

Research Methods

CSCI 8901:
Deliberate Practice & Being Productive

Prof. Tim Wood
GWU

Composers

How long after one becomes interested in music is it that one becomes world class?

- John Hayes, psychologist

Studied 500 “masterworks” pieces by 76 composers

When did they produce their world class music?

Composers

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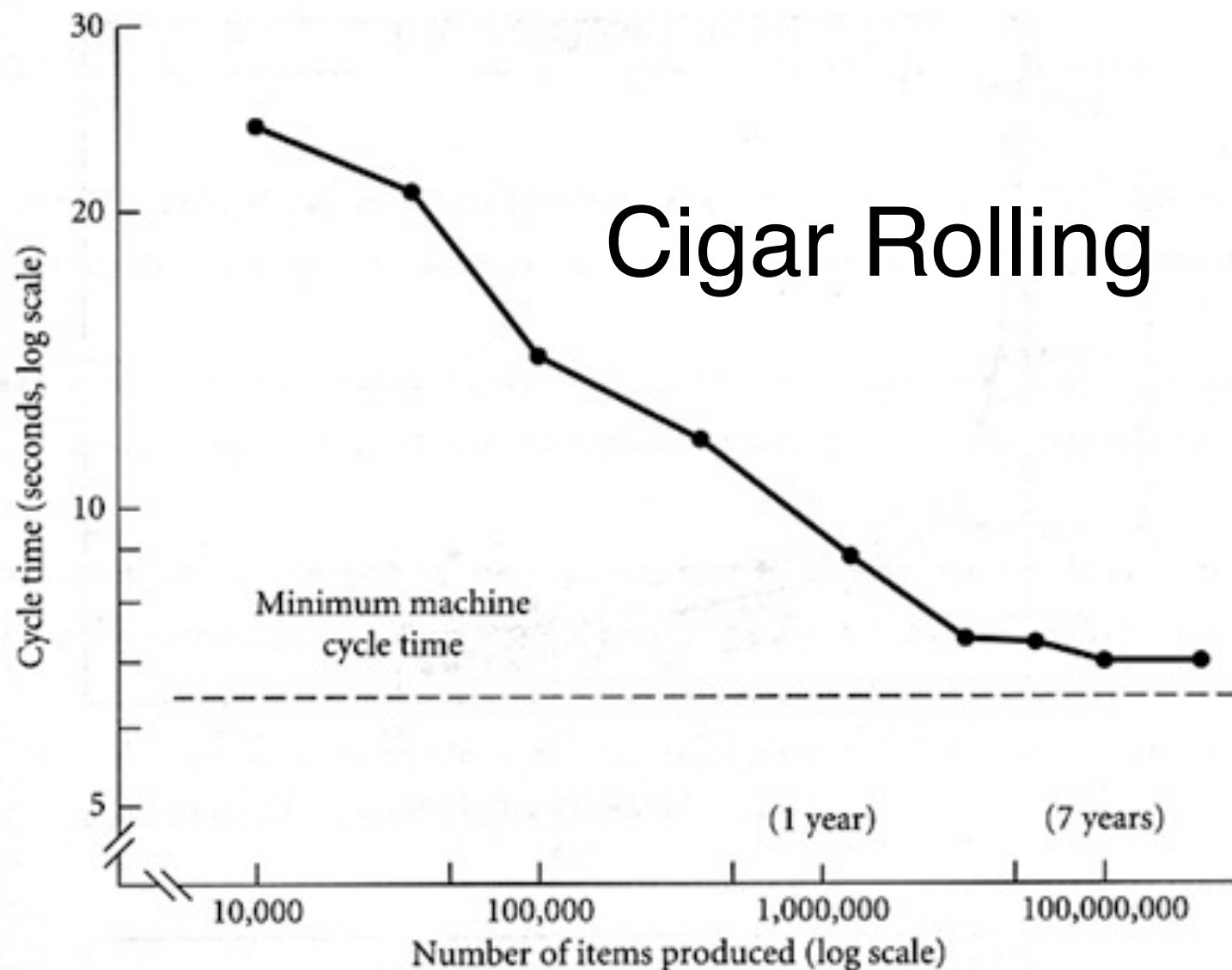
Studied 500 “masterworks” pieces by 76 composers

When did they produce their world class music?

