ACCU 2023

KEYNOTE:
THE MEDIUM IS THE MESSAGE

STEPHANIE BRENHAM

Stephanie Brenham

- Rendering Lead Programmer at Ubisoft Toronto
- Far Cry 6: Navgtr for Outstanding Graphics 2021
- Oscar Award Winning Maya
- First programming job: Homeproject.com

Setting the Stage

- Worked in a lot of different types of productions
  - from start up software companies to AAA games

- Commonality to building a collaborative cross functional teams

- Tech needs to match the wider context
  - From research to software products to games and games engines

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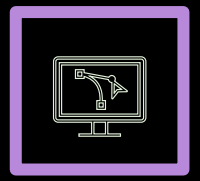

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Chromatic Aberration

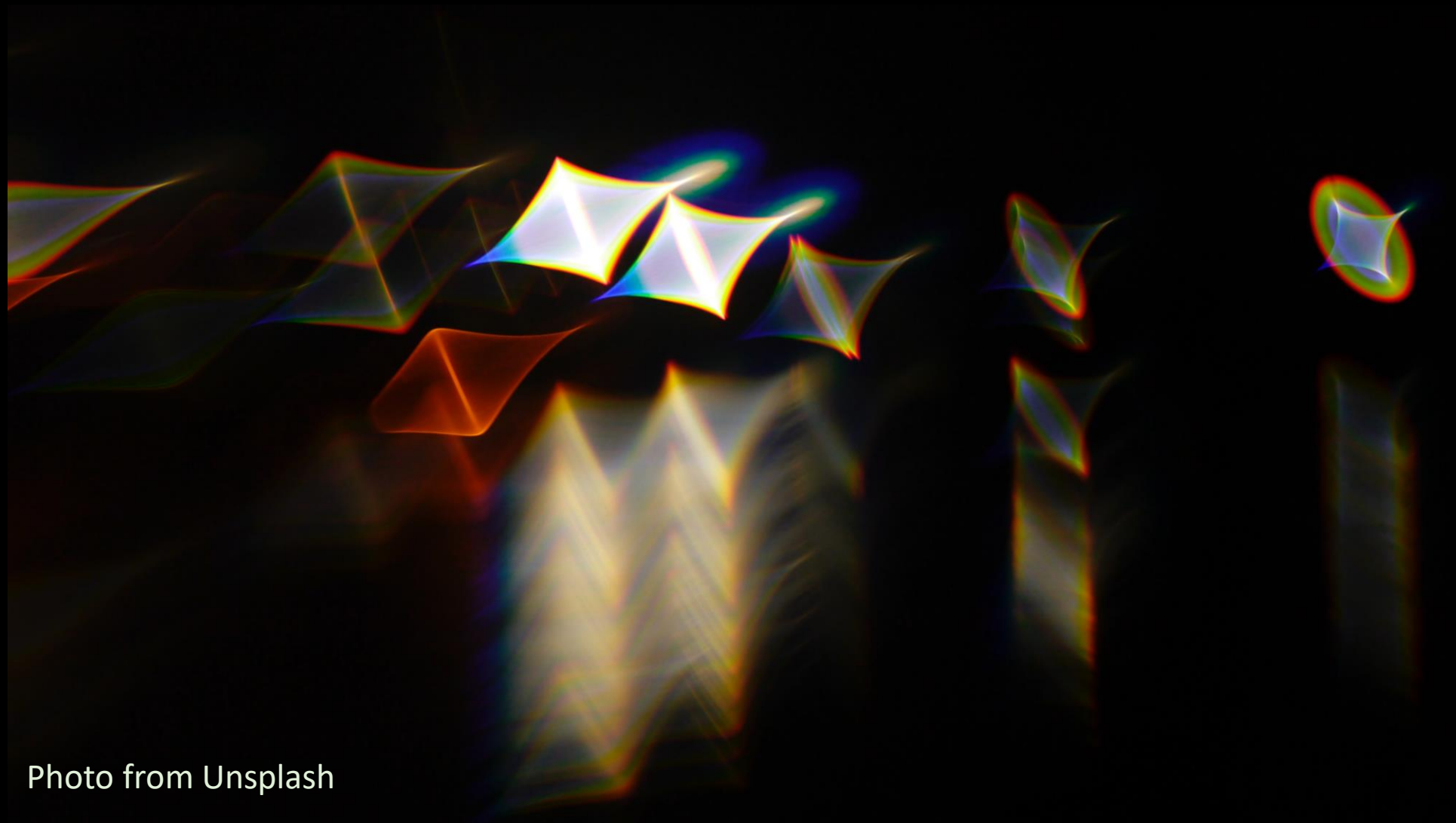
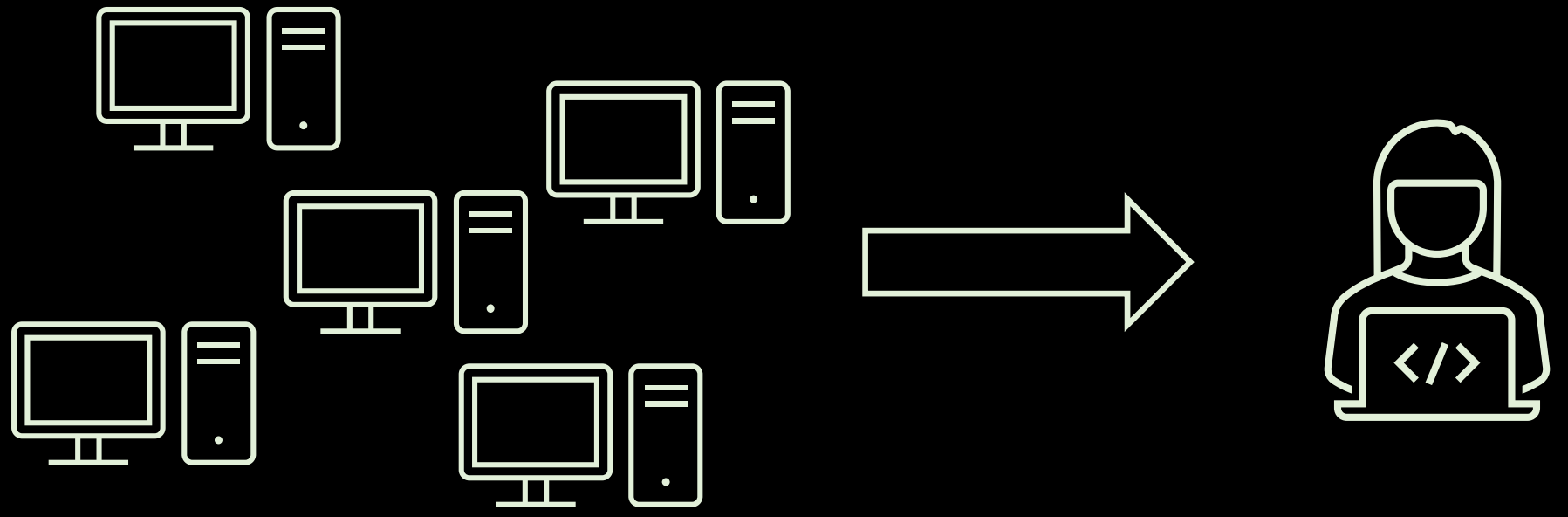


