

## OpenTV 기반 대화형 셋톱박스 기술동향

November 23, 2001

Young H. Ko



Break On Through

## Agenda

- About OpenTV
- Which Service Must Network Operators Offer?
- Mass Storage and Digital Consumer
- Carina : OpenTV PVR Platform
- CE Revolution is driven by PayTV

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- **About OpenTV**
- **Which Service Must Network Operators Offer?**
- **Mass Storage and Digital Consumer**
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## OpenTV

The world's leading  
**interactive television** and  
**media** solutions company.



- **Proven**
- **Easy to Deploy**
- **Superior Content**
- **Profitable for Operators**

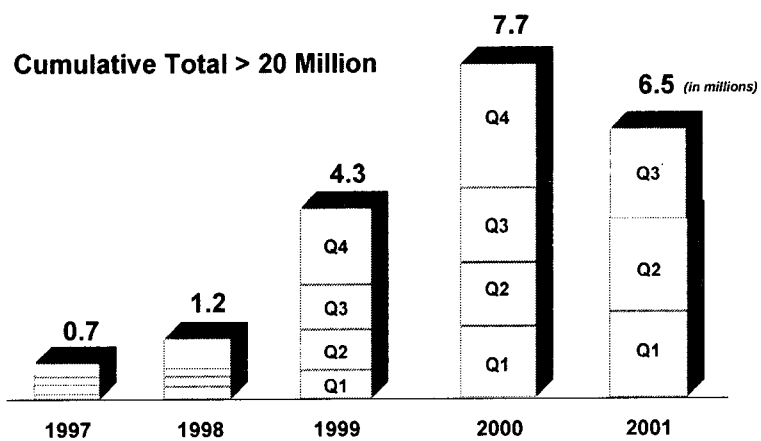
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## The World Leader

- 20,000,000+ Set-top boxes deployed
- 48 operators worldwide (31 deployments)
- 36 Set-Top box manufacturers
- 1,100+ independent developers
- \$63,000,000 of revenue in 2000
- 36 patents worldwide, *starting in 1992*

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## OpenTV Deployments

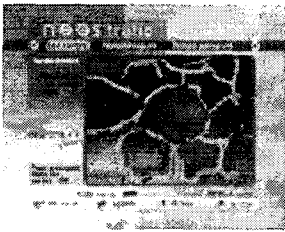
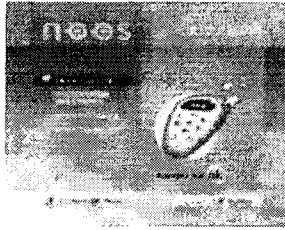


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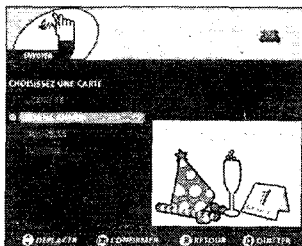
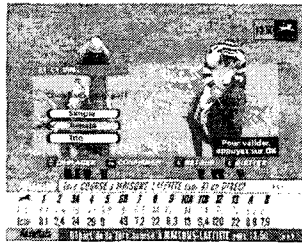
## OpenTV Success Story: NOOS



- Largest Digital Cable Network in Europe
- Deployed since 1997
- 300,000 OpenTV Cable Set-top boxes
- 780,000 homes passed
- Several different interactive applications on air: EPG, Instant Weather, Classified ads, Instant Roads Conditions, Customer Subscription Management, Instant News with AFP



## OpenTV Success Story: TPS France

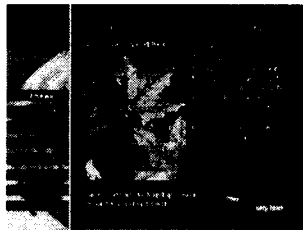
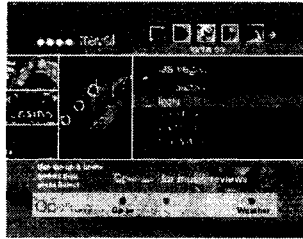


