Session Objectives

— Power Enterprise Pools 1.0 - A powerful foundation for a flexible, available, and affordable private cloud IT infrastructure

— Power Enterprise Pools 2.0 – Building on PEP 1.0 to enhance the cloud experience with IBM Power Systems

— Common challenges with PEP 1.0 and how to avoid them

— Introducing the key new features of PEP 2.0

— Recently announced, PEP 1.0 can be upgraded to PEP 2.0!

— *And "the treasure"*

Power Enterprise Pools 1.0
A powerful foundation for a flexible, available, and affordable private cloud IT infrastructure

Mobile processor and memory activations may be re-allocated to any system within a defined pool
— Systems with different clock speeds can coexist in the same pool
— Activation assignment and resource movement is controlled by the HMC

Three different forms of this original pool:
— IBM Power System E980 servers and previous generation E870 or E880, E870C and E880C systems
— Original High-end pool for POWER7+ 780, Power 795 & Power E880 systems
— Original Midrange pool for POWER7+ 770 systems & Power E870

Activations can be moved within a pool at any time, without contacting IBM
— No limit to the number of times activations can be moved

Movement of activations is instant, dynamic and non-disruptive
— Ideal for workload balancing and optimizing application availability

Maintain control and deliver flexibility at the same time

Power Enterprise Pools 2.0

— Shared Utility Capacity across a pool of Power E980 systems

- Purchase System and Base capacity
- Variable demand addressed by purchasing Capacity Credits for Metered capacity
- Cloud Management Console with HMC automatically tracks and debits against Capacity Credits based on actual usage

All processor & memory resources are fully activated
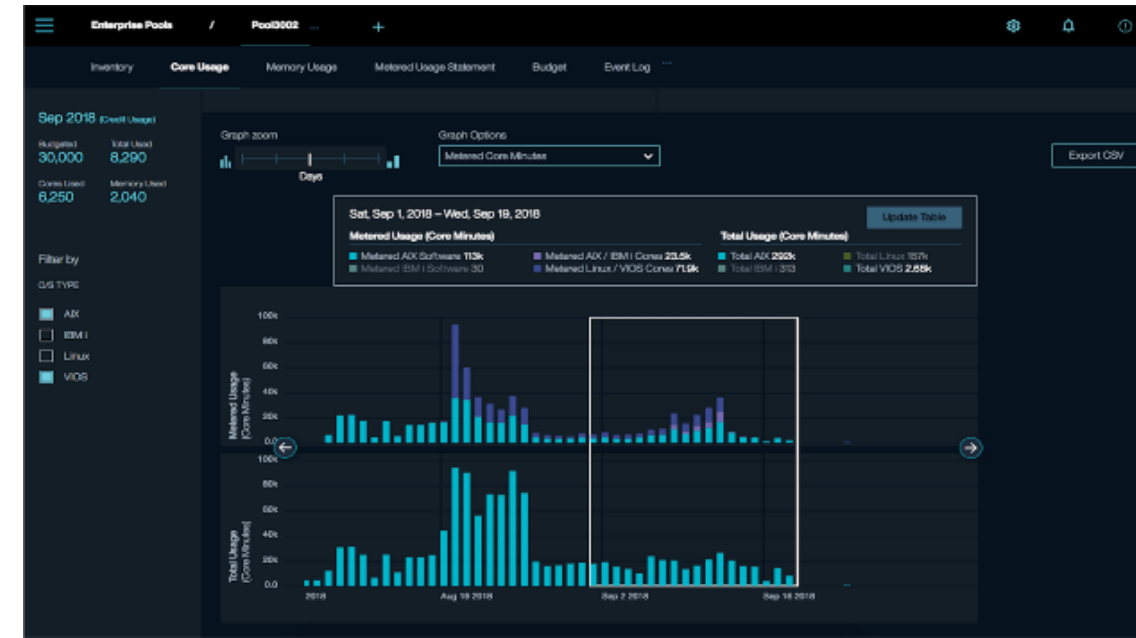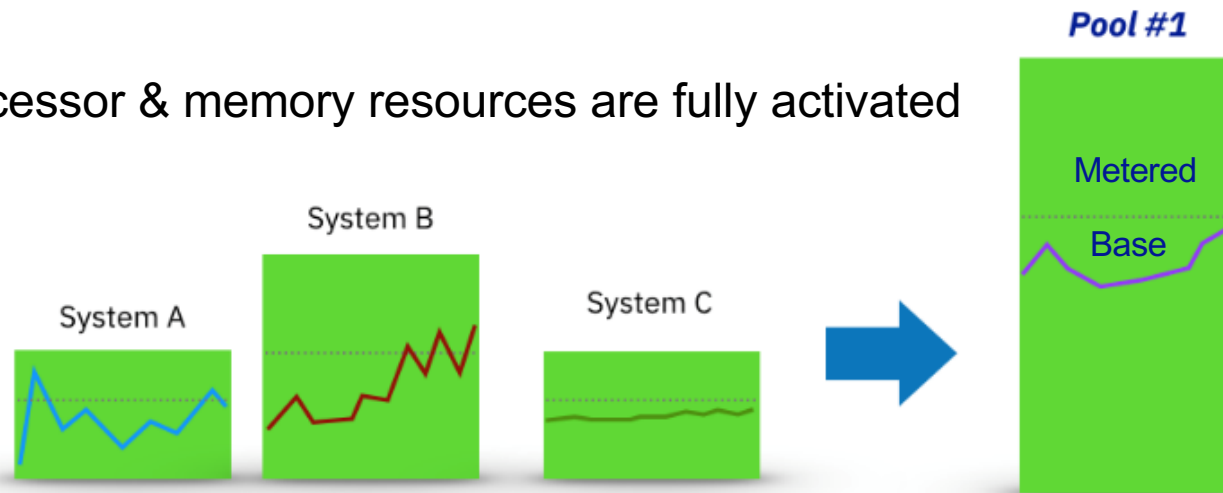
— Base and Metered Capacity

- Processor activations
- Memory activations
- AIX and IBM i licenses

— Usage tracked by the minute via Cloud Management Console

— Announced : April 23rd
— Initial GA : May 17th

Adding Mobile CoD Resources to a Server

— HMC manages all additions of mobile resources to a server within a pool

— Server must have inactive resources to be assigned mobile resources

— Mobile resources can co-exist on source and target server for 48 hours before client is considered to be "out of compliance"

— Mobile resources that are added are used to satisfy unreturned mobile resources first

— Mobile resources remain on the server until the user removes them via the HMC

There is a process...
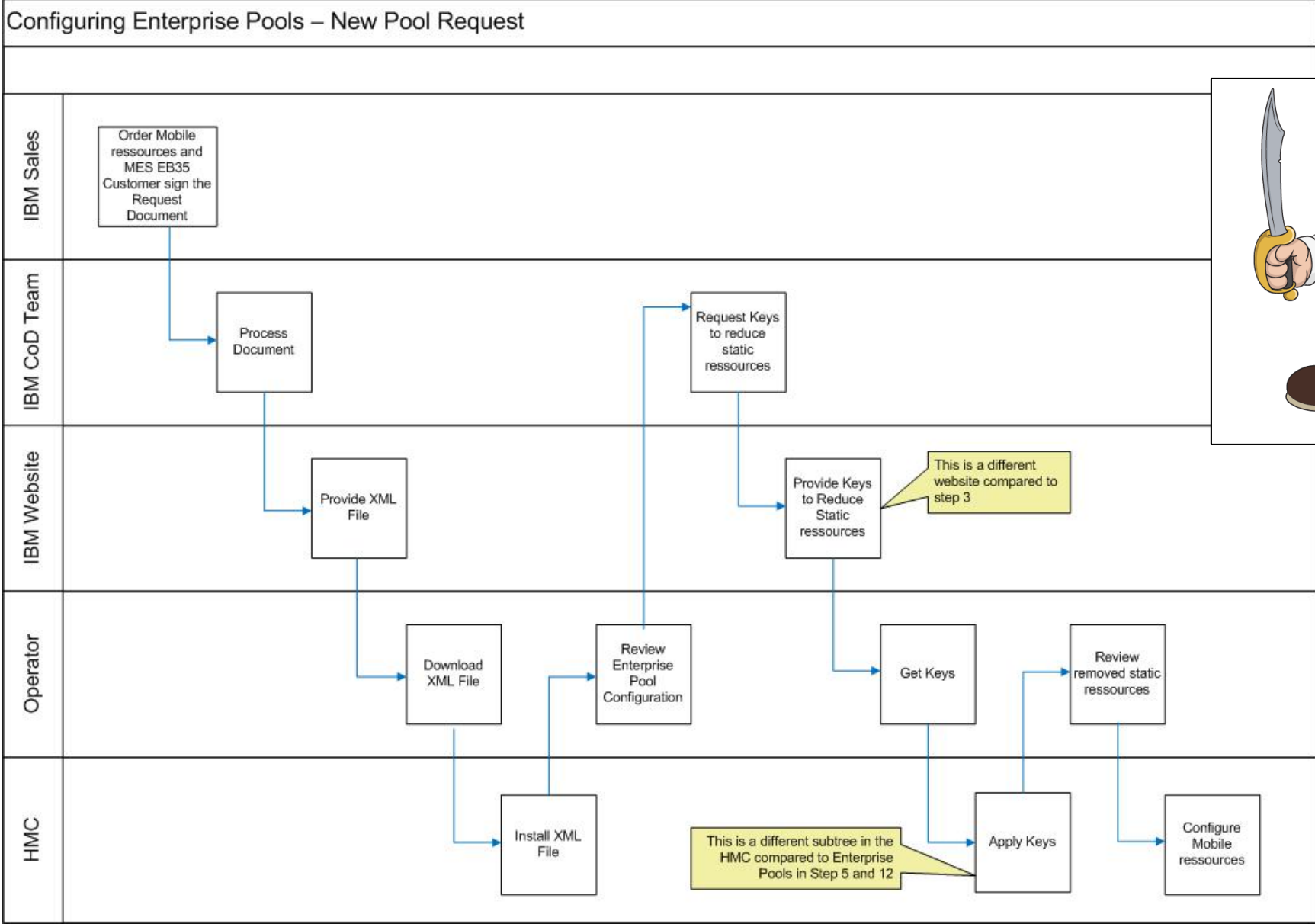
Contracts

— Need to get two contracts signed
  - IBM License Supplement for Power Enterprise Pools (Z126-6228).
    - Required once per client
    - "base" – necessary but useless until combined with addendum
  - IBM License Supplement for Power Enterprise Pools Addendum (Z126-6229)
    - Used to assign or remove systems to/from a pool
    - "addendum to base"
  - Sent to pcod@us.ibm.com

