Media Compression: Not What It Used To Be

Coding+_____

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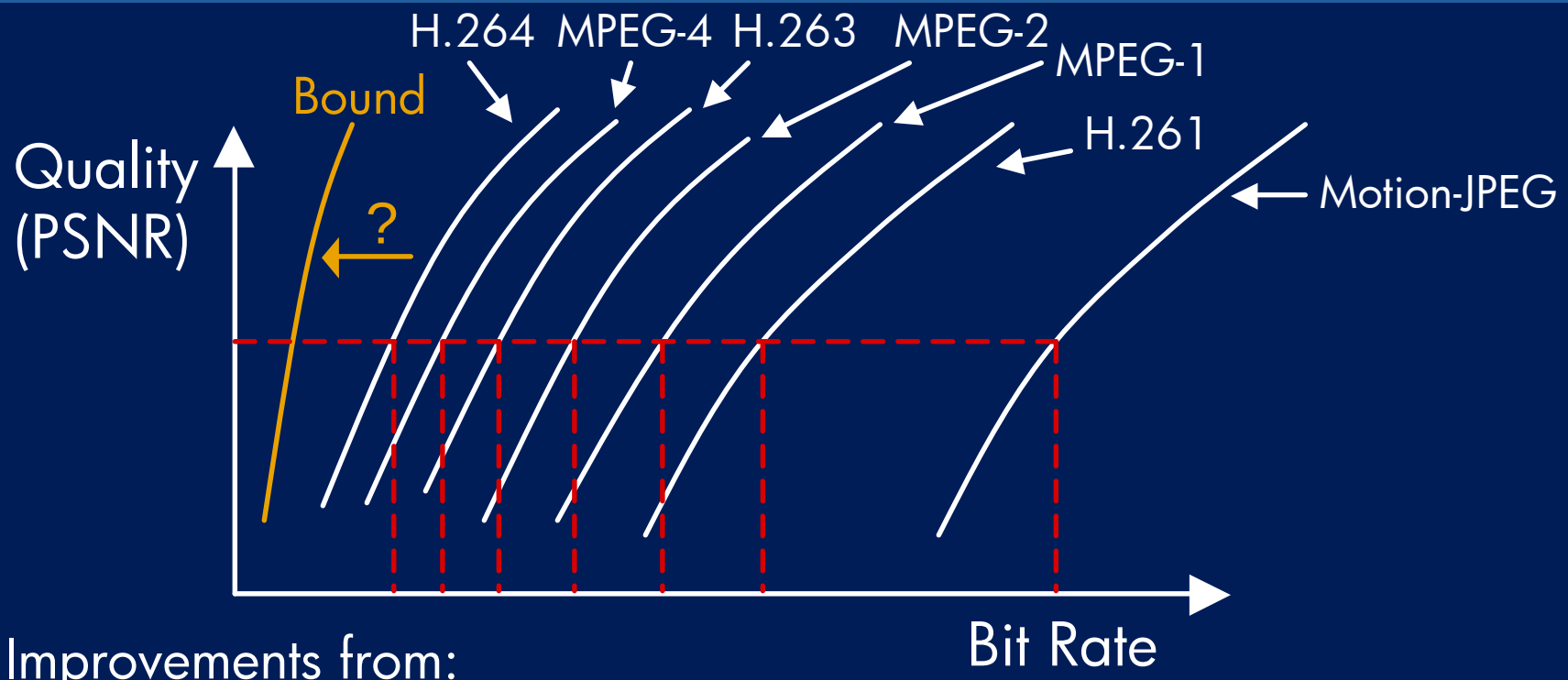
Challenges: Past, Present, and Future

- Past: Primarily a pure coding problem
  - Maximize quality for a given bit rate
  - Contexts: Stored media, one-to-one
- Present: Coding+_____ (coding *plus* functionality)
  - e.g. Media coding + networking, media coding + editing
    - Contexts: One-to-many, many-to-many, many-to-one
      - -- Unpredictable & time-varying bandwidths and loss rates
- Future???
  - Coding+_____
  - Additional media types, e.g. synthetic content
  - Distributed compression (e.g. sensor networks)

