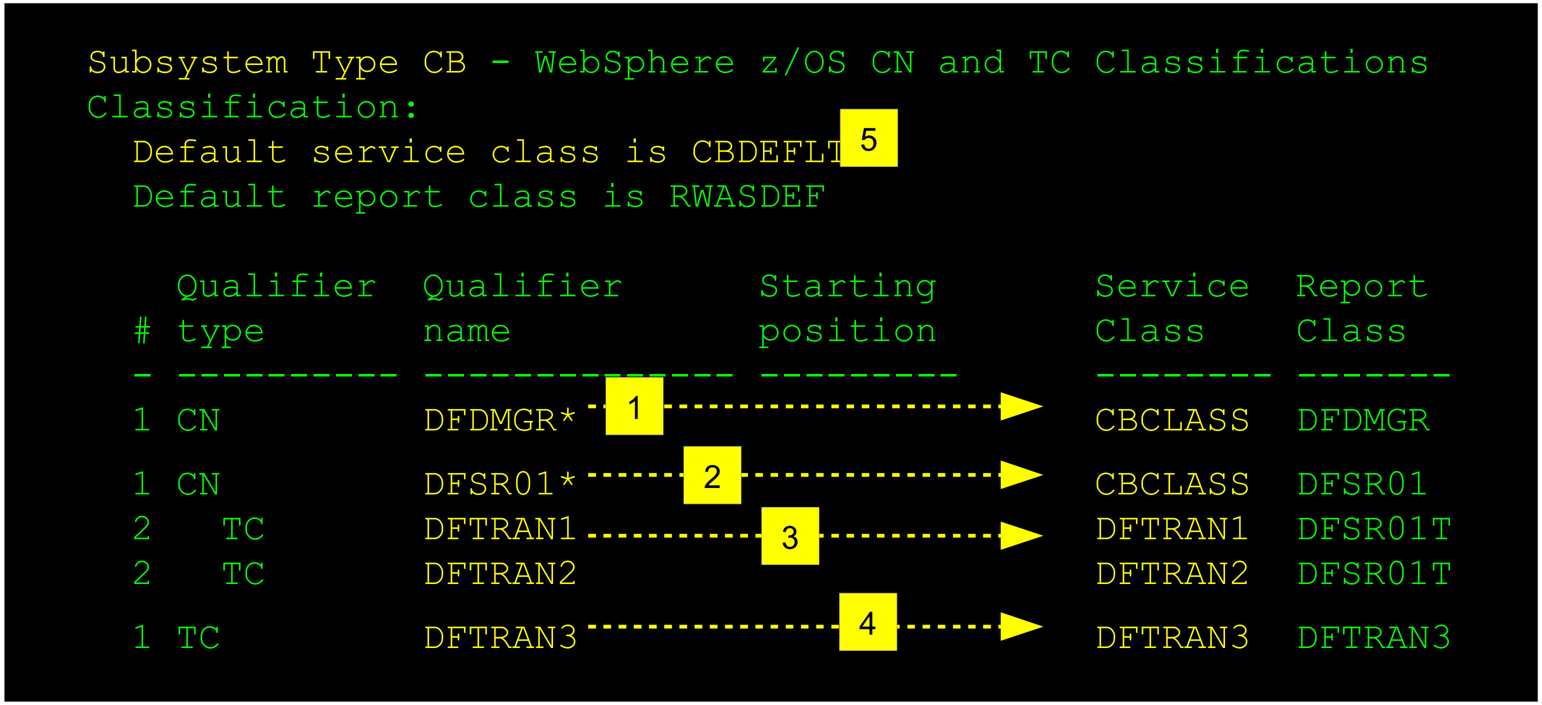
From external address space such as CICS or batch

Traditional GET application or Message Driven Bean (MDB)

Yeah, a unique case from the others

Assigning a Service Class to the Enclave

This is for the work request ... earlier we saw how the CR was classified using the STC type. Now we look at the CB type ...



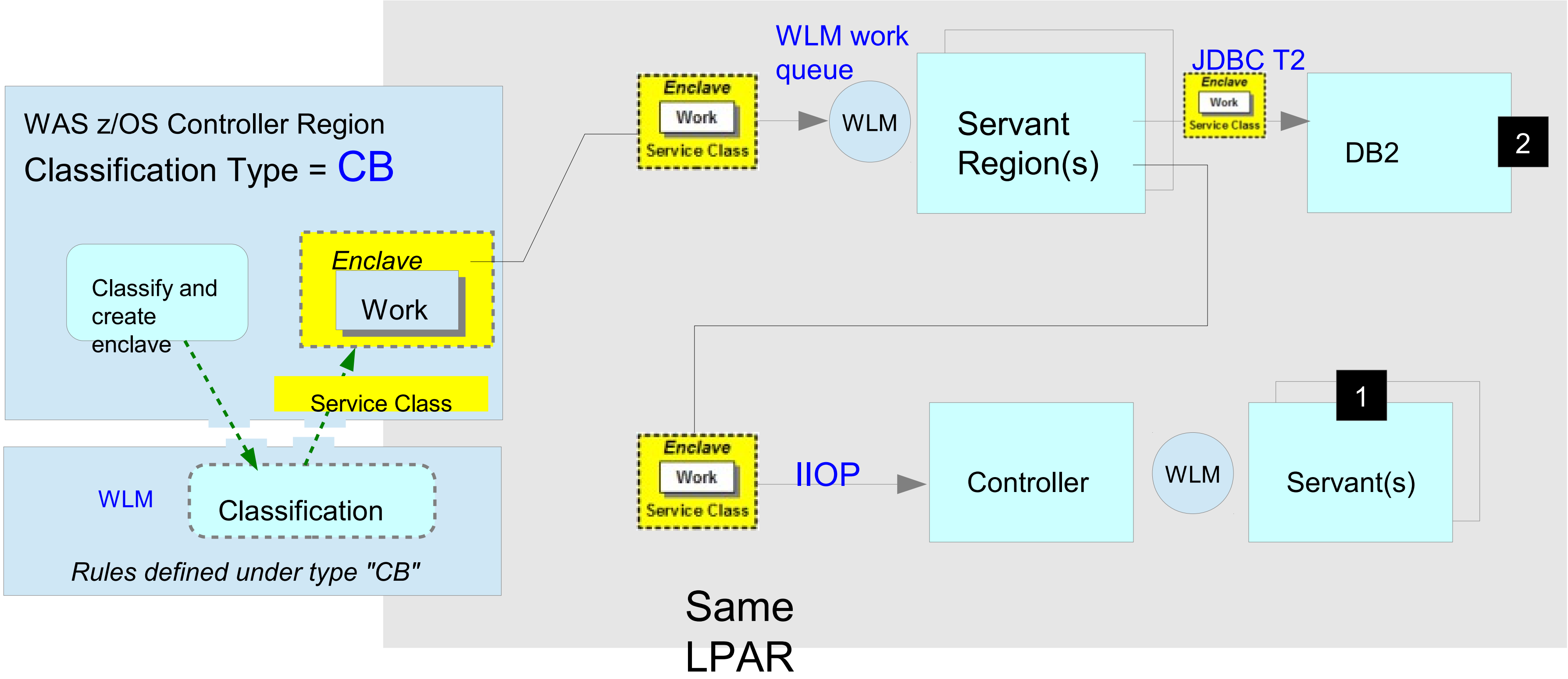
```
Subsystem Type CB - WebSphere z/OS CN and TC Classifications
Classification:
  Default service class is CBDEFLT
  Default report class is RWASDEF

    Qualifier  Qualifier      Starting        Service  Report
  # type       name           position        Class    Class
  - ---------- -------------- ---------       -------- -------
  1 CN         DFDMGR*                        CBCLASS  DFDMGR

  1 CN         DFSR01*                        CBCLASS  DFSR01
  2   TC       DFTRAN1                        DFTRAN1  DFSR01T
  2   TC       DFTRAN2                        DFTRAN2  DFSR01T

  1 TC         DFTRAN3                        DFTRAN3  DFTRAN3
```