— Why?
  - Pools don't just allow you to move the resources the customer owns in the Pool
  - You can activate the resources before you deactivate, to allow the move
  - Means the resources are active in more than one place at the same time, for a period of time
  - Contract needed to ensure customer returns to state
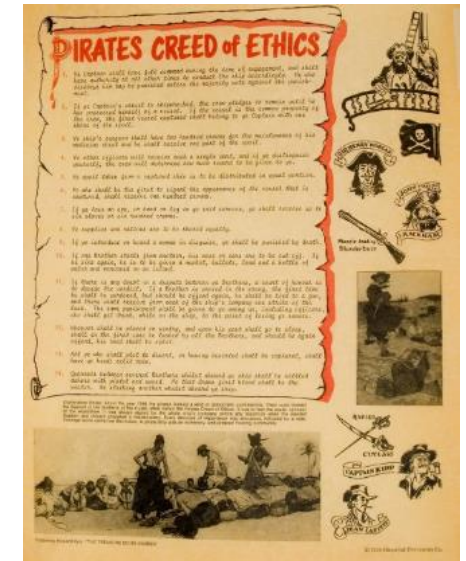
— What do you do next?
  - AFTER contracts (base and addendums in place) place, order via MES no-charge Mobile Enablement feature code #EB35 for each server in the pool
  - Ordering #EB35 (with contracts in place) has IBM create an XML configuration file for the master HMC for the pool
  - Ordering mobile activations (with contracts in place) has IBM create an XML configuration file for the master HMC
  - With the XML configuration file, the master HMC knows what servers are in what pool and what mobile resources are available for that pool

Power Enterprise Pools 1.0 Glossary

— Static Processor / Memory Activation
- traditional "active" processor /memory activations that are ordered in one-core or one GB increments against a specific MTM/serial number
- Can only reside and be used exclusively by the system it was ordered against
- Can be converted to Mobile Processor / Memory Activations
- Static processor and memory activations are known to the system by VPD card

— Mobile Processor / Mobile 100GB Memory Activation
- Mobile processor and/or memory activations are ordered in one-core or 100GB memory increments against a specific MTM/serial number.
- Activations can be moved by client from one server to another within a pre-defined pool of servers as many times as client desires
- HMC, via the HMC File, manages the movement of mobile resources
- Due to implementation reasons, Mobile Processor activations cannot be ordered on new systems

— Mobile-Enabled Processor / Mobile-enabled 100GB Memory Activation
- a new processor and/or memory activation, ordered via new or MES, that initially runs in a static status but can later converted to the Mobile status for no-charge
- Eliminates the conversion pricing premium and the requirement for multiple client POs for new ships

— HMC Config File
- XML file delivered by IBM via website that defines the servers in a Pool and the mobile resources associated with the pool

Mobile Enabled and Mobile Activation

— Mobile Enabled Activations work like "Static" Activations
  - Cost the same as Mobile, to allow zero-cost MES to convert in the future
— POD and MOD codes delivered on Power CoD website
— Codes are cumulative

— Codes are delivered per server

— Mobile Activations are different

— Delivered in "xml" file from slightly different area of Power CoD website

— Each file is "stand alone"
  - Replaces file that came before
  - Non-cumulative

— Delivered per pool, not per server

Common mistake

— Initial order had Mobile Enabled Activations
— Then get the contracts signed, and convert to Mobile Activations
— So far, so good.
— Add additional capacity, so order some more Mobile Enabled Activations
  - Oops!

  - Those need to be converted, with an additional MES, to Mobile Activations
  - No benefit, extra work, extra chance for things to go wrong

— If the pool is up and running, order Mobile, not Mobile Enabled Activations for further capacity

Auto-Conversion of Mobile-Enabled to True Mobile

— It is now possible to do an in-place conversion of mobile enabled cores and memory to mobile activations.

— Eliminates the need for replacing mobile-enabled resources with true mobile resources via activations and de-activations.

— This allows for a non-disruptive conversion, even if all mobile-enabled resources are in use, and/or there are no dark (un-activated) resources to leverage for the swapping of mobile and mobile-enabled.

— It also eliminates the clerical step of reporting the de-activations back to the Power CoD project office.

— Requirements:

• HMC must be at minimum level V8R8.4.0 (a.k.a. 840) - SP1 not required but recommended.

• Any server undergoing the automatic conversion must be at one of the following minimum levels: FW 780.50, FW 820.50, FW 830.40 (Dec 2016), FW 840.00

• Two new feature codes #EME0 (for memory) and #EPE0 (for cores) need to be ordered with the feature conversions in order to take advantage of this capability.

Understanding the XML Config File

```xml
<CoDSystemPool xmlns="http://www.ibm.com/xmlns/hsc/jaxb/cod/" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    <PoolID>0003</PoolID>
    <SequenceNumber>0005</SequenceNumber>

    <MemoryResourceEntitlement>
        <ActivationCode>B84AEC64065CD17CGMEM000300100045E7</ActivationCode>
        <MTMS>9119-FHB*444F34A</MTMS>
    </MemoryResourceEntitlement>

    <ProcessorResourceEntitlement><ActivationCode>D6AD9E529BBE7692GPRC000300210045CC</ActivationCode>
        <MTMS>9119-FHB*444F34A</MTMS>
    </ProcessorResourceEntitlement>

    <PoolMember>
        <ActivationCode>F1434F1B48B8F22EGMBR00030002004186</ActivationCode>
        <MTMS>9119-FHB*444F34A</MTMS>
        <ActivationType>Add</ActivationType>
    </PoolMember>

    <PoolMember>
        <ActivationCode>CEF7FBB0F40F39DEGMBR00030002004113</ActivationCode>
        <MTMS>9119-FHB*445253A</MTMS>
        <ActivationType>Add</ActivationType>
    </PoolMember>

    <Signature xmlns="http://www.w3.org/2000/09/xmldsig#">
```

— **PoolID** - this is a unique pool ID for the pool.

— **SequenceNumber** - the config file sequence number will increment as changes are made to pools (e.g. servers are added to pools). This insures the config files are processed sequentially.

— **MemoryResourceEntitlement** - this is the activation codes for the Pools memory resources. Note that these activations are keyed by a specific server identified in the MTMS statement. That server processes the activations as the HMC does not have this capability. This server must be active, visible to the HMC, and also as we have learned not in a trial COD state. Once activated these resources become available to the pool. The number of 100GB activations is represented in four decimal digits in the activation code: B84AEC64065CD17CGMEM0003**0010**0045E7 <- in this case there are **1TB (100GB*10)** of mobile memory, counting six digits in from the end.

— **ProcessorResourceEntitlement** - similarly, this is the activation information for pool processor resources. Again, the number of activations is in four decimal digits six characters from the end: D6AD9E529BBE7692GPRC0003**0021**0045CC <- 21 mobile cores.

— **PoolMember** - this adds or removes a server from the pool. You will only see servers for which feature code #EB35 has been ordered.

Waiting for the "xml" file

— So you might be anxiously awaiting the availability of the config file download - and frequently check the download site. You will notice the following over time:

- Initially there will be a file available for download - which will have a pool ID number, but the will be zero bytes.

- You may find at some point later, within a day or so of the MES orders, there is a complete file for download. This will be available when all servers in the pool's #EB35 features have shipped, and at least one set of mobile resources has shipped. **This file might not fully reflect all ordered mobile resources.** It will likely be Sequence #0001.

- If the initial file with sequence # 0001 does not contain all the expected resources (see above for determining that from decoding the activation string), there will be one or more pool config files available for download, with the sequence number incrementing. So you're going to probably be "camping" on this download link until it has the config file that represents the complete set of mobile resources for the pool.

"Views" of Mobile Activations

— AAS/WTAAS (e-config/IBM internal) View:
  - Mobile activation is a hardware feature belonging to a specific system serial number (example feature code of 9117-MME)
  - All feature codes stay with system they are ordered against …. Unless moved by MES order
  - Has no idea these are "mobile".

— Master HMC View:
  - The pool's XML file says
    a. who is in the pool (by server serial number)
    b. What is the total number of mobile activations in the pool
  - HMC also knows what static activations each server has
  - Has no idea AAS/WTAAS exists

Permanent Asset Transfer Process of Mobile Activations

1. Create a Power Enterprise Pool with the Donor & Target systems in it, order #EB35 as MES ($0) on each system and sign Pools contracts. Engage local TSS team in sell cycle to project HWMA adjustments needed as a result of Mobile resource asset transfer.

2. Order RPO/MES Remove quantity of Mobile Processor (#EP22, #EP23), Memory Activation (EMA4), PowerVM specify (#8002) and AIX License Core Counter (#9440) hardware features from Donor Power 770, 780 or 795

3. Request approval for RPQ 8A2231 and provide email to pcod@us.ibm.com with :
   - Donor Mach Type/Model, Serial Number, and quantity of each Mobile Processor and/or Memory Activation feature being transferred (removed)
   - Order # of the RPO/MES that removes the features from the Donor system
   - Target POWER8 Mach Type/Model, Serial Number, and quantity of each Mobile Processor and/or Memory Activation feature being transferred (added)

4. MES RPQ 8A2231 (no-charge) on Target POWER8 system with RPQ approval # from Step 3 to indicate a Mobile COD feature asset transfer

5. RPO/MES Add converted processor activation feature #EP2V (E880) or #EP2U (E870) to Target POWER8 system in same quantity of #EP23 (Power 780+/795) or #EP22 (Power 770+) removed

6. RPO/MES Add #EMA7 Mobile Memory Activation feature to Target POWER8 system in same quantity as #EMA4 feature removed from Donor