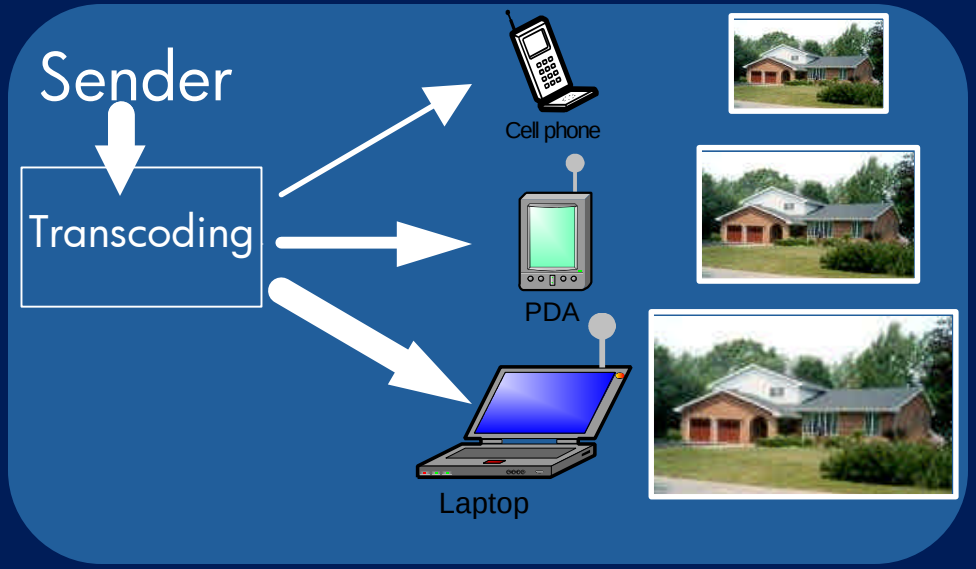
Evolution of Video Coding



- Improvements from:
  - Getting the details right; Many enhancements & additional flexibility
  - Much more computation and memory
  - Rate-distortion optimization
- Future gains: Temporal dimension
- What is the best we can do???

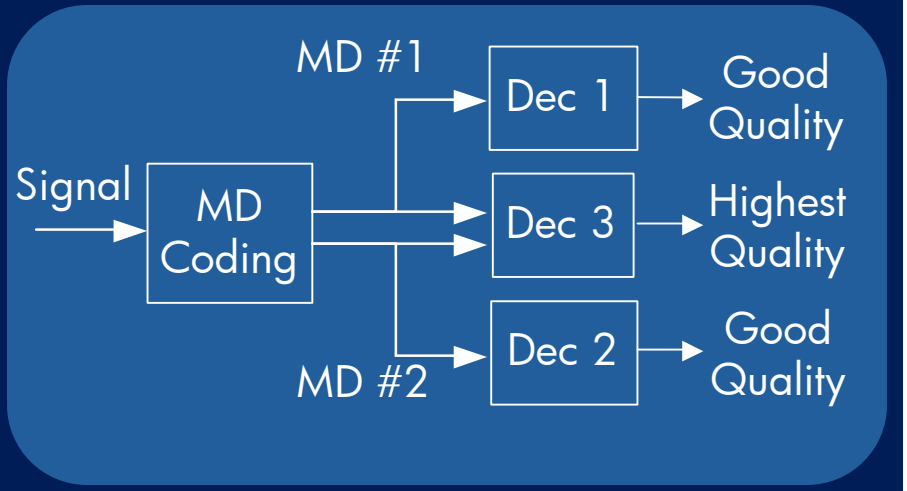
Media over Networks

- Coding + Transcoding for unknown or time-varying bandwidths & diverse clients



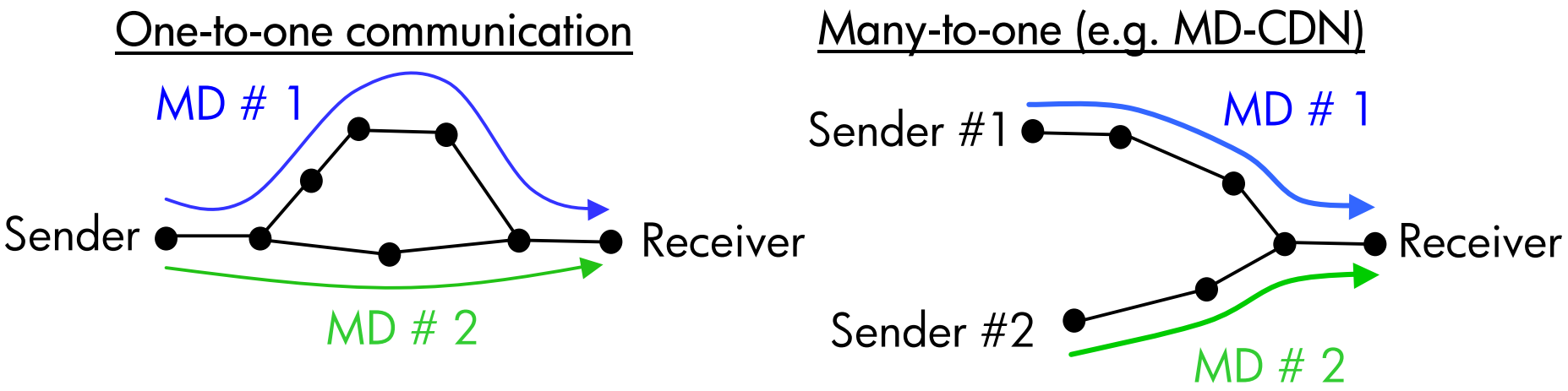
- Coding + Robustness for unreliable transport

