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- DVD-EXTRA processing
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- Sheffield-based software company
- Parent company is ZOO Digital Group plc
- Sister company is ZOO Digital Publishing Ltd. – publisher of interactive entertainment software
- ZOOtech develops and markets professional DVD-Video development software

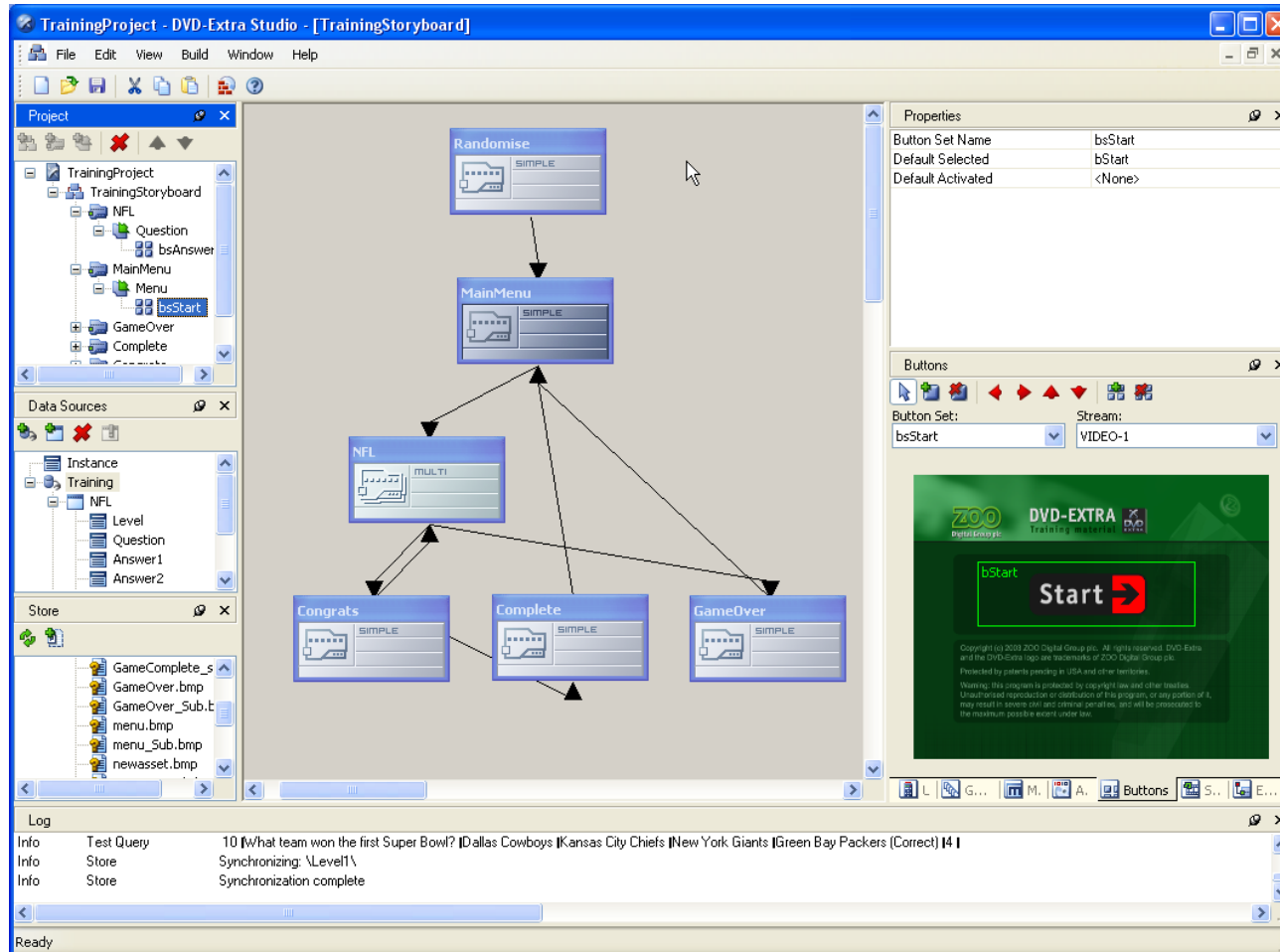
- High quality digital video and audio
- Widescreen display
- Surround sound
- Subtitles
- Multiple camera angles
- Menus
- Interactivity (navigation commands)

- Film and Video market
- Education
- Training
- Games
- Marketing and promotions
- Product catalogues
- Point of sale

- DVD-Video standard supports interactivity
- Interactivity has been largely inaccessible until now
- Conventional DVD authoring tools are designed for linear content production
- These tools are unsuited to interactive content production

