Has Cloud Computing Come and Gone Already?

IT Infrastructure (BUSI 4404)

Due: April 3th, 2018

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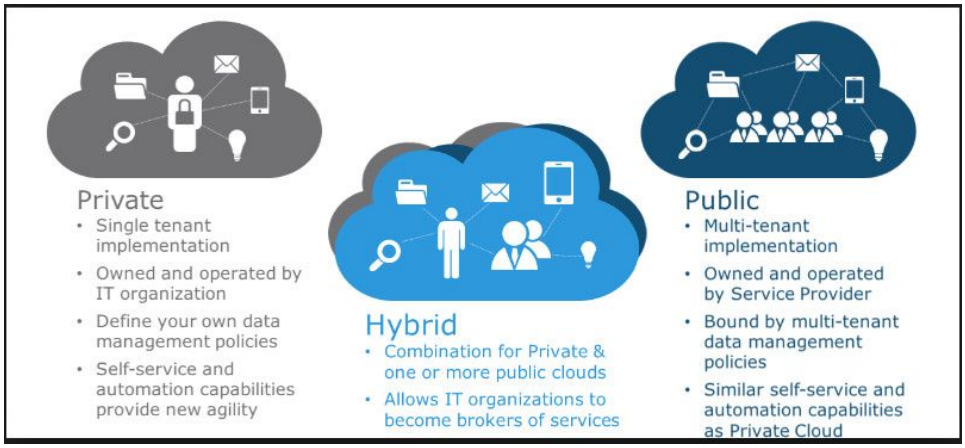


Figure 2:

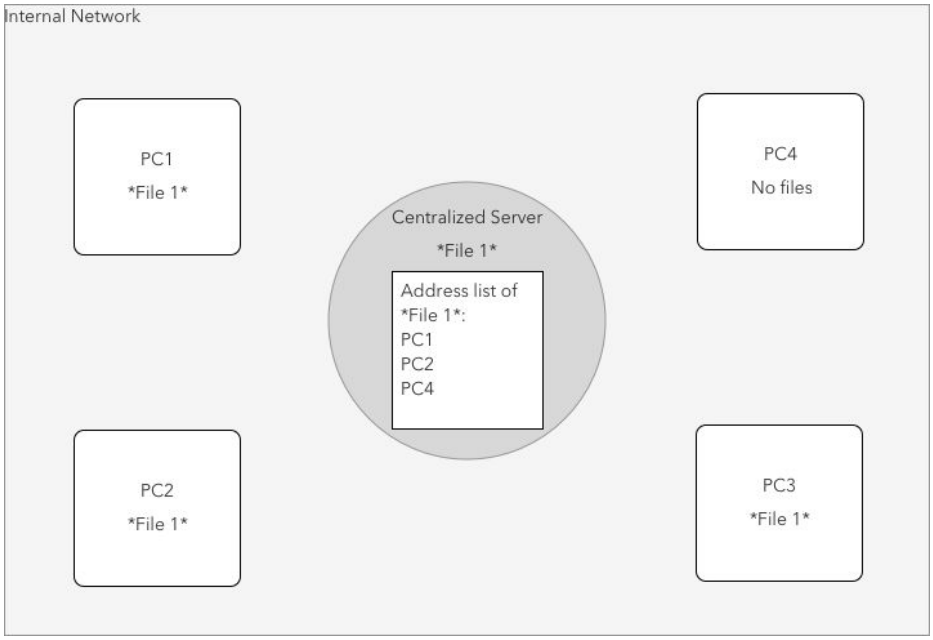


Figure 3:

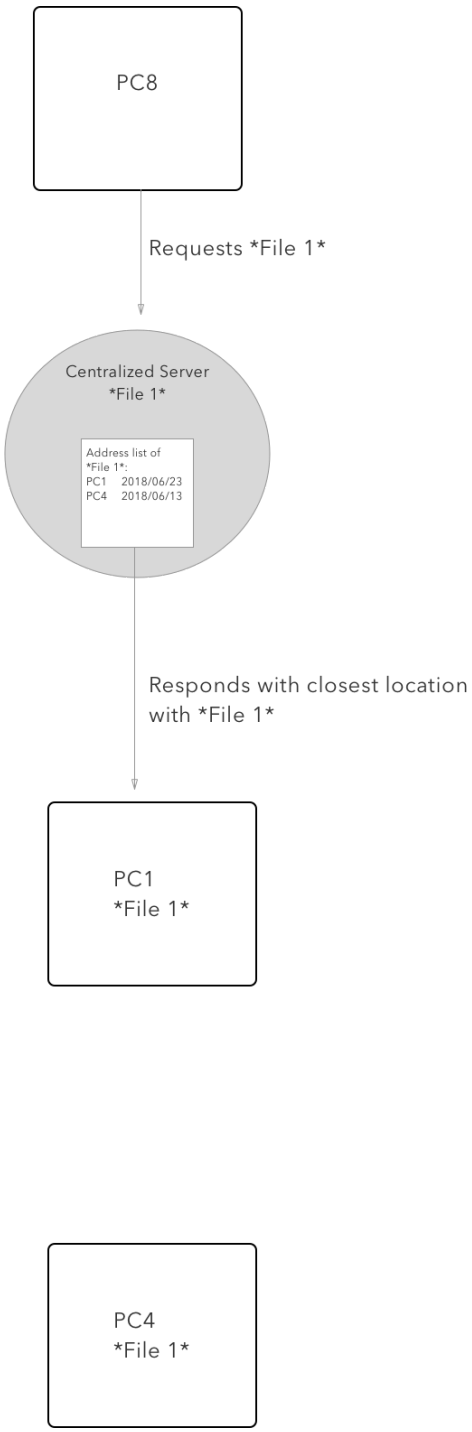

PC8
Requests *File 1*
Centralized Server
File 1
Address list of
File 1:
PC1 2018/06/23
PC4 2018/06/13
Responds with closest location
with *File 1*
PC1
File 1
PC4
File 1

Figure 4:

Engineering and Preparation:

DESCRIPTION	MATERIAL COST	LABOR COST	TOTAL
Engineering	$ -	$13,725.00	$13,725.00
Permits and Approvals	$ -	$2,550.51	$2,550.51
Demolition & Outside Preparation	$ -	$2,550.51	$2,550.51
			$18,826.02

Power:

DESCRIPTION	MATERIAL COST	LABOR COST	TOTAL
Utility Improvements	$5,093.50	$2,210.44	$7,303.94
Main Switch Gear	$27,450.00	$12,505.00	$39,955.00
Transfer Switches	$19,825.00	$1,700.34	$21,525.34
UPS Systems	$54,900.00	$12,200.00	$67,100.00
TVSS System	$340.07	$340.07	$680.14
Generators with Enclosures	$43,920.00	$8,841.76	$52,761.76
Counduit and Cabling for Generators	$1,360.27	$1,360.27	$2,720.54
Data Center Lighting with HMT	$1,428.28	$1,224.24	$2,652.53
Lightining Protection	$510.10	$170.03	$680.14
Room PDU's	$15,250.00	$12,200.00	$27,450.00
			$222,829.39

Environmental Controls:

DESCRIPTION	MATERIAL COST	LABOR COST	TOTAL
HVAC	$18,910.00	$13,602.71	$32,512.71
Raised Floor	$2,652.53	$4,080.81	$6,733.34
Condesate Drains	$272.05	$272.05	$544.11
Leak Detection	$816.16	$163.23	$979.40
Intergen Fire Suppresion	$5,764.50	$2,040.41	$7,804.91
			$48,574.47

Security and Monitoring:

DESCRIPTION	MATERIAL COST	LABOR COST	TOTAL
Facility Management System	$2,040.41	$340.07	$2,380.47
CCTV System	$1,020.20	$170.03	$1,190.24
Building Access system	$1,006.50	$170.03	$1,176.53
			$4,747.24

