



Making PSIP Work for You

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Triveni Digital, Inc

Who is Triveni Digital?



Supplier of solutions to DTV broadcasters

- GuideBuilder™ PSIP generators
- StreamScope™ stream analyzers
- SkyScraper™ data broadcast systems
 - general purpose datacasting
 - interactive TV content insertion
- StreamBridge™ PSIP translators
- StreamDoctor™ diagnostic service
- Custom Solutions group for special projects

LVCC booth 3349 at NAB2001, South Hall 2

Outline



-
- PSIP in a Nutshell
 - ATSC Transport Stream Structure
 - MPEG-2 PSI tables
 - ATSC PSIP tables
 - PSIP Implementation Issues

PSIP in a Nutshell



-
- Program and System Information Protocol
 - Metadata inserted into broadcast stream
 - Enables:
 - Tuning to virtual channels
 - Displaying channel name (on channel changes)
 - Interactive electronic program guides (EPGs)
 - Automatic language selection for audio track
 - “V-Chip” function (parental content blocking)
 - Accurate receiver time-of-day clock setting

ATSC Broadcast Stream



- May contain multiple ***virtual channels***:
 - Video channels, each with a video stream, one or more audio streams, and possibly one or more data streams.
 - Audio channels, each with one or more audio streams and possibly one or more data streams.
 - Data-only channels, each with one or more data streams.
- Based on ***MPEG-2 transport stream***

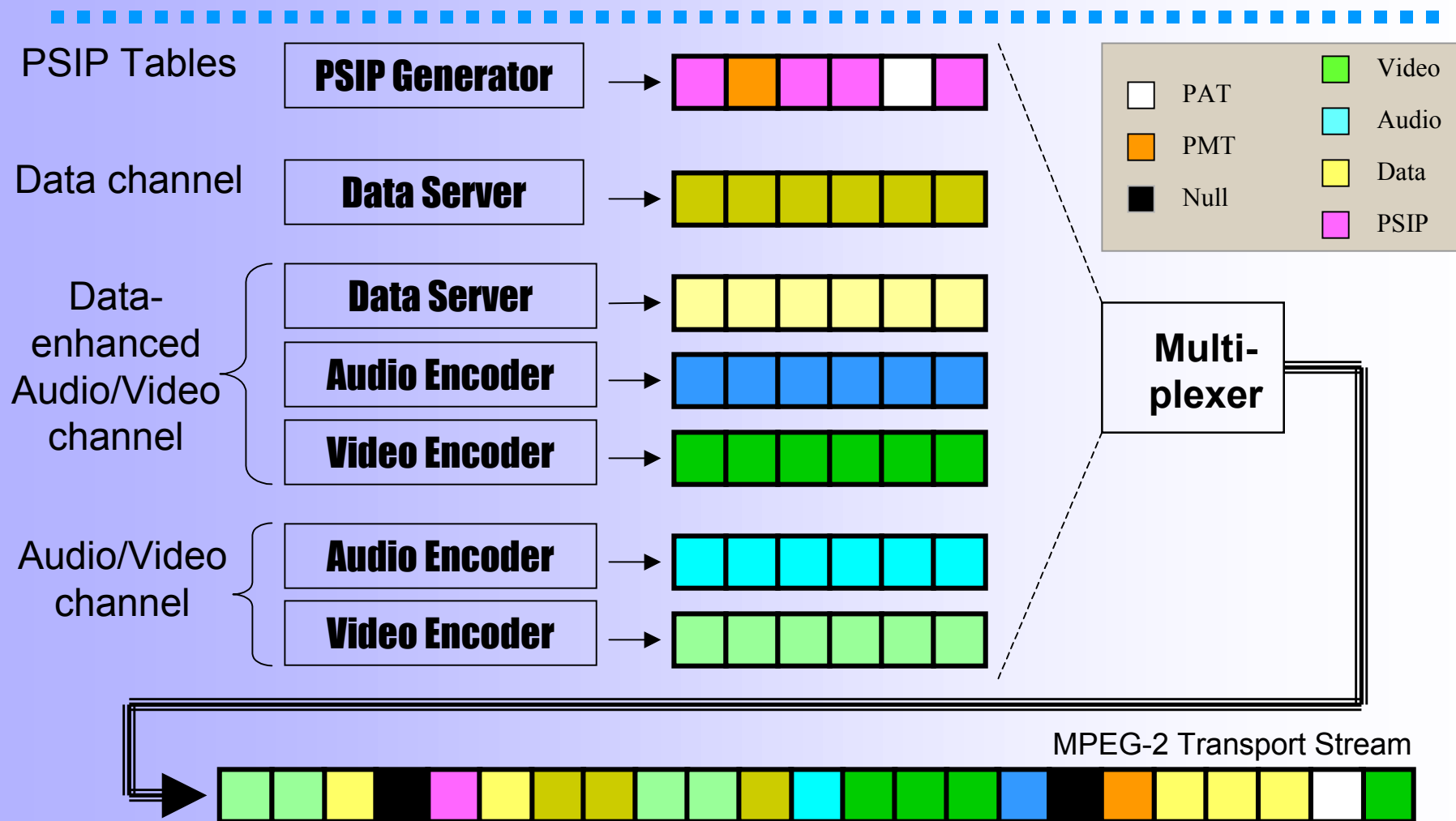
MPEG-2 Transport Stream



- Consists of 188-byte **transport packets**; 4 byte header, 184 byte payload in each
- Conveys interleaved **elementary streams** -- audio, video, data, PSI, ...
- Elementary stream to which each packet belongs is identified by **packet id (PID)** in packet header.



