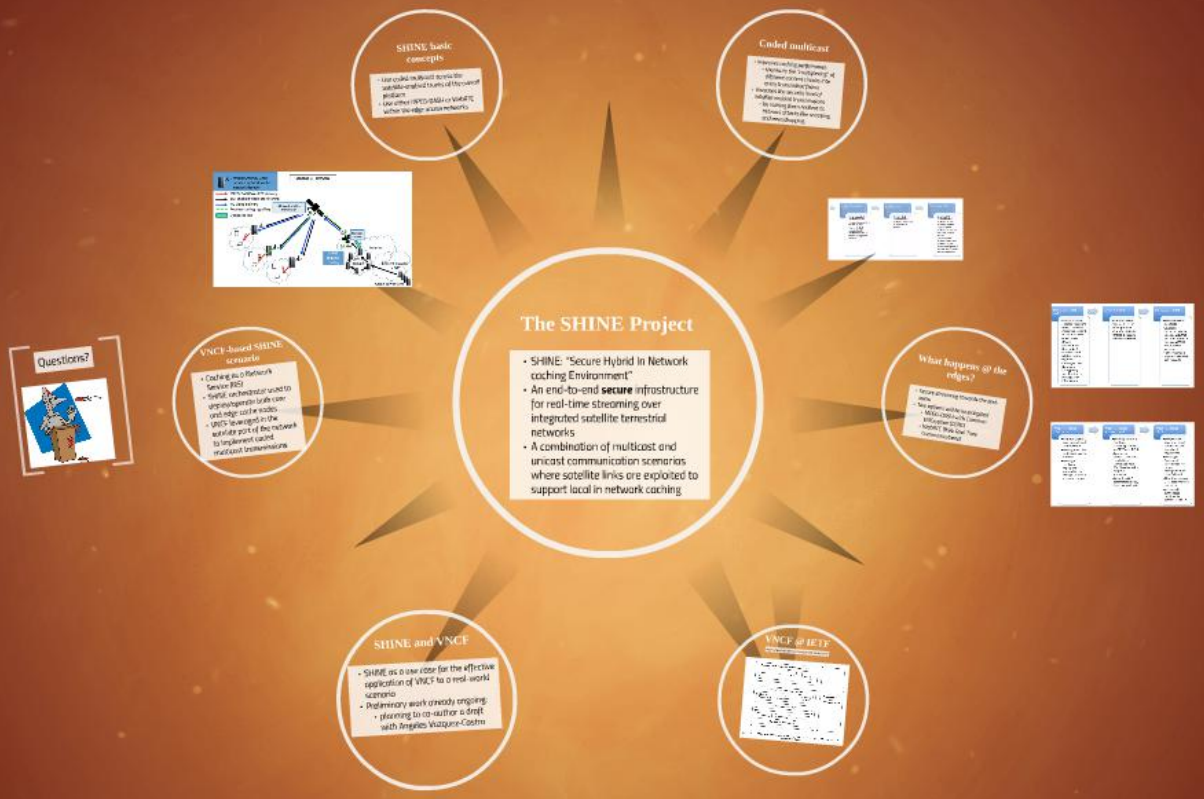
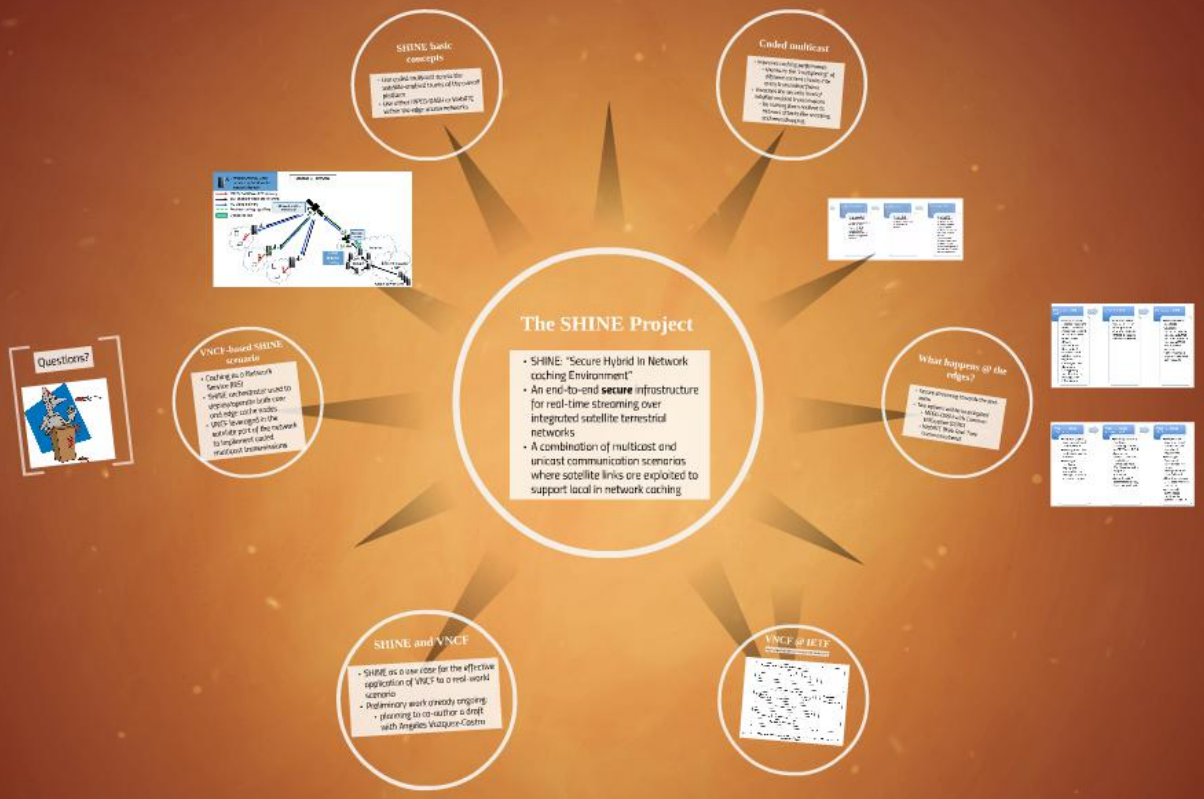