Enclaves created in WAS CR are classified by rules in CB subsystem type:

1. CN of DFDMGR* matches the Deployment Manager. Work there goes to CBCLASS.
2. Work in DFSR01* cluster *without* a transaction classification gets CBCLASS as well.
3. Work in DFSR01* cluster *with* TC of DFTRAN1 or DFTRAN2 get service classes as shown
4. Work that matches the TC of DFTRAN3 *regardless of WAS CN* gets service class DFTRAN3
5. Anything that doesn't match any specific rules gets the default service class of CBDEFLT

Enclave Propagation

We get to why all this enclave classification stuff is done -- so that WLM can manage the threads inside the servant regions



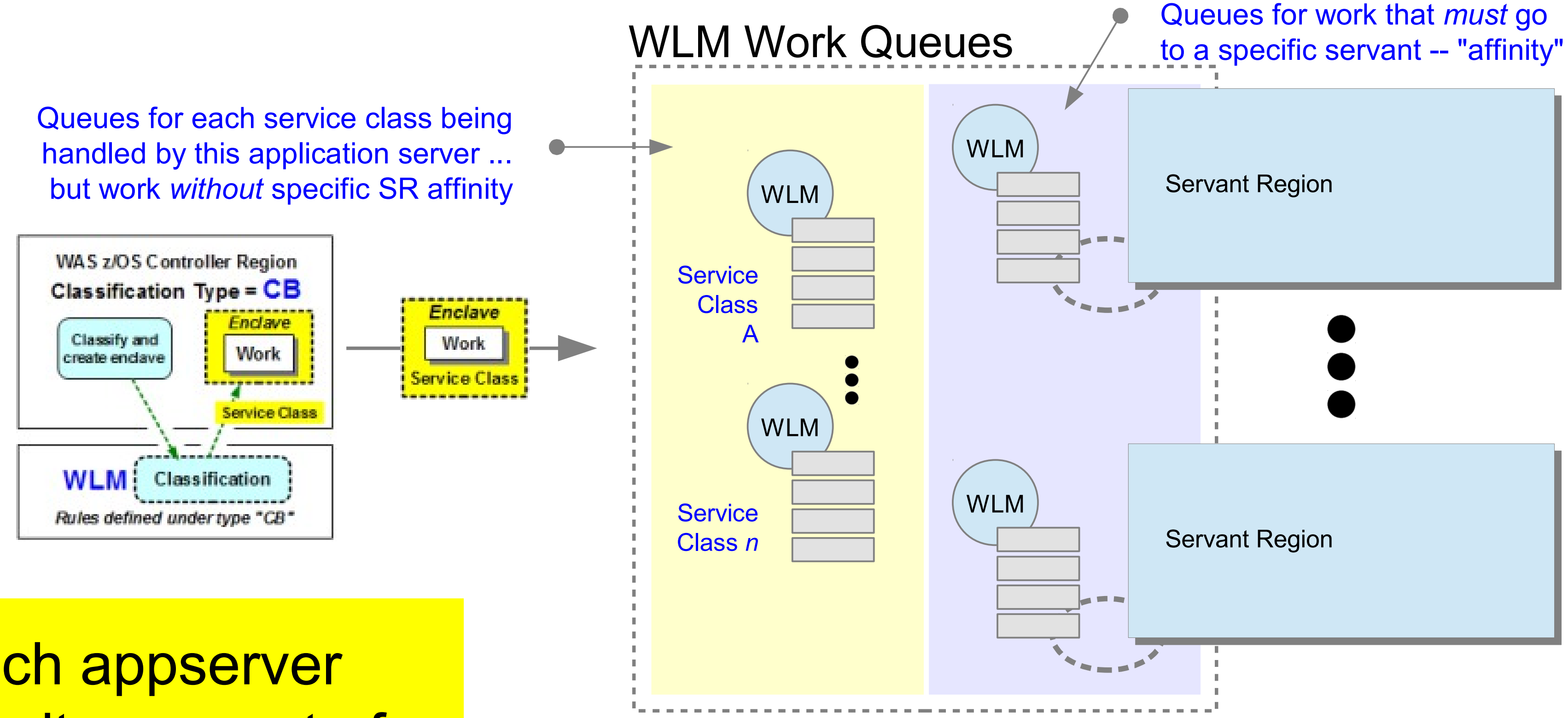
1. If you don't want the enclave propagated into these target servers you may turn it off with the `protocol_iiop_local_propagate_wlm_enclave = false` environment variable
2. What about CICS? CICS does its own classification so propegation from WAS to CICS not possible. But enclave propagation to DB2 over a JDBC T2 driver very possible, and the benefit is a single reporting "container" for resources consumed associated with the enclave.

How Does WLM Pick a Servant?

Hint: it's not random ☺

A More Precise Picture of the CR / SR Structure

Typically we draw only one WLM work queue between the CR and the SR. But in truth there are multiple:



Queues for each service class being handled by this application server ... but work *without* specific SR affinity

Queues for work that *must* go to a specific servant -- "affinity"

Each appserver has its own set of such work queues

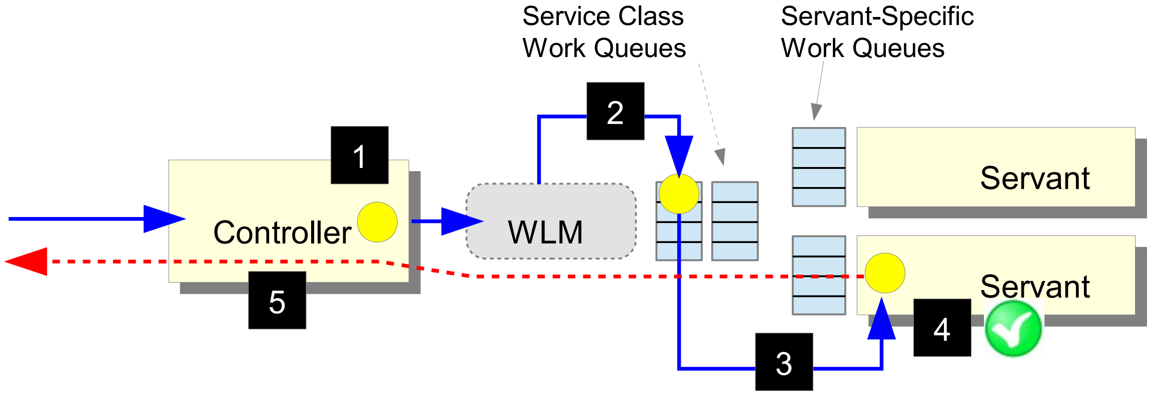
Two questions come to mind:

1. If affinity, what creates the affinity?
2. If no affinity, then which servant gets the work?

Affinity to a Specific Client:

Here's a brief overview of the flow creating affinity, then what happens for requests after that:

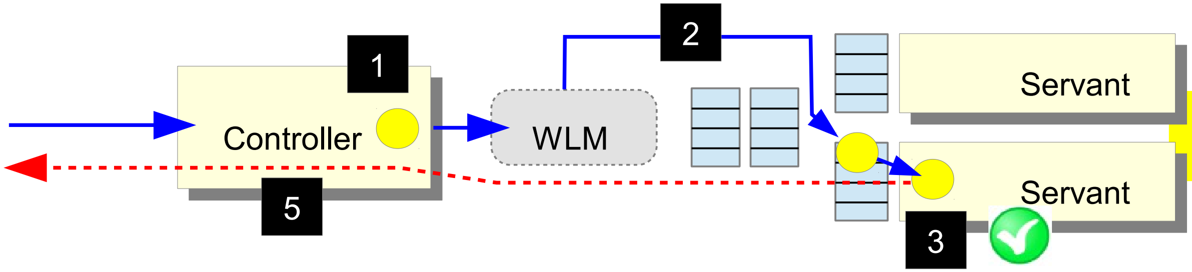
- *Initial Request*



1. Works comes into CR and is classified as described earlier
2. No affinity yet exists, so WLM places work on the work queue for that service class
3. WLM indicates which servant should take the work.