7. Contact local TSS team to update HWMA records & contracts for Donor & Target systems, to reflect the changes in # Mobile Processor Activations on each.
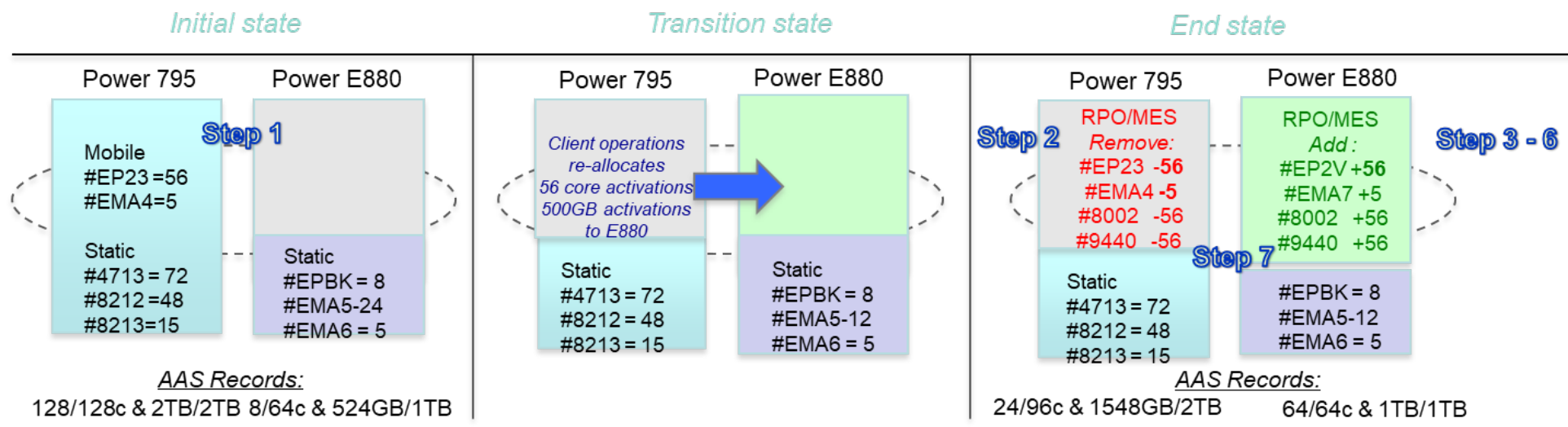
Mobile Processor Feature codes

— On the E870C:
- (#EP82) - 1-core Mobile Processor Activation
  - This feature delivers one (1) mobile processor activation

- (#EP83) - 1-core Mobile Processor activation from P7
  - This feature delivers one (1) mobile processor activation brought over from P7 system.

— On the E880C:
- (#EP8J) - 1-core Mobile Processor Activation (CSE)
  - This feature delivers one (1) mobile processor activation

- (#EP8K) - 1-core Mobile Processor activation from P7 (CSE)
  - This feature delivers one (1) mobile processor activation brought over from P7 system.

— On the E980:
- (#EFPD) - Mobile processor activation for M9S
  - Mobile processor activation upgrade for M9S/80H

- (#EP2W) - Mobile Processor activation M9S/80H (Upgrade from P8)
  - One Core Mobile Activation upgrade from POWER8

- (#EFPH) - Mobile processor activation for M9S (Upgrade from P7)
  - Mobile processor activation upgrade from POWER7

Power Enterprise Pool – Mobile Software

— Clients can temporarily transfer software entitlements within the pool for eligible programs but must license at least one core on each system
  - Eligible products: AIX, IBM i, PowerVM, PowerSC, PowerHA, PowerVP, PowerVC, VMControl, SmartCloud Entry, Systems Director
  - Other IBM program products associated with AIX, IBM i, etc. are not temporarily transferable
  - "Temporary" can be days, weeks, months, years; but stops when the serial number server of record with the license entitlement is removed from the pool
  - A maximum number of processor core license entitlements can be transferred from a server to another server(s) in the pool. This max is the lesser of a) the number of mobile activations or b) one less than the number of core entitlements (must leave one entitlement on the server).

— IBM Software Group product licensing is calculated by PVU for the total amount of simultaneous capacity required

— Most ISV software is similarly calculated based on total capacity, but the client will need to confirm with the ISV

— The Client will need to discuss this mobile capability with any ISVs who still license by serial number

Flexible licensing
for software
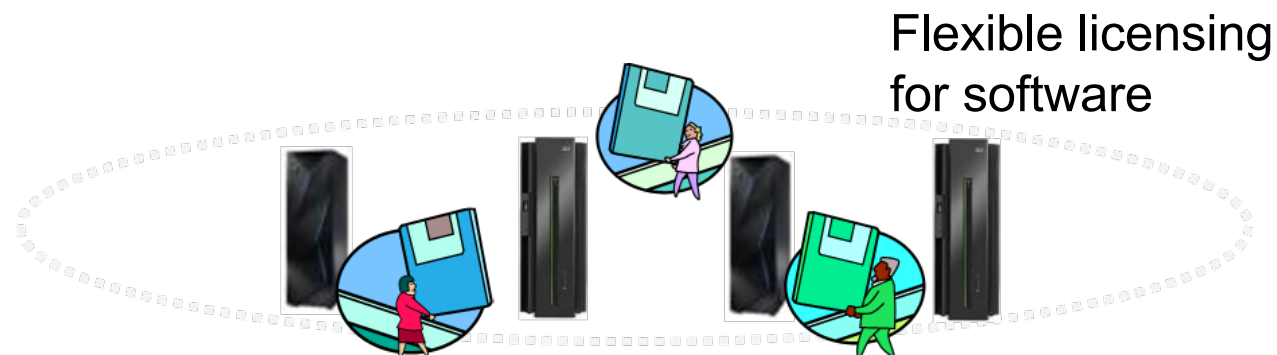
Things to take away

— Ensure the reality that is installed matches the IBM Inventory before you begin
— Get those contracts going very early
— Use Mobile Enabled Activations if Contracts might not be ready or the order will be delayed
— Keep good records of
  • Starting position for servers
  • Changes made
  • Order numbers
— Give "xml" files time, as they won't be complete when they first appear, and there might be multiple iterations before it is actually ready
— Don't order Mobile Enabled once the pool is running

Power Enterprise Pools 2.0 with Utility Capacity

Power Enterprise Pools 2.0 will offer Utility Capacity across a collection of Power E980 systems to deliver seamless multi-system resource sharing and new flexibility for clients deploying a private cloud infrastructure.
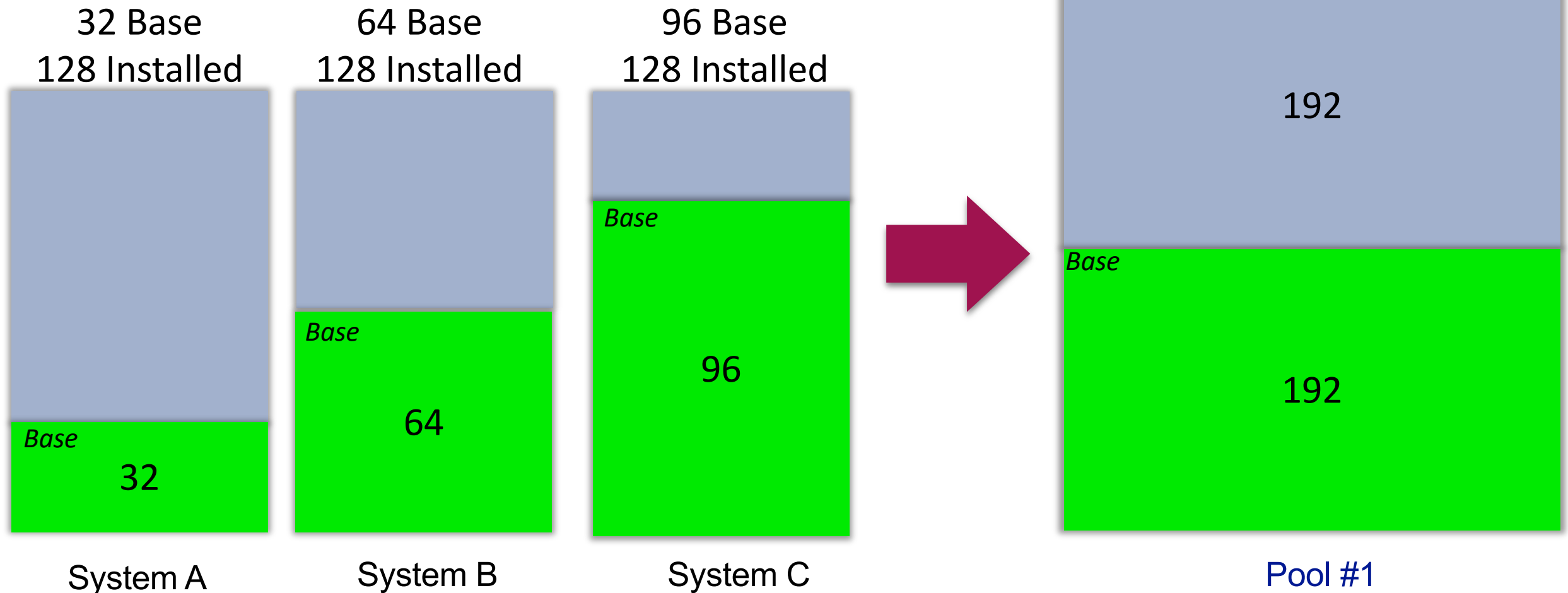
Utility Capacity consists of :
— Base Capacity - purchased on each Power E980 system but aggregated across the pool for consumption monitoring
  - Base Processor Activation (1 core - any OS)
  - Base Linux Processor Activation (1 core)
  - Base AIX software license entitlement (1 core)
  - Base IBM i software license entitlement (1 core)
  - Base 1 GB Memory usage
— Metered Capacity - additional resource above Base Capacity, activated for use when each system is added to a Pool
  - Metered resource consumption is monitored by the minute at the pool level
  - Metered Capacity resource consumption is charged by the minute for specific resources consumed above a pool's aggregated Base Capacity
— Clients may manage potential resource consumption via PowerVM & PowerVC configuration & resource management options & policies

