

# BINARY SPACE

## RELIABLE SPACE SYSTEMS

## The Virtual Producer™ Project

All information is subject to change without notice and does not represent a commitment on the part of **BINARY SPACE**.  
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### Document Change Log

Issue	Revision	Date	Affected	Reason for change
1	0	June 2011	All	New document
1	1	July 2011	Page 9	Added 'Title' property for the video tag.
1	2	October 2011	Pages 5-7	Added 'Posture' & 'Mood' Producer Slang tags
1	3	May 2012	Page 9	Extended 'video' & 'video clip' tags
1	4	October 2013	Page 3,12	Updated/new figures



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### 1. Introduction

Producing 3D animated videos is still a time-consuming and highly repetitive task. Despite the fact that there is a lot of software available for creating 3D content, putting it all together requires a huge effort, which often has a bad influence on the story. Furthermore, there are currently no tools using synthetic voices and so the video-maker needs to get involved in that part as well.

### 2. Goals

The Virtual Producer™ project attempts to overcome the above mentioned challenges by providing an easy, low-cost solution combining all tasks necessary to produce 3D content within one tool:

- Convert a story written in the 'Producer Slang' language (see a later chapter) directly into a video without any human interaction
- Generate idle animations (breathing, head/body movements etc.)
- Apply moods (happy, sad etc.) to the actors
- Provide synthetic voices
- Highly configurable

Furthermore, the Virtual Producer™ will provide animations required to support the marketing activities of **BINARY SPACE**.

### 3. Concept

In most cases, videos are produced to tell a story – and this is the key design point of the Virtual Producer™: Why not add stage directions right into the plain story text and let software render everything, including the actor's idle animations? As long as there is only one actor speaking at a given moment, this is good enough!

A special language called 'Producer Slang' has been developed to contain instructions on how to speak and animate a scene. Scripts written in this language serve as input for the Virtual Producer™, which then generates the video output without any further human interaction.

In order to perform all the necessary tasks required to do this, the Virtual Producer™ takes advantage of some additional software:

- *3D Content Provider*  
The heart of the Virtual Producer™ is, of course, the 3D content provider, which will provide most services like scene rendering and animations.
- *Speech Software*  
The generation of the synthetic voices requires special software granting control over how text is spoken.



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- **Media & Encoder Software**

The rendered images must be encoded and mixed with the speech (and other) audio files.

After the evaluation of several 3D content providers (including game developing environments), the [DAZ 3D Studio](#) was selected to serve as basis for the Virtual Producer™, which is implemented as a plug-in to DAZ 3D:

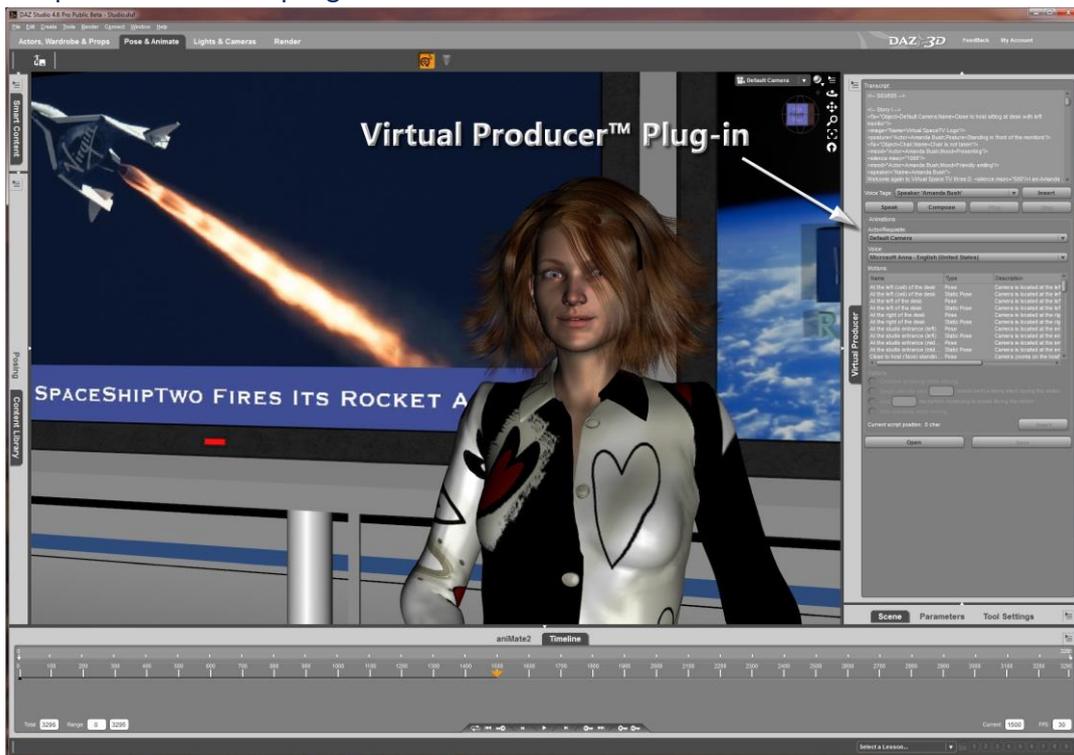


Figure 3.1. - DAZ 3D Studio

The figure to the right shows once again what the Virtual Producer™ is doing:

Takes a script written in the 'Producer Slang' language, animates all actors and requisites of the scene as specified and generates the resulting video.

It is intended to extend the capabilities of the Virtual Producer™ to include an automatic web search for interesting topics in order to set up a show completely autonomously.

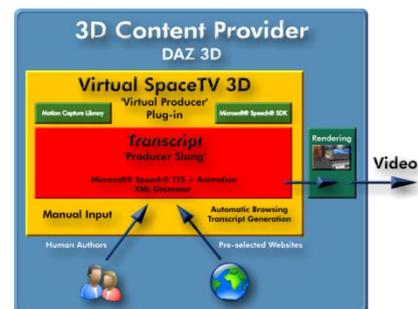


Figure 3.2. - Virtual Producer™ Plug-in



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In more detail the Virtual Producer™ performs the following steps:

### 1. Pass

Analysis of the script and measurement the spoken text.

### 2. Pass

Generation of the audio files resulting from the spoken text. Various actors are supported.

### 3. Pass

Inserting the specified actor and requisites animations at the calculated time (based on the first pass).

### 4. Pass

Applying random idle animations to all the actors. These animations are user-definable and include breathing, head & body movements as well as moods (reflected by facial expressions).

### 5. Pass

Applying the lip-synchronization and associated facial animations to the actors.

### 6. Pass

Encoding all rendered images to a video.

### 7. Pass

Multiplexing the various audio & video files.

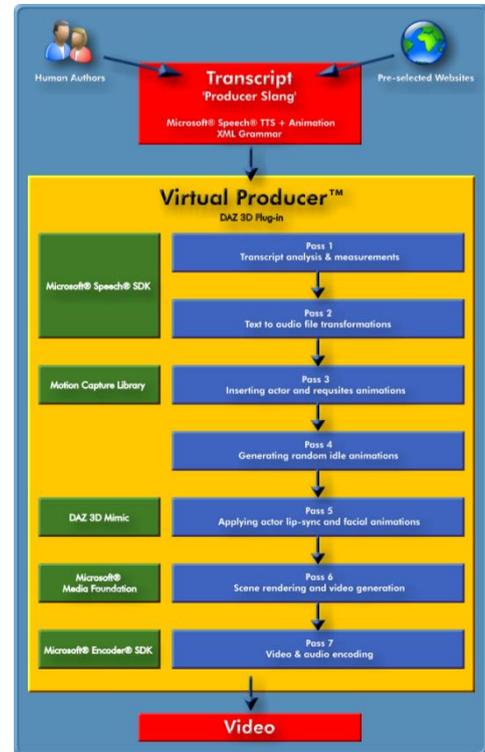


Figure 3.3. - Virtual Producer™ Workflow

The Virtual Producer™ is highly configurable as it allows the user to define how, for example, the actors should breathe or move around. All these pre-defined poses & animations are summarized in a scene set-up file.