- 1.3 million digital subscribers
- iTV services generated \$71 million in revenue in 2000.
- 91% of the audience use at least one iTV service
- 631,000 use Weather service daily
- 679,000 use EPG daily
- 260,000 use TV Banking, of whom 80% had never used any home banking previously.
- 1,000 viewers per day respond to interactive advertising





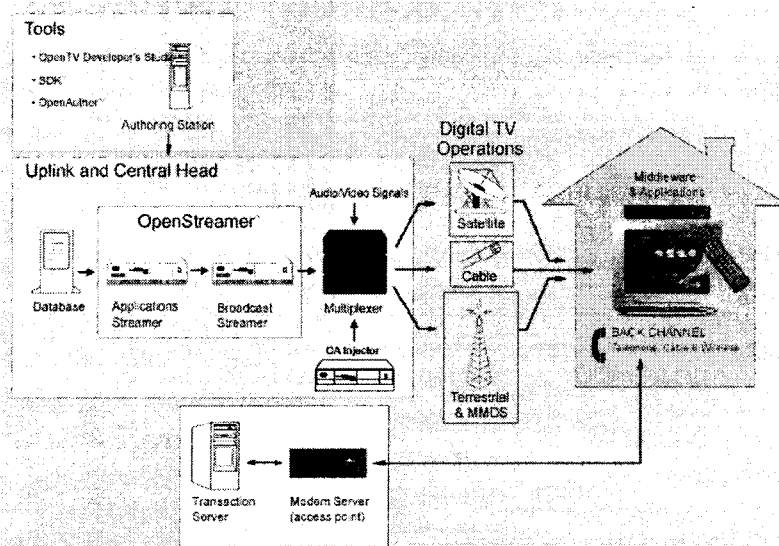
## OpenTV Success Story: BSkyB



- Over 5 million digital subscribers
- 60% of subscribers access the Open.... iTV service weekly
- Churn reduced from 14.2% to 9.8% per annum
- 84 merchants and brand partners
- 12% have made purchases with 2/3rds having repeat purchasing
- Over 1.3 million TV e-mail accounts
- 2,000 page Sky Digital Text service powered by OpenTV Publisher
- Betting revenue generating over \$2 of new revenue per STB per month



## Comprehensive End to End Solution



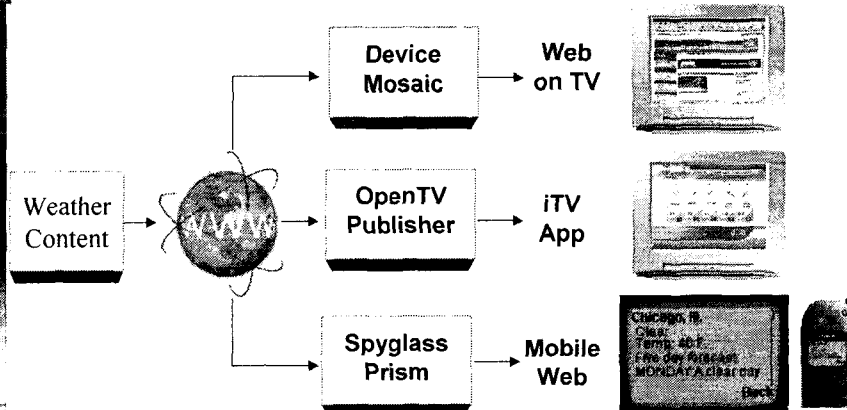
## OpenTV Value Proposition

- **Proven**
  - > OpenTV's solutions are deployed to 16M STBs worldwide.
- **Easy to Deploy**
  - > Designed for optimum integration into your current system, requiring minimal bandwidth and hardware expenses.
- **Superior Content**
  - > OpenTV can provide a wide array of applications from a multitude of vendors that can be easily integrated into your existing service.
- **Profitable**
  - > Use today's investment in basic interactive services to build tomorrow's advanced iTV system
  - > Offer new revenue-generating services and maximize your investment in digital television.