Enterprise Pools 2.0 purchase example

Client purchases Power E980 systems with new Base Processor & Memory Activation resources.
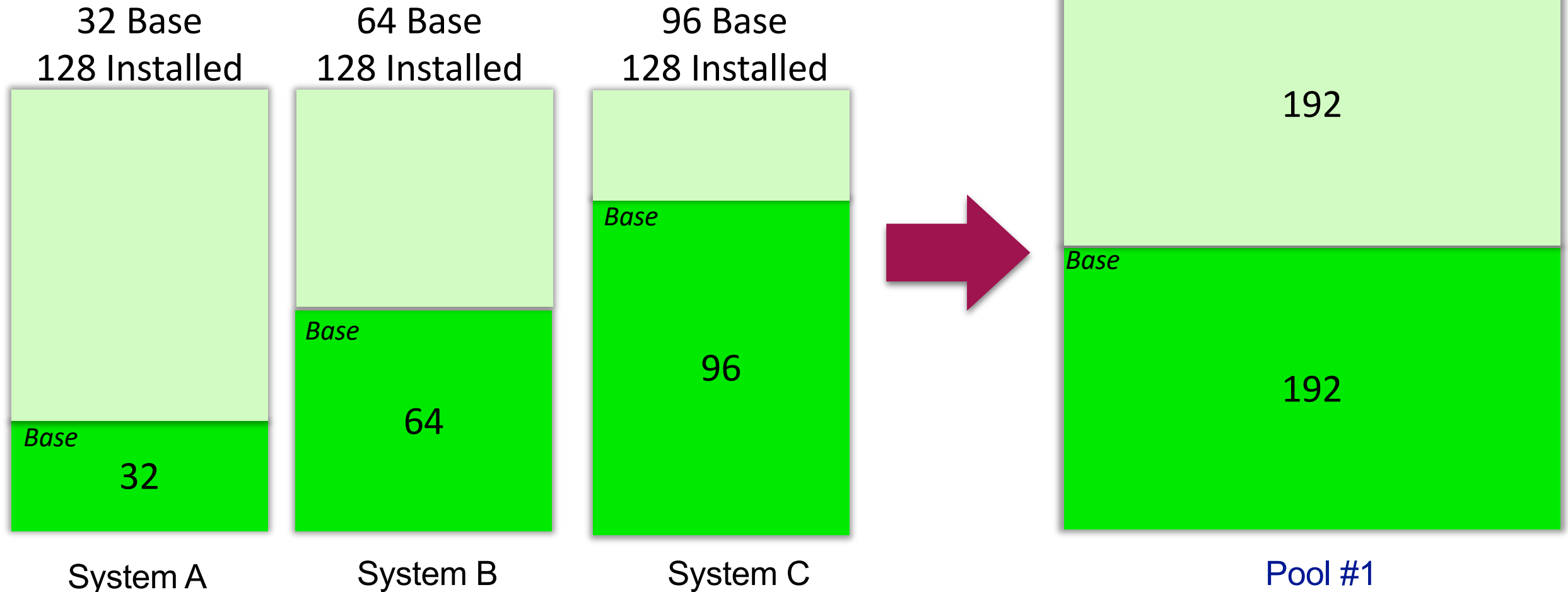
Processors Active by System

Pool = 192 Base
Pool = 384 Installed

32 Base
128 Installed

64 Base
128 Installed

96 Base
128 Installed

192

Base

192

Base
32

Base
64

Base
96

System A

System B

System C

Pool #1

Enterprise Pools 2.0 purchase example
All remaining resources are activated when a Pool is started.
Resource usage is metered for minutes above the pool's aggregate Base resources
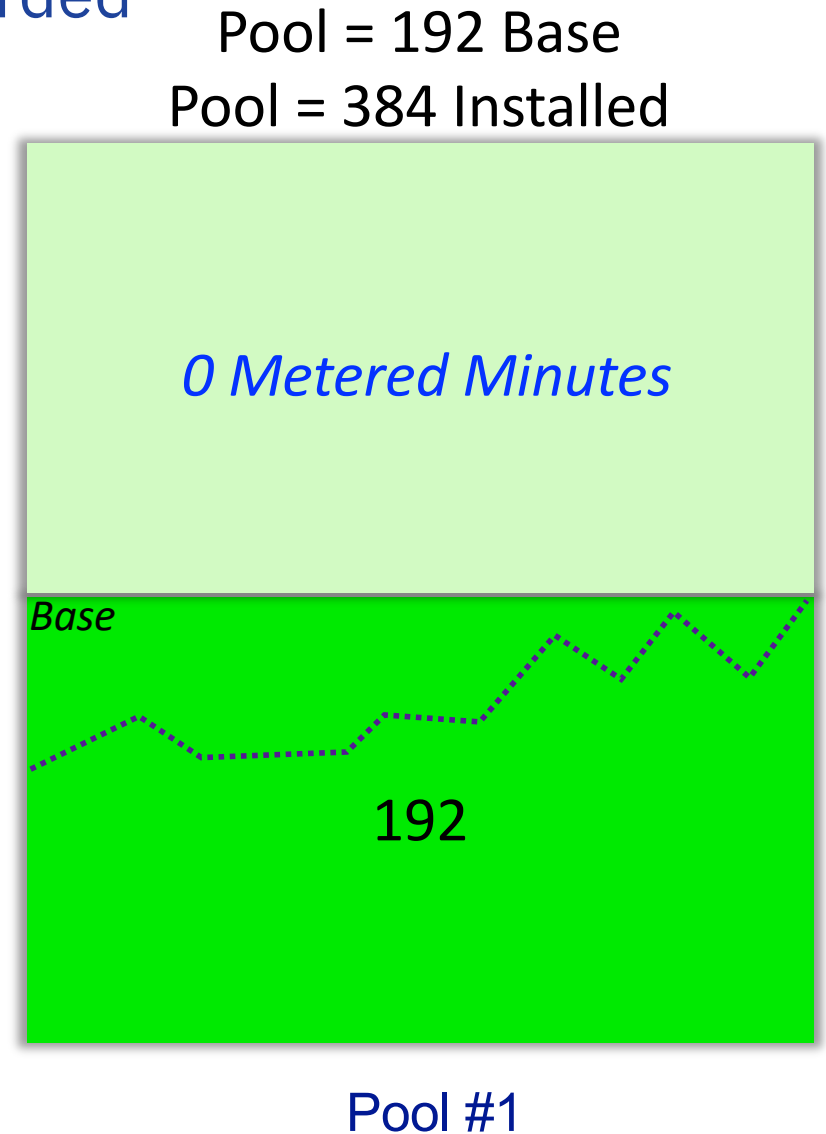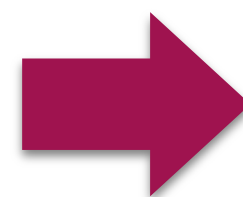
Processors Active by System

