The Cosmos Hub

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authored collectively by members of the Cosmos community

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1 Introduction

The vision of the Cosmos Network, as laid out in 2016, has been realized.[1] The creation of a secure software stack for building and connecting application-specific blockchains has catalyzed a thriving ecosystem of sovereign interoperable communities and an increasingly dynamic inter-blockchain communication economy. The interchain as originally imagined is taking form. The Cosmos Network is an association of autonomous communities connected economically and ideologically with the Cosmos Hub. It is a voluntary association of blockchains that subscribe to a philosophy of sovereign interoperability, localism, and pluralism. A network of networks that uphold the right for communities to maintain technological sovereignty and peacefully interoperate. This philosophy is grounded in a humility for the extraordinarily rich cultural diversity of human beings. It is tacit recognition of the fundamental limits of our discretionary reason in organizing planetary sustainability, while serving as a call to use technology as best we can to facilitate responsible self-governance. Cosmos offers a meta-political economy, one that recognizes the need for representation of different interests at different scales, and for an approach that can bridge the gap from local to global and back.

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[1] Kwon, Jae; Buchman, Ethan. "Cosmos Whitepaper." Aug. 2016, https://v1.cosmos.network/resources/whitepaper.

The Cosmos Hub's inaugural role was to originate the internet of blockchains. It did so by resourcing the development of the Cosmos SDK, IBC, and Tendermint, the core open-source primitives for the blockchain applications that now populate the interchain. However, with an active and increasingly sophisticated IBC network, the needs of the interchain have evolved. Accordingly, the Cosmos Hub must also transition into a new role: to grow a resilient interchain economy.

In this new role, the Cosmos Hub becomes a secure platform for others to build the next generation of interchain-native infrastructure and applications, opening new opportunities for interchain coordination. From this substrate, the Cosmos Hub renews its purpose as a provider of infrastructure services whose utility scales with the growth of the interchain. The Cosmos Hub will secure and capitalize ecosystem-critical applications, while serving as the port of entry for new Cosmos participants, and a coordinating center for the infrastructure and administrative concerns of the interchain.

This paper describes the Cosmos Hub's layered architecture, beginning with the collaborative effort required to build and maintain the Cosmos Stack. One layer above is the Hub's Interchain Security and Liquid Staking functionality, which provide a platform for secure economic scaling. And on top of this scaling platform, a newly proposed layer of Hub-specific functionality: the Interchain Scheduler and the Interchain Allocator, whose joint purpose is to grow a more resilient interchain.

- **Social Coordination Technology:** The Cosmos Hub is a natural place for Tendermint, Cosmos SDK, and IBC DAOs. A presence on the Cosmos Hub will open the funding and control of the open-source software to a wider group of stakeholders.

- **Interchain Security:** Security is a necessary foundation to build essential components for the Cosmos Network, and the Cosmos Hub's Interchain Security environment will be enriched with new capabilities that make it more useful, efficient, and cooperative.

- **Liquid Staking:** Liquidity is critical in the proof of stake economy. The Cosmos community has studied liquid staking for years and will soon provide the secure infrastructure for premier vendors to issue liquid staking assets.[2]

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[2]Lutsch, Felix; Crain, Brian; Shapiro, Gabriel; Dillon, Brendan. "Liquid Staking Research Report: Implications of Proof-of-Stake Assets in Decentralized Finance." Jun. 2020, https://mirror.chorus.one/liquid-staking-report.pdf.

- **Interchain Scheduler:** The IBC economy is a patchwork of asynchronous markets, introducing an enormous variety of cross-domain maximum extractable value (MEV) opportunities. This market can be made more efficient, more secure, and more lucrative for Cosmos chains and their users. The interchain needs a secure block space market to avoid off-chain cartelization and more options for chains seeking to optimize the use of block space.

- **Interchain Allocator:** Sustaining the rapid growth of the interchain will require new approaches to on-chain economic coordination. The Interchain Allocator is a platform for delegated parties to grow and align ATOM-based markets, facilitating multi-chain trust and coordination. The integration of sovereign political economies through transparent collateralized agreements will unlock higher-order economic power and capital efficiency.
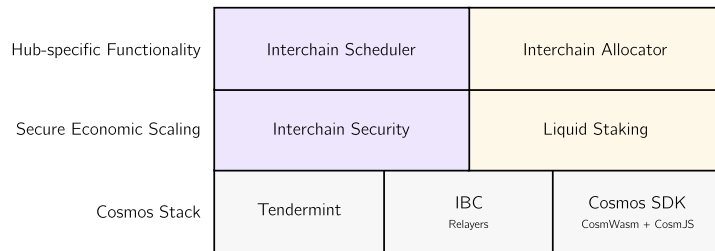

Figure 1: A simplified representation of the core functionality provided by the Cosmos Hub. The bottom layer is the Cosmos Stack, funded by the Hub and stewarded by core teams. The middle layer consists of the upcoming upgrades to scalability of the Hub's security and liquidity system. Built on top of Interchain Security and Liquid Staking is Hub-specific functionality, the proposed Interchain Scheduler and Allocator.

With these primitives, the Cosmos Hub will become a self-propagating economic engine that drives the expansion and integration of the Cosmos Network. This 'Cosmos Network' is an area of economic association with the Cosmos Hub, primarily via the use of ATOM as the preferred collateral.

The Interchain Scheduler and the Interchain Allocator drive the growth of the Cosmos Network, together creating a flywheel whereby:

1. Cosmos Hub collects revenues from interchain economic activity by creating a secure block space market, the Interchain Scheduler, and charging a matching fee.

2. Revenue is used to drive long term ecosystem alignment and add promising new projects to the Cosmos Hub's holdings via the Interchain Allocator. In turn, these projects expand the Scheduler's addressable market.
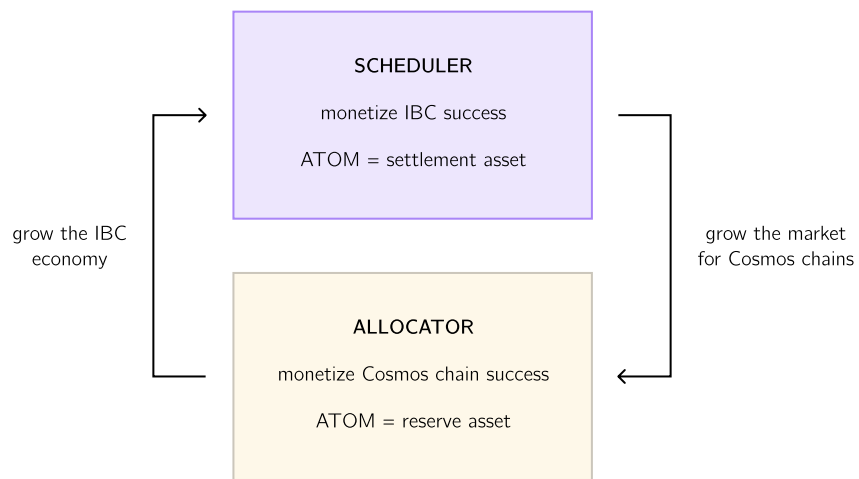

Figure 2: Core positive feedback loop driving the growth of a resilient interchain. The Scheduler monetizes IBC economic activity with revenues going to Allocator. The Allocator supports new Cosmos chains, expanding the addressable market of the Scheduler.