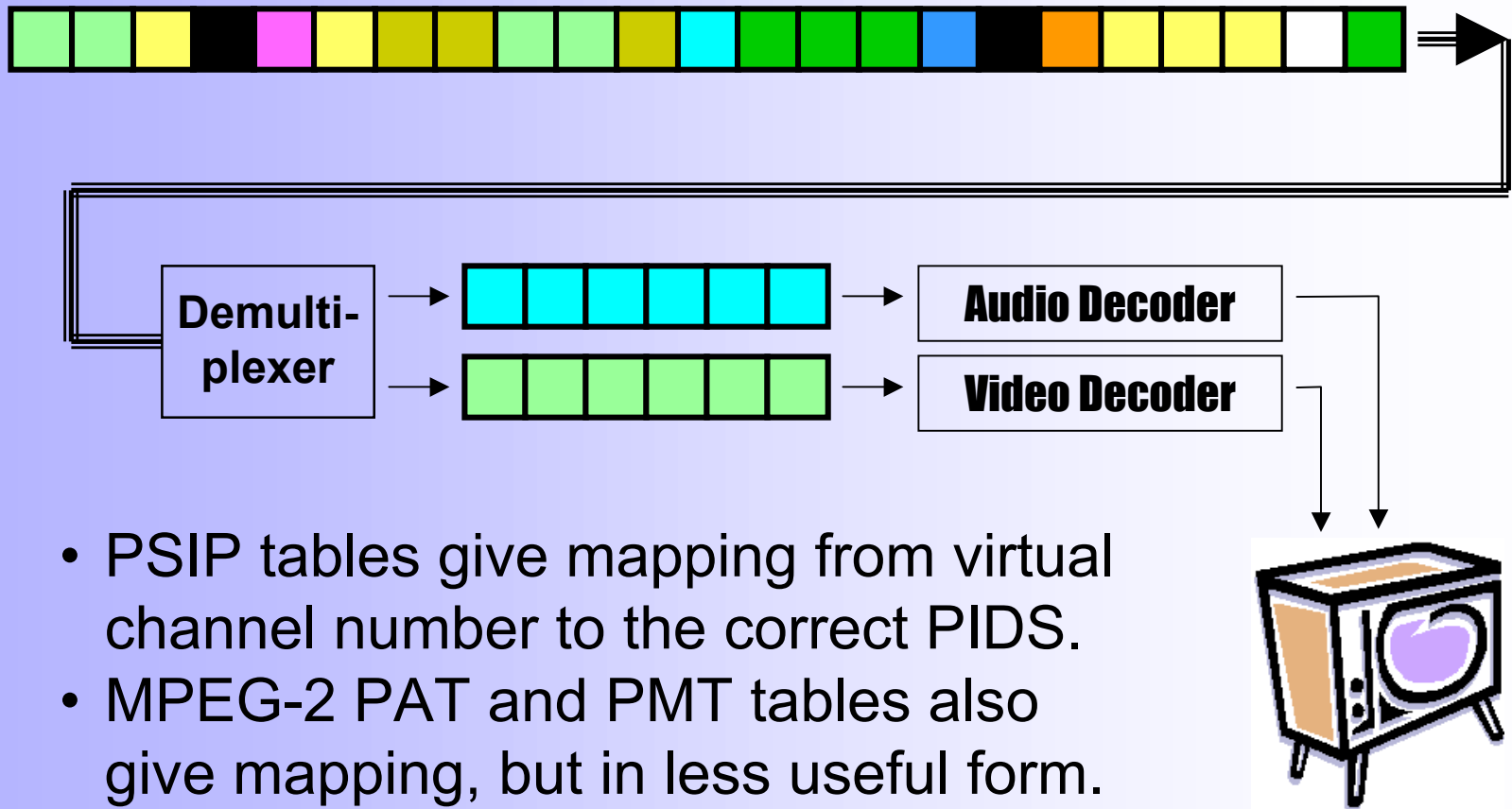
Transport Stream Encoding



Transport Stream Decoding



MPEG-2 Transport Stream



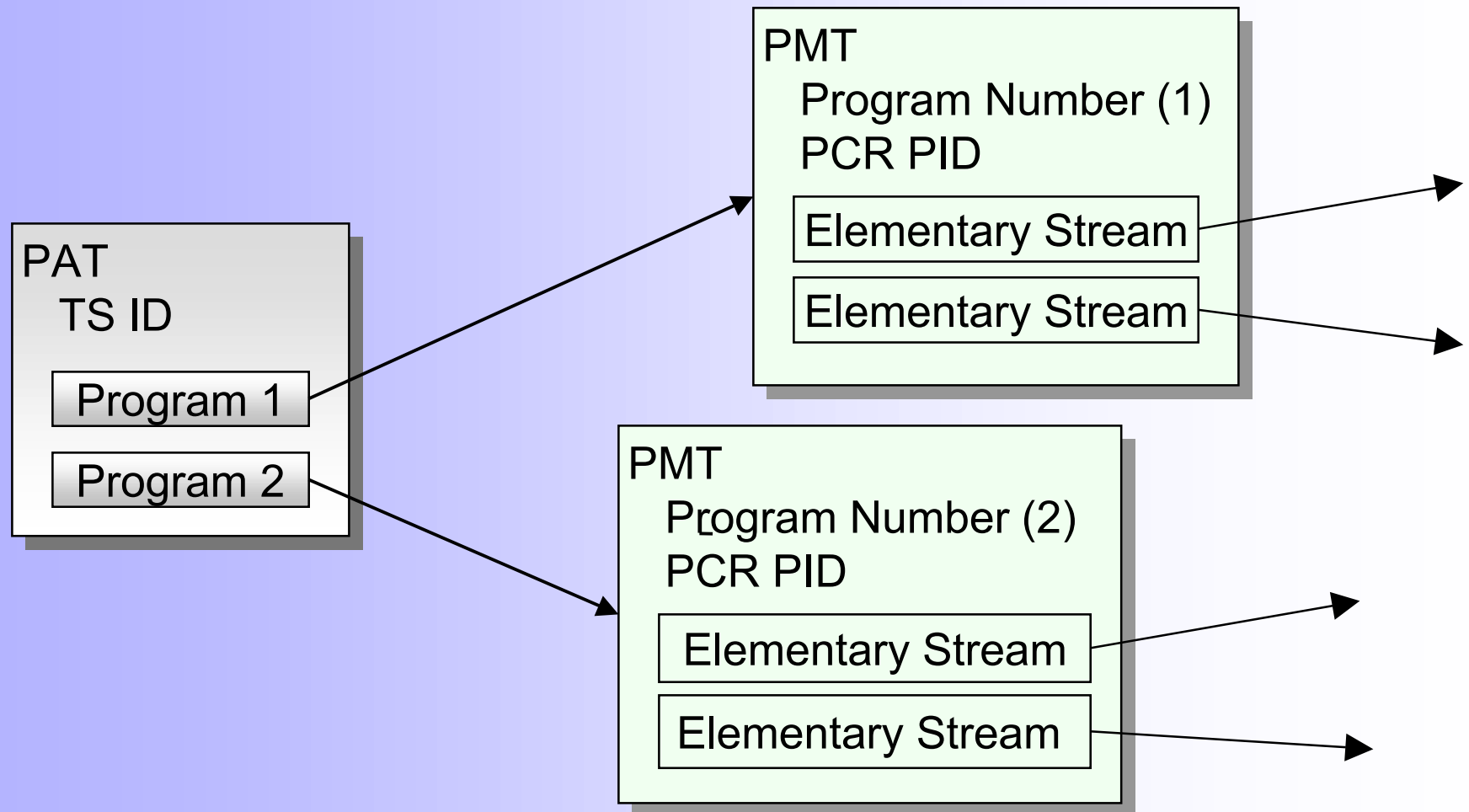
- PSIP tables give mapping from virtual channel number to the correct PIDS.
- MPEG-2 PAT and PMT tables also give mapping, but in less useful form.

