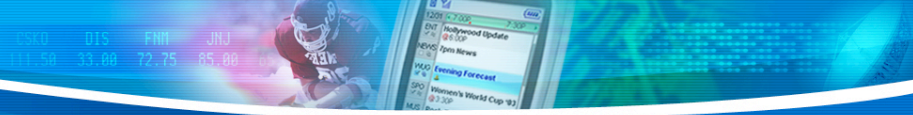




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Overview



Agenda

- **Mobile Multimedia Challenges**
- **The MediaFLO™ Initiative**
 - FLO™ Technology
 - MediaFLO media distribution system (MDS)
 - MediaFLO USA Inc.



MediaFLO Initiative

- **FLO Technology**
 - Wireless technology optimized for delivering multicast content to large number of hand-held and portable devices
 - Streaming audio and video, non real-time multimedia, IP data

- **MediaFLO Media Distribution System (MDS)**
 - End-to-end product and service offering that enables secure and efficient delivery of high-quality network-scheduled multimedia content to a large number of subscribers for easy viewing on hand-held and portable devices
 - Operates over UMTS, HSDPA, 1xEV-DO & FLO networks

- **MediaFLO USA Inc.**
 - QUALCOMM subsidiary responsible to deploy and operate a nationwide “mediacast” network (based on 700 MHz spectrum)



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Mobile Multimedia Challenges



Mobile Multimedia Challenges

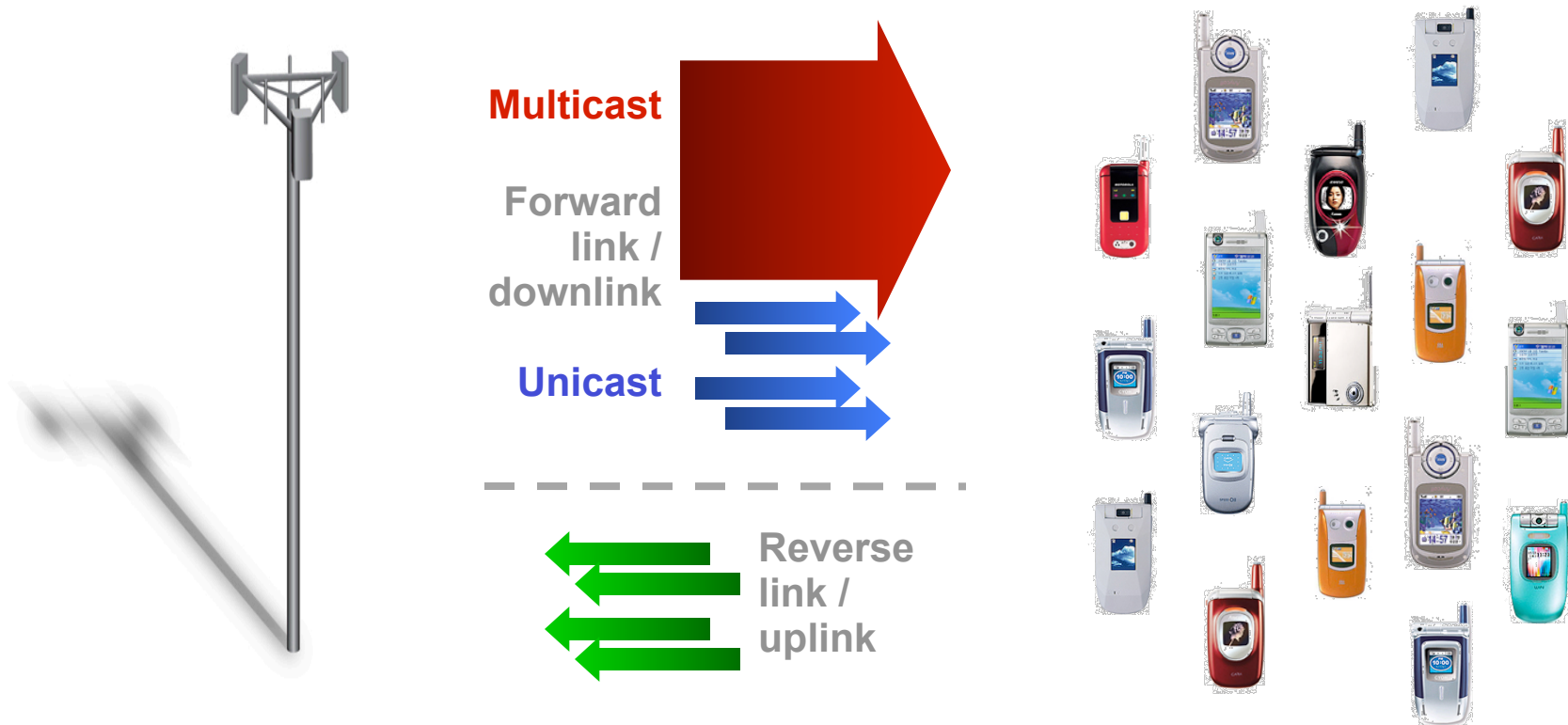
To provide multimedia services to subscribers, a mobile operator must...

