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**We just had a book failure!  
(and why Enhanced Book Availability  
is your friend.)**

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**SHARE**  
in Boston

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A what? Only the second zEC12 book failure since the machines started shipping. This failure was not the same as the first one.



## Motivation for this session

- Had I seen this presentation we would have handled the situation differently.
- zEnterprise EC12 Technical Guide (SG24-8049-00)
  - Section 10.3 zEC12 Enhanced book availability ...
  - A degraded restart in the rare event of a book failure
  - A book replacement for repair or physical memory upgrade

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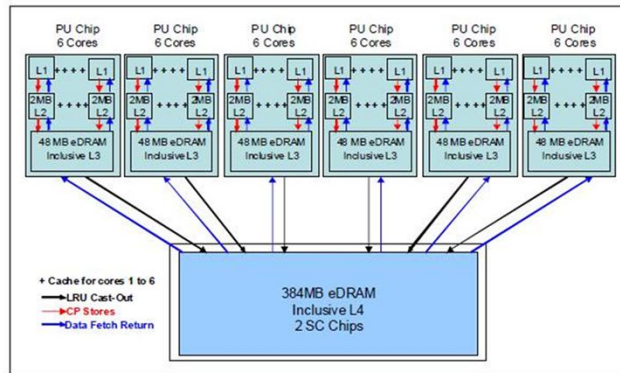
Up to now nothing can really prepare you for this situation. If I had seen this presentation before this event we would have reacted quite differently and had the bulk of our applications up and running in a couple of hours.

With this information you can avoid the mistakes we made and get up and running quickly.

Enhanced Book Availability is most commonly used for a planned outage for repair or memory upgrade.

The Redbook alludes to it's use in a book failure but even after the event it wasn't clear to me how to apply the information to a failure.

# Review...



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Revision or new information? Note the L4 cache. I'll talk about it on the next slide.

## What happened

- L4 is shared between books
- Multi-bit failure in L4 cache
- Machine check stops to protect data integrity
  
- HMC Hardware messages
  - CPC Failure. Repair can be done concurrently
  - IML the processor and run degraded

And when it check stopped the first thing I heard was “Our consoles have disappeared. And there are no icons on the HMC”

On top of that the processor call home failed which was a firewall and network problem we created so we had to call in to IBM and report the failure.

On the HMC: Console Actions -> Hardware Management Console Settings -> Customize Outbound Connectivity -> Configure -> Test -> Start

## What we did

- Did a PoR (just like the message said).
- Only one LPAR failed to activate for lack of memory.
- One complained about insufficient zIIPs. Can't explain that one.
- Did not do what we should have next ☹️

This is where you need to pay attention. This is where the magic begins.

Unfortunately I didn't capture the messages at the time and they couldn't be found in any logs so I wasn't able to get the exact message when the dust settled to review.

## What we didn't understand

- ALL the remaining book resources are available (not just the ones we purchased)
- i.e. PUs, memory
- The system allocates the PUs according to some algorithm.

I'll show you what I mean on the next slide.



## Before and after

Before failure (two books):      After PoR (one book):

8 GP	6 GP
2 zIIP	1 zIIP
18 IFL	14 IFL
1 CF	1 CF
--	--
29	22
704 GB	512 GB

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This shows the two working books configuration and after PoR how the remaining book got configured. The other 5 PUs in the book are reserved for SAP and a spare. Note all the installed memory (not just the 352 GB we purchased) is available.

## Lesson

- Look carefully and make sure in the lpar activation order of the reset profile you activate your most loved ones first.
- If you've got CF lpars they should be first.
- If you don't get the results you want, change the storage allocation of the image profiles and try again.

I use a spreadsheet with all the LPARs listed with a column for memory and activation order. Sort it in activation order and sum the memory and you can predict which LPARs won't activate.



## Ready to remove



This shows the book (left hand one) ready to be removed. Interface cables removed. Cooling still connected.