Photo from Unsplash

Film & VFX Workflow



Render Iterations: Overnight

Post FX Iterations: Minutes

Tech As a Service

- Obvious question: What are we trying to create?

- Focus of My Career: Bringing art to people through tech
  - Artist workflows are not something most programmers understand

Cross functional teams: Who, What, How, and Why

The Key Questions

- Who can represent the client perspective?
- What is your tech supposed to do?
- How will it get done?
- Why should it do that?

- Programmers & Research Scientist supply the how
- Clients provide the what and the why

The Missing Why

- Programmers & Research Scientist
  - Great at speaking to the What and the How
- Many overlook the Why
- Understanding Why Gives Us
  - Appreciation for client motivations
  - Knowledge of client workflows

An Example of What

```
void Skeleton3D::execute_modifications(real_t p_delta, int p_execution_mode) {
	if (!modification_stack.is_valid()) {
		return;
	}

	if (modification_stack->skeleton != this) {
		modification_stack->set_skeleton(this);
	}

	modification_stack->execute(p_delta, p_execution_mode);
}
```

When You Add the Why

```
void Skeleton3D::execute_modifications(real_t p_delta, int p_execution_mode) {
	if (!modification_stack.is_valid()) {
		return;
	}

	// Needed to avoid the issue where the stack loses reference to the
	// skeleton when the scene is saved.
	if (modification_stack->skeleton != this) {
		modification_stack->set_skeleton(this);
	}

	modification_stack->execute(p_delta, p_execution_mode);
}
```

The Comments Tell the Why

- Code should clearly show what is being done
- The hidden need for Why
  - Why was this implementation chosen instead of other alternatives?
  - Are there specific lines needed to prevent issues later? Why?
- Code should show What, Comments should show Why

Using Data To Inform the Why

- Clear reasoning doesn’t rely on opinions only
- Use data to inform why you make decisions
- Triaging
  - Scope/risk of fix
  - Impact on affected customers
  - Estimated % of customer base affected

Not All Progress Is Equal

Photo by Kevin Den Heijer on Unsplash

Why – The North Star

- The path to success is not a straight line
- The feature set we are building often changes
- Use Why to ensure that work is still relevant

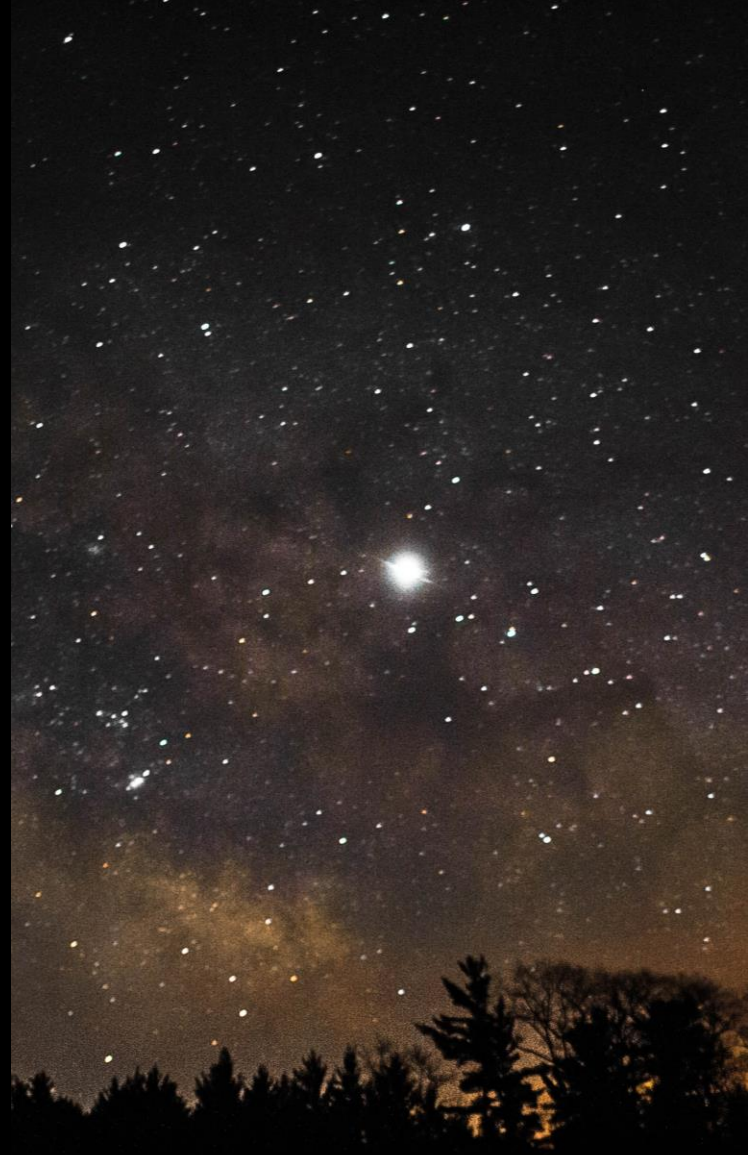


Photo by Mike Setchell on Unsplash

Research and Production

- Research
  - Figuring out if ideas work
  - Usually aimed at fitting into the company's ecosystem of tech
  - The goal is to conclude by integrating into a product

