This slide deck for offline viewing:

https://github.com/ewbarnard/dragons

Here Be Dragons

Finding the Joy in Software Development

Edward Barnard, 2021 Midwest PHP

Book coming Summer 2021

Here Be Dragons

So Say the Gatekeepers

- Strong tendency toward “gate keeping” in 2020s
- Senior developers warn “there be dragons” while announcing a “hands off” policy toward crucial areas of code base
- You and I need to get past that
- Where’s the fun when you can’t touch the dragons?

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Gate Keeping

The UNIX Guru

- *Computer Holy Wars:* Hold it right there, buddy
- That scruffy beard… those suspenders, that smug expression
- You're one of those condescending UNIX computer users!
- Here's a nickel, kid. Get yourself a better computer.

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The UNIX Guru

My Visits

- First visit — “it’s in the *man* page”
- Filesystem checks after editing the root filesystem in single-user mode — “it’s in the *man* page”
- Empty data structure passed to a system call and eventually passed to my device driver — “it’s in the *man* page”
  - But it wasn’t in the man page — “it’s in the code”
  - I showed him the code

The UNIX Guru

Do you see the problem here?

- Our Guru did not want to “dumb down” the discussion for his audience
- If you want to work with the Guru, you need to rise to his or her level, not the other way around
- You’re expected to *work* for it, just like the Guru did in the first place
- Show a willingness to “pay your dues”

With respect, I disagree.

“If I have seen further than others, it is by standing on the shoulders of giants.”

— Sir Isaac Newton (1675), likely quoting Bernard of Chartres (1159)

The Modern Guru

Yours is the shoulder

- ***Bring*** people up to your level, in the small things and big things
- It's on ***you*** to explain over and over
- Work within the ***other*** person's context
- Example — helping a family member with phone privacy settings, explaining over and over, helping develop changed habits

When you ARE the Guru

Yours is the shoulder

- We don’t extend the craft by expecting everyone to “pay their dues” like we did
- We extend the craft by helping others ***exceed*** our own mastery
- Yours is the shoulder of giants — it’s on you to help others see further

But what if I’m not the Guru?

Dune by Frank Herbert (1965), pp. 65-66

Learn that you can learn

"Many marked the speed with which Paul learned the necessities of the planet Dune. The teachers, of course, know the basis for this speed. For the others, we can say that Paul learned rapidly because **his first training was in how to learn**. And the first lesson of all was **the basic trust that he could learn**. It is shocking to find how many people do not believe that they can learn, and how many more believe learning to be difficult. Paul knew that every experience carries its lesson."

Quote slightly edited for clarity.

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Let’s Have Fun With the Dragons!

My NSA “Mug Shot”

The safe-arrival call

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MINNEAPOLIS — Network Systems Corp. (NSC) this week will announce a series of enhancements to its Remote Device System (RDS) channel extender line that will enable the units to support remote mainframe storage devices as if they were locally attached to a host.

The company also plans to unveil a new line of channel extenders to support links to tape drives.

Mainframe channel extension for direct-access storage devices (DASD) will enable users to augment disaster recovery strategies by deploying IBM or third-party DASD or tape drives at remote locations and using them to back up data as it is written to local drives.

the remote DASD unit a full set of command sequences, instead of forcing the unit to process one sequence and echo back to the host for additional instructions, thereby creating delays.

"We behave as if we were the true mainframe channel," Corneille said.

DASD support on the RDS lines is being offered as a free upgrade to existing users, while base prices for the RDS models will remain unchanged for new customers.

Corneille also said it added a multihop support feature to the RDS line that enables the channel extenders to route data over sev-

The software emulates an IBM channel control program over the wide-area connection, giving

channel speeds. The RDS Printer Support Application is available

(continued on page 29)

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"By the very nature of a disaster recovery plan, you should want your critical data volumes accessible at a remote location."

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COMMANDS AND INSTRUCTIONS

COMMANDS

Commands executed by this subsystem fall into one of the following three categories:

1. Burst Commands
2. Motion Control Commands
3. Non-Motion Control Commands

The table on this page and the one on 40-008 list the subsystem commands and command codes. Commands not listed will set COMMAND REJECT.

Programming Note: The 3803/3420 subsystem has no interlocking to prevent improper sequencing of write- and read-type operations that may result in writing extraneous bits or leaving partial blocks on tape. Avoiding these improper sequences is a program responsibility.

Avoid the following two basic sequences:

1. A write-type operation after a forward read-type operation **except**:

   a. When the block or Tape Mark (TM) read is known to be followed by a TM. A tape mark is a special block used to separate files.

   b. When the block or TM read is known to have been followed by erase record gap (ERG) or is known to have been the last block written before a backward operation.

   For example: **R R W* avoid.**
   W B R W* allowed.

2. A read forward-type operation following write-type

* indicates the logical record on which problems may occur.

