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Patient safety at Risk

The fallout from disjointed hospital systems and siloed knowledge

David M. Wright, CDH-E
Founder & CEO, Disruptive Innovations &
Disruptive Innovators Media Brand

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INTRODUCTION

About Me

- Live in Brooklyn, NY
- Computer Nerd
- Husband + Girldad x2
- Serial Entrepreneur
- Active in HIMSS & CHIME Foundation Member
- CHIME Certified Digital Health Executive (CDH-E)

About Disruptive Innovations

- Founded in 2018 in NYC
- Digital Business & IT Consulting
- Heavy Healthcare Focus
- CX / Patient / Human Experience Advocacy

Some of Our Customers

EMORY HEALTHCARE
RWJBarnabas HEALTH
PennState Health
Summa Health
Kettering HEALTH
capitalhealth
OSF HEALTHCARE

Storytime

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Join us as we uncover the approach and expertise needed to tackle such complex challenges and restore sanity and safety in healthcare.

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Case study: The Lagwood Medical Institute PACS LATENCY Evaluation

Background:

Lagwood Medical Institute (LMI) is a sprawling academic health system with a storied history of providing exceptional care to the citizens of Lagwood and beyond. Despite its many accolades, LMI's Radiology division was struggling with a series of misadventures, primarily due to latency, interoperability challenges and image transfer issues.

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key stakeholders

Dr. Ima Blinkmore Chief Radiologist

Dr. Hugh Mann
Chief Medical Officer

Penny Pincher
Chief Operating Officer

Wanda Workflow
Manager of Radiology Operations

Chip Clicker
Chief Information Officer

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LMI's BIG Problem

Slow System Performance of Picture Archiving and Communications Systems (PACS \ CPACS Imaging Systems)

*DICOM - Digital Imaging and Communications in Medicine
The international standard for the acquisition, storage, printing, and transmission of medical imaging data and information. DICOM files contain image data, such as X-rays, CT scans, MRI scans, and ultrasound images, as well as associated metadata like patient information and image acquisition details.

Client Background:

LMI , a multihospital academic health system serving a large patient population, reported significant latency in DICOM* imaging load times, impacting both radiology and cardiology workflows for internal and teleworkers.

Impact on Healthcare:

Slow imaging system performance can result in delayed diagnoses, heightened patient anxiety, and physician frustration, ultimately impacting the quality of patient care. In some situations, timely access to imaging can be crucial for patient outcomes.