All but 3 of the 500 happened after 10 years of practice

The Value of Practice

"The world record for blindfold chess has been broken by Timur Gareyev, a 28-year-old US grandmaster. He played **48 games simultaneously... wearing an actual blindfold** and taking 23 hours, all the while on an exercise bike on which he rode the equivalent of 50 miles." -- The Guardian, 2017



Masters can accomplish things that "normal" people cannot dream of!

The Road to Excellence

It takes 10,000 hours to master a skill

- (maybe)

That's 5 years of 40 hour weeks focused full time on being a researcher

About the time of a PhD...

Deliberate Practice

How to practice effectively?

Practice that is purposeful and systematic

- Not just repetition

You need to get feedback on your work

- Very difficult to do this by yourself

You need to adjust what you do to ensure you are always challenged

- Set targets for what you want to accomplish and see if you meet them

Anders Ericsson

Researched how to study more effectively in 1970s

Asked Steve to memorize a string of random numbers

Expectation: people can keep ~7 things in short term memory at a time

Let's try...

Next slide has a string of 10 digits.

Try to memorize as much of it as you can!

- Left to right order

Don't write anything down!



1 6 3 9 5 3 5 9 4 2



and let's sit for a moment...

Memory?

Write down as many digits as you can remember

How many did you get?

1 6 3 9 5 3 5 9 4 2

—————→ until first incorrect digit

Remembering Numbers

Remember this 5 digit number:

4 5 1 3 6

Get it right? Remember this 6 digit number

- Increase length by 1

Get it wrong? Remember this 4 digit number

- Decrease length by 2

Repeat... for 200 two hour sessions

Representing Numbers

For many sessions, ~10 was the maximum length Steve could remember

Break through! Got up to 20 digits!

- Changed how he thought of the numbers - envisioned digits grouped on a branch with leaves

Keep going...

Representing Numbers

Eventually could consistently repeat an 81 digit string of numbers!

- Way more than the 7 pieces of information we think people can remember!

How did he get there?

- Repetition
- Clear goal of what to do next (add 1 more digit)
- Immediate feedback loop
- Persistence

Steve and Dario

Ericsson next asked Steve to train Dario

- Taught him his way of representing numbers as branches and leaves

Reached ~20 digits memorized much more quickly than Steve did... then got stuck

Eventually reached 100+ digits, but needed to come up with his own representation strategies

What worked?

What can we learn from Steve and Dario?

Ericsson's Core Components

Deliberate practice requires:

- Specific goal
- Intense focus
- Immediate feedback
- Frequent discomfort

Most activities are more complex than memorizing digits!

Mental Representation

Experts can:

Hold complex situations in their minds

- 40+ chessboards in your head at once

Make accurate predictions

- Anticipate how the other sports team will respond to a play

Condense information

- Reduce a 100 digit string into easier to remember chunks

Expert Coaching

Getting advice and feedback from someone who is already an expert can accelerate your learning!

Your advisor is an expert on many things

- But possibly not the specific details of your next research project!

Specific Goal

What do you want to get better at?

Intense Focus

How can you better focus on your work?

Immediate Feedback

How can you quickly find out what you are doing well or poorly?

Frequent Discomfort

How can you push yourself beyond your comfort zone?

Deliberate Practice for Research

Most people talk about deliberate practice for “easily” trained skills

- Memorizing numbers
- Swinging a tennis racket
- Learning a new language
- Learning a new programming language

How can we apply the same concepts to our research?

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How to put in your 10,000 hours?

Lots of distractions!

