

SCORSESE

The role of satellite in
collaborative adaptive bitrate
streaming services

Outline

- Overview
 - Study objectives
 - Consortium
- Use cases and requirements
- Multimedia services
- Architecture and technical solutions
- Integrated deployment scenarios
- Conclusion

About SCORSESE

- Several studies predict explosion in video traffic
- Major factors : OTT video delivery, Portable device, increasing demand, UHD etc.
- Poses challenges for future service delivery
- To forestall this, currently developments in:
 - Next-Gen codecs
 - Delivery standards
 - New CDN
 - Terrestrial network architecture
 - Satellite network architecture
- But, all technologies are developing **independently!**
- In SCORSESE, we identify and exploit **synergies** in these emerging technologies

Study objectives

- Define integrated satellite-terrestrial video delivery scenarios
- Defining architectures for integrated scenarios
- Demonstrate the architectures via PoCs
- Provide value creation perspectives and cost assessments for the integrated architectures
- Provide recommendations for relevant development and standardization activities

Consortium

- Nomor Research GmbH, Munich, Germany
- European Broadcasting Union
- Fraunhofer Institute for Integrated Circuits IIS, Erlangen, Bavaria, Germany
- RAI - Radiotelevisione Italiana, Italy
- Jet-Stream, Netherlands

Use cases and requirements covered

- Use cases covered (5G use cases METIS-II):
 - “Denser urban information society”
 - “Broadband access everywhere”
- Future envisioned video service requirements:
 - High data
 - Low latency
 - Broad coverage
- This study items hopes to cover these requirements with a focus on video-delivery

Multimedia services – Part 1

- Different multimedia services were considered and analyzed in detail
- Live TV
- Video on Demand
 - Catch-up TV
 - Connected TV/Hybrid TV
 - Push VOD/PVR
- Interactive services
 - Location information services
 - Second screen / Companion device
- Cloud gaming service
- Virtualized corporate encoding factory

Multimedia services – Part 2

- Further shortlisted based on
 1. Business relevance and
 2. Most likely to face growth issues in future
- Shortlisted adaptive bitrate streaming services:
 - Generic VoD
 - Live TV
 - Connected TV/Hybrid TV
 - Push VoD/ PVR
 - Catch-up TV
- Requirements specific for each service are also being considered

Architectural and technical solutions – Part 1



- Timeline of the current project : 2015 – 2017
- Final architecture will be available in mid-2016
- A preliminary concept of the solution is available
- Solutions will enable Assured QoS video delivery exploiting synergies of next-gen content generation and delivery protocols, CDNs, terrestrial and satellite networks

Architectural and technical solutions – Part 2



- Major technological components already identified
- **DASH** will be used for delivery of services
- **In-network caching** and **in-network video processing**, along with the **CDN**, would be used to adapt the contents
- **Predictive caching** will be used to intelligently populate caches
- **DVB-S2X satellite standard** will be integrated with existing terrestrial network

Architectural and technical solutions – Part 3



- The **software-defined approach** envisioned in 5G network will be explored
- To be seen how resources (cache and processing) requested according to demand
- Also, how satellite can be used to dual-backhaul these caches
- Other relevant 5G study items will also be explored
- Particularly how the satellite can be integrated in the 5G ecosystem