- Enhance network to support a large number of simultaneous multimedia users consuming huge quantities of shared traffic
- Minimize incremental costs
- Control demand (busy hour load) of the data network

...while providing the primary voice and personal data services!



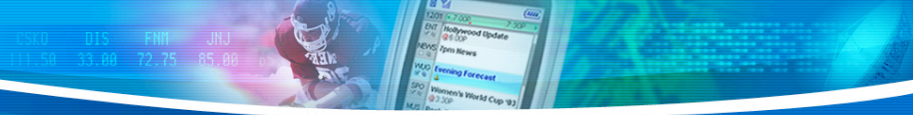
Multipurpose Cellular Networks





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**The MediaFLO™
Initiative**



Rationale for developing FLO technology

- **Increasing demand for multimedia delivery to hand-held and portable devices**
- **High cost of providing high-quality streaming multimedia services over unicast networks**
- **Need for an efficient multicast mechanism for delivering multiple channels of high quality streaming multimedia to a large number of subscribers**
- **The primary bi-directional voice and data services cannot be compromised**



Why not an existing digital TV standard?

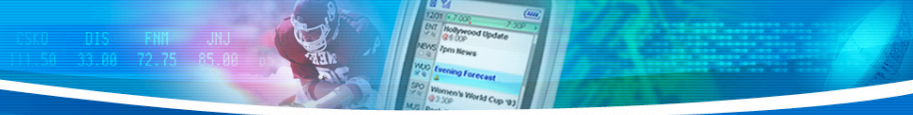
- **The digital TV standards were designed for transmission to homes**
 - Receivers stay in fixed locations
 - Receivers have access to power from wall sockets
- **ATSC does not perform well in mobile channels**
- **DVB-T requires the mobile to demodulate the entire multiplex**
- **ISDB-T has a mobile mode but only enables transmission of 1 mobile program in 1/13 of a 6 MHz channel**
 - Loss of frequency diversity
 - Multiple RF channels needed to offer many channels

...FLO was developed to address the mobile multimedia environment at all layers and did not inherit of compromised designs from fixed TV world



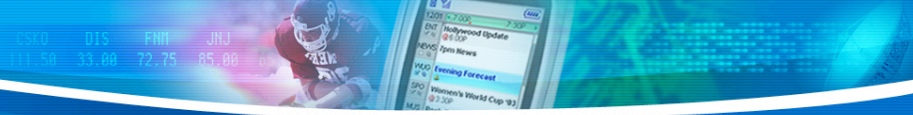
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FLO Technology



FLO™ Technology: A New Air Interface

- **Specifically designed for mobile reception of multicast content**
 - Power consumption, memory, and form-factor designed for mobile devices
- **Significantly greater coverage per tower than cellular/PCS networks**
 - Higher power transmitters
 - Fewer sites lower service delivery costs
- **Greater than 6 Mbps throughput in 6 MHz**
 - Modulation modes support data rates up to 11 Mbps
- **Dramatically lower cost per bit than delivery over cellular/PCS networks**
 - More efficient than competitive multicast technologies



FLO System Main Features

- **FLO is optimized for multimedia delivery to handheld/portable devices.**
 - Real time multimedia
 - Non-real time multimedia (clipcast)
 - IP Datacasting
- **FLO specifically addresses constraints of handheld/portable devices**
 - Power consumption, form factor, memory, etc. optimized for mobile phone
- **Receivers for this system will be integrated into handheld/portable devices.**
- **Forward-link-only network is separate from cellular network.**
- **Reverse link for interactive applications will be provided by the cellular network**

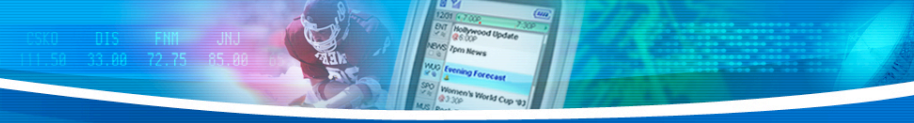


FLO System Main Features (cont.)