- DVD-Video is a playback format
- All material played must exist on the disc
- No support for dynamic creation of material during playback
- Interactive programs require (the perception of) dynamic creation of material
- Support of interactive programs requires the production of complex DVD titles with large numbers of audio-visual assets
- This is very costly using conventional DVD authoring

- DVD-EXTRA: a new method of developing interactive DVD-Video titles
- A way to create complex interactive titles easily, efficiently and reliably
- Used to create discs for DVD-Video playback similar to multimedia CD-ROM
- Implemented in a Microsoft Windows-based system: DVD-EXTRA STUDIO



The screenshot shows the DVD-EXTRA STUDIO interface with a storyboard for a training DVD menu. The storyboard consists of several menu screens:

- Randomise** (SIMPLE) - Points to MainMenu
- MainMenu** (SIMPLE) - Points to NFL, Congrats, Complete, and GameOver
- NFL** (MULTI) - Points to Congrats, Complete, and GameOver
- Congrats** (SIMPLE) - Points to Complete
- Complete** (SIMPLE) - Points to GameOver
- GameOver** (SIMPLE) - Points to Complete

The interface includes a Project tree on the left, a Properties panel on the right, and a preview window at the bottom right showing a menu screen with a "Start" button. The preview window also displays copyright information for ZOO Digital Group.

Properties Panel:

| | |
|-------------------|---------|
| Button Set Name | bsStart |
| Default Selected | bStart |
| Default Activated | <None> |

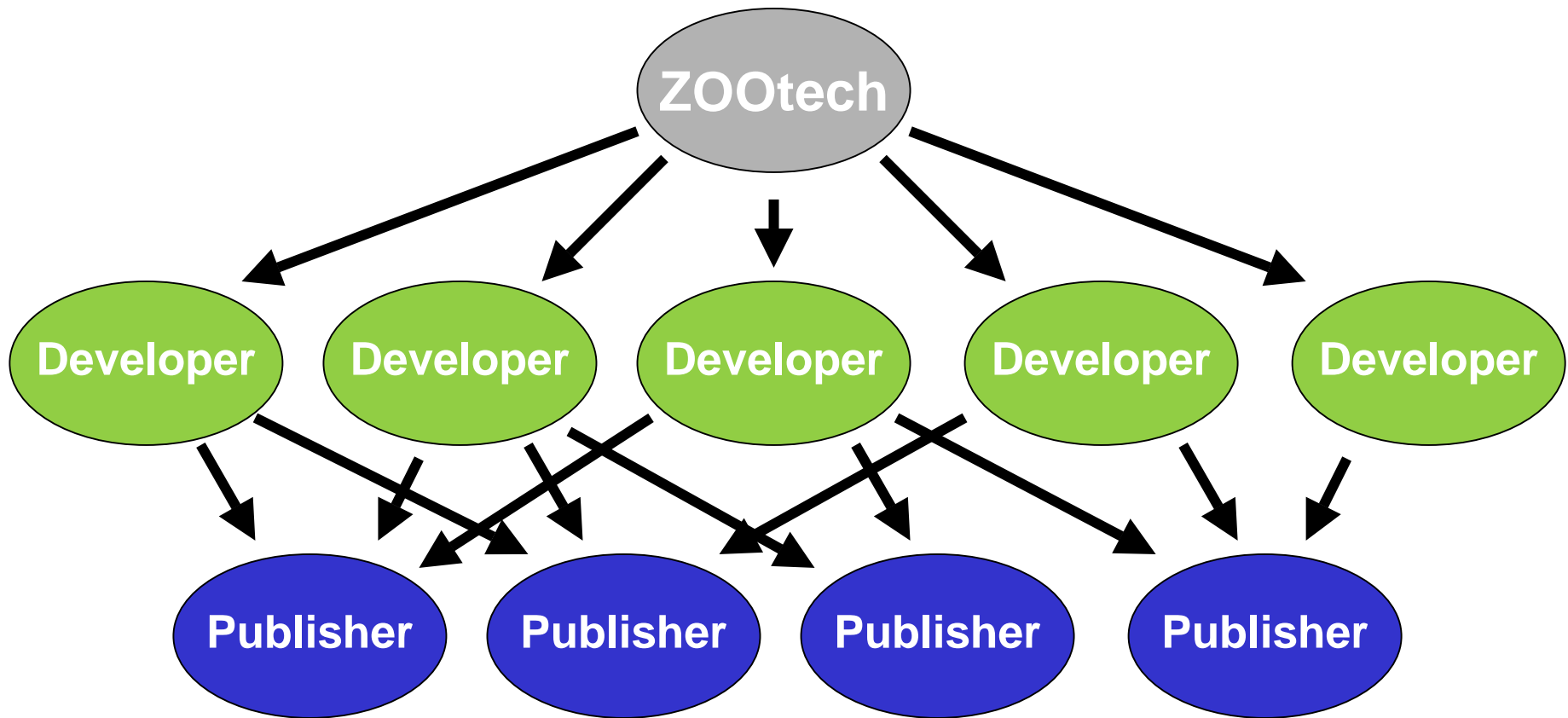
Buttons Panel:

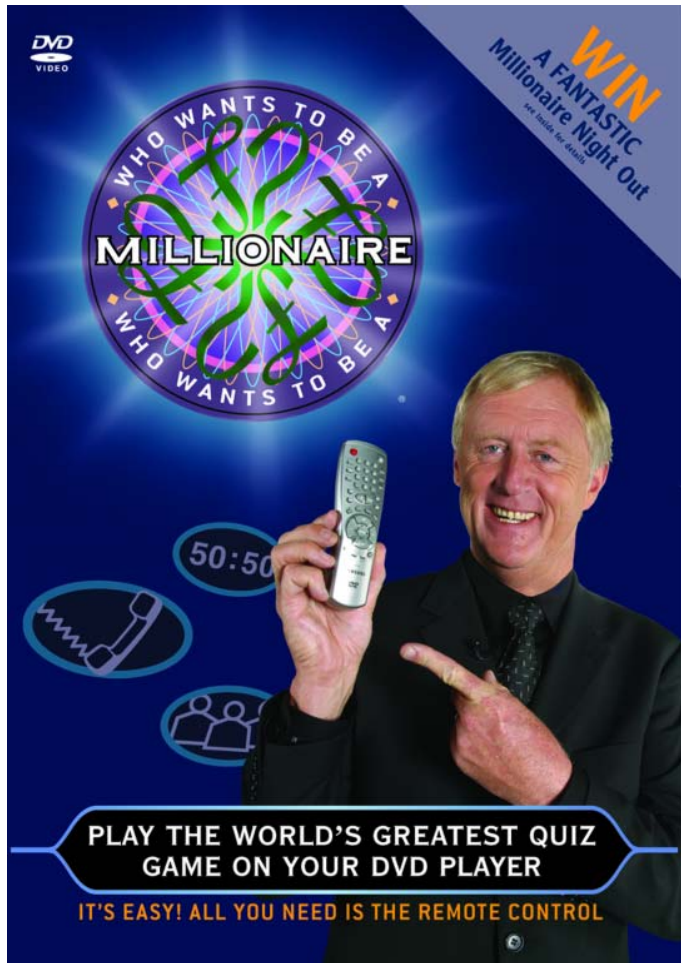
Button Set: bsStart Stream: VIDEO-1

Log:

```

Info  Test Query      10 |What team won the first Super Bowl? |Dallas Cowboys |Kansas City Chiefs |New York Giants |Green Bay Packers (Correct) |4 |
Info  Store           Synchronizing: \Level1\
Info  Store           Synchronization complete
    
```



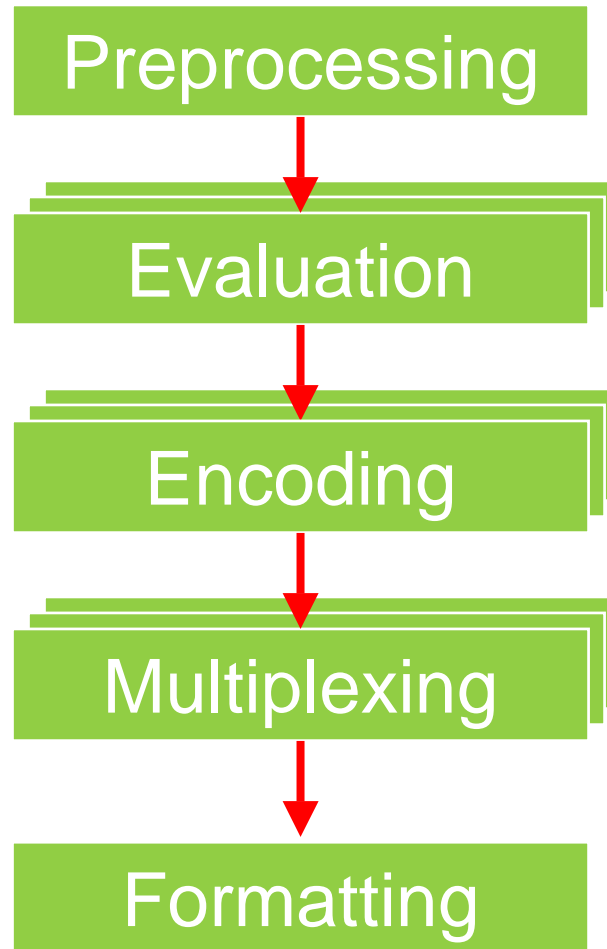


- Fully playable on any DVD-Video player
- Based on the chart-topping TV show from Celador
- Hosted by the UK celebrity Chris Tarrant
- Featuring all aspects of the TV experience – 50:50, Phone a Friend, Ask the Audience

