AN OVERVIEW OF AVAILABILITY

RICHARD FIELD – POWER *CONSULTING*

INTRODUCTIONS

Richard Field

POWER *CONSULTING*

Independent IBMi dedicated technical specialist

IBM i AVAILABILITY - TOPICS

- BACKUP
- DR / HA
- MIRROR

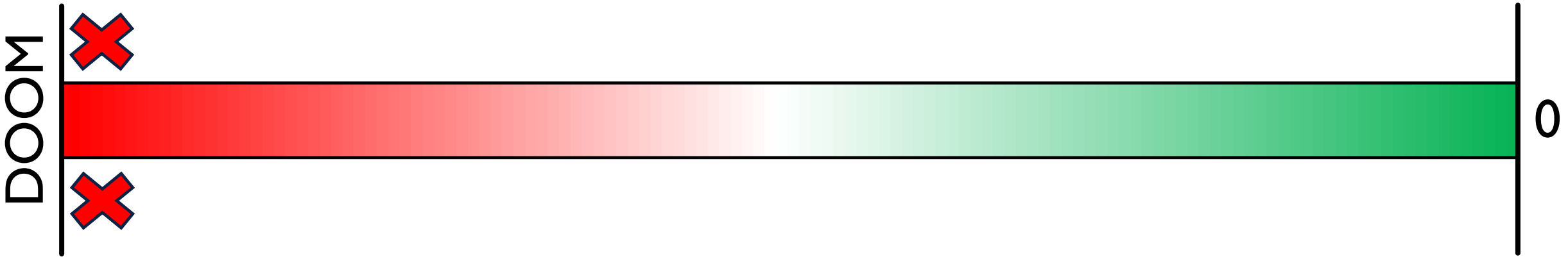
TERMINOLOGY

- **BACKUP – Saving data in some form for later re-use or recovery**
- **DR or DISASTER RECOVERY – the ability to recover from an outage, failure or disaster to a point in time and continue to operate as a business**
- **HA or HIGH AVAILABILITY – the capability to run with zero, or near zero, downtime with minimal or no loss of data and recovery in a very short time, or instantaneously.**
- **RPO or RECOVERY POINT OBJECTIVE – the POINT where you want to, or can, recover from, such as last good backup, or last completed transaction.**
- **RTO or RECOVERY TIME OBJECTIVE – the TIME required to return to an operating position, may be measured in seconds, minutes, hours or even days.**

The Slide Rule of Availability

RPO = no backup = no recovery

Last Transaction



RTO = never

Immediate

NO BACKUP

TAPE BACKUP

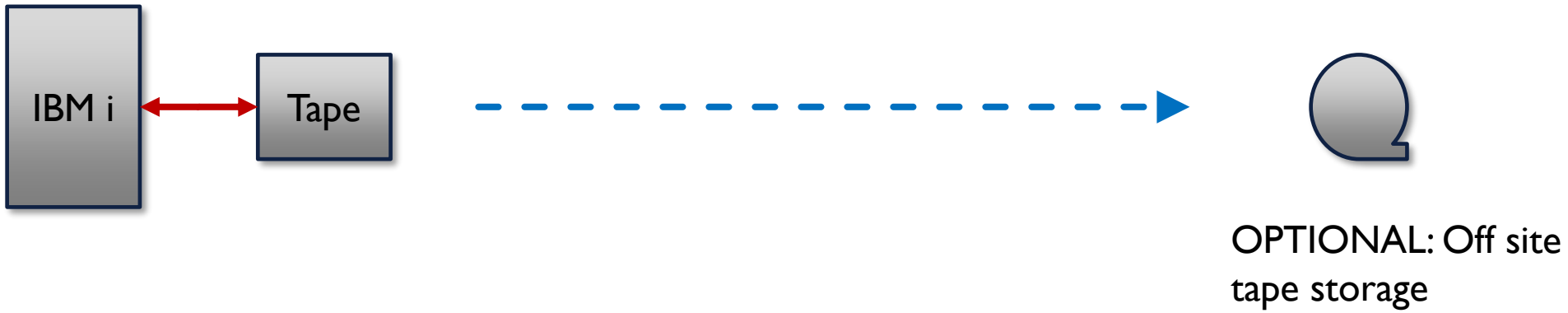
PLUS

- simple
- inexpensive
- reliable

MINUS

- Slow
- RPO is not good
- RTO is not good
- manual handling
- difficult to transport and copy. Data protection?

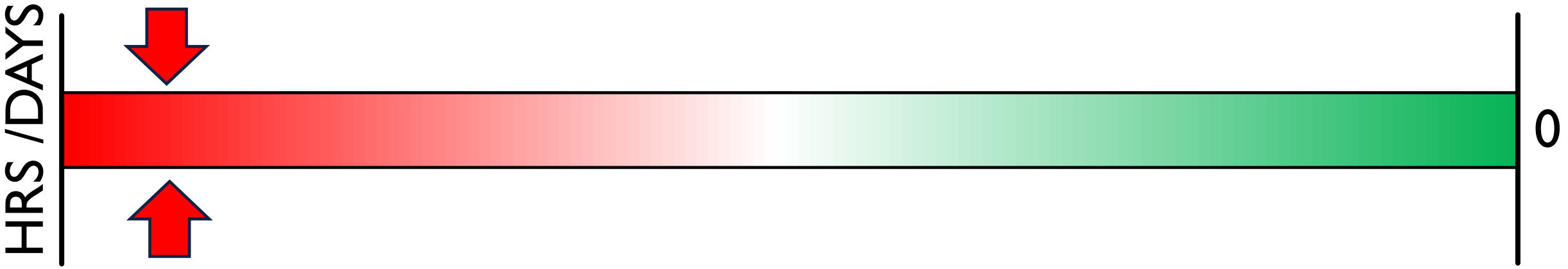
SINGLE SITE



TAPE BACKUP

BACKUP – what does it give us?