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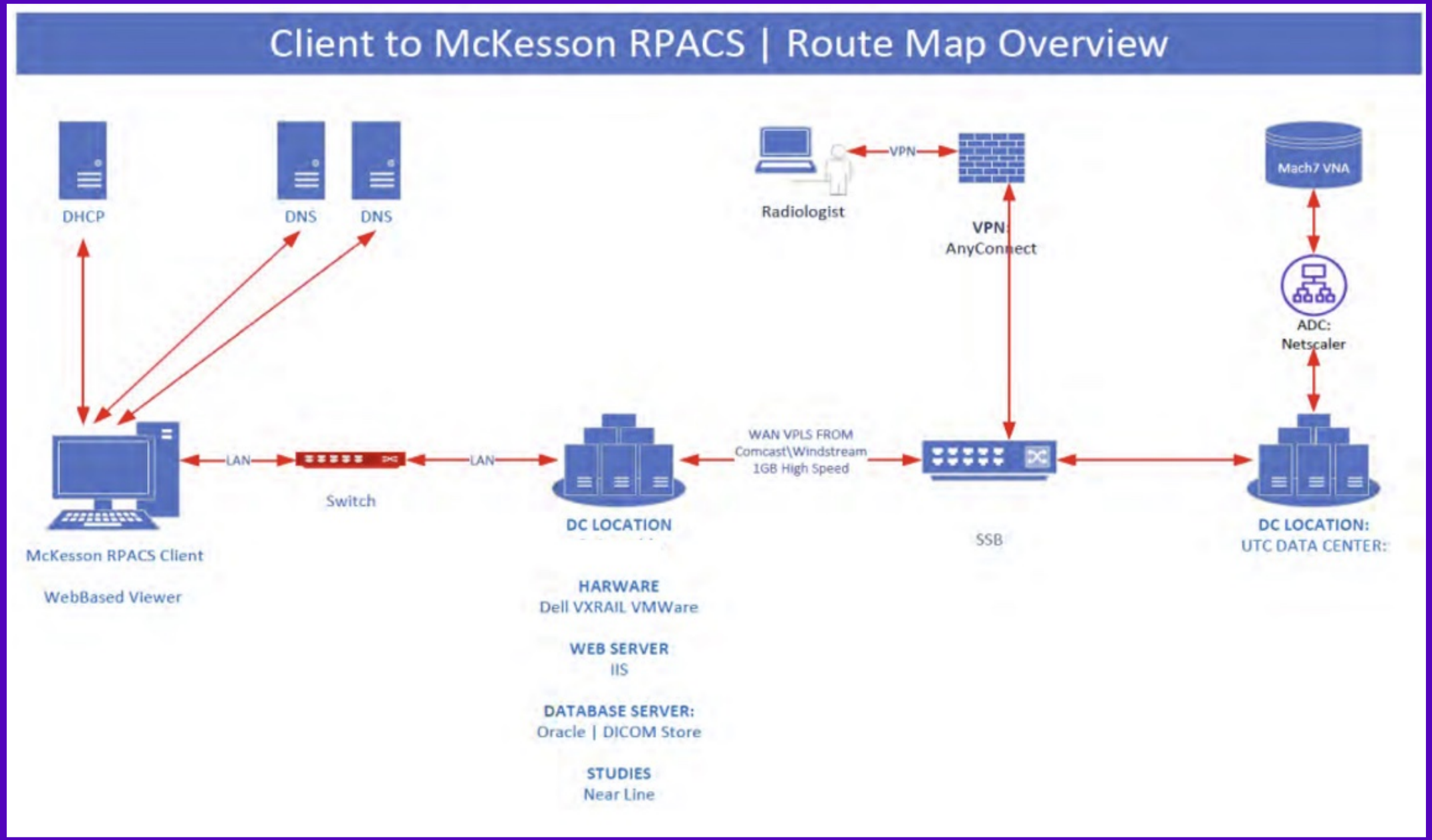
LMI's Architecture



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INITIAL ASSESSMENT AND ENGAGEMENT OVERVIEW

Engagement details

Our team was initially engaged for a 12 week period, including a multidisciplinary team of technical experts - a physician (ex-CIO), project manager, and system architects (ex-CIO), healthcare leadership, and the hospital's internal staff.

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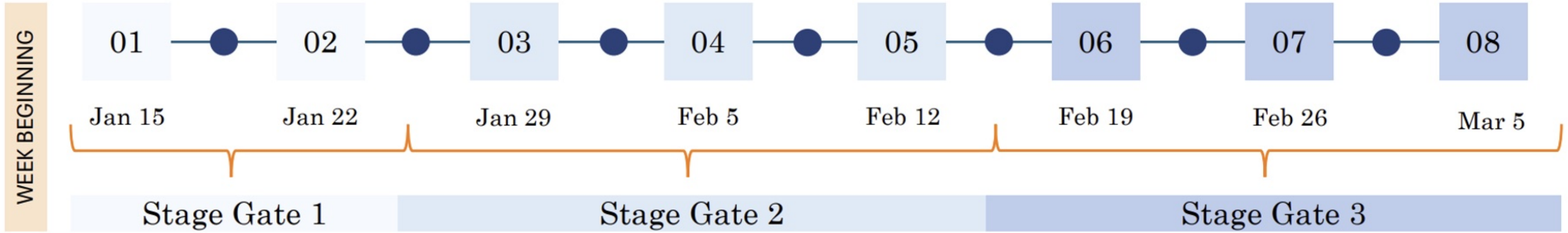
Engagement details

Exhibit A – 3.7 Timeline

SG 1 Objectives
- Introductions
- Walk Through
- Discovery
- Inventory
- RCA – Entry Points

