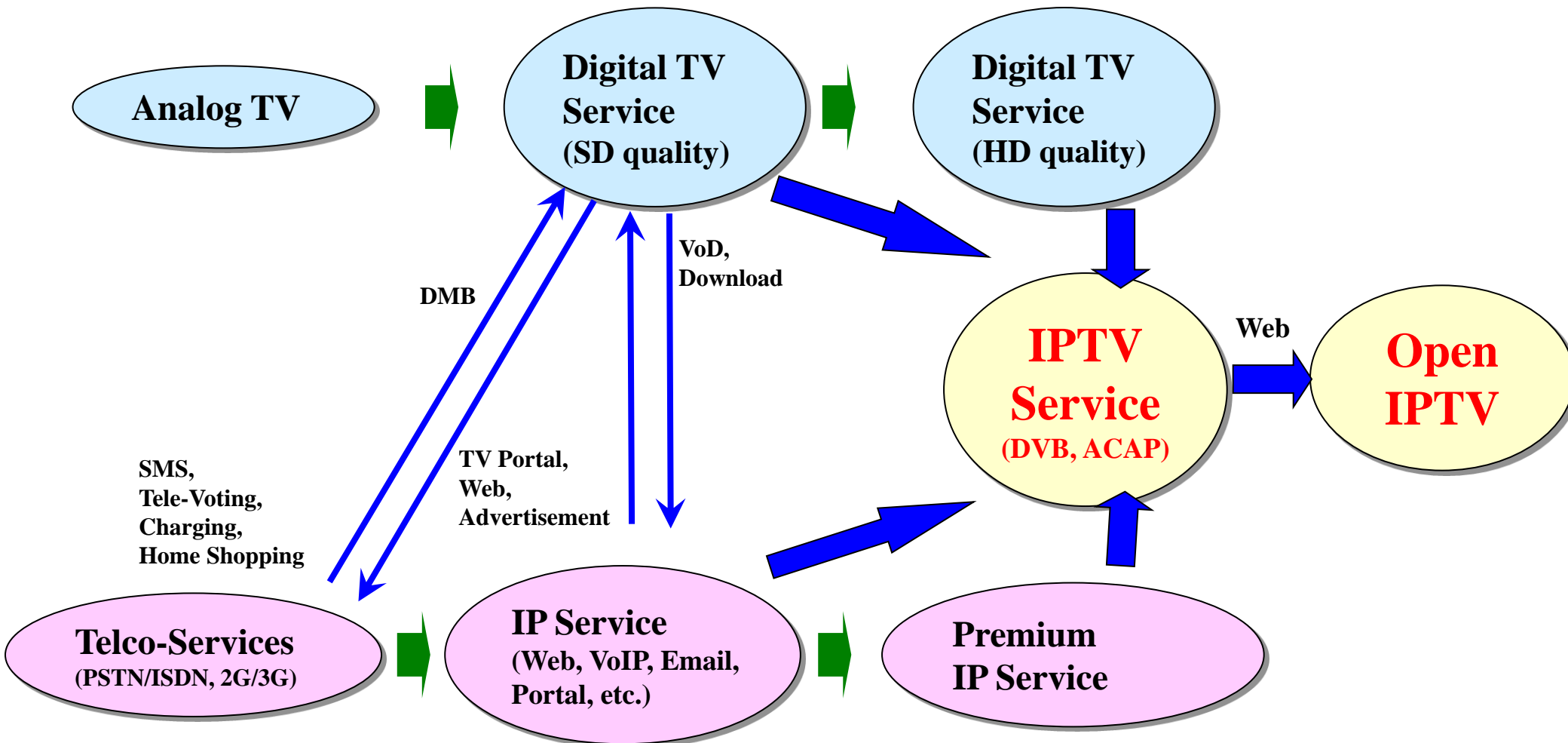

Open IPTV Testbed through TEIN

Choi Kwangjin

BcN Engineering Research Center

KAIST(Korea Advanced Institute of Science and Technology)