- Production
  - Aims at specific markets for profitability
  - The goal is to be cyclical in nature
  - Provides solutions that scale over time

Research with Production as a Client

- Productions are the ones responsible to bring the vision to life
- Aim for light weight relationship throughout development
- Give ownership to a representative from research and production
  - Own problem solving not pointing fingers

Prototyping: World between Worlds

- Needed to prove riskier ideas
- Flexible and process light
  - Local builds and tests are fine for most things
- Two main uses cases for prototypes
  - Unclear the approach will work in the current code base?
  - Needs isolated testing outside the complex code base?

Production: Proof is in the Pudding

- Doesn’t mean anything till it’s shipped

- 80% of the stress is in the last 20%
  - Production needs to speak to every decision

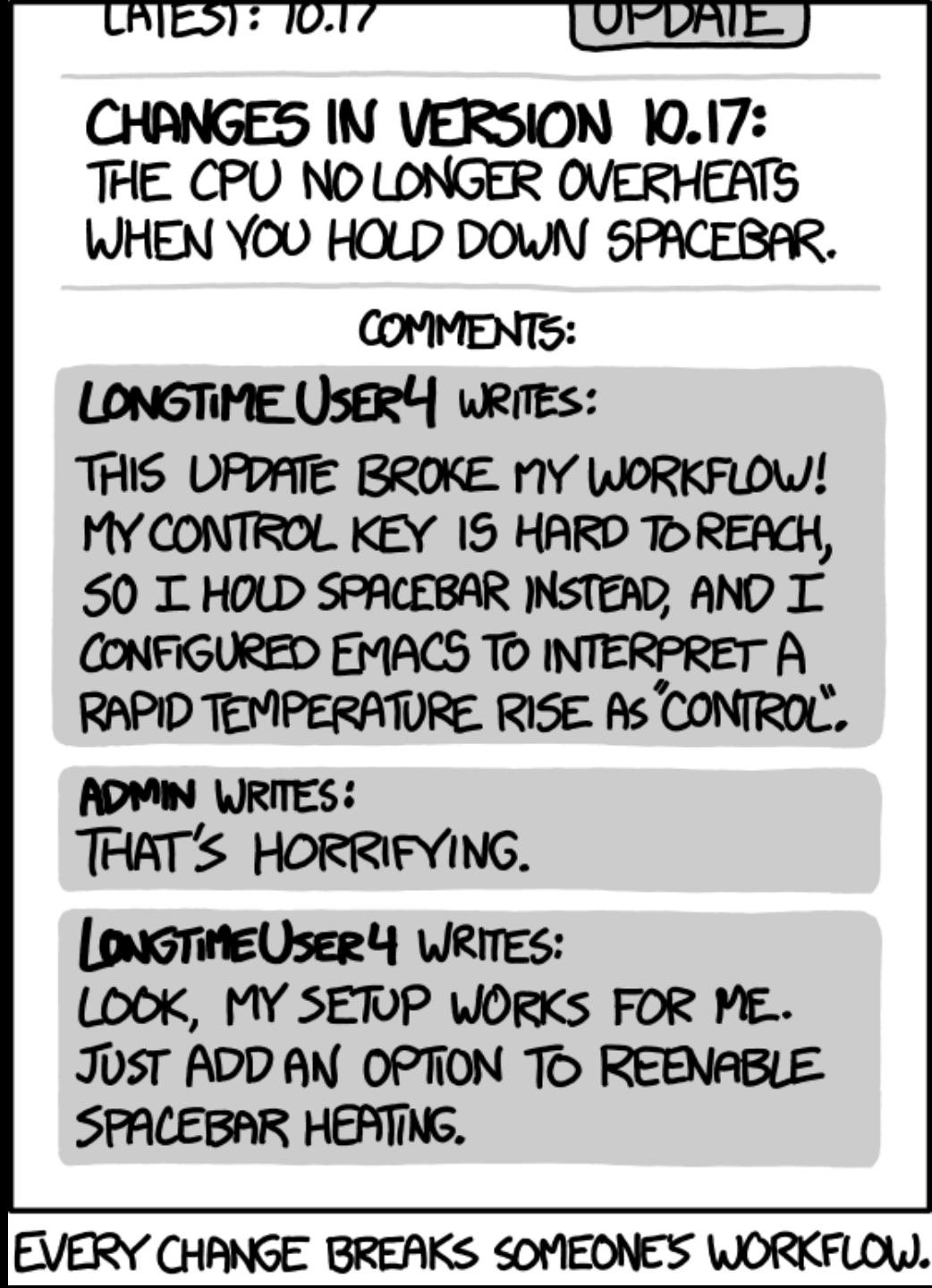
- The value of decisions often isn’t evident until you’re shipping