The result is a renewed role for ATOM as preferred collateral within the Cosmos Network. The Cosmos Hub becomes a long-term holder of ecosystem assets, drawing valuable projects into Cosmos. ATOM stability, liquidity, and the overall attractiveness of ATOM denominated collateral increase with a growing asset backing and deeper ATOM markets. The network effect thus encourages more participants to join the Cosmos Network and integrate with one another. Likewise, the public works sponsored by the Cosmos Hub will lead to a healthier ecosystem and more demand for the Hub's infrastructure offerings.

Like a port city at the center of a vast ocean trade network, the Cosmos Hub will grow to offer increasingly favorable conditions for life and trade within the Cosmos Network and the interchain at large.[3]

2   Securely Scaling Cosmos

The Cosmos Hub is the most secure pillar of the interchain. Interchain Security enables the reuse of the same validator set and staked collateral to secure additional state machines. New projects can develop as independent applications within the Cosmos Hub's security boundary while the Hub continues to minimize its security surface. Liquid Staking providers will be the first users of Interchain Security, enabling ATOM holders to earn staking rewards while also using their ATOM to pursue other opportunities. Together, Interchain Security and Liquid Staking create a secure base layer for projects to build and capitalize valuable interchain utilities.
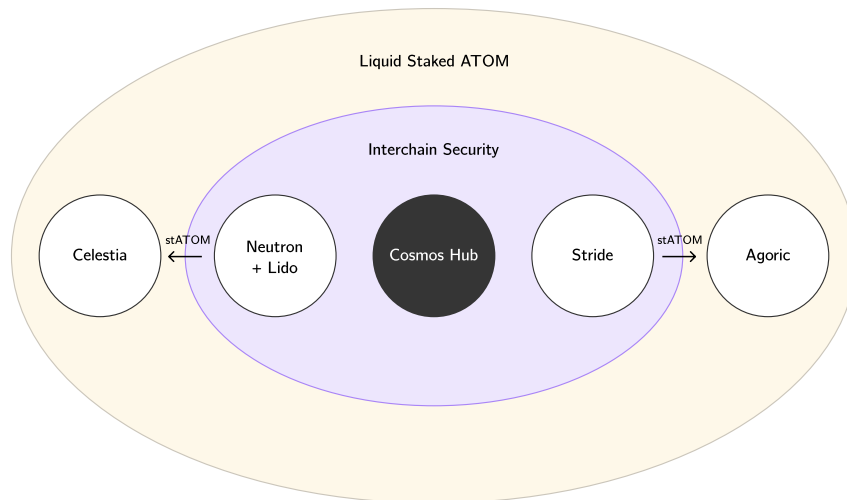

Figure 3: Interchain Security empowers independent projects to build on the Cosmos Hub while Liquid Staking positions ATOM to become the premier interchain reserve asset.

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[3]Buchman, Ethan; Hart, Sam. "The Cosmos Hub is a Port City." Feb. 2021, https://blog.cosmos.network/the-cosmos-hub-is-a-port-city-5b7f2d28debf.

2.1 Interchain Security

Interchain Security enables the Cosmos Hub to host a novel category of applications with complementary functionality. The Cosmos Hub establishes trust by putting ATOM at risk for consumer chain faults, enabling parallel development from core teams and collaboration with incentive-aligned consumer chains.[4] For these projects, Interchain Security's value proposition starts with an increase in economic security up to the Cosmos Hub's cost of corruption, together with a substantial reduction in the marginal cost of security when compared to the cost of an independent validator set. Interchain Security gives consumer chains a faster, easier, and cheaper path to market, accelerating innovation within the service perimeter. Participating projects will be naturally aligned with the Cosmos Hub community, benefitting from a variety of integrations and collaborative opportunities with other Cosmos chains.

The development platform afforded by Interchain Security allows the Cosmos Hub to fulfill several of the functions imagined from inception by allowing third parties to utilize the Hub's essential infrastructure to build commercial applications, for instance:

- **Rollup Settlement:** A canonical rollup settlement system and scaling solution in which external data availability providers publish fraud proofs and resolve fork-choice disputes.

- **IBC Routing:** A market for IBC relay contracts and multi-hop connections, aggregating relay providers to create a simple, cost-effective, and reliable IBC connectivity subscription for a wide coverage area.

- **Multiverse:** An application deployment utility for projects to permissionlessly launch consumer chains within a sandboxed environment such as CosmWasm. Infrastructure automation would make creating a blockchain secured by the Hub as easy as deploying a smart contract.

- **Chain Name Service (CNS):** A utility analogous to a root certificate authority for the interchain. A secure identification and authentication service for IBC-connected blockchains would provide a single location for chains to permissionlessly manage information about themselves. By establishing a secure connection to this resource, clients or on-chain entities can discover information about other resources within the interchain. A CNS architecture would likely require components deployed both to the Cosmos Hub directly as well as a consumer chain.

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[4]Kwon, Jae. "The Shape of Cosmos." Sep. 2020,
https://github.com/jaekwon/cosmos_roadmap/tree/master/shape_of_cosmos.

Interchain Security also allows for several avenues of application development. Chains may join as independent economic units, diverting a portion of inflation and fees to cover security costs. Alternatively, core Hub functionality may be built on a consumer chain and receive financing for infrastructure build-out, opting for a fee split rather than a dedicated token, or some combination thereof.

The utility of Interchain Security for consumer chains rests on providing strong accountability guarantees to a broad set of Cosmos chains and substantiating the Hub's credible neutrality.

2.2   Liquid Staking

A practical consequence of the current competition between staking and external uses of capital is that most staking assets are confined to their originating chain, which hinders cross-chain composability.[5] Therefore, full economic integration of the interchain requires liquid staking. The user experience and capital efficiency improvement offered by liquid staking is so substantial that liquid staked assets are expected to become the dominant transactional medium—particularly for use-cases exogenous to the originating chain.

Centralized exchanges already provide a form of liquid stake by custodying assets and staking on behalf of their users. They do so while allowing tokens to trade freely within the confines of their platform. Moreover, it is possible to create liquid stake custodially via cryptographic means or via Interchain Accounts. Since the benefits of liquid staking effectively makes these applications unavoidable, the Cosmos Hub must ensure that the liquid staking system is as safe and decentralized as possible by providing for it in-protocol. The current 5% slashing penalty for equivocation means that ATOM collateral is considerably under-utilized. The liquid staking module will enable the creation of delegation shares, and thereby liquid staked assets, which can be used cross-chain with acceptable risk and user experience tradeoffs. Specifically, delegation shares allow protocols to accurately price risk while removing the need for unbonding prior to third party liquid asset issuance. The resulting liquid staking asset can be easily exported over IBC and accrue rewards while composing with other protocols to expand the utility of ATOM across the interchain.

Liquid staking requires providers to custody assets, and therefore represents a significant change to the Cosmos Hub's security model. The most effective way to ensure long-term security is to make sure both individual providers and the marketplace for provision remains decentralized.

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[5]Manian, Zaki. "ATOM 2021." Aug. 2020, https://github.com/cosmosdevs/atom2021.

A competitive marketplace for liquid staking provision will further improve the consumer experience, driving protocols to compete on several dimensions, including trust minimization and safety. This market for cross-chain liquidity will be the catalyst for ATOM deployment across the interchain, creating new waves of innovation built on secure Cosmos-native collateral.