Network Coding in the SHINE ESA project

IETF98, Chicago



Network Coding in the SHINE ESA project

IETF98, Chicago

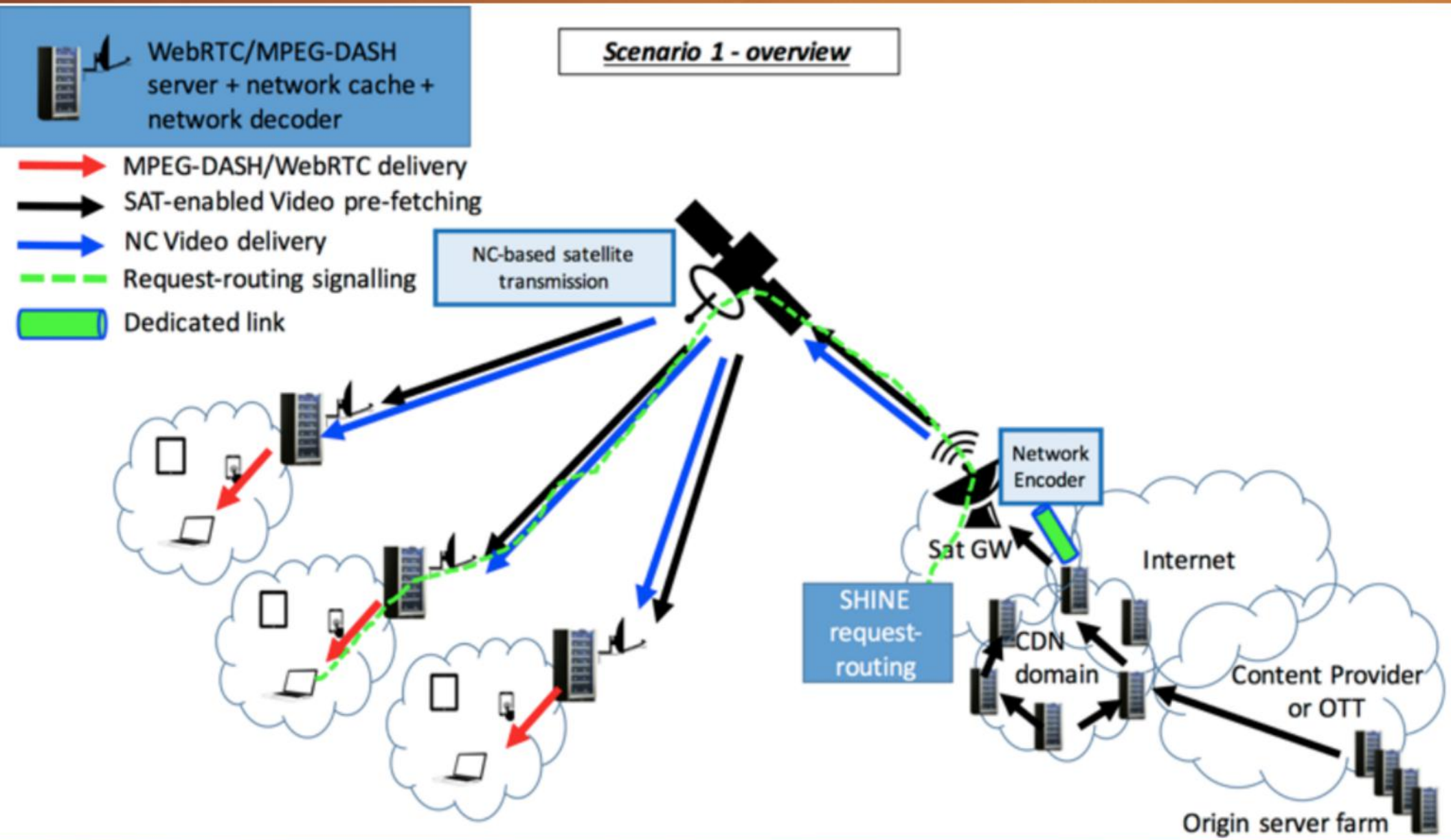
The SHINE Project

- SHINE: "Secure Hybrid In Network caching Environment"
- An end-to-end **secure** infrastructure for real-time streaming over integrated satellite terrestrial networks
- A combination of multicast and unicast communication scenarios where satellite links are exploited to support local in network caching