Maya is a Career Software

- People build entire careers using primarily Maya all day long
- More willing to accept complex workflows to achieve exact results
- Reduce a key workflow from 10 clicks to 3 clicks: Hero!!
- Entire release focused on workflow improvements

The Risk Of A Large Established Product

Many thanks to XKCD for this comic!



Hyrum’s Law

With a sufficient number of users of an API,
it does not matter what you promise in the contract:
with time all observable behavior of your system
will be depended on by somebody.

Maya and the Golden Path

- More paths
  - Which path is used where?
  - Updating effort == effort x number of paths
- Code Maintenance: it’s a thing
- Use and Enforce a Golden Path

Photo by Akshay Nanavati on Unsplash

Client Representatives

- Maya is not a part of a Film or VFX house
- Artists were hired to bring the client perspective to Maya

“…[the] most interesting thing we were doing at that time actually was working with Synthesizers but throwing the manuals away… because these things are programmed by high tech buffs who have no idea of what can be done musically.”

David Bowie

Games: Artist in their Native Habitat

- Finding people to represent the artistic vision
  - Art directors – the vision
  - Technical Artists & Leads – confirm the why and the what

- Turning artistic vision into actionable items is a talent
  - What are the elements of an image that impacts us most

- The big little details

Game Production Pipeline

- Focus on productions with bespoke game engines
- Game systems tuned to specific player experiences
- The prime directive of the team is to ship the game

Software vs Games

- Software used to get something done
  - Workflow improvements are key
  - The goal is a making the user feel productive

- Games are entertainment
  - Workflows should not get in the way
  - The goal is immersion

Frame Stutters Are Not Your Friend

- For many tech systems: the less the player notices them the better
- Smooth frame rates produce positive player experiences
  - Fighting games, First person shooters, etc.
- Worst-case performance of an algorithm is critical information