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## OpenTV Solutions: Interactive Content Everywhere

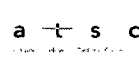
- Write Once, Use Many times
- Optimize Look and Feel for each device



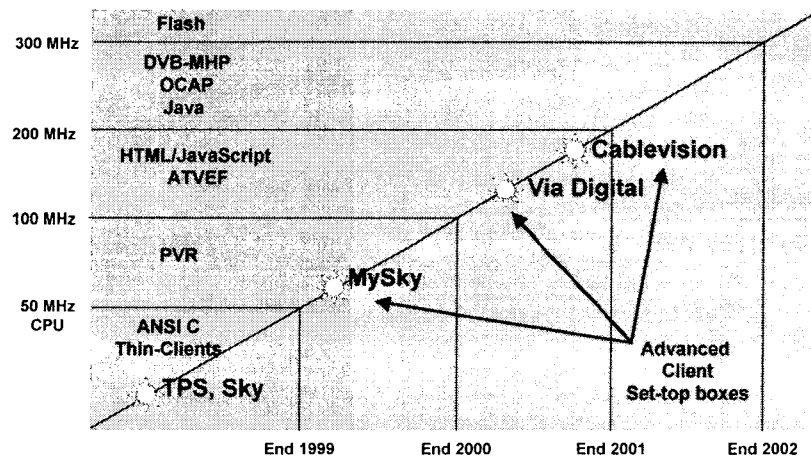
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## OpenTV Supports Open Standards

- **Compliant with currently recognized standards**
  - > Migration path toward emerging ones
  - > Maintain backward compatibility with existing products
- **Active on a variety of standards bodies**
  - > Provides technical expertise and leadership
  - > Active Member @ CableLabs, DVB-MHP, ATSC DASE, ARIB
- **Committed to deliver products that meet open and recognized standards with the goal of interoperability**
- **Key driver of specifications around the world**

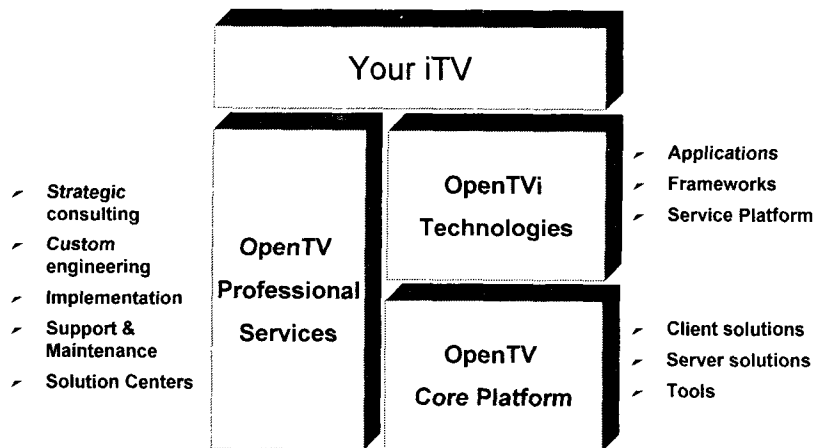


## OpenTV Platform evolution





## OpenTV Solutions Offering



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## Television Network Operators are Facing New Challenges

- **TV infrastructure is rapidly migrating from Analog to Digital**
- **Technology shifts open the door to competition to traditional broadcasters**
  - > Digitization of content, compression of Audio and Video, new transmission techniques and explosion of bandwidth
  - > Terrestrial, cable, satellite, telephone, wireless
- **Network Operators must acquire new subscribers, keep existing subscribers, increase revenues per subscribers**
- **Network Operators must strike balance between**
  - > Range of services to offer
  - > Cost of infrastructure
  - > Flexibility and longevity of infrastructure

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## Which Services Must Network Operators Offer?

- **Competitive pressure forces Network Operator to offer a wide range of services**
- **Network Operators must offer a broad TV offering**
  - > Local and national free to air
  - > Premium pay TV (sports, themes)
  - > Movies
- **Network Operators must offer a wide range of interactive services**
  - > To prevent subscribers to churn out to competitors
  - > Generate the same additional revenues as their competitors
    - > Advertising, commerce, gambling

In Europe, 90% of digital STBs are interactive.