   We cover this in detail next.
4. Application creates an affinity, such as creating an HTTPSession object
5. Response goes back with affinity key, which the CR keeps track of

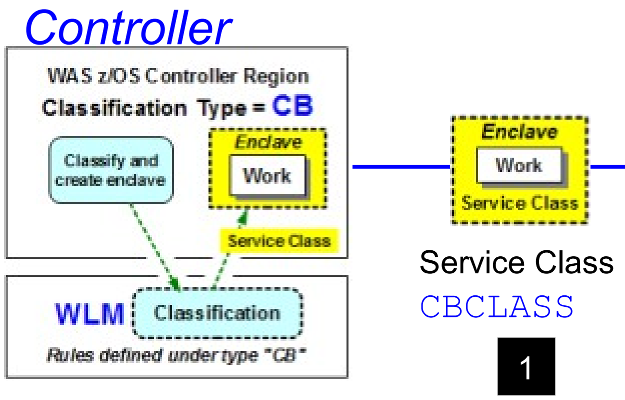
- *Follow-on Requests*

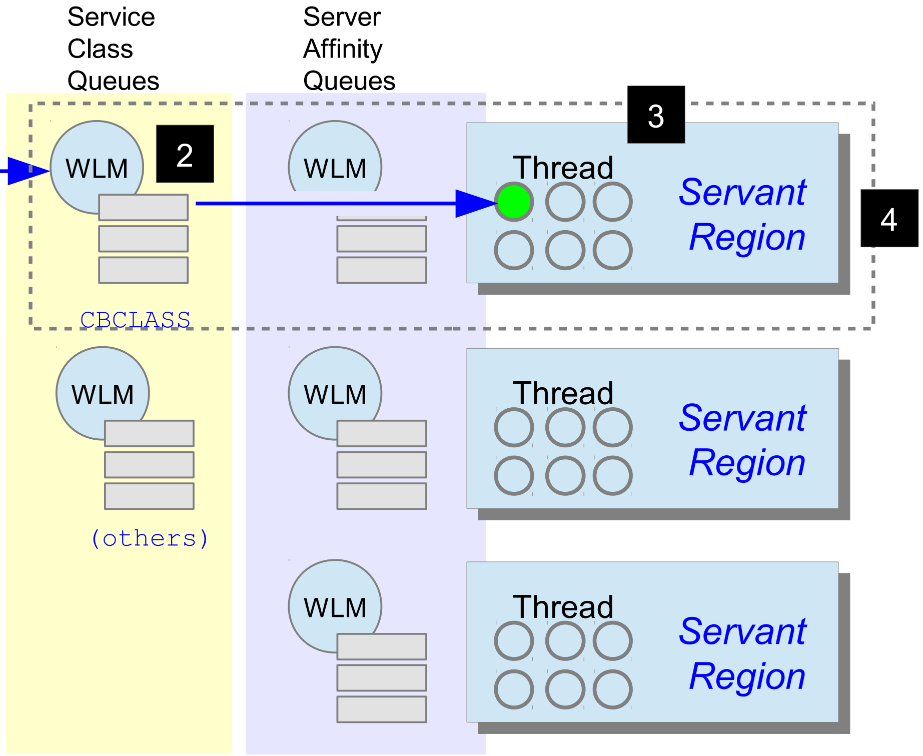


1. Works comes into CR and is classified as described earlier. Affinity exists, so CR alerts WLM to that affinity
2. WLM now puts the work on the specific work queue for that servant
3. The servant takes the work off its queue
4. Response goes back with affinity key; CR knows to maintain affinity

Key Concept: Servants "Bound" to Service Class

Once a servant region has done work for a particular service class, WLM "binds" that servant to service class queue:





1. Works comes into CR and is classified as described earlier.
2. A WLM work queue for that service class is created
3. A servant is chosen (next chart) ... enclave dispatched to a worker thread in that servant
4. WLM now sees that servant as "bound" (or "associated") with that servant class.

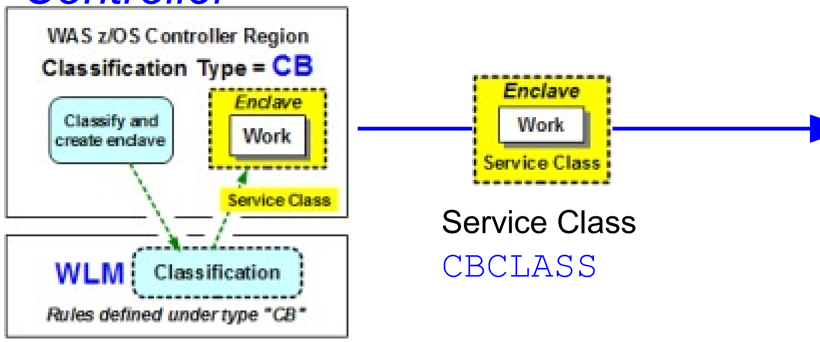
Work for that service class will now go to that servant. Other service classes sent to other servants

The key is how work gets allocated in the first place ... that's next

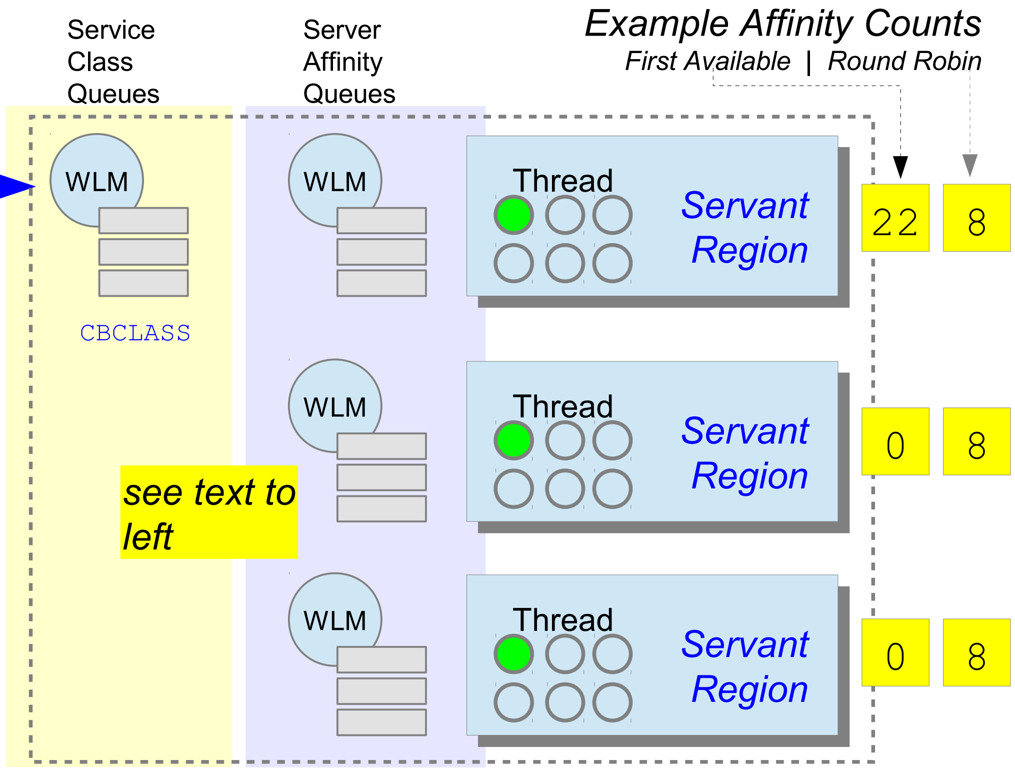
Choosing a Servant -- One Service Class

Imagine a multi-servant application server (ex: MIN=3, MAX=3) where all the work coming is gets assigned to the same WLM service class