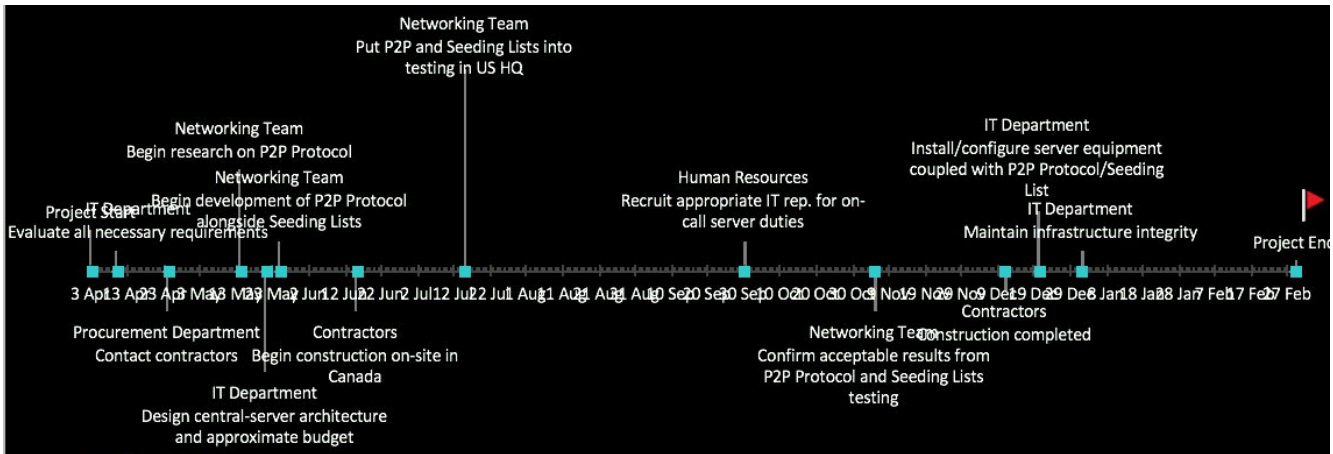
Network:

DESCRIPTION	MATERIAL COST	LABOR COST	TOTAL
Core Network Equipment	$ -	$10,065.00	$10,065.00
			$10,065.00

Data Centre:

	BUILD YOUR OWN
Construction Cost	$305,000.00
Floor Space	$2,500.00
Electricity	$93,312.00
Electrical Maintenance	$16,168.51
HVAC Maintenanance	$3,025.60
Other Systems Maintenance	$1,573.06
24x7x365 Staff	$ -
Redundant Internet Circuits	$120,000.00

Figure 5:



Project Milestones

Date	Milestone	Assigned To	Position
2018-04-03	Project Start		20
2018-04-10	Evaluate all necessary requirements	IT Department	10
2018-04-24	Contact contractors	Procurement Department	-20
2018-05-14	Begin research on P2P Protocol	Networking Team	50
2018-05-21	Design central-server architecture and approximate budget	IT Department	-50
2018-07-15	Begin development of P2P Protocol alongside Seeding Lists	Networking Team	100
2018-05-25	Begin construction on-site in Canada	Contractors	15
2018-09-30	Put P2P and Seeding Lists into testing in US HQ	Networking Team	15
2018-06-15	Recruit appropriate IT rep. for on-call server duties	Human Resources	-20
2018-11-05	Confirm acceptable results from P2P Protocol and Seeding Lists testing	Networking Team	-20
2018-12-11	Construction completed	Contractors	-10
2018-12-20	Install/configure server equipment coupled with P2P Protocol/Seeding	IT Department	30
2019-01-01	Maintain infrastructure integrity	IT Department	10
2019-03-01	Project End		5

Executive Summary:

Amongst America's largest restaurant chains, Super Eats Incorporated plans to expand internationally by placing their second HQ in Canada by March of 2019. As a collective, the organization has decided to expand IT operations to effectively accommodate the extensive number of requests they receive within the wide range of applications they support including web services, inventory tracking systems, senior management tools, and other technological systems, to name a few. As it goes, the company's team in charge of the IT infrastructure expansion realizes the troubles faced in Cloud Computing currently such as forthcoming scaling requirements, centralization vulnerability, and trust demands in corporate/governmental industries which in turn offers no guarantees to the clients. With these concerns highly prioritized, the team offers this report as a professional proposal to management regarding coverage of the problem description, scope and requirements of the solution, cost-benefit analysis, and the implementation plan. The plan included three major deliverables including a centralized-server, a new and improved P2P protocol, as well as a list management system for peers with seeds all encompassing strict deadlines within the project management timeline. Although the IT costs of this expansion are estimated to be well over $600,000, the organization's mission to protect its confidential data plays crucial deciding factor. Additionally, the organization embodies the technological knowledge to internalize the process. By designing a hybrid between a centralized environment as well as distributed, our team believes that the implementation plan follows closely inline with the values of the organization and proves to be an acceptable alternative to Cloud Computing.