- SHINE: “Secure Hybrid In Network caching Environment”
- An end-to-end **secure** infrastructure for real-time streaming over integrated satellite terrestrial networks
- A combination of multicast and unicast communication scenarios where satellite links are exploited to support local in network caching

SHINE basic concepts

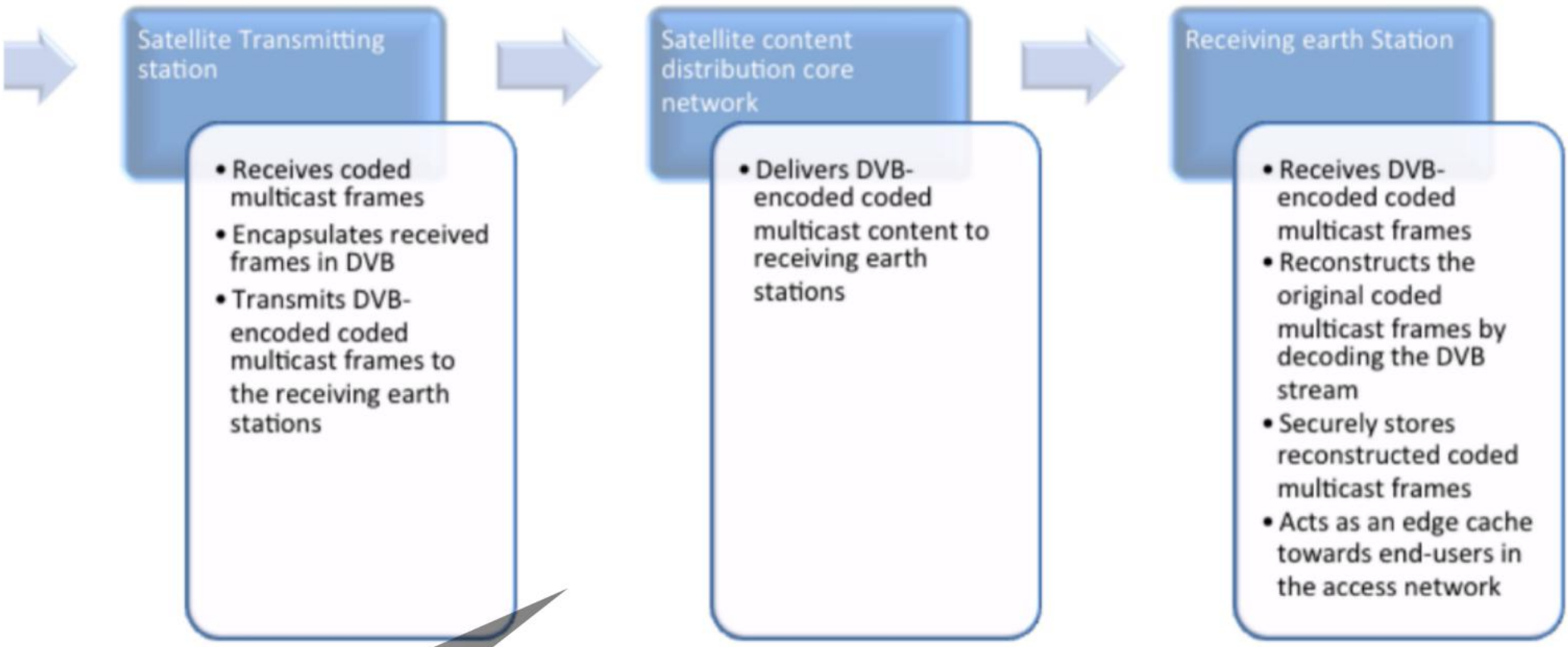
- Use coded multicast across the satellite-enabled trunks of the overall platform
- Use either MPEG-DASH or WebRTC within the edge access networks