## 4. Producer Slang

A central part of the Virtual Producer™ is the language used to prepare the input. It is called 'Producer Slang' and is based on the Microsoft® Speech® TTS XML based syntax. In order to include set directions, it has been extended with additional tags:

### Speaker Tag:

**<speaker="Name=Actor name">Text to be spoken</speaker>**

Directs the Virtual Producer™ to select the appropriate voice for synthesizing the text to be spoken.



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### **Fix Tag:**

`<fix="Object=Actor or requisite name;Name=Pose name"/>`

Applies the specified pose to the actor or requisite twice at the time calculated by its position in the script.

### **Note:**

This can be useful to prevent unwanted movement extrapolations.

### **Pose Tag:**

`<pose="Object= Actor or requisite name;Name= Pose name"/>`

Applies the specified pose to the actor or requisite at the time calculated by its position in the script.

### **Animation Tag:**

`<animation="Object= Actor or requisite name;Name=Animation name"/>`

Inserts the specified animation of the actor or requisite at the time calculated by its position in the script.

### **Posture Tag:**

`<posture="Actor= Actor name;Posture=Posture name"/>`

Inserts the specified posture of the actor at the time calculated by its position in the script and selects the appropriate idle body animations (until a different posture is specified).

### **Mood Tag:**

`<mood="Actor= Actor name;Mood=Mood name"/>`

Applies the specified mood to the actor at the time calculated by its position in the script and selects the appropriate idle facial animations (until a different mood is specified).

### **Image Tag:**

`<image="Name=Image name"/>`

Overlays the image on a specified surface at the time calculated by its position in the script. The properties of the image as well as its target surface are defined in the scene set-up file.

### **Image Sequence Tag:**

`<image sequence="Name=Image sequence name"/>`

Overlays the image sequence on a specified surface starting at the time calculated by its position in the script.

The properties of the image sequence as well as its target surface are defined in the scene set-up file.



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### Audio Tag:

**<audio clip="Name=Audio clip name"/>**

Overlays the audio clip at the time calculated by its position in the script.  
The properties of the audio clip are defined in the scene set-up file.

### Video Tag:

**<video clip="Name=Video clip name"/>**

Overlays the video clip on the specified surface and at the time calculated by its position in the script.  
The properties of the video clip are defined in the scene set-up file.

The Microsoft® Speech® TTS XML supports five additional tags that control the state of the current voice: **volume**, **rate**, **pitch**, **emph**, and **spell**.

### Example:

```
<fix="Object=Default Camera;Name=Camera (Host Position)"/> <speaker="Name=Amanda Bush"><silence msec="10000"/>Welcome to our first broadcast of the 'Virtual Space TV'.<silence msec="2000"/></speaker> <pose="Object=Default Camera;Name=Camera (Host Position)"/>
```

The Virtual Producer™ first positions the camera called 'Default Camera' at the 'Camera (Host Position)', selects the speaker called 'Amanda Bush' as speaker, waits 10s before saying 'Welcome to our first broadcast of the ,Virtual Space TV'.' with the synthetic voice assigned to Amanda Bush.

## 5. Scene Set-up File

The scene set-up file contains all pre-defined resources required for a show. It is a XML-based file accepting the following tags:

### Actor Tag:

```
<actor="Name=Actor name;Voice=Voice name;Directory=Directory name;Postures=Postures names;Moods=Mood names;IdleBreathing=DAZ 3D poses;IdleBodyMovements= DAZ 3D poses;IdleEyesMovements= DAZ 3D poses;IdleFacialExpressions= DAZ 3D poses"/>
```

<i>Actor name</i>	Name of the actor
<i>Voice name</i>	Name of the Microsoft® Speech® compatible voice to be assigned to the actor
<i>Directory name</i>	Specifies the directory for all actor related files