Company Overview:

Super Eats Incorporated

Super Eats Incorporated is an international restaurant chain that is currently expanding corporate headquarters from the United states to Canada expecting completion of development as of March 2019. Super Eats Incorporated is a company who fosters national scale technological operations with applications ranging areas such as web services, inventory tracking systems, senior management tools, and other technological systems.

Given the magnitude of the organization, they're IT Department must familiarize themselves with modern technological know-how in not only America, but Canada as well. The organization has reached a point where an additional head office must be established in Canada where the business requires a vast increase of processing power in order to properly facilitate the expansion of the company, however feel that the future of Cloud Computing is unsustainable and therefore are looking for alternative solutions.

Description of The Problem:

Cloud Computing as we know it is an incredibly favorable and convenient IaaS platform for any organization implementing IT Infrastructure modifications. It has served as the major platform over the past decade for organizations ranging from small to large as a place to store data in a secure and accessible fashion (Technology Review, 2011). However, when referring to the foundation of Cloud Computing including concerns such as scalability, vulnerability, and redundancy, the future of its sustainability does not look promising. The most critical issue Cloud Computing is currently facing is the future of its long term scaling requirements. As it

goes, computational speeds, and storage capacity of computers are growing faster than the bandwidth of networks raising debates in regards to the face of net neutrality (The End of The Cloud is Coming, 2017). This raises the concern for the future of server request-response management on the grounds that data volumes grow without bounds, for the reason that this will require incredible throughput to handle the enormous amount of consecutive client requests. A circumstance such as this calls for unique client-server design models drawing effective attributes from a combination of systems such as P2P, Cloud Computing, and Centralized Computing (Pre-allocation Strategies of Computational Resources in Cloud Computing, 2011). Additionally, as Cloud Computing might seem as if it is decentralized, it is incredibly centralized hence its irrational amount of unified requests. Centralized Computing has several pros, however given the global scale of Cloud Computing, it signals discretion in the areas of computational availability, and permanence (The End of The Cloud is Coming, 2017). Through multiple datacenters, this issue is semi-mitigated, however utilizing only a single service is incredibly vulnerable not to mention the demand of trust required to subscribe to that service. In most cases, these Cloud Computing services are operated by legal entities, with the power to force their clients to abide by their policies. Finally, an ongoing issue in both Cloud Computing, and Private Computing is the possibility of data breaches. That being said, authorizing any IaaS provider to control your data can be a dangerous decision (Stratoscale) leading to the next point discussing how the problem surrounding Cloud Computing with relation to Super Eats Incorporated operations will be tackled.

By the means of a calculated combination of fitting attributes from P2P, Centralized, and Decentralized Computational Systems, Super Eats Incorporated will be able to accommodate

their international expansion without posing the threats derived from Cloud Computing. The proposed implementation plan will entertain the higher level business requirements included in the extension of the head offices inventory systems, website, other technological systems, and senior management tools such as an increased need in processing power, and effective database infrastructure.

Scope and Requirements of Proposed Solution:

Given the demand of looking for a infrastructure model which data is stored internally, and files are spread across the entire network, the higher level solution we plan to implement consists of private centralized architecture while maintaining peer-to-peer attributes to facilitate effective processing of internal file transferring. In a sense, the proposed solution will extract policies such as self-service and automation capabilities from public domains, whilst including policies such as internal IT ownership, where data management policies will be developed internally. An illustration of how these policies are assigned can be seen in **figure 1**. In order to administer redundant data, we plan to record addresses of employees who acquire files, similar to seeding in BitTorrent or blockchain applications. Considering the existing future amount of utilized personal computers in the Canadian HQ, this processing power can be distributed across the network. The addresses kept in file lists will be used in the process of file delegation, using P2P technologies to decrease the need for a central server, as well as reduce costs, and increase file transfer efficiency. A typical user scenario might include some user downloading a file from the network, where the closest online machine with the file available would be requested, personal workstation or central server, and distribute the file accordingly. The recent user that

now has the file would be added to the list of users who make the file available to any network file transfer requests. An example of this case scenario using this proposed solution can be examined in **figure 2**. That being said, the need for a centralized server cannot be completely eliminated, as this protocol is only useful for read-only file transfers, however it can be lessened.