RPO = last good backup – 4hrs, 8hrs, 24hrs, 48hrs ? **Last Transaction**



RTO = time to restore from last backup – 4hrs, 8hrs, 24hrs, 48hrs ? **Immediate**

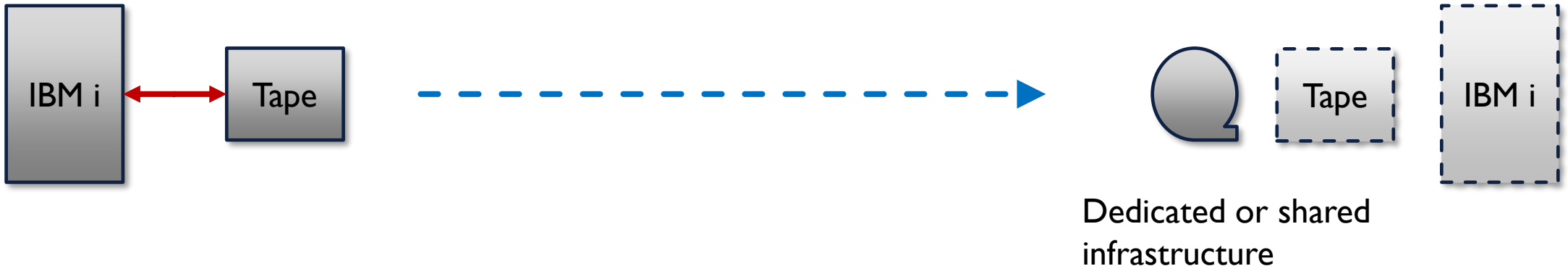
But… complete site loss, exclusion, system/tape drive destroyed there's no recovery

TAPE BACKUP

DISASTER RECOVERY

- **PLUS**
  - **Relatively simple**
  - **Less expensive than HA (but more than tape)**
  - **Can recover from site loss**
- **MINUS**
  - **Not immediate, risk of 'shared' infrastructure**
  - **RPO is still last backup**
  - **RTO is still time to restore generally**
  - **How do you get back?**
  - **How often is it tested?**

DUAL SITE

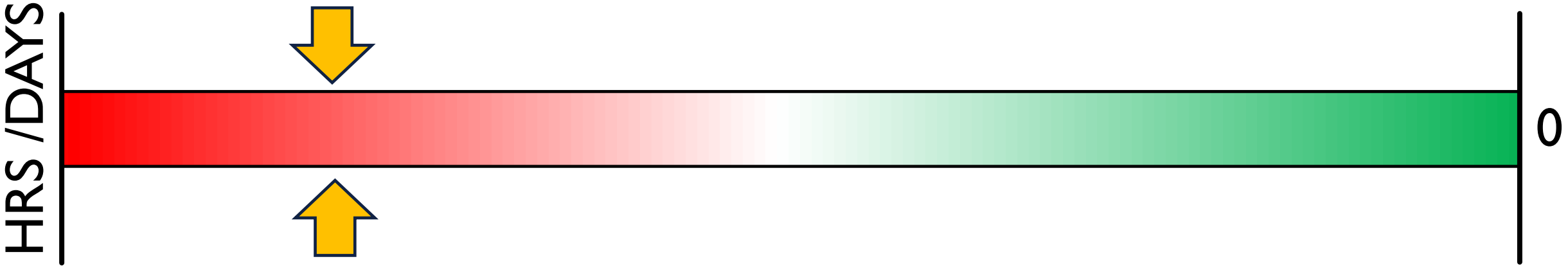


DISASTER RECOVERY (DR)

DISASTER RECOVERY – An improvement on tape

RPO = last good backup – but generally already offsite

Last Transaction



RTO = time to restore backup, unless contract includes pre-restore

Immediate

Improved on tape only but short of 'Highly Available', swap back can be a challenge

DISASTER RECOVERY (DR)

BACKUP VAULTS

- **PLUS**
  - **Most emulate tape drives/library – no need to change processes**
  - **Compression, Encryption and de-duplication**
  - **Automatic replication to 2nd location**
- **MINUS**
  - **Still need a backup window**
  - **Still need a restore from 'tape'**
  - **Cost (compared to simple tape solution)**

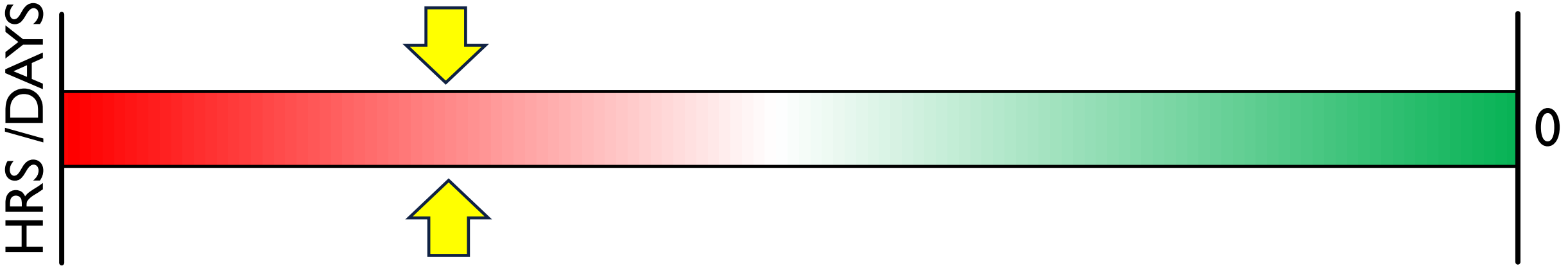
DUAL SITE

BACKUP VAULTS / VIRTUAL TAPE LIBRARY

VTL – An improvement on tape

RPO = last good backup – but more frequent backups?

