

LBTM

I.A.S: Discover Expedition Education and Outreach Investors Call

The University of North Texas College of Engineering

3/6/24 1700 CST

Luka Bostick

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🌐 <https://github.com/LBTM-Luka/3.6.24>

⌚ github.com/LukaBostick

MATERIALS FOR THIS TALK



LBTM

LBTM Investors Call

Committee Review and Vote

Review Committee

Name	Institution	Qualifications	Email
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Willy Vasquez	UT Austin, MIT	Cryptography PhD Student Computer Science Ms	wrv@utexas.edu
Hannah Pil	NC State Univ.	Genetics PhD	hdpl@ncsu.edu

Overview

Talk Order

- Introduction to Quantum Computing
- Discover Expedition
- What is LBTM?
- I.A.A.S: Discover Expedition Education and Outreach
- Committee Review and Vote
 - UX
 - Web Architecture
 - Stack

LBTM Investors Call

Introduction to Quantum Computing

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- Qubits
- Gates
- Algorithms

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Introduction to Quantum Computing

		Classical Computer
Fundamental Logic element		"Bit": classical bit (transistor, spin in magnetic memory, ...)
State		$0 \text{ or } 1$
Measurement		Discrete states Deterministic measurement: EX Set as 1, measure as 1
		Quantum Computers
"Qubit": quantum bit		(any coherent two-level system)
Superposition		$\alpha 0\rangle + \beta 1\rangle$
$ 0\rangle$ "And" $ 1\rangle$		Superposition states Probabilistic measurement: EX IF $ \alpha = \beta $, 50% $ 0\rangle$, 50% $ 1\rangle$

Types of Qubits

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1. A Photonic qubit → a single particle of light
2. Trapped ion qubit → the outermost electron of an ion
3. Superconducting qubit → Resistance-free current at very low temperature
4. Topological qubit → Collection of quasiparticles

²quantum computing algorithms barry burd <https://www.amazon.com/Quantum-Computing-Algorithms-little-Math-ebook/dp/BoBQWDLZSZ>

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DISCoVER Expedition

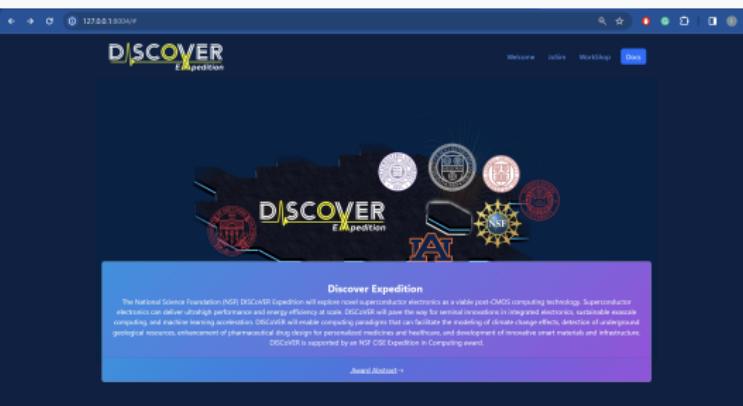
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- Team
- Research
- Outreach

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Discover Expedition³

Grant Overview

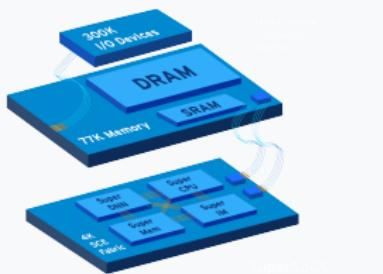


³Structure of OOP

www.freecodecamp.org/news/what-is-object-oriented-programming/

Discover Expedition⁴

Research:



⁴Structure of OOP

www.freecodecamp.org/news/what-is-object-oriented-programming/

LBTM Project in Active Development

Expedition

Discover



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What is LBTM?

LBTM

- History
- Company Principles
- Financial Disclosure

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What is LBTM?