SG 2 Objectives
- RCA – Target 1 Map 1 Analysis (RPACS)
- RCA – Target 2 Map 2 Analysis (CPACS)
- Data Collection – Comprehensive
  (Server\Network\Workstation\Applications\Security)
- Analysis
- Recommendations
- Results

SG 3 Objectives
- RCA – Target 2 Map 2 Analysis (CPACS)
- RCA – Target 3 Map 3 Analysis (Philips)
- RCA – Target 4 Map 4 Analysis (VPN\Remote Access)
- Data Collection – Comprehensive
  (Server\Network\Workstation\Applications\Security)
- Analysis
- Recommendations
- Results



Outcomes *
- Collected Contact List
- Inspected Infrastructure
- Collected Information
  - Team Resources
  - Infrastructure
  - Application Workflows
- Hardware\Software Details

** Created RCA Targets Map-1, Map-2, Map-3, Map-4*

Outcomes
- Evaluated Collected Data from Target 1 Map 1 Data (RPACS)
  - Identified anomalous DNS data.
  - Identified server RAM resource issues on Web and DB Server
  - Identified missing Q\R nodes on RPACS DB\WEB
  - Identified missing Q\R nodes on Mach7 VNA
  - Identified issues with Siemens Team Play comms
  - Identified unexpected TCP communications
- Shared findings – Server, Network, Security, Apps + Vendors

**** Recommended remediation & next steps for all the above.***

Outcomes
- Evaluated Collected Data from Target 2 Map 2 Data (CPACS)
  - Identified anomalous layer 2 communication.
  - Identified server RAM resource issues on DB Server
  - Identified unexpected TCP communications
  - Identified unexplained storage latency on VXRAIL
  - Identified performance gap between Test and Prod
  - Identified unusual network coms back to ADC
- Evaluated Collected Data from Target 3 Map 3 (Philips)
  - Fully Managed System Vendor Provided Analysis
- Shared findings – Server, Network, Security, Apps + Vendors

**** Recommended remediation & next steps for all the above.***

discovery findings (Layer 3)

- Much of what we were told was wrong; bad data
- We expected 3 PACS systems - we found 5
- Acquisition after acquisition with expedience – barely any assimilation
- Fragmented IT groups / Ego / Politics
- Kept old systems… What's the priority? Spin the wheel!
- IT not included in important conversations + initiatives
- Culture of Distrust and Fear

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Identified Issues

- Problem #1: Clinicians using the PACS/ CPACS
  - Cardiology system: PACS component: doppler ultrasound cine loops
  - OAD worklist: thumbnails weren't populating – couldn't see them.
  - Loading like on dialup modem
  - Click: screen supposed to go full screen; Cine loop not loading; super slow
- Problem #2: Images from PACS not available to clinicians when they're doing rounds (and other places remotely)
  - Why that morning: took 2-3 minutes, 10m to open a case; reduces number of cases they can handle each day

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EXAMPLE Issue

- QoS: SMB Dell Storage: Windows Server; EMC; thumbnails sometimes being served on MRI, sent to SMB server
- The point: someone had to go to each one of these places, instrument it, and figure out what was actually going wrong

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Discovery Findings (Technical)

- Outdated documentation
- Insufficient vendor support and accountability
- Lack of application performance monitoring tools
- Hardware w/ inadequate capacity
- Misconfigured system settings
- Outdated system requirements
- Network inefficiencies stem from legacy configurations.

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Technical Evaluation Methodology: A systematic troubleshooting approach

Central to Peripheral Approach

Daily Huddles / Agile Methodology

steps taken

- Root Cause Analysis (RCA)
- Performance Monitoring Tools
- Hardware and Network Assessment
- Vendor Collaboration

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DETAILED FINDINGS & SOLUTIONS

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Issues Found & solutionS Offered