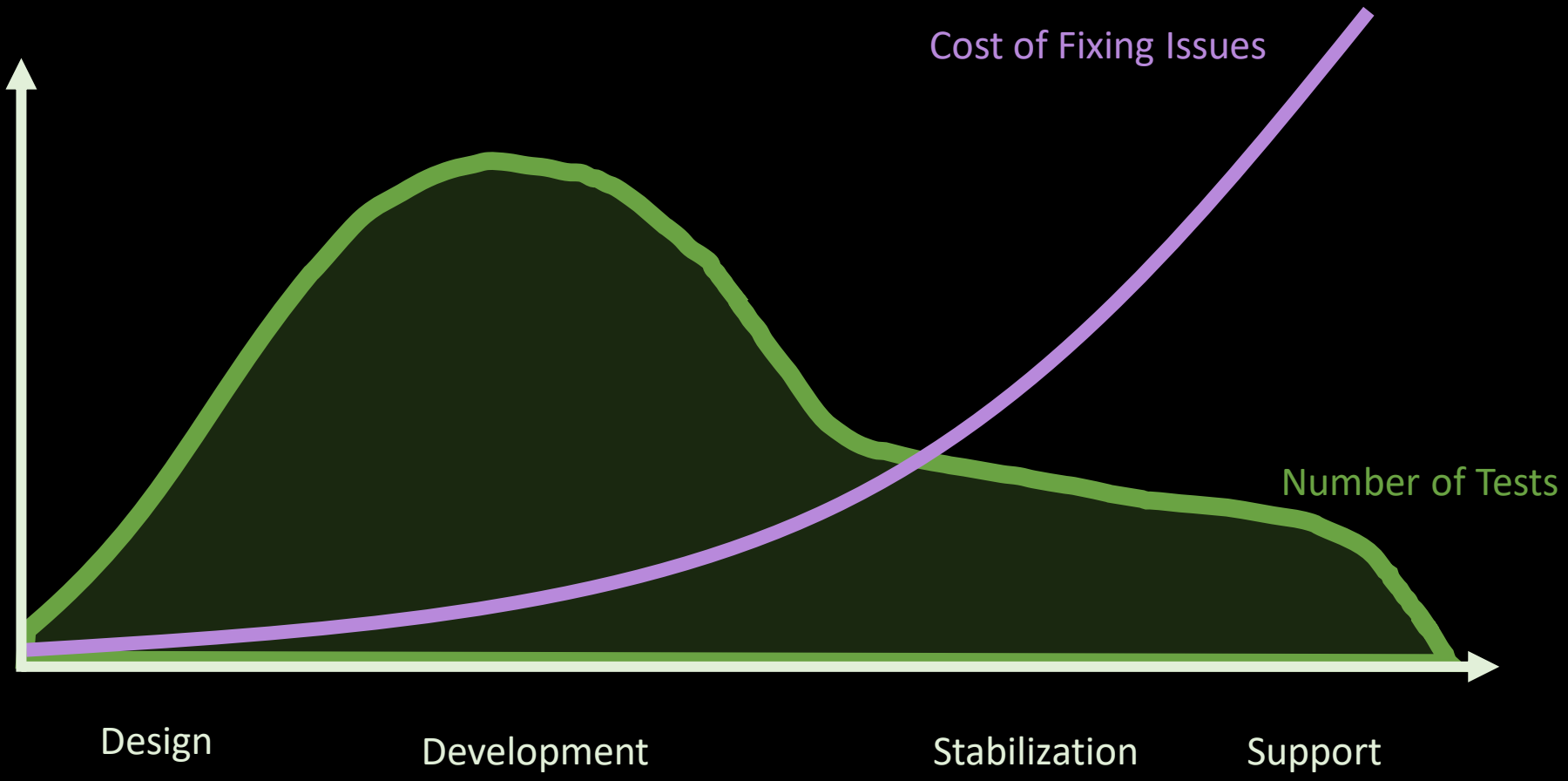
When You Know What Is In the Box

- For efficiency games tech need to be hardware aware
  - Higher level code can be protected
- PC gaming requires compatibility labs
  - Need to support the wide variety of hardware configuration
- Gaming Consoles
  - strict requirements and formal submission process