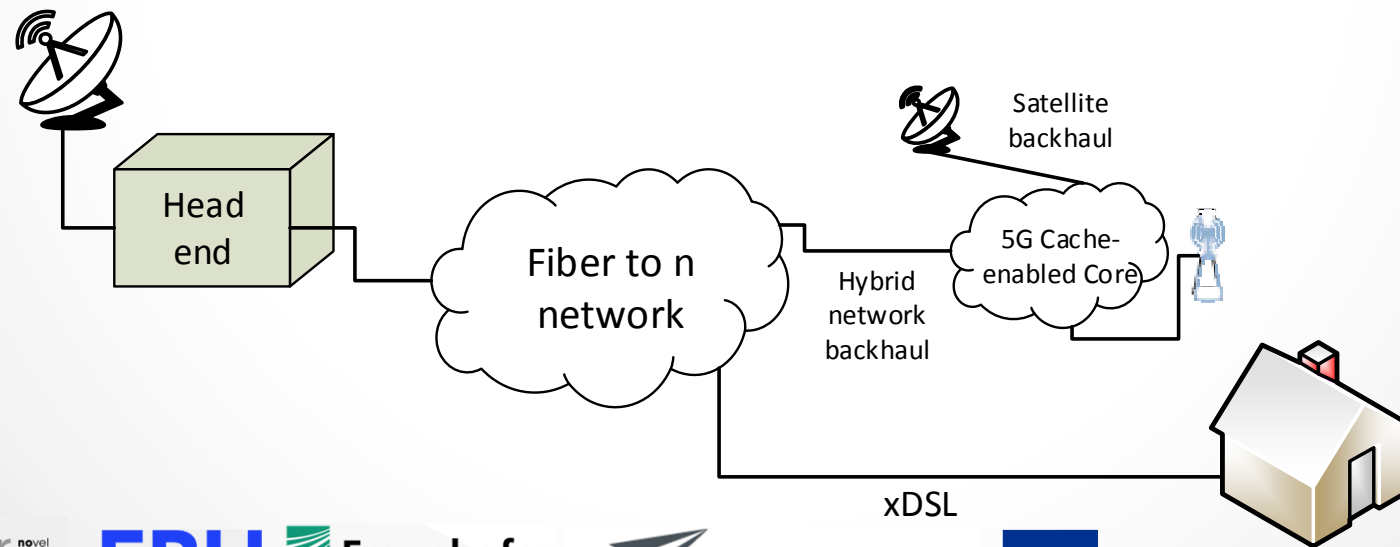
Integrated deployment scenarios



- Identified few promising integrated deployment solutions
- These will be shortlisted according to business relevance and other parameters
- Integrated architecture for each deployment solution will be defined and optimized
- The shortlisted scenario and architecture will be available by mid-2016

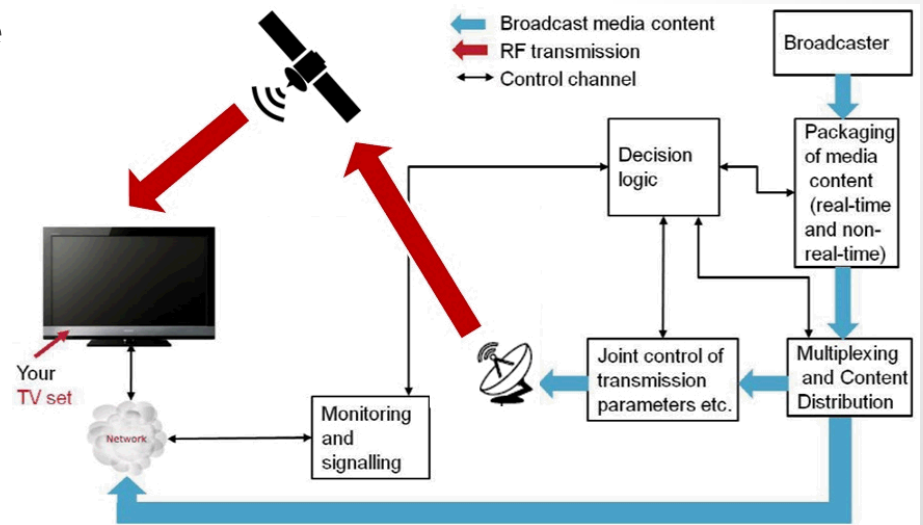
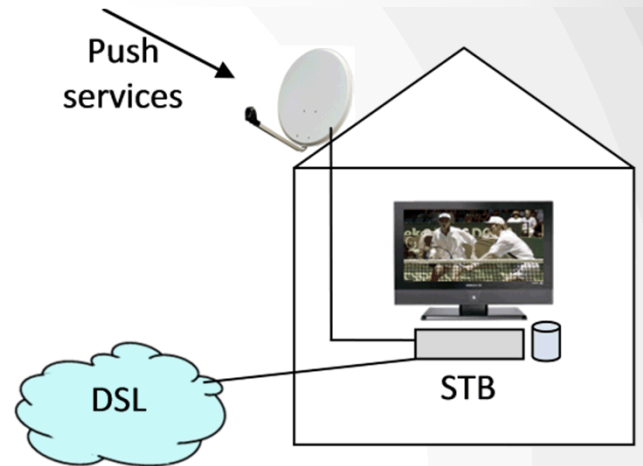
Satellite as hybrid backhaul for 5G ultra-dense network

