

Response to the Council's request for additional information, June 5, 2023. Councilor McCauley's questions

James Pope responding.

This proposal covers

- [Replacement] Refreshing the server cluster in our current primary data center, Police HQ.
- [New] Create a new server cluster within one of the schools, as the schools are on our Municipal Fiber Network, and have purpose built server rooms.
- [Replacement] New hardware on-premise, situated in a third location, to provide backups and archiving of data. This system will also send our data offsite to our cold backup location.
- [Replacement] New large UPS for the primary DC at Police HQ.
- [New] Power and Environmental monitoring sensors for both DC locations
- [New/Replacement] Software license (VMware, Microsoft, Veeam)
- [New] Network Access Control software for building networks, Network Monitoring Software
 - This security software is different from what is included in the IT FY24 OpEx Budget.
- [New] KVMs, Out-of-band Management Network, PDUs, related cable management accessories
- Consultants to assist with the build and migration.

Both sites are within the City. Will this DC be High Availability? Geo-Redundant?

Yes, both the primary and secondary server clusters are located within city limits and physically separated by approximately a mile, with an elevation differential of 46 feet (PD at 26 Ft, Bresnahan at 72 Ft.). These clusters will indeed be established with a high-availability configuration, which not only enables seamless movement of workloads between the two sites but also empowers the secondary site to automatically take over operations should any unforeseen issues affect the primary server cluster. This project also includes on-premise backup and archiving, that will be located in a third-location. A fourth location will be into the cloud storage and stored cold.

Is there separation (and thus redundancy) in utility/electrical feeds, network Access points.

Electrical infrastructure, both sites are equipped with generators and are either already furnished or slated to be equipped with appropriately sized battery backup systems. However, it's crucial to note that redundancy in terms of electrical service providers is not available.

Network access, both sites are interconnected via our municipally owned fiber network. Each site is allocated two sets of fiber pairs. These sets follow distinct paths back to the central hub, which serves to enhance the resilience and redundancy of our network. Furthermore, these connections are configured for high availability, supplemented by redundant network hardware on both ends of the connection.

Currently, our network structure operates on a hub-and-spoke model. Future planning aims to transition this network to a mesh configuration or potentially include a wireless backhaul component. This evolution will provide additional paths between sites, further bolstering the robustness of our network. Please note that this prospective network enhancement is not encompassed within the current project scope.

Please define the applications to be supported?

The scope of applications and services supported by our data center spans across various operational domains:

- End User Computing Support: This includes services such as identity management, network services, user data and shared data storage, and secure remote access.
- IT Operations: We host solutions for backup and archival, monitoring, logging, and hardware management.
- Public Safety: This includes applications for records management and computer-aided dispatch, building security systems, and secure remote access.
- Water/Sewer Department: Our SCADA system, data logging, and history tracking applications are vital for maintaining our utilities infrastructure.
- City Operations: We host systems for property appraisal, cash management, Department of Public Service fuel pumps, on-premise Munis components, and our phone system.

It's important to note that several applications and services have transitioned, or are in the process of transitioning, to cloud-hosted solutions within the next 12 months. For the time being, we still need to maintain their on-premise versions, at least for the upcoming year.

How is storage driving the underlying costs?

Most of the services we operate do not require large amounts of storage, there are specific datasets that we are making both on-premise and cloud storage accommodations. These include architectural/engineering drawings and high-resolution videos produced by DPS.

Currently, we host 15TB of production data, and we use about 30 TB for backup purposes. Additionally, I estimate we have another 10TB being stored "off network" that I am looking to bring under management.

What is the Security platform, how will it be managed, and do we have liability insurance built into this?

The security software being implemented in this project pertains to Network Access Control across all our sites. This allows us to better monitor and control the devices connecting to our networks, thus enhancing our security posture. It's important to note that our broader security infrastructure, comprising various other software and services, is funded through the OpEx budget.

As for cybersecurity insurance, the City does maintain a policy that covers potential cybersecurity incidents. This is a separate entity and isn't tied directly to the costs of this project.

Has there been an analysis done comparing Standalone Datacenter versus (a) cloud-based center, or Versus (b) hybrid cloud based center (1 site local/1 site remote)?

Yes, we conducted an analysis comparing different models; public cloud, hybrid, and varying options for on-premise.

Our examination included two on-premise scenarios. The first involved outright purchasing all necessary components. The second, and the one we've chosen to proceed with, functions essentially as an on-premise private cloud. In this model, we subscribe to the capacity we need from Dell. They install the necessary hardware on our premises, similar to the hardware we would have purchased under the first model. However, Dell maintains ownership and management of the hardware throughout our agreement. The City's responsibility is primarily confined to hosting our virtual machines on this platform, overseeing Microsoft and VMware operations.

We also estimated costs for a baseline cloud implementation. This estimate contains the base minimum of service to run our workloads in one availability zone in the public cloud, from which two scenarios can be extrapolated:

1. Full Cloud: The estimated costs represent the baseline for a full cloud transition. It's important to note that these costs do not fully account for high availability or multiple ingress/egress points into the Public Cloud.
2. Hybrid Cloud: This scenario would combine on-premise infrastructure with a Public Cloud site. Costs for this model would be in addition to a scaled-back on-premise deployment (one server cluster, however the rest of the project would be unchanged).

In both scenarios, the preliminary cost projections were higher than alternatives before we fully architected the solution.

