

## \$0 RAISED

0% of minimum target: \$50,000

0% of maximum goal raised: \$1,000,000

0 Investors

\$250 minimum investment

### Notable Investors

#### Techstars

Worldwide seed accelerator network

techstars

#### Catalyst Accelerator

Defense & national security accelerator



### Customers



Letter Of Intent



Letter Of Intent



Letter Of Intent



PITCH DISCUSSION UPDATES

### Highlights

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### HIGHLIGHTS



#### \$500K+ in contracts

Contracts with the US Air Force, NASA, and Navy



#### Wholly owned IP

Xairos holds 2 core US patents



#### Deep industry and startup experience

Founders with 50+ years of success in tech & business



### SUMMARY

**PROBLEM** All networks and communications rely on GPS for timing that is inaccurate, insecure and subject to multi-billion dollar outages.

**SOLUTION** Xairos is building a global timing service demonstrated to be 1000x more accurate and more secure than GPS timing.

**PRODUCT** The Xairos Quantum Clock Synchronization (QCS) system.

**TRACTION** \$500K+ in revenue from study phase contracts with the US Air Force, NASA, and Navy, Graduate of 3 prestigious Accelerators: Techstars Space 2021, Air Force Catalyst 2019, and CDL Quantum Stream 2021, Awarded \$250K Advanced Industries Grant by the State of Colorado (selected from 100+ competitors)

**CUSTOMERS** NASA, US Navy, US Air Force

**BUSINESS MODEL** Subscription/recurring payment

**MARKET** Approx. Market Size: \$500B

**COMPETITION** Two groups - timing and synchronization hardware providers and position and navigation startups - are potential competitors but also partners.

**TEAM** Extensive space, quantum and business background with decades of government, commercial and startup experience.

**VISION** To replace the timing from GPS and essentially own time and the markets it unlocks.

**USE OF FUNDS** To expand our team and facilities and turn our proof-of-concept into a commercial product.

## MEDIA MENTIONS



### Quantum Communications, "Spooky" Quantum Entanglement, and Applications in the Space Industry

David Mityng discusses the growing field of quantum communications, and how it applies to the space industry.



### Quantum Communications in Space: A Deeper Dive

David Mityng joined John Gilroy to talk quantum key distribution and clock synchronization.



### The next generation of dual-use frontier technologies

Xairos amongst 10 Selected for Techstars Space Accelerator Class of 2021.

## DEAL TERMS

How it works ⓘ

Deal type	Convertible debt
Valuation cap	\$10,000,000
Discount	20.0%
Maturity date	April 29, 2025
Type of security	Convertible debt
Interest rate	5.0%
Investment range	\$250 - \$100,000
Funding goal	\$50,000 - \$1,000,000
Closing date	April 30, 2022, 1:00 AM ET
FORM C	FORM C ⓘ

## PROBLEM



**All networks and communications rely on GPS for timing that is inaccurate, insecure and subject to multi-billion dollar outages.**

On January 26, 2016, communications around the world started to fail. Emergency radios in the US went offline, and even power grids started to malfunction. For a few frantic hours, network engineers scrambled to prevent a global communication meltdown. On the individual level, ambulance drivers struggled to find the shortest routes to patients without critical applications like Google Maps, panicked engineers in Europe had to coordinate with equipment makers, from iPhones to tractors, to help resolve things before global telecommunications networks collapsed and in many areas, BBC digital radio was

out for almost two days [1,2].

The culprit: a 13-millisecond error in Global Positioning System (GPS) clocks [3].

Despite its name, GPS is not just about location, but about time. Over half of GPS' \$1.4T in economic benefits come from its role as the world's timekeeper [4]. All modern networks, communications, and navigation applications require this timing synchronization to function normally. In fact, according to the U.S. Department of Homeland Security, there are 16 sectors of infrastructure dubbed "critical," and no less than 14 of them depend heavily on GPS [5]. An error in their timekeeping could wreak havoc on the finance sector to crash since it relies on GPS-derived systems to time-stamp market transactions. GPS failure could also result in the collapse of computer network synchronization, which affects digital television and radio. Outside of these embedded systems, radar weather reporting, seismic monitoring and asteroid tracking in Earth's orbit could all go offline; the results of which could all be potentially catastrophic. Though we may not realize it, GPS clocks have a hand in all.

But despite our reliance on it, GPS is not nearly secure or accurate enough for modern networks; a problem that is only going to get worse since everything from solar flares and space debris to politically charged hostile attacks can all scramble its satellite frequencies. On the receiver side, GPS signals can be jammed in a variety of ways with hardware and/or by sophisticated spoofing practices [5]. It has been estimated that a loss of the GPS timing signal will cause over \$1B per day in damages, and a prolonged outage will knock society back to the stone ages as ATMs, internet, cell phones, and power grids fail [6].