e.g. Multiple Description Coding



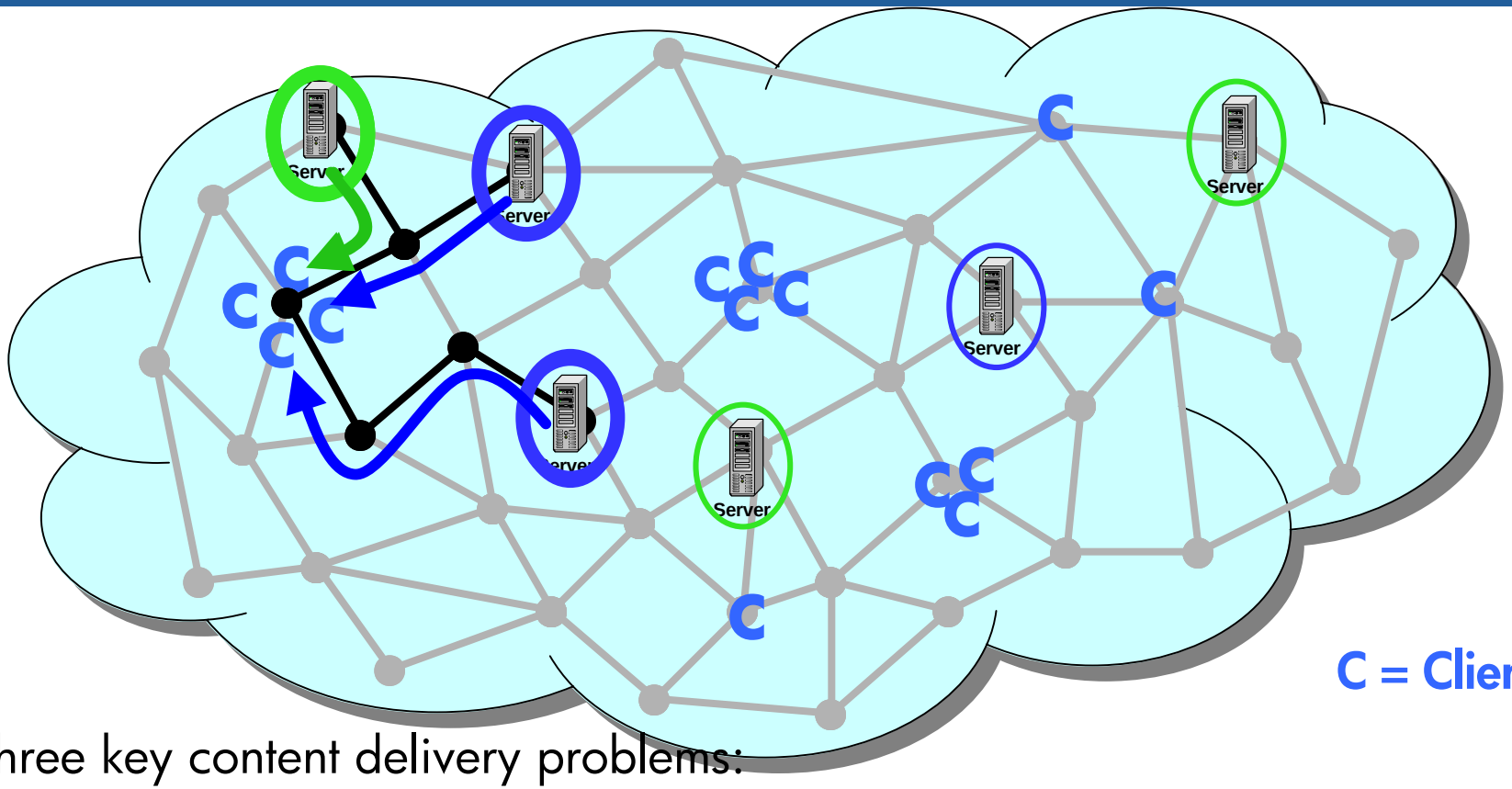
Coding + Routing

- To overcome unreliable networks:



- Multiple description coding plus path diversity ⇒ Good Match!