MPEG-2 Program Specific Information (PSI)



- Gives very basic tuning information:
 - PAT (Program Association Table: one for entire transport stream; identifies “programs” (virtual channels) in stream and gives PIDs for PMTs.
 - PMT (Program Map Table): one per “program”; identifies elementary streams in “program” and gives their types (audio, video, etc.) and PIDs.
- Supports tuning by physical channel number and MPEG-2 program number.

Graphical View of PAT/PMT



ATSC PSIP Tables

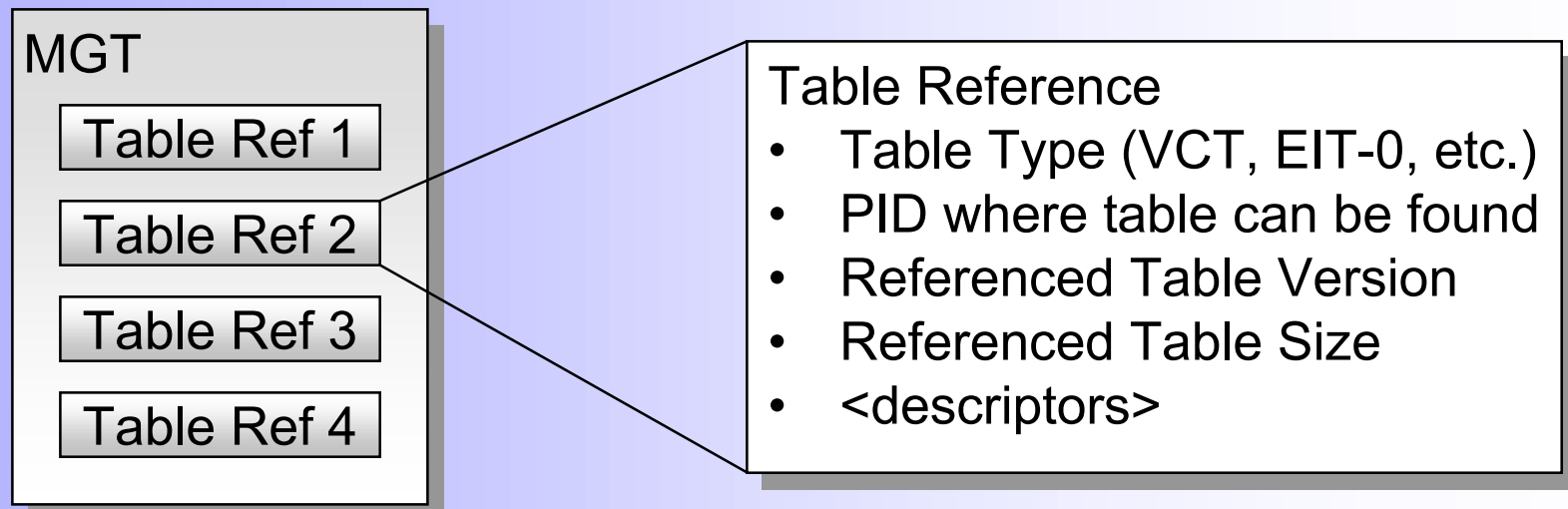


- Master Guide Table (MGT)
- System Time Table (STT)
- Virtual Channel Table (VCT)
- Rating Region Table (RRT)
- Event Information Table (EIT)
- Extended Text Table (ETT)
- Directed Channel Change Table (DCCT)
- DCC Selection Code Table (DCCSDT)

Master Guide Table (MGT)



- MGT is the top-level “roadmap”
 - Identifies what PSIP tables are in transport stream
 - Gives PIDs so receiver can find them
 - Indicates when any table has been updated