Controller



Service Class
`CBCLASS`



see text to left

First Available

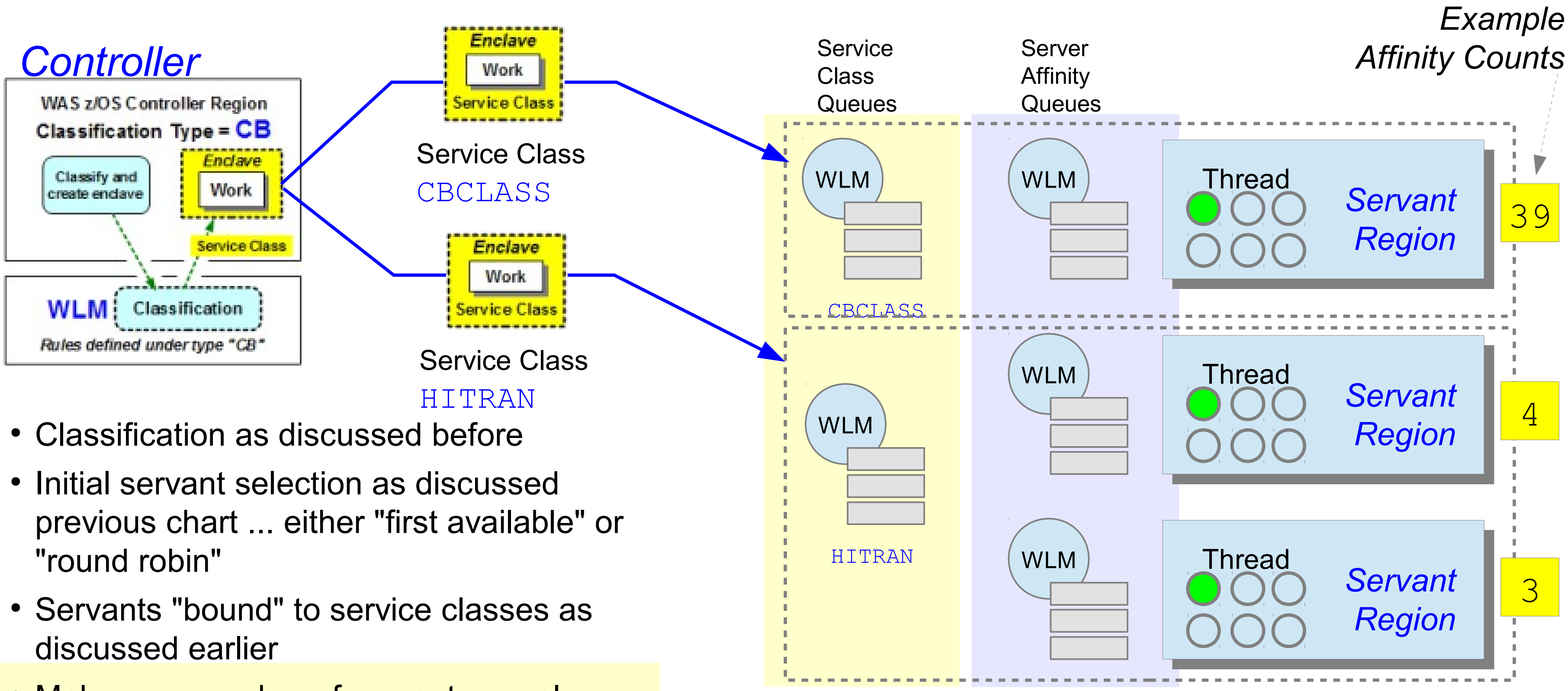
- Enclave dispatched to first available thread
- That servant "bound" to service class (prev. chart)
- Work continues to that servant until threads occupied, then spills over to next servant
- If no threads immediately available, WLM places on service class work queue

Round Robin

- `wlm_stateful_session_placement_on = 1`
- WLM assumes every dispatch will create an affinity
- Seeks to balance affinities across servants bound to that service class.

Choosing a Servant -- Multiple Service Classes

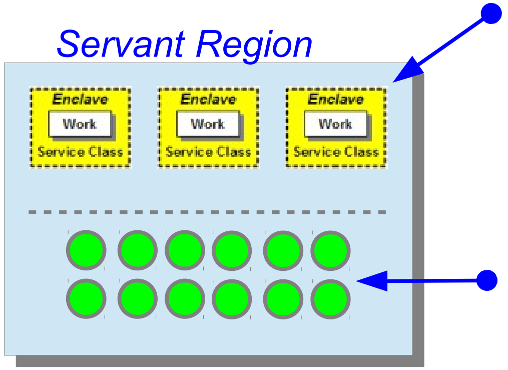
Now imagine a multi-servant application server where the work gets assigned to multiple WLM service classes:



- Classification as discussed before
- Initial servant selection as discussed previous chart ... either "first available" or "round robin"
- Servants "bound" to service classes as discussed earlier
- Make sure number of servants equal or greater than service classes serviced
- It's important to understand how work is being classified -- you can "waste" a servant if a classification takes place you weren't anticipating (usually default service class is the problem)

How Threads are Managed in a Servant

It depends ...



Enclave Threads

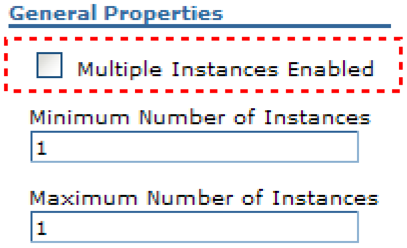
- Work dispatched to servant from CR with an associated WLM enclave
- WLM manages the thread to the service class of the enclave
- Recall that servants are bound to a service class and generally serve only enclaves of that service class, but exception cases do exist

Non-Enclave Threads

- These are threads doing things like GC and other work
- These are managed according to the service class to which the servant region is bound, unless....ManageNonEnclaveWork=No

Special case -- "single servant mode"

Unchecked -- therefore "single servant mode"



General Properties

□ Multiple Instances Enabled

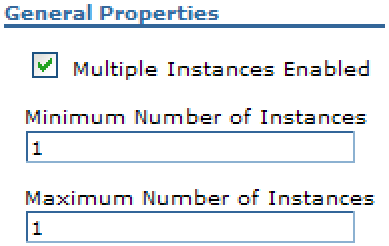
Minimum Number of Instances

1

Maximum Number of Instances

1

Checked -- multi-servant *even though MIN=1, MAX=1*



General Properties

☑ Multiple Instances Enabled

Minimum Number of Instances

1

Maximum Number of Instances

1

Single Servant Mode

- WLM will mix different service classes into servant and manage each thread according to its service class