Even if this may come as a surprise to members of the general public, it has actually been a known and well-understood concern for over two decades in government and industry circles [7]. Despite a GPS replacement being signed into US law in 2018, a backup still hasn't been built. There have been a handful of attempts to develop and institute a public-sector GPS replacement over the years, however, because the problem is so large and complex to tackle, these efforts have borne minimal fruit [8, 9]. The US military is working on it (slowly) but there is no incentive to improve this for civilian use [10]. The result is that there is no clear timeline on a new government-provided timing infrastructure, and we continue to rely on an inefficient, outdated technological system that leaves countless industries vulnerable to great risk.

There is no question about the value an alternate timing solution can bring to world economies [11,12]. The question is more about what technology will enable this, and who will provide it.

At Xairos, we believe we have answers to both of those questions.

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## SOLUTION

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**Xairos is building a global timing service demonstrated to be 1000x more accurate and more secure than GPS timing.**

The vulnerabilities of current GPS systems are too serious to ignore and the world needs an alternate global timekeeping service.

Enter Xairos, and the pioneering, proprietary quantum communication technology our team developed in 2018.

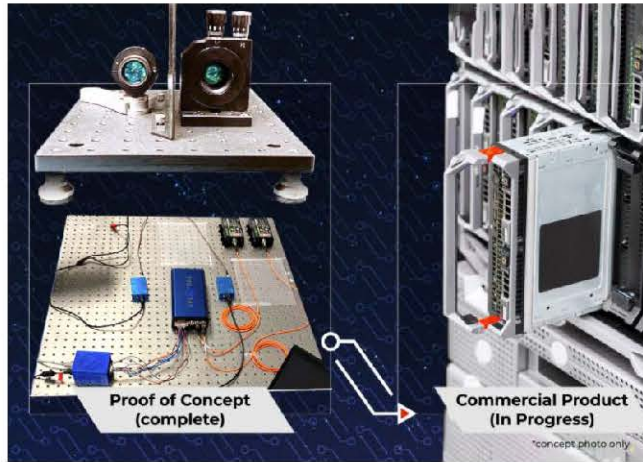
By using a novel algorithm and off-the-shelf optical quantum hardware, Xairos is able to deliver a timing solution that is demonstrated to be three orders of magnitude more accurate and more secure than the timing services provided by GPS.

In addition, GPS satellites are large and expensive because they require huge atomic clocks that are needed to maintain timing stability [13]. An architecture using small satellites with chip-scale atomic clocks synchronized with Quantum Clock Synchronization (QCS) would not only be cheaper but also much more accurate and resilient than the current timekeeping services offered by GPS.

## PRODUCT



### The Xairos Quantum Clock Synchronization (QCS) system.



*Our system.*

Xairos' technology was demonstrated in a lab in 2018 and 2021 using off-the-shelf quantum and optical hardware, and we are now in the process of packaging this hardware into a compact terrestrial fiber optic product.

Once we have our compact terrestrial fiber optic product, we will use it to provide timing over a local terrestrial network. We aim to demonstrate this functionality as a pilot program in 2022, to show commercial traction and revenue ahead of launching our first satellite.

Once we have a terrestrial network, our next stage of development will be to add a small constellation of optical communications satellites, either via hosted payloads on partner crafts or via our own wholly owned vehicles. With just 8-12 6U CubeSats we could provide resilient and reliable global timing services offering picosecond accuracy and near unhackable security.

## TRACTION



**\$500K+ in revenue from study phase contracts with the US Air Force, NASA, and Navy**

**Graduate of 3 prestigious Accelerators: Techstars Space 2021, Air Force Catalyst 2019, and CDL Quantum Stream 2021**

**Awarded \$250K Advanced Industries Grant by the State of Colorado (selected from 100+ competitors)**

Our technology has received strong support and validation from a variety of sources, including contracts with large government customers, partnerships with commercial and research agencies, and selection for prestigious accelerators and grants. This is especially impressive considering our startup is only two years old. Our team may be small, but it is the right team to tackle this problem with the right experience, and the reason we have been able to accomplish so much so quickly.