Coding + Content Delivery



Three key content delivery problems:

1) Where to deploy the servers? (Server Placement)
2) How to distribute the content? (Content Distribution across Servers)
3) How to select for each client the best server? (Server Selection)

Multiple Description Content Delivery Network (MD-CDN)

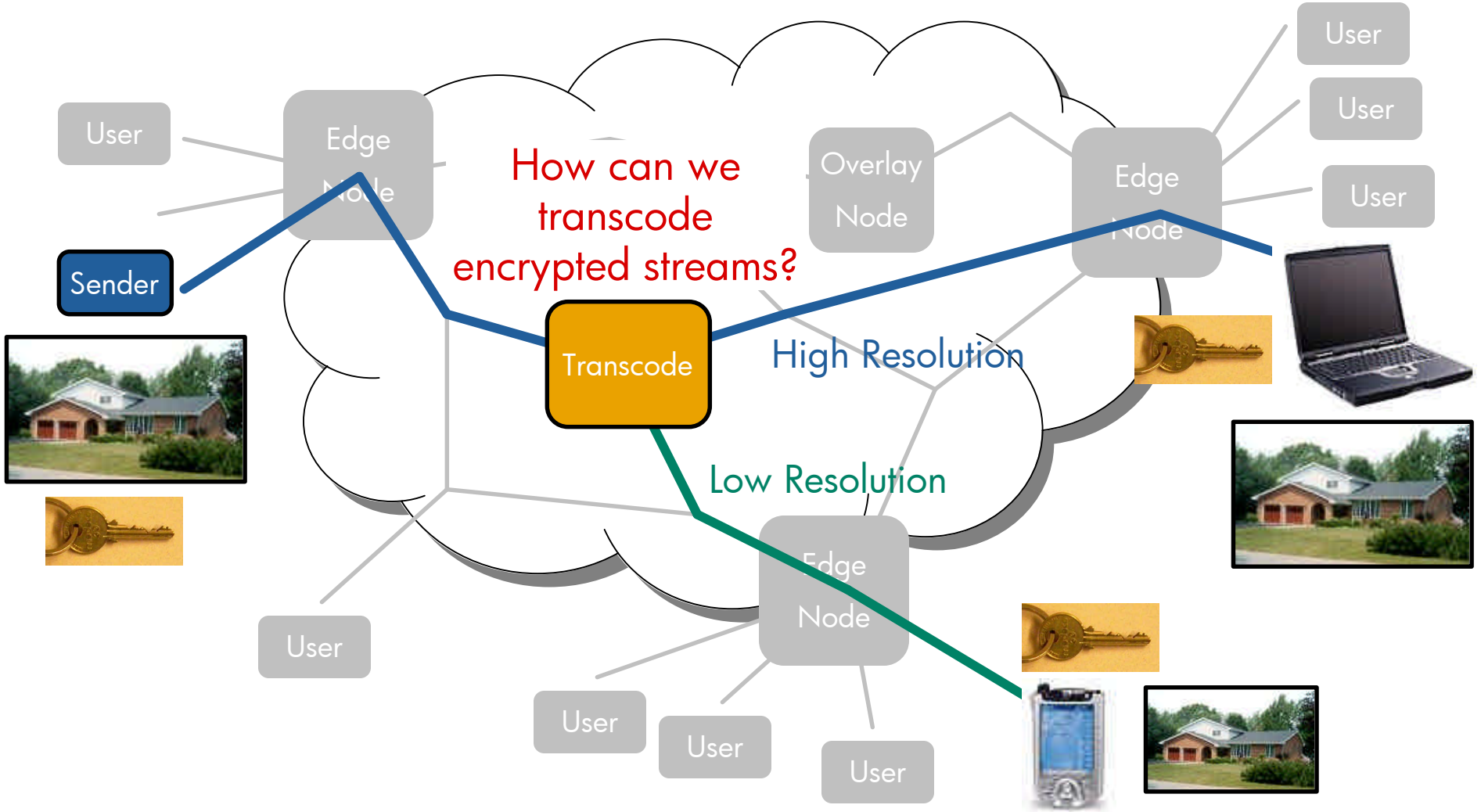
Interlayer Optimization

Example layers or modules: source coding, channel coding, networking, encryption, complexity, power

- Separate optimization:
  - Theoretically optimal in certain cases [Shannon]
  - Practically very important, basis for many real-world systems
  - Produces limitations