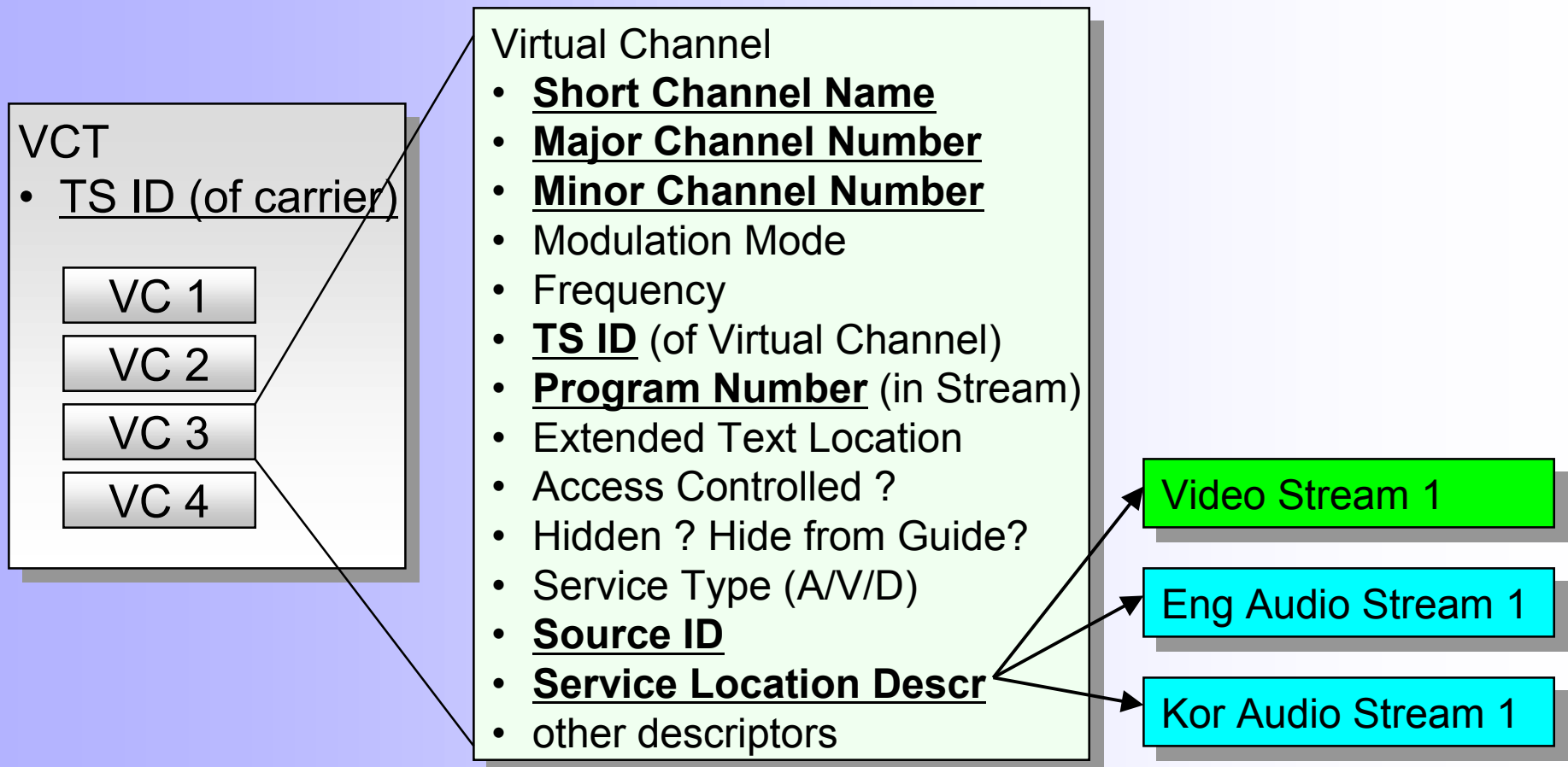


Virtual Channel Table (VCT)



- Has same info as PAT & PMTs, plus more.
- Allows tuning by virtual major-minor channel number, rather than physical channel number and MPEG-2 “program” number.
- Allows language track selection.
- Allows channel name to be displayed on channel changes and in EPG.
- ATSC receivers are designed to use VCT; may have trouble with PAT and PMTs alone.

Virtual Channel Table (VCT)



Event Info Tables (EITs) Extended Text Tables (ETTs)



- Support on-screen program info displays
 - At every channel change, and on request
 - Program title, start time, end time, content advisory rating, closed caption indicator
 - Extended descriptive information on request
 - No PSIP data → lost chance to retain viewers
- Support on-screen interactive EPG
(Electronic Program Guide)

Electronic Program Guide



- Guides viewers to programs/channels
- No PSIP data → lost chance to attract viewers

4:13:19 PM MON Oct 8

Try **Interactive Playmaker™** only at **HBO**

4:00 PM 4:30 PM 5:00 PM 5:30 PM

	5	Blues Brothers	
	54	The Practice	ER
	2 - 1	HeadlineNews	Headline...
	8 - 1	Promised Land	Touched...
	10 - 1	3rd Rock	Will and... Frasier
	11 - 1	Dawson's Creek	Mars Att...
	13 - 1	ABC Monday Night Football	
	14 - 1	Laws of Deception	

Blues Brothers

TV-PC

Station Logos

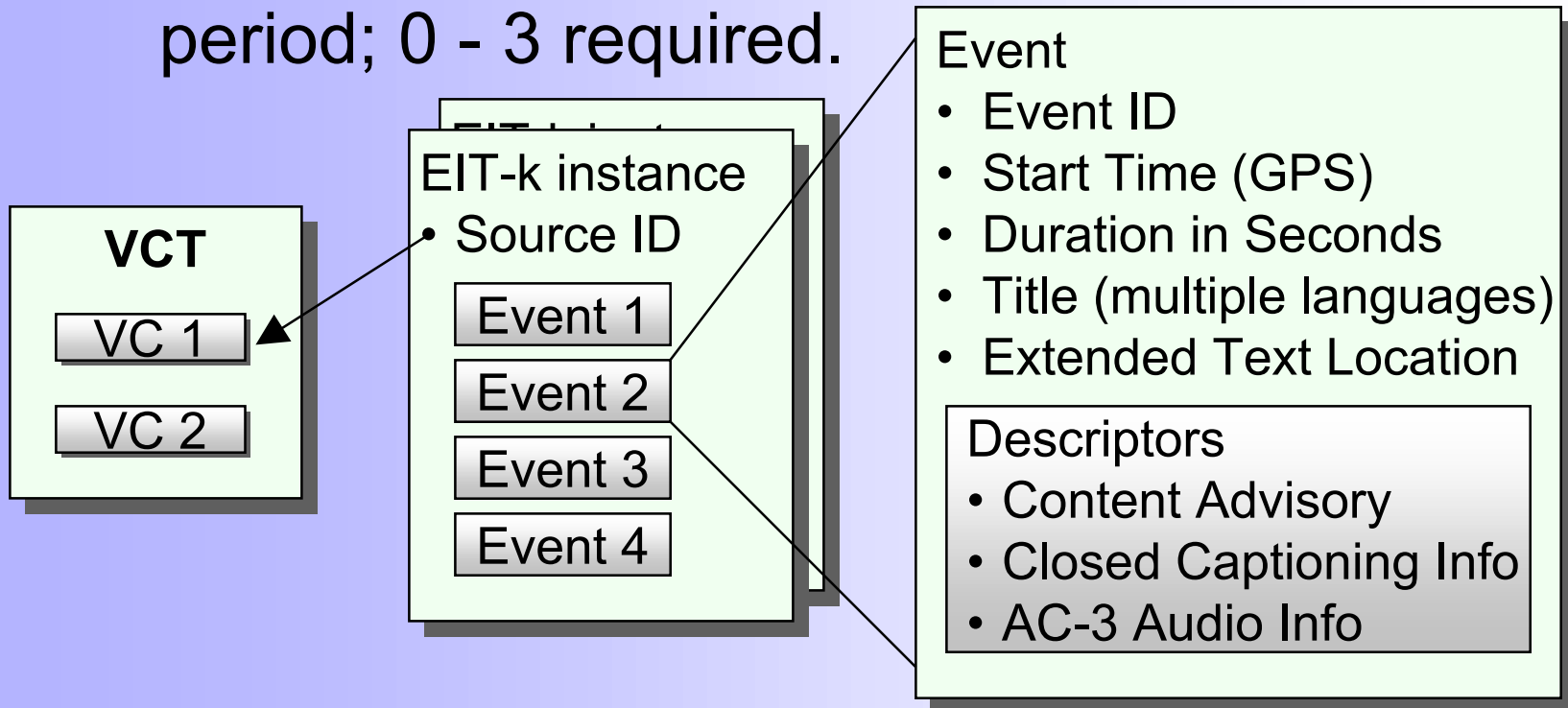
Banner Ad

Trailers

Event Information Tables (EITs)