3 ATOM: The Interchain Reserve Currency

3.1 Issuance

Today, the Cosmos Hub's monetary policy is designed to balance security with liquidity by targeting 2/3 of ATOM supply staked. If the staking ratio falls below this target, issuance increases incrementally until either the staking ratio is brought back to the target level or the maximum issuance threshold is reached. Additional staking is incentivized, increasing security at the cost of liquidity. Conversely, if the staking ratio rises above 2/3, issuance incrementally decreases to ensure the availability of liquid supply. Staking is thus disincentivized, improving liquidity at the cost of security.

However, keeping 2/3 of the entire monetary base staked is a substantial capital inefficiency that limits growth and hinders cross-chain composability. Liquid staking increases capital efficiency by allowing users to stake ATOM while simultaneously using the claims on staked ATOM as working capital, thus removing the competition between staking and other opportunities.

Since liquid staking solves the problem that the current monetary policy was originally designed to address, issuance can now be reconsidered. Rather than try to balance security with liquidity, the revised monetary policy should balance interchain adoption, growth, and capitalization with fiscal responsibility, while preserving the security afforded by the original regime.[6]

Following sufficient adoption of liquid staking, this new monetary policy would consist of two phases: transition and steady state. The purpose of the transition phase is twofold. First, to allow consumer chains time to join Interchain Security, helping to subsidize security expenditure, and second, to give the community an opportunity to develop the social infrastructure necessary to effectively manage a sizable treasury. The transition phase starts the moment that Cosmos shifts to the new monetary policy and ends 36 months later, at which point the steady state phase begins and lasts indefinitely. During the transition phase, issuance directed to the distribution module declines from the present exponential rate, approximately 1% of the total ATOM monetary base per month, to a constant rate of 300,000 ATOM per month (a nod to the speed of light, 300,000 km per second).

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[6]Chitra, Tarun; Kulkarni, Kshitij. "Improving Proof of Stake Economic Security via MEV Redistribution." Aug. 2022,
https://people.eecs.berkeley.edu/~ksk/files/MEV_Redistribution.pdf.

Upon initiation of the transition phase, the first of twelve 4,000,000 ATOM tranches is deposited into the Treasury. The eleven remaining tranches may be issued at any time per ATOM holder vote (shown as yearly intervals in Figure 4). Further provisions on Treasury use may be determined by ATOM holders as later described in section 5.2.

$$Issuance_{distribution} = \begin{cases} 3,375,000 * (1 - 0.065)^{month} & \text{if } month \leq 36 \\ 300,000 & \text{if } month > 36 \end{cases}$$

The amount of ATOM issued and distributed to validators and delegators as a security subsidy will begin at the same level as immediately precedes the transition phase. The subsidy will decrease by 6.5% every month for 36 months, until it reaches 300,000 ATOM per month. At this point, the revenue generated from Interchain Security should exceed the diminished security cost under liquid staking and remaining tail emissions directed proportionally toward a set of beneficiaries determined by ATOM governance. As a safety measure, if the staking rate ever falls below ²/₃, the new monetary policy will pause and the original monetary policy will resume, incrementally increasing issuance up to a maximum percentage of supply until the staking ratio again exceeds ²/₃, at which point issuance will return to a fixed 300,000 ATOM per month. Note that the security subsidy will also continue to fund the Community Pool as staking rewards are granted via the distribution module, which will automatically direct 5% of funds to the Community Pool.

The remaining issuance is directed to the new Cosmos Hub Treasury and will be used to support initiatives that increase adoption, growth, and capitalization of the interchain, including public works and opportunities for expansion. By having a well funded treasury, the Cosmos Hub can ensure that capital is not an obstacle in the pursuit of worthwhile endeavors, enabling more interchain developer activity and greater liquidity; helping protocols bootstrap their economies while increasing the Scheduler's addressable market.
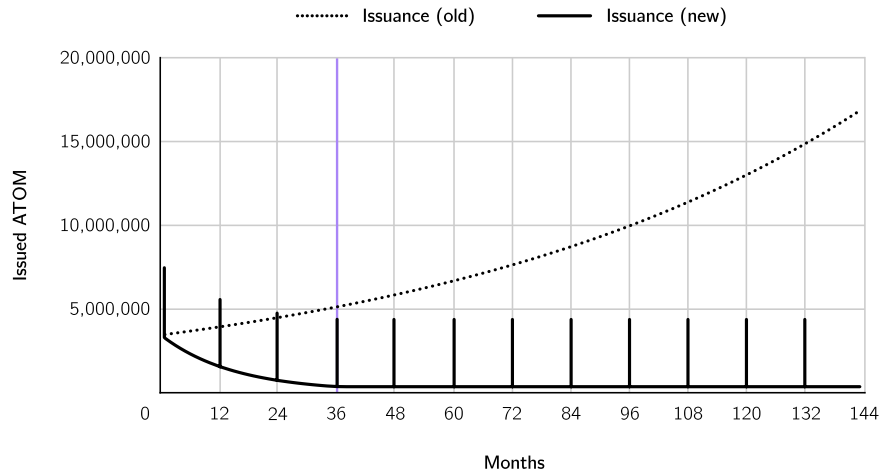
Figure 4: New issuance from time of activation. Issuance during the transition phase (i.e. first 36 months) is intended to wean stakers off of the security subsidy. Twelve tranches of 4,000,000 ATOM may be proposed successively to endow the Cosmos Hub Treasury. The Cosmos Hub Treasury is used to capitalize the Allocator and public works.
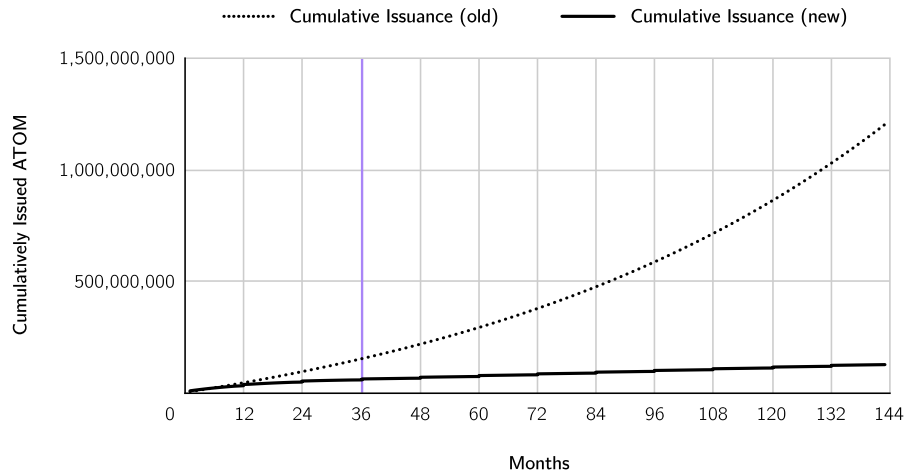

Figure 5: Cumulative issuance from time of activation. The proposed new issuance model will substantially reduce the growth of total ATOM supply over time by shifting from exponential to linear growth.