We expect the same trend in Asia / Pacific.

Interactive TV reduced churn by 30% at BSKyB.

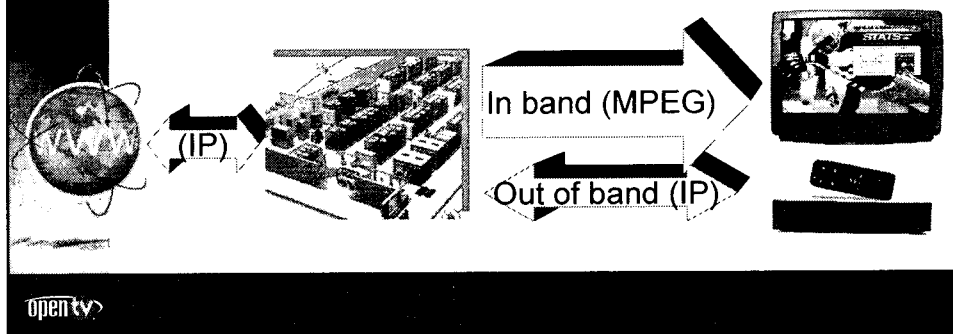
Gambling generated \$2 per sub per month at BSKyB.

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## Which Network Infrastructure?

➤ **Selecting the right infrastructure will have significant impact on**

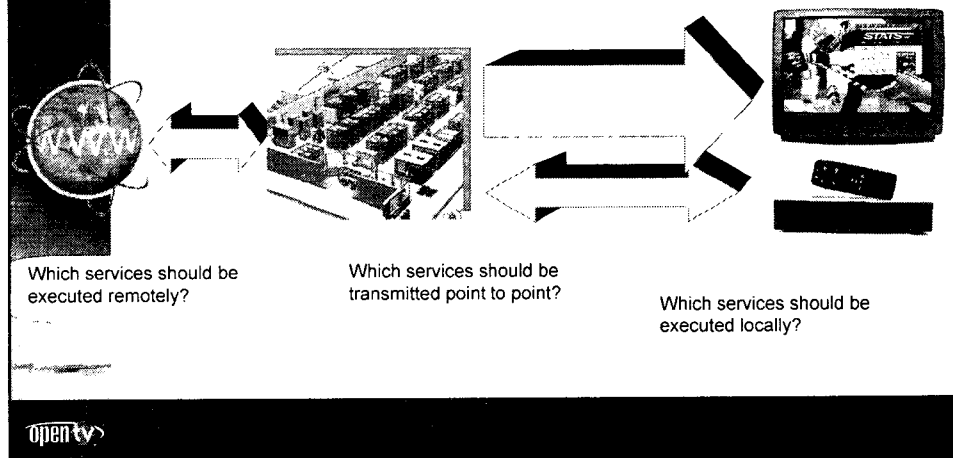
- > Deployment speed and costs
- > Hardware and Operation costs
- > Flexibility and longevity of the infrastructure



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## Which Network Infrastructure?

Which services should be transmitted broadcast?



Which services should be executed remotely?

Which services should be transmitted point to point?

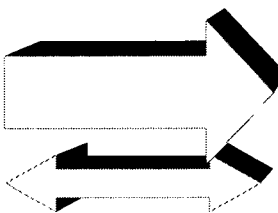
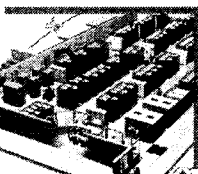
Which services should be executed locally?

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## Which Network Infrastructure?

Very cost effective:  
Leverage of existing content  
and infrastructure.

Very cost effective:  
no additional cost per sub.



Costly:  
Additional server and  
bandwidth cost per sub  
and per service.

Costly:  
Additional server and  
bandwidth per sub.