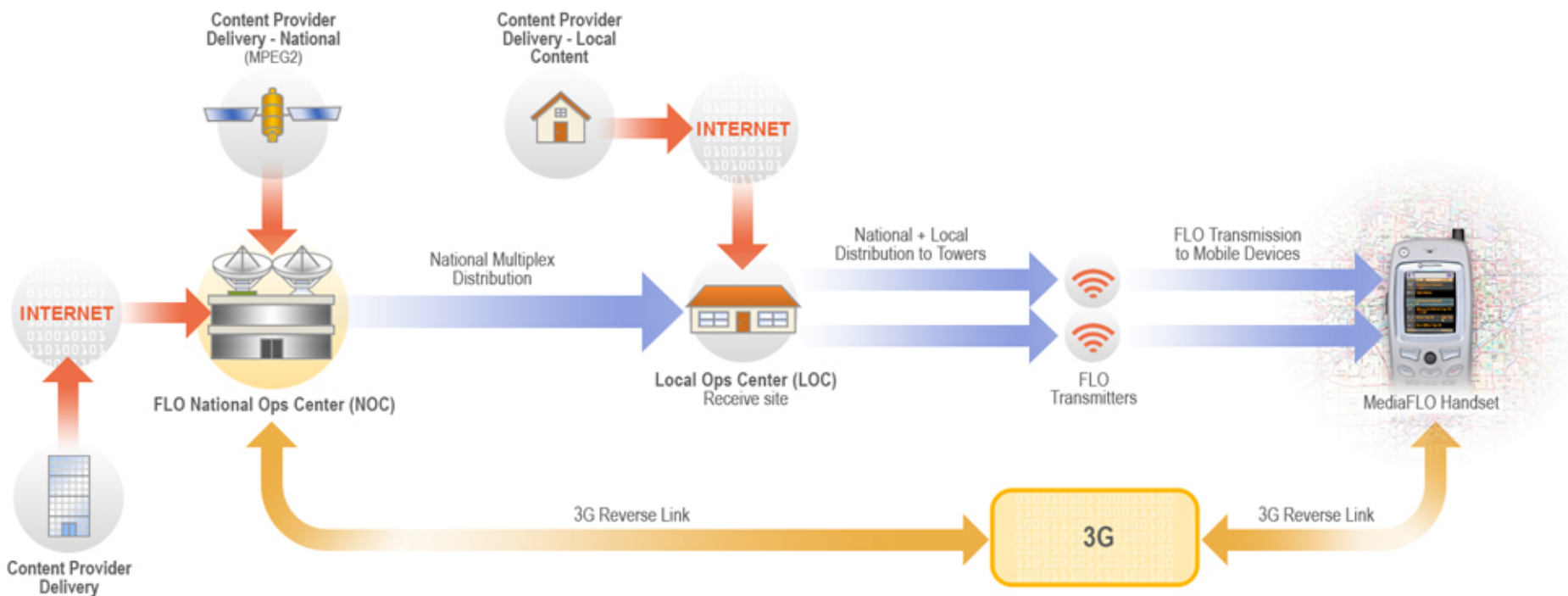
- **Best suited for spectrum below 800 MHz**
 - Better propagation characteristics
 - Designed for 6 MHz channels in the UHF and VHF band
 - Design also supports versions with 5 , 7, and 8 MHz bandwidths

- **High throughput enables large number of channels of streaming content to be offered in one FLO RF channel.**
 - Data throughput greater than 6 Mbps in 6 MHz
 - With 6 Mbps, one FLO channel can support around 25 streaming QVGA resolution video channels encoded with H.264, for example.
 - Different data rates enable trade off between coverage and throughput.