3.2 Fees

Today, transaction fees paid to the Cosmos Hub are sent to the distribution module and split among the Community Pool, delegators, and validators. With the addition of Interchain Security, a portion of transaction fees and issuance from each consumer chain will be sent to the Cosmos Hub's distribution module, paying to secure all chains and replacing the current issuance subsidy.
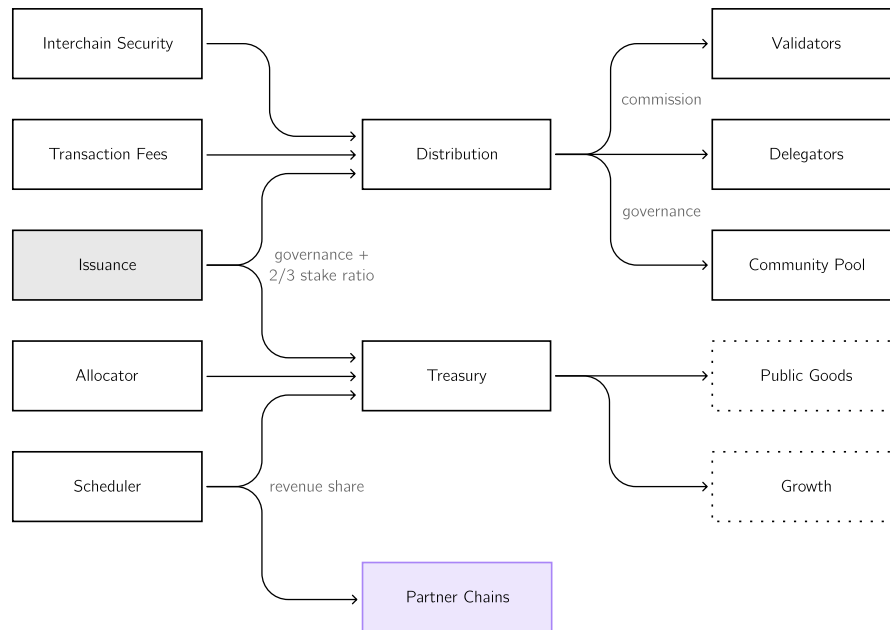

Figure 6: Interchain Security replaces issuance as a means of incentivizing validators and delegators. If the stake ratio ever drops below $2/3$, issuance will revert to the original issuance model until the ratio returns to $2/3$ or higher. Issuance not directed to the distribution module is directed to the Cosmos Hub Treasury, a new capital pool managed by domain-specific councils to fund public goods and grow a resilient interchain.

The anticipated global fee module will add a whitelist of accepted tokens with corresponding fee minimums that will be maintained by Cosmos Hub governance. While serviceable in the short-term, governance-determined pricing for every accepted token is cumbersome and prone to resource mispricing, particularly as the whitelist grows. Instead, governance should set a single ATOM floor fee, while the base fee is algorithmically priced in response to demand. Exchange rates obtained from trust-minimized oracles may then be used to automatically update the corresponding price for all remaining whitelisted tokens. The Cosmos

Hub governance may then elect to use infrastructure provided by the Allocator in order to periodically auction collected fees into a target currency, ATOM, or stablecoins before tokens are sent to the distribution module.

All other applications may create their own fee mechanisms with the assumption of transaction inclusion. For instance, the Allocator and Scheduler can customize their fee structure depending on their chosen architecture, with returns flowing to the Cosmos Hub Treasury.

4   The Cosmos Economic Engine

With a secure domain for adding new functionality, beginning with cross-chain liquidity, the Cosmos Hub now has the necessary components to assume its role as platform for the creation of valuable utilities, a hub for the interchain. In order to realize its purpose, to drive the expansion of a more secure and efficient IBC economy and building long-term alignment with a growing Cosmos Network, the Cosmos Hub will require two mutually-reinforcing systems:

1. **Interchain Scheduler:** a secure cross-chain block space marketplace and MEV solution

2. **Interchain Allocator:** a venue for economic coordination and interchain project alignment

4.1   Interchain Scheduler: A Secure Blockspace Marketplace

While Interchain Security provides a secure platform for building a coalition of Cosmos-aligned applications, the Interchain Scheduler builds on top of this platform to offer defensible utility that scales with the growth of the wider IBC economy. This is achieved with a marketplace for tokenized cross-chain block space.

MEV relay networks enable off-chain markets for private transaction submission. Such systems are attractive because they allow more expressive and efficient execution of user intent with capabilities like front-running protection, multi-transaction bundling, failed transaction prevention, and transaction sequence priority. As MEV opportunities grow, such relay systems are becoming increasingly active within the interchain. And by offering MEV relay service on multiple chains, relays are able to further articulate cross-chain execution guarantees.[7]

The assurances of an MEV relay network are only as strong as the number of validators running modified software. While attractive for individual users, this

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[7]Obadia, Alexandre; Salles, Alejo; Lakshman, Sankar; Chitra, Tarun; Chellani, Vaibhav; Daian, Philip. "Unity is Strength: A Formalization of Cross-Domain Maximal Extractable Value." Dec. 2021, https://arxiv.org/pdf/2112.01472.pdf.

model presents systemic centralizing concerns if left unchecked. Functionality rests on trusted relationships among validators, MEV relays, and builders, even extending to intermediation of the node software run by validators. Therefore, these networks are possible vectors for off-chain cartelization with little counter-force to ensure accountability as they scale. At worst, the monopolizing tendency of off-chain block space markets could undermine efficient transaction fee pricing and, ultimately, chain security.

Beyond centralization concerns, the revenues generated from MEV networks are typically shared among validators or clients directing orderflow, while protocols and their token holders are left out of the value chain. To ensure fairness and efficiency for chains and users alike, the interchain ecosystem requires a competitive market with differentiated MEV solutions. The Interchain Scheduler addresses these concerns by bringing MEV markets on-chain, thereby minimizing trust, improving quality of service, and enabling direct block space regulation by chains themselves. Moreover, an on-chain market can provide a more fair and transparent system for returning revenues to their originating protocols and token holders.

Using the capabilities enabled by Tendermint's latest ABCI++ upgrade, transaction inclusion and ordering can be segregated and the rights to order transactions for a designated block in the future can be tokenized, traded, and transported over IBC.[8][9]

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[8] Waters, Callum. "Tendermint's New Application Blockchain Interface — ABCI++." Sep. 2022, https://medium.com/the-interchain-foundation/tendermints-new-application-blockchain-interface-abci-86d46bd6f987.

[9] Floersch, Karl. "MEV Auction: Auctioning transaction ordering rights as a solution to Miner Extractable Value." Jan. 2020, https://ethresear.ch/t/mev-auction-auctioning-transaction-ordering-rights-as-a-solution-to-miner-extractable-value/6788.

The Scheduler system works as follows:

1. When the consumer chain enables the Scheduler module, it can enter into a cross-chain contract to provide a portion of their block space (e.g., one block every minute). Chains may sell as much blockspace in the marketplace as they wish, above some minimal threshold.

2. Once the agreement is in place, the Scheduler issues non-fungible token reservations representing each future block region on the consumer chain. Reservation tokens from all participating chains are then periodically auctioned in batches.

3. Optionally, tokenized reservations may be traded on a secondary market. This is possible until the reservation is redeemed to the appropriate validator on the partner chain, along with the desired transaction sequence.