WebRTC/MPEG-DASH server + network cache + network decoder
Scenario 1 - overview
MPEG-DASH/WebRTC delivery
SAT-enabled Video pre-fetching
NC Video delivery
Request-routing signalling
Dedicated link
NC-based satellite transmission
Network Encoder
Sat GW
SHINE request-routing
Internet
CDN domain
Content Provider or OTT
Origin server farm

Coded multicast

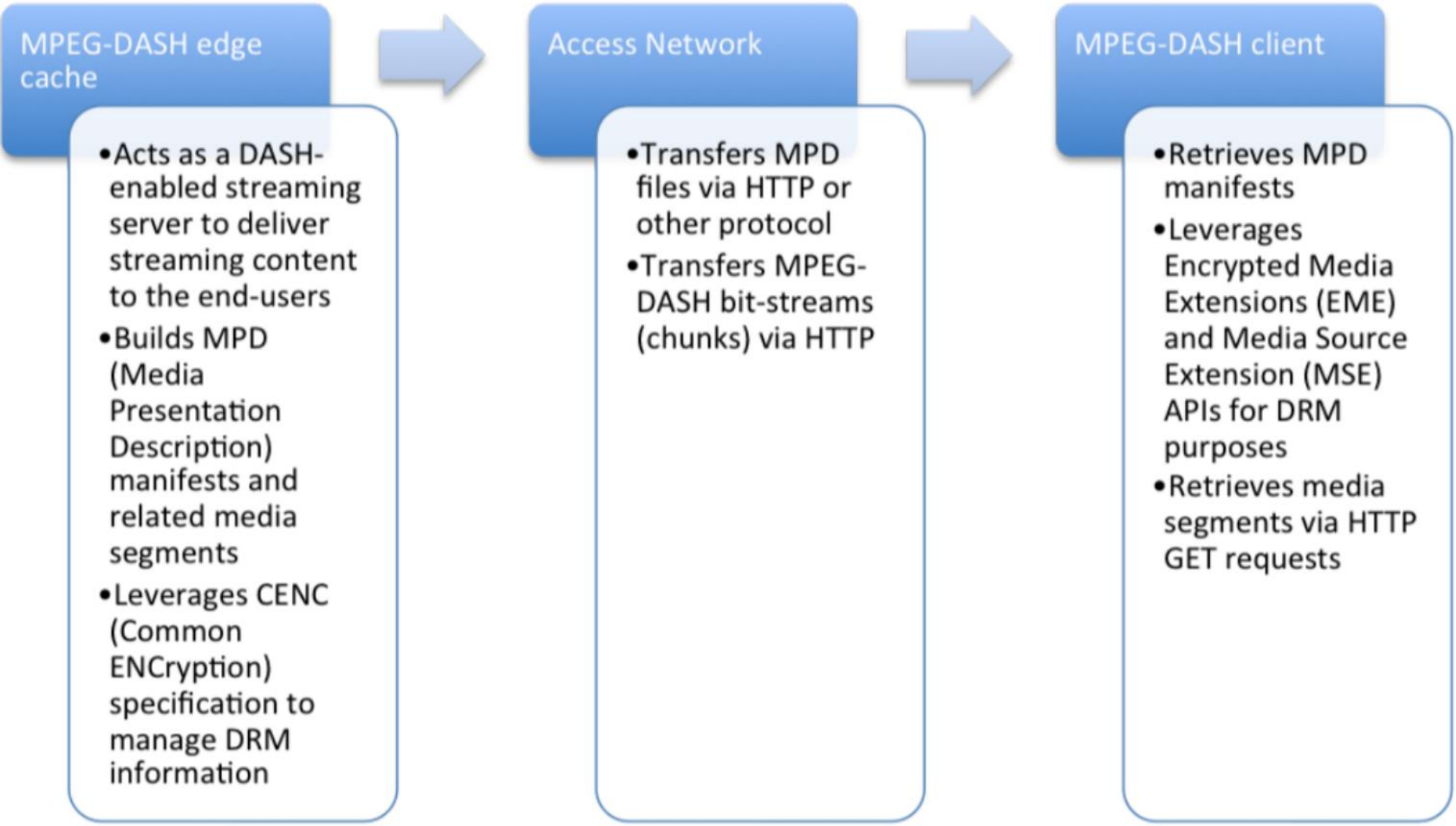
- Improves caching performance
  - thanks to the "multiplexing" of different content chunks into every transmitted frame
- Increases the security level of satellite enabled transmissions
  - by making them resilient to network attacks like snooping and eavesdropping