Last Transaction



RTO = time to restore backup, but should be quicker from disk

Immediate

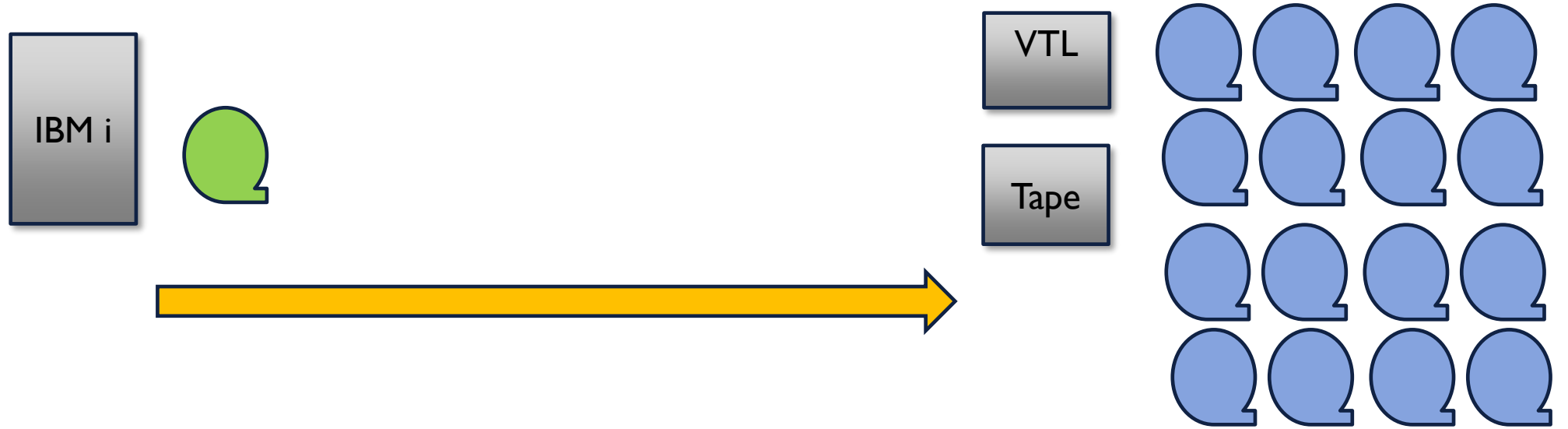
Improved on tape only but still short of 'Highly Available'

DISASTER RECOVERY (DR)

CDP – CONTINUOUS DATA PROTECTION

- **PLUS**
  - **Similar to VTL**
  - **But also more frequent backups – e.g. dozens per day**
- **MINUS**
  - **All saves are 'save while active'**
  - **Still need to restore**
  - **Cost (compared to simple tape solution)**