4. Upon successful block execution, a split of proceeds from the Scheduler auction are sent back to the partner chain.

By purchasing synchronous regions of block space on different chains, users can lock-in arbitrage opportunities or schedule cross-chain settlement transactions with strong execution guarantees.
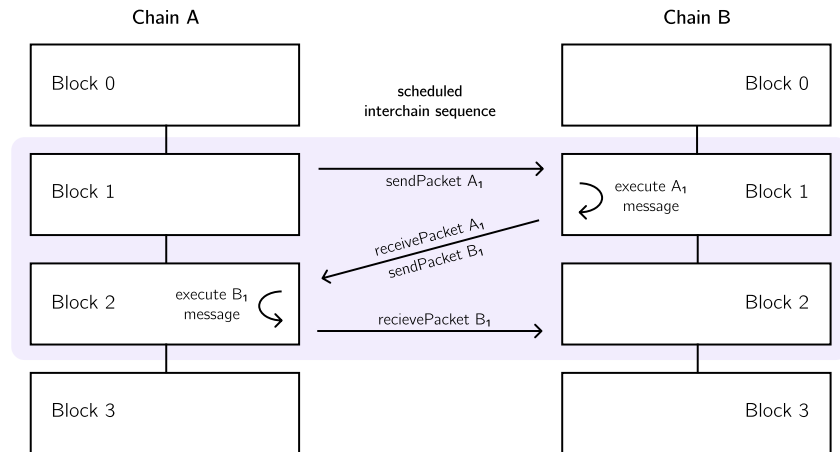

Figure 7: Depiction of a scheduled sequence of transactions occurring over multiple chains in successive blocks. The Scheduler leverages ABCI++ to enable partner chains to tokenize reservations for future block space. Those reservations are auctioned in a common MEV marketplace, enabling stronger atomicity and settlement guarantees than off-chain counterparts.

In moving the interchain MEV market on-chain, the Scheduler can offer a trust-minimized assurance that users hold an exclusive right to order transactions for future block regions. Moreover, a common market for multi-chain block space will command higher rates by securing cross-chain atomicity, while establishing defensible network effects. This novel market structure is intended to complement the off-chain MEV economy, providing different trade-offs and increasing competition to the benefit of chain security.
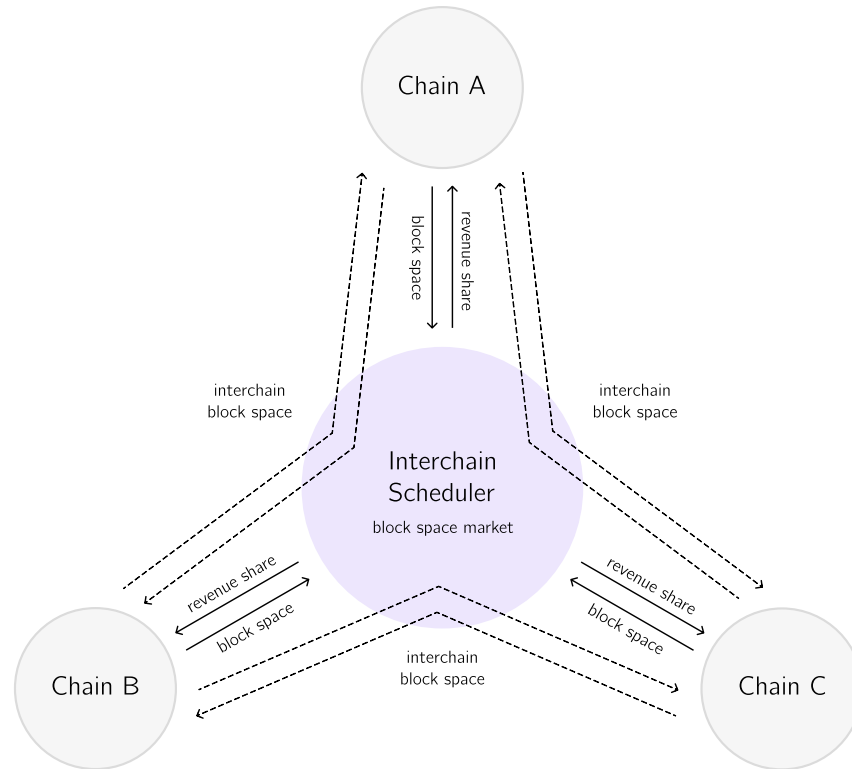

Figure 8: The Scheduler creates an in-protocol market for interchain block space, allowing chains to specify allowable MEV. Unlike other solutions that only split revenues with validators, the Scheduler also splits revenues with consumer chains.

A portion of block space may also be designated for use by other chains within the Scheduler network, analogous to a free trade agreement where the goods and services of neighboring economies are given preference. The Scheduler system will provide a substrate for service providers to create a variety of MEV-native applications: settlement layers with cross-chain time preference, IBC relay aggregators and routing utilities, on-demand liquidity networks, or trust-minimized best execution services.

The Scheduler will be available first to Interchain Security consumer chains for a secure initial deployment. The intention is to expand to become the primary venue for future interchain block space. The cross-chain MEV revenues generated from the Interchain Scheduler will flow back to the Cosmos Hub Treasury to drive growth by capitalizing public works and the Interchain Allocator.

4.2 Interchain Allocator: Economic Coordination and Long-Term Alignment

To date, ATOM has funded the development of foundational software components powering a thriving ecosystem. ATOM's liquidity, availability on exchanges, and its engaged user base has made it the primary entrypoint for those looking to experiment with new Cosmos applications.

However, until liquid staking is introduced, interchain growth is hindered by the conflict between the native staking system and other opportunities for utilizing ATOM. Liquid staked assets eliminate the opportunity cost of staking, prompting growth. However, to further support ecosystem growth and economic alignment, the Cosmos Hub could also offer functionality for external protocols and communities to develop strategies for economic coordination between staked ATOMs and new projects in the interchain, aligning the utility of ATOM with ecosystem growth.

The function of the Interchain Allocator is to provide new Cosmos projects a more efficient path to user acquisition, liquidity, and long-term ecosystem alignment.
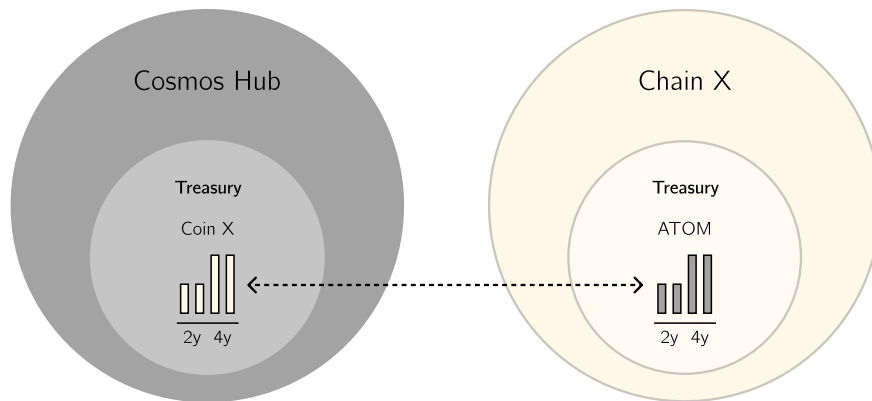

Figure 9: The Interchain Allocator is a system for capital allocation and incentive alignment. The more Coin X that the Cosmos Hub holds and the more ATOM that Chain X holds, the more incentive aligned the two chains become.

The Allocator provides two basic tools that enable incentive-aligned communities to develop strategies for economic coordination on behalf of the Cosmos Hub:

1. **Covenant:** a system for establishing multilateral agreements with designated chains and IBC-enabled entities.

2. **Rebalancer:** a system for automatically managing asset portfolios with public liquidity.