- **Significantly greater coverage per tower than cellular networks**
 - Designed for higher power transmitters (50 kW ERP vs. 1-2 kW ERP)
 - Fewer sites lower service delivery/deployment costs (30-50 times fewer sites)



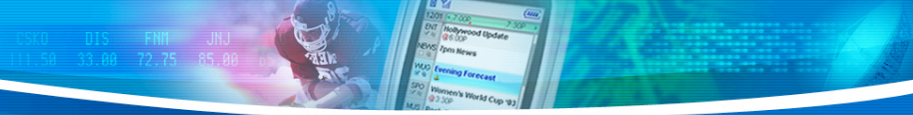
FLO Network





Support for Commercial Multimedia Services

- **Services (channels of programming) organized in packages for easy subscription management**
- **Wide area and localized content in a single carrier**
- **Wide area and local ad insertion**
- **Blackout**
- **Retune**

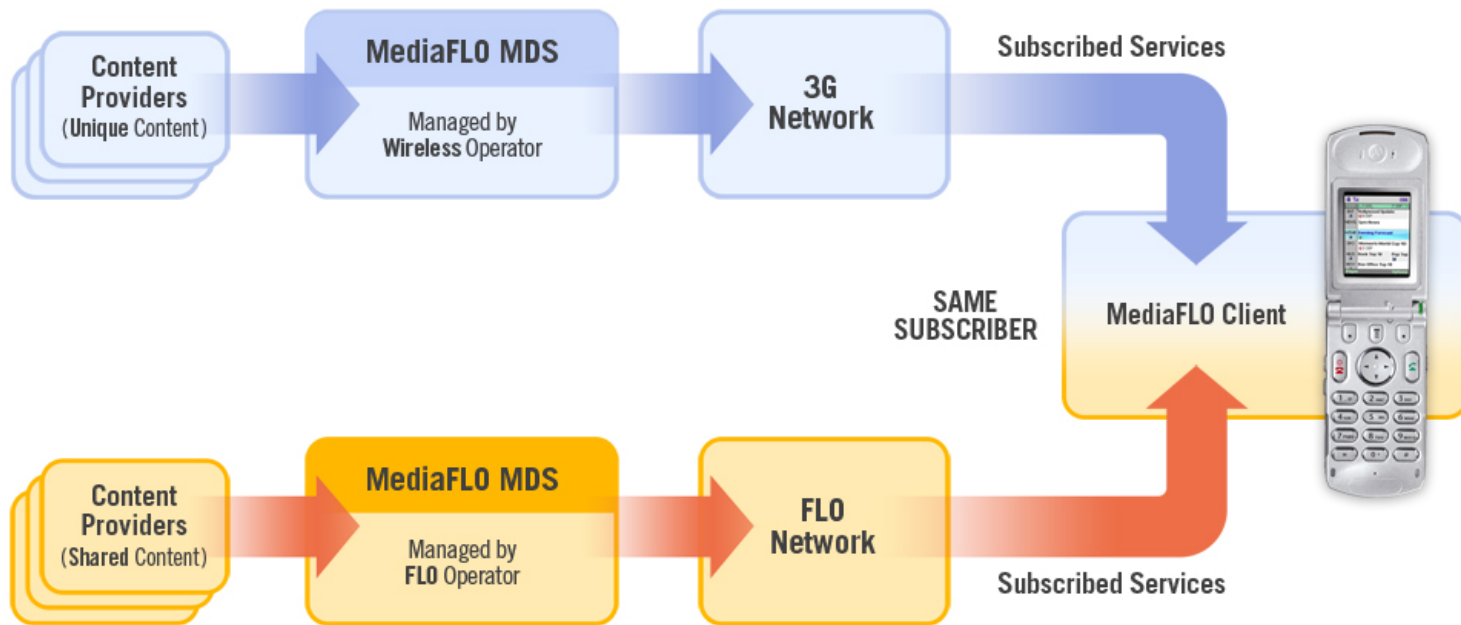


Simultaneous UMTS/HSDPA Operation

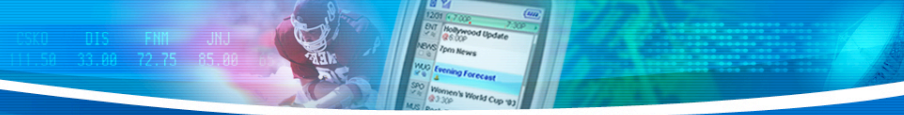
- **FLO devices will be multi-mode, multi-band**
- **FLO service is one-way**
 - Use UMTS/HSDPA reverse link and/or alternative IP-link for access control and subscription management
 - Interactive services also available over the same data connections
- **The device can monitor the cellular paging channel and receive incoming calls while receiving data via the FLO air interface**
- **The device can also initiate cellular calls while monitoring the FLO air interface**