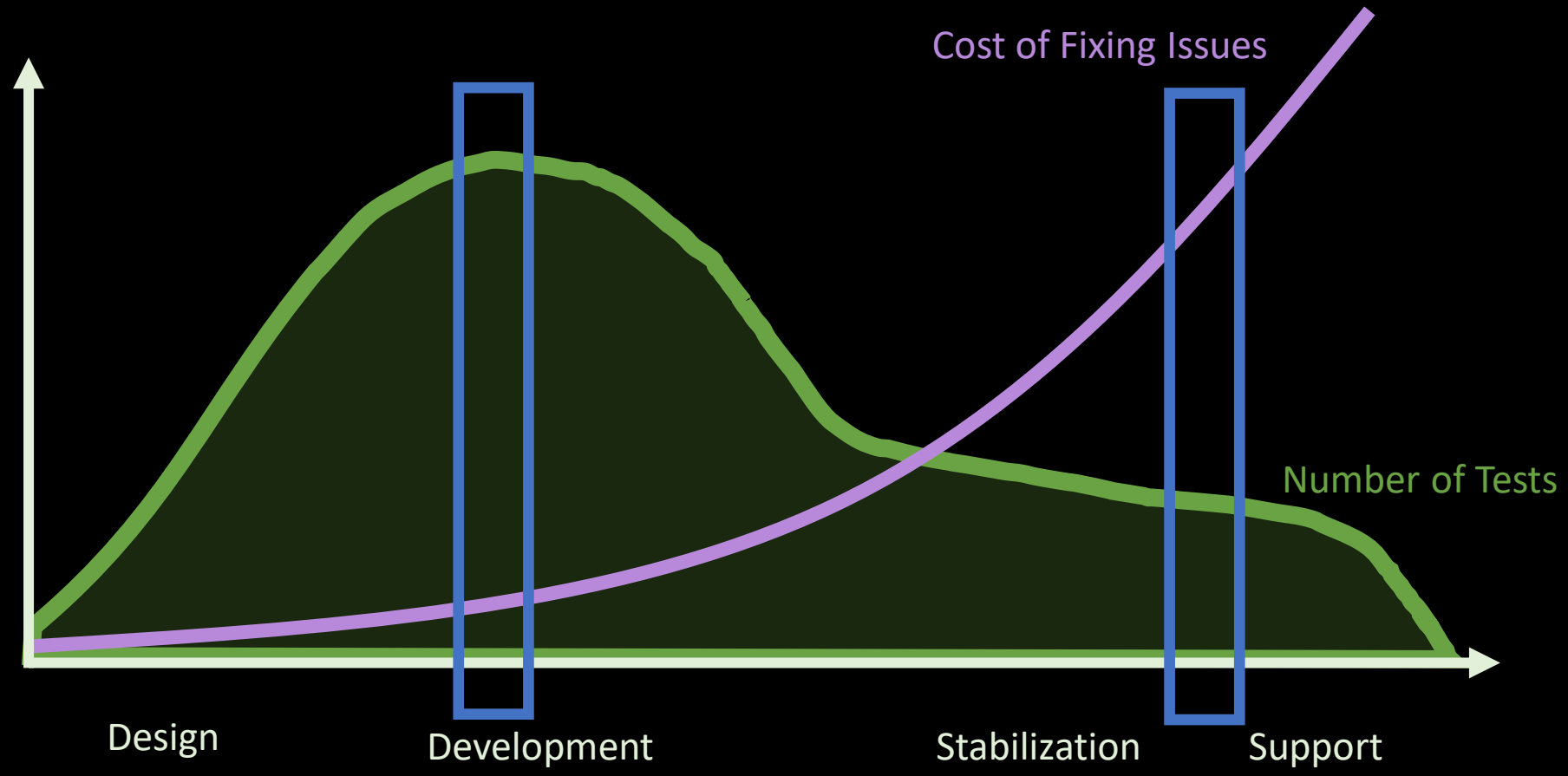
Art Pipeline in Games

- There are more artists and content creators than programmers
  - Animators, Character Art, Lighting, Level Art, UI Art, etc.
- Tech artists and their leads determine how data will be created
- Artists need to fit their work inside tight budgets

Shifting Left



Last Minute Issues? Art It Away



Game Engines as Tech

- Game Engine used by more than one game production/type
- Not all tech agendas are tied a game production