- Improves caching performance
  - thanks to the "multiplexing" of different content chunks into every transmitted frame
- Increases the security level of satellite enabled transmissions
  - by making them resilient to network attacks like snooping and eavesdropping


Satellite Transmitting station
• Receives coded multicast frames
• Encapsulates received frames in DVB
• Transmits DVB-encoded coded multicast frames to the receiving earth stations
Satellite content distribution core network
• Delivers DVB-encoded coded multicast content to receiving earth stations
Receiving earth Station
• Receives DVB-encoded coded multicast frames
• Reconstructs the original coded multicast frames by decoding the DVB stream
• Securely stores reconstructed coded multicast frames
• Acts as an edge cache towards end-users in the access network

What happens @ the edges?

- Secure streaming towards the end-users
- Two options will be investigated
  - MPEG-DASH with Common ENCryption (CENC)
  - WebRTC (Web Real Time Communications)


MPEG-DASH edge cache
•Acts as a DASH-enabled streaming server to deliver streaming content to the end-users
•Builds MPD (Media Presentation Description) manifests and related media segments
•Leverages CENC (Common ENCryption) specification to manage DRM information
Access Network
•Transfers MPD files via HTTP or other protocol
•Transfers MPEG-DASH bit-streams (chunks) via HTTP
MPEG-DASH client
•Retrieves MPD manifests
•Leverages Encrypted Media Extensions (EME) and Media Source Extension (MSE) APIs for DRM purposes
•Retrieves media segments via HTTP GET requests

WebRTC-enabled edge cache

- Acts as a WebRTC peer towards end-user browsers
- Leverages DTLS to protect data while in transit
- Leverages certificate fingerprint information to manage DRM-like access to content

WebRTC-enabled access network

- Securely transfers real-time streaming content via SRTP over DTLS
- Leverages WebRTC simulcast capabilities (combined with RTCP feedback) for adaptive streaming
- Optimizes QoS parameters (delay, jitter, packet loss)

WebRTC-enabled client

- Dynamically generates client certificates and associated fingerprints
- Leverages fingerprint information for proper management of client's identity
- Negotiates secure DTLS sessions with the server
- Accesses (if authorized) multimedia content via SRTP