The Cosmos Hub community will actively seek to fund incentive-aligned communities that can credibly aid in achieving the Allocator's mandate, which includes the following:

- Increasing the velocity of new Cosmos project creation

- Accelerating project growth and sustainability

- Expanding the economy for cross-chain blockspace

- Aligning incentives between new projects and the Cosmos Hub

- Making ATOM the most desirable, widely deployed reserve asset in the interchain

The Cosmos Hub would seek to fund incentive-aligned DAOs to carry out the Allocator's mandate as successful execution will require human judgment. For example, to create an incentive-aligned DAO from which the Cosmos Hub may source judgment, ATOM stakers could "bond" their liquid stake to a new DAO instance for a specified duration. More ATOM bonded with a longer lockup results in greater voting power within the DAO, where $VotingPower = AtomAmount * RemainingBondDuration$. The Cosmos Hub may grant this DAO a recurring funding rate and a performance-dependent bonus, which is paid to DAO participants in exchange for their service and for putting their capital at risk. This new DAO could then utilize the Covenant and Rebalancer to achieve the Allocator's mandate.

Covenant

Without the Covenant system, protocol-to-protocol coordination is cumbersome, requiring multiple governance proposals to conduct the simplest inter-protocol arrangement (e.g., establish an interchain account, send tokens, enter a liquidity pool). The Covenant system streamlines this process by creating a vehicle that can implement inter-protocol transactions with as little as a single action by each protocol. To use it, one protocol sets parameters and deposits the funds into a covenant. If the other protocol has any issues with the original parameters, they may establish and fund a new covenant with updated parameters. This process repeats until a covenant is fully funded, at which point the deal terms are active.

While the Covenant system itself is a simple primitive, other protocols can use this system to build increasingly sophisticated multilateral agreements to improve inter-protocol coordination, liquidity provisioning, and incentive alignment.
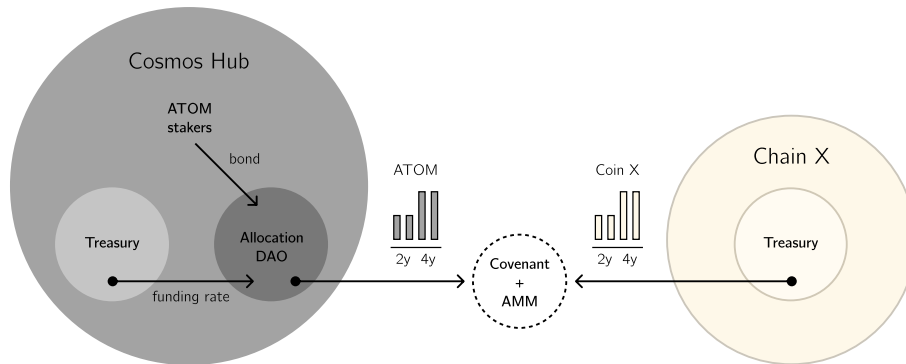

Figure 10: The Hub's Allocation DAO uses the Covenant system to enter into on-chain agreements with other chains. In time, the Hub may support multiple Allocation DAOs. Other chains may form their own Allocation DAOs, which would further streamline cross-protocol coordination.

Rebalancer

The Rebalancer system is a tool for the execution of third-party capital allocation strategies for liquid assets that takes the current portfolio, a target portfolio, and exchange policy as inputs. The Rebalancer periodically computes assets to be sold or acquired to incrementally move toward the target portfolio. The assets are sold or acquired according to the user's desired policy, which could include gradual dutch auction or direct trade on a whitelisted exchange.[10] Users of the Rebalancer can set parameters to strike the desired balance between urgency and slippage minimization on a portfolio or per-asset basis.

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[10] Frankie; Robinson, Dan; White, Dave; andy8052. "Gradual Dutch Auctions." Apr. 2022, https://www.paradigm.xyz/2022/04/gda.

Interchain Allocation

Together, these tools can be used to create collateralized agreements with other decentralized entities, deploying and rebalancing capital. Examples of how protocols may use the Allocator include:

- Mutual stakeholding and protocol-to-protocol collaboration

- Providing guarantees on auction price floors

- Expanding liquid staked ATOM markets by entering into AMM pools with liquid staked ATOM or ATOM-backed assets such as collateralized stablecoins

- Rebalancing reserves and tuning the monetary properties of ATOM with diversified collateral backing in order to make ATOM a more desirable collateral asset

- Participating in other chain's governance as a delegate of the Cosmos Hub by voting as a block on proposals from tokens held by the DAO or third parties

The Allocator is a response to market demand. Protocols already seek alignment with ATOM, the Cosmos Network, and core software development initiatives. The Allocator gives such projects a more streamlined, formal, and quantifiable means of collaboration.

Cosmos is uniquely positioned to support emerging IBC-enabled applications in building utility and increasing interchain liquidity. Increasing interchain liquidity is a win-win for both Hub-aligned protocols and the Hub itself because it strengthens the economic development of the Hub-aligned protocol, while simultaneously increasing the utility of the Interchain Scheduler. Greater liquidity increases the utility of the Interchain Scheduler because it increases the market for arbitrage, making blockspace more valuable, thereby increasing the amount an MEV captor could pay for Scheduler-provided blockspace while remaining profitable.

The positive feedback loop between the Scheduler benefiting from increased interchain liquidity and the Allocator deploying capital to increase interchain liquidity gives the Hub asymmetric advantages relative to other liquidity providers. That is, the Scheduler and Allocator combined enable the Hub to benefit from providing liquidity, which reduces the Hub's overall risk and enables the Hub to provide more capital.

Lastly, in addition to the network having the largest and most sophisticated validator set, Cosmos can also use capital allocation as an added incentive for chains to choose the Cosmos Hub as their Interchain Security provider and further integrate with the Cosmos Network as it matures.

In addition to these immediate next steps for the Cosmos Hub, the Allocator opens numerous opportunities for expanding the greater Cosmos Network:

1. **Multiple Allocator DAOs:** The Allocator would be designed to allow for more than one Allocator DAO. The Cosmos community will likely fund Allocator DAOs with differentiated theses and access so as to improve Cosmos Hub treasury diversity and performance.

2. **Liquidity-as-a-Service:** an incentive-aligned community could deploy ATOM into a covenant and automatically use that ATOM to create liquidity provider tokens when a counterparty matches the ATOM with a given amount of a different token (e.g.,100 ATOM matched with 5,000 IST to create ATOM-IST LP tokens).

3. **Under-Collateralized Financing:** Prior to Interchain Security, there was no on-chain way for a lender to recoup capital in an under-collateralized loan if the borrower defaults. With Interchain Security, a capitalized entity could provide loans to consumer chains without the borrowing protocol putting down any collateral upfront. If the borrowing protocol defaults on its loan, they could mint the borrowing protocol's tokens to cover losses.

4. **Liquidity Saving:** Covenants can be used to direct capital into trade networks, improving liquidity profiles and reducing the occurrence of insolvency due to stressors. Such injections can be optimized for network level properties to improve the overall health of the network.

5. **Allocation Beyond the Cosmos Hub:** Protocols may use the Allocator's Covenant and Rebalancer tools without the Cosmos Hub as a counterparty. Any usage of the Allocator is beneficial to the Cosmos Hub, even when the Cosmos Hub is not a counterparty, because it facilitates future integration into the Cosmos Network.

The Interchain Allocator is designed to increase the rate of Cosmos-aligned project growth and expand the cross-chain blockspace economy. Accordingly, the Allocator fosters cross-protocol coordination while installing ATOM as the primary reserve asset of the interchain. The Cosmos Network's expanding sphere of ATOM-based collateral establishes a region of cooperative integration, benefiting all those who contribute to its success. In providing a generalized multi-party collateralization system, the Interchain Allocator forms the basis for a more collaborative interchain economy, empowering creative endeavors that leverage the primitive to engender trust and effect the next phase of interchain growth.