Service Evolution for IPTV



Objective of Testbed

- Global experiment and development of Web-based global open IPTV platform through TEIN(Trans-Eurasia Information Network)

Research Details

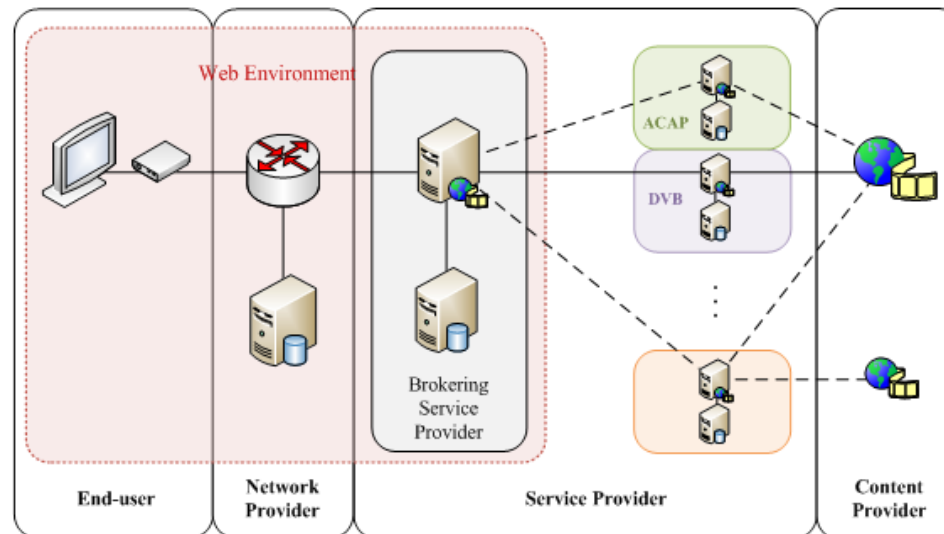
□ Web-based Open IPTV portal service demonstration

- IPTV Brokering Service
 - Prosumer
- Content Syndication
 - Aggregation of UCC data to Open IPTV
- Content delivery service
 - Hybrid of multicast and unicast
- QoS, QoE measurements on Open IPTV service between Korea and the other country

Web-based IPTV Brokering Service Models and Scenarios

□ The key roles of the Brokering Service Provider are

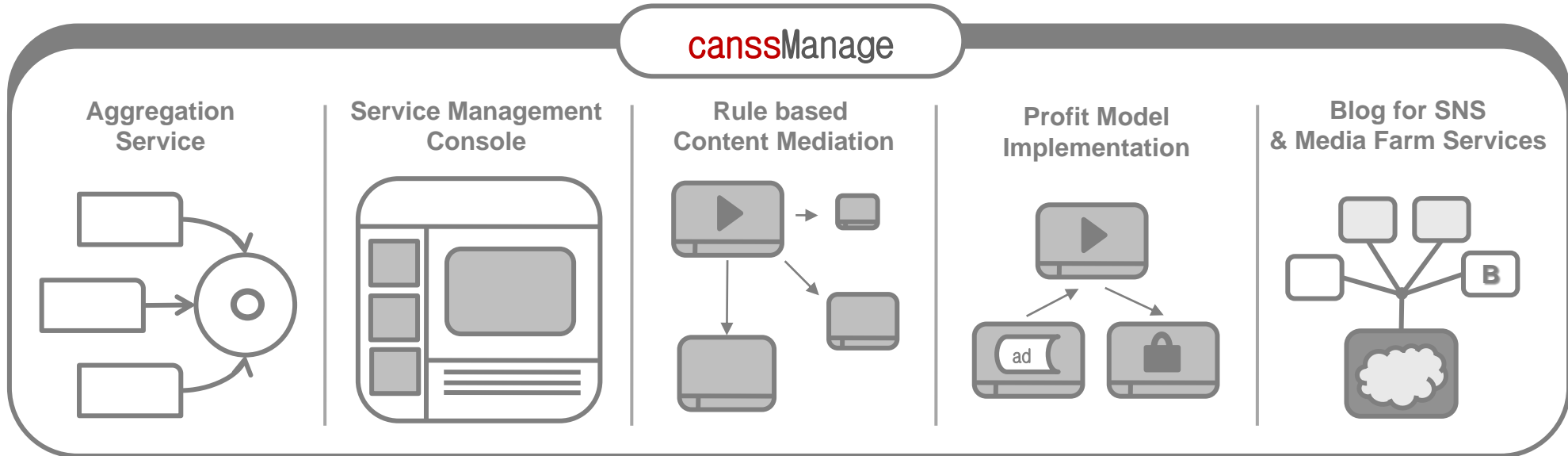
- (i) aggregating and managing contents or information on contents from several original service providers
- (ii) converting and optimizing the formats or codecs of contents or information on contents