Integrated Service Overview

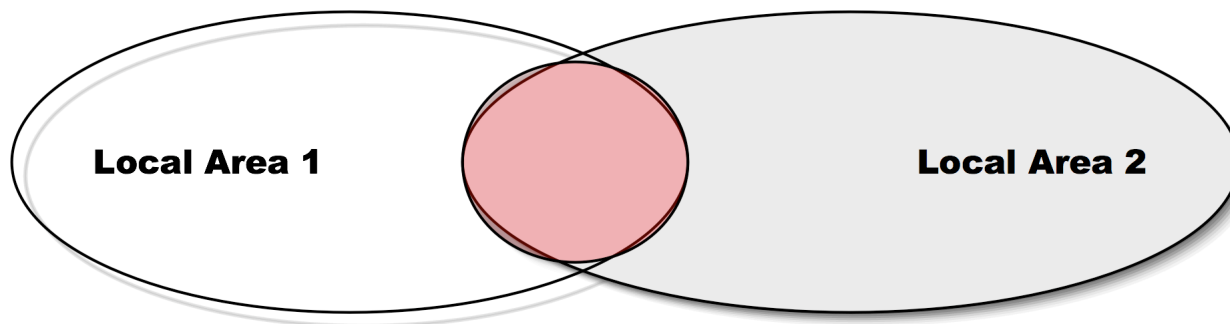


- FLO network complementary to a 3G operator's existing network
- Integrated Service Model supports:
 - **3G operator-acquired content delivered over 3G network**
 - **MediaFLO-acquired content delivered over the FLO network**
 - **All subscribed content distributed in one integrated user interface**



Wide Area and Local Services

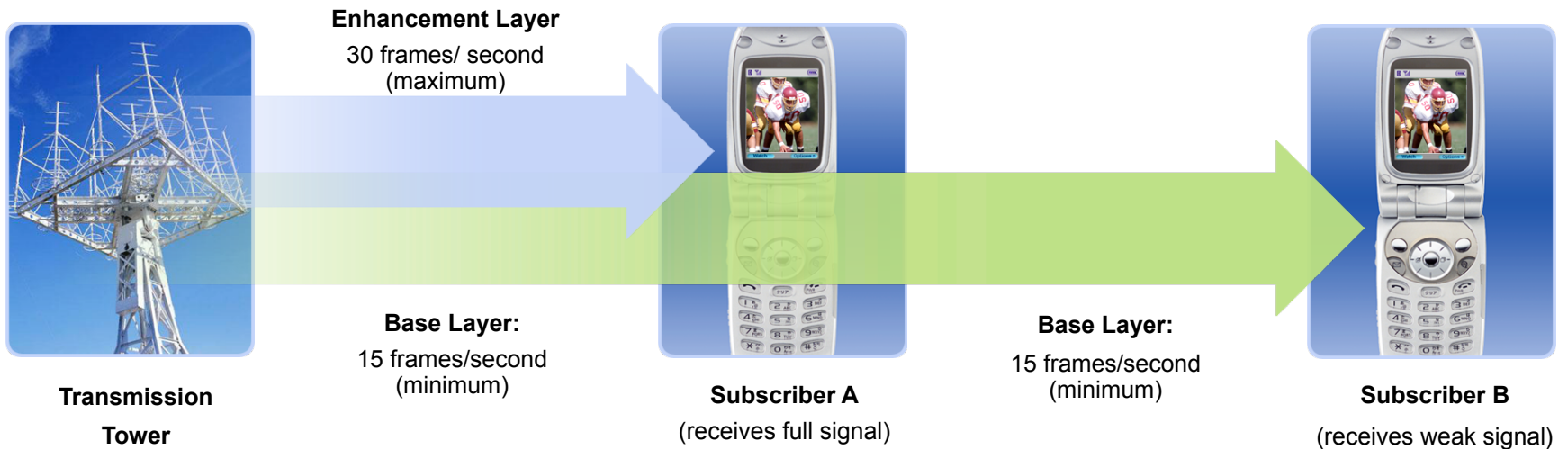
- Capacity can be flexibly allocated to wide-area and local services
- Wide-area services do not experience degradation at the boundary of local service areas