Evidently, the centralized server has shown to be an incredibly useful system given the appropriate context, and therefore we will utilize its responsibility in our solution plan to store crucial private data, and deliver time sensitive applications such as the organizations Canadian website. The P2P-Centralized hybrid will make use of all unused computing power including onsite workstations in order to reduce the load on the main centralized servers and more than that, subsidizing the request throughput bottleneck. The onsite personal workstations will operate during regular business hours when the use of transaction processing, and management systems are most necessary. By way of this solution, Super Eats Incorporated will save capital due to using their existing systems, and lessening the need for overall infrastructure expansion.

As it goes, the main benefits of Cloud Computing appear when an organization is focused on the face of the business, prioritizes reduced capital expenditures, and doesn't bear the technological knowledge to develop the infrastructure internally (Whitehat Virtual Technologies). Yet, given that Super Eats Incorporated is an international company that bears the tools, experience, connections, and technological knowledge to construct IT infrastructure, as well as owns working capital to pay for initial set up costs and further, this is an achievable goal by all means. Additionally, given that Super Eats Incorporated encompasses confidential, and competitive advantage information that cannot afford to be leaked, Cloud Computing could jeopardize the organization as a whole.

Moreover, the project scope of this implementation plan will be broken into appropriately sized deliverables. As it goes, there are three major components to this implementation plan including the centralized server, P2P protocol, and managed seeding lists. Knowing this, each individual component will be tackled separately, starting with an evaluation of the requirements necessary, moving on to a calculated budget, and finishing a set of discharge objectives.

Centralized Server:

Requirements:

The central server for Super Eats Incorporated's Canadian HQ must provide a securely accessible gateway to all internal requests within the firewall. The organizations end-users, and guests on the network must be able to communicate with the server 24/7, therefore the server must not be turned off for any reason. An IT representative must always be on-call for any apparent shutdowns, and restore the server state promptly. Remote end-users must be allowed access in so much as they are connected via VPN. File transfers must be conducted efficiently according to P2P protocols. The server is responsible for managing all internal users/licenses, and their given permissions accordingly. Given the modern time-frame, the central server must be able to handle mobile platform requests such as Android and iOS.

Calculated budget:

According to Expedient, the costs endured in building a central server internally can be large, however well worth the investment (Expedient, 2018). As it goes, building a server includes not only fixed computing costs, but the fixed costs of contracting electrical development, construction development, legal permits, and more. That being said, once the fixed costs have

been covered, the variable costs are minimal. For example, according to the recent adjustments from the EIA, as of 2018 the electricity cost per KwH is only 12.87 cents. Knowing this, the costs of the central server will be settled over a 5 year payback period for the reason that computing equipment must be renewed approximately every 5 years (Tech Radar, 2015), followed my fractional variable costs. Considering Super Eats Incorporated's national presence, this approximate budget shouldn't be an issue.

Discharge objectives:

The main objective is to complete the implementation process of the central server in parallel with the process of instantiating the Canadian HQ. By doing this, the Canadian employees of Super Eats Incorporated will be given the tools needed to be productive in our corporate environment.

P2P Protocol:

Requirements:

Considering a non-cloud environment, the P2P protocol must only support read-only files for the reason that edited files will not be central. By utilizing the P2P protocol in parallel with the centralized server, files will be spread across the entire network in a semi-distributed fashion. Through providing this redundancy of data, each client will have the power to access files efficiently, and effectively. Relaying back on the major issues included in Cloud Computing, our P2P protocol will solve the issues involved in computing availability, capacity, permanence, and evidently address bandwidth problems such as bottlenecks. To save on power, the P2P system

will be only available during major work hours according to the timezone of the Canadian HQ. Finally, the P2P environment will reduce the risk of losing important data in bulk.

Calculated budget:

The P2P protocol will be designed and managed by the US HQ networking team associated with the IT department of Super Eats Incorporated. This will be the teams major project for the upcoming term in parallel with the construction of the Canadian HQ. Inspirations for the protocol will be derived from alternative similar protocols such as BitTorrent's "Kademila" which breaks file into addressable blocks likewise to blockchain methodologies, or DAGs. For these reasons, costs will include the salaries of the members of the networking team, as well as licensing and publicity costs to utilize currently practised protocols listed above.