Material adapted from Jensen's Research methods course

Do it all



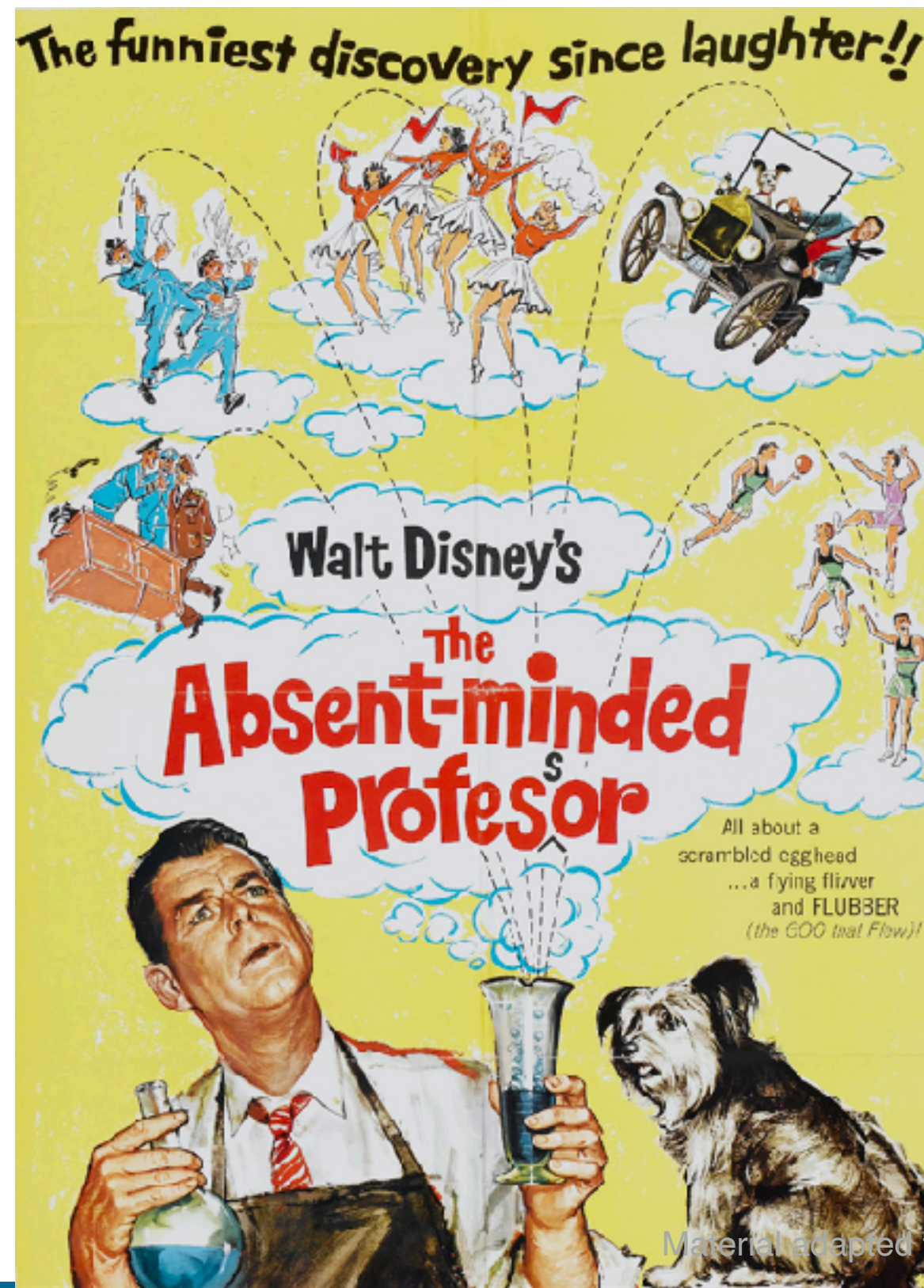
Material adapted from Jensen's Research methods course

Do it now



Material adapted from Jensen's Research methods course

Do what you want



Material adapted from Jensen's Research methods course

Are these effective?

Do it all: Spend more hours than anyone else

Do it now: Focus on the immediate deadlines

Do what you want: Arbitrarily pick and choose, ignoring the parts you don't care about

Material adapted from Jensen's Research methods course

Are these effective?

Do it all: Spend more hours than anyone else

- There isn't enough time to do everything

Do it now: Focus on the immediate deadlines

- Most urgent things are not necessarily the most important

Do what you want: Pick and choose, ignoring the parts you don't care about

- Too selfish; disrupts your collaborations and other relationships

Material adapted from Jensen's Research methods course

Time Management is...

Making progress

Making progress on the right things

Making progress on the right things as efficiently as possible

Making progress on the right things as efficiently as possible and feeling good about it

What do you do?