VNCF @ IETF

draft-vazquez-nfvrg-netcod-function-virtualization-00

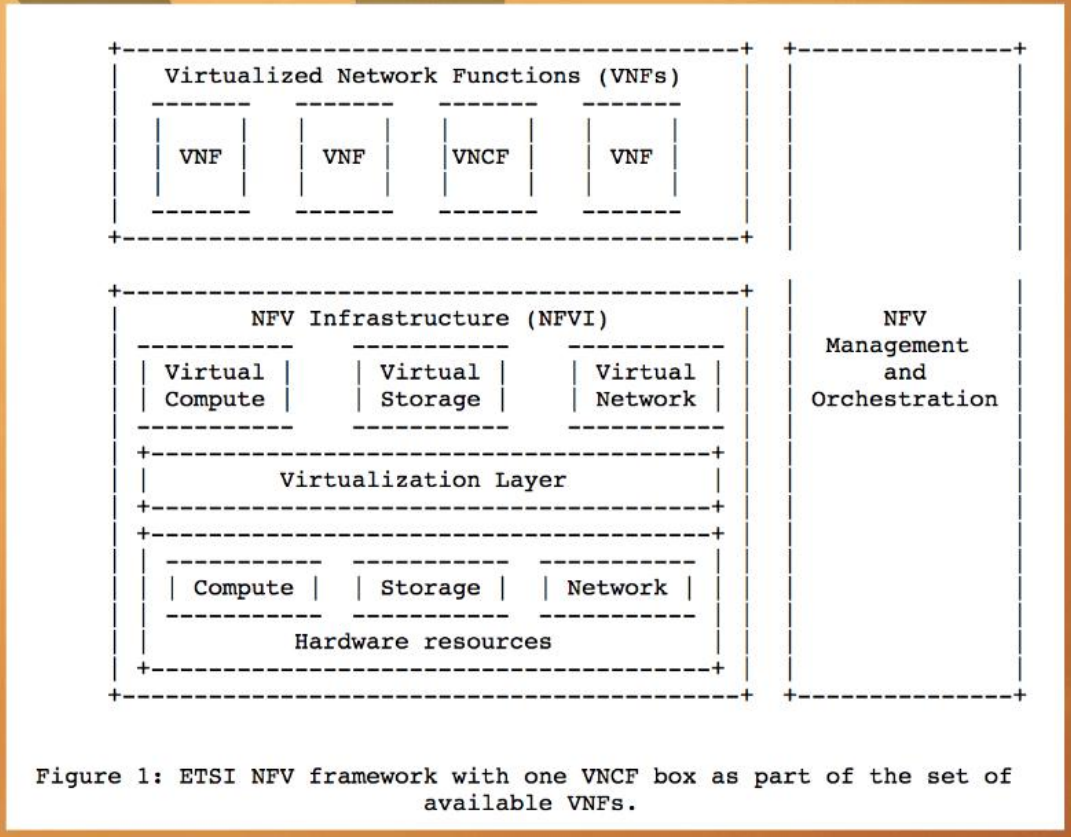


Figure 1: ETSI NFV framework with one VNCF box as part of the set of available VNFs.