Because it may be difficult or impossible to ensure the above safe situations, a write after read forward sequence should be used only in applications where mat and command sequence exists.

following a backspace. Assume the at with labels where * is used to

* EOF * HDR * DATA SET * EOF **

set involves the following . After processing the next to TM, read foward to verify the header (HDR) label of the last data set, backspace, write a new HDR, and rewrite the data set. If a new data set is being added, the read forward verifies the second consecutive TM, and thus, the true end of a data set on this tape. A backspace, write new HDR, etc., completes the sequence.

Burst Commands	Command Byte 0	1	2	3	4	5	6	7	Hex
Write	0	0	0	0	0	0	0	1	01
Read Forward	0	0	0	0	0	0	1	0	02
Read Backward	0	0	0	0	1	1	0	0	0C
Sense	0	0	0	0	0	1	0	0	04
Sense Reserve	1	1	1	1	0	1	0	0	F4
Sense Release	1	1	0	1	0	1	0	0	D4
Request Track-In-Error	0	0	0	1	1	0	1	1	1B
Loop Write-To-Read	1	0	0	0	1	0	1	1	8B
Set Diagnose	0	1	0	0	1	0	1	1	4B

Motion Control Commands	Command Byte 0	1	2	3	4	5	6	7	Hex

Non-Motion Control Commands	Command Byte 0	1	2	3	4	5	6	7	Hex
No-Operation	0	0	0	0	0	0	1	1	03
Diagnostic Mode Set	0	0	0	0	1	0	1	1	0B
Mode Set 1	See 40-008								
Mode Set 2	See 40-008								

BURST COMMANDS

Burst commands transfer data across the channel/tape control interface. Channel End and Device End are signaled when the operation is complete (ending status).

The burst commands are:

Write
Read Forward
Read Backward
Sense
Sense Reserve
Sense Release
Request Track-In-Error
Loop Write-To-Read (maintenance aid*)
Set Diagnose (maintenance aid*)

* Diagnostic programs issue maintenance aid commands via start I/Os (SIOs) that are op-codes in the Channel Command Word (CCW).

WRITE

Write records data on tape as it moves forward and creates an interblock gap (IBG) at the end of each block. The tape control checks the parity of each data byte received from the I/O interface.

3803-2 / 3420
Magnetic Tape Subsystem
Maintenance Manual

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Key Skill: Finding Patterns in the Noise

Let's examine 142857

- Multiply by 2 — 285714 (left circular shift of two digits) 14 2857 → 2857 14
- Multiply by 3 — 428571 (left circular shift one digit, first digit moved to back)
- Multiply by 4 — 571428 (left circular shift four digits)
- Multiply by 5 — 714285 (left circular shift five digits)
- Multiply by 6 — Guess what? See the pattern? Does it hold? What's left?

Key Skill: Finding Patterns in the Noise

Let's examine 142857

- Multiply by 2 — 285714 (left circular shift of two digits)
- Multiply by 3 — 428571 (left circular shift one digit, first digit moved to back)
- Multiply by 4 — 571428 (left circular shift four digits)
- Multiply by 5 — 714285 (left circular shift five digits)
- Multiply by 6 — 857142 (left circular shift three digits)
- Multiply by 7 — 999999 (game over!)

Key Skill: Finding Patterns in the Noise

Let's examine 142857

- The pattern comes from decimal fractions
  - 1/2 = .5, 1/3 = .333…, 1/4 = .25, 1/5 = .2, 1/6 = .18666…
  - 1/7 = .142857 142857 142857… (there's our number)
  - 2/7 = .285714 285714…
  - Is there a point to this weirdness?

Key Skill: Finding Patterns in the Noise

I solved the NSA problem by spotting a bit of weirdness

- In the noise of continuous data transfers, we spotted a sequence that should not be there
- We noted the *wrong* pattern was in the noise
- This is an extremely useful skill — if you can develop it
- I have a theory about developing that skill…

Achieve weirdness,
and in the process you get better at
spotting the weirdness,
and you'll be finding the problems (bugs)
that nobody else can.

But the process starts by gaining the skills.

Dragon Wrangling

Why Bother?

- Once you're the expert, have fun with it!
- Expect to put in the work to *become* the expert
- Expect to always be learning — our industry evolves (remember *Dune*)
- Gain that "been there done that" confidence as you put in the work to continue learning over and over again

“Experience” Has Its Own Schedule

“Testing” vs “Production” — embrace the adventure!

“We made it!”

“Partying at the summit
without the summertime crowds”

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On the Shoulders of Giants

Build Trust, Earn Trust

- Many newbies want all the answers, NOW. Don't be that person.
- Learn to learn. Learn how you best learn — so that you can put in the work, gain the skills.
- Expect to be continuously learning — and that it's up to you.
- You be "the shoulder" in small things, and when the big things come, you'll know what to do.
- Find ways to help others *exceed* your own mastery.

Some take off like a rocket, never to return

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“If I have seen further than others, it is by standing on the shoulders of giants.”

— **Future You, just chillin amongst the dragons**

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