Multi-Servant, MIN/MAX=1

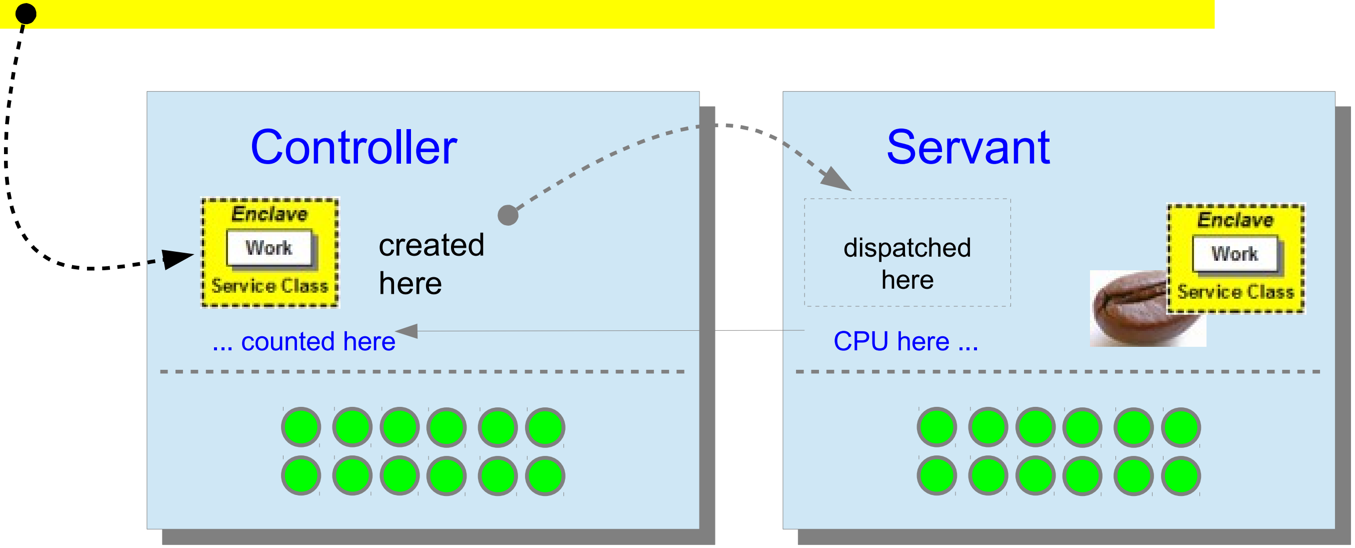
- WLM will bind a servant to first service class that comes in; other service classes will sit on the queue and eventually time out

Reporting CPU Usage

Where CPU is reported depends on whether or not it's an enclave thread, and if it was an asynch bean

CPU for enclaves attributed to the Controller -- it created the enclave. This true despite fact the enclave is dispatched and run on a *servant thread*

And ... if enclave propagated into DB2 over T2, then that CPU also attributed to the controller region where the enclave created.



For asynch beans ... it depends ☺

More on asynch beans in a bit

CPU for non-enclave threads used by CR is attributed to the CR region

CPU for non-enclave threads used by SR is attributed to the SR region

WLM-less Queueing

WAS takes over some of the work from WLM

Overview of WLM-less Queueing

It's based on the `server_use_wlm_to_queue_work` variable:

If variable = 1
(default)

- Uses WLM work queues
- WLM controls dispatching to the servant region
- What we've discussed up to this point is how it works
- Generally preferred for stateless workloads
- Well suited for:
  - Stateless +
  - multi-servant +
  - multiple service class goals

If variable = 0

- WAS uses its own queues
- WAS controls dispatching to the servant region
- Three routing options:
  Discussed next page
- Generally preferred for stateful workloads
- Well suited for:
  - Stateful +
  - multi-servant +
  - All requests have same service goal

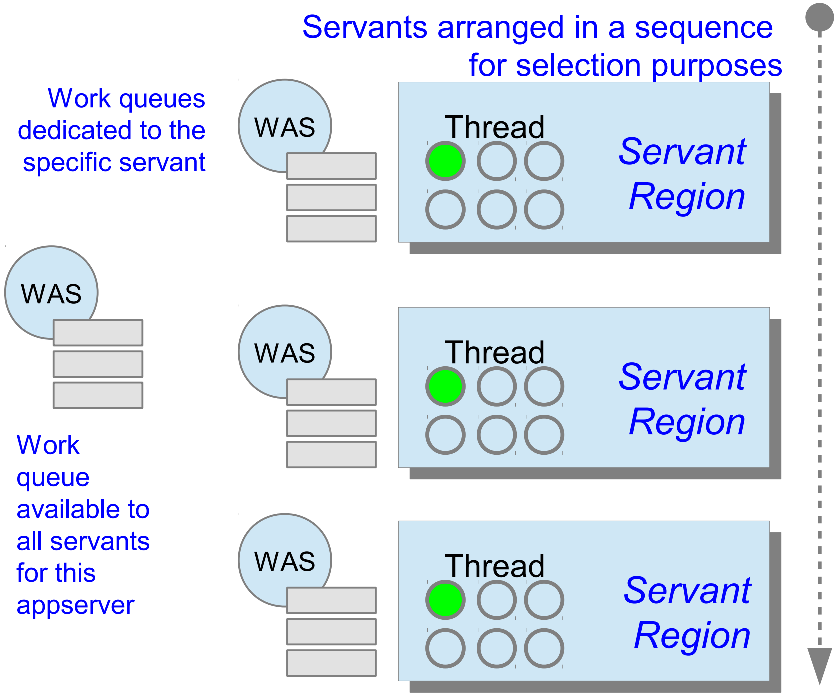
InfoCenter for this and other custom properties, search: `urun_rproperty_custpropertie s`

Hot Thread, Round Robin and Hot Robin

These are the three routing options when that variable is set to have WAS control the routing.

Yet another customer property:

```
server_work_distribution_algorithm = 0 | 1 | 2
```



Servants arranged in a sequence for selection purposes
Work queues dedicated to the specific servant
WAS
Thread
Servant Region
WAS
WAS
Thread
Servant Region
Work queue available to all servants for this appserver
WAS
Thread
Servant Region

0 Hot Thread

- First available thread in the servant sequence list
- If no threads, then onto the global queue and next idle thread (any servant) takes it

1 Round Robin

- Try to dispatch to next servant in the list
- If no idle thread, then place on dedicated queue

2 Hot Robin (7.0.0.7 and above)

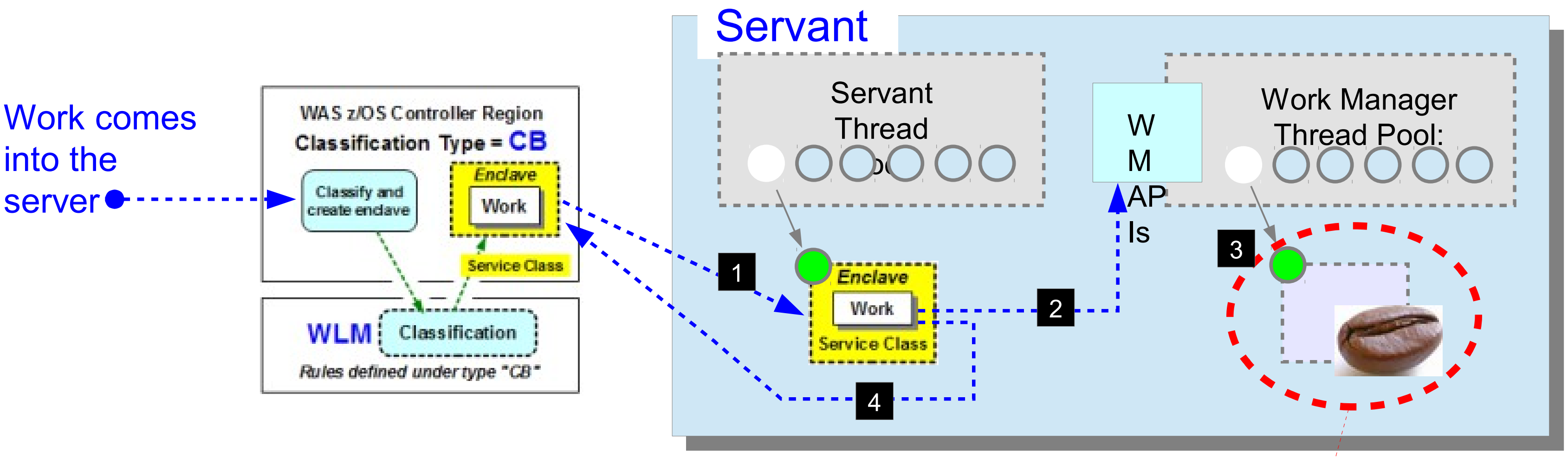
- Try to dispatch to next servant in the primary round-robin list
- If no thread, then go to next servant in the secondary round-robin list
- If still no threads, then place on global queue
- First available thread takes it

What About Asynch Beans?

They march to a different drummer ...