canssManage(Content Syndication)

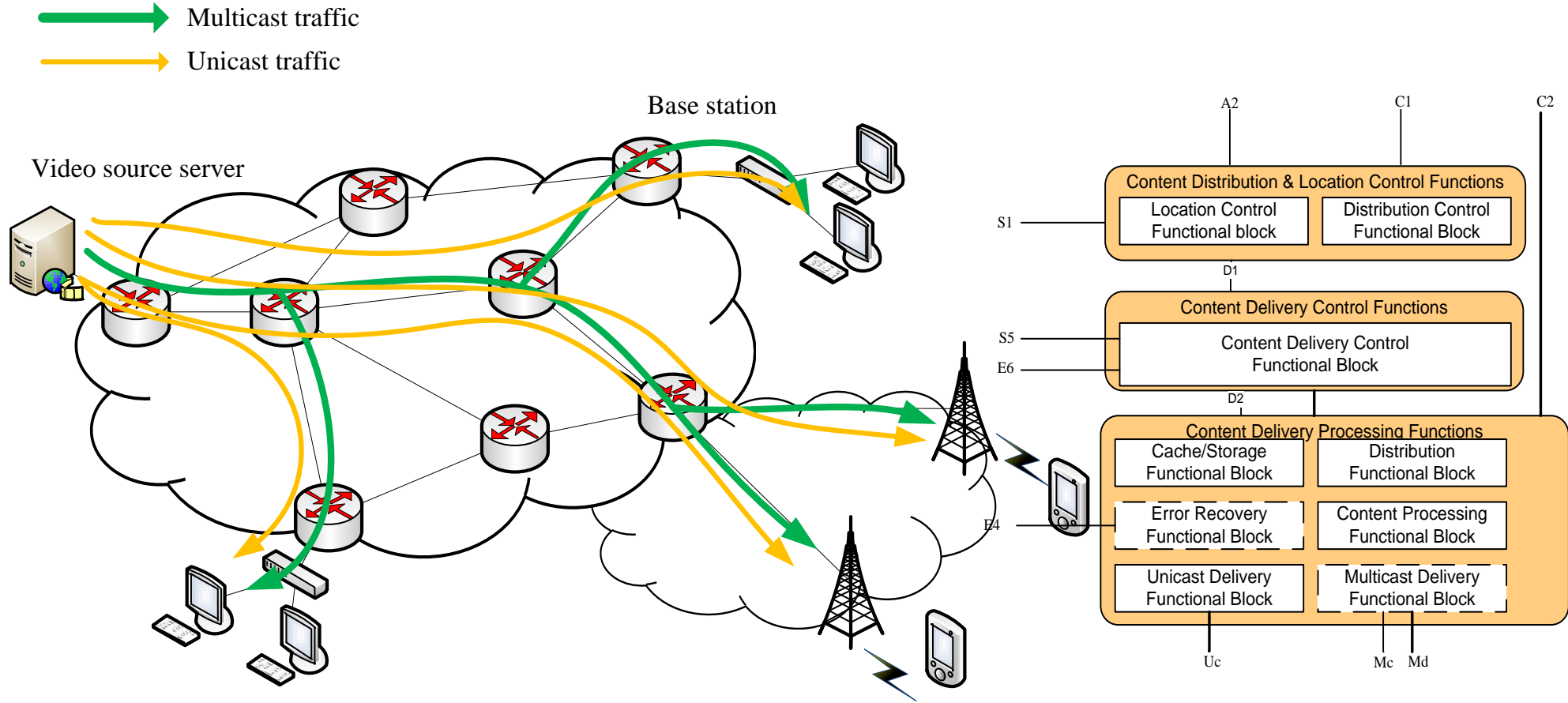
Make rich media management easy

canssManage offers a variety of products and services for effectively publishing your rich media for broadband and mobile



- ⌘ **Aggregation Service** offers multiple easy-to-use tools for programmatically (or manually) uploading your media content into canss using Watch Folders and Feed Readers by offering a reliable and versatile suite of tools for getting your media into our system.
- ⌘ **Service Management Console** provides a smart interface for managing your media. Ingest content, enter metadata, apply business policies, and publish your media
- ⌘ **Rule based Content Mediation** converts your video into the media formats you need. Hosted by canss, transcodes can be completed by our shared farm or on dedicated boxes
- ⌘ **Profit Model Implementation** helps you maximize your broadband video's earning potential with effective ways to distribute it to the right audience, connect it with quality advertising, and let viewers promote your video to their social networks.