SINGLE or DUAL SITE

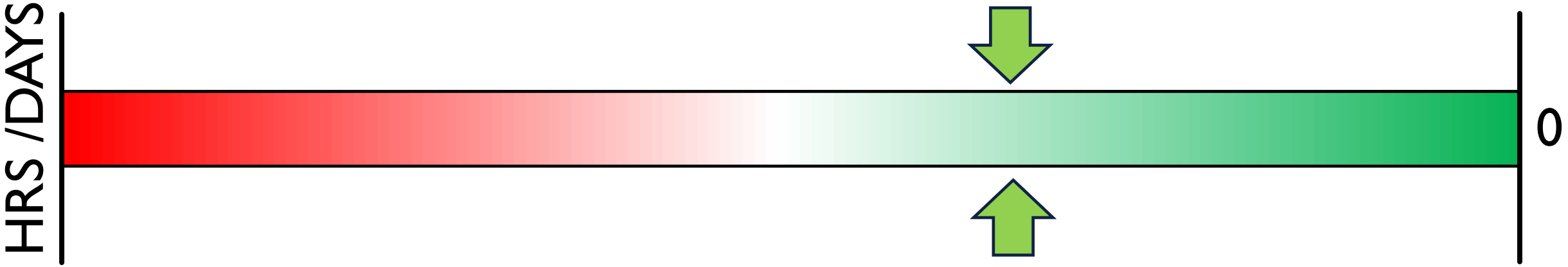


CONTINUOUS DATA PROTECTION

CDP – Getting warmer…

RPO = last good backup – 15mins to an hour

Last Transaction



RTO = time to restore backup, but should be quicker from disk

Immediate

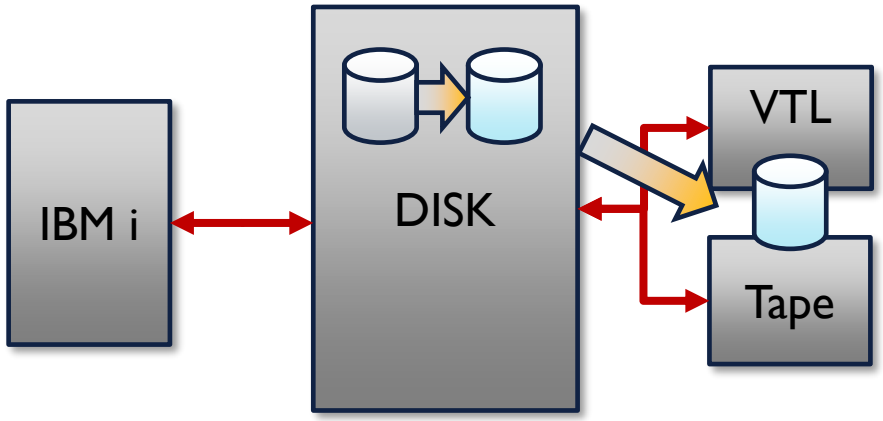
Further improved on daily tape but STILL short of 'Highly Available'

CONTINUOUS DATA PROTECTION

FLASH COPY

- **PLUS**
  - **Minimal backup window**
  - **Super fast snapshot of data**
- **MINUS**
  - **External storage only**
  - **Requires IBM toolkit to automate (Cost)**
  - **Needs additional storage capacity (but can be ‘thin provisioned’)**

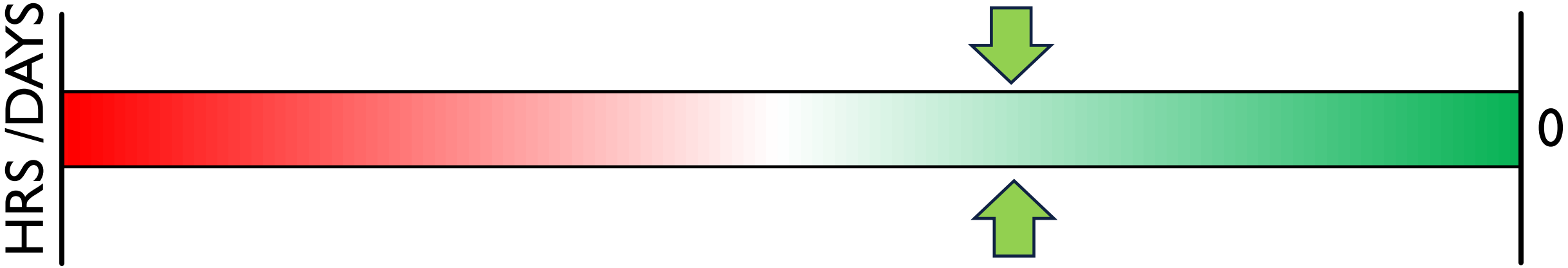
SINGLE or DUAL SITE



FLASH COPY BACKUP

FLASH COPY

RPO = last good backup – how often to backup? **Last Transaction**



RTO = time to restore backup, but you have the Flash Copy too **Immediate**

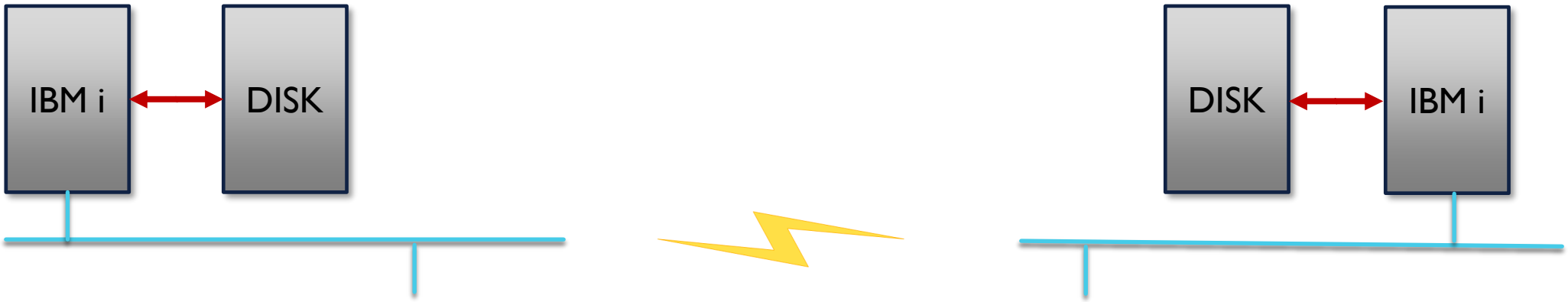
BIG improvement if backup window the issue – can suspend ASP to initiate copy.