1. Research and Consulting Company dedicated to creating accessible academic infrastructure



L B T M
Research and Development

LBTM's Core Principle

1. Sustainable Development

- Meets the needs of the present without compromising the future⁵
- LBTM maintains an on-premise Data Center that allows
 - Avoid using redundant cloud Resources
 - Increase the lifetime of existing Resources by using refurbished hardware

⁵Massoud Pedram | Sustainable Computing A Quantitative Perspective
<https://discoverexpedition.usc.edu/outreach/#seminarseries>

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I.A.A.S: Discover Expedition Education and Outreach

LBTM

- Problem Statement
- Design: Constraints
- Architectural: Principles

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I.A.A.S For Quantum Education

1. Constraints⁶

- 1.1. GraphQL to drive the UI
- 1.2. Message Driven
- 1.3. Reactive
 - 1.3.1. Enable and encourage the UI to update in real-time

⁶Royal, Peter, author. Building Modern Business Applications Reactive Cloud Architecture for Java, Spring, and PostgreSQL. Berkeley, CA:Apress : Imprint: Apress, 2023.

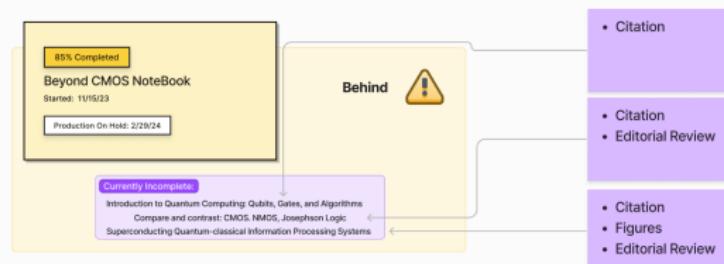
I.A.A.S For Quantum Education

1. Principles⁷

Description	Principles
VC	Never Forget
Observer → <i>State</i>	Message Driven
(OLTP)+(OLAP)	Read/Write Separation
Low Downtime	Partial Availability
nonspecific Stack	Design Flexibility
Microservices	Modularity
TDD	Testability
No architecture Rewrites	Amenability to Change

⁷Royal, Peter, author. Building Modern Business Applications Reactive Cloud Architecture for Java, Spring, and PostgreSQL Apress, 2023.

I.A.A.S For Quantum Education



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Committee Review and Vote

LBTM

- UX
- Web Architecture
- Stack

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Voting Instructions: Please send items for approval to my email. Once I've gathered enough feedback, I'll update the committee. The options are listed in order of my recommendation and comfort level.

UX: Option 1

The screenshots show a dark-themed website for 'DISCOVER EXPEDITION'.

Screenshot 1: Home Page

DISCOVER EXPEDITION
The National Science Foundation (NSF) DISCOVER Expedition is a multi-institutional initiative to create and demonstrate technologies for advanced computing technology. This includes ultracold atoms, atomic interferometers, and magnetic fields at cold temperatures. The site features news, research, and educational resources.

Screenshot 2: Video Page

Videos

Why SQUID (superconductor electronic)?

These families of superconductive logic:
SQUID - Superconducting Quantum Interference Device
Josephson Junction Logic
Interdigitated Josephson Junction Logic

Why SQUID (superconductor electronic)?

These families of superconductive logic:
Comparing energy efficient SQUID and RCOFL against CMOS (including organic in scaling)

Screenshot 3: Why Now?

Why NOW!
Disruptive new computing applications
Need for energy efficiency
Ability to build new design rules for better performance
Microscopic studies of materials in computing technology

Meet The Team

MASOUD PEDRAM
Researcher, Institute of Technology

EBY G. FREEMAN
Researcher, Institute of Technology

MIRALI AVAFAKRAM
Researcher, Institute of Technology

UX: Option 2

L^AT_EX.css

VINCENT DÖRIG

MAY 2020

Abstract

This almost class-less CSS library turns your HTML document into a website that looks like a L^AT_EX document. Write semantic HTML, add `<link rel="stylesheet" href="https://latex.now.sh/style.css">` to the `<head>` of your project and you are good to go. The source code can be found on GitHub at <https://github.com/vincentdoerig/latex-css>.