Additional company achievements and proof points include:

- Partnership Agreements with Spire Global, Blue Cubed, SpeQtral, Louisiana State University (LSU), Quantum Economic Development Consortium (QED-C)



- Invited to present at a number of space and quantum conferences, including the Q2B Practical Quantum Computing conference, Photonics West, Satellite Innovation Conference, CyberSat, and Asia Pacific Satellite Communications Council
- Robust sales pipeline with interest from a wide range of government agencies, commercial telecommunications companies and data centers, defense primes and satellite operators
- The company is the holder of two core patents for our technology with other valuable IP in development

## CUSTOMERS



**NASA**  
LETTER OF INTENT



**US Navy**  
LETTER OF INTENT



**US Air Force**  
LETTER OF INTENT

We have a strong sales pipeline with a range of government and commercial partners and customers:

- US Air Force – pursuing time distribution across a constellation of satellites as the starting point for a future Positioning, Navigation and Timing (PNT) system to replace GPS [14].
- NASA – interested in timing for lunar missions. Getting a good time reference, and, by extension, position information, for satellites outside the GPS belt is an important use case.
- JPL – interested in our technology for deep space missions. Again, getting a good time reference, and, by extension, position information, for satellites outside the GPS belt is an important use case.
- Navy and other DoD agencies – interested in precision timing for sensors and radars across ships. This is necessary for data fusion applications as well as locating the position of adversary signal emitters through time difference of arrival (TDOA) [15].
- Department of Energy (DOE) – Xairos would provide secure timing for power grids and quantum networks.
- National Science Foundation (NSF) – we are currently conducting a joint project with university partners related to quantum gravity.

Our product provides value in the form of both network security and as well as timing precision for end users. We expect customer interest and contracts from a variety of industries.

- Telecommunications (e.g. AT&T, T-Mobile/Sprint, BT, Telefonica, NTT) – our product's precision timing unlocks more bandwidth and lowers latency, and its security features can help to keep the network online (it is estimated that a GPS outage of 24 hours would cripple most networks) [16].
- Data networks (e.g. Facebook, AWS, NVIDIA, Google) – imperfect time synchronization across different nodes in a database network produces different flavors of correctness anomalies, which our system can address.
- Finance (e.g. JPMorgan Chase, ABN AMRO) – our system offers non-hackable timestamping, which can offer a secure settlement of transactions between banks. For stock exchanges, we can reduce latency (by 10% to 50%) in financial transactions for high-frequency traders (HFT).
- Satellite operators (e.g. Spire Global, Eutelsat, Inmarsat) – we can provide more accurate timing for sensing and communication satellites.
- Industry 4.0 – using our timing technology, manufacturing lines would be able to function at much higher speeds while possibly eliminating processing bottlenecks.

## BUSINESS MODEL



### Subscription/Recurring Payment

Selling a product or service that customers pay on a recurring basis, usually month to month, or annually

We plan to introduce a subscription model into an industry that is currently hardware sales driven and capital expenditure heavy. While our competition sells timing boxes that are between roughly \$3,500-\$50,000 per unit, we intend to sell a time subscription for \$500/month.

Our goal is to provide a turnkey service on a monthly subscription instead of a one-time hardware sale. Our subscription will include hardware service, holdover and more accuracy than even the most expensive timing boxes can provide. Plus, at \$500/month, our customers would be able to save the costly upfront costs of expensive timing boxes.

Here is an example table of our costs as compared to approximate tiers of competition in the industry:<sup>\*</sup>

	Basic Timekeeping Box	Top Tier Timekeeping Box	Xairos Basic Service
Accuracy	40 nanoseconds (Primary Reference Time Clock - PRTC)	30 nanoseconds (Enhanced Primary Reference Time Clock - ePRTC)	1 nanosecond (In time, we can offer accuracy up to 10 picoseconds <sup>**</sup> )
Holdover	None	48 hours	Infinite
Resiliency	Depends on GPS	Can function without GPS for short periods	GPS-independent; More satellites for extra resiliency
Support	Only for hardware issues	Only for hardware issues	Full support in case of hardware or signal outage
Service Fees for Support, Testing, Regular Network Checks	Extra	Extra	Included
Average Price	\$3500	\$50,000	\$500/month

<sup>\*</sup>The data shown in this table may not be accurate and is being used only for illustrative purposes.

<sup>\*\*</sup>A picosecond is 3 orders of magnitude more accurate than a nanosecond.

Xairos' timekeeping boxes should cost a few thousand dollars in quantity, though these will be more expensive as we scale up production for the first few units.

The reason standard timekeeping boxes can cost up to \$50K today is that they need very expensive atomic clocks to achieve accuracy and resiliency beyond the GPS signal. Our system does not need that.