- ⌘ **Blog for SNS & Media Farm Service** provides social network service for using the content like blog, streaming and downloads support with utility-based pricing on a system optimized for broadband video content, and offers multiple-use online media storage in a utility-based pricing program that is fully integrated into canss media farm system.

Hybrid of Multicast and Unicast



Terminals' requests for VoD are served by a video source server through multicast and unicast

Hybrid Staggered Multicast (HSM)

□ Combination of staggered multicast and patching

- Allocate N multicast streams for a video with $T(=L/N)$ second across streams
- Missed part of video content was delivered through unicast stream

Server bandwidth consumption model

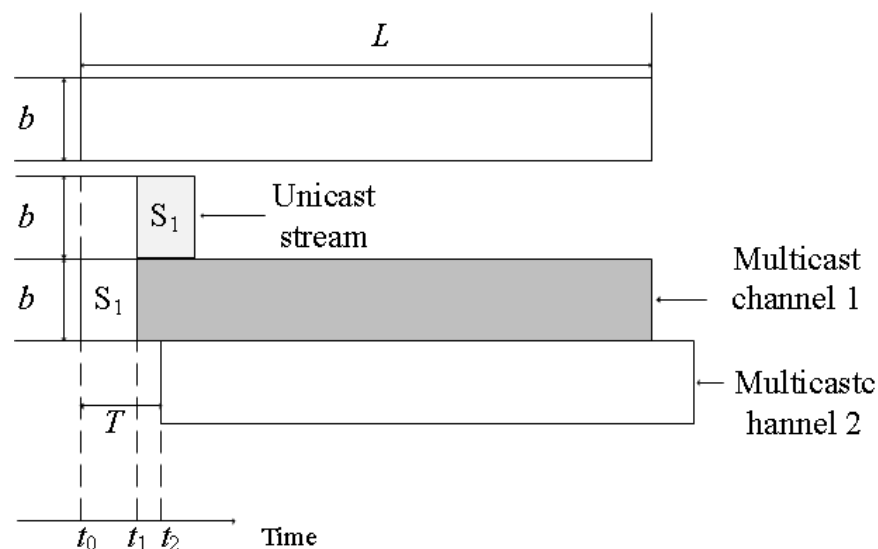
$$E[S_s(\lambda, L, N_s)] = \sum_{k=1}^{\infty} \frac{(\lambda T_s)^k e^{-\lambda T_s}}{k!} E[S_s(\lambda, L, N_s) | K_s = k]$$