UX: Option 3

Rhythm-Evolution

The image shows a dark-themed website template for "Rhythm Evo". At the top, there's a navigation bar with links: Home, Pages, Elements, Portfolio, Blog, Shop, a search bar, a cart icon, and a user profile icon. Below the header, the main content area has a dark background with thin, light-colored diagonal lines creating a subtle grid pattern. In the center, the text "RHYTHM TEMPLATE" is displayed above a large, bold, white slogan: "We bring innovation ideas into design". Below the slogan are two white rectangular buttons with black text: "LEARN MORE" and "START PROJECT". A small circular progress bar is visible at the bottom center.

Architecture: Option 1

Event Sourcing and Command Query Responsibility Segregation

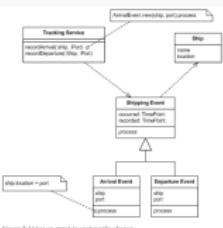
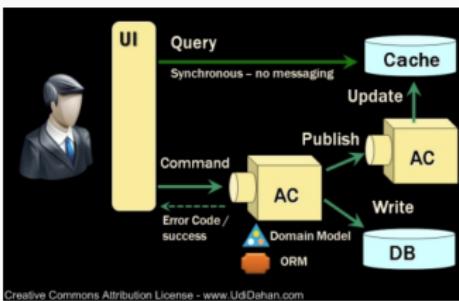


Figure 2: Using an event to capture the change.

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⁸<https://www.martinfowler.com/eaaDev/EventSourcing.html>

⁹<https://udidahan.com/2009/12/09/clarified-cqrs/>

Architecture: Option 2

Hexagonal Architecture

Reaching the hexagonal application with driving operations 135

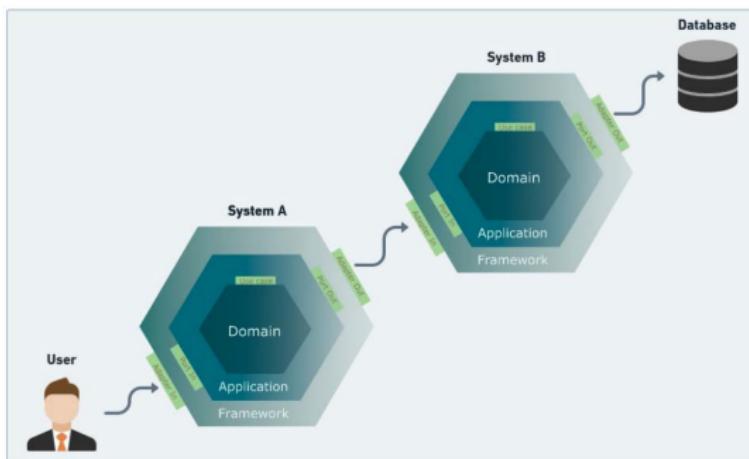


Figure 5.9 – Multiple hexagonal applications

¹⁰Davi Vieira Designing Hexagonal Architecture with Java
<https://www.amazon.com/Designing-Hexagonal-Architecture-Java-change-tolerant/dp/1801816484>