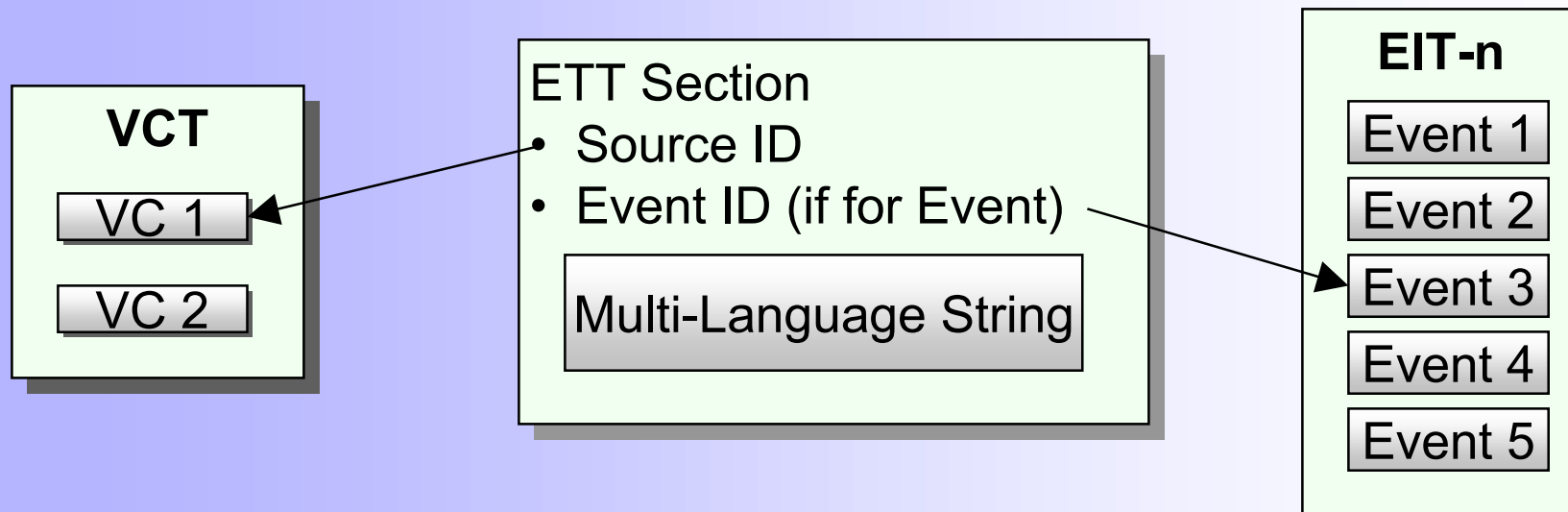
- Describe “events” (TV programs).
- EIT-0 through EIT-127; each covers 3 hour period; 0 - 3 required.



Extended Text Tables (ETTs)



- Text descriptions for channels and events
- May be in multiple languages
- May use huffman coding to reduce bandwidth



System Time Table (STT)



- Gives Clock Time
 - Gives the current GPS time
 - Gives daylight savings time indicators

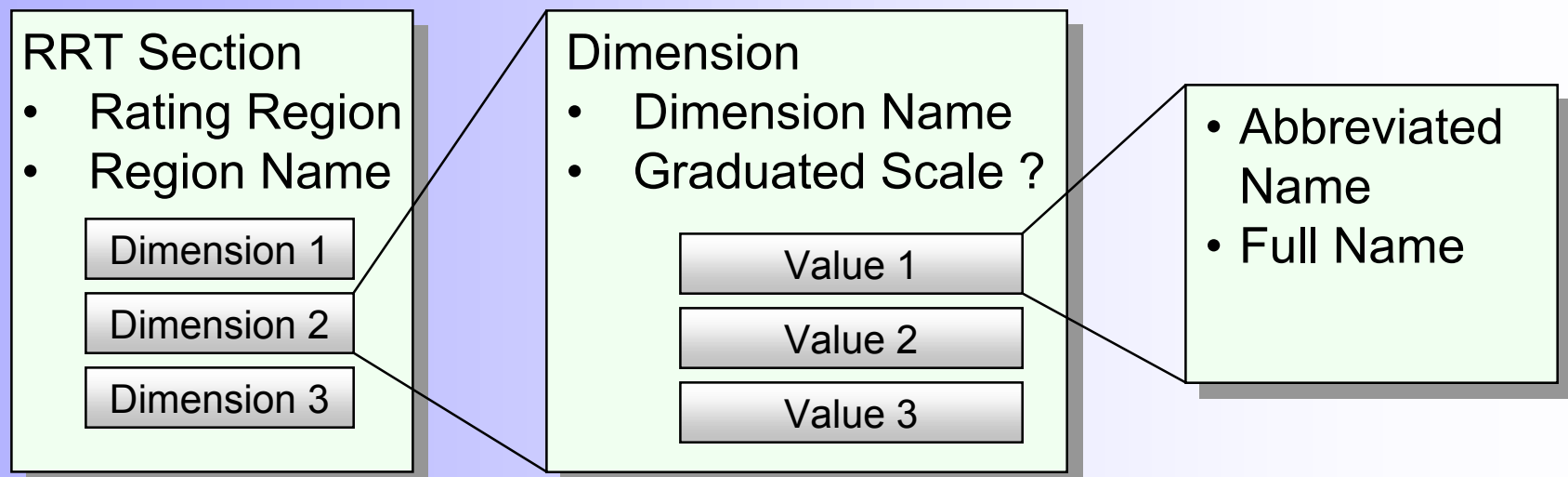
STT

- System Time in GPS Seconds
- UTC Offset in Seconds
- Daylight Savings Time ?
- Day of Month to Switch
- Hour of Month to Switch

Rating Region Table (RRT)



- Defines content advisory system(s) in use
 - Defines rating scheme(s) for rating region(s) (MPAA and TV Parental Guidelines in USA)
 - Ratings are referenced by Content Advisory Descriptors in EITs