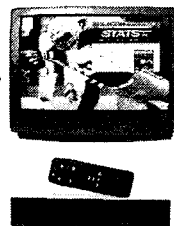
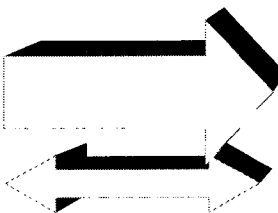
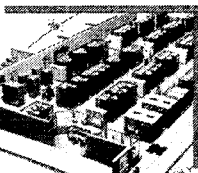
Very cost effective:  
Minimizes network traffic.  
Leverages existing PayTV  
infrastructure.

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## Which Network Infrastructure?

Leverage Internet / cell  
phone content and  
infrastructure.

Broadcast generic content.



Carry premium content and  
revenue generating transactions  
point to point.

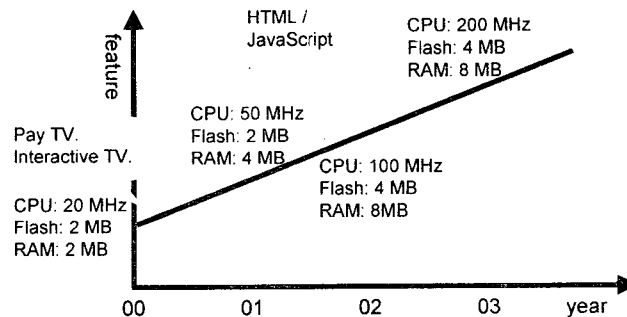
Execute Interactive  
Services locally.

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## Which Hardware Features for the STBs?

### ➤ Network Operators must follow closely the Technology Curve

- > Price of STB hardware is evolving very quickly
- > Custom STB hardware costs considerably more



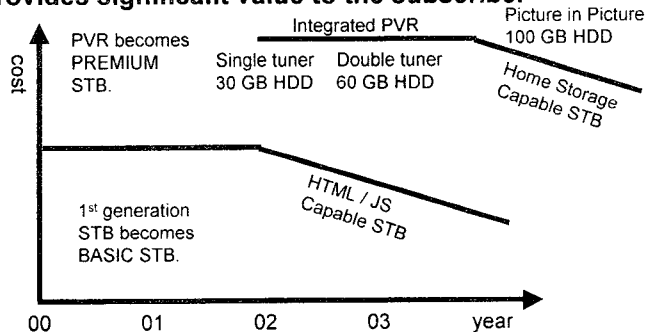
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## Which STB at Which Cost?

### ➤ Network Operators will continue to deploy BASIC STB

- > Basic STBs will provide primary infrastructure for ITV

### ➤ PVR will become PREMIUM STB because it provides significant value to the subscriber



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## Should Network Operators Invest in Home Networking Now?