Stack: Option 1

LAMP

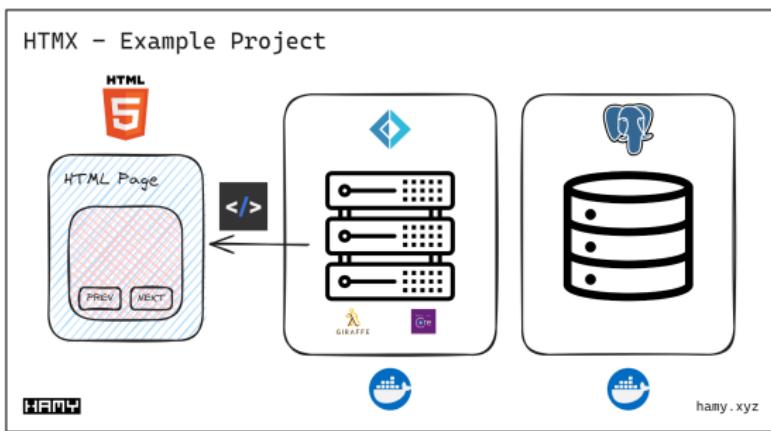


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¹¹LAMP Stack: The Power of Open-Source in Web Development
[https://www.qsoft.com/post/
lamp-stack-the-power-of-open-source-in-web-development](https://www.qsoft.com/post/lamp-stack-the-power-of-open-source-in-web-development)

Stack: Option 2

F#, PostgreSQL, and HTMX¹²

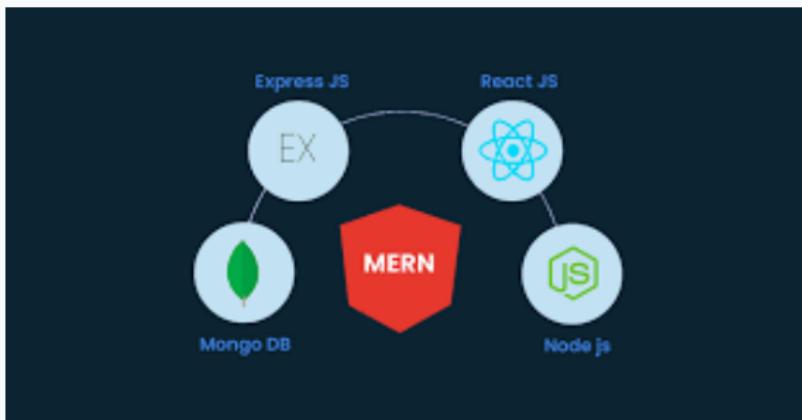


¹²F# is a JavaScript and .NET language for webhttps://fsharp.org/

¹³<https://hamy.xyz/labs/2023-12-fsharp-htmx>

Stack: Option 3

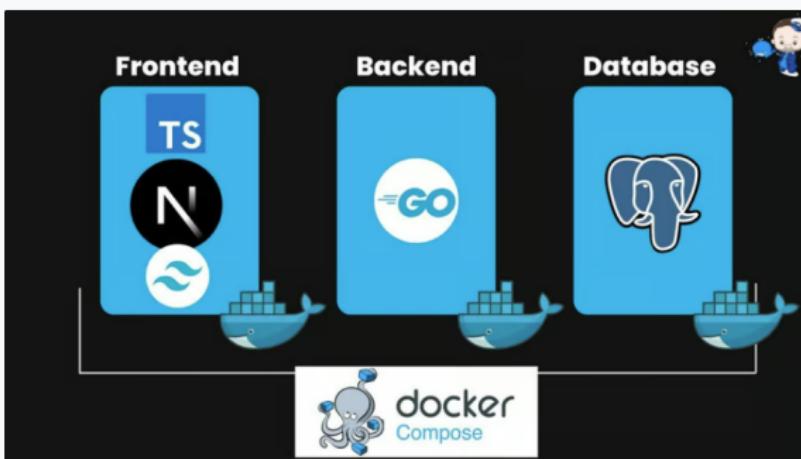
MERN



¹⁴<https://inzint.com/mern-stack-why-should-we-choose-mern-stack/>

Stack: Option 4

Go + TypeScript with nextjs, PostgreSQL and Docker



¹⁵[https://dev.to/francescoxx/
go-typescript-full-stack-web-app-with-nextjs-postgresql-and-docker-42ln](https://dev.to/francescoxx/go-typescript-full-stack-web-app-with-nextjs-postgresql-and-docker-42ln)

I want to thank Land Sea, and Sky and my academic review committee. ,

Without your support, the Work we do at LBTM would be nonexistent



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