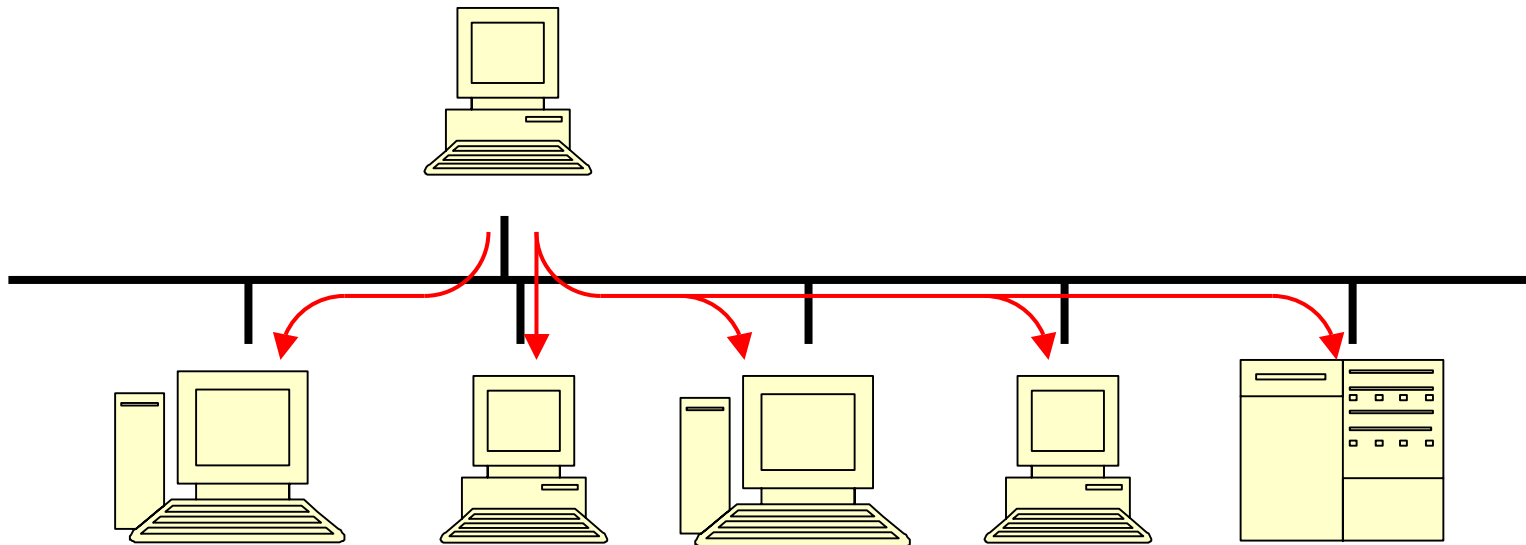
Millionaire Statistics



| | |
|--|-------------------------------------|
| Disc | DVD5 (single layer, 4.7GB) |
| Number of questions | 15 levels |
| Question sequencing | Fully randomized - no repeats |
| Number of possible game variations | 10^{27} (1 followed by 27 zeroes) |
| DVD-EXTRA storyboard | 50 components |
| DVD-EXTRA generators | 10 generators |
| Number of unique assets created by DVD-EXTRA | 92,067 |
| Number of multiplexed assets (includes duplicates) | 220,738 |
| Number of menus | 8,000 approx |
| Number of navigational links | 56,000 approx |



- Evaluation and encoding are very CPU intensive
- Evaluation can be memory intensive
- Incoming data set *may* be large
- Output data set is up to 8.5 Gbytes
- Intermediate data set can be 100's Gbytes



- Inter-processor communications are minimal – OK
- Data storage and transfer requirements are significant
- Viability hinges on balance between:
 - processing capacity
 - data transfer overhead

- Significant distributed processing resource is required (processor farm)
- Windows platform is preferred

- Storage requirements can be distributed across the processor farm
– OK
- Volatility of intermediate data – incremental build implications

- Outgoing data is up to 8.5 Gbytes

| Bandwidth | Theoretical Transfer Time |
|-----------|---------------------------|
| 128 Kbps | 7 days 16 hours |
| 1 Mbps | 23 hours |
| 10 Mbps | 2 hours 21 mins |
| 100 Mbps | 14 mins |
| 1 Gbps | 1 min 24 secs |

- DVD-EXTRA processing is well suited to distributed computation
- Data transfer requirements are significant
- Viability of the Grid depends most significantly on availability of bandwidth

Thank You



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