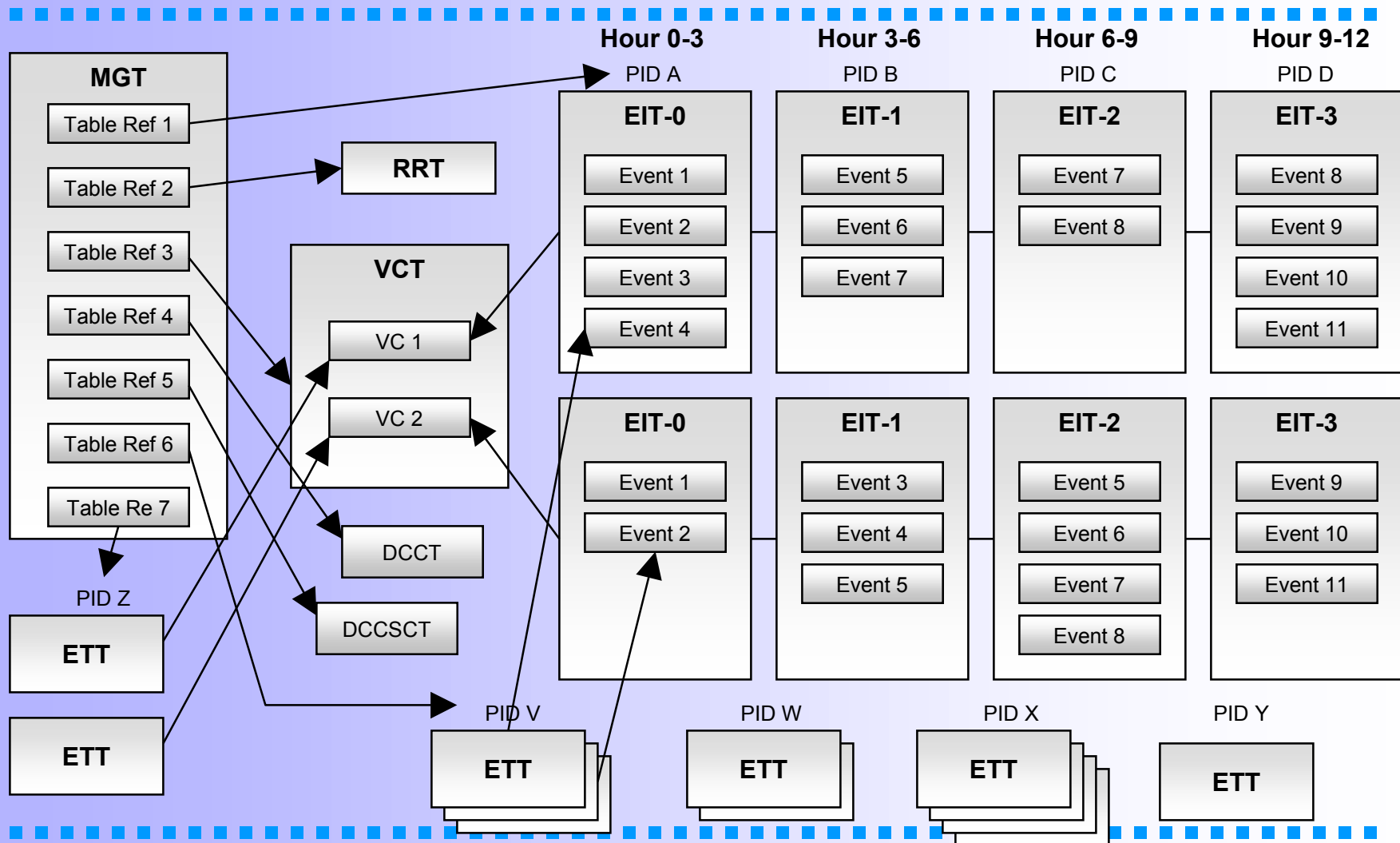


Directed Channel Change Tables (DCCT, DCCSCT)



- Directed Channel Change Table (DCCT)
 - Instructs receiver to change channels, based on viewer preferences, demographics, location, etc.
 - Usually used to change channels within transport stream, e.g., multiple regional news broadcasts
- DCC Selection Code Table (DCCSCT)
 - Provides classification scheme used for viewer to express preferences during TV receiver setup
- Especially useful on channel lineup changes (e.g., between 4 SD and 1 HD channel).

PSIP Tables: The Big Picture



PSIP Implementation Issues



- Basic requirements:
 - Gather the correct information
 - Get table formats and timing correct
 - Insert information into broadcast
- Must fit into station environment
- Must evolve with station

Gathering the Information



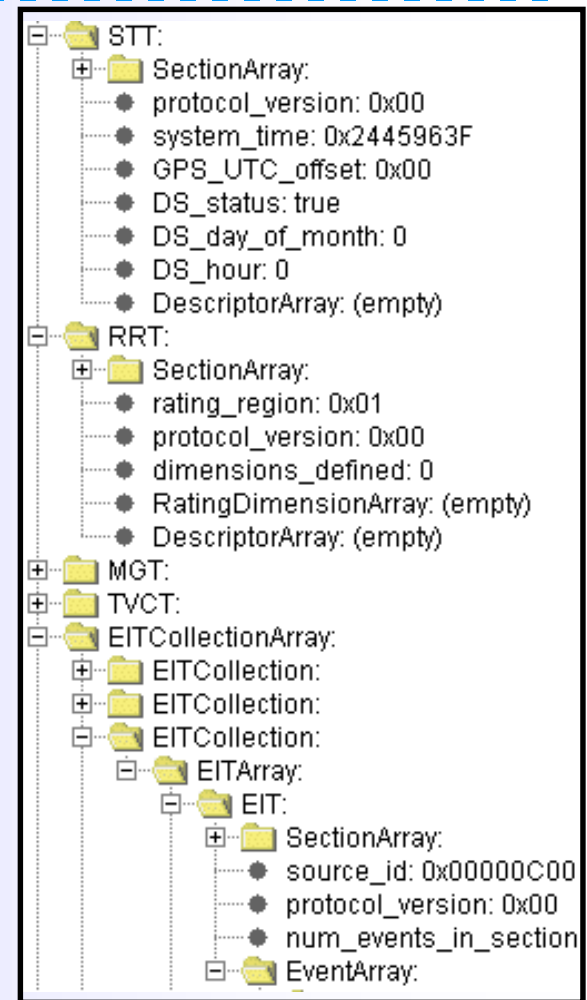
- Manual entry/editing:
 - User context, user terminology
(hides complexity; prevents inconsistency)
 - Remote UIs for different departments
 - Convenient operations for last minute updates
- Automated interfaces:
 - Subscription to listing service
 - Interface to traffic system
 - Interface to automation system