Strategies

Covey's Priority Matrix

Getting Things Done

- Manageable tasks

Pomodoro

- Timed work

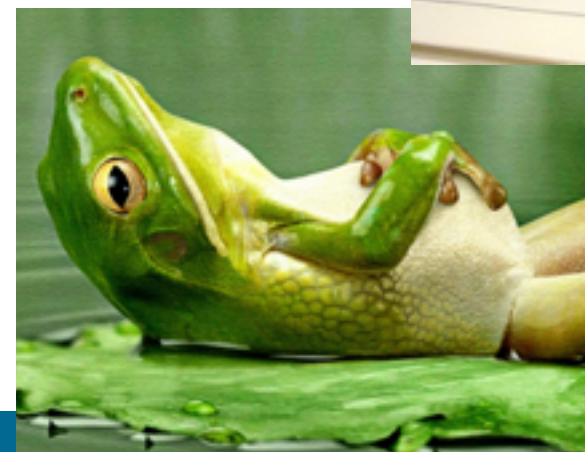
Don't Break the Chain

- Continuous work

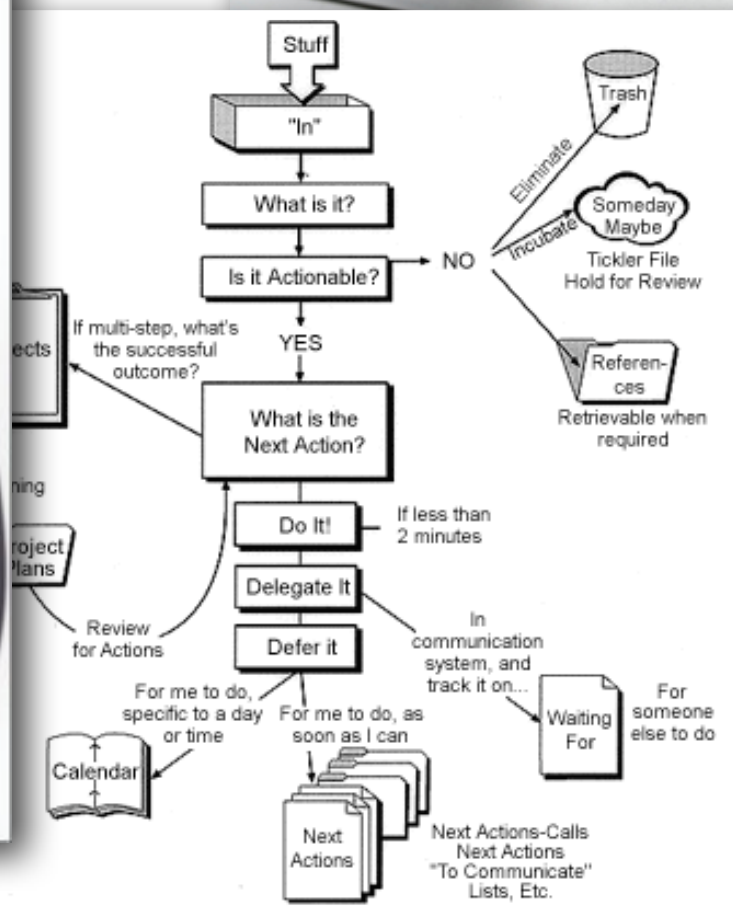
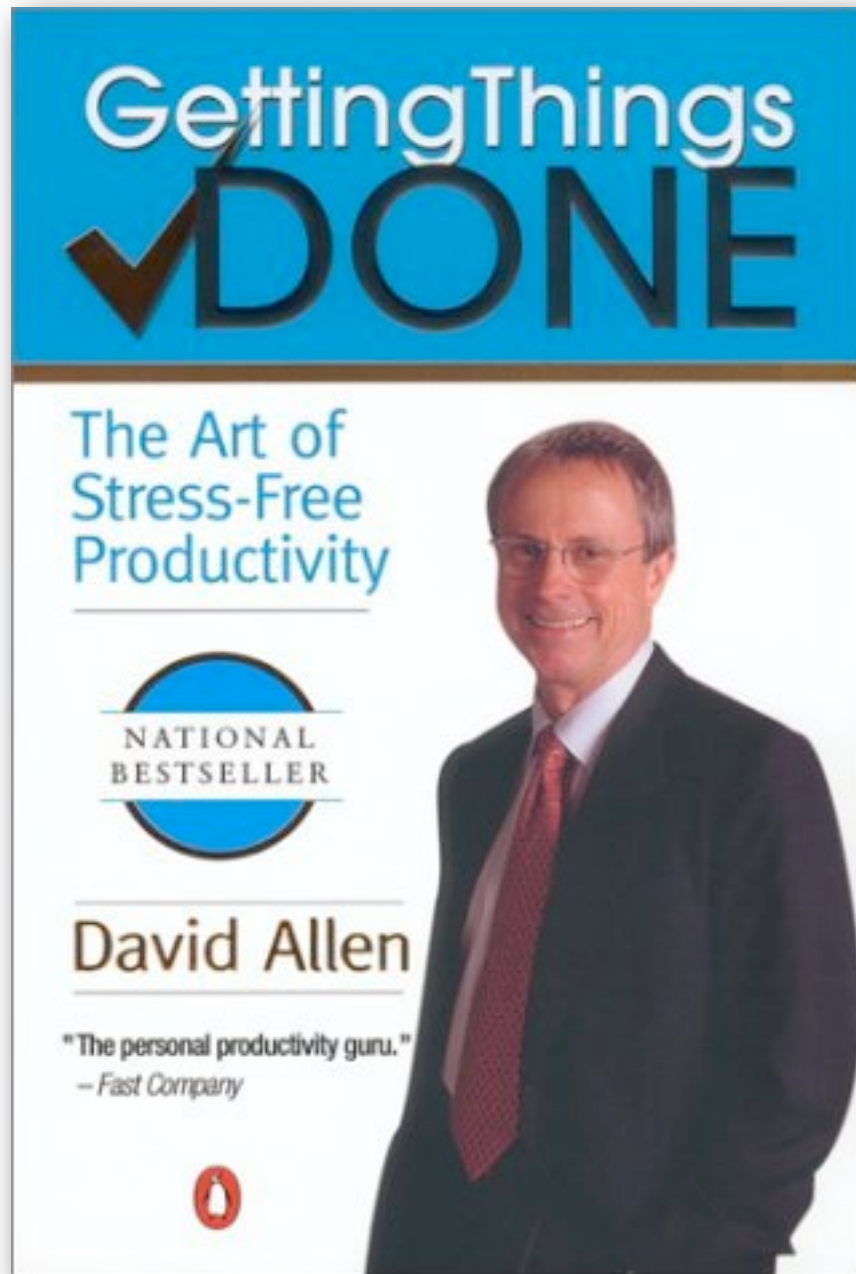
Eat the Frog