FLASH COPY BACKUPS

HIGH AVAILABILITY - LOGICAL

- **PLUS**
  - Can give near zero RTO/RPO
  - Technology Agnostic
  - Ability to use backup copy for queries and backups
  - Can roll back errors
- **MINUS**
  - Server overhead
  - Needs monitoring and admin

SINGLE or (Better) DUAL SITE



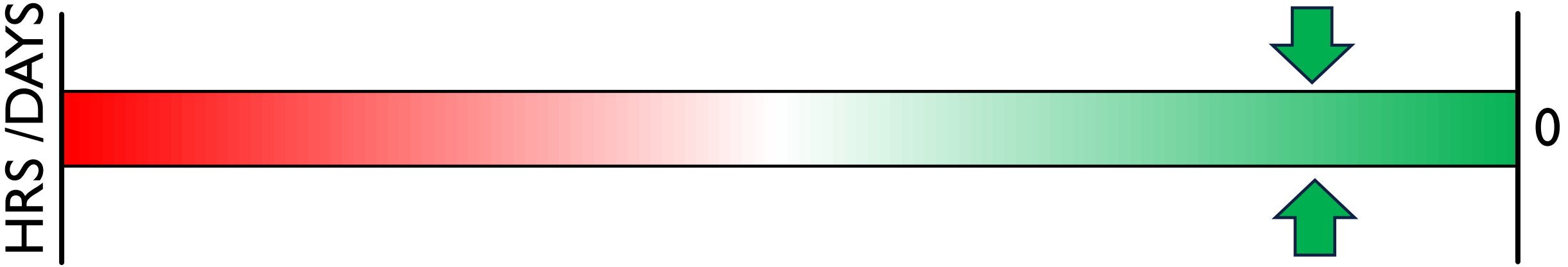
Changes are journaled and sent to remote

HIGH AVAILABILITY - LOGICAL

Logical Replication – now we're cooking with gas

RPO = last transaction or very close to

Last Transaction



RTO = less than 1 hour, time to make decision and failover.

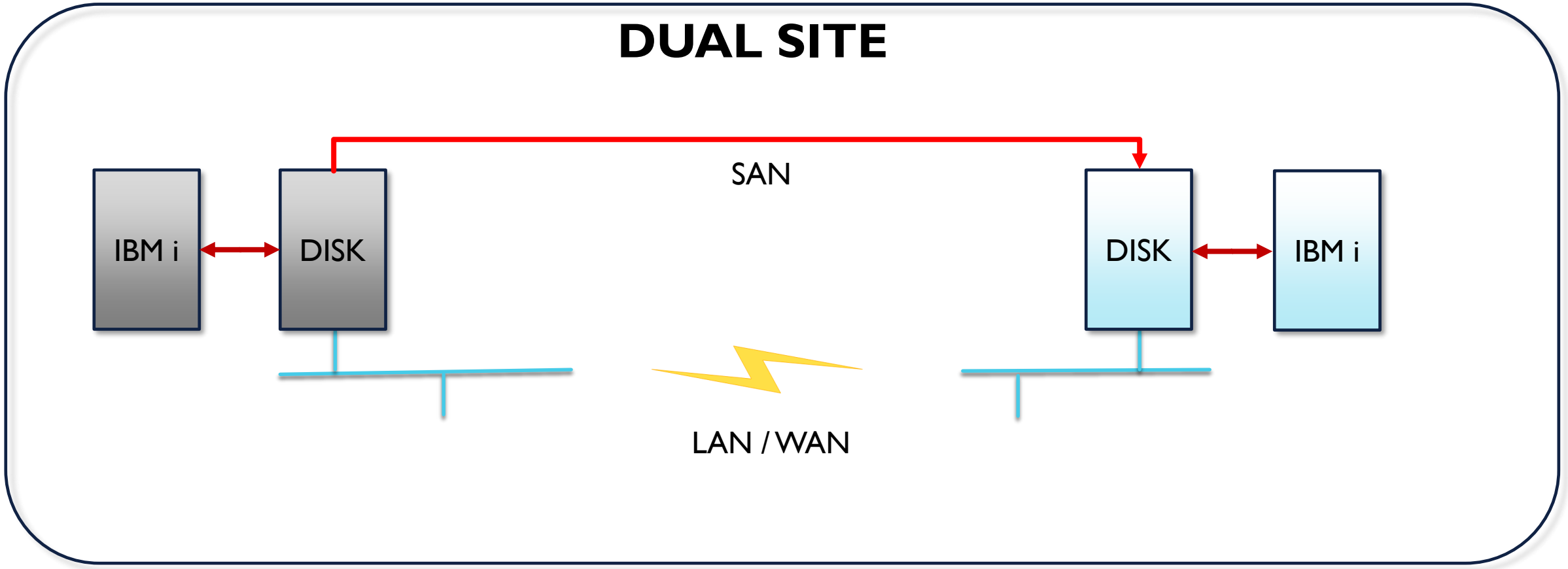
Immediate

For some, as close as you need to get

HIGH AVAILABILITY - LOGICAL

HIGH AVAILABILITY - HARDWARE

- **PLUS**
  - Can give near zero RTO/RPO
  - NO server overhead
  - Minimal admin
- **MINUS**
  - Tech dependent
  - Can’t roll back errors
  - Can’t use the backup copy

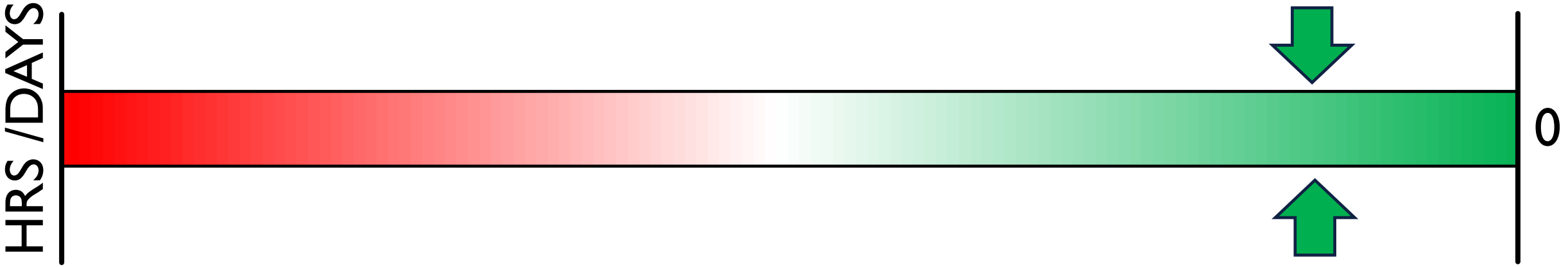


HIGH AVAILABILITY – HARDWARE PART I

Hardware Replication – Fast DR

RPO = last disk write completed (Sync or Async)