Manual User Interface: Hiding Complexity



User Interface

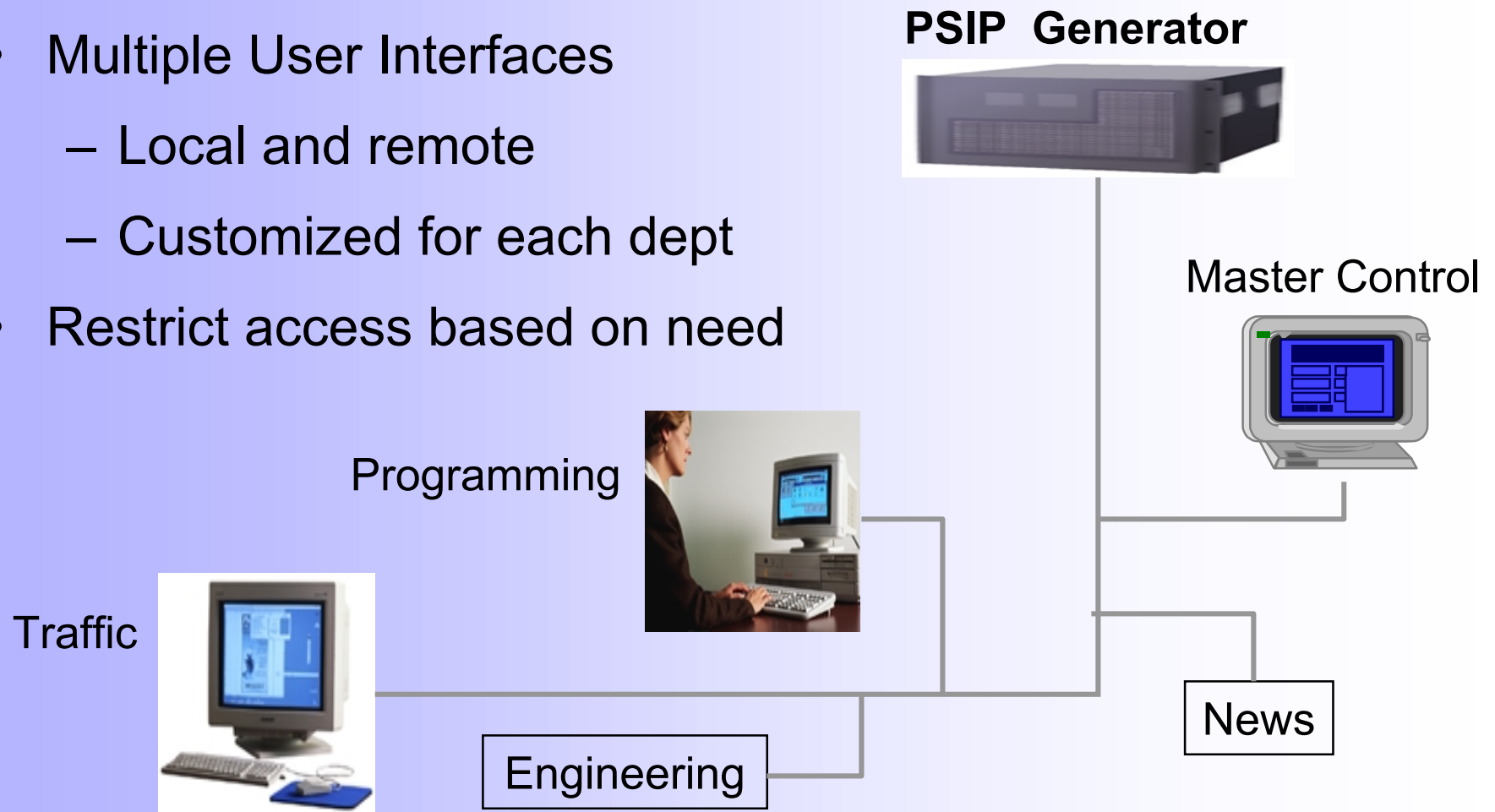
Start Time	Duration	End Time	Event Name	
04:00	120	06:00	Wyatt Earp	The portrait tra defending boor
06:00	35	06:35	News	
06:35	30	07:05	George Michael Sports Machine	
07:05	60	08:05	Dateline NBC	Stipulations of
08:05	60	09:05	Meet the Press	(R)Crisis in Yug Podesta, White
09:05	55	10:00	Kickin' It	
10:00	30	10:30	Endless Youth	
10:30	30	11:00	Game Warden Wildlife Journal	(R)Bison; firea



Remote User Interface Considerations



- Multiple User Interfaces
 - Local and remote
 - Customized for each dept
- Restrict access based on need