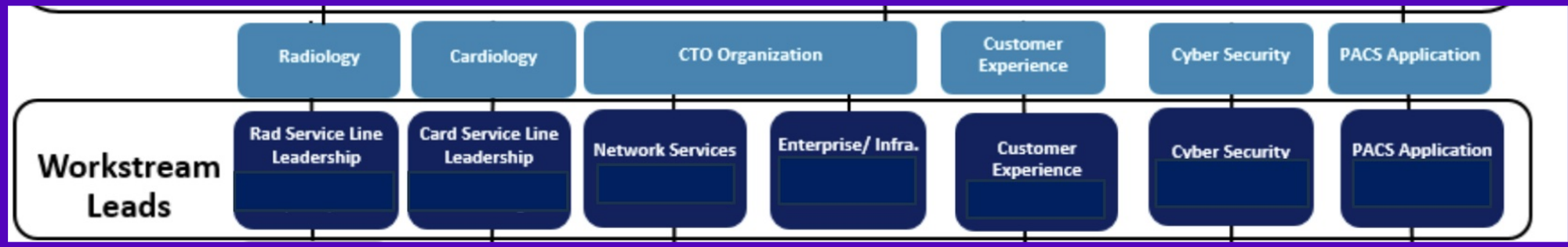
McKesson PACS

Issues:

- Hyperconverged Hardware underestimation
- Resource contention
- Configuration inaccuracies
- Out of date configuration to archive server
- Database servers were inadequately provisioned

Solution:

- Comprehensive system review, reconfiguration, workload assessment and resize, and hardware upgrade recommendations.



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Issues Found & solutionS Offered

McKesson Cardiology PACS

Issues:

- Suboptimal configuration of web and repository SMB storage servers
- Recent changes to architecture (centralized to distributed) have led to inefficient system communication and extra WAN calls over slow links
- Database servers were inadequately provisioned

Solution:

- Redesign deployment architecture to centralized model and collaborate with vendor for optimal network vs SMB storage settings.
- Recommended system upgrade to latest version to take advantage of SMB vs WEB download capabilities.

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Issues Found & solutionS offered

Philips Radiology Remote Access:

Issues:
Suboptimal network performance over VPN.

Solution:
Enhance network collaboration, optimize routing configurations, optimize load-balancers, and implement WAN optimization technologies. Identified misconfiguration with carrier.

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Issues Found & solutionS Offered

VPN/Remote Access:

Issues: Network congestion and misconfiguration. Identified misconfiguration with carrier causing loops with cyber equipment and internal\external routing leading to lost packets, and retransmissions.

Solution: Comprehensive network review, traffic prioritization, routing clean-up, and capacity planning.

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IMPACT & RESOLUTION

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Immediate outcomes

Memory and Configuration Fixes: Addressed memory deficiencies and inaccurate configurations, leading to improved performance.

Network Optimizations: Reduced latency and improved remote access experience through network reconfiguration.

Vendor Neutral Medical Archive Configuration Fixes: Addressed configuration issues with multiple vendors, leading to immediate improvement in prior image retrieval for radiologist.

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LONG-TERM RECOMMENDATIONS

Performance Monitoring Framework

Storage and Network Enhancements

Collaborative Planning

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SUMMARY & CONCLUSION

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How we helped

Complexity of Issues

Systematic Approach

Collaborative Effort

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storytime

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Testimonials

Chip Clicker
Chief Information Officer

"We were experiencing latency issues moving and viewing PACS images. Disruptive Innovations brought us a team of radiology and networking experts who provided both immediate and sustained improvements."

Dr. Ima Blinkmore Chief
Radiologist

"…Lag time has decreased, and so has my stress."

Dr. Hugh Mann
Chief Medical Officer

"We still have some work ahead of us, but this exercise helped us get clear on some of the changes we need to make technically and operationally to facilitate better patient outcomes, and to create a better working environment for our clinicians."

Penny Pincher
Chief Operating Officer

"I know we're doing something right because I've stopped getting calls from our CEO and our doctors."

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This dramatic improvement highlights the critical importance and impact of a trusted partner in resolving complex multi-system performance issues in large multi-center healthcare settings.

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Help I'm Looking for…

If you're part of a health system, a health insurance company, or a customer experience enthusiast and/or any of this is interesting to you, contact me!

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