Last Transaction

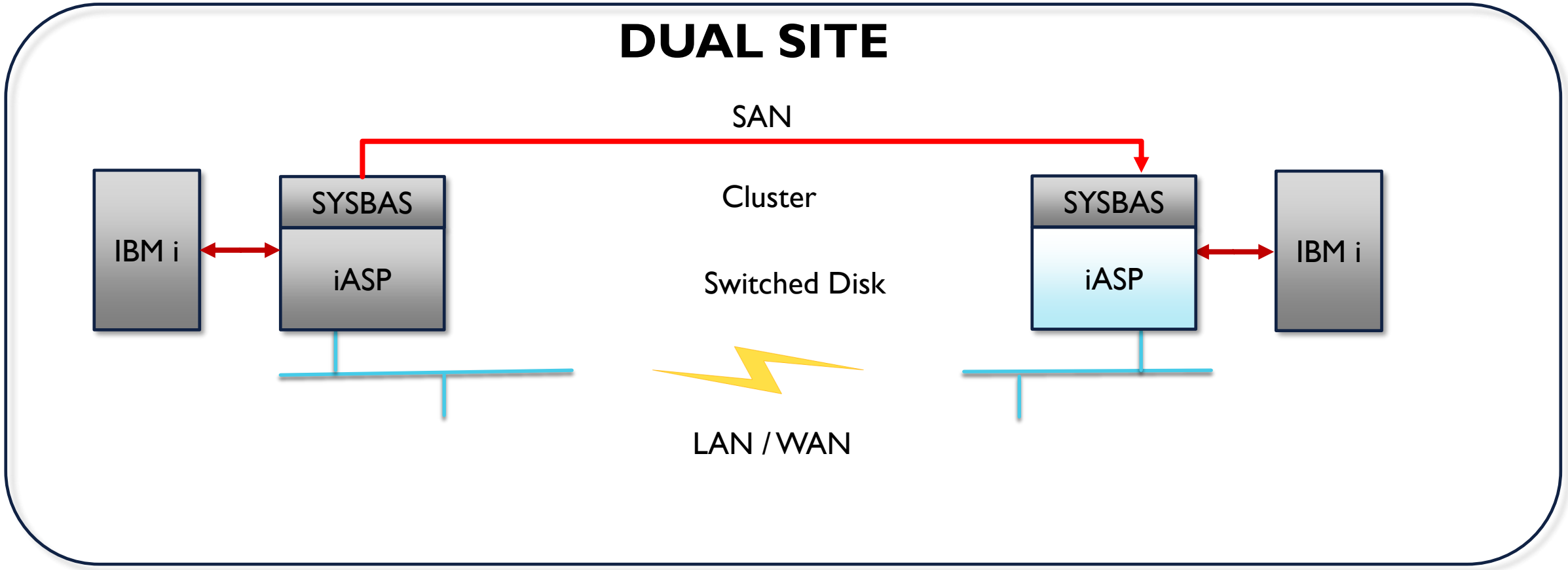


RTO = less than 1 hour, time to make decision and failover.

Immediate

Fast cold standby – switch storage and IPL system/partition

HIGH AVAILABILITY – HARDWARE PART 1

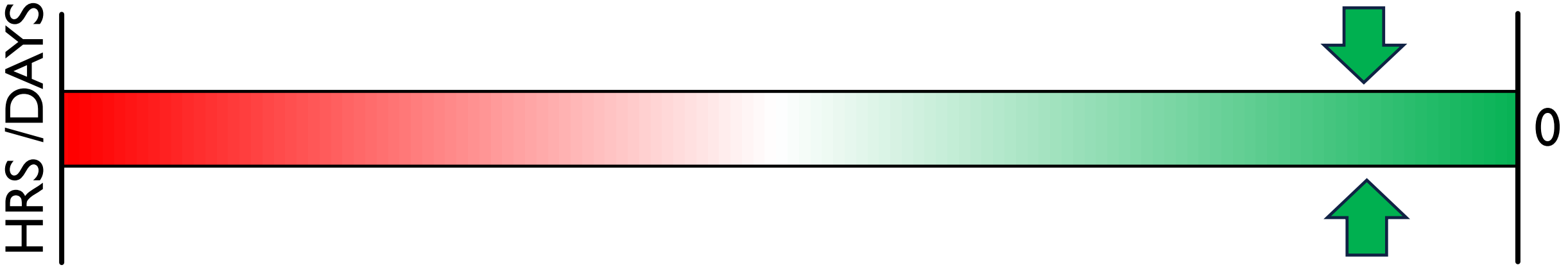


HIGH AVAILABILITY – HARDWARE PART 2

Hardware Replication – switched disk - HA

RPO = last disk write completed (Sync or Async)

Last Transaction



RTO = c. 15 mins, time to make decision and failover.