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<i>Posture names</i>	Comma separated postures for the actor (e.g. 'Sitting', 'Sitting & Typing', 'Idle Standing' etc.) <u>Syntax:</u> Node to apply the posture to/filename (e.g. 'Amanda Bush/Sitting.dsb')
<i>Mood names</i>	Comma separated moods the actor can have (e.g. 'Happy', 'Sad' etc.) <u>Syntax:</u> Node to apply the mood to/filename (e.g. 'Head/Sad.dsb')
<i>DAZ 3D poses</i>	Comma separated poses of the actor <u>Syntax:</u> Node to apply the pose to/filename For <i>IdleBodyMovements</i> poses an optional '(Posture=X)' can be added to the filename to indicate that those idle body movements should only be applied when the actor has the posture X. Furthermore, the tag '(Speaking)' can be added to the filename too to prevent the use of the pose when the actor is silent (not speaking). For <i>IdleFacialExpressions</i> poses an optional '(Mood=X)' can be added to the filename to indicate that those idle facial expressions should only be applied when the actor is in mood X.

Lists the various actors involved in a scene and how their idle animations should take place.

### **Fix Tag:**

**<fix="Name=Pose name;Description=Text;Location=File name;Duration=0;Objects=Actor or requisite names"/>**

<i>Pose name</i>	Name of the pose
<i>Text</i>	Describes the pose
<i>File name</i>	Specifies the DAZ 3D pose file name
<i>Actor or requisite names</i>	Comma separated actor or requisite name to which the pose can be applied to

Lists the various fix-poses required for a scene.

### **Pose Tag:**

**<pose="Name=Pose name;Description=Text;Location=File name;Duration=0;Objects=Actor or requisite names"/>**

Lists the various poses required for a scene.



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### **Animation Tag:**

**<animation**="Name=*Animation name*;Description=*Text*;Location=*File name*;  
Duration=*ms*; Objects=*Actor or requisite names*"/>

<i>Animation name</i>	Name of the animation
<i>Text</i>	Describes the animation
<i>File name</i>	Specifies the file name of the animation
<i>ms</i>	Duration of the animation (in ms)
<i>Actor or requisite names</i>	Comma separated actor or requisite name to which the animation can be applied to

Lists the various animations required for a scene.

### **Image Tag:**

**<image**="Name=*Image name*;Description=*Text*;Location=*File name*;  
*Surface=Node/Surface*"/>

<i>Image name</i>	Name of the image
<i>Text</i>	Describes the image
<i>File name</i>	Specifies the file name of the image
<i>Node/Surface</i>	Forward-slash separated name of the node and its surface on which the image should be overlaid

Lists the various image overlays required for a scene.

### **Image Sequence Tag:**

**<image sequence**="Name=*Image sequence name*;Description=*Text*;Location=*File name*;  
*Surface=Node/Surface*;StartNo=*n<sub>1</sub>*;StopNo=*n<sub>2</sub>*"/>

<i>Image sequence name</i>	Name of the image sequence
<i>Text</i>	Describes the image sequence
<i>File name</i>	Specifies the file names of the images as part of the sequence

#### Syntax:

The file name must contain placeholders for the numbers (e.g. '*path\filename%02u.bmp*')

<i>Node/Surface</i>	Forward-slash separated name of the node and its surface on which the images should be overlaid
<i>n<sub>1</sub></i>	Number of the first image to overlay
<i>n<sub>2</sub></i>	Number of the last image to overlay

Lists the various image sequence overlays required for a scene.



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### Audio Clip Tag:

**<audio clip**="Name=*Audio clip name*;Description=*Text*;Location=*File name*;Fade-In= $t_1$ ;Fade-Out= $t_2$ ;Duration=*ms*;Volume=*vol*"/>

<i>Audio clip name</i>	Name of the audio clip
<i>Text</i>	Describes the audio clip
<i>File name</i>	Specifies the file name of the audio clip
$t_1$	Specifies the fade-in time interval (in ms)
$t_2$	Specifies the fade-out time interval (in ms)
<i>ms</i>	Duration of the audio clip (in ms)
<i>vol</i>	Volume of the audio overlay (0-10)

Lists the various audio clips required for a scene.