Pool = 192 Base
Pool = 384 Installed

32 Base
128 Installed

64 Base
128 Installed

96 Base
128 Installed

192

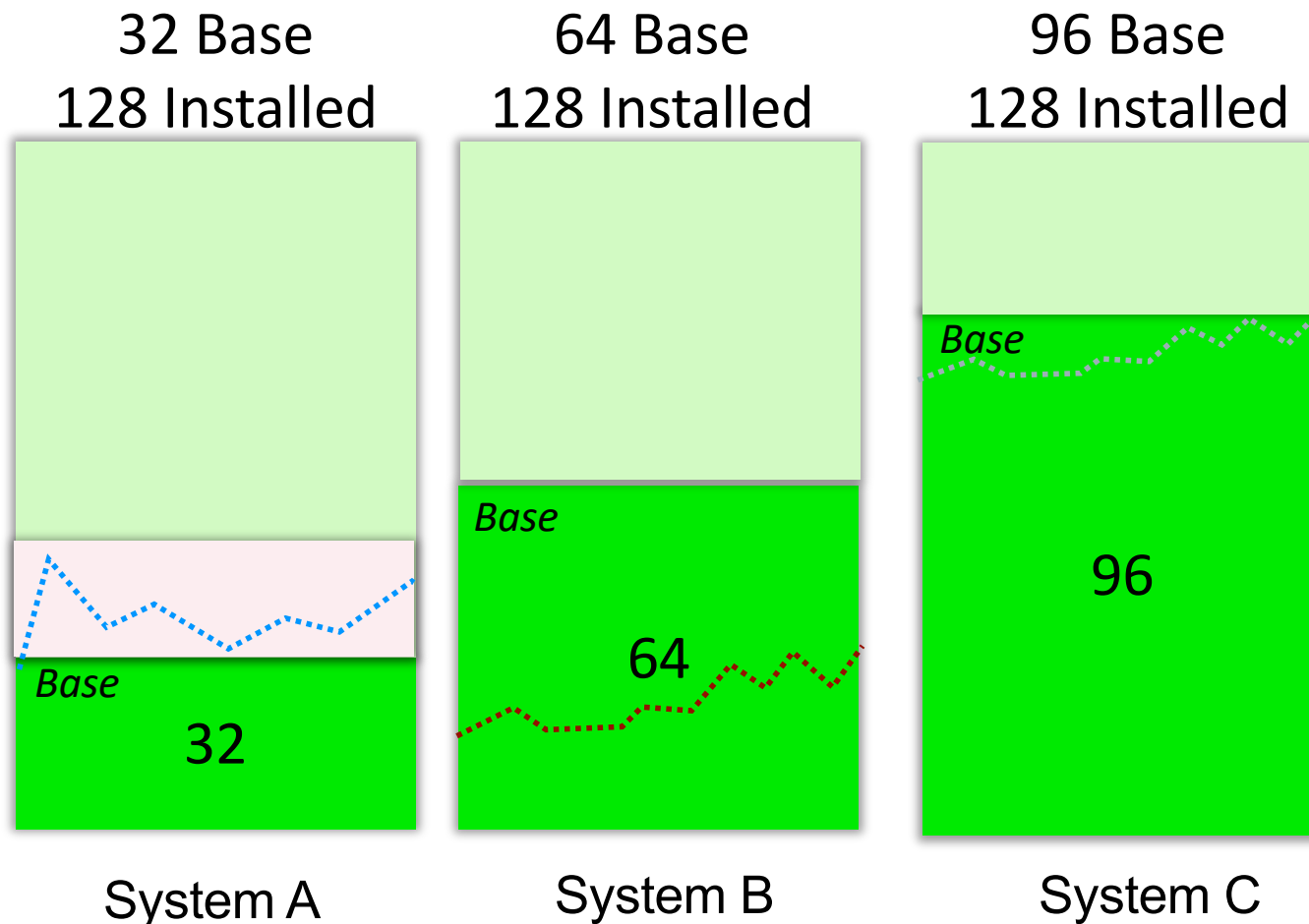*Base*
32

Base
64

Base
96

Base
192

System A

System B

System C

Pool #1

Enterprise Pools 2.0 purchase example

Processor Example - Pool has 1 system using more than its Base Processor Activations, but another system is idle, using less than its Base Processor resources at the same time, so 0 Metered resource usage is recorded
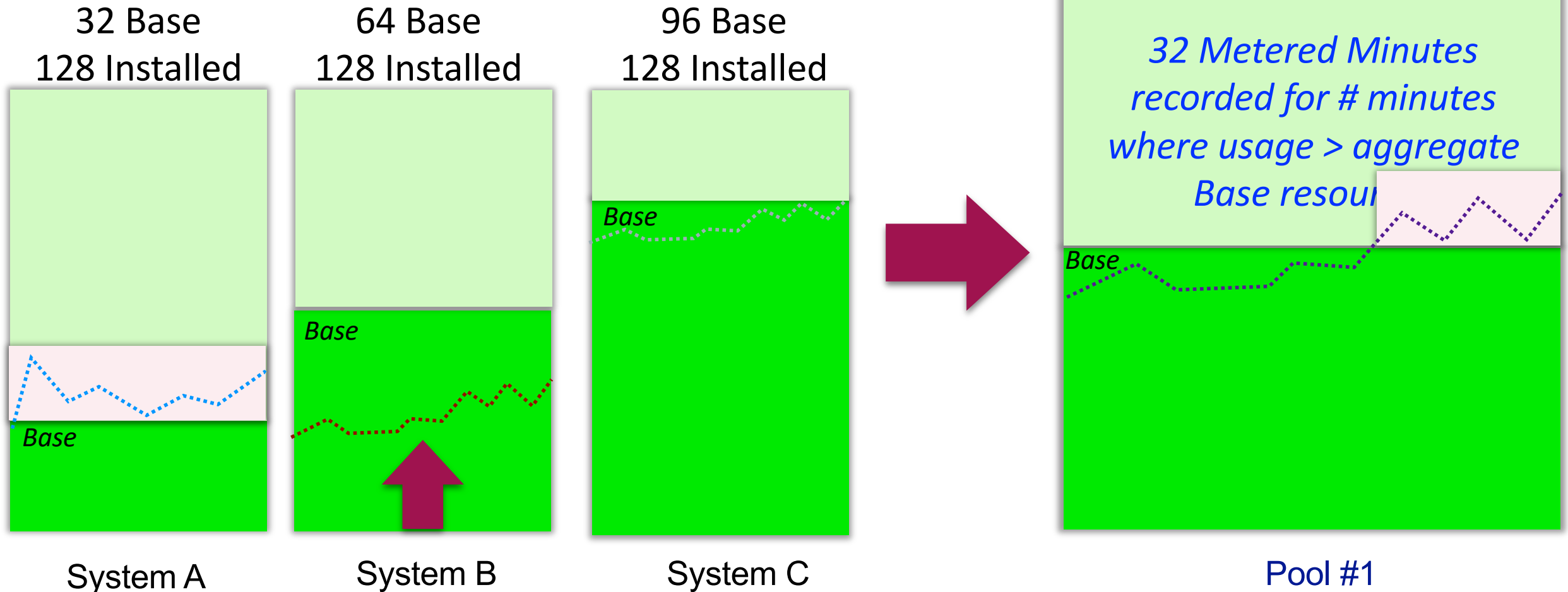
Pool = 192 Base
Pool = 384 Installed

Processors Active by System

32 Base
128 Installed

64 Base
128 Installed

96 Base
128 Installed

0 Metered Minutes

Base

Base

Base

Base

32

64

96

192

System A

System B

System C

Pool #1

Enterprise Pools 2.0 purchase example

Processor Example - Processor usage > the aggregate of Base Processor Activations across the pool, so Metered Processor Capacity minutes are recorded and Metered Capacity Credits are debited accordingly
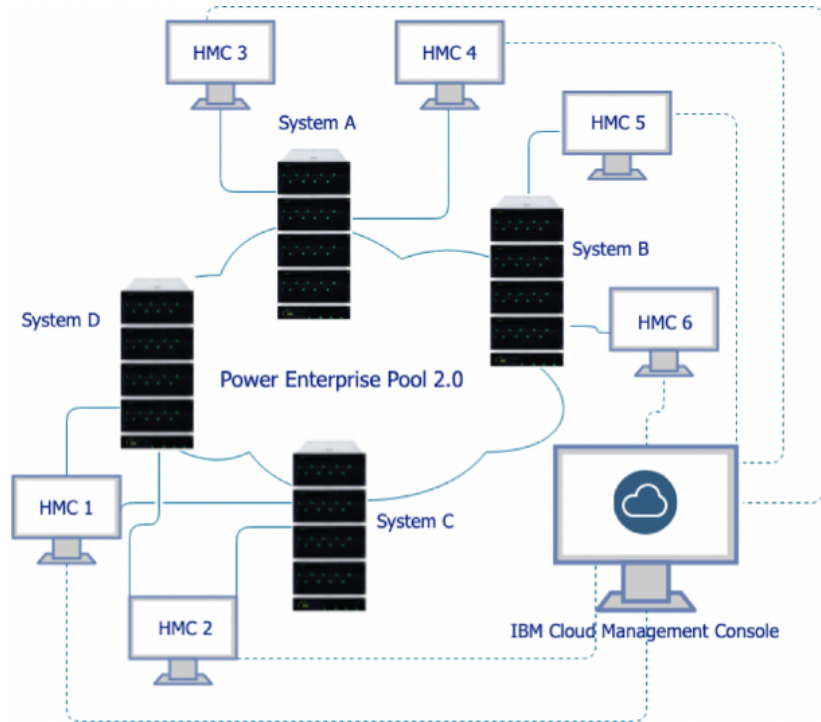
Processors Active by System

Pool = 192 Base
Pool = 384 Installed

32 Base
128 Installed

64 Base
128 Installed

96 Base
128 Installed

Base

Base

Base

Base

32 Metered Minutes recorded for # minutes where usage > aggregate Base resour...

Base

System A

System B

System C

Pool #1

Pools 2.0 Consumption Rate Table

Resource Type	Metered Usage Ratio (Minutes : 1 Credit)
Processor Activation (1 core - any operating system)	20,000
Processor Activation (1 core - Linux/VIOS only)	40,000
AIX software entitlement (1 core)	30,000
IBM i software entitlement (1 core)	1,500
Memory Activation (1 GB)	1,500,000

Power Enterprise Pools 2.0 Blog

— Thanks to Jyoti for pointing our this useful blog on PEP 2.0:

— https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/Power%20Systems/page/Power%20Enterprise%20Pools%202.0%20with%20Utility%20Capacity%20-%20A%20Cloud-Based%20Approach

Upgrade PEP or existing E980 into PEP 2.0

— Clients can only make an MES change into a Pools 2.0 environment from an existing Power E980 system. To ensure a smooth transition, clients with IBM Power System E870, E870C, E880, or E880C servers who want to enable a Pools 2.0 environment should first upgrade their servers to an Power E980 system. Then each of these systems can be transitioned to a Pools 2.0 environment with a subsequent MES order.

— Clients in an existing Power Enterprise Pool (1.0) with Mobile activations should remove feature EH35 and the Pools enablement feature and replace them with Pools 2.0 enablement feature EP20. When feature EP20 is ordered, clients must also convert all of their existing Static, Mobile, and Mobile-enabled activations to corresponding base activation features.

— New feature conversions enable clients who have an existing IBM® Power® System E980 server without IBM Power Enterprise Pools 2.0 (Static or Mobile-enabled activations) or a system enabled for the initial Power Enterprise Pool with Mobile activations to make a miscellaneous equipment specification (MES) hardware change into a Power Enterprise Pools 2.0 environment by:

• Upgrading their processor and memory activations from Static, Mobile-enabled, or Mobile-to-base activation features
• Adding feature EP20 (Pools 2.0 enablement)
• Purchasing initial capacity credits for use in a Pools 2.0 environment

https://www-01.ibm.com/common/ssi/ShowDoc.wss?docURL=/common/ssi/rep_ca/4/877/ENUSZG19-0084/index.html&lang=en&request_locale=en
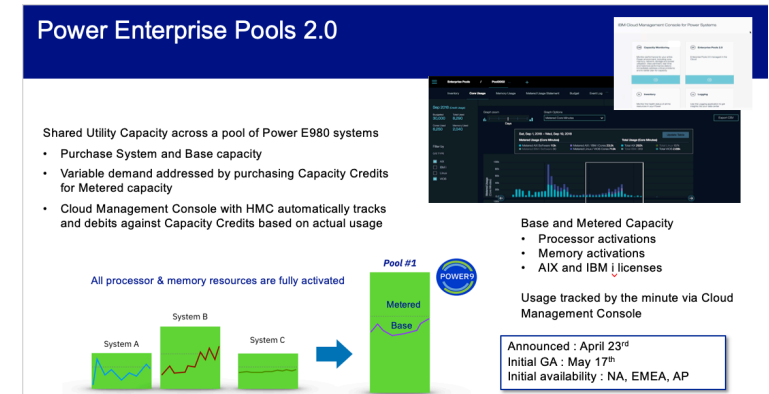
Now, on to the treasure!

Treasure Hunting Use Cases

➤ PEP v2.0 Value Assessment Tool (PVA Tool)

➤ Managing Failover Capacity with PowerHA ROHA

➤ Managing Frame Utilization with PowerVC DRO

➤ Evacuating Frames with the LPM Automation Tool

➤ IBM VM Recovery Manager HA & DR

Treasure Hunting Use Cases

➢ PEP v2.0 Value Assessment Tool (PVA Tool)

➢ Managing Failover Capacity with PowerHA ROHA

➢ Managing Frame Utilization with PowerVC DRO

➢ Evacuating Frames with the LPM Automation Tool

➢ Disaster Recovery with IBM VM Recovery Manager

Power Enterprise Pools 2.0 processor example: Optimize ROI

3 systems & opportunity to optimize ROI with Base & Metered options for delivering capacity

Processors required without Pools 2.0 to handle peak per system

ROI may be optimized by balancing total cost of Base activations vs. cost of Metered resource use over time for potential overall savings

PVA Tool

— The **Power Enterprise Pool 2.0 Value Assessment Tool** (PVA) was designed to give customers insight into the potential benefits of the Power Enterprise Pools 2.0 offering.

— Understand the benefits of PEP 2.0 before making the investment.

— Use historical data from legacy systems and see rPerf scaled core utilization relative to E980 systems.