- Hardest step first

	URGENT	NOT URGENT
IMPORTANT	I ACTIVITIES: Crises, pressing problems, deadline-driven projects	II ACTIVITIES: Exercise, long-range planning, preparation, preventive maintenance, relationship building, personal growth activities, some leisure
NOT IMPORTANT	III ACTIVITIES: Interruptions, some calls, some mail, some reports, some meetings	IV ACTIVITIES: Trivia, busy work, some mail, some calls, time wasters, some pleasant activities



Getting Things Done



Material adapted from Jensen's Research methods course

GTD Key Ideas

Empty your brain

- Don't use your brain to store upcoming tasks or worries about the future
- Your brain should focus on the work for your current task and next step

Work from zero

- Don't let tasks build up; clear your "inbox"
- This means defining manageable tasks and deadlines

Projects

- Group your tasks into categories and define what is needed to succeed in each area

GTD Key Ideas

Next Actions, not to dos

- Specify what actions you need to take, not a list of high level tasks

Periodic Review

- Evaluate how you are doing and adjust the system as needed

GTD Goals

Not to get more things done

Instead, focus on making good choices about what to do next!

- Identify the work you need to do
- Categorize and prioritize it
- Decide what to focus on
- Periodically evaluate and adjust course

Relieve mental stress and brain space

- Everything important is stored somewhere else
-

GTD: Is this perfect?

Probably not...

Which approach is right for you?

Maybe all of them?