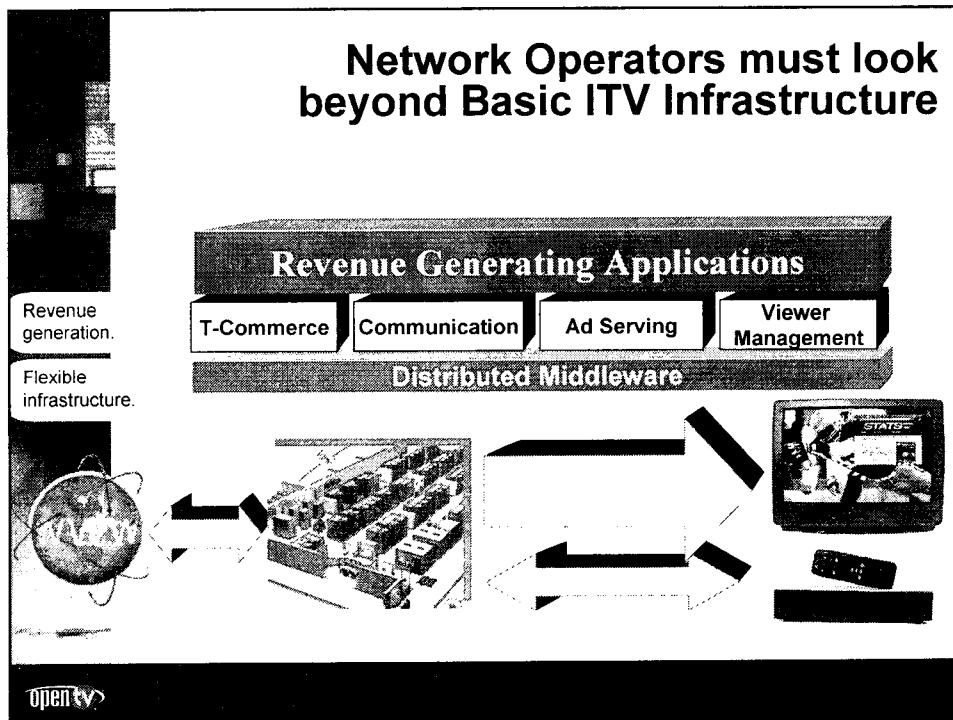
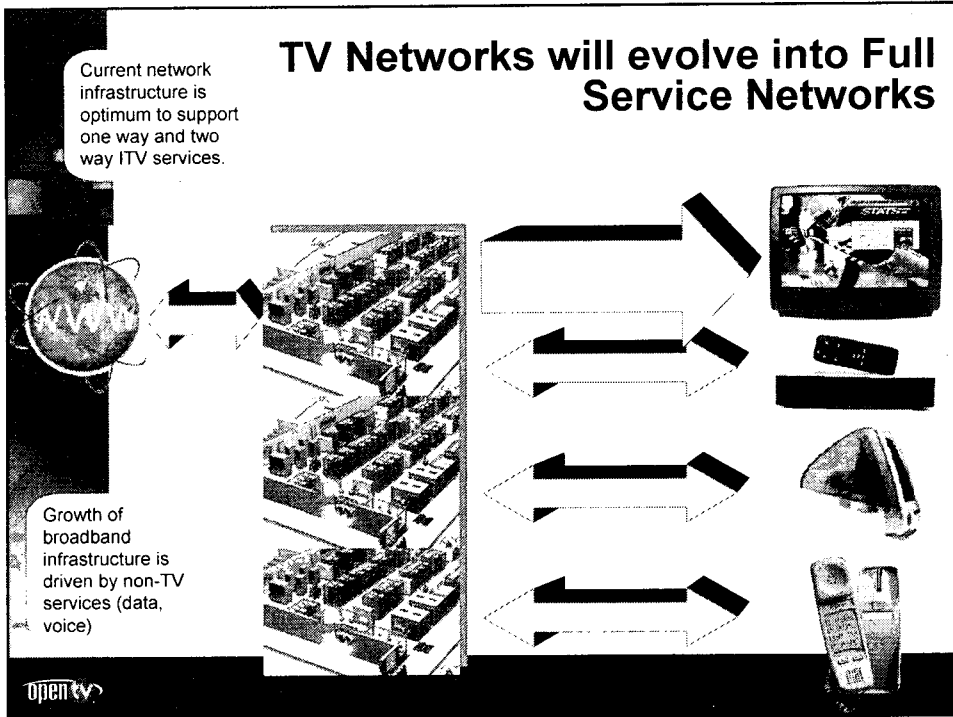
- **Home networking provides value to the subscriber**
  - > High speed delivery of entertainment and data to other devices
    - > Entertainment: TV tablets, digital music players, game consoles
    - > Data: PDAs, PCs
  - > Always on connection
- **Home networking generates revenue opportunities for Network Operators**
  - > Control delivery of content to other devices than television

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## Should Network Operators Invest in Home Networking Now?

- **Investing in home networking is still risky**
  - > There are not enough devices to connect to the network
  - > There is no clear winner among competing technologies
    - > Ethernet, USB, P1394 / iLink, Hyperlan, BlueTooth
    - > Wired versus wireless
  - > Regulatory and content rights issues are still unresolved
- **We recommend to postpone investment in Home Networking until 2<sup>nd</sup> generation Premium STB (2003)**
  - > Basic STB does not have enough resources to serve as Home Gateway
  - > 2<sup>nd</sup> generation Premium STB will have enough storage to act as Home Entertainment Server

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## Mass Storage and the Digital Consumer

