Edge Computing and Its Potential Effect on Rural LECs

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Agenda

- Introduction
  - What is edge computing?
  - Edge computing history
  - Edge computing components
- Common edge computing applications
- Trends
- Potential effects on RLECs
  - Pros and cons
  - Opportunities

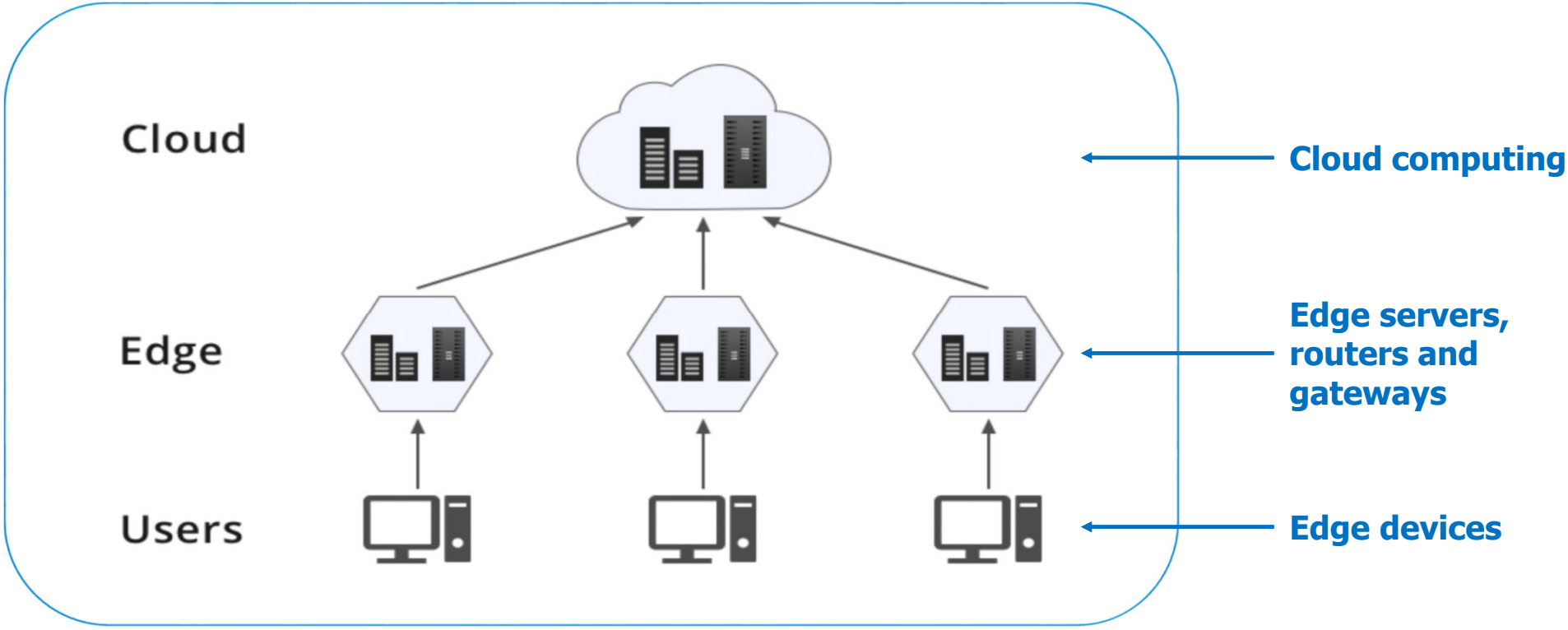
Introduction
What is edge computing?

- Edge computing – refers to the practice of processing, storing and analyzing data at or close to where data is generated, consumed and processed by end user devices or local servers
  - Reflects a decentralization of data computing power
  - Ideal for applications that cannot tolerate latency
- Cloud computing – refers to using a computing platform hosted on the internet or private IP network to process, store and analyze data
  - Data is sent to centralized data centers to be processed
  - Ideal for applications that can tolerate some latency and do not require real-time processing

Introduction
Edge computing history

- The concept of edge computing began to emerge in the 1980s with the proliferation of personal computers and local area networks
  - Computers were connected to LANs to share resources and data, marking the initial decentralization of computing power
- Initially, edge computing involved mostly caching functions
- Later, as the volume of data generated by IoT devices increased, centralized cloud architectures faced challenges related to latency, bandwidth constraints and data privacy
- The limitations of centralized cloud computing and advances in edge-based hardware technology continue to pave the way for the rise of edge computing