The preferred model — the on-premise private cloud (Dell ApEx) — provides several benefits. It lowers our initial capital outlay and outsources hardware management of the server clusters to Dell. This reduces the management burden on our IT department, stabilizes our service environment, and removes the failure risk associated with our current, outdated, and unsupported server hardware. Furthermore, this sets up Newburyport for future success by enabling us to gradually move compatible applications and services to the cloud, which will in turn reduce our future needs.

CapEx (Purchase, On Premise)	Year 1	Year 2	Year 3	Year 4	Year 5	
Backup + Data Archiving	\$85,896	\$3,000	\$3,000	\$3,000	\$3,000	
Power - Primary DC, Power Management, Environmental Monitoring	\$93,700					
Servers - Primary, Secondary, ROBO	\$557,411					
Microsoft Licenses	\$56,460				\$67,751	
Network Security SW + Monitoring Software	\$59,553	\$8,933	\$9,380	\$9,849	\$10,341	
Consulting	\$45,170	\$8,000	\$8,000	\$8,000	\$8,000	Total
Total	\$898,189	\$19,933	\$20,380	\$20,849	\$89,092	\$1,048,443
Public Cloud (Purchase + Subscriptions)	Year 1	Year 2	Year 3	Year 4	Year 5	
Backup + Data Archiving	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	
Power - Primary DC, Power Management, Environmental Monitoring	\$51,400					
Onsite Servers	\$135,000					
Microsoft Licenses	\$34,647				\$41,577	
Network Security SW + Monitoring Software	\$59,553	\$8,933	\$9,380	\$9,849	\$10,341	
Consulting	\$75,000	\$25,000	\$25,000	\$25,000	\$25,000	
Public Cloud	\$175,438	\$179,824	\$184,319	\$188,927	\$193,650	Total
Total	\$531,038	\$213,756	\$218,699	\$223,776	\$270,568	\$1,457,837
ApEx (Purchase + Subscriptions, On Premise)	Year 1	Year 2	Year 3	Year 4	Year 5	
Backup + Data Archiving	\$85,896	\$3,000	\$3,000	\$11,000	\$11,000	
Power - Primary DC, Power Management, Environmental Monitoring	\$88,900					
Servers - Primary, Secondary, ROBO	\$323,644			\$94,025	\$94,025	
Microsoft Licenses	\$56,460				\$67,751	
Network Security SW + Monitoring Software	\$59,553	\$8,933	\$9,380	\$9,849	\$10,341	
Consulting	\$15,000					Total
Total	\$629,453	\$11,933	\$12,380	\$114,874	\$183,118	\$951,757

Has a 5 year TCO analysis been done (assume 1 software upgrade every 2 yrs, when will equipment need an upgrade)

Yes, a 5-year TCO analysis has indeed been conducted for the three considered options. Under the ApEx Model, equipment will be refreshed whenever performance degrades or at least every three years, given that we continue to subscribe to the service. When purchasing outright, we could expect a refresh cycle of about 7-8 years, with the timing largely determined by the costs of hardware maintenance agreements.

As for software upgrades, we have minimum 3-year subscriptions for all software purchases. The primary software-related expense will be for Microsoft licenses, which might require renewals roughly every 5 years. This cost has been factored into the TCO analysis to provide a comprehensive view of the financial implications over the projected period.

It's crucial to note that predicting technology trends and costs five years into the future is challenging due to the rapid pace of change in the tech industry. The landscape of options could shift dramatically in that time. By opting for the ApEx model, we mitigate upfront expenditure and secure the flexibility to reassess our situation at the three-year mark. The 5-year projection is based on the assumption that our setup remains relatively unchanged from the beginning of this project.

	Summary	
	5 Year	10 Year
CapEx	\$1,048,443	\$1,385,142
Public Cloud	\$1,472,837	\$2,803,063
APEX	\$951,757	\$1,666,924

Is a 24 hour support plan needed? If so how will out of hours be handled?

Regardless of the selected model, our 24-hour support protocol, which is primarily managed by our internal IT staff, remains unchanged. What does change with the ApEx model is that the hardware management responsibilities are outsourced to Dell. This means hardware-related issues are first handled by Dell before being escalated to our in-house IT team.

Our intention with this investment is to equip Newburyport with a robust, modern, and optimally supported infrastructure. This strategic upgrade aims to significantly reduce the number of support issues escalating to emergency status. Consequently, while we have established protocols for dealing with out-of-hours issues, our strategic focus leans toward implementing a robust infrastructure that substantially reduces the chances of such incidents occurring in the first place.

Regarding the proposed Bill-of-Materials, what is on extended lead time?

Given the current unpredictability of supply chains, it's difficult to guarantee precise lead times. Colleagues in the industry report a general improvement with delivery timelines ranging between 30-60 days. However, opting for the ApEx model with Dell does offer a bit more certainty, as Dell has committed to a 28-day delivery period for the server clusters.

Is it possible that this proposal be built in phases?

It is important to understand that this project is designed to cover the fundamental needs of Newburyport, and the proposed components are closely interconnected and vital to achieving our stated goals. Currently, our infrastructure has been utilized beyond its expected lifespan, introducing substantial operational risks. Consequently, addressing all these components concurrently through this proposal is crucial to minimize these risks and ensure consistent performance and reliability of our systems. Therefore, I firmly recommend against a phased introduction of this project, especially if spread over multiple years.