5 Cosmos Governance: A Forum for Sovereign Interoperability

The Cosmos design pattern is one of composable modules and standardized messaging that gives rise to emergent structure. This philosophy runs through the social infrastructure of the Cosmos as much as its technical components. The software development process is highly decentralized with no one Cosmos development team. Rather, development is accomplished via an intricate network of open source projects and contributors.[11] However, to achieve the ambitions of this next phase of interchain cooperation, Cosmos will require a shared organizational language and a substrate for decentralized planning, resourcing, and accountability.[12]

5.1 The Cosmos Governance Stack

The Cosmos SDK has a history of pioneering governance innovations, such as an advanced delegation system; governance-activated node upgrades; and a generalized message passing system that allows any account, whether individual, group, smart contract, or chain, to execute arbitrary transactions, locally or over IBC.

However, the Cosmos Hub's ambitious technical roadmap and commitment to building an autonomous, self-sustaining political economy requires pushing these technologies even further, extending governance capabilities to suit Cosmos' needs and creating more robust social layers that tie together a constellation of participating entities, core teams, funding organizations, and other DAOs that wish to make the Hub their home.

Without advance knowledge of the precise social architecture that will emerge in this next phase of Cosmos development, the Cosmos Hub should furnish a generalized system that may be used by any Hub-aligned DAO to flexibly deploy governance infrastructure that meets their needs.

The Governance Stack would provide a general specification for DAOs to self-describe their organizational structure and relationships with one another. The Cosmos Governance Stack gives entities a shared vocabulary for expressing governance forms with adaptive on-chain and off-chain layers. The modular organizational infrastructure could be adapted to meet a particular group's needs, while offering transparency into their operations facilitating accountability and alignment. The following example illustrates what such a system might look like for three different entities.

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[11]Buchman, Ethan. "The Mind, Body, and Soul of Cosmos." May 2022,
https://blog.cosmos.network/the-mind-body-and-soul-of-cosmos-140ee7cec0cd.
[12]Buchman, Ethan. "Phases of Cosmos." Sep. 2022,
https://ebuchman.github.io/posts/phases-of-cosmos/.

	Consensus Council	Interchain Security Council	Allocation DAO
Mandate: organizational purpose + obligation to ATOM, Cosmos, Interchain	self-determined	ATOM gov-determined	ATOM gov-determined + self-determined specialization
Committee: criteria for membership + procedure for adding/removing members	permissioned, self-determined	none, optimistic proposal	permissionless, self-bond
Eligibility: term limit or stake required for continued participation	indefinite, none	2 years, none	indefinite, 1000 ATOM @ 1 year time × stake weighted
Incentivization: recurring payment or performance-based compensation	1000 ATOM/year	10,000 ATOM/year, 2 year vesting + performance bonus	10,000 ATOM/year + performance bonus
Return: parameters for flow of funds back to Cosmos Hub Treasury	none	100% profits	100% profits
Authorization: accorded rights for taking privileged in-protocol actions	cut Tendermint release	optimistically propose block production rate	none
Planning: scope of work + success criteria, upstream/downstream dependencies	OKRs	OKRs	AUM target for specific market sector
Reporting: format + schedule for project updates, justification, monitoring	quarterly dev updates	quarterly dev updates + growth metrics	none
Representation: voting power within the Cosmos Assembly	1	3	2

Figure 11: Given the complexity of the ideas proposed in this paper, creating a flexible system to deploy new DAOs, help them coordinate with one another, and hold them accountable would increase the likelihood of successful implementation. The proposed governance stack combines new and existing components (e.g., Gov, Groups, Authz, and Interchain Accounts) to create a language shared by DAOs operating on the Hub. New features include systems for recurring payments, planning, and reporting. The diagram above compares three different DAO patterns. Note that the inputs above are for demonstrative purposes only and are not suggestive of a specific proposal.

Most of the requisite technology is available today—Groups, Authz, and Interchain Accounts—though they are rarely represented as an integrated system for creating organizational assemblages that interact on-chain. The parameters above are put forward for community consideration with the intention of arriving at a standard for establishing Hub-based DAOs that can effectively coordinate and govern shared resources.

5.2   The Cosmos Assembly

With a more articulated way to establish new entities, a wide range of organizational structures can establish themselves on the Cosmos Hub. Core teams can establish a presence, as could representatives from across the ecosystem, including infrastructure providers, community organizations, and other chains.

To access Cosmos Hub resources, these entities would participate in a common system for planning and coordination of public goods and growth-oriented endeavors. This system must remain flexible enough to dynamically provision resources and authorities while remaining accountable to the Cosmos Hub and the interchain with appropriate checks and balances.

The Cosmos Hub Assembly, a proposed decentralized organizational body, could represent the strategic interests of the Cosmos Hub community. The Cosmos Hub Assembly, together with a set of domain-specific Councils, form a governance supply chain that enables a variety of entities to work within a common framework.[13]
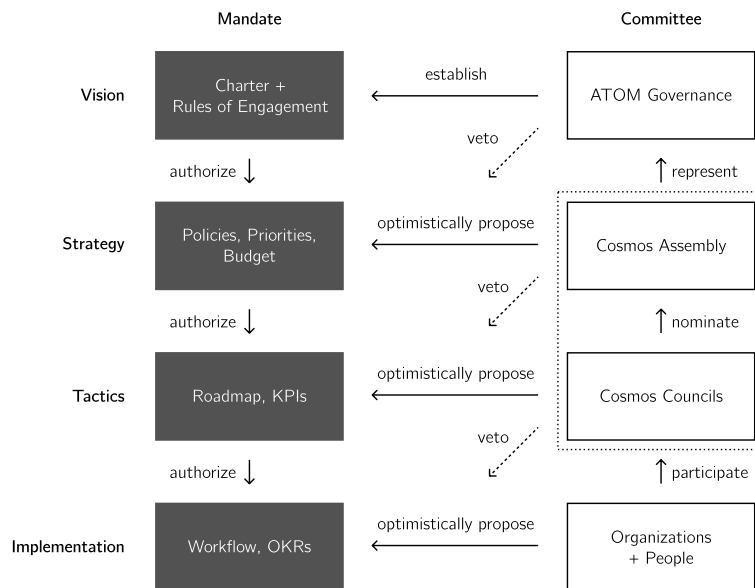

Figure 12: Proposed Cosmos Hub governance structure. DAOs may apply to become a council if they wish to access Cosmos Hub Treasury resources or become accountable for delegated Cosmos Hub roles and capabilities. All councils together form the Cosmos Assembly, which does yearly budgeting and goal-setting. The Assembly is accountable to ATOM holders, who have ultimate veto.

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[13]Hasu. "Simple MakerDAO — Governance from first principles." Jun. 2022,
https://forum.makerdao.com/t/simple-makerdao-governance-from-first-principles/16207.

Today, the Cosmos Stack and the Cosmos Hub are built by a variety of organizations that contribute to product-specific working groups. Most recently, the Consensus Council was created to formalize one such multi-stakeholder relationship. Likewise, temporary initiatives, such as proposal 72 to onboard consumer chains to Interchain Security, are typically mediated by multi-signature committees.

The Councils and Assembly system are intended to make existing informal and off-chain workflows more explicit, accountable, and open to wider participation.[14] Improvements to the Cosmos Hub Forum over the last year, as well as new on-chain functionality like generic Gov proposals and the Groups module improve the Cosmos community's capacity to coordinate. Likewise, adoption of Authz and upcoming features such as optimistic voting, allowing designated third parties to defensively revoke capabilities and block actions, will increase operational efficiency through constrained delegation.