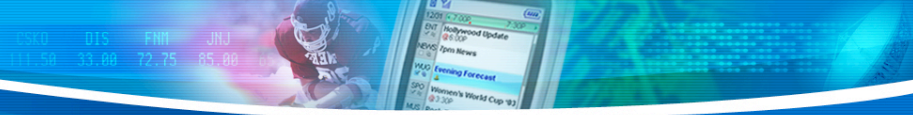




Layered Modulation

- **System supports transmission of base and enhancement layers with different levels of robustness**
 - Used in conjunction with layered source coding extends coverage area
 - Provides a more graceful degradation of reception, as compared to a single grade of service





Ensuring a Quality Viewing Experience

- **Fast channel switching time**
 - ~1.5 seconds

- **Low power consumption**
 - ~ 4 hours streaming video possible in a standard mobile phone

- **High Efficiency**
 - More high-resolution media channels, with better coverage

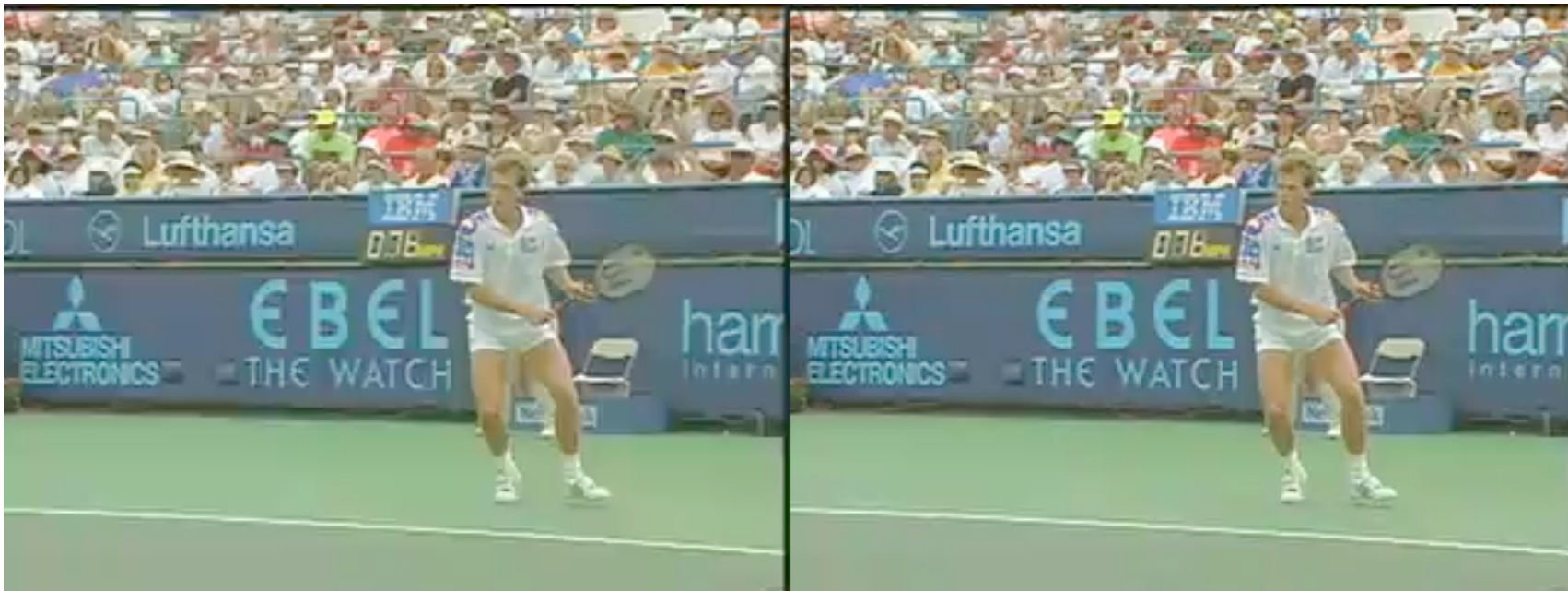
- **High Quality Services**
 - Video (QVGA, 30 fps, H.264)
 - ~ 15 channels
 - Audio streams (AAC+ parametric stereo)
 - ~ 10 channels
 - Clip-casting (network scheduled via MediaFLO media distribution system)
 - ~ 40 channels or ~800 minutes per day
 - Arbitrary IP data-casting
 - Multiplexed with other services