— PEP 2.0 value calculated from historical CPU consumption data (one minute samples)

— Enhancement items:
  • AIX licenses calculations and integration
  • PowerHA calculations and integration

Physical CPU Consumption
(a look under the hood)

```
hscroot@mghmc:~> lslparutil -m Server-9117-MMC-SN105C627 -s s
-r lpar --filter lpar_names=tk_client4 -n 5
-F time,lpar_name,time_cycles,capped_cycles,uncapped_cycles

08/19/2014 00:00:01,tk_client4,57128844165869583,2101580556690666,65134521038724200
08/19/2014 00:01:01,tk_client4,57084606898946411,2099830346976073,65078043365245131
08/19/2014 00:02:01,tk_client4,57040369581440206,2098041394103272,65019310570401523
08/19/2014 00:03:01,tk_client4,56996132201262607,2096247138018427,64961064623230901
08/19/2014 00:04:01,tk_client4,56951895572644835,2094502335264528,64905048528493313
PHYSC =
(2096247138018427-2094502335264528) + (64961064623230901-64905048528493313)
----------------------------------------------------------------
(56996132201262607 - 56951895572644835)
```

PVA Tool

```
stgturgut:perl turgut$ ./pva.pl --dumppricing --country=DE


Pricing for country=DE:

CEC=EFP1 (3.90 - 4.0 GHz 32-core proc) €  96,166.94
            IFL ELBK (Linux proc act for EFP1/EFP5 ) €      .20
           base EP90 (1-core Base Act Pools 2 EFP1 ) € 1    .67
       baselinux EP96 (1-core BaseAct Linux EFP1    ) €      .40
         mobile EFPE (1 core Mob Act EFP1/EFP5      ) € 1    .20
         static EFPA (1 core activation for EFP1    ) €      .00

CEC=EFP2 (3.70 - 3.9 GHz 40-core proc) € 252,603.00
            IFL ELBL (Linux proc act for EFP2/EFP6 ) €      .20
           base EP91 (1-core Base Act Pools 2 EFP2 ) € 1    .67
       baselinux EP97 (1-core BaseAct Linux EFP2    ) €      .40
         mobile EFPF (1 core Mob Act EFP2/EFP6      ) € 1    .20
         static EFPB (1 core activation for EFP2    ) €      .00

CEC=EFP4 (3.58 - 3.9 GHz 44-core proc) € 415,457.00
            IFL ELBQ (Linux proc act for EFP4/EFP8 ) € 1    .20
           base EP93 (1-core Base Act Pools 2 EFP4 ) € 1    .67
       baselinux EP99 (1-core BaseAct Linux EFP4    ) €      .40
         mobile EFPN (1 core Mob Act EFP4/EFP8      ) € 1    .20
         static EFP9 (1 core activation for EFP4    ) € 1    .60

CEC=EFP3 (3.55 - 3.9 GHz 48-core proc) € 818,529.00
            IFL ELBM (Linux proc act for EFP3/EFP7 ) €      .20
           base EP92 (1-core Base Act Pools 2 EFP3 ) € 1    .67
       baselinux EP98 (1-core BaseAct Linux EFP3    ) €      .40
         mobile EFPG (1 core Mob Act EFP3/EFP7      ) € 1    .20
         static EFPC (1 core act for EFP3/EHC6      ) € 1    .60




PID=5765-AMT-0001 (AIX 7.2 Standard Edition Monthly Term Offering - Per Processor Core on Medium Server        ) €    .20
    5771-AMT-2288 (AIX 7.2 Standard Edition Monthly Term Offering - 1 Year SWMA Per Processor Core on Medium Server   ) €    .00

PID=5765-CBA-0001 (Enterprise Cloud Edition AIX - Per Processor Core on Medium Server                          ) €    .00
    5771-CBA-2303 (Enterprise Cloud Edition AIX - 1 Year SWMA Per Processor Core on Medium Server              ) €    .00

PID=5765-CD3-0006 (AIX 7.2 ENTERPRISE EDITION V1 - Per Processor Core on Medium Server                         ) €    .00
    5771-AEZ-1475 (AIX 7.2 ENTERPRISE EDITION V1 - 1 Year SWMA Per Processor Core on Medium Server             ) €    .00

PID=5765-G98-0009 (IBM AIX Standard Edition V7 - Per Processor Core on Medium Server                           ) €    .66
    5771-SWM-1510 (IBM AIX Standard Edition V7 - 1 Year SWMA Per Processor Core on Medium Server               ) €    .00
```

List Prices

PVA Tool

```
Possible configurations:

    EFP1 3.90 – 4.0 GHz 32-core proc:

        24 CECs, 768 cores. Growth= 4.05%

    +-------+-------------+-------------+-------------+-----------+---------+-------------+-------------+
    | Base  | P R O C E S S O R   M I N U T E S       | RATIO   | EQUIVALENT  |    TOTAL    |
    | Procs | 100% static |    base     | static-base |  utility  | (s-b):u | PROC MINS   |   SAVINGS   |
    +-------+-------------+-------------+-------------+-----------+---------+-------------+-------------+
    |  288  | 1,813,165,410 | 24,874,560 | 1,788,290,850 | 2,572,370 | 695.19 | 32,591,670 | 1,780,573,740 |
    |  289  | 1,813,165,410 | 24,960,930 | 1,788,204,480 | 2,541,098 | 703.71 | 32,584,224 | 1,780,581,186 |
    |  290  | 1,813,165,410 | 25,047,300 | 1,788,118,110 | 2,510,079 | 712.38 | 32,577,537 | 1,780,587,873 |
    |  291  | 1,813,165,410 | 25,133,670 | 1,788,031,740 | 2,479,318 | 721.18 | 32,571,624 | 1,780,593,786 |
    |  292  | 1,813,165,410 | 25,220,040 | 1,787,945,370 | 2,448,796 | 730.13 | 32,566,428 | 1,780,598,982 |
    |  293  | 1,813,165,410 | 25,306,410 | 1,787,859,000 | 2,418,497 | 739.24 | 32,561,901 | 1,780,603,509 |
    |  294  | 1,813,165,410 | 25,392,780 | 1,787,772,630 | 2,388,446 | 748.51 | 32,558,118 | 1,780,607,292 |
    |  295  | 1,813,165,410 | 25,479,150 | 1,787,686,260 | 2,358,634 | 757.93 | 32,555,052 | 1,780,610,358 |
    |  296  | 1,813,165,410 | 25,565,520 | 1,787,599,890 | 2,329,059 | 767.52 | 32,552,697 | 1,780,612,713 |
    |  297  | 1,813,165,410 | 25,651,890 | 1,787,513,520 | 2,299,728 | 777.27 | 32,551,074 | 1,780,614,336 |
    |  299  | 1,813,165,410 | 25,824,630 | 1,787,340,780 | 2,241,736 | 797.30 | 32,549,838 | 1,780,615,572 |
    |  300  | 1,813,165,410 | 25,911,000 | 1,787,254,410 | 2,213,062 | 807.50 | 32,550,186 | 1,780,615,224 |
    |  301  | 1,813,165,410 | 25,997,370 | 1,787,168,040 | 2,184,620 | 818.07 | 32,551,230 | 1,780,614,180 |
    |  302  | 1,813,165,410 | 26,083,740 | 1,787,081,670 | 2,156,398 | 828.73 | 32,552,934 | 1,780,612,476 |
    |  303  | 1,813,165,410 | 26,170,110 | 1,786,995,300 | 2,128,400 | 839.60 | 32,555,310 | 1,780,610,100 |
    |  304  | 1,813,165,410 | 26,256,480 | 1,786,908,930 | 2,100,633 | 850.65 | 32,558,379 | 1,780,607,031 |
    |  305  | 1,813,165,410 | 26,342,850 | 1,786,822,560 | 2,073,085 | 861.91 | 32,562,105 | 1,780,603,305 |
    |  306  | 1,813,165,410 | 26,429,220 | 1,786,736,190 | 2,045,742 | 873.39 | 32,566,446 | 1,780,598,964 |
    |  307  | 1,813,165,410 | 26,515,590 | 1,786,649,820 | 2,018,620 | 885.08 | 32,571,450 | 1,780,593,960 |
    |  308  | 1,813,165,410 | 26,601,960 | 1,786,563,450 | 1,991,705 | 897.00 | 32,577,075 | 1,780,588,335 |
```

Treasure Hunting Use Cases

➢ PEP v2.0 Value Assessment Tool (PVA Tool)

➢ Managing Failover Capacity with PowerHA ROHA

➢ Managing Frame Utilization with PowerVC DRO

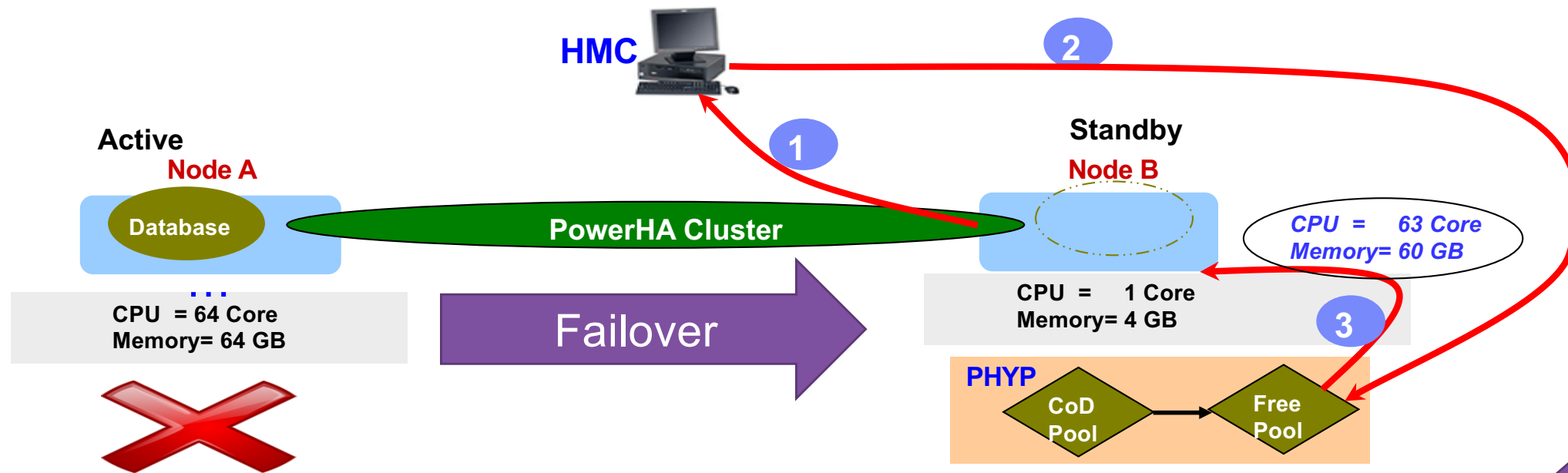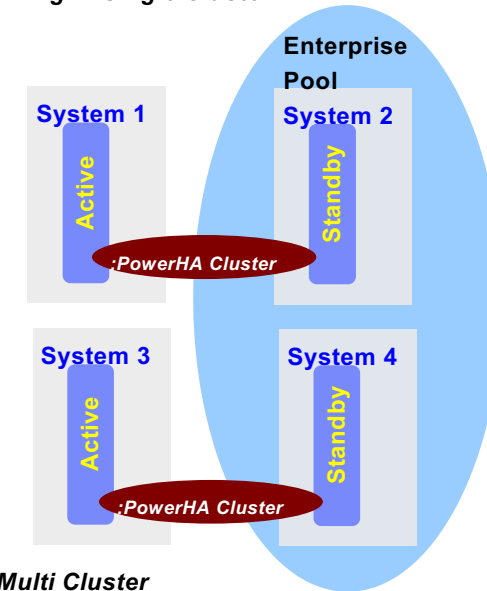➢ Evacuating Frames with the LPM Automation Tool

➢ IBM VM Recovery Manager HA & DR

PowerHA SystemMirror 7.2 (2015 Release): Feature Summary

	Feature	Description
1	**ROHA (Resource Optimized High Availability)**	• **Flexible Capacity management across various Power pools** • **Enterprise Pool Integration** • **Manipulate Shared Processor Pool Sizes** • **New HMC Integration Tunables**

Failover Capacity

- Traditionally, standby partitions have "failover capacity" which was ready to take on full workload

- What if you could just size the partition big enough "to keep the lights on", then:
  - Move Enterprise Pool activations to the standby frame, to allow for higher entitlement
  - Increase the entitlement of the standby LPAR to the active LPAR size, to handle full workload

- Ideally – this could be automated
  - PowerHA RoHA
  - HA script for other HA solutions (Lab Services has a script for that)

RoHA – Hypothetical Cost Savings Example

HMC

②

PowerHA™

Active
Node A

Standby
Node B

①

Database

PowerHA Cluster

CPU = 63 Core
Memory= 60 GB

. . .