- Congested backhaul in future 5G networks predicted
- Instead of deploying new fibre, use satellite backhauls
- Small cache-enabled cell have dual backhauls
- DVB-S2X provide solution for wireless backhaul
- Has elements of predictive caching, in-network caching, in-network processing, among others



Content caching in set top boxes

- Satellite has a role of (alternative or co-operative) access network for multi-homing UE
- For OTT services, pre-downloading in background done via satellite
- Dynamic Broadcast concept of “terrestrial network” can be extended for Satellites
- Hybrid services delivered through Dual connections



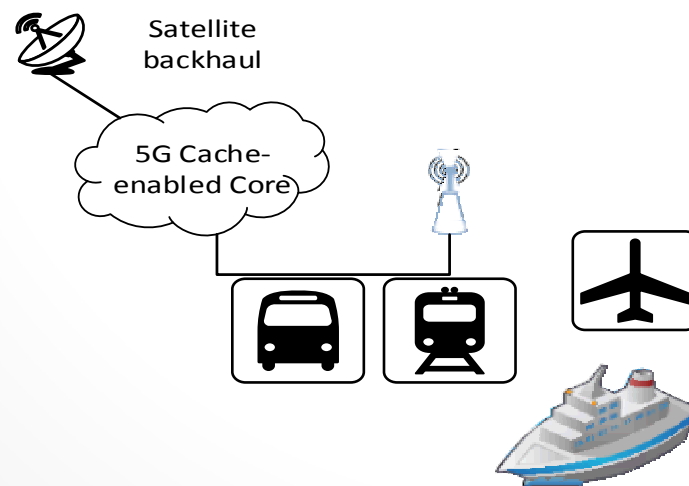
Satellite live/linear stream feed into local Point of Presence



Satellite for Intra-CDN Content Retrieval for Moving Vehicles

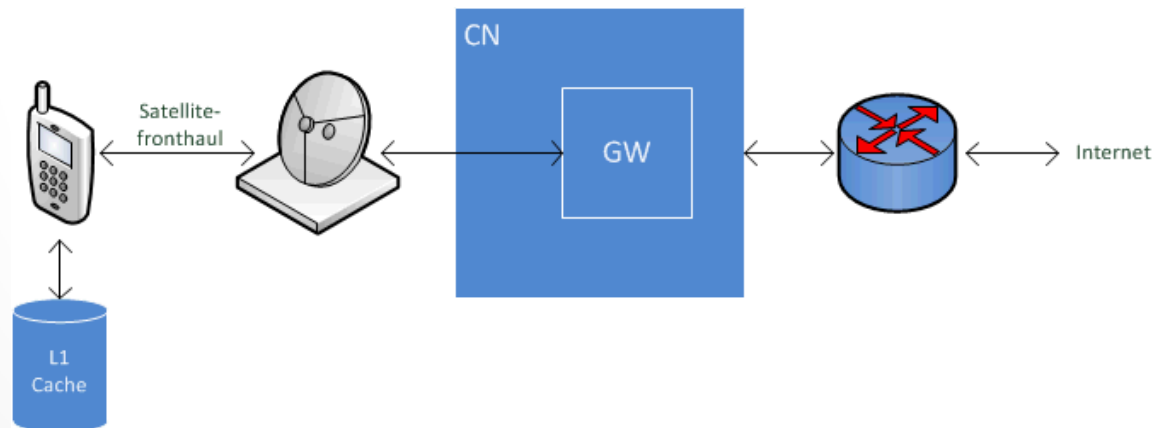


- A cache-enabled 5G on a moving vehicle backhauled by satellite link
- Smart cache replenishing strategies to avoid congestion
- MEO satellite for low delay critical services
- Possible processing for adaption to network conditions



Satellite for Direct to UE Communication

- Satellite technology : DVB-NGH to cache on portable devices
- Devices will be dual homing
- Technical challenges – Battery operated devices and limited processing capability



Conclusion

- It will become clear how Satellite components & overall terrestrial ecosystem can be exploited to find synergies
- Specifically, architectural aspects on how satellite component can support 5G distributed network video caching will become clear
- By the conclusion of study, we hope to provide recommendation for development & standardization activities