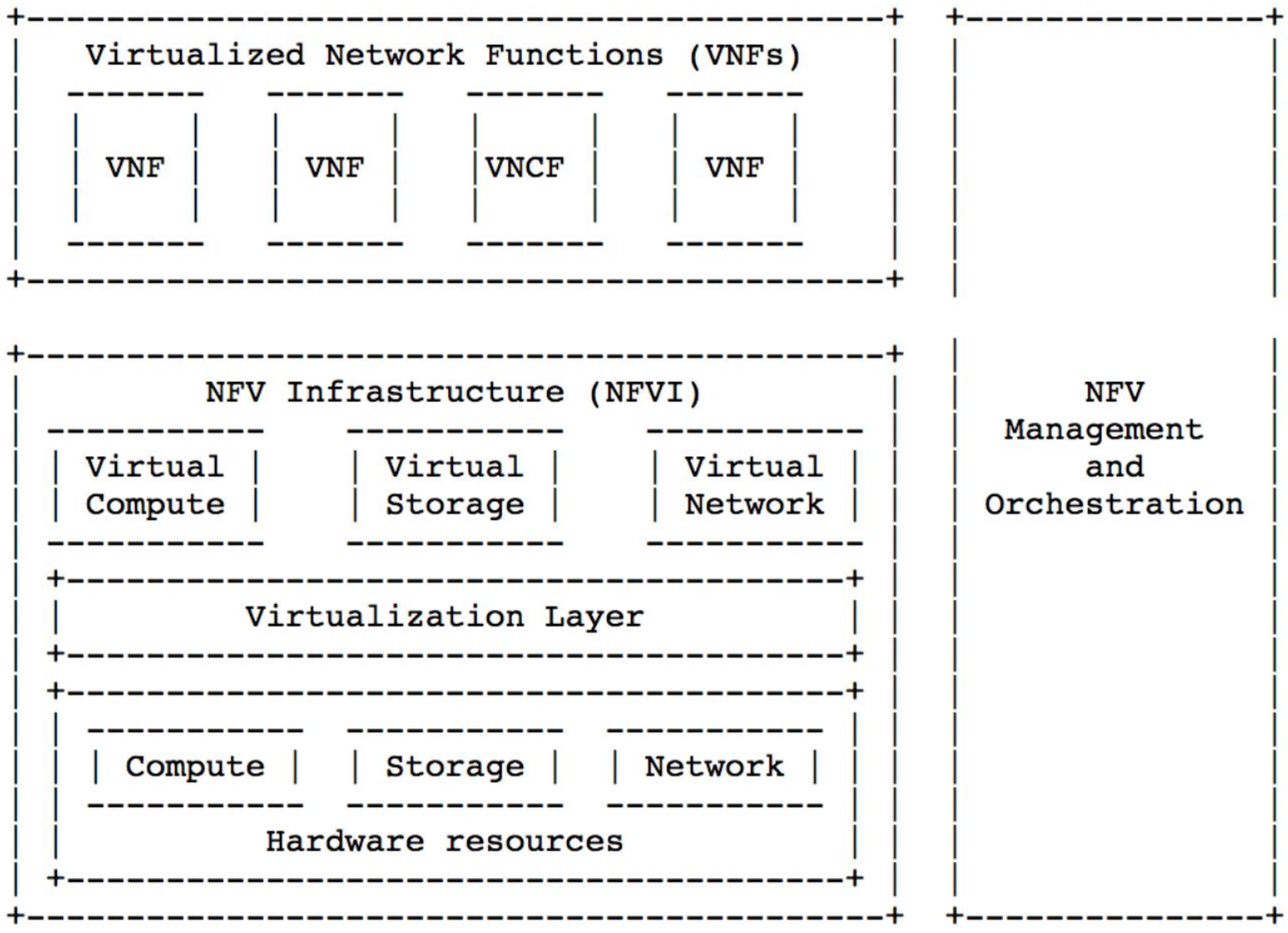


Figure 1: ETSI NFV framework with one VNCF box as part of the set of available VNFs.