CPU = 64 Core
Memory= 64 GB

CPU = 1 Core
Memory= 4 GB

③

Failover

PHYP

CoD Pool → **Free Pool**

Savings
=~ $1.5M

Database Example: Power 8: Core Factor=1.0, License/Core=$47500

Normal configuration (128 cores)	CoD Configuration (65 cores)
$3,040,000 ($3M)	$1,567,500 ($1.5M)

RoHA – Setup Example

- Enterprise Pool based capacity upgrade before failover
- Best suited for optimization in multi cluster setups

```
                    Advanced Configuration
Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                              [Entry Fields]
HMC Communication
* Timeout in minutes for the HMC commands            [5]
* Number of retries for one HMC command              [5]
* Delay in seconds between retries                   [10]

Resources Release
* Timeout in minutes for the synchronous
  release of resources                               [5]
* Force synchronous release of resources             [no]

CoD Parameters
* Number of activating days for CoD On/Off requests  [30]

Shared Processor Pool (SPP)
* Increase SPP limits as necessary                   [yes]

Shutdown secondary LPARs (*dev* and *test* LPARs)
* At takeover, if necessary                          [no]

Enterprise Pool resources
* Always use Enterprise Pool resources first
  and CoD resources second                           [yes]
(Using Enterprise Pool resources does not result in extra costs)

F1=Help          F2=Refresh          F3=Cancel          F4=List
F5=Reset         F6=Command          F7=Edit            F8=Image
F9=Shell         F10=Exit            Enter=Do
```


System 1 / **System 2**

Active / Standby

:PowerHA Cluster

PHYP / PHYP

Enterprise Pool

Assign resources before failover

Fig 1: Single Cluster

Enterprise Pool

System 1 / **System 2**

Active / Standby

:PowerHA Cluster

System 3 / **System 4**

Active / Standby
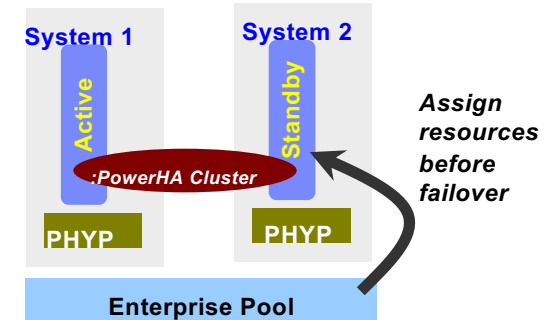
:PowerHA Cluster

Fig 2: Multi Cluster

Treasure Hunting Use Cases

✓ PEP v2.0 Value Assessment Tool (PVA Tool)

✓ Managing Failover Capacity with PowerHA ROHA

➢ **Managing Frame Utilization with PowerVC DRO**

➢ Evacuating Frames with the LPM Automation Tool

➢ IBM VM Recovery Manager HA & DR

Dynamic Resource Optimization (DRO)

- Continuously monitors the resource (CPU) utilization of physical hosts and virtual machines in a cloud environment

- PowerVC admin creates optimization policy at the **host group** level

- When usage imbalances are detected, the PowerVC DRO optimizes the cloud, making adjustments for workloads whose characteristics change over time
    - Core activation first, if enabled
    - VM Migration, if enabled

- Integrated with Power Enterprise Pools

- Runs in Advise Only or Active mode

- Can be switched on or off at any time

- Hosts or VMs can be excluded from DRO
    - Their CPU utilization is still included in calculations, but hosts cannot be used for migrations and VMs cannot be migrated

- PowerVC 1.3.0 or later required

Dynamic Resource Optimization (DRO)

- ## The Best Part

  - You don't need PowerVC set up to manage cloud VM deployment
  - So don't let that stop you from using DRO
  - No SAN/LAN configuration to mess with
  - Just...
    - install PowerVC
    - Identify HMCs and discover frames (hosts)
    - Create a host group
    - Set your thresholds, and other parameters ...

Enabling and Configuring DRO

Hosts ▸ Create Host Group

Create Host Group

VessTest

* Placement policy:

CPU Utilization Balanced ▾

Dynamic Resource Optimizer

⑦ *Learn more about DRO settings*

☑ Enable Dynamic Resource Optimizer (DRO)

Mode:

○ Advise only: Optimization operations are recommended but not performed when the specified threshold value is exceeded.

◉ Active: Optimization operations are performed when the specified threshold value is exceeded.

Operations (select at least one):

☑ Migrate virtual machines to another host in the host group. Migrations are performed after mobile cores have been activated, if applicable.

☐ Activate mobile cores on the host. Requires that the host is a member of a Capacity on Demand (CoD) pool.

* CPU utilization threshold (%):	70	* Stabilization (times): ⑦	2
* Run interval (minutes): ⑦	5	* Maximum concurrent migrations: ⑦	10

- Can be enabled for new or existing host groups
- Note the mode setting

Excluding Hosts from DRO

Hosts ▸ Host: CPT2

Host: CPT2

🔄 Refresh | 📝 Edit Host Connection | 📤 Remove Host | 🔧 Enter Maintenance Mode | 📊 Edit DRO Properties

▾ Information

Name:	CPT2
State:	🟩 Operating
Health:	🟩 OK

❓ Select the checkbox below to exclude host **CPT2** from DRO operations.

☑️ Exclude host **CPT2**

[OK] [Cancel]

- The change is dynamic and be done at any time

DRO Advise Mode Example

DRO Events

Refresh | Display events from: **Past 24 hours** ▼   Filter ▼

⇥ *No filter applied*

Timestamp ▼	Type	Host Group	Host	Description
12/28/15, 11:51 AM	✅ Threshold satisfied	VessTest	CPT1	The CPU utilization for host CPT1 is **58.6%**, which no longer exceeds the CPU utilization threshold of **60%**.
12/28/15, 11:35 AM	⚠ Threshold exceeded	VessTest	CPT1	The CPU utilization for host CPT1 is **60.03%**, which exceeds the CPU utilization threshold of **60%**.

DRO Active Mode Example

💬 DRO Events
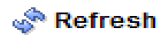
🔄 **Refresh** | Display events from: [Past 24 hours ▼]   [Filter] ⇉ ▼

⇉ *No filter applied*

Timestamp ▼	Type	Host Group	Host	Description
12/29/15, 12:27 PM	✅ Threshold satisfied	VessTest	CPT1	The CPU utilization for host **CPT1** is **58.2%**, which no longer exceeds the CPU utilization threshold of **60%**.
12/29/15, 12:20 PM	✅ Migration successful	VessTest	CPT1	Successfully migrated virtual machine **Unimportant_LPAR** from host **CPT1** to host **MGMT**.
12/29/15, 12:15 PM	ℹ️ Migration started	VessTest	CPT1	Migrating virtual machine **Unimportant_LPAR** from host **CPT1** to host **MGMT**.

🖥️ Virtual Machines
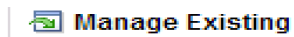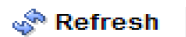
🔄 **Refresh** | ▷ Start ⬤ Stop ↻ Restart | ✖ Delete | 📷 Capture 🔲 Resize ↪ Migrate | 📥 Attach Volume | 🔳 **Manage Existing**   [Filter]

📤 Unmanage   ⇉ ▼

⇉ *No filter applied*

Name 2 ▲	Host 1 ▲	IP	State	Health	Task
📄 Important_LPAR	CPT1	10.150.40.40 (Static)	🟩 Active	🟩 OK	
📄 AIX71CI_t	CPT2	10.150.30.30 (Static)	🟩 Active	🟩 OK	
📄 Unimportant_LPAR	MGMT	10.150.40.41 (Static)	🟩 Active	🟩 OK	

DRO Scheduling – PowerVC 1.3.1.2

- You can now enable DRO only during certain times by scheduling it

Memory-based DRO – PowerVC 1.3.2 – NovaLink Only

Create Host Group

☑ Configure Dynamic Resource Optimizer (DRO)

Schedule:
- ⦿ Always enable DRO
- ◯ Enable DRO during specific times

Mode:
- ⦿ Advise only: Optimization operations are recommended but not performed when the specified threshold value is exceeded.
- ◯ Active: Optimization operations are performed when the specified threshold value is exceeded.

Resource to monitor:
- ◯ CPU

  Operations (select at least one):
  - ☑ Migrate virtual machines to another host in the host group. Migrations are performed after mobile cores have been activated, if applicable.
  - ☐ Activate mobile cores on the host. Requires that the host is a member of an enterprise pool.
- ⦿ Memory. Migrate virtual machines between NovaLink managed hosts.

* Utilization threshold (%): `70`

* Run interval (minutes): ⍰ `5`

Memory-based DRO – PowerVC 1.3.3 – NovaLink Only

As of PowerVC 1.3.3 – Memory DRO can now use Enterprise Pool memory activations

Dynamic Resource Optimizer

⑦ *Learn more about DRO settings*

☑ Configure Dynamic Resource Optimizer (DRO)

Schedule:
- ⦿ Always enable DRO
- ○ Enable DRO during specific times

Mode:
- ○ Advise only: Optimization operations are recommended but not performed when the specified threshold value is exceeded.
- ⦿ Active: Optimization operations are performed when the specified threshold value is exceeded.

Resource to monitor:
- ○ CPU
- ⦿ Memory. Only supported for NovaLink managed hosts.

Operations (select at least one):
- ☐ Migrate virtual machines to another host in the host group. Migrations are performed after mobile cores or memory have been activated, if applicable.
- ☑ Activate mobile cores or memory on the host. Requires that the host is a member of an Enterprise Pool.