A Quality Viewing Experience

**Q2VGA, 15 fps, H.264, ~ 128 kbps
3G best performance**

**QVGA, 30 fps, H.264, ~ 314 kbps
FLO technology typical**





User Experience

- Instantly Recognizable and Easy to Use
- A Client, Not Simply a Player
- Platform for Interactivity
- Platform for Advertisement





FLO Data Service Example: Idle Screen UI





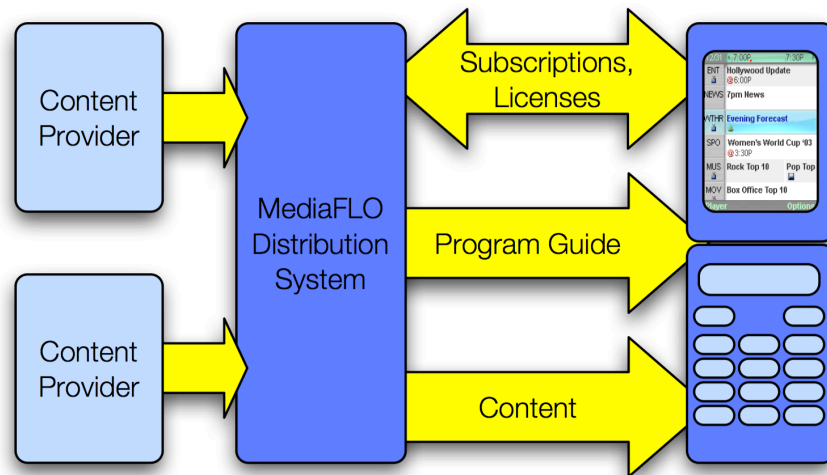
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MDS Technology



MediaFLO media distribution system (MDS)

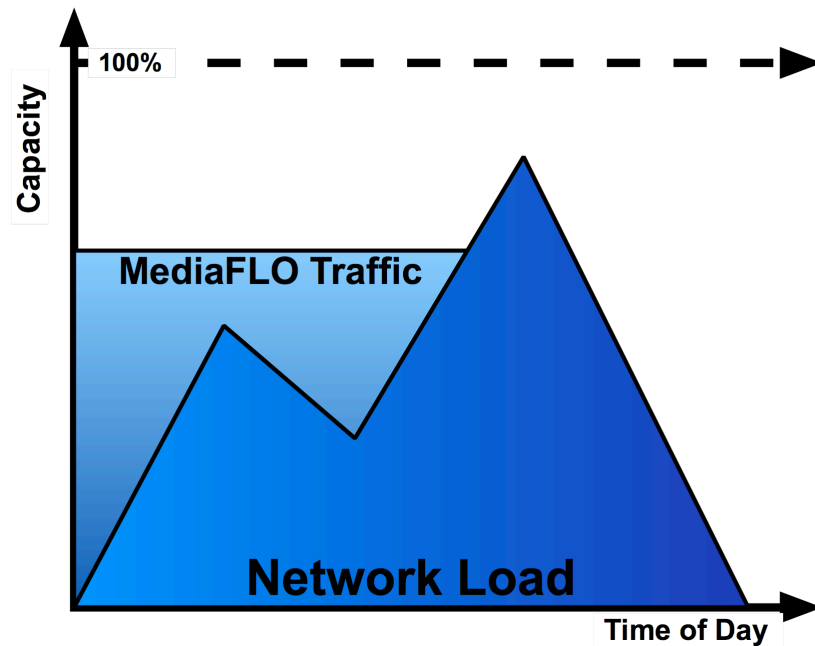
- **Client/Server system**
 - Efficient distribution of encrypted content across wireless networks
- **Network scheduled delivery (or clip-casting) allows the operator to predict network loading and costs**
- **Unified interface for content providers**
- **Unified user interface for both network scheduled and streaming content**
- **Subscription based billing is predictable and easy to understand.**





“Network Scheduled” Delivers Predictable Costs

- Operator determines the service line-up of channels with content
 - Each channel has different schedules for delivery and viewing
- The MDS is aware of all user subscriptions and manages the total amount of wireless network capacity required to deliver content
- The MDS schedules the delivery of content to smooth capacity utilization, therefore reducing demands during peak times





Access Control

- **Access rights (service keys) are delivered out of band from content**
- **Access control utilizes asymmetric encryption**
- **Content is encrypted with AES**
- **Encrypted program keys are delivered with the content**
- **Program keys are encrypted with service keys**

Content is delivered encrypted end-to-end and is never decrypted until it is being played.



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.....
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