### Video Clip Tag:

**<video clip**="Name=*Video clip name*;Description=*Text*;Location=*File name*;Position= $X,Y,dX,dY$ ;Fade-In= $t_1$ ;Fade-Out= $t_2$ ;Opacity= $n$ ; Duration=*ms*; Volume=*vol*"/>

<i>Video clip name</i>	Name of the video clip
<i>Text</i>	Describes the video clip
<i>File name</i>	Specifies the file name of the video clip
$X,Y,dX,dY$	Position ( $X,Y$ ) and width ( $dX,dY$ ) of the video overlay
$t_1$	Specifies the fade-in time interval (in ms)
$t_2$	Specifies the fade-out time interval (in ms)
$n$	Specifies the opacity of the overlay (0-100)
<i>ms</i>	Duration of the video clip (in ms)
<i>vol</i>	Volume of the video overlay (0-10)

Lists the various video clips required for a scene.

### Note:

Video clip overlays can only take place on flat, rectangular and non-animated surfaces.

### Video Tag:

**<video**="Title=*Video title*;Fps= $n$ ;Resolution= $XxY$ ;Output=*File name*;Location=*Image files name*"/>

<i>Video title</i>	Title of the video
$n$	Frames per second of the final video (typically 30)
$XxY$	Resolution (in pixels) of the resulting video
<i>File name</i>	Specifies the file name of the final video
<i>Image files name</i>	Name of the image files resulting from the rendering process

Specifies the properties of the resulting video.



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### 6. Software Requisites

The following software is required to use the Virtual Producer™:

- DAZ 3D Studio (32-bit & 64-bit)
- Microsoft® Speech® SDK
- Neospeech® TTS Voices (VW Kate, VW Paul)
- Microsoft® Media Foundation®
- Microsoft® Encoder® SDK

The Virtual Producer™ is written in C++ (Microsoft® Foundation Classes)/C# and has been developed using Microsoft® Visual Studio® 2010 (SP1).

### 7. Future

The Virtual Producer™ will first be used to create a simple broadcast called 'Virtual SpaceTV 3D' covering important events from space and science:

<http://www.youtube.com/channel/UCHGqd2unZL8WFOc6Fxxu1Sw/videos>

Depending on the resulting feed-back it might be extended to automatically browse pre-selected websites for news and to compose shows completely autonomously.



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## A. Virtual Producer™ Plug-in

Transcript:

```
<posture="Actor=Amanda Bush;Posture=Sitting at the desk"/>  
<mood="Actor=Amanda Bush;Mood=Friendly smiling"/>  
<silence msec="500"/>  
<mood="Actor=Amanda Bush;Mood=Presenting"/>  
<mood="Actor=Amanda Bush;Mood=Friendly smiling"/>  
<speaker="Name=Amanda Bush">  
Hi I'm Amanda Bush.  
<silence msec="1000"/>  
</speaker>
```

Voice Tags:

Animations

Actor/Requisite:

Voice:

Motions:

Name	Type
Standing between the monitors	Static Pose
Standing between the monitors with left monitor	Static Pose
Standing between the monitors with right monitor	Static Pose
Standing in front of the left monitor (distant) with monitors	Static Pose
Standing in front of the left monitor with left monitor	Static Pose
Standing in front of the space weather monitor	Static Pose
Standing left to the left monitor (distant) with left monitor	Static Pose
Standing left to the left monitor (out of view) with left m...	Static Pose
Standing left to the left monitor with left monitor	Static Pose
Standing right to the space weather monitor	Static Pose
Sitting at the desk	Posture

Options:

Continue speaking while moving

Speak only the next  words before being silent during the motion

Wait  ms before continuing to speak during the motion

Stop speaking while moving

Current script position: 0 char

Figure A.1. - Virtual Producer™ Plug-in



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## B. Virtual Producer™ Show Template (Script Editor)