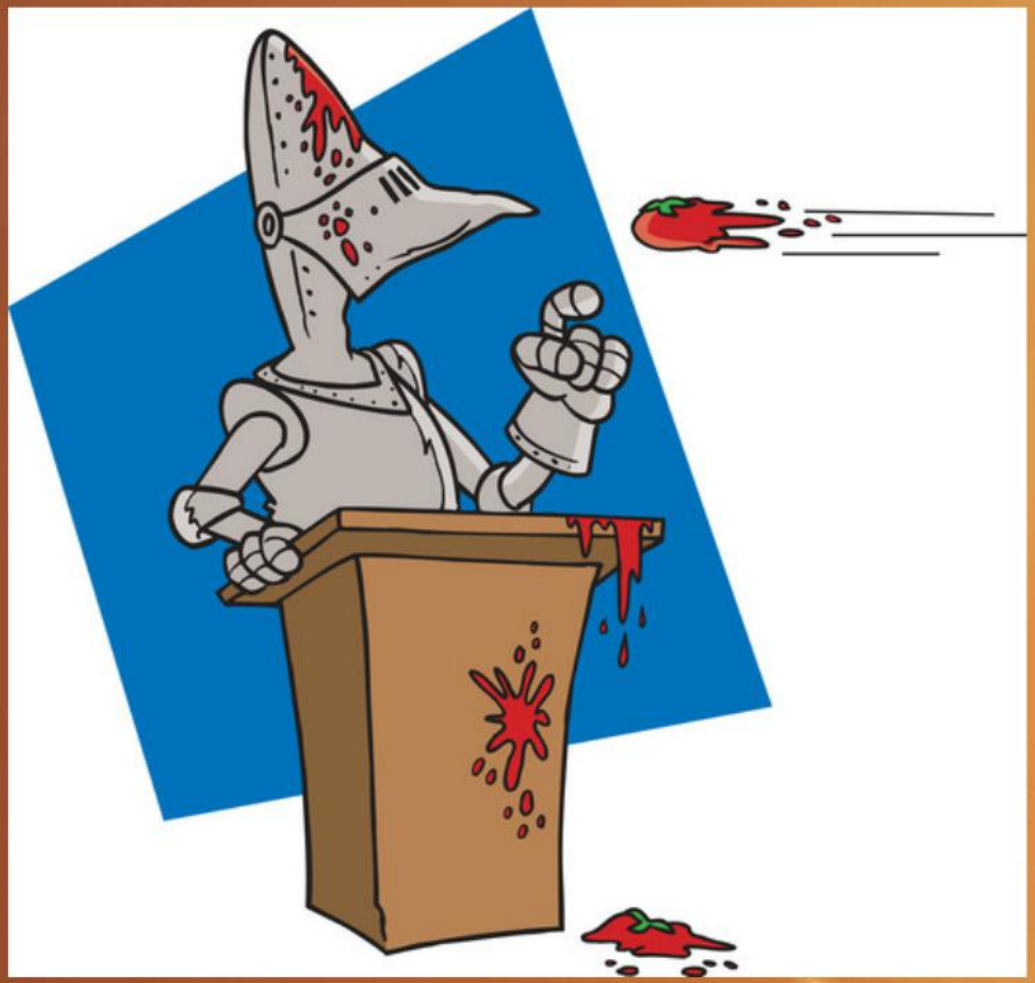
SHINE and VNCF

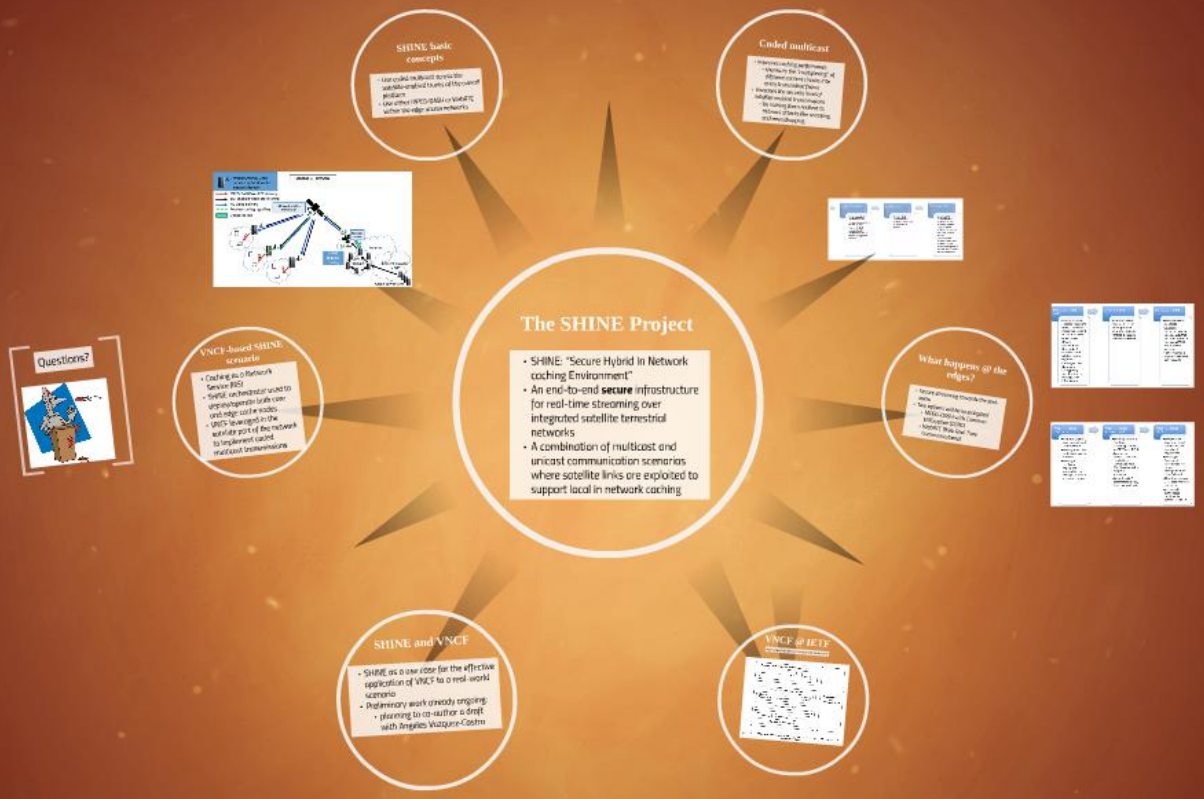
- SHINE as a use case for the effective application of VNCF to a real-world scenario
- Preliminary work already ongoing:
  - planning to co-author a draft with Angeles Vazquez-Castro

VNCF-based SHINE scenario

- Caching as a Network Service (NS)
- SHINE orchestrator used to deploy/operate both core and edge cache nodes
- VNCF leveraged in the satellite part of the network to implement coded multicast transmissions

Questions?





Network Coding in the SHINE ESA project

IETF98, Chicago