As shown in the table above, Xairos intends to price our premier, all-inclusive service at 2x the base model price and about 1/10th the top tier price annually. We intend for all customers to receive 1000 times more accurate timekeeping and thus better performance capabilities at a modest price point. Essentially, we will provide a cost competitive solution against the most basic timekeeping services and substantial cost savings against the top tier of those services that exist today. As such, we believe our target markets will find our value proposition and customer costs to be highly attractive.

Initially, we intend to subcontract out our terrestrial box development to existing Timing and Synchronization Hardware manufacturers. These are large, well established companies that have existing sales channels and the capability of building tens of thousands of units for Xairos.

There are two models we can consider for our initial go-to-market:

- Wholesale Model – Xairos buys the units from the hardware partner, then has our personnel install and test them with our end customers.
- Revenue Share or Licensing Model – Xairos splits the revenue or gets a fixed sales fee from the hardware partner (for leveraging their relationships and sales channels). In this case, either Xairos or the partner would be responsible for installation, billing, and support.

We will need more upfront financing to go with the Wholesale Model, but would get better back end revenue to then cover these costs.

The Revenue Share/Licensing Model may seem more attractive to our hardware partners and will let us focus on technology development and building out the space segment of our business (customers and use cases) further.



**\$500B**

Approximate Total Market Size

Now before we get into explaining further, you may be thinking; "Why should I pay for timing when GPS is free?"

For the sake of argument let's ignore the cost to the taxpayer, which is roughly \$1.8B a year [17]. To the consumer using a location app, it is free - though only because your location data is monetized. And for the enterprise user that needs timing from GPS? Well, those hardware and system costs are very expensive [18]. Nearly half a million GPS-tied timing boxes are sold a year, ranging in price from a few to tens of thousands of dollars a box [19]. A basic design meets older 4G timing standards with no holdover (backup timekeeping in case of a GPS outage) [20]. More expensive designs meet newer 5G timing standards and/or provide up to 48-hour holdovers [21]. On top of this, telecommunications companies and data centers spend lots of time and capital to ensure the timing stability and performance of their networks [22]. But they are running up against the natural (and two decade old) limits that the "free" GPS system can provide [23] (see "Problem" section above).

The global timing service market is an enabling technology for many of the world's largest markets (see image below). That being said, our go-to-market strategy is to first tackle the \$5B annual timing hardware market. Every year, almost 500,000 timing units are sold to hundreds of commercial entities in telecoms, defense, power, finance, and many more.

These companies are already spending billions annually on hardware that helps them track timing as effectively as possible. Our solution will help our customers not only save as much 10x on their capital expenditures, but it will also help them have up to 1000x more accurate time enabling them to provide more and much greater service to their customers.

Long term market opportunities can grow exponentially, as we know that many of the promising technologies of the future including self-driving cars, autonomous flying vehicles and nano-scale IOT, to name a few, will need to rely on picosecond accuracy from timing services. Xairos can unlock so many of these use cases, which today is impossible because of the limits of timing accuracy provided by GPS (30-40 nanoseconds, where one nanosecond is  $10^{-9}$  seconds, and one picosecond is  $10^{-12}$  seconds).

## COMPETITION



**Two groups - timing and synchronization hardware providers and position and navigation startups - are potential competitors but also partners.**

Our competition fits into two separate groups that are potential partners:

### 1. Timing and Synchronization Hardware providers.

These are the current providers of timing and synchronization hardware for telecommunication, financial and data networks. Leaders in this field include: MicroChip, Ericsson, IBM, OPNT, Cambium Networks, ADVA, Empowered Networks and SyncWorks. These companies sell almost half a million GPS-linked units each year, with prices per unit ranging from \$3500 to over \$50,000, and are potential partners for our space-based solution under a licensing or revenue-sharing agreement.

Because our technology isn't reliant on decades old public infrastructure, we have advantages in ease of use, lower lifetime cost, and up to 1000x improvement in accuracy. Because of this, our customers can provide their customers with better service for lower cost.

### 2. Position, Navigation and Timing (PNT) startups

## 2. Position, Navigation and Timing (PNT) startups

This refers to companies that are developing radio frequency (RF)-based positioning to augment the GPS position signal. This includes startups like Satelles, SatNav, TrustPoint, Xona Space System and Orolia.

While RF-based positioning services could be considered potential competitors to our quantum solution, we feel that these providers are more likely to be partners willing to host our quantum laser communication payload on their satellites.