* Utilization threshold (%):	17
* Run interval (minutes): ⑦	5
* Stabilization (times): ⑦	2
* Maximum concurrent migrations: ⑦	10

Treasure Hunting Use Cases

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✓ Managing Failover Capacity with PowerHA ROHA

✓ Managing Frame Utilization with PowerVC DRO

➢ Evacuating Frames with the LPM Automation Tool

➢ IBM VM Recovery Manager HA & DR

Power Enterprise Pools & LPM Automation Tool

Power Enterprise Pools & LPM Automation Tool

Power Enterprise Pools & LPM Automation Tool

For more info:

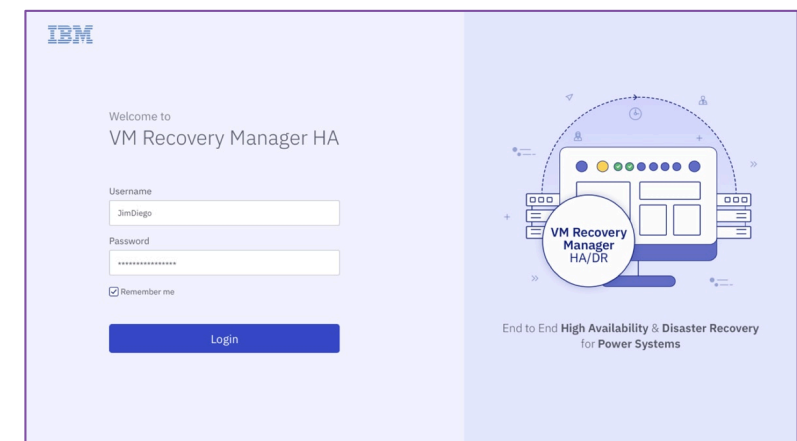Go to Bob Foster's youtube channel:

http://ibm.biz/bobtube

Visit IBM Community and Forums:

http://ibm.biz/lpm_srr_tool

Treasure Hunting Use Cases

✓ PEP v2.0 Value Assessment Tool (PVA Tool)

✓ Managing Failover Capacity with PowerHA ROHA

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✓ Evacuating Frames with the LPM Automation Tool

➢ **IBM VM Recovery Manager HA & DR**

What is VM Recovery Manager DR?

VM Restart based DR: Simplified Disaster Recovery Solution for Power

A simplified way to manage DR

- Automated Disaster Recovery management
- Economics of eliminating hardware and software resources on backup site
  - *Enterprise Pool support (optional)*
- Easier deployment for DR: unlike clustering or middleware replication technologies
- VM restart technology has no OS or middleware dependencies
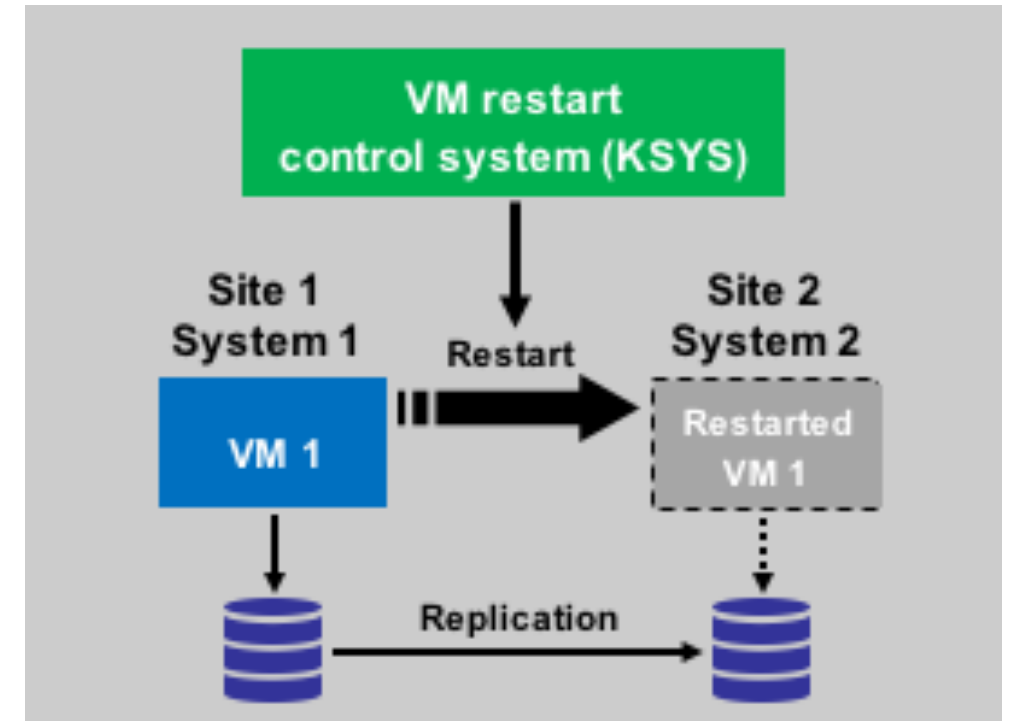
- Support for IBM POWER7®, POWER8®, and POWER9® Systems
- Support for heterogeneous guest OSs
  - AIX
  - Red Hat
  - SUSE
  - Ubuntu
  - IBM i

VM Recovery Manager (GDR) First Release Capabilities

Capability	Customer Value
Supports P7 & P8 Systems	Enables customer to move older P7 systems to DR site and pair with P8 in main data center
Support for AIX, IBM I, and Linux Guest VMs	DR for AIX and Linux (all major flavors) enables uniform DR solution for Power platform
Enterprise Pool Support	**Flexible capacity management to reduce costs**
Daily validation	Early detection of faulty configuration and other issues
Storage Replication	Offloaded uniform data copy methods. Support for EMC SRDF Async in 2016
Customization framework	Plugin script to do custom checks every day and custom process events as they occur
Easy to deploy	Less than 10 steps deployment enables simplified DR

A Warning about Power Enterprise Pools and a DR Event

— The Bad News:
  • When a frame goes offline, it takes mobile resources with it

— The Good News:
  • You can utilize those resources in an "unreturned" state
  • When you ask to put those resources in the pool, you get them for a grace period to use
  • Now you can move Power Enterprise Pool activations from Production to DR to use
  • You can show your boss how much money you saved by not buying activations in DR

— The Bad News, Part 2:
  • 48 hours after the Server Grace Period expires, the Pool Grace Period expires
  • Resources are now "locked" in place, until you can return the un-returned cores/memory

— The Good News, Part 2:
  • IBM can work with you to solve this problem (we can create a new XML file that deletes the out-of-compliance servers).

Treasure Hunting Use Cases

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✓ Managing Failover Capacity with PowerHA ROHA

✓ Managing Frame Utilization with PowerVC DRO

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✓ IBM VM Recovery Manager HA & DR

Thank you!
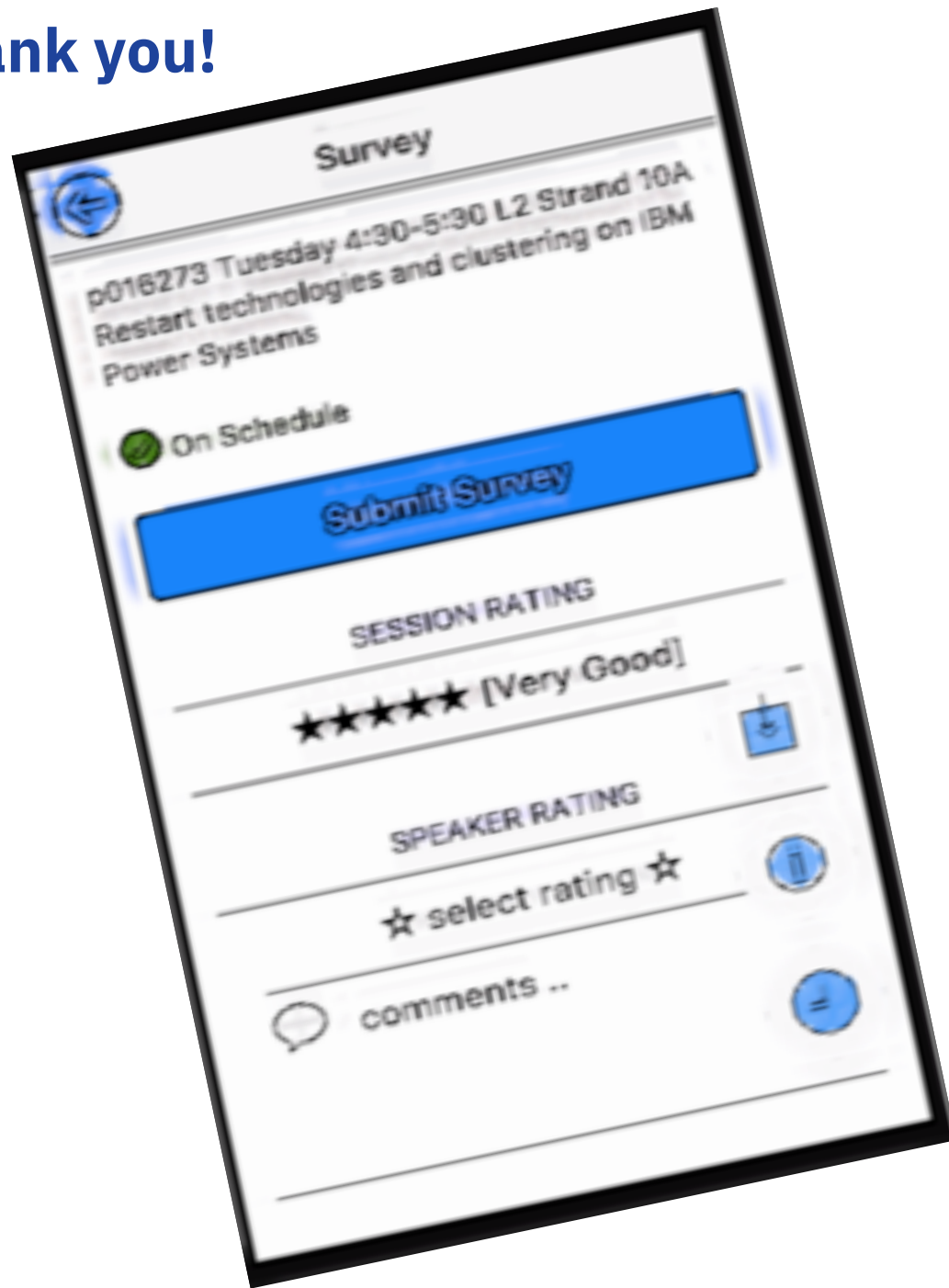
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