ATOM holders have the responsibility of defining and updating the Cosmos Hub Charter, which includes directives at the highest level: the purpose of the Cosmos Hub, its essential governance architecture, as well as which entities are admitted Councils. Furthermore, ATOM holders have ultimate discretion over the passage of policies, priorities, and budgets with veto power on all proposals put forward by the Cosmos Assembly.

For a DAO to become a council, it must put up a proposal for discussion on the Cosmos Hub forum that includes the items required by the Governance Stack. It must then convince ATOM governance to pass the proposal. If successful, the council will be added to the Charter, resourced, and accorded the appropriate authorities.

The Cosmos Assembly is composed of delegates from each of the respective councils. The number of seats for any given council represents the weight of that council within the Cosmos Assembly. On a yearly basis, the Cosmos Assembly will set priorities, perform a participatory budgeting process, and draft a proposal that will be proposed optimistically, subject to ATOM holder veto.

Public accountability is perhaps the most significant challenge of decentralized governance. The introduction of a new Community Council can aid in this effort. The Cosmos Community Council will represent the interests of the ATOM Community within the Cosmos Assembly and on a day-to-day basis. Their role will include observing the work of core teams, providing feedback on product decisions, and providing a bridge to the wider community by communicating important facets of ongoing workstreams. The precise role of the Community Council and specifics about its formation should be discussed on the Cosmos Hub Forum in conjunction with the initial formation of the Cosmos Hub Charter.

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[14]Informal Systems. "Workflow." Accessed Sep. 2022, https://workflow.informal.systems/.

The Cosmos Governance Stack and the subsequent formation of a Cosmos Assembly permit the higher-order organization required for the next phase of Cosmos's development. Though Cosmos Hub governance is in some ways the most mature in the ecosystem, it will need to evolve significantly to meet the needs of a growing political economy. The first step in this process should be a community dialogue on the forum about a Cosmos Hub Charter and initial Rules of Engagement. Some of the issues that will need close attention include balance of power among committees representing various stakeholders, term limits, mitigating conflict of interest, and provisions about membership within multiple organizational bodies. Community-driven creation of initial governing documents will be complex, but effective governance is only created through a shared commitment to accountability and decentralization of power.

6   Conclusion

The Cosmos Hub gave rise to the internet of blockchains. Interchain Security and Liquid Staking are the final building blocks required for a secure interchain economy, which in turn, enable the creation of the Hub's application-specific functionality, the Interchain Allocator and Interchain Scheduler.

Together, the Allocator and Scheduler would create a flywheel that builds additional utility: the Allocator capitalizes new Cosmos chains and incentivizes them to transact while the Scheduler creates a market for high-value IBC transactions and uses revenue to support network growth. With the creation of this powerful economic bloc, the Cosmos Hub's success becomes coupled to the success of other Cosmos chains and that of the wider IBC economy. Infrastructure and community come together to drive the expansion of the interchain with credibly neutral functionality, capital, and social infrastructure.

Today, the Cosmos Stack is the leading framework for building sovereign interoperable blockchains. With the introduction of the Scheduler and Allocator systems, the Cosmos Hub will become the leading platform for scaling IBC-enabled applications, securing foundational infrastructure for the interchain and accelerating economic coordination for the next chapter of interchain growth.
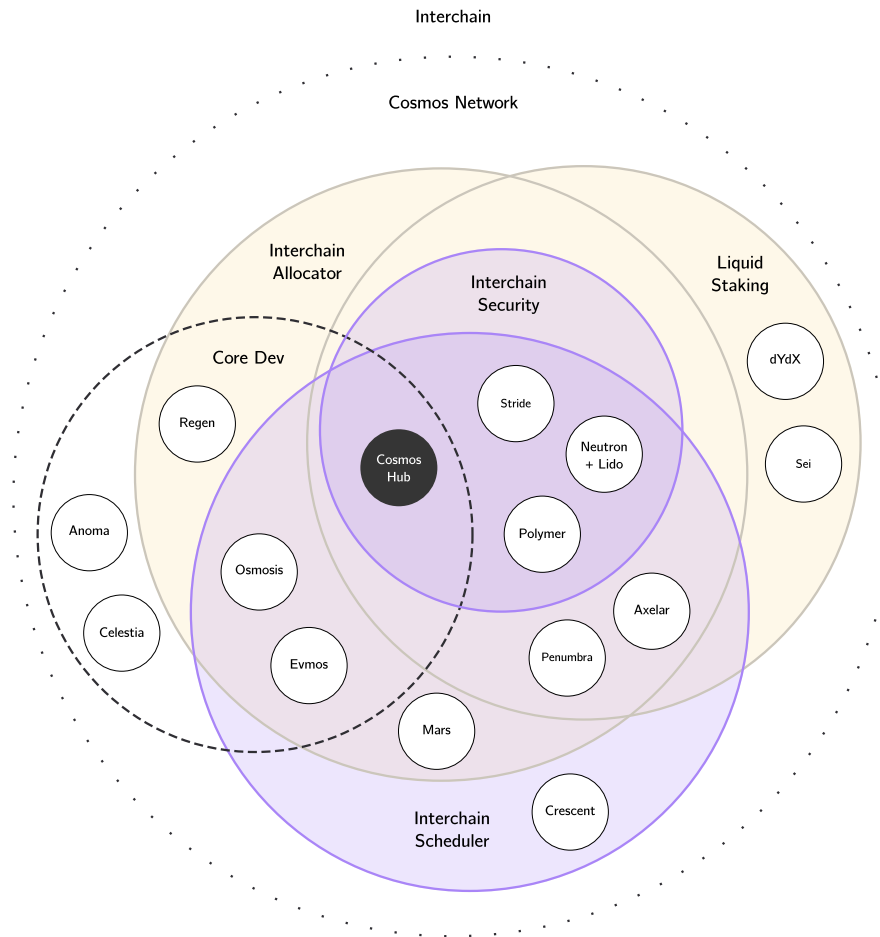
Figure 13: Cosmos is a political union of sovereign interoperable blockchains with shared public infrastructure. Regions of interchain features utilizing ATOM comprise the Cosmos Network. Placement of chains is for illustrative purposes only.

7 Disclaimer

This paper is a collaborative effort by many members of the Cosmos community. It outlines a proposed direction for the Cosmos Hub. However, the contents do not entail a commitment by any authors or their respective organizations. The Cosmos community is responsible for the adaptation and adoption of the measures proposed in this paper. The success of any proposal will depend ultimately on the hard work of the wider community and those building within the Cosmos Network. The information presented herein is being provided by the parties listed above (the PARTIES) for information purposes only. Neither the PARTIES nor any of their affiliates, nor any of their respective directors, officers, managers, employees or representatives make any representations or warranties, express or implied, with respect to any of the material or information contained herein. Neither do the PARTIES or any such person assume or otherwise have any responsibility or any liability whatsoever to you or any of your affiliates, or any of your or your affiliates' respective directors, officers, managers, employees, or representatives resulting from the use of the information and material contained herein. Information provided here is supplied in good faith based on information believed, but is not guaranteed to be accurate or complete. The information provided in this paper does not constitute investment advice, financial advice, trading advice, or any other sort of advice and you should not treat any of the paper's content as such. The PARTIES recommend you conduct your own due diligence and consult your financial advisor before making any investment decisions of any kind.

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