$$= \sum_{k=1}^{\infty} \frac{(\lambda T_s)^k e^{-\lambda T_s}}{k!} b \left(L + \frac{kT_s}{2} \right) = b \left(L + \frac{\lambda L^2}{2N_s^2} \right)$$

$$E[R_s(\lambda, N_s)] = \lambda T_s = \frac{\lambda L}{N_s}$$

$$c_s(\lambda, L, N_s) = \lambda \frac{E[S_s(\lambda, L, N_s)]}{E[R_s(\lambda, N_s)]} = b \left(N_s + \frac{\lambda L}{2N_s} \right)$$

$$N_s = \sqrt{\frac{\lambda L}{2}} \quad \text{Minimizes } c_s$$



QoS/QoE

□ QoE has become an important factor

- Video services through Internet has expanded not through broadcast network
 - E.g: Hulu, NetFlix, Youtube
- Definition of QoE
 - The overall acceptability of an application or service, as perceived *subjectively* by end-user (ITU-T P.10/G.100)

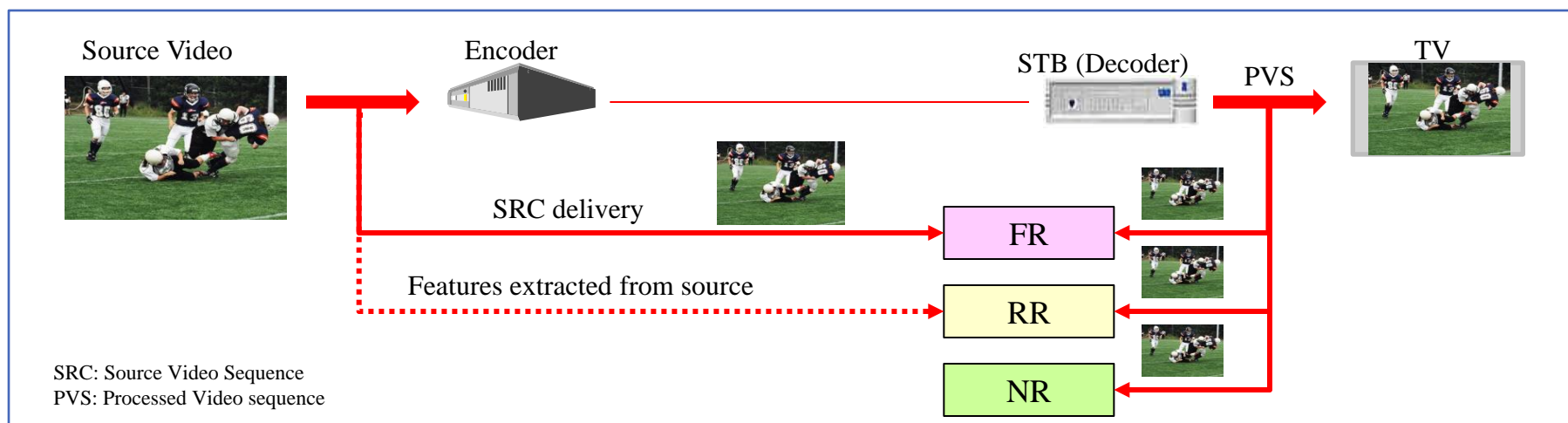


QoE degradation

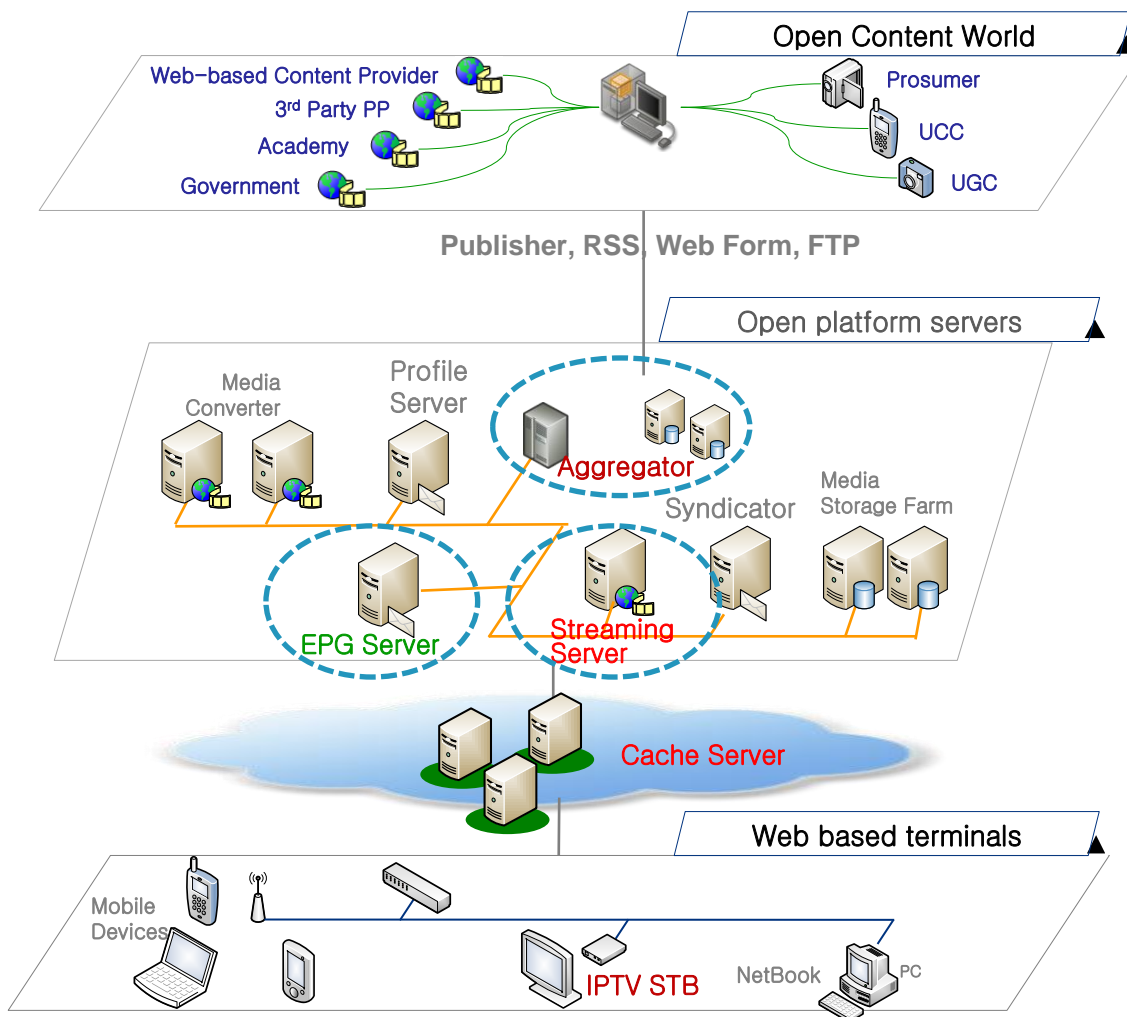
QoE Measurement

Media Layer Model

- FR/RR/NR Model
 - Uses decoded media (audio/video) signal
 - Measures video MOS (except audio MOS)
- Related Staple Recommendations
 - J.144 : 4 algorithms of FR (full reference) Model – SDTV
 - BT, Yonsei, CPqD, NTIA
 - J.247 : 4 algorithms of FR (full reference) Model – QCIF, CIF, VGA
 - NTT, OPTICOM, Psytechnics, Yonsei