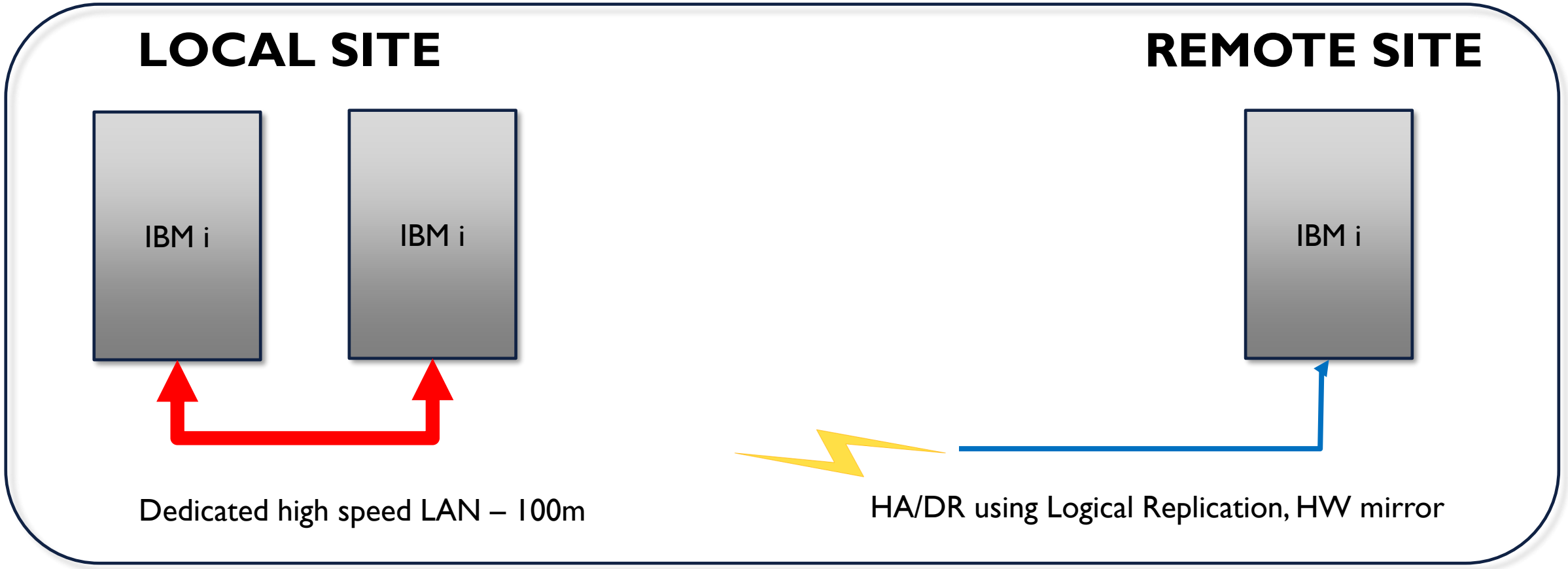
Immediate

Fast warm standby – switch storage and Vary on iASP

HIGH AVAILABILITY – HARDWARE PART 2

DB2 MIRROR

- **PLUS**
  - **Synchronous replication**
  - **Internal or External Storage**
  - **RPO and RTO ZERO**
- **MINUS**
  - **Tech dependent (POWER8/9 & i7.4 & specific adapters)**
  - **Local site only (100m)**
  - **EXPENSIVE ! (but its only money and its all relative!)**

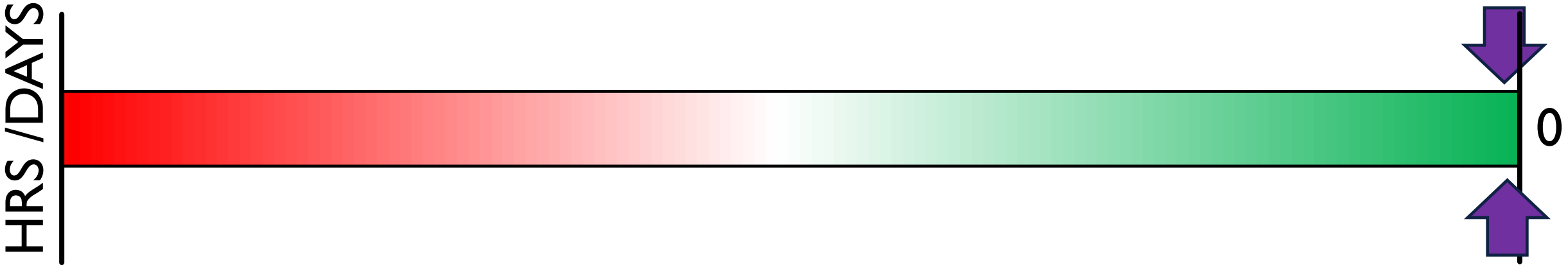

LOCAL SITE
REMOTE SITE
IBM i
IBM i
IBM i
Dedicated high speed LAN – 100m
HA/DR using Logical Replication, HW mirror

DB2 MIRROR

DB2 MIRROR – Ultimate HA

RPO = last Transaction (Sync)

Last Transaction



RTO = immediate (Active-Active)