Introduction
Edge computing components



Source: FS

Introduction
Edge computing components

- Edge devices – physical devices located at the edge of the network, such as sensors, actuators, cameras, smartphones, gaming systems and IoT devices that generate or consume data

- As industries continue to adopt IoT, edge computing and smart technologies, the diversity and quantity of edge devices will likely increase

Introduction
Edge computing components

- Edge servers – small scale servers (typically computers) deployed at the network edge and responsible for:
  - Caching content
  - Delivering content
  - Processing data locally
  - Providing application-specific services to users or devices at the network edge
- Unprocessed data need not be sent back and forth to a distant data center
  - Edge servers can handle raw data and return content directly to a client device

Introduction
Edge computing components

- Edge routers/gateways – intermediary devices between edge devices and the cloud
  - Routing – edge routers are responsible for routing data packets between different networks
  - Network address translation – allows multiple devices within a local network to share a single public IP address when communicating with external networks
  - Quality of service – prioritizes certain types of network traffic over others
  - May provide security and VPN support
- Commonly deployed in enterprise networks, telecommunications networks, data centers and ISP networks

Common edge computing applications

- IOT devices – edge computing is essential for processing data generated by IoT devices
  - Real-time data analysis, reducing the need to transmit large amounts of data to centralized cloud servers
- Smart manufacturing – tasks such as predictive maintenance and quality control
- Smart cities – traffic management, public safety and environmental monitoring
- Health care – remote patient monitoring, telemedicine and real-time health analytics

Common edge computing applications

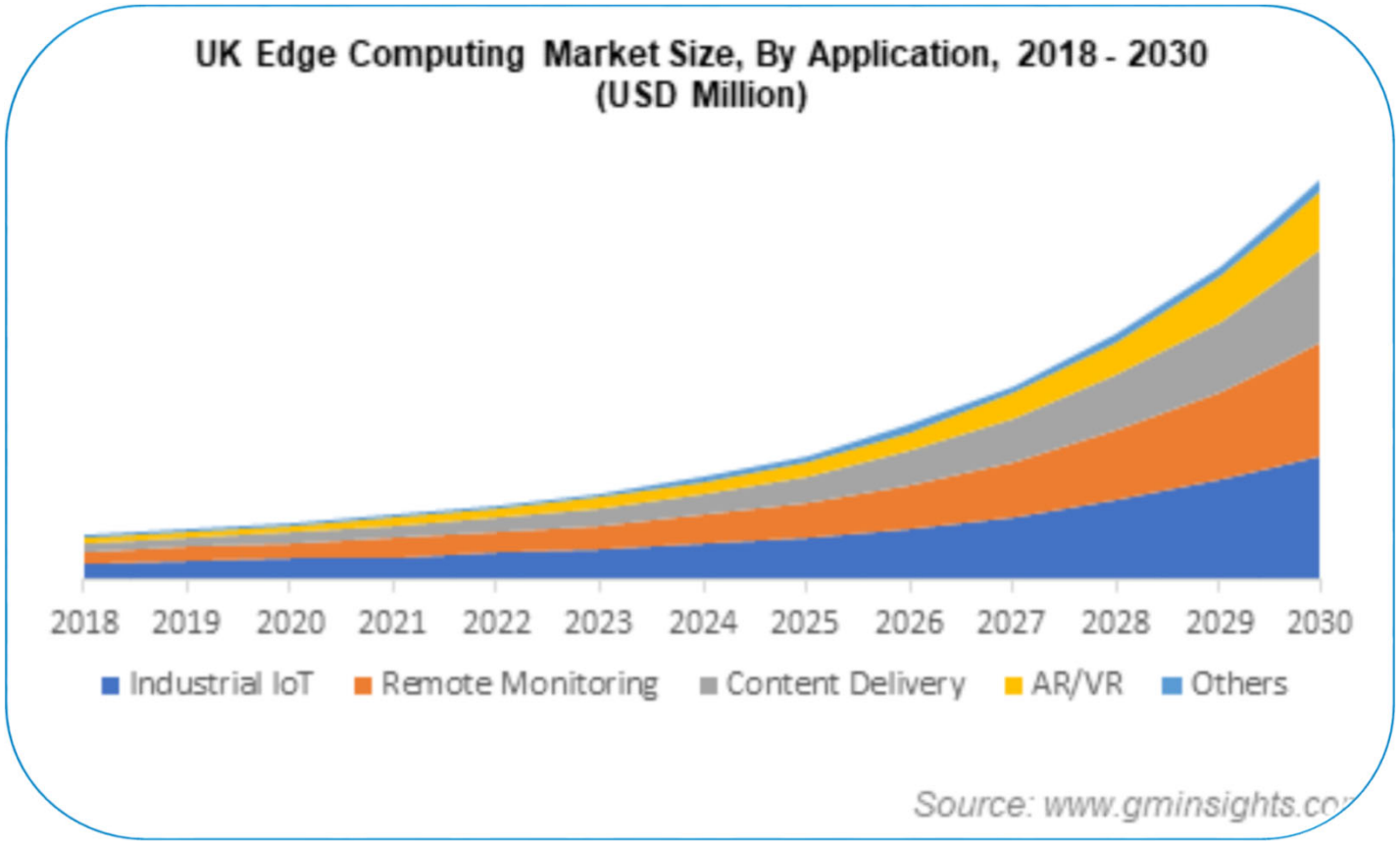
- Autonomous vehicles – tasks such as real-time navigation, object detection and decision-making
- Remote monitoring – industries such as oil and gas monitor equipment in remote areas
- Content delivery – by caching content (e.g., music and video) at the edge, content delivery can be greatly improved
- Gaming, virtual reality and augmented reality – edge servers can reduce latency and improve the gaming experience
- Artificial intelligence at the edge – allows for real-time data analysis

