The Blockchain And The New Architecture Of Trust Study Guide

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In recent years, blockchain technology has emerged as a revolutionary force transforming the way we perceive, establish, and maintain trust in digital interactions. Traditionally, trust was built through centralized authorities, intermediaries, or physical verification methods. However, the advent of blockchain introduces a decentralized, transparent, and immutable framework that redefines the very concept of trust. This new architecture leverages cryptography, consensus mechanisms, and distributed ledgers to foster secure peer-to-peer transactions without the need for intermediaries. As a result, blockchain is reshaping industries from finance and supply chain management to healthcare and voting systems, heralding a paradigm shift towards a more transparent and resilient digital trust infrastructure.

Understanding the Blockchain: The Foundation of the New Trust Architecture

What Is Blockchain Technology?

Blockchain is a distributed ledger technology that records transactions across multiple computers in a secure, transparent, and immutable manner. Each block in the chain contains a set of transactions, a timestamp, and a cryptographic hash of the previous block, creating a continuous and tamper-proof chain.

Key Features of Blockchain

- Decentralization: No single entity controls the entire network, reducing the risk of centralized points of failure or manipulation.
- Immutability: Once recorded, data cannot be altered or deleted, ensuring data integrity.
- Transparency: Transactions are visible to all participants with appropriate permissions, fostering trust through openness.
- Security: Cryptographic algorithms secure data, making unauthorized access or tampering exceedingly difficult.
- Consensus Mechanisms: Protocols such as Proof of Work (PoW) or Proof of Stake (PoS) ensure agreement among participants on the state of the ledger.

The Traditional Trust Model vs. Blockchain's Trust Architecture

Traditional Trust Model

Historically, trust has been established through:

- Central Authorities: Banks, governments, or certification bodies act as guarantors.
- Intermediaries: Third parties verify identities, transactions, or data.
- Physical Verification: Documents, signatures, or physical inspections.

This approach relies heavily on the integrity and reliability of central entities, which introduces risks like fraud, censorship, or single points of failure.

Blockchain's Trust Model

Blockchain replaces centralized trust with distributed consensus, where:

- Trust is built through cryptographic proofs rather than individual authority.
- Participants rely on the network's rules and consensus protocols.
- Transparency and immutability ensure accountability and reduce the need for blind faith.

Components of the New Architecture of Trust

- Distributed Ledger Technology (DLT)

DLT ensures all participants have synchronized and identical copies of the ledger, eliminating the need for a trusted third party.

- Cryptography

- Public-Key Cryptography: Facilitates secure transactions and identity verification.
- Hash Functions: Ensure data integrity and linkage of blocks.
- Digital Signatures: Authenticate the origin of transactions.

- Consensus Protocols

Protocols that enable network participants to agree on the ledger's current state, such as:

- Proof of Work (PoW): Miners solve complex puzzles to validate transactions.
- Proof of Stake (PoS): Validators are chosen based on their stake in the network.
- Delegated Proof of Stake (DPoS): Participants elect delegates to validate transactions.

- Smart Contracts

Self-executing contracts coded with rules that automatically enforce agreements without intermediaries, enhancing trustworthiness and reducing disputes.

Impact of Blockchain on Various Industries

Financial Services

- Cryptocurrencies: Bitcoin, Ethereum, and other digital assets operate on blockchain, enabling decentralized finance (DeFi).
- Cross-Border Payments: Faster, cheaper, and more transparent international transactions.
- Fraud Prevention: Immutable ledgers reduce fraud risks.

Supply Chain Management

- Traceability: Real-time tracking of products from origin to consumer.
- Authenticity Verification: Ensuring product authenticity, especially for luxury goods and pharmaceuticals.
- Efficiency: Reducing paperwork and delays.

Healthcare

- Secure Data Sharing: Protect patient data while allowing authorized access.
- Verification: Authenticity of medical records and pharmaceuticals.
- Clinical Trials: Transparent and tamper-proof records.

Voting and Governance

- Transparent Elections: Immutable records reduce election fraud.
- Decentralized Governance: Increased participation and trust in decision-making processes.

Challenges and Limitations of the Blockchain Trust Architecture

Scalability

Blockchain networks face limitations in handling high transaction volumes, affecting speed and efficiency.