I follow productivity fads

- An approach I use now won't work for me forever

Some approaches/tools I've used:

- Expensive Moleskine notebooks
- GTD
- Pomodoro
- Pivotal Tracker
- Evernote
- Remember the Milk, Wunderlist, Todoist

My Current Approach

Dropbox Paper

- Allows easy mix of text notes and todos
- Bulleted notes about each day
- Weekly todo lists with key tasks to focus on

Benefits:

- Everything in one place
- Memory

September 25, 2018

- Wei AT&T
 - need to validate testbed is working - use simpler forwarder than LB
 - need to ensure packets aren't too large
 - TRES was adding VLAN headers - this may have caused traffic to be dropped by cloud lab switch?
 - Test with min size UDP packet PCAPs
 - need to understand where traffic is being dropped
 - running out of flow table space
 - simple way to do flow deletion - delete flow once it has received X packets, where X is the size of the PCAP
 - if only using 5,000 con/sec it should last many minutes with 60million flow entries
 - why is it running out in seconds?
 - BESS isn't making time stamps right
 - Maybe b/c need to add VXLAN header to offset?
 - USAA
 - Cancelled independent assessor
 - Paul Davis Restoration - in EC
 - will contact us within 24 hours



September 24, 2018

- KK
 - Michael should look at CoNext submission
 -

Weeklies

- 2113 quiz review
- 2113-data-structures-module
- 2113 data structures project
- 6421-add-containers-to-slides
- CSR+NeTS thing
- more-EOS-planning-

My Current Approach v2

The screenshot shows a Trello board for 'SmartNIC' with several columns: 'Problems needs to figure out', 'Todo', 'Doing', 'Done', 'SmartNIC flood Papers', and 'SmartNIC relevant Project Thoughts'. The 'Doing' column contains a diagram of a network stack. The 'SmartNIC flood Papers' column includes a 'DDoS' graphic and a 'SYN flood DDoS attack' article. The 'SmartNIC relevant Project Thoughts' column features a bar chart comparing 'Application over eRPC is fast'.

Problems needs to figure out

- Metrics we may focus
- type of smartNIC to use?
- Flood attack Data Introduction
- Possible Functions of the project

Todo

- AccelTCP Installation
- Floem paper may be good to be read
- IPipe borrows some techniques approaches from related RDMA projects RDMA.
- Performance testing of Bluefield SmartNICs

Doing

- Nokia White Paper

Done

- SmartNIC-synflood google slides Link
- Mtcp installation and test by syn flood
- Ngix Server Configuration to make the largest # of active connections.
- Test ngx without random IP for hping
- gather data for mTCP with random IP hping

SmartNIC flood Papers

- SYN flood DDoS attack | Cloudflare
- SYN cookies ate my dog - breaking TCP on Linux

SmartNIC relevant Project Thoughts

- Flood Attack Defense
- Encryption of user information
- Problems NanoPU presents
- Application over eRPC is fast
- SmartNIC trade-offs
- My idea plus
- Network Aggregation(Link Aggregation)?

Set Goals

What do you want to accomplish...

- in the next 7 days?
- by the end of the semester?
- by the end of the summer?

*People **overestimate** what they can do in a week and **underestimate** what they can do in a year!*

Do this every semester/month/week!

Important part

Have some kind of system...

Adapt as needed to be sure you are being effective

Best part of being a PhD student...

Freedom to do whatever you want, whenever you want!

Worst part of being a PhD student...

Freedom to do whatever you want, whenever you want!

Learn to use a calendar

Mark out blocks of time you will spend on different types of work

- Courses, thinking, reading, coding, writing, etc

Use calendar invites!

Tue 22	Wed 23	Thu 24	Fri 25
Go to DC Work	Go to DC Work		Go to DC Work Gutter replacement
			9:30 AM SEAS Personnel Meeting
10 AM PhD status updates	10 AM Student Slots 10 AM CS faculty meeting	10 AM Zhen/Tim	
11 AM Dr. Wood Meeting School of Engineerl...	10:30 AM Sibren 11:30 AM Women faculty luncheon		11 AM Kevin?
	12:45 PM CSCI 8901 Research...		
1 PM Student Slots 1:15 PM look at d...	Dave and sydney		1 PM Student Slots 1 PM ONVM MS meeting
Grace Liu: Meetings	Dave and nicole		2 PM Aspiratio... GW...
Nick: Meetings	Student... review d...		Grace Liu: Meetings
	Ratnadeep Bhattacha...		
	4:30 PM ONVM Meeting		

Put in the time

Working hard does pay off

- But you need to work effectively

There is no way to hit your 10,000 hours if you aren't putting in a full work week

How do you spend your time?