Trends

Edge computing market size forecast

Source: Precedence Research

Trends



Effect on rural LECs
Pros

- Improved service delivery – edge computing allows RLECs and their affiliates to reduce latency and improve the performance of services such as video streaming, online gaming and real-time communication
  - This can lead to higher customer satisfaction and retention
- Efficient network management – by distributing computing resources closer to the network edge, rural telecommunications providers can optimize their network traffic, reduce congestion and reduce transport costs
  - May reduce demand on middle mile facilities
- Data privacy and security – processing data at the edge can enhance privacy and security by reducing the need to transmit sensitive data to centralized locations for analysis

Effect on rural LECs
Pros

- Offline operation – allows devices to continue functioning even when they are disconnected from the central network or cloud
- Cost efficiency – can reduce costs associated with transmitting and storing large volumes of data in centralized location
- New revenue streams – opens opportunities for RLECs and their affiliates to offer value-added services such as edge analytics, content caching and edge security solutions
- Broadband demand – may stimulate demand for broadband services or speeds
- Wireless backhaul capacity – may increase the demand for wireless backhaul capacity

Effect on rural LECs
Cons

- Complexity – implementing edge computing architectures can be complex, especially when dealing with many distributed devices
- Security risks – may be more vulnerable to physical tampering of devices in remote or industrial settings
- Reliability and maintenance – edge devices deployed in remote or harsh environments may experience higher failure rates and require regular maintenance
- Investment challenges – implementing edge computing infrastructure requires significant investments in hardware, software and skilled personnel
- Network issues – may overtax nonscalable or poorly designed broadband networks

Effect on rural LECs
Edge computing opportunities

- Identify use cases – providers should identify specific use cases where edge computing can provide the most value
  - Including reducing latency for real-time applications, optimizing bandwidth usage, supporting IoT deployments or offering value-added services like edge analytics
- Content delivery networks – telcos can deploy edge servers at their network edges to cache popular content locally
- Network security – edge computing enables telcos to implement security mechanisms to detect and mitigate threats closer to the source
- Develop edge applications – telecommunication providers should develop or partner with third-party developers to create edge applications

Summary

- Edge computing is the practice of processing, storing and analyzing data at or close to where data is generated, consumed and processed by end user devices or local servers
- Can reduce latency and improve the performance of services such as video streaming, online gaming and real-time communication
- Can improve network management, reduce congestion and reduce transport costs, particularly middle mile facilities
- Presents new revenue opportunities to RLECs and their affiliates

Questions?

thank you!

Acronyms

- IOT — Internet of Things
- IP — Internet Protocol
- ISP — Internet Service Provider
- LAN — Local Area Network
- LEC — Local Exchange Carrier
- NECA — National Exchange Carrier Association
- RLEC — Rural Local Exchange Carrier
- VPN — Virtual Private Network