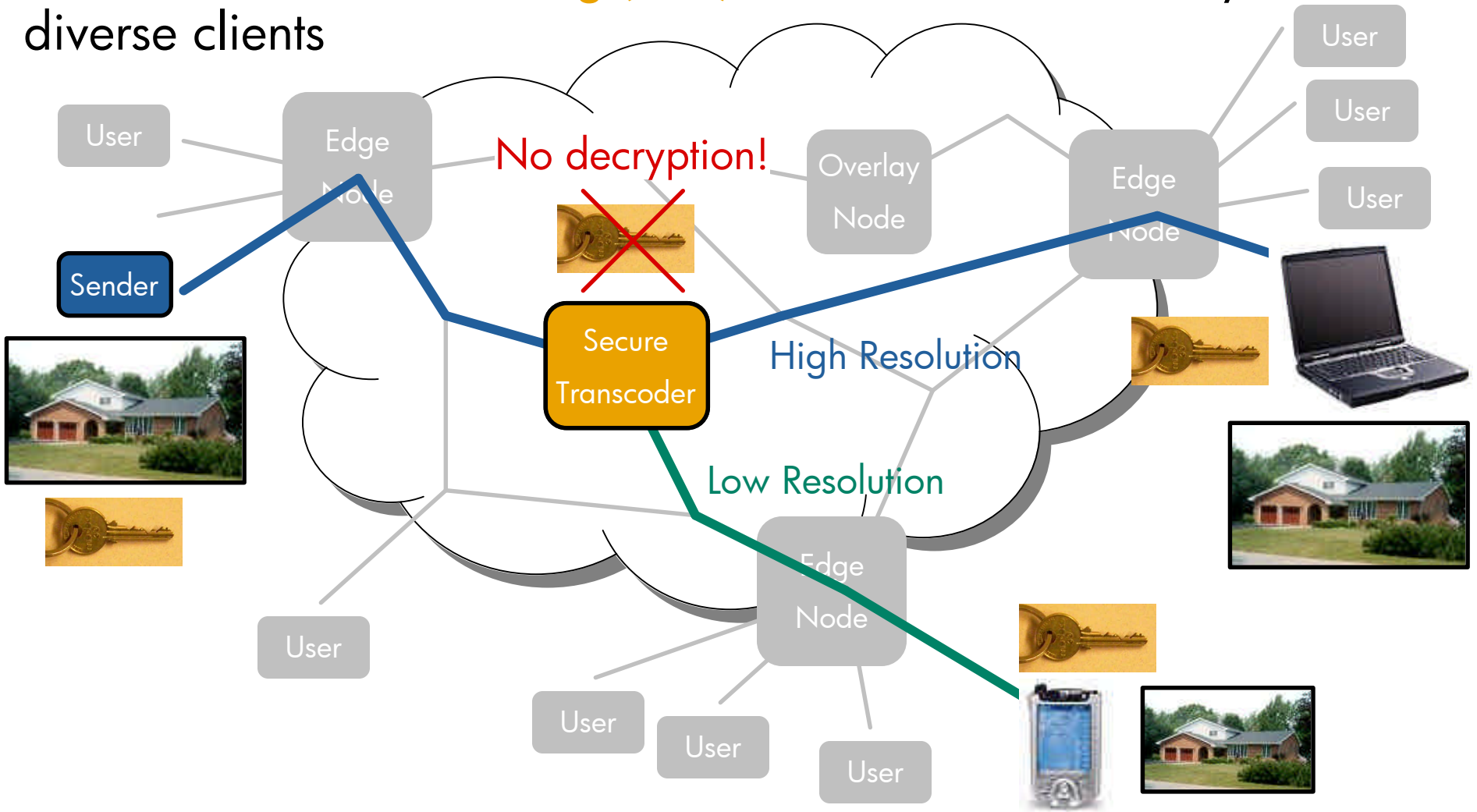
- Interlayer optimization
  - Potential for significant performance gains
    - → Difference between local and global optimum
  - New functionalities

Example Problem: Transcoding for Diverse Clients and End-to-End Security



Coding + Encryption + Packetization

Secure Scalable Streaming (SSS): Secure media delivery for diverse clients



Final Thoughts

- Coding+_____ : Rich area with potential for high impact
  - Interlayer analysis, design, optimization
- Examples:
  - Coding + Transcoding
  - Coding + Robustness
  - Coding + Routing
  - Coding + Content Delivery
  - Coding + Encryption + Packetization
  - Coding + Editing
  - …
- "Compression is not what it used to be", it's much more

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