- **Local mass storage: a basic feature of Interactive Digital TV receivers.**
  - > Entertainment content is becoming digital
    - > Music in the 80s
    - > Television in the 90s
  - > The volume of personal data is growing quickly
    - > Calendars, agendas, photo albums, e-mail, personal Web site

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## Mass Storage and the Digital Consumer

- Local mass storage becomes feasible and useful.
  - > Price of mass storage is dropping
  - > Density of mass storage is growing
  - > Devices are connected
    - > (see pervasive Web presentation)

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## Mass Storage and the Digital Consumer

- Local mass storage is better.
  - > Portable, personal
  - > Cache personal and entertainment content

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## Local Mass Storage makes Television better

- Mass storage makes you watch more television.
  - > Watching what you want
    - > Recording
  - > Watching when you want
    - > Time shifting

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## Local Mass Storage makes Television cheaper

- Local mass storage saves bandwidth.
  - > Storage cost is dropping faster than bandwidth cost

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## Local Mass Storage makes Interactive Television better

- Interactive Television becomes more like Television.
  - > Video editing replaces code development or Web publishing
  - > Interactive layer and television layer become one
    - > Seamless integration of linear and interactive content

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## The value proposition for Local Mass Storage

- Local Mass Storage generates more revenues.
  - > **Network partition**
  - > Pay per play, product catalog
- Local Mass Storage increases Consumer control
  - > **User partition**
  - > PVR
- Local mass storage or seamless mass storage?
- • **Gadi Tirosh, NDS - Director of Marketing, Interactive Solutions**
- • **Jim Barton, TIVO - Chief Technical Officer**

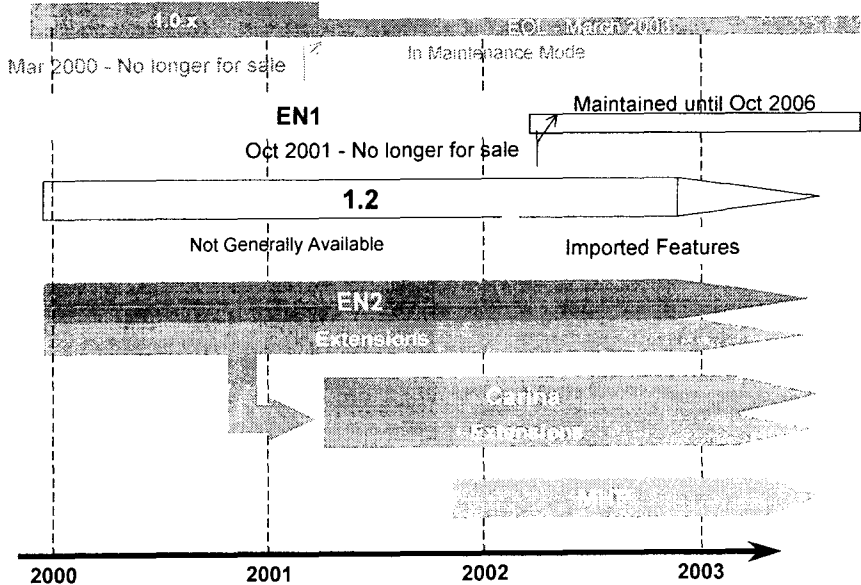
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## Middleware Product Lines



## Middleware Roadmap

- **Hard Disk Drive Support: Q1-2001**
- **Carina Multipipe Phase 1: Q2-2001**
  - > Manages multiple tuners, hard drives, displays
  - > Built on "Pipeline" concept
- **Carina Multipipe Phase 2 – Q4 2001**
  - > Supports multiple/simultaneous Decoders
  - > Recording/playback of multiple programs simultaneously
  - > Recording/playback of O-code applications