Energy Consumption

Proof of Work networks consume significant energy, raising environmental concerns.

Privacy Concerns

While transparency is a feature, sensitive data must be protected, necessitating privacy-preserving solutions.

Regulatory Uncertainty

Legal frameworks and regulations are still evolving, which may impact adoption and trust.

Interoperability

Different blockchain platforms often lack compatibility, hindering integration across systems.

The Future of Trust in a Blockchain-Driven World

Innovations in Blockchain Technology

- Layer 2 Solutions: Off-chain protocols like Lightning Network to improve scalability.
- Zero-Knowledge Proofs: Enable privacy-preserving transactions without revealing sensitive data.
- Decentralized Identity: Self-sovereign identity management empowering users to control their data.

Building a Trust Ecosystem

- Standardization: Developing universal standards to ensure interoperability.
- Regulation: Clear legal frameworks to foster confidence.
- Education: Increasing awareness and understanding of blockchain benefits and limitations.

Potential Impact

- Enhanced Transparency: Governments and organizations adopting blockchain for greater accountability.
- Reduced Corruption: Immutable records discourage fraudulent activities.
- Empowered Individuals: Greater control over personal data and digital identities.

Conclusion

The blockchain and the new architecture of trust represent a fundamental shift from reliance on centralized authorities to a decentralized, transparent, and secure framework. By harnessing cryptography, consensus mechanisms, and distributed ledgers, blockchain technology offers a resilient foundation for establishing and maintaining trust in the digital age. While challenges remain, ongoing innovation and regulatory development promise to expand blockchain's role across industries, ultimately leading to a more trustworthy and equitable digital ecosystem. Embracing this new trust architecture is essential for organizations and individuals aiming to thrive in an increasingly interconnected world.

The Blockchain and the New Architecture of Trust: Redefining Relationships in the Digital Age

In recent years, the phrase the blockchain and the new architecture of trust has moved from niche technical circles into mainstream discussions about how technology can reshape societal structures. At its core, blockchain technology offers a revolutionary way to establish, verify, and maintain trust without reliance on traditional intermediaries like banks, governments, or corporations. This paradigm shift is not just technological but philosophical, challenging long-held assumptions about authority, transparency, and security in digital interactions.

Understanding the Traditional Architecture of Trust

Before delving into how blockchain introduces a new architecture of trust, it?s essential to understand the traditional systems we rely on.

Centralized Trust Models

Historically, trust in societal transactions has been mediated by centralized institutions:

- Financial Institutions: Banks and payment processors verify and record transactions.
- Government Agencies: Issue passports, licenses, and legal documents to establish identity and ownership.

- Legal Systems: Courts and regulatory bodies enforce contracts and resolve disputes.
- Corporate Entities: Maintain records of ownership, supply chains, and customer data.

In these models, trust is placed in the integrity and authority of these centralized entities. Users must rely on their security protocols, legal authority, and reputation.

Limitations of Centralization

While effective, centralized systems have inherent drawbacks:

- Single Points of Failure: Hacks, fraud, or technical failures can compromise entire systems.
- Opacity and Corruption: Central authorities may lack transparency, leading to potential abuse of power.
- Inefficiency: Multiple layers of verification and intermediaries slow down processes.
- Lack of Accessibility: Some populations lack access to traditional trust institutions, creating barriers.

The Emergence of Blockchain Technology

What Is Blockchain?

Blockchain is a distributed ledger technology that records transactions across multiple computers (nodes). Each block contains a set of transactions, cryptographically linked to the previous block, forming an immutable chain.

Core Principles of Blockchain

- Decentralization: No single entity controls the entire network.
- Transparency: Transactions are visible to all participants.
- Immutability: Once recorded, data cannot be altered retroactively.
- Security: Cryptographic techniques protect data integrity and authenticity.
- Consensus Mechanisms: Network participants agree on the validity of transactions via protocols like Proof of Work or Proof of Stake.

How Blockchain Builds Trust

By removing the need for a central authority, blockchain enables participants to trust the system based on its inherent technical guarantees. The distributed nature ensures that no single malicious actor can compromise the ledger, and cryptographic proofs secure data integrity.

The New Architecture of Trust: Key Features and Implications

- Trust Through Transparency and Verifiability

Unlike traditional trust models that depend on secrecy and authority, blockchain fosters a system where trust is rooted in transparency.