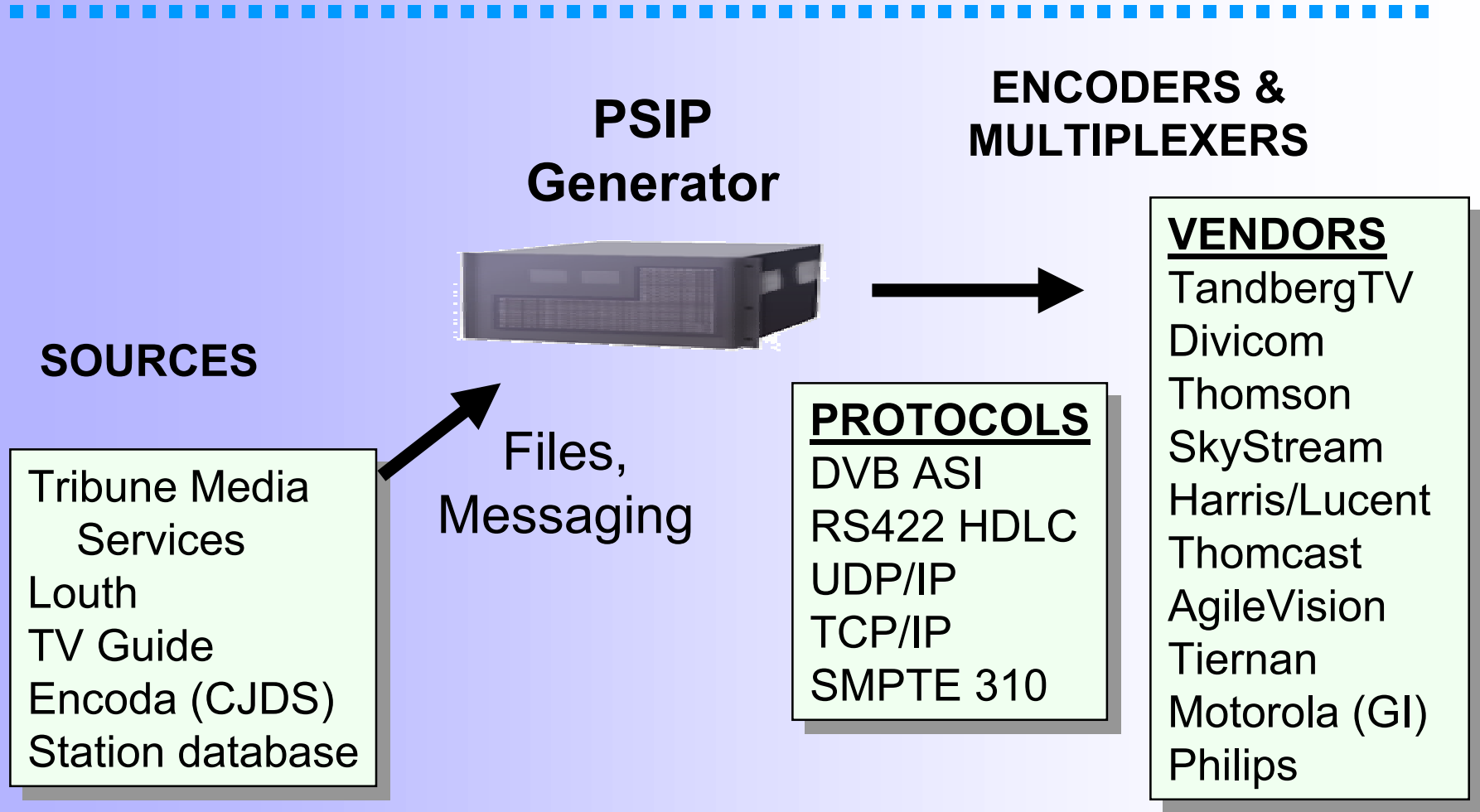


Automated Interfaces

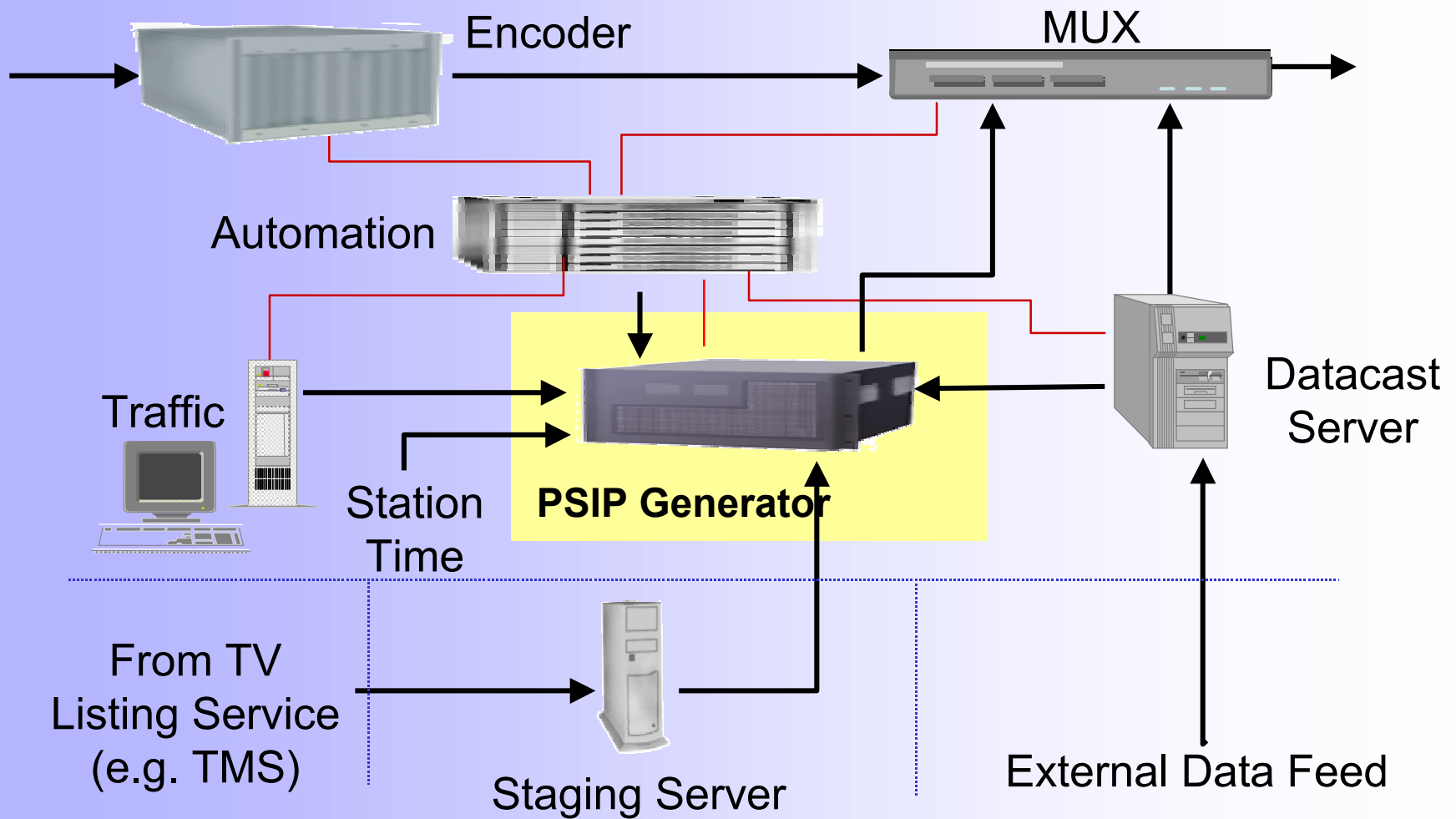


- Listing service
 - + Leverages existing input to listing service
 - + Leverages listing service program info database
 - Subscription cost (but less than manual entry)
- Traffic system
 - + Leverages existing information in traffic system
- Automation system
 - + Catches last minute programming changes
 - + Ensures precise timing of changes to VCT

Inserting PSIP into Broadcast



Fitting into Station Environment



Evolving with Station



-
- Interoperable with diverse data sources
 - Able to merge data from multiple sources
 - Interoperable with diverse encoders/muxes
 - Fault tolerant: 24 hours/day, 7 days/week
 - Will support future PSIP extensions

Summary



- PSIP is important
 - Provides tuning info needed by receivers
 - Supports EPG to attract viewers to channel(s)
 - Enables “V-chip” (content advisory) controls
 - Enables language selection for audio track
 - Maintains correct time in DTV receiver
- PSIP generation system must be:
 - Easy to use
 - Highly automated to minimize staffing costs
 - Fully integrated into station environment

QUESTIONS?



THANKS!

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