## Memory



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It didn't occur to me that the replacement wouldn't have have memory installed. Here the CE's are swapping memory from the failed book to the replacement.

## Dealing with the water



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Here's the Fill and Drain Kit in use. We had to drain coolant, and here we are putting it back – about a litre. Not a drop was spilled.



# VPD

- What the healthy machine looks like

Configuration for M/T 2827-H43 S/N 02FFFFF

```
-----  
VPD date: 27 Apr 2013 3:39:07 p.m.  
Machine information: M/T: 2827-H43 S/N: 02FFFFF SW model: 513  
                   ADD PHY  
Memory information: Book 0: Total PHYSical size:1280  
[GB]                Book 1: 512 640 20% RAIM: 256  
                   Book 2: Addressable:1024  
                   Book 3: 512 640 Enabled: 736  
                   Customer ordered memory: 704  
                   HSA: 32  
  
High Water Mark: Max purchased KCID: 55 Max purchased CPs: 8  
                  Active KCID : 55 MSU: 808  
  
PU configuration:      Perm CoD Total  
CPs : 8 05 13  
SAPs : 8 00 08 Spare PUs: 2  
ICPs : 1 00 01 Failed PUs: 0  
IFLs : 18 05 23 Unassigned IFLs: 0  
zAAPs: 0 00 00  
zIIPs: 2 00 02
```

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Your IBM team can get this VPD data for your machine.

# VPD



Book configuration M/T 2827-H43 S/N 02FFFFFF

VPD date 27 Apr 2013 3:39:07 p.m.

Book	Location	MCM PUs	Failed PUs	P/N	S/N	CCIN
1	A25BLG06	30	0	95Y5605	YH10HA28S005	59B0
3	A25BLG15	27	0	95Y5755	YH104531H005	59B2
Total		57	0			

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Here's more VPD data. Note the replacement book (Book 1) has 30 PUs. That's because the replacement books in the field are for the HA1 model.



## What IBM has done

- Able to recreate the error on the book sent back to POK.
- Changed manufacturing/testing process.
- Trained support reps to ask questions and guide customers through recovery.

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A number of phone calls with IBM engineering. These were the major points from the final review.

## Phew

- Once the book is replaced the processor will automatically start using the resources and you can activate the remaining lpars.



This is pretty cool. No PoR needed to start using the replaced book.

## What could slow things down?

- Remember the replacement book may not be available locally.
- In our case it would have to be flown in from Chicago.
- We were lucky one of the CE's had a vehicle big enough to transport it from the local parts depot.
- What if the replacement part is bad?

For the single book folks – this applies to you too!



## It's bigger than a bread box



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This is how the replacement book arrived. The packing became the coffin for the failed book on the way out.

## Should we have invoked our DR plan?

- How long will the book replacement take?
- Time to rouse people.
- Network preparation, CBU activation, IPL time.
- And what about returning to main site afterwards?
  
- Remember the same people who are trying to recover the main site are the ones you'll need to activate the DR site.

These are some of the questions you have to ask/think about.

## Conclusion

- Had I known and understood this we could have had our production environment up and running again in about two hours instead of closer to six hours.
- I hope you never go through an event like this but if you do, remember this presentation and how you can reduce the pain to your organization.

## Additional Reading



- Mainframe IBMSystems, July/August 2013, page 40.
  - “Architected for Availability” by C Kevin Schum and Scott Swaney.
- [http://www.ibmssystemsmagmainframedigital.com/nxtbooks/ibmsystemsmag/mainframe\\_20130708/index.php#/44](http://www.ibmssystemsmagmainframedigital.com/nxtbooks/ibmsystemsmag/mainframe_20130708/index.php#/44)
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I found this article very interesting in light of what I learned as a result of the book failure.

Thanks Beth at MSP TechMedia for the links. Watch the wrap 😊

And always remember ...

Without a plan, there's one less thing  
to go wrong.