- Open Ledger: All transactions are visible to network participants.
- Verifiable Data: Participants can independently verify transaction histories.
- Auditability: Immutable records facilitate easy auditing and accountability.

- Trust Decentralized from Institutions to Protocols

Instead of trusting institutions, users place trust in protocols?the underlying code and consensus rules.

- Code as Law: Smart contracts execute agreements automatically, reducing reliance on third-party enforcement.
- Distributed Validation: Multiple nodes validate transactions, reducing the risk of fraud or manipulation.

- Enhanced Security Through Cryptography

Blockchain employs advanced cryptographic techniques:

- Digital Signatures: Authenticate identities and authorize transactions.
- Hash Functions: Ensure data integrity.
- Consensus Algorithms: Prevent double-spending and malicious activities.

- Resilience and Fault Tolerance

Distributed networks are inherently resilient:

- No Central Point of Failure: Data is replicated across nodes.
- Censorship Resistance: Difficult for any single party to dominate or censor data.

Practical Applications of the New Trust Architecture

The blockchain?s transformative potential extends across various sectors:

Financial Services

- Decentralized Finance (DeFi): Peer-to-peer lending, borrowing, and trading without intermediaries.
- Cross-Border Payments: Faster, cheaper, and more transparent remittances.

Supply Chain Management

- Traceability: Immutable records track products from origin to consumer.
- Authenticity: Verify provenance and prevent counterfeiting.

Identity Management

- Self-Sovereign Identity: Users control their digital identities, reducing reliance on centralized authorities.
- Secure Access: Simplify verification processes for services and voting.

Legal and Governance

- Smart Contracts: Automated, enforceable agreements that execute upon predefined conditions.
- Decentralized Autonomous Organizations (DAOs): Collective decision-making without centralized leadership.

Challenges and Limitations of the New Trust Architecture

While promising, the blockchain-based trust model faces hurdles:

Scalability Issues

- Transaction Throughput: Networks like Bitcoin and Ethereum face limitations in processing capacity.
- Latency: Confirmation times can be slow, impacting real-time applications.

Energy Consumption

- Proof of Work: Mining requires significant computational power, raising environmental concerns.

Regulatory and Legal Uncertainty

- Lack of Clear Frameworks: Governments are still developing policies on blockchain and crypto assets.
- Jurisdictional Challenges: Cross-border transactions complicate legal enforcement.

Security Concerns

- Smart Contract Bugs: Coding errors can lead to vulnerabilities.
- Private Key Management: Loss of keys can result in permanent loss of assets.

Adoption Barriers

- Technical Complexity: User interfaces and onboarding processes need simplification.
- Cultural Resistance: Trust in traditional institutions is deeply ingrained.

The Future of Trust: Synergy or Replacement?

The new architecture of trust introduced by blockchain does not necessarily aim to eliminate existing institutions but to complement and enhance them.

Hybrid Models

- Combining traditional trust mechanisms with blockchain solutions for increased efficiency.
- Using blockchain for transparent record-keeping while relying on legal systems for enforcement.

Potential for Global Trust Networks

- Interoperability: Cross-chain protocols enable diverse networks to communicate.
- Decentralized Identity Platforms: Empower individuals with control over their personal data.

Ethical and Societal Considerations

- Ensuring equitable access and preventing misuse.
- Addressing privacy concerns in transparent systems.

Conclusion: A Paradigm Shift in Trust

The blockchain and the new architecture of trust represent a fundamental shift in how humanity establishes and maintains confidence in digital transactions and relationships. Moving from centralized authorities to decentralized protocols grounded in cryptography and consensus, this paradigm offers increased transparency, security, and resilience.

However, realizing its full potential requires addressing technical, regulatory, and societal challenges. As blockchain matures, it promises to foster a more open, trustworthy, and equitable digital ecosystem?one where trust is built into the very fabric of technology itself. Embracing this evolution could redefine not only commerce but also the social contracts that underpin our collective existence.