- Prime directive of central team is the game engine’s health

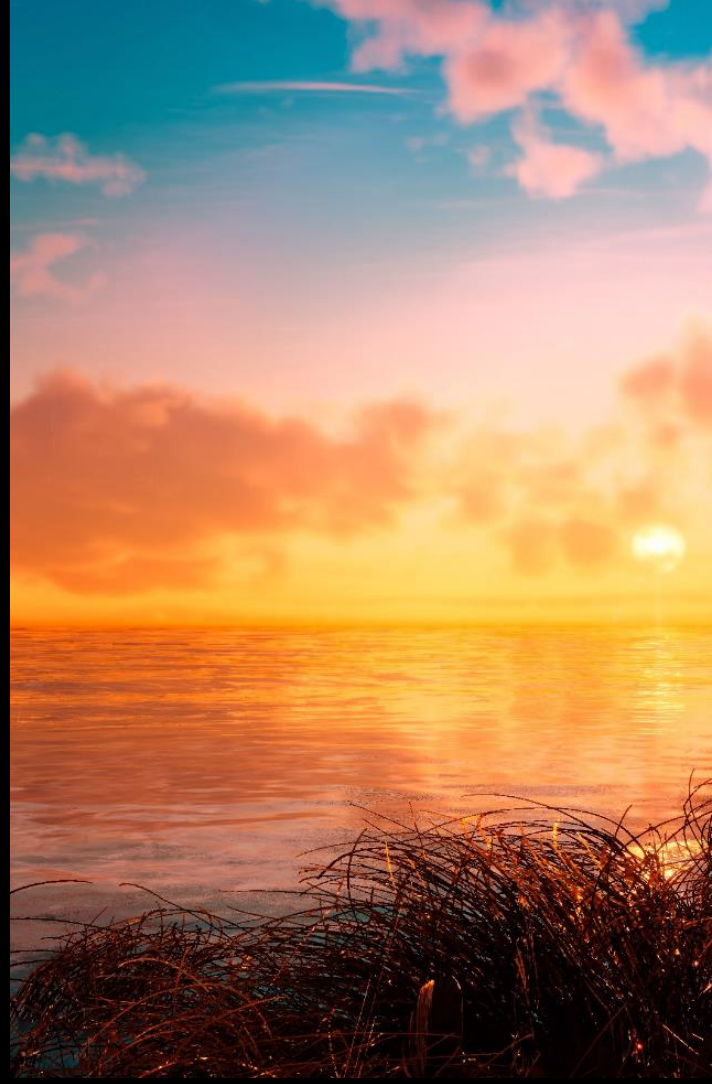
Production Pipeline – Game Engine

- The games productions are the clients
- Game engines want a close relationship with key customers
- Concrete examples prevent over-engineering

Feature vs Tech Foundation

- Game Features
  - Content and features should be paired like fine wine and the meal
  - No tech salads, aim for a cohesive whole
  - Sunsets in Far Cry 6

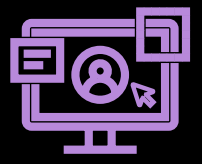
- Tech Foundation
  - Game features are like the light fixtures and taps
  - Tech foundation is the wiring and the plumbing
  - E.g., geometry and texture streaming



Sindy JB 🎮📸
@SindyJ_B

FarCry 6

#FarCry6 #farcry #vprt #photomode #VirtualPhotography #PC

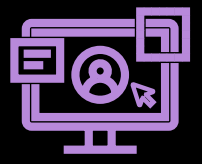


Nothing Tests a Feature Like a Game

- Games have entire teams dedicated to create rich and diverse data
- Many different systems all running at once (UI, AI, streaming, etc.)
- The game engine is like the OS for the game systems

Game Engine: Playing Nice with Others

- Games has a wide ecosystem of content creation
- Game engines as a platform for incorporating content
- Tools programmers ensure the flow of content to engine



Process: Like Getting a Table for Dinner

- Get a table at a restaurant any where in the world
- The job of process is to let us forget the repetitive parts
- Focuses effort on key strengths

Process As a Way to Focus Innovation

- Clear processes to ensure smooth hand off points
- Common processes to reduce duplication
- Standard processes give us a Golden Path
  - Everyone gets to benefit from improvements

Credit to: Software Engineering at Google: Lessons Learned from Programming Over Time.

- Curated by Titus Winters, Tom Manshreck, Hyrum Wright

Many Thanks To Godot

```
/*                          GODOT ENGINE                                */
/*                      https://godotengine.org                         */
/*************************************************************************/
/* Copyright (c) 2007-2022 Juan Linietsky, Ariel Manzur.                 */
/* Copyright (c) 2014-2022 Godot Engine contributors (cf. AUTHORS.md).   */
/*                                                                       */
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/* "Software"), to deal in the Software without restriction, including   */
/* without limitation the rights to use, copy, modify, merge, publish,   */
/* distribute, sublicense, and/or sell copies of the Software, and to    */
/* permit persons to whom the Software is furnished to do so, subject to */
/* the following conditions:                                             */
/*                                                                       */
/* The above copyright notice and this permission notice shall be        */
/* included in all copies or substantial portions of the Software.       */
```

https://github.com/godotengine/godot/blob/master/scene/3d/skeleton_3d.cpp

Take Aways

- The primary importance of asking: Why?

- Successful software products require long term thinking

- The dynamic quality that relates code and content creation

- How the wider context affects tech decisions we make

Feel Free to Reach Out

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- Mastodon: @StephsTangents@mastodon.gamedev.place
- Twitter: @StephsTangents

Thank you!!