High-Level Overview of Asynch Beans

Here's a schematic diagram of how the CR / SR structure looks when asynchronous beans are introduced:



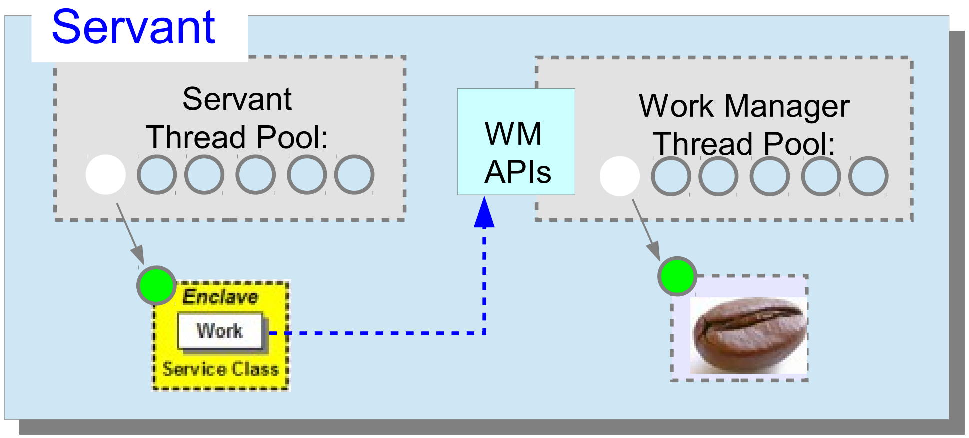
Work comes into the server
WAS z/OS Controller Region
Classification Type = CB
Classify and create enclave
Enclave
Work
Service Class
WLM
Classification
Rules defined under type "CB"
Servant
Servant Thread Pool
W M APIs
Work Manager Thread Pool:
1
Enclave
Work
Service Class
2
3
4

1. Classified work is dispatched to the servant per the methods already discussed. The servant thread joins the created enclave.
2. At some point the application requests of the work manager that an asynch bean be started
3. At some point the asynch bean is started. It receives a thread out of the thread pool maintained by the work manager
4. The original work completes and returns -- the asynch bean may or may not yet be launched; if launched it may or may not be complete.

What about this?
How is it classified?
What enclave does it join?

Asynch Beans -- Three Scenarios

Much depends on *how* the work manager is called:



If `isDaemon=true` passed in on `startWork` API, then ...

- Asynchronous bean considered a very long running process ... potentially forever
- A new thread is created rather than pulling from the work manager thread pool
- A new enclave is created with classification based on "Daemon transaction class" defined under *Resources* ⇨ *Asynchronous Beans* ⇨ *Work managers* in the Admin Console
- If no Daemon transaction class defined, then `ASYNCDMN` is used

If `WorkWithExecutionContext` specified on `startWork` API, then ...

- If the “z/OS WLM Service Class” service is enabled on both extracting and execution WorkManagers...
  - The work manager calls a WLM API and gets the classification attributes for the original work request
  - A *new* enclave is created with the same classification attributes as the original request
- If not, well, its complicated

If execution context *not* set on `startWork` API, then ...

- The work manager registers with WLM as a "user of the original work request enclave"
- That allows for the original work request to complete but the enclave to stay in existence
- The asynchronous bean operates under the classification attributes of the original work request enclave

If asynch bean scheduled from non-enclave threads, then ...

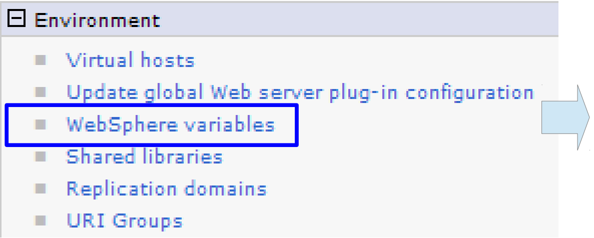
- There is no original enclave to work with
- A new enclave is created with classification based on "Default transaction class" defined under *Resources* ⇨ *Asynchronous Beans* ⇨ *Work managers* in the Admin Console
- If no Default transaction class defined, then `ASYNCBN` is used

Using the Classification XML File

InfoCenter, search on `rrun_wlm_tclass_sample` for a sample

How it Works

The file supplies a set of criteria to match requests to transaction class names, which then match with rules in the CB subsystem type

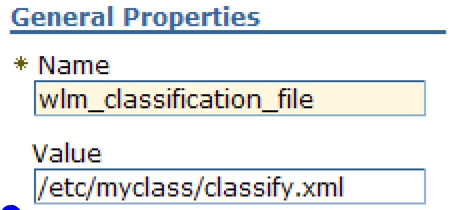


⊟ Environment

- Virtual hosts
- Update global Web server plug-in configuration
- WebSphere variables
- Shared libraries
- Replication domains
- URI Groups

Scope to cell or node

server scope for classification deprecated



General Properties

* Name

wlm_classification_file

Value

/etc/myclass/classify.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE Classification SYSTEM "Classification.dtd"
>
<Classification schema_version="1.0">
  :
   <InboundClassification type="iiop" ... >
     (classification information)
   </InboundClassification>
   <InboundClassification type="http" ... >
     (classification information)
   </InboundClassification>
   <InboundClassification type="sip" ... >
     (classification information)
   </InboundClassification>
   <InboundClassification type="mdb" ... >
     (classification information)
   </InboundClassification>
   <InboundClassification type="sib" ... >
     (classification information)
   </InboundClassification>
  :
</Classification>
```

Transaction Name based on request match

Rules in CB subsystem type

Service Class Reporting Class

From that we get goals and importance based on specific transactions based on criteria in the classification XML file

Some Hints

The file supplies a set of criteria to match requests to transaction class names, which then match with rules in the CB subsystem type

IIOP

If you classify at the method level, use the mangled method name. You can find that in the generated stub or tie.

HTTP

URI is commonly used, and wildcarding is allowed. Match on host and port also possible.

SIP

There's nothing in a SIP request to match on, so the classification is somewhat binary ... "if SIP, then transaction name is ..."

MDB

For "Plan A" MDBs (persistent durable queues received from MQ via the controller's message listener port) you can classifiy under the MDB type.

For "Plan B" MDBs (listener in the servant) the classification falls under "internal"

SIB

Type "jmsra" applies to MDBs which that use the default message provider

Type "destinationmediation" applies to mediations defined on the SIBus

Internal Work

There's work that WAS itself needs to do. This is where it's classified (along with MDB Plan B)

Optimized Local Adapters

Handled in a special way. Go to the InfoCenter and search on `tdat_olawlm`

How to Account for Internal Work

There *will* be internal work classified. How can you account for it without it simply falling under the CN default Service Class?

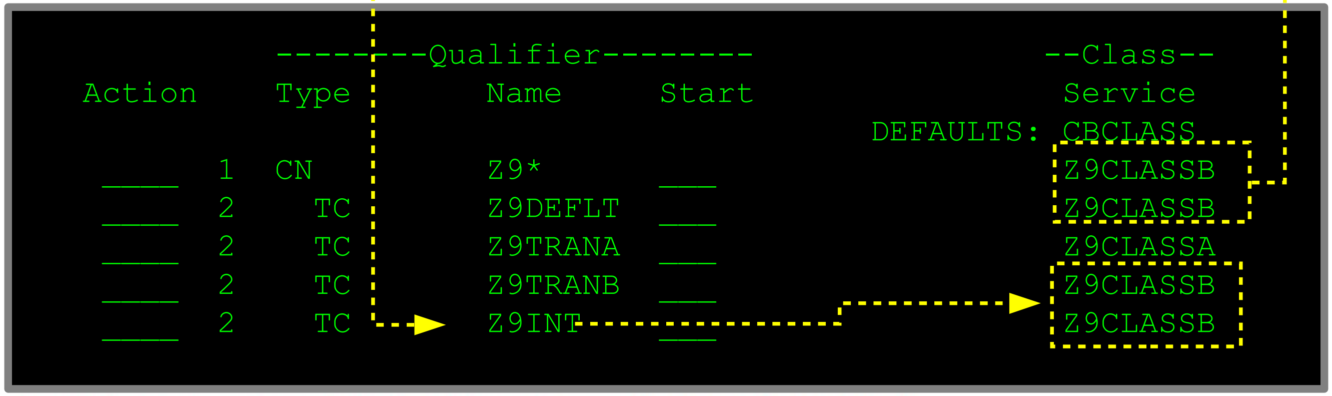
```
<Classification schema_version="1.0">
   <InboundClassification type="http" schema_version="1.0"
      default_transaction_class="Z9DEFLT" >
      <http_classification_info
            uri="/SuperSnoopWeb/*" transaction_class="Z9TRANA"
            description="Snoop" />
      <http_classification_info
            uri="/MyIVT/*" transaction_class="Z9TRANB"
            description="MyIVT" />
   </InboundClassification>
  <InboundClassification type="internal" schema_version="1.0"
     default_transaction_class="Z9INT" >
   </InboundClassification>
</Classification>
```

"http" is one of several inbound work types:

```
http    internal
iiop    mdb
sip     ola
```

Account for internal work as shown. Then map to a TC you know will be used by one of your other rules.

Do same for the default TC and the CN default and you then have all cases covered.



```
               --------Qualifier--------          --Class--
   Action      Type        Name      Start          Service
                                          DEFAULTS: CBCLASS
  ____     1   CN          Z9*       ___            Z9CLASSB
  ____     2     TC        Z9DEFLT   ___            Z9CLASSB
  ____     2     TC        Z9TRANA   ___            Z9CLASSA
  ____     2     TC        Z9TRANB   ___            Z9CLASSB
  ____     2     TC        Z9INT     ___            Z9CLASSB
```

You can assign separate reporting classes to isolate out the internal work and get numbers on each service class

AE_SPREADMIN …

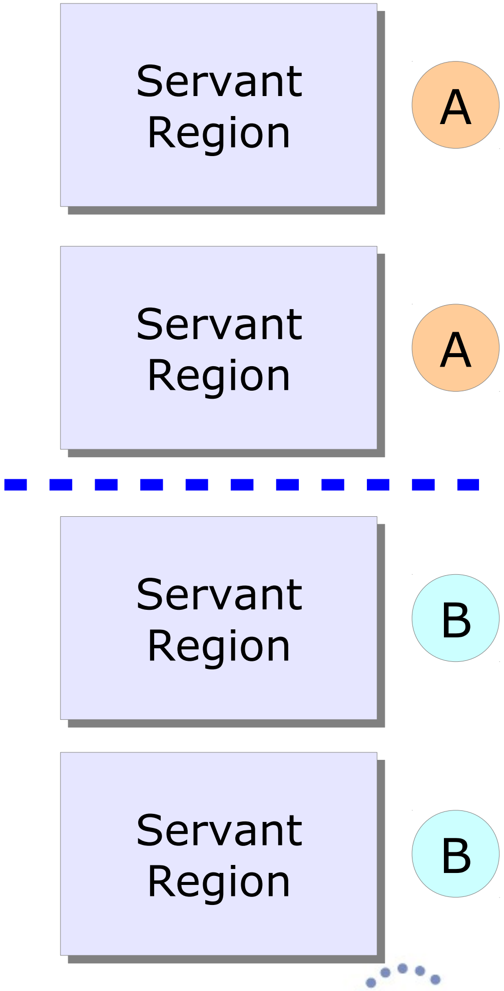
`wlm_ae_spreadmin` and Re-Balancing of Service Classes

This is the next level of nuance in this ... one final control that determines the behavior you see in this. Assume for example MIN=4 and two Service Classes seen:

`wlm_ae_spreadmin = 1`

Default, prior to V8 fixed at this value

Control Region
zWLM



With value = 1 WLM will attempt to balance service classes across the minimum servants

Servants that hosted SC=A may get rebalanced to start hosting SC=B

Can start new servant for SC if max not met

If #SC > max servants then nowhere to go

How's My Work Being Classified?

Some hints and tips on determining classification results

Some Available Tools

- WLMQUE

  A TSO-based tool that displays each application environment and information about the servant regions associated with it. Download the tool and documentation at:

  `ibm.com/servers/eserver/zeries/zos/wlm/tools/wlmque.html`

- RMF
  - IBM's tool to report on activity on z/OS. There are others....
- SMF 120.9
  - The WebSphere SMF record contains an abundance of information about what requests are run
  - This includes the data used with the XML file to classify the request
  - Also which servant region the request was dispatched in and whether it was dispatched with affinity