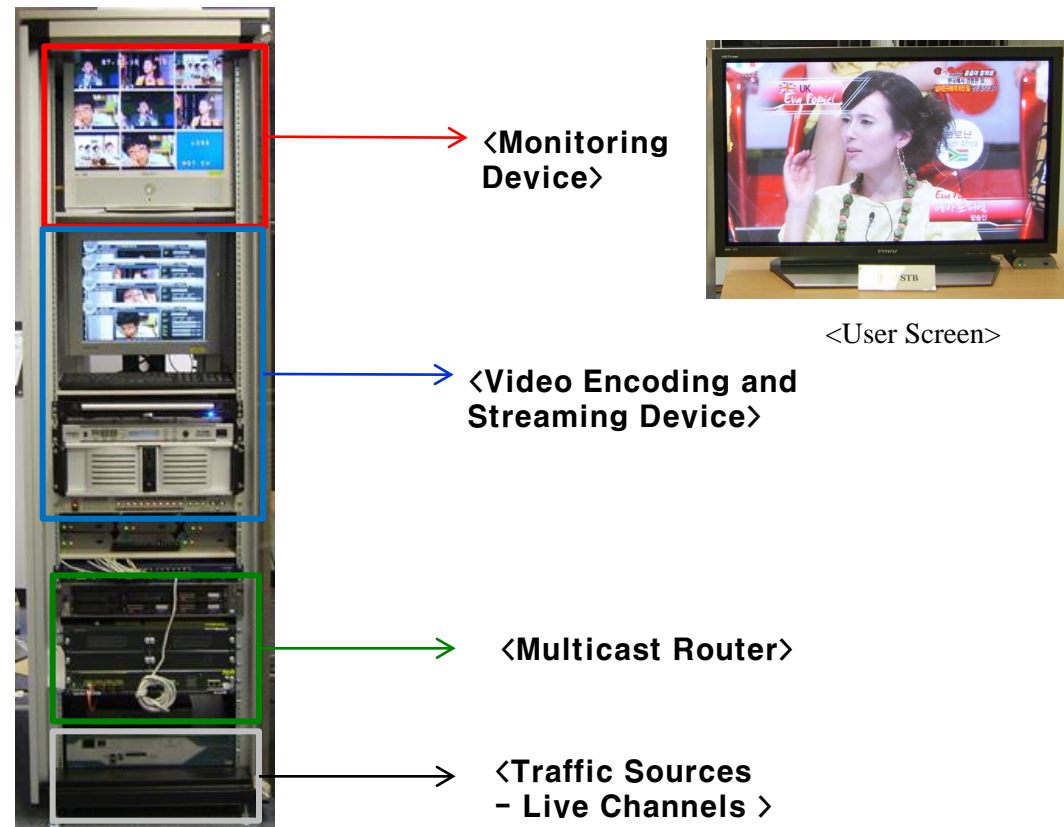
Web-based Open IPTV Platform



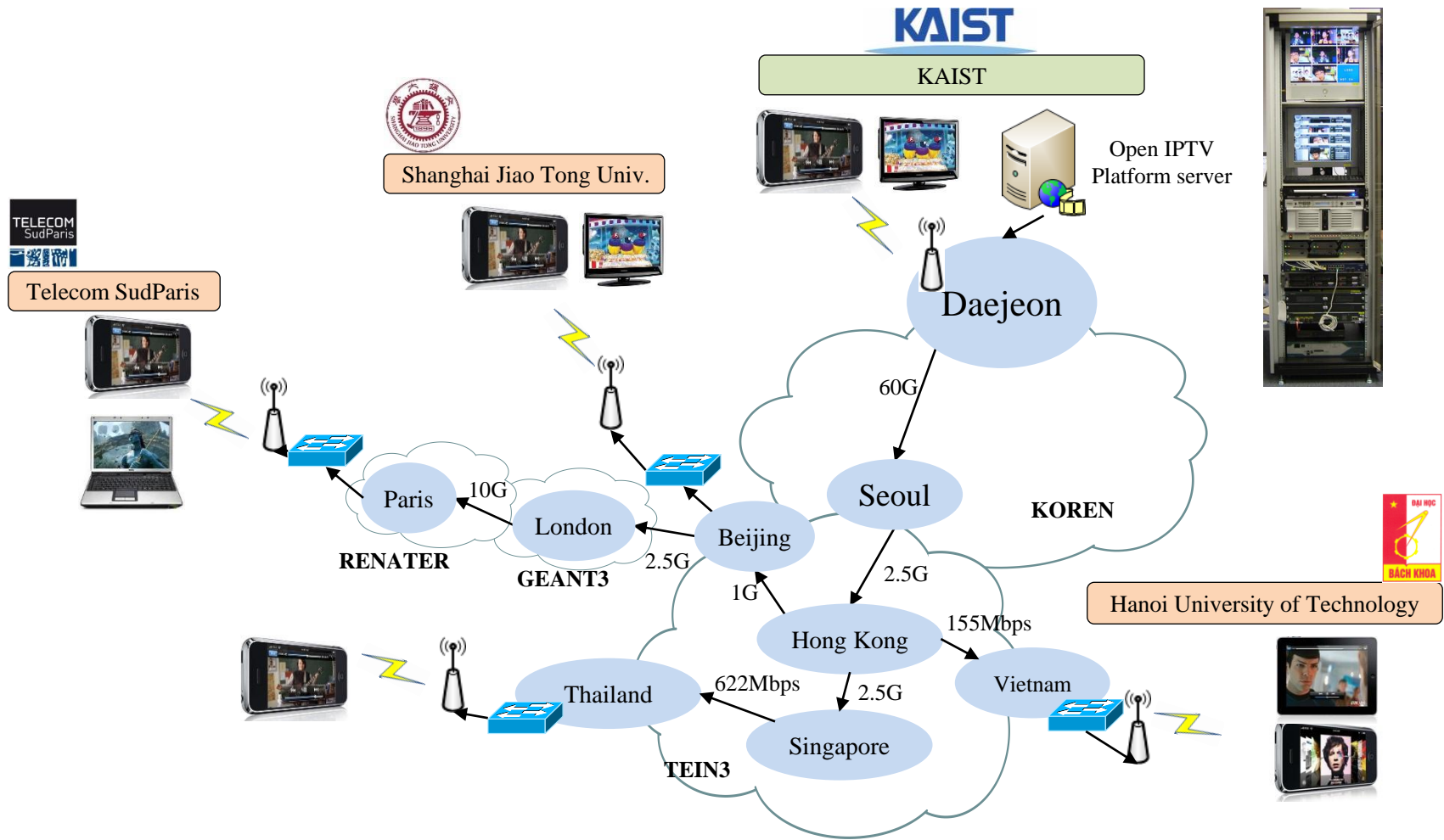
Open IPTV Server Configuration

□ IPTV Testbed Configuration – Head-end

- Test service
 - Linear IPTV
 - Video-on-Demand



Network Topology



Experiment Environment

	Devices	Quantity	Detail
Join Country	PC, Laptop	1 or more	HTML5
	Smartphone (e.g. iPhone)	1 or more	iOS 5.0 or higher
	Smartphone (Android)	1 or more	Android 3.0 (Honeycomb) or higher 4.0 (Ice Cream Sandwich) or 4.1 (Jellybean) are recommended
	Smartpad (e.g. iPad)	1 or more	iOS 5.0 or higher
Korea	Web Server and Media Streaming Server		Apache HTTP server for web portal Adobe Media server for HTTP Live Streaming

Conclusion

- Middle-ware platform of IPTV will be integrated with open Web environment
- Objective of this project is to implement global Web-based open IPTV service testbed
 - Key feature: Web-based portal site, IPTV Brokering, Content syndication, Content delivery, QoS/QoE measurement

Thank you