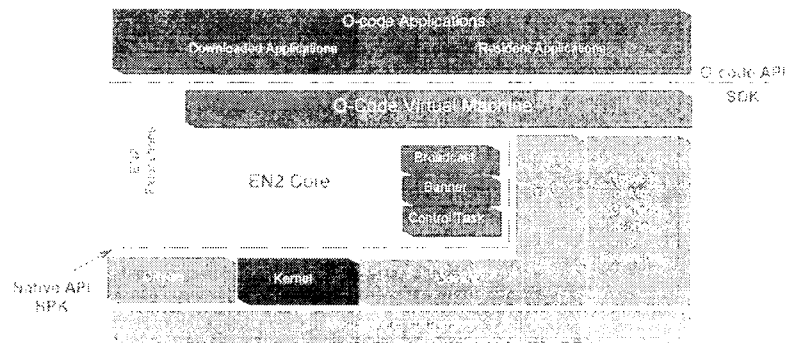
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## What is EN2?

- **Portable**
  - > Applications: through o-code virtual machine
  - > Drivers: Driver API (extended with new functionality)
  - > Kernel: Kernel API (not changed since OTV 1.0)
- **Extensible**
  - > Provide optional functionality
  - > Changes to the core are minimal
  - > Functionality adjusts to customers technical needs and price structure balance
  - > Interfaces specific STB hardware capabilities
  - > Can be added as market requirements change
- **Scalable**
  - > Supports current generation of inexpensive STB to high end STBs.
  - > Wide Variety of Configurations to support HW

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## EN2 Block Architecture



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## Carina: Next Middleware (1/2)

### ➤ Carina

- > Manages multiple tuners, hard drives, displays
  - > Recording/playback of multiple and simultaneous A/V streams
  - > Recording/playback of O-code applications with the associated A/V program
- > Built on "Pipeline" concept
  - > Dynamic
  - > Can provide audio, video, and Teletext services

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## Carina: Next Middleware (2/2)

### ➤ Carina

- > Based on EN2
  - > EN2 iTV applications are 100% compatible
  - > Backward compatibility:
    - > All EN2 extensions are compatible
    - > Some EN2 Drivers will be compatible

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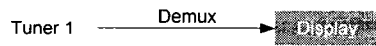
## What is a Pipeline?

- Pipelines are constructs that provide a set of services using a collection of hardware within the set top box.
- These services involve controlling and processing streams of data flowing between hardware and software components.
- Each pipeline is defined in terms of:
  - > a set of services it provides
  - > a set of hardware elements which it uses
  - > the current state of controls on the streams of data it is handling
- A pipeline is a connection between one Source Component and one Destination Component.
  - > The Source Component groups together all the elements necessary to control the input of data (i.e. tuner, demux, disk, DVD and so on)
  - > The Destination Component refers to all the elements controlling the output of data (a/v decoder, disk, download, Teletext, subtitle, VBI and so on).
- A privileged application or a native task can define and create pipelines at start-up time or dynamically.
- An application uses defined pipeline(s)

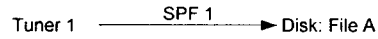
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## Pipeline Basics - Examples

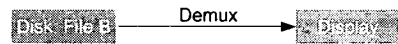
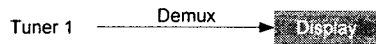
### Live Broadcast



### Independent VCR Playback and Recording

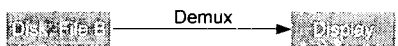
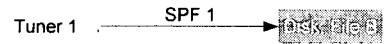
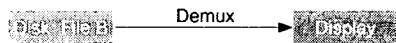
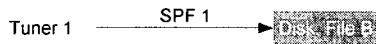


### Independent Live Broadcast & Recording



### Independent Time Shifted and Recording

### Time Shifted



#### NOTE:

**Demux:** real one that acquires PES and Sections from transport stream

**SPF:** (Single Program Filter) filters out MPEG2 packets that don't belong to a given program

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## **CE revolution is driven by PayTV**

- **Network Operators must acquire new subs, keep existing subs, increase revenue per subs**
- **Competitive pressure forces Network Operators to offer a wide range of services : Broad TV and Interactive Services**
- **Local Mass Storage makes Television better and generates more revenues**
- **Carina, next middleware, manages pipeline from multiple tuners, hard drivers, displays**

## **CE revolution is driven by PayTV**

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