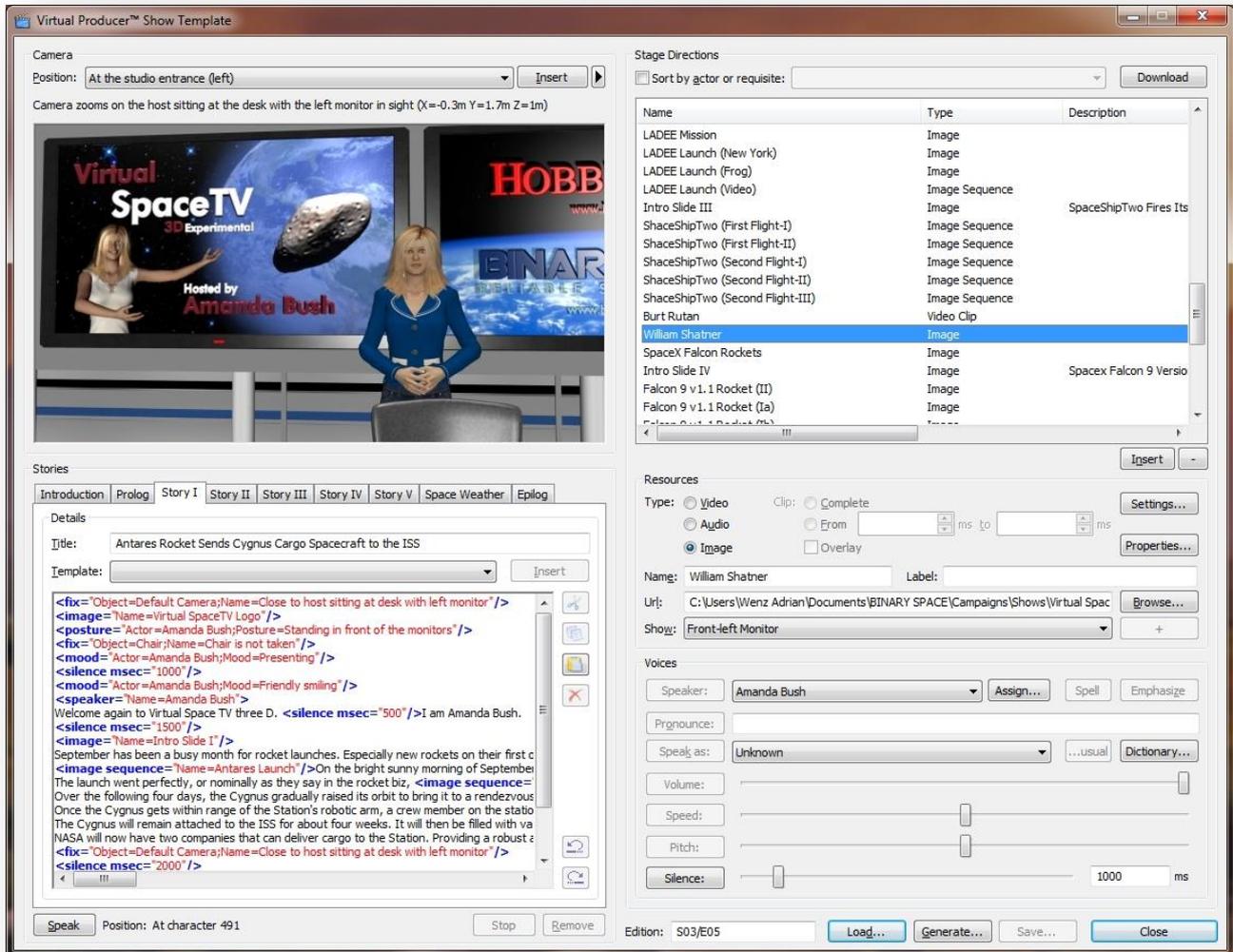


Figure B.1. - Virtual Producer™ Show Template (Script Editor)