QuestionAnswer What is the fundamental concept behind blockchain technology and how does it build trust? Blockchain is a decentralized, distributed ledger that records transactions securely and transparently. Its cryptographic protocols and consensus mechanisms eliminate the need for a central authority, thereby establishing trust through transparency, immutability, and shared validation. How does blockchain redefine the traditional architecture of trust in digital transactions? Blockchain shifts trust from centralized intermediaries to a decentralized network where multiple participants validate and record transactions, reducing reliance on third parties and increasing security, transparency, and resilience against fraud. What are the key components of the new architecture of trust enabled by blockchain? The key components include decentralization, cryptographic security, consensus algorithms (like proof of work or proof of stake), smart contracts, and transparent ledgers, all working together to establish trust without intermediaries. In what industries is blockchain transforming the traditional trust models most significantly? Blockchain is significantly impacting finance (cryptocurrencies, cross-border payments), supply chain management, healthcare, voting systems, and digital identity management, by providing secure, transparent, and tamper-proof record-keeping. What challenges does the new architecture of trust face in widespread adoption? Challenges include scalability issues, regulatory uncertainties, energy consumption concerns, lack of understanding or trust in emerging technology, and interoperability between different blockchain platforms. How do smart contracts contribute to the new architecture of trust? Smart contracts are self-executing agreements encoded on the blockchain that automatically

enforce terms without intermediaries, increasing efficiency, reducing fraud, and strengthening trust through transparent and immutable code. Can blockchain-based trust systems replace traditional institutions completely? While blockchain can decentralize and democratize trust, it is unlikely to replace all traditional institutions entirely. Instead, it will complement and transform existing systems, creating hybrid models that leverage blockchain?s strengths. What is the future potential of blockchain and the new architecture of trust in digital society? The future holds increased adoption in various sectors, enhanced security and transparency, and the development of decentralized autonomous organizations (DAOs). It promises a more secure, transparent, and trustless environment for digital interactions and transactions.

Related keywords: blockchain, distributed ledger, decentralization, trustless systems, smart contracts, cryptography, digital identity, consensus mechanisms, peer-to-peer networks, data integrity

Architecture a very short introduction very short

architecture a very short introduction very short is a concise way to understand the fundamental principles and significance of architecture as an art and science of designing spaces. Architecture shapes our environment, influences our daily lives, and reflects cultural identities across history. In this article, we will explore the key aspects of architecture, its history, types, elements, and its impact on society.

Understanding Architecture: A Brief Overview

What Is Architecture?

Architecture is the art and science of designing and constructing buildings and other physical structures. It combines creativity, technical skill, and practical considerations to create functional, safe, and aesthetically pleasing environments. Architecture is not only about shelter but also about creating spaces that inspire, communicate cultural values, and improve quality of life.

The Importance of Architecture

Architectural designs influence how people interact with their surroundings. Well-designed architecture enhances safety, efficiency, and comfort while also serving as a cultural expression. Iconic structures often become symbols of identity and pride for communities and nations.

The History of Architecture

Ancient Civilizations

Early architecture dates back to ancient civilizations such as Egypt, Mesopotamia, Greece, and Rome. These societies developed foundational structures like pyramids, temples, aqueducts, and amphitheaters, showcasing technological innovation and cultural priorities.

Medieval Architecture

Medieval architecture features castles, cathedrals, and monasteries characterized by Gothic and Romanesque styles. These structures emphasized grandeur, religious symbolism, and defensive features.

Renaissance and Modern Periods

The Renaissance revived classical principles, emphasizing symmetry, proportion, and harmony. The modern era introduced new materials like steel and concrete, leading to innovative designs such as skyscrapers and contemporary architecture.

Contemporary Architecture

Today?s architecture incorporates sustainable practices, smart technology, and minimalist aesthetics. It aims to balance environmental responsibility with functionality and aesthetic appeal.

Types of Architecture

Residential Architecture

Focuses on designing homes, apartments, and housing communities. Priorities include comfort, privacy, and functionality.

Commercial Architecture

Covers office buildings, shopping malls, hotels, and other business-related structures. These designs often emphasize accessibility, branding, and efficiency.

Industrial Architecture

Designs factories, warehouses, and plants. These structures prioritize durability, safety, and operational flow.

Institutional and Public Architecture

Includes schools, hospitals, government buildings, and cultural centers. The focus is on capacity, safety, and community service.

Landscape Architecture

Involves designing outdoor spaces such as parks, gardens, and urban plazas, integrating natural elements with built environments.