Immediate

As close as you can get now – but you still need DR

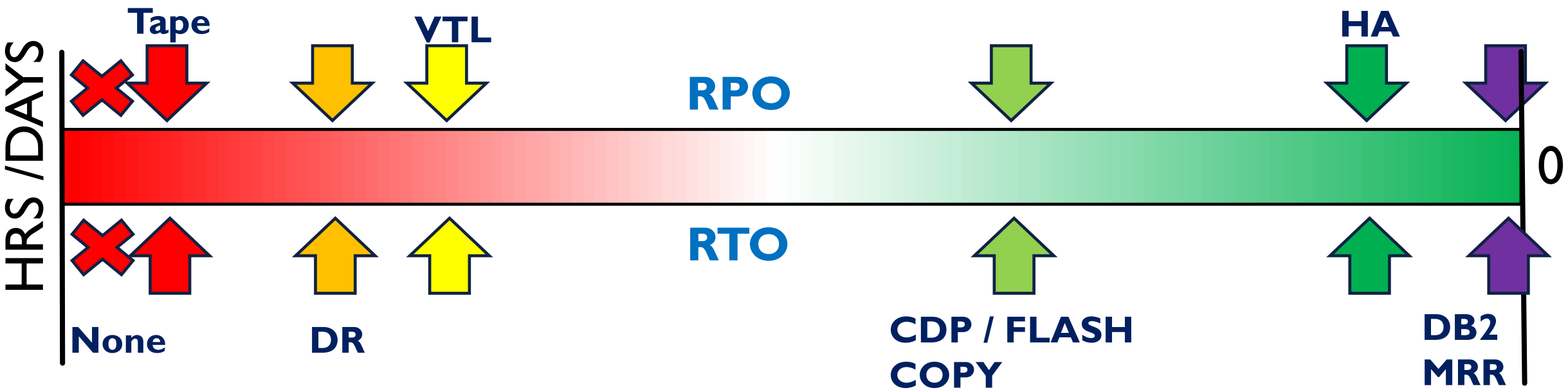
DB2 MIRROR

IBM i AVAILABILITY - SUMMARY

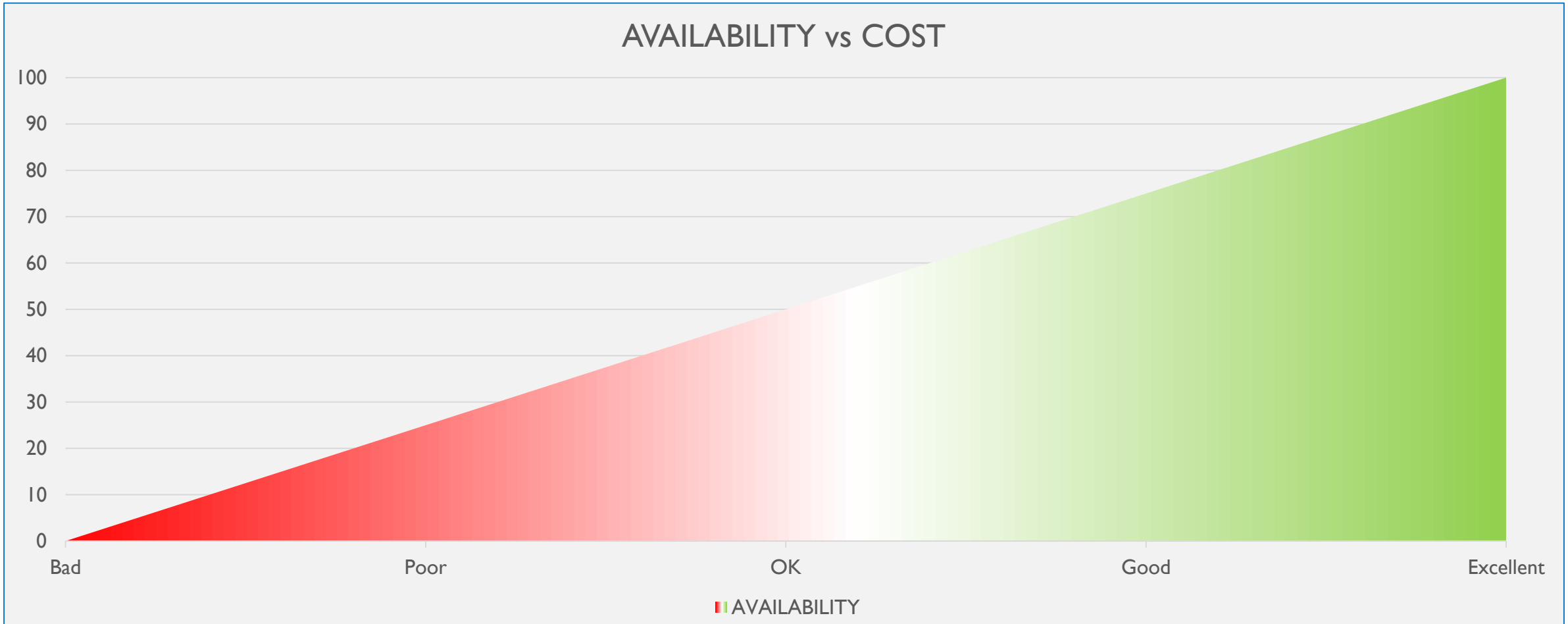
- BACKUP – you can improve
- DR / HA – define your objectives
- You get what you pay for

SUMMARY

RPO = the where
RTO = the how long



SUMMARY


AVAILABILITY vs COST
100
90
80
70
60
50
40
30
20
10
0
Bad
Poor
OK
Good
Excellent
AVAILABILITY

SUMMARY

THANK YOU

RICHARD FIELD

+44 7801 257036

RICHARD.FIELD@POWERCONSULT.ORG.UK