Discharge objectives:

Similar to the discharge objective of the central server, the P2P protocol will be completely developed and ready for deployment upon completion of the Canadian HQ construction. However, as Super Eats Incorporated's technical development projects follow the Software Development Life Cycle plan, the protocol will be exhaustively tested (Tutorials Point, 2018) within a confined environment in the American HQ so that it can be confidently employed in the Canadian HQ when admissible.

Seeding Lists:

Requirements:

The Seeding Lists will manage availability of all files on the internal network. Although the lists will be centrally located and managed, they will include all locations of the files according to

system name. One major issue of Cloud Computing includes accumulated data contributing to overall lack of capacity and data availability. The seeding lists will solve this issue by utilizing time stamps. Each owner's timestamp of a given file will expire in a timely fashion to free up network capacity and availability, for instance, a duration of 2 years with the exception of the central server. Additionally, the lists will assist with the routing of requests to locate the closest response. For clarity, an example where the seeding lists are utilized in an average scenario is displayed in **figure 3**.

Calculated budget:

The budget associated with the implementation of seeding lists will be null, as this piece to the puzzle includes no costs. The lists will utilize SQL to determine routing decisions, and direct requests over the newly acquired P2P protocol.

Discharge objectives:

Similar to the discharge objective of the P2P protocol, the seeding lists will be completely developed and ready for deployment upon completion of the Canadian HQ construction. However, as Super Eats Incorporated's technical development projects follow the Software Development Life Cycle plan, the seeding lists will be exhaustively tested alongside the P2P protocol within a confined environment in the American HQ so that they together can be confidently employed in the Canadian HQ when admissible.

Finally, the project scope and requirements are evidently measurable, achievable, realistic, and subject to deliverable deadlines. Realizing the few major components of the plan, our team plans to complete their separate objectives in parallel leading to the finished product.

As it goes, Cloud Computing's methodologies are in no way sustainable and although our plan is costly, it can be seen as a major investment and rightful alternative for the future of Super Eats Incorporated's existence in the food industry of America. We are pleased to propose this deserving option and guarantee to fulfill your expectations.

Cost-Benefit Analysis For Proposed Solution:

According to Expedient Systems, that most optimal payback period for IT infrastructure is approximately five years considering IT equipment should be renewed at the beginning of year six (Expedient, 2018). IT infrastructure expansion can either be outsourced or internalized, therefore this cost-benefit analysis will evaluate the costs endured, positives, and negatives of both options given the time-frame of a five year payback period (SysGen, 2018).

Outsource IT Infrastructure Expansion:

Cost: $321,955

Pros: No capital expenses, currently scalable, accessibility

Cons: Destined by internet connection, data security

Insource IT Infrastructure Expansion:

Cost: $591,579 + overtime charges

Pros: Control, data security, cost-effective for companies not concerned about up-time

Cons: Capital investment in infrastructure, requires space and IT support, subject to data loss

Through justification of the differences between insourcing and outsourcing, our team remains rightful in our decision to insource the expansion. Although Cloud Computing is seemingly scalable and accessible as of today, the future of its existence is to risky. Additionally, as an organization we value internal data security. Finally, capital costs can be broken down into annually, quarterly, or monthly expenses of $140,000, $35,000 or $11,667 respectfully.

Proposed Implementation Plan For The Proposed Solution:

Figure 4 displays the total estimated fixed, and variable costs encountered for half a decade inclusively, for the development of a single Tier I server cabinet according to the EIA's current electricity charges, and average network connection of 10 Mbps, with a five year payback period (Expedient, 2018).

Considering the development of the P2P protocol, the networking team in charge of the project will be given a budget of $50,000 for research and licensing/publishing costs. Member salaries of the team will be considered sunk costs as they would be compensated under all circumstances. Likewise, the seeding lists budget will be considered null as the licensing for SQL would also be endured under all outcomes.

Therefore by summing up all costs, the project budget will be $591,579 with an additional $100,000 added to support uncertainty and sensitivity instances, as well as overtime charges and accommodation expenses.

Considering the deadline of March 2019 the timeline for implementation will prioritize this date within all deliverables. Although quality will not be sacrificed in the case interruptions,

the timeline will be subject to adaptability in rare occurrences. In **figure 5** you will find a proposed implementation plan.

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