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## TEAM



**Extensive space, quantum and business background with decades of government, commercial and startup experience.**

Founding team:



### David Mitlyng

CEO / Co-Founder

- 30 years of space, optics and business experience
- First employee at BridgeSat (business development, strategy & product management); led the company through its Series A funding round
- Executive at Hughes Space and Communications, Orbital ATK and SSL
- BS in Aeronautical Engineering from Cal Poly SLO
- MS in Aeronautics and Astronautics from Stanford University
- MBA from the MIT Sloan School of Management



### Dr. James Troupe

Chief Quantum Scientist / Co-Founder

- 30 years of space, optics and business experience
- First employee at BridgeSat (business development, strategy & product management); led the company through its Series A funding round
- Executive at Hughes Space and Communications, Orbital ATK and SSL
- BS in Aeronautical Engineering from Cal Poly SLO
- MS in Aeronautics and Astronautics from Stanford University
- MBA from the MIT Sloan School of Management

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## VISION



**To replace the timing from GPS and essentially own time and the markets it unlocks.**

Timing is foundational for all modern networks. Once our system is in place with a small constellation of satellites, we can address much larger adjacent markets that need this security and precision. This includes low-latency high-frequency trades, quantum networking, terrestrial Positioning, Navigation and Timing (PNT) for autonomous vehicles and IOT devices, and mineral exploration through



precise gravity gradient measurements [24, 25].

At Xairos, we envision a future where cars drive autonomously with the aid of sub-centimeter 5G positioning enabled by quantum timing. We expect to see IOT devices that sense environmental changes on the microscopic level, enabled by quantum timing. And maybe also a world where you can use your phone to guide you in large cities and inside buildings without skipping a beat, all enabled by Quantum timing.

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## USE OF FUNDS



**To expand our team and facilities and turn our proof-of-concept into a commercial product.**

The funds raised via this campaign will support our efforts to scale up and build our commercial product. Specifically, they will be used to cover the costs of building our proof-of-concept (POC) demonstration unit, making key hires to support our growth and further conversations with clients, and for general and administrative expenses.

Expected use of proceeds

- \$275K – building proof-of-concept (POC) demonstration unit
- \$250K – Expanding team and satellite development
- \$125K – Sales and Marketing for commercial contracts
- \$850K – Upkeep of product development and facilities

This funding will give Xairos 18 months of runway, which we believe is enough time to build our commercial product and establish critical commercial and government contracts. Once we do this, our aim will be to land a small Series A that we can use to fund our first satellite.

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## COMPANY



**Xairos**

Sat Applications/Connectivity

Xairos is one of the only companies building a secure timing service for the modern world. Our timing system is 1000 times more accurate and more secure than timing from GPS. This allows you to know your position to the width of a human hair, and networks to move more data and faster.

Website	<a href="http://xairos.com/">xairos.com/</a>
Employee Count	5 People
Founding year	2019
Company type	Private

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## RISKS & DISCLOSURES



**Technology and commercial market development is a small, but manageable, risk that we can offset with our government**

Xairos' development roadmap is focused primarily on the commercial market. Government projects will progress in parallel and will help fund and de-risk this commercial development. Our team will focus on government projects that complement our commercial development roadmap so we don't distract or overcommit precious internal resources.

#### **Risks associated with Product**

***Our product is not yet ready for commercial deployment.***

Additional research and development is required before our product will be usable for spaceflight applications. We may encounter unexpected delays or additional expenses, or may never have a product accepted by the market. If there is a lack of uptake by potential customers of a new product, the company may not succeed.

#### **Operational Risks**

***We are a recently formed company and have limited operating history on which to evaluate our performance.***

Xairos was recently formed in March 2019. Accordingly, the Company has a limited history upon which an evaluation of its performance and future prospects can be made. Our current and proposed operations are subject to all the business risks associated with new enterprises. These include likely fluctuations in operating results as the Company reacts to developments in its market, managing its growth and the entry of competitors into the market. We expect to incur net losses until we can establish a consistent base of customers for the Company's product. There is no assurance that we will be profitable or generate sufficient revenues to support our operations.

#### **Economic and Industry risks**

***Evolving regulations governing the growth and availability of space based applications and services may impact the Company's business and prospects.***

We anticipate U.S. and International space regulations will evolve and may impact our operations and business success. If new or changed regulations are introduced, they may limit our ability to market and sell our products and services to customers, as well as possibly limiting our customer's ability to apply our products and services.

***We are dependent on general economic conditions.***

Our business model is dependent on our target customers being able to finance their own operations and interest in spaced based applications for new radiation shielding materials and forecasting system. Our business model is thus dependent on national and international economic conditions. Adverse national and international economic conditions may reduce the future interest of our target customers, which would negatively impact our revenues and possibly our ability to continue operations. These fluctuations may be significant and could impact our ability to operate our business

Hi. Need any help?