- SMF 120.9 browser with plugin
  - There is a sample plugin provided with the Java browser that can generate a sample classification XML file based on the work you are running

More Information on WAS SMF

IBM Techdocs:

WP101342 – Overview of SMF 120-9

WP101726 – Writing your own SMF Browser Plugins

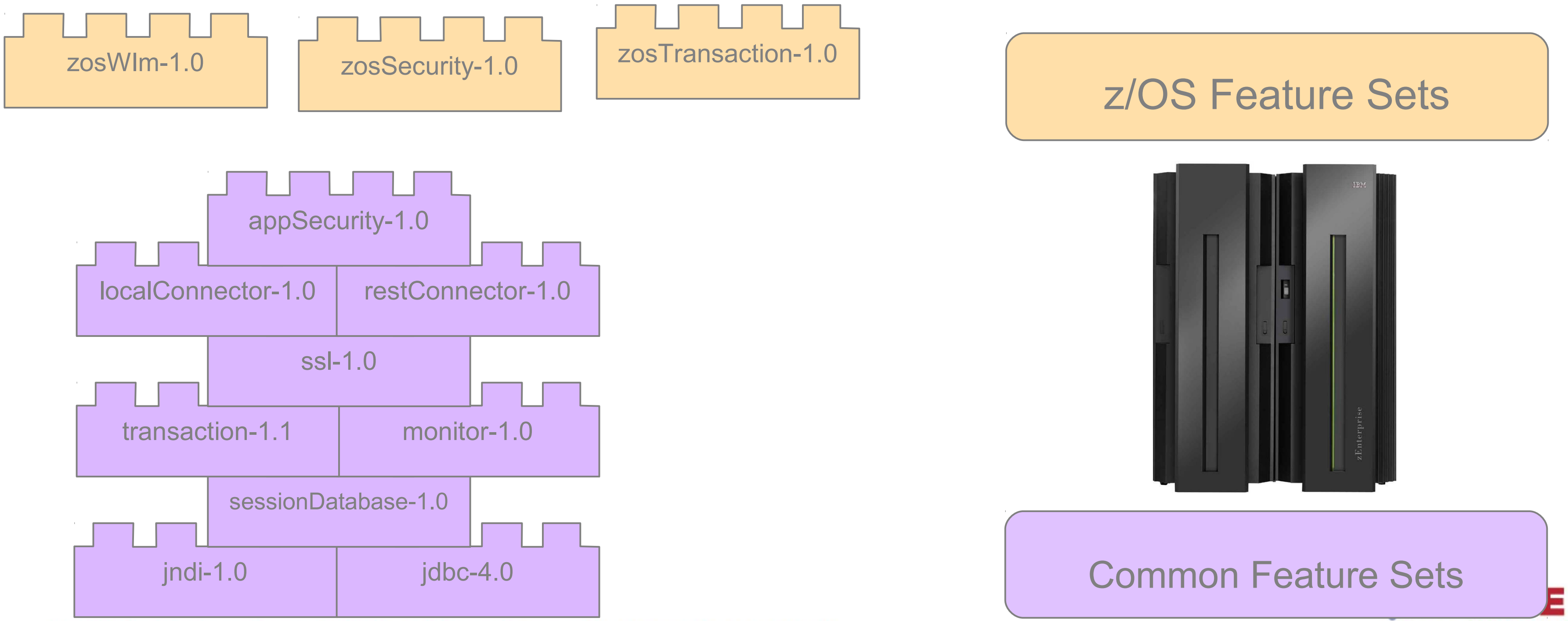
WP102312 – A 'reference' to the plugins I've written

WP102311 – Using those plugins to 'analyze' some data

What about Liberty?

What is the WAS for z/OS Liberty profile?

- The WAS for z/OS Liberty profile is Liberty with *optional*, independently enabled *extensions* that exploit z/OS facilities
  - Only enable exploitation of z/OS features you need
  - Only configure the z/OS functions you use
- Focus of v8.5 is basic integration and exploitation



zosWlm-1.0

zosSecurity-1.0

zosTransaction-1.0

z/OS Feature Sets

appSecurity-1.0

localConnector-1.0

restConnector-1.0

ssl-1.0

transaction-1.1

monitor-1.0

sessionDatabase-1.0

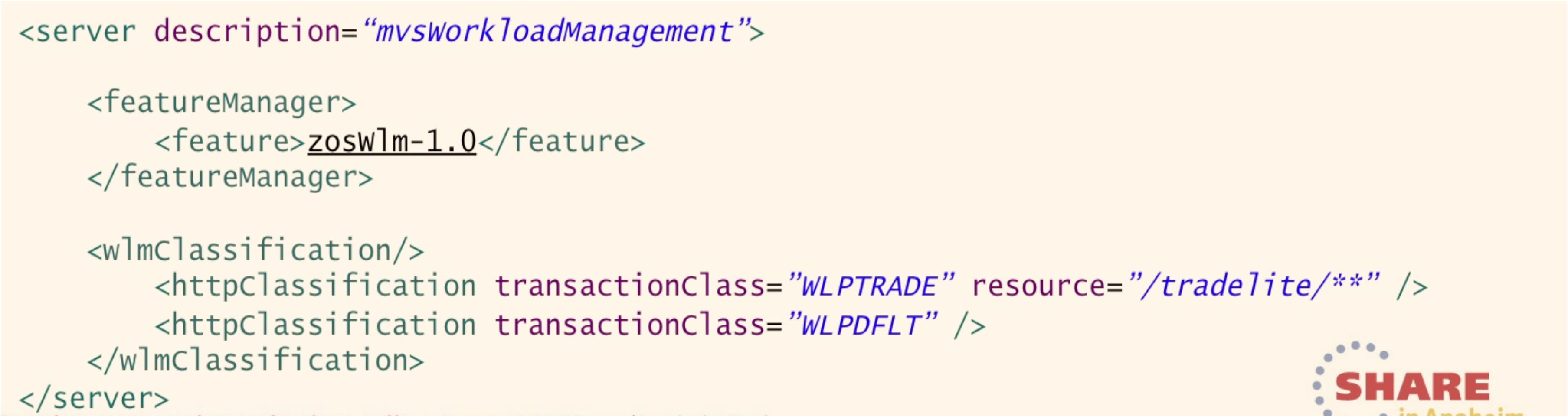
jndi-1.0

jdbc-4.0

Common Feature Sets

Feature – z/OS Workload Manager

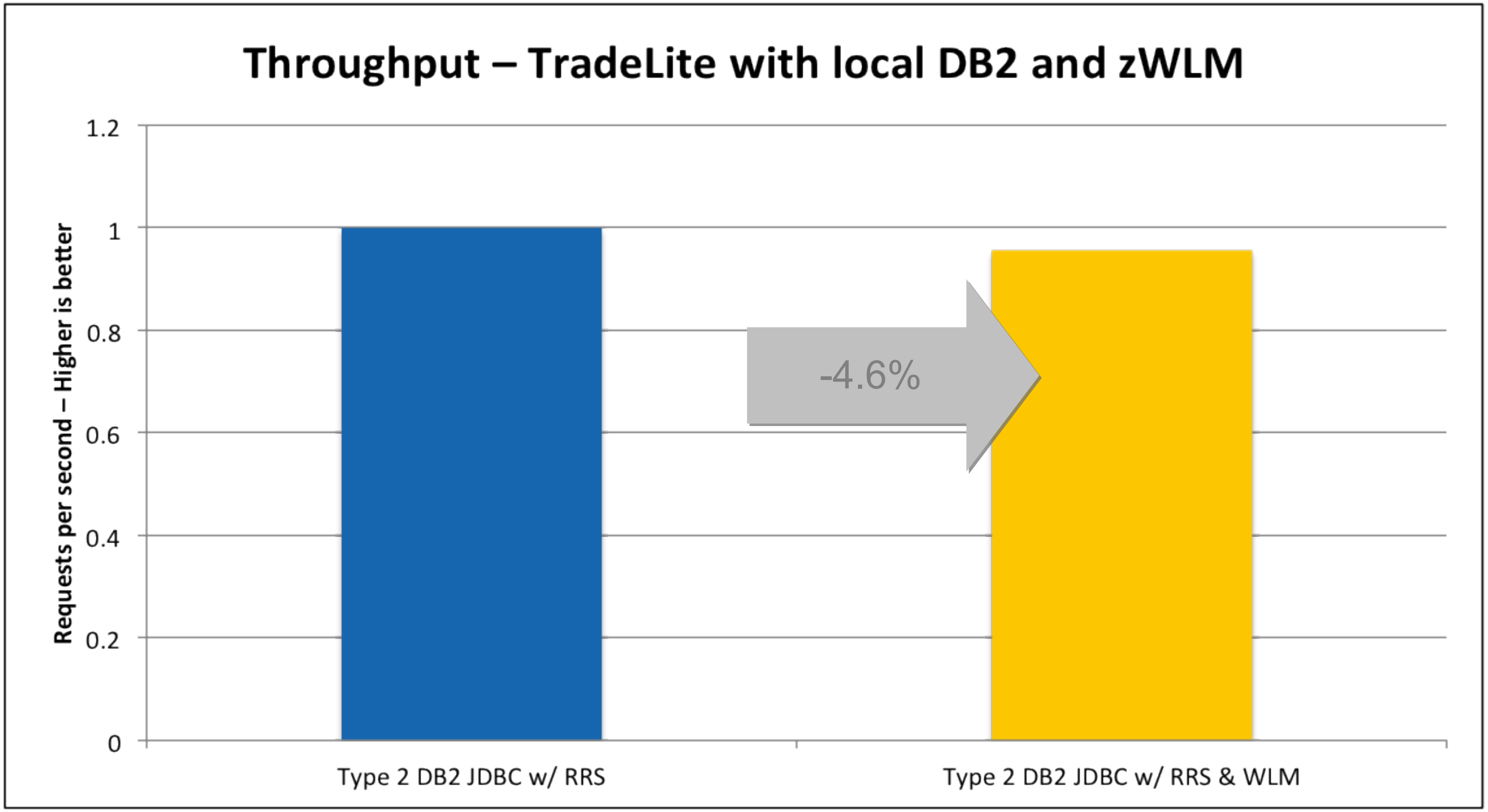
- Adds support to classify HTTP requests with z/OS WLM
  - Classification associates response time goals and importance to work run in WebSphere
  - z/OS workload manager will manage the resources available on the system in a way that ensures the most important work runs while attempting to meet response time goals
  - RMF reports provide information about completed transactions, response times, etc by service class



```
<server description=“mvsWorkloadManagement”>

    <featureManager>
        <feature>zosWlm-1.0</feature>
    </featureManager>

    <wlmClassification/>
        <httpClassification transactionClass=”WLPTRADE” resource=”/tradelite/**” />
        <httpClassification transactionClass=”WLPDFLT” />
    </wlmClassification>
</server>
```

Feature – z/OS Workload Manager

- *The impact of enabling zWLM is under 5%*



- z196, 4-way LPAR running z/OS 1.13
- 64bit IBM Java 6.0.1 with compressed references, 1M large pages, 2GB heap
- IBM DB2 for z/OS v10, T2 JDBC with keepDynamic