Key Elements of Architectural Design

Form and Function

The fundamental principle that architecture should be both aesthetically pleasing (form) and serve its intended purpose (function).

Space and Volume

The arrangement of interior and exterior spaces to facilitate movement, interaction, and comfort.

Materials and Construction

Choice of building materials influences durability, appearance, and sustainability.

Lighting and Ventilation

Designing for natural and artificial lighting, along with proper airflow, to enhance comfort and energy efficiency.

Structural Integrity

Ensuring safety and stability through sound engineering principles.

Architectural Styles and Movements

Classical Architecture

Features symmetry, columns, and elaborate ornamentation inspired by Greek and Roman designs.

Gothic Architecture

Known for pointed arches, ribbed vaults, flying buttresses, and stained glass windows.

Modernism

Emphasizes minimalism, functionalism, and the use of modern materials like steel and glass.

Postmodernism

Combines traditional elements with contemporary design, often with playful or ironic touches.

Sustainable Architecture

Focuses on environmentally friendly design practices, energy efficiency, and use of renewable materials.

The Role of Technology in Modern Architecture

Building Information Modeling (BIM)

A digital process that improves accuracy and collaboration during design and construction.

Parametric Design

Uses algorithms to generate complex forms and optimize performance.

Smart Buildings

Incorporate sensors, automation, and IoT technology to improve energy efficiency and user experience.

Green Building Materials

Use of eco-friendly, recycled, or low-impact materials to reduce environmental footprint.

The Impact of Architecture on Society

Economic Impact

Architectural projects generate jobs, attract tourism, and contribute to local economies.

Cultural Significance

Buildings often reflect cultural values, history, and identity, fostering community pride.

Environmental Responsibility

Sustainable architecture helps mitigate climate change through energy efficiency and green practices.

Urban Development and Planning

Good architecture promotes organized, accessible, and vibrant urban environments.

Challenges and Future Trends in Architecture

Climate Change and Sustainability

Architects are increasingly adopting eco-friendly designs to combat global warming.

Technological Integration

Advances in digital fabrication, AI, and robotics are transforming how structures are conceived and built.

Adaptive and Resilient Design

Creating buildings that can withstand natural disasters and adapt to changing conditions.

Inclusive Architecture

Designing spaces that are accessible and welcoming to all individuals, regardless of ability or background.

Conclusion

Architecture, though briefly introduced here, is a vital discipline that combines artistry, science, and social responsibility. It influences our surroundings profoundly, from iconic monuments to everyday homes. As technology advances and societal needs evolve, architecture continues to innovate, striving for sustainability, resilience, and inclusiveness. Understanding its principles and history enriches our appreciation for the built environment and inspires future generations to design thoughtful, impactful spaces.

Architecture: A Very Short Introduction

Architecture is often regarded as both an art and a science?an essential discipline that shapes the

spaces where we live, work, and interact. It influences our environment, reflects cultural values, and showcases technological innovation. Despite its significance, many people seek a concise understanding of what architecture truly entails. This guide offers a very short introduction to architecture, exploring its fundamental concepts, history, key elements, and contemporary trends.

What is Architecture?

At its core, architecture is the practice of designing and constructing buildings and other physical structures. It goes beyond mere construction; it embodies creativity, functionality, cultural expression, and technical expertise. Architecture is about solving spatial problems?creating environments that are safe, comfortable, and inspiring.

The Dual Nature of Architecture

- Artistic Aspect: Architecture expresses aesthetic values, cultural identity, and artistic vision. It can evoke emotion, symbolize power, or reflect traditions.
- Technical Aspect: It involves engineering principles, material science, environmental considerations, and sustainability. Architects must ensure their designs are structurally sound and functional.

A Brief History of Architecture

Understanding architecture's evolution helps clarify its significance and the forces shaping it today.

Ancient Beginnings

- Prehistoric Structures: Early humans built shelters from natural materials like caves and simple huts.
- Ancient Civilizations: The Egyptians, Greeks, and Romans developed monumental architecture?pyramids, temples, aqueducts?demonstrating technological innovation and cultural values.

Medieval to Renaissance Era

- Gothic Cathedrals: Characterized by verticality, stained glass, and intricate stonework.
- Renaissance: Revival of classical ideals?symmetry, proportion, harmony?leading to iconic structures like Brunelleschi?s Dome.

Modern Architecture

- Industrial Revolution: New materials (steel, glass) and technologies revolutionized design possibilities.
- 20th Century: Movements like Modernism and Postmodernism challenged traditional aesthetics, emphasizing function, minimalism, and diversity.

Contemporary Trends

- Emphasis on sustainability, smart buildings, and adaptive reuse.
- Integration of digital tools like Building Information Modeling (BIM).

Key Elements of Architecture

Understanding architecture involves recognizing its core components:

Form and Space

- Form: The shape and configuration of a building.
- Space: The interior and exterior environments designed for human activity.

Function

Designs are driven by their purpose?residential, commercial, cultural, or recreational.

Materials

Choices range from traditional (stone, wood) to modern (concrete, steel, glass), affecting aesthetics, durability, and sustainability.

Light and Color

Lighting influences mood, functionality, and perception of space. Color adds emotional and visual impact.

Structural Systems

Frameworks that support buildings include:

- Load-bearing walls
- Framing systems (steel, timber)
- Innovative solutions (tensile structures)

Context and Environment

Designs respond to their surroundings?climate, landscape, urban fabric?blending or contrasting with existing environments.

The Role of an Architect

An architect is a professional responsible for the conception, design, and oversight of building projects. Their role includes:

- Understanding client needs and site conditions
- Developing design concepts
- Creating detailed drawings and models
- Coordinating with engineers, contractors, and stakeholders
- Ensuring compliance with regulations and standards

Modern Architectural Movements and Styles

While architecture is diverse, some notable styles include:

- Modernism: Emphasizes simplicity, functionality, and the absence of ornament.
- Postmodernism: Reacts against modernism, embracing eclecticism and symbolism.
- Brutalism: Features raw concrete and bold, geometric forms.
- Deconstructivism: Disrupts traditional forms to create fragmented and dynamic structures.
- Sustainable Architecture: Focuses on eco-friendly practices, energy efficiency, and materials.

Contemporary Topics in Architecture

Sustainability and Green Building

- Use of renewable energy sources
- Incorporation of green roofs and walls
- Passive design strategies for energy conservation

Smart Buildings and Technology

- Integration of IoT devices for automation
- Building management systems for efficiency
- Use of digital modeling and visualization tools

Urban Design and Public Spaces

- Creating inclusive, accessible urban environments
- Revitalization of neighborhoods and public parks
- Addressing urban challenges like congestion and pollution

The Impact of Architecture on Society

Architecture shapes societal values and behaviors. Well-designed spaces promote health, community, and cultural identity. Conversely, poorly planned structures can lead to social issues and environmental degradation.

Cultural Reflection

Buildings often symbolize cultural identity, history, and aspirations.

Economic Influence

Architectural innovation can boost tourism, property values, and local economies.

Environmental Responsibility

Sustainable design reduces carbon footprint and conserves resources.

Final Thoughts

While this very short introduction touches on the essentials, architecture is a vast field that intertwines creativity, science, and societal values. Every structure tells a story?about its creators, its users, and the times it was built in. Whether ancient or modern, architecture remains a vital part of our human experience, shaping the world around us in profound ways.

Remember: architecture is not just about buildings; it?s about creating environments that inspire, protect, and serve humanity?an ongoing dialogue between form, function, and environment.

QuestionAnswer What is the main focus of 'Architecture: A Very Short Introduction'? It provides a concise overview of architecture's history, principles, and significance in society. Who is the author of 'Architecture: A Very Short Introduction'? The book is authored by Andrew Ballantyne. Why is 'Architecture: A Very Short Introduction' considered a good starting point? Because it offers a brief yet comprehensive overview suitable for beginners and those interested in architecture. What topics are covered in this book? It covers architectural history, design principles, urban planning, and the cultural impact of architecture. Is 'Architecture: A Very Short Introduction' suitable for non-experts? Yes, it is written in an accessible manner, making complex concepts understandable for general readers. How does the book address modern architectural trends? It discusses contemporary styles, innovations, and the evolving role of architecture in society. Can this book help someone pursuing a career in architecture? Yes, it provides foundational knowledge that can enhance understanding and inspire further study in the field.

Related keywords: architecture, introduction, brief, overview, design